Reference Manual: Commands

SAP® Adaptive Server® Enterprise 16.0

Contents

CHAPTER 1 Commands

SAP® Adaptive Server® Enterprise commands, clauses, and other elements are used to construct a Transact-SQL® statement.

Permission checks for an SAP® ASE command may differ based on the granular permissions setting. Check the Permission section for each command for details. See *Using Granular Permissions* in the *Security Administration Guide* for more information on granular permissions.

alter database

Increases the amount of space allocated to a database, as well as to the modified pages section of an archived database. Alters one or more database-wide properties such as data manipulation language (DML) logging level, defaults for compression, in-row large object (LOB) storage, and so on.

Syntax

```
alter database database_name
    [on {default | database_device} [= size]
        [, database_device [= size]]...]
    [log on {default | database_device} [= size]
        [, database_device [= size]]...]
    set { [durability = { no_recovery | at_shutdown | full}]
        [[,] dml_logging = {full | minimal} ]
        [[,] template = { database_name | NULL}]
    [, [no] async_init]
    [, compression = {none | row | page}]
    [, lob_compression = {compression_level | off}]
    [,] inrow_lob_length = value [log off database_device
       [= size | [from logical_page_number] [to logical_page_number]]
    [, database_device
    [= size | [from logical_page_number] [to logical_page_number]]
    [with override]
    [for load]
    [for proxy_update]
```

To fully encrypt and decrypt databases:

```
alter database database_name
{[encrypt with key_name | decrypt [with key_name]] [parallel
degree_of_parallelism]
| resume [encryption | decryption [parallel degree_of_parallelism]]
| suspend [encryption | decryption]
}
```

To shrink databases:

```
alter database database_name
off database_device {=size  | [from page_number] [to
page_number]}
[, database_device...]
[with time='time']
[with check_only]
```

Parameters

- ***database_name*** **–** is the name of the database. The database name can be a literal, a variable, or a stored procedure parameter.
- **on –** indicates a size and location for the database extension. If you have your log and data on separate device fragments, use **on** for the data device and **log on** for the log device.
- **default –** indicates that **alter database** can put the database extension on any default database devices (as shown by the **sp_helpdevice** stored procedure in *Reference Manual: Procedures*). To specify a size for the database extension without specifying the exact location, use:

  ```
  on default = size
  ```

  To change a database device's status to default, use **sp_diskdefault**.
- ***database_device*** **–** is the name of the database device on which to locate the database extension. A database can occupy more than one database device with different amounts of space on each. Use **disk init** to add database devices to SAP® Adaptive Server® Enterprise.
- ***size*** **–** is the amount of space to allocate to the database extension. The following are example unit specifiers, using uppercase, lowercase, single and double quotes interchangeably: "k" or "K" (kilobytes), "m" or "M" (megabytes), "g" or "G" (gigabytes), and "t" or "T" (terabytes). SAP® recommends that you always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier. If you do not provide a unit specifier, the value provided is presumed to be in megabytes.

  If you do not specify a value, **alter database** extends a database by 1MB or 4 allocation unit, whichever is larger. Minimum amounts are:

Server's Logical Page Size	Database Extended By
2K	1MB
4K	1MB
8K	2MB
16K	4MB

- **log on –** indicates that you want to specify additional space for the database's transaction logs. The **log on** clause uses the same defaults as the **on** clause.
- **durability –** determines the durability level of the database, and is one of:
  - **full** – all transactions are written to disk. This is the default if you do not specify a durability level when you create the database, and ensures full recovery from a server

failure. All system databases except `tempdb` use this durability level (the traditional durability level for disk-resident databases). `tempdb` uses a durability level of **no_recovery**.

- **no_recovery** – transactions are durable only while the server is running. All durability is lost if the server fails or is shut down politely. For disk-residents databases with durability set to **no_recovery**, the SAP ASE server periodically writes data at runtime to the disk devices, but in an uncontrolled manner. After any shutdown (polite, impolite, or server failure and restart) a database created with **no_recovery** is not recovered, but is re-created from the `model` or, if defined, the template database.
- **at_shutdown** – transactions are durable while the server is running and after a polite shutdown. All durability is lost if the server fails.

- **[no] async_init –** Enables or disables asynchronous database initialization.
- **compression –** indicates the level of compression **alter database** applies to newly created tables in this database.
  - **none** – the data is not compressed.
  - **row** – compresses one or more data items in an individual row. The SAP ASE server stores data in a **row**-compressed form only if the compressed form saves space compared to an uncompressed form.
  - **page** – when the page fills, existing data rows that are row-compressed are then compressed using page-level compression to create page-level dictionary, index, and character-encoding entries.

    The SAP ASE server compresses data at the page level only after it has compressed data at the row level, so setting the compression to **page** implies both **page** and **row** compression.
- **lob_compression = off | *compression_level* –** Determines the compression level for the newly created table. Selecting **off** means the table does not use LOB compression.
- ***compression_level* –** table compression level:
  - 0 – the lob column is not compressed.
  - 1 through 9 – the SAP ASE server uses ZLib compression. Generally, the higher the compression number, the more the SAP ASE server compresses the LOB data, and the greater the ratio between compressed and uncompressed data (that is the greater the amount of space savings, in bytes, for the compressed data versus the size of the uncompressed data).

    However, the amount of compression depends on the LOB content, and the higher the compression level , the more CPU-intensive the process. That is, level 9 provides the highest compression ratio but also the heaviest CPU usage.
  - 100 – the SAP ASE server uses FastLZ compression. The compression ratio that uses the least CPU usage; generally used for shorter data.
  - 101 – the SAP ASE server uses FastLZ compression. A value of 101 uses slightly more CPU than a value of 100, but uses a better compression ratio than a value of 100.

- **inrow_lob_length = *value* –** specifies the number of bytes for an in-row `text` or `image` LOB column, and the number of characters for an in-row `Unitext` LOB column.
- **log off *database_device* –** removes unwanted portions of the log for the database from the specified database device. Using **log off** decreases the amount of space allocated to the log of a database, as well as to the modified pages section of an archive database.

  You cannot use **log off** with any other **alter database** parameter, including **log on, for load**, or **with override**.
- **= *size* –** specifies the amount of space at the end of the device that the command should affect. For this purpose, the end of a device is the highest-numbered logical page used by this database on that device. This command specifies physical storage, removing every log page on the specified device from the database:

  ```
  alter database sales_db log off mylogdev
  ```

  Size specifications round up to fit an exact number of allocation units. In an installation using a 16KB logical page size, you remove 52MB, not 50, because each allocation unit on that server is 4MB. The only time the SAP ASE server removes less space than specified is when the database's log segment uses less than that much space on that device.
- **from *logical_page_number* –** identifies the first page number affected by this command. The SAP ASE server automatically adjusts the number to indicate the allocation page's page ID. The default **from** location is the lowest numbered logical page on the device.
- **to *logical_page_number* –** identifies the last page affected by the command. Only complete allocation units (multiples of 256 pages) can be removed, so the SAP ASE server automatically adjusts the page number upwards to the last page in the allocation unit. If *logical_page_number* is the exact page number of an allocation page (that is, it is divisible by 256), that allocation unit is unaffected. For example, **to 512** affects pages up to but not including page 512.

  The default **to** location is the highest-numbered logical page on the device.
- **dml_logging {minimal | default} –** indicates the level of logging for **insert**, **update**, and **delete** commands. **full** (the default) records all changes to the log for a complete record of all transactions. If the database uses **minimal logging**, the SAP ASE server attempts to not log row or page changes to `syslogs`. However, the SAP ASE server may generate some in-memory logging activity to support run-time operations such as rolling back transactions.
- **template –** determines the template the database uses. One of:
  - *database_name* – user database that is disk-resident at full durability, and in a usable state.
  - **NULL** – removes the binding to the current template database. The database uses `model` as its template database during subsequent server restarts.
- **with override –** forces the SAP ASE server to accept your device specifications, even if they mix data and transaction logs on the same device, thereby endangering up-to-the-minute recoverability for your database. If you attempt to mix log and data on the same

device without using this clause, the **alter database** command fails. If you mix log and data, and use **with override**, you are warned, but the command succeeds.

- **for load –** is used only after **create database for load**, when you must re-create the space allocations and segment usage of the database being loaded from a dump.
- **for proxy_update –** forces the resynchronization of proxy tables within the proxy database.
- **encrypt with *key_name* –** instructs SAP ASE to fully encrypt the database.

  Specifically, the command retrieves the corresponding key ID from the `sysencryptkeys` system table in the `master` database and set the `encrkeyid` column in its related `sysdatabases` row.

  key_name is the database encryption key you used to encrypt the database. If you do specify a different key name, the command fails and SAP ASE displays an error message.

  SAP ASE fails to run **alter database** and displays an error message if the database is already:

  - Encrypted with another key.
  - Being encrypted.

  If you run this command on a partially encrypted database that is not currently being encrypted, SAP ASE treats the command as if you specified the `resume encryption` option, as long as the key name is the same as the previously specified key.
- **decrypt [with *key_name*] –** instructs SAP ASE to decrypt the database. When decrypting a database, `[with key_name]` is optional, as SAP ASE looks up the key ID in the `sysdatabases` system table. The command fails, however, if you specify *key_name* with a different key name than what was used to encrypt the database.
- **resume decryption –** instructs SAP ASE to resume the decryption process for the database in which an earlier decryption process was suspended. SAP ASE ignores this command if the *database_name* is already completely decrypted.
- **parallel *degree_of_parallelism* –** determines how many worker threads to initiate for the task.

  Create a thread for each database storage virtual device, as long as the number is equal to or fewer than "`number of worker processes`" configuration. The *degree_of_parallelism* number should be no larger than the number of database devices because additional worker threads do not improve encryption performance. If you do not specify *degree_of_parallelism*, SAP ASE internally defines the value based on the number of online engines, as well as how the database is distributed across various devices.
- **resume encryption –** resumes the encryption process from the page where encryption was previously suspended.

  The command fails if:

  - There is an encryption process already running in SAP ASE.

    - Encryption was never started on the database.
    - The encryption process already completed.

    You can use `parallel` *`degree_of_parallelism`* with `resume encrypt`. If you do not specify `parallel` *`degree_of_parallelism`*, SAP ASE determines the value based on how the database is distributed across various engines.
- **suspend encryption –** terminates all encryption worker threads that are encrypting data. SAP ASE records the progress of encryption so that `resume encryption` can restart encryption where the previous encryption process stopped. SAP ASE ignores this command if there is no encryption in progress.
- **off –** specifies the device from which you are releasing space for shrinking databases. The off clause includes:
    - *database_device* – is the name of the database device on which to locate the database extension. A database can occupy more than one database device with different amounts of space on each device.

      database_device includes either the *=size* parameter or the **from** or **to** parameters (not both). The default from page is 0 (zero). If you do not specify any modifiers with the **from** clause, SAP ASE releases all storage for this database on the indicated device.
    - *size* – specifies the amount of space to be released from the database. **alter database** accepts a specific size, or a **from ... to** declaration:
        - Specific size – an integer. If you do not include a unit specifier, SAP ASE uses megabytes as the unit. You can also include “k” or “K” (kilobytes), “m” or “M” (megabytes), “g” or “G” (gigabytes), and “t” or “T” (terabytes). SAP ASE recommends that you always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier. If you do not provide a unit specifier, the value provided is presumed to be in megabytes. For example:
            - **alter database ... off mydev1 = 200** – removes 200 megabytes
            - **alter database ... off mydev1 = '2g'** – removes 2 gigabytes
        - **from ... to** declaration – unsigned integers. See below.

      SAP ASE releases the highest-numbered logical pages of this database associated with the indicated device. SAP ASE rounds the value for *size* up, if needed, to indicate an even number of allocation units.

      If you specify more space than is currently in use by this database on the indicated device, SAP ASE limits the specified size or page IDs to the amount of space available.
    - **from** *page_number* – specifies the low end of the range of logical pages to be released. SAP ASE rounds the **from** value down, if needed, to represent the first page of the allocation unit containing the indicated page. The default value for **from** is 0 (zero).
    - **to** *page_number* – specifies the high end of the range of logical pages to be released. SAP ASE rounds the **to** value up, if necessary, to represent the last page of the allocation unit containing the indicated page. The default value for **to** is the highest-numbered logical page in the database.

      However, if the **to** page is an allocation page itself (which is the starting page of an allocation unit) and is not the same as the **from** page, the **alter database ... off** command does not affect the allocation unit containing the specified **to** page. SAP ASE assumes that a user requesting a precise page range does not intend to affect the specified end page, so it decrements the end page rather than increasing it.

Note: SAP ASE does not issue an error message if you indicate a **from** page value that is greater than the **to** page value. Instead, SAP ASE swaps the **from** and **to** values before applying the rounding logic.

- **with check_only** – checks for:
  - The expected results of shrinking the database rather than actually shrinking the database.
  - Tables with text columns that are not marked as having text back-linked to their owning rows. All text and image columns are required to have back-linked pointers to the home data row in the first text page.
  - Sufficient room in the remainder of the database to accommodate everything that must be moved. Any indication of a potential problem is reported.
  - And reports any potential problems where a significant amount of time could be spent sorting the index

  When checking the indexes, if the results indicate that there could be enough duplicate key entries that the command will spend a significant amount of time sorting the index, the index is reported as a problem. The recommendation is that the index should be dropped before shrinking the database and the index be re-created after the database is shrunk.

  Results of the checks being done by **with check_only** can be compromised by any other work being performed on in the database while the checks are running, or by work that was done after the checks are run but before the actual shrink is completed.
- **with time=***'time'* – specifies the maximum length of time **alter database ... off** may run, and is specified as hours, minutes, and seconds (*HH:MM:SS*). If you do not include the full specification, **alter database** interprets the missing sections for *time* as:
  - *XX:YY* is interpreted as *MM:SS*.
  - *XX* is interpreted as minutes.
  - Empty sections are treated as zero. For example, **alter database** interprets both “:: 30” and “:30” as 30 seconds. However, **alter database** interprets “1::” as 1 hour, and "2:" as 2 minutes.

    If **alter database ... off** does not finish within the specified period of time, work in progress is abandoned, and the command exits with an error message. Any completed work remains done.

Note: Use either **alter database off** or **alter database log off** to shrink the log segment. Both commands perform the same function.

Examples

- **Adds 3MB to Database –** Adds 3MB (1,536 pages) to a user database configured for 2K logical pages on a default database device:

```
alter database mydb
```

- **Adds 3MB to Database on Device –** Adds 3MB to the space allocated for the `pubs2` database on the database device named `newdata`:

```
alter database pubs2 on newdata = 3
```

- **Adds 10MB for Data and 2MB for Log –** Adds 10MB of space for data on `userdata1` and 2MB for the log on `logdev` for a server configured for 2K logical pages:

```
alter database production
on userdata1 = "10M"
log on logdev = '2.5m'
```

- **Changes Durability Level –** Changes the durability level of `pubs5_rddb`, a relaxed-durability database to change it to a regular database with full durability:

```
alter database pubs5_rddb
set durability = full
```

- **Changes Template –** Alters the template for the `pubs3` database:

```
alter database pubs3
set template = new_pubs_template_db
```

- **Changes Durability Level of Disk-Resident Database –** Changes the durability level of a disk-resident database with relaxed durability:

```
alter database pubs7 set durability=at_shutdown
```

- **Changes DML Logging Level –** Changes the DML logging level for the `model` database, which is set to a durability level of full. Any databases created from `model` after this change inherit the minimal logging level property:

```
alter database model set dml_logging = minimal
```

- **Changes Compression Level –** Changes `pubs2` database to page-level compression:

```
alter database pubs2
set compression = page
```

- **Changes Database to LOB Compression –** Changes the `pubs2` database to use LOB compression:

```
alter database pubs2 set lob_compression = 100
```

- **Modifies Length of In-Row LOB Columns in Database –** Modifies the `pubs` database to change the length of its in-row LOB columns to 400 bytes:

```
alter database pubs
  set inrow_lob_length = 400
```

- **Removes 50MB of Database from Device –** Removes 50MB of database `sales_db` from device `mylogdev`:

```
alter database sales_db log off mylogdev='50M'
```

This example removes the highest-numbered logical pages of `sales_db` that are on `mylogdev`, up to a maximum of 50MB.

- **Specifies Pages to Remove –** Removes space for database `sales_db` from device `mylogdev`, specifying exactly which pages are to be removed:

  ```
  alter database sales_db log off mylogdev from 7168 to
      15360
  ```

  Because logical page 15360 is an allocation page, this example affects all logical pages on `mydev` from 7168 through 15359. It does not, however, affect page 15360, nor does it affect any pages in the named range that are not physically located on `mylogdev`.

- **Encrypts an Existing Database –** This example alters an existing database called `existdb` for encryption using an encryption key called `dbkey`:

  ```
  alter database existdb encrypt with dbkey
  ```

  The example does not specify the parallel degree, leaving it up to SAP ASE to determine how many worker threads should be initiated to encrypt `existdb` in parallel.

- **Suspends an Encryption of a Database –** This example suspends an encryption operation on a database called `existdb`:

  ```
  alter database existdb suspend encryption
  ```

- **Resumes Encrypting a Database –** This example resumes a suspended encryption on a database called `existdb`:

  ```
  alter database existdb resume encryption
  ```

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **alter database** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, for **sybsecurity**, you must be the database owner or have any of these privileges: `own database` (on **sybsecurity**) or `manage auditing`. For all other databases, you must be database owner or have the `own database` privilege (on the database).
Disabled	With granular permissions disabled, you must be the database owner, a user with **sa_role**, or a user with **sso_role** (for **sybsecurity**).

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	2
Audit option	**alter**
Command or access audited	**alter database**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **alter size** • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a **set proxy** is in effect

See also

- *create database* on page 104
- *disk init* on page 319
- *drop database* on page 342
- *load database* on page 485

alter database Restrictions

Additional considerations for **alter database**.

Restrictions for using **alter database** are:

- Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier.
- The SAP ASE server reports an error if the total size of all fixed-length columns, plus the row overhead, is greater than the table's locking scheme and page size allows.
- Because the SAP ASE server allocates space for databases for **create database** and **alter database** in chunks of 256 logical pages, these commands round the specified size down to the nearest multiple of allocation units.
- You can specify the *size* as a `float` datatype, however, the size is rounded down to the nearest multiple of the allocation unit.
- Although the SAP ASE server does create tables in the following circumstances, you see errors about size limitations when you perform data manipulation language operations:
  - If the length of a single variable-length column exceeds the maximum column size.

    - For data-only locked tables, if the offset of any variable-length column other than the initial column exceeds the limit of 8191 bytes.
- If the SAP ASE server cannot allocate the requested space, it comes as close as possible per device and prints a message telling how much space has been allocated on each database device.
- You must be using the `master` database, or executing a stored procedure in the `master` database, to use **alter database**.
- You can expand the `master` database only on the master device. An attempt to use **alter database** to expand the `master` database to any other database device results in an error message. For example, use:

  ```
  alter database master on master = 1
  ```
- Each time you allocate space on a database device with **create database** or **alter database**, that allocation represents a device fragment, and the allocation is entered as a row in `sysusages`.
- If you use **alter database** on a database that is being dumped, **alter database** cannot complete until the dump finishes. The SAP ASE server locks the in-memory map of database space use during a dump. If you issue **alter database** while this in-memory map is locked, the SAP ASE server updates the map from the disk after the dump completes. If you interrupt **alter database**, the SAP ASE server instructs you to run **sp_dbremap**. If you do not run **sp_dbremap**, the space you added does not become available to the SAP ASE server until you restart the server.
- You can use **alter database on** `database_device` on an offline database.

See also **sp_addsegment**, **sp_dropsegment**, **sp_helpdb**, **sp_helpsegment**, **sp_logsdevice**, **sp_renamedb**, **sp_spaceused** in *Reference Manual: Procedures*.

Using alter database for Archive Databases

You can use **alter database** to add space to the modified pages section of an archive database at any time, not only when space runs out.

Increasing the space in the modified pages section allows a suspended command to resume operation. The syntax is:

```
alter database database_name
    [ on database_device [= size]
        [, database_device [= size]]...]
```

Altering In-Memory and Relaxed Durability Databases

Keep these in mind when using **alter database** for in-memory and relaxed-durability databases.

- You cannot set specify `model`, `master` or `sybsystemdb` as the template database.
- Setting the database name in the **use template** claue to NULL removes the binding to any existing template database, and defines `model` as the template database.

- Altering the template definition of a database that appears earlier in the database recovery order sequence than its template database automatically reorders the recovery order so the new template database appears prior to its dependent database in the database recovery order when you restart the server.
- If you change the settings for **durability** or **dml_logging**, **alter database** automatically attempts to set the databases to single-user mode before executing the command. You can manually set the database to single-user mode before you issue **alter table**.
- Databases must be in single-user mode before you can change the durability level setting.
- You can increase the size of an in-memory database only on in-memory storage caches that already host the in-memory database.
- You cannot change the durability level of system, template, or local temporary databases.
- The load sequence is broken when you change the durability level of the database to **full**. For example, for a disk-resident database using full durability, if you:
  1. Dump a database.
  2. Perform a **dump transaction**.
  3. Perform a second **dump transaction**.
  4. Changed the durability to **no_recovery**.
  5. Changed the durability to **full**.

  You cannot perform a third **dump transaction**. Instead, you must perform a full **dump database**.

Backing Up master After Allocating More Space

Back up the `master` database with **dump database** after each use of **alter database**. This makes recovery easier and safer in case `master` becomes damaged.

If you use **alter database** and do not back up `master`, you may be able to recover the changes with **disk refit**.

Placing the Log on a Separate Device

To increase the amount of storage space allocated for the transaction log when you have used the **log on** extension to **create database**, include the name of the log’s device in the **log on** clause when you issue **alter database**.

If you did not use the **log on** extension of **create database** to place your logs on a separate device, you may not be able to recover fully in case of a hard disk failure. In this case, you can extend your logs by using **alter database** with the **log on** clause, then using **sp_logdevice** to move the log to its own devices.

Altering Databases for Compression

set compression specifies the database-wide compression level, which applies only to newly created tables.

You can use **set lob_compression** by itself or with other **set** subclauses. However, other **set** subclauses require the database to be in single-user mode (for example, if you change the durability level of the database).

In-row LOB Columns

Use **inrow_lob_length** to increase or decrease the in-row LOB length database-wide.

The SAP ASE server uses in-row LOB compression if:

- The table is implicitly or explicitly row- or page-compressed, and,
- Any of the in-row large object columns in the table are implicitly or explicitly LOB compressed.

Changing the **inrow_lob_length** affects the creation of LOB columns in future **create table** or **alter table add** column commands. The valid values are within the range of 0 to the logical page size of the database.

Shrinking Log Space

Information about the **log off** variant of **alter database**.

- Although the **log off** option specifies the range the range of pages to be removed as logical pages, it is the associated physical pages that are actually removed. The logical pages remain in the database as unusable since they form a hole. A hole is one or more allocation units for which there is no associated physical storage.
- Information about which allocation units—space that is divided into units of 256 data pages when you create a database or add space to a database—exist on the devices that are available in the `master.dbo.sysusages` table, which lists disk pieces by database ID, starting logical page number, size in logical pages, device ID, and starting offset in the device.
- If the specified **to** page is less than the **from** page, the pages are switched—that is, the **to** page becomes the **from** page, and vice versa. If **from** and **to** name the same page, the command affects only the allocation unit containing that page. The command does not adjust the **to** page in a way that causes a command error.
- The entire device is affected if you do not provide any clauses. This is equivalent to **log off*device* from 0**. This command specifies physical storage, removing every log page on the specified device from the database:

  ```
  alter database sales_db log off mylogdev
  ```
- If **alter database** detects an error, it does not execute, and returns a message indicating the reason, such as:

- The database log becomes too small.
- The fragments to be removed contain pages that are allocated to `syslogs`. That is, the active log occupies space in the log fragments to be removed.
- The amount of log free space after the fragment is removed is too small to accommodate the last chance threshold.

Getting Help on Space Usage

To see the names, sizes, and usage of device fragments already in use by a database, execute **sp_helpdb** ***dbname***. To see how much space the current database is using, execute **sp_spaceused**.

The system and default Segments

The `system` and `default` segments are mapped to each new database device included in the **on** clause of an **alter database** command. To unmap these segments, use **sp_dropsegment**.

When you use **alter database** (without **override)** to extend a database on a device already in use by that database, the segments mapped to that device are also extended. If you use the **override** clause, all device fragments named in the **on** clause become system/default segments, and all device fragments named in the **log on** clause become log segments.

Using alter database to Awaken Sleeping Processes

If user processes are suspended because they have reached a last-chance threshold on a log segment, use **alter database** to add space to the log segment. The processes awaken when the amount of free space exceeds the last-chance threshold.

Using the alter database for proxy_update Parameter

If you enter the **for proxy_update** clause with no other options, **alter database** does not extend the size of the database; instead, the proxy tables, if any, are dropped from the proxy database and re-created from the metadata obtained from the path name specified during **create database ... with default_location = 'pathname'**.

If you use **alter database** with other options to extend the size of the database, the proxy table synchronization is performed after the size extensions are made.

for proxy_update provides the database administrator with an easy-to-use, single-step operation with which to obtain an accurate and up-to-date proxy representation of all tables at a single remote site.

Resynchronization is supported for all external data sources, not just the primary server in a high availability-cluster environment. Also, a database need not have been created with the **for proxy_update** clause. If a default storage location has been specified, either through **create database** or with **sp_defaultloc**, the metadata contained within the database can be synchronized with the metadata at the remote storage location.

To make sure databases are synchronized correctly so that all the proxy tables have the correct schema to the content of the primary database you just reloaded, you may need to run the **for proxy_update** clause on the server hosting the proxy database.

Fully Encrypting Databases

Considerations when encrypting or decrypting databases.

- Database encryption occurs while the database is running. This means the database is accessible by other users while it is being encrypted; you need not put it into single-user mode.
- The encryption process does not interrupt user queries, updates, or insert operations on the database.
- You can suspend and resume database encryption, so that you can resume encrypting the database after restarting SAP ASE.
- The encryption operation is not transactional.
- You can alter both archive and temporary databases for encryption and decryption.
- SAP ASE records the encryption progress of a database and provides utilities to report its status.

The command fails if:

- You use it on a database that is already encrypted.
- You use it on a database that is being encrypted. If you use this command on a partially encrypted database, but there is no encryption process running in SAP ASE, the command resumes encryption from the location where it was last suspended as long as you use the same database encryption key name in your previous command to encrypt the database.

Restrictions:

- You cannot encrypt the `master` and `model` databases.
- You cannot decrypt a database that is being encrypted, or encrypt a database that is being decrypted.
- You cannot drop or unmount a database when it is being encrypted.
- You cannot load another database on top of a database that is being encrypted.
- You cannot back up (dump) a database while a database is being encrypted.

alter encryption key

Changes the current password, adds and drops a key copy, regenerates an encryption key.

Syntax

Altering the master key:

```
alter encryption key [dual] master
    with char_string { add encryption
```

```
        {with passwd char_string for user user_name [for recovery]
        | for automatic_startup    }
    | modify encryption { with passwd char_string [for recovery]
        | for automatic_startup }
    | drop encryption
       { for user user_name | for recovery | for automatic_startup }
    | regenerate key
        [ with passwd char_string] | recovery encryption
        with passwd char_string | modify owner user_name }
```

Altering the `syb_extpasswdkey` service key:

```
alter encryption key syb_extpasswdkey
    [ with { static key | master key}]
        { regenerate key [ with { static key | master key }]
        | modify encryption [ with { static key | master key }] }
```

Altering the column encryption key:

```
alter encryption key [[database.][owner].] keyname
    { [ as | not default ]
    [dual] master
        [ with { static key | master key} ]
        regenerate key
       [ with { static key | master key [no] dual_control} ] | [with
passwd
        'password' | system_encr_passwd | login_passwd  |
             'base_key_password']
    modify encryption
        [ with {passwd {'password' |  system_encr_passwd |
                login_passwd } | master key }]
        [[no] dual_control] for automatic startup
    add encryption [ with passwd 'password' | 'key_copy_password']
        for user user_name
        [for [login_association | recovery | automatic_startup]]
    drop encryption for { user user_name | recovery
        [ for recovery ] | [ for automatic_startup ]}
        | [ with passwd 'password ']
    recover encryption with passwd 'password'
            | modify owner user_name }
```

Parameters

- ***keyname* –** is the name for a column encryption key.
- **as [not] default –** indicates that the database default property should be assigned to, or unassigned from, this key.
- **[dual] master –** database level keys used to encrypt other keys within the database in which they are defined. These keys are not used to encrypt data.
- **static key | master key –** The first instance of the **with {static key | master key}** clause is merely an assertion of how the **syb_extpasswdkey** is currently encrypted. Because the SAP ASE server knows how **syb_extpasswdkey** is currently encrypted, this clause is optional.

  The second instance of **with {static key | master key}** clause following the **regenerate key** action allows the administrator to change the encryption on the regenerated key from static to dynamic, or vice versa. If the clause is omitted, the regenerated key is encrypted as it was prior to this command being issued.

The third instance of **with {static key | master key}** clause following the **modify encryption** action changes the protection on the existing key to use the static key or the master key as specified. If the clause is omitted, the static key is used by default.

- **[no] dual_control –** indicates whether dual control is used to create the master key.
- **regenerate key –** indicates you are regenerating the key
- **with passwd ['*password*' | *system_encr_passwd* | *login_password* '*base_key_password*'] –** specifies the current password the SAP ASE server uses to decrypt the column encryption key, and a new password for one of the following purposes:

  - Modify the encryption of a key or a key copy.
  - Encrypt a newly-added key copy. The key owner can add key copies for individual users that are accessible through a private password or a login password.
  - Recover the encryption key after losing a password.

  The SAP ASE server supports the following passwords for keys:

  - *password* – a character string up to 255 bytes long.
  - *login_passwd* – tells the SAP ASE server to use the session's login password.
  - *system_encr_passwd* – system encryption password for the current database.
  - **'*base_key_password*'** – the password used to encrypt the base key, and may be known only by the key custodian. The password can be upto 255 bytes in length. The SAP ASE server uses the first password to decrypt the base column-encryption key.

  If you do not specify **with passwd**, the default is *system_encr_passwd*.
- **modify encryption –** indicates you are modifying the encryption key or key copy.
- **for automatic startup –** indicates that the key copy is to be used to access the master or dual master key after the server is restarted with automatic master key access enabled.
- **add encryption –** adds an encrypted key copy for a designated user.

  key_copy_password – the password used to encrypt the key copy. The password cannot be longer than 255 bytes. The SAP ASE server makes a copy of the decrypted base key, encrypts it with a key encryption key derived from the *key_copy_password*, and saves the encrypted base key copy as a new row in `sysencryptkeys`.
- **for user *user_name* –** specifies the user for whom you are adding or dropping a key copy.
- **for login_association –** indicates that the key copy being added later becomes encrypted by the assigned user's login password during his or her first access to this key.
- **for recovery –** indicates that the key copy is to be used to recover the master key in case the password is lost.
- **drop encryption –** indicates that you are dropping the key copy for the specified user.
- **recover encryption –** makes the base key accessible through a new password. Does not apply to key copies.

- **modify owner –** changes the key's owner to the specified user.

Examples

- **Example 1 –** Changes `my_key` to the default encryption key:

  ```
  alter encryption key my_key as default
  ```

  You must have the **sso_role** or **keycustodian_role** to change the default property of a key. If the command above is executed by:

  - The system security officer (SSO), the SAP ASE server removes the default property unconditionally from the previous default key, if one exists.
  - The key custodian, he or she must own `my_key`. The key custodian must own the previous default key, if one exists.

  To remove the default property from `my_key`, the SSO or the key custodian, as owner of the key, executes:

  ```
  alter encryption key my_key as not default
  ```

  If `my_key` is not the default key, this command returns an error.

- **Example 2 –** Changes the password on the `important_key` encryption key:

  ```
  alter encryption key important_key
       with passwd 'oldpassword'
       modify encryption
       with passwd 'newpassword'
  ```

  If this command is executed by:

  - The key owner – the command reencrypts the base key
  - The user assigned a key copy – the command reencrypts that key copy.

- **Example 3 –** Changes the password on a key copy to the current session's login password (can be executed only by a user who has been assigned a key copy):

  ```
  alter encryption key important_key
       modify encryption
       with passwd login_passwd
  ```

  You can encrypt only key copies with a login password. the SAP ASE server returns an error if you attempt to encrypt the base key with a login password.

- **Example 4 –** Changes the password for the `important_key` encryption key to the system password:

  ```
  alter encryption key important_key
       with passwd 'ReallyBigSecret'
       modify encryption with passwd system_encr_passwd
  ```

This command can be executed only by the key owner or a user with **sso_role**, and is allowed only if a key has no key copies. (Base keys with copies must be encrypted by a user-specified password.) This example modifies the encryption of the base key.

- **Example 5 –** Changes the password for the `important_key` encryption key from the system encryption password to a new password. Because the system encryption password is the default password, it need not be specified in the statement:

```
alter encryption key important_key
     modify encryption
     with passwd 'ReallyNewPassword'
```

- **Example 6 –** Adds encryption for user “ted” for the `important_key` encryption key with the password “just4now”:

```
alter encryption key important_key
     with passwd 'TopSecret'
     add encryption with passwd 'just4now'
     for user 'ted'
```

  You must be a key owner or a user with the sso_role to execute this command. the SAP ASE server uses “TopSecret” to decrypt the base key, making a copy of the raw key and encrypting it for Ted using the password “just4now.”

- **Example 7 –** Modifies the encryption for Ted to use a new password. Only Ted can execute this command:

```
alter encryption key important_key
     with passwd 'just4now'
     modify encryption
     with passwd 'TedsOwnPassword'
```

- **Example 8 –** Drops encryption for user “ted” for the `important_key` encryption key (you must have the sso_role or be the key owner to execute this command):

```
alter encryption key important_key
     drop encryption for user 'ted'
```

- **Example 9 –** Modifies the owner of `important_key` to new owner, “tinnap” (you must have the **sso_role** or be the key owner to execute this command):

```
alter encryption key important_key modify owner tinnap
```

- **Example 10 –** Uses the master key to encrypt an existing CEK “k2”:

```
alter encryption key k2
        with passwd 'goodbye'
        modify encryption
        with master key
```

- **Example 11 –** Reencrypt an existing CEK “k3” that is currently encrypted by the master key, to use dual control:

```
alter encryption key k3
        modify encryption
        with master key
        dual_control
```

- **Example 13 –** Sets up the recovery key copy and uses it for key recovery after losing a password.

  1. The key custodian originally creates a new encryption key protected by a password:

     ```
     create encryption key key1 for AES passwd 'loseitl8ter'
     ```

  2. The key custodian adds a special encryption key recovery copy for `key1` for Charlie:

     ```
     alter encryption key key1 with passwd 'loseitl8ter'
          add encryption
          with passwd 'temppasswd'
          for user charlie
          for recovery
     ```

  3. Charlie assigns a different password to the recovery copy and saves this password in a locked drawer:

     ```
     alter encryption key key1
          with passwd 'temppasswd'
          modify encryption
          with passwd 'finditl8ter'
          for recovery
     ```

  4. If the key custodian loses the password for base key, he can obtain the password from Charlie and recover the base key from the recovery copy of the key using:

     ```
     alter encryption key key1
          with passwd 'finditl8ter'
          recover encryption
          with passwd 'newpasswd'
     ```

Usage

- If the SSO issues **alter encryption key** to set the key as the database default, the specified key replaces any existing key as the default.
- If the key custodian issues **alter encryption key** to set a key as the database default, the specified key and the current default key (if it exists) must be owned by the key custodian.
- Keys are owned and managed by users with **keycustodian_role**, the **sso_role**, or by users who are explicitly granted permission for the **create encryption key** command. Keys are used by all users who have permissions to process and see the data from encrypted columns. How the SAP ASE server protects keys affects how they are accessed:
  1. The key owner creates the key for encryption by the system encryption password–when users access the encrypted data, the SAP ASE server decrypts the base key using the system encryption password. The key owner does not create individual key copies for users.
  2. The key custodian encrypts the base key with an explicit password – rather than create key copies, the key custodian shares this password with all users who process encrypted data. Users or applications must supply this password with the **set encryption passwd** command to access data. See **set encryption passwrd**.

3. The key custodian adds key copies for end users so that users do not have to share passwords. Users must enter their key copy’s password using **set encryption passwd** to access encrypted columns. Alternatively, the key custodian can set up key copies for encryption by the key assignee's login password. This password does not have to be entered through **set encryption passwd**.

- When you create a key using create encryption key, the SAP ASE server saves the key in encrypted form, along with the key’s properties, as a row in `sysencryptkeys`. This row represents the base key. The key owner can choose to allow access to encrypted data exclusively through the base key, or use **alter encryption key** to add key copies for individual users.
- If you do not include the **with passwd** parameter with **alter encryption**, the SAP ASE server uses the system encryption password.
- You cannot use the system encryption password to alter the base key of a key that has copies, and you cannot encrypt copies of keys with the system encryption password.
- Users assigned key copies modify only their own key copies.
- If you specify for *login_association*, the SAP ASE server temporarily encrypts the key copy with the system encryption password. The key copy is reencrypted by the copy owner’s login password when he or she encrypts or decrypts data with that key.
- You cannot specify **for recovery** and *login_association* for the same key copy.

See also:

- **sp_encryption** in *Reference Manual: Procedures*
- *Encrypted Column Users Guide*

Permissions

The permission checks for **alter encryption key** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage column encryption key` privilege to execute `alter encryption key` as default or not default. You must be the key owner or have the following privilege depending the key type: • column encryption key – `manage column encryption key` • master key – `manage master key` • service key – `manage service key` to: • Use **alter encryption key** to add or drop key copies, recover the key, and modify the key owner. • Execute **alter encryption key** to modify the password of the base key. **Note:** You must be the user assigned the key copy to modify the key copy password. You implicitly have permission to modify your own key copy's password.
Disabled	With granular permissions disabled, you must be a user with **sso_role**, or **keycustodian_role** to execute **alter encryption key** as default or not default. You must be the system security officer or the key owner to: • Use **alter encryption key** to add or drop key copies, recover the key, and modify the key owner. • Execute **alter encryption key** to modify the password of the base key. **Note:** You must be the user assigned the key copy to modify the key copy password. You implicitly have permission to modify your own key copy's password.

Auditing

For information about auditing encrypted columns, see *Auditing Encrypted Columns* in the *Encrypted Columns Users Guide*.

See also

- *create encryption key* on page 121
- *drop encryption key* on page 346

alter login

Changes the attributes of a login account.

Syntax

```
alter login login_name
    { [modify attribute_value_pair_list ]
    | [add auto activated roles role_name [, role_name_list ]]
    | [drop auto activated roles { ALL | role_name [,
role_name_list ]}]
    | [drop attribute_name_list ]
    | [ with password caller_password
    modify password [immediately] new_loginName_password ] }
```

Parameters

- ***login_name* –** specifies the name of the login account to be changed.
- **modify –** changes attribute values to the new values specified if the attributes exist. If the attributes do not exist, the specified list of attributes and corresponding values are added to the login account. The *attribute_value_ pair_list* is an attribute name and a specified value. Specify one or more from the following:

Parameter	Parameter Value	Description
login profile	Valid values: • *login_profile_name* • **ignore** • **default**	• *login_profile_name* binds the specified login profile to the specified login account. If a login profile binding already exist, it becomes replaced with the specified login profile. • **ignore** eliminates any login profile binding. If a login profile binding exist, it gets removed. A default login profile is not be applicable and attributes are applied as they were prior to release 15.7. • **default** default removes an existing login profile binding and associates the default login profile with the login account. If login profile *login_profile_name* is not specified and a default login profile exists, then the default login profile is associated with the login account.
fullname	*name_value*	Full name of user who owns the login account. Adds a full name or modifies an existing name. Default is NULL.

Parameter	Parameter Value	Description
password expiration	Valid range: 0 to 32767 days	Password expiration interval. Default is 0, meaning the password never expires.
min password length	Valid range: 0 to 30.	Minimum password length required. Default is 6.
max failed attempts	Valid range: -1 to 32767.	Number of login attempts allowed, after which the login account is locked. -1 indicates the failed count is tracked but not locked. Default is 0, meaning the failed count is not tracked and the account is not locked due to failed login attempts.
authenticate with	Valid values: **ASE**, **LDAP**, **PAM**, **KERBEROS**, **ANY**	Specifies the mechanism used for authenticating the login account. When **ANY** is used, the SAP ASE server checks for a defined external authentication mechanism. If one is defined, the SAP ASE server uses the defined mechanism., otherwise the **ASE** mechanism is used. If **authenticate with *authentication mechanism*** is not specified, **ANY** is used for the login account.
default database	*default_database_name*	Specifies a database to be the default. Default is Master.
default language	*default_language*	Specifies a language to be the default. Default is **us_english**
login script	*login_script_name*	Specifies a valid stored procedure. Limited to 120 characters for a login script.
exempt inactive lock	Valid values: **TRUE** or **FALSE**.	Specifies whether or not to exempt login accounts from being locked due to inactivity. Default is **FALSE**, which indicates account are not exempt.

- **add auto activated roles –** specifies the previously granted, non-password protected user defined roles that must be automatically activated on login.
- **drop auto activated roles –** specifies the previously granted user defined roles must not be automatically activated on login. **ALL** specifies all granted user defined roles.
- **drop –** drops specified attributes from the login account. Specify one or more of the following attributes to be dropped:

  - **login profile** – removes the login profile binding from the specified login account. If the **login profile ignore** parameter has been specified, the parameter is removed and existing default login profile is no longer ignored.
  - **fullname** – removes the name associated with the login account.
  - **password expiration** – removes any password expiration values.
  - **min password length** – removes any restrictions for a minimum password length.
  - **max failed attempts** – removes restrictions for the number of failed attempts allowed.
  - **authenticate with** – removes specifications for authentication mechanisms.
  - **default database** – removes specifications for a default database.
  - **default languag** – removes specifications for a default languages.
  - **login script** – removes specifications to apply a login script.
  - **exempt inactive lock** – removes specifications indicating whether or not to lock login accounts due to inactivity. Sets the default value of FALSE where login accounts are not exempt.
- **with password *caller_password* modify *new_loginName_password* –** changes the login password to the new specified password.
- **immediately –** specifies whether a password immediately takes effect on users who are logged in. If you:
  - Specify **immediately** – the password changes immediately in the `syslogins` table, and users who are logged in get their passwords updated while they are still logged in.
  - Do not specify **immediately** – all users—with an exception to the caller—who are logged, in keep their old passwords until they reconnect.

Examples

- **Example 1 –** Binds the login profile `emp_lp` to the login account `ravi`.
  ```
  alter login ravi modify login profile emp_lp
  ```
- **Example 2 –** When **ignore** is specified, all login profiles are ignored, whether it is a login profile that has been bound to the `users_1` login account or a defined default login profile.
  ```
  alter login users_1 modify login profile ignore
  ```
- **Example 3 –** Creates two login profiles; the first is `general_lp`, which is a default login profile and the second is a login profile name `emp_lp`, which is defined for a specific group of employees. After the login profiles are created, attributes from both login profiles are applied to a login account. See *Applying Login Profile and Password Policy Attributes* in the *Security Administration Guide* for information about the order in which attributes are applied.
  ```
  create login profile general_lp as default with default database
  master default language us_english
  track lastlogin true authenticate with ASE
  ```

```
create login profile emp_lp with default database empdb
autheticate with
LDAP
```

The following binds the login profile `emp_lp` to the login account `users_2`. The **default language** and **track lastlogin** are not defined in login profile `emp_lp` but are defined in the default login profile. Therefore, the **default language** and **track lastlogin** values are applied from `general_lp`.

```
alter login users_22 modify login profile emp_lp
```

- **Example 4 –** Creates two login profiles; the first is `newEmployee_lp` for new employees and the second is `default_lp` for existing employees.

  ```
  create login profile newEmployee_lp with login script
  "newEmp_script"

  create login profile default_lp as default with login script
  "def_script"
  ```

  The following applies the login script `newEmp_script` to `employee_new` upon login.

  ```
  create login employee_new with password myPasswd33 login profile
  "newEmployee_lp"
  ```

  The login profile `default_lp` is applied upon login to existing accounts that do not have a login script specified through a login profile.

- **Example 5 –** Shows how to enforce different roles that are granted and automatically activated for contract employees and full time employees:

  ```
  create login profile contractEmp_lp
  grant role access_role to contractEmp_lp
  alter login profile contractEmp_lp add auto activated roles
  access_role
  create login contractEmp_emp1 with password c_Emp43 login profile
  "contract_lp"
  create login contractEmp_emp2 with password c_Emp44 login profile
  "contract_lp"
  create login contractEmp_emp3 with password c_Emp44 login profile
  "contract_lp"
  ```

Usage

Precedence rules determine how login account attributes are applied when attributes are taken from different login profiles, or when values have been specified using **sp_passwordpolicy.**

For precedence rules, see *Applying Login Profile and Password Policy Attributes* in the *Security Administration Guide.*

See also:

- **create login**, **create login profile**, **alter login profile**, **drop login**, **drop login profile**
- For information about altering login accounts, see the *Security Administration Guide*.
- **lprofile_id**, **lprofile_name** in *Reference Manual: Building Blocks*
- **sp_passwordpolicy**, **sp_displaylogin**, **sp_displayroles**, **sp_locklogin** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **alter login** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `manage any login` privilege to **alter login** accounts in general. To modify a login account's password, you must have the `change password privilege` or be the account owner. The account owner is allowed to modify the account's full name.
Disabled	With granular permissions disabled, you must have sso_role to **alter login** accounts in general. The account owner is allowed to modify the account's password and full name.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	138
Audit option	**login_admin**
Command or access audited	**alter login**
Information in `extrainfo`	Keywords contain: • **MODIFY *attribute_value_pair_list*** • **DROP *attribute_name_list*** • **MODIFY PASSWORD** • **ADD AUTO ACTIVATED ROLES *role1* [*role2*][... [*roleN*]...]]** • **DROP AUTO ACTIVATED ROLES {ALL | *role1* [, *role2* [... [, *roleN*] ...]] }**

See also

- *alter login profile* on page 29

- *create login* on page 160
- *create login profile* on page 163
- *drop login* on page 352
- *drop login profile* on page 354

alter index

Renames indexes in base or global temporary tables and foreign key role names of indexes and foreign keys explicitly created by a user.

Syntax

```
alter index [[database.][owner].]table_name.index_name
set index_compression = {none | page} | modify_partition_clause

modify_partition_clause::=
modify partition partition_name [,partition_name]...
set index_compression = {none | page | default}
```

Parameters

- **index_compression –** changes the local index partition's compression state affects only index rows that are newly inserted or updated in the partition. Valid values are:
  - `none` – the index page for the specified index is not compressed. Indexes that are specifically created with **index_compression = page** are compressed.
  - `page` – when the page is full, existing index rows are compressed using the page prefix compression. When a row is added, a check is performed to determine whether the row is suitable for compression.

Examples

- **Example 1 –** Sets the compression state to on for the index `idx_char`:

  ```
  alter index order_line.idx_char
      set index_compression = page
  ```

Usage

-

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **alter index** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner, or a user with the `create any index` privilege.
Disabled	With granular permissions disabled, you must be the table owner or a user with **sa_role**. **create index** permission defaults to the table owner and is not transferable.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	104
Audit option	
Command or access audited	**alter index**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – Name of the index • *Proxy information* – original login name, if a **set proxy** is in effect

alter login profile

Changes the attributes of a login profile.

Syntax

```
alter login profile login_profile_name
    {  [as [ not ] default ]
    | [modify attribute_value_pair_list ]
    | [add auto activated roles role_name [, role_name_list ]]
    | [drop auto activated roles { ALL | role_name [,
role_name_list ]}]
    | [drop attribute_name_list] }
```

Parameters

- **as [not] default – as default** modifies the login profile to be the default login profile. **as not default** removes the default property of the specified login profile.

- **login_profile_name –** specifies the name of the login profile to be changed.
- **modify –** attribute values are changed to the new values specified if the attributes exist. If the attributes do not exist, the specified list of attributes and corresponding values are added to the specified login profile. The *attribute_value_ pair_list* is an attribute name and a specified value. Specify one or more of the following attributes:

Parameter	Parameter Value	Description
default database	*default_database_name*	Specifies a database in the SAP ASE server. The default is `master`.
default language	*default_language*	Specifies a language. The default is **us_english**
login script	*login_script_name*	Specifies a valid stored procedure. Limited to 120 characters for a login script.
authenticate with	Valid values: **ASE**, **LDAP**, **PAM**, **KERBEROS**, **ANY**	Specifies the mechanism used for authenticating the login account. When **ANY** is used, the SAP ASE server checks for a defined external authentication mechanism. If one is defined, the SAP ASE server uses the defined mechanism., otherwise the **ASE** mechanism is used. If **authenticate with *authentication mechanism*** is not specified, **ANY** is used for the login account.
track lastlogin	Valid values: **TRUE**, **FALSE**.	Enables last login updates. The default is **TRUE**, which is to update.
stale period	1 .. 32767 days. Duration: **D** (days), **W** (weeks), **M** (months), **Y (years)**	Indicates the duration a login account is allowed to remain inactive before it is locked due to inactivity. The default is **D** (days).

- **add auto activated roles –** specifies the previously granted non-password protected user defined roles that must be automatically activated on login. An error is generated if the role specified is not granted to the login. By default, user defined roles are not automatically activated on login.
- **drop auto activated roles –** specifies the previously granted user defined roles must not be automatically activated on login. **ALL** specifies all granted user defined roles.
- **drop *attribute_name_list* –** removes the following:
  - **default database** – removes the default database specification.
  - **default language** – removes thedefault languages specification.
  - **login script**– removes specifications to apply a login script.

- **authenticate with** – removes specifications for authentication mechanisms that are associated with the account.
- **track last login** – removes specifications that enable last login updates.
- **stale period** – removes any restrictions that have been specified for the login account to remain inactive before it is locked.

Examples

- **Example 1 –** Configures `eng_lp` as the default login profile. If there is an existing default login profile, its default property is removed.

  ```
  alter login profile eng_lp as default
  ```

- **Example 2 –** Alters the login profile `mgr_lp` to automatically activate the previously granted `program_role`, `product_role`, and `admin_role`, roles on login if they are not password protected.

  ```
  alter login profile mgr_lp add auto activated roles program _role,
  product_role, admin_role
  ```

- **Example 3 –** Alters the login profile `mgr_lp` to remove the automatic activation of the previously granted role `admin_role` on login.

  ```
  alter login profile mgr_lp drop auto activated roles admin_role
  ```

- **Example 4 –** Alters the login profile `mgr_lp` to remove the **login script** attribute. Once removed, a login account associated with `mgr_lp` uses the values of a default login script, if one is defined. If one is not defined, the login script attribute be set to the default value, which is no login script with be invoked on login.

  ```
  alter login profile mgr_lp drop login script
  ```

Usage

- Precedence rules determine how login account attributes are applied when attributes are taken from different login profiles or when values have been specified using **sp_passwordpolicy.** For precedence rules, see *Applying Login Profile and Password Policy Attributes* in the *Security Administration Guide*.
- You can specify a login script to be invoked at login. For more information, see *Invoking a Login Script* in the *Security Administration Guide*.

See also:

- **create login**, **create login profile**, **alter login**, **drop login**, **drop login profile**
- For information about altering login profiles, see the *Security Administration Guide*.
- **lprofile_id**, **lprofile_name** in *Reference Manual: Building Blocks*
- **sp_passwordpolicy**, **sp_displaylogin**, **sp_displayroles**, **sp_locklogin** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **alter login profile** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `manage any login profile` privilege to execute **alter login profile**.
Disabled	With granular permissions disabled, you must have sso_role to execute **alter login profile**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	140
Audit option	security_profile
Command or access audited	**alter login profile**
Information in `extrainfo`	Keywords contain: • **DEFAULT** • **NOT DEFAULT** • **DROP *attribute_name_list*** • **MODIFY *attribute_value_pair_list*** • **ADD AUTO ACTIVATED ROLES *role1* [*role2*][... [*roleN*]...]]** • **DROP AUTO ACTIVATED ROLES {ALL | *role1* [, *role2* [... [, *roleN*] ...]] }**

See also

- *alter login* on page 23
- *create login* on page 160
- *create login profile* on page 163
- *drop login* on page 352
- *drop login profile* on page 354

alter precomputed result set

Alters the properties or policies of a precomputed result set.

Syntax

```
alter {precomputed result set | materialized view}
        [owner_name.]prs_name
    [{immediate | manual } refresh]
    [enable | disable]
    [{enable | disable } use in optimization]
```

Parameters

- **precomputed result set | materialized view –** alters a materialized view or precomputed result set.
- ***prs_name* –** name of the precomputed result set. A fully qualified *prs_name* cannot include the server or database name.
- **{immediate | manual} refresh –** determines the refresh policy:
  - **immediate** – (the default) the precomputed result set is updated during the same transaction that updates the base tables.
  - **manual** – the precomputed result set is explicitly updated. When you use the **manual** parameter, updates to the base tables are not reflected in the precomputed result set until you explicitly issue **refresh**. Because precomputed result sets set to **manual** are not maintained, the SAP ASE server considers them to be stale, even after you issue the **refresh** parameter, and therefore the query processor selects this data for query rewrite only if the query accepts stale data.
- **enable | disable –** specifies whether the precomputed result set is available for operations. This option overrides all other precomputed result set options.
  - **enable** – (the default) the precomputed result set is available for operations. Only precomputed result sets configured for **enable** are maintained according to their refresh policy.
  - **disable** – the precomputed result set is not available for operations. Disabled precomputed result sets are not considered for maintenance or query rewrites. If a precomputed result set is configured for **disable**, it is not:
    - Used for the query rewrite during optimization, whether or not you specify **use in optimization**.
    - Populated, whether or not you specify **with populate**.
- **{enable | disable} use in optimization –** specifies whether to include a precomputed result set for query rewrite during optimization. **use in optimization** is enabled by default. Precomputed result sets are considered for query rewrite depending on how their **refresh** parameter is set:

- **immediate** – considered for all queries.
- **manual** – considered only if the query accepts stale data.

Examples

- **Example 1 –** Alters the `authors_prs` from a manual to an immediate refresh policy:

  ```
  alter precomputed result set authors_prs
  immediate refresh
  ```

Usage

- Precomputed result sets are automatically refreshed when you change them from a **manual** to an **immediate** refresh policy.
- If the base table or view on which the precomputed result set is based is dropped or altered, the precomputed result set is automatically altered to **disable**.

Permissions

You must be the precomputed result set owner to execute the **alter** command.

alter...modify owner

Transfers the ownership of database objects from one owner to another.

Syntax

```
alter { object_type | all } [owner.]{object_name | * }
    modify owner
    { name_in_db | loginame only login_name }
    [ preserve permissions ]
```

Parameters

- ***object_type* –** the type of object whose ownership is to be explicitly transferred. Specify one of the following object types:
  - **table** – user tables and proxy tables
  - **view** – views
  - **procedure** – stored procedures
  - **function** – user-defined functions
  - **default** – defaults defined separately from the creation of tables
  - **rule** – rules
  - **type** – user-defined datatypes
  - **encryption key** – encryption keys

- **all –** all permitted object types. When specified as **all *owner.**** , the ownership of all permitted objects owned by the specified owner are transferred. When specified as **all *owner.object_name***, the ownership of permitted objects with name *object_name* owned by the specified owner are transferred.
- ***owner.* –** indicates the current owner of the object, which is determined by the owner's database user ID (`uid`). Specifying *owner* is optional when the user is transferring the ownership of objects owned by themselves. Ownership of objects in the `sysobjects` table are associated with the owner's login name and uid.
- ***object_name* –** indicates the name of the object in which the ownership is to be transferred. An attempt to transferred the ownership of an object with *object_name* set to the same owner results in an error message.
- *** –** all objects owned by *owner* and specified by *object_type* . When *object_type* is **all**, all objects owned by *owner* are transferred. When *owner* is the database owner, * is not allowed.
- ***name_in_db* –** the database user name of the new owner to whom the ownership transfered. The user specified by *name_in_db* must be an existing user and cannot be a guest, role, group, or an alias.
- **loginame only *login_name* –** transfers only the `loginame` field in `sysobjects` of objects involved to *login_name*. *login_name* must be a valid login in the `syslogins` table.
- **preserve permissions –** indicates whether or not to preserve explicitly granted or revoked permissions on the objects whose ownership are being transferred:

  - When specified – all explicitly granted or revoked permissions on the objects are preserved and the *grantor* of the permissions is changed to the new owner.

    For example, Bill granted **select** permission on table `bill_table` to Mark with grant option. Mark then granted **select** permission on table `bill_table` to John. If the ownership of the table is then transferred to Eric with **preserve permissions** specified, Mark and John retain their permission on `bill_table`.
  - When not specified – all existing explicitly granted and revoked permissions on the objects are removed from the system, and as a result, rows in the `sysprotects` table that correspond to the object are deleted.

  Implicit permissions on objects are not preserved for previous owners. New owners acquire all implicit permissions.

  For example, Bill is the owner of `bill_table` and possesses the implicit **alter**, **delete**, **insert**, **references**, **select**, and **update** permissions and explicit **decrypt** permission on bill_table. After an ownership transfer to Eric with **preserve permission** specified, Bill only retains **decrypt** permission on `bill_table`.

Examples

- **Example 1 –** Transfers ownership of the table named `bill.author` to Eric:

```
alter table bill.author
    modify owner eric
```

- **Example 2 –** Transfers ownership of the view named `bill.vw_author_in_ca` to eric without removing all existing explicitly granted permissions:

```
alter view bill.vw_author_in_ca
    modify owner eric
    preserve permissions
```

- **Example 3 –** Transfers ownership of all tables owned by Bill to Eric:

```
alter table bill.*
    modify owner eric
```

- **Example 4 –** Transfers ownership of all objects owned by Bill to Eric:

```
alter all bill.*
    modify owner eric
```

- **Example 5 –** The command fails when the new owner Cindy already owns an table named `cindy.publisher`.

```
alter table bill.publisher
    modify owner cindy
```

- **Example 6 –** An error results when an attempt is made to transfer the ownership of `bill.publisher` to Cindy because `bill.publisher` is not a stored procedure.

```
alter procedure bill.publisher
```

```
    modify owner cindy
```

Usage

The ownership of the following dependant objects is implicitly transferred when the ownership of the objects they depend on have been transferred:

- `trigger` – ownership of triggers are updated along with the dependent table when the owners are the same. The ownership of a DBO owned trigger cannot be altered if the trigger was created for a non DBO owned table or view.
- Declarative objects, which are defined during the table or view creation.
  - Defaults
  - Decrypt defaults
  - Dheck constraints
  - Reference constraints
  - Partition constraints
  - Computer columns

When transferring ownership of objects:

- Use caution in the following system databases: `sybsecurity`, `sybsystemdb`, `model`, `sybsystemprocs`, `sybsyntax`, `dbccdb`, and `tempdb`.

- Do not transfer ownership of system objects supplied and managed by SAP, such as but not limited to, user tables with `spt_` prefix, system stored procedures with the **sp_** prefix, and monitor tables. Doing so can render the system database unusable.

When transferring encryption keys:

- To an owner who owns a copy of the key is not allowed and the command fails.
- Changing the owner of encryption keys does not effect the assignees of the encryption key copies.

You cannot use the **alter ... modify owner** command to change the owner of a precomputed result set. To change the owner, drop the precomputed result set and re-create with the new owner.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **alter... modify owner** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `alter any object owner` privilege for objects other than encryption key. Only encryption key owners or user with the following privilege (based on encryption key type) can transfer the encryption key ownership: • column encryption key – `manage column encryption key` • master key – `manage master key` • service key – `manage service key` The database users (with `alter any object owner` privilege) who are explicitly or implicitly aliased to the database owner are not allowed to transfer the ownership of objects they concretely own. An object is identified as concretely owned by the database owner if it includes database owner user ID for the value of `sysobjects.uid`, and NULL or the database owner's login name for the value of `sysobjects.loginame`.

Setting	Description
Disabled	With granular permissions disabled: • System security officer (SSO) users are allowed to use this command to transfer the ownership of objects. • Only SSO users and encryption key owners can transfer the encryption key ownership. • Database owner (DBO) users and users who are explicitly or implicitly aliased to the DBO are allowed to transfer the ownership of objects with a type other than encryption keys with the following restrictions: • Database owners are not allowed to transfer the ownership of objects they concretely own. An object is identified as concretely owned by the database owner if it includes DBO_UID for the value of `sysobjects.uid`, and NULL or the database owner's login name for the value of `sysobjects.loginame`. • The functionality of transferring the ownership of multiple objects in one command is disabled for safety reasons and the transfer of DBO objects must be in the form of **dbo.*object_name***.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	124
Audit option	**alter**
Command or access audited	**alter .. modify owner**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – one of: • `USER TYPE` *owner.obj_name* – if you are changing user-defined types' ownership • `NEW OWNER` – *name_in_db* • `PRESERVE PERMISSIONS` – if the option is specified • `NEW LOGINAME` – *login_name*, if `LOGINAME ONLY` *login_name* is specified • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

alter role

Defines mutually exclusive relationships between roles; adds, drops, and changes passwords for roles; specifies the password expiration interval, the minimum password length, and the maximum number of failed logins allowed for a specified role. Also locks and unlocks roles.

Syntax

```
alter role role1 {add | drop} exclusive
    {membership | activation} role2
```

```
alter role role_name [add passwd "password" |
    drop passwd] [lock | unlock]
```

```
alter role {role_name | "all overrides"}
    set {passwd expiration | min passwd length |
    max failed_logins} option_value
```

Parameters

- ***role1* –** is one role in a mutually exclusive relationship.
- **add –** adds a role in a mutually exclusive relationship; adds a password to a role.
- **drop –** drops a role in a mutually exclusive relationship; drops a password from a role.
- **exclusive –** makes both named roles mutually exclusive.
- **membership –** does not allow you to grant users both roles at the same time.
- **activation –** allows you to grant a user both roles at the same time, but does not allow the user to activate both roles at the same time.
- ***role2* –** is the other role in a mutually exclusive relationship.
- ***role_name* –** is the name of the role for which you want to add, drop, or change a password. Use *role_name* to specify the password expiration interval, the minimum password length, and the maximum number of failed logins.
- **passwd –** adds or drops a password to a role.
- ***password* –** is the password to add to a role. You cannot use variables for passwords. For rules on passwords, see *Managing Adaptive Server Logins, Database Users, and Client Connections* in the *System Administration Guide, Volume 1*.
- **lock –** locks the specified role.
- **unlock –** unlocks the specified role.
- **all overrides –** applies the setting that follows to the entire server rather than to a specific role.
- **set –** activates the option that follows it.
- **passwd expiration –** specifies the password expiration interval in days. It can be any value between 0 – 32767, inclusive.
- **min passwd length –** specifies the minimum length allowed for the specified password.

- **max failed_logins –** specifies the maximum number of failed login attempts allowed for the specified password.
- ***option_value* –** specifies the value for **passwd expiration**, **min passwd length**, or **max failed_logins**. To set **all overrides**, set the value of *option_value* to -1.

Examples

- **Example 1 –** Defines `intern_role` and `specialist_role` as mutually exclusive at the membership level:

```
alter role intern_role add exclusive membership
    specialist_role
```

- **Example 2 –** Defines roles as mutually exclusive at the membership level and at the activation level:

```
alter role specialist_role add exclusive membership
    intern_role
alter role intern_role add exclusive activation
    surgeon_role
```

- **Example 3 –** Adds a password to an existing role:

```
alter role doctor_role add passwd "physician"
```

- **Example 4 –** Drops a password from an existing role:

```
alter role doctor_role drop passwd
```

- **Example 5 –** Locks `physician_role`:

```
alter role physician_role lock
```

- **Example 6 –** Unlocks `physician_role`:

```
alter role physician_role unlock
```

- **Example 7 –** Changes the maximum number of failed logins allowed for `physician_role` to 5:

```
alter role physician_role set max failed_logins 5
```

- **Example 8 –** Sets the minimum password length for `physician_role`, an existing role, to five characters:

```
alter role physician_role set min passwd length 5
```

- **Example 9 –** Overrides the minimum password length of all roles:

```
alter role "all overrides" set min passwd length -1
```

- **Example 10 –** Removes the overrides for the maximum failed logins for all roles:

```
alter role "all overrides" set max failed_logins -1
```

Usage

- The **alter role** command defines mutually exclusive relationships between roles, and adds, drops, and changes passwords for roles.
- The **all overrides** parameter removes the system overrides that were set using **sp_configure** with any of the following parameters:
  - **passwd expiration**
  - **max failed_logins**
  - **min passwd length**

  Dropping the role password removes the overrides for the password expiration and the maximum failed logins options.

  Password complexity checks are set at the login level using **create login** or **alter login**. Set the options at the global level using **sp_passwordpolicy** or **sp_configure**. See *Manage Roles* in the *Security Administration Guide*.
- When you use **alter role** to lock or unlock roles, you set (or unset) the `locksuid`, `lockdate`, and `lockreason` columns that are added to `syssrvroles`.

See also:

- For more information on altering roles, see the *System Administration Guide*.
- **mut_excl_roles**, **proc_role**, **role_contain**, **role_id**, **role_name** in *Reference Manual: Building Block*
- **sp_activeroles**, **sp_displaylogin**, **sp_displayroles** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **alter role** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `manage roles` privilege.
Disabled	With granular permissions disabled, you must be a user with sso_role.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	85

Information	Values
Audit option	**roles**
Command or access audited	**create role**, **drop role**, **alter role**, **grant role**, or **revoke role**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *create role* on page 193
- *drop role* on page 359
- *grant* on page 419
- *revoke* on page 559
- *set* on page 607

Changing Passwords for Roles

To change the password for a role, first drop the existing password, then add the new password.

```
alter role doctor_role drop passwd
```

```
alter role doctor_role add passwd "physician"
```

Note: Passwords that existed before SAP ASE version 12.x and that are attached to user-defined roles do not expire.

Mutually Exclusive Roles

Consideration for mutually exclusive roles.

- You need not use any particular order to specify the roles in a mutually exclusive relationship or role hierarchy.
- You can use mutual exclusivity with role hierarchy to impose constraints on user-defined roles.
- Mutually exclusive membership is a stronger restriction than mutually exclusive activation. If you define two roles as mutually exclusive at membership, they are implicitly mutually exclusive at activation.
- If you define two roles as mutually exclusive at membership, defining them as mutually exclusive at activation has no effect on the membership definitions. Mutual exclusivity at activation is added and dropped independently of mutual exclusivity at membership.

- You cannot define two roles as mutually exclusive property after granting both roles to users or roles. Revoke either granted role from existing grantees before attempting to define the roles as mutually exclusive at the membership level.
- If two roles are defined as mutually exclusive at activation, the system security officer can assign both roles to the same user, but the user cannot activate both roles at the same time.
- If the system security officer defines two roles as mutually exclusive at activation, and users have already activated both roles or, by default, have set both roles to activate at login, the SAP ASE server makes the roles mutually exclusive, but issues a warning message naming specific users with conflicting roles. The users' activated roles do not change.

alter table

Makes changes to existing tables.

- Adds new columns to a table; drops or modifies existing columns; adds, changes, or drops constraints; changes properties of an existing table; enables or disables triggers on a table, changes the compression level of a table.
- Supports adding, dropping, and modifying computed columns, and enables the materialized property, nullability, or definition of an existing computed column to be changed.
- Partitions and repartitions a table with specified partition strategy, adds partitions to a table with existing partitions, and splits or merges existing partitions.

Syntax

```
alter table [[database.][owner].]table_name
    {add column_name datatype}
        [default {constant_expression | user | null}]
        {identity | null | not null [not materialized]}
        [off row | in row]
        [[constraint constraint_name]
        {{unique | primary key}
            [clustered | nonclustered]
            [asc | desc]
            [with {fillfactor = pct,
                max_rows_per_page = num_rows,
                reservepagegap = num_pages
                immediate_allocation]
            [on segment_name]
        | references [[database.][owner].]ref_table
            [(ref_column)]
            [match full]
        | check (search_condition)]
        [encrypt [with [[database.][owner].] keyname]
            [decrypt_default {constant_expression | null}]]
        [compressed = compression_level | not compressed]
        [, next_column]...
    | add [constraint constraint_name]
        {unique | primary key}
            [clustered | nonclustered]
             (column_name [asc | desc]    [, column_name [asc |
desc]...])
            [with {fillfactor = pct,
                max_rows_per_page = num_rows,
                reservepagegap = num_pages}]
            [on segment_name]
        | foreign key (column_name [{, column_name}...])
            references [[database.][owner].]ref_table
            [(ref_column [{, ref_column}...])]
        [match full]
    | add lob-colname { text | image | unitext }
        [null] [ in row [ (length) ] ]
    | check (search_condition)}
    | set {  [ dml_logging = {full | minimal | default}]
           | [,compression = {NONE | PAGE | ROW | ALL} ]
           | [,index_compression = {NONE | PAGE} ]
           | [,"erase residual data" (on | off) ]
          }
        [lob_compression = off | compression_level]
    | drop {column_name [, column_name]...
        | constraint constraint_name}
    | modify column_name
        [datatype [null | not null]]
        [[[encrypt [with keyname] [decrypt_default [value]]
            | decrypt
        ]
        [[not] compressed]
        [compressed = compression_level | not compressed]
        | modify lob-column [ in row (length)]
                [, next_column]...
    | replace column_name
        default {constant_expression | user | null}
        | decrypt_default {constant_expression | null}
        | drop decrypt_default    |
    lock {allpages | datarows | datapages} }
    | with exp_row_size=num_bytes
        | transfer table [on | off]
        | no datacopy}
    | partition number_of_partitions
    | unpartition
    | partition_clause
    | add_partition_clause
```

alter table syntax for partitions:

```
partition_clause::=
    partition by range (column_name[, column_name]...)
         ([partition_name] values <= ({constant | MAX}
            [, {constant | MAX}] ...) [on segment_name]
            [compression_clause] [on segment_name]
            [, [partition_name] values <= ({constant | MAX}
                [, {constant | MAX}] ...) [on segment_name]]...)
    | partition by hash (column_name[, column_name]...)
        { (partition_name [on segment_name]
            [, partition_name [on segment_name]]...)
            [compression_clause] [on segment_name]
        | number_of_partitions
            [on (segment_name[, segment_name] ...)]}

    | partition by list (column_name)
         ([partition_name] values (constant[, constant] ...)
            [on segment_name]
            [compression_clause] [on segment_name]
            [, [partition_name] values (constant[, constant] ...)
                [on segment_name]] ...)

    | partition by roundrobin
        { (partition_name [on segment_name]
            [, partition_name [on segment_name]]...)
            [compression_clause] [on segment_name]
        | number_of_partitions
            [on (segment_name [, segment_name]...)]}

add_partition_clause::=
    add partition
        { ([partition_name] values <= ({constant | MAX}
            [, {constant | MAX}]...)
            [on segment_name]
            [compression_clause] [on segment_name]
            [, [partition_name ] values <= ({constant | MAX}
                [, {constant | MAX}] ...)
                [on segment_name]]...)
       | modify partition {partition_name [, partition_name . . .] }
        set compression [= {default | none | row | page}]
        set index_compression [= {none | page} ]

        | ([partition_name] values (constant[, constant] ...)
            [on segment_name]
            [, [partition_name] values (constant[, constant] ...)
                [on segment_name]] ...)}
```

alter table syntax for computed columns:

```
alter table
    add column_name {compute | as}
        computed_column_expression...
            [materialized | not materialized]
    drop column_name
    modify column_name {null | not null |
        {materialized | not materialized} [null | not null] |
        {compute | as} computed_column_expression
            [materialized | not materialized]
            [null | not null]}
```

alter table syntax for dropping, splitting, merging, and moving partitions:

```
alter table table_name
    drop partition partition_name [, partition_name]...
    split partition partition_name
    merge partition  {partition_name  [{, partition_name}…]}
        into destination_partition_name [on segment_name]
    move partition partition_name  [{, partition_name}…]
        to destination_segment_name
```

Parameters

- ***table_name*** **–** is the name of the table to change. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.
- **add –** specifies the name of the column or constraint to add to the table. If CIS is enabled, you cannot use **add** for remote servers.
- ***column_name*** **–** is the name of a column in that table. If Java is enabled in the database, the column can be a Java-SQL column.
- ***datatype*** **–** is any system datatype except `bit`, or any user-defined datatype except those based on `bit`.

  If Java is enabled in the database, *datatype* can be the name of a Java class installed in the database, either a system class or a user-defined class. See *Java in Adaptive Server Enterprise*.
- **default –** specifies a default value for a column. If you specify a default and the user does not provide a value for this column when inserting data, the SAP ASE server inserts this value. The default can be a *constant_expression*, **user** (to insert the name of the user who is inserting the data), or **null** (to insert the null value).

  The SAP ASE server generates a name for the default in the form of *tabname_colname_objid,* where *tabname* is the first 10 characters of the table name, *colname* is the first 5 characters of the column name, and *objid* is the object ID number for the default. Setting the default to **null** drops the default.

  If CIS is enabled, you cannot use **default** for remote servers.
- ***constant_expression*** **–** is a constant expression to use as a default value for a column. It cannot include global variables, the name of any columns, or other database objects, but can include built-in functions. This default value must be compatible with the datatype of the column.
- **user –** specifies that the SAP ASE server should insert the user name as the default if the user does not supply a value. The datatype of the column must be `char(30)`, `varchar(30)`, or a type that the SAP ASE server implicitly converts to `char`; however, if the datatype is not `char(30)` or `varchar(30)`, truncation may occur.
- **null | not null –** specifies the SAP ASE server behavior during data insertion if no default exists.

  null specifies that a column is added that allows nulls. The SAP ASE server assigns a null value during inserts if a user does not provide a value.

  The properties of a bit-type column must always be **not null**.

not null specifies that a column is added that does not allow nulls. Users must provide a non-null value during inserts if no default exists.

If you do not specify **null** or **not null**, the SAP ASE server uses **not null** by default. However, you can switch this default using **sp_dboption** to make the default compatible with the SQL standards. If you specify (or imply) **not null** for the newly added column, a default clause is required. The default value is used for all existing rows of the newly added column, and applies to future inserts as well.

- **materialized | not materialized –** indicates whether you are creating a materialized or nonmaterialized column.
- **encrypt [with *keyname*] –** specifies an encrypted column and the key used to encrypt it.

  keyname identifies a key created using **create encryption key**. The table owner must have **select** permission on *keyname*. If *keyname* is not supplied, the server looks for a default key created using **create encryption key** or **alter encryption key**.

  See *Encrypting Data*, in *Database Encryption* for a list of supported datatypes.
- **decrypt_default *constant_expression* –** specifies that this column returns a default value for users who do not have decrypt permissions, and *constant_expression* is the value the SAP ASE server returns on **select** statements instead of the decrypted value. The value can be NULL on nullable columns only. If the **decrypt_value** cannot be converted to the column's datatype, the SAP ASE server catches the conversion error only when the query executes.
- **decrypt –** decrypts the encrypted column.
- **compressed = *compression_level* | not compressed –** indicates if the data in the row is compressed and to what level.
- ***compression_level* –** Level of compression. The compression levels are:

  - 0 – the row is not compressed.
  - 1 through 9 – the SAP ASE server uses ZLib compression. Generally, the higher the compression number, the more the SAP ASE server compresses the LOB data, and the greater the ratio between compressed and uncompressed data (that is the greater the amount of space savings, in bytes, for the compressed data versus the size of the uncompressed data).

    However, the amount of compression depends on the LOB content, and the higher the compression level , the more CPU-intensive the process. That is, level 9 provides the highest compression ratio but also the heaviest CPU usage.
  - 100 – the SAP ASE server uses FastLZ compression. The compression ratio that uses the least CPU usage; generally used for shorter data.
  - 101 – the SAP ASE server uses FastLZ compression. A value of 101 uses slightly more CPU than a value of 100, but uses a better compression ratio than a value of 100.

  The compression algorithm ignores rows that do not use LOB data.
- **identity –** indicates that the column has the IDENTITY property. Each table in a database can have one IDENTITY column with a datatype of:

    - Exact `numeric` and scale of 0, or
    - Any of the integer datatypes, including signed or unsigned `bigint`, `int`, `smallint`, or `tinyint`.

  IDENTITY columns are not updatable and do not allow nulls.

  IDENTITY columns store sequential numbers, such as invoice numbers or employee numbers that are automatically generated by the SAP ASE server. The value of the IDENTITY column uniquely identifies each row in a table.
- **off row | in row –** specifies whether the Java-SQL column is stored separately from the row, or in storage allocated directly in the row.

  The storage for an **in row** column cannot exceed 16K bytes, depending on the page size of the database server and other variables. The default value is **off row**.
- **constraint –** introduces the name of an integrity constraint. If CIS is enabled, you cannot use **constraint** for remote servers.
- ***constraint_name* –** is the name of the constraint, which must conform to the rules for identifiers and be unique in the database. If you do not specify the name for a table-level constraint, the SAP ASE server generates a name in the form of *tabname_colname_objectid*, where *tabname* is the first 10 characters of the table name, *colname* is the first 5 characters of the column name, and *objectid* is the object ID number for the constraint. If you do not specify the name for a unique or primary key constraint, the SAP ASE server generates a name in the format *tabname_colname_tabindid*, where *tabindid* is a string concatenation of the table ID and index ID.

  Constraints do not apply to the data that already exists in the table at the time the constraint is added.
- **unique –** constrains the values in the indicated column or columns so that no two rows can have the same non-null value. This constraint creates a unique index that can be dropped only if the constraint is dropped. You cannot use this option with the **null** option.
- **primary key –** constrains the values in the indicated column or columns so that no two rows can have the same value and so that the value cannot be NULL. This constraint creates a unique index that can be dropped only if the constraint is dropped.
- **clustered | nonclustered –** specifies that the index created by a **unique** or **primary key** constraint is a clustered or nonclustered index. **clustered** is the default (unless a clustered index already exists for the table) for primary key constraints; **nonclustered** is the default for unique constraints. There can be only one clustered index per table. See **create index** for more information.
- **asc | desc –** specifies whether the index is to be created in ascending (**asc**) or descending (**desc**) order. The default is ascending order.
- **with fillfactor=*pct* –** specifies how full to make each page when the SAP ASE server creates a new index on existing data. “pct” stands for percentage. The **fillfactor** percentage is relevant only when the index is created. As data changes, pages are not maintained at any particular level of fullness.

Warning! Creating a clustered index with a **fillfactor** affects the amount of storage space your data occupies, since the SAP ASE server redistributes the data as it creates the clustered index.

The default for **fillfactor** is 0; this is used when you do not include **with fillfactor** in the **create index** statement (unless the value has been changed with **sp_configure**). When specifying a **fillfactor**, use a value between 1 and 100.

A **fillfactor** of 0 creates clustered indexes with completely full pages and nonclustered indexes with completely full leaf pages. It leaves a comfortable amount of space within the index B-tree in both clustered and nonclustered indexes. There is seldom a reason to change the **fillfactor**.

If the **fillfactor** is set to 100, the SAP ASE server creates both clustered and nonclustered indexes, with each page 100 percent full. A **fillfactor** of 100 makes sense only for read-only tables—tables to which no data is ever added.

fillfactor values smaller than 100 (except 0, which is a special case) cause the SAP ASE server to create new indexes with pages that are not completely full. A **fillfactor** of 10 might be a reasonable choice if you are creating an index on a table that eventually holds a great deal more data, but small **fillfactor** values cause each index (or index and data) to take more storage space.

- **transfer table [on | off] –** alters a table's eligibility for incremental transfer. The default value is to make no change, whether the table is marked for transfer or not. If the **alter table** command specifies **set transfer table**, and the selection of **on** or **off** differs from the current value, the table's eligibility is changed.
- **max_rows_per_page =** ***num_rows*** **–** limits the number of rows on data pages and the leaf-level pages of indexes. Unlike **fillfactor**, the **max_rows_per_page** value is maintained until it is changed with **sp_chgattribute**.

  If you do not specify a value for **max_rows_per_page**, the SAP ASE server uses a value of 0 when creating the index. When specifying **max_rows_per_page** for data pages, use a value between 0 – 256. The maximum number of rows per page for nonclustered indexes depends on the size of the index key; the SAP ASE server returns an error message if the specified value is too high.

  For indexes created by constraints, a **max_rows_per_page** setting of 0 creates clustered indexes with full pages, and nonclustered indexes with full leaf pages. A setting of 0 leaves a comfortable amount of space within the index B-tree in both clustered and nonclustered indexes.

  If **max_rows_per_page** is set to 1, the SAP ASE server creates both clustered and nonclustered leaf index pages with one row per page at the leaf level. You can use this to reduce lock contention on frequently accessed data.

  Low **max_rows_per_page** values cause the SAP ASE server to create new indexes with pages that are not completely full, use more storage space, and may cause more page splits.

Warning! Creating a clustered index with **max_rows_per_page** can affect the amount of storage space your data occupies, since the SAP ASE server redistributes the data as it creates the clustered index.

- **reservepagegap = *num_pages* –** specifies a ratio of filled pages to empty pages to be left during extent I/O allocation operations for the index created by the constraint. For each specified *num_pages*, an empty page is left for future expansion of the table. Valid values are 0 – 255. The default value, 0, leaves no empty pages.
- **immediate_allocation –** Explicitely creates a table when you have enabled **sp_dboption 'deferred table allocation'**.
- **on *segment_name* –** specifies the segment on which the index exists or is to be placed. When using **on *segment_name***, the logical device must already have been assigned to the database with **create database** or **alter database**, and the segment must have been created in the database with **sp_addsegment**. See your system administrator or use **sp_helpsegment** for a list of the segment names available in your database.

  If you specify **clustered** and use the **on *segment_name*** option, the entire table migrates to the segment you specify, since the leaf level of the index contains the actual data pages.

  For partitions, **on *segment_name*** specifies the segment on which to place the partition.
- **references –** specifies a column list for a referential integrity constraint. You can specify only one column value for a column constraint. By including this constraint with a table that references another table, any data inserted into the *referencing* table must already exist in the *referenced* table.

  To use this constraint, you must have **references** permission on the referenced table. The specified columns in the referenced table must be constrained by a unique index (created by either a **unique** constraint or a **create index** statement). If no columns are specified, there must be a **primary key** constraint on the appropriate columns in the referenced table. Also, the datatypes of the referencing table columns must exactly match the datatype of the referenced table columns.

  If CIS is enabled, you cannot use **references** for remote servers.
- **foreign key –** specifies that the listed columns are foreign keys in this table for which the matching primary keys are the columns listed in the **references** clause.
- ***ref_table* –** is the name of the table that contains the referenced columns. You can reference tables in another database. Constraints can reference as many as 192 user tables and internally generated worktables. Use **sp_helpconstraint** to check a table's referential constraints.
- ***ref_column* –** is the name of the column or columns in the referenced table.
- **match full –** specifies that if all values in the referencing columns of a referencing row are:

  - Null – the referential integrity condition is true.
  - Non-null values – if there is a referenced row where each corresponding column is equal in the referenced table, then the referential integrity condition is true.

If they are neither, then the referential integrity condition is false when:

- All values are non-null and not equal, or
- Some of the values in the referencing columns of a referencing row are non-null values, while others are null.

- **check –** specifies a *search_condition* constraint that the SAP ASE server enforces for all the rows in the table. If CIS is enabled, you cannot use **check** for remote servers.
- ***search_condition* –** is a Boolean expression that defines the **check** constraint on the column values. These constraints can include:
    - A list of constant expressions introduced with **in**
    - A set of conditions, which may contain wildcard characters, introduced with **like**
      An expression can include arithmetic operations and Transact-SQL functions. The *search_condition* cannot contain subqueries, aggregate functions, parameters, or host variables.
- ***next_column* –** includes additional column definitions (separated by commas) using the same syntax described for a column definition.
- **set dml_logging –** determines the amount of logging for **insert**, **update**, and **delete** (DML) operations. One of:
    - **full** – the SAP ASE server logs all transactions,
    - **minimal** – the SAP ASE server does not log row or page changes
    - **default** – logging is set to the table default.
- **add *lob-colname* { text | image | unitext } –** adds the LOB column with the specified datatype.
- **[null] [in row [(*length*)]] –** specifies the maximum length for the LOB column to remain in-row. If you do not specify length, the SAP ASE server applies the database-wide setting in effect for in-row length.

  If you do not use **in row (*length*)**, and the database-wide setting is not in effect, the LOB column is added with off-row storage of the data.
- **modify *lob-column* in row [(*length*)] –** changes only the property of the LOB column to in-row, up to the specified length. When you run this command, no data moves.

  You can also use this option to increase the length of an in-row LOB column.

  Note: You cannot use this option to decrease the length of a LOB column, nor can you specify 0 as the length. Depending on the amount of space available on the page, the off-row LOB data is moved in-row up to the specified in-row length during updates that occur after this modification.
- **set compression –** indicates the level of compression to be applied to the table or partition. The new compression level applies to newly inserted or updated data:
    - **default** – resets the compression level for the specified partitions to the compression level of the table.

  - **none** – the data in this table or partition is not compressed. For partitions, **none** indicates that data in this partition remains uncompressed even if the table compression is altered to **row** or **page** compression.
  - **page** – when the page fills, existing data rows that are row-compressed are then compressed using page-level compression to create page-level dictionary, index, and character-encoding entries. Set **page** compression at the partition or table level.

    The SAP ASE server compresses data at the page level only after it has compressed data at the row level, so setting the compression to **page** implies both **page** and **row** compression.
  - **row** – compresses one or more data items in an individual row. The SAP ASE server stores data in a **row** compressed form only if the compressed form saves space compared to an uncompressed form. Set **row** compression at the partition or table level.
- **set index_compression –** specifies the index compression to be enabled or disabled to the table, index, or the local index partition. If the table is modified to be index compressed, newly created indexes are compressed.
  - `NONE` – indexes on the specified table are not compressed.
  - `PAGE` – all indexes on the specified table are compressed.
- **set lob_compression = *compression_level* –** changes the compression level for a table that uses LOB datatypes.
- **set "erase residual data" {on | off} –** specifies whether to remove residual data from deletions in SAP ASE.
- **drop –** specifies the name of a column or constraint to drop from the table. If CIS is enabled, you cannot use **drop** for remote servers.
- **modify –** specifies the name of the column for which you are changing the datatype or nullability.
- **[not] compressed –** indicates if the modified column is compressed.
- **replace –** specifies the column for which to replace the default value with the new value specified by a following **default** clause. If CIS is enabled, you cannot use **replace** for remote servers.
- **enable | disable trigger –** enables or disables a trigger. See the *System Administration Guide* for information about triggers.
- **lock datarows | datapages | allpages –** changes the locking scheme to be used for the table.
- **with exp_row_size=*num_bytes* –** specifies the expected row size. You can apply this parameter only:
  - To datarows and datapages locking schemes.
  - To tables with variable-length rows.
  - When **alter table** performs a data copy, such as with **alter table add** or **modify**. You cannot use **with exp_row_size=*num_bytes*** with **alter table lock change** operations.

Valid values are 0, 1, and any value between the minimum and maximum row length for the table. The default value is 0, which means a server-wide setting is applied.

- **no datacopy –** indicates that **alter table** drops colums without performing a data copy, preventing the **alter table... drop** command from blocking other commands running on the table while the **alter table** operation occurs.
- **partition *number_of_partitions* –** adds (*number_of_partitions* –1) empty partitions to an unpartitioned table (round-robin-partitioned table with a single partition). Thus, the total number of partitions for the table becomes *number_of_partitions*. If Component Integration Services (CIS) is enabled, you cannot use **partition** for remote servers.
- **unpartition –** changes a round-robin-partitioned table without indexes, to an unpartitioned table. If CIS is enabled, you cannot use **unpartition** for remote servers.
- **partition by range –** specifies that records are to be partitioned according values in the partitioning column or columns. Each partitioning column value is compared with sets of user-supplied upper and lower bounds to determine partition assignment.
- ***column_name* –** when used in the *partition_clause*, specifies a partition key column. A partition key column cannot be an encrypted column.
- ***partition_name* –** specifies the name of a new partition on which table records are to stored. Partition names must be unique within the set of partitions on a table or index. Partition names can be delimited identifiers if **set quoted_identifier** is on. Otherwise, they must be valid identifiers.

  If *partition_name* is omitted, the SAP ASE server creates a name in the form ***table_name_partition_id***. The SAP ASE server truncates partition names that exceed the allowed maximum length.
- **values <= *constant* | MAX –** specifies the inclusive upper bound of values for a named partition. Specifying a constant value for the highest partition bound imposes an implicit integrity constraint on the table. The keyword MAX specifies the maximum value in a given datatype.
- **on *segment_name* –** when used in the *partition_clause*, specifies the segment on which the partition is to be placed. When using **on *segment_name***, the logical device must already have been assigned to the database with **create database** or **alter database**, and the segment must have been created in the database with **sp_addsegment**. See your system administrator or use **sp_helpsegment** for a list of the segment names available in your database.
- **partition by hash –** specifies that records are to be partitioned by a system-supplied hash function. The function computes the hash value of the partition keys that specify the partition to which records are assigned.
- **partition by list –** specifies that records are to be partitioned according to literal values specified in the named column. The partition key contains only one column. You can list as many as 250 constants as the partition values for each list partition.
- **partition by round-robin –** specifies that records are to be partitioned in a sequential manner. A round-robin-partitioned table has no partitioning key. Neither the user nor the optimizer knows in which partition a particular record resides.

- **add partition –** applies only to range- or list-partitioned tables:
  - For range-partitioned tables – adds one or more partitions to the upper end of a range partitioned table.
  - For list-partitioned tables – adds one or more partitions with a new set of values.
- **modify partition –** specifies the partitions for which you are modifying the compression level.
- **compute | as –** adds or drops a new computed column. Follow the same rules defined for the **create table** command and the **alter table add** rules.
- ***computed_column_expression* –** is any valid Transact-SQL expression that does not contain columns from other tables, local variables, aggregate functions, or subqueries. It can be one or a combination of column name, constant, function, global variable, or case expression, connected by one or more operators. You cannot cross-reference between computed columns, except when virtual computed columns reference materialize computed columns. You cannot reference encrypted column in a *computed_column_expression*.
- **materialized | not materialized –** specifies whether a computer column is materialized or not. These are reserved keywords in the **modify** clause that specify whether the computed column is materialized, or physically stored in the table. By default, a computed column is **not materialized** (that is, not physically stored in the table). You can also use this parameter to change the definitions of existing virtual computed columns; that is, to materialize them.
- ***table_name* drop partition *partition_name* [, *partition_name*]... –** drops one or more list or range partitions. You cannot use **alter table** to drop a hash or round-robin partition.

  For each partition you drop, the SAP ASE server:

  - Deletes all data on the partition
  - Deletes the partition definition from the system catalog
  - Drops all corresponding local index partitions that refer to this data partition
  - Regenerates the partition condition object of the base table and each local index
  - Deletes all statistics information on this partition
  - Rebuilds all global indexes

  Note: If you attempt to drop a partition from a table that is referenced by another table, and the partition to be dropped and the referencing table are not empty, the command fails because of possible violations with the foreign-key constraint, and the SAP ASE server displays error message 13971.
- **split partition *partition_name* into *partition_condition_clause* –** redistributes partition data to two or more partitions.
- ***partition_condition_clause* –** indicates conditions that specify how to split the source partition data. Typically, conditions are a numerical range or a data range. The partition conditions should cover all, and only, the data in the source partition.

partition_condition_clause may be on the same segment as the source partition, or on a new segment. If you do not specify destination partition segments, the SAP ASE server creates the new partitions on the segment on which the source partition resides.

- **merge partition –** combine the data from two or more merge-compatible partitions into a single partition.
- ***destination_partition_name*** **–** a new or existing partition. If *destination_partition_name* is an existing partition, it cannot be any of the source partitions you are merging. If you do not specify a destination partition name, a system-generated name is picked.
- **move partition –** moves a partition (and its index) to a specified segment.
- ***destination_segment_name*** **–** a new or existing segment to which you are moving the partition. You cannot specify "default" as the ***destination_segment_name*****.**

Examples

- **Adds a column to a table –** Adds a column to a table. For each existing row in the table, the SAP ASE server assigns a NULL column value:

```
alter table publishers
add manager_name varchar (40) null
```

- **Adds an IDENTITY column to a table –** For each existing row in the table, the SAP ASE server assigns a unique, sequential column value. The IDENTITY column can be type `numeric` or `integer`, and have a scale of zero. The precision determines the maximum value (10^5 -1, or 99,999) that can be inserted into the column:

```
alter table sales_daily
add ord_num numeric (5,0) identity
```

- **Adds a primary key constraint to the authors table –** If there is an existing primary key or unique constraint on the table, you must drop the existing constraint first (see next example):

```
alter table authors
add constraint au_identification
primary key (au_id, au_lname, au_fname)
```

- **Drops a constraint –** Drops the `au_identification` constraint:

```
alter table titles
    drop constraint au_identification
```

- **Creates an index on authors –** The index has a **reservepagegap** value of 16, leaving 1 empty page in the index for each 15 allocated pages:

```
alter table authors
add constraint au_identification
primary key (au_id, au_lname, au_fname)
with reservepagegap = 16
```

- **Removes the default constraint –** Removes the default constraint on the `phone` column in the `authors` table. If the column allows NULL values, NULL is inserted if no column value is specified. If the column does not allow NULL values, an insert that does not specify a column value fails:

```
alter table authors
    replace phone default null
```

- **Modifies the emp table –** Modifies the `emp` table to encrypt the `ssn` column and specifies decrypt default:

```
alter table emp modify ssn encrypt with key1
    decrypt_default '000-00-0000'
```

- **Decrypts data –** Decrypts credit card data that is longer sensitive:

```
alter table stolen_ccards
     modify ccard decrypt
```

If card was encrypted by a key protected by a user-defined password, precede this command with the **set encryption key** command.

- **Adds an encrypted column to an existing table –** Since keyname is omitted, the SAP ASE server looks for the database default encryption key:

```
alter table sales_mgr
     add bonus money null encrypt
```

- **Sets a password –** Sets the password for the `ssn_key` encryption key and encrypts the `ssn` column in the existing `employee` table.

```
set encryption passwd '4evermore' for key ssn_key
alter table employee modify ssn
         encrypt with ssn_key
```

If `ssn` in this example is an existing encrypted column encrypted by “key1” the alter table would cause the SAP ASE server to decrypt `ssn` using “key1” and reencrypt `ssn` using “ssn_key”.

- **Adds a decrypt default to a column –** Adds a decrypt default to the `salary` column, which is already encrypted:

```
alter table employee replace salary
    decrypt_default $0.00
```

- **Removes the decrypt default –** Removes the decrypt default for `salary` without removing the encryption property:

```
alter table employee replace salary drop
    decrypt_default
```

- **Changes an unpartitioned table –** Changes an unpartitioned table to a range-partitioned table with three partitions, each of which is on a different segment:

```
alter table titles partition by range (total_sales)
    (smallsales values <= (500) on seg1,
    mediumsales values <= (5000) on seg2,
    bigsales values <= (25000) on seg3)
```

- **Adds range partition –** Adds another range partition to the `titles` table:

```
alter table titles add partition
     (vbigsales values <= (40000) on seg4)
```

- **Alters a table to use low-level compression –** Alters the `titles` table in the `pubs2` database to use row-level compression:

```
alter table titles set compression = row
```

- **Changes a table to use page-level compression –** Changes the Y2009 partition of the sales table to use page-level compression:

```
alter table sales modify partition Y2009
set compression = page
```

- **Changes the compression state to `NONE` –** Alters the existing table `order_line`, changing the compression state to `NONE`:

```
alter table order_line set index_compress = NONE
```

- **Changes the compressionstate to `PAGE`: –** Alters the existing table `sales`, changing the state to `PAGE` for compression of the local index partition Y2009:

```
alter table sales
modify partition Y2009 set index_compression = PAGE
```

- **Changes a locking scheme –** Changes the locking scheme for the `titles` table to datarows locking:

```
alter table titles lock datarows
```

- **Adds a non-null column –** Adds the not-null column `author_type` to the `authors` table with a default of `primary_author`:

```
alter table authors
    add author_type varchar (20)
    default "primary_author" not null
```

- **Drops columns from a table –** Drops the `advance`, `notes`, and `contract` columns from the `titles` table:

```
alter table titles
    drop advance, notes, contract
```

- **Modifies a column with a default of NULL –** Modifies the `city` column of the `authors` table to be a `varchar(30)` with a default of NULL:

```
alter table authors
    modify city varchar (30) null
```

- **Modifies a column with a default of not NULL –** Modifies the `stor_name` column of the `stores` table to be NOT NULL. Its datatype, `varchar(40)`, remains unchanged:

```
alter table stores
    modify stor_name not null
```

- **Modifies a column and changes the locking scheme of a table –** Modifies the `type` column of the `titles` table and changes the locking scheme of the `titles` table from allpages to datarows:

```
alter table titles
    modify type varchar (10)
    lock datarows
```

- **Makes various modifications to a column –** Modifies the `notes` column of the `titles` table from `varchar(200)` to `varchar(150)`, changes the default value from NULL to NOT NULL, and specifies an **exp_row_size** of 40:

```
alter table titles
    modify notes varchar (150) not null
    with exp_row_size = 40
```

- **Adds an incremental transfer attribute –** Adds the incremental transfer attribute to `mytable`:

```
alter table mytable set transfer table on
```

- **Removes an incremental transfer attribute –** Removes the incremental transfer attribute from `mytable`:

```
alter table mytable set transfer table off
```

- **Adds, modifies, drops column –** Adds, modifies, and drops a column, and then adds another column in one query. Alters the locking scheme and specifies the **exp_row_size** of the new column:

```
alter table titles
    add author_type varchar (30) null
    modify city varchar (30)
    drop notes
    add sec_advance money default 1000 not null
    lock datarows
    with exp_row_size = 40
```

- **Modifies a column to support in-row LOB –** Modifies the `description` column of `mymsgs` table to support in-row LOB 400 bytes long:

```
alter table mymsgs modify description in row (400)
```

- **Adds a virtual computed column –** Adds a virtual computed column:

```
alter table authors
    add fullname compute au_fname + ' ' + au_lname
```

- **Changes a computed column from virtual to materialized –** Changes a virtual computed column to a materialized computed column:

```
alter table authors modify fullname materialized
```

- **Splits a partition in two –** Splits the partition containing the `orders` table into two partitions:

```
alter table orders
split partition P2
into
( P5 values <= (25000) on seg2,
  P6 values <= (50000) on seg3)
```

- **Merges partitions into a single partition –** Merges the partitions containing the `sales` table into a single partition:

  ```
  alter table sales
  merge partition Q1, Q2, Q3, Q4
  into Y2007
  ```

- **Example 32 –** Moves the orders table to the `seg4` segment:

  ```
  alter table orders
    move partition P2 to seg4
  ```

- **Drops a column from a table –** Drops the `total_sales` column from the `titles` table with a data copy:

  ```
  alter table titles
  drop total_sales
  with no datacopy
  ```

Usage

- If there are multiple triggers on a table, the table owner can disable any or all of the multiple triggers defined on that table.
- When you set the **"erase resdual data"** option on a table, the operations for the table (**drop table**, **delete row**, **alter table**, **drop index**) that result in residual data automatically clean up deallocated space. The default is set to **off**.
- You cannot use **alter table** on a segment that includes a virtually hashed table.
- You cannot use **alter table** on a segment that includes the VHASH table, since a virtually hashed table must take only one exclusive segment, which cannot be shared by other tables or databases.
- Before you add, modify, or drop columns on a table, run **sp_depends** to see if there are any stored procedures that depend on the table you are changing. If such stored procedures exist, drop, then re-create the stored procedures as necessary after changing table schema.
- If stored procedures using **select *** reference an altered table, no new columns appear in the result set, even if you use the **with recompile** option. You must drop the procedure and re-create it to include these new columns. Otherwise, the wrong results may be caused by **insert into table1 select * from table2** in the procedure when the tables have been altered and new columns have been added to the tables.
- When the table owner uses **alter table**, the SAP ASE server disables access rules during the execution of the command and enables them upon completion of the command. The access rules are disabled to avoid filtering of the table data during **alter table**.
- If you specify **clustered** and use the **on *segment_name*** option, the entire table migrates to the segment you specify, since the leaf level of the index contains the actual data pages.
- **alter table. . . transfer table** involves data copy (similar to adding or removing a column): it is a very expensive command in terms of performance.
- **alter table** performs error checking for check constraints before it alters the table.
- When using **on *segment_name*** for partitions, the logical device must already have been assigned to the database with **create database** or **alter databse**, and the segment must have

been created in the database with **sp_addsegment**. See your system administrator or use **sp_helpsegment** for a list of the segment names available in your database.

See also **sp_chgattribute**, **sp_help**, **sp_helppartition**, **sp_rename** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

See *System and User-Defined Datatypes* in *Reference Manual: Building Blocks* for datatype compliance information.

Permissions

The permission checks for **alter table** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner or a user with `alter any table` privilege. A user with `setuser` privilege can impersonate the table owner by executing the **setuser** command.
Disabled	With granular permissions disabled, you must be the table owner or a user with **sa_role.** The database owner can impersonate the table owner by running the **setuser** command

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	3
Audit option	**alter**
Command or access audited	**alter table**

Information	Values
Information in `ex-trainfo`	• *Roles* – current active roles • *Keywords or options* – **add column**, **drop column**, **modify column**, **replace column**, **add constraint**, or **drop constraint** • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a **set proxy** is in effect • If the **set** option for **set transfer table [on | off]** is: • **on** – the SAP ASE server prints `SET TRANSFER TABLE ON` in the extra info in the audit record. • **off** – the SAP ASE server prints `SET TRANSFER TABLE OFF`.

See also

- *create index* on page 140
- *create table* on page 207
- *dbcc* on page 278
- *drop database* on page 342
- *dump transaction* on page 391
- *insert* on page 473
- *setuser* on page 658
- *select* on page 579

Restrictions for alter table

Restrictions that apply when using **alter table**.

- Do not alter the system tables.
- You cannot add a column of datatype `bit` to an existing table if you specify a default value. This default value must be 0 or 1.
- When you run **alter table drop column** against columns with large objects (LOB), the SAP ASE server drops any replication indexes if:
  - The table contains LOB columns, and
  - The table is marked for replication, and
  - The LOB column contains a replication index

  Consequently, the SAP ASE server may require a long time to drop the replication index if the table is large.
- The maximum number of columns in a table is:
  - 1024 for fixed-length columns in both all-pages-locked (APL) and data-only-locked (DOL) tables

    - 254 for variable-length columns in an APL table
    - 1024 for variable-length columns in a DOL table
- **alter table** raises an error if the number of variable-length columns in an APL table exceeds 254.
- Drop, then re-create compiled objects after changing a table's lock schema.
- You cannot use the **no datacopy** parameter on:
    - Materialized or virtual computed columns
    - Encrypted columns
    - XML columns
    - `timestamp` columns
    - `bit` columns
    - Java columns
- The maximum length for in-row Java columns is determined by the maximum size of a variable-length column for the table's schema, locking style, and page size.
- When converting a table to a different locking scheme, the data in the source table cannot violate the limits of the target table. For example, if you attempt to convert a DOL table with more than 254 variable-length columns to an APL table, **alter table** fails because an APL table is restricted to having no more than 254 variable-length columns.
- Columns with fixed-length data (for example `char`, `binary`, and so on) have the maximum sizes shown in these two tables. The following describes the maximum row and columns lengths for an APL table:

Page Size	Maximum Row Length	Maximum Column Length
2KB (2048 bytes)	1962	1960 bytes
4KB (4096 bytes)	4010	4008 bytes
8KB (8192 bytes)	8106	8104 bytes
16KB (16384 bytes)	16298	16296 bytes

The following describes the maximum row and columns lengths for a DOL table:

Page Size	Maximum Row Length	Maximum Column Length
2KB (2048 bytes)	1964	1958 bytes

Page Size	Maximum Row Length	Maximum Column Length
4KB (4096 bytes)	4012	4006 bytes
8KB (8192 bytes)	8108	8102 bytes
16KB (16384 bytes)	16300	16294 bytes – if table does not include any variable length columns.
16KB (16384 bytes)	16300 (subject to a max start offset of varlen = 8191)	8191-6-2 = 8183 bytes – if table includes at least one variable-length column. This size includes 6 bytes for the row overhead and 2 bytes for the row-length field.

- The maximum number of bytes of variable-length data per row depends on the locking scheme for the table. The following describes the maximum size columns for an APL table:

Page Size	Maximum Row Length	Maximum Column Length
2KB (2048 bytes)	1960	1960
4KB (4096 bytes)	4008	4008
8KB (8192 bytes)	8104	8157
16KB (16384 bytes)	16296	16227

The following describes the maximum size columns for a DOL table:

Page Size	Maximum Row Length	Maximum Column Length
2KB (2048 bytes)	1960	1958
4KB (4096 bytes)	4008	4006
8KB (8192 bytes)	8157	8102
16KB (16384 bytes)	16294	16294

- You cannot use **alter table** to add a declarative or check constraint and then insert data into the table in the same batch or procedure. Either separate the **alter** and **insert** statements into two different batches or procedures, or use **execute** to perform the actions separately.
- You cannot use the following variable in **alter table** statements that include defaults:

  ```
  declare @a int
  select @a = 2
  alter table t2 add c3 int
  default @a
  ```

  Doing so results in error message 154; `Variable is not allowed in default.`
- SQL user-defined functions are not currently supported with **create proxy table, create table at remote server,** or **alter table.**

  Note: The execution of SQL functions requires the syntax **username.functionname()**.

alter table and Encrypted Columns

Considerations for using encrypted columns.

- When used to add or modify an encrypted column, **alter table** may take a significant amount of time if the table contains a large number of rows.
- Modifying a column for encryption may cause the row size of the table to increase.
- You cannot use **alter table** to encrypt or decrypt a column:
  - If the column belongs to a clustered or placement index. To encrypt or decrypt such a column, drop the index, alter the column, and re-create the index.
  - If the table has a trigger defined. Drop the trigger before you modify the column. Afterwards, re-create the trigger:
- If you modify the type of an encrypted column belonging to a clustered or placement index, the index is out of order, and **alter table** displays an error. Drop the index before modifying the type. Afterwards, re-recreate the index.
- You can encrypt these datatypes:
  - `int, smallint, tinyint`
  - `unsigned int`, `unsigned smallint`, `unsigned tinyint`
  - `bigint`, `unsigned bigint`
  - `decimal` and `numeric`
  - `float4` and `float8`
  - `money`, `smallmoney`
  - `date`, `time`, `smalldatetime`, `datetime`, `bigdatetime`
  - `char` and `varchar`
  - `unichar`, `univarchar`
  - `binary` and `varbinary`
  - `bit`

- The underlying datatype of encrypted data on disk is `varbinary`. Null values are not encrypted.
- Modifying the datatype of the encrypted column belonging to a clustered or placement index results in the index being out of order, and **alter table** displays an error. Drop the index before modifying the type, after which you re-create the index.
- **alter table** reports an error if you:
  - Change a computed column to an encrypted column, or change an encrypted column to a computed column
  - Enable a column for encryption where the column is referenced in an expression used by a computed column
  - Change a computed column to reference an encrypted column.
  - Encrypt a column that is a member of a functional index
  - Specify an encrypted column as a partition key
  - Enable a column for encryption that is already used as a partition key

Note: Referential integrity between encrypted columns is supported when the columns are encrypted with the same key. For details, see *Encrypting Data* in the *Encrypted Columns Users Guide*.

Altering a Table's Compression

Considerations for altering table compression.

- Use **set compression** to change the compression level of the table for future data inserts or updates. **set compression** does not affect existing data rows and pages that are already compressed, but does require exclusive access to the table.
- You cannot change a partition's compression level in the same command in which you are altering a table's compression level. You must perform these operations as independent commands
- You may use **set compression** with other **set** parameters.
- Changing the table's compression level affects only those partitions that do not already have an explicitly defined compression level. All partitions without an explicitly defined compression level implicitly inherit the table's compression level. For example, if you modify a table's compression level from uncompressed to row-level compression, all partitions that had a compression level of **none** do not change, but partitions for which their compression level was undefined are changed to row-level compressed.
- Altering a table's compression level does not change the compression level for existing columns. For example, if `my_table` and its columns are uncompressed, when you alter the compression level of `my_table`, its columns initially remain uncompressed. However, the SAP ASE server compresses these columns individually when they fill with enough data to trigger the compression mechanism.
- The default behavior for newly added columns depends on the table's compression setting. For compressed tables, the column's datatype determines its compression level. For uncompressed tables, new columns are uncompressed.

- You may add compressed materialized computed columns to a table or compress them later.

Interactions Between Compression and Other alter table Parameters

When a command requires data movement, the SAP ASE server compresses any uncompressed data rows in the source partitions if the target partition is compressed. When you include a compression clause, **alter table** includes these interactions between the parameters.

- **set** – you:
  - Cannot combine **set** with **add**, **drop**, or **modify** clauses.
  - Cannot combine the **modify partition set** clause with other **modify *column_name*** parameters.
  - Cannot use the **all** keyword with **modify partition** and include partition names in the clause.
- **add**:
  - You may add nullable and non-nullable compressed columns to existing tables. Adding non-nullable columns requires data movement.
  - Columns added to a compressed table use row compression if they are configured for an appropriate datatype.
  - Modifying a column’s datatype to one that is eligible for row compression in a compressed table does not change the column’s compression level.
  - If you do not specify **not compressed** for a new column, it inherits the table’s compression level. For example, if the table is row-level compressed, any column you add to the table uses row-level compression as well.
- **drop**:
  - Dropping a compressed column causes data movement.
  - If the other columns in a table or partition are not compressed, or cannot be compressed, you must change the compression state to **none** before dropping the last compressed column.
- **modify**:
  - You can modify a compressed column in an existing table to **not compressed** and vice versa.
  - You can change a column’s datatype simultaneously with its compression level. However, the target datatype must be eligible for row compression. If the target datatype is not eligible for compression, the SAP ASE server ignores the request to compress it during the **modify** operation.
  - The SAP ASE server issues an error if you attempt to modify the compression level of a column that you cannot create as a compressed column. For example, the SAP ASE server issues an error message if you attempt to compress a virtual computed column.
- Combining **add**, **drop**, and **modify**:

  - You can issue multiple **add**, **drop**, or **modify** parameters that include one or more compressed columns in a single **alter table** statement. The data movement for this **alter table** command is dictated by the data movement restrictions for the parameters.
  - If **alter table** requires data movement, the column's compression level remains unchanged for the columns not affected by the **add**, **drop**, or **modify** parameters.
- Repartitioning a table – if you do not specify the compression clause for new partitions, the SAP ASE server sets the compression level for the new partitions as:
  - Uncompressed if the source table and all of its partitions are uncompressed.
  - The same compression level as the source table, if all of its partitions are compressed with the same compression level.
  - Uncompressed if:
    - The table or the individual partitions are compressed differently, or,
    - The source table is not compressed, but some of its partitions are

    The SAP ASE server does not compress the new partitions because it may be difficult to uniquely map and migrate the compression attribute from the original compressed partitions to the new partitions. You must explicitly state the compression level as part of the **alter table** command to specify which target partitions must be compressed during the data copy.
- **add partition** – newly added partitions inherit the table's compression level if you do not specify a partition level in the **compression** clause.
- **drop partition** – dropping a table's only compressed partition does not change the table's compression level if the table includes multiple partitions.

  If a table has been defined for compression, it remains compressed after the partition is dropped, and the SAP ASE server automatically configures future partitions for compression.
- Changing the locking scheme – the SAP ASE server requires data movement if you change the locking scheme of a table from allpages-locked to data-only-locked, or vice-versa. You cannot simultaneously change the compression level of the table or individual partitions when you change the locking scheme. Instead, you must run the **set compression** command to specify the compression level before you change the locking scheme.
- Unpartitioning a table – if at least one source partition is compressed when you unpartition a table, the entire table is marked as compressed when you run **alter table**. The SAP ASE server issues a warning message if the table was initially uncompressed.
- Other commands – you cannot combine parameters that specify the default value of a column, enable or disable triggers, add or drop column-level or table-level constraints, and so on, with commands that specify column-level or partition-level compression or copy data.
- If **alter table** does not include data movement, existing data is not affected, and the SAP ASE server applies the table's compression level to data once it is inserted. If **alter table** includes data movement, existing data is compressed or decompressed according to the table's compression level.
- These **alter table** events include data movement:

    - Adding non-null columns
    - Dropping columns
    - Modifying a column to increase its length (for example, from a `smallint` to an `int`, or from `char(3)` to `varchar(45)`)
- These **alter table** events do not include data movement:
    - Adding null column
    - Adding null text column (adding a non-null text column has restrictions)
    - Modifying a variable-length column to increase its length (for example, from `varchar(5)` to `varchar(20)` or from `varchar(20)` to `varchar(40)`)
- You cannot compress proxy tables or partitions or columns on proxy tables.

Altering the Compression Level for a Table Using Large Objects

Changing the table's large object (LOB) compression level affects only the LOB columns that do not have an explicitly defined compression level. Columns without an explicitly defined compression level implicitly inherit the table's compression level.

The default behavior for newly added LOB columns for which you have not specified a LOB compression clause depends on the table's LOB compression level. For LOB compressed tables, the SAP ASE server uses the table's LOB compression level for the columns. For LOB uncompressed tables, newly added LOB columns remain uncompressed.

Interactions between compression and other **alter table** parameters for tables with LOB data:

- **drop column** – if the table includes no compressed LOB columns after dropping columns, the table uses the table-level LOB column compression level.
- **add column**
    - You can add a nullable compressed LOB column, but you cannot add a non-nullable compressed LOB column.
    - For a table not set to LOB compression, by default, newly added LOB columns are not compressed. Newly added LOB columns with LOB compression subclauses can be compressed or not compressed as specified.
- **modify column**
    - You can uncompress an existing compressed LOB column. Although newly inserted data is uncompressed, existing data remains compressed.
    - You can change the compression level of an existing LOB column. Although newly inserted data assumes the new compression level, existing data retains the original compression level.
    - You can change an uncompressed LOB column to **compressed**.
    - You cannot modify a regular column to a LOB column (compressed or uncompressed).
    - You can modify a compressed LOB column to:
        - Compressed `text` columns using *n*`char`, *n*`varchar`, `unichar`, and `univarchar`
        - Compressed `image` columns using `varbinary` and `binary`

  - Compressed `unitext` columns using *n*`char`, *n*`varchar`, `unichar`, `univarchar`, `varbinary`, and `binary`

  Compressed off-row `java` columns cannot be modified to regular columns.

  The SAP ASE server decompresses the LOB data, truncating the data if necessary to fit the regular column length, and converting it to the regular datatype. The maximum length of the regular column is governed by the SAP ASE server page size.

- Combinations of **add**, **drop**, **modify**, and **set lob_compression**:
  - You can issue multiple **add**, **drop**, or **modify** subcommands in a single **alter table** command—or **set lob_compression** and **set compression** subclauses—that involves one or more compressed columns.
  - If you add a column to a LOB-compressed table and include **set lob_compression = 0** in the command, the newly added column is not compressed.
  - If you add a column to a regular, uncompressed table, and include **set lob_compression = *compression_level*** in the command, the newly added column is compressed.

  Existing LOB data is not affected by **alter table** commands; only future DMLs are affected by the changed LOB compression attributes. Use **update** and **select into** to compress or uncompress existing LOB data.

Getting Information About Tables

To rename a table, execute **sp_rename** (do not rename the system tables). For information about a table and its columns, use **sp_help**. For information about integrity constraints (**unique**, **primary key**, **references**, and **check**) or the **default** clause, see **create table**.

Specifying Ascending or Descending Ordering in Indexes

Use the **asc** and **desc** keywords after index column names to specify the sort order for the index. Creating indexes so that columns are in the same order specified in the **order by** clause of queries eliminates the sorting step during query processing.

See *Indexing for Performance* in *Performance and Tuning Guide: Basics*.

Using Cross-Database Referential Integrity Constraints

When you create a cross-database constraint, the SAP ASE server stores information in the `sysreferences` table of each database.

Information Stored in sysreferences	Columns with Information About the Referenced Table	Columns with Information About the Referencing Table
Key column IDs	`refkey1` through `refkey16`	`fokey1` through `fokey16`
Table ID	`reftabid`	`tableid`
Database ID	`pmrydbid`	`frgndbid`

Information Stored in sysreferences	Columns with Information About the Referenced Table	Columns with Information About the Referencing Table
Database name	`pmrydbname`	`frgndbname`

When you drop a referencing table or its database, the SAP ASE server removes the foreign-key information from the referenced database.

Because the referencing table depends on information from the referenced table, the SAP ASE server does not allow you to:

- Drop the referenced table,
- Drop the external database that contains the referenced table, or
- Rename either database with **sp_renamedb**.

You must first use **alter table** to remove the cross-database constraint.

Each time you add or remove a cross-database constraint, or drop a table that contains a cross-database constraint, dump *both* the affected databases.

Warning! Loading earlier dumps of these databases may cause database corruption.

The `sysreferences` system table stores the **name** and the ID number of the external database. The SAP ASE server cannot guarantee referential integrity if you use **load database** to change the database name or to load it onto a different server.

Warning! Before dumping a database to load it with a different name or move it to another SAP ASE server, use **alter table** to drop all external referential integrity constraints.

Changing Defaults

You can create column defaults either by declaring the default as a column constraint in the **create table** or **alter table** statement, or by creating the default using the **create default** statement and binding it to a column using **sp_bindefault**.

- You cannot replace a user-defined default bound to the column with **sp_bindefault**. First use **sp_unbindefault** to unbind the default.
- If you declare a default column value with **create table** or **alter table**, you cannot bind a default to that column with **sp_bindefault**. Drop the default by altering it to NULL, then bind the user-defined default. Changing the default to NULL unbinds the default and deletes it from the `sysobjects` table.

Setting Space Management Properties for Indexes

The space management properties **fillfactor**, **max_rows_per_page**, and **reservepagegap** in the **alter table** statement apply to indexes that are created for **primary key** or **unique** constraints. The space management properties affect the data pages of the table if the constraint creates a clustered index on an allpages-locked table.

- Use **sp_chgattribute** to change **max_rows_per_page** or **reservepagegap** for a table or an index, to change the **exp_row_size** value for a table, or to store **fillfactor** values.
- Space management properties for indexes are applied when indexes are:
  - Re-created as a result of an **alter table** command that changes the locking scheme for a table from allpages locking to data-only locking or vice versa.
  - Automatically rebuilt as part of a **reorg rebuild** command.
- To see the space management properties currently in effect for a table, use **sp_help**. To see the space management properties currently in effect for an index, use **sp_helpindex**.
- The space management properties **fillfactor**, **max_rows_per_page**, and **reservepagegap** help manage space usage for tables and indexes in the following ways:
  - **fillfactor** leaves extra space on pages when indexes are created, but the **fillfactor** is not maintained over time. It applies to all locking schemes.
  - **max_rows_per_page** limits the number of rows on a data or index page. Its main use is to improve concurrency in allpages-locked tables.
  - **reservepagegap** specifies the ratio of empty pages to full pages to apply for commands that perform extent allocation. It applies to all locking schemes.

  You can store space management properties for tables and indexes so that they are applied during **alter table** and **reorg rebuild** commands.
- This table shows the valid combinations of space management properties and locking schemes. If an **alter table** command changes the table so that the combination is not compatible, the values stored in the stored in system tables remain there, but are not applied during operations on the table. If the locking scheme for a table changes so that the properties become valid, then they are used.

Parameter	Allpages	Datapages	Datarows
max_rows_per_page	Yes	No	No
reservepagegap	Yes	Yes	Yes
fillfactor	Yes	Yes	Yes
exp_row_size	No	Yes	Yes

- This table shows the default values and the effects of using the default values for the space management properties.

Parameter	Default	Effect of Using the Default
max_rows_per_page	0	Fits as many rows as possible on the page, up to a maximum of 256
reservepagegap	0	Leaves no gaps
fillfactor	0	Fully packs leaf pages

Conversion of max_rows_per_page to exp_row_size

If a table has **max_rows_per_page** set, and the table is converted from allpages locking to data-only locking, the value is converted to an **exp_row_size** value before the **alter table...lock** command copies the table to its new location. The **exp_row_size** is enforced during the copy.

If max_rows_per_page is Set to	Set exp_row_size to
0	Percentage value set by **default exp_row_size percent**
255	1, that is, fully packed pages
1 – 254	The smaller of: • Maximum row size • 2002/**max_rows_per_page** value

Using reservepagegap

Commands that use large amounts of space allocate new space by allocating an extent rather than allocating single pages. The **reservepagegap** keyword causes these commands to leave empty pages so that future page allocations take place close to the page that is being split, or to the page from which a row is being forwarded.

The **reservepagegap** value for a table is stored in `sysindexes`, and is applied when the locking scheme for a table is changed from allpages locking to data-only locking, or vice versa. To change the stored value, use **sp_chgattribute** before running **alter table**.

reservepagegap specified with the **clustered** keyword on an allpages-locked table overwrites any value previously specified with **create table** or **alter table**.

Partitioning Tables for Improved Performance

Use the **partition by** clause to partition an unpartitioned table or repartition an already partitioned table. The task requires a data copy; all data rows are redistributed according to the specified partition criteria.

- You may run this task in parallel if the SAP ASE server is configured for parallel processing. You must set the **select into/bulkcopy/pllsort** option to true. If the table has indexes, you must drop the indexes before you can change:
  - An unpartitioned table into a semantic-partitioned table.
  - The partitioning type.
  - The partitioning key – you need not drop indexes to change other attributes of the partitions, such as number of partitions, partition bounds, or partition location; the indexes are built automatically.
- You can use the **add partition** clause to add empty partitions to list- or range-partitioned tables, but not to hash or round-robin-partitioned tables.

For range-partitioned tables, you can add new partitions only to the high end of the partition conditions. If the last existing partition has the maximum boundary (**values <= (MAX)**), you cannot add new partitions.

- The **partition *number_of_partition*** and **unpartition** clauses are provided for compatibility with versions of SAP ASE earlier than 15.0. You can use **partition *number_of_partition*** only on unpartitioned tables to add (***number_of_partition*-1**) empty round-robin partitions; existing data is placed on the first partition, with subsequent data distributed among all partitions. If the table has a global clustered index, the SAP ASE server places subsequent data rows in the first partition. To redistribute the data, drop and re-create the index.

  Note: These commands do not require data movement. However, because the SAP ASE server performs a number of internal steps, the commands, especially when executed on large tables, do not occur instantly. To avoid data corruption, do not interrupt the operation while you partition or unpartition a table.

  You can use the **unpartition** clause only on round-robin-partitioned tables without indexes.
- You cannot partition system tables.
- You cannot partition remote proxy tables.
- You cannot issue the partition-related **alter table** commands within a user-defined transaction.
- You cannot change a table's partitioning properties using the **partition by** clause if there are active open cursors on the table.
- After using the **partition by** clause, you must perform a full database dump before you can use **dump transaction**.
- You cannot drop a column that is part of a partitioning key.
- Alter key columns with care. In some cases, modifying the datatype of a key column might redistribute data among partitions. See the *Transact-SQL Users Guide*.
- Changing a table's partitioning properties increments the schema count, which causes existing stored procedures that access this table to recompile the next time they are executed.

Using Computed Columns

Considerations when using computed columns.

- When you add a new computed column without specifying nullability and the materialization property, the default option is nullable and not materialized.
- When you add a new materialized computed column, the *computed_column_expression* is evaluated for each existing row in the table, and the result is stored in the table.
- You cannot add new computed columns and add or modify their base columns at the same time.
- You can modify the entire definition of an existing computed column. This is a quick way to drop the computed column and add a new one with the same name. Such a column

behaves like a new computed column: its defaults are not materialized and nullable, if you do not specify these options.

- You can modify the materialization property of an existing computed column without changing its other properties, such as the expression that defines it or its nullability.
- When you modify a not-null, materialized computed column into a virtual column, you must specify "null" in the **modify** clause.
- When you modify a computed column that is not materialized, to materialize it, the *computed_column_expression* is evaluated for each existing row in the table, and the result is stored in the table.
- If you modify existing columns that are index keys, the index is rebuilt.
- You cannot modify a materialized computed column into a virtual column if it has been used as an index key; you must first drop the index.
- You cannot modify a regular column to become a computed column, or a computed column to become a regular column.
- You cannot modify or drop the base column referenced by a computed column.
- You cannot drop a computed column if it is used as an index key.

Adding IDENTITY Columns

Considerations for adding an IDENTITY column.

- When adding a `numeric` or integer IDENTITY column to a table, make sure the column precision is large enough to accommodate the number of existing rows. If the number of rows exceeds $10^{precision}$ - 1, the SAP ASE server prints an error message and does not add the column.
- When adding an IDENTITY column to a table, the SAP ASE server:
  - Locks the table until all the IDENTITY column values have been generated. If a table contains a large number of rows, this process may be time-consuming.
  - Assigns each existing row a unique, sequential IDENTITY column value, beginning with 1.
  - Logs each insert operation into the table. Use **dump transaction** to clear the database's transaction log before adding an IDENTITY column to a table with a large number of rows.
- Each time you insert a row into the table, the SAP ASE server generates an IDENTITY column value that is one higher than the value. This value takes precedence over any defaults declared for the column in the **alter table** statement or bound to it with **sp_bindefault**.

Altering Table Schema

Considerations for altering the table schema.

- **add**, **drop**, **modify**, and **lock** subclauses are useful when changing an existing table's schema. A single statement can contain any number of these subclauses, in any order, as long as the same column name is not referenced more than once in the statement.
- If stored procedures using **select *** reference a table that has been altered, no new columns appear in the result set, even if you use the **with recompile** option. You must drop the procedure and re-create it to include these new columns.
- To ensure that triggers fire properly, drop and re-create all triggers on an altered table after you perform an **add**, **drop**, **modify**, or **lock** operation.
- The SAP ASE server issues an error message if you add a **not null** column with **alter table**.
- You cannot drop all the columns in a table. Also, you cannot drop the last remaining column from a table (for example, if you drop four columns from a five-column table, you cannot then drop the remaining column). To remove a table from the database, use **drop table**.
- A data copy is required:
  - To drop a column
  - To add a NOT NULL column
  - For most **alter table ... modify** commands

  Use **set noexec on** and **showplan on** options to determine if a data copy is required for a particular **alter table** command.
- You can specify a change in the locking scheme for the modified table with other **alter table** commands (**add**, **drop**, or **modify**) when the other **alter table** command requires a data copy.
- If **alter table** performs a data copy**, select into /bulkcopy/pllsort** must be turned on in the database that includes the table whose schema you are changing.
- The modified table retains the existing space management properties (**max_rows_per_page**, **fillfactor**, and so on) and indexes of the table.
- **alter table** that requires a data copy does not fire any triggers.
- You can use **alter table** to change the schema of remote proxy tables created and maintained by CIS. See the *Component Integration Services Users Guide*.
- You cannot perform a data copy and add a table level or referential integrity constraint in the same statement.
- You cannot perform a data copy and create a clustered index in the same statement.
- If you add a **not null** column, you must also specify a default clause. This rule has one exception: if you add a user-defined type column, and the type has a default bound to it, you need not specify a default clause.
- You can always add, drop, or modify a column in allpages-locked tables. However, there are restrictions for adding, dropping, or modifying a column in a data-only-locked table, which are described in the following table:

Type of Index	All Pages Locked, Partitioned Table	All Pages Locked, Unpartitioned Table	Data-Only-Locked, Partitioned Table	Data-Only-Locked, Unpartitioned Table
Clustered	Yes	Yes	No	Yes
Nonclustered	Yes	Yes	Yes	Yes

If you need to add, drop, or modify a column in a data-only-locked table partitioned with a clustered index, you can:

1. Drop the clustered index.
2. Alter the data-only-locked table.
3. Re-create the clustered index.

- You cannot add a NOT NULL Java object as a column. By default, all Java columns always have a default value of NULL, and are stored as either `varbinary` strings or as `image` datatypes.
- You cannot modify a partitioned table that contains a Java column if the modification requires a data copy. Instead, first unpartition the table, execute **alter table**, then repartition the table.
- You cannot drop the key column from an index or a referential integrity constraint. To drop a key column, first drop the index or referential integrity constraint, then drop the key column. See the *Transact-SQL Users Guide*.
- You can drop columns that have defaults or rules bound to them. Any column-specific defaults are also dropped when you drop the column. You cannot drop columns that have check constraints or referential constraints bound to them. Instead, first drop the check constraint or referential constraint, then drop the column. Use **sp_helpconstraint** to identify any constraints on a table, and use **sp_depends** to identify any column-level dependencies.
- You cannot drop a column from a system table. Also, you cannot drop columns from user tables that are created and used by SAP-provided tools and stored procedures.
- You can generally modify the datatype of an existing column to any other datatype if the table is empty. If the table is not empty, you can modify the datatype to any datatype that is explicitly convertible to the original datatype.
- You can:
  - Add a new IDENTITY column.
  - Drop an existing IDENTITY column.
  - Modify the size of an existing IDENTITY.

  See the *Transact-SQL Users Guide* for more information.
- Altering the schema of a table increments the schema count, causing existing stored procedures that access this table to be renormalized the next time they are executed. Changes in datatype-dependent stored procedures or views may fail with datatype

normalization errors. Update these dependent objects so they refer to the modified schema of the table.

Restrictions for Modifying a Table Schema

Restrictions when modifying table schema.

- You cannot run **alter table** from inside a transaction.
- Altering a table's schema can invalidate backups that you made using **bcp**. These backups may use a table schema that is no longer compatible with the table's current schema.
- You can add NOT NULL columns with check constraints, however, the SAP ASE server does not validate the constraint against existing data.
- You cannot change the locking scheme of a table using the **alter table . . . add**, **drop**, or **modify** commands if the table has a clustered index and the operation requires a data copy. Instead you can
  1. Drop the clustered index.
  2. Alter the table's schema.
  3. Re-create the clustered index.
- You cannot alter a table's schema if there are any active open cursors on the table.

Restrictions for Modifying text and image Columns

Restrictions that apply when you modify `text` and `image` columns.

- You can only add `text` or `image` columns that accept null values.

  To add a `text` or `image` column so it contains only non-null values, first add a column that only accepts null values and then update it to the non-null values.
- You can modify a column from `text` datatype only to the following datatypes:
  - `[n]char`
  - `[n]varchar`
  - `unichar`
  - `univarchar`
  - `nchar`
  - `nvarchar`
- You can modify a column from `image` datatype only to `binary` or `varbinary`.
- You cannot add a new `text` or `image` column and then drop an existing `text` or `image` column in the same statement.
- You cannot modify a column to either `text` or `image` datatype.

Modifying Tables With Unitext Columns

Restrictions that apply when you use **alter table** to modify `unitext` columns.

- You can add a new `unitext` column that accepts NULL values.

- You can modify a column from `unitext` only to the following datatypes:
  - `[n]char`
  - `[n]varchar`
  - `unichar`
  - `univarchar`
  - `binary`
  - `varbinary`
- You cannot modify a column to the `unitext` datatype.
- You cannot add a `unitext` column and drop an existing `unitext` column in the same statement.

Changing Locking Schemes

alter table supports changing from any locking scheme to any other locking scheme.

- You can change:
  - From allpages to datapages or vice versa
  - From allpages to datarows or vice versa
  - From datapages to datarows or vice versa
- Before you change from allpages locking to a data-only locking scheme, or vice versa, use **sp_dboption** to set the database option **select into/bulkcopy/pllsort** to true, then run **checkpoint** in the database if any of the tables are partitioned and the sorts for the indexes require a parallel sort.
- After changing the locking scheme from allpages-locking to data-only locking or vice versa, you cannot use the **dump transaction** command to back up the transaction log; you must first perform a full database dump.
- When you use **alter table...lock** to change the locking scheme for a table from allpages locking to data-only locking or vice versa, the SAP ASE server makes a copy of the table's data pages. There must be enough room on the segment where the table resides for a complete copy of the data pages. There must be space on the segment where the indexes reside to rebuild the indexes.

  Clustered indexes for data-only-locked tables have a leaf level above the data pages. If you are altering a table with a clustered index from allpages-locking to data-only-locking, the resulting clustered index requires more space. The additional space required depends on the size of the index keys.

  Use **sp_spaceused** to determine how much space is currently occupied by the table, and use **sp_helpsegment** to see the space available to store the table.
- When you change the locking scheme for a table from allpages locking to datapages locking or vice versa, the space management properties are applied to the tables, as the data rows are copied, and to the indexes, as they are re-created. When you change from one data-only locking scheme to another, the data pages are not copied, and the space management properties are not applied.

- If a table is partitioned, changing the locking scheme performs a partition-to-partition copy of the rows. It does not balance the data on the partitions during the copy.
- When you change the locking scheme for a table, the **alter table...lock** command acquires an exclusive lock on the table until the command completes.
- When you use **alter table...lock** to change from datapages locking to datarows locking, the command does not copy data pages or rebuild indexes. It updates only system tables.
- Changing the locking scheme while other users are active on the system may have the following effects on user activity:
  - Query plans in the procedure cache that access the table are recompiled the next time they are run.
  - Active multistatement procedures that use the table are recompiled before continuing with the next step.
  - Ad hoc batch transactions that use the table are terminated.

  Warning! Changing the locking scheme for a table while a bulk-copy operation is active can cause table corruption. Bulk copy operates by first obtaining information about the table and does not hold a lock between the time it reads the table information and the time it starts sending rows, leaving a small window of time for an **alter table...lock** command to start.

Adding Java-SQL Columns

If Java is enabled in the database, you can add Java-SQL columns to a table.

The declared class (*datatype*) of the new Java-SQL column must implement either the **Serializable** or **Externalizable** interface.

When you add a Java-SQL column to a table, the Java-SQL column cannot be specified:

- As a foreign key
- In a references clause
- As having the UNIQUE property
- As the primary key

If you specify:

- **in row** – the value stored cannot exceed 16KB, depending on the page size of the data server.
- If **off row** – the column cannot be:
  - Referenced in a check constraint
  - Referenced in a **select** that specifies **distinct**
  - Specified in a comparison operator, in a predicate, or in a **group by** clause

See *Java in Adaptive Server Enterprise*.

Restrictions for Shared-Disk Clusters

A referential integrity constraint cannot reference a column on a local temporary database except from a table on the same local temporary database. **alter table** fails when it attempts to create a reference to a column on a local temporary database from a table in another database.

You cannot encrypt a column with an encryption key stored in a local temporary database unless the column's table resides on the same local temporary database. **alter table** fails if it attempts to encrypt a column with an encryption key on the local temporary database and the table is in another database.

alter thread pool

Alters a thread pool.

Considerations for process mode

alter thread pool is not supported in process mode.

Syntax

```
alter thread pool pool_name with { pool name = "new_name"
    thread count = thread_count,
    [pool description = "description"]}
    [idle timeout = time_period]
        [for instance inst_name | global ]
```

Parameters

- ***pool_name* –** name of the thread pool you are altering.
- **pool name = "*new_name*" –** new name for the pool you are altering.
- **thread count = *thread_count* –** new number of threads in the thread pool. Must be greater than or equal to 1.
- **pool description = "*description*" –** describes the pool's purpose. Must be fewer than 256 characters.
- **idle timeout = *time_period* –** time, in microseconds, that threads look for work before going to sleep. A value of -1 means the threads never go to sleep, and continue to consume CPU if no work is available. A value of 0 indicates that threads immediately go to sleep if they find no work.
- **for instance [*inst_name* | global] –** is name of the instance, or global for all instances.

Examples

- **Example 1 –** Renames the `order_pool` thread pool to `sales_pool`:

```
alter thread pool order_pool with pool name = 'sales_pool'
```

- **Example 2 –** Modifies the `sales_pool` thread pool to contain 7 threads:

  ```
  alter thread pool sales_pool with thread count = 7
  ```

- **Example 3 –** Modifies the name and description for `sales_pool`:

  ```
  alter thread pool sales_pool with pool name = "larger_sales_pool",
  pool
      description = 'thread pool exclusive to sales group'
  ```

- **Example 4 –** Modify `sales_pool` so threads sleep if they find no work after 500 microseconds:

  ```
  alter thread pool order_pool with idle timeout = 500
  ```

- **Example 5 –** Modify `sales_pool` so threads never go to sleep if they find no work:

  ```
  alter thread pool order_pool with idle timeout = -1
  ```

Usage

- *thread_count* must be greater than or equal to 1.
- When you reduce a thread count, the thread pool you specify must wait for currently running tasks to yield before it reduces the number of threads, which may cause a slight delay in the SAP ASE server shrinking the pool.
- You cannot rename system-created thread pools (which begin with `syb_`). However, you can use **alter thread pool** to change the number of threads or idle timeout in system-created thread pools.
- You cannot use Transact-SQL variables as parameters with **alter thread pool**.
- You can set **idle timeout** only for engine thread pools.
- You may issue **alter thread pool** with **execute immediate**.

Standards

ANSI SQL – Compliance level: Transact-SQL extension

Permissions

The permission checks for **alter thread pool** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `manage any thread pool` privilege.
Disabled	With granular permissions disabled, you must have **sa_role**. **alter thread pool** permission is not included in the **grant all** command.

Auditing

Information	Values
Event	143
Audit option	
Command or access audited	
Information in `extrainfo`	The old name, new name, and thread count

See also

- *create thread pool* on page 251
- *drop thread pool* on page 366

begin...end

Encloses a series of SQL statements so that control-of-flow language, such as **if...else**, can affect the performance of the entire group.

Syntax

```
begin
    statement block
end
```

Parameters

- ***statement block* –** is a series of statements enclosed by **begin** and **end**.

Examples

- **Example 1 –** Without **begin** and **end**, the **if** condition would cause execution of only one SQL statement:

  ```
  if (select avg (price) from titles) < $15
  begin
      update titles
      set price = price * $2
      select title, price
      from titles
      where price > $28
  end
  ```

- **Example 2 –** Without **begin** and **end**, the **print** statement would not execute:

  ```
  create trigger deltitle
  on titles
  for delete
  ```

```
as
if (select count (*) from deleted, salesdetail
 where salesdetail.title_id = deleted.title_id) > 0
    begin
        rollback transaction
        print "You can’t delete a title with sales."
    end
else
    print "Deletion successful--no sales for this
        title."
```

Usage

begin...end blocks can nest within other **begin...end** blocks.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **begin...end**.

See also

- *if...else* on page 470

begin transaction

Marks the starting point of a user-defined transaction.

Syntax

```
begin tran[saction] [transaction_name]
```

Parameters

- ***transaction_name* –** is the name assigned to this transaction. Transaction names must conform to the rules for identifiers. Use transaction names only on the outermost pair of nested **begin transaction**/**commit** or **begin transaction**/**rollback** statements.

Examples

- **Example 1 –** Explicitly begins a transaction for the **insert** statement:

  ```
  begin transaction
      insert into publishers (pub_id) values ("9999")
  commit transaction
  ```

Usage

- Define a transaction by enclosing SQL statements and system procedures within the phrases **begin transaction** and **commit**. If you set chained transaction mode, the SAP ASE server implicitly invokes a **begin transaction** before the following statements: **delete**, **insert**, **open**, **fetch**, **select**, and **update**. You must still explicitly close the transaction with a **commit**.
- To cancel all or part of a transaction, use the **rollback** command. The **rollback** command must appear within a transaction; you cannot roll back a transaction after it is committed.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **begin transaction**.

See also

- *commit* on page 89
- *begin transaction* on page 83
- *delete* on page 310
- *insert* on page 473
- *open* on page 523
- *fetch* on page 412
- *select* on page 579
- *update* on page 680
- *rollback* on page 574
- *save transaction* on page 577

break

Causes an exit from a while loop. **break** is often activated by an **if** test.

Syntax

```
while logical_expression
    statement
break
    statement
continue
```

Parameters

- ***logical_expression* –** is an expression (a column name, constant, any combination of column names and constants connected by arithmetic or bitwise operators, or a subquery) that returns TRUE, FALSE, or NULL. If the logical expression contains a **select** statement, enclose the **select** statement in parentheses.

Examples

- **Example 1 –** If the average price is less than $30, double the prices. Then, select the maximum price; if it is less than or equal to $50, restart the **while** loop and double the prices again. If the maximum price is more than $50, exit the **while** loop and print a message:

```
while (select avg (price) from titles) < $30
 begin
    update titles
    set price = price * 2
    select max (price) from titles
  if (select max (price) from titles) > $50
       break
    else
       continue
 end
 begin
  print "Too much for the market to bear"
 end
```

Usage

- **break** causes an exit from a **while** loop. Statements that appear after the keyword **end**, which marks the end of the loop, are then executed.
- If two or more **while** loops are nested, the inner **break** exits to the next outermost loop. First, all the statements after the end of the inner loop run; then, the next outermost loop restarts.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **break**.

See also

- *continue* on page 101
- *select* on page 579
- *while* on page 719

checkpoint

Writes all **dirty** pages (pages that have been updated since they were last written) to the database device.

Syntax

```
checkpoint [all | [dbname[, dbname, dbname, ........]]
```

Examples

- **Example 1 –** Writes all dirty pages in the current database to the database device, regardless of the system checkpoint schedule:

  ```
  checkpoint
  ```

Usage

There are additional considerations when using **checkpoint**:

- You can use **checkpoint** with an archive database, however, the checkpoint process does not automatically checkpoint an archive database.
- Use **checkpoint** only as a precautionary measure in special circumstances.
- **sp_dboption** automatically defaults to using **checkpoint** when you change a database option.
- You can specify one or more databases to run **checkpoint**.

Automatic checkpoints:

- Checkpoints caused by the **checkpoint** command supplement automatic checkpoints, which occur at intervals calculated by the SAP ASE server on the basis of the configurable value for maximum acceptable recovery time.
- **checkpoint** shortens the automatic recovery process by identifying a point at which all completed transactions are guaranteed to have been written to the database device. A typical **checkpoint** takes about 1 second, although checkpoint time varies, depending on the amount of activity on the SAP ASE server.
- The automatic **checkpoint** interval is calculated by the SAP ASE server on the basis of system activity and the recovery interval value in the system table `syscurconfigs`. The recovery interval determines **checkpoint** frequency by specifying the maximum amount of time it should take for the system to recover. Reset this value by executing **sp_configure**.
- You can configure the SAP ASE server with multiple checkpoint processes. This allows the SAP ASE server with multiple engines to checkpoint tasks more frequently, thereby shortening the automatic recovery process.

- If the housekeeper task can flush all active buffer pools in all configured caches during the server's idle time, it wakes up the checkpoint task. The checkpoint task determines whether it can checkpoint the database.

  Checkpoints that occur as a result of the housekeeper task are known as *free checkpoints*. They do not involve writing many dirty pages to the database device, since the housekeeper task has already done this work. They may improve recovery speed for the database.

See also **sp_configure**, **sp_dboption** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **checkpoint** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled: • To execute **checkpoint** on a particular database you must be the database owner or have either the `checkpoint` or `own database` (on the database) privilege. • To execute **checkpoint all**, you must be the database owner of all applicable databases or have either the `checkpoint any database` privilege or `own and database` privilege. Otherwise **checkpoint all** runs against those databases in which you have permission to run **checkpoint**.
Disabled	With granular permissions disabled: • To execute **checkpoint** *database*, you must be the database owner or be a user with any of these: • **sa_role**, or, • **replication_role**, or, • **oper_role** • To execute **checkpoint all**, you must be the database owners of all applicable data-bases or a user with any of these: • **sa_role**, or, • **replication_role** Otherwise, **checkpoint all** only runs against those database you own. .

close

Deactivates a cursor.

Syntax

```
close cursor_name
```

Parameters

- ***cursor_name*** **–** is the name of the cursor to close.

Examples

- **Example 1 –** Closes the cursor named `authors_crsr`:

  ```
  close authors_crsr
  ```

Usage

- The **close** command essentially removes the cursor's result set. The cursor position within the result set is undefined for a closed cursor.
- The SAP ASE server returns an error message if the cursor is already closed or does not exist.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Permissions

No permission is required to use **close**.

See also

- *deallocate cursor* on page 300
- *declare cursor* on page 304
- *fetch* on page 412
- *open* on page 523

commit

Marks the ending point of a user-defined transaction.

Syntax

```
commit [tran | transaction | work] [transaction_name]
```

Parameters

- **tran | transaction | work –** specifies that you want to commit the transaction or the work. If you specify **tran**, **transaction**, or **work**, you can also specify a *transaction_name*.
- ***transaction_name* –** is the name assigned to the transaction. It must conform to the rules for identifiers. Use transaction names only on the outermost pair of nested **begin transaction**/**commit** or **begin transaction**/**rollback** statements.

Examples

- **Example 1 –** After updating the `royaltyper` entries for the two authors, insert the savepoint `percentchanged`, then determine how a 10 percent increase in the book's price would affect the authors' royalty earnings. The transaction is rolled back to the savepoint with the **rollback transaction** command:

```
begin transaction royalty_change

update titleauthor
    set royaltyper = 65 from titleauthor, titles
    where royaltyper = 75
    and titleauthor.title_id = titles.title_id
    and title = "The Gourmet Microwave"

update titleauthor
    set royaltyper = 35 from titleauthor, titles
    where royaltyper = 25
    and titleauthor.title_id = titles.title_id
    and title = "The Gourmet Microwave"

save transaction percentchanged

update titles
    set price = price * 1.1
    where title = "The Gourmet Microwave"

select (price * total_sales) * royaltyper
    from titles, titleauthor
    where title = "The Gourmet Microwave"
    and titles.title_id = titleauthor.title_id

rollback transaction percentchanged
```

```
commit transaction
```

Usage

- Define a transaction by enclosing SQL statements and system procedures with the phrases **begin transaction** and **commit**. If you set the chained transaction mode, the SAP ASE server implicitly invokes a **begin transaction** before the following statements: **delete**, **insert**, **open**, **fetch**, **select**, and **update**. You must still explicitly enclose the transaction with a **commit**.
- To cancel all or part of an entire transaction, use the **rollback** command. The **begin transaction** command must appear within a transaction. You cannot roll back a transaction after the **commit** has been entered.
- If no transaction is currently active, the **commit** or **rollback** statement has no effect on the SAP ASE server.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The **commit transaction** and **commit tran** forms of the statement are Transact-SQL extensions.

Permissions

No permission is required to use **commit**.

See also

- *begin transaction* on page 83
- *delete* on page 310
- *insert* on page 473
- *open* on page 523
- *fetch* on page 412
- *select* on page 579
- *update* on page 680
- *rollback* on page 574
- *save transaction* on page 577

compute Clause

Generates summary values that appear as additional rows in the query results.

Syntax

```
start_of_select_statement
    compute row_aggregate (column_name)
        [, row_aggregate (column_name)]...
    [by column_name [, column_name]...]
```

Parameters

- ***row_aggregate*** **–** is one of the following:
    - **sum** – is the total of values in the (numeric) column.
    - **avg** – is the average of values in the (numeric) column.
    - **min** – is the lowest value in the column.
    - **max** – is the highest value in the column.
    - **count** – is the number of values in the column as an `integer`.
    - **count** – is the number of values in the column as a `bigint`.
- ***column_name*** **–** is the name of a column, which must be enclosed in parentheses. You can use numeric columns only with **sum** and **avg**. You can only use `integer`, `numeric`, and `decimal` columns with **sum** and **avg**.
- **by –** calculates the row aggregate values for subgroups. Whenever the value of the **by** item changes, row aggregate values are generated. If you use **by**, you must use **order by**.

  Listing more than one item after **by** breaks a group into subgroups and applies a function at each level of grouping.

Examples

- **Example 1 –** Calculates the sum of the prices of each type of cookbook that costs more than $12:

```
select type, price
from titles
where price > $12
    and type like "%cook"
    order by type, price
compute sum (price) by type

type       price
---------  ------------
mod_cook          19.99
           sum
           ------------
```

```
                  19.99
type       price
---------  ------------
trad_cook         14.99
trad_cook         20.95
           sum
           ------------
                  35.94
 (5 rows affected)
```

- **Example 2 –** Calculates the sum of the prices and advances for each type of cookbook that costs more than $12, with one **compute** clause applying several aggregate functions to the same set of grouping columns:

```
select type, price, advance
from titles
where price > $12
    and type like "%cook"
    order by type, price
compute sum (price), sum (advance) by type

type       price      advance
---------  ---------  ------------
mod_cook       19.99          0.00
          sum         sum
           ---------  ------------
               19.99          0.00

type       price      advance
---------  ---------  ------------
trad_cook      14.99      8,000.00
trad_cook      20.95      7,000.00
           sum        sum
           ---------  ------------
               35.94     15,000.00
 (5 rows affected)
```

- **Example 3 –** Calculates the sum of the prices and maximum advances of each type of cook book that costs more than $12, with one **compute** clause applying several aggregate functions to the same set of grouping columns:

```
select type, price, advance
from titles
where price > $12
    and type like "%cook"
    order by type, price
compute sum (price), max (advance) by type type     price
advance
--------- --------- -------------
mod_cook      19.99         0.00
          sum
          ---------
              19.99
                    max
                    -------------
                             0.00
```

```
type      price     advance
--------- --------- -------------
trad_cook     14.99      8,000.00
trad_cook     20.95      7,000.00
          sum
          ---------
              35.94
                     max
                     -------------
                          8,000.00
 (5 rows affected)
```

- **Example 4 –** Breaks on `type` and `pub_id` and calculates the sum of the prices of psychology books by a combination of type and publisher ID:

```
select type, pub_id, price
from titles
where price > $10
    and type = "psychology"
    order by type, pub_id, price
compute  sum (price) by type, pub_id type
pub_id    price
------------ --------- -----------
psychology   0736          10.95
psychology   0736          19.99
                        sum
                        ---------
                           30.94

type         pub_id    price
------------ --------- ---------
psychology   0877          21.59
                       sum
                       ---------
                           21.59
 (5 rows affected)
```

- **Example 5 –** Calculates the grand total of the prices of psychology books that cost more than $10 in addition to calculating sums by `type` and `pub_id`, using more than one **compute** clause to create more than one group:

```
select type, pub_id, price
from titles
where price > $10
    and type = "psychology"
order by type, pub_id, price
compute  sum (price) by type, pub_id
compute  sum (price) by type

type         pub_id    price
------------ --------- ---------
psychology   0736          10.95
psychology   0736          19.99
                       sum
                       ---------
                           30.94
```

```
type         pub_id    price
------------ --------- ---------
psychology   0877          21.59
                       sum
                       ---------
                           21.59
                       sum
                       ---------
                           52.53
 (6 rows affected)
```

- **Example 6 –** Calculates the grand totals of the prices and advances of cook books that cost more than $10:

```
select type, price, advance
from titles
where price > $10
    and type like "%cook"
compute sum (price), sum (advance)

type       price        advance
---------  -----------  --------------
mod_cook         19.99            0.00
trad_cook        20.95        8,000.00
trad_cook        11.95        4,000.00
trad_cook        14.99        7,000.00
            sum         sum
           -----------  --------------
                 67.88       19,000.00
 (5 rows affected)
```

  You can use **compute** without **by** to generate grand totals, grand counts, and so on. **order by** is optional if you use the **compute** keyword without **by**.

- **Example 7 –** Calculates the sum of the price of cook books and the sum of the price used in an expression:

```
select type, price, price*2
from titles
    where type like "%cook"
compute sum (price), sum (price*2)

type         price
------------ --------------  ------------
mod_cook              19.99         39.98
mod_cook               2.99          5.98
trad_cook             20.95         41.90
trad_cook             11.95         23.90
trad_cook             14.99         29.98
              sum             sum
              =============  ============
                      70.87        141.74
```

Usage

- The **compute** clause allows you to see the detail and summary rows in one set of results. You can calculate summary values for subgroups, and you can calculate more than one aggregate for the same group.
- You can use **compute** without **by** to generate grand totals, grand counts, and so on. **order by** is optional if you use the **compute** keyword without **by**.
- If you use **compute by**, you must also use an **order by** clause. The columns listed after **compute by** must be identical to or a subset of those listed after **order by** and must be in the same left-to-right order, start with the same expression, and cannot skip any expressions. For example, if the **order by** clause is **order by a, b, c**, the **compute by** clause can be any (or all) of these:

```
compute by a, b, c
compute by a
compute by a, b
```

See also **avg**, **count**, **max**, **min**, **sum** in *Reference Manual: Building Block*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

See also

- *group by and having Clauses* on page 459
- *select* on page 579

compute Clause Restrictions

Restrictions for the **compute** clause.

- You cannot use more than 127 aggregate columns in a **compute** clause.
- You cannot use a **compute** clause in a cursor declaration.
- You can compute summary values for both expressions and columns. Any expression or column that appears in the **compute** clause must appear in the **select** list.
- Aliases for column names are not allowed as arguments to the row aggregate in a **compute** clause, although you can use them in the **select** list, the **order by** clause, and the **by** clause of **compute**.
- In a **select** statement with a **compute** clause, the order of columns in the select list overrides the order of the aggregates in the **compute** clause. Open Client™, JDBC, and DB-Library™ programmers must be aware of this in order to put the aggregate results in the right place.
- You cannot use **select into** in the same statement as a **compute** clause, because statements that include **compute** do not generate normal tables.

- If a **compute** clause includes a **group by** clause:
  - The **compute** clause cannot contain more than 255 aggregates.
  - The **group by** clause cannot contain more than 255 columns.
- Columns included in a **compute** clause cannot be longer than 255 bytes.

compute Results Appear as a New Row or Rows

The aggregate functions ordinarily produce a single value for all the selected rows in the table or for each group, and these summary values are shown as new columns.

For example:

```
select type, sum (price), sum (advance)
from titles
where type like "%cook"
group by type
```

```
type
-------------  ---------  ----------
mod_cook           22.98  15,000.00
trad_cook          47.89  19,000.00

 (2 rows affected)
```

The **compute** clause allows you to retrieve detail and summary rows with one command. For example:

```
select type, price, advance
from titles
where type like "%cook"
order by type
compute sum (price), sum (advance) by type
```

```
type        price       advance
----------  ----------  -----------------
mod_cook          2.99          15,000.00
mod_cook         19.99               0.00

Compute Result:
---------------------- -----------------
                 22.98          15,000.00
type         price         advance
----------  ----------  -----------------
trad_cook        11.95           4,000.00
trad_cook        14.99           8,000.00
trad_cook        20.95           7,000.00

Compute Result:
---------------------- -----------------
                 47.89          19,000.00
 (7 rows affected)
```

The output and grouping of different types of **compute** clauses are:.

Clauses and Grouping	Output	Examples
One **compute** clause, same function	One detail row	1, 2, 4, 6, 7
One **compute** clause, different functions	One detail row per type of function	3
More than one **compute** clause, same grouping columns	One detail row per **compute** clause; detail rows together in the output	Same results as having one compute clause with different functions
More than one **compute** clause, different grouping columns	One detail row per **compute** clause; detail rows in different places, depending on the grouping	5

Case-Sensitivity

If your server has a case-insensitive sort order installed, **compute** ignores the case of the data in the columns you specify.

For example, given this data:

```
select * from groupdemo
```

```
lname      amount
---------- ------------------
Smith                  10.00
smith                   5.00
SMITH                   7.00
Levi                    9.00
Lévi                   20.00
```

compute by on `lname` produces these results:

```
 select lname, amount from groupdemo
 order by lname
 compute sum (amount) by lname
```

```
 lname      amount
 ---------- ------------------------
 Levi                           9.00

 Compute Result:
 ------------------------
                     9.00

 lname      amount
 ---------- ------------------------
 Lévi                          20.00

Compute Result:
 ------------------------
                    20.00
 lname      amount
 ---------- ------------------------
 smith                          5.00
 SMITH                          7.00
 Smith                         10.00

Compute Result:
 ------------------------
                    22.00
```

The same query on a case- and accent-insensitive server produces these results:

```
 lname      amount
 ---------- ------------------------
 Levi                           9.00
 Lévi                          20.00

 Compute Result:
 ------------------------
                    29.00

 lname      amount
 ---------- ------------------------
 smith                          5.00
 SMITH                          7.00
 Smith                         10.00

 Compute Result:
 ------------------------
                    22.00
```

connect to...disconnect

(Component Integration Services only) Connects to the specified server and disconnects the connected server.

Syntax

This syntax is sent to the SAP ASE server verbatim. Use this syntax with CIS to create a passthru to a different server:

```
connect to server_name
disconnect
    [from ASE]
    [all]
    [connection_name]
```

This syntax opens a new JDBC-level connection to the SAP ASE server, and does not use CIS. You can specify the arguments in any order. If you do not include arguments, the SAP ASE server prompts you for connection parameters:

```
connect
    [to ASE engine_name]
    [database database_name]
    [as connection_name]
    [user user_id]
    [identified by password]]]
```

This syntax opens a new JDBC-level connection to the SAP ASE server. This syntax does not use CIS:

```
connect using connect_string
```

Parameters

- ***server_name* –** is the server to which a pass through connection is required.
- **from ASE –** disconnects from the current SAP ASE server.
- **all –** disconnects from all SAP ASE servers.
- ***connection_name* –** disconnects from the specified connection.
- ***engine_name* –** connects to the specified engine.
- ***database_name* –** connects to the specified database.
- ***connection_name* –** connects to the configured connection.
- ***user_id* –** connects to the user with this ID.
- ***connection_string* –** connects using a predetermined connection string.

Examples

- **Example 1 –** Establishes a passthrough connection to the server named MYSERVER:

  ```
  connect to MYSERVER
  ```

- **Example 2 –** Disconnects the connected server:

  ```
  disconnect
  ```

- **Example 3 –** Disconnects from all servers:

  ```
  disconnect all
  ```

Usage

- **connect to** specifies the server to which a passthrough connection is required. Passthrough mode enables you to perform native operations on a remote server.
- *server_name* must be the name of a server in the `sysservers` table, with its server class and network name defined.
- When establishing a connection to *server_name* on behalf of the user, CIS uses one of the following identifiers:
  - A remote login alias described in `sysattributes`, if present
  - The user's name and password

  In either case, if the connection cannot be made to the specified server, the SAP ASE server returns an error message.

- After making a passthrough connection, CIS bypasses the Transact-SQL parser and compiler when subsequent language text is received. It passes statements directly to the specified server, and converts the results into a form that can be recognized by the Open Client interface and returned to the client program.
- To close the connection created by the **connect to** command, use the **disconnect** command. You can use this command only after the connection has been made using **connect to**.
- You can abbreviate the **disconnect** command to **disc**.
- The **disconnect** command returns an error unless **connect to** has been previously issued and the server is connected to a remote server.

See also **sp_addserver**, **sp_autoconnect**, **sp_helpserver**, **sp_passthru**, **sp_remotesql**, **sp_serveroption** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must have the **connect** privilege to use the **connect** to command..

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	90
Audit option	**security**
Command or access audited	**connect to**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **connect to** • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *create existing table* on page 126
- *grant* on page 419

continue

Restarts the **while** loop. **continue** is often activated by an **if** test.

Syntax

```
while boolean_expression
        statement
    break
        statement
continue
```

Examples

- **Example 1 –** If the average price is less than $30, double the prices. Then, select the maximum price. If the maximum price is less than or equal to $50, restart the **while** loop and double the prices again. If the maximum price is more than $50, exit the **while** loop and print a message:

```
while (select avg (price) from titles) < $30
begin
  update titles
  set price = price * 2
  select max (price) from titles

  if (select max (price) from titles) > $50
     break
  else
     continue
end

begin
print "Too much for the market to bear"
end
```

Usage

continue restarts the **while** loop, skipping any statements after **continue**.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **continue**.

See also

- *break* on page 84

- *while* on page 719

create archive database

Creates an archive database.

Syntax

```
create archive database db_name
    [encrypt with key_name]
    [on db_device [= size]
        [, db_device [= size] ] ... ]
    with scratch_database = db_name
```

Parameters

- **encrypt with *key_name* –** creates an archive database that is encrypted, using the same key you used to encrypt the database you backed up (dumped).
- **on –** specifies the modified pages section. The SAP ASE server requires traditional database storage to store modified pages. Use the **on** clause to specify the location and size of the modified pages section.
- ***db device* –** specifies the database device on which you want to create your modified pages section.
- ***size* –** specifies the size of the modified pages section you want to create. If you omit *size*, 5120 pages are allocated.
- **with scratch_database –** (required if a scratch database does not already exist) specifies the name of an existing database in which information about the archive database is maintained. The `sysaltusages` system table, which maps logical pages in the archive database onto physical pages, is stored in the scratch database.

Examples

- **Example 1 –** This could be a typical archive database command sequence.

  1. Create the scratch database, if necessary:

     ```
     create database scratchdb
         on datadev1 = 100
         log on logdev1 = 50
     ```

     This creates a 150MB traditional database called `scratchdb`.
  2. Designate the database you just created as a scratch database:

     ```
     sp_dboption "scratchdb", "scratch database", "true"
     ```
  3. Create the archive database:

     ```
     create archive database archivedb
         on datadev2 = 20
         with scratch_database = scratchdb
     ```

This creates an archive database called `archivedb`, with a 20MB modified pages section.

4. Materialize your archive database:

```
load database archivedb
    from "/dev/dumps/050615/proddb_01.dmp"
    stripe on "/dev/dumps/050615/proddb_02.dmp"
```

5. Bring the database online:

```
online database archivedb
```

6. Check the consistency of the archive database using **dbcc** commands. For example:

```
dbcc checkdb(archivedb)
```

7. Load a transaction log dump, and restore objects from the archive database:

```
load tran archivedb
    from "/dev/dumps/050615/proddb1_log_01.dmp"
load tran archivedb
    from "/dev/dumps/050615/proddb1_log_02.dmp"
online database archivedb
select * into proddb.dbo.orders from     archivedb.dbo.orders
load tran archivedb
    from "/dev/dumps/050615/proddb1_log_03.dmp"
online database archivedb
```

Usage

- You can load dumps of the `master` database into an archive database.
- You cannot use an in-menory database as an archive database.You should not use an in-memory database as a scratch database.

Permissions

There is no special permission to use the `encrypt with` option of the **create archive database** command. However, users need **select** permission on the database encryption key to be able to reference it as the *key_name*.

The permission checks for **create archive database** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `create database` privilege.
Disabled	With granular permissions disabled, you must be the system administrator or have `create database` privilege.

create database

Creates a new database.

Syntax

Syntax for nonclustered environments:

```
create [inmemory] [temporary] database database_name
    [use database_name as template]
    [on {default | database_device} [= size]
        [, database_device [= size]]...]
    [log on database_device [= size]
        [, database_device [= size]]...]
    [with {dbid = number, default_location = "pathname", override}]
        | [[,]durability = { no_recovery
            | at_shutdown
            | full} ]
        [, [no] async_init]
        [ [,] compression = {none | row | page}]
        [ [,] lob_compression = {compression_level | off}]
        [ [,] inrow_lob_length = value ]         }...
    [for {load | proxy_update}]
    [ encrypt with key_name]
```

Syntax for cluster environments:

```
create [ [ global | system ] temporary ] database database_name
    [ for instance instance_name ]
    [on {default | database_device} [= size]
        [, database_device [= size]]...]
    [log on database_device [= size]
        [, database_device [= size]]...]
    [with {override | default_location = "pathname"}]
    [for {load | proxy_update}]
```

Parameters

- **temporary –** indicates that you are creating a temporary database.
- **inmemory –** required for in-memory databases.
- ***database_name*** **–** is the name of the new database, which must conform to the rules for identifiers, and cannot be a variable.
- **on –** indicates a location and size for the database.
- **default –** indicates that **create database** can put the new database on any default database devices, as shown in `sysdevices.status`. To specify a size for the database without specifying a location, use:

  ```
  on default = size
  ```

  To change a database device's status to "default," use **sp_diskdefault**.

- ***database_device* –** is the logical name of the device on which to locate the database. A database can occupy different amounts of space on each of several database devices. To add database devices to an SAP ASE server, use **disk init**.
- **size –** is the amount of space to allocate to the database extension. You can use the following unit specifiers, using uppercase, lowercase, single and double quotes interchangeably: ‘k’ or “K” (kilobytes), “m” or ‘M’ (megabytes), “g” or “G” (gigabytes), and ‘t’ or ‘T’ (terabytes). You should always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier. If you do not provide a unit specifier, the value provided is presumed to be in megabytes.
- **log on –** specifies the logical name of the device for the database logs. You can specify more than one device in the **log on** clause.
- **with –** can be specified in any order. You must specify at least one of the following options when you use the **with** clause:
  - **with dbid = *number*** – specifies the `dbid` for the new database. If you do not explicitly specify the `dbid`, the server assigns an unused `dbid`.
  - **with default_location** – specifies the storage location of new tables. If you also specify the **for proxy_update** clause, one proxy table for each remote table or view is automatically created from the specified location.
  - **with override** – forces the SAP ASE server to accept your device specifications, even if they mix data and transaction logs on the same device, thereby endangering up-to-the-minute recoverability for your database. If you attempt to mix log and data on the same device without using this clause, the **create database** command fails. If you mix log and data, and use **with override**, you are warned, but the command succeeds.
- **durability = –** determines the durability level of the database:
  - **full** – all transactions are written to disk. This is the default if you do not specify a durability level when you create the database, and ensures full recovery from a server failure. All system databases use this durability level (the traditional durability level for disk-resident databases).
  - **no_recovery** – transactions are not durable to disk and all changes are lost if the server fails or is shut down. For disk-based databases, the SAP ASE server periodically writes data at runtime to the disk devices, but in an uncontrolled manner. After any shutdown (polite, impolite, or server failure and restart) a database created with **no_recovery** is not recovered, but is re-created from the `model` or template (if defined) database.
  - **at_shutdown** – transactions are durable while the server is running and after a polite shutdown. All durability is lost if the server fails.
- **[no] async_init –** enables or disables asynchronous database initialization.
- **compression –** indicates the level of compression to be applied to newly created tables or partitions:
  - **none** – data is not compressed.

    - **row** – compresses one or more data items in an individual row. The SAP ASE server stores data in a **row**-compressed form only if the compressed form saves space compared to an uncompressed form.
    - **page** – when the page fills, existing data rows that are row-compressed are then compressed using page-level compression to create page-level dictionary, index, and character-encoding entries.

      The SAP ASE server compresses data at the page level only after it has compressed data at the row level, so setting the compression to **page** implies both **page** and **row** compression.
- **lob_compression = off | *compression_level* –** Determines the compression level for the newly created table. Selecting **off** means the table does not use LOB compression.

  The compression algorithm ignores rows that do not use LOB data.

  Table compression level. The compression levels are:

    - 0 – the row is not compressed.
    - 1 through 9 – the SAP ASE server uses ZLib compression. Generally, the higher the compression number, the more the SAP ASE server compresses the LOB data, and the greater the ratio between compressed and uncompressed data (that is the greater the amount of space savings, in bytes, for the compressed data versus the size of the uncompressed data).

      However, the amount of compression depends on the LOB content, and the higher the compression level , the more CPU-intensive the process. That is, level 9 provides the highest compression ratio but also the heaviest CPU usage.
    - 100 – the SAP ASE server uses FastLZ compression. The compression ratio that uses the least CPU usage; generally used for shorter data.
    - 101 – the SAP ASE server uses FastLZ compression. A value of 101 uses slightly more CPU than a value of 100, but uses a better compression ratio than a value of 100.
- **inrow_lob_length = *value* –** specifies the number of bytes. The range of valid values for **inrow_lob_length** is 0 through the logical page size of the database. A value of 0 turns off LOB specification database-wide, and all LOB columns without a specific **in row** clause are created as off-row LOB columns.
- **dml_logging –** specifies the logging level for DML operations.
- **full | minimal –** specifies either full logging or minimal logging of the DML operations.
- **for load –** invokes a streamlined version of **create database** that you can use only for loading a database dump.
- **for proxy_update –** automatically gets metadata from the remote location and creates proxy tables. You cannot use **for proxy_update** unless you also specify **with default_location**.
- **global temporary –** indicates that you are creating a global temporary database.
- **system temporary –** indicates that you are creating a local system temporary database.
- **temporary –** indicates that you are creating a temporary database.

- **for instance *instance_name* –** specifies the instance that is to own the local system temporary database or local temporary database you are creating. This parameter is not used when creating global temporary databases.

  Note: You must create a local user temporary database from the instance that is to own it. You can create a local system temporary database from any instance.

- **encrypt with *key_name* –** creates a fully encrypted database. *key_name* is the name of the database encryption key.

Examples

- **Example 1 –** Creates a database named `pubs`:

```
create database pubs
```

- **Example 2 –** Creates a 4MB database named `pubs`:

```
create database pubs
on default = 4
```

  If you do not provide a unit specifier for *size*, the value provided for `pubs` is presumed to be in megabytes.

- **Example 3 –** Creates a database named `pubs` with 3MB on the `datadev` device and 2MB on the `moredatadev` device:

```
create database pubs
    on datadev = "3M", moredatadev = '2.0m'
```

- **Example 4 –** Creates a database named `pubs` with 3MB of data on the `datadev` device and a 0.5GB log on the `logdev` device:

```
create database pubs
    on datadev='3m'
    log on logdev='0.5g'
```

- **Example 5 –** Creates a proxy database named `proxydb` but does not automatically create proxy tables:

```
create database proxydb
with default_location
"UNITEST.pubs.dbo."
```

- **Example 6 –** Creates a proxy database named `proxydb` and automatically creates proxy tables:

```
create database proxydb
on default = "4M"
with default_location
"UNITEST.pubs2.dbo."
for proxy_update
```

- **Example 7 –** Creates a proxy database named `proxydb`, and retrieves the metadata for all of the remote tables from a remote database:

```
create database proxydb
on default = 4
with default_location
"UNITEST.pubs2.."
for proxy_update
```

- **Example 8 –** Creates a database called `pubs` with `dbid` 15:

```
create database pubs with dbid = 15
```

- **Example 9 –** Creates a temporary database called `mytempdb1`, with 3MB of data on the `datadev` device and 1MB of log on the `logdev` device:

```
create temporary database mytempdb1
    on datadev = '3m' log on logdev = '1M'
```

- **Example 10 –** In a cluster environment, creates a local user temporary database on "ase1." Execute the following command from the owner instance ("ase1"):

```
create temporary database local_tempdb1 for instance
ase1
```

  or:

```
create temporary database local_tempdb1
```

- **Example 11 –** In a cluster environment, creates a local system temporary database on "ase1." Execute this command from any instance in the cluster:

```
create system temporary database local_systempdb1 for
instance ase1
```

- **Example 12 –** In a cluster environment, creates a global temporary database:

```
create global temporary database global_tempdb1
```

- **Example 13 –** Creates an in-memory database on two different in-memory storage devices, `imdb_data_dev1` for the data and `imdb_logdev` for the log:

```
create inmemory database imdb2
on imdb_data_dev1 = '1.0g'
log on imdb_logdev = '0.5g'
with durability = no_recovery
```

- **Example 14 –** Creates an in-memory database on multiple in-memory storage devices. `imdb_data_dev1` and `imdb_data_dev2` contain all data, and `inmem_logdev` contains the log:

```
create inmemory database imdb3
on imdb_data_dev1 = '100m',
   imdb_data_dev2 = '200m'
log on inmem_logdev = '50m'
with durability=no_recovery
```

- **Example 15 –** Creates the `pubs5` database using the `pubs2` database as the template:

```
create inmemory database pubs5
use pubs2 as template
on imdb_duck1_cach = '5m'
```

```
log on imdb_duck_log = '5m'
with durability = no_recovery
```

- **Example 16 –** Creates a relaxed-durability database named `pubs5_rddb`:

  ```
  create database pubs5_rddb on pubs5_dev = '6M'
  log on pubs5_log = '2M'
  with durability = at_shutdown
  ```

- **Example 17 –** Creates an in-memory storage cache dedicated to an in-memory temporary database:

  1. Create the in-memory storage cache:

     ```
     sp_cacheconfig inmem_tempdb_cache, "40m", inmemory_storage,
     "none", "cache_partition=2"
     ```
  2. Create an in-memory device to create temporary database:

     ```
     DISK INIT name = "inmem_dev"
     , physname = "inmem_tempdb_cache"
     , size = "40m"
     , type='inmemory'
     ```
  3. Create the in-memory database:

     ```
     create inmemory temporary database temp_imdb
     on inmem_dev = "20m"
     with durability = no_recovery
     ```

- **Example 18 –** Creates a temporary database on an existing disk-device with durability set to **no_recovery**:

  ```
  create temporary database tempdb_rddb_norec
  on datadev = "5m" log on logdev = "5m"
  with durability = no_recovery
  ```

- **Example 19 –** Creates the `emaildb` database, and configures it for page-level compression:

  ```
  create database emaildb
  on email_dev = '50M'
  with compression = page
  ```

- **Example 20 –** Creates the `email_lob_db` database and configures it for a LOB compression level of 101:

  ```
  Create database email_lob_db
  on email_lob_dev = '50M'
  with lob_compression = 101
  ```

- **Example 21 –** Creates a database called pubs that allows in-row LOB data with a length of 300 bytes:

  ```
  create database pubs
      with inrow_lob_length = 300
  ```

- **Example 22 –** Creates an encrypted database called `demodb` with a log called `demodev` on a machine called `demologdev`, using an encrypttion key called `dbkey`:

```
create database demodb on demodev log on demologdev encrypt with
dbkey
```

Usage

- Use **create database** from the `master` database.
- You can specify the *size* as a `float` datatype, however, the size is rounded down to the nearest multiple of the allocation unit.
- If you do not explicitly state the size of the database, the size is determined by the size of the **model** database. The minimum size that you can create a database is four allocation units.
- Because the SAP ASE server allocates space for databases for **create database** and **alter database** in chunks of 256 logical pages, these commands round the specified size down to the nearest multiple of allocation units.
- If you do not include a unit specifier, the SAP ASE server interprets the size in terms of megabytes of disk space, and this number is converted to the logical page size the server uses.
- If you do not specify a location and size for a database, the default location is any default database devices indicated in `master..sysdevices`. The default size is the larger of the size of the `model` database or the **default database size** parameter in `sysconfigures`.

  system administrators can increase the default size by using **sp_configure** to change the value of **default database size** and restarting the SAP ASE server. The **default database size** parameter must be at least as large as the `model` database. If you increase the size of the `model` database, you must also increase the default size.

  If the SAP ASE server cannot give you as much space as you want where you have requested it, it comes as close as possible, on a per-device basis, and prints a message telling how much space was allocated and where it was allocated. The maximum size of a database is system-dependent.
- If you create a proxy database using:

  ```
  create database mydb on my_device
  with default_location = "pathname" for proxy_update
  ```

  The presence of the device name is enough to bypass size calculation, and this command may fail if the default database size (the size of the `model` database) is not large enough to contain all of the proxy tables.

  To allow CIS to estimate database size, do not include any device name or other option with this command:

  ```
  create database mydb
  with default_location = "pathname" for proxy_update
  ```
- Specify whether to encrypt a database when you create it, and all the data inserted into the database becomes encrypted automatically. The size of the database does not change when it is encrypted, and all storage access functions work identically whether a database is encrypted or not. The types of databases that support encryption are:

- Normal user database
- Temporary database
- Archive database

You cannot encrypt an in-memory database.

See also **sp_changedbowner**, **sp_diskdefault**, **sp_helpdb**, **sp_logdevice**, **sp_renamedb**, **sp_spaceused** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **create database** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have `create database` privilege. If you are creating the `sybsecurity` database, you must have the `manage auditing` privilege.
Disabled	With granular permissions disabled, you must be system administrator or have **create database** privilege. If you are creating the `sybsecurity` database, you must be a system security officer.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	9
Audit option	**create**
Command or access audited	**create database**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *alter database* on page 1
- *disk init* on page 319
- *disk reinit* on page 330
- *drop database* on page 342
- *dump database* on page 373
- *load database* on page 485
- *online database* on page 520

Restrictions for create database

The SAP ASE server can manage as many as 32,767 databases.

- The `dbid` should always be greater than zero and less than the maximum `dbid` of 32,767.
- The SAP ASE server can create only one database at a time. If two database creation requests collide, one user sees this message:

  ```
  model database in use: cannot create new database
  ```
- Each time you allocate space on a database device with **create database** or **alter database**, that allocation represents a device fragment, and the allocation is entered as a row in `sysusages`.
- The maximum number of named segments for a database is 32. Segments are named subsets of database devices available to a particular SAP ASE server. For more information about segments, see the *System Administration Guide*.

Temporary Databases

You cannot use either **with default_location** or **for proxy_update** parameters with the **create temporary database** command.

Doing so generates an error, such as the following two examples:

```
1> create temporary database tb1 with default_location
     "remSERVER.mydb.."
```

```
Msg 102, Level 15, State 7:
Server 'ebi_SUS_AS125x_SUN32', Line 1:
Incorrect syntax near 'create temporary database'.
```

```
1> create temporary database tb1 with default_location
     "remSERVER.mydb.." for proxy_update
```

```
Msg 102, Level 15, State 7:
Server 'ebi_SUS_AS125x_SUN32', Line 1:
Incorrect syntax near 'create temporary database'.
```

The temporary status of a database, which is set during the creation of the temporary database, is indicated by value 0x00000100 (256 decimal) of the `status3` field of a `sysdatabases` entry.

In addition to all options inherited from `model`, a temporary database, like the system `tempdb`, has the following database options set:

- **select into/bulkcopy**
- **trunc log on chkpt**

As with system `tempdb`, the guest user is added to the temporary database, and **create table** permission is granted to PUBLIC.

Unused pages are not cleared during creation of the temporary database, since a temporary database is re-created every time the server is restarted.

Creating Compressed Databases

Considerations that apply when creating compressed databases.

- The compression setting for **create table . . .with compression** overrides the **create database** compression setting.
- Temporary tables created with **select into** do not inherit the compression level from the database.
- The default setting for compression in the `model` database is **none** (data compression is off for all databases based on `model`).
- When you enable data compression in `tempdb` or other temporary databases, temporary tables created in a session or inside stored procedures do not inherit `tempdb`’s compression level.
- The database to which a task is bound determines the compression level of the temporary tables it creates.

Creating Databases With In-Row LOBs

The SAP ASE server uses in-row LOB compression if the table is implicitly or explicitly row- or page-compressed, and, any of the in-row large object columns in the table are implicitly or explicitly LOB compressed.

The in-row size can be as large as the maximum row size allowed in the database. The SAP ASE server lowers the limit on the size of individual column’s in-row LOB storage during inserts and updates, based on the space available for storage in a single page, minus any page or row overheads.

When you create a table in a database where you have specified a valid in-row LOB length database-wide, all LOB columns in the table are created as in-row unless you specify **off row** in the syntax for the column’s definition. The column’s in-row length, in bytes, is specified by this database-wide setting.

The default value for **inrow_lob_length** setting is 0 bytes, which causes no changes in behavior to existing databases when you upgrade to SAP ASE version 15.7. Changing this default allows applications with different requirements on in-row storage to control how much LOB data is stored in-row.

The database-wide setting applies only to newly created tables or LOB columns added to existing tables after the database-wide setting is applied or changed. The in-row LOB length inherited by each LOB column when the table was initially created remains unchanged, even when the database-wide setting is altered. To change an individual LOB column's in-row length or in-row property, use **alter table modify column**.

To change the default length, use the **inrow_lob_length** parameter of **alter database**.

Creating In-Memory and Relaxed Durability Databases

The *database_device* you list for the in-memory database must be an in-memory storage device.

The **for load** parameter indicates that the database is created initially in a state waiting to be loaded using a **load database** command.

You cannot:

- Create an in-memory database on a default device.
- Use in-memory databases for system databases (other than **tempdb**).
- Use an in-memory database as an archive database. You should not use an in-memory database as a scratch database.
- Use the same name for the database you are creating and its template database.
- Specify system databases, including **model**, as the template database.
- Mix disk-based and cache-based storage devices. The SAP ASE server treats databases created entirely on in-memory storage cache as in-memory databases. You cannot use:
  - In-memory storage devices created on different in-memory storage caches for one in-memory database
  - In-memory storage devices created on one in-memory storage cache, either in full or in part, for different in-memory databases
- Use the **use as template** parameter with the **with default_location =** parameter.
- Use the **for load** and **for proxy update** parameters with the **use as template** parameter.

You can:

- Create in-memory databases on in-memory storage devices residing on named caches as long as all the in-memory storage devices are hosted by in-memory storage cache.
- Create mixed log-and-data in-memory databases on the same in-memory storage devices. However, mixed log-and-data in-memory databases must be on a single cache.

The **durability = no_recovery** parameter is required when you create an an in-memory database. This parameter reinforces the behaviour that in-memory databases are always recreated when you restart the server.

SAP ASE includes a 30-day trial period, during which you can try the in-memory database feature. However, if you use this feature, at the end of the trial period, you must:

- Purchase an in-memory license, or

- Purchase an SAP ASE license that does not include the in-memory feature. In this case, you must drop and recreate the user-defined temporary databases without using the explicit **durability** parameter.

New Databases Created from model

The SAP ASE server creates a new database by copying the `model` database.

You can customize `model` by adding tables, stored procedures, user-defined datatypes, and other objects, and by changing database option settings. New databases inherit these objects and settings from `model`.

To guarantee recoverability, **create database** must clear every page that was not initialized when the `model` database was copied. This may take several minutes, depending on the size of the database and the speed of your system.

If you are creating a database to load a database dump into it, you can use the **for load** option to skip the page-clearing step. This makes database creation considerably faster.

Ensuring Database Recoverability

Back up the `master` database each time you create a new database. This makes recovery easier and safer if `master` is damaged.

Note: If you create a database and fail to back up `master`, you may be able to recover the changes with **disk reinit**.

The **with override** clause allows you to mix log and data segments on a single device. However, for full recoverability, the device or devices specified in **log on** should be different from the physical device that stores the data. In the event of a hard-disk failure, you can recover the database from database dumps and transaction logs.

You can create a small database on a single device that is used to store both the transaction log and the data, but you *must* rely on the **dump database** command for backups.

The size of the device required for the transaction log varies according to the amount of update activity and the frequency of transaction log dumps. As a rule of thumb, allocate to the log device 10 – 25 percent of the space you allocate to the database itself. It is best to start small, since space allocated to a transaction log device cannot be reclaimed and cannot be used for storing data.

Using the for load Option

You can use the **for load** option for recovering from media failure or for moving a database from one machine to another, if you have not added to the database with **sp_addsegment**.

Use **alter database for load** to create a new database in the image of the database from which the database dump to be loaded was made. For a discussion of duplicating space allocation when loading a dump into a new database, see the *System Administration Guide*.

When you create a database using the **for load** option, you can run only the following commands in the new database before loading a database dump:

- **alter database for load**
- **drop database**
- **load database**

After you load the database dump into the new database, you can also use some **dbcc** diagnostic commands in the databases. After you issue the **online database** command, there are no restrictions on the commands you can use.

A database created with the **for load** option has a status of “don’t recover” in **sp_helpdb** output.

Getting Information About Databases

To get a report on a database, execute **sp_helpdb**; for a report on the space used in a database, use **sp_spaceused**.

Using with default_location and for proxy_update

Without the **for proxy_update** clause, the behavior of the **with default_location** clause is the same as that provided by **sp_defaultloc**—a default storage location is established for new and existing table creation, but proxy table definitions are not automatically imported during the processing of **create database**.

If **for proxy_update** is specified with no **default_location**, an error is reported.

When a proxy database is created (using the **for proxy_update** option), CIS is called upon to:

- Provide an estimate of the database size required to contain all proxy tables representing the actual tables and views found in the primary server’s database. This estimate is the number of database pages needed to contain all proxy tables and indexes. The estimate is used if no size is specified, and no database devices are specified.
- Create all proxy tables representing the actual tables and views found in the companion server’s database.
- Grant all permissions on proxy tables to public.
- Add the `guest` user to the proxy database.
- The database status is set to indicate that this database “Is_A_Proxy”. This status is contained in `master.dbo.sysdatabases.status3`.

create default

Specifies a value to insert in a column (or in all columns of a user-defined datatype) if no value is explicitly supplied at insert time.

Syntax

```
create default [or replace] [owner.]default_name
    as constant_expression
```

Parameters

- **or replace –** if the default already exists, replaces the default definition with the new definition.
- ***default_name* –** is the name of the default, which must conform to the rules for identifiers and cannot be a variable. Specify the owner's name to create another default of the same name owned by a different user in the current database. The default value for *owner* is the current user.

  When you use **or replace**, if the specified default name already exists, then it is replaced with the new default definition. The object name and ID remain the same.
- ***constant_expression* –** is an expression that does not include the names of any columns or other database objects. It can include global variables and built-in functions that do not reference database objects. Enclose character and date constants in quotes and use a "0x" prefix for binary constants.

  When you use **or replace**, the definition of the default can be changed when the default is replaced. The new default value overrides the old default.

Examples

- **Example 1 –** Creates a default called D1 that uses the *@@spid* global variable:

  ```
  create default D1 as @@spid
  ```

- **Example 2 –** Defines a default value, then binds it to the appropriate column or user-defined datatype:

  ```
  create default phonedflt as "UNKNOWN"
  ```

- **Example 3 –** The default takes effect only if there is no entry in the `phone` column of the `authors` table:

  ```
  sp_bindefault phonedflt, "authors.phone"
  ```

  No entry is different from a null value entry. To get the default, issue an **insert** command with a column list that does not include the column that has the default.

- **Example 4 –** Creates a default value, `todays_date`, that inserts the current date into the columns to which it is bound:

  ```
  create default todays_date as getdate ()
  ```

- **Example 5 –** This example first creates a default with a phone number defined as `UNKNOWN`:

  ```
  create default phonedflt as "UNKNOWN"

  select object_id("phonedflt")
  -----------
  1001051571
  ```

  This default replaces the previously created default using the **or replace** clause. The phone number is changed, but the object ID of the default remains the same:

  ```
  create or replace default phonedflt as "999-999-9999"

  select object_id("phonedflt")
  -----------
  1001051571
  ```

Usage

- Bind a default to a column or user-defined datatype—but not an SAP ASE server-supplied datatype—with **sp_bindefault**.
- You can bind a new default to a datatype without unbinding the old one. The new default overrides and unbinds the old one.
- **create default** performs error checking for check constraints before it creates the default.
- To hide the source test of a default, use **sp_hidetext**.

See also **sp_bindefault**, **sp_help**, **sp_helptext**, **sp_rename**, **sp_unbindefault** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Use the **default** clause of the **create table** statement to create ANSI SQL-compliant defaults.

Permissions

Any user who impersonates the default owner through an alias or **setuser** cannot replace the default.

The permission checks for **create default** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `create default` privilege to create a default. To create a default for another user, you must have the `create any default` privilege. To replace the default, you must be the default owner.
Disabled	With granular permissions disabled, you must be the database owner, a user with **sa_role**, or have the `create default` privilege to create a default. To create a default for another user, you must have **sa_role**. To replace the default, you must be the default owner.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	14
Audit option	**create**
Command or access audited	**create default**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Other information* – NULL • *Current value* – NULL • *Proxy information* – original login name, if **set proxy** is in effect • or replace – for **create or replace**

See also

- *alter table* on page 43
- *create rule* on page 195
- *create table* on page 207
- *drop default* on page 344
- *drop rule* on page 361
- *insert* on page 473

create default Restrictions

Restrictions for **create default**.

- You can create a default only in the current database.
- You cannot combine **create default** statements with other statements in a single batch.
- You must drop a default using **drop default** before you create a new one of the same name; you must unbind a default using **sp_unbindefault**, before you drop it.

Datatype Compatibility

The SAP ASE server generates an error message when it attempts to insert a default value that is not compatible with the column's datatype.

For example, if you bind a character expression such as "N/A" to an `integer` column, any **insert** that does not specify the column value fails.

If a default value is too long for a character column, the SAP ASE server either truncates the string or generates an exception, depending on the setting of the **string_rtruncation** option. See the **set** command.

Getting Information about Defaults

Default definitions are stored in `syscomments`.

- After a default is bound to a column, its object ID is stored in `syscolumns`. After a default is bound to a user-defined datatype, its object ID is stored in `systypes`.
- To rename a default, use **sp_rename**.
- For a report on the text of a default, use **sp_helptext**.

Defaults and Rules

If a column has both a default and a rule associated with it, the default value must not violate the rule. A default that conflicts with a rule cannot be inserted. The SAP ASE server generates an error message each time it attempts to insert such a default.

Defaults and Nulls

If a column does not allow nulls, and you do not create a default for the column, when a user attempts to insert a row but does not include a value for that column, the insert fails and the SAP ASE server generates an error message.

This table shows the relationship between the existence of a default and the definition of a column as NULL or NOT NULL.

Column Null Type	No Entry, no Default	No Entry, Default Exists	Entry is Null, no Default	Entry isNull, Default Exists
NULL	Null inserted	Default value inserted	Null inserted	Null inserted
NOT NULL	Error, command fails	Default value inserted	Error, command fails	Error, command fails

Specifying a Default Value in create table

You can define column defaults using the **default** clause of the **create table** statement as an alternative to using **create default**.

However, these column defaults are specific to that table; you cannot bind them to other tables. See **create table** and **alter table** for information about integrity constraints.

Objects Dependent on Replaced Defaults

Considerations when using **or replace**.

- Many columns can be bound to a replaced default.
- User defined datatypes can be bound to the replaced defaults.

Procedures that access these columns are recompiled when the default is replaced and the procedure is executed.

create encryption key

Creates encryption keys. All the information related to keys and encryption is encapsulated by **create encryption key**, which allows you to specify the encryption algorithm and key size, the key's default property, an optional user-specified password to encrypt the key, as well as the use of an initialization vector or padding during the encryption process.

The SAP ASE server uses Security Builder Crypto for key generation and encryption.

Syntax

Create the master key:

```
create encryption key [dual] master
    [for AES] with passwd char_literal
```

Create the service key:

```
create encryption key syb_extpasswdkey
    [ with { static key | master key }]
create encryption key syb_syscommkey
        [ with { static key | master key }]
```

Create the column encryption key:

```
create encryption key [[database.][owner].]keyname
    [as default]
    [for algorithm_name]
    [with [{{passwd {char_literal | system_encr_passwd} | master
key}]
    [key_length num_bits]
    [init_vector {null | random}]
    [pad {null | random}]
    [[no] dual_control]}]
```

Create an encryption key for fully encrypted databases:

```
create encryption key keyname
    [for algorithm]
    for database encryption
    [with
        {[master key]
        [key_length 256]
        [init_vector random]
        [[no] dual_control]}
```

Parameters

- ***keyname*** **–** must be unique in the user's table, view, and procedure name space in the current database. Specify the *database* name if the key is in another database; specify the *owner* name if you are creating a key for another user. The default value for *owner* is the current user, and the default value for *database* is the current database. Only the system security officer can create keys for other users.
- **as default –** allows the system security officer or the key custodian to create a database default key for encryption. The existence of a database default encryption key enables the table creator to specify encryption without using a keyname on **create table**, **alter table**, and **select into**. The SAP ASE server uses the default key from the same database. The default key may be changed. See **alter encryption key**.
- **for *algorithm_name* –** specifies the algorithm you are using. Advanced Encryption Standard (AES) is the only algorithm supported. AES supports key sizes of 128 bits, 192 bits, and 256 bits, and a block size of 16 bytes.
- **`for database encryption` –** indicates that you are creating an encryption key to encrypt an entire database, rather than a column.
- **for AES –** uses the Advanced Encryption Standard (AES) encryption algorithm to encrypt data.
- **syb_extpasswdkey | syb_syscommkey –**
    - **syb_extpasswdkey** – all external passwords in `sysattributes` are reencrypted with the new key using strong encryption
    - **syb_syscommkey** – any subsequent execution of `sp_hidetext` uses the new key with strong encryption. `sp_hidetext` must be executed on an existing database object for the object to be encrypted with the new key

- **static key | master key –** indicates that you are creating an encryption key using a static or master key.

  Specifying `master key` creates a master key in the `master` database, and indicates to SAP ASE to protect the database encryption key using that key. By default, SAP ASE uses this master key (if it exists) to protect database encryption keys.
- **keylength *num_bits* –** the size, in bits, of the key to be created. For AES, valid key lengths are 128, 192, and 256 bits. The default key length is 128 bits.

  The only valid length for a database encryption key is 256; you see an error message if you use any other size.
- ***password_phrase* –** is a quoted alphanumeric string of up to 255 bytes in length that the SAP ASE server uses to generate the key used to encrypt the column encryption key (the key encryption key).
- **init_vector random –** specifies use of an initialization vector during encryption. When an initialization vector is used by the encryption algorithm, the cipher text of two identical pieces of plain text are different, which prevents a cryptanalyst from detecting patterns of data. Use an initialization vector to increase the security of your data.

  An initialization vector has some performance implications. Index creation, and optimized joins and searches, can be performed only on a column for which the encryption key does not specify an initialization vector.

  The default is to use an initialization vector, that is, **init_vector random**. Use of an initialization vector implies using a cipher-block chaining (CBC) mode of encryption; setting **init_vector null** implies the electronic codebook (ECB) mode.
- **init_vector null –** omits the use of an initialization vector when encrypting. This makes the column suitable for supporting an index.

  Database encryption enforces stronger security than column encryption; if you specify `init_vector null` for database encryption as you can for creating a column encryption key, SAP ASE returns an error.
- **pad null –** is the default, which omits random padding of data. You cannot use padding if the column must support an index.
- **pad random –** data is automatically padded with random bytes before encryption. You can use padding instead of an initialization vector to randomize the cipher text. Padding is suitable only for columns whose plaintext length is less than half the block length. For the AES algorithm, the block length is 16 bytes.
- **[no] dual_control –** Indicates whether the new key must be encrypted using dual controls. By default, dual control is not configured. Both the master key and dual master key must exist in the `master` database to use `dual control`.

Examples

- **Example 1 –** Specifies a 256-bit key called “safe_key” as the database default key. The system security officer enters:

```
create encryption key safe_key as default for AES with keylength
256
```

- **Example 2 –** Creates a 128-bit key called “salary_key” for encrypting columns using random padding:

  ```
  create encryption key salary_key for AES with init_vector null pad
  random
  ```

- **Example 3 –** Creates a 192-bit key named “mykey” for encrypting columns using an initialization vector:

  ```
  create encryption key mykey for AES with keylength 192 init_vector
  random
  ```

- **Example 4 –** Ceates a key that is protected by a user-specified password:

  ```
  create encryption key key1 with passwd 'Worlds1Biggest6Secret'
  ```

  You must enter user-specified passwords that protect keys before accessing a column encrypted by the key. See **set**.

- **Example 5 –** Specifies a 256-bit key called “safe_key” as the database default key. Because the key does not specify a password, the SAP ASE server uses the database-level master key as the key encryption key for safe_key. If there is no master key, the SAP ASE server uses the system encryption password:

  ```
  create encryption key safe_key as default for AES with keylength
  256
  ```

- **Example 6 –** Encrypts CEK k3 with a combination of the master key and “Whybother”:

  ```
  create encryption key k3 with passwd 'Whybother' dual_control
  create encryption key k1 with keylength 192
  ```

- **Example 7 –** Creates a master key to protect "testkey":

  ```
  create encryption key testkey for database encryption
      with master key
  ```

- **Example 8 –** Creates a dual master key to protect "testkey":

  ```
  create encryption key testkey for database encryption
      with dual_control
  ```

- **Example 9 –** Creates both a master key and dual master key to protect "testkey":

  ```
  create encryption key testkey for database encryption
      with master key dual_control
  ```

- **Example 10 –** Creates a master key to protect "testkey", while explicitly excluding the dual master key:

  ```
  create encryption key testkey for database encryption
      with master key no dual_control
  ```

- **Example 11 –** Creates a master key to protect "testkey" while explicitly excluding a dual master key:

  ```
  create encryption key testkey for database encryption
      with no dual control
  ```

- **Example 12 –**

  ```
  sp_configure 'enable encrypted columns', 1
  create encryption key master with passwd "testpassword"
  set encryption passwd 'testpassword' for key master
  create encryption key dbkey for database encryption
  ```

Usage

The SAP ASE server does not save the user-specified password. It saves a string of validating bytes known as the “salt” in `sysencryptkeys.eksalt`, which allows the SAP ASE server to recognize whether a password used on a subsequent encryption or decryption operation is legitimate for a key. You must supply the password to the SAP ASE server before you can access any column encrypted by **keyname**.

For fully encrypted databases:

- The database encryption key does not support the `pad` option in **create encryption key** command.
- The database encryption key cannot be the default key for column encryption.
- Successfully created database encryption keys are stored in the `sysencryptkeys` table of the `master` database and are indicated by this key type:

  ```
  #define EK_DBENCKEY       0x1000
  ```

For information about auditing, see *Auditing Encrypted Columns* in the *Encrypted Columns Users Guide*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **create encryption key** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the following privilege or privileges based on the encryption key type: • column encryption key – `create encryption key` or `manage column encryption key` • master key – `manage master key` • service key – `manage service key` • database encryption key – `manage database encryption key` You must have the `manage any encryption key` privilege to create an encryption key for another user.
Disabled	With granular permissions disabled, you must be a user with **sso_role**, **keycustodian_role**, or have **create encryption key** privilege to create an encryption key. You must have **sso_role** to create an encryption key for another user.

See also

- *alter encryption key* on page 15
- *set* on page 607
- *drop encryption key* on page 346
- *grant* on page 419
- *revoke* on page 559

create existing table

(Component Integration Services only) Creates a proxy table, then retrieves and stores metadata from a remote table and places the data into the proxy table. Allows you to map the proxy table to a table, view, or procedure at a remote location.

The preferred method of creating proxy tables is the **create proxy_table** command, which eliminates the need to define the column definitions.

Syntax

```
create existing table table_name (column_list)
    [on segment_name]
    [[external {table | procedure | file | connection_type}] at
pathname
    [column delimiter "string"]]
```

Parameters

- ***table_name* –** specifies the name of the table for which you want to create a proxy table.

- ***column_list* –** specifies the name of the column list that stores information about the remote table.
- **on *segment_name* –** specifies the segment that contains the remote table.
- **external –** specifies that the object is a remote object.
- **table –** specifies that the remote object is a table or a view. The default is **external table**.
- **procedure –** specifies that the remote object is a stored procedure.
- **file –** specifies that the remote object is a file.
- ***connection_type* –** determines whether a remote procedure call uses the current or a separate connection. The valid values are:

  - **non_transactional** – is a separate connection is used to execute the RPC.
  - **transactional** – is the existing connection is used to execute the RPC.

  The default behavior is transactional.
- **at *pathname* –** specifies the location of the remote object. *pathname* takes the form: ***server_name.dbname.owner.object***, where:

  - *server_name* (required) – is the name of the server that contains the remote object.
  - *dbname* (optional) – is the name of the database managed by the remote server that contains this object.
  - *owner* (optional) – is the name of the remote server user that owns the remote object.
  - *object* (required) – is the name of the remote table, view, or procedure.
- **column delimiter –** used to separate fields within each record when accesssing flat files. The column delimiter can be up to 16 bytes long.
- ***string* –** the column delimiter string can be any character sequencer, but if the string is longer than 16 bytes, only the first 16 bytes are used. The use of column delimiter for proxy tables mapped to anything but files results in a syntax error.

Examples

- **Example 1 –** Creates the proxy table `authors`:

```
create existing table authors
(
au_id        id,
au_lname     varchar (40)    NOT NULL,
au_fname     varchar (20)    NOT NULL,
phone        char (12),
address      varchar (40)    NULL,
city         varchar (20)    NULL,
state        char (2)        NULL,
zip          char (5)        NULL,
contract     bit
)
at "nhserver.pubs2.dbo.authors"
```

- **Example 2 –** Creates the proxy table `syb_columns`:

```
create existing table syb_columns
(
id        int,
number    smallint,
colid     tinyint,
status    tinyint,
type      tinyint,
length    tinyint,
offset    smallint,
usertype  smallint,
cdefault  int,
domain    int,
name      varchar (30),
printfmt  varchar (255)    NULL,
prec      tinyint         NULL,
scale     tinyint         NULL
)
at "remote1.master.dbo.columns"
```

- **Example 3 –** Creates a proxy table named `blurbs` for the `blurbs` table at the remote server SERVER_A:

```
create existing table blurbs
(
author_id      id      not null,
copy           text    not null
)
at "SERVER_A.db1.joe.blurbs"
```

- **Example 4 –** Creates a proxy table named `rpc1` for the remote procedure named `p1`:

```
create existing table rpc1
(
column_1       int,
column_2       int
)
external procedure
at "SERVER_A.db1.joe.p1"
```

Usage

- **create existing table** does not create a new table unless the remote object is a file. Instead, CIS checks the table mapping to confirm that the information in *column_list* matches the remote table, verifies the existence of the underlying object, and retrieves and stores metadata about the remote table.
- If the host data file or remote server object does not exist, the command is rejected with an error message.
- If the object exists, the system tables `sysobjects`, `syscolumns`, and `sysindexes` are updated. The verification operation requires these steps:
  1. The nature of the existing object is determined. For host data files, this requires determining file organization and record format. For remote server objects, this requires determining whether the object is a table, a view, or an RPC.
  2. For remote server objects (other than RPCs), column attributes obtained for the table or view are compared with those defined in the `column_list`.

3. Index information from the host data file or remote server table is extracted and used to create rows for the `sysindexes` system table. This defines indexes and keys in the SAP ASE server terms and enables the query optimizer to consider any indexes that might exist on this table.

- The **on *segment_name*** clause is processed locally and is not passed to a remote server.
- After successfully defining an existing table, issue **update statistics** for the table. This allows the query optimizer to make intelligent choices regarding index selection and join order.
- CIS allows you to create a proxy table with a column defined as NOT NULL even though the remote column is defined as NULL. It displays a warning to notify you of the mismatch.
- The location information provided by the **at** keyword is the same information that is provided by **sp_addobjectdef**. The information is stored in the `sysattributes` table.
- CIS inserts or updates a record in the `systabstats` catalog for each index of the remote table. Since detailed structural statistics are irrelevant for remote indexes, only a minimum number of columns are set in the `systabstats` record—`id`, `indid`, and `rowcnt`.
- External files cannot be of datatypes `text`, `image`, or Java ADTs.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create existing table permission defaults to the table owner and is not transferable.

See also

- *alter table* on page 43
- *create table* on page 207
- *create proxy_table* on page 190
- *drop index* on page 350
- *insert* on page 473
- *order by clause* on page 524
- *set* on page 607
- *update* on page 680

Datatype Conversions

When using **create existing table**, you must specify all datatypes with recognized SAP ASE datatypes.

If the remote server tables reside on a class of server that is heterogeneous, the datatypes of the remote table are automatically converted into the specified SAP ASE types when the data is retrieved. If the conversion cannot be made, CIS does not allow the table to be defined.

The *Component Integration Services Users Guide* contains a section for each supported server class and identifies all possible datatype conversions that are implicitly performed by CIS.

Changes by Server Class

All server classes allow you to specify fewer columns than there are in the table on the remote server.

In addition, all server classes:

- Match the columns by name.
- Allow the column type to be any datatype that can be converted to and from the datatype of the column in the remote table.

Remote Procedures

When the proxy table is a procedure-type table, you must provide a column list that matches the description of the remote procedure's result set. **create existing table** does *not* verify the accuracy of this column list.

No indexes are created for procedures.

CIS treats the result set of a remote procedure as a virtual table that can be sorted, joined with other tables, or inserted into another table using **insert** or **select**. However, a procedure type table is considered read-only, which means you cannot issue the following commands against the table:

- **alter table**
- **create index**
- **delete**
- **insert**
- **truncate table**
- **update**

Begin the column name with an underscore (_) to specify that the column is not part of the remote procedure's result set. These columns are referred to as parameter columns. For example:

```
create existing table rpc1
 (
    a        int,
    b        int,
    c        int,
    _p1      int null,
    _p2      int null
)
external procedure
at "SYBASE.sybsystemprocs.dbo.myproc"
```

In this example, the parameter columns `_p1` and `_p2` are input parameters. They are not expected in the result set, but can be referenced in the query:

```
select a, b, c from t1
where _p1 = 10 and _p2 = 20
```

CIS passes the search arguments to the remote procedure as parameters, using the names ***@p1*** and ***@p2***.

Parameter-column definitions in a **create existing table** statement:

- Must allow a null value.
- Cannot precede regular result columns—they must appear at the end of the column list.

If a parameter column is included in a **select** list and is passed to the remote procedure as a parameter, the return value is assigned by the **where** clause.

If a parameter column is included in a **select** list, but does not appear in the **where** clause or cannot be passed to the remote procedure as a parameter, its value is NULL.

A parameter column can be passed to a remote procedure as a parameter if the SAP ASE query processor considers it a searchable argument. A parameter column is considered a searchable argument if it is not included in any **or** predicates. For example, the **or** predicate in the second line of the following query prevents the parameter columns from being used as parameters:

```
select a, b, c from t1
where _p1 = 10 or _p2 = 20
```

Encrypted Columns

create existing table automatically updates `syscolumns` with any encrypted column metadata from the remote table. You cannot include the **encrypt** keyword in the column list for a **create existing table** command.

create function

Creates a user-defined function, which is a saved Transact-SQL routine that returns a specified value.

Syntax

```
create [or replace] function [ owner_name. ] function_name
    [ ( @parameter_name [as] parameter_datatype [ = default ]
        [ ,...n ] ) ]
    returns return_datatype
    [ with recompile]
    as
    [begin]
    function_body
    return scalar_expression
    [end]
```

Parameters

- **or replace –** redefines an existing function. Use this clause to change the definition of an existing user defined function without dropping, re-creating, and regranting object privileges previously granted on the function. If the function is redefined, it is recompiled when the function is used.
- ***owner_name* –** is the name of the user ID that owns the user-defined function. Must be an existing user ID.
- ***function_name* –** is the name of the user-defined function. Function names must conform to the rules for identifiers and must be unique within the database and to its owner. Function names cannot be the same as other SAP ASE functions.

  When used with **or replace**, is the name of the function remains the same, although its definition is changed.

  Note: To reference or invoke a user-defined function, specify the *owner_name.function_name*, followed by parentheses (see the **BONUS** function in the "Examples" section below). Specify expressions as arguments for all the parameters within the parentheses. You cannot specify the parameter names in the argument list when you invoke a function.You must supply argument values for all of the parameters, and the argument values must be in the same sequence in which the parameters are defined in the **create function** statement. When a function's parameter has a default value, you must specify the keyword "default" when calling the function to get the default value.
- ***@parameter_name* –** is the parameter in the user-defined function. You can declare one or more parameters in a **create function** statement. A function can have a maximum of 2,047 parameters. The value of each declared parameter must be supplied by the user when the function is executed, unless you define a default for the parameter.

  Specify a parameter name using an "at" sign (*@*) as the first character. The parameter name must conform to the rules for identifiers. Parameters are local to the function. You can use the same parameter names in other functions.

  If a parameter has a default value, the user must specify the keyword "default" when they call the function to get the default value.

  When used with **or replace**, you can alter the names and number of parameters.
- ***parameter_datatype* –** is the datatype of the parameter. All scalar datatypes and Java abstract datatypes (ADTs) can be used as a parameter for user-defined functions. However, user-defined functions do not support the `timestamp`, `text`, `image` and `unitext`.

  When used with **or replace**, you can change the datatype of the parameter to the function.
- ***with recompile* –** indicates that the SAP ASE server never saves a plan for this function; instead, a new plan is created each time the function is referenced in a SQL statement. Use *with recompile* when you expect the execution of this function to be atypical, and require a new plan.

When used with **or replace**, you can change the option to recompile, or not to recompile every time the function is replaced.

- ***return_datatype* –** is the return value of a scalar, user-defined function. *return_datatype* can be any of the scalar datatypes and Java abstract datatypes except `text`, `image`, `unitext`, and `timestamp`.

  When used with **or replace**, you can alter the return datatype of the function.
- ***scalar_expression* –** specifies the scalar value the scalar function returns.

  You can invoke scalar-valued functions where scalar expressions are used, including computed columns and **check** constraint definitions.

  When used with **or replace**, you can change the value returned by the function.
- ***function_body* –** specifies a series of Transact-SQL statements, which together do not produce a side effect but define the value of the function. *function_body* is used only in scalar functions and multistatement table-valued functions. In scalar functions, *function_body* is a series of Transact-SQL statements that evaluate to a scalar value.

  When used with **or replace**, you can change the SQL statements that define the value of the function

Examples

- **Example 1 –** Creates a user-defined function named **bonus**:

```
create function BONUS(@salary int, @grade int, @dept_id int)
returns int
as
    begin
    declare @bonus int
    declare @cat int
    set @bonus = 0
    select @cat = dept_cat from department
        where dept_id = @dept_id

    if (@cat < 10)
        begin
            set @bonus = @salary *15/100

        end
        else
            begin
            set @bonus = @salary * 10/100
        end
return @bonus
end
```

- **Example 2 –** Defines a function which concatenates `firstname` and `lastname` strings.

```
create function fullname(
    @firstname char(30),
    @lastname char(30))
```

```
returns char(61)
as
begin
declare @name char(61)
set @name = @firstname|| ‘ ‘ ||@lastname
return @name
end

select object_id("fullname")
-----------
473049690
```

This function replaces the previously created `fullname` function using the **or replace** clause. After replacing the function, the local variable `@name` is removed. The object ID of the function remains the same.

```
create or replace function fullname(
    @firstname char(30),
    @lastname char(30))
returns char(61)
as
begin
return(@firstname|| ' ' ||@lastname)
end

select object_id("fullname")
-----------
473049690
```

Usage

- If the owner of the user-defined function also owns all the database objects referenced inside, then all the other users who have **execute** permission on the function are automatically granted access permissions to all the referenced objects when they execute the function.
- When a function is created, the SAP ASE server checks to see if it is a SQL user-defined function or a SQLJ user-defined function. If it is the latter, the SAP ASE server checks for “sa” permissions. If it is a SQL function, the SAP ASE server checks for **create function** privileges.

If a function is referenced in a computed column or functional index, it cannot be replaced.

Permissions

Any user who impersonates the function owner through an alias or **setuser** cannot replace the function.

The permission checks for **create function** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `create function` privilege to create a function. To create a function for another user, you must have the `create any function` privilege. You must be the function owner to replace the function.
Disabled	With granular permissions disabled, you must be the database owner, a user with **sa_role**, or have the `create function` privilege to create a function. To create a function for another user, you must have **sa_role**. You must be the function owner to replace the function.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	97
Audit option	**create**
Command or access audited	**create function**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect • or replace – for **create or replace**

Objects Dependent on Replaced Functions

If a replaced function is called by another function, both functions are recompiled when called. If the interface of the replaced function does not match that in the calling function, then the calling function must be replaced, otherwise, the calling function raises an error. You can execute **sp_depends** on the replaced function to check for any calling objects.

For example, `testfun1` is replaced to have two parameters instead of one. The calling function, `testfun2`, must be replaced to account for the second parameter.

```
create function testfun1 (@para1 int)
    returns int
    as
    begin
        declare @retval int
        set @retval = @para1
        return @retval
    end
create function testfun2 (@para int)
    returns int
    as
    begin
        declare @retval int
        select @retval= dbo.testfun1 (@para)
        return @retval
    end
create or replace function testfun1 (@para1 int,@para2 int)
    returns int
    as
    begin
        declare @retval int
        set @retval = @para1+@para2
        return @retval
    end
```

create function (SQLJ)

Creates a user-defined function by adding a SQL wrapper to a Java static method. Can return a value defined by the method.

Syntax

```
create function [or replace] [owner.]sql_function_name
         ([ sql_parameter_name sql_datatype
            [(length)| (precision[, scale ])]
        [[, sql_parameter_name sql_datatype
            [(length)| (precision[, scale])]]
        ...]])
    returns sql_datatype
        [(length)| (precision[, scale])]
    [modifies sql data]
    [returns null on null input |
        called on null input]
    [deterministic | not deterministic]
    [exportable]
    language java
    parameter style java
    external name 'java_method_name
        [([java_datatype[, java_datatype
        ...]])] '
```

Parameters

- **or replace –** redefines an existing function. Use this clause to change the definition of an existing user defined SQLJ function without dropping, re-creating, and regranting object privileges previously granted on the function.

- ***sql_function_name* –** is the Transact-SQL name of the function, must conform to the rules for identifiers, and cannot be a variable. The name remains the same even when you use **or replace**.
- ***sql_parameter_name* –** is the name of an argument to the function. The value of each input parameter is supplied when the function is executed. Parameters are optional; a SQLJ function need not take arguments.

  Parameter names must conform to the rules for identifiers. If the value of a parameter contains nonalphanumeric characters, it must be enclosed in quotes. This includes object names qualified by a database name or owner name, since they include a period. If the value of the parameter begins with a numeric character, it also must be enclosed in quotes.

  Use **or replace** to change the names and the number of parameters.
- ***sql_datatype* [(*length*) | (*precision* [, *scale*])] –** is the Transact-SQL datatype of the parameter. See **create procedure** for more information about these parameters.

  sql_datatype is the SQL procedure signature.

  Use **or replace** to change the Transact-SQL datatype of the parameter to the function.
- **returns *sql_datatype* –** specifies the result datatype of the function.

  Use **or replace** to change result datatype of the function .
- **modifies sql data –** indicates that the Java method invokes SQL operations, reads, and modifies SQL data in the database. This is the default and only implementation. It is included for syntactic compatibility with the ANSI standard.
- **deterministic | not deterministic –** included for syntactic compatibility with the ANSI standard. Not currently implemented.
- **exportable –** specifies that the procedure is to be run on a remote server using the SAP ASE OmniConnect™ feature. Both the procedure and the method it is built on must reside on the remote server.
- **language java –** specifies that the external routine is written in Java. This is a required clause for SQLJ functions.
- **parameter style java –** specifies that the parameters passed to the external routine at runtime are Java parameters. This is a required clause for SQLJ functions.
- **external –** indicates that **create function** defines a SQL name for an external routine written in a programming language other than SQL.
- **name –** specifies the name of the external routine (Java method). The specified name—**'*java_method_name* [*java_datatype*[{, *java_datatype*} ...]]'**—is a character-string literal and must be enclosed in single quotes.

  Use **or replace** to change the name of the external routine.
- ***java_method_name* –** specifies the name of the external Java method.

  Use **or replace** to change tthe Java method.
- ***java_datatype* –** specifies a Java datatype that is mappable or result-set mappable. This is the Java method signature.

Use **or replace** to change the Java datatype.

Examples

- **Example 1 –** Creates a function `square_root` that invokes the **java.lang.Math.sqrt()** method:

```
create function square_root
    (input_number double precision) returns
        double precision
    language java parameter style java
    external name 'java.lang.Math.sqrt'
```

- **Example 2 –** Creates a SQLJ function named `sqlj_testfun`.

```
create function sqlj_testfun (p1 int)
                      returns int
                      language java
                      parameter style java
                      external name 'UDFSample.sample(int)'
```

The following replaces the previously created SQLJ function using the **or replace** clause. Parameter `p2` is added and the external java method is changed but the object ID of the SQLJ function remains the same.

```
create or replace function sqlj_testfun (p1 int,p2 int)
                      returns int
                      language java
                      parameter style java
                     external name 'UDFSample.sample2(int,int)'
```

Usage

- You cannot create a SQLJ function with the same name as an SAP ASE built-in function.
- You can create user-defined functions (based on Java static methods) and SQLJ functions with the same class and method names.

Note: The SAP ASE server searching order ensures that the SQLJ function is always found first.

- You can include a maximum of 31 parameters in a **create function** statement.
- When a function is created, the SAP ASE server checks to see if it is a SQL user-defined function or a SQLJ user-defined function. If it is the latter, the SAP ASE server checks for “sa” permissions. If it is a SQL function the SAP ASE server checks for **create function** privileges.
- If the replaced SQLJ function is called by another function, both functions will be recompiled when called.
- If the interface of the replaced function does not match that in the calling function, then the calling function must be replaced, otherwise the calling function raises an error. You can execute **sp_depends** on the replaced function to check for any calling objects.
- If a function is referenced in a computed column or functional index, it cannot be replaced.

For objects dependent on replaced functions:

- If the replaced SQLJ function is called by another function, both functions will be recompiled when called.
- If the interface of the replaced function does not match that in the calling function, then the calling function must be replaced, otherwise the calling function raises an error. You can execute **sp_depends** on the replaced function to check for any calling objects.

See also:

- See *Java in Adaptive Server Enterprise* for more information about **create function**.
- **sp_depends**, **sp_help**, **sp_helpjava**, **sp_helprotect** in *Reference Manual: Procedures*

Permissions

Any user who impersonates the function owner through an alias or **setuser** cannot replace the function.

The permission checks for **create function** (SQLJ) differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `create function` privilege to create a function (SQLJ). To create a function (SQLJ) for another user, you must have the `create any function` privilege. You must be the function owner to replace the function.
Disabled	With granular permissions disabled, you must be the database owner, a user with **sa_role**, or have the `create function` privilege to create a function (SQLJ). To create a function (SQLJ) for another user, you must have **sa_role**. You must be the function owner to replace the function.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	97
Audit option	**install**
Command or access audited	**create function**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a **set proxy** is in effect • `or replace` – for **create or replace**

See also

- *create procedure* on page 169
- *create function (SQLJ)* on page 136
- *drop function (SQLJ)* on page 349

create index

Creates an index on one or more computed or noncomputed columns in a table. Creates partitioned indexes. Allows computed columns, like ordinary columns, to be index keys, and creates function-based indexes. A function-based index has one or more expressions as its index key.

The existing **create index** syntax can create indexes on computed columns, but function-based indexes require additional syntax.

Syntax

```
create [unique] [clustered | nonclustered] index index_name
    on [[database.][owner].]table_name
         (column_expression [asc | desc]
            [, column_expression [asc | desc]]...)
    [with {fillfactor = pct,
            online,
            max_rows_per_page = num_rows,
            reservepagegap = num_pages,
            consumers = x, ignore_dup_key, sorted_data,
            [ignore_dup_row | allow_dup_row],
            [statistics using num_steps values ]
            [, statistics hash_option]
           [, statistics max_resource_granularity = int]
            [, statistics histogram_tuning_factor = int]
            [, statistics print_progress = int] } ]
    [on segment_name]
    [index_partition_clause]
    [with index_compression = { NONE | PAGE }]...]]]
```

To create index partitions:

```
index_partition_clause::=
    [local index [partition_name
    [with index_compression = { NONE | PAGE }][on segment_name]
    [, partition_name [on segment_name]
    [with index_compression = { NONE | PAGE }][on segment_name]...]]
```

For function-based indexes:

```
create [unique | nonclustered] index index_name
    on [[database.] [owner].] table_name
     (column_expression [asc | desc]
    [, column_expression [asc | desc]]...
```

Parameters

- **unique –** prohibits duplicate index values (also called “key values”). The system checks for duplicate key values when the index is created (if data already exists), and each time data is added with an **insert** or **update**. If there is a duplicate key value or if more than one row contains a null value, the command fails, and the SAP ASE server prints an error message giving the duplicate entry.

  Warning! The SAP ASE server does not detect duplicate rows if a table contains any non-null `text`, `unitext`, or `image` columns.

  insert and **update** commands, which generate duplicate key values, can succeed if you create your index using the **allow_dup_row** option.

  Composite indexes (indexes in which the key value is composed of more than one column) can also be unique.

  The default is nonunique. To create a nonunique clustered index on a table that contains duplicate rows, specify **allow_dup_row** or **ignore_dup_row**.

  When you create a unique local index on range-, list-, and hash-partitioned tables, the index key list is a superset of the partition-key list.
- **clustered –** means that the physical order of rows on the current database device is the same as the indexed order of the rows. The bottom, or *leaf level*, of the clustered index contains the actual data pages. A clustered index almost always retrieves data faster than a nonclustered index. Only one clustered index per table is permitted.

  If **clustered** is not specified, **nonclustered** is assumed.
- **nonclustered –** means that the physical order of the rows is not the same as their indexed order. The leaf level of a nonclustered index contains pointers to rows on data pages. You can have as many as 249 nonclustered indexes per table.
- ***index_name* –** is the name of the index. Index names must be unique within a table, but need not be unique within a database.
- ***table_name* –** is the name of the table in which the indexed column or columns are located. Specify the database name if the table is in another database, and specify the owner’s name

if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

- ***column_expression*** **–** is a valid Transact-SQL expression that references at least one base column, and does not contain columns from other tables, local and global variables, aggregate functions, or subqueries.

Note: *column_expressions* replaces the *column_name* variable used in SAP ASE versions earlier than 15.0.

- **asc | desc –** specifies whether the index is to be created in ascending or descending order for the column specified. The default is ascending order.
- **fillfactor –** specifies how full the SAP ASE server makes each page when it creates a new index on existing data. The **fillfactor** percentage is relevant only when the index is created. As data changes, the pages are not maintained at any particular level of fullness.

  The value you specify is not saved in `sysindexes`. Use **sp_chgattribute** to create stored **fillfactor** values.

  The default for **fillfactor** is 0; this is used when you do not include **with fillfactor** in the **create index** statement (unless the value has been changed with **sp_configure**). When specifying a **fillfactor**, use a value between 1 and 100.

  A **fillfactor** of 0 creates clustered indexes with completely full pages and nonclustered indexes with completely full leaf pages. It leaves a comfortable amount of space within the index B-tree in both the clustered and nonclustered indexes. There is seldom a reason to change the **fillfactor**.

  If the **fillfactor** is set to 100, the SAP ASE server creates both clustered and nonclustered indexes with each page 100 percent full. A **fillfactor** of 100 makes sense only for read-only, to which no data is ever added.

  fillfactor values smaller than 100 (except 0, which is a special case) cause the SAP ASE server to create new indexes with pages that are not completely full. A **fillfactor** of 10 might be a reasonable choice if you are creating an index on a table that eventually holds a great deal more data, but small **fillfactor** values cause each index (or index and data) to occupy more storage space.

Warning! Creating a clustered index with a **fillfactor** affects the amount of storage space your data occupies, since the SAP ASE server redistributes the data as it creates the clustered index.

- **max_rows_per_page –** limits the number of rows on data pages and the leaf-level pages of indexes. Unlike **fillfactor**, the **max_rows_per_page** value is maintained until it is changed with **sp_chgattribute**.

  If you do not specify a value for **max_rows_per_page**, the SAP ASE server uses a value of 0 when creating the table. Values for tables and clustered indexes range from 0 to 183K on a 2K page, to 0 to 1486 on a 16K page.

The maximum number of rows per page for nonclustered indexes depends on the size of the index key. The SAP ASE server returns an error message if the specified value is too high.

A **max_rows_per_page** value of 0 creates clustered indexes with full pages and nonclustered indexes with full leaf pages. It leaves a comfortable amount of space within the index B-tree in both clustered and nonclustered indexes.

If **max_rows_per_page** is set to 1, the SAP ASE server creates both clustered and nonclustered indexes with one row per page at the leaf level. Use low values to reduce lock contention on frequently accessed data. However, low **max_rows_per_page** values cause the SAP ASE server to create new indexes with pages that are not completely full, uses storage space, and may cause more page splits.

If CIS is enabled, you cannot use **max_rows_per_page** for remote servers.

Warning! Creating a clustered index with **max_rows_per_page** can affect the amount of storage space your data occupies, since the SAP ASE server redistributes the data as it creates the clustered index.

- **with reservepagegap =** ***num_pages*** **–** specifies a ratio of filled pages to empty pages to be left during extent I/O allocation operations. For each specified *num_pages*, an empty page is left for future expansion of the index. Valid values are 0 – 255. The default is 0.
- **with consumers –** specifies the number of consumer processes that should perform the sort operation for creating the index. The actual number of consumer processes used to sort the index may be different from the specified number, depending on the number of worker processes available and the number of data partitions.
- **ignore_dup_key –** cancels attempts of duplicate key entry into a table that has a unique index (clustered or nonclustered). The SAP ASE server cancels the attempted **insert** or **update** of a duplicate key with an informational message. After the cancellation, the transaction containing the duplicate key proceeds to completion.

  You cannot create a unique index on a column that includes duplicate values or more than one null value, whether or not **ignore_dup_key** is set. If you attempt to do so, the SAP ASE server prints an error message that displays the first of the duplicate values. You must eliminate duplicates before the SAP ASE server can create a unique index on the column.
- **ignore_dup_row –** allows you to create a new, nonunique clustered index on a table that includes duplicate rows. **ignore_dup_row** deletes the duplicate rows from the table, and cancels any **insert** or **update** that would create a duplicate row, but does not roll back the entire transaction.
- **allow_dup_row –** allows you to create a nonunique clustered index on a table that includes duplicate rows, and allows you to duplicate rows with **insert** and **update** statements.
- **sorted_data –** speeds creation of clustered indexes or unique nonclustered indexes when the data in the table is already in sorted order (for example, when you have used **bcp** to copy data that has already been sorted into an empty table).
- **with statistics using** ***num_steps*** **values –** specifies the number of steps to generate for the histogram used to optimize queries. If you omit this clause:

    - The default value is 20, if no histogram is currently stored for the leading index column.
    - The current number of steps is used, if a histogram for the leading column of the index column already exists.

  If you specify 0 for *num_steps*, the index is re-created, but the statistics for the index are not overwritten in the system tables.

  The actual number of steps may differ from the one you specify; if the histogram steps specified with *num_steps* is *M*, and the histogram_tuning_factor parameter is *N*, then the actual steps are between *M* and *M*N*, depending on the number of frequency cells that exist in the distribution.
- **online –** creates indexes without blocking access to the data.
- **on *segment_name* –** creates the index on the named segment. Before using the **on *segment_name*** option, initialize the device with **disk init**, and add the segment to the database using **sp_addsegment**. See your system administrator, or use **sp_helpsegment** to generate a list of the segment names available in your database. There are two locations where you can use **on *segment_name***:

    - Immediately before the *index_partition_clause* – defines a global default which is used for all partitions where the segment is not explicitly defined in the *index_partition_clause*.
    - Within that clause itself – allows you to specify a segment for each individual partition

  See the examples section for an example that uses **on *segment_name*** in both locations.
- ***hash_option* –** indicates whether to gather index statistics on tables:

    - **hashing** – statistics are gathered with hashing.
    - **new_ hashing** – enables hash-based gathering for minor attributed columns that have not had statistics previously gathered.
    - **no_ hashing** – no hash-based statistics are gathered.
- **with statistics hashing –**

    - **max_resource_granularity** – sets the maximum percentage of system resources a query can use.
    - **histogram_tuning_factor** – controls the number of steps that SAP ASE analyzes per histogram.
    - **print_progress** – shows progress messages during gathering of statictics with hashing.
- **local index –** specifies, for semantically partitioned tables, an index that is always equipartitioned with its base table; that is, the table and index share the same partitioning key and partitioning criteria. For round-robin-partitioned tables, a local index means that index keys in each of the tables' index partitions refer to data rows in one and only one table partition.

For both semantically partitioned tables and round-robin-partitioned tables, each table partition has only one corresponding index partition.

- ***partition_name*** **–** specifies the name of a new partition on which indexes are to be stored. Partition names must be unique within the set of partitions on a table or index. Partition names can be delimited identifiers if **set quoted_identifier** is on. Otherwise, they must be valid identifiers.

  If *partition_name* is omitted, the SAP ASE server creates a name in the form *table_name_partition_id*. The SAP ASE server truncates partition names that exceed the allowed maximum length.
- **index_compression = { NONE | PAGE } –** specifies whether to compress an index or index partition. Values are:
  - `NONE` – the index page for the specified index is not compressed. Indexes that are specifically created with **index_compression = PAGE** are compressed.
  - `PAGE` – when the page is full, existing index rows are compressed using the page prefix compression. When a row is added, a check determines whether the row suitable for compression.

Examples

- **Example 1 –** Creates an index named `au_id_ind` on the `au_id` column of the `authors` table:

```
create index au_id_ind on authors (au_id)
```

- **Example 2 –** Creates a unique clustered index named `au_id_ind` on the `au_id` column of the `authors` table:

```
create unique clustered index au_id_ind
on authors (au_id)
```

- **Example 3 –** Creates an index named `ind1` on the `au_id` and `title_id` columns of the `titleauthor` table:

```
create index ind1 on titleauthor (au_id, title_id)
```

- **Example 4 –** Creates a nonclustered index named `zip_ind` on the `zip` column of the `authors` table, filling each index page one-quarter full and limiting the sort to 4 consumer processes:

```
create nonclustered index zip_ind
on authors (postalcode)
with fillfactor = 25, consumers = 4
```

- **Example 5 –** Creates an index with ascending ordering on `pub_id` and descending order on `pubdate`:

```
create index pub_dates_ix
on titles (pub_id asc, pubdate desc)
```

- **Example 6 –** Creates an index on `title_id`, using 50 histogram steps for optimizer statistics and leaving 1 empty page out of every 40 pages in the index:

```
create index title_id_ix
on titles (title_id)
with reservepagegap = 40,
statistics using 50 values
```

- **Example 7 –** Creates a local, clustered index on a partitioned `salesdetail` table. The `clust_idx` index inherits the partition strategy, partition key, and partition bounds of `salesdetail`.

  ```
  create clustered index clust_idx
  on salesdetail (ord_num) local index
  ```

- **Example 8 –** Creates a nonpartitioned, nonclustered global index on a partitioned `sales` table, which is partitioned by range on the `date` column.

  ```
  create nonclustered index global_idx
  on sales (order_num)
  ```

- **Example 9 –** First, creates a table, `pback_sales,` with three data partitions:

  ```
  create table pback_sales (c1 int, c2 int,
      c3 varchar (20)) partition range (c1)
          (p1 c1 values <= (10),
          p2 c1 values <= (20),
          p3 c1 values <= (MAX))
  ```

  Then, creates a local, function-based index on partition `p1`:

  ```
  create index fc_idx on pback_sales (c1*c2) local index
      p1
  ```

- **Example 10 – create index with sorted_data** selects a parallel query plan when an explicit **consumers =** clause is included. This example uses a parallel query plan for the first query, but uses a serial query plan for the second:

  ```
  create index i1 on t1(c1) with sorted_data, consumers = N
  create index i1 on t1(c1) with sorted_data
  ```

- **Example 11 –** Creates a function-based index:

  ```
  create index sum_sales on mytitles (price * total_sales)
  ```

- **Example 12 –** Specifies the **on *segment_name*** clause both before and after the partition name:

  ```
  use tempdb
  go
  if not exists(select 1 from tempdb..syssegments where name =
  'seg1')
      exec sp_addsegment seg1,tempdb,master
  go
  if not exists(select 1 from tempdb..syssegments where name =
  'seg2')
      exec sp_addsegment seg2,tempdb,master
  go
  if not exists(select 1 from tempdb..syssegments where name =
  'seg3')
      exec sp_addsegment seg3,tempdb,master
  go
  ```

```
if not exists(select 1 from tempdb..syssegments where name =
'seg4')
    exec sp_addsegment seg4,tempdb,master
go
if exists(select 1 from sysobjects where name = 't1')
    drop table t1
go
create table t1 (a int, b varchar(30)) partition by roundrobin (p1
on seg1, p2 on seg2)
go
create index t1_i1 on t1 (a) local index
go
create index t1_i2 on t1 (a) on seg3 local index ip1 on seg4
go
sp_help t1
go
```

Provides the following output:

```
 Name Owner Object_type Create_date
---- ----- ----------- -------------------
t1   dbo   user table  Aug 7 2008 11:14AM

(1 row affected)
Column_name Type    Length Prec Scale Nulls Default_name Rule_name
    Access_Rule_name Computed_Column_object Identity
----------- ------- ------ ---- ----- ----- ------------ ---------
    ---------------- ---------------------- ----------
a          int         4 NULL  NULL    0 NULL        NULL
     NULL           NULL                        0
b          varchar    30 NULL  NULL    0 NULL        NULL
     NULL           NULL                        0
Object has the following indexes

index_name index_keys index_description index_max_rows_per_page
    index_fillfactor index_reservepagegap
index_created       index_local
---------- ---------- ----------------- -----------------------
    ---------------- -------------------- -------------------
-----------
t1_i1       a       nonclustered                            0
               0                0 Aug  7 2008 11:14AM Local Index
t1_i2       a       nonclustered                           0
               0                0 Aug  7 2008 11:14AM Local Index

(2 rows affected)
index_ptn_name   index_ptn_seg
---------------- -------------
t1_i1_952063116  default
t1_i1_968063173  default
ip1             seg4
t1_i2_1000063287 seg3

(4 rows affected)
No defined keys for this object.
name type      partition_type partitions partition_keys
```

```
---- ---------- -------------- ---------- --------------
t1   base table roundrobin            2 NULL

(1 row affected)

partition_name partition_id pages row_count segment create_date
-------------- ------------ ----- --------- -------
--------------------
p1             920063002    1        0 seg1    Aug 7 2008 11:14AM
p2             936063059    1        0 seg2    Aug 7 2008 11:14AM

Partition_Conditions
--------------------
NULL

Avg_pages   Max_pages   Min_pages   Ratio(Max/Avg)   Ratio(Min/Avg)
----------- ----------- -----------
--------------    ----------------
1          1          1               1.000000   1.000000
Lock scheme Allpages
The attribute 'exp_row_size' is not applicable to tables with
allpages lock scheme.
The attribute 'concurrency_opt_threshold' is not applicable to
tables with
allpages lock scheme.

exp_row_size reservepagegap fillfactor max_rows_per_page
identity_gap ascinserts
------------ -------------- ---------- -----------------
------------ -----------
0            0              0        0                0           0

(1 row affected)
concurrency_opt_threshold optimistic_index_lock
dealloc_first_txtpg
------------------------- ---------------------
-------------------
0                        0                  0

(1 row affected)
(return status = 0)
```

- **Example 13 –** Creates a compressed index called `idx_order_line` on columns `ol_delivery_d` and `ol_dist_info`:

  ```
  create index idx_order_line
      on order_line (ol_delivery_d, ol_dist_info)
  with index_compression = page
  ```

  If the index has an index row length that is too short to benefit from compression, a warning is raised indicating the index will not be compressed.

- **Example 14 –** Creates a compressed index called `idx_Sales`. The index contains local index partitions that can be compressed. Index prefix compression is applied to the local index partition. Page prefix compression is applied while the index page is full:

```
create index idx_sales
    on Sales(store_id, order_num)
    local index ip1 with index_compression = PAGE,
    ip2 with index_compression = PAGE,
ip3
```

- **Example 15 –** Creates a unique clustered index named `au_id_ind` on the `au_id` and `title_id` columns of the `authors` table. Statistics are gathered with hashing, counts 50 steps, and enables **print_progress** which shows progress messages:

```
create unique clustered index au_id_ind
    on authors(au_id, title_id)
    with statistics hashing,
        statistics using 50 values,
        statistics print_progress = 1
```

- **Example 16 –** Creates an index named `ind1` on the `au_id` and `title_id` columns of the `titleauthor` table. Statistics are gathered with hashing, counts 50 steps, and sets the percentage of system resources a query can use at 80 percent using the **max_resource_granularity** option:

```
create index ind1
    on titleauthor (au_id, title_id)
    with statistics using 50 values,
        statistics hashing,
        statistics max_resource_granularity = 80
```

- **Example 17 –** Creates a nonclustered index named `zip_ind` on the `postalcode` and `au_id` columns of the `authors` table. Each index page is filled one-quarter full and the sort is limited to 4 consumer processes. Statistics are gathered with hashing, counts 50 steps, and generates an intermediate 40-step histogram:

```
create nonclustered index zip_ind
    on authors(postalcode, au_id)
    with fillfactor = 25,
        consumers = 4,
        statistics using 50 values,
        statistics hashing,
        statistics histogram_tuning_factor = 40
```

- **Example 18 –** Creates a unique clustered index named `au_id_ind` on the `au_id` and `title_id` columns of the `authors` table. Statistics are gathered with hashing for minor attributed columns that have not had statistics previously gathered:

```
create unique clustered index au_id_ind
    on authors(au_id, title_id)
    with statistics new_hashing
```

Usage

- Periodically run **update statistics** if you add data to the table that changes the distribution of keys in the index. The query optimizer uses the information created by **update statistics** to select the best plan for running queries on the table.

- You can create non-clustered local index in parallel for partitioned tables that includes empty partitions.
- If the table contains data when you create a nonclustered index, the SAP ASE server runs **update statistics** on the new index. If the table contains data when you create a clustered index, the SAP ASE server runs **update statistics** on all the table's indexes.
- Index all columns that are regularly used in joins.
- When CIS is enabled, the **create index** command is reconstructed and passed directly to the SAP ASE associated with the table.
- You cannot use **create index** (clustered or unclustered) on the segment that includes the virtually hashed table, since a virtually hashed table must take only one exclusive segment, which cannot be shared by other tables or databases
- You can run **writetext** concurrently with the **online** parameter.

See also:

- **sp_addsegment**, **sp_chgattribute**, **sp_helpcomputedcolumn**, **sp_helpindex**, **sp_helpsegment**, **sp_spaceused** in *Reference Manual: Procedures*
- **optdiag** in the *Utility Guide*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **create index** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner, or a user with the `create any index` privilege.
Disabled	With granular permissions disabled, you must be the table owner or a user with **sa_role**. **create index** permission defaults to the table owner and is not transferable.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	104
Audit option	**create**
Command or access audited	**create index**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – Name of the index • *Proxy information* – original login name, if a **set proxy** is in effect

See also

- *alter table* on page 43
- *create table* on page 207
- *drop index* on page 350
- *insert* on page 473
- *order by clause* on page 524
- *set* on page 607
- *update* on page 680
- *reorg* on page 549

Creating Indexes Efficiently

Indexes speed data retrieval, but can slow data updates. For better performance, create a table on one segment and create its nonclustered indexes on another segment, when the segments are on separate physical devices.

The SAP ASE server can create indexes in parallel if a table is partitioned and the server is configured for parallelism. It can also use sort buffers to reduce the amount of I/O required during sorting. See *Parallel Sorting* in *Performance and Tuning Guide: Optimizer and Abstract Plans*.

Create a clustered index before creating any nonclustered indexes, since nonclustered indexes are automatically rebuilt when a clustered index is created.

When using parallel sort for data-only-locked tables, the number of worker processes must be equal or exceed the number of partitions, even for empty tables. The database option **select into/bulkcopy/pllsort** must also be enabled.

Creating Clustered Indexes

A table "follows" its clustered index. When you create a table, using the **on *segment_name*** extension to **create clustered index**, the table migrates to the segment where the index is created.

If you create a table on a specific segment, then create a clustered index without specifying a segment, the SAP ASE server moves the table to the default segment when it creates the clustered index there.

Because `text`, `unitext`, and `image` data is stored in a separate page chain, creating a clustered index with **on *segment_name*** does not move text and image columns.

To create a clustered index, the SAP ASE server duplicates the existing data; the server deletes the original data when the index is complete. Before creating a clustered index, use **sp_spaceused** to make sure that the database has at least 120 percent of the size of the table available as free space.

The clustered index is often created on the table's primary key (the column or columns that uniquely identify the row). You can record the primary key in the database (for use by front-end programs and **sp_depends**) using **sp_primarykey**.

To allow duplicate rows in a clustered index, specify **allow_dup_row**.

Creating Indexes on Compressed Table

Considerations that apply when creating indexes on compressed tables.

- If a table requires sorting, the SAP ASE server compresses all rows that are available for compression during the data copy operation.
- The SAP ASE server does not perform a data copy if you create a clustered index using **sorted_data**, and does not compress any data rows while it builds the clustered index.
- The SAP ASE server does not compress index key values: It compresses only the values in the data rows.
- You may select index key columns and create unique indexes even if the key columns are compressed. To perform nonclustered uniqueness checks, examine the uncompressed index keys in an index page.
- The SAP ASE server uses the uncompressed index key and row formats to verify support for **ignore_dup_key**, **ignore_dup_row**, and **allow_dup_row**.
- The SAP ASE server applies the **fillfactor** parameter only for row-level compression.
- When it applies the **fillfactor** parameter to the data pages of an allpages-locked clustered index, the SAP ASE server considers the:
  - Final compressed row format
  - Space required for compression

  The SAP ASE server may additionally compress the page space used with subsequent page compression operations, resulting in lower **fillfactor** values.

- The SAP ASE server applies the **respagegap** parameter at the page level so it is not affected by compression.
- **max_rows_per_page** includes a page's data rows only, and not the hidden page-dictionary, index, and character-encoding entries.

Creating Indexes on Encrypted Columns

You can create an index on an encrypted column if you specify the encryption key without any initialization vector or random padding. Indexes on encrypted columns are useful for equality and nonequality matches, but cannot be used to match case-insensitive data, or to perform range searches of any data.

To improve performance on both equality and nonequality searches, and on joins, create indexes on encrypted columns.

create index reports an error if you create:

- A functional index using an expression that references an encrypted column
- An index on a column encrypted with initialization vector or random padding

Note: You cannot use an encrypted column in an expression for a functional index.

Specifying Ascending or Descending Ordering in Indexes

Use the **asc** and **desc** keywords after index column names to specify the sorting order for the index keys.

Creating indexes so that columns are in the same order specified in the **order by** clause of queries eliminates the sorting step during query processing. See *Indexing for Performance* in *Performance and Tuning Guide: Locking*.

Space Requirements for Indexes

Space is allocated to tables and indexes in increments of one extent, or eight pages, at a time. Each time an extent is filled, another extent is allocated. Use **sp_spaceused** to display the amount of space allocated to and used by an index.

In some cases, using the **sorted_data** option allows the SAP ASE server to skip copying the data rows. In these cases, you need only enough additional space for the index structure itself. Depending on key size, this is usually about 20 percent of the size of the table.

Duplicate Rows

Considerations when using **ignore_dup_row** and **allow_dup_row** options.

- The **ignore_dup_row** and **allow_dup_row** options are irrelevant when you create a nonunique, nonclustered index. The SAP ASE server attaches a unique row identification number internally in each nonclustered index; duplicate rows are not a problem, even for identical data values.

- **ignore_dup_row** and **allow_dup_row** are mutually exclusive.
- In all-pages-locked tables, nonunique clustered indexes allows duplicate keys, but does not allow duplicate rows unless you specify **allow_dup_row**. This behavior differs for data-only-locked tables.
- **allow_dup_row** allows you to create a nonunique, clustered index on a table that includes duplicate rows. If a table has a nonunique, clustered index that was created without the **allow_dup_row** option, you cannot create new duplicate rows using the **insert** or **update** command.

  If any index in the table is unique, the requirement for uniqueness takes precedence over the **allow_dup_row** option. You cannot create an index with **allow_dup_row** if a unique index exists on any column in the table.
- The **ignore_dup_row** option is also used with a nonunique, clustered index. The **ignore_dup_row** option eliminates duplicates from a batch of data. **ignore_dup_row** cancels any **insert** or **update** that would create a duplicate row, but does not roll back the entire transaction.
- This table illustrates how **allow_dup_row** and **ignore_dup_row** affect attempts to create a nonunique, clustered index on a table that includes duplicate rows and attempts to enter duplicate rows into a table.

Option Setting	Create an Index on a Table That Has Duplicate Rows	Insert Duplicate Rows into a Table With an Index
Neither option set	**create index** fails.	**insert** fails.
allow_dup_row set	**create index** completes.	**insert** completes.
ignore_dup_row set	Index is created, but duplicate rows are deleted; error message.	All rows are inserted, except duplicates; error message.

This table shows which index options you can use with the different types of indexes:

Index Type	Options
Clustered	**ignore_dup_row** | **allow_dup_row**
Unique, clustered	**ignore_dup_key**
Nonclustered	None
Unique, nonclustered	**ignore_dup_key**

Using Unique Constraints in Place of Indexes

As an alternative to **create index**, you can implicitly create unique indexes by specifying a unique constraint with the **create table** or **alter table** statement. The unique constraint creates a clustered or nonclustered unique index on the columns of a table. These *implicit* indexes are named after the constraint, and they follow the same rules for indexes created with **create index**.

You cannot drop indexes supporting unique constraints using the **drop index** statement. They are dropped when the constraints are dropped through an **alter table** statement or when the table is dropped. See **create table** for more information about unique constraints.

Using the sorted_data Option to Speed Sorts

The **sorted_data** option can reduce the time needed to create an index by skipping the sort step and by eliminating the need to copy the data rows to new pages in certain cases. The speed increase becomes significant on large tables, and increases to several times faster in tables larger than 1GB.

If **sorted_data** is specified, but data is not in sorted order, the SAP ASE server displays an error message, and the command fails.

The effects of **sorted_data** for creating a clustered index depend on whether the table is partitioned and whether certain other options are used in the **create index** command. Some options require data copying, if used at all, for nonpartitioned tables and sorts plus data copying for partitioned tables, while others require data copying only if you use:

- The **ignore_dup_row** option
- The **fillfactor** option
- The **on *segmentname*** clause to specify a segment that is different from the segment where the table data is located
- The **max_rows_per_page** clause to specify a value that is different from the value associated with the table

Creating a nonunique, nonclustered index succeeds, unless there are rows with duplicate keys. If there are rows with duplicate keys, the SAP ASE server displays an error message, and the command fails.

This table shows when the sort is required and when the table is copied for partitioned and nonpartitioned tables.

Options	Partitioned Table	Unpartitioned Table
No options specified	Parallel sort necessary only for creating a clustered index on a round-robin-partitioned table; copies data, distributing evenly on partitions; creates index tree.	Either parallel or nonparallel sort; copies data, creates index tree.
with sorted_data only or **with sorted_data on *same_segment***	Creates index tree only. Does not perform the sort or copy data. Does not run in parallel.	Creates index tree only. Does not perform the sort or copy data. Does not run in parallel.

Options	Partitioned Table	Unpartitioned Table
with sorted_data and **ignore_dup_row** or **fillfactor** or **on** ***other_segment*** or **max_rows_per_page**	Parallel sort; copies data, distributing evenly on partitions; creates index tree.	Copies data and creates the index tree. Does not perform the sort. Does not run in parallel.

Specifying the Number of Histogram Steps

Use the **with statistics** clause to specify the number of steps for a histogram for the leading column of an index. Histograms are used during query optimization to determine the number of rows that match search arguments for a column.

To re-create an index without updating the values in `sysstatistics` for a column, use 0 for the number of steps. This avoids overwriting statistics that have been changed with **optdiag**.

If you specify the **histogram_tuning_factor** parameter with a value, then **create index** uses anywhere between 20 and M*20 steps, depending on the number of frequency cells that have been isolated. The default is 20, but you can specify a different number with the **using step values** option.

Space Management Properties

fillfactor, **max_rows_per_page**, and **reservepagegap** help manage space on index pages in different ways.

- **fillfactor** applies to indexes for all locking schemes. For clustered indexes on allpages-locked tables, it affects the data pages of the table. On all other indexes, it affects the leaf level of the index.
- **max_rows_per_page** applies only to index pages of allpages-locked tables.
- **reservepagegap** applies to tables and indexes for all locking schemes.

reservepagegap affects space usage in indexes when:

- The index is created.
- **reorg** commands on indexes are executed.
- Nonclustered indexes are rebuilt after creating a clustered index.

When a **reservepagegap** value is specified in a **create clustered index** command, it applies to:

- The data and index pages of allpages-locked tables
- Only the index pages of data-only-locked tables

The *num_pages* value specifies a ratio of filled pages to empty pages on the leaf level of the index so that indexes can allocate space close to existing pages, as new space is required. For example, a **reservepagegap** of 10 leaves 1 empty page for each 9 used pages.

reservepagegap specified along with **create clustered index** on an allpages-locked table overwrites any value previously specified with **create table** or **alter table**.

You can change the space management properties for an index with **sp_chgattribute**. Changing properties with **sp_chgattribute** does not immediately affect storage for indexes on the table. Future large scale allocations, such as **reorg rebuild**, use the **sp_chgattribute** value.

The **fillfactor** value set by **sp_chgattribute** is stored in the `fill_factor` column in `sysindexes`. The **fillfactor** is applied when an index is re-created as a result of an **alter table...lock** command or a **reorg rebuild** command.

Index Options and Locking Modes

Allpages-locked and data-only-locked tables are supported by certain index options. On data-only-locked tables, the **ignore_dup_row** and **allow_dup_row** options are enforced during **create index**, but are not enforced during **insert** and **update** operations.

Data-only-locked tables always allow the insertion of duplicate rows.

Index Type	Allpages-Locked Table	Data-Only-Locked Table	
		During Index Creation	During Inserts
Clustered	**allow_dup_row**, **ignore_dup_row**	**allow_dup_row**, **ignore_dup_row**	**allow_dup_row**
Unique clustered	**ignore_dup_key**	**ignore_dup_key**	**ignore_dup_key**
Nonclustered	None	None	None
Unique nonclustered	**ignore_dup_key**	**ignore_dup_key**	**ignore_dup_key**

This table shows the behavior of commands that attempt to insert duplicate rows into tables with clustered indexes, and when the clustered indexes are dropped and re-created.

Options	Allpages-Locked Table	Data-Only-Locked Table
No options specified	Insert fails with error message 2615. Re-creating the index succeeds.	Insert succeeds. Re-creating the index fails with error message 1508.
allow_dup_row	Insert and re-creating the index succeed.	Insert and re-creating the index succeed.
ignore_dup_row	Insert fails with “Duplicate row was ignored” message. Re-creating the index succeeds.	Insert succeeds. Re-creating the index deletes duplicate rows.

Using the sorted_data Option on Data-Only-Locked Tables

You can use the **sorted_data** option to **create index** only immediately following a bulk-copy operation into an empty table. Once data modifications to that table cause additional page allocations, you cannot use the **sorted_data** option.

Specifying different values for space management properties may override the sort suppression functionality of the **sorted_data**.

Getting Information About Tables and Indexes

Each index—including composite indexes—is represented by one row in `sysindexes`.

For information about the order of the data retrieved through indexes and the effects of an SAP ASE-installed sort order, see the **order by clause**.

For information about a table's indexes, execute **sp_helpindex**. For information about index partitions, you can also execute **sp_helpartitions**.

Each index partition and data partition is represented by one row in `syspartitions`.

Creating Indexes on Computed Columns

You can use materialized computed columns as index keys, as though they were regular columns.

To convert a virtual column to a materialized column and index it, use **alter table modify** with the **materialized** option before executing **create index**.

A computed column need not be deterministic to be used as an index key; however, you must be careful about the possible impact of a nondeterministic column on the queries that reference it.

Creating Partitioned Indexes

A local index inherits the partition strategies, partition columns, and partition bounds (for range and list partitions) of the base table.

The SAP ASE server maintains local indexes, rebuilding the local index if the base table is repartitioned with a different partition key.

The SAP ASE server supports:

Index Type	Table Type
Local clustered and nonclustered partitioned indexes	Partitioned tables
Global, clustered, unpartitioned indexes	Round-robin-partitioned tables
Global, nonclustered, unpartitioned indexes	All partitioned tables

For range-, hash-, and list-partitioned tables, clustered indexes are always local. The SAP ASE server creates a local clustered index whether or not “local index” is included in the syntax.

Creating Function-Based Indexes

Considerations for creating function-based indexes.

- You can create indexes directly on expressions.
- The expression must be deterministic.
- Since the SAP ASE server does not verify the deterministic property of the expression index key, the user must manually maintain the property. A change in this property can cause unexpected results.
- As a function-based index key must be deterministic, its result is preevaluated, and reused without reevaluation. The SAP ASE server assumes all function-based index keys to be deterministic and uses their pre-evaluated values when they are referenced in a query; they are reevaluated only when the values of their base columns are changed.
- An index can have multiple function-based index keys or a combination of function-based index keys and regular columns.
- Expressions used as index keys must be deterministic. An expression key is different from a computed column index key, which needs to be evaluated only once, and does not require the deterministic property. An expression, however, must be reevaluated upon each occurrence of the expression in a specified query, and must always return the same result.
- If a user-defined function that is referenced by a function-based index is dropped or becomes invalid, any operations that call that function fail.
- The SAP ASE server does not support clustered function-based indexes.
- You cannot create a function-based index with the **sorted_data** option.
- Once you create an index key on an expression, subsequent queries recognize the expression as an index key only if the expression is exactly the same as the expression used to create the index key.
- All **insert**, **delete**, and **update** operations on base columns cause the SAP ASE server to automatically update the value of function-based index keys.

create index and Stored Procedures

The SAP ASE server automatically recompiles stored procedures after executing **create index** statements. Although ad hoc queries that you start before executing **create index** continue to work, they do not take advantage of the new index.In SAP ASE versions 12.5 and earlier, **create index** was ignored by cached stored procedures.

create login

Creates a login account; specifies a password, a login profile for the account, and user-supplied parameters to be assigned to the account.

Syntax

```
create login login_name with [encrypted]
    password password
    [attribute_value_pair_list]
```

Parameters

- ***login_name* –** specifies the name of the login account to be created; it must start with an alphabetic character and cannot exceed 30 characters in length.
- **with encrypted –** specifies an encrypted password for the new login account.
- **password *passwordValue* –** specifies a password for the new login account.
- ***attribute_value_pair_list* –** list of attributes and corresponding values to be added to the login account. The *attribute_value_ pair_list* is an attribute name and value. Specify one or more of the following:

Parameter	Parameter Value	Description
login profile	Valid values: • *login_profile_name* • **ignore**	• *login_profile_name* binds the specified login profile to the specified login account. • **ignore** eliminates any login profile binding. A default login profile is not applicable and attributes are applied as they were prior to release 15.7. If a login profile is not specified, a default login profile is applied. See *Applying Login Profile and Password Policy Attributes* in the *Security Administration Guide*.
suid	Valid values: Unique value between [-32768, 2147483647] excluding [-2, -1, 0, 1, 2].	By default an suid is generated and automatically assigned to the login account upon creation.
fullname	*name_value*	Full name of user who owns the login account. Default is NULL.
login script	*login_script_name*	Specifies a valid stored procedure. Limited to 120 characters for a login script.

Parameter	Parameter Value	Description
password expiration	Valid range: 0 to 32767 days.	Password expiration interval. Default is 0, meaning the password never expires.
min password length	Valid range: 0 to 30.	Minimum password length required. Default is 6.
max failed attempts	Valid range: -1 to 32767.	Number of login attempts allowed after which the login account is locked. -1 indicates the failed count is tracked but not locked. Default is 0, meaning the failed count is not tracked and the account is not locked due to failed login attempts.
default database	*default_database_name*	Specifies a database to be the default. Default is Master.
default language	*default_language*	Specifies a language to be the default. Default is **us_english**
authenticate with	Valid values: **ASE**, **LDAP**, **PAM**, **KERBEROS**, **ANY**	Specifies the mechanism used for authenticating the login account. When **ANY** is used, the SAP ASE server checks for a defined external authentication mechanism. If one is defined, the SAP ASE server uses the defined mechanism., otherwise the **ASE** mechanism is used. If **authenticate with *authentication mechanism*** is not specified, **ANY** is used for the login account.
exempt inactive lock	Valid values: **TRUE** or **FALSE**	Specifies whether or not to exempt login accounts from being locked due to inactivity. Default is FALSE which indicates accounts are not exempt.

Examples

- **Example 1 –** Creates a login account with password `itsA8ecret`, applies the login profile `emp_lp`, applies server user ID 7, and specifies that the account is not locked due to inactivity

```
create login ravi with password itsA8ecret login profile
emp_lp suid 7 exempt inactive lock true
```

Usage

- Precedence rules determine how login account attributes are applied when attributes are taken from different login profiles or when values have been specified using **sp_passwordpolicy.**
- For ease of management, it is strongly recommended that all users' SAP ASE login names be the same as their operating system login names. This makes it easier to correlate audit data between the operating system and the SAP ASE server. Otherwise, keep a record of the correspondence between operating system and server login names.

See also:

- For more information about creating login accounts, see the *Security Administration Guide*. For precedence rules, see *Applying login profile and password policy attributes* in the *Security Administration Guide.*
- **lprofile_id**, **lprofile_name** in *Reference Manual: Building Blocks*
- **sp_passwordpolicy**, **sp_displaylogin**, **sp_displayroles**, **sp_locklogin** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **create login** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with the `manage any login` privilege.
Disabled	With granular permissions disabled, you must be a user with **sso_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	103
Audit option	`login_admin`
Command or access audited	**create login**
Information in `extrainfo`	Keywords contain: **WITH** ***attribute_value_pair_list***

See also

- *alter login* on page 23
- *alter login profile* on page 29
- *create login profile* on page 163
- *drop login* on page 352
- *drop login profile* on page 354

create login profile

Creates a login profile with specified attributes.

Syntax

```
create login profile login_profile_name [ as default ]
    [ with { attributes from login_name |
attribute_value_pair_list } ]
```

Parameters

- **login_profile_name –** specifies the name of the login profile to be created.
- **as default –** sets the created login profile as the default for all login accounts except `sa` and `probe`.
- **with attributes from *login_name* | *attribute_value_pair_list* –** when *login_name* is specified, creates a login profile with attributes values taken from the specified login account. The *attribute_value_ pair_list* specifies, an attribute name and corresponding value. Specify one or more of the following attributes and value:
  - **default database *default_database_name*** – specifies a default database. The default is `Master`.
  - **default language *default_language*** – specifies a default language. The default is **us_english**
  - **login script *login_script_name*** – specifies a valid stored procedure. Limited to 120 characters for a login script.
  - **authenticate with** – specifies the mechanism used for authenticating the login account. Valid values: **ASE**, **LDAP**, **PAM**, **KERBEROS**, **ANY**

    When **ANY** is used, the SAP ASE server checks for a defined external authentication mechanism. If one is defined, the SAP ASE server uses the defined mechanism., otherwise the **ASE** mechanism is used.

    If **authenticate with *authentication mechanism*** is not specified, **ANY** is used for the login account.
  - **track lastlogin** – enables last login updates. Valid values: **TRUE**, **FALSE**. The default is TRUE, which is to update.

- **stale period** – indicates the duration a login account is allowed to remain inactive before it is locked due to inactivity. Valid values are 1 .. 32767 days. Duration: **D** (days), **W** (weeks), **M** (months), **Y** (years). The default is **D** (days).
- **profile id** – shares the ID space with the server user ID (suid) of login accounts. By default, the login profile ID is generated and automatically assigned to the login profile upon creation

  Valid value is unique between login accounts and login profiles. Range: [-32768, 2147483647] Excluding: -2, -1, 0, 1, 2

Examples

- **Example 1 –** Creates a login profile. Attribute values that are not set follow the precedence rules:

  ```
  create login profile eng_lp
  ```

  For information, see *Applying Login Profile and Password Policy Attributes* in the *Security Administration Guide*.

- **Example 2 –** Creates a login profile and transfers the login attribute values from the login account `ravi` to the new login profile `ravi_lp`. Attribute values that are not set follow the precedence rules.

  ```
  create login profile ravi_lp with attributes from ravi
  ```

- **Example 3 –** Creates login profile `sa_login_profile` with the authentication method ASE.

  ```
  create login profile sa_login_profile with authenticate
  with ASE
  ```

Usage

Precedence rules determine how login account attributes are applied when attributes are taken from different login profiles, or when values have been specified using **sp_passwordpolicy.**

See also:

- For information about creating login profiles, invoking a login script at login, and precedence rules, see the *Security Administration Guide*.
- **lprofile_id**, **lprofile_name** in *Reference Manual: Building Block*
- **sp_passwordpolicy**, **sp_displaylogin**, **sp_displayroles**, **sp_locklogin** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **create login profile** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with the `manage any login profile` privilege.
Disabled	With granular permissions disabled, you must be a user with **sso_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	137
Audit option	security_profile
Command or access audited	**create login profile**
Information in `extrainfo`	Keywords contain **DEFAULT** If the login profile is made the default: **{attributes from *login_name* | *attribute_value_pair_list*}**

See also

- *alter login* on page 23
- *alter login profile* on page 29
- *create login* on page 160
- *drop login* on page 352
- *drop login profile* on page 354

create plan

Creates an abstract plan.

Syntax

```
create plan query plan
    [into group_name]
    [and set @new_id]
```

Parameters

- ***query*** **–** is a string literal, parameter, or local variable containing the SQL text of a query.
- ***plan*** **–** is a string literal, parameter, or local variable containing an abstract plan expression.
- **into *group_name* –** specifies the name of an abstract plan group.
- **and set *@new_id* –** returns the ID number of the abstract plan in the variable.

Examples

- **Example 1 –** Creates an abstract plan for the specified query:

  ```
  create plan "select * from titles where price > $20" " (t_scan
  titles)"
  ```

- **Example 2 –** Creates an abstract plan for the query in the `dev_plans` group, and returns the plan ID in the variable ***@id***:

  ```
  declare @id int
  create plan "select au_fname, au_lname from authors where au_id =
  '724-08-9931' "
  " (i_scan au_id_ix authors)"
  into dev_plans
  and set @id
  select @id
  ```

Usage

- **create plan** saves the abstract plan in the group specified with **into**. If no group name is specified, the plan is saved in the currently active plan group.
- Queries and abstract plans specified with **create plan** are not checked for valid SQL syntax, and plans are not checked for valid abstract plan syntax. Also, the plan is not checked for compatibility with the SQL text. You should immediately check all plans created with **create plan** for correctness by running the query specified in the **create plan** statement.
- If another query plan in the group has the same SQL text, **replace** mode must be enabled with **set plan replace on**. Otherwise, the **create plan** command fails.
- You must declare *@new_id* before using it in the **and set** clause.
- The abstract plan group you specify with **into** must already exist.
- The SAP ASE server ignores any literal parameterization you specify when creating an abstract plan if you enable server-wide literal parameterization using the **sp_configure "enable literal autoparam", 1** system procedure.

See also:

- *Performance and Tuning Guide: Optimizer and Abstract Plans.*
- **sp_add_qpgroup**, **sp_configure "enable literal autoparam"**, **sp_find_qplan**, **sp_help_qplan**, **sp_set_qplan** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **create plan**.

See also

- *set* on page 607

create precomputed result set

Creates precomputed result sets and the policies required to maintain them.

Syntax

```
create {precomputed result set | materialized view}
    [owner_name.]prs_name [(alternative_column_name
    [[constraint constraint_name]
        unique (column_name,...)]
    [{immediate | manual} refresh]
    [{populate | nopopulate}]
    [enable | disable]
    [{enable | disable} use in optimization]
    [lock { datarows | datapages | allpages}]
    [on segment_name]
    [partition_clause]

as query_expression
```

Parameters

- **precomputed result set | materialized view –** creates a materialized view or precomputed result set.
- ***prs_name* –** name of the precomputed result set. A fully qualified *prs_name* cannot include the server or database name.
- ***alternative_column_name* –** indicates the name for the precomputed result set column.
- **encrypt [with [*database*.[*owner*].]*keyname*]] [*decrypt_default*] –**

  specifies an encrypted column.

  - *keyname* – identifies a key created using **create encryption key**. The table owner must have **select** permission on *keyname*. If *keyname* is not supplied, the server looks for a default key created using **create encryption key** or **alter encryption key**.
  - *decrypt_default* – specifies that this column returns a default value for users who do not have decrypt permissions.

See “Encrypting Data,” in the *Encrypted Columns Users Guide* for a list of supported datatypes.

- **constraint *constraint_name* –** introduces the name of an integrity constraint, which must conform to the rules for identifiers and be unique in the database.

  If you do not specify the name for a unique or primary-key constraint, the SAP ASE server generates a name in the format *tabname_colname_tabindid*, where *tabindid* is a string concatenation of the table ID and index ID.
- **unique (*column_name,...*) –** constrains the values in the indicated column or columns so that no two rows have the same value.
- **{immediate | manual} refresh –** determines the refresh policy:
  - **immediate** – (default) updates the precomputed result set during the same transaction that updates the base tables.
  - **manual** – explicitly updates the precomputed result set. When you use the **manual** parameter, updates to the base tables are not reflected in the precomputed result set until you explicitly issue **refresh**. Because **manual** precomputed result sets are not maintained, the SAP ASE server considers them to be stale, even after you issue the **refresh** parameter. Therefore, the query processor selects this data for query rewrite only if the query accepts stale data.
- **populate | nonpopulate –** specifies whether to populate the precomputed result set after it is created, or create it with only the metadata information, and populate it later:
  - **populate** – (default) result set is populated as part of the **create** command.
  - **nonpopulate** – result set is not populated as part of the **create** command. If you specify **nonpopulate**, you cannot run the **enable** parameter on the precomputed result set. The SAP ASE server enables the precomputed result set the next time you issue the **refresh** command.
- **enable | disable –** specifies whether the precomputed result set is available for operations. This option overrides all other precomputed result set options.
  - **enable** – (default) is available for operations. Only precomputed result sets configured for **enable** are maintained according to their refresh policy.
  - **disable** – is not available for operations. Disabled precomputed result sets are not considered for maintenance or query rewrites. If a precomputed result set is configured for **disable**, it is not:
    - Used for the query rewrite during optimization, whether or not you specify **use in optimization**.
    - Populated, whether or not you specify **with populate**.
- **{enable | disable} use in optimization –** specifies whether to include a precomputed result set for query rewrite during optimization. **use in optimization** is enabled by default. Precomputed result sets are considered for query rewrite depending on how their **refresh** parameter is set:
  - **immediate** – is considered for all queries.

    - **manual** – is considered only if the query accepts with stale data.
- **lock {datarows | datapages | allpages} –** indicates the level of locking the precomputed result set uses.

Examples

- **Example 1 –** Creates the `prs_1` precomputed result set:

```
create precomputed result set prs_1
as select col1, col2 from test_table
```

Usage

You must set these **set** parameters before you create or alter precomputed result sets:

- **set ansinull on**
- **set arithabort on**
- **set arithignore off**
- **set string_rtruncation on**

You cannot include a **like** clause with **create precomputed result sets** or **create materialized view** that includes an **immediate refresh** parameter.

Standards

The **create precomputed result set** command is a Transact-SQL extension and is not covered by the SQL standard.

Permissions

You must have `create table` and `create view` privileges to create precomputed result sets.

Auditing

Creating precomputed result sets is not audited.

create procedure

Creates or replaces a stored procedure or an extended stored procedure (ESP) that can take one or more user-supplied parameters.

Note: For syntax and usage information about the SQLJ command for creating procedures, see **create function (SQLJ)**.

Syntax

```
create [or replace] procedure [owner.]procedure_name[;number]
    [[(@parameter_name datatype [(length) | (precision [, scale])]
        [= default][output]
    [, @parameter_name datatype [(length) | (precision [, scale])]
        [= default][output]]...)]]
    [with {recompile | execute as {owner | caller}} ]
    as {SQL_statements | external name dll_name}
```

Parameters

- **create –** creates a new procedure.
- **or replace –** if the specified procedure does not exist, a new procedure is created. If the procedure does exist, the procedure definition is changed; existing permissions, auditing options, and replication attributes are preserved. Previously granted privileges on a replaced procedure are preserved.
- ***procedure_name* –** is the name of the procedure. It must conform to the rules for identifiers and cannot be a variable. Specify the owner's name to create another procedure of the same name owned by a different user in the current database. The default value for *owner* is the current user.

  If the procedure is being replaced, the name of the procedure remains the same and the object identifier of the procedure in all the respective catalogs remains the same.
- ***;number* –** is an optional integer used to group procedures that share the same name so they can be dropped together with a single **drop procedure** statement. Procedures used in the same application are often grouped this way. For example, if the procedures used with the application named **orders** are named `orderproc;1`, `orderproc;2`, and so on, the following statement drops the entire group:

  ```
  drop proc orderproc
  ```

  Once procedures have been grouped, individual procedures within the group cannot be dropped. For example, the following statement is not allowed:

  ```
  drop procedure orderproc;2
  ```

  You cannot group procedures if you are running SAP ASE in the *evaluated configuration*. The evaluated configuration requires that you disallow procedure grouping so that every stored procedure has a unique object identifier and can be dropped individually. To disallow procedure grouping, a system security officer must use **sp_configure** to reset **allow procedure grouping**. For more information about the evaluated configuration, see the *System Administration Guide*.

  If **or replace** is not specified and the procedure exists, SAP ASE raises an error that the procedure has already been created with that group number, and you must create the procedure with a different group number. If **or replace** clause is specified, but the group number is not, but the procedure exists with different group numbers, an error is raised because the procedure is part of a group and it cannot be replaced. You cannot specify the group number to replace an existing procedure with that group number. This is similar to the dropping of procedures where individual procedures within a group cannot be dropped.

- ***parameter_name* –** is the name of an argument to the procedure. The value of each parameter is supplied when the procedure is executed. Parameter names are optional in **create procedure** statements—a procedure is not required to take any arguments.

  Parameter names must be preceded by the @ sign and conform to the rules for identifiers. A parameter name, including the @ sign, can be a maximum of 30 characters, and larger for identifiers. Parameters are local to the procedure: the same parameter names can be used in other procedures.

  If the value of a parameter contains nonalphanumeric characters, it must be enclosed in quotes. This includes object names qualified by a database name or owner name, since they include a period. If the value of a character parameter begins with a numeric character, it also must be enclosed in quotes.

  You can change the name and number of parameters when the procedure definition is replaced.
- ***datatype*[(*length*) | (*precision* [, *scale*])] –** is the datatype of the parameter. See *User-Defined Datatypes* in *Reference Manual: Building Blocks*. Stored procedure parameters cannot have a datatype of `text`, `unitext`, or `image` or a user-defined datatype whose underlying type is `text`, `unitext`, or `image`.

  The `char`, `varchar`, `unichar`, `univarchar`, `nchar`, `nvarchar`, `binary`, and `varbinary` datatypes should include a *length* in parentheses. If you omit the length, the SAP ASE server truncates the parameter value to 1 character.

  The `float` datatype expects a binary *precision* in parentheses. If you omit the precision, the SAP ASE server uses the default precision for your platform.

  The `numeric` and `decimal` datatypes expect a *precision* and *scale*, enclosed in parentheses and separated by a comma. If you omit the precision and scale, the SAP ASE server uses a default precision of 18 and a scale of 0.

  You can use **or replace** to change the type, length, precision and scale of the parameters.
- ***default* –** defines a default value for the procedure's parameter. If a default is defined, a user can execute the procedure without giving a parameter value. The default must be a constant. It can include the wildcard characters (%, _, [ ], and [^]) if the procedure uses the parameter name with the keyword **like** (see Example 2).

  The default can be NULL. The procedure definition can specify that some action be taken if the parameter value is NULL (see Example 3).

  You can use **or replace** to change the default to NULL for the parameters, or set a different value when the procedure is replaced.
- **output –** indicates that the parameter is a return parameter. Its value can be returned to the **execute** command that called this procedure. Use return parameters to return information to the calling procedure.

To return a parameter value through several levels of nested procedures, each procedure must include the **output** option with the parameter name, including the **execute** command that calls the highest level procedure.

The **output** keyword can be abbreviated to **out**.

You can use **or replace** to change the return parameter of the procedure.

- **with recompile –** means that the SAP ASE server creates a new plan each time the procedure is executed. Use this optional clause when you expect that the execution of a procedure is atypical—that is, when you need a new plan. The **with recompile** clause has no impact on the execution of an extended stored procedure.

  If an existing procedure has been created with this option, then it can be changed using the **or replace** clause so that SAP ASE does not create a new plan each time the procedure is executed. If the existing procedure has not been created using **with recompile**, then it can be replaced with the new definition so that the plan is created each time the procedure is executed.
- **with execute as –** specifies whether to execute the procedure as the owner or the caller. When executed as the owner, all actions in the procedure are checked against the privileges of the procedure owner. When executed as the caller, all actions in the procedure are checked against the privileges of the procedure caller.

  An existing procedure's **with execute as** clause can be changed from owner to caller and vice versa. You can also re-create a procedure without the **with execute as** clause using the **or replace** clause.
- **owner –** checks runtime permissions, executes DDL, and resolves objects names on behalf of the procedure owner. **execute as definer** is also supported as an alternative syntax.
- **caller –** checks runtime permissions, executes DDL, and resolves objects names on behalf of the procedure caller. **execute as invoker** is also supported as an alternative syntax.
- ***SQL_statements* –** specifies the actions the procedure is to take. You can include any number and kind of SQL statements, with the exception of **create view**, **create default**, **create rule**, **create procedure**, **create trigger**, and **use**.

  create procedure SQL statements often include control-of-flow language, including one or more of the following: **declare**; **if...else**; **while**; **break**; **continue**; **begin...end**; **goto label**; **return**; **waitfor**; **/* *comment* */**. They can also refer to parameters defined for the procedure.

  The SQL statements can reference objects in another database, as long as they are properly qualified.

  You can change the body of the procedure to contain statements different from those in the existing procedure.
- **external name –** creates an extended stored procedure. You cannot use the *number* parameter with **as external name**.

  Extended stored procedures can also be replaced.

- ***dll_name* –** specifies the name of the dynamic link library (DLL) or shared library containing the functions that implement the extended stored procedure. The *dll_name* can be specified with no extension or with a platform-specific extension, such as `.dll` on Windows NT or `.so` on Sun Solaris. If you specify the extension, enclose the entire *dll_name* in quotation marks.

  The name of the dynamic linked library that implements the extended stored procedures can be changed.

Examples

- **Example 1 –** Given a table name, the procedure `showind` displays its name and the names and identification numbers of any indexes on any of its columns:

  ```
  create procedure showind @tabname varchar (30)
  as
    select sysobjects.name, sysindexes.name, indid
    from sysindexes, sysobjects
    where sysobjects.name = @tabname
    and sysobjects.id = sysindexes.id
  ```

  Here are the acceptable syntax forms for executing `showind`:

  ```
  execute showind titles
  ```

  ```
  execute showind @tabname = "titles"
  ```

  Or, if this is the first statement in a file or batch:

  ```
  showind titles
  ```

- **Example 2 –** Displays information about the system tables if the user does not supply a parameter:

  ```
  create procedure
  showsysind @table varchar (30) = "sys%"
  as
    select sysobjects.name, sysindexes.name, indid
    from sysindexes, sysobjects
    where sysobjects.name like @table
    and sysobjects.id = sysindexes.id
  ```

- **Example 3 –** Specifies an action to be taken if the parameter is NULL (that is, if the user does not give a parameter):

  ```
  create procedure
  showindnew @table varchar (30) = null
  as
    if @table is null
     print "Please give a table name"
    else
     select sysobjects.name, sysindexes.name, indid
     from sysindexes, sysobjects
     where sysobjects.name = @table
     and sysobjects.id = sysindexes.id
  ```

- **Example 4 –** Multiplies two integer parameters and returns the product in the **output** parameter, ***@result***:

  ```
  create procedure mathtutor @mult1 int, @mult2 int,
    @result int output
  as
  select @result = @mult1 * @mult2
  ```

  If the procedure is executed by passing it three integers, the **select** statement performs the multiplication and assigns the values, but does not print the return parameter:

  ```
  mathtutor 5, 6, 32
   (return status 0)
  ```

- **Example 5 –** Both the procedure and the **execute** statement include `output` with a parameter name so that the procedure can return a value to the caller:

  ```
  declare @guess int
  select @guess = 32
  exec mathtutor 5, 6, @result = @guess output
   (1 row affected)
   (return status = 0)

  Return parameters:

  @result
  -----------
          30
  ```

  The output parameter and any subsequent parameters in the **execute** statement, ***@result***, must be passed as:

  ```
  @parameter = value
  ```

  - The value of the return parameter is always reported, whether or not its value has changed.
  - ***@result*** does not need to be declared in the calling batch because it is the name of a parameter to be passed to `mathtutor`.
  - Although the changed value of ***@result*** is returned to the caller in the variable assigned in the execute statement (in this case, ***@guess***), it appears under its own heading (***@result***).

- **Example 6 –** You can use return parameters in additional SQL statements in the batch or calling procedure. This example shows how to use the value of ***@guess*** in conditional clauses after the **execute** statement by storing it in another variable name, ***@store***, during the procedure call. When return parameters are used in an **execute** statement that is part of a SQL batch, the return values are printed with a heading before subsequent statements in the batch are executed.

  ```

  declare @guess int
  declare @store int
  select @guess = 32
  select @store = @guess
  ```

```
execute mathtutor 5, 6, @result = @guess output
select Your_answer = @store, Right_answer = @guess
if @guess = @store
    print "Right-o"
else
    print "Wrong, wrong, wrong!"
 (1 row affected)
 (return status = 0)

Return parameters:

@result
-----------
        30
Your_answer Right_answer
----------- ------------
         32           30

 (1 row affected)
Wrong, wrong, wrong!
```

- **Example 7 –** Creates an extended stored procedure named **xp_echo**, which takes an input parameter, ***@in***, and echoes it to an output parameter, ***@out***. The code for the procedure is in a function named **xp_echo**, which is compiled and linked into a DLL named `sqlsrvdll.dll`:

```
create procedure xp_echo @in varchar (255),
        @out varchar (255) output
as external name "sqlsrvdll.dll"
```

- **Example 8 –** Creates a procedure using the **execute as owner** clause. Jane creates the procedure and Bill requires only **execute** permission to run the procedure. The table `emp_interim` is created and owned by Jane. If Jane does not have **create table** permission, the procedure fails:

```
create procedure p_emp
    with execute as owner as
    select * into emp_interim
    from jane.employee
grant execute on p_emp to bill
```

- **Example 9 –** Creates a procedure using the **execute as caller** clause. Jane creates the procedure and Bill requires execute permission to run the procedure. Jane owns both `p_emp` and `jane.employee`. Bill requires **select** permission on `jane.employee`. The table `emp_interim` is created and owned by Bill. Bill must have **create table** permission:

```
create procedure p_emp
    with execute as caller as
    select * into emp_interim
    from jane.employee
grant execute on p_emp to bill
```

- **Example 10 –** Creates a procedure using the **execute as owner** clause with references to an object with an unqualified name. Jane creates the procedure and Bill executes the procedure. The SAP ASE server searches for a table named `t1` owned by Jane. If `jane.t1` does not exist, the SAP ASE server looks for `dbo.t1`. If the SAP ASE server resolves `t1` to `dbo.t1`, permission to insert into `t1` must have been granted to Jane:

```
create procedure insert p
    with execute as owner as
    insert t1 (c1) values (100)
grant execute on insert p to bill
```

- **Example 11 –** Creates a procedure using the **execute as caller** clause with references to an object with an unqualified name. Jane creates the procedure and Bill executes the procedure. The SAP ASE server searches for a table named `t1` owned by Bill. If `bill.t1` does not exist, the SAP ASE server looks for `dbo.t1`. If the SAP ASE server resolves `t1` to `dbo.t1`, permission to insert into `t1` must have been granted to Bill:

```
create procedure insert p
    with execute as caller as
    insert t1 (c1) values (100)
grant execute on insert p to bill
```

- **Example 12 –** Creates a procedure using the **execute as owner** clause that invokes a nested procedure in another database with a fully qualified name. Jane creates the procedure and Bill executes the procedure. The login associated with Jane resolves to user Jane in `otherdb`. The SAP ASE server checks that user Jane in `otherdb` has **execute** permission on `jim.p_child`. If `jim.p_child` has been created with **execute as owner** then `p_child` is executed on behalf of Jim. If `jim.p_child` has been created with **execute as caller** or without the **execute as clause**, then `p_child` is executed on behalf of Jane:

```
create procedure p master
     with execute as owner
    as exec otherdb.jim.p_child
grant execute p master to bill
```

- **Example 13 –** Creates a procedure using the **execute as caller** clause that invokes a nested procedure in another database with a fully qualified name. Jane creates the procedure and Bill executes the procedure. The login associated with Bill resolves to user Bill in `otherdb`. The SAP ASE server checks that user Bill in `otherdb` has **execute** permission on `jim.p_child`. If `jim.p_child` has been created with **execute as owner** then `p_child` is executed on behalf of Jim. If `jim.p_child` has been created with **execute as caller** or without the **execute as clause**, then `p_child` is executed on behalf of Bill:

```
create procedure p master
    with execute as caller
      as exec otherdb.jim.p_child
  grant execute on p master to bill
```

- **Example 14 –** Based on a table of information about products, which is defined as:

```
create table Products (
    ProductID int,
    ProductName varchar(30),
    Discontinued varchar(10))

create procedure ProductType
    @product_ID int,
    @type char(10) output
as
declare @prod_name char(20)
select @prod_name = ProductName, @type =
    case @prod_name
        when 'Tee Shirt' then 'Shirt'
        when 'Sweatshirt' then 'Shirt'
        when 'Baseball Cap' then 'Hat'
        when 'Visor' then 'Hat'
        when 'Shorts' then 'Shorts'
        else 'UNKNOWN'
    end
from Products
where ProductID = @product_ID

select object_id("ProductType")
-----------
425049519
```

This next command replaces the `ProductType` procedure using the **or replace** clause. The parameters for `Tee Shirt` and `Sweatshirt` are updated, but the object ID of the procedure remains the same.

```
create or replace procedure ProductType
    @product_ID int,
    @type char(10) output
as
declare @prod_name char(20)
select @prod_name = ProductName, @type =
    case @prod_name
        when 'Tee Shirt' then 'T Shirt'
       when 'Sweatshirt' then 'Long Sleeve Shirt'
        when 'Baseball Cap' then 'Hat''
        when 'Visor' then 'Hat'
        when 'Shorts' then 'Shorts'
        else 'UNKNOWN'
    end
from Products
where ProductID = @product_ID

select object_id("ProductType")
-----------
425049519
```

Usage

- To avoid seeing unexpected results due to changes in settings, run **set rowcount 0** as your initial statement before executing **create procedure**. The scope of **set** is limited to the **create procedure** command, and resets to your previous setting once the procedure exits.

- After a procedure is created, you can run it by issuing the **execute** command along with the procedure's name and any parameters. If a procedure is the first statement in a batch, you can give its name without the keyword **execute**.
- You can use **sp_hidetext** to hide the source text for a procedure, which is stored in `syscomments`.
- When a stored procedure batch executes successfully, the SAP ASE server sets the ***@@error*** global variable to 0.
- A procedure that calls a replaced procedure is recompiled when it executes. If replacing the procedure changed the number or type of parameters, the calling procedure must be replaced. You can run **sp_depends** on the replaced procedure to verify whether there are calling procedures that are affected by the changed definition.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

When you create a procedure, no permission checks are made on objects, such as tables and views, that are referenced by the procedure. Therefore, you can create a procedure successfully even though you do not have access to its objects. All permission checks occur when a user executes the procedure.

When the procedure is executed, permission checks on objects depend upon whether the procedure and all referenced objects are owned by the same user.

- If the procedure's objects are owned by different users, the invoker must have been granted direct access to the objects. For example, if the procedure performs a select from a table that the user cannot access, the procedure execution fails.
- If a procedure and its objects are owned by the same user, special rules apply. The invoker automatically has "implicit permission" to access the procedure's objects even though the invoker could not access them directly. Without having to grant users direct access to your tables and views, you can give them restricted access with a stored procedure. In this way, a stored procedure can be a security mechanism. For example, invokers of the procedure might be able to access only certain rows and columns of your table. See *Using Stored Procedures as Security Mechanisms* in the *Security Administration Guide*.

Any user who impersonates the procedure owner through an alias or **setuser** cannot replace the procedure.

The following describes permission checks for **create procedure** (also when creating an extended procedure) that differ based on your granular permissions settings.

Setting	Description
Enabled	When granular permissions is enabled, you must have the `create procedure` privilege to create a procedure. To create a procedure for another user, you must have the `create any procedure` privilege. You must be the procedure owner to replace the procedure.
Disabled	With granular permissions disabled, you must be the database owner, a user with **sa_role**, or have the `create procedure` privilege to create a procedure. To create a procedure for another user, you must have **sa_role**. You must be the procedure owner to replace the procedure.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	11
Audit option	**create**
Command or access audited	**create procedure**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – For **execute as owner**, the procedure owner name and the keywords **execute as owner** are displayed. For **execute as caller**, the procedure caller name and keywords **execute as caller** are displayed. • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *create function (SQLJ)* on page 136
- *drop procedure* on page 357
- *execute* on page 406
- *create view* on page 268
- *create default* on page 117
- *create rule* on page 195
- *create procedure* on page 169
- *create trigger* on page 253

- *use* on page 708
- *declare* on page 302
- *if...else* on page 470
- *while* on page 719
- *break* on page 84
- *continue* on page 101
- *begin...end* on page 82
- *goto label* on page 418
- *return* on page 556
- *waitfor* on page 710
- *select* on page 579
- *grant* on page 419

create procedure Restrictions

Restrictions for **create procedure**.

- The maximum number of parameters that a stored procedure can have is 2048.
- The maximum number of local and global variables in a procedure is limited only by available memory.
- The maximum amount of text in a stored procedure is 16MB.
- You cannot combine a **create procedure** statement with other statements in a single batch.
- You can create a stored procedure only in the current database, although the procedure can reference objects from other databases. Most objects referenced in a procedure must exist at the time you create the procedure. However, you can include statements like **drop table**, **create index**, or **truncate table**. These are allowed in a **create procedure** statement even if the underlying object does not exist when you create the procedure.

  You can create an object within a procedure, then reference it, provided the object is created before it is referenced.

  You cannot use **alter table** in a procedure to add a column and then refer to that column within the procedure.
- If you use **select *** in your **create procedure** statement, the procedure (even if you use the **with recompile** option to **execute**) does not pick up any new columns you may have added to the table. You must **drop** the procedure and re-create it. Otherwise, the wrong results can be caused by the **insert...select** statement of **insert into table1 select * from table2** in the procedure when new columns have been added to both tables.
- Within a stored procedure, you cannot create an object (including a temporary table), drop it, then create a new object with the same name. The SAP ASE server creates the objects defined in a stored procedure when the procedure is executed, not when it is compiled.

Warning! Certain changes to databases, such as dropping and re-creating indexes, can cause object IDs to change. When object IDs change, stored procedures recompile automatically, and can increase slightly in size. Leave some space for this increase.

execute as Stored Procedure

You cannot use the **set session authorization** statement inside an **execute as owner** stored procedure even if the statement is embedded in nested procedure defined with or without the execute as clause.

The **execute as** clause is not supported for SQLJ procedures.

Plans in the procedure cache for the same procedure created with **execute as caller** are not shared across users as the objects in the procedure must be resolved to the user executing the procedure. Because of this, procedure cache usage may increase if many users are executing the procedure.The plan for a particular user is reused when the user executes the procedure again.

For information about the **execute as** stored procedure, see *Managing User Permissions* in the *Security Administration Guide*.

System Procedures

System administrators can create new system procedures in the `sybsystemprocs` database.

System procedure names must begin with the characters "**sp_**". You can execute these procedures from any database by specifying the procedure name; you need not qualify it with the `sybsystemprocs` database name. For more information about creating system procedures, see the *System Administration Guide*.

System procedure results may vary, depending on the context in which they are executed. For example, `sp_foo`, which executes the **db_name ()** system function, returns the name of the database from which it is executed. When executed from the `pubs2` database, it returns the value "pubs2":

```
use pubs2
sp_foo
```

```
------------------------------
pubs2
```

When executed from `sybsystemprocs`, it returns the value "sybsystemprocs":

```
use sybsystemprocs
sp_foo
```

```
------------------------------
sybsystemprocs
```

Nested Procedures

Procedure nesting occurs when one stored procedure calls another.

- If you execute a procedure that calls another procedure, the called procedure can access objects created by the calling procedure.

- The nesting level increments when the called procedure begins execution, and decrements when the called procedure completes execution. Exceeding the maximum of 16 levels of nesting causes the transaction to fail.
- You can call another procedure by name or by a variable name in place of the actual procedure name.
- The current nesting level is stored in the ***@@nestlevel*** global variable.
- **execute as** procedures can be nested with the nested procedures being created with or without the **execute as** clause

Procedure Return Status

Stored procedures can return an integer value called a return status. The return status either indicates that the procedure executed successfully or specifies the type of error that occurred.

When you execute a stored procedure, it automatically returns the appropriate status code. The SAP ASE server currently returns these status codes:

Code	Meaning
0	Procedure executed without error
-1	Missing object
-2	Datatype error
-3	Process was chosen as deadlock victim
-4	Permission error
-5	Syntax error
-6	Miscellaneous user error
-7	Resource error, such as out of space
-8	Nonfatal internal problem
-9	System limit was reached
-10	Fatal internal inconsistency
-11	Fatal internal inconsistency
-12	Table or index is corrupt
-13	Database is corrupt
-14	Hardware error

Codes -15 through -99 are reserved for future use.

Users can generate a user-defined return status with the **return** statement. The status can be any integer other than 0 through -99. The following example returns 1 when a book has a valid contract and 2 in all other cases:

```
create proc checkcontract @titleid tid
as
if (select contract from titles where
        title_id = @titleid) = 1
   return 1
else
   return 2
```

```
checkcontract @titleid = "BU1111"
```

```
 (return status = 1)
```

```
checkcontract @titleid = "MC3026"
```

```
 (return status = 2)
```

If more than one error occurs during execution, the code with the highest absolute value is returned. User-defined return values take precedence over system-defined values.

Object Identifiers

Consideration for working with object identifiers.

- To change the name of a stored procedure, use **sp_rename**.
- To change the name of an extended stored procedure, drop the procedure, rename and recompile the supporting function, then re-create the procedure.
- If a procedure references table names, column names, or view names that are not valid identifiers, you must **set quoted_identifier on** before the **create procedure** command and enclose each such name in double quotes. The **quoted_identifier** option does not need to be on when you execute the procedure.
- You can replace the procedure if any of the objects it references have been renamed..
- Inside a stored procedure, object names used with the **create table** and **dbcc** commands must be qualified with the object owner's name if other users are to make use of the stored procedure. For example, user "mary," who owns the table `marytab`, should qualify the name of her table inside a stored procedure (when it is used with these commands) if she wants other users to be able to execute it. This is because the object names are resolved when the procedure is run. When another user tries to execute the procedure, the SAP ASE server looks for a table called `marytab` owned by the user "mary" and not a table called `marytab` owned by the user executing the stored procedure.

  Thus, if `marytab` is not qualified, and user "john" tries to execute the procedure, the SAP ASE server looks for a table called `marytab` owned by the owner of the procedure ("mary," in this case) or by the database owner if the user table does not exist. For example, if the table `mary.marytab` is dropped, the procedure references `dbo.marytab`.

Object names used with other statements (for example, **select** or **insert**) inside a stored procedure need not be qualified because the names are resolved when the procedure is compiled.

Temporary Tables and Procedures

You can create a procedure to reference a temporary table if the temporary table is created in the current session. A temporary table created within a procedure is removed when the procedure exits.

System procedures such as **sp_help** work on temporary tables, but only if you use them from `tempdb`.

See the *Transact-SQL Users Guide*.

Setting Options in Procedures

You can use the **set** command inside a stored procedure. Most **set** options remain in effect during the execution of the procedure, then revert to their former settings.

However, if you use a **set** option (such as **identity_insert**) which requires the user to be the object owner, a user who is not the object owner cannot execute the stored procedure.

Extended Stored Procedures

If you use the **as *external name*** syntax, **create procedure** registers an extended stored procedure (ESP). Extended stored procedures execute procedural language functions rather than Transact-SQL commands.

(Windows) An ESP function should not call a C runtime signal routine. This can cause XP Server to fail, because Open Server™ does not support signal handling on Windows NT.

To support multithreading, ESP functions should use the Open Server **srv_yield** function, which suspends and reschedules the XP Server thread to allow another thread of the same or higher priority to execute.

The DLL search mechanism is platform-dependent. On Windows NT, the sequence of a DLL file name search:

1. The directory from which the application is loaded
2. The current directory
3. The system directory (SYSTEM32)
4. Directories listed in the PATH environment variable

If the DLL is not in the first three directories, set the PATH to include the directory in which it is located.

On UNIX platforms, the search method varies with the particular platform. If it fails to find the DLL or shared library, it searches `$SYBASE/lib`.

Absolute path names are not supported.

Objects Dependent on Replaced Procedures

If a replaced procedure is called by another procedure, both procedures are recompiled when called. If the interface of the replaced procedure does not match that in the calling procedure, then the calling procedure must be replaced, otherwise, the calling procedure raises an error. You can execute **sp_depends** on the replaced procedure to check for any calling objects.

Getting Information About Procedures

You can get information about the objects referenced by a procedure, display the text of a procedure, or generate a list of ESPs and supporting DLLs.

- For a report on the objects referenced by a procedure, use **sp_depends**.
- To display the text of a **create procedure** statement, which is stored in `syscomments`, use **sp_helptext** with the procedure name as the parameter. You must be using the database where the procedure resides when you use **sp_helptext**. To display the text of a system procedure, execute **sp_helptext** from the `sybsystemprocs` database.
- To see a list of system extended stored procedures and their supporting DLLs, use **sp_helpextendedproc** from the `sybsystemprocs` database.

create procedure (SQLJ)

Creates or replaces a SQLJ stored procedure by adding a SQL wrapper to a Java static method. Accepts user-supplied parameters and return result sets and output parameters.

Note: For syntax and usage information about the Transact-SQL command for creating procedures, see **create procedure**.

Syntax

```
create [or replace] procedure [owner.]sql_procedure_name
     ([[in | out | inout] sql_parameter_name
        sql_datatype [(length) |
         (precision[, scale])]
        [=default]
    ...])
    [, [in | out | inout] sql_parameter_name
        sql_datatype [(length) |
         (precision[, scale])]]
        [=default]
    ...])
    [modifies sql data]
    [dynamic result sets integer]
    [deterministic | not deterministic]
    language java
    parameter style java
    external name 'java_method_name
        [([java_datatype[, java_datatype
        ...]])]'
```

Parameters

- **create –** creates a new SQLJ procedure.
- **or replace –** if the specified SQLJ procedure does not exist, a new SQLJ procedure is created. If the SQLJ procedure does exist, the definition is changed.
- ***sql_procedure_name* –** is the Transact-SQL name of the procedure, which must conform to the rules for identifiers and cannot be a variable. Specify the owner's name to create another procedure of the same name owned by a different user in the current database. The default value for *owner* is the current user.

  Use **or replace** to change the name and number of parameters.
- **in | out | inout –** specifies the mode of the listed parameter. **in** indicates an input parameter; **out** indicates an output parameter; and **inout** indicates a parameter that is both an input and an output parameter. The default mode is **in**.

  Use **or replace** to change the mode of the listed parameter.
- ***sql_parameter_name* –** is the name of an argument to the procedure. The value of each input parameter is supplied when the procedure is executed. Parameters are optional; a SQLJ stored procedure need not take arguments.

  Parameter names must conform to the rules for identifiers. If the value of a parameter contains nonalphanumeric characters, it must be enclosed in quotes. This includes object names qualified by a database name or owner name, since they include a period. If the value of the parameter begins with a numeric character, it also must be enclosed in quotes.
- ***sql_datatype* [(*length*) | (*precision* [, *scale*])] –** is the Transact-SQL datatype of the parameter.

  sql_datatype is the SQL procedure signature.

  Use **or replace** to change the type, length, precision, and scale of the parameters.
- ***default* –** defines a default value for the procedure's parameter. If a default is defined, you can execute the procedure without a parameter value. The default must be a constant. It can include wildcard characters (%, _, [ ], and ^) if the procedure uses the parameter name with the keyword **like**.

  The default can be NULL. The procedure definition can specify some action to be taken if the parameter value is NULL.

  Use **or replace** to change the default to NULL for the parameters, or set a different value when the procedure is changed.
- **modifies sql data –** indicates that the Java method invokes SQL operations, reads, and modifies SQL data in the database. This is the default and only implementation. It is included for syntactic compatibility with the ANSI standard.
- **dynamic result sets *integer* –** specifies that the Java method can return SQL result sets. *integer* specifies the maximum number of result sets the method can return. This value is implementation-defined.

- **deterministic | not deterministic –** this syntax is supported for compatibility with other SQLJ-compliant vendors.

  Use **or replace** to change the deterministic value.
- **language java –** specifies that the external routine is written in Java. This is a required clause for SQLJ stored procedures.
- **parameter style java –** specifies that the parameters passed to the external routine at runtime are Java parameters. This is a required clause for SQLJ stored procedures.
- **external –** indicates that **create procedure** defines a SQL name for an external routine written in a programming language other than SQL.

  Use **or replace** to change the name of the external routine.
- **name –** specifies the name of the external routine (Java method). The specified name is a character-string literal and must be enclosed in single quotes:

  ```
  'java_method_name [ java_datatype
                    [{, java_datatype} ...]]'
  ```
- ***java_method_name* –** specifies the name of the external Java method.

  Use **or replace** to change the Java method name.
- ***java_datatype* –** specifies a Java datatype that is mappable or result-set mappable. This is the Java method signature.

  Use **or replace** to change the Java datatype.

Examples

- **Example 1 –** Creates the SQLJ procedure `java_multiply`, which multiplies two integers and returns an integer.

  ```
  create procedure java_multiply (param1 integer,
        param2 integer, out result integer)
      language java parameter style java
      external name 'MathProc.multiply'
  ```
- **Example 2 –** Returns values that are always larger than 10:

  ```
  create procedure my_max (a int = 10, b int = 10)
  language java parameter style java
  external name 'java.lang.Math.max'

  exec my_max
   (return status = 10)

  exec my_max 8
   (return status = 10)
  ```

  See also the examples for Transact-SQL **create procedure**.
- **Example 3 –** Creates a SQLJ procedure named `proc_name`.

  ```
  create procedure sqlj_proc (param int)
                               language java
  ```

```
                             parameter style java
                     external name 'UDFSample.sample(int)'
```

This procedure replaces the previously created SQLJ procedure using the **or replace** clause. Parameter `p2` is added and the external java method is changed but the object ID of the SQLJ procedure remains the same.

```
create or replace procedure sqlj_proc (p1 int, p2 int)
                             language java
                             parameter style java
                     external name 'UDFSample.add(int,int)'
```

Usage

- The SQLJ **create procedure** syntax differs from the Transact-SQL **create procedure** syntax for compatibility with the SQLJ ANSI standard. The SAP ASE server executes each type of stored procedure in the same way.
- To avoid seeing unexpected results due to changes in settings, run **set rowcount 0** as your initial statement before executing **create procedure**. The scope of **set** is limited to just your **create procedure** command, and resets to your previous setting once the procedure exits.
- You can include a maximum of 31 **in**, **inout**, and **out** parameters in a **create procedure** statement.
- To comply with the ANSI standard, do not precede parameter names with the @ sign. When executing a SQLJ stored procedure from **isql** or other non-Java client, however, you must precede parameter names with the @ sign, which preserves the naming order.
- A Transact-SQL procedure that calls a replaced SQLJ procedure is recompiled when it executes. If replacing the SQLJ procedure changed the number or type of parameters, the calling procedure must be replaced. You can run **sp_depends** on the replaced procedure to verify whether there are calling procedures that are affected by the changed definition.

See also **sp_depends**, **sp_help**, **sp_helpjava**, **sp_helprotect** in *Reference Manual: Procedures*.

Permissions

When you create a procedure, no permission checks are made on objects, such as tables and views, that are referenced by the procedure. Therefore, you can successfully create a procedure without having access to its objects. All permission checks occur when a user executes the procedure.

When the procedure is executed, permission checks on objects depend upon whether the procedure and all referenced objects are owned by the same user.

- If the procedure's objects are owned by different users, the invoker must have been granted direct access to the objects. For example, if the procedure performs a select from a table that the user cannot access, the procedure execution fails.

- If a procedure and its objects are owned by the same user, special rules apply. The invoker automatically has "implicit permission" to access the procedure's objects even though the invoker could not access them directly. Without having to grant users direct access to your tables and views, you can give them restricted access with a stored procedure. In this way, a stored procedure can be a security mechanism. For example, invokers of the procedure might be able to access only certain rows and columns of your table.

Any user who impersonates the procedure owner through an alias or **setuser** cannot replace the procedure.

The following describes permission checks for **create procedure** that differ based on your granular permissions settings.

Setting	Description
Enabled	When granular permissions is enabled, you must have the `create procedure` privilege to create a procedure. To create a procedure (SQLJ) for another user, you must have the `create any procedure` privilege. You must be the procedure owner to replace the procedure.
Disabled	With granular permissions disabled, you must be the database owner, a user with **sa_role**, or have the `create procedure` privilege to create a procedure. To create a procedure (SQLJ) for another user, you must have **sa_role**. You must be the procedure owner to replace the procedure.

Auditing

Event	Audit Option	Command or access audited	Information in **extra-info**
11	create	create procedure	• Roles – current active roles • Keywords or options – NULL • Previous value – NULL • Other information – NULL • Current value – NULL • Proxy information – original login name, if set proxy is in effect • or replace – for **create or replace**

See also

- *create procedure* on page 169
- *create function (SQLJ)* on page 136
- *drop procedure* on page 357

create proxy_table

(Component Integration Services only) Creates a proxy table without specifying a column list. CIS derives the column list from the metadata it obtains from the remote table.

Syntax

```
create proxy_table table_name
    [external [table | directory | file]]
    at pathname
    [column delimiter "<string>"]
```

Parameters

- ***table_name*** **–** specifies the local proxy table name to be used by subsequent statements. *table_name* takes the form **dbname.owner.object**, where *dbname* and *owner* are optional and represent the local database and owner name. If *dbname* is not specified, the table is created in the current database; if *owner* is not specified, the table is owned by the current user. If either *dbname* or *owner* is specified, the entire *table_name* must be enclosed in quotes. If only *dbname* is present, a placeholder is required for *owner*.
- **external table –** specifies that the object is a remote table or view. **external table** is the default, so this clause is optional.
- **external directory –** specifies that the object is a directory with a path in the following format: "`/tmp/directory_name` [;R]", where "R" indicates "recursive."
- **external file –** specifies that the object is a file with a path in the following format: "`/tmp/filename`".
- **at *pathname*** **–** specifies the location of the remote object. *pathname* takes the form *server_name.dbname.owner.object*, where:
  - *server_name* – is the name of the server that contains the remote object.
  - *dbname* – (optional) is the name of the database managed by the remote server that contains this object.
  - *owner* – (optional) is the name of the remote server user that owns the remote object.
  - *object* – is the name of the remote table or view.
- ***string*** **–** The column delimiter string can be any character sequencer, but if the string is longer than 16 bytes, only the first 16 bytes are used. The use of a column delimiter for proxy tables mapped to anything but files results in a syntax error.

Examples

- **Example 1 –** Creates a proxy table named `t1` that is mapped to the remote table `t1`. CIS derives the column list from the remote table:

  ```
  create proxy_table t1
  at "SERVER_A.db1.joe.t1"
  ```

Usage

- **create proxy_table** is a variant of the **create existing table** command. You use **create proxy_table** to create a proxy table, but (unlike **create existing table**) you do not specify a column list. CIS derives the column list from the metadata it obtains from the remote table.
- The location information provided by the **at** keyword is the same information that is provided by **sp_addobjectdef**. The information is stored in the `sysattributes` table.
- If the remote server object does not exist, the command is rejected with an error message.
- If the object exists, the local system tables are updated. Every column is used. Columns and their attributes are obtained for the table or view.
- CIS automatically converts the datatype of the column into an SAP ASE datatype. If the conversion cannot be made, the **create proxy_table** command does not allow the table to be defined.
- Index information from the remote server table is extracted and used to create rows for the system table `sysindexes`. This defines indexes and keys in SAP ASE terms and enables the query optimizer to consider any indexes that may exist on the table.
- After defining the proxy table, issue an **update statistics** command for the table. This allows the query optimizer to make intelligent choices regarding join order.
- When executing **create proxy_table *table_name* at *pathname***, the table and column names assumes the same case as *table_name*, if the server identified by *pathname* is case-insensitive (such as DB2 and Oracle).

  The columns returned by a case-insensitive server (typically in uppercase), is stored in SAP ASE as lowercase, if *table_name* is lowercase. If *table_name* is uppercase, then the column names is stored as uppercase values. If *table_name* is in mixed case, all column names are stored as received from the remote site.
- **create proxy_table** is not supported with temporary tables.
- You cannot combine **create proxy_table** statement with other statements in a single batch.
- A proxy table stores only metadata. As such, the only space used is the result of making entries in system catalogs. It is estimated that a hundred proxy tables consume about 1MB of space, assuming an average of two indexes per table.
- SQL user-defined functions are not currently supported with **create proxy table, create table at remote server,** or **alter table.**

  Note: The execution of SQL functions requires the syntax **username.functionname()**.

- If the remote SAP ASE table has one or more encrypted columns, CIS updates the proxy table's metadata in `syscolumns` to reflect the column's encryption properties and its key ID.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create proxy_table permission defaults to the table owner and is not transferable.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	11
Audit option	**create**
Command or access audited	**create procedure**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *update statistics* on page 698
- *create existing table* on page 126
- *create table* on page 207

create role

Creates a user-defined role; specifies the password expiration interval, the minimum password length, and the maximum number of failed logins allowed for a specified role at creation. You can also associate a password with the role at the time that the role is created.

Syntax

```
create role role_name [with passwd "password"
    [, {passwd expiration | min passwd length |
    max failed_logins} option_value]]
```

Parameters

- ***role_name* –** is the name of the new role, which must be unique to the server and conform to the rules for identifiers. *role_name* cannot be a variable.
- **with passwd –** attaches a password the user must enter to activate the role.
- ***password* –** is the password to attach to the role. Passwords must be at least 6 characters in length and must conform to the rules for identifiers. You cannot use variables for passwords.
- **passwd expiration – password expiration interval** specifies the password expiration interval in days. It can be any value between 0 and 32767, inclusive. For example, if you create a new login on August 1, 2007 at 10:30 a.m., with a password expiration interval of 30 days, the password expires on August 31, 2007 at 10:30 a.m.
- **min passwd length –** specifies the minimum password length required for the specified role.
- **max failed_logins –** specifies the number of allowable failed login attempts for the specified login.
- ***option_value* –** specifies the value for **passwd expiration**, **min passwd length**, or **max failed_logins**.

Examples

- **Example 1 –** Creates a role named **doctor_role**:

  ```
  create role doctor_role
  ```

- **Example 2 –** Creates a role named **doctor_role** with the password “physician”:

  ```
  create role doctor_role with passwd "physician"
  ```

- **Example 3 –** Sets **passwd expiration** to 7 days. The password for the role expires at the time of day that the password was last changed after the specified period has passed (in this example, 7 days):

```
create role intern_role with passwd "temp244",
passwd expiration 7
```

- **Example 4 –** Sets the maximum number of failed logins allowed for `intern_role`:

```
create role intern_role with passwd "temp244"
max failed_logins 20
```

- **Example 5 –** Sets the minimum password length for `intern_role`:

```
create role intern_role with passwd "temp244",
min passwd length 0
```

Usage

- Use **create role** from the `master` database.
- If you attach a password to the role, the user granted this role must specify the password to activate the role.

  For information on adding a password to a role after creation, see the **alter role** command.

  Note: Passwords created in versions before 12.x that are attached to user-defined roles do not expire.
- Role names must be unique to the server.
- Role names cannot be the same as user names. You can create a role with the same name as a user, but when you grant privileges, SAP ASE resolves naming conflicts by making the grant to the user instead of the role.

  For more information on naming conflicts, see the **grant role** command.

The restrictions for create role are:

- The maximum number of roles that can be created per server session is 1024. However, 32 roles are reserved for system roles, such as **sa_role** and **sso_role**. Also, a special user-defined role, `sa_serverprivs_role` was created by SAP ASE. Therefore, the maximum number of user-defined roles that can be created per server session is 991.
- If you create a role with an attached password, a user cannot activate that role by default at login. Do not create a role with an attached password if the user to whom you grant that role needs to activate the role by default at login.

See also **sp_activeroles**, **sp_displaylogin**, **sp_displayroles**, **sp_helprotect** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **create role** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with the `manage roles` privilege.
Disabled	With granular permissions disabled, you must be a user with **sso_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	85
Audit option	**roles**
Command or access audited	**create role**, **drop role**, **alter role**, **grant role**, or **revoke role**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *alter role* on page 39
- *drop role* on page 359
- *grant* on page 419
- *revoke* on page 559
- *set* on page 607

create rule

Specifies the domain of acceptable values for a particular column or for any column of a user-defined datatype, and creates access rules.

Syntax

```
create [or replace] [{and | or} access]] rule
    [owner.]rule_name
    as condition_expression
```

Parameters

- **create –** creates a rule if one does not already exist.
- **or replace –** if the rule already exists, replaces the rule definition with the new definition.
- **access –** specifies that you are creating an access rule. An access rule can be changed from an “and” rule to an “or” rule, and vice versa. Access rules cannot be replaced with a domain rule of the same name, and vice versa.

  See *Managing User Permissions* in the *System Administration Guide*.
- ***rule_name* –** is the name of the new rule, which must conform to the rules for identifiers and cannot be a variable. Specify the owner’s name to create another rule of the same name owned by a different user in the current database. The default value for *owner* is the current user.

  If the specified rule name already exists, it is replaced with the new rule definition, but the name is preserved.
- ***condition_expression* –** specifies the conditions that define the rule. It can be any expression that is valid in a **where** clause, and can include arithmetic operators, relational operators, **in**, **like**, **between**, and so on. However, *condition_expression* cannot reference a column or any other database object. Built-in functions that do not reference database objects can be included.

  A *condition_expression* takes one argument, which must be prefixed by the @ sign and refers to the value that is entered via the **update** or **insert** command. You can use any name or symbol to represent the value when you write the rule. Enclose character and date constants in quotes, and precede binary constants with “0x”.

  You can change the definition of the rule when the rule is replaced. The new rule value overrides the old rule value.

Examples

- **Example 1 –** Creates a rule named `limit`, which limits the value of `advance` to less than $1000:

  ```
  create rule limit
  as @advance < $1000
  ```
- **Example 2 –** Creates a rule named `pubid_rule`, which restricts the values of `pub_id` to 1389, 0736, or 0877:

  ```
  create rule pubid_rule
  as @pub_id in ('1389', '0736', '0877')
  ```
- **Example 3 –** Creates a rule named `picture`, which restricts the value of `value` to always begin with the indicated characters:

  ```
  create rule picture
  as @value like '_-%[0-9]'
  ```

- **Example 4 –** Creates a rule named `limit`, which limits the value of advance to $1000:

  ```
   create rule limit
      as @advance < $1000

  select object_id("limit")
   -----------
  1017051628
  ```

  This next command replaces the created rule. The limit is changed using the **or replace** clause. The object ID of the rule remains the same.

  ```
   create or replace rule limit
      as @advance < $2000

  select object_id("limit")
   -----------
  1017051628
  ```

- **Example 5 –** The table owner creates an **AND access rule** called `uname_acc_rule`:

  ```
  create access rule uname_acc_rule
  as @username = suser_name()

  select object_id("uname_acc_rule")

  -----------
  1033051685
  ```

  Replace `uname_acc_rule` with an **OR access rule**:

  ```
  create or replace or access rule uname_acc_rule
  as @username = suser_name()

  select object_id("uname_acc_rule")

  -----------
  1033051685
  ```

Usage

- To hide the text of a rule, use **sp_hidetext**.
- To rename a rule, use **sp_rename**.

Objects that are dependent on replaced rules:

- Columns from many tables can be bound to the replaced rules.
- User defined datatypes can be bound to the replaced rules.

Procedures that access these columns will be recompiled when the rule is replaced and the procedure is executed.

See also **sp_bindrule**, **sp_help**, **sp_helptext**, **sp_hidetext**, **sp_rename**, **sp_unbindrule** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Entry-level compliant.

To create rules using ANSI SQL-compliant syntax, use the **check** clause of the **create table** statement.

Permissions

Any user who impersonates the rule owner through an alias or **setuser** cannot replace the rule.

The permission checks for **create rule** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `create rule` privilege to create a rule. To create a rule for another user, you must have the `create any rule` privilege. You must be the rule owner to replace the rule.
Disabled	With granular permissions disabled, you must be the database owner, a user with **sa_role**, or have the `create rule` privilege to create a rule. To create a rule for another user, you must have **sa_role**. You must be the rule owner to replace the rule

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	13
Audit option	**create**
Command or access audited	**create rule**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect • or replace – for **create or replace**

See also

- *update* on page 680

- *insert* on page 473
- *create table* on page 207
- *alter table* on page 43
- *create default* on page 117
- *drop rule* on page 361
- *drop table* on page 363

create rule Restrictions

Restrictions for **create rule**.

- You can create a rule only in the current database.
- Rules do not apply to the data that already exists in the database at the time the rules are created.
- **create rule** statements cannot be combined with other statements in a single batch.
- You cannot bind a rule to an Adaptive-Server-supplied datatype or to a column of type `text`, `unitext`, `image`, or `timestamp`.
- You must drop a rule before you create a new one of the same name, and you must unbind a rule before you drop it. Use:

  ```
  sp_unbindrule objname [, futureonly]
  ```

Binding Rules

Use **sp_bindrule** to bind a rule to a column or user-defined datatype.

-
  ```
  sp_bindrule rulename, objname [, futureonly]
  ```
- A rule that is bound to a user-defined datatype is activated when you insert a value into, or update, a column of that type. Rules do not test values inserted into variables of that type.
- The rule must be compatible with the datatype of the column. For example, you cannot use the following as a rule for an exact or approximate numeric column:

  ```
  @value like A%
  ```

  If the rule is not compatible with the column to which it is bound, SAP ASE generates an error message when it tries to insert a value, not when you bind it.
- You can bind a rule to a column or datatype without unbinding an existing rule.
- Rules bound to columns always take precedence over rules bound to user-defined datatypes, regardless of which rule was most recently bound. This table indicates the precedence when binding rules to columns and user-defined datatypes where rules already exist:

New Rule Bound to	Old Rule Bound to User-Defined Datatype	Old Rule Bound to Column
User-defined datatype	New rule replaces old	No change

New Rule Bound to	Old Rule Bound to User-Defined Datatype	Old Rule Bound to Column
Column	New rule replaces old	New rule replaces old

- Rules do not override column definitions. If a rule is bound to a column that allows null values, you can insert NULL into the column, implicitly or explicitly, even though NULL is not included in the text of the rule. For example, if you create a rule specifying “@val in (1,2,3)” or “@amount > 10000”, and bind this rule to a table column that allows null values, you can still insert NULL into that column. The column definition overrides the rule.
- If a column has both a default and a rule associated with it, the default must fall within the domain defined by the rule. A default that conflicts with a rule is never inserted. The SAP ASE server generates an error message each time it attempts to insert the default.
- You can define rules using **check** with the **create table** statement, which creates integrity constraints. However, these constraints are specific for that table; you cannot bind them to other tables. See **create table** and **alter table** for information about integrity constraints.
- To get a report on a rule, use **sp_help**.
- To display the text of a rule, which is stored in the `syscomments` system table, execute **sp_helptext** with the rule name as the parameter.
- After a rule is bound to a particular column or user-defined datatype, its ID is stored in the `syscolumns` or `systypes` system tables.

create schema

Creates a new collection of tables, views, and permissions for a database user.

Syntax

```
create schema authorization authorization_name
    create_object_statement
        [create_object_statement ...]
    [permission_statement ...]
```

Parameters

- ***authorization_name*** **–** is the name of the current user in the database.
- ***create_object_statement*** **–** is a **create table** or **create view** statement.
- ***permission_statement*** **–** is a **grant** or **revoke** command.

Examples

- **Example 1 –** Creates the `newtitles`, `newauthors`, `newtitleauthors` tables, the `tit_auth_view` view, and the corresponding permissions:

```
create schema authorization pogo
    create table newtitles (
        title_id tid not null,
        title varchar (30) not null)
```

```
    create table newauthors (
        au_id id not null,
        au_lname varchar (40) not null,
        au_fname varchar (20) not null)
```

```
    create table newtitleauthors (
        au_id id not null,
        title_id tid not null)
```

```
    create view tit_auth_view
    as
        select au_lname, au_fname
            from newtitles, newauthors,
                newtitleauthors
        where
        newtitleauthors.au_id = newauthors.au_id
        and
        newtitleauthors.title_id =
             newtitles.title_id
```

```
    grant select on tit_auth_view to public
    revoke select on tit_auth_view from churchy
```

Usage

- Schemas can be created only in the current database.
- The *authorization_name*, also called the *schema authorization identifier*, must be the name of the current user.
- The user must have the correct command permissions (**create table** and **create view**). If the user creates a view on tables owned by another database user, permissions on the view are checked when a user attempts to access data through the view, not when the view is created.
- The **create schema** command is terminated by:
  - The regular command terminator ("go" is the default in **isql**).
  - Any statement other than **create table**, **create view**, **grant**, or **revoke**.
- If any of the statements within a **create schema** statement fail, the entire command is rolled back as a unit, and none of the commands take effect.
- **create schema** adds information about tables, views, and permissions to the system tables. Use the appropriate drop command (**drop table** or **drop view**) to drop objects created with **create schema**. You cannot change permissions granted or revoked in a schema with the standard **grant** and **revoke** commands outside the schema creation statement.
- Clusters only – you cannot include a referential integrity constraint that references a column on a local temporary database unless it is from a table on the same local temporary database. **create schema** fails when it attempts to create a reference to a column on a local temporary database from a table in another database.

See also **isql** in the *Utility Guide*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

create schema can be executed by any user of a database. The user must have permission to create the objects specified in the schema; that is, **create table** and **create view** permission.

See also

- *create table* on page 207
- *create view* on page 268
- *grant* on page 419
- *revoke* on page 559
- *drop table* on page 363
- *drop view* on page 369

create service

Wraps the supplied SQL statement in a stored procedure with the specified name and parameters.

Syntax

```
create service service-name [secure security_options ] [, userpath
path]
            [, alias alias-name]
    type { xml | raw | soap }
        [[(@parameter_name datatype [(length ) | (precision [,
scale ])]
            [= default][output]
    [, @parameter_name datatype [(length ) | (precision [, scale ])]
            [= default][output]]...[)]]
as SQL_statements
```

```
security_options ::= (security_option_item [security_option_item])
```

Parameters

- ***service-name*** **–** is the name for the user-defined Web service. This name can be any name that is valid for a stored procedure. When the **drop service** command is invoked with this service name, the corresponding stored procedure is dropped. If you specify the name of an existing service, an exception results.
- ***security_option_item*** **–**
    - **clear** – indicates that HTTP is used to access this Web service.

    - **ssl** – indicates HTTPS is used to access this Web service.
- ***path* –** is a character-string literal specifying the user-defined path to be appended to the URL accessing the Web service. By default, *path* is null.
- ***alias-name* –** is a character-string-literal specifying the user-defined Web service alias.
- ***parameter_name* –** is the name of an argument to the user-defined Web service. The value of this parameter is supplied when the Web service is executed. Parameter names must be preceded by the @ sign and conform to the rules for identifiers. These conditions are the same as for the *parameter_name* parameter of the **create procedure** command.
- ***SQL_statements* –** are the actions the user-defined Web service is to take. Any number and type of SQL statements can be included, with the exception of **create view**, **create default**, **create rule**, **create procedure**, **create trigger**, and **use**.
- **type –**
    - **soap** – implies an HTTP **POST** request and must be compliant with all the SOAP rules. The data is returned in SQL/XML format.
    - **raw** – indicates that the output is to be sent without any alteration or reformatting. This implies an HTTP **GET** request. The invoked stored procedure can specify the exact output.
    - **xml** – indicates that the result set output is returned in SQL/XML format. This implies an HTTP **GET** request.

Note: For datatype mappings between SAP ASE stored procedures and SOAP user-defined Web services, see the *Web Services Users Guide*.

Examples

- **Example 1 –** A user-defined Web service, **rawservice**, of type **raw** is created to return the version of the current database. The **create service** command is entered from the **isql** command line for the `pubs2` database:

  ```
  1> use pubs2
  2> go
  1> create service rawservice type raw as select '<html><h1>' +
  @@version + '</h1></html>'
  2> go
  ```

  The newly created user-defined Web service is then deployed:

  ```
  1> sp_webservices 'deploy', 'all'
  2> go
  ```

  The Web Service Definition Language for the newly created user-defined Web service is at `http://myhost:8181/services/pubs2?wsdl`.

  The newly created user-defined Web service is available at the following URL, where **bob** and **bob123** are the user ID and password of the creator of the user-defined Web service:

  ```
  http://myhost:8181/services/pubs2?
  method=rawservice&username=bob&password=bob123
  ```

The output, an SAP ASE version string, appears in an HTML `<h1>` tag in the browser window.

- **Example 2 –** A user-defined Web service, **xmlservice**, of type **xml** is created to return the version of the current database. The **create service** command is entered from the **isql** command line for the `pubs2` database:

```
1> use pubs2
2> go
1> create service xmlservice userpath "testing" type xml as select
@@version
2> go
```

The newly created user-defined Web service is then deployed:

```
1> sp_webservices 'deploy', 'xmlservice'
2> go
```

Note: For details on the **deploy** option, see **sp_webservices** in *Reference Manual: Procedures*.

The WSDL for user-defined Web service is at:

```
http://myhost:8181/services/pubs2/testing?wsdl
```

You can invoke the user-defined Web service from a browser at the following URL, where **bob** and **bob123** are the user ID and password of the creator of the user-defined Web service:

```
http://myhost:8181/services/pubs2/testing?method=xmlervice&
username=bob&password=bob123
```

The output appears as XML in the browser window.

- **Example 3 –** A user-defined Web service is made available to a SOAP client to execute the stored procedure **sp_who**. One argument is supplied, and the optional **userpath** token is specified:

```
create service sp_who_service userpath
'myservices/args' type soap @loginname varchar(30) as
exec sp_who @loginname
```

The Web service is created as **sp_who_service** in the `pubs2` database and, after being deployed it is accessible at:

```
http://localhost:8181/pubs2/myservices/args/sp_who_service
```

The WSDL for the service is available at:

```
http://localhost:8181/pubs2/myservices/args?wsdl
```

The signature for the Web method, described in the WSDL file, is:

```
DataReturn[] sp_who_service (xsd:string username,
    xsd:string password, xsd:string loginname)
```

The new service is invoked by a SOAP client with one parameter, **loginname**, of type `varchar(30).`

Usage

Except for the following differences, the resulting stored procedure behaves the same as a stored procedure created with the **create procedure** command, following existing stored procedure rules for execution, replication, **sp_helptext**, and recompilation, and is executable from **isql**:

- The resulting stored procedure can be dropped only with the **drop service** command, not the **drop procedure** command.
- The `syscomments` table is populated with DDL necessary to re-create the **create service** command.
- The specified service name cannot create a stored procedure group.

Note: To make a user-defined Web service available through the SAP ASE Web Services engine, you must use the **deploy** option of **sp_webservices**. However, the stored procedure for a user-defined Web service is accessible from **isql**, even if it has not been deployed.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

To use a Web service, you must be granted **execute** permission explicitly:

Permissions on Objects at	Description
Service creation	When you create a Web service, SAP ASE makes no permission checks on objects, such as tables and views, that are referenced by the service. Therefore, you can successfully create a Web service even though you do not have access to its objects. All permission checks occur when a user executes the Web service.

Permissions on Objects at	Description
Web service execution	When the Web service is executed, permission checks on objects depend on whether the Web service and all referenced objects are owned by the same user. • If the Web service's objects are owned by different users, the invoker must have been granted direct access to the objects. For example, if the Web service performs a select from a table that the user cannot access, the Web service execution fails. • If a Web service and its objects are owned by the same user, however, special rules apply. The invoker automatically has "implicit permission" to access the Web service's objects even though the invoker could not access them directly. Without having to grant users direct access to your tables and views, you can give them restricted access with a stored procedure. In this way, a stored procedure can be a security mechanism. For example, invokers of the Web service might be able to access only certain rows and columns of your table. A detailed description of the rules for implicit permissions is discussed in the *System Administration Guide*.

The following describes permission checks for **create service** that differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `create procedure` privilege. You must have `create any procedure` privilege to use **create service** for other users.
Disabled	With granular permissions disabled, you must have the **create procedure** privilege, be the database owner, or a user with **sa_role.** You must be a user with **sa_role** to use **create rule** for other users.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	11
Audit option	**create**
Command or access audited	**create services**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

create table

Creates new tables and optional integrity constraints, defines computed columns and table, row, index, and partition compression levels. Defines encrypted columns, decrypt defaults, and partition properties. Removes residual data from deletions.

Note: Syntax for creating table partitions is listed separately. See the syntax for partitions.

Syntax

```
create table [[database.[owner].]table_name (column_name datatype
    [default {constant_expression  | user | null}]
    [{identity | null | not null}]
        [ in row [(length)] | off row ]
        [[constraint constraint_name]
        {{unique | primary key}
        [clustered | nonclustered] [asc | desc]
        [with {fillfactor = pct,
                max_rows_per_page = num_rows,}
                reservepagegap = num_pages]
                dml_logging = {full | minimal}
                [deferred_allocation | immediate_allocation])
        [on segment_name]
        | references [[database.]owner.]ref_table
            [(ref_column)]
            [match full]
            | check (search_condition)}]]}
    [[encrypt [with [database.[owner].]key_name]
        [decrypt_default constant_expression | null]]
                        [not compressed]
        [compressed = {compression_level | not compressed}
    [[constraint [[database.[owner].]key_name]
        {unique | primary key}
            [clustered | nonclustered]
             (column_name [asc | desc]
                [{, column_name [asc | desc]}...])
            [with {fillfactor = pct
                max_rows_per_page = num_rows,
                reservepagegap = num_pages}]
            [on segment_name]
        | foreign key (column_name [{,column_name}...])
            references [[database.]owner.]ref_table
                [(ref_column [{, ref_column}...])]
                [match full]
        | check (search_condition) ...}
    [{, {next_column | next_constraint}}...])
    [lock {datarows | datapages | allpages}]
    [with {max_rows_per_page = num_rows,
            exp_row_size = num_bytes,
            reservepagegap = num_pages,
            identity_gap = value
            transfer table [on | off],
            dml_logging = {full | minimal},
            compression = {none | page | row},
            "erase residual data" {on | off}}],
            lob_compression = off | compression_level,
            index_compression [={NONE | PAGE}
    [on segment_name]
    [partition_clause]
    [[external table] at pathname]
    [for load]
    compression_clause::=
        with compression = {none | page | row}
```

Use this syntax for partitions:

```
partition_clause::=    partition by range (column_name[,
column_name]...)
         ([partition_name] values <= ({constant | MAX}
            [, {constant | MAX}] ...)
                [compression_clause] [on segment_name]
            [, [partition_name] values <= ({constant | MAX}
                [, {constant | MAX}] ...)
                [compression_clause] [on segment_name]]...)

    | partition by hash (column_name[, column_name]...)
        { (partition_name
                [compression_clause] [on segment_name]
            [, partition_name
                [compression_clause] [on segment_name]]...)
        | number_of_partitions
            [on (segment_name[, segment_name] ...)]}

    | partition by list (column_name)
         ([partition_name] values (constant[, constant] ...)
                [compression_clause] [on segment_name]
            [, [partition_name] values (constant[, constant] ...)
                [compression_clause] [on segment_name]] ...)

    | partition by roundrobin
        { (partition_name [on segment_name]
            [, partition_name
                [compression_clause] [on segment_name]]...)
        | number_of_partitions
            [on (segment_name[, segment_name]...)]}
```

Use this syntax for computed columns

```
create table [[database.[owner].] table_name
     (column_name {compute | as}
        computed_column_expression
            [[materialized] [not compressed]] | [not materialized]}
```

Use this syntax to create a virtually hashed table

```
create table [database.[owner].]table_name
. . .
    | {unique | primary key}
    using clustered
    (column_name [asc | desc] [{, column_name [asc | desc]}...])=
    (hash_factor [{, hash_factor}...])
        with max num_hash_values key
```

Parameters

- ***table_name*** – is the explicit name of the new table. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

  You cannot use a variable for the table name. The table name must be unique within the database and to the owner. If you have **set quoted_identifier on**, you can use a delimited identifier for the table name. Otherwise, it must conform to the rules for identifiers. For more information about valid table names, see *Identifiers* in *Reference Manual: Building Blocks*.

  You can create a temporary table by preceding the table name with either a pound sign (#) or "`tempdb..`". See *Tables Beginning with # (Temporary Tables)* in *Reference Manual: Building Blocks*.

  You can create a table in a different database, as long as you are listed in the `sysusers` table and have **create table** permission for that database. For example, you can use either of the following to create a table called `newtable` in the database `otherdb`:

  ```
  create table otherdb..newtable
  ```

  ```
  create table otherdb.yourname.newtable
  ```
- ***column_name*** – is the name of the column in the table. It must be unique in the table. If you have **set quoted_identifier on**, you can use a delimited identifier for the column. Otherwise, it must conform to the rules for identifiers. For more information about valid column names, see *Expressions, Idenfiers, and Wildcard Characters* in *Reference Manual: Building Blocks*.
- ***datatype*** – is the datatype of the column. System or user-defined datatypes are acceptable. Certain datatypes expect a length, *n*, in parentheses:

  ```
   datatype (n)
  ```

  Others expect a precision, *p*, and scale, *s*:

```
datatype (p,s)
```

See *System and User-Defined Datatypes* in *Reference Manual: Building Blocks* for more information.

If Java is enabled in the database, *datatype* can be the name of a Java class, either a system class or a user-defined class, that has been installed in the database. See *Java in Adaptive Server Enterprise* for more information.

- **default –** specifies a default value for a column. If you specify a default, and the user does not provide a value for the column when inserting data, the SAP ASE server inserts the default value. The default can be a constant expression or a built-in, to insert the name of the user who is performing the insert, or **null**, to insert the null value. The SAP ASE server generates a name for the default in the form of *tabname_colname_objid*, where *tabname* is the first 10 characters of the table name, *colname* is the first 5 characters of the column name, and *objid* is the object ID number for the default. Defaults declared for columns with the IDENTITY property have no effect on column values.

  You can reference global variables in the **default** section of **create table** statements that do not reference database objects. You cannot, however, use global variables in the **check** section of **create table**.
- ***constant_expression* –** is a constant expression to use as a default value for the column. It cannot include global variables, the name of any columns, or other database objects, but can include built-in functions that do not reference database objects. This default value must be compatible with the datatype of the column, or the SAP ASE server generates a datatype conversion error when attempting to insert the default.
- **user | null –** specifies that the SAP ASE server should insert the user name or the null value as the default if the user does not supply a value. For **user**, the datatype of the column must be either `char (30)` or `varchar (30)`. For **null**, the column must allow null values.
- **identity –** indicates that the column has the IDENTITY property. Each table in a database can have one IDENTITY column with a datatype of:

  - exact `numeric` and a scale of 0; or
  - Any of the integer datatypes, including signed or unsigned `bigint`, `int`, `smallint`, or `tinyint`.

  IDENTITY columns are not updatable and do not allow nulls.

  IDENTITY columns are used to store sequential numbers—such as invoice numbers or employee numbers—that are generated automatically by the SAP ASE server. The value of the IDENTITY column uniquely identifies each row in a table.
- **null | not null –** specifies SAP ASE server behavior during data insertion if no default exists.

  null specifies that the SAP ASE server assigns a null value if a user does not provide a value.

  not null specifies that a user must provide a non-null value if no default exists.

The properties of a bit-type column must always be **not null**.

If you do not specify **null** or **not null**, the SAP ASE server uses **not null** by default. However, you can switch this default using **sp_dboption** to make the default compatible with the SQL standards.

- **in row –** instructs the SAP ASE server to store data in the LOB column as in-row whenever there is enough space in the data page. The LOB column's data is stored either fully as in-row or fully off-row.
- ***length* –** (optional) specifies the maximum size at which LOB column data can be stored as in-row. Anything larger than this value is stored off-row, while anything equal to or less than *length* is stored as in-row, as long as there is enough space on the page.

  When you do not specify *length*, the SAP ASE server uses the database-wide setting for in-row length.
- **off row –** (optional) provides default behavior for storing LOB columns off-row. The SAP ASE server assumes this behavior for your new table unless you specify **in row**. If you do not specify the **off row** clause and you set the database-wide in-row length, **create table** creates the LOB column as an in-row LOB column.
- **off row | in row –** specifies whether a Java-SQL column is stored separate from the row (**off row**) or in storage allocated directly in the row (**in row**).

  The default value is **off row**. See *Java in Adaptive Server Enterprise*.
- ***size_in_bytes* –** specifies the maximum size of the in-row column. An object stored in-row can occupy up to approximately 16K bytes, depending on the page size of the database server and other variables. The default value is 255 bytes.
- **constraint *constraint_name* –** introduces the name of an integrity constraint.

  constraint_name is the name of the constraint. It must conform to the rules for identifiers and be unique in the database. If you do not specify the name for a referential or check constraint, the SAP ASE server generates a name in the form *tabname_colname_objectid* where:

  - *tabname* – is the first 10 characters of the table name
  - *colname* – is the first 5 characters of the column name
  - *objectid* – is the object ID number for the constraint

  If you do not specify the name for a unique or primary key constraint, the SAP ASE server generates a name in the format *tabname_colname_tabindid*, where *tabindid* is a string concatenation of the table ID and index ID.
- **unique –** constrains the values in the indicated column or columns so that no two rows have the same value. This constraint creates a unique index that can be dropped only if the constraint is dropped using **alter table**.
- **primary key –** constrains the values in the indicated column or columns so that no two rows have the same value, and so that the value cannot be NULL. This constraint creates a unique index that can be dropped only if the constraint is dropped using **alter table**.

- **clustered | nonclustered –** specifies that the index created by a **unique** or **primary key** constraint is a clustered or nonclustered index. **clustered** is the default for primary key constraints; **nonclustered** is the default for unique constraints. There can be only one clustered index per table. See **create index** for more information.
- **asc | desc –** specifies whether the index created for a constraint is to be created in ascending or descending order for each column. The default is ascending order.
- **fillfactor –** specifies how full the SAP ASE server makes each page when it creates a new index on existing data. The **fillfactor** percentage is relevant only when the index is created. As the data changes, the pages are not maintained at any particular level of fullness.

  The default for **fillfactor** is 0; this is used when you do not include **with fillfactor** in the **create index** statement (unless the value has been changed with **sp_configure**). When specifying a **fillfactor**, use a value between 1 and 100.

  A **fillfactor** of 0 creates clustered indexes with completely full pages and nonclustered indexes with completely full leaf pages. It leaves a comfortable amount of space within the index B-tree in both the clustered and nonclustered indexes. There is seldom a reason to change the **fillfactor**.

  If the **fillfactor** is set to 100, the SAP ASE server creates both clustered and nonclustered indexes with each page 100 percent full. A **fillfactor** of 100 makes sense only for read-only tables—tables to which no data is ever added.

  fillfactor values smaller than 100 (except 0, which is a special case) cause the SAP ASE server to create new indexes with pages that are not completely full. A **fillfactor** of 10 might be a reasonable choice if you are creating an index on a table that eventually holds a great deal more data, but small **fillfactor** values cause each index (or index and data) to take more storage space.

  If CIS is enabled, you cannot use **fillfactor** for remote servers.

  Warning! Creating a clustered index with a **fillfactor** affects the amount of storage space your data occupies, since the SAP ASE server redistributes the data as it creates the clustered index.

  decrypt_default allows the sso to specify a value to be returned to users who do not have decrypt permissions on the encrypted column. Decrypt default values are substituted for text, image, or unitext columns retrieved through the **select** statement.
- **max_rows_per_page –** limits the number of rows on data pages and the leaf-level pages of indexes. Unlike **fillfactor**, the **max_rows_per_page** value is maintained when data is inserted or deleted.

  If you do not specify a value for **max_rows_per_page**, the SAP ASE server uses a value of 0 when creating the table. Values for tables and clustered indexes are between 0 and 256. The maximum number of rows per page for nonclustered indexes depends on the size of the index key; the SAP ASE server returns an error message if the specified value is too high.

A **max_rows_per_page** of 0 creates clustered indexes with full data pages and nonclustered indexes with full leaf pages. It leaves a comfortable amount of space within the index B-tree in both clustered and nonclustered indexes.

Using low values for **max_rows_per_page** reduces lock contention on frequently accessed data. However, using low values also causes the SAP ASE server to create new indexes with pages that are not completely full, uses more storage space, and may cause more page splits.

If CIS is enabled, and you create a proxy table, then **max_rows_per_page** is ignored. Proxy tables do not contain any data. If **max_rows_per_page** is used to create a table, and later a proxy table is created to reference that table, then the **max_rows_per_page** limits apply when you **insert** or **delete** through the proxy table.

- **reservepagegap = *num_pages* –** specifies the ratio of filled pages to empty pages that are to be left during extent I/O allocation operations. For each specified *num_pages*, an empty page is left for future expansion of the table. Valid values are 0 – 255. The default value is 0.
- **dml_logging = {full | minimal} –** determines the amount of logging for **insert**, **update** and **delete** operations, and for some forms of bulk inserts. One of
  - **full** – the SAP ASE server logs all transactions
  - **minimal** – Adaptive Sever does not log row or page changes
- **deferred_allocation –** defers a table or index's creation until the table is needed. Deferred tables are created at the first **insert**.
- **immediate_allocation –** Explicitly creates a table when you have enabled **sp_dboption 'deferred table allocation'**.
- **on *segment_name* –** when used with the **constraint** option, specifies that the index is to be created on the named segment. Before the **on *segment_name*** option can be used, the device must be initialized with **disk init**, and the segment must be added to the database with **sp_addsegment**. See your system administrator or use **sp_helpsegment** for a list of the segment names available in your database.

  If you specify **clustered** and use the **on *segment_name*** option, the entire table migrates to the segment you specify, since the leaf level of the index contains the actual data pages.
- **references –** specifies a column list for a referential integrity constraint. You can specify only one column value for a column constraint. By including this constraint with a table that references another table, any data inserted into the *referencing* table must already exist in the *referenced* table.

  To use this constraint, you must have **references** permission on the referenced table. The specified columns in the referenced table must be constrained by a unique index (created by either a **unique** constraint or a **create index** statement). If no columns are specified, there must be a **primary key** constraint on the appropriate columns in the referenced table. Also, the datatypes of the referencing table columns must match the datatype of the referenced table columns.

- ***ref_table* –** is the name of the table that contains the referenced columns. You can reference tables in another database. Constraints can reference as many as 192 user tables and internally generated worktables.
- ***ref_column* –** is the name of the column or columns in the referenced table.
- **match full –** specifies that if all values in the referencing columns of a referencing row are:

  - Null – the referential integrity condition is true.
  - Non-null values – if there is a referenced row where each corresponding column is equal in the referenced table, then the referential integrity condition is true.

  If they are neither, then the referential integrity condition is false when:

  - All values are non-null and not equal, or
  - Some of the values in the referencing columns of a referencing row are non-null values, while others are null.
- **check (*search_condition*) –** specifies the **check** constraint on the column values and a *search_condition* constraint that the SAP ASE server enforces for all the rows in the table. You can specify **check** constraints as table or column constraints; **create table** allows multiple **check** constraints in a column definition.

  Although you can reference global variables in the **default** section of **create table** statements, you cannot use them in the **check** section.

  The constraints can include:

  - A list of constant expressions introduced with **in**
  - A set of conditions introduced with **like,** which may contain wildcard characters

  Column and table check constraints can reference any columns in the table.

  An expression can include arithmetic operators and functions. The *search_condition* cannot contain subqueries, aggregate functions, host variables, or parameters.
- **encrypt [with *key_name*] –** creates an encrypted column. Specify the database name if the key is in another database. Specify the owner's name if *key_name* is not unique to the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

  The table creator must have **select** permission on the key. If you do nto supply *key_name*, the SAP ASE server looks for a default key in the database.

  keyname identifies a key created using **create encryption key**. The creator of the table must have **select** permission on *keyname*. If *keyname* is not supplied, the SAP ASE server looks for a default key created using the **as default** clause on **create encryption key** or **alter encryption key**.

  See *Encrypting Data* in the *Encrypted Columns Users Guide* for a list of supported datatypes.

- **decrypt_default *constant_expression* –** specifies that this column returns a default value for users who do not have decrypt permissions, and *constant_expression* is the constant value the SAP ASE server returns on **select** statements instead of the decrypted value. The value can be NULL on nullable columns only. If the decrypt default value cannot be converted to the column's datatype, the SAP ASE server catches the conversion error only when it executes the query.
- **compression = *compression_level* | not compressed –** indicates if the data in the row is compressed and to what level.
- **foreign key –** specifies that the listed columns are foreign keys in this table whose target keys are the columns listed in the following **references** clause. The foreign-key syntax is permitted only for table-level constraints, not for column-level constraints.
- ***next_column* | *next_constraint* –** indicates that you can include additional column definitions or table constraints (separated by commas) using the same syntax described for a column definition or table constraint definition.
- **lock datarows | datapages | allpages –** specifies the locking scheme to be used for the table. The default is the server-wide setting for the configuration parameter **lock scheme**.
- **exp_row_size = *num_bytes* –** specifies the expected row size; applies only to **datarows** and **datapages** locking schemes, and only to tables with variable-length rows. Valid values are 0, 1, and any value between the minimum and maximum row length for the table. The default value is 0, which means a server-wide setting is applied.
- **identity_gap *value* –** specifies the identity gap for the table. This value overrides the system identity gap setting for this table only.

  value is the identity gap amount.
- **transfer table [on | off] –** marks the table for incremental transfer. The default value of this parameter is **off**.
- **dml_logging –** determines the amount of logging for **insert**, **update** and **delete** operations, and for some forms of bulk inserts. One of

  - **full** – the SAP ASE server logs all transactions
  - **minimal** – Adaptive Sever does not log row or page changes
- **compression –** indicates the level of compression at the table or the partition level. Specifying the compression level for the partition overrides the compression level for the table. The SAP ASE server compresses individual columns only in partitions that are configured for compression.

  - **none** – the data in this table or partition is not compressed. For partitions, **none** indicates that data in this partition remains uncompressed even if the table compression is altered to **row** or **page** compression.
  - **row** – compresses one or more data items in an individual row. The SAP ASE server stores data in a row compressed form only if the compressed form saves space compared to an uncompressed form. Set **row** compression at the partition or table level.

  - **page** – when the page fills, existing data rows that are row-compressed are then compressed using page-level compression to create page-level dictionary, index, and character-encoding entries. Set **page** compression at the partition or table level.

    The SAP ASE server compresses data at the page level only after it has compressed data at the row level, so setting the compression-level to **page** implies both **page** and **row** compression.
- **"erase residual data" {on | off} –** Supports the ability to remove residual data from deletions in SAP ASE.
- **lob_compression = off | *compression_level* –** Determines the compression level for the table. The table has no LOB compression if you select **off**.
- ***compression_level* –** Table compression level. The compression levels are:

  - 0 – the row is not compressed.
  - 1 through 9 – the SAP ASE server uses ZLib compression. Generally, the higher the compression number, the more the SAP ASE server compresses the LOB data, and the greater the ratio between compressed and uncompressed data (that is the greater the amount of space savings, in bytes, for the compressed data versus the size of the uncompressed data).

    However, the amount of compression depends on the LOB content, and the higher the compression level , the more CPU-intensive the process. That is, level 9 provides the highest compression ratio but also the heaviest CPU usage.
  - 100 – the SAP ASE server uses FastLZ compression. The compression ratio that uses the least CPU usage; generally used for shorter data.
  - 101 – the SAP ASE server uses FastLZ compression. A value of 101 uses slightly more CPU than a value of 100, but uses a better compression ratio than a value of 100.

  The compression algorithm ignores rows that do not use LOB data.
- **index_compression [={NONE | PAGE} –**

  - NONE – indexes on the specified table are not compressed. Indexes that are specifically created with **index_compression = PAGE** are compressed.
  - PAGE – all indexes on the specified table are compressed. Indexes that are specifically created with **index_compression = NONE** are not compressed.
- **on *segment_name* –** specifies the name of the segment on which to place the table. When using **on *segment_name***, the logical device must already have been assigned to the database with **create database** or **alter database**, and the segment must have been created in the database with **sp_addsegment**. See your system administrator or use **sp_helpsegment** for a list of the segment names available in your database.

  When used for partitions, specifies the segment on which to place the partition.
- **external table –** specifies that the object is a remote table or view. **external table** is the default, so specifying this is optional.
- **for load –** creates a table available only to **bcp in** and **alter table unpartition** operations. You can use **row_count()** on a table you create using **for load**.

- **partition by range –** specifies records are to be partitioned according to specified ranges of values in the partitioning column or columns.
- ***column_name* –** when used in the *partition_clause*, specifies a partition key column.
- ***partition_name* –** specifies the name of a new partition on which table records are stored. Partition names must be unique within the set of partitions on a table or index. Partition names can be delimited identifiers if **set quoted_identifier** is on. Otherwise, they must be valid identifiers.

  If *partition_name* is omitted, the SAP ASE server creates a name in the form *table_name_patition_id*. The SAP ASE server truncates partition names that exceed the allowed maximum length.
- **on *segment_name* –** when used in the *partition_clause*, specifies the segment on which the partition is to be placed. Before the **on *segment_name*** option can be used, the device must be initialized with **disk init**, and the segment must be added to the database using the **sp_addsegment** system procedure. See your system administrator or use **sp_helpsegment** for a list of the segment names available in your database.
- **values <= constant | MAX –** specifies the inclusive upper bound of values for a named partition. Specifying a constant value for the highest partition bound imposes an implicit integrity constraint on the table. The keyword MAX specifies the maximum value in a given datatype.
- **partition by hash –** specifies records are to be partitioned by a system-supplied hash function. The function computes the hash value of the partition keys that specify the partition to which records are assigned.
- **partition by list –** specifies records are to be partitioned according to literal values specified in the named column. Only one column can partition a list-partitioned table. You can specify up to 250 distinct list values for each partition.
- **partition by round-robin –** specifies records are to be partitioned in a sequential manner. A round-robin-partitioned table has no partitioning key. Neither the user nor the optimizer knows the partition of a particular record.
- **at *pathname* –** specifies the location of the remote object. Using the **at *pathname*** clause results in the creation of a proxy table.

  pathname takes the form *server_name.dbname.owner.object;aux1.aux2*, where:

  - *server_name* (required) – is the name of the server that contains the remote object.
  - *dbname* (optional) – is the name of the database managed by the remote server that contains this object.
  - *owner* (optional) – is the name of the remote server user that owns the remote object.
  - *object* (required) – is the name of the remote table or view.
  - *aux1.aux2* (optional) – is a string of characters that is passed to the remote server during a **create table** or **create index** command. This string is used only if the server is class `db2`. `aux1` is the DB2 database in which to place the table, and `aux2` is the DB2 tablespace in which to place the table.

- **{compute | as} –** reserved keywords that you can use interchangeably to indicate that a column is a computed column.
- ***computed_column_expression* –** is any valid T-SQL expression that does not contain columns from other tables, local variables, aggregate functions, or subqueries. It can be one or a combination of column name, constant, function, global variable, or case expression, connected by one or more operators. You cannot cross-reference between computed columns except when virtual computed columns reference materialize computed columns.
- **materialized | not materialized –** specifies whether or not the computed column is materialized and physically stored in the table. If neither keyword is specified, a computed column by default is **not materialized**, and thus not physically stored in the table.
- **using clustered –** indicates you are creating a virtually hashed table. The list of columns are treated as key columns for this table.
- ***column_name* [asc | desc] –** because rows are placed based on their hash function, you cannot use [asc | desc] for the hash region. If you provide an order for the key columns of virtually hashed tables, it is used only in the overflow clustered region.
- ***hash_factor* –** required for the hash function for virtually hashed tables. For the hash function, a hash factor is required for every key column. These factors are used with key values to generate hash value for a particular row.
- **with max *num_hash_values* key –** the maximum number of hash values that you can use. Defines the upper bound on the output of this hash function.

Examples

- **Example 1 –** Creates the `foo` table using the *@@spid* global variable with the default parameter:

```
create table foo (
      a      int
    , b      int      default @@spid
)
```

- **Example 2 –** Creates the `titles` table:

```
create table titles (
      title_id       tid              not null
    , title          varchar (80)     not null
    , type           char (12)        not null
    , pub_id         char (4)         null
    , price          money            null
    , advance        money            null
    , total_sales    int              null
    , notes          varchar (200)    null
    , pubdate        datetime         not null
    , contract       bit              not null
)
```

- **Example 3 –** Creates a table `mytable` using **for load**:

```
create table mytable (
      col1    int
```

```
    , col2    int
    , col3    (char 50)
)
partitioned by roundrobin 3 for load
```

The new table is unavailable to any user activities until it is unpartitioned.

1. Load the data into `mytable`, using **bcp in**.
2. Unpartition `mytable`.

The table is now available for any user activities.

- **Example 4 –** Creates the `compute` table. The table name and the column names, `max` and `min`, are enclosed in double quotes because they are reserved words. The `total score` column name is enclosed in double quotes because it contains an embedded blank. Before creating this table, you must **set quoted_identifier on**.

```
create table "compute" (
      "max"             int
    , "min"             int
    , "total score"     int
)
```

- **Example 5 –** Creates the `sales` table and a clustered index in one step with a unique constraint. (In the `pubs2` database installation script, there are separate **create table** and **create index** statements):

```
create table sales (
      stor_id           char (4)      not null
    , ord_num           varchar (20)  not null
    , date              datetime      not null
    , unique clustered (stor_id, ord_num)
)
```

- **Example 6 –** Creates the `salesdetail` table with two referential integrity constraints and one default value. There is a table-level, referential integrity constraint named `salesdet_constr` and a column-level, referential integrity constraint on the `title_id` column without a specified name. Both constraints specify columns that have unique indexes in the referenced tables (`titles` and `sales`). The **default** clause with the `qty` column specifies 0 as its default value.

```
create table salesdetail (
      stor_id   char (4)                  not null
    , ord_num   varchar (20)              not null
    , title_id  tid                       not null
          references titles (title_id)
    , qty       smallint default 0        not null
    , discount  float                     not null,

constraint salesdet_constr
    foreign key (stor_id, ord_num)
    references sales (stor_id, ord_num)
)
```

- **Example 7 –** Creates the table `publishers` with a check constraint on the `pub_id` column. This column-level constraint can be used in place of the `pub_idrule` included in the `pubs2` database.

```
create rule pub_idrule
as @pub_id in ("1389", "0736", "0877", "1622", "1756")
or @pub_id like "99[0-9][0-9]"
```

```
create table publishers (
    pub_id char (4) not null
    check (pub_id in ("1389", "0736", "0877", "1622",
        "1756")
        or pub_id like "99[0-9][0-9]")
    , pub_name     varchar (40)      null
    , city         varchar (20)      null
    , state        char (2)          null
)
```

- **Example 8 –** Specifies the `ord_num` column as the IDENTITY column for the `sales_daily` table. The first time you insert a row into the table, the SAP ASE server assigns a value of 1 to the IDENTITY column. On each subsequent insert, the value of the column increments by 1.

```
create table sales_daily (
      stor_id         char (4)          not null
    , ord_num         numeric (10,0)    identity
    , ord_amt         money             null
)
```

- **Example 9 –** Specifies the datapages locking scheme for the `new_titles` table and an expected row size of 200:

```
create table new_titles (
      title_id       tid
    , title           varchar (80)    not null
    , type            char (12)
    , pub_id          char (4)        null
    , price           money           null
    , advance         money           null
    , total_sales     int             null
    , notes           varchar (200)   null
    , pubdate         datetime
    , contract        bit
)
lock datapages
with exp_row_size = 200
```

- **Example 10 –** Specifies the **datarows** locking scheme and sets a **reservepagegap** value of 16 so that extent I/O operations leave 1 blank page for each 15 filled pages:

```
create table new_publishers (
      pub_id       char (4)        not null
    , pub_name     varchar (40)    null
    , city         varchar (20)    null
    , state        char (2)        null
)
```

```
lock datarows
with reservepagegap = 16
```

- **Example 11 –** Creates a table named `big_sales` with minimal logging:

```
create table big_sales (
      storid        char(4)         not null
    , ord_num       varchar(20)     not null
    , order_date    datetime        not null
)
with dml_logging = minimal
```

- **Example 12 –** Creates a deferred table named `im_not_here_yet`:

```
create table im_not_here_yet (
col_1 int,
col_2 varchar(20)
)
with deferred_allocation
```

- **Example 13 –** Creates a table named `mytable`, that uses the locking scheme datarows, and permits incremental transfer:

```
create table mytable (
      f1 int
    , f2 bigint not null
    , f3 varchar (255) null
)
lock datarows
with transfer table on
```

- **Example 14 –** Creates a table named `genre` with row-level compression:

```
create table genre (
      mystery      varchar(50)    not null
    , novel        varchar(50)    not null
    , psych        varchar(50)    not null
    , history      varchar(50)    not null
    , art          varchar(50)    not null
    , science      varchar(50)    not null
    , children     varchar(50)    not null
    , cooking      varchar(50)    not null
    , gardening    varchar(50)    not null
    , poetry       varchar(50)    not null
)
with compression = row
```

- **Example 15 –** Creates a table named `sales` on segments `seg1`, `seg2`, and `seg3`, with compression on `seg1`:

```
create table sales (
      store_id     int    not null
    , order_num    int    not null
    , date         datetime    not null
)
partition by range (date)
    ( Y2008 values <= ('12/31/2008')
      with compression = page on seg1,
      Y2009 values <= ('12/31/2009') on seg2,
      Y2010 values <= ('12/31/2010') on seg3)
```

- **Example 16 –** Creates the `email` table, which uses a LOB compression level of 5:

```
create table email (
      user_name      char (10)
    , mailtxt        text
    , photo          image
    , reply_mails    text)
    with lob_compression = 5
```

- **Example 17 –** Creates a constraint supported by a unique clustered index; the index order is ascending for `stor_id` and descending for `ord_num`:

```
create table sales_south (
      stor_id     char (4)         not null
    , ord_num     varchar (20)     not null
    , date        datetime         not null
    , unique clustered (stor_id asc, ord_num desc)
)
```

- **Example 18 –** Creates a table named `t1` at the remote server SERVER_A and creates a proxy table named `t1` that is mapped to the remote table:

```
create table t1 (
      a    int
    , b    char (10)
)
at "SERVER_A.db1.joe.t1"
```

- **Example 19 –** Creates a table named `employees`. `name` is of type `varchar`, `home_addr` is a Java-SQL column of type **Address**, and `mailing_addr` is a Java-SQL column of type **Address2Line**. Both **Address** and **Address2Line** are Java classes installed in the database:

```
create table employees (
      name            varchar (30)
    , home_addr       Address
    , mailing_addr    Address2Line
)
```

- **Example 20 –** Creates a table named `mytable` with an `identity` column. The identity gap is set to 10, which means ID numbers are allocated in memory in blocks of ten. If the server fails or is shut down with no wait, the maximum gap between the last ID number assigned to a row and the next ID number assigned to a row is 10 numbers:

```
create table mytable (
      IdNum    numeric (12,0)    identity
)
with identity_gap = 10
```

- **Example 21 –** Creates a table `my_publishers`, which is partitioned by list according to values in the `state` column. See the *Transact-SQL Users Guide* for more information about creating table partitions.

```
create table my_publishers (
      pub_id      char (4)         not null
```

```
    , pub_name    varchar (40)    null
    , city        varchar (20)    null
    , state       char (2)        null
)
partition by list (state) (
      west values ('CA', 'OR', 'WA') on seg1
    , east values ('NY', 'MA') on seg2
)
```

- **Example 22 –** Creates the table `fictionsales`, which is partitioned by range according to values in the `date` column:

```
create table fictionsales (
      store_id     int          not null
    , order_num    int          not null
    , date         datetime     not null
)
partition by range (date) (
      q1 values <= ("3/31/2005") on seg1
    , q2 values <= ("6/30/2005") on seg2
    , q3 values <= ("9/30/2005") on seg3
    , q4 values <= ("12/31/2005") on seg4
)
```

- **Example 23 –** Creates the table `currentpublishers`, which is partitioned by round-robin:

```
create table currentpublishers (
      pub_id      char (4)        not null
    , pub_name    varchar (40)    null
    , city        varchar (20)    null
    , state       char (2)        null
)
partition by roundrobin 3 on (seg1)
```

- **Example 24 –** Creates the table `mysalesdetail`, which is partitioned by hash according to values in the `ord_num` column:

```
create table mysalesdetail (
      store_id    char (4)        not null
    , ord_num     varchar (20)    not null
    , title_id    tid             not null
    , qty         smallint        not null
    , discount    float           not null
)
partition by hash (ord_num) (
      p1 on seg1
    , p2 on seg2
    , p3 on seg3
)
```

- **Example 25 –** Creates a table called `mytitles` with one materialized computed column:

```
create table mytitles (
      title_id    tid    not null
    , title    varchar (80)     not null
    , type    char (12)         not null
    , pub_id    char (4)        null
    , price    money            null
    , advance    money          null
    , total_sales    int        null
    , notes    varchar (200)    null
    , pubdate    datetime       not null
    , sum_sales    compute price * total_sales
        materialized
)
```

- **Example 26 –** Creates an employee table with a nullable encrypted column. The SAP ASE server uses the database default encryption key to encrypt the `ssn` data:

```
create table employee_table (
      ssn             char(15)    null
      encrypt name    char(50)
    , deptid          int
)
```

- **Example 27 –** Creates a customer table with an encrypted column for credit card data:

```
create table customer (
ccard char(16) unique
   encrypt with cc_key
   decrypt_default 'XXXXXXXXXXXXXXXX', name char(30)
)
```

The `ccard` column has a unique constraint and uses `cc_key` for encryption. Because of the decrypt_default specifier, the SAP ASE server returns the value 'XXXXXXXXXXXXXXXX' instead of the actual data when a user without decrypt permission selects the `ccard` column.

- **Example 28 –** Creates a table that specifies `description` as an in-row LOB column 300 bytes long, `notes` as an in-row LOB column without a specified length (inheriting the size of the off-row storage), and the `reviews` column as stored off-row regardless of condition:

```
create table new_titles (
      title_id       tid              not null
    , title          varchar (80)     not null
    , type           char (12)        null
    , price          money            null
    , pubdate        datetime         not null
    , description    text             in row (300)
    , notes          text             in row
    , reviews        text             off row
)
```

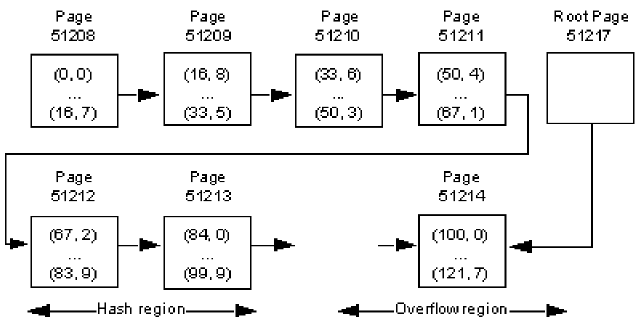
- **Example 29 –** Creates a virtually hashed table named `orders` on the `pubs2` database on the `order_seg` segment:

```
create table orders (
      id    int
    , age    int
    , primary key using clustered (id,age) = (10,1) with max 1000
key
)
on order_seg
```

The layout for the data is:

- The `order_seg` segment starts on page ID 51200.
- The ID for the first data object allocation map (OAM) page is 51201.
- The maximum rows per page is 168.
- The row size is 10.
- The root index page of the overflow clustered region is 51217.

Figure 1: Data Layout for the Example



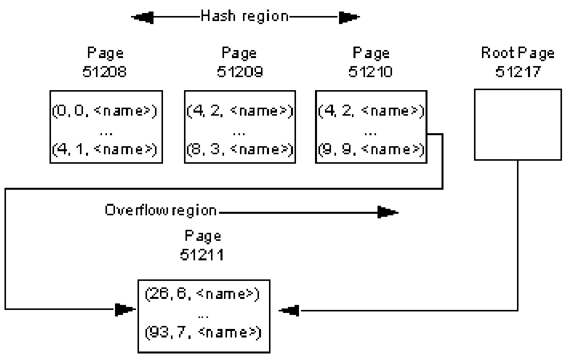
- **Example 30 –** Creates a virtually hashed table named `orders` on the `pubs2` database on the `order_seg` segment:

```
create table orders (
      id    int default NULL
    , age    int
    , primary key using
        clustered (id,age) = (10,1) with max 100 key
    , name    varchar(30)
)
on order_seg
```

The layout for the data is:

- The `order_seg` segment starts on page ID 51200.
- The ID for the first data OAM page is 51201.
- The maximum rows per page is 42.
- The row size is 45.
- The root index page of the overflow clustered region is 51217.

Figure 2: Data Layout for the Example



- **Example 31 –** The following scenarios use these two tables:
  - `create table t1 (col1 int) with "erase residual data" on`
  - `create table t2 (col1 int) with "erase residual data" off`

  Scenario 1

  The option to erase residual data is turned on for table `t1` because it is set at the database level, so that both the **drop table** and **truncate table** commands for `t1` result in the cleanup of all residual data from its pages.

  Table `t2`, however, has the **erase residual data** option turned off explicitly, as it was created with the "**erase residual data off**" clause. Residual data is not removed, even though the "`erase residual data`" option is set to `true` at the database level. As a result, residual data remains, even after running **drop table** and **truncate table** on `t2`:

```
create database db1
go
sp_dboption db1, "erase residual data", true
go
use db1
go
create table t1 (col int)
go
insert t1 values ...
go
create table t2 (col1 int, col2 char(10)) with "erase residual
data" off
go
truncate table t1
go
drop table t1
go
truncate table t2
go
drop table t2
go
```

Scenario 2

In this example:

- Table `t1` does not have "`erase residual data off`" set explicitly, but does have it set at the database level, resulting in the removal of residual data from `t1` when you run **truncate table t1**.
- Table `t2` has the "`erase residual data`" option set at creation, because the option was set at the database level. This results in the removal of residual data from `t2` when you run **truncate table t2**.
- Table `t3` is marked with "`erase residual data off`" explicitly, so that even though **sp_dboption** sets "`erase residual data`" to true, residual data is not removed when SAP ASE runs **truncate table t3**.

```
create database db1
go
use db1
go
create table t1 (col int)
go
sp_dboption db1, "erase residual data", true
go
create table t2 (col1 int, col2 char(10))
go
create table t3 (col1 int, col2 char(10)) with "erase residual
data" off
go
truncate table t1
go
truncate table t2
go
truncate table t3
go
```

Scenario 3

In this example:

- Although both `t1` and `t2` tables had the "`erase residual data` option not set by default, because "`erase_residual_data` was turned on at the session level just before the **truncate table** command was executed, the residual data is removed on both `t1` and `t2`.
- Although table `t3` has the "`erase residual data`" option explicitly set to `off`, residual data is still removed when the **truncate** command is executed, because the "`erase_residual_data`" option is set at the session level.

```
create database db1
go
use db1
go
create table t1(col int)
go
```

```
create table t2 (col1 int, col2 char(10))
go
create table t3 (col1 int, col2 char(10)) with "erase residual
data" off
go
set erase_residual_data on
go
truncate table t1
go
truncate table t2
go
truncate table t3
go
```

- **Example 32 –** Creates the index compressed table `order_line` with columns `ol_delivery_d` and `ol_dist_info` compressed and using page-level compression:

```
create table order_line (
    ol_o_id         int,
    ol_d_id         tinyint,
    ol_w_id         smallint,
    ol_number       tinyint,
    ol_i_id         int,
    ol_supply_w_id  smallint,
    ol_delivery_d   datetime,
    ol_quantity     smallint,
    ol_amount       float,
    ol_dist_info    char(24) )
lock datapages
    with index_compression = page
```

  By default, indexes created on this table are compressed by default. However, if an index has an index row length that is too short to benefit from compression, a warning is raised, indicating that the index will not be compressed.

Usage

- **create table** creates a table and optional integrity constraints. The table is created in the currently open database unless you specify a different database in the **create table** statement. You can create a table or index in another database, if you are listed in the `sysusers` table and have **create table** permission in the database.
- Space is allocated to tables and indexes in increments of one extent, or eight pages, at a time. Each time an extent is filled, another extent is allocated. To see the amount of space allocated and used by a table, use **sp_spaceused**.
- The maximum length for in-row Java columns is determined by the maximum size of a variable-length column for the table's schema, locking style, and page size.
- **create table** performs error checking for check constraints before it creates the table.
- When using **create table** from CIS with a column defined as `char` (*n*) NULL, CIS creates the column as `varchar` (*n*) on the remote server.

- Use the **asc** and **desc** keywords after index column names to specify the sort order for the index. Creating indexes so that columns are in the same order specified in the **order by** clause of queries eliminates the sorting step during query processing.
- If an application inserts short rows into a data-only-locked table and updates them later so that their length increases, use **exp_row_size** to reduce the number of times that rows in data-only-locked tables are forwarded to new locations.
- The location information provided by the **at** keyword is the same information that is provided by **sp_addobjectdef**. The information is stored in the `sysattributes` table.
- When you set this option on a table, the operations for the table (**drop table**, **delete row**, **alter table**, **drop index**) that result in residual data automatically clean up deallocated space.

See also **sp_addmessage**, **sp_addsegment**, **sp_addtype**, **sp_bindmsg**, **sp_chgattribute**, **sp_commonkey**, **sp_depends**, **sp_foreignkey**, **sp_help**, **sp_helpjoins**, **sp_helpsegment**, **sp_primarykey**, **sp_rename**, **sp_spaceused** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Transact-SQL extensions include:

- Use of a database name to qualify a table or column name
- IDENTITY columns
- The **not null** column default
- The **asc** and **desc** options
- The **reservepagegap** option
- The **lock** clause
- The **on *segment_name*** clause

  See *System and User-Defined Datatypes* in *Reference Manual: Building Blocks* for datatype compliance information.

Permissions

Any user can create temporary tables and new tables with logging disabled.

The following describes permission checks for **create table** that differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `create table` privilege to create a table. To create a table for another user, you must have the `create any table` privilege.

Setting	Description
Disabled	With granular permissions disabled, you must be the database owner, a user with **sa_role**, or a user with the `create table` privilege to create a table. To create a table for another user, you must have **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	10
Audit option	**create**
Command or access audited	**create table**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect • If the **with** option for **with transfer table [on | off]** is: • **on** – the SAP ASE server prints `WITH TRANSFER TABLE ON` in the extra info in the audit record. • **off** – the SAP ASE server prints `WITH TRANSFER TABLE OFF`.

See also

- *alter table* on page 43
- *create default* on page 117
- *create existing table* on page 126
- *create index* on page 140
- *create rule* on page 195
- *create schema* on page 200
- *create trigger* on page 253
- *create view* on page 268
- *drop index* on page 350
- *drop rule* on page 361
- *drop table* on page 363

- *execute* on page 406
- *grant* on page 419
- *if...else* on page 470
- *load database* on page 485
- *select* on page 579
- *while* on page 719
- *disk init* on page 319
- *alter database* on page 1
- *create database* on page 104

Restrictions for create table

Restrictions for using **create table**.

- The maximum number of columns in a table depends on the width of the columns and the server's logical page size:
  - The sum of the columns' sizes cannot exceed the server's logical page size.
  - The maximum number of columns per table cannot exceed 1024.
  - The maximum number of variable-length columns for an all-pages lock table is 254.

    For example, if your server uses a 2K logical page size and includes a table of integer columns, the maximum number of columns in the table is far fewer than 1024. (1024 * 4 bytes exceeds a 2K logical page size.)

    You can mix variable- and fixed-length columns in a single table as long as the maximum number of columns does not exceed 1024. For example, if your server uses a 8K logical page size, a table configured for APL can have 254 nullable integer columns (these are variable-length columns) and 770 non-nullable integers, for a total of 1024 columns.
- There can be as many as 2,000,000,000 tables per database and 1024 user-defined columns per table. The number of rows per table is limited only by available storage.
- Although the SAP ASE server does create tables in the following circumstances, you receive errors about size limitations when you perform DML operations:
  - If the total row size for rows with variable-length columns exceeds the maximum column size
  - If the length of a single variable-length column exceeds the maximum column size
  - For data-only-locked tables, if the offset of any variable-length column other than the initial column exceeds the limit of 8191 bytes
- The SAP ASE server reports an error if the total size of all fixed-length columns, plus the row overhead, is greater than the table's locking scheme and page size allows. These limits are for APL tables are:

Page Size	Maximum Row Length	Maximum Column Length
2K (2048 bytes)	1962 bytes	1960 bytes

Page Size	Maximum Row Length	Maximum Column Length
4K (4096 bytes)	4010 bytes	4008 bytes
8K (8192 bytes)	8106 bytes	8104 bytes
16K (16384 bytes)	16298 bytes	16296 bytes

The limits for DOL tables are:

Page Size	Maximum Row Length	Maximum Column Length
2K (2048 bytes)	1964 bytes	1958 bytes
4K (4096 bytes)	4012 bytes	4006 bytes
8K (8192 bytes)	8108 bytes	8102 bytes
16K (16384 bytes)	16300 bytes	16294 bytes If table does not include any variable-length columns
16K (16384 bytes)	16300 (subject to a max start offset of varlen = 8191)	8191-6-2 = 8183 bytes If table includes at least one variable-length column. This size includes six bytes for the row overhead and two bytes for the row length field

- The maximum number of bytes of variable length data per row depends on the locking scheme for the table:

Page Size	Maximum Row Length	Maximum Column Length
2K (2048 bytes)	1962	1960
4K (4096 bytes)	4010	4008
8K (8192 bytes)	8096	8104
16K (16384 bytes)	16298	16296

The maximum size of columns for a DOL table:

Page Size	Maximum Row Length	Maximum Column Length
2K (2048 bytes)	1964	1958
4K (4096 bytes)	4012	4006

Page Size	Maximum Row Length	Maximum Column Length
8K (8192 bytes)	8108	8102
16K (16384 bytes)	16300	16294

- If you create a DOL table with a variable-length column that exceeds a 8191-byte offset, you cannot add any rows to the column.
- If you create tables with `varchar`, `nvarchar`, `univarchar`, or `varbinary` columns for which total defined width is greater than the maximum allowed row size, a warning message appears, but the table is created. If you try to insert more than the maximum number bytes into such a row, or to **update** a row so that its total row size is greater than the maximum length, the SAP ASE server produces an error message, and the command fails.
- When a **create table** command occurs within an **if...else** block or a **while** loop, the SAP ASE server creates the schema for the table before determining whether the condition is true. This may lead to errors if the table already exists. To avoid this situation, either make sure a view with the same name does not already exist in the database or use an **execute** statement, as follows:

```
if not exists
    (select * from sysobjects where name="my table")
begin
execute "create table mytable (x int)"
end
```

- You cannot issue **create table** with a declarative default or check constraint and then insert data into the table in the same batch or procedure. Either separate the create and insert statements into two different batches or procedures, or use **execute** to perform the actions separately.
- You cannot use the following variable in **create table** statements that include defaults:

```
declare @p int
select @p = 2
create table t1 (c1 int default @p, c2 int)
```

  Doing so results in error message 154: “Variable is not allowed in default.”
- Virtually-hashed tables have these restrictions:

  SQL user-defined functions are not currently supported with **create proxy table, create table at remote server,** or **alter table.**

  Note: The execution of SQL functions requires the syntax **username.functionname()**.
- - Virtually-hashed tables must have unique rows. Virtually hashed tables do not allow multiple rows with the same key-column values because the SAP ASE server cannot keep one row in the hash region and another with the same key-column value in the overflow clustered region.
  - You must create each virtually-hashed table on an exclusive segment.

Creating Compressed Tables

Considerations for creating compressed tables.

- Unless you state otherwise, the SAP ASE server:
  - Sets data compression to NULL when you create a table.
  - Preserves the existing compression level when you modify a table.
  - Sets all partitions to the compression level specified in the **create table** clause.
- You can create a table with table-level compression but leave some partitions uncompressed, which allows you to maintain uncompressed data in an active partitions format, and to periodically compress the data when appropriate.
- The SAP ASE server supports partition-level compression for all forms of partitioning except round-robin partitions.
- Columns marked as **not compressed** are not selected for row or page compression. However, in-row columns (including materialized computed columns) are eligible for compression:
  - All fixed-length data smaller than 4 bytes is ineligible for row compression. However, the SAP ASE server may compress these datatypes during page-index compression.
  - All data, fixed or with a variable length of 4 bytes or larger, is eligible for row compression.
- By default, the SAP ASE server creates uncompressed nonmaterialized computed columns.
- The SAP ASE server first compresses the columns eligible for compression at the row level. If the compressed row is longer than the uncompressed row, the SAP ASE server discards the compressed row and stores the uncompressed row on disk, ensuring that compression does not waste space.
- Data pages may simultaneously contain compressed and uncompressed data rows.
- You may compress fixed-length columns.
- You can use the **with exp_row_size** clause to create compressed data-only-locked (DOL) tables only for fixed-length rows. You cannot use the **with exp_row_size** clause on allpages-locked (APL) tables.
- If you specify an expected row size, but the uncompressed row length is smaller than the expected row size, the SAP ASE server does not compress the row.
- After you enable compression for a table, all **bcp** and DML operations that are executed on the table compress the data.
- Compression may allow you to store more rows on a page, but it does not change the maximum row size of a table. However, it can change the effective minimum row size of a table.
- Use **not compressed** for columns that could be row- or page-index compressed, but for which the nature of the column makes compression inapplicable or meaningless (for example, columns that use the `bit` datatype, encryption, or a timestamp column).
- Compressing a table does not compress its indexes.

Restrictions for Compression

Restrictions for using compression.

- You cannot compress:
    - System tables
    - Worktables
    - Nonmaterialzed computed columns
    - IDENTITY columns
    - Timestamps added for data transfer
    - All datatypes; see the *Compression Users Guide* for a list of unsupported datatypes
    - Encrypted columns
- You cannot create a table for compression if the minimum row size exceeds the size of the maximum user data row for the configured locking scheme and page size combination. For example, you cannot create a data-only-locked table with a 2K page size that includes column `c1` with a `char(2007)` datatype because it exceeds the maximum user data row size. For row and page compression, the SAP ASE server performs the same row size check as for a new table.
- You cannot create a table for **row** or **page** compression that has only short, fixed-length columns smaller than 4 bytes.

Using Indexes

A table “follows” its clustered index. If you create a table on one segment, then create its clustered index on another segment, the table migrates to the segment where the index is created.

You can make inserts, updates, and selects faster by creating a table on one segment and its nonclustered indexes on another segment, if the segments are on separate physical devices. See *Using Clustered or Nonclustered Indexes* in *Transact-SQL Users Guide*.

Renaming a Table or Its Columns

Use **sp_rename** to rename a table or column.

After renaming a table or any of its columns, use **sp_depends** to determine which procedures, triggers, and views depend on the table, and redefine these objects.

Warning! If you do not redefine these dependent objects, they no longer work after the SAP ASE server recompiles them.

Restrictions on Compressing Tables That Use Large Object (LOB) Data

Restrictions for compressing data on LOB tables.

You cannot:

- Compress computed text columns
- Issue LOB compression clauses (for example, **lob_compression =**) on regular columns, XML data
- Use LOB compression for system and worktables

Column Definitions

Considerations for creating a column from a user-defined datatype.

- You cannot change the length, precision, or scale.
- You can use a NULL type to create a NOT NULL column, but not to create an IDENTITY column.
- You can use a NOT NULL type to create a NULL column or an IDENTITY column.
- You can use an IDENTITY type to create a NOT NULL column, but the column inherits the IDENTITY property. You cannot use an IDENTITY type to create a NULL column.

Only columns with variable-length datatypes can store null values. When you create a NULL column with a fixed-length datatype, the SAP ASE server automatically converts it to the corresponding variable-length datatype. The SAP ASE server does not inform the user of the type change.

This table lists the fixed-length datatypes and the variable-length datatypes to which they are converted. Certain variable-length datatypes, such as `moneyn`, are reserved types that cannot be used to create columns, variables, or parameters:

Table 1. Variable-Length Datatypes Used to Store Nulls

Original Fixed-Length Datatype	Converted to
`char`	`varchar`
`nchar`	`nvarchar`
`binary`	`varbinary`
`datetime`	`datetimn`
`float`	`floatn`
`bigint`, `int`, `smallint`, `tinyint`	`intn`
`unsigned bigint, unsigned int, unsigned smallint`	`uintn`
`decimal`	`decimaln`
`numeric`	`numericn`
`money` and `smallmoney`	`moneyn`

For a report on a table and its columns, execute the system procedure **sp_help**.

You can create column defaults in two ways: by declaring the default as a column constraint in the **create table** or **alter table** statement, or by creating the default using the **create default** statement and binding it to a column using **sp_bindefault**.

Temporary Tables

Usage information for temporary tables.

- Temporary tables are stored in the temporary database, `tempdb`.
- The first 13 characters of a temporary table name must be unique per session. Such tables can be accessed only by the current SAP ASE server session. They are stored in `tempdb..objects` by their names plus a system-supplied numeric suffix, and they disappear at the end of the current session or when they are explicitly dropped.
- Temporary tables created with the “`tempdb..`” prefix are shareable among SAP ASE server user sessions. Create temporary tables with the “`tempdb..`” prefix from inside a stored procedure only if you intend to share the table among users and sessions. To avoid inadvertent sharing of temporary tables, use the “`#`” prefix when creating and dropping temporary tables in stored procedures.
- Temporary tables can be used by multiple users during an the SAP ASE server session. However, the specific user session usually cannot be identified because temporary tables are created with the “guest” user ID of 2. If more than one user runs the process that creates the temporary table, each user is a “guest” user, so the `uid` values are all identical. Therefore, there is no way to know which user session in the temporary table is for a specific user. The system administrator can add the user to the temporary table using **create login**, in which case the individual `uid` is available for that user’s session in the temporary table.
- You can associate rules, defaults, and indexes with temporary tables, but you cannot create views on temporary tables or associate triggers with them.
- When you create a temporary table, you can use a user-defined datatype only if the type is in `tempdb..systypes`. To add a user-defined datatype to `tempdb` for only the current session, execute **sp_addtype** while using `tempdb`. To add the datatype permanently, execute **sp_addtype** while using `model`, then restart the SAP ASE server so that `model` is copied to `tempdb`.

Defining Integrity Constraints

The **create table** statement helps control a database’s integrity through a series of integrity constraints as defined by the SQL standards.

- These integrity constraint clauses restrict the data that users can insert into a table. You can also use defaults, rules, indexes, and triggers to enforce database integrity.

  Integrity constraints offer the advantages of defining integrity controls in one step during the table creation process and of simplifying the creation of those integrity controls.

However, integrity constraints are more limited in scope and less comprehensive than defaults, rules, indexes, and triggers.

- You must declare constraints that operate on more than one column as table-level constraints; declare constraints that operate on only one column as column-level constraints. Although the difference is rarely noticed by users, column-level constraints are checked only if a value in the column is being modified, while the table-level constraints are checked if there is any modification to a row, regardless of whether or not it changes the column in question.

  Place column-level constraints after the column name and datatype, before the delimiting comma. Enter table-level constraints as separate comma-delimited clauses. The SAP ASE server treats table-level and column-level constraints the same way; neither way is more efficient than the other.
- You can create the following types of constraints at the table level or the column level:
  - A **unique** constraint does not allow two rows in a table to have the same values in the specified columns. In addition, a **primary key** constraint disallows null values in the column.
  - A *referential integrity* (**references**) constraint requires that the data being inserted or updated in specific columns has matching data in the specified table and columns.
  - A **check** constraint limits the values of the data inserted into the columns.

  You can also enforce data integrity by restricting the use of null values in a column (using the **null** or **not null** keywords) and by providing default values for columns (using the **default** clause).
- You can use **sp_primarykey**, **sp_foreignkey**, and **sp_commonkey** to save information in system tables, which can help clarify the relationships between tables in a database. These system procedures do not enforce key relationships or duplicate the functions of the **primary key** and **foreign key** keywords in a **create table** statement. For a report on keys that have been defined, use **sp_helpkey**. For a report on frequently used joins, execute **sp_helpjoins**.
- Transact-SQL provides several mechanisms for integrity enforcement. In addition to the constraints you can declare as part of **create table**, you can create rules, defaults, indexes, and triggers. This table summarizes the integrity constraints and describes the other methods of integrity enforcement:

In create table	Other Methods
unique constraint	**create unique index** (on a column that allows null values)
primary key constraint	**create unique index** (on a column that does not allow null values)
references constraint	**create trigger**
check constraint (table level)	**create trigger**
check constraint (column level)	**create trigger** or **create rule** and **sp_bindrule**
default clause	**create default** and **sp_bindefault**

The method you choose depends on your requirements. For example, triggers provide more complex handling of referential integrity (such as referencing other columns or objects) than those declared in **create table**. Also, the constraints defined in a **create table** statement are specific for that table; unlike rules and defaults, you cannot bind them to other tables, and you can only drop or change them using **alter table**. Constraints cannot contain subqueries or aggregate functions, even on the same table.

- **create table** can include many constraints, with these limitations:
  - The number of **unique** constraints is limited by the number of indexes that a table can have.
  - A table can have only one **primary key** constraint.
  - You can include only one **default** clause per column in a table, but you can define different constraints on the same column.

  For example:

  ```
  create table discount_titles
   (title_id   varchar (6)   default "PS7777" not null
        unique clustered
        references titles (title_id)
        check (title_id like "PS%"),
           new_price   money)
  ```

  Column `title_id` of the new table `discount_titles` is defined with each integrity constraint.
- You can create error messages and bind them to referential integrity and **check** constraints. Create messages with **sp_addmessage** and bind them to the constraints with **sp_bindmsg**.
- The SAP ASE server evaluates check constraints before enforcing the referential constraints, and evaluates triggers after enforcing all the integrity constraints. If any constraint fails, the SAP ASE server cancels the data modification statement; any associated triggers do not execute. However, a constraint violation *does not* roll back the current transaction.
- In a referenced table, you cannot update column values or delete rows that match values in a referencing table. Update or delete from the referencing table first, then try updating or deleting from the referenced table.
- You must drop the referencing table before you drop the referenced table; otherwise, a constraint violation occurs.
- For information about constraints defined for a table, use **sp_helpconstraint**.

Unique and Primary-Key Constraints

Considerations when using unique and primary-key constraints.

- You can declare **unique** constraints at the column level or the table level. **unique** constraints require that all values in the specified columns be unique. No two rows in the table can have the same value in the specified column.
- A **primary key** constraint is a more restrictive form of **unique** constraint. Columns with **primary key** constraints cannot contain null values.

Note: The **create table** statement's **unique** and **primary key** constraints create indexes that define unique or primary key attributes of columns. **sp_primarykey**, **sp_foreignkey**, and **sp_commonkey** define logical relationships between columns. These relationships must be enforced using indexes and triggers.

- Table-level **unique** or **primary** key constraints appear in the **create table** statement as separate items and must include the names of one or more columns from the table being created.
- **unique** or **primary key** constraints create a unique index on the specified columns. The **unique** constraint in Example 3 creates a unique, clustered index, as does:

  ```
  create unique clustered index salesind
      on sales (stor_id, ord_num)
  ```

  The only difference is the index name, which you could set to `salesind` by naming the constraint.
- The definition of **unique** constraints in the SQL standard specifies that the column definition cannot allow null values. By default, the SAP ASE server defines the column as not allowing null values (if you have not changed this using **sp_dboption**) when you omit **null** or **not null** in the column definition. In Transact-SQL, you can define the column to allow null values along with the **unique** constraint, since the unique index used to enforce the constraint allows you to insert a null value.
- **unique** constraints create unique, nonclustered indexes by default; **primary key** constraints create unique, clustered indexes by default. There can be only one clustered index on a table, so you can specify only one **unique clustered** or **primary key clustered** constraint.
- The **unique** and **primary key** constraints of **create table** offer a simpler alternative to the **create index** statement. However:
  - You cannot create nonunique indexes.
  - You cannot use all the options provided by **create index**.
  - You must drop these indexes using **alter table drop constraint**.

Referential Integrity Constraints

Referential integrity constraints require that data inserted into a *referencing* table that defines the constraint must have matching values in a *referenced* table.

- A referential integrity constraint is satisfied for either of the following conditions:
  - The data in the constrained columns of the referencing table contains a null value.
  - The data in the constrained columns of the referencing table matches data values in the corresponding columns of the referenced table.

  Using the `pubs2` database as an example, a row inserted into the `salesdetail` table (which records the sale of books) must have a valid `title_id` in the `titles` table. `salesdetail` is the referencing table and `titles` table is the referenced table. Currently, `pubs2` enforces this referential integrity using a trigger. However, the `salesdetail` table could include this column definition and referential integrity constraint to accomplish the same task:

```
title_id tid
    references titles (title_id)
```

- The maximum number of table references allowed for a query is 192. Use **sp_helpconstraint** to check a table's referential constraints.
- A table can include a referential integrity constraint on itself. For example, the `store_employees` table in `pubs3`, which lists employees and their managers, has the following self-reference between the `emp_id` and `mgr_id` columns:

  ```
  emp_id id primary key,
  mgr_id id null
          references store_employees (emp_id),
  ```

  This constraint ensures that all managers are also employees, and that all employees have been assigned a valid manager.
- You cannot drop a referenced table until the referencing table is dropped or the referential integrity constraint is removed (unless it includes only a referential integrity constraint on itself).
- The SAP ASE server does not enforce referential integrity constraints for temporary tables.
- To create a table that references another user's table, you must have **references** permission on the referenced table. For information about assigning **references** permissions, see the **grant** command.
- Table-level, referential integrity constraints appear in the **create table** statement as separate items. They must include the **foreign key** clause and a list of one or more column names.

  Column names in the **references** clause are optional only if the columns in the referenced table are designated as a primary key through a **primary key** constraint.

  The referenced columns must be constrained by a unique index in that referenced table. You can create that unique index using either the **unique** constraint or the **create index** statement.
- The datatypes of the referencing table columns must match the datatypes of the referenced table columns. For example, the datatype of `col1` in the referencing table (`test_type`) matches the datatype of `pub_id` in the referenced table (`publishers`):

  ```
  create table test_type
   (col1 char (4) not null
      references publishers (pub_id),
  col2 varchar (20) not null)
  ```
- The referenced table must exist when you define the referential integrity constraint. For tables that cross-reference one another, use the **create schema** statement to define both tables simultaneously. As an alternative, create one table without the constraint and add it later using **alter table**. See **create schema** or **alter table** for more information.
- The **create table** referential integrity constraints offer a simple way to enforce data integrity. Unlike triggers, constraints cannot:
  - Cascade changes through related tables in the database
  - Enforce complex restrictions by referencing other columns or database objects

- Perform “what-if” analysis

Referential integrity constraints do not roll back transactions when a data modification violates the constraint. Triggers allow you to choose whether to roll back or continue the transaction depending on how you handle referential integrity.

Note: The SAP ASE server checks referential integrity constraints before it checks any triggers, so a data modification statement that violates the constraint does not also fire the trigger.

Using Cross-Database Referential Integrity Constraints

Usage considerations for cross-database referential integrity constraints.

- When you create a cross-database constraint, the SAP ASE server stores the following information in the `sysreferences` system table of each database:

Table 2. Information Stored for Referential Integrity Constraints

Information Stored in `sysreferences`	Columns with Information About the Referenced Table	Columns with Information About the Referencing Table
Key column IDs	`refkey1` through `refkey16`	`fokey1` through `fokey16`
Table ID	`reftabid`	`tableid`
Database ID	`pmrydbid`	`frgndbid`
Database name	`pmrydbname`	`frgndbname`

- You can drop the referencing table or its database. The SAP ASE server automatically removes the foreign-key information from the referenced database.
- Because the referencing table depends on information from the referenced table, the SAP ASE server does not allow you to:
  - Drop the referenced table,
  - Drop the external database that contains the referenced table, or
  - Use **sp_renamedb** to rename either database.

  You must use **alter table** to remove the cross-database constraint before you can do any of these actions.
- Each time you add or remove a cross-database constraint, or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

  Warning! Loading earlier dumps of databases containing cross-database constraints may cause database corruption.
- The `sysreferences` system table stores the name and the ID number of the external database. The SAP ASE server cannot guarantee referential integrity if you use **load database** to change the database name or to load it onto a different server.

Warning! Before dumping a database to load it with a different name or move it to another SAP ASE server, use **alter table** to drop all external referential integrity constraints.

check Constraints

A **check** constraint limits the values a user can insert into a column in a table.

- A **check** constraint specifies a *search_condition* that any non-null value must pass before it is inserted into the table. A *search_condition* can include:
  - A list of constant expressions introduced with **in**
  - A range of constant expressions introduced with **between**
  - A set of conditions introduced with **like**, which can contain wildcard characters

  An expression can include arithmetic operators and Transact-SQL built-in functions. The *search_condition* cannot contain subqueries, aggregate functions, or a host variable or parameter. The SAP ASE server does not enforce **check** constraints for temporary tables.
- A column-level **check** constraint can reference only the column in which it is defined; it cannot reference other columns in the table. Table-level **check** constraints can reference any column in the table.
- **create table** allows multiple **check** constraints in a column definition.
- **check** integrity constraints offer an alternative to using rules and triggers. They are specific to the table in which they are created, and cannot be bound to columns in other tables or to user-defined datatypes.
- **check** constraints do not override column definitions. If you declare a **check** constraint on a column that allows null values, you can insert NULL into the column, implicitly or explicitly, even though NULL is not included in the *search_condition*. For example, if you create a **check** constraint specifying “pub_id in (“1389”, “0736”, “0877”, “1622”, “1756”)” or “@amount > 10000” in a table column that allows null values, you can still insert NULL into that column. The column definition overrides the **check** constraint.

IDENTITY Columns

Information about using IDENTITY columns.

- The first time you insert a row into the table, the SAP ASE server assigns the IDENTITY column a value of 1. Each new row gets a column value that is 1 higher than the last value. This value takes precedence over any defaults declared for the column in the **create table** statement or bound to the column with **sp_bindefault**.

  The maximum value that can be inserted into an IDENTITY column is $10^{\text{precision}}$ - 1 for a numeric. For integer identities, it is the maximum permissible value of its type (such as 255 for `tinyint`, 32767 for `smallint`).

  See *System and User-Defined Datatypes* in *Reference Manual: Building Blocks* for more information about identifiers.
- Inserting a value into the IDENTITY column allows you to specify a seed value for the column or to restore a row that was deleted in error. The table owner, database owner, or system administrator can explicitly insert a value into an IDENTITY column after using **set identity_insert *table_name* on** for the base table. Unless you have created a unique index

on the IDENTITY column, the SAP ASE server does not verify the uniqueness of the value. You can insert any positive integer.

- You can reference an IDENTITY column using the **syb_identity** keyword, qualified by the table name where necessary, instead of using the actual column name.
- System administrators can use the **auto identity** database option to automatically include a 10-digit IDENTITY column in new tables. To turn on this feature in a database, use:

  ```
  sp_dboption database_name, "auto identity", "true"
  ```

  Each time a user creates a table in the database without specifying a **primary** key, a **unique** constraint, or an IDENTITY column, the SAP ASE server automatically defines an IDENTITY column. This column, SYB_IDENTITY_COL, is not visible when you retrieve columns with the **select** * statement. You must explicitly include the column name in the select list.
- Server failures can create gaps in IDENTITY column values. Gaps can also occur due to transaction rollbacks, the deletion of rows, or the manual insertion of data into the IDENTITY column. The maximum size of the gap depends on the setting of the **identity burning set factor** and **identity grab size** configuration parameters, or the **identity_gap** value given in the **create table** or **select into** statment. See *Managing Identity Gaps in Tables* in the *Transact-SQL Users Guide*.

Specifying a Locking Scheme

To specify the locking scheme for a table, use the keyword **lock** and one of: allpages locking, datapages locking, datarows locking.

- Allpages locking – locks data pages and the indexes affected by queries.
- Datapages locking – locks only data pages.
- Datarows locking – locks only data rows.

If you do not specify a locking scheme, the default locking scheme for the server is used. The server-wide default is set with the configuration parameter **lock scheme**.

You can use **alter table** to change the locking scheme for a table.

Getting Information About Tables

There are several system procedures you can use to obtain information about tables.

- **sp_help** displays information about tables, listing any attributes (such as cache bindings) assigned to the specified table and its indexes, giving the attribute's class, name, integer value, character value, and comments.
- **sp_depends** displays information about the views, triggers, and procedures in the database that depend on a table.
- **sp_helpindex** reports information about the indexes created on a table.
- **sp_helpartition** reports information about the table's partition properties.

Creating Tables with Partitions

Considerations for creating tables with partitions.

- Before you create a table with partitions, you must prepare the disk devices and segments that you are using for the partitions.
- Range partitioning is dependent on sort order. If the sort order is changed, you must repartition the table for the new sort order.
- Range-partition bounds must be in ascending order according to the order in which the partitions are created.
- A column of `text`, `unitext`, `image`, or `bit`, Java datatype, or computed column cannot be part of a partition key, but a partitioned table can include columns with these datatypes. A composite partition key can contain up to 31 columns.
- For range and hash partitions, the partition key can be a composite key with as many as 31 columns. In general, however, a table with more than four partition columns becomes hard to manage and is not useful.
- Bound values for range and list partitions must be compatible with the corresponding partition key datatype. If a bound value is specified in a compatible but different datatype, the SAP ASE server converts the bound value to the partition key's datatype. The SAP ASE server does not support:
  - Explicit conversions.
  - Implicit conversions that result in data loss.
  - NULL as a boundary in a range-partitioned table.
  - Conversions from nonbinary datatypes to `binary` or `varbinary` datatypes.
- You can use NULL in a value list for list-partitioned tables.
- You can partition a table that contains `text` and `image` columns, but partitioning has no effect on the way the SAP ASE server stores the `text` and `image` columns because they reside on their own partition.
- You cannot partition remote tables.
- The SAP ASE server considers NULL to be lower than any other partition key value for a given parition key column.

Creating Tables With Computed Columns

Take these into consideration when creating tables with computed columns.

- *computed_column_expression* can reference only columns in the same table.
- The deterministic property of *computed_column_expression* significantly affects data operations. See *Deterministic Property* in the *Transact-SQL Users Guide*.
- Computed columns cannot have default values, and cannot be `identity` or `timestamp` columns.

- You can specify nullability only for materialized computed columns. If you do not specify nullability, all computed columns are, by default, nullable. Virtual computed columns are always nullable.
- Triggers and constraints, such as `check`, `rule`, `unique`, `primary key`, or `foreign key`) support only materialized computed columns. You cannot use them with virtual computed columns.
- If a user-defined function in a computed column definition is dropped or becomes invalid, any computed column operations that call that function fail.

Creating Tables with Encrypted Columns

Considerations for creating tables with encrypted columns.

You can encrypt these datatypes:

- `int, smallint, tinyint`
- `unsigned int`, `unsigned smallint`, `unsigned tinyint`
- `bigint`, `unsigned bigint`
- `decimal`, `numeric`
- `float4`, `float8`
- `money`, `smallmoney`
- `date`, `time`, `smalldatetime`, `datetime`, `bigdatetime`
- `char`, `varchar`
- `unichar`, `univarchar`
- `binary`, `varbinary`
- `bit`

The underlying datatype of encrypted data on disk is `varbinary`. Null values are not encrypted.

create table displays an error if you:

- Specify a computed column based on an expression that references one or more encrypted columns.
- Use the **encrypt** and **compute** parameters on the same column.
- List an encrypted column in the **partition** clause

During **create table**, **alter table**, and **select into** operations, the SAP ASE server calculates the maximum internal length of the encrypted column. The database owner must know the maximum length of the encrypted columns before he or she can make decisions about schema arrangements and page sizes.

You can create an index on an encrypted column if you specify the encryption key without any initialization vector or random padding. Adpative Server issues an error if you execute **create index** on an encrypted column with an initialization vector or random padding.

You can define referential integrity constraints on encrypted columns when:

- Both referencing and referenced columns are encrypted.
- The key you use to encrypt the columns specifies **init_vector null** and you have not specified **pad random**.

You cannot encrypt a computed column, and an encrypted column cannot appear in the expression defining a computed column. You cannot specify an encrypted column in the *partition_clause* of **create table**.

See *Encrypted Data* in the *Encrypted Columns Users Guide*.

Limitations When Creating Virtually Hashed Tables

Limitations for creating virtually hashed tables.

- You cannot use **create table** on the segment that includes a virtually hashed table, since a virtually hashed table must take only one exclusive segment, which cannot be shared by other tables or databases.
- Virtually hashed tables must have unique rows. Virtually hashed tables do not allow multiple rows with the same key column values because the SAP ASE server cannot keep one row in the hash region and another with the same key column value in the overflow clustered region.
- **truncate table** is not supported. Use **delete from *table_name*** instead.
- SQL92 does not allow two unique constraints on a relation to have the same key columns. However, the primary key clause for a virtually hashed table is not a standard unique constraint, so you can declare a separate unique constraint with the same key columns as the virtually hashed keys.
- Because you cannot create a virtually hashed clustered index after you create a table, you also cannot drop a virtually hashed clustered index.
- You must create a virtually hashed table on an exclusive segment. You cannot share disk devices you assign to the segments for creating a virtually hashed table with other segments.
- You cannot create two virtually hashed tables on the same exclusive segment. The SAP ASE server supports 32 different segments per database. Three segments are reserved for the default, system, and log segments, so the maximum number of virtually-hashed tables per database is 29.
- You cannot use the **alter table** or **drop clustered index** commands on virtually hashed tables.
- Virtually hashed tables must use all-pages locking.
- The key columns and hash factors of a virtually hashed table must use the `int` datatype.
- You cannot include `text` or `image` columns in virtually hashed tables, or columns with datatypes based on the `text` or `image` datatypes.
- You cannot create a partitioned virtually hashed table.

Creating Tables for In-Memory and Relaxed Durability Databases

Table-level logging settings defined by **create table** also apply to tables created via **select into**.

Although you can create tables with minimal logging in databases using full durability, the databases do not use minimal logging for these tables. The SAP ASE server allows you to set these tables to minimal logging so you can use these databases as templates for other databases with durability set to **no_recovery**, where minimal logging takes effect in the dependent database.

Restrictions for Shared-Disk Clusters

Restrictions for working with shared-disk clusters.

- Include a referential integrity constraint that references a column on a local temporary database unless it is from a table on the same local temporary database. **create table** fails if it attempts to create a reference to a column on a local temporary database from a table in another database.
- Encrypt a column with an encryption key stored in a local temporary database unless the column's table resides on the same local temporary database. **alter table** fails if it attempts to encrypt a column with an encryption key on the local temporary database and the table is in another database.

Space Management Properties

The space management properties **fillfactor**, **max_rows_per_page**, **exp_row_size**, and **reservepagegap** help manage space usage for tables.

- **fillfactor** leaves extra space on pages when indexes are created, but the **fillfactor** is not maintained over time.
- **max_rows_per_page** limits the number of rows on a data or index page. Its main use is to improve concurrency in allpages-locked tables, since reducing the number of rows can reduce lock contention. If you specify a **max_rows_per_page** value and **datapages** or **datarows** locking, a warning message is printed. The table is created, and the value is stored in `sysindexes`, but it is applied only if the locking scheme is changed later to **allpages**.
- **exp_row_size** specifies the expected size of a data row. It applies only to data rows, not to indexes, and applies only to data-only-locked tables that have variable-length columns. It is used to reduce the number of forwarded rows in data-only-locked tables. It is needed mainly for tables where rows have null or short columns when first inserted, but increase in size as a result of subsequent updates. **exp_row_size** reserves space on the data page for the row to grow to the specified size. If you specify **exp_row_size** when you create an allpages-locked table, a warning message is printed. The table is created, and the value is stored in `sysindexes`, but it is applied only if the locking scheme is changed later to **datapages** or **datarows**.

- **reservepagegap** specifies the ratio of empty pages to full pages to apply for commands that perform extent allocation. It applies to both data and index pages, in all locking schemes.

This table shows the valid combinations of space management properties and locking scheme. If a **create table** command includes incompatible combinations, a warning message is printed and the table is created. The values are stored in system tables, but are not applied. If the locking scheme for a table changes so that the properties become valid, then they are used.

Property	allpages	datapages	datarows
max_rows_per_page	Yes	No	No
exp_row_size	No	Yes	Yes
reservepagegap	Yes	Yes	Yes
fillfactor	Yes	Yes	Yes

This table shows the default values and the effects of using default values for the space management properties.

Property	De-fault	Effect of Using the Default
max_rows_per_page	0	Fits as many rows as possible on the page, up to a maximum of 255
exp_row_size	0	Uses the server-wide default value, which is set with the configuration parameter **default exp_row_size percent**
reservepagegap	0	Leaves no empty pages during extent allocations
fillfactor	0	Fully packs leaf pages, with space left on index pages

Using reservepagegap

Commands that use large amounts of space allocate new space by allocating an extent rather than allocating single pages. The **reservepagegap** keyword causes these commands to leave empty pages so that subsequent page allocations occur close to the page being split or close to the page from which a row is being forwarded.

This table shows when **reservepagegap** is applied:

Command	Applies to data pages	Applies to index pages
Fast **bcp**	Yes	Fast **bcp** is not used if indexes exist
Slow **bcp**	Only for heap tables, not for tables with a clustered index	Extent allocation not performed

Command	Applies to data pages	Applies to index pages
select into	Yes	No indexes exist on the target table
create index or **alter table...constraint**	Yes, for clustered indexes	Yes
reorg rebuild	Yes	Yes
alter table...lock (For allpages-locking to data-only locking, or vice versa)	Yes	Yes

Java-SQL Columns

If Java is enabled in the database, you can create tables with Java-SQL columns.

The declared class (*datatype*) of the Java-SQL column must implement either the **Serializable** or **Externalizable** interface.

When you create a table, you cannot specify a Java-SQL column:

- As a foreign key
- In a references clause
- As having the UNIQUE property
- As the primary key

If **in row** is specified, the value stored cannot exceed 16K bytes, depending on the page size of the database server and other variables.

If **off row** is specified:

- The column cannot be referenced in a check constraint.
- The column cannot be referenced in a **select** that specifies **distinct**.
- The column cannot be specified in a comparison operator, in a predicate, or in a **group by** clause.

Refer to *Java in Adaptive Server Enterprise*.

Determining Values for hash_factor

You can keep the hash factor for the first key as 1. The hash factor for all the remaining key columns is greater than the maximum value of the previous key allowed in the hash region multiplied by its hash factor.

The SAP ASE server allows tables with hash factors greater than 1 for the first key column to have fewer rows on a page. For example, if a table has a hash factor of 5 for the first key column, after every row in a page, space for the next four rows is kept empty. To support this, the SAP ASE server requires five times the amount of table space.

If the value of a key column is greater than or equal to the hash factor of the next key column, the current row is inserted in the overflow clustered region to avoid collisions in the hash region.

For example, `t` is a virtually hashed table with key columns `id` and `age`, and corresponding hash factors of (10,1). Because the hash value for rows (5, 5) and (2, 35) is 55, this may result in a hash collision.

However, because the value 35 is greater than or equal to 10 (the hash factor for the next key column, `id`), the SAP ASE server stores the second row in the overflow clustered region, avoiding collisions in the hash region.

In another example, if `u` is a virtually hashed table with a primary index and hash factors of (id1, id2, id3) = (125, 25, 5) and a *max hash_value* of 200:

- Row (1,1,1) has a hash value of 155 and is stored in the hash region.
- Row (2,0,0) has a hash value 250 and is stored in overflow clustered region.
- Row (0,0,6) has a hash factor of 6 x 5, which is greater than or equal to 25, so it is stored in the overflow clustered region.
- Row (0,7,0) has a hash factor of 7 x 25, which is greater than or equal to 125, so it is stored in the overflow clustered region

create thread pool

Creates a user-defined thread pool.

Considerations for process mode

create thread pool is not supported in process mode.

Syntax

```
create thread pool pool_name with thread count = count
    [, pool description = description ]
    [idle timeout = time_period]
        [for instance inst_name | global ]
```

Parameters

- ***pool_name* –** name of the pool you are creating.
- **thread count = *count* –** number of threads in the pool. Must be greater than or equal to 1.
- **pool description = *description* –** (Optional) describes the pool's purpose. Must be fewer than 256 characters.
- **idle timeout = *time_period* –** time, in microseconds, that threads look for work before going to sleep. The default is 100 microseconds. A value of -1 means the threads never go

to sleep, and continue to consume CPU if no work is available. A value of 0 indicates that threads immediately go to sleep if they find no work.

- **for instance [*inst_name* | global] –** is name of the instance, or global for all instances.

Examples

- **Example 1 –** Creates a thread pool named `sales_pool` with 10 threads:

  ```
  create thread pool sales_pool with thread count = 10
  ```

- **Example 2 –** Creates a thread pool named `order_pool`, which includes a description:

  ```
  create thread pool order_pool with thread count = 10,
  pool description = 'used for handling order entry users'
  ```

- **Example 3 –** Creates a thread pool named `order_pool` with 2 threads and an **idle timeout** of 500 microseconds:

  ```
  create thread pool order_pool with thread count = 2,
  idle timeout = 500
  ```

Usage

- Use **sp_addexeclass** to associate workload with a user-created thread pool.
- The SAP ASE server must have a sufficient number of free engines to bring online all threads (specified by *count*) in an engine pool. The value for **max online engines** determines the total number of engines. The total number of active threads in all engine pools cannot exceed the value of **max online engines**.
- *pool_name* cannot start with `syb_`, which is reserved for SAP-created thread pools.
- You cannot use Transact-SQL variables as parameters to **create thread pool**.
- A value of 0 for **idle timeout** 0 indicates that threads immediately go to sleep if they find no work.
- A value of -1 for **idle timeout** 0 indicates that threads never go to sleep, and continue to consume CPU if no work is available.
- You can issue **create thread pool** with **execute immediate**.

When using the `for instance` clause:

- If you do not specify the **for instance** clause, **create thread pool** creates thread pools on all instances.
- You can only create instance-specific pools from the same instance.
- The instance-specific attribute has precedence over global attributes.
- To create thread pools with the same name but with different attributes, create a thread pool on first instance, then use **alter thread pool** on the other instances.
- Rename and description are global operations; for example, both *pool_name* and *description* are same for all instances.

Standards

ANSI SQL – Compliance level: Transact-SQL extension

Permissions

The permission checks for **create thread pool** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with the `manage any thread pool` privilege.
Disabled	With granular permissions disabled, you must be a user with **sa_role**.

Auditing

Information	Values
Event	42
Audit option	
Command or access audited	
Information in `extrainfo`	Pool name and thread count

See also

- *alter thread pool* on page 80
- *drop thread pool* on page 366

create trigger

Creates one or more new triggers, or re-creates an existing trigger. A trigger is a type of stored procedure that is often used to enforce integrity constraints, executing automatically when a user attempts a specified data modification statement on a specified table.

Syntax

```
create [or replace] trigger [owner.]trigger_name
    on [owner.]table_name
    {for {insert , update} | instead of {insert, update, delete}}
     [order integer]
     [as
        [if update (column_name)
            [{and | or} update (column_name)]...]
            SQL_statements
        [if update (column_name)
            [{and | or} update (column_name)]...
            SQL_statements]...]
```

Parameters

- **create –** creates a trigger if one does not already exist.
- **or replace –** re-creates an existing trigger. Use this clause to change the definition of a trigger. When specifying **or replace**, auditing options on the trigger are not dropped. If there is no existing trigger with the name you enter, a new one is created and the old trigger remains. This is in conjunction with multiple triggers.
- ***trigger_name* –** is the name of the trigger, which must conform to the rules for identifiers and be unique in the database. Specify the owner's name to create another trigger of the same name owned by a different user in the current database. The default value for *owner* is the current user. If you use an owner name to qualify a trigger, you must explicitly qualify the table name the same way.

  You cannot use a variable for a trigger name.

  The name of the trigger is not changed when the trigger definition is replaced. The name of the new trigger definition must match the old name to be replaced. If the trigger name differs from any existing trigger, a new trigger is created and the old trigger is not dropped .
- ***table_name* –** is the name of the table on which to create the trigger. If more than one table of the same name exists in the database, specify the owner's name. The default value for *owner* is the current user.

  You cannot change the name of the table when a trigger is replaced. If an existing trigger is modified to associate the trigger with another table, then an error is raised indicating that the trigger already exists on another table and cannot be replaced.
- **for | instead of – for** – used before **insert**, **delete**, or **update** to indicate what you are creating the trigger for.

  instead of – creates and fills the inserted and deleted *pseudo tables*, which are used in the trigger to examine the rows that would have been modified by the original **insert**, **delete**, or **update** query.

  You cannot change an "instead of" trigger to a "for" trigger, and vice versa.
- **insert, update, delete –** can be included in any combination. **delete** cannot be used with the **if update** clause.

  You can change these actions when you use the **or replace** clause. For example, if the old trigger definition specifies all clauses, the replacement definition can specify all clauses, or a combination of the actions.
- **order *integer* –** specifies a partial or full ordering of trigger firing:

  - Full ordering occurs when you create all the triggers using the `order` clause.

  - Partial ordering occurs if you do not specify the `order` clause on some of the triggers. Triggers without the `order` clause implicitly take order number 0 and do not have a defined order, except that they fire after those triggers created using `order`.

- ***SQL_statements*** **–** specifies trigger conditions and trigger actions. Trigger conditions determine whether the attempted **insert**, **update**, or **delete** causes the trigger actions to be carried out. The SQL statements often include a subquery preceded by the keyword **if**. In Example 2, below, the subquery that follows the keyword **if** is the trigger condition.

  Trigger actions take effect when the user action (**insert**, **update**, or **delete**) is attempted. If multiple trigger actions are specified, they are grouped with **begin** and **end**.

  You can change trigger conditions and actions when the trigger definition is replaced.
- **if update –** tests whether the specified column is included in the **set** list of an **update** statement or is affected by an **insert**. **if update** allows specified trigger actions to be associated with updates to specified columns (see Example 3). More than one column can be specified, and you can use more than one **if update** statement in a **create trigger** statement.

  You can drop or add the **if update** and change the column name referenced by this clause.
- **order *integer* –** the order of the trigger firing can also be changed when the trigger definition is replaced.

Examples

- **Example 1 –** Prints a message when anyone tries to add data or change data in the `titles` table:

```
create trigger reminder
on titles
for insert, update as
print "Don't forget to print a report for accounting."
```

- **Example 2 –** Prevents insertion of a new row into `titleauthor` if there is no corresponding `title_id` in the `titles` table:

```
create trigger t1
on titleauthor
for insert as
if (select count (*)
    from titles, inserted
    where titles.title_id = inserted.title_id) = 0
begin
print "Please put the book's title_id in the
        titles table first."
rollback transaction
end
```

- **Example 3 –** If the `pub_id` column of the `publishers` table is changed, make the corresponding change in the `titles` table:

```
create trigger t2
on publishers
```

```
for update as
if update (pub_id) and @@rowcount = 1
begin
    update titles
    set titles.pub_id = inserted.pub_id
    from titles, deleted, inserted
    where deleted.pub_id = titles.pub_id
end
```

- **Example 4 –** Deletes title from the `titles` table if any row is deleted from `titleauthor`. If the book was written by more than one author, other references to it in `titleauthor` are also deleted:

```
create trigger t3
on titleauthor
for delete as
begin
    delete titles
    from titles, deleted
    where deleted.title_id = titles.title_id
    delete titleauthor
    from titleauthor, deleted
    where deleted.title_id = titleauthor.title_id
    print "All references to this title have been
    deleted from titles and titleauthor."
end
```

- **Example 5 –** Prevents updates to the primary key on weekends. Prevents updates to the price or advance of a title unless the total revenue amount for that title surpasses its advance amount:

```
create trigger stopupdatetrig
on titles
for update
as
if update (title_id)
  and datename (dw, getdate ())
  in ("Saturday", "Sunday")
  begin
    rollback transaction
    print "We don't allow changes to"
    print "primary keys on the weekend!"
  end
if update (price) or update (advance)
  if (select count (*) from inserted
    where (inserted.price * inserted.total_sales)
    < inserted.advance) > 0
    begin
    rollback transaction
    print "We don't allow changes to price or"
    print "advance for a title until its total"
    print "revenue exceeds its latest advance."
    end
```

- **Example 6 –** Uses **instead of** triggers to update union views:

```
create table EmployeeWest (
    empid                         int primary key,
    empname                       varchar(30),
    empdob                        datetime,
    region                        char(5)
        constraint region_chk
           check (region='West'))

create table EmployeeEast (
    empid                         int primary key,
    empname                       varchar(30),
    empdob                        datetime,
    region                        char(5)
        constraint region_chk
           check (region='East’))

create view Employees as
    select * from EmployeeEast
    union all
    select * from EmployeeWest

create trigger EmployeesInsertTrig on Employees
instead of insert as
begin

   insert into EmployeeEast select * from inserted where region =
"East"

   insert into EmployeeWest select * from inserted where region =
"West"
end

--will insert the data into the EmployeeEast table
insert into Employees values (10, 'Jane Doe', '11/11/1967',
'East')

--will insert the data into the EmployeeWest table
insert into Employees values (11, 'John Smith', '01/12/1977',
'West')

--will insert multiple rows into EmployeeEast and
--EmployeeWest tables. Employee2 table includes employees
--from both East and West.
insert into Employees select * from Employee2
```

- **Example 7 –** Uses **instead of** triggers to implement encrypted column support, storing data in the database in encrypted form without changing applications (the user-defined functions, **my_encrypt** and **my_decrypt**, perform the encryption and decryption operations on the data):

```
CREATE TABLE Employee_t (id int PRIMARY KEY, name varchar(20),
            salary binary (64))
--where the id and name columns are stored unencrypted, salary is
--encrypted and id is a primary key.

create view employee_v as select id, name, my_decrypt (salary)
from employee_t
```

```
CREATE TRIGGER EmployeeInsert
ON employee_v
INSTEAD OF INSERT
AS
BEGIN
    INSERT employee_t SELECT id, name, my_encrypt (salary)
    FROM inserted
END

CREATE TRIGGER employeeUpdate
ON employee_v
INSTEAD OF UPDATE
AS
BEGIN
    DELETE FROM employee_t WHERE id IN (SELECT id FROM deleted)
    INSERT employee_t SELECT id, name, my_encrypt (salary)
    FROM inserted
END

CREATE TRIGGER employeeDelete
ON employee_v
INSTEAD OF DELETE
AS
BEGIN
    DELETE FROM employee_t WHERE id IN (SELECT id FROM deleted)
END
```

- **Example 8 –** Creates a trigger that prints a message when anyone tries to insert or update data in the `titles` table:

```
create trigger reminder
on titles
for insert, update as
print "Don't forget to print a report for accounting."

select object_id("reminder")
-----------
1312004674
```

The next command changes the message of the printed trigger when anyone tries to update data in the titles table using the **or replace** clause:

```
create or replace trigger reminder
on titles
for update as
print "Don't forget to give a report to accounting."

select object_id("reminder")
-----------
1312004674
```

Usage

- To avoid seeing unexpected results due to changes in settings, run **set rowcount 0** as your initial statement before executing **create trigger**. The scope of **set** is limited to only the **create trigger** command, and resets to your previous setting once the procedure exits.
- A trigger fires only once per data modification statement. A complex query containing a **while** loop may repeat an **update** or **insert** many times, and the trigger is fired each time.
- In versions earlier than SAP ASE 16.0, consecutive **create trigger** commands dropped the old trigger and replaced it with a new trigger definition. However, the auditing options for the trigger were also dropped. Using the optional **or replace** clause, the definition is replaced, and auditing options are preserved.
- In SAP ASE version 16.0 and later, when there are multiple triggers, specifying **create** without **or replace** raises an error if the trigger name is same. If you specify a different trigger name, a new trigger is created and the old trigger remains.
- In versions of SAP ASE earlier than 16.0, if an existing trigger was replaced with the new trigger definition by specifying create without or replace, the name of the new trigger did not need to be same as the name of the old trigger name.
- You can only use the `order` *`integer`* clause with `for {insert | update | delete}`; you cannot use it with `instead of {insert | update | delete}` triggers.
- If you use a duplicate number for `order`, SAP ASE reports an error. `order` numbers need not be consecutive; in fact, nonconsecutive numbers might be preferable, as they allow you to insert new triggers into the middle of an order.

See also **sp_commonkey**, **sp_configure**, **sp_depends**, **sp_foreignkey**, **sp_help**, **sp_helptext**, **sp_primarykey**, **sp_rename**, **sp_spaceused** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

Permissions on objects at trigger creation – when you create a trigger, the SAP ASE server makes no permission checks on objects such as tables or views that the trigger references. Therefore, you can successfully create a trigger, even though you do not have access to its objects. All permission checks occur when the trigger fires.

Permissions on objects at trigger execution – when the trigger executes, permission checks on its objects depend on whether the trigger and its objects are owned by the same user.

- If the trigger and its objects are not owned by the same user, the user who caused the trigger to fire must have been granted direct access to the objects. For example, if the trigger performs a select from a table the user cannot access, the trigger execution fails. In addition, the data modification that caused the trigger to fire is rolled back.

- If a trigger and its objects are owned by the same user, special rules apply. The user automatically has implicit permission to access the trigger's objects, even though the user cannot access them directly. See the detailed description of the rules for implicit permissions in the *System Administration Guide*.

Permissions for **instead of**and for triggers **instead of** – **instead of** triggers have the same permission requirements as **for** triggers: to create a view with **instead of** triggers, permission for **insert**/**update**/**delete** for the view, not the underlying tables, must be granted to the user.

Any user who impersonates the trigger owner through an alias or **setuser** cannot replace the trigger.

The following describes permission checks for **create trigger** that differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner and the `create trigger` privilege must not have been revoked to create a trigger. To create a trigger for another user's table, you must have the `create any trigger` privilege. You must be the trigger owner to replace the trigger.
Disabled	With granular permissions disabled, only a system security officer can grant or revoke permissions to create triggers. A user with **sa_role** has implicit permission to create a trigger on any user table. Users can create triggers only on tables that they own. You must be the trigger owner to replace the trigger. The system security officer may revoke user permission to create triggers. Revoking permission to create triggers affects only the database in which the systems security officer issues the **revoke** command. Permission to run the **create trigger** command is restored to the users whose permission was revoked when the system security officer explicitly grants them `create trigger` privilege.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	12
Audit option	**create**
Command or access audited	**create trigger**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect • or replace – for **create or replace**

See also

- *alter table* on page 43
- *create procedure* on page 169
- *drop trigger* on page 368
- *rollback trigger* on page 576
- *set* on page 607
- *create table* on page 207
- *select* on page 579
- *create database* on page 104
- *create default* on page 117
- *create index* on page 140
- *create rule* on page 195
- *create view* on page 268
- *alter database* on page 1
- *truncate table* on page 672
- *grant* on page 419
- *revoke* on page 559
- *update statistics* on page 698
- *load database* on page 485
- *load transaction* on page 501
- *disk init* on page 319
- *disk refit* on page 329
- *disk reinit* on page 330
- *disk remirror* on page 334
- *disk unmirror* on page 339

Triggers and Referential Integrity

Triggers are commonly used to enforce *referential integrity* (integrity rules about relationships between the primary and foreign keys of tables or views), and to supply cascading deletes and updates.

A trigger fires only after the data modification statement has completed and the SAP ASE server has checked for any datatype, rule, or integrity constraint violations. The trigger and the statement that fires it are treated as a single transaction that can be rolled back from within the trigger. If a severe error is detected, the entire transaction is rolled back.

You can also enforce referential integrity using constraints defined with the **create tablecreate table** statement as an alternative to using **create trigger**. See **create table** and **alter table** for information about integrity constraints.

The deleted and inserted Logical Tables

`deleted` and `inserted` are logical (conceptual) tables. They are structurally identical to the table for which the trigger is defined—that is, the table on which the user action is attempted—and hold the old values or new values of the rows that would be changed by the user action.

Note: Both inserted and deleted tables appear as views on the transaction log, but they are fake tables on `syslogs`.

`deleted` and `inserted` tables can be examined by the trigger to determine whether or how the trigger action should be carried out, but the tables themselves cannot be altered by the trigger's actions.

`deleted` tables are used with **delete** and **update**; `inserted` tables, with **insert** and **update**. An **update** is a **delete** followed by an **insert**: it affects the `deleted` table first, and then the `inserted` table.

Trigger Restrictions

Restrictions for using triggers.

- You can create a trigger only in the current database. If you use an owner name to qualify a trigger, you must explicitly qualify the table name the same way. A trigger can reference objects outside the current database.
- A trigger cannot apply to more than one table. However, the same trigger action can be defined for more than one user action (for example, **insert** and **update**) in the same **create trigger** statement. A table can have a maximum of three triggers—one each for **insert**, **update**, and **delete**.
- Each new trigger in a table or column for the same operation (**insert**, **update**, or **delete**) overwrites the previous one. No warning message appears before the previous trigger is overwritten.

- You cannot create a trigger on a session-specific temporary table.
- You cannot create a trigger on a view.
- You cannot create a trigger on a system table.
- You cannot use triggers that select from a `text`, `unitext`, or `image` column of the inserted or deleted table.
- Triggers should not include **select** statements that return results to the user, since special handling that allows modifications to the trigger table must be written into every application program for the returned results.
- If a trigger references table names, column names, or view names that are not valid identifiers, you must **set quoted_identifier on** before the **create trigger** command, and enclose each such name in double quotes. The **quoted_identifier** option does not need to be on when the trigger fires.

Triggers and Performance

In performance terms, trigger overhead is usually very low. The time involved in running a trigger is spent mostly in referencing other tables, which are either in memory or on the database device.

The `deleted` and `inserted` tables often referenced by triggers are always in memory rather than on the database device, because they are logical tables. The location of other tables referenced by the trigger determines the amount of time the operation takes.

Setting Options Within Triggers

You can use the **set** command inside a trigger. The **set** option you invoke remains in effect during the execution of the trigger, then reverts to its former setting. In particular, you can use the **self_recursion** option inside a trigger so that data modifications by the trigger itself can cause the trigger to fire again.

Dropping a Trigger

You must drop and re-create the trigger if you rename any of the objects referenced by the trigger.

You can rename a trigger with **sp_rename**.

When you drop a table, any triggers associated with it are also dropped.

Actions That Do Not Cause Triggers to Fire

A **truncate table** command is not caught by a **delete** trigger.

Although a **truncate table** statement is, in effect, like a **delete** without a **where** clause (it removes all rows), changes to the data rows are not logged, and so cannot fire a trigger.

Since permission for the **truncate table**command defaults to the table owner and is not transferable, only the table owner need worry about inadvertently circumventing a **delete** trigger with a **truncate table** statement.

The **writetext** command, whether logged or unlogged, does not cause a trigger to fire.

Nesting Triggers and Trigger Recursion

By default, the SAP ASE server allows nested triggers.

- To prevent triggers from nesting, use **sp_configure** to set the **allow nested triggers** option to 0 (off):

  ```
  sp_configure "allow nested triggers", 0
  ```
- Triggers can be nested to a depth of 16 levels. If a trigger changes a table on which there is another trigger, the second trigger fires and can then call a third trigger, and so forth. If any trigger in the chain sets off an infinite loop, the nesting level is exceeded and the trigger aborts, rolling back the transaction that contains the trigger query.

  Note: Since triggers are put into a transaction, a failure at any level of a set of nested triggers cancels the entire transaction: all data modifications are rolled back. Supply your triggers with messages and other error handling and debugging aids to determine where the failure occurred.
- The global variable *@@nestlevel* contains the nesting level of the current execution. Each time a stored procedure or trigger calls another stored procedure or trigger, the nesting level is incremented. The nesting level is also incremented by one when a cached statement is created. If the maximum of 16 is exceeded, the transaction aborts.
- If a trigger calls a stored procedure that performs actions that would cause the trigger to fire again, the trigger is reactivated only if nested triggers are enabled. Unless there are conditions within the trigger that limit the number of recursions, this causes a nesting-level overflow.

  For example, if an update trigger calls a stored procedure that performs an update, the trigger and stored procedure execute once if **allow nested triggers** is off. If **allow nested triggers** is on, and the number of updates is not limited by a condition in the trigger or procedure, the procedure or trigger loop continues until it exceeds the 16-level maximum nesting value.
- By default, a trigger does not call itself in response to a second data modification to the same table within the trigger, regardless of the setting of the **allow nested triggers** configuration parameter. A **set** option, **self_recursion**, enables a trigger to fire again as a result of a data modification within the trigger. For example, if an update trigger on one column of a table results in an update to another column, the update trigger fires only once when **self_recursion** is disabled, but it can fire up to 16 times if **self_recursion** is set on. The **allow nested triggers** configuration parameter must also be enabled in order for self-recursion to take place.

Restrictions for instead of

Restrictions for using `instead of` triggers.

- If a trigger references table names, column names, or view names that are not valid identifiers, you must set **quoted_identifier on** before the **create trigger** command, and enclose each such name in double quotation marks. The **quoted_identifier** option does not need to be **on** when the trigger fires; bracketed identifiers also work.

- Using the **set cursor rows** command with client cursors, cursors declared through Open Client calls, or Embedded SQL™, may prevent positioned **delete** and **update** from firing an **instead of** trigger. A positioned update statement is a SQL **update** statement that contains the **where current of <*cursorname*>** clause to update only the row upon which the cursor, **<*cursorname*>**, is currently positioned.
- Joins are not allowed in searched **delete** and **update** statements that would fire an **instead of** trigger.
- **positioned delete** and **update** on cursors defined with joins does not fire an **instead of** trigger.

  A **positioned delete** (or **positioned update**) is a SQL **delete** (or **update**) statement containing a **where current of <*cursorname*>** clause to delete (or update) only the row upon which the cursor, **<*cursorname*>**, is currently positioned.
- For **positioned delete** and **update** statements that fire an **instead of** trigger, the **instead of** trigger must exist when the cursor is declared.

Getting Information About Triggers

Get information about working with triggers.

- The execution plan for a trigger is stored in `sysprocedures`.
- Each trigger is assigned an identification number, which is stored as a new row in `sysobjects` with the object ID for the table to which it applies in the `deltrig` column, and also as an entry in the `deltrig`, `instrig`, and `updtrig` columns of the `sysobjects` row for the table to which it applies.
- Use **sp_helptext** to display the text of a trigger, which is stored in `syscomments`.

  If the system security officer has reset the **allow select on syscomments.text column** parameter with **sp_configure** (as required to run the SAP ASE server in the evaluated configuration), you must be the creator of the trigger or a system administrator to view the text of the trigger through **sp_helptext**.
- For a report on a trigger, use **sp_help**.
- For a report on the tables and views that are referenced by a trigger, use **sp_depends**.

Triggers and Transactions

When a trigger is defined, the action it specifies on the table to which it applies is always implicitly part of a transaction, along with the trigger itself.

Triggers are often used to roll back an entire transaction if an error is detected, or they can be used to roll back the effects of a specific data modification:

- When the trigger contains the **rollback transaction** command, the rollback aborts the entire batch, and any subsequent statements in the batch are not executed.

- When the trigger contains the **rollback trigger**, the rollback affects only the data modification that caused the trigger to fire. The **rollback trigger** command can include a **raiserror** statement. Subsequent statements in the batch are executed.

Since triggers execute as part of a transaction, the following statements and system procedures are not allowed in a trigger:

- All **create** commands, including **create database**, **create default**, **create index**, **create procedure**, **create rule**, **create table**, **create trigger**, and **create view**
- All **drop** commands
- **alter database** and **alter table**
- **truncate table**
- **grant** and **revoke**
- **update statistics**
- **sp_configure**
- **load database** and **load transaction**
- **disk init**, **disk refit**, **disk reinit**, **disk remirror**, , **disk unmirror**
- **select into**

If a desired result (such as a summary value) depends on the number of rows affected by a data modification, use *@@rowcount* to test for multirow data modifications (an **insert**, **delete**, or **update** based on a **select** statement), and take appropriate actions. Any Transact-SQL statement that does not return rows (such as an **if** statement) sets *@@rowcount* to 0, so the test of *@@rowcount* should occur at the beginning of the trigger.

Inserting and Updating Triggers

When an **insert** or **update** command executes, the SAP ASE server simultaneously adds rows to both the trigger table and the inserted table. The rows in the inserted table are always duplicates of one or more rows in the trigger table.

An **update** or **insert** trigger can use the **if update** command to determine whether the **update** or **insert** changed a particular column. **if update (*column_name*)** is true for an **insert** statement whenever the column is assigned a value in the select list or in the **values** clause. An explicit NULL or a default assigns a value to a column and thus activates the trigger. An implicit NULL, however, does not.

For example, if you create the following table and trigger:

```
create table junk
 (aaa int null,
bbb int not null)
```

```
create trigger trigtest on junk
for insert as
if update (aaa)
    print "aaa updated"
if update (bbb)
    print "bbb updated"
```

Inserting values into either column or into both columns fires the trigger for both column `aaa` and column `bbb`:

```
insert junk (aaa, bbb)
values (1, 2)
```

```
aaa updated
bbb updated
```

Inserting an explicit NULL into column `aaa` also fires the trigger:

```
insert junk
values (NULL, 2)
```

```
aaa updated
bbb updated
```

If there was a default for column `aaa`, the trigger would also fire.

However, with no default for column `aaa` and no value explicitly inserted, the SAP ASE server generates an implicit NULL and the trigger does not fire:

```
insert junk (bbb)
values (2)
```

```
bbb updated
```

if update is never true for a **delete** statement.

instead of and for Triggers

You can interleave nesting **instead of** and **for** triggers.

For example, an **update** statement on a view with an **instead of update** trigger causes the trigger to execute. If the trigger contains a SQL statement updating a table with a **for** trigger defined on it, that trigger fires. The **for** trigger may contain a SQL statement that updates another view with an **instead of** trigger that then executes, and so forth.

instead of and **for** triggers have different recursive behaviors. **for** triggers support recursion, while **instead of** triggers do not. If an **instead of** trigger references the same view on which the trigger was fired, the trigger is not called recursively. Rather, the triggering statement applies directly to the view; in other words, the statement is resolved as modifications against the base tables underlying the view. In this case, the view definition must meet all restrictions for an updatable view. If the view is not updatable, an error is raised.

For example, if a trigger is defined as an **instead of update** trigger for a view, the **update** statement executed against the same view within the **instead of** trigger does not cause the trigger to execute again. The update exercised by the trigger is processed against the view, as though the view did not have an **instead of** trigger. The columns changed by the update must be resolved to a single base table.

create view

Creates or replaces a view, which is an alternative way to look at the data in one or more tables.

Syntax

```
create [or replace] view [owner.]view_name
    [(column_name[, column_name]...)]
    as
    select [distinct] select_statement
    [with check option]
```

Parameters

- **create –** creates a view if one does not already exist.
- **or replace –** replaces an existing view definition without changing any of a view's security attributes.
- ***view_name* –** is the name of the view. The name cannot include the database name. If you have **set quoted_identifier on**, you can use a delimited identifier. Otherwise, the view name cannot be a variable and must conform to the rules for identifiers. Specify the owner’s name to create another view of the same name owned by a different user in the current database. The default value for *owner* is the current user.

  Only an existing view can be replaced. The object name and ID remain the same.
- ***column_name* –** specifies names to be used as headings for the columns in the view. If you have **set quoted_identifier on**, you can use a delimited identifier. Otherwise, the column name must conform to the rules for identifiers.

  You can always supply column names, but they are required only on:

  - A column is derived from an arithmetic expression, function, string concatenation, or constant
  - Two or more columns have the same name (usually because of a join)
  - You want to give a column in a view a different name than the column from which it is derived (see Example 3)

  Column names can also be assigned in the **select** statement (see Example 4). If no column names are specified, the view columns acquire the same names as the columns in the **select** statement.

  With the **or replace** clause, you can change column names for the view as follows:

  - If the previous definition of the view contained headings for columns names, then the new definition of the view can omit the headings, or have different headings for column names.

    - If the previous definition of the view did not contain headings for column names, the new definition can contain headings for the view column names.
    - You can change the number of column headings according to the column names in the **select_statement**.
- **select –** begins the **select** statement that defines the view.
- **distinct –** specifies that the view cannot contain duplicate rows.

  If the original definition of the view did not specify `distinct` clause, you can change this parameter so the new view cannot contain duplicate rows.
- ***select_statement* –** completes the **select** statement that defines the view. The **select** statement can use more than one table, and other views.

  The columns specified in the target list of the **select_statement** of the replaced view can be changed to drop or add columns.
- **with check option –** indicates that all data modification statements are validated against the view selection criteria. All rows inserted or updated through the view must remain visible through the view. If you create a view using `with check option`:

    - Each row that is inserted or updated through the view must meet the selection criteria of the view.
    - All views derived from the "base" view must satisfy its check option. Each row inserted or updated through the derived view must remain visible through the base view.

  A view created with the **with check option** clause can be replaced without this clause, and vice versa.

Examples

- **Example 1 –** Creates a view derived from the `title`, `type`, `price`, and `pubdate` columns of the base table `titles`:

```
create view titles_view
as select title, type, price, pubdate
from titles
```

- **Example 2 –** Creates "new view" from "old view." Both columns are renamed in the new view. All view and column names that include embedded blanks are enclosed in double quotation marks. Before creating the view, you must use **set quoted_identifier on**.

```
create view "new view" ("column 1", "column 2")
as select col1, col2 from "old view"
```

- **Example 3 –** Creates a view that contains the titles, advances, and amounts due for books that have a price less than $5.00:

```
create view accounts (title, advance, amt_due)
as select title, advance, price * total_sales
```

```
from titles
where price > $5
```

- **Example 4 –** Creates a view derived from two base tables, `authors` and `publishers`. The view contains the names and cities of authors who live in a city in which there is a publisher:

```
create view cities
 (authorname, acity, publishername, pcity)
as select au_lname, authors.city, pub_name,
publishers.city
from authors, publishers
where authors.city = publishers.city
```

- **Example 5 –** Creates a view with the same definition as in the previous example, but with column headings included in the **select** statement:

```
create view cities2
as select authorname = au_lname,
acity = authors.city, publishername = pub_name, pcity =
publishers.city
from authors, publishers
where authors.city = publishers.city
```

- **Example 6 –** Creates a view, `author_codes`, derived from `titleauthor` that lists the unique author identification codes:

```
create view author_codes
as select distinct au_id
from titleauthor
```

- **Example 7 –** Creates a view, `price_list`, derived from `title` that lists the unique book prices:

```
create view price_list (price)
as select distinct price
from titles
```

- **Example 8 –** Creates a view of the `stores` table that excludes information about stores outside of California. The **with check option** clause validates each inserted or updated row against the view's selection criteria. Rows for which `state` has a value other than "CA" are rejected:

```
create view stores_cal
as select * from stores
where state = "CA"
with check option
```

- **Example 9 –** Creates a view, `stores_cal30`, which is derived from `stores_cal`. The new view inherits the check option from `stores_cal`. All rows inserted or updated through `stores_cal30` must have a `state` value of "CA". Because `stores_cal30` has no **with check option** clause, you can insert or update rows through `stores_cal30` for which `payterms` has a value other than "Net 30":

```
create view stores_cal30
as select * from stores_cal
where payterms = "Net 30"
```

- **Example 10 –** Creates a view, `stores_cal30_check`, derived from `stores_cal`. The new view inherits the check option from `stores_cal`. It also has a **with check option** clause of its own. Each row that is inserted or updated through `stores_cal30_check` is validated against the selection criteria of both `stores_cal` and `stores_cal30_check`. Rows with a `state` value other than "CA" or a `payterms` value other than "Net 30" are rejected:

```
create view stores_cal30_check
as select * from stores_cal
where payterms = "Net 30"
with check option
```

- **Example 11 –** Uses a SQL-derived table in creating a view:

```
create view psych_titles as
   select *
      from (select * from titles
               where type = "psychology") dt_psych
```

- **Example 12 –** Based on the view `Current_Product_List`, which lists all active products from the table `Products`. The view is defined as:

```
create view Current_Product_List as
select ProductID, ProductName
from Products
where Discontinued = "No"

select object_id("Current_Product_List")
-----------
889051172
```

This next command adds the `Category` column to `Current_Product_list` using the **or replace** clause. The object ID of the view remains the same:

```
create or replace view Current_Product_List as
select ProductID, ProductName, Category
from Products
where Discontinued = "No"

select object_id("Current_Product_List")
-----------
889051172
```

- **Example 13 –** Replaces V1—a view that has dependent objects:

```
create table T1(C1 int, C2 int)
create table T2(C1 int, C2 int)

create view V1 as select * from T1
create view V2 as select * from V1

create function foo1
returns int
```

```
as
begin
    declare @number int
    select @number = C1 from V2
end
return @number
select object_id("V1")
-----------
985051514
```

```
create or replace V1 as select * from T2

select * from V2

select dbo.foo1()

select object_id("V1")
-----------
985051514
```

The replaced version of `V1` references `T2` instead of `T1`. Both `V2` and `foo1` will be recompiled. `select * from v2` recompiles `V2`, but not `foo1`, which is recompiled when the UDF is invoked.

Usage

- You can use views as security mechanisms by granting permission on a view, but not on its underlying tables.
- You can use **sp_rename** to rename a view.
- When you query through a view, the SAP ASE server checks to make sure that all the database objects referenced anywhere in the statement exist, that they are valid in the context of the statement, and that data update commands do not violate data integrity rules. If any of these checks fail, you see an error message. If the checks are successful, **create view** "translates" the view into an action on the underlying tables.
- For more information about views, see the *Transact-SQL Users Guide*.

For getting information about views:

- To create a report of the tables or views on which a view depends, and of objects that depend on a view, execute **sp_depends**.
- To display the text of a view, which is stored in `syscomments`, execute **sp_helptext** with the view name as the parameter.

See also:

- *Identifiers* in *Reference Manual: Building Blocks*
- **sp_depends**, **sp_help**, **sp_helptext**, **sp_rename** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The use of more than one **distinct** keyword and the use of "***column_heading = column_name***" in the **select** list are Transact-SQL extensions.

Permissions

When you create a view, the SAP ASE server makes no permission checks on objects, such as tables and views, that are referenced by the view. Therefore, you can create successfully a view even if you do not have access to its objects. All permission checks occur when a user invokes the view.

When a view is invoked, permission checks on its objects depend on whether the view and all referenced objects are owned by the same user.

- If the view and its objects are not owned by the same user, the invoker must have been granted direct access to the objects. For example, if the view performs a **select** from a table the invoker cannot access, the **select** statement fails.
- If the view and its objects are owned by the same user, special rules apply. The invoker automatically has implicit permission to access the view's objects even though the invoker could not access them directly. Without having to grant users direct access to your tables, you can give them restricted access with a view. In this way, a view can be a security mechanism. For example, invokers of the view might be able to access only certain rows and columns of your table. A detailed description of the rules for implicit permissions is discussed in the *System Administration Guide*.
- If a column in the table is encrypted, you must have decrypt permission to select from the view. If the view and its objects are not owned by the same user, you must have decrypt permission on the encrypted column in the table to select from the view. If the view and its objects are owned by the same user, it is sufficient to grant decrypt permission to the user who must select from the view on the view column that corresponds to the encrypted column in the table.

Any user who impersonates the view owner through an alias or **setuser** cannot replace the view.

Setting	Description
Enabled	With granular permission enabled, you must have the `create view` privilege to create a view. To create a view for another user, you must have the `create any view` privilege. You must be the view owner to replace the view.
Disabled	With granular permissions disabled, you must be the database owner, a user with **sa_role**, or have the `create view` privilege to create a view. To create a view for another user, you must have **sa_role**. You must be the view owner to replace the view.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	16
Audit option	**create**
Command or access audited	**create view**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect • or replace – for create or replace

See also

- *create schema* on page 200
- *drop view* on page 369
- *update* on page 680
- *select* on page 579
- *group by and having Clauses* on page 459
- *set* on page 607

Restrictions on Views

Restrictions for using views.

- You can create a view only in the current database.
- The number of columns referenced by a view cannot exceed 1024.
- You cannot create a view on a temporary table.
- You cannot create a trigger or build an index on a view.
- You cannot use **readtext** or **writetext** on `text`, `unitext`, or `image` columns in views.
- You cannot include **order by**, **compute** clauses, or the keyword **into** in the **select** statements that define views.
- You cannot update, insert, or delete from a view with **select** statements that include the **union** operator.
- If you create a view using a local or a global variable, the SAP ASE server issues error message 7351: "Local or global variables not allowed in view definition."
- You can combine **create view** statements with other SQL statements in a single batch.

Warning! When a **create view** command occurs within an **if...else** block or a **while** loop, the SAP ASE server creates the schema for the view before determining whether the condition is true. This may lead to errors if the view already exists. To avoid this, verify that a view with the same name does not already exist in the database or use an **execute** statement, as follows:

```
if not exists
    (select * from sysobjects where name="mytable")
begin
execute ("create table mytable (x int)")
end
```

View Resolution

If you alter the structure of a view's underlying tables by adding or deleting columns, the new columns do not appear in a view that is defined using the **select** * clause unless you drop, and then redefine the view. The asterisk shorthand is interpreted and expanded when the view is first created.

If a view depends on a table or view that has been dropped, the SAP ASE server produces an error message when anyone tries to use the view. If a new table or view with the same name and schema is created to replace the one that has been dropped, the view again becomes usable.

You can redefine a view without redefining other views that depend on it, unless the redefinition makes it impossible for the SAP ASE server to translate any dependent views.

Modifying Data Through Views

Usage information for modifying data through views.

- **delete** statements are not allowed on multitable views.
- **insert** statements are not allowed unless all **not null** columns in the underlying table or view are included in the view through which you are inserting new rows. The SAP ASE server cannot supply values for **not null** columns in the underlying table or view.
- You cannot insert directly to a computed column through a view. The value of computed columns can only be generated internally by the SAP ASE server.
- **insert** statements are not allowed on join views created with **distinct** or **with check option.**
- **update** statements are allowed on join views **with check option**. The update fails if any of the affected columns appear in the **where** clause, in an expression that includes columns from more than one table.
- If you insert or update a row through a join view, all affected columns must belong to the same base table.
- You cannot update or insert into a view defined with the **distinct** clause.
- Data update statements cannot change any column in a view that is a computation, and cannot change a view that includes aggregates.

IDENTITY Columns and Views

To insert an explicit value into an IDENTITY column, the table owner, database owner, or system administrator must **set identity_insert *table_name* on** for the column's base table, not through the view through which it is being inserted.

You cannot use the ***column_name* = identity (*precision*)** syntax to add a new IDENTITY column to a view.

group by Clauses and Views

When creating a view for security reasons, be careful when using aggregate functions and the **group by** clause.

A Transact-SQL extension allows you to name columns that do not appear in the **group by** clause. If you name a column that is not in the **group by** clause, the SAP ASE server returns detailed data rows for the column. For example, this Transact- SQL extended column query returns a row for every 18 rows—more data than you might intend:

```
select title_id, type, sum (total_sales)
from titles
group by type
```

While this ANSI-compliant query returns one row for each type (6 rows):

```
select type, sum (total_sales)
from titles
group by type
```

distinct Clauses and Views

The **distinct** clause defines a view as a database object that contains no duplicate rows. A row is defined to be a duplicate of another row if all of its column values match the same column values in another row. Null values are considered to be duplicates of other null values.

Querying a subset of a view's columns can result in what appear to be duplicate rows. If you select a subset of columns, some of which contain the same values, the results appear to contain duplicate rows. However, the underlying rows in the view are still unique. The SAP ASE server applies the **distinct** requirement to the view's definition when it accesses the view for the first time (before it does any projection and selection) so that all the view's rows are distinct from each other.

You can specify **distinct** more than once in the view definition's **select** statement to eliminate duplicate rows, as part of an aggregate function or a **group by** clause. For example:

```
select distinct count (distinct title_id), price
from titles
```

The scope of **distinct** applies only for that view; it does not cover any new views derived from the **distinct** view.

Creating Views from SQL-Derived Tables

To create a view using a SQL-derived table, add the derived table expression in the **from** clause of the **select** part of the **create view** statement.

A view created using a SQL-derived table can be updated if the derived table expression can be updated. The update rules for the derived table expression follow the update rules for the **select** part of the **create view** statement.

Data can be inserted through a view that contains a SQL-derived table if the **insert** rules and permission settings for the derived table expression follow the **insert** rules and permission settings for the **select** part of the **create view** statement.

Temporary tables and local variables are not permitted in a derived table expression that is part of a **create view** statement.

SQL-derived tables cannot have unnamed columns.

For more information about derived table expressions, see the *Transact-SQL Users Guide*.

Objects Dependent on Replaced Views

Views can be contained in other object definitions.

- If the view that is replaced is contained in another view, the parent view is automatically recompiled when it is accessed.
- If the number of columns in a view changes due to replacing, you may need to fix the definitions of other views and procedures that reference this view.

  In this situation, the owner has replaced `V1` with different number of columns and column names. `P` must also be replaced.

  ```
  create view V1 as select C1 from T1
  create procedure P as select * from V1
  ```

  ```
  create or replace V1 as select C1, C2 from T1
  ```

  In this next situation, the owner has replaced V2 by removing C2 from the definition. When P is executed, an error is raised, as C2 is no longer part of V2 . Because of this, P must be replaced.

  ```
  create view V2 as select C1, C2 from T2
  create procedure P as select C2 from V2
  ```

  ```
  create or replace V2 as select C1 from T2
  ```

  Before you replace a view, run **sp_depends** to determine if there are any stored procedures or parent views that depend on the view you are replacing. If such stored procedures or parent views exist, replace the stored procedures or parent views as necessary after replacing the view.
- `Instead of` triggers defined on the view are dropped when the view is replaced

- Any PRS that are dependent on the replaced view will require a full refresh to restore them to a usable state. You can neither refresh them, nor use them for query rewrite until they are recompiled.

dbcc

Database consistency checker (**dbcc**) checks the logical and physical consistency of a database and provides statistics, planning, and repair functionality.

Certain **dbcc** commands apply only to shared-disk clusters. See the separately listed **dbcc** syntax for clusters.

Syntax

```
dbcc addtempdb (dbid |database_name)
```

```
dbcc checkalloc [(database_name[, fix | nofix])]
```

```
dbcc checkcatalog [(database_name[, fix])
```

```
dbcc checkdb [(database_name[, skip_ncindex])]
```

```
dbcc checkindex ({table_name | table_id}, index_id
    [, bottom_up[, partition_name | partition_id]])
```

```
dbcc checkstorage [(database_name)]
```

```
dbcc checktable (table_name | table_id
    [, skip_ncindex | fix_spacebits | "check spacebits" |
    bottom_up | NULL[, partition_name | partition_id)
```

```
dbcc checkverify (dbname[, tblname[, ignore_exclusions]])
```

```
dbcc complete_xact (xid, {["commit", “1pc”] | "rollback"})
```

```
dbcc dbrepair (database_name, dropdb, flushthreshold)
```

```
dbcc engine ({offline, [enginenum] | "online"})
```

```
dbcc fix_text ({table_name | table_id})
```

```
dbcc forget_xact (xid)
```

```
dbcc indexalloc (table_name | table_id, index_id
    [, optimized | fast | NULL [, fix | nofix | NULL
    [, partition_name | partition_id]]])
```

```
dbcc monitor (increment, <group name>)
```

```
dbcc monitor (decrement, <group name>)
```

```
dbcc monitor (reset, <group name>)
```

```
dbcc pravailabletempdbs
dbcc rebuild_text (table_name | table_id | "all"[, column[,
text_page
    [, data_partition_name | data_partition_id]]])
```

```
dbcc reindex ({table_name | table_id})
```

```
dbcc serverlimits
```

```
dbcc stackused
```

```
dbcc tablealloc (table_name | table_id [, full | optimized | fast |
NULL
    [, fix | nofix | NULL [, data_partition_name |
data_partition_id]]])
```

```
dbcc textalloc (table_name | table_id [, full | optimized | fast |
NULL
    [, fix | nofix | NULL [, data_partition_name |
data_partition_id]]])
```

```
dbcc {traceon | traceoff} (flag [, flag ...])
```

```
dbcc tune ({ascinserts, {0 | 1} , table_name |
        cleanup, {0 | 1} |
        cpuaffinity, start_cpu {, on| off} |
        des_greedyalloc, dbid, object_name,
            " {on | off}" | deviochar vdevno, "batch_size" |
        des_bind, dbid, object_name
        des_unbind, dbid, object_name
        doneinproc {0 | 1}})
```

```
dbcc upgrade_object [ ( dbid | dbname
    [,[database.[owner].]compiled_object_name' |
         'check' | 'default' | 'procedure' | 'rule' |
         'trigger' | 'view'
         [, 'force' ] ] )
```

```
dbcc zapdefraginfo
```

dbcc syntax for clusters only:

```
dbcc nodetraceon(trace_flag_number)
dbcc nodetraceoff(trace_flag_number)
```

```
dbcc set_scope_in_cluster("cluster"|"instance"|"scope")
```

```
dbcc quorum
```

Parameters

- **addtempdb –** adds a temporary database to the global list of available temporary databases. If the database does not exist or is not a temporary database, an error is generated. If the database is already a member of the list, an informational message prints.
- ***dbid* –** is the database ID.

- ***database_name* –** is the name of the database to check. If no database name is given, **dbcc** uses the current database.
- **checkalloc –** checks the specified database to see that all pages are correctly allocated and that no page that is allocated is not used. If no database name is given, **checkalloc** checks the current database. It always uses the **optimized** report option (see **tablealloc**).

  checkalloc reports on the amount of space allocated and used.
- **fix | nofix –** determines whether **dbcc** fixes the allocation errors found. The default mode for **checkalloc** is **nofix**. You must put the database into single-user mode to use the **fix** option. For details on page allocation in SAP ASE servers, see the *System Administration Guide*.
- **checkcatalog –** checks for consistency in and between system tables. For example, **checkcatalog** makes sure that every type in `syscolumns` has a matching entry in `systypes`, that every table and view in `sysobjects` has at least one column in `syscolumns`, and that the last checkpoint in `syslogs` is valid. You can use **checkcatalog** in an archive database, but not the **fix** version of **checkcatalog**.

  checkcatalog also reports on any segments that have been defined. If no database name is given, **checkcatalog** checks the current database.
- **fix –** determines whether **dbcc** fixes the `sysindexes` errors it finds. The default mode for **checkcatalog** is to not fix the errors. You must put the database into singleuser mode to use the **fix** option. The new `sysindexes` checks may result in new errors, not raised by **dbcc checkcatalog**, in SAP ASE servers earlier than version 12.5.2.
- **checkdb –** runs the same checks as **checktable**, but on each table, including `syslogs`, in the specified database. If no database name is given, **checkdb** checks the current database. You can use **checkdb** in an archive database.
- **skip_ncindex –** causes **dbcc checktable** or **dbcc checkdb** to skip checking the nonclustered indexes on user tables. The default is to check all indexes.
- **checkindex –** runs the same checks as **checktable**, but only on the specified index. You can use **checkindex** in an archive database.
- **bottom_up –** (data-only-locked tables only) checks indexes in a bottom-up order when specifying this option with **checkindex**. The **bottom_up** check involves verifying whether each data row has a corresponding index row.
- ***partition_name* | *partition_id* –** is the name or ID of the data partition to check. If you specify a partition, **dbcc** skips global indexes.
- **checkstorage –** checks the specified database for allocation, object allocation map (OAM) page entries, page consistency, text valued columns, allocation of text valued columns, and text column chains. The results of each **dbcc checkstorage** operation are stored in the `dbccdb` database. For details on using **dbcc checkstorage**, and on creating, maintaining, and generating reports from `dbccdb`, see the *System Administration Guide*.
- **checktable –** checks the specified table to see that index and data pages are correctly linked, that indexes are in properly sorted order, that all pointers are consistent, that the data information on each page is reasonable, and that page offsets are reasonable. You can use **checktable** in an archive database.

Certain changes to **dbcc checktable** refer to virtually-hashed tables:

- In addition to the regular checks it performs, **checktable** verifies that the layout of data and OAM pages in the hash region is correct:
  - Data pages are not allocated in an extent reserved for OAM pages as per the layout.
  - The OAM pages are allocated only in the first extent of an allocation unit.

- ***table_name* | *table_id* –** is the name or object ID of the table to check.
- **fix_spacebits –** is for tables that use datapages or datarows locking, and checks for the validity of space bits and fixes any invalid space bits. Space bits are stored per page and indicate the room available in a page for new inserts.
- **check spacebits –** checks space bits for tables that use datapages or datarows locking tables. If you specify **check spacebits**, **dbcc** does not check nonclustered indexes.
- **checkverify –** verifies the results of the most recent run of **dbcc checkstorage** for the specified database. For details on using **dbcc checkverify**, see the *System Administration Guide*.
- ***ignore_exclusions* –** enables or disables the exclusion list. Value is either 0, the default (enables the exclusion list), or 1 (disables the exclusion list).
- **complete_xact –** heuristically completes a transaction by either committing or rolling back its work. The SAP ASE server retains information about all heuristically completed transactions in the `master.dbo.systransactions` table, so that the external transaction coordinator may have some knowledge of how the transaction was completed.

  Warning! Heuristically completing a transaction in the prepared state can cause inconsistent results for an entire distributed transaction. The system administrator's decision to heuristically commit or roll back a transaction may contradict the decision made by the coordinating SAP ASE server or protocol.

- ***xid* –** is a transaction name from the `systransactions.xactname` column. You can also determine valid `xid` values using **sp_transactions**.
- **1pc –** heuristically completes a transaction that was subject to a one-phase commit protocol optimization—instead of the regular two-phase commit protocol—by the external transaction manager that was coordinating its completion. This option allows the heuristic commit of a transaction that was not in the prepared state.
- **dbrepair (*database_name*, dropdb) –** drops a damaged database. **drop database** does not work on a damaged database.

  No one can use the database being dropped when this **dbcc** statement is issued (including the user issuing the statement).
- **engine –** takes the SAP ASE engines offline or brings them online. If *enginenum* is not specified, **dbcc engine (offline)** takes the highest-numbered engine offline. See *Managing Multiprocessor Servers* in the *System Administration Guide*.
- **fix_text –** upgrades `text` values after an SAP ASE character set has been changed from any character set to a new multibyte character set.

  Changing to a multibyte character set makes the internal management of `text` data more complicated. Since a `text` value can be large enough to cover several pages, the SAP ASE server must be able to handle characters that span page boundaries. To do so, the server requires additional information on each of the `text` pages. The system administrator or table owner must run **dbcc fix_text** on each table that has `text` data to calculate the new values needed. See the *System Administration Guide*.

- **forget_xact** – removes the completion status of a heuristically completed transaction from `master.dbo.systransactions`. **forget_xact** can be used when the system administrator does not want the coordinating service to have knowledge that a transaction was heuristically completed, or when an external coordinator is not available to clear commit status in `systransactions`.

Warning! Do not use **dbcc forget_xact** in a normal DTP environment, since the external transaction coordinator should be permitted to detect heuristically-completed transactions. X/Open XA-compliant transaction managers and the SAP ASE server transaction coordination services automatically clear the commit status in `systransactions`.

- **indexalloc** – checks the specified index to see that all pages are correctly allocated and that no page that is allocated is not used. This is a smaller version of **checkalloc**, providing the same integrity checks on an individual index. You can use **indexalloc** in an archive database.

  indexalloc produces the same three types of reports as **tablealloc**: **full**, **optimized**, and **fast**. If no type is indicated, or if you use **null**, the SAP ASE server uses **optimized**. The **fix | nofix** option functions the same with **indexalloc** as with **tablealloc**.

Note: You can specify **fix** or **nofix** only if you include a value for the type of report (**full**, **optimized**, **fast**, or **null**).

- ***table_name* | *table_id*** – is the table's name or the table's object ID.
- ***indid*** – is the ID of the index that is checked during **dbcc indexalloc**.
- **fix_spacebits** – is for tables of type `datapages` or `datarows` lockscheme, and checks for the validity of space bits and fixes any invalid space bits. Space bits are stored per page and indicate the room available in a page for new inserts.
- **check spacebits** – checks space bits for datapages or datarows locked tables. If you specify **check spacebits**, **dbcc** does not check nonclustered indexes.
- **full** – reports all types of allocation errors.
- **optimized** – produces a report based on the allocation pages listed in the object allocation map (OAM) pages for the index. It does not report and cannot fix unreferenced extents on allocation pages that are not listed in the OAM pages. The **optimized** option is the default.
- **fast** – does not produce an allocation report, but produces an exception report of pages that are referenced but not allocated in the extent (2521-level errors).
- **fix | nofix** – determines whether **indexalloc** fixes the allocation errors found in the table. The default is **fix** for all indexes except indexes on system tables, for which the default is **nofix**. To use the **fix** option with system tables, you must first put the database in single-user mode.

You can specify **fix** or **nofix** only if you include a value for the type of report (**full**, **optimized**, **fast**, or **null**).

- ***partition_name* | *partition_id* –** if you specify a partition ID, allocation checks are performed on the partition identified by **(indid, partition id)**.
- **monitor increment, *group name* –** The **increment** and **decrement** commands increase and decrease, by 1, the usage counts for the monitor counters in the specified group. The **reset** command sets the usage count for the monitor counters in the specified group to zero. This turns off collection of monitoring data for this group.

  group name can be one of the following:

  - **'all'** – determine usage count for the **all** group, which comprises most of the monitor counters, by selecting the *@@monitors_active* global variable.
  - **spinlock_s** – usage counts for **spinlock_s** reported by the **dbcc resource** command.
  - **appl** – usage counts for **appl** reported by the **dbcc resource** command.
- **pravailabletempdbs –** prints the global list of available temporary databases.
- **rebuild_text –** rebuilds or creates an internal SAP ASE version 12.0 or later data structure for `text`, or `unitext`, `image` data. This data structure enables the SAP ASE server to perform random access and asynchronous prefetch during data queries.You can run **rebuild_text** on all tables in a database, a single table, or a data partition.
- ***table_name* | *table_id* | "all" –** is the table's name or the table's object ID, or all the objects in the database.
- ***column* –** is the ID or name of the column of the text column. **dbcc rebuild_text** rebuilds the internal data structure of each text value of this column.
- ***text_page* –** is the logical page number of the first text page. **dbcc rebuild_text** rebuilds the internal data structure of this text page.
- ***data_partition_name* | *data_partition_id* –** is name or ID of the data partition. If you specify *text_page*, *data_partition_name* (or *data_partition_id*) is ignored.
- **reindex –** checks the integrity of indexes on user tables by running a fast version of **dbcc checktable**. It can be used with the table name or the table's object ID (the `id` column from `sysobjects)`. **reindex** prints a message when it discovers the first index-related error, then drops and re-creates the suspect indexes. The system administrator or table owner must run **dbcc reindex** after the SAP ASE sort order has been changed and indexes have been marked "suspect" by the SAP ASE server.

  When **dbcc** finds corrupt indexes, it drops and re-creates the appropriate indexes. If the indexes for a table are already correct, or if the table has no indexes, **dbcc reindex** does not rebuild the index, but prints an informational message instead.

  dbcc reindex aborts if a table is suspected of containing corrupt data. When that happens, an error message instructs the user to run **dbcc checktable**. **dbcc reindex** does not allow reindexing of system tables. System indexes are checked and rebuilt, if necessary, as an automatic part of recovery after the SAP ASE server is restarted following a sort order change.

- **serverlimits –** displays the limits the SAP ASE server enforces on various entities, including the lengths of identifiers and the maximum number of different objects such as number of columns in a table, number of indexes on a table, page sizes, row-overheads, and so on. Use the information to determine the various sizing characteristics of the the SAP ASE server process.
- **stackused –** reports the maximum amount of stack memory used since the server first started.
- **tablealloc –** checks the specified table or data partition to see that all pages are correctly allocated, and that no page that is allocated is not used. This is a smaller version of **checkalloc**, providing the same integrity checks on an individual table. It can be used with the table name or the table's object ID (the `id` column from `sysobjects`). You can use **tablealloc** in an archive database. For an example of **tablealloc** output, see the *System Administration Guide*.

  Three types of reports can be generated with **tablealloc**: **full**, **optimized**, and **fast**. If no type is indicated, or if you use **null**, the SAP ASE server uses **optimized**.
- **textalloc –** checks the allocation integrity of `text` or `image` pages in a database. You can use **dbcc textalloc** with an archive database.
- **full –** is equivalent to **checkalloc** at a table level; it reports all types of allocation errors.
- **optimized –** produces a report based on the allocation pages listed in the object allocation map (OAM) pages for the table. It does not report and cannot fix unreferenced extents on allocation pages that are not listed in the OAM pages. The **optimized** option is the default.
- **fast –** does not produce an allocation report, but produces an exception report of pages that are referenced but not allocated in the extent (2521-level errors).
- **fix | nofix –** determines whether or not **tablealloc** fixes the allocation errors found in the table. The default is **fix** for all tables except system tables, for which the default is **nofix**. To use the **fix** option with system tables, you must first put the database in single-user mode.

  You can specify **fix** or **nofix** only if you include a value for the type of report (**full**, **optimized**, **fast**, or **null**).
- ***data_partition_name* | *data_partition_id* –** is name or ID of the data partition to check. If you specify a partition, **dbcc tablealloc** skips global indexes.
- **traceon | traceoff –** toggles the printing of diagnostics during query optimization. Values 3604 and 3605 toggle, sending trace output to the user session and to the error log, respectively.
- **tune –** enables or disables tuning flags for special performance situations. You must reissue **dbcc tune** each time you restart the SAP ASE server. For more information on the individual options, see *Performance and Tuning Guide: Basics*.
- **upgrade_object –** upgrades a compiled object from the text stored in the syscomments table. The **upgrade_object** parameters are:

Parameters	Description
dbid	Specifies the database ID. If you do not specify *dbid*, all compiled objects in the current database are upgraded.
dbname	Specifies the database name. If you do not specify *dbname*, all compiled objects in the current database are upgraded.
compiled_ob-ject_name	Is the name of a specific compiled object you want to upgrade. If you use the fully qualified name, *dbname* and *database* must match, and you must enclose the fully qualified name in quotes. If the database contains more than one compiled object of the same name, use the fully qualified name. Otherwise, all objects with the same name are parsed, and if no errors are found, upgraded.
check	Upgrades all check constraints and rules. Referential constraints are not compiled objects and do not require upgrading.
default	Upgrades all declarative defaults and the defaults created with the **create default** command.
procedure	Upgrades all stored procedures.
rule	Upgrades all rules and check constraints.
trigger	Upgrades all triggers.
view	Upgrades all views.
force	Specifies that you want to upgrade the specified object even if it contains a **select *** clause. Do not use **force** unless you have confirmed that the **select *** statement is not returning unexpected results. The **force** option does not upgrade objects that contain reserved words, contain truncated or missing source text, refer to nonexistent temporary tables, or do not match the quoted identifier setting. You must fix these objects before they can be upgraded.

The keywords **check**, **default**, **procedure**, **rule**, **trigger**, and **view** specify the classes of compiled objects to be upgraded. When you specify a class, all objects in that class, in the specified database, are upgraded, provided that **dbcc upgrade_object** finds no errors or potential problem areas.

- **check –** checks syntax for the specified compiled object in `syscomments` in the specified database. Does not raise errors on occurrences of **select**.

  For **upgrade_object**, upgrades all check constraints and rules. Referential constraints are not compiled objects and do not require upgrading.
- **force –** forces an upgrade of the object from `syscomments` even if an upgrade is not required.
- ***object_name* –** is the name of the compiled object.

- ***object_type* –** is one of the following object types that the SAP ASE server compiles: **procedure**, **function**, **view**, **trigger**, **default**, **rule**, **condition**.
- ***compiled_object_name* –** is the name of a specific compiled object you want to upgrade. If you use the fully qualified name, *database_name* and *database* must match, and you must enclose the fully qualified name in quotes. If the database contains more than one compiled object of the same name, use the fully qualified name. Otherwise, all objects with the same name are parsed, and if no errors are found, upgraded.
- **default –** upgrades all declarative defaults and the defaults created with the **create default** command.
- **procedure –** upgrades all stored procedures.
- **rule –** upgrades all rules and check constraints.
- **trigger –** upgrades all triggers.
- **view –** upgrades all views.

  The keywords **check**, **default**, **procedure**, **rule**, **trigger**, and **view** specify the classes of compiled objects to be upgraded. When you specify a class, all objects in that class, in the specified database, are upgraded, provided that **dbcc upgrade_object** finds no errors or potential problem areas.
- **force –** specifies that you want to upgrade the specified object even if it contains a **select *** clause. Do not use **force** unless you have confirmed that the **select *** statement is not returning unexpected results. The **force** option does not upgrade objects that contain reserved words, contain truncated or missing source text, refer to nonexistent temporary tables, or do not match the quoted identifier setting. You must fix these objects before they can be upgraded.
- **zapdefraginfo –** deletes rows that are stored in `sysattributes`. For every data partition undergoing incremental reorganization, a row is stored in `sysattributes`. Use **zapdefraginfo** to delete this information before performing a downgrade.

  In a running server, if the rows with defragmentation information for a specific object are accidentally lost from `sysattributes`, use **zapdefraginfo** to reset the extent version information for the specific object so that a later **reorg defrag** will not fail to consider all the extents of the object.
- ***trace_flag_number* –** is the number of the trace flag you are enabling or disabling.
- **cluster –** sets the **dbcc** command scope to the cluster. Subsequent **dbcc** commands have a cluster-wide effect.
- **instance –** sets the **dbcc** command scope to the current instance. Subsequent **dbcc** commands affect only the local instance.
- **scope –** displays the current scope of the **dbcc** command, either **cluster** or **instance**.

Examples

- **Example 1 –** Checks `pubs2` for page allocation errors:

```
dbcc checkalloc (pubs2)
```

- **Example 2 –** Checks database consistency for `pubs2` and places the information in the `dbccdb` database:

```
dbcc checkstorage (pubs2)
```

- **Example 3 –** Checks the `salesdetail` table:

```
dbcc checktable (salesdetail)
```

```
Checking salesdetail
The total number of pages in partition 1 is 3.
The total number of pages in partition 2 is 1.
The total number of pages in partition 3 is 1.
The total number of pages in partition 4 is 1.
The total number of data pages in this table is 10.
Table has 116 data rows.
DBCC execution completed. If DBCC printed error
messages, contact a user with system administrator (SA)
role.
```

- **Example 4 –** Heuristically aborts the transaction “distributedxact1:”

```
dbcc complete_xact (distributedxact1, "rollback")
```

- **Example 5 –** Upgrades text values for `blurbs` after a character set change:

```
dbcc fix_text (blurbs)
```

- **Example 6 –** Runs **checkverify** on the table `tab`, with exclusion list disabled, in the database `my_db`:

```
dbcc checkverify(my_db, tab)
```

- **Example 7 –** Runs **dbcc checkverify** on table `tab`, in database `my_db`, with the exclusion list enabled:

```
dbcc checkverify (my_db, tab, 0)
```

- **Example 8 –** Runs **dbcc checkverify** on table `tab`, in database `my_db`, with the exclusion list disabled, enter:

```
dbcc checkverify (my_db, tab, 1)
```

- **Example 9 –** Removes information for the transaction “distributedxact1” from `master.dbo.systransactions`:

```
dbcc forget_xact (distributedxact1)
```

- **Example 10 –** Returns a full report of allocation for the index with an `indid` of 2 on the `titleauthor` table and fixes any allocation errors:

```
dbcc indexalloc ("pubs..titleauthor", 2, full)
```

- **Example 11 –** Prints the global list of available temporary databases:

```
dbcc pravailabletempdbs
```

```
Available temporary databases are:
Dbid: 2
Dbid: 4
```

```
Dbid: 5
Dbid: 6
Dbid: 7
DBCC execution completed. If DBCC printed error
messages, contact a user with system administrator (SA) role.
```

- **Example 12 –** Rebuilds or creates an internal SAP ASE data structure for all `text` and `image` columns in the `blurbs` table:

```
dbcc rebuild_text (blurbs)
```

- **Example 13 –** Checks part of the `titles` table that resides on the `smallsales` partition (which contains all booksales less than 5000)

```
dbcc checktable (titles, NULL, "smallsales")
```

- **Example 14 – dbcc reindex** Discoveres one or more corrupt indexes in the `titles` table:

```
dbcc reindex (titles)
```

```
One or more indexes are corrupt. They will be rebuilt.
```

- **Example 15 –** Checks the maximum amount of stack memory used since the SAP ASE server started:

```
dbcc stackused
```

- **Example 16 –** Upgrades all stored procedures in the `listdb` database:

```
dbcc upgrade_object(listdb, 'procedure')
```

- **Example 17 –** Upgrades all rules and check constraints in the `listdb` database. Double quotes are used around **rule** because **set quoted identifiers** is **off**.

```
dbcc upgrade_object(listdb, list_proc)
```

- **Example 18 –** Displays an abridged output showing various forms of limits in your SAP ASE server:

```
dbcc serverlimits
```

```
Limits independent of page size:
================================

Server-wide, Database-specific limits and sizes

Max engines per server                                          :
128
Max number of logins per server                                :
2147516416
Max number of users per database                               :
2146484223
Max number of groups per database                               :
1032193
Max number of user-defined roles per server                     :
1024
Max number of user-defined roles per (user)
session                      : 127
Min database page size                                          :
```

```
2048
Max database page size                                              :
16384
...

Database page-specific limits

APL page header size                                               : 32
DOL page header size                                                :
44
Max reserved page gap                                               :
255
Max fill factor                                                   : 100

Table, Index related limits

Max number of columns in a table/view                               :
1024
Max number of indexes on a table                                    :
250
Max number of user-keys in a single index on an unpartitioned
table   : 31
Max number of user-keys in a single local index on a partitioned
table : 31
...
General SQL related

Max size of character literals, sproc parameters                    :
16384
Max size of local @variables in T-SQL                               :
16384
Max number of arguments to stored procedures                        :
2048
Max number of arguments to dynamic SQL                              :
2048
Max number of aggregates in a COMPUTE clause                         :
254
...

Maximum lengths of different Identifiers

Max length of server name                                           :
30
Max length of host name                                             :
30
Max length of login name                                            :
30
Max length of user name                                             :
30
...

Limits as a function of the page size:
======================================

Item dependent on page
size                : 2048    4096    8192    16384
```

```
-----------------------------------------------------------------
---------

Server-wide, Database-specific limits and sizes

Min number of virtual pages in master device     : 11780 22532
45060 90116
Default number of virtual pages in master device : 23556 45060
90116 180228
Min number of logical pages in master device     : 11776 11264
11264 11264
Min number of logical pages in tempdb             : 2048 1536 1536
1536

Table-specific row-size limits

Max possible size of a log-record row on APL log page : 2014 4062
8158 16350

Physical Max size of an APL data row, incl row-overheads : 1962
4010 8106 16298
Physical Max size of a DOL data row, incl row-overheads : 1964 4012
8108 16300

Max user-visible size of an APL data row : 1960 4008 8104 16296
Max user-visible size of a DOL data row : 1958 4006 8102 16294
Max user-visible size of a fixed-length column in an APL table :
1960 4008 8104 16296
Max user-visible size of a fixed-length column in a DOL table :
1958 4006 8102 16294
...
```

Note: To show a complete listing of limits in the server, execute **dbcc traceon (3604)** to get the output to the client session.

- **Example 19 –** Returns an optimized report of allocation for this table, but does not fix any allocation errors:

  ```
  dbcc tablealloc (publishers, null, nofix)
  ```

- **Example 20 –** Performs allocation checks on the `smallsales` partition. All the local indexes on `smallsales` are included in the check, while the global indexes are excluded:

  ```
  dbcc tablealloc (titles, null, null, smallsales)
  ```

- **Example 21 –** Uses **sp_transactions** to determine the name of a one-phase commit transaction that did not heuristically commit because it was not in a "prepared" state. The example then explains how to use the **1pc** parameter to successfully commit the transaction:

  ```
  sp_transactions
  ```

  ```
  xactkey                                type    coordinator starttime
      state          connection dbid spid loid failover    srvname
  namelen
  ```

```
    xactname
------------------------------  ------- ----------- ---------
    ------------- ---------- ---- ---- ---- --------    ---------
--------
    -------------
0xbc0500000b00000030c316480100 External XA          Feb 2 2004
1:07PM
    Done-Detached Detached       1   0 2099 Resident Tx NULL     88
    28_u7dAc31Wc380000000000000000000000000000000001HFpfSxkDM000F
U_00003M00
        00Y_:SYBBEV0A_LRM
(1 row affected)

 (return status = 0)
```

If you try to commit this transaction, the SAP ASE server issues an error message:

```
dbcc complete_xact
("28_u7dAc31Wc380000000000000000000000000000000001HFpfSxkDM000FU_
00003M0000Y_:SYBBEV0A_LRM", "commit"))
```

The error message the SAP ASE server issues:

```
Msg 3947, Level 16, State 1:
Server 'PISSARRO_1251_P', Line 1:
A heuristic completion related operation failed. Please see
errorlog for more details.
DBCC execution completed. If DBCC printed error messages, contact
a user with system administrator (SA) role.
```

Because the transaction is in a “done” state, you can use a one-phase commit protocol optimization to heuristically complete the transaction after verifying the transaction was committed. You can commit this transaction using the **dbcc complete_xact (“1pc”)** parameter:

```
dbcc complete_xact
("28_u7dAc31Wc380000000000000000000000000000000001HFpfSxkDM000FU_
00003M0000Y_:SYBBEV0A_LRM", "commit", "1pc")
```

```
DBCC execution completed. If DBCC printed error messages, contact
a user with system administrator (SA) role.
```

You can remove the transaction from `systransactions` with the **dbcc forget_xact** command:

```
dbcc forget_xact
("28_u7dAc31Wc380000000000000000000000000000000001HFpfSxkDM0
00FU_00003M0000Y_:SYBBEV0A_LRM")
DBCC execution completed. If DBCC printed error messages, contact
a user with system administrator (SA) role.
```

If you run **sp_transactions** again, the previous transaction does not appear:

```
sp_transactions
```

```
xactkey  type  coordinator  starttime  state  connection  dbid  s
pid
      loid   failover  srvnname  namelen  xactname
```

```
-------- ----- ------------ ---------- ------
----------- ----- -----
      ------ --------- --------- -------- --------
 (0 row affected)
```

- **Example 22 –** Enables trace flag 3604:

  ```
  dbcc nodetraceoff(3604)
  ```

  ```
  DBCC execution completed. If DBCC printed error messages, contact
  a user with system administrator (SA) role.
  ```

- **Example 23 –** Sets the **dbcc** scope to the cluster:

  ```
  dbcc set_scope_in_cluster('cluster')
  ```

- **Example 24 –** Sets the **dbcc** scope to the instance:

  ```
  dbcc set_scope_in_cluster('instance')
  ```

- **Example 25 –** Displays the current scope for **dbcc** commands:

  ```
  dbcc set_scope_in_cluster('scope')
  ```

Usage

- **dbcc checkstorage** reports a soft fault if any data page that is not the first data page is empty for nonhashed tables. However, **dbcc checkstorage** does not report this soft fault for the hashed region of a virtually-hashed table. Any data page in the hashed region of a virtually-hashed table can be empty.
- You can run **dbcc** while the database is active, except for the **dbrepair (*database_name*, dropdb)** option and **dbcc checkalloc** with the **fix** option.
- **dbcc** locks database objects as it checks them. For information on minimizing performance problems while using **dbcc**, see the **dbcc** discussion in the *System Administration Guide*.
- When **dbcc** commands are executing, users cannot access an archive database. If you attempt to access an archive database while **dbcc** commands are being performed, you receive a message saying that the database is in single-user mode.
- Most **dbcc** commands work with in-memory and relaxed durability databases.
- You cannot lock a table on which you previously executed the **dbcc tune(des_bind…)** command because the SAP ASE server does not allow shared or exclusive table locks on hot objects. For example, the SAP ASE server issues warning number 8242 if you:
  - Create a table
  - Run **dbcc tune (des_bin. . .)**. For example:

    ```
    dbcc tune(des_bin, 4, new_table)
    ```

  - Attempt to lock the table:

    ```
    begin tran
    lock table new_table in exclusive mode
    go
    ```

    ```
    Msg 8242, Level 16, State 1:
    Server 'server01', Line 2:
    ```

```
The table ‘new_table’ in database 'big_db' is bound to metadata
cache memory. Unbind the table and retry the query later.
```

- You can use variants of the **dbcc** commands on an archive database that is online or offline. However, you can use **dbcc** with a **fix** option only on an online archive database.
- To qualify a table or an index name with a user name or database name, enclose the qualified name in single or double quotation marks. For example:

  ```
  dbcc tablealloc ("pubs2.pogo.testtable")
  ```
- You cannot run **dbcc reindex** within a user-defined transaction.
- **dbcc fix_text** can generate a large number of log records, which may fill up the transaction log. **dbcc fix_text** is designed so that updates are performed in a series of small transactions: in case of a log space failure, only a small amount of work is lost. If you run out of log space, clear your log and restart **dbcc fix_text** using the same table that was being upgraded when the original **dbcc fix_text** failed.
- If you are using a replicated database and need to load a dump from an earlierversion of the SAP ASE server to the current version, use **dbcc dbrepair**. For example:
  - Load a dump from a production system of the earlier version of the SAP ASE server into a test system of the current version SAP ASE server, or
  - In a warm standby application, initialize a standby database of the current version of the SAP ASE server with a database dump from an active database of the earlier version of the SAP ASE server.
- If you attempt to use **select**, **readtext**, or **writetext** on `text` values after changing to a multibyte character set, and you have not run **dbcc fix_text**, the command fails, and an error message instructs you to run **dbcc fix_text** on the table. However, you can delete `text` rows after changing character sets without running **dbcc fix_text**.
- **dbcc** output is sent as messages or errors, rather than as result rows. Client programs and scripts should check the appropriate error handlers.
- If a table is partitioned, **dbcc checktable** returns information about each partition.
- `text` and `image` data that has been upgraded to SAP ASE version 12.x or later is not automatically upgraded from its original storage format. To improve query performance and enable prefetch for this data, use the **rebuild_text** keyword against the upgraded `text` and `image` columns.
- The amount of stack memory used in the past is only an indication of possible future needs. The SAP ASE server may require more stack memory than it used in the past. Periodically run **dbcc stackused** to find your current stack memory usage.
- **dbcc upgrade_object check** is used to detect `syscomments` text corruption caused by SAP ASE defects that occurred before you upgraded the SAP ASE server. This `syscomments` text corruption is serious because it causes the upgrade process to fail.
- If any error is reported by **dbcc upgrade_object check**, you must drop and re-create the *compiled_object*.

(Cluster Edition only) **dbcc traceon** and **dbcc traceoff** apply trace flags for the entire cluster, while **dbcc nodetraceoff** and **dbcc nodetraceon** apply trace flags locally.

See also **sp_configure**, **sp_helpdb** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **dbcc** commands differ based on your granular permissions settings. This table shows the permission requirement for each **dbcc** command.

Note: You can run a **dbcc** command if you have any one of the requirements (privileges or ownership) listed in the table for that command.

Table 3. Permissions Requirement for dbcc Command

DBCC Command Name	Permission Requirement	
	Granular Permissions Disabled	Granular Permissions Enabled
addtempdb	• Database owner • sa_role	• Database owner • `own database`
checkalloc	• `dbcc checkalloc` • Database owner • sa_role	• `dbcc checkalloc`
checkcatalog	• `dbcc checkcatalog` • Database owner • sa_role	• `dbcc checkcatalog`
checkdb	• `dbcc checkdb` • Database owner • sa_role	• `dbcc checkdb`
checkindex	• `dbcc checkindex` • Table owner • sa_role	• `dbcc checkindex` • Table owner
checkstorage	• `dbcc checkstorage` • Database owner • sa_role	• `dbcc checkstorage`

DBCC Command Name	Permission Requirement	
	Granular Permissions Disabled	Granular Permissions Enabled
checktable	• `dbcc checktable` • Table owner • sa_role	• `dbcc checktable` • Table owner
checkverify	• `dbcc checkverify` • Database owner • sa_role	• `dbcc checkverify`
cis showcaps	• sa_role	• `manage server`
cis remcon	• sa_role	• `manage server`
complete_xact	• sa_role	• `manage server`
dbrepair dropdb	• Database owner • sa_role	• Database owner • `own database`
engine	• sa_role	• `manage server`
fix_text	• `dbcc fix_text` • Object owner • sa_role	• `dbcc fix_text` • Object owner
forget_xact	• sa_role	• `manage server`
indexalloc	• `dbcc indexalloc` • Table owner • sa_role	• `dbcc indexalloc` • Table owner
monitor	• sa_role	• `manage server`
pravailabletempdbs	• sa_role	• `manage server`
quorum	• sa_role	• `manage cluster`

DBCC Command Name	Permission Requirement	
	Granular Permissions Disabled	Granular Permissions Enabled
rebuild_text	• Table owner • sa_role	• Table owner • `manage database`
reindex	• `dbcc reindex` • Table owner • sa_role	• `dbcc reindex` • Table owner
serverlimits	• sa_role	• `manager server`
set_scope_in_cluster	• sa_role	• `manage cluster`
stackused	• sa_role	• `manager server`
tablealloc	• `dbcc tablealloc` • Table owner • sa_role	• `dbcc tablealloc` • Table owner
textalloc	• `dbcc textalloc` • Table owner • sa_role	• `dbcc textalloc` • Table owner
trace flags – **3604**, **3605**	• sa_role	• `set tracing` • `monitor qp per-formance` • `set switch`
all other trace flags	• sa_role	• set switch
tune ascinserts	• `dbcc tune` • Table owner • sa_role	• `dbcc tune` • Table owner
tune all other parameters	• `dbcc tune` • sa_role	• `dbcc tune`

DBCC Command Name	Permission Requirement	
	Granular Permissions Disabled	Granular Permissions Enabled
upgrade_object	• `object owner` • Database owner • sa_role	• `manage database` • Object owner

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	81
Audit option	**dbcc**
Command or access audited	**dbcc**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – Any of the **dbcc** keywords such as **checkstorage** and the options for that keyword • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *drop database* on page 342

Using dbcc quorum (clusters only)

Usage information for **dbcc quorum**.

- **dbcc quorum** output goes to:
  - By default, terminal that started the SAP ASE server
  - The client session if trace flag 3604 or 3605 is on
- **dbcc quorum** accepts an integer parameter for the number of view records to print. For example, to print the 20 most recently view records, use:

  ```
  dbcc quorum(20)
  ```
- If you do not include a parameter **dbcc quorum** prints the 10 most recent view records.
- Issue **dbcc quorum (-1)** to view all records.

Restrictions on dbcc checkstorage for Shared-Disk Clusters

Restrictions for using **dbcc checkstorage on** shared-disk clusters.

- You cannot include instance-only named caches with **dbcc checkstorage**. **dbcc checkstorage** issues this error message if you do so:

  ```
  The cache %1! cannot be used because it is an instance only cache
  ```
- To run **dbcc checkstorage** against a local temporary database, you must run the command from the same instance that owns the local temporary database.
- For performance reasons, **dbcc checkstorage** in the Cluster Edition may not query the latest version of a page in the cluster. This may cause the Cluster Edition to report more soft faults than other versions.

  For well-partitioned applications where a single instance updates a database, **dbcc checkstorage** behaves as earlier non-Cluster Edition SAP ASE versions.

Using dbcc complete_xact

dbcc complete_xact enables a system administrator to commit or roll back a distributed transaction in circumstances where the external transaction coordinator cannot.

In versions of SAP ASE earlier than 15.0, a transaction could not heuristically committed unless it was in the “prepare” state, and the transaction coordinator used a two-phase commit protocol to commit the transaction. However, in some cases, a transaction coordinator may want to use a one-phase commit protocol as an optimization to commit the transaction.

1pc heuristically completes a transaction that was subject to a one-phase commit protocol optimization—instead of the regular two-phase commit protocol—by the external transaction manager that was coordinating its completion. Heuristically committing such a transaction requires that the transaction be in a “done” state (as reported by **sp_transactions**).

Note: Before heuristically completing the transaction, the system administrator should make every effort to determine whether the coordinating transaction manager committed or rolled back the distributed transaction.

Checking Performed by dbcc checkcatalog

dbcc checkcatalog checks and reports on a variety of issues.

- For each row in `sysindexes` that maps to a range-, hash-, or list-partitioned table, there exists one row in `sysobjects` where `sysindexes.conditionid` equals `sysobjects.id`. **dbcc checkcatalog** also performs this check for each row in `sysindexes` that maps to a round-robin-partitioned table that has a partition condition.
- For each row in `sysindexes` that maps to a range-, hash-, or list-partitioned table, there exists one or more rows in `sysprocedures` where `sysindexes.conditionid` equals `sysprocedures.id`. **dbcc checkcatalog** also performs this check for each row

in `sysindexes` that maps to a round-robin-partitioned table that has a partition condition.

- For each row in `sysindexes` that maps to a range-, hash-, or list-partitioned table, there exists one row in `syspartitionkeys` where the following conditions are true: `sysindexes.id` equals `syspartitionkeys.id` and `sysindexes.indid` equals `syspartitionkeys.indid`. **dbcc checkcatalog** also performs this check for each row in `sysindexes` that maps to a round-robin-partitioned table that has a partition condition.
- For each row in `sysindexes`, there exists one or more rows in `syspartitions` where both of the following conditions are true: `sysindexes.id` equals `syspartitions.id` and `sysindexes.indid` equals `syspartitions.indid`.
- For each row in `sysobjects` where type is `N`, there exists one row in `sysindexes` where `sysindexes.conditionid` equals `sysobjects.id`.
- For each row in `syspartitions`, there exists a row in `sysindexes` where the following conditions are true: `syspartitions.id` equals `sysindexes.id` and `syspartitions.indid` equals `sysindexes.indid`.
- For each row in `syspartitionkeys`, there exists a row in `sysindexes` where the following conditions are true: `syspartitionkeys.id` equals `sysindexes.id` and `syspartitionkeys.indid` equals `sysindexes.indid`.
- For each row in `syspartitions`, there exists one row in `syssegments` where the following condition is true: `syspartitions.segments` equals `syssegments.segment`.
- For each row in `systabstats`, there exists a row in `syspartitions` where the following conditions are true: `syspartitions.id` equals `systabstats.id`, `syspartitions.indid` equals `systabstats.indid` and `syspartitions.partitionid` equals `systabstats.partitionid`.

  Text indexes (`indid`=255) do not have entries in `systabstats`.
- For each row in `sysstatistics`, there exists a row in `sysobjects` where the following condition is true: `sysstatistics.id` equals `sysobjects.id`.
- For each encryption key row in `sysobjects`, the SAP ASE server checks `sysencryptkeys` for a row defining that key.
- For each column in `syscolumns` marked for encryption, the SAP ASE server verifies that a key-in `sysobjects` and `sysencryptkeys`.
- **dbcc checkcatalog** ensures that:
  - The corresponding base key is present in `sysencryptkeys` for every key copy in `sysencryptkeys`. If the base key is not present, the SAP ASE server issues an error.
  - For every key copy, the corresponding `uid` is present in `sysusers`. If the `uid` is not present, the SAP ASE server issues an error.

- For every decrypt default defined on a column, that the corresponding decrypt default is present in `sysobjects` and `sysattributes`. If the corresponding decrypt default is not present, the SAP ASE server issues an error.

Using dbcc checktable

If the log segment is on its own device, running **dbcc checktable** on the `syslogs` table reports the logs used and free space.

For example:

```
Checking syslogs
The total number of data pages in this table is 1.
*** NOTICE: Space used on the log segment is 0.20 Mbytes, 0.13%.
*** NOTICE: Space free on the log segment is 153.4 Mbytes,
99.87%.DBCC execution completed.  If dbcc printed error messages, see
your system administrator.
```

If the log segment is not on its own device, the following message appears:

```
*** NOTICE:  Notification of log space used/free cannot be reported
because the log segment is not on its own device.
```

In addition to the regular checks it performs, **checktable** verifies that the preallocation performed during table creation is correct:

- The number of pages preallocated matches the total number of data pages that must be allocated for the specified *max hash key* value.
- The data pages are not preallocated in an extent where the preallocation scheme specifies that only object allocation map (OAM) pages are allowed.
- The OAM pages are allocated only in the first extent of an allocation unit.

deallocate cursor

Makes a cursor inaccessible and releases all memory resources that are committed to that cursor.

Syntax

```
deallocate [cursor] cursor_name
```

Parameters

- ***cursor_name* –** is the name of the cursor to deallocate.

Examples

- **Example 1 –** Deallocates the cursor named “authors_crsr”:

  ```
  deallocate cursor authors_crsr
  ```

- **Example 2 –** Also deallocates the cursor named "authors_crsr," but omits **cursor** from the syntax:

  ```
  deallocate authors_crsr
  ```

Usage

- You can use **deallocate cursor** with an archive database.
- The SAP ASE server returns an error message if the cursor does not exist.
- You must deallocate a cursor before you can use its cursor name as part of another **declare cursor** statement.
- **deallocate cursor** has no effect on memory resource usage when specified in a stored procedure or trigger.
- You can **deallocate** a cursor whether it is open or closed.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **deallocate cursor**.

See also

- *close* on page 88
- *declare cursor* on page 304

deallocate locator

Deletes a large object (LOB) stored in memory and invalidates its LOB locator.

Syntax

```
deallocate locator locator_descriptor
```

Parameters

- ***locator_descriptor* –** is a valid representation of a LOB locator: a host variable, a local variable, or the literal binary value of a locator.

Examples

- **Example 1 –** Deallocates the LOB referenced by *@v*:

  ```
  deallocate locator @v
  ```

Usage

- Use **deallocate locator** within a transaction. The SAP ASE server automatically deallocates each locator at the end of a transaction.
- **deallocate locator** can conserve memory. When many LOB locators are created within a transaction, use **deallocate locator** to remove individual LOBs and locators when they are no longer needed.

See also **locator_literal**, **locator_valid**, **return_lob**, **create_locator** in *Reference Manual: Building Blocks*.

Permissions

Any user can execute **deallocate locator**.

See also

- *truncate lob* on page 670

declare

Declares the name and type of local variables for a batch or procedure.

Syntax

Variable declaration:

```
declare @variable_name datatype
    [, @variable_name datatype]...
```

Variable assignment:

```
select @variable = {expression | select_statement}
    [, @variable = {expression | select_statement} ...]
    [from table_list]
    [where search_conditions]
    [group by group_by_list]
    [having search_conditions]
    [order by order_by_list]
    [compute function_list [by by_list]]
```

Parameters

- ***@variable_name*** **–** must begin with @ and must conform to the rules for identifiers.
- ***datatype*** **–** can be either a system datatype or a user-defined datatype.

Examples

- **Example 1 –** Declares two variables and prints strings according to the values in the variables:

```
declare @one varchar (18), @two varchar (18)
select @one = "this is one", @two = "this is two"
if @one = "this is one"
    print "you got one"
if @two = "this is two"
    print "you got two"
else print "nope"
```

```
you got one
you got two
```

- **Example 2 –** Prints “Ouch!” if the maximum book price in the `titles` table is more than $20.00:

```
declare @veryhigh money
select @veryhigh = max (price)
    from titles
if @veryhigh > $20
    print "Ouch!"
```

Usage

- Assign values to local variables with a **select** statement.
- The maximum number of parameters in a procedure is 2048. The number of local or global variables is limited only by available memory. The @ sign denotes a variable name.
- Local variables are often used as counters for **while** loops or **if...else** blocks. In stored procedures, they are declared for automatic, noninteractive use by the procedure when it executes. Local variables must be used in the batch or procedure in which they are declared.
- The **select** statement that assigns a value to the local variable usually returns a single value. If there is more than one value to return, the variable is assigned the last one. The **select** statement that assigns values to variables cannot be used to retrieve data in the same statement.
- The **print** and **raiserror** commands can take local variables as arguments.
- Users cannot create global variables and cannot update the value of global variables directly in a **select** statement.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use declare.

See also

- *print* on page 531
- *raiserror* on page 538
- *select* on page 579

- *while* on page 719

declare cursor

Defines a cursor, by associating a select statement with a cursor name. You can use **declare cursor** with an archive database.

Syntax

```
declare cursor_name
[semi_sensitive | insensitive] [scroll | no scroll]
[release_locks_on_close]
    cursor for select_statement
    [for {read only | update [of column_name_list]}]
```

Parameters

- ***cursor_name* –** is the name of the cursor being defined.
- ***select_statement* –** is the query that defines the cursor result set. See **select** for more information.
- **semi_sensitive –** specifies that the data changes made independently of the cursor may be visible to the cursor result set. The visibility of the dependent data changes depends on the query plan chosen by the optimizer. If there is no worktable created in the plan, the data changes are visible to the result set. The default is **semi_sensitive**.
- **insensitive –** specifies that the data changes made independently of the cursor are not visible to the cursor result set. If you do not specify this argument, the default is **semi_sensitive**. You cannot update an insensitive cursor.
- **scroll | no scroll –** specifies whether the declared cursor is scrollable. Scrollable cursors allowing you fetch the cursor result set nonsequentially, allowing you to scan the cursor back and forth. You cannot update a scrollable cursor.
- **release_locks_on_close –** allows you to configure the lock-releasing behavior of each cursor so that the shared locks can be released when the cursor is closed, even if the transaction is active. This option applies to cursors of all types.
- **for read only –** specifies that the cursor result set cannot be updated.
- **for update –** specifies that the cursor result set is updatable.
- **of *column_name_list* –** is the list of columns from the cursor result set (specified by the *select_statement*) defined as updatable. The SAP ASE server also allows you to include columns that are not specified in the list of columns of the cursor's *select_statement* (and excluded from the result set), but that are part of the tables specified in the *select_statement*.

Examples

- **Example 1 –** Defines a result set for the `authors_crsr` cursor that contains all authors from the `authors` table who do not reside in California:

```
declare authors_crsr cursor
for select au_id, au_lname, au_fname
from authors
where state != 'CA'
```

- **Example 2 –** Defines a read-only result set for the `titles_crsr` cursor that contains the business-type books from the `titles` table:

  ```
  declare titles_crsr cursor
  for select title, title_id from titles
  where title_id like "BU%"
  for read only
  ```

- **Example 3 –** Defines an updatable result set for the `pubs_crsr` cursor that contains all of the rows from the `publishers` table. It defines the address of each publisher (`city` and `state` columns) for update:

  ```
  declare pubs_crsr cursor
  for select pub_name, city, state
  from publishers
  for update of city, state
  ```

- **Example 4 –** Defines an insensitive scrollable result set for the `stores_scrollcrsr` that contains the book stores in California:

  ```
  declare stores_scrollcrsr insensitive scroll cursor
  for select stor_id, stor_name
  from stores where state = 'CA'
  ```

- **Example 5 –** Defines an insensitive nonscrollable result set for the `stores_scrollcrsr` that contains the book stores in California:

  ```
  declare stores_scrollcrsr insensitive no scroll cursor
  for select stor_id, stor_name
  from stores where state = 'CA'
  ```

Usage

- A **declare cursor** statement must precede any **open** statement for that cursor.
- You cannot include other statements with **declare cursor** in the same Transact-SQL batch.
- You can include up to 1024 columns in an **update** clause of a client's **declare cursor** statement.
- *cursor_name* must be a valid SAP ASE identifier containing no more than 30 characters.
- You cannot include encrypted columns in the **for update** clause of a **declare cursor** statement.
- You cannot update a scrollable cursor.
- You cannot update an insensitive cursor.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Permissions

No permission is required to use **declare cursor**.

See also

- *open* on page 523

Using Scrollable Cursors

Usage information for scrollable cursors.

- If you do specify **insensitive** or **semi_sensitive** when you execute **declare cursor**, the default sensitivity is implicit, so that the cursor's sensitivity depends on the query plan chosen by the optimizer. If the query plan has any worktable created, the cursor becomes insensitive.
- If you specify the cursor's sensitivity to be semisensitive, sensitivity also depends on the query plan.
- If you specify **insensitive**, the cursor is *read_only*. You cannot use a **for update** clause in a cursor declaration.
- If you do not specify the cursor's scrollability, **no scroll** is implied.
- All scrollable cursors are read-only. You cannot use a **for update** clause in a cursor declaration.

Cursor select Statements

Consider the following when using cursor **select** statements.

- *select_statement* can use the full syntax and semantics of a Transact-SQL **select** statement, with these restrictions:
  - Must contain a **from** clause
  - Cannot contain a **compute**, **for browse**, or **into** clause
  - Can contain the **holdlock** keyword
- The *select_statement* can contain references to Transact-SQL parameter names or Transact-SQL local variables (for all cursor types except language). The names must reference the Transact-SQL parameters and local variables defined in the procedure, trigger, or statement batch that contains the **declare cursor** statement.

  The parameters and local variables referenced in the **declare cursor** statement do not have to contain valid values until the cursor is opened.
- The *select_statement* can contain references to the `inserted` and `deleted` temporary tables that are used in triggers.

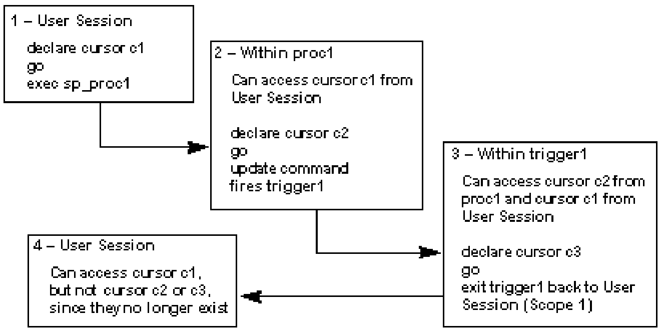
Cursor Scope

A cursor's existence depends on its scope. The scope refers to the context in which the cursor is used, that is, within a user session, within a stored procedure, or within a trigger.

Within a user session, the cursor exists only until the user ends the session. The cursor does not exist for any additional sessions started by other users. After the user logs off, the SAP ASE server deallocates the cursors created in that session.

If a **declare cursor** statement is part of a stored procedure or trigger, the cursor created within it applies to stored procedure or trigger scope and to the scope that launched the stored procedure or trigger. Cursors declared inside a trigger on an `inserted` or a `deleted` table are not accessible to any nested stored procedures or triggers. However, cursors declared inside a trigger on an `inserted` or a `deleted` table are accessible within the scope of the trigger. Once the stored procedure or trigger completes, the SAP ASE server deallocates the cursors created within it.

This shows how cursors operate between scopes:


1 – User Session
declare cursor c1
go
exec sp_proc1
2 – Within proc1
Can access cursor c1 from User Session
declare cursor c2
go
update command fires trigger1
3 – Within trigger1
Can access cursor c2 from proc1 and cursor c1 from User Session
declare cursor c3
go
exit trigger1 back to User Session (Scope 1)
4 – User Session
Can access cursor c1, but not cursor c2 or c3, since they no longer exist

A cursor name must be unique within a given scope. The SAP ASE server detects name conflicts within a particular scope only during runtime. A stored procedure or trigger can define two cursors with the same name if only one is executed. For example, the following stored procedure works because only one `names_crsr` cursor is defined in its scope:

```
create procedure proc2 @flag int
as
if @flag > 0
    declare names_crsr cursor
    for select au_fname from authors
else
    declare names_crsr cursor
    for select au_lname from authors
return
```

Result Set

A cursor result set is generated as the rows are returned through a **fetch** of that cursor. This means that a cursor **select** query is processed like a normal **select** query. This process, known as a *cursor scan*, provides a faster turnaround time and eliminates the need to read rows that are not required by the application.

Cursor result set rows may not reflect the values in the actual base table rows. For example, a cursor declared with an **order by** clause usually requires the creation of an internal table to order the rows for the cursor result set. The SAP ASE server does not lock the rows in the base table that correspond to the rows in the internal table, which permits other clients to update these base table rows. In this case, the rows returned to the client from the cursor result set are not in sync with the base table rows.

A restriction of cursor scans is that they can only use the unique indexes of a table. However, if none of the base tables referenced by the cursor result set are updated by another process in the same lock space as the cursor, the restriction is unnecessary. The SAP ASE server allows the declaration of cursors on tables without unique indexes, but any attempt to update those tables in the same lock space closes all cursors on the tables.

Updatable Cursors

After defining a cursor using **declare cursor**, the SAP ASE server determines whether the cursor is updatable or read-only.

If:

- A cursor is updatable – you can update or delete rows through the cursor; that is, use *cursor_name* to do a position **update** or **delete**.
- A cursor is read-only – you cannot use *cursor_name* to perform a position **update** or **delete**.

Use the **for update** or **for read only** clause to explicitly define a cursor as updatable or read-only. You cannot define an updatable cursor if its *select_statement* contains one of the following constructs:

- **distinct** option
- **group by** clause
- Aggregate function
- Subquery
- **union** operator
- **at isolation read uncommitted** clause

If you do not specify either the **for update** or the **read only** clause, the SAP ASE server checks to see whether the cursor is updatable.

The SAP ASE server also defines a cursor as read-only if you declare a language- or server-type cursor that includes an **order by** clause as part of its *select_statement*. The SAP ASE server handles updates differently for client- and execute-type cursors, thereby eliminating this restriction.

When using updatable cursors and allpages locking:

- If you do not specify a *column_name_list* with the **for update** clause, all the specified columns in the query are updatable. The SAP ASE server attempts to use unique indexes for updatable cursors when scanning the base table. For cursors, the SAP ASE server considers an index containing an IDENTITY column to be unique, even if it is not so declared.
- If you do not specify the **for update** clause, the SAP ASE server chooses any unique index, although it can also use other indexes or table scans if no unique index exists for the specified table columns. However, when you specify the **for update** clause, the SAP ASE server must use a unique index defined for one or more of the columns to scan the base table. If none exists, it returns an error.
- In most cases, include only columns to be updated in the *column_name_list* of the **for update** clause. If the table has only one unique index, you do not need to include its column in the **for update *column_name_list***; the SAP ASE server finds it when it performs the cursor scan. If the table has more than one unique index, do not include any of them in the **for update *column_name_list***.

  This allows the SAP ASE server to use that unique index for its cursor scan, which helps prevent an update anomaly called the *Halloween problem*. Another way to prevent the Halloween problem is to create tables with the **unique auto_identity index** database option. See the *System Administration Guide*.

  The Halloween problem occurs when a client updates a column of a cursor result set row that defines the order in which the rows are returned from the base tables. For example, if the SAP ASE server accesses a base table using an index, and the index key is updated by the client, the updated index row can move within the index and be read again by the cursor. This is a result of an updatable cursor only logically creating a cursor result set. The cursor result set is actually the base tables that derive the cursor.

If you specify the **read only** option, you cannot update the cursor result set using the cursor name to perform **update** or **delete**.

Releasing Locks at Cursor Close

release_locks_on_close has no effect if the cursor scan occurs at isolation level 1.

The default behavior at isolation levels 2 and 3 if the transaction is committed or rolled back before the cursor is closed is for the SAP ASE server to release the shared locks acquired by the cursor until that point, with the exception of the lock on the last fetched row. If you use **release_on_locks_close**, the shared locks acquired by the cursor exist until the cursor is closed.

Use **sp_cursorinfo** to determine if a cursor was declared with the **release_on_locks_close** parameter:

```
1) sp_cursorinfo
2> go
```

```
Cursor name 'c' is declared at nesting level '0'.
The cursor is declared as NON-SCROLLABLE
RELEASE_LOCKS_ON_CLOSE cursor.
The cursor id is 917505.
The cursor has been successfully opened 0 times.
The cursor will remain open when a transaction is
committed or rolled back.
```

delete

Removes rows from a table.

Syntax

```
delete
    [top unsigned_integer]
    [from] [[database.]owner.]{view_name|table_name}
    [where search_conditions]
    [plan "abstract plan"]
```

```
delete [[database.]owner.]{table_name | view_name}
    [from [[database.]owner.]{view_name [readpast]|
        table_name
            [(index {index_name | table_name}
                [prefetch size][lru|mru])]}
            [readpast]
    [, [[database.]owner.]{view_name [readpast]|
        table_name
            [(index {index_name | table_name}
                [prefetch size][lru|mru])]
            [readpast]} ...]
    [where search_conditions]]
    [plan "abstract plan"]
```

```
delete [from] [[database.]owner.]{table_name|view_name}
    where current of cursor_name
```

Parameters

- **from (after delete) –** is an optional keyword used for compatibility with other versions of SQL.
- ***view_name* | *table_name* –** is the name of the view or table from which to remove rows. Specify the database name if the view or table is in another database, and specify the owner’s name if more than one view or table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.
- **where –** is a standard **where** clause.

- **from (after *table_name* or *view_name*) –** lets you name more than one table or view to use with a **where** clause when specifying which rows to delete. This **from** clause allows you to delete rows from one table based on data stored in other tables, giving you much of the power of an embedded **select** statement.
- **top *unsigned_integer* –** is used to limit the number of rows to the number of rows specified by *unsigned_integer*.
- **readpast –** specifies that the **delete** command skip all pages or rows on which incompatible locks are held, without waiting for locks or timing out. For datapages-locked tables, *readpast* skips all rows on pages on which incompatible locks are held; for datarows-locked tables, it skips all rows on which incompatible locks are held.
- **index *index_name* –** specifies an index to use for accessing *table_name*. You cannot use this option when you delete from a view.
- **prefetch *size* –** specifies the I/O size, in kilobytes, for tables that are bound to caches with large I/Os configured. You cannot use **prefetch** when you delete from a view. **sp_helpcache** shows the valid sizes for the cache an object is bound to, or for the default cache.

  When using **prefetch** and designating the prefetch size (*size*), the minimum is 2K and any power of two on the logical page size up to 16K. **prefetch** size options, in kilobytes, are:

Logical Page Size	Prefetch Size Options
2	2, 4, 8 16
4	4, 8, 16, 32
8	8, 16, 32, 64
16	16, 32, 64, 128

  The **prefetch** size specified in the query is only a suggestion. To allow the size specification, configure the data cache at that size. If you do not configure the data cache to a specific size, the default **prefetch** size is used.

  To configure the data cache size, use **sp_cacheconfigure**.

  Note: You cannot use **prefetch** for remote servers if you enable CIS.
- **lru | mru –** specifies the buffer replacement strategy to use for the table. Use **lru** to force the optimizer to read the table into the cache on the MRU/LRU (most recently used/least recently used) chain. Use **mru** to discard the buffer from cache, and replace it with the next buffer for the table. You cannot use this option when you delete from a view.
- **plan "*abstract plan*" –** specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. See *Creating and Using Abstract Plans* in the *Performance and Tuning Guide: Optimizer and Abstract Plans*.
- **where current of *cursor_name* –** causes the SAP ASE server to delete the row of the table or view indicated by the current cursor position for *cursor_name*.

Examples

- **Example 1 –** Deletes all rows from the `authors` table:

  ```
  delete authors
  ```

- **Example 2 –** Deletes a row or rows from the `authors` table:

  ```
  delete from authors where au_lname = "McBadden"
  ```

- **Example 3 –** Deletes rows for books written by Bennet from the `titles` table.

  ```
  delete titles
  from titles, authors, titleauthor
  where authors.au_lname = 'Bennet'
    and authors.au_id = titleauthor.au_id
    and titleauthor.title_id = titles.title_id
  ```

  The `pubs2` database includes a trigger (`deltitle`) that prevents the deletion of the titles recorded in the `sales` table; drop this trigger for this example to work.

- **Example 4 –** Deletes a row from the `titles` table currently indicated by the cursor `title_crsr`:

  ```
  delete titles where current of title_crsr
  ```

- **Example 5 –** Determines which row has a value of 4 for the IDENTITY column and deletes it from the `authors` table. Note the use of the **syb_identity** keyword instead of the actual name of the IDENTITY column:

  ```
  delete authors where syb_identity = 4
  ```

- **Example 6 –** Deletes rows from `authors`, skipping any locked rows:

  ```
  delete from authors from authors readpast
  where state = "CA"
  ```

- **Example 7 –** Deletes rows from `stores`, skipping any locked rows. If any rows in `authors` are locked, the query blocks on these rows, waiting for the locks to be released:

  ```
  delete stores from stores readpast, authors
  where stores.city = authors.city
  ```

Usage

In pre-12.5.2 versions of SAP ASE, queries that used **update** and **delete** on views with a **union all** clause were sometimes resolved without using worktables, which occasionally lead to incorrect results. In SAP ASE 12.5.2 and later, queries that use **update** and **delete** on views with a **union all** clause are always resolved using worktables in `tempdb`.

The **index**, **prefetch**, and **lru | mru** options override the choices made by the SAP ASE optimizer. Use these options with caution, and always check the performance impact with **set statistics io on**. See *Using the set statistics Command* in *Performance and Tuning Guide: Monitoring and Analyzing*.

You can define a trigger to take a specified action when a **delete** command is issued on a specified table.

Standards

ANSI SQL – Compliance level: Entry-level compliant. The use of more than one table in the **from** clause and qualification of table name with database name are Transact-SQL extensions.

readpast is a Transact-SQL extension.

Permissions

If **set ansi_permissions** is **on**, you must have **select** permission on all columns appearing in the **where** clause, in addition to the regular permissions required for **delete** statements. By default, **ansi_permissions** is **off**.

The following describes permission checks for **delete** that differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table or view owner, or a user with `delete` permission, or a user with `delete any table` permission.
Disabled	With granular permissions disabled, you must have **delete** permission, be the table owner, or a user with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	18
Audit option	**delete**
Command or access audited	**delete** from a table
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **delete** • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

Information	Values
Event	19
Audit option	**delete**
Command or access audited	**delete** from a view
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **delete** • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *create trigger* on page 253
- *drop table* on page 363
- *drop trigger* on page 368
- *truncate table* on page 672
- *where clause* on page 712
- *update* on page 680
- *insert* on page 473
- *delete* on page 310
- *commit* on page 89
- *rollback* on page 574
- *declare cursor* on page 304
- *open* on page 523
- *select* on page 579
- *fetch* on page 412

delete Restrictions

Restrictions for using **delete**

- You cannot use **delete** with a multitable view (one whose **from** clause names more than one table), even though you may be able to use **update** or **insert** on that same view. Deleting a row through a multitable view changes multiple tables, which is not permitted. **insert** and **update** statements that affect only one base table of the view are permitted.
- The SAP ASE server treats two different designations for the same table in a **delete** as two tables. For example, the following **delete** issued in `pubs2` specifies `discounts` as two tables (`discounts` and `pubs2..discounts`):

```
delete discounts
from pubs2..discounts, pubs2..stores
where pubs2..discounts.stor_id =
    pubs2..stores.stor_id
```

In this case, the join does not include `discounts`, so the **where** condition remains true for every row; the SAP ASE server deletes all rows in `discounts` (which is not the desired result). To avoid this problem, use the same designation for a table throughout the statement.

- If you are deleting a row from a table that is referenced from other tables via referential constraints, the SAP ASE server checks all the referencing tables before permitting the delete. If the row you are attempting to delete contains a primary key that is being used as a foreign key by one of the referencing tables, the delete is not allowed.

Deleting All Rows from a Table

Considerations for deleting all rows from a table.

- If you do not use a **where** clause, all rows in the table named after **delete** [**from**] are removed. The table, though empty of data, continues to exist until you issue a **drop table** command.
- **truncate table** and **delete** without a row specification are functionally equivalent, but **truncate table** is faster. **delete** removes rows one at a time and logs these transactions. **truncate table** removes entire data pages, and the rows are not logged.

  Both **delete** and **truncate table** reclaim the space occupied by the data and its associated indexes.
- You cannot use the **truncate table** command on a partitioned table. To remove all rows from a partitioned table, either use the **delete** command without a **where** clause, or unpartition the table before issuing **truncate table**.

delete and Transactions

In chained transaction mode, each **delete** statement implicitly begins a new transaction if no transaction is currently active.

Use **commit** to complete any deletes, or use **rollback** to undo the changes. For example:

```
delete from sales where date < ’01/01/06’
if exists (select stor_id
   from stores
   where stor_id not in
    (select stor_id from sales))
      rollback transaction
else
      commit transaction
```

This batch begins a transaction (using the chained transaction mode) and deletes rows with dates earlier than Jan. 1, 2006 from the `sales` table. If it deletes all sales entries associated with a store, it rolls back all the changes to `sales` and ends the transaction. Otherwise, it commits the deletions and ends the transaction. For more information about the chained mode, see the *Transact-SQL Users Guide*.

Using the where current of Parameter

Use the clause **where current of** with cursors.

- Before deleting rows using the clause **where current of**, first define the cursor with **declare cursor** and open it using the **open** statement. Use one or more **fetch** statements to position the cursor on the row to delete. The cursor name cannot be a Transact-SQL parameter or local variable. The cursor must be an updatable cursor, or the SAP ASE server returns an error. Any deletion to the cursor result set also affects the base table row from which the cursor row is derived. You can delete only one row at a time using the cursor.
- You cannot delete rows in a cursor result set if the cursor's **select** statement contains a join clause, even though the cursor is considered updatable. The *table_name* or *view_name* specified with a **delete...where current of** must be the table or view specified in the first **from** clause of the **select** statement that defines the cursor.
- After the deletion of a row from the cursor's result set, the cursor is positioned before the next row in the cursor's result set. You must issue a **fetch** to access the next row. If the deleted row is the last row of the cursor result set, the cursor is positioned after the last row of the result set. The following describes the position and behavior of open cursors affected by a **delete**:
  - If a client deletes a row (using another cursor or a regular **delete**) and that row represents the current cursor position of other opened cursors owned by the same client, the position of each affected cursor is implicitly set to precede the next available row. However, one client cannot delete a row representing the current cursor position of another client's cursor.
  - If a client deletes a row that represents the current cursor position of another cursor defined by a join operation and owned by the same client, the SAP ASE server accepts the **delete** statement. However, it implicitly closes the cursor defined by the join.

Using readpast

Considerations for using `readpast`.

- **readpast** allows **delete** commands on data-only-locked tables to proceed without being blocked by incompatible locks held by other tasks.
  - On datarows-locked tables, **readpast** skips all rows on which shared, update, or exclusive locks are held by another task.
  - On datapages-locked tables, **readpast** skips all pages on which shared, update, or exclusive locks are held by another task.
- Commands specifying **readpast** block if there is an exclusive table lock.
- If the **readpast** option is specified for an allpages-locked table, it is ignored. The command blocks as soon as it finds an incompatible lock.

- If the session-wide isolation level is 3, the **readpast** option is silently ignored. The command executes at level 3. The command blocks on any rows or pages with incompatible locks.
- If the transaction isolation level for a session is 0, a **delete** command using **readpast** does not issue warning messages. For datapages-locked tables, **delete** with **readpast** modifies all rows on all pages that are not locked with incompatible locks. For datarows-locked tables, it affects all rows that are not locked with incompatible locks.
- If the **delete** command applies to a row with two or more text columns, and any text column has an incompatible lock on it, **readpast** locking skips the row.

delete statistics

Removes statistics from the `sysstatistics` system table.

Syntax

```
delete [shared] statistics table_name
    [partition data_partition_name]
    [(column_name[, column_name] ...)]
```

Parameters

- **shared –** removes simulated statistics information from `sysstatistics` in the `master` database.
- ***table_name* –** removes statistics for all columns in the table.
- ***data_partition_name* –** deletes all statistics for the data partition. Global statistics are not deleted.
- ***column_name* –** removes statistics for the specified column.

Examples

- **Example 1 –** Deletes the densities, selectivities, and histograms for all columns in the `titles` table:

  ```
  delete statistics titles
  ```

- **Example 2 –** Deletes densities, selectivities, and histograms for the `pub_id` column in the `titles` table:

  ```
  delete statistics titles (pub_id)
  ```

- **Example 3 –** Deletes densities, selectivities, and histograms for the `smallsales` partition of the `titles` table:

  ```
  delete statistics titles partition smallsales
  ```

- **Example 4 –** Deletes densities, selectivities, and histograms for `pub_id`, `pubdate`, without affecting statistics on the single-column `pub_id` or the single-column `pubdate`:

  ```
  delete statistics titles (pub_id, pubdate)
  ```

- **Example 5 –** Deletes densities, selectivities, and histograms for the column `pub_id` and for the data partition `smallsales`:

  ```
  delete statistics titles partition smallsales (pub_id)
  ```

Usage

- **delete statistics** does not affect statistics in the `systabstats` table.
- **delete statistics on a data partition** does not delete global statistics.
- When you issue the **drop table** command, the corresponding rows in `sysstatistics` are dropped. When you use **drop index**, the rows in `sysstatistics` are not deleted. This allows the query optimizer to continue to use index statistics without incurring the overhead of maintaining the index on the table.

  Warning! Densities, selectivities, and histograms are essential to good query optimization. The **delete statistics** command is provided as a tool to remove statistics not used by the optimizer. If you inadvertently delete statistics needed for query optimization, run **update statistics** on the table, index, or column.

- Loading simulated statistics with the **optdiag** utility command adds a small number of rows to `master..sysstatistics` table. If the simulated statistics are no longer in use, use the **delete shared statistic** command to drop the information in `master..sysstatistics`.

See also **optdiag** in the *Utility Guide*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **delete statistics** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner, or a user with `delete statistics` permission.

Setting	Description
Disabled	With granular permissions disabled, you must be the table owner, a user with sa_role, or a user with `delete statistics` permission.. **delete statistics** permission an be granted or transferred to anyone by table owner or system administrator.

See also
- *drop table* on page 363
- *drop index* on page 350
- *update statistics* on page 698
- *create index* on page 140
- *grant* on page 419
- *revoke* on page 559
- *update* on page 680

disk init

Makes a physical device or file usable by the SAP ASE server.

Syntax

```
disk init
    name = "device_name",
    physname = { 'physical_name' | 'cache_name'}
    skip_alloc={true | false},
    [vdevno = virtual_device_number,]
    size = number_of_blocks
    [, type = 'inmemory' ]
    [, vstart = virtual_address
        , cntrltype = controller_number]
        [, dsync = {true | false}]
    [, directio = {true | false}]
    [, instance = "instance_name"]
```

Parameters

- ***device_name* –** is the name of the database device or file. The name must conform to the rules for identifiers and must be enclosed in single or double quotes. This name is used in the **create database** and **alter database** commands.
- ***physical_name* –** is the full specification of the database device or cache. This name must be enclosed in single or double quotes. When the physical device path is relative, **disk init** returns a warning.
- ***cache_name* –** name of the cache on which you are creating the disk.

- **inmemory –** indicates you are creating an in-memory device.
- **skip_alloc –** is a Boolean parameter for the **disk init** command. It is supported for devices created on non-Windows file systems and on Windows raw systems. When **skip_alloc** is set to true, users can avoid initialization of pages with zeros. The default of **skip_alloc** is false.
- **vdevno –** is the virtual device number, which must be unique among the database devices associated with the SAP ASE server. The device number 0 is reserved for the master device. Otherwise, valid device numbers must be between 1 and 2,147,483,647.

  To determine the virtual device number, look at the `device_number` column of the **sp_helpdevice** report, and use the next unused integer.
- **size –** is the amount of space to allocate to the new device. The following are example unit specifiers, using uppercase, lowercase, and single and double quotes interchangeably: ‘k’ or “K” (kilobytes), “m” or ‘M’ (megabytes), “g” or “G” (gigabytes), and ‘t’ or ‘T’ (terabytes). You should always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier. Acceptable values are:
  - `5120` = 10MB
  - `"5120"` = 10MB
  - `"10M"` = 10MB
- **vstart –** is the starting virtual address, or the offset, for the SAP ASE server to begin using the database device. The following are example unit specifiers, using uppercase, lowercase, and single and double quotes interchangeably: ‘k’ or “K” (kilobytes), “m” or ‘M’ (megabytes), “g” or “G” (gigabytes), and ‘t’ or ‘T’ (terabytes). You should always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier.

  The size of the offset depends on how you enter the value for **vstart**.
  - If you do not specify a unit size, **vstart** uses 2K pages for its starting address. For example, if you specify `vstart = 13`, the SAP ASE server uses 13 * 2K pages as the offset for the starting address.
  - If you specify a unit value, **vstart** uses the unit value as the starting address. For example, if you specify `vstart = "13M"`, the SAP ASE server sets the starting address offset at 13MB.

  The default value (and usually the preferred value) of **vstart** is 0. If the specified device does not have the sum of **vstart** + **size** blocks available, the **disk init** command fails. If you are running the Logical Volume Manager on an AIX operating system, **vstart** should be 2. Specify **vstart** only if instructed to do so by SAP Technical Support.
- **cntrltype –** specifies the disk controller. Its default value is 0. Reset **cntrltype** only if instructed to do so by SAP Technical Support.
- **dsync –** specifies whether writes to the database device are flushed to the storage media, or are buffered only when using operating system files. This option is meaningful only when

you are initializing an operating system file; it has no effect when initializing devices on a raw partition. By default, all operating system files are initialized with **dsync** set to true.

- **directio –** allows you to configure the SAP ASE server to transfer data directly to disk, bypassing the operating system buffer cache. The SAP ASE server passes the device options to Backup Server, which enables Backup Server to access the database device with the appropriate directio option.

  directio is a static parameter that requires a restart of the SAP ASE server to take effect.

  By default, **directio** is set to false for nonclustered SAP ASE servers, and to true for clustered SAP ASE servers.

  The **directio** parameter is ignored for raw devices.
- **instance = "*instance_name*" –** (clusters only) specifies the device as private and sets its owning instance to *instance_name*.

Examples

- **Example 1 –** Does not initialize pages with zeros:

  ```
  disk init name="d2", physname="/usr/sybase/devices/d3.dat",
  skip_alloc="true",
  size="10G"
  ```

  SAP ASE servers do not allocate space during disk initialization if **skip_alloc** is set to **true**.
- **Example 2 –** Initializes 10MB of a disk on a UNIX system:

  ```
  disk init
  name = "user_disk",
  physname = "/dev/rxy1a",
  vdevno = 2, size = 5120
  ```
- **Example 3 –** Initializes 10MB of a disk on a UNIX operating system file. The SAP ASE server opens the device file with the **dsync** setting, and writes to the file are guaranteed to take place directly on the storage media:

  ```
  disk init
  name = "user_file",
  physname = "/usr/u/sybase/data/userfile1.dat",
  vdevno = 2, size = 5120, dsync = true
  ```
- **Example 4 –** Creates a device named “user_disk” that uses **directio** to write data directly to disk:

  ```
  disk init
  name = "user_disk",
  physname = "/usr/u/sybase/data/userfile1.dat",
  size = 5120,
  directio= true
  ```
- **Example 5 –** Creates a device named `inmemory_dev`:

  ```
  disk init name = inmemory_dev,
  physname = 'imdb_cache',
  ```

```
size = '3G',
type = 'inmemory'
```

Usage

- Use block devices as a database device only on the HP-UX, Windows, and Linux platforms. **disk init** and **disk reinit** display a warning message if you attempt to create a block device on a different platform.
- Use **skip_alloc** to expedite crash recovery on non-NT file systems and on NT raw systems. Also, using **skip_alloc** with the **directio** feature creates devices faster and improves durability of updates. Regardless of space availability, **skip_alloc** always prints a warning message about making sure the SAP ASE server has the required space for future use.
- The master device is initialized by the installation program; you need not initialize this device with **disk init**.
- Devices created with **disk init** have restricted permissions.
- To successfully complete disk initialization, the “sybase” user must have the appropriate operating system permissions on the device that is being initialized.
- You can specify the size as a float, but the size is rounded down to the nearest multiple of 2K.
- If you do not use a unit specifier for size, **disk init** uses the virtual page size of 2K.
- The minimum size of a disk piece that you can initialize using **disk init** is the larger of:
  - One megabyte
  - One allocation unit of the server’s logical page size
- **directio** and **dsync** are mutually exclusive. If a device has **dsync** set to true, you cannot set **directio** to true for this device. To enable **directio** for a device, you must first reset **dsync** to false.
- **directio** is not available on all platforms. If you issue **disk init** with the **directio** parameter on a platform on which it is not supported, the SAP ASE server issues the message `No such parameter: 'directio'`.
- Use **disk init** for each new database device. Each time **disk init** is issued, a row is added to `master..sysdevices`. A new database device does not automatically become part of the pool of default database storage. Use **sp_diskdefault** to assign default status to a database device.
- Back up the `master` database with the **dump database** or **dump transaction** command after each use of **disk init**. This makes recovery easier and safer in case `master` is damaged. If you add a device with **disk init** and fail to back up `master`, you may be able to recover the changes by using **disk reinit**, then stopping and restarting the SAP ASE server.
- Assign user databases to database devices using the **on** clause of the **create database** or **alter database** command.
- The preferred method for placing a database’s transaction log (the system table `syslogs`) on a different device than the one on which the rest of the database is stored is to use the **log on** extension to **create database**. Alternatively, you can name at least two devices when you create the database, then execute **sp_logdevice**. You can also use **alter**

database to extend the database onto a second device, then run **sp_logdevice**. The **log on** extension immediately moves the entire log to a separate device. The **sp_logdevice** method retains part of the system log on the original database device until transaction activity causes the migration to become complete.
- For a report on all SAP ASE devices on your system (both database and dump devices), execute **sp_helpdevice**.
- Use **sp_dropdevice** to remove a database device. You must first drop all existing databases on that device.

See also **sp_diskdefault**, **sp_dropdevice**, **sp_helpdevice**, **sp_logdevice** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **disk init** differ based on your granular permissions settings. You must be using the `master` database to use **disk init**.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage disk` privilege.
Disabled	With granular permissions disabled, you must be a user with **sa_role**. **disk init** permission is not transferable.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	20
Audit option	**disk**
Command or access audited	**disk init**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **disk init** • *Previous value* – NULL • *Current value* – NULL • *Other information* – name of the disk • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *dump database* on page 373
- *dump transaction* on page 391
- *disk reinit* on page 330
- *create database* on page 104
- *alter database* on page 1
- *disk refit* on page 329
- *load database* on page 485
- *load transaction* on page 501

Using dsync with disk init

Considerations for using **dsync**.

Note: Do not set **dsync** to **false** for any device that stores critical data. The only exception is `tempdb`, which can safely be stored on devices for which **dsync** is set to **false**.

- (UNIX only) On raw devices, you cannot:
  - Set **directio** or **dsync** to true
  - Set **directio** or **dsync** via the **sp_deviceattr** stored procedure to true.

  Note: For HPUX, only the **dsync** option applies.

  Doing so returns a message such as:

  ```
  You cannot set option dsync for raw device 'dev/raw/raw235'
  ```

  or:

  ```
  You cannot set attribute dsync for raw device 'myrawdisk1'
  ```
- When **dsync** is on, writes to the database device are guaranteed to take place on the physical storage media, and the SAP ASE server can recover data on the device in the event of a system failure.
- When **dsync** is off, writes to the database device may be buffered by the UNIX file system. The UNIX file system may mark an update as being completed, even though the physical media has not yet been modified. In the event of a system failure, there is no guarantee that

data updates have ever taken place on the physical media, and the SAP ASE server may be unable to recover the database.

- **dsync** is always on for the master device file.
- Turn off the **dsync** value only when databases on the device need not be recovered after a system failure. For example, you may consider turning **dsync** off for a device that stores only the `tempdb` database.
- The SAP ASE server ignores the **dsync** setting for devices stored on raw partitions—writes to those device are guaranteed to take place on the physical storage media, regardless of the **dsync** setting.
- **disk reinit** ensures that `master..sysdevices` is correct if the **master** database has been damaged or if devices have been added since the last dump of **master**.

Creating Devices for In-Memory and Relaxed Durability Databases

Considerations for creating devices for in-memory and relaxed durability databases.

- The logical name of the in-memory device cannot be the same as the name of the cache on which a device is created.
- In-memory devices are reserved for the first in-memory database you assign to it.
- You must use the physical device name as the logical name of the in-memory device.
- The logical name of the in-memory device must be unique across all devices.
- You cannot:
  - Use these parameters when you create an in-memory device: **vstart**, **cntrltype**, **dsync**, **directio**, and **skip_alloc**.
  - Create an in-memory device that is larger than the cache on which it is created.
  - Create an in-memory device from a regular named cache, including the default data cache.
  - Increase the size of an in-memory device once it is created. However, you can use **sp_cacheconfig** to increase the size of the in-memory cache, and use **disk init** to create new in-memory devices.
  - Use these commands against in-memory devices: **disk resize**, **disk mirror**, **disk remirror**, **disk unmirror**, **disk refit**, and **disk reinit**.
  - Use the **sp_deviceattr** and **sp_diskdefault** system procedures on disk devices.

disk mirror

Creates a software mirror that immediately takes over when the primary device fails.

Syntax

```
disk mirror
    name = "device_name",
    mirror = "physicalname"
    [, writes = {serial | noserial}]
    [clear = {TRUE | FALSE}]
```

Parameters

- **name –** is the name of the database device to mirror. This is recorded in the `name` column of the `sysdevices` table. The name must be enclosed in single or double quotes.
- **mirror –** is the full path name of the database mirror device that is to be your secondary device. It must be enclosed in single or double quotes. If the secondary device is a file, *physicalname* should be a path specification that clearly identifies the file, which the SAP ASE server creates. The value of *physicalname* cannot be an existing file.
- **writes –** allows you to choose whether to enforce serial writes to the devices. In the default case (**serial**), the write to the primary database device is guaranteed to finish before the write to the secondary device begins. If the primary and secondary devices are on different physical devices, serial writes can ensure that at least one of the disks is unaffected in the event of a power failure. **serial** writes are generally slower than **noserial** writes.
- **clear –** initializes the mirror device with zeros to guarantee that the underlying filesystem has reserved space for the mirror device. The default value, **FALSE**, does not clear the mirror, and executing a write to the device might fail through lack of space on the file system. If you specify **TRUE**, the mirror is cleared, forcing the file system to reserve space for the device.

Examples

- **Example 1 –** `tranlog` is the logical device name for a raw device. The `tranlog` device was initialized with **disk init** and is being used as a transaction log device (as in **create database**...**log on** *tranlog*). The following command mirrors the transaction log device:

```
disk mirror
  name = "tranlog",
  mirror = "/dev/rxy1e"
```

- **Example 2 –** Creates a software mirror for the database device `user_disk` on the file `mirror.dat`:

```
disk mirror
    name = "user_disk",
    mirror = "/server/data/mirror.dat"
```

Usage

- Disk mirroring creates a software mirror of a user database device, the master database device, or a database device used for user database transaction logs. If a database device fails, its mirror immediately takes over.

  Disk mirroring does not interfere with ongoing activities in the database. You can mirror or unmirror database devices without shutting down the SAP ASE server.
- Use **dump database** to back up the `master` database after each use of **disk mirror**. This makes recovery easier and safer in case `master` is damaged.
- When a read or write to a mirrored device is unsuccessful, the SAP ASE server unmirrors the bad device and prints error messages. The SAP ASE server continues to run,

unmirrored. The system administrator must use the **disk remirror** command to restart mirroring.

- The **clear** option in this command has no effect when used on the NT platform.
- You can mirror the master device, devices that store data, and devices that store transaction logs. However, you cannot mirror dump devices.
- Devices are mirrored; databases are not.
- A device and its mirror constitute one logical device. The SAP ASE server stores the physical name of the mirror device in the `mirrorname` column of the `sysdevices` table. It does not require a separate entry in `sysdevices` and should not be initialized with **disk init**.
- To retain use of asynchronous I/O, always mirror devices that are capable of asynchronous I/O to other devices capable of asynchronous I/O. In most cases, this means mirroring raw devices to raw devices and operating system files to operating system files.

  If the operating system cannot perform asynchronous I/O on files, mirroring a raw device to a regular file produces an error message. Mirroring a regular file to a raw device works, but does not use asynchronous I/O.
- On systems that support asynchronous I/O, the **writes** option allows you to specify whether writes to the first device must finish before writes to the second device begin (**serial**) or whether both I/O requests are to be queued immediately, one to each side of the mirror (**noserial**). In either case, if a write cannot be completed, the I/O error causes the bad device to become unmirrored
- Mirror all default database devices so that you are still protected if a **create database** or **alter database** command affects a database device in the default list.
- For greater protection, mirror the database device used for transaction logs.
- Always put user database transaction logs on a separate database device. To put a database's transaction log (that is, the system table `syslogs`) on a device other than the one on which the rest of the database is stored, name the database device and the log device when you create the database. Alternatively, use **alter database** to extend the database onto a second device, then run **sp_logdevice**.
- If you mirror the database device for the `master` database, you can use the `-r` option and the name of the mirror for UNIX, when you restart the SAP ASE server with the **dataserver** utility program. Add this to the `RUN_servername` file for that server so that the **startserver** utility program knows about it. For example, to start a master device named `master.dat` and its mirror, `mirror.dat` enter:

  ```
  dataserver -dmaster.dat -rmirror.dat
  ```

  See **dataserver** and **startserver** in the *Utility Guide*.
- If you mirror a database device that has unallocated space (room for additional **create database** and **alter database** statements to allocate part of the device), **disk mirror** begins mirroring these allocations when they are made, not when the **disk mirror** command is issued.

- For a report on all SAP ASE devices on your system (user database devices and their mirrors, as well as dump devices), execute **sp_helpdevice**.

See also:

- **sp_diskdefault**, **sp_helpdevice**, **sp_logdevice** in *Reference Manual: Procedures*
- **dataserver**, **startserver** in the *Utility Guide*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **disk mirror** differ based on your granular permissions settings. You must be using the `master` database to use **disk mirror**.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage disk` privilege.
Disabled	With granular permissions disabled, you must be a user with **sa_role**. **disk mirror** permission is not transferable.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	23
Audit option	**disk**
Command or access audited	**disk mirror**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **disk mirror** • *Previous value* – NULL • *Current value* – NULL • *Other information* – name of the disk • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *disk remirror* on page 334
- *disk init* on page 319

- *create database* on page 104
- *alter database* on page 1
- *disk refit* on page 329
- *disk reinit* on page 330
- *disk unmirror* on page 339
- *dump database* on page 373
- *dump transaction* on page 391
- *load database* on page 485
- *load transaction* on page 501

disk refit

Rebuilds the `master` database's `sysusages` and `sysdatabases` system tables from information contained in `sysdevices`.

Syntax

```
disk refit
```

Usage

The SAP ASE server automatically shuts down after **disk refit** rebuilds the system tables.

Use **disk refit** after **disk reinit** as part of the procedure to restore the master database.

Note: You must start the SAP ASE server with trace flag 3608 before you run **disk refit**. However, make sure you read the information in the *Troubleshooting and Error Messages Guide* before you start the SAP ASE server with any trace flag.

See also:

- *System Administration Guide*.
- **sp_addumpdevice**, **sp_helpdevice** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **disk refit** differ based on your granular permissions settings. You must be using the `master` database to use **disk refit**.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage disk` privilege.
Disabled	With granular permissions disabled, you must be a user with **sa_role**. **disk refit** permission is not transferable.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	21
Audit option	**disk**
Command or access audited	**disk refit**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **disk refit** • *Previous value* – NULL • *Current value* – NULL • *Other information* – Name of the disk • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *disk reinit* on page 330
- *disk init* on page 319

disk reinit

Rebuilds the `master` database's `sysdevices` system table. Use **disk reinit** as part of the procedure to restore the `master` database.

Syntax

```
disk reinit
    name = "device_name",
    physname = "physicalname" ,
    [vdevno = virtual_device_number ,]
    size = number_of_blocks
    [, vstart = virtual_address
        , cntrltype = controller_number]
        [, dsync = {true | false}]
    [, directio = {true | false}]
    [, instance = "instance_name"]
```

Parameters

- **name –** is the name of the database device, which must conform to the rules for identifiers, and must be enclosed in single or double quotes. This name is used in the **create database** and **alter database** commands.
- **physname –** is the name of the database device. The physical name must be enclosed in single or double quotes.
- **vdevno –** is the virtual device number, which must be unique among the database devices associated with the SAP ASE server. The device number 0 is reserved for the master device. Otherwise, valid device numbers are between 1 and 2,147,483,647.

  To determine the virtual device number, look at the `device_number` column of the **sp_helpdevice** report, and use the next unused integer.
- **size –** is the current size of the device being reinitialized. The following are example unit specifiers, using uppercase, lowercase, and single and double quotes interchangeably: ‘k’ or “K” (kilobytes), “m” or ‘M’ (megabytes), “g” or “G” (gigabytes), and ‘t’ or ‘T’ (terabytes). You should always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier.
- **vstart –** is the starting virtual address, or the offset, for the SAP ASE server to begin using the database device. The following are example unit specifiers, using uppercase, lowercase, and single and double quotes interchangeably: ‘k’ or “K” (kilobytes), “m” or ‘M’ (megabytes), “g” or “G” (gigabytes), and ‘t’ or ‘T’ (terabytes). You should always include a unit specifier. Quotes are optional if you do not include a unit specifier. However, you must use quotes if you include a unit specifier. If you do not provide a unit specifier, the value provided is presumed to be in megabytes. The size of the offset depends on how you enter the value for **vstart**.

  - If you do not specify a unit size, **vstart** uses 2K pages for its starting address. For example, if you specify `vstart = 13`, the SAP ASE server uses 13 * 2K pages as the offset for the starting address.
  - If you specify a unit value, **vstart** uses it as the starting address. For example, if you specify `vstart = "13M"`, the SAP ASE server sets the starting address offset at 13MB.

  The default value (and usually the preferred value) of **vstart** is 0. If the specified device does not have the sum of **vstart** + **size** blocks available, **disk reinit** fails.

  Note: If you are running the Logical Volume Manager on an AIX operating system, **vstart** should be 2.

  Specify **vstart** only if instructed to do so by SAP Product Support.
- **cntrltype –** specifies the disk controller. Its default value is 0. Reset it only if instructed to do so by SAP Product Support.

- **dsync –** specifies whether writes to the database device are flushed to the storage media, or are buffered only when using operating system files. This option is meaningful only when you are initializing an operating system file; it has no effect when initializing devices on a raw partition. By default, all operating system files are initialized with **dsync** set to **true**.
- **directio –** allows you to configure the SAP ASE server to transfer data directly to disk, bypassing the operating system buffer cache. The SAP ASE server passes the device options to Backup Server, which enables Backup Server to access the database device with the appropriate **directio** option.

  directio is a static parameter that requires a restart of the SAP ASE server to take effect.

  By default, **directio** is set to **false** for nonclustered SAP ASE servers, and to **true** for clustered SAP ASE servers.

  The **directio** parameter is ignored for raw devices.
- **instance = "*instance_name*" –** (clusters only) specifies the device as private and sets its owning instance to *instance_name*.

Examples

- **Example 1 –** Adds a new row to the `sysdevices` table. This new row contains the characteristics of the existing device currently being reinitialized:

```
disk reinit
name = "user_file",
physname = "/usr/u/sybase/data/userfile1.dat",
vdevno = 2, size = 5120, dsync = true
```

- **Example 2 –** Adds a new row to the `sysdevices` table, with the data transferred directly to disk. This new row contains the characteristics of the existing device currently being reinitialized:

```
disk reinit
name = "user_disk",
physname = "/usr/u/sybase/data/userfile1.dat",
size = 5120, directio= true
```

Usage

- You should use block devices as a database device only on the HP-UX, Windows, and Linux platforms. **disk init** and **disk reinit** display a warning message if you attempt to create a block device on a platform we do not recommend.
- **disk reinit** ensures that `master..sysdevices` is correct if the master database has been damaged or if devices have been added since the last dump of `master`.
- **disk reinit** is similar to **disk init**, but does not initialize the database device.
- You can specify the *size* as a `float`, but the size is rounded down to the nearest multiple of 2K.
- If you do not use a unit specifier for *size*, **disk reinit** uses the virtual page size of 2K.

- By default, the **directio** option is set to false (off) for all platforms.
- For complete information on restoring the `master` database, see the *System Administration Guide*.

See also **sp_addumpdevice**, **sp_helpdevice** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **disk reinit** differ based on your granular permissions settings. You must be using the `master` database to use **disk reinit**.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage disk` privilege.
Disabled	With granular permissions disabled, you must be a user with **sa_role**. **disk reinit** permission is not transferable.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	22
Audit option	**disk**
Command or access audited	**disk reinit**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **disk reinit** • *Previous value* – NULL • *Current value* – NULL • *Other information* – name of the disk • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *disk init* on page 319
- *alter database* on page 1
- *create database* on page 104

- *dbcc* on page 278
- *disk refit* on page 329

Using dsync with Disk Reinit

Usage information for **dsync**.

Note: Do not set **dsync** to false for any device that stores critical data. The only exception is `tempdb`, which can safely be stored on devices for which **dsync** is set to false.

- When **dsync** is on, writes to the database device are guaranteed to take place on the physical storage media, and the SAP ASE server can recover data on the device in the event of a system failure.
- **directio** and **dsync** are mutually exclusive. If a device has **dsync** set to true, you cannot set **directio** to true for this device. To enable **directio** for a device, you must first reset **dsync** to false.
- When **dsync** is off, writes to the database device may be buffered by the UNIX file system. The UNIX file system may mark an update as being completed, even though the physical media has not yet been modified. In the event of a system failure, there is no guarantee that data updates have ever taken place on the physical media, and the SAP ASE server may be unable to recover the database.
- **dsync** is always on for the master device file.
- Turn off the **dsync** value only when databases on the device need not be recovered after a system failure. For example, you may consider turning **dsync** off for a device that stores only the `tempdb` database.
- The SAP ASE server ignores the **dsync** setting for devices stored on raw partitions—writes to those device are guaranteed to take place on the physical storage media, regardless of the **dsync** setting.
- The **dsync** setting is not used on the Windows NT platform.
- **disk reinit** ensures that `master..sysdevices` is correct if the `master` database has been damaged or if devices have been added since the last dump of `master`.

disk remirror

Restarts disk mirroring after it is stopped by failure of a mirrored device, or temporarily disabled by the **disk unmirror** command.

Syntax

```
disk remirror
    name = "device_name"
```

Parameters

- **name –** is the name of the database device that you want to remirror, which is recorded in the `name` column of the `sysdevices` table, and must be enclosed in single or double quotes.

Examples

- **Example 1 –** Resumes software mirroring on the database device `user_disk`:

  ```
  disk remirror
    name = "user_disk"
  ```

Usage

- Disk mirroring creates a software mirror of a user database device, the master database device, or a database device used for user database transaction logs. If a database device fails, its mirror immediately takes over.

  Use the **disk remirror** command to reestablish mirroring after it has been temporarily stopped by failure of a mirrored device, or temporarily disabled with the **mode = retain** option of the **disk unmirror** command. The **disk remirror** command copies data on the retained disk to the mirror.
- Back up the `master` database with the **dump database** command after each use of **disk remirror**. This makes recovery easier and safer in case `master` is damaged.
- If mirroring was permanently disabled with the **mode = remove** option, you must remove the operating system file that contains the mirror before using **disk remirror.**
- Database devices, not databases, are mirrored.
- You can mirror, remirror, or unmirror database devices without shutting down the SAP ASE server. Disk mirroring does not interfere with ongoing activities in the database.
- When a read or write to a mirrored device is unsuccessful, the SAP ASE server unmirrors the bad device and prints error messages. The SAP ASE server continues to run, unmirrored. The system administrator must use **disk remirror** to restart mirroring.
- In addition to mirroring user database devices, always put user database transaction logs on a separate database device. The database device used for transaction logs can also be mirrored for even greater protection. To put a database's transaction log (that is, the system table `syslogs`) on a different device than the one on which the rest of the database is stored, name the database device and the log device when you create the database. Alternatively, use **alter database** to point to a second device, then run **sp_logdevice**.
- If you mirror the database device for the `master` database, you can use the `-r` option and the name of the mirror for UNIX, when you restart the SAP ASE server with the **dataserver** utility program. Add this option to the `RUN_servername` file for that server so that the **startserver** utility program knows about it. For example, the following command starts a master device named `master.dat` and its mirror, `mirror.dat`:

  ```
  dataserver -dmaster.dat -rmirror.dat
  ```

See **dataserver** and **startserver** in the *Utility Guide*.

- For a report on all SAP ASE devices on your system (user database devices and their mirrors, as well as dump devices), execute **sp_helpdevice**.

See also:

- **sp_diskdefault**, **sp_helpdevice**, **sp_logdevice** in *Reference Manual: Procedures*
- **dataserver**, **startserver** in the *Utility Guide*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **disk remirror** differ based on your granular permissions settings. You must be using the `master` database to use **disk remirror**.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage disk` privilege.
Disabled	With granular permissions disabled, you must be a user with **sa_role**. **disk remirror** permission is not transferable.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	25
Audit option	**disk**
Command or access audited	**disk remirror**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **disk remirror** • *Previous value* – NULL • *Current value* – NULL • *Other information* – name of the disk • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *dump database* on page 373

- *alter database* on page 1
- *create database* on page 104
- *disk init* on page 319
- *disk mirror* on page 325
- *disk refit* on page 329
- *disk reinit* on page 330
- *disk unmirror* on page 339
- *dump transaction* on page 391
- *load database* on page 485
- *load transaction* on page 501

disk resize

Dynamically increases the size of the device used by the SAP ASE server.

Syntax

```
disk resize
    name = "device_name",
    size = additional_space
```

Parameters

- ***name*** **–** is the name of the device for which you are increasing the size.
- ***additional_space*** **–** is the amount of additional space you are adding to the device.

Examples

- **Example 1 –** Increase the size of `testdev` by 4MB:

  ```
  disk resize
  name = "test_dev",
  size = "4M"
  ```

Usage

- The **disk resize** command allows you to dynamically increase the size of your disks.
- After you resize a device, dump the master device, which maintains the size of the device in the `sysdevices` table. If you attempt a recovery from an old dump of the master device, the information stored in `sysdevices` is not current.
- Any properties that are set on the device continue to be set after you increase its size.
- During the physical initialization of the disk, if any error occurs due to insufficient disk space, **disk resize** extends the database device to the point before the error occurs.

  For example, on a server that uses 4K logical pages, if you try to increase the size of the device by 40MB, but only 39.5MB is available, then the device is extended only by

39.5MB. From the extended size (39.5MB), only 39MB is used by the SAP ASE server. The last 0.5MB is allocated but not used, as 4K servers configure devices in one MB minimums.

To utilize the last 0.5MB, make sure that there is at least another 1.5MB available for the device, then re-run **disk resize**, specifying 1.5MB as the incremental size.

- You cannot use **disk resize** to decrease the size of the device.
- *device_name* must have a valid identifier. The device is initialized using the **disk init** command and, it must refer to a valid SAP ASE device, not a dump or load device.
- The following are example unit specifiers, using uppercase, lowercase, and single and double quotes interchangeably: 'k' or "K" (kilobytes), "m" or 'M' (megabytes), "g" or "G" (gigabytes), and 't' or 'T' (terabytes). You should always include a unit specifier. Although it is optional, you should always include the unit specifier with the **disk resize** command to avoid confusion in the actual number of pages allocated.

  You must enclose the unit specifier in single or double quotes. If you do not use a unit specifier, the size defaults to the number of disk pages.
- Permanently disable mirroring while the resize operation is in progress. You can reestablish mirroring when the resize operation is completed.

See also **sp_addsegment**, **sp_dropsegment**, **sp_helpdb**, **sp_helpsegment**, **sp_logdevice**, **sp_renamedb**, **sp_spaceused** in *Reference Manual: Procedures*.

Standards

ANSI SQL – compliance level: Transact-SQL extension.

Permissions

The permission checks for **disk resize** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage disk` privilege.
Disabled	With granular permissions disabled, you must be a user with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	100
Audit option	**disk**
Command or access audited	**disk resize**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – index name • *Proxy information* – original login name, if a **set proxy** is in effect

See also

- *create database* on page 104
- *disk init* on page 319
- *drop database* on page 342
- *load database* on page 485

disk unmirror

Suspends disk mirroring initiated with the **disk mirror** command to allow hardware maintenance or the changing of a hardware device.

Syntax

```
disk unmirror
    name = "device_name"
    [, side = {"primary" | secondary}]
    [, mode = {retain | remove}]
```

Parameters

- **name –** is the name of the database device to unmirror. The name must be enclosed in single or double quotes.
- **side –** specifies whether to disable the **primary** device or the **secondary** device (the mirror). By default, the secondary device is unmirrored.
- **mode –** determines whether the unmirroring is temporary (**retain**) or permanent (**remove**). By default, unmirroring is temporary.

  Specify **retain** when you plan to remirror the database device later in the same configuration. This option mimics what happens when the primary device fails:

  - I/O is directed only at the device *not* being unmirrored.
  - The `status` column of `sysdevices` indicates that mirroring is deactivated.
    remove eliminates all `sysdevices` references to a mirror device.

- The `status` column indicates that the mirroring feature is ignored.
- The `phyname` column is replaced by the name of the secondary device in the `mirrorname` column if the primary device is the one being deactivated.
- The `mirrorname` column is set to NULL.

Examples

- **Example 1 –** Suspends software mirroring for the database device `user_disk`:

```
disk unmirror
name = "user_disk"
```

- **Example 2 –** Suspends software mirroring for the database device `user_disk` on the secondary side:

```
disk unmirror name = "user_disk", side = secondary
```

- **Example 3 –** Suspends software mirroring for the database device `user_disk` and removes all device references to the mirror device:

```
disk unmirror name = "user_disk", mode = remove
```

Usage

- Disk mirroring creates a software mirror of a user database device, the master database device, or a database device used for user database transaction logs. If a database device fails, its mirror immediately takes over.

  disk unmirror disables either the original database device or the mirror, either permanently or temporarily, so that the device is no longer available to the SAP ASE server for reads or writes. It does not remove the associated file from the operating system.
- Disk unmirroring alters the `sysdevices` table in the `master` database. Back up the `master` database with the **dump database** command after each use of **disk unmirror**. This makes recovery easier and safer in case `master` is damaged.
- You can unmirror a database device while it is in use.
- You cannot unmirror any of a database's devices while a **dump database**, **load database**, or **load transaction** is in progress. The SAP ASE server displays a message asking whether to abort the dump or load or to defer the **disk unmirror** until after the dump or load completes.
- You cannot unmirror a database's log device while a **dump transaction** is in progress. The SAP ASE server displays a message asking whether to abort the dump or defer the **disk unmirror** until after the dump completes.

  Note: dump transaction with truncate_only and **dump transaction with no_log** are not affected when a log device is unmirrored.
- Mirror all the default database devices so that you are still protected if a **create** or **alter database** command affects a database device in the default list.

- When a read or write to a mirrored device is unsuccessful, the SAP ASE server automatically unmirrors the bad device and prints error messages. The SAP ASE server continues to run, unmirrored. A system administrator must restart mirroring with the **disk remirror** command.
- For a report on all SAP ASE devices on your system (user database devices and their mirrors, as well as dump devices), execute **sp_helpdevice**.
- Use **disk remirror** to reestablish mirroring after it is temporarily stopped with the **mode = retain** option of the **disk unmirror** command. If mirroring is permanently disabled with the **mode = remove** option, you must remove the operating system file that contains the mirror before using **disk remirror**.

See also:

- **sp_diskdefault**, **sp_helpdevice**, **sp_logdevice** in *Reference Manual: Procedures*
- **dataserver**, **startserver** in the *Utility Guide*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **disk unmirror** differ based on your granular permissions settings. You must be using the `master` database to use **disk unmirror**.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage disk` privilege.
Disabled	With granular permissions disabled, you must be a user with **sa_role**. **disk unmirror** permission is not transferable.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	24
Audit option	**disk**
Command or access audited	**disk unmirror**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **disk unmirror** • *Previous value* – NULL • *Current value* – NULL • *Other information* – name of the disk • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *dump database* on page 373
- *load database* on page 485
- *load transaction* on page 501
- *dump transaction* on page 391
- *disk unmirror* on page 339
- *alter database* on page 1
- *disk remirror* on page 334
- *create database* on page 104
- *disk init* on page 319
- *disk mirror* on page 325
- *disk refit* on page 329
- *disk reinit* on page 330

drop database

Removes one or more databases, including archive databases, from the SAP ASE server.

Syntax

```
drop database database_name [, database_name] ...
```

Parameters

- ***database_name* –** is the name of a database to remove. Use **sp_helpdb** to get a list of databases.

Examples

- **Example 1 –** Removes the `publishing` database and all its contents:

  ```
  drop database publishing
  ```

- **Example 2 –** `key_db` is the database where the encryption key resides and `col_db` is the database containing the encrypted columns. The SAP ASE server raises an error and fails to drop `key_db`. The drop of `col_db` succeeds. To drop both databases, drop `col_db` first:

  ```
  drop database col_db, key_db
  ```

Usage

- When dropping an archive database, all the rows for that database are deleted from the `sysaltusages` table in the `scratch` database. This requires log space in the `scratch` database.
- Removing a database deletes the database and all its objects, frees its storage allocation, and erases its entries from the `sysdatabases` and `sysusages` system tables in the `master` database.
- **drop database** clears the suspect page entries pertaining to the dropped database from `master..sysattributes`.

When using encrypted columns and **drop database**, to prevent accidental loss of keys, **drop database** fails if the database contains keys currently used to encrypt columns in other databases. To drop a database:

- Use **alter table** to decrypt the columns, or modify the columns for encryption using a different key.
- Drop the table or database containing the encrypted columns.

See also **sp_changedbowner**, **sp_helpdb**, **sp_renamedb**, **sp_spaceused** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **drop database** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the database owner or have the `own database` privilege on the database. To drop `sybsecurity`, you must be the database owner or have the `manage auditing` privilege.
Disabled	With granular permissions disabled, you must be the database owner, a user with **sa_role**, or for `sybsecurity`, a user with **sso_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	26
Audit option	**drop**
Command or access audited	**drop database**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *alter database* on page 1
- *create database* on page 104
- *dbcc* on page 278
- *use* on page 708

drop default

Removes a user-defined default.

Syntax

```
drop default [owner.]default_name
    [, [owner.]default_name] ...
```

Parameters

- ***default_name* –** is the name of an existing default. Execute **sp_help** to display a list of existing defaults. Specify the owner's name to drop a default of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

- **Example 1 –** Removes the user-defined default `datedefault` from the database:

```
drop default datedefault
```

Usage

- You cannot drop a default that is currently bound to a column or to a user-defined datatype. Use **sp_unbindefault** to unbind the default before you drop it.
- You can bind a new default to a column or user-defined datatype without unbinding its current default. The new default overrides the old one.
- When you drop a default for a NULL column, NULL becomes the column's default value. When you drop a default for a NOT NULL column, an error message appears if users do not explicitly enter a value for that column when inserting data.

See also **sp_help**, **sp_helptext**, **sp_unbindefault** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **drop default** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the default owner or a user with `drop any default` privilege.
Disabled	With granular permissions disabled, you must be the default owner or a user with **sa_role**.

drop default permission defaults to the owner of the default and is not transferable.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	31
Audit option	**drop**
Command or access audited	**drop default**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *create default* on page 117

drop encryption key

Allows key owners to drop the named encryption key, including database encryption keys used for fully encrypted databases.

Syntax

```
drop encryption key [[database.][owner].]keyname
```

The syntax for explicitly dropping an external login password service key is:

```
drop encryption key syb_extpasswdkey
    with password encryption downgrade
```

The syntax for explicitly dropping a hidden text service key is:

```
drop encryption key syb_syscommkey_dddddd
```

Or:

```
drop encryption key syb_syscommkey with text encryption downgrade
```

Parameters

- ***database* –** is the name of the database.
- ***owner* –** is the owner.
- ***keyname* –** is the name of the key.
- **syb_extpasswdkey –** name of the service key

  When you specify **with password encryption downgrade**, the SAP ASE server resets external login passwords with the algorithm used in versions earlier than 15.7, and the Replication Agent password, and the CIS and RTMS external login passwords are reset to an invalid value.

After the key is dropped, the administrator must reenter the passwords manually to resume using the corresponding services.

- **syb_syscommkey_ddddddd –** is the explicit name of an individual syscomments service key to be dropped.
- **syb_syscommkey with text encryption downgrade –** the SAP ASE server reencrypts all the hidden text in syscomments with the algorithm used in versions earlier than 15.7.

Examples

- **Example 1 –** Drops the encryption key `cc_key`:

```
drop encryption key cust.dbo.cc_key
```

Usage

- If the key has key copies, the copies are dropped along with the base key.
- The command fails if:
  - Any column in any database is encrypted using the key.
  - The database encryption key you are dropping is still used to encrypt any database.
- **drop encryption key** cannot check databases that are archived, suspect, offline, unrecovered, or currently being loaded for columns encrypted by the key. The command issues a warning message naming the unavailable database, but does not fail. When the database is brought online, any tables with columns that were encrypted with the dropped key are not usable. To restore the key, the system administrator must load a dump of the dropped key's database from a time that precedes when the key was dropped.

See also **sp_encryption** and **sp_help** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **drop encryption key** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the key owner or a user with `manage any encryption key` privilege. For fully encrypted databases, SAP ASE creates a new permission called "`manage database encryption key`." You must have this permission to create a data-base encryption key.

Setting	Description
Disabled	With granular permissions disabled, you must be the key owner or a user with **sso_role**. For fully encrypted databases, you must be a user with sso_role, keycustodian_role, or have **create encryption key** privilege.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	109
Audit option	
Command or access audited	**drop encryption key**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *create encryption key* on page 121
- *alter encryption key* on page 15

drop function

Removes one or more user-defined functions from the current database.

Syntax

```
drop function{ [ owner_name . ] function_name } [ ,...n ]
```

Parameters

- ***owner_name* –** is the name of the user ID that owns the user-defined function. Must be an existing user ID.
- ***function_name* –** is name of the user-defined function to be removed. Specifying the owner name is optional; the server name and database name cannot be specified.

Examples

- **Example 1 –** Drops the `bonus` function:

  ```
  drop function bonus
  ```

Usage

drop function drops scalar SQL user-defined functions from your current database.

Permissions

The permission checks for **drop function** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the function owner or a user with `drop any function` privilege.
Disabled	With granular permissions disabled, you must be the function owner or a user with **sa_role**.

drop function (SQLJ)

Removes a SQLJ function.

Syntax

```
drop func[tion] [owner.]function_name
    [, [owner.]function_name ] ...
```

Parameters

- ***[owner.]function_name* –** is the SQL name of a SQLJ function.

Examples

- **Example 1 –** Removes the SQLJ function **square_root**:

  ```
  drop function square_root
  ```

Usage

drop function removes only user-created functions from the current database. It does not remove system functions.

See also *Java in Adaptive Server Enterprise* for more information about SQLJ functions.

Permissions

The permission checks for **drop function** (SQLJ) differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the function owner or a user with `drop any function` privilege.
Disabled	With granular permissions disabled, you must be the function owner or a user with **sa_role**. Permissions are not transferable.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	98
Audit option	**drop**
Command or access audited	**drop function**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a **set proxy** is in effect

See also

- *create function (SQLJ)* on page 136

drop index

Removes an index from a table in the current database.

Syntax

```
drop index table_name.index_name
    [, table_name.index_name] ...
```

Parameters

- ***table_name* –** is the table in which the indexed column is located. The table must be in the current database.
- ***index_name* –** is the index to drop. In Transact-SQL, index names need not be unique in a database, though they must be unique within a table.

Examples

- **Example 1 –** Removes `au_id_ind` from the `authors` table:

  ```
  drop index authors.au_id_ind
  ```

Usage

- Once the **drop index** command is issued, you regain all the space that was previously occupied by the index. This space can be used for any database objects.
- You cannot use **drop index** on system tables.
- **drop index** cannot remove indexes that support unique constraints. To drop such indexes, drop the constraints through **alter table** or drop the table. See **create table** for more information about unique constraint indexes.
- You cannot drop indexes that are currently used by any open cursor. For information about which cursors are open and what indexes they use, use **sp_cursorinfo**.
- To get information about what indexes exist on a table, use the following, where `objname` is the name of the table:

  ```
  sp_helpindex objname
  ```

See also **sp_cursorinfo**, **sp_helpindex**, **sp_spaceused** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **drop index** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner .
Disabled	With granular permissions disabled, you must be the table owner.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	105
Audit option	
Command or access audited	**drop index**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a **set proxy** is in effect

See also

- *create index* on page 140
- *setuser* on page 658

drop login

Drops a login account or list of accounts.

Syntax

```
drop login login_name [, login_name_list] [ with override ]
```

Parameters

- **login_name –** specifies the name of login account to be dropped.
- **login_name_list –** specifies a list of login accounts to be dropped.
- **with override –** drops the login even if there are non-available databases that cannot be checked for login references.

Examples

- **Example 1 –** Drops the login accounts ravi and vinod.

  ```
  drop login ravi, vinod
  ```

Usage

- Executing **drop login** removes a user login from the SAP ASE server, deleting the user's entry from `master.dbo.syslogins`.

- The SAP ASE server reuses a dropped login's server user ID, which compromises accountability. You can avoid dropping accounts entirely and, instead, use **sp_locklogin** to lock any accounts that are no longer used.
- If you need to drop logins, be sure to audit these events (using **sp_audit**) so that you have a record of them.
- **drop login** deletes all resource limits associated with the dropped login.
- **drop login** fails if the login to be dropped is a user in any database on the server. Use sp_dropuser to drop the user from a database. You cannot drop a user from a database if that user owns any objects in the database.
- If the login to be dropped is a System Security Officer, **drop login** verifies that at least one other unlocked System Security Officer's account exists. If not, **drop login** fails. Similarly, **drop login** ensures that there is always at least one unlocked system administrator account.

See also:

- For more information about dropping login accounts, see the *Security Administration Guide*.
- **lprofile_id**, **lprofile_name** in *Reference Manual: Building Blocks*
- **sp_passwordpolicy**, **sp_displaylogin**, **sp_displayroles**, **sp_locklogin** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **drop login** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage any login` privilege.
Disabled	With granular permissions disabled, you must be a user with **sso_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	139
Audit option	**login_admin**

Information	Values
Command or access audited	**drop login**
Information in `extrainfo`	Keywords contain: ***loginname1[, ... [, loginnameN]]***

See also

- *alter login* on page 23
- *alter login profile* on page 29
- *create login* on page 160
- *create login profile* on page 163
- *drop login profile* on page 354

drop login profile

Drops a login profile or list of login profiles.

Syntax

```
drop login profile login_profile_name [, login_profile_name_list]
     [ with override ]
```

Parameters

- **login_profile_name –** specifies the name of the login profile to be dropped.
- **login_profile_name_list –** specifies a list of login profiles to be dropped.
- **with override –** forcefully drops login profiles that are bound to login accounts. The login accounts associated with the dropped login profile are associated with the default login profile.

Examples

- **Example 1 –** Drops the login profile `group1_login_profile` if it is not bound to one or more login accounts:

  ```
  drop login profile group1_login_profile
  ```

- **Example 2 –** Generates an error because the `sa_login_profile` being bound to one or more login accounts:

  ```
  drop login profile sa_login_profile

  Msg 11193, Level 16, State 1:
  Line 1:
  The specified login profile is the default login profile
  and/or associated with one or more login accounts.
  ```

```
Remove the default property and/or associations or use
the WITH OVERRIDE clause to drop the login profile.
```

- **Example 3 –** Drops the `sa_login_profile` even though it is bound to one or more login accounts:

```
drop login profile sa_login_profile with override
```

Usage

- The command **drop login profile** removes the login profile if it is not bound to a login account.
- Use **drop login profile with override** to forcefully remove a login profile that is bound to a login account. If the login profile is bound to a login account, the login account is bound to the default login account, if one exist. If the default login profile is also not present, precedence rules prior to SAP ASE version 15.7 are observed for the login account.

See also:

- For more information about dropping login profiles, see the *Security Administration Guide*.
- **lprofile_id**, **lprofile_name** in *Reference Manual: Building Blocks*
- **sp_passwordpolicy**, **sp_displaylogin**, **sp_displayroles**, **sp_locklogin** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **drop login profile** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage any login profile` privilege.
Disabled	With granular permissions disabled, you must be a user with **sso_role** to drop the login profile.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	141
Audit option	**security_profile**
Command or access audited	**drop login profile**
Information in `extrainfo`	Keywords contain: ***login_profile_name*** **[WITH OVERRIDE]**

See also

- *alter login* on page 23
- *alter login profile* on page 29
- *create login* on page 160
- *create login profile* on page 163
- *drop login* on page 352

drop precomputed result set

Drops a precomputed result set.

Syntax

```
drop {precomputed result set | materialized view}
    [owner_name.]prs_name
```

Parameters

- **materialized view | precomputed result set –** drops a materialized view or precomputed result set.
- ***prs_name* –** name of the precomputed result set. A fully qualified *prs_name* cannot include the server or database name.

Examples

- **Example 1 –** Drops the `authors_prs` precomputed result set:

  ```
  drop precomputed result set authors_prs
  ```

Standards

The **drop precomputed result set** command is a Transact-SQL extension and is not covered by the SQL standard.

Permissions

You must be the precomputed result set owner.

Auditing

Dropping precomputed result sets is not audited.

drop procedure

Removes a procedure.

Syntax

```
drop proc[edure] [owner.]procedure_name
    [, [owner.]procedure_name] ...
```

Parameters

- ***procedure_name* –** is the name of the Transact-SQL or SQLJ procedure to drop. Specify the owner's name to drop a procedure of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

- **Example 1 –** Deletes the stored procedure **showind**:

  ```
  drop procedure showind
  ```

- **Example 2 –** Unregisters the extended stored procedure `xp_echo`:

  ```
  drop procedure xp_echo
  ```

Usage

- **drop procedure** drops user-defined stored procedures, system procedures, and extended stored procedures (ESPs).
- The SAP ASE server checks the existence of a procedure each time a user or a program executes that procedure.
- A procedure group (more than one procedure with the same name but with different `number` suffixes) can be dropped with a single **drop procedure** statement. For example, if the procedures used with the application named **orders** were named `orderproc;1`, `orderproc;2`, and so on, the following statement drops the entire group:

  ```
  drop proc orderproc
  ```

  Once procedures have been grouped, individual procedures within the group cannot be dropped. For example, the following statement is not allowed:

  ```
  drop procedure orderproc;2
  ```

You cannot drop extended stored procedures as a procedure group.

- **sp_helptext** displays the procedure's text, which is stored in `syscomments`.
- **sp_helpextendedproc** displays ESPs and their corresponding DLLs.
- Dropping an ESP unregisters the procedure by removing it from the system tables. It has no effect on the underlying DLL.
- **drop procedure** drops only user-created stored procedures from your current database.

See also **sp_depends**, **sp_dropextendedproc**, **sp_helptext**, **sp_rename** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **drop procedure** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the procedure owner or a user with `drop any procedure` privilege.
Disabled	With granular permissions disabled, you must be the procedure owner or a user with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	28
Audit option	**drop**
Command or access audited	**drop procedure**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *create procedure* on page 169
- *create procedure (SQLJ)* on page 185

drop role

Drops a user-defined role.

Syntax

```
drop role role_name [with override]
```

Parameters

- ***role_name* –** is the name of the role you want to drop.
- **with override –** overrides any restrictions on dropping a role. When you use the **with override** option, you can drop any role without having to check whether the role permissions have been dropped in each database.

Examples

- **Example 1 –** Drops the named role only if all permissions in all databases have been revoked. The system administrator or object owner must revoke permissions granted in each database before dropping a role, or the command fails:

  ```
  drop role doctor_role
  ```

- **Example 2 –** Drops the named role and removes permission information and any other reference to the role from all databases:

  ```
  drop role doctor_role with override
  ```

Usage

- You need not drop memberships before dropping a role. Dropping a role automatically removes any user's membership in that role, regardless of whether you use the **with override** option.
- Use **drop role** from the `master` database.
- All rows corresponding to a dropped role are removed from the `syspasswordhistory` table.

You cannot use **drop role** to drop system roles.

See also **sp_activeroles**, **sp_displaylogin**, **sp_displayroles**, **sp_helprotect** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **drop role** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage roles` privilege.
Disabled	With granular permissions disabled, you must be a user with **sso_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	85
Audit option	**roles**
Command or access audited	**create role**, **drop role**, **alter role**, **grant role**, or **revoke role**
Information in `extrain-fo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *alter role* on page 39
- *create role* on page 193
- *grant* on page 419
- *revoke* on page 559
- *set* on page 607

drop rule

Removes a user-defined rule.

Syntax

```
drop rule [owner.]rule_name[, [owner.]rule_name] ...
```

Parameters

- ***rule_name*** **–** is the name of the rule to drop. Specify the owner's name to drop a rule of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

- **Example 1 –** Removes the rule **pubid_rule** from the current database:

  ```
  drop rule pubid_rule
  ```

Usage

- Before dropping a rule, unbind it using **sp_unbindrule**. If the rule has not been unbound, an error message appears, and the **drop rule** command fails.
- You can bind a new rule to a column or user-defined datatype without unbinding its current rule. The new rule overrides the old one.
- After you drop a rule, the SAP ASE server enters new data into the columns that were previously governed by the rule without constraints. Existing data is not affected in any way.

See also **sp_bindrule**, **sp_help**, **sp_helptext**, **sp_unbindrule** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **drop rule** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the rule owner or a user with `drop any rule` privilege.

Setting	Description
Disabled	With granular permissions disabled, you must be the rule owner or a user with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	30
Audit option	**drop**
Command or access audited	**drop rule**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *create rule* on page 195

drop service

The **drop service** command removes a user-defined Web service from the current database. Both the metadata and the corresponding stored procedure are removed.

Syntax

```
drop service service-name
```

Parameters

- ***service-name* –** is the name for the user-defined Web service. This name can be any name that is valid for a stored procedure. If you specify the name of a service that does not exist, an exception results. Also, you cannot drop a service that is currently in use by another session.

Examples

- **Example 1 –** Drops the user-defined Web service named **sp_who_service**:

```
drop service sp_who_service
```

Usage

You must undeploy a user-defined Web service before you can drop it.

See also:

- *Web Services Users Guide*
- **sp_webservices** in *Reference Manual: Procedures*

Permissions

The permission checks for **drop service** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the service owner or a user with `drop any procedure` privilege.
Disabled	With granular permissions disabled, you must be a user with sa_role.

See also

- *create service* on page 202

drop table

Removes a table definition and all of its data, indexes, partition properties, triggers, encryption properties, and permissions from the database.

Syntax

```
drop table [[database.]owner.]table_name
    [, [[database.]owner.]table_name] ...
```

Parameters

- ***table_name* –** is the name of the table to drop. Specify the database name if the table is in another database, and specify the owner's name if more than one table by the same name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

Examples

- **Example 1 –** Removes the table `roysched` and its data and indexes from the current database:

  ```
  drop table roysched
  ```

Usage

- When you use **drop table**, any rules or defaults on the table lose their binding, and any triggers associated with it are automatically dropped. If you re-create a table, you must rebind the appropriate rules and defaults and re-create any triggers.
- When you drop a table, any partition condition associated with the table is also dropped.
- Dropping a table drops any decrypt default associated with the table's columns, and drops the columns' encryption properties.
- The system tables affected when a table is dropped are `sysobjects`, `syscolumns`, `sysindexes`, `sysprotects`, `syscomments`, `syspartitions`, `syspartitionkeys`, and `sysprocedures`.
- If CIS is enabled, and if the table being dropped was created with **create existing table**, the table is not dropped from the remote server. Instead, the SAP ASE server removes references to the table from the system tables.

See also **sp_depends**, **sp_help**, **sp_spaceused** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **drop table** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner or a user with `drop any table` privilege.
Disabled	With granular permissions disabled, you must be the table owner or a user with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	27

Information	Values
Audit option	**drop**
Command or access audited	**drop table**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *alter table* on page 43
- *create table* on page 207
- *delete* on page 310
- *truncate table* on page 672

Restrictions for drop table

Restrictions for **drop table**.

- You cannot use the **drop table** command on system tables.
- You can drop a table in any database, as long as you are the table owner. For example, use either of the following to drop a table called `newtable` in the database `otherdb`:

  ```
  drop table otherdb..newtable
  ```

  ```
  drop table otherdb.yourname.newtable
  ```
- If you delete all the rows in a table or use the **truncate table** command, the table still exists until you drop it.

Dropping Tables with Cross-Database Referential Integrity Constraints

When you create a cross-database constraint, the SAP ASE server stores information in the `sysreferences` system table of each database.

Table 4. Information Stored About Referential Integrity Constraints

Information Stored in `sysreferences`	Columns with Information About Referenced Table	Columns with Information About Referencing Table
Key column IDs	`refkey1` through `refkey16`	`fokey1` through `fokey16`

Information Stored in `sysreferences`	Columns with Information About Referenced Table	Columns with Information About Referencing Table
Table ID	`reftabid`	`tableid`
Database name	`pmrydbname`	`frgndbname`

Because the referencing table depends on information from the referenced table, the SAP ASE server does not allow you to:

- Drop the referenced table,
- Drop the external database that contains it, or
- Use **sp_renamedb** to rename either database.

Use **sp_helpconstraint** to determine which tables reference the table you want to drop. Use **alter table** to drop the constraints before reissuing **drop table**.

You can drop a referencing table or its database. The SAP ASE server automatically removes the foreign-key information from the referenced database.

Each time you add or remove a cross-database constraint or drop a table that contains a cross-database constraint, dump both of the affected databases.

Warning! Loading earlier dumps of these databases can cause database corruption. For more information about loading databases with cross-database referential integrity constraints, see the *System Administration Guide*.

drop thread pool

Drops a user-defined pool.

Considerations for process mode

drop thread pool is not supported in process mode.

Syntax

```
drop thread pool pool_name
    [for instance inst_name | global ]
```

Parameters

- ***pool_name* –** name of the pool you are dropping.
- **for instance [*inst_name* | global] –** is name of the instance, or global for all instances.

Examples

- **Example 1 –** Drops a pool named `sales_pool`:

```
drop thread pool sales_pool
```

Usage

- The SAP ASE server reassigns tasks associated with the dropped thread pool to `syb_default_pool`.
- You cannot drop thread pools that are currently using an execution class definition. Use **sp_dropexeclass** to remove the execution class.
- You cannot drop system-created thread pools (those beginning with `syb_`).
- Thread pools must wait for currently running tasks to yield before they can be dropped, which may cause a slight delay in the SAP ASE server dropping the pool.
- Tasks running in a thread pool that you drop migrate to `syb_default_pool`.
- You cannot use Transact-SQL variables as parameters to **drop thread pool**.
- You can issue **drop thread pool** with **execute immediate**.

Standards

ANSI SQL-Compliance level: Transact-SQL extension

Permissions

The permission checks for **drop thread pool** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage any thread pool` privilege.
Disabled	With granular permissions disabled, you must be a user with **sa_role**.

Auditing

Information	Values
Event	144
Audit option	
Command or access audited	
Information in `extrainfo`	Pool name

See also

- *alter thread pool* on page 80
- *create thread pool* on page 251

drop trigger

Removes a trigger.

Syntax

```
drop trigger [owner.]trigger_name
    [, [owner.]trigger_name] ...
```

Parameters

- ***trigger_name* –** is the name of the trigger to drop. Specify the owner's name to drop a trigger of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

- **Example 1 –** Removes `trigger1` from the current database:

  ```
  drop trigger trigger1
  ```

Usage

- **drop trigger** drops a trigger in the current database.
- You need not explicitly drop a trigger from a table to create a new trigger for the same operation (**insert**, **update**, or **delete**). In a table or column, each new trigger for the same operation overwrites the previous one.
- When a table is dropped, the SAP ASE server automatically drops any triggers associated with it.
- You can use **drop trigger** to remove or replace an existing trigger, or multiple triggers. The **drop trigger** command drops a single trigger. If you have multiple triggers on a table, you can drop them individually.

See also **sp_depends**, **sp_help**, **sp_helptext** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **drop trigger** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the trigger owner or a user with `drop any trigger` privilege.
Disabled	With granular permissions disabled, you must be the trigger owner or a user with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	29
Audit option	**drop**
Command or access audited	**drop trigger**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *create trigger* on page 253

drop view

Removes one or more views from the current database.

Syntax

```
drop view [owner.]view_name [, [owner.]view_name] ...
```

Parameters

- ***view_name* –** is the name of the view to drop. Specify the owner's name to drop a view of the same name owned by a different user in the current database. The default value for *owner* is the current user.

Examples

- **Example 1 –** Removes the view `new_price` from the current database:

  ```
  drop view new_price
  ```

Usage

- When you use **drop view**, the definition of the view and other information about it, including privileges, is deleted from the system tables `sysobjects`, `syscolumns`, `syscomments`, `sysdepends`, `sysprocedures`, and `sysprotects`.
- Existence of a view is checked each time the view is referenced, for example, by another view or by a stored procedure.

See also **sp_depends**, **sp_help**, **sp_helptext** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **drop view** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the view owner or a user with `drop any view` privilege.
Disabled	With granular permissions disabled, you must be the view owner or a user with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	33
Audit option	**drop**
Command or access audited	**drop view**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL

See also

- *create view* on page 268

dump configuration

Creates a backup of the SAP ASE configuration files into a specified dump directory. The copy is created by the SAP ASE server, not the Backup Server.

Syntax

```
dump config[uration] to dump_dir
    [with {
        file = (file_option, file_option...)}
    } ]
```

Parameters

- **with file = (*file_option*, *file_option*...)} –** allows you to make the backup of one or more files based on the options you specify.

  Valid *file_option* values include:

  - **server_config[uration]** – server configuration file.
  - **dump_history** – dump history file.
  - **cluster_config[uration]** – cluster configuration file. In cluster configurations in SAP ASE Cluster Edition, each instance can have its own server configuration file. The **dump configuration** command dumps the server configuration files of the instance on which it was executed. The cluster configuration file is generated from the quorum device, and is named `cluster.cfg` with the current timestamp appended.
  - **'all'** – (default) all listed (known) configuration files.

  If you omit *file_option*, all existing configuration files are backed up.

Examples

- **Example 1 –** Creates a backup of the server configuration file and the dump history file:

```
dump configuration to "/myserver/test/backupserver"
    with file = "server_config"
```

- **Example 2 –** Creates a backup of all listed (known) configuration files:

```
dump configuration
```

Usage

- The *list_option* value **'all'** must be in either single or double quotes.

See also:

- **dump database**, **load database**, **load transaction**, **online database**
- *Backing Up and Restoring User Databases* in the *System Administration Guide*.
- **sp_addumpdevice**, **sp_dboption**, **sp_dropdevice**, **sp_helpdevice**, **sp_hidetext**, **sp_logdevice**, **sp_volchanges** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **dump configuration** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage dump configuration` privilege.
Disabled	With granular permissions disabled, you must be a user with **oper_role** or **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	147
Audit option	**dump_config**
Command or access audited	**dump configuration**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – User-supplied config file options • *Proxy information* – Original login name, if **set proxy** is in effect

dump database

Makes a backup copy of the entire database, including the transaction log, in a form that can be read in with **load database**. Dumps and loads are performed through Backup Server.

If you are not dumping compressed data, the target platform of a **load database** operation need not be the same platform as the source platform where the **dump database** operation occurred. Dumps and loads of compressed data must occur on the same platform. However, **dump database** and **load database** are performed from either a big-endian platform to a little-endian platform, or from a little-endian platform to a big-endian platform.

Syntax

```
dump database database_name cumulative
    using config = config_name
    [with {
        verify [= header | full]
        }]
    to [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]
        [with shrink_log]
        with verify[= header | full]
    [stripe on [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]]
    [[stripe on [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]]...]
    [with {
        listonly=load_sql | create_sql,
        density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
       compression = compress_level, verify={crc | read_after_write}
        dumpvolume = volume_name,
        file = file_name,
        [dismount | nodismount],
        [nounload | unload],
        passwd = password,
        retaindays = number_days,
        [noinit | init],
        notify = {client | operator_console}
        }]
```

(Tivoli Storage Manager) Use this syntax for copying the database when the Tivoli Storage Manager provides backup services.

```
dump database database_name
    to "syb_tsm::object_name"
        [blocksize = number_bytes]
    [stripe on "[syb_tsm::]object_name"
        [blocksize = number_bytes]]...]
    [with {
        blocksize = number_bytes,
        compression = compress_level,
        passwd = password,
        [noinit | init],
        notify = {client | operator_console},
        verify[ = header | full]
        } ]
```

Parameters

- **config = *config_name* –** reads the specified dump configuration and performs a dump operation using the specified values.

  You cannot specify a stripe directory as a parameter for the command if you use a dump configuration. The SAP ASE server creates the dump files in the stripe directory specified by the dump configuration. The dump files are named using this convention:

  ```
  database_name.dump_type.date-timestamp.stripeID
  ```

  Explicitly specified command parameters override the parameter values specified by the dump configuration.
- **cumulative –** specify that the backup you create is a cumulative incremental dump.
- ***database_name* –** is the name of the database from which you are copying data. The database name can be specified as a literal, a local variable, or a stored procedure parameter.
- **compress::*compression_level* –** has been deprecated, and is included only for compatibility with older applications. Use **"compression = *compress_level*"** for

compression instead. See *Backing Up and Restoring User Databases* in the *System Administration Guide, Volume 2* for more information about the **compress** option.

Note: You should use the native **"compression = *compress_level*"** option over the older **"compress::*compression_level*"** option. The native option allows compression of both local and remote dumps, and the dumps that it creates describe their own compression level during a load. The older option is retained for compatibility with older applications.

- **to *stripe_device* –** is the device to which to copy the data.
- **at *backup_server_name* –** is the name of the Backup Server. Do not specify this parameter when dumping to the default Backup Server. Specify this parameter only when dumping over the network to a remote Backup Server. You can specify as many as 32 remote Backup Servers with this option. When dumping across the network, specify the *network name* of a remote Backup Server running on the machine to which the dump device is attached. For platforms that use interfaces files, the *backup_server_name* must appear in the interfaces file.
- **density = *density_value* –** overrides the default density for a tape device. Valid densities are 800, 1600, 6250, 6666, 10000, and 38000. Not all values are valid for every tape drive; use the correct density for your tape drive.
- **blocksize = *number_bytes* –** overrides the default block size for a dump device. The block size must be at least one database page (2048 bytes for most systems) and must be an exact multiple of the database page size. For optimal performance, specify the **blocksize** as a power of 2, for example, 65536, 131072, or 262144.
- **capacity = *number_kilobytes* –** is the maximum amount of data that the device can write to a single tape volume. The capacity must be at least five database pages and should be less than the recommended capacity for your device.

  A general rule for calculating capacity is to use 70 percent of the manufacturer's maximum capacity for the device, allowing 30 percent for overhead such as record gaps and tape marks. The maximum capacity is the capacity of the device on the drive, not the drive itself. This rule works in most cases, but may not work in all cases, due to differences in overhead across vendors and across devices.

  On UNIX platforms that cannot reliably detect the end-of-tape marker, indicate how many kilobytes can be dumped to the tape. You must supply a **capacity** for dump devices specified as a physical path name. If a dump device is specified as a logical device name, the Backup Server uses the *size* parameter stored in the `sysdevices` system table unless you specify a capacity.
- **compression = *compress_level* –** is a number between 0 and 9, 100, or 101. For single-digit compression levels, 0 indicates no compression, and 9 provides the highest level of compression. Compression levels of 100 and 101 provide a faster, more efficient compression mode, with 100 providing faster compression and 101 providing better compression. If you do not specify *compress_level*, the SAP ASE server does not compress the dump.

Note: You should use the native **"compression = *compress_level*"** option over the older **"compress::*compression_level*"** option, which is retained only for compatibility with older applications.

- **verify={crc | read_after_write} –** adds a cyclic redundancy check for accidental changes to raw data for database dumps created with compression to check and for verification that the compression blocks can be correctly read and decompressed. Options are:
  - **verify=crc** – indicates that you are performing a cyclic redundancy check.
  - **verify=read_after_write** – Backup Server rereads every compressed block after writing and decompressing it. If Backup Server finds an error, it prints the offset in the file it finds the error. You cannot use **verify=read_after_write** with **load database** commands.
- **dumpvolume = *volume_name* –** establishes the name that is assigned to the volume. The maximum length of *volume_name* is 6 characters. Backup Server writes the *volume_name* in the ANSI tape label when overwriting an existing dump, dumping to a new tape, or dumping to a tape whose contents are not recognizable. The **load database** command checks the label and generates an error message if the wrong volume is loaded.

Warning! Label each tape volume as you create it so that the operator can load the correct tape.

- **with shrink_log –** is used when a hole in the database might be created when the **alter database log off** command is used to shrink space from the log. This command automatically removes holes at the end of the database if the database is not in a dump sequence. Likewise, **dump database** automatically removes any hole at the end of the database if the database is not in a dump sequence (that is, when youa re forced to run **dump database** because **dump transaction** is not allowed, when, for example, any minimally logged command is performed). The **with shrink_log** option of **dump database** removes holes at the end of the database, regardless of whether the database is in a dump sequence or not..
- **with verify[= header | full] –** allows the Backup Server to perform a minimal header or structural row check on the data pages as they are being copied to the archives. There are no structural checks done at this time to `gam`, `oam`, `allocation pages`, `indexes`, `text`, or `log` pages. The only other check is done on pages where the page number matches to the page header. Any faults found are reported in the **backupserver** error log.
- **stripe on *stripe_device* –** is an additional dump device. You can use as many as 32 devices, including the device named in the **to *stripe_device*** clause. The Backup Server splits the database into approximately equal portions, and sends each portion to a different device. Dumps are made concurrently on all devices, reducing the time required to make a dump, and requiring fewer volume changes during the dump..
- **dismount | nodismount –** on platforms that support logical dismount, determines whether tapes remain mounted. By default, all tapes used for a dump are dismounted when the dump completes. Use **nodismount** to keep tapes available for additional dumps or loads.
- **nounload | unload –** determines whether tapes rewind after the dump completes. By default, tapes do not rewind, allowing you to make additional dumps to the same tape

volume. Specify **unload** for the last dump file to be added to a multidump volume. This rewinds and unloads the tape when the dump completes.

- **passwd = *password* –** is the password you provide to protect the dump file from unauthorized users. The password must be between 6 and 30 characters long. You cannot use variables for passwords. See *Managing Adaptive Server Logins, Database Users, and Client Connections* in the *System Administration Guide, Volume 1*.
- **retaindays = *number_days* –** (UNIX systems) when dumping to disk, specifies the number of days that Backup Server protects you from overwriting the dump. If you try to overwrite the dump before it expires, Backup Server requests confirmation before overwriting the unexpired volume.

  Note: This option applies only when dumping to a disk; it does not apply to tape dumps.

  The *number_days* must be a positive integer or 0, for dumps that you can overwrite immediately. If you do not specify a **retaindays** value, Backup Server uses the **tape retention in days** value set by **sp_configure**.
- **noinit | init –** determines whether to append the dump to existing dump files or reinitialize (overwrite) the tape volume. By default, the SAP ASE server appends dumps following the last end-of-tape mark, allowing you to dump additional databases to the same volume. New dumps can be appended only to the last volume of a multivolume dump. Use **init** for the first database you dump to a tape to overwrite its contents.

  Use **init** when you want Backup Server to store or update tape device characteristics in the tape configuration file. See the *System Administration Guide*.
- **file = *file_name* –** is the name of the dump file. The name cannot exceed 17 characters and must conform to operating system conventions for file names.
- **notify = {client | operator_console} –** overrides the default message destination.

  On operating systems that offer an operator terminal feature, volume change messages are always sent to the operator terminal on the machine on which Backup Server is running. Use **client** to route other Backup Server messages to the terminal session that initiated the **dump database**.

  On operating systems that do not offer an operator terminal feature, such as UNIX, messages are sent to the client that initiated the **dump database**. Use **operator_console** to route messages to the terminal on which Backup Server is running.
- **syb_tsm::*obj_name* –** is the keyword that invokes the `libsyb_tsm.so` module that enables communication between Backup Server and Tivoli Storage Manager.
- ***object_name* –** is the name of the backup object on TSM server.

Examples

- **Example 1 –** Dumps the database using the `dmp_cfg2` dump configuration:

```
dump database testdb using config = dmp_cfg2
```

- **Example 2 –** Dumps the database using the `dmp_cfg2` dump configuration. The archive files created as part of the dump operation are password-protected:

```
dump database testdb using config = dmp_cfg2
    with passwd='mypass01'
```

Note: The password must be in single or double quotes.

- **Example 3 –** Performs a database dump using the `dmp_cfg2` dump configuration, explicitly specifying compression level 6, thereby overriding the compression level that was configured in `dmp_cfg2`:

```
dump database testdb using config = dmp_cfg2
    with compression=6
```

- **Example 4 –** Dumps the database `pubs2` to a tape device. If the tape has an ANSI tape label, this command appends this dump to the files already on the tape, since the **init** option is not specified:

```
dump database pubs2
    to "/dev/nrmt0"
```

- **Example 5 –** (UNIX only) Dumps the `pubs2` database, using the REMOTE_BKP_SERVER Backup Server. The command names three dump devices, so the Backup Server dumps approximately one-third of the database to each device. This command appends the dump to existing files on the tapes. The **retaindays** option specifies that the tapes cannot be overwritten for 14 days:

```
dump database pubs2
    to "/dev/rmt4" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt5" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt0" at REMOTE_BKP_SERVER
with retaindays = 14
```

- **Example 6 –** Initializes the tape volume, overwriting any existing files:

```
dump database pubs2
    to "/dev/nrmt0"
    with init
```

- **Example 7 –** Rewinds the dump volumes upon completion of the dump:

```
dump database pubs2
    to "/dev/nrmt0"
    with unload
```

- **Example 8 –** (UNIX only) Sends Backup Server messages requesting volume changes to the client which initiated the dump request, rather than sending them to the default location, the console of the Backup Server machine:

```
dump database pubs2
    to "/dev/nrmt0"
    with notify = client
```

- **Example 9 –** Creates a compressed dump of the `pubs2` database into a local file called `dmp090100.dmp` using a compression level of 4:

```
dump database pubs2 to
    "compress::4::/opt/bin/Sybase/dumps/dmp090100.dmp"
```

Alternatively, you can create a compressed dump of the `pubs2` database into a local file called `dmp090100.dmp` using a compression level of 100 using **compression = *compression_level*** syntax:

```
dump database pubs2 to "/opt/bin/Sybase/dumps/dmp090100.dmp"
    with compression = 100
```

- **Example 10 –** Dumps the `pubs2` database to the remote machine called "remotemachine" and uses a compression level of 4:

```
dump database pubs2 to "/Syb_backup/mydb.db" at remotemachine
    with compression = "4"
```

- **Example 11 –** Dumps the `pubs2` database to the TSM backup object "obj1.1":

```
dump database pubs2 to "syb_tsm::obj1.1"
```

- **Example 12 –** Dumps the `pubs2` database to the TSM backup object "obj1.2" using multiple stripes:

```
dump database pubs2 to "syb_tsm::obj1.2"
    stripe on "syb_tsm::obj1.2"
    stripe on "syb_tsm::obj1.2"
    stripe on "syb_tsm::obj1.2"
    stripe on "syb_tsm::obj1.2"
```

- **Example 13 –** Removes the last fragment in `sales_db1`, which is a database hole at the end of the database.

select * indicates there is a hole at the end of the database:

```
select * from sysusages where dbid=db_id("sales_db1")
go
```

```
 dbid segmap lstart  size vstart location unreservedpgs  crdate
         vdevno
 ---- ------ ------- ---- ------ -------- -------------- --------
--------- ------
    5      3      0  1536   1536       0           598  May 5 2011
2:59PM      3
    5      4   1536  1536   1536       0          1530  May 5 2011
2:59PM      4
    5      0   3072  1536   3072       4          1526  May 5 2011
2:59PM     -5
```

```
dump database sales_db1 to "/tmp/sales_db1.dmp" with shrink_log
go
```

```
Backup Server session id is: 42. Use this value when executing the
'sp_volchanged' system
stored procedure after fulfilling any volume change request from
the Backup Server.
Backup Server: 4.41.1.1: Creating new disk file /tmp/
sales_db1.dmp.
Backup Server: 6.28.1.1: Dumpfile name 'sales_db1111250D8E6  '
section number 1 mounted
on disk file '/tmp/sales_db1.dmp'
Backup Server: 4.188.1.1: Database sales_db1: 892 kilobytes (55%)
DUMPED.
```

```
Backup Server: 4.188.1.1: Database sales_db1: 934 kilobytes (100%)
DUMPED.
Backup Server: 3.43.1.1: Dump phase number 1 completed.
Backup Server: 3.43.1.1: Dump phase number 2 completed.
Backup Server: 3.43.1.1: Dump phase number 3 completed.
Backup Server: 4.188.1.1: Database sales_db1: 942 kilobytes (100%)
DUMPED.
Backup Server: 3.42.1.1: DUMP is complete (database sales_db1).
```

Run **select *** to confirm that the fragment is successfully removed:

```
select * from sysusages where dbid=db_id("sales_db1")
go
```

```
 dbid segmap lstart  size vstart location unreservedpgs  crdate
         vdevno
 ---- ------ ------- ---- ------ -------- -------------- --------
--------- ------
    5      3      0  1536   1536        0           598  May 5 2011
2:59PM      3
    5      4   1536  1536   1536        0          1530  May 5 2011
2:59PM      4
```

- **Example 14 –** Verifies database `new_dump` before dumping it to the `mydumpdev` device:

```
dump database new_dump to mydumpdev with
compression=x,verify=read_after_write
```

- **Example 15 –** Performs a cyclic redundancy check and rereads every compressed block before dumping database `new_dump` to the `mydumpdev` device:

```
dump database new_dump to mydumpdev with
compression=x,verify=read_after_write,verify=crc
```

Usage

If you use **sp_hidetext** followed by a cross-platform **dump** and **load**, you must manually drop and re-create all hidden objects.

dump database executes in three phases. A progress message informs you when each phase completes. When the dump is finished, it reflects all changes that were made during its execution, except for those initiated during phase 3.

Cyclic redundancy checks:

- Dumps created without the **verify=crc** parameter use the same format as versions of Backup Server earlier than 16.0.
- SAP ASE ignores the **verify=crc** option if the database was not originally dumped using **verify=crc**.
- You cannot load dumps that include cyclic redundancy checks with versions of Backup Server that do not include this functionality.
- **verify={crc | read_after_write}** checks are applicable only for files created using the **with compression** parameter.

- **verify=crc** works with any file type, including raw devices, disk files, tapes, pipes, or APIs. However, **verify=read_after_write** requires a 'seek back' for rereading the block, and is applicable only with raw devices and disk files.
- SAP ASE ignores, and does not raise an error message, if you include **verify={crc | read_after_write}** parameters that are not applicable.

Dumping compressed data:

- You cannot create a dump of a compressed table on one platform and load this dump on a different platform.
- Compressed data is dumped directly to an archived location.
- **create index** commands on compressed tables that contain any form of compressed or uncompressed rows are fully recovered during a **load transaction**.

If you issue a **dump** command without the **init** qualifier and Backup Server cannot determine the device type, the **dump** command fails. See the *System Administration Guide*.

Backup servers:

- You must have a Backup Server running on the same machine as the SAP ASE server. The Backup Server must be listed in the `master..sysservers` table. This entry is created during installation or upgrade; do not delete it.
- If your backup devices are located on another machine so that you dump across a network, you must also have a Backup Server installed on the remote machine.

The **dump database** command takes into account when a device is mirrored and will store the path to mirror devices along with regular devices in the dump header. The **sybdumptran** utility first attempts to open the primary device, and in the event the primary device cannot be opened, the mirrored device is opened, if one exists.

Database dumps from a 32-bit version of an SAP ASE server are fully compatible with a 64-bit version of an SAP ASE server of the same platform, and vice-versa.

See also:

- *Backing Up and Restoring User Databases* in the *System Administration Guide*; *Using Backup Server with IBM Tivoli Storage Manager* for **dump database** syntax when the Tivoli Storage Manager is licensed at your site..
- **sp_addthreshold**, **sp_dumpdevice**, **sp_dropdevice**, **sp_dropthreshold**, **sp_helpdb**, **sp_helpdevice**, **sp_helpthreshold**, **sp_hidetext**, **sp_logdevice**, **sp_spaceused**, **sp_volchanged** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **dump database** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the database owner, or a user with `dump database` privilege or `own database` privilege on the database.
Disabled	With granular permissions disabled, you must be the database owner or a user with any of these roles: • **sa_role**, or, • **replication_role**, or, • **oper_role**

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	34
Audit option	**dump**
Command or access audited	**dump database**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *dump transaction* on page 391
- *load database* on page 485
- *load transaction* on page 501

Commands and System Procedures Used to Back Up Databases

Commands and system procedures used to back up databases.

To	Use
Make routine dumps of the entire database, including the transaction log.	**dump database**

To	Use
Make routine dumps of the transaction log, then truncate the inactive portion. The inactive portion of a transaction log is not truncated if **dump transaction** is running concurrently with **dump database**.	**dump transaction**
Dump the transaction log after failure of a database device.	**dump transaction with no_truncate**
Truncate the log without making a backup, then copy the entire database.	**dump transaction with truncate_only** **dump database**
Truncate the log after your usual method fails due to insufficient log space, then copy the entire database.	**dump transaction with no_log** **dump database**
Respond to the Backup Server volume change messages.	**sp_volchanged**

Scheduling Dumps

Considerations for scheduling dumps.

- SAP ASE database dumps are dynamic—they can take place while the database is active. However, they may slow the system down slightly, so you may want to run **dump database** when the database is not being heavily updated.
- Back up the `master` database regularly and frequently. In addition to your regular backups, dump `master` after each **create database, alter database**, and **disk init** command is issued.
- Back up the `model` database each time you make a change to the database.
- Use **dump database** immediately after creating a database, to make a copy of the entire database. You cannot run **dump transaction** on a new database until you have run **dump database**.
- Each time you add or remove a cross-database constraint or drop a table that contains a cross-database constraint, dump both of the affected databases.

  Warning! Loading earlier dumps of these databases can cause database corruption.
- Develop a regular schedule for backing up user databases and their transaction logs.
- Use thresholds to automate backup procedures. To take advantage of SAP ASE last-chance threshold, create user databases with log segments on a device that is separate from data segments. For more information about thresholds, see the *System Administration Guide*.

Specifying Dump Devices

Usage information for specifying dump devices.

- You can specify the dump device as a literal, a local variable, or a parameter to a stored procedure.
- You cannot dump to the null device (on UNIX, `/dev/null`).
- Dumping to multiple stripes is supported for tape and disk devices. Placing multiple dumps on a device is supported only for tape devices.
- You can specify a local dump device as:
  - A logical device name from the `sysdevices` system table
  - An absolute path name
  - A relative path name

  Backup Server resolves relative path names using the current working directory in the SAP ASE server.
- When dumping across the network, you must specify the absolute path name of the dump device. The path name must be valid on the machine on which Backup Server is running. If the name includes any characters except letters, numbers, or the underscore (_), you must enclose it in quotes.
- Ownership and permissions problems on the dump device may interfere with the use of **dump** commands. **sp_addumpdevice** adds the device to the system tables, but does not guarantee that you can dump to that device or create a file as a dump device.
- You can run more than one dump (or load) at the same time, as long as each uses different dump devices.

Restrictions for dump database

Restrictions for using **dump database**.

- The maximum file path/name size for a physical device is 127 characters.
- If a database has proxy tables, the proxy tables are a part of the database save set. The content data of proxy tables is not included in the save; only the pointer is saved and restored.
- You cannot remove holes that are not at the end of the database using the **with shrink_log** option.
- You cannot mix SAP dumps and non-SAP data (for example, UNIX archives) on the same tape.
- If a database has cross-database referential integrity constraints, the `sysreferences` system table stores the name—not the ID number—of the external database. The SAP ASE server cannot guarantee referential integrity if you use **load database** to change the database name or to load it onto a different server.

  Warning! Before dumping a database to load it with a different name or move it to another SAP ASE server, use **alter table** to drop all external referential integrity constraints.

- You cannot use **dump database** in a user-defined transaction.
- If you issue **dump database** on a database where a **dump transaction** is already in progress, **dump database** sleeps until the transaction dump completes.
- When using 1/4-inch cartridge tape, you can dump only one database or transaction log per tape.
- You cannot dump a database if it has offline pages. To force offline pages online, use **sp_forceonline_db** or **sp_forceonline_page**.
- Before you run **dump database**, for a cross platform dump and load, move the database to a transactional quiescent status:
  1. Verify the database runs cleanly by executing **dbcc checkdb** and **dbcc checkalloc**.
  2. To prevent concurrent updates from open transactions by other processes during **dump database**, use **sp_dboption** to place the database in a single-user mode.
  3. Flush statistics to `systabstats` using **sp_flushstats**.
  4. Wait for 10 to 30 seconds, depending on the database size and activity.
  5. Run **checkpoint** against the database to flush updated pages.
  6. Run **dump database**.
- **dump transaction** and **load transaction** are not allowed across platforms.
- **dump database** and **load database** to or from a remote `backupserver` are not supported across platforms.
- You cannot load a password-protected dump file across platforms.
- If you perform **dump database** and **load database** for a parsed XML object, you must parse the text again after the **load database** is completed.
- The SAP ASE server cannot translate embedded data structures stored as `binary`, `varbinary`, or `image` columns.
- **load database** is not allowed on the `master database` across platforms.
- Stored procedures and other compiled objects are recompiled from the SQL text in `syscomments` at the first execution after the **load database**.

  If you do not have permission to recompile from text, then the person who does must recompile from text using **dbcc upgrade_object** to upgrade objects.

  Note: If you migrate login records in the `syslogins` system table in the `master` database from Solaris to Linux, you can perform a **bcp -c** character format bulk copy, and the login password from Solaris is compatible on Linux. For all other combinations and platforms, login records must be re-created because the passwords are not compatible.

Dumping Databases with Devices That Are Mirrored

At the beginning of a **dump database**, the SAP ASE server passes Backup Server the primary device name of all database and log devices. If the primary device has been unmirrored, the SAP ASE server instead passes the name of the secondary device. If any named device fails before the Backup Server completes its data transfer, the SAP ASE server aborts the dump.

If a user attempts to unmirror any of the named database devices while a **dump database** is in progress, the SAP ASE server displays a message. The user executing the **disk unmirror** command can abort the dump or defer the **disk unmirror** until after the dump is complete.

Dumping the System Databases

The `master`, `model`, and `sybsystemprocs` databases do not have separate segments for their transaction logs. Use **dump transaction with truncate_only** to purge the log, then use **dump database** to back up the database.

Backups of the `master` database are needed for recovery procedures in case of a failure that affects the `master` database. See the *System Administration Guide* for step-by-step instructions for backing up and restoring the `master` database.

If you are using removable media for backups, the entire `master` database must fit on a single volume, unless you have another SAP ASE server that can respond to volume change messages.

Dump Files

Dumping a database with the **init** option overwrites any existing files on the tape or disk.

If you perform two or more dumps to a tape device and use the same file name for both dumps (specified with the **FILENAME** parameter), the SAP ASE server appends the second dump to the archive device. You cannot restore the second dump, because the SAP ASE server locates the first instance of the dump image with the specified file name and restores this image instead. The SAP ASE server does not search for subsequent dump images with the same file name.

Backup Server sends the dump file name to the location specified by the **with notify** clause. Before storing a backup tape, the operator should label it with the database name, file name, date, and other pertinent information. When loading a tape without an identifying label, use the **with headeronly** and **with listonly** options to determine the contents.

Volume Names

Dump volumes are labeled according to the ANSI tape-labeling standard. The label includes the logical volume number and the position of the device within the stripe set.

During loads, Backup Server uses the tape label to verify that volumes are mounted in the correct order. This allows you to load from a smaller number of devices than you used at dump time.

Note: When dumping and loading across the network, you must specify the same number of stripe devices for each operation.

Changing Dump Volumes

(UNIX systems) Backup Server requests a volume change when the tape capacity has been reached. After mounting another volume, the operator notifies Backup Server by executing **sp_volchanged** on any SAP ASE server that can communicate with Backup Server.

If Backup Server detects a problem with the currently mounted volume, it requests a volume change by sending messages to either the client or its operator console. The operator can use the **sp_volchanged** system procedure to respond to these messages.

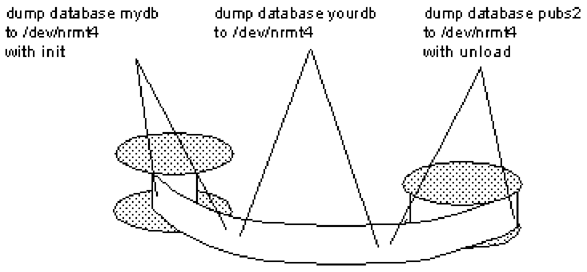
Appending to or Overwriting a Volume

By default (**noinit**), Backup Server writes successive dumps to the same tape volume, making efficient use of high-capacity tape media. Data is added following the last end-of-tape mark. New dumps can be appended only to the last volume of a multivolume dump.

Before writing to the tape, Backup Server verifies that the first file has not yet expired. If the tape contains non-SAP data, Backup Server rejects it to avoid destroying potentially valuable information.

Use the **init** option to reinitialize a volume. If you specify **init**, Backup Server overwrites any existing contents, even if the tape contains non-SAP data, the first file has not yet expired, or the tape has ANSI access restrictions.

This figure illustrates how to dump three databases to a single volume using:
- **init** to initialize the tape for the first dump
- **noinit** (the default) to append subsequent dumps
- **unload** to rewind and unload the tape after the last dump



File Names and Archive Names

The name of a dump file identifies the database that was dumped and when the dump was made. However, in the syntax, *file_name* has different meanings depending on whether you are dumping to disk or to a UNIX tape.

```
file = file_name
```

In a dump to disk, the path name of a disk file is also its file name.

In a dump to a UNIX tape, the path name is not the file name. The ANSI Standard Format for File Interchange contains a file name field in the HDR1 label. For tapes conforming to the ANSI specification, this field in the label identifies the file name. The ANSI specification applies these labels only to tape; it does not apply to disk files.

This creates two problems:

- UNIX does not follow the ANSI convention for tape file names. UNIX considers the tape's data to be unlabeled. Although the data can be divided into files, those files have no name.
- In Backup Server, the ANSI tape labels are used to store information about the archive, negating the ANSI meanings. Therefore, disk files also have ANSI labels, because the archive name is stored there.

The meaning of *filename* changes, depending on the kind of dump you are performing. For example, in this syntax:

```
dump database database_name to 'filename' with file='filename'
```

- The first *filename* refers to the path name you enter to display the file.
- The second *filename* is actually the archive name, the name stored in the HDR1 label in the archive, which the user can specify with the **file=*filename*** parameter of the **dump** or **load** command.

When the archive name is specified, the server uses that name during a database load to locate the selected archive.

If the archive name is not specified, the server loads the first archive it encounters.

In both cases, **file='*archivename*'** establishes the name that is stored in the HDR1 label, and which the subsequent **load** uses to validate that it is looking at the correct data.

If the archive name is not specified, a **dump** creates one; a **load** uses the first name it encounters.

The meaning of *filename* in the **to '*filename*'** clause changes, according to whether you are performing a disk or tape dump:

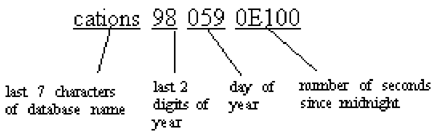
- If the dump is to tape, '*filename*' is the name of the tape device.
- If the dump is to disk, it is the name of a disk file.

If this is a disk dump and '*filename*' is not a complete path, the server's current working directory is prepended to the file name.

If you are dumping to tape and you do not specify a file name, Backup Server creates a default file name by concatenating:

- Last seven characters of the database name
- Two-digit year number
- Three-digit day of the year (1 – 366)
- Hexadecimal-encoded time at which the dump file was created

For example, the file `cations980590E100` contains a copy of the `publications` database made on the 59th day of 1998:


cations
98
059
0E100
last 7 characters of database name
last 2 digits of year
day of year
number of seconds since midnight

dump database Performance

Due to the design of indexes within a dataserver that provides an optimum search path, index rows are ordered for fast access to the table's data row. Index rows that contain row identifiers (RIDs), are treated as binary to achieve fast access to the user table.

Within the same architecture platform, the order of index rows remains valid, and search order for a selection criteria takes its normal path. However, when index rows are translated across different architectures, the order by which optimization was performed is invalidated, leading to an invalid index on user tables in a cross-platform dump and load.

When a database dump from a different architecture, such as big endian to little endian, is loaded, certain indexes are marked as suspect:

- Nonclustered index on APL tables.
- Clustered index on DOL tables.
- Nonclustered index on DOL tables.

To fix indexes on the target system, after loading from a different architecture dump, either:

- Drop and re-create all of the indexes, or,
- Use **sp_post_xpload**. See *System Procedures* in *Reference Manual: Procedures*.

Re-creating indexes on large tables can be a lengthy process. **sp_post_xpload** validates indexes, drops invalid indexes, and re-creates dropped indexes, in a single command.

Using **sp_post_xpload** may take longer than dropping and re-creating indexes individually. You should use the drop and re-create indexes on those databases larger than 10GB.

Compressed Dumps for an Archive Database

To use a compressed dump for an archive database:

- Create the compressed dump using the **with compression = <*compression level*>** option of the **dump database** or **dump tran** command.
- Create a memory pool for accessing the archive database.

Note: Dumps generated with “**compress::**” cannot be loaded into an archive database. Therefore, any references to compression in this chapter refer to dumps generated using the **with compression = <compression level>** option.

There are no compatibility issues with dumps using this compression option on traditional databases.

Compatibility Issues for a Compressed Dump

Backup Server versions 15.0 ESD #2 and later generate a different format of compressed dump than earlier versions.

Therefore:

- You can load compressed dump made using a Backup Server version 15.0 ESD #2 and later only into a pre-15.0 ESD #2 installation using a Backup Server version 15.0 ESD #2 or later.
- If you are using a pre-15.0 ESD #2 installation and want to use your dumps for an archive database, use Backup Server version 15.0 ESD #2 or later to create compressed database dumps.

Note: You can use a 15.0 ESD #2 Backup Server for both dump and loads.

Encrypted Columns and dump database

dump and **load** work on the ciphertext of encrypted columns, ensuring that the data for encrypted columns remains encrypted while on disk. These commands also pertain to the entire database; default keys and keys that are created in the same database are dumped and loaded along with the data to which they pertain.

If your keys are in a separate database than the columns they encrypt, you should:

- When you dump the database containing encrypted columns, you also dump the database where the key was created. This is necessary if new keys have been added since the last dump.
- When you dump the database containing an encryption key, dump all databases containing columns encrypted with that key. This keeps the encrypted data in sync with the available keys.
- After loading the database containing the encryption keys and the database containing the encrypted columns, bring both databases online at the same time.

Because of metadata dependencies of encrypted columns on the key’s database, follow the steps below if you intend to load the key database into a database with a different name (if your data is stored in the same database as your keys, you need not follow these steps):

1. Before dumping the database containing the encrypted columns, use **alter table** to decrypt the data.
2. Dump the databases containing keys and encrypted columns.

3. After loading the databases, use **alter table** to reencrypt the data with the keys in the newly named database.

The consistency issues between encryption keys and encrypted columns are similar to those for cross-database referential integrity. See *Cross-Database Constraints and Loading Databases* in the *System Administration Guide*.

dump transaction

Makes a copy of a transaction log, and removes the inactive portion of the log, if the **dump transaction** command is not running concurrently with another **dump database**.

See the Tivoli Storage Manager (TSM) syntax for **dump tranaction** syntax when Tivoli is licensed at your site.

Syntax

To make a routine log dump:

```
dump tran[saction] database_name
    to [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]
    [stripe on [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]]
    [[stripe on [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]]...]
    [with {
        density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        compression = compress_level,
        dumpvolume = volume_name,
        file = file_name,
        [dismount | nodismount],
        [nounload | unload],
        retaindays = number_days,
        [noinit | init],
        notify = {client | operator_console},
        standby_access}]
```

To truncate the log without making a backup copy:

```
dump tran[saction] database_name
    with truncate_only
```

To truncate a log that is filled to capacity. *Use only as a last resort, as you will lose the contents of your log*:

```
dump tran[saction] database_name
    with no_log
```

To back up the log after a database device fails:

```
dump tran[saction] database_name
    to [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]
    [stripe on [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]]
    [[stripe on [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        dumpvolume = volume_name,
        file = file_name]]...]
    [with {
        density = density_value,
        blocksize = number_bytes,
        capacity = number_kilobytes,
        compression = compress_level
        dumpvolume = volume_name,
        file = file_name,
        [dismount | nodismount],
        [nounload | unload],
        retaindays = number_days,
        [noinit | init],
        no_truncate,
        notify = {client | operator_console}}]
```

To copy the transaction log when the Tivoli Storage Manager provides backup services:

```
dump transaction database_name
    to "syb_tsm::object_name"
        [blocksize = number_bytes]
    [stripe on "[syb_tsm::]object_name"
```

```
        [blocksize = number_bytes]]...]
    [with {
        blocksize = number_bytes,
        compression = compress_level,
        passwd = password,
        [noinit | init],
        notify = {client | operator_console},
        verify[ = header | full]
        } ]
```

To dump a transaction based on the settings specified in a configuration file:

```
dump transaction database_name
    using config = configuration_name
    [with {
        verify [= header | full]
        }]
```

Parameters

- ***database_name*** **–** is the name of the database from which you are copying data. The name can be given as a literal, a local variable, or a parameter to a stored procedure.
- ***configuration_name*** **–** is a unique dump configuration name. The parameter values specified in the dump configuration are used to perform the dump operation.

  Any other parameters are explicitly specified in the command override the values specified by the dump configuration.

  You cannot specify a stripe directory as a parameter for the command if you use a dump configuration. The SAP ASE server creates the dump files in the stripe directory specified by the dump configuration. Dump file names use this convention:

  `Database_Name.Dump_Type.Date-Timestamp.StripeID`
- **compress::*compression_level* –**

  is a number between 0 and 9, 100, or 101. For single-digit compression levels, 0 indicates no compression, and 9 provides the highest level of compression. Compression levels of 100 and 101 provide a faster, more efficient compression mode, with 100 providing faster compression and 101 providing better compression. If you do not specify *compression_level*, the SAP ASE server does not compress the dump.

  For more information about the **compress** option, see *Backing Up and Restoring User Databases* in the *System Administration Guide*.

  Note: The **compression = *compress_level*** option allows you to compress a dump file on both local and remote machines, and differs from the **compress::*compression_level*** option, which you can use only to compress a dump file on local machine. Beginning with SAP ASE version 15.0, SAP supports—and recommends—the native **compression = *compression_level*** syntax.

- **truncate_only –** removes the inactive part of the log without making a backup copy. Use on databases without log segments on a separate device from data segments. Do not specify a dump device or Backup Server name.
- **no_log –** removes the inactive part of the log without making a backup copy and without recording the procedure in the transaction log. Use **no_log** only when you are completely out of log space and cannot run the usual **dump transaction** command. Use **no_log** as a last resort and use it only once after **dump transaction with truncate_only** fails.
- **to *stripe_device* –** is the device to which data is being dumped.
- **at *backup_server_name* –** is the name of the Backup Server. Do not specify this parameter if you are dumping to the default Backup Server. Specify this parameter only if you are dumping over the network to a remote Backup Server. You can specify as many as 32 different remote Backup Servers using this option. When dumping across the network, specify the *network name* of a remote Backup Server running on the machine to which the dump device is attached. For platforms that use interfaces files, *backup_server_name* must appear in the interfaces file.
- **density = *density_value* –** overrides the default density for a tape device. Valid densities are 800, 1600, 6250, 6666, 10000, and 38000. Not all values are valid for every tape drive; use the correct density for your tape drive.
- **blocksize = *number_bytes* –** overrides the default block size for a dump device. The block size must be at least one database page (2048 bytes for most systems) and must be an exact multiple of the database page size.

  Note: Whenever possible, use the default block size; it is the best block size for your system.
- **capacity = *number_kilobytes* –** is the maximum amount of data that the device can write to a single tape volume. The capacity must be at least five database pages, and should be slightly less than the recommended capacity for your device.

  A general rule for calculating capacity is to use 70 percent of the manufacturer's maximum capacity for the device, leaving 30 percent for overhead, such as record gaps and tape marks. This rule works in most cases, but may not work in all cases because of differences in overhead across vendors and devices.

  On UNIX platforms that cannot reliably detect the end-of-tape marker, you must indicate how many kilobytes can be dumped to the tape. You must supply a **capacity** for dump devices specified as a physical path name. If a dump device is specified as a logical device name, the Backup Server uses the *size* parameter stored in the `sysdevices` system table, unless you specify a capacity.
- **compression = *compress_level* –** is a number between 0 and 9, 100, or 101. For single-digit compression levels, 0 indicates no compression, and 9 provides the highest level of compression. Compression levels of 100 and 101 provide a faster, more efficient compression mode, with 100 providing faster compression and 101 providing better compression. If you do not specify *compression_level*, the SAP ASE server does not compress the dump.

Note: You should use the native **"compression = *compress_level*"** option over the older **"compress::*compression_level*"** option. The native option allows compression of both local and remote dumps, and the dumps that it creates then describe their own compression level during a load. The older option is retained for compatibility with older applications.

- **dumpvolume = *volume_name* –** establishes the name that is assigned to the volume. The maximum length of *volume_name* is 6 characters. The Backup Server writes the *volume_name* in the ANSI tape label when overwriting an existing dump, dumping to a brand new tape, or dumping to a tape for which the contents are not recognizable. The **load transaction** command checks the label and generates an error message if the wrong volume is loaded.
- **stripe on *stripe_device* –** is an additional dump device. You can use up to 32 devices, including the device named in the **to *stripe_device*** clause. The Backup Server splits the log into approximately equal portions and sends each portion to a different device. Dumps are made concurrently on all devices, reducing the time and the number of volume changes required.
- **dismount | nodismount –** (on platforms that support logical dismount) determines whether tapes remain mounted. By default, all tapes used for a dump are dismounted when the dump completes. Use **nodismount** to keep tapes available for additional dumps or loads.
- **nounload | unload –** determines whether tapes rewind after the dump completes. By default, tapes do not rewind, allowing you to make additional dumps to the same tape volume. Specify **unload** for the last dump file to be added to a multidump volume. This rewinds and unloads the tape when the dump completes.
- **retaindays = *number_days* –** (on UNIX platforms) specifies the number of days that Backup Server protects you from overwriting a dump. If you try to overwrite a dump before it expires, Backup Server requests confirmation before overwriting the unexpired volume.

  Note: This option is meaningful for disk, 1/4-inch cartridge, and single-file media. On multifile media, this option is meaningful for all volumes except the first.

  The *number_days* must be a positive integer or 0, for dumps you can overwrite immediately. If you do not specify a **retaindays** value, Backup Server uses the server-wide **tape retention in days** value, set by **sp_configure.**
- **noinit | init –** determines whether to append the dump to existing dump files or reinitialize (overwrite) the tape volume. By default, the SAP ASE server appends dumps following the last end-of-tape mark, allowing you to dump additional databases to the same volume. You can append new dumps only to the last volume of a multivolume dump. Use **init** for the first database you dump to a tape, to overwrite its contents.

  Use **init** when you want Backup Server to store or update tape device characteristics in the tape configuration file. See the *System Administration Guide*.

- **file = *file_name* –** is the name of the dump file. The name cannot exceed 17 characters and must conform to operating system conventions for file names. If you do not specify a file name, Backup Server creates a default file name.
- **no_truncate –** dumps a transaction log, even if the disk containing the data segments for a database is inaccessible, using a pointer to the transaction log in the `master` database. The **with no_truncate** option provides up-to-the-minute log recovery when the transaction log resides on an undamaged device, and the `master` database and user databases reside on different physical devices.

  If you use **dump tran** with **no_truncate** you must follow it with **dump database**, not with another **dump tran**. If you load a dump generated using the **no_truncate** option, the SAP ASE server prevents you from loading any subsequent dump.
- **notify = {client | operator_console} –** overrides the default message destination.
  - On operating systems that offer an operator terminal feature, volume change messages are always sent to the operator terminal on the machine on which the Backup Server is running. Use **client** to route other Backup Server messages to the terminal session that initiated the **dump database**.
  - On operating systems (such as UNIX) that do not offer an operator terminal feature, messages are sent to the client that initiated the **dump database**. Use **operator_console** to route messages to the terminal on which the Backup Server is running.
- **with standby_access –** specifies that only completed transactions are to be dumped. The dump continues to the furthest point it can find at which a transaction has just completed and there are no other active transactions.
- **syb_tsm –** is the keyword that invokes the libsyb_tsm.so module that enables communication between Backup Server and TSM.
- ***object_name* –** is the name of the backup object on TSM server.
- ***configuration_name* –** is a unique dump configuration name. The parameter values specified in the dump configuration are used to perform the dump operation.

  If other parameters are explicitly specified in the command, they override the parameter values specified by the dump configuration.

  You cannot specify a stripe directory as a parameter for the command if you use a dump configuration. The SAP ASE server creates the dump files in the stripe directory specified by the dump configuration. The dump files are named using this convention:

  ```
  Database Name.Dump Type.Date-Timestamp.StripeID
  ```

Examples

- **Example 1 –** Dumps the transaction log to a tape, appending it to the files on the tape, since the **init** option is not specified:

  ```
  dump transaction pubs2
      to "/dev/nrmt0"
  ```

- **Example 2 –** Dumps the transaction log for the `mydb` database, using the Backup Server REMOTE_BKP_SERVER. The Backup Server dumps approximately half the log to each of the two devices. The **init** option overwrites any existing files on the tape. The **retaindays** option specifies that the tapes cannot be overwritten for 14 days:

```
dump transaction mydb
    to "/dev/nrmt4" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt5" at REMOTE_BKP_SERVER
with init, retaindays = 14
```

- **Example 3 –** Dumps completed transactions from the `inventory_db` transaction log file to device `dev1`:

```
dump tran inventory_db to dev1 with standby_access
```

- **Example 4 –** Dumps the transaction log for the pubs2 database to the TSM backup object "demo2.2" with 100-level compression.

```
dump transaction pubs2 to "syb_tsm::demo2.2"
    with compression = 100
```

- **Example 5 –** Dumps the database using the “dmp_cfg2” configuration. The archive files created during the dump are password-protected:

```
dump transaction testdb using config = 'dmp_cfg2'
   with passwd = 'my_pass01'
go
```

- **Example 6 –** Dumps the database using the “dmp_cfg2” configuration using compression level 6 and (that is, overriding the compression level specified in “`dmp_cfg2`)”:

```
dump transaction testdb using config = 'dmp_cfg2'
   with compression = 6
go
```

Usage

If you use **sp_hidetext** followed by a cross-platform **dump** and **load**, you must manually drop and re-create all hidden objects.

The **dump transaction** command takes into account when a device is mirrored and will store the path to mirror devices along with regular devices in the dump header. The **sybdumptran** utility first attempts to open the primary device, and in the event the primary device cannot be opened, the mirrored device is opened, if one exists.

The commands and system procedures used to back up databases and logs are:

To	Use
Make routine dumps of the entire database, including the transaction log.	**dump database**
Make routine dumps of the transaction log, then truncate the inactive portion. The inactive portion of the log is not truncated if **dump transaction** is running concurrently with **dump database**.	**dump transaction**

To	Use
Dump the transaction log after failure of a database device.	**dump transaction with no_truncate**
Truncate the log without making a backup. Then copy the entire database.	**dump transaction with truncate_only** **dump database**
Truncate the log after your usual method fails due to insufficient log space. Then copy the entire database.	**dump transaction with no_log** **dump database**
Respond to the Backup Server volume change messages.	**sp_volchanged**

See also:

- *Backing Up and Restoring User Databases* in the *System Administration Guide*.
- **sp_addumpdevice**, **sp_dboption**, **sp_dropdevice**, **sp_helpdevice**, **sp_hidetext**, **sp_logdevice**, **sp_volchanged** in *Reference Manual: Procedures*
- User documentation for Tivoli Storage Manager for more information about creating back-ups when TSM is supported at your site.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **dump transaction** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the database owner, or a user with `dump database` privilege or `own database` privilege on the database.
Disabled	With granular permissions disabled, you must be the database owner or a user with any of these roles: • **sa_role**, or, • **replication_role**, or, • **oper_role**

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	35
Audit option	**dump**
Command or access audited	**dump transaction**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *dump database* on page 373
- *load database* on page 485
- *load transaction* on page 501
- *online database* on page 520

dump transaction Restrictions

Restrictions for using **dump transaction**.

- The maximum file path/name size for a physical device is 127 characters.
- You cannot dump to the null device (on UNIX, `/dev/null`).
- You cannot use the **dump transaction** command in a transaction.
- When using 1/4-inch cartridge tape, you can dump only one database or transaction log per tape.
- You cannot run **dump transaction *database_name* to** before fully dumping a newly created database.
- You cannot use **dump transaction *database_name* to** once an unlogged operation has been performed in the database.
- You cannot issue **dump the transaction log** while the **trunc log on chkpt** database option is enabled or after enabling **select into/bulk copy/pllsort** and making minimally logged changes to the database with **select into**, fast bulk copy operations, default unlogged **writetext** operations, or a parallel sort. Use **dump database** instead.

  Warning! Do not modify the log table `syslogs` with a **delete, update**, or **insert** command.

- If a database does not have a log segment on a separate device from data segments, you cannot use **dump transaction** to copy the log and truncate it.

- If a user or threshold procedure issues a **dump transaction** command on a database where a **dump database** or another **dump transaction** is in progress, the second command sleeps until the first completes.
- To restore a database, use **load database** to load the most recent database dump; then use **load transaction** to load each subsequent transaction log dump in the order in which it was made.
- Each time you add or remove a cross-database constraint, or drop a table that contains a cross-database constraint, dump both of the affected databases.

  Warning! Loading earlier dumps of these databases can cause database corruption.
- You cannot mix SAP dumps and non-SAP data (for example, UNIX archives) on the same tape.
- You cannot dump a transaction **with no_log** or **with truncate_only** if the database has offline pages.

Restrictions differ when using the **with no_truncate** option. Under normal circumstances, the SAP ASE server returns an error message when:

- Running **dump transaction *database_name* to** before fully dumping a newly created databases:
  ```
  This database has not been dumped since it was
  created or upgraded or a transaction dump may have
  been loaded using the UNTIL_TIME clause. You must
  perform a DUMP DATABASE before you can dump its
  transaction log.
  ```
- Using **dump transaction *database_name* to** once you have performed a minimally logged operation in the database:
  ```
  Dump transaction is not allowed because a
  non-logged operation was performed on the database.
  Dump your database or use dump transaction with
  truncate_only until you can dump your database.
  ```
  See *Fully Recoverable DDL and dump transaction* for more information.
- Using **dump transaction *database_name* to** after you have performed **dump transaction with truncate_only**:
  ```
  DUMP TRANsaction to a dump device is not allowed
  where a truncate-only transaction dump has been
  performed after the last DUMP DATABASE. Use DUMP
  DATABASE instead.
  ```

When you use the **with no_truncate** option in your **dump transaction *database_name* to *dump_file*** command, however, the SAP ASE server does not perform a check of the database and thus does not return any of these error messages. The SAP ASE server assumes that your database has some lost data (for example, from a failed disk) and is therefore inaccessible.

You do, however, get an error message when you then try to load your transaction. Your **load transaction** process may fail, with this error message:

```
Specified file 'dump device' is out of sequence. Current
timestamp is <X> while dump was from <Y>.
```

Copying the Log After Device Failure

After device failure, use **dump transaction with no_truncate** to copy the log without truncating it. You can use this option only if your log is on a separate segment and your `master` database is accessible.

The backup created by **dump transaction with no_truncate** is the most recent dump for your log. When restoring the database, load this dump last.

Dumping Databases Without Separate Log Segments

When a database does not have a log segment on a separate device from data segments, use **dump transaction with truncate_only** to remove committed transactions from the log without making a backup copy.

Warning! **dump transaction with truncate_only** provides no means to recover your databases. Run **dump database** at the earliest opportunity to ensure recoverability.

Use **with truncate_only** on the `master`, `model`, and `sybsystemprocs` databases, which do not have log segments on a separate device from data segments.

You can also use **with truncate_only** on very small databases that store the transaction log and data on the same device.

Mission-critical user databases should have log segments on a separate device from data segments. Use the **log on** clause of **create database** to create a database with a separate log segment, or **alter database** and **sp_logdevice** to transfer the log to a separate device.

Dumping Only Complete Transactions

When you use **with standby_access** to dump the transaction log, the dump proceeds to the furthest point in the log at which all earlier transactions have completed and there are no records belonging to open transactions.

Use the **with standby_access** option to dump transaction logs for loading into a server that acts as a warm standby server for the database.

You must use **dump tran[saction]...with standby_access** in all situations where you load two or more transaction logs in sequence and you want the database to be online between loads.

After loading a dump made with the **with standby_access** option, use the **online database** command with the **for standby_access** option to make the database accessible.

Warning! If a transaction log contains open transactions and you dump it without the **with standby_access** option, the SAP ASE server does not allow you to load the log, bring the database online, then load a subsequent transaction dump. If you are going to load a series of transaction dumps, you can bring the database online only after a load that was originally dumped **with standby_access** or after loading the entire series.

Dumping Without the Log

dump transaction...with no_log truncates the log without logging the dump transaction event. Because it copies no data, it requires only the name of the database.

Warning! Use **dump transaction with no_log** only as a last resort, after your usual method of dumping the transaction log (**dump transaction** or **dump transaction with truncate_only**) fails because of insufficient log space. **dump transaction with no_log** provides no means to recover your databases. Run **dump database** at the earliest opportunity to ensure recoverability.

Every use of **dump transaction...with no_log** is considered an error and is recorded in the SAP ASE error log.

If you have created your databases with log segments on a separate device from data segments, written a last-chance threshold procedure that dumps your transaction log often enough, and allocated enough space to your log and database, you should not have to use **with no_log**. If you must use **with no_log**, increase the frequency of your dumps and the amount of log space.

Scheduling Dumps

Transaction log dumps are dynamic—they can take place while the database is active. They may slow the system slightly, so run dumps when the database is not being heavily updated.

Develop a regular schedule for backing up user databases and their transaction logs.

dump transaction uses less storage space and takes less time than **dump database**. Typically, transaction log dumps are made more frequently than database dumps.

Using Thresholds to Automate dump transaction

Use thresholds to automate backup procedures. To take advantage of the SAP ASE last-chance threshold, create user databases with log segments on a separate device from data segments.

When space on the log segment falls below the last-chance threshold, the SAP ASE server executes the last-chance threshold procedure. Including a **dump transaction** command in your last-chance threshold procedure helps protect you from running out of log space. See **sp_thresholdaction**.

You can use **sp_addthreshold** to add a second threshold to monitor log space. For more information about thresholds, see the *System Administration Guide*.

Specifying Dump Devices

You can specify the dump device as a literal, a local variable, or a parameter to a stored procedure.

You can specify a local dump device as:

- A logical device name from the `sysdevices` system table
- An absolute path name
- A relative path name

The Backup Server resolves relative path names using the current working directory in the SAP ASE server.

Dumping to multiple stripes is supported for tape and disk devices. Placing multiple dumps on a device is supported only for tape devices.

When dumping across the network, specify the absolute path name of the dump device. The path name must be valid on the machine on which the Backup Server is running. If the name includes any characters except letters, numbers, or underscores (_), enclose it in quotes.

Ownership and permissions problems on the dump device may interfere with use of **dump** commands. **sp_addumpdevice** adds the device to the system tables, but does not guarantee that you can dump to that device or create a file as a dump device.

You can run more than one dump (or load) at the same time, as long as they use different dump devices.

Determining Tape Device Characteristics

If you issue a **dump transaction** command without the **init** qualifier, and Backup Server cannot determine the device type, the **dump transaction** command fails.

See the *System Administration Guide*.

Backup Servers

You must have a Backup Server running on the same machine as your SAP ASE server. The Backup Server must be listed in the `master..sysservers` table. This entry is automatically created during installation or upgrade and should not be deleted.

If your backup devices are located on another machine so that you dump across a network, you must also have a Backup Server installed on the remote machine.

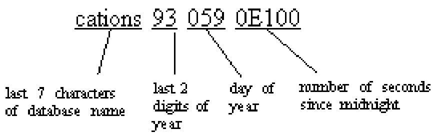
Dump Files

Dumping a log with the **init** option overwrites any existing files on the tape or disk.

Dump file names identify which database was dumped and when the dump was made. If you do not specify a file name, Backup Server creates a default file name by concatenating the following:

- Last seven characters of the database name
- Two-digit year number
- Three-digit day of the year (1– 366)
- Hexadecimal-encoded time at which the dump file was created

For example, the file `cations930590E100` contains a copy of the `publications` database made on the 59th day of 1993:


cations 93 059 0E100
last 7 characters of database name
last 2 digits of year
day of year
number of seconds since midnight

The Backup Server sends the dump file name to the location specified by the **with notify** clause. Before storing a backup tape, the operator should label it with the database name, file name, date, and other pertinent information. When loading a tape without an identifying label, use the **with headeronly** and **with listonly** options to determine the contents.

Volume Names

Dump volumes are labeled according to the ANSI tape-labeling standard. The label includes the logical volume number and the position of the device within the stripe set.

During loads, Backup Server uses the tape label to verify that volumes are mounted in the correct order. This allows you to load from a smaller number of devices than you used at dump time.

Note: When dumping and loading across the network, you must specify the same number of stripe devices for each operation.

Changing Dump Volumes

(On UNIX systems) The Backup Server requests a volume change when the tape capacity has been reached. After mounting another volume, the operator notifies the Backup Server by executing the **sp_volchanged** system procedure on any SAP ASE server that can communicate with the Backup Server.

If the Backup Server detects a problem with the currently mounted volume (for example, if the wrong volume is mounted), it requests a volume change by sending messages to either the client or its operator console. The operator responds to these messages with the **sp_volchanged** system procedure.

Appending To or Overwriting a Volume

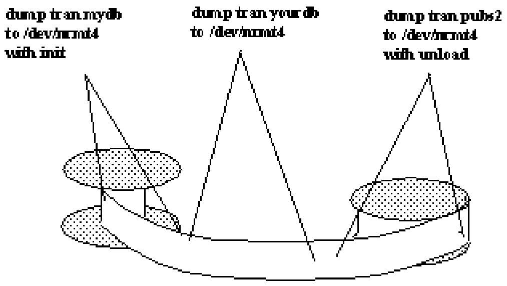
By default (**noinit**), Backup Server writes successive dumps to the same tape volume, making efficient use of high-capacity tape media. Data is added following the last end-of-tape mark. New dumps can be appended only to the last volume of a multivolume dump.

Before writing to the tape, Backup Server verifies that the first file has not yet expired. If the tape contains non-SAP data, Backup Server rejects it to avoid destroying potentially valuable information.

Use the **init** option to reinitialize a volume. If you specify **init**, Backup Server overwrites any existing contents, even if the tape contains non-SAP data, the first file has not yet expired, or the tape has ANSI access restrictions.

This figure illustrates how to dump three transaction logs to a single volume. Use:

- **init** to initialize the tape for the first dump
- **noinit** (the default) to append subsequent dumps
- **unload** to rewind and unload the tape after the last dump



Dumping Logs Stored on Mirrored Devices

At the beginning of a **dump transaction**, the SAP ASE server passes the primary device name of each logical log device to the Backup Server. If the primary device has been unmirrored, the SAP ASE server passes the name of the secondary device instead. If the named device fails before Backup Server completes its data transfer, the SAP ASE server aborts the dump.

If you attempt to unmirror a named log device while a **dump transaction** is in progress, the SAP ASE server displays a message. The user executing the **disk unmirror** command can abort the dump or defer the **disk unmirror** until after the dump completes.

dump transaction with truncate_only and **dump transaction with no_log** do not use the Backup Server. These commands are not affected when a log device is unmirrored, either by a device failure or by a **disk unmirror** command.

dump transaction copies only the log segment. It is not affected when a data-only device is unmirrored, either by a device failure or by a **disk unmirror** command.

Fully Recoverable DDL and dump transaction

In versions of SAP ASE earlier than 15.7, some operations are minimally logged. Since **dump transaction** is not allowed after a minimally logged operation, this restriction has an effect on recoverability and scalability.

- Recoverability and operational scalability for very large database (VLDB) installations, where **dump database** may be very time consuming.
- Up-to-the-minute recoverability of the database. Even though minimally logged operations are fully recoverable from a server failure, changes after the last successful transaction dump may be lost when data devices are broken, or if the database is corrupted. You cannot, after a minimally logged operation, use **dump tran with no_truncate** to dump the log, then recover the database using the dumped transaction log.
- You cannot restore the database to a particular time using **dump transaction**, and then **load tran with until_time**.

Beginning with SAP ASE 15.7, you can use **dump transaction** to fully recover the following operations that in earlier versions of SAP ASE were minimally logged:

- **select into** including select into a proxy table
- **alter table** commands that require data movement
- **reorg rebuild**

Use **sp_dboption** in in the `master` database to fully log commands that are, by default, minimally logged.

execute

Runs a procedure or dynamically executes Transact-SQL commands.

Syntax

```
[exec[ute]] [@return_status =]
    [[[server .]database.]owner.]procedure_name[;number]
        [[@parameter_name =] value |
            [@parameter_name =] @variable [output]
        [, [@parameter_name =] value |
            [@parameter_name =] @variable [output]...]]
    [with recompile]
```

or

```
exec[ute] ("string" | char_variable
    [+ "string" | char_variable]...)
```

Parameters

- **execute | exec –** is used to execute a stored procedure or an extended stored procedure (ESP). This keyword is necessary if there are multiple statements in the batch.

  execute is also used to execute a string containing Transact-SQL.
- ***@return_status* –** is an optional integer variable that stores the return status of a stored procedure. *@return_status* must be declared in the batch or stored procedure before it is used in an **execute** statement.
- ***server* –** is the name of a remote server. You can execute a procedure on another SAP ASE server as long as you have permission to use that server and to execute the procedure in that database. If you specify a server name, but do not specify a database name, the SAP ASE server looks for the procedure in your default database.
- ***database* –** is the database name. Specify the database name if the procedure is in another database. The default value for *database* is the current database. You can execute a procedure in another database as long as you are its owner or have permission to execute it in that database.
- ***owner* –** is the procedure owner's name. Specify the owner's name if more than one procedure of that name exists in the database. The default value for *owner* is the current user. The owner name is optional only if the database owner owns the procedure or if you own it.
- ***procedure_name* –** is the name of a procedure defined with **create procedure**.
- ***number* –** is an optional integer used to group procedures of the same name so that they can be dropped together with a single **drop procedure** statement. Procedures used in the same application are often grouped this way. For example, if the procedures used with an application named **orders** are named *orderproc;1*, *orderproc;2*, and so on, the following statement drops the entire group:

  ```
  drop proc orderproc
  ```

  After procedures have been grouped, individual procedures within the group cannot be dropped. For example, you cannot execute the statement:

  ```
  drop procedure orderproc;2
  ```
- ***parameter_name* –** is the name of an argument to the procedure, as defined in **create procedure**. Parameter names must be preceded by the @ sign.

  If the "**@*parameter_name* = *value***" form is used, parameter names and constants need not be supplied in the order defined in **create procedure**. However, if this form is used for any parameter, it must be used for all subsequent parameters.
- ***value* –** is the value of the parameter or argument to the procedure. If you do not use the "**@*parameter_name* = *value***" form, you must supply parameter values in the order defined in **create procedure**.
- ***@variable* –** is the name of a variable used to store a return parameter.
- **output –** indicates that the stored procedure is to return a return parameter. The matching parameter in the stored procedure must also have been created with the keyword **output**.

The **output** keyword can be abbreviated to **out**.

- **with recompile –** forces compilation of a new plan. Use this option if the parameter you are supplying is atypical or if the data has significantly changed. The changed plan is used on subsequent executions. The SAP ASE server ignores this option when executing an extended system procedure.

Note: Using **execute procedure with recompile** many times can adversely affect procedure cache performance. Since a new plan is generated every time you use **with recompile**, a useful performance plan may be pushed out of the cache if there is insufficient space for new plans.

- ***string* –** is a literal string containing part of a Transact-SQL command to execute. There are no restrictions to the number of characters supplied with the literal string.
- ***char_variable* –** is the name of a variable that supplies the text of a Transact-SQL command.

Examples

- **Example 1 –** All three statements execute **showind** with a parameter value `titles`:

```
execute showind titles
```

```
exec showind @tabname = titles
```

If this is the only statement in a batch or file:

```
showind titles
```

- **Example 2 –** Executes **checkcontract** on the remote server GATEWAY. Stores the return status indicating success or failure in ***@retstat***:

```
declare @retstat int
execute @retstat = GATEWAY.pubs.dbo.checkcontract "409-56-4008"
```

- **Example 3 –** Executes **roy_check**, passing three parameters. The third parameter, ***@pc***, is an **output** parameter. After execution of the procedure, the return value is available in the variable ***@percent***:

```
declare @percent int
select @percent = 10
execute roy_check "BU1032", 1050, @pc = @percent output
select Percent = @percent
```

- **Example 4 –** Displays information about the system tables if you do not supply a parameter:

```
create procedure
showsysind @table varchar (30) = "sys%"
as
  select sysobjects.name, sysindexes.name, indid
  from sysindexes, sysobjects
  where sysobjects.name like @table
  and sysobjects.id = sysindexes.id
```

- **Example 5 –** Executes **xp_echo**, passing in a value of “Hello World!” The returned value of the extended stored procedure is stored in a variable named *result*:

```
declare @input varchar (12), @in varchar (12),
    @out varchar (255), @result varchar (255)
select @input="Hello World!"
execute xp_echo @in = @input, @out= @result output
```

- **Example 6 –** The final **execute** command concatenates string values and character variables to issue the Transact-SQL command:

```
select name from sysobjects where id=3
```

```
declare @tablename char (20)
declare @columname char (20)
select @tablename="sysobjects”
select @columname="name"
execute ('select ' + @columname + ' from ' + @tablename + ' where
id=3')
```

- **Example 7 –** Executes **sp_who**:

```
declare @sproc varchar (255)
select @sproc = "sp_who"
execute @sproc
```

Usage

- You can use **execute** with an archive database as long as any statements that reference the archive database are allowed within the archive database. A transaction inside or outside a stored procedure is not permitted with an **execute** command.
- Procedure results may vary, depending on the database in which they are executed. For example, the user-defined system procedure **sp_foo**, which executes the **db_name()** system function, returns the name of the database from which it is executed. When executed from the `pubs2` database, it returns the value “pubs2”:

```
exec pubs2..sp_foo
------------------------------
pubs2
 (1 row affected, return status = 0)
```

  When executed from `sybsystemprocs`, it returns the value “sybsystemprocs”:

```
exec sybsystemprocs..sp_foo
------------------------------
sybsystemprocs
 (1 row affected, return status = 0)
```

- There are two ways to supply parameters—by position, or by using:

```
@parameter_name = value
```

  If you use the second form, you need not supply the parameters in the order defined in **create procedure**.

If you are using the **output** keyword and intend to use the return parameters in additional statements in your batch or procedure, the value of the parameter must be passed as a variable. For example:

```
parameter_name = @variable_name
```

When executing an extended stored procedure, pass all parameters by either name or value. You cannot mix parameters by value and parameters by name in a single invocation of the **execute** command for an ESP.

If you execute a stored procedure and specify more parameters than the number of parameters expected by the procedure, the server ignores the extra parameters.

Note: If you spell any parameter name incorrectly, the server ignores it by treating it as an extra. You see no warnnings about the spelling error, and if the parameter is defined with a default value, the server executes the procedure using that default value instead of the value you provided with the misspelled parameter.

- The dynamic SQL syntax of **exec (@*parameter_name*)** is also valid; however, it may take more keystrokes. For example, the dynamic SQL command **exec (@sproc ="7")** passes the integer value 7 to the procedure, but this can also be accomplished using **exec @sproc 7**.
- You cannot use `text`, `unitext`, and `image` columns as parameters to stored procedures or as values passed to parameters.
- Executing a procedure specifying **output** for a parameter that is not defined as a return parameter in **create procedure** causes an error.
- You cannot pass constants to stored procedures using **output**; the return parameter requires a variable name. You must declare the variable's datatype and assign it a value before executing the procedure. Return parameters cannot have a datatype of `text`, `unitext`, or `image`.
- You need not use the keyword **execute** if the statement is the first one in a batch. A batch is a segment of an input file terminated by the word "go" on a line by itself.
- Since the execution plan for a procedure is stored the first time it is run, subsequent run time is much shorter than for the equivalent set of standalone statements.
- Nesting occurs when one stored procedure calls another. The nesting level is incremented when the called procedure begins execution and is decremented when the called procedure completes execution. The nesting level is also incremented by one when a cached statement is created. Exceeding the maximum of 16 levels of nesting causes the transaction to fail. The current nesting level is stored in the *@@nestlevel* global variable.
- Return values 0 and -1 through -14 are currently used by the SAP ASE server to indicate the execution status of stored procedures. Values from -15 through -99 are reserved for future use. See **return** for a list of values.
- Parameters are not part of transactions, so if a parameter is changed in a transaction that is later rolled back, its value does not revert to its previous value. The value that is returned to the caller is always the value at the time the procedure returns.
- If you use **select *** in a stored procedure, the procedure does not pick up any new columns you might have added to the table using **alter table**, even if you use the **with recompile**

option. To do so, you must drop and re-create the stored procedure, or else an **insert** based on a **select *** can cause erroneous results. Even if the newly added column has a default bound to it, the result of the **insert** is NULL for the newly added column.

When you drop and re-create the stored procedure or reload the database, you see an errror message if the column defintions of the target table do not match the **select *** result.

- Commands executed via remote procedure calls cannot be rolled back.
- The **with recompile** option is ignored when the SAP ASE server executes an extended stored procedure.

See also **sp_addextendedproc**, **sp_depends**, **sp_dropextendedproc**, **sp_helptext**, **sp_procxmode** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission to execute Transact-SQL commands defined with the *string* or *char_variable* options is checked against the user executing the command, unless the procedure was set up using the execution mode “dynamic ownership chain.” See **sp_procxmode**.

The permission checks for **execute** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the procedure owner or a user with `execute` permission on the procedure.
Disabled	With granular permissions disabled, you must have **execute** permission on the procedure.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	38
Audit option	**exec_procedure**
Command or access audited	Execution of a procedure

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – all input parameters • *Proxy information* – original login name, if **set proxy** is in effect

Information	Values
Event	39
Audit option	**exec_trigger**
Command or access audited	Execution of a trigger
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *create procedure* on page 169
- *drop procedure* on page 357
- *return* on page 556

fetch

Returns a row or a set of rows from a cursor result set.

Syntax

```
fetch [next | prior | first | last | absolute
    fetch_offset | relative fetch_offset]
    [from] cursor_name
    [into fetch_target_list]
```

Parameters

- **next | prior | first | last | absolute | relative –** are keywords that specify the fetch direction. You do not need to specify the fetch direction for nonscrollable cursors. If you specify the fetch direction, you can use any of the other options to access the rows from a scrollable cursor. You must specify the *fetch_offset* when you use **absolute** or **relative**.

- **[from]** ***cursor_name*** **–** is the name of the cursor. **from** is optional.
- ***fetch_offset*** **–** specifies the offset value from a specific position. *fetch_offset* is required when you specify **absolute** or **relative**. *fetch_offset* can be either signed numeral literal with scale of zero, or Transact-SQL variable with a type of integer or numeric with a zero-scale numeral.
- ***fetch_target_list*** **–** is a comma-separated list of parameters or local variables into which cursor results are placed. The parameters and variables must be declared prior to the **fetch**.

Examples

- **Example 1 –** Returns a row of information from the cursor result set defined by the `authors_crsr` cursor:

  ```
  fetch authors_crsr
  ```

- **Example 2 –** Returns a row of information from the cursor result set defined by the `pubs_crsr` cursor into the variables *@name*, *@city*, and *@state*:

  ```
  fetch pubs_crsr into @name, @city, @state
  ```

- **Example 3 –** With scrollable cursors, you can use numeric literal offset with orientation keyword **absolute**. In this example, the 25th row is specified. Enter:

  ```
  fetch absolute 25 from pubs_crsr
      into @name, @city, @state
  ```

- **Example 4 –** To use a Transact-SQL variable representing the 25th row, enter:

  ```
  declare @offset int
  select @offset = 25
  fetch absolute @offset from c1
  ```

Usage

You can fetch one or more rows at a time. To determine the number of rows fetched, use the **cursor rows** option of the **set** command, specifying the number of rows to fetch.

The value of *@@rowcount* is affected by whether the specified cursor is forward-only or scrollable. If the cursor is the default, nonscrollable cursor, the value of *@@rowcount* increments one by one, in the forward direction only, until the total number of rows in the result set are fetched.

Once all the rows have been read from the cursor result set, *@@rowcount* represents the total number of rows in the cursor results set. *@@rowcount* after a fetch to get the number of rows read for the cursor specified in that fetch.

If the cursor is scrollable, there is no maximum value for *@@rowcount*. For more information on *@@rowcount*, see *Reference Manual: Building Blocks*.

Cursor position:

- For nonscrollable cursors, after you fetch all the rows, the cursor points to the last row of the result set. If you fetch again, the SAP ASE server returns a warning through the *@@sqlstatus* and *@@fetch_status* global variables, with value indicating there is no more data, and the cursor position moves beyond the end of the result set. You can no longer update or delete from that current cursor position.
- With **fetch into**, the SAP ASE server does not advance the cursor position when an error occurs, because the number of variables in the *fetch_target_list* does not equal the number of target list expressions specified by the query that defines the cursor. However, it does advance the cursor position, even if a compatibility error occurs between the datatypes of the variables and the datatypes of the columns in the cursor result set.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The fetch of multiple rows is a Transact-SQL extension.

Permissions

fetch permission defaults to all users.

See also

- *declare cursor* on page 304
- *open* on page 523
- *set* on page 607

Status Information

Status information from *@@sqlstatus* and *@@fetch_status* global variables.

Only a **fetch** statement can set *@@sqlstatus* and *@@fetch_status*. Other statements have no effect on *@@sqlstatus* or *@@fetch_status*.

The *@@sqlstatus* global variable holds status information (warning exceptions) resulting from the execution of a **fetch** statement. Its value reflects the last cursor fetched:

Value	Description
0	Indicates successful completion of the fetch statement.
1	Indicates that the fetch statement resulted in an error.
2	Indicates that there is no more data in the result set. This warning can occur if the current cursor position is on the last row in the result set and the client submits a fetch statement for that cursor.

The *@@fetch_status* global variable provides information about whether **fetch** is executed successfully in a scrollable cursor:

Value	Description
0	Indicates successful completion of the fetch statement.
-1	Indicates that the fetch operation failed, or the row fetched was beyond the result set.
-2	Reserved for future use.

fetch Restrictions

Restrictions for using **fetch**.

- Before you can use **fetch**, you must declare the cursor and **open** it.
- You can use **fetch** with an archive database.
- The *cursor_name* cannot be a Transact-SQL parameter or local variable.
- For nonscrollable cursors, you cannot **fetch** a row that has already been fetched. There is no way to backtrack through the result set, but you can close and reopen the cursor to create the cursor result set again and start from the beginning.
- The SAP ASE server expects a one-to-one correspondence between the variables in the *fetch_target_list* and the target list expressions specified by the **select** statement that defines the cursor. The datatypes of the variables or parameters must be compatible with the datatypes of the columns in the cursor result set.
- When you set chained transaction mode, the SAP ASE server implicitly begins a transaction with the **fetch** statement if no transaction is currently active. However, this situation occurs only when you set the **close on endtran** option and the cursor remains open after the end of the transaction that initially opened it, since the **open** statement also automatically begins a transaction.

Using Scrollable Cursors with fetch_direction

Additional information for using scrollable cursors with *fetch_direction*.

- If not specified, the default value is **next**.
- If not **next**, the cursor must be declared scrollable.
- *fetch_offset* must be an exact, signed numeric, with a scale of zero.
- Positions the cursor beyond the last row or before the first row, no data is returned and no error is raised.
- Is **absolute**, when *fetch_offset* >0, the offset is calculated from the position before the first row of the result set. If *fetch_offset* <0, the offset is calculated from the position after the last row of the result set.
- Is **relative**, when *fetch_offset* n>0, the cursor is placed *n* rows after the current position; if *fetch_offset* n<0, the cursor is placed **abs (*n*)** rows before the current position.

The row number specified in the result set is counted from 1; the first row is number 1.

Multiple Rows per Fetch

Each **fetch** returns one row to the client in default behavior. The returned rows per **fetch** can be changed to another number by entering:

```
set cursor rows number for cursor_name
```

number specifies the number of rows per **fetch** the cursor can execute. This number can be a numeric literal with no decimal point, or a local variable of type `integer`. If *cursor rows* is greater than one, multiple rows return to the client after **fetch**. In some cases, the rows returned by **fetch** may be less than the number of rows specified, depending on the cursor's position. The current cursor position is always one row.

Rules for Positioning the Scrollable Cursor

There are rules that govern the position of the cursor in **fetch_orientation** options when you are fetching the cursor rows, where *cursPos* is the cursor position.

See the **fetch_orientation**

These terms used in rules for positioning the scrollable cursor are:

- *curRowsetStart* – the cursor's current position.
- *new_CurRowsetStart* – the new current position of the cursor.
- *total_rows* – the total number of rows in the cursor result set.
- *before_first* – the row position before the first row of the cursor result set. This variable has a value of 0.
- *after_last* – the row position after the last row of the cursor result set. This variable has a value of *total_rows* + 1.
- *first_row* – the position at the first row of the cursor result set. This variable has value of 1.
- *last_row* – the position at the last row of the cursor result set. This variable has the same value as *total_rows*.
- *fetchSize* – the number of rows requested for each **fetch** operation.

Rule	Description
Fetch first	The *new_CurRowsetStart* always moves to *first_row*, regardless of the position of *CurRowsetStart* and the value of *fetchSize*.
Fetch last	• If *total_rows* >= *fetchSize*, then *new_CurRowsetStart* = *total_rows* – *fetchSize* + 1. • If *total_rows* < *fetchSize*, then *new_CurRowsetStart* is on *first_row*.

Rule	Description
Fetch next	• If *CurRowsetStart* is *before_first*, then *new_CurRowsetStart* is on *first_row*. • Let *curPos* = (*CurRowsetStart* + *fetchSize*), • *curPos* <=*total_rows*, then *new_CurRowsetStart* = *curPos* • *curPos* > *total_rows*, *new_CurRowsetStart* is *after_last* • If *CurRowsetStart* is *after_last* row, then *new_CurRowsetStart* remains on *after_last*.
Fetch prior	• *new_CurRowsetStart* is *before_first* when one of these conditions is true: • (*CurRowsetStart* >= 1) && (*CurRowsetStart* - *fetchSize* <=0) • *CurRowsetStart* is *before_first* • Let *curPos* = *CurRowsetStart* – *fetchSize*; iff 1 <=*curPos* <=*total_rows*, then *new_CurRowsetStart* = *curPos*. • If (*CurRowsetStart* is *after_last*), let *curPos* = *total_rows* – *fetchSize* + 1 *new_Cur-RowsetStart* = *curPos* if *curPos* > 0 *new_CurRowsetStart* is *before_first* if *curPos* <= 0
Fetch relative	• If (*CurRowsetStart* is *before_first*) && (*fetch_offset* > 0), then *new_CurRowsetStart* = *fetch_offset*. • *new_CurRowsetStart* is *before_first* if one of these conditions is true: • (*CurRowsetStart* is *before_first*) and (*fetch_offset* < 0) • (*CurRowsetStart* is on *first_row*) and (*fetch_offset* < 0) • (*CurRowsetStart* is *after_last*) and ((*CurRowsetStart* + *fetch_offset* + 1) <= 0) • If (1 < *CurRowsetStart* <= *total_rows*), let *curPos* = *CurRowsetStart* + *fetch_offset*, then: • *new_CurRowsetStart* is on *first_row* iff (*curPos* < 1) and *abs* (*fetch_offset*) <= *fetchSize* • *new_CurRowsetStart* is before *first_row* iff (*curPos* < 1) && (***abs* (*fetch_offset*)** *fetchSize*) • *new_CurRowsetStart* = *curPos* iff (0 < *curPos* <=*total_rows*) • *new_CurRowsetStart* is *after_last* iff *curPos* > *total_rows* • If (*CurRowsetStart* is *after_last*), let *curPos* = *CurRowsetStart* + *fetch_offset* +1, then: • *new_CurRowsetStart* = *curPos* iff 1 <= *curPos* <= *total_rows* • *new_CurRowsetStart* is *before_first* iff *curPos* <= 0 • *new_CurRowsetStart* is *after_last* iff *curPos* > *total_rows*

Rule	Description
Fetch absolute	• If *fetch_offset* = 0, *new_CurRowsetStart* is *before_first* • If *fetch_offset* > *total_rows*, *new_CurRowsetStart* is *after_last* • If 0 < *fetch_offset* <= *total_rows*, *new_CurRowsetStart* = *fetch_offset* • If (*fetch_offset* < 0) && (**abs** (**fetch_offset**) > *total_rows*), let *abs_offset* = **abs** (**fetch_offset**) *new_CurRowsetStart* is *before_first* iff *abs_offset* > *fetchSize* *new_CurRowsetStart* is on *first_row* iff *abs_offset* <= *fetchSize* • If (*fetch_offset* < 0) && (**abs** (**fetch_offset**) <= *total_rows*) *new_CurRowsetStart* = *total_rows* + *fetch_offset* + 1

goto label

Branches to a user-defined label.

Syntax

```
label:
    goto label
```

Examples

- **Example 1 –** Shows the use of a label called `restart`:

```
declare @count smallint
select @count = 1
restart:
  print "yes"
select @count = @count + 1
while @count <=4
  goto restart
```

Usage

- The label name must conform to the rules for identifiers and must be followed by a colon (:) when it is declared. It is not followed by a colon when it is used with **goto**.
- Make the **goto** dependent on an **if** or **while** test, or some other condition, to avoid an endless loop between **goto** and the label.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **goto**.

See also

- *if...else* on page 470
- *while* on page 719

grant

Assigns permissions to individual users, groups of users, and roles.

Syntax

Grants permission to access database objects:

```
grant {all [privileges] | permission_list}
    on {table_name as [correlation_name][(column_list)]
        | view_name[(column_list)]
        | stored_procedure_name | SQL_function_name}
        | keyname}
    [where search_conditions [as pred_name]]
    to {public | name_list | role_list}
    [with grant option]
    [granted by grantor]
```

Grants permission to use built-in functions:

```
grant select
    on [builtin] builtin
    to {name_list | role_list}
    [granted by grantor]
```

Grants system privileges to execute certain commands:

```
grant {all [privileges] | privilege_list}
    to {public | name_list | role_list}
    [granted by grantor]
```

Grants **dbcc** privileges:

```
grant {dbcc_privilege [on database ]
        [, dbcc_privilege [on database ], ...]}
    to {user_list | role_list }
    [granted by grantor]
```

Grants the default permissions for specific system tables:

```
grant default permissions on system tables
```

Grants permission that allows grantee to switch server user identity to any other server login and limit its use based on the target login's roles:

```
grant set proxy to name_list
    [restrict role role_list | all | system]
    [granted by grantor]
```

Parameters

- **all –** when used to assign permission to access database objects, **all** specifies that all permissions, except `decrypt`, that are applicable to the specified object are granted. All object owners can use **grant all** with an object name to grant permissions on their own objects. You must grant decrypt permissions separately.

  When granular permissions is not enabled, a system administrator or the database owner can use **grant all** to assign privileges to create database objects (see syntax for "Grants system privileges to execute certain commands"). When used by a system administrator, **grant all** assigns all **create** privileges (**create database**, **create default**, **create procedure**, **create rule**, **create table**, **create function**, and **create view**). When the database owner uses **grant all** , or executes **grant all** outside the master database, the SAP ASE server grants all **create** privileges except **create database** and prints an informational message.

  Granting all create privileges using **grant all** is not supported when granular permissions is enabled. For more information, see *Using Granular Permissions* in the *Security Administration Guide*.

  all cannot be used for a **grant** statement that includes a **where** clause.
- ***permission_list* –** is a list of object access permissions granted. If more than one permission is listed, separate them with commas. This table illustrates the access permissions that can be granted on each type of object:

Object	*permission_list* Can Include
Column	**select, update, references**, **decrypt** Column names can be specified in *column_list*.
Encryption key	**select**
Stored procedure	**execute**
SQL function	**execute**
Table	**select, insert, delete, update, references**, **update statistics**, **delete statistics**, **truncate table**, **decrypt**, **transfer table**, **identity_insert** *, **identity_update** *
View	**select, insert, delete, update**, **decrypt**, **identity_insert** *, **identity_update** *

Note: Permissions with asterisk (*) can only be granted when granular permissions is enabled.

- ***correlation_name* –** is used only for **grant ... where** commands as an alias for referencing columns in *table_name* in the **where** clause.
- ***table_name* –** is the name of the table on which you are granting permissions. The table must be in your current database. Only one object can be listed for each **grant** statement.

- ***column_list* –** is one or more named columns, separated by commas, to which the permissions apply. If columns are specified, only **select**, **references**, **decrypt**, and **update** permissions can be granted.

  When the **grant** is made on one or more named columns using a **where** clause, then the SAP ASE server enforces row-level access on the user's **select**, **update** or **delete** command as follows:

  - one or more of the named columns on a **grant select** statement is referenced in the target list or where clause of the user's **select** statement
  - one or more of the named columns on a **grant update** statement is referenced in the target list of the user's **update** statement
  - one or more columns on a **grant select** is referenced in the **where** clause of the user's **update** or **delete** statement where the session has set `ansi_permissions` on.
- ***view_name* –** is the name of the view on which you are granting permissions. The view must be in your current database.
- ***stored_procedure_name* –** is the name of the stored procedure on which you are granting permission. The stored procedure must be in your current database.
- ***key_name* –** is the name of an encryption key on which you are granting access. The *key_name* must be in your current database.
- ***SQL_function_name* –** is the name of the SQL function to which you are granting permission. The stored function must be in your current database. You can list only one function for each grant statement.
- **where *search_conditions* –** acts as a row filter, and combines with any **where** clause specified in **select**, **update**, or **delete** statements. You can use the **where** syntax only when granting **select**, **update**, and **delete** privileges on a table. *search_conditions* can make use of all syntax allowed in a generic **where** clause. If the **where** clause accesses a different table from the one being granted, you must use a subquery. For information on using a where clause on the grant statement see *Granting Predicated Privileges* in the *Security Administration Guide*.
- **as *pred_name* –** is the name of the predicate, and must be unique among the names of other objects owned by the grantor in the current database and must conform to the rules for identifiers. If you omit *pred_name*, the SAP ASE server assigns a unique name to the **grant** predicate, which you can view by using **sp_helprotect**. *pred_name* may not be used on grant statements with no **where** clause. Predicates can be referenced by name by the **revoke** command.
- **public –** is all users. For object access permissions, **public** excludes the object owner. For object creation permissions or **set proxy** authorizations, **public** excludes the database owner.
- ***name_list* –** is a list of users’ and group names, separated by commas.
- ***role_list* –** is a list of roles—either system-defined or user-defined—to which you are granting the permission.
- **with grant option –** allows the users specified in *name_list* to grant object access permissions to other users. You can grant permissions **with grant option** only to individual

users, not to "public" or to a group or role. Predicated privileges cannot be granted with the **with grant option**.

- **granted by *grantor* –** indicates the grantor as a user in the database different from the user executing the command.
- ***grantor* –** a valid user name in current database, grantor's user identity instead of the executor's user identity would be recorded in the system catalog `sysprotects` as the grantor.
- ***builtin* –** is a built-in function. Specifying the keyword *builtin* before the built-in function name allows you to differentiate between a table and a grantable built-in function with the same name. The grantable *builtin* functions are **set_appcontext**, **get_appcontext**, **list_appcontext**, **authmech**, **rm_appcontext**, and **next_identity** (requires select permission on the IDENTITY column).
- ***privilege_list* –** is a list of system privileges that can be granted. System privileges include server-wide and database-wide privileges. See the "Usage" section for details on how to grant system privileges. Use commas to separate multiple commands.
- ***dbcc_privilege* –** is the name of the **dbcc** privilege you are granting. It cannot be a variable. See the *Usage* section on grantable server-wide **dbcc** and database-wide **dbcc** privileges.

  Note: You cannot grant or revoke **dbcc** privileges to public or groups.

- ***database* –** is the name of the database on which you are granting permissions. It is used with granting database-wide **dbcc** privileges. The **on database** clause is optional, and the database must be the current database. The grantee must be a valid user in the target database. *database* conforms to the rules for identifiers and cannot be a variable.

  If there are multiple granted actions in the same command, *database* must be unique.
- **set proxy –** grants permission for a user to impersonate another user. If grantees do not have the roles in the *role_list* already granted to them, **set proxy** to the target login fails if the target login has any roles in the *role_list* granted.
- **system –** the grantee cannot switch their identity with anyone who possesses a system role they do not possess. Use *system* only with the **set proxy** parameter.
- **restrict role *role_list* –** allows the grantee to switch identities only if the grantee and the target login have any roles included in the *role_list*.
- **all –** The grantee can grant their identity to anyone who has the same set of roles they possess. That is, the grantee cannot inherit any new roles by executing the set proxy command.
- **default permissions on system tables –** specifies that you grant the default permissions for the system tables listed in *Granting Default Permissions on System Tables* in the *Usage* section.

Examples

- **Example 1 –** Grants Mary and the "sales" group permission to use the **insert** and **delete** commands on the `titles` table:

```
grant insert, delete
on titles
to mary, sales
```

- **Example 2 –** Grants **select** permission on the **get_appcontext** function to “public” (which includes all users):

  ```
  grant select on builtin get_appcontext to public
  ```

  Compare this to the following, which grants **select** permission on a table called `get_appcontext`, if a table with that name exists:

  ```
  grant select on get_appcontext to public
  ```

  Specifically including the **builtin** argument in your **grant** statement ensures that you do not mistakenly select a table that has the same name as a function—in this example, the **get_appcontext** function versus a table called `get_appcontext`.

- **Example 3 –** Two ways to grant **update** permission on the `price` and `advance` columns of the `titles` table to “public” (which includes all users):

  ```
  grant update
  on titles (price, advance)
  to public
  ```

  or:

  ```
  grant update (price, advance)
  on titles
  to public
  ```

- **Example 4 –** Grants **transfer table** permission to user Mary for the `titles` table:

  ```
  grant transfer table on titles to mary
  ```

- **Example 5 –** Grants Mary and John permission to use the **create database** and **create table** commands. Mary and John’s **create table** permission applies only to the `master` database:

  ```
  grant create database, create table
  to mary, john
  ```

- **Example 6 –** Grants complete access permissions, except **decrypt** permission, on the `titles` table to all users:

  ```
  grant all on titles
  to public
  ```

- **Example 7 –** Gives Mary permission to use the **update** command on the `authors` table and to grant that permission to others:

  ```
  grant update on authors
  to mary
  with grant option
  ```

- **Example 8 –** Gives Bob permission to use the **select** and **update** commands on the `price` column of the `titles` table and to grant that permission to others:

```
grant select, update on titles (price)
to bob
with grant option
```

- **Example 9 –** Grants permission to execute the **new_sproc** stored procedure to all system security officers:

```
grant execute on new_sproc
to sso_role
```

- **Example 10 –** Grants James permission to create a referential integrity constraint on another table that refers to the `price` column of the `titles` table:

```
grant references on titles (price)
to james
```

Note: Before you create a table that includes a referential integrity constraint to reference another user's table, you must be granted **references** permission on that referenced table. The table must also include a unique constraint or unique index on the referenced columns. See **create table** for more information about referential integrity constraints.

- **Example 11 –** Grants the database owner permission to specify column encryption using the `ssn_key`, when executed by the key owner. The database owner requires **select** permission on `ssn_key` to reference it on **create table**, **alter table**, or **select into**:

```
grant select on ssn_key to dbo
```

- **Example 12 –** Grants Bob permission to create encyption keys:

```
grant create encyption key to Bob
```

- **Example 13 –** Grants **decrypt** permission on all encrypted columns in the `customer` table:

```
grant decrypt on customer to accounts_role
```

- **Example 14 –** Grants `dump any database` privilege to Joe in `master` to allow him to dump any database:

```
1> use master
2> go
1> grant dump any database to joe
2> go
```

- **Example 15 –** Grants `create any object` privilege to Joe in database `pubs2` to allow Joe create any object privilege on behalf of himself or on behalf of other users in `pubs2`:

```
1> use pubs2
2> go
1> grant create any object to joe
2> go
```

- **Example 16 –** Grants `manage roles` to Alex. This returns an error because server-wide privileges require that `master` be the current database:

```
1> use pubs2
2> go
```

```
1> grant manage roles to alex
2> go
```

```
Msg 4627, Level 16, State 1:
Line 1:
The user must be in the master database to GRANT/REVOKE this
command.
```

- **Example 17 –** Through the use of a role, the system administrator allows Carlos to run **dbcc checkalloc** on any database where he is a valid user, or where a database allows a “guest” user.

  Note: You do not need to add Carlos as an actual user in the `master` database if the user “guest” already exists in `master`.

```
1> use master
2> go
1> create role checkalloc_role
2> go
1> grant dbcc checkalloc any database to checkalloc_role
2> go
1> create login carlos with password carlospassword
2> go
1> grant role checkalloc_role to carlos
2> go
```

- **Example 18 –** Gives Frank, a valid user in the `master` database, the ability to execute **dbcc checkdb** for all databases in the server:

```
1> use master
2> go
1> create login frank with password frankpassword
2> go
```

```
Password correctly set.
Account unlocked.
New login created.
 (return status = 0)
```

```
1> sp_adduser frank
2> go
```

```
New user added.
 (return status = 0)
```

```
1> grant dbcc checkdb any database to frank
2> go
```

Now Frank can execute the **dbcc checkdb** command on each database in the server where he is a valid user:

```
% isql -Ufrank -Pfrankpassword -SSERVER
1> dbcc checkdb (tempdb)
2> go
```

```
Checking tempdb: Logical pagesize is 2048 bytes
Checking sysobjects: Logical pagesize is 2048 bytes
...
```

```
The total number of data pages in this table is 1. DBCC
execution completed. If DBCC printed error messages,
contact a user with system administrator (SA) role.
```

Note: You cannot grant or revoke **dbcc** privileges to public or groups.

- **Example 19 –** If Walter needs to be a maintenance user for `pubs2` but the system administrator does not want to grant him administrator-level privileges elsewhere, the system administrator can execute:

```
1> use pubs2
2> go
1> grant dbcc checkdb on pubs2 to walter
2> go
```

Note: The system administrator must be in the target database—in this case `pubs2`—and Walter must be a valid user in this target database. The on `pubs2` clause is optional.

Walter can now execute the **dbcc checkdb** command on the `customers` database without encountering an error.

- **Example 20 –** Erroneously applies **grant dbcc** and **revoke dbcc** to groups or public:

```
1> grant dbcc tablealloc on pubs2 to public
```

```
Msg 4629, Level 16, State 1:
Line 1:
GRANT/REVOKE DBCC does not apply to groups or PUBLIC.
```

```
1> sp_addgroup gr
```

```
New group added.
 (return status = 0)
```

```
1> grant dbcc tablealloc on pubs2 to gr
```

```
Msg 4629, Level 16, State 1:
Line 1:
GRANT/REVOKE DBCC does not apply to groups or PUBLIC.
```

- **Example 21 –** You cannot grant system privileges using the **grant** option:

```
grant change password to alex with grant option
```

```
Msg 156, Level 15, State 1:
Line 1:
Incorrect syntax near the keyword 'with'.
```

- **Example 22 –** Allows Harry to use **truncate table** and **updates statistics** on the `authors` table:

```
grant truncate table on authors to harry
grant update statistics on authors to harry
```

- **Example 23 –** Allows Billy to use the **delete statistics** command on the `authors` table:

```
grant delete statistics on authors to billy
```

- **Example 24 –** Grants **truncate table**, **update**, and **delete statistics** privileges to all users with the **oper_role** (if Billy and Harry possess the **oper_role**, they can now execute these commands on `authors`):

  ```
  grant truncate table on authors to oper_role
  grant update statistics on authors to oper_role
  grant delete statistics on authors to oper_role
  ```

- **Example 25 –** Implicitly grants permissions for **truncate table**, **delete statistics**, and **update statistics** through a stored procedure. For example, assuming Billy owns the `authors` table, he can execute the following to grant Harry privileges to run **truncate table** and **update statistics** on `authors`:

  ```
  create procedure sproc1
  as
  truncate table authors
  update statistics authors
  go
  grant execute on sproc1 to harry
  go
  ```

  You can also implicitly grant permissions at the column level for **update statistics** and **delete statistics** through stored procedures.

- **Example 26 –** Grants Harry and Billy permission to execute either **set proxy** or **set session authorization** to impersonate another user in the server:

  ```
  grant set proxy to harry, billy
  ```

- **Example 27 –** Grants users with **sso_role** permission to execute either **set proxy** or **set session authorization** to impersonate another user in the server:

  ```
  grant set session authorization to sso_role
  ```

- **Example 28 –** Grants **set proxy** to Joe but restricts him from switching identities to any user with the **sa**, **sso**, or **admin** roles (however, if he already has these roles, he can **set proxy** for any user with these roles):

  ```
  grant set proxy to joe
  restrict role sa_role, sso_role, admin_role
  ```

  When Joe tries to switch his identity to a user with **admin_role** (in this example, **Our_admin_role**), the command fails unless he already has **admin_role**:

  ```
  set proxy Our_admin_role
  ```

  ```
  Msg 10368, Level 14, State 1:
  Server 's', Line 2:Set session authorization permission
  denied because the target login has a role that you do
  not have and you have been restricted from using.
  ```

  After Joe is granted the **admin_role** and retries the command, it succeeds:

  ```
  grant role admin_role to joe
  set proxy Our_admin_role
  ```

- **Example 29 –** Restricts Joe from being granted any new roles when switching identities:

```
grant set proxy to joe
restrict role all
```

Joe can **set proxy** only to those users who have the same roles (or roles with fewer privileges) than he has.

- **Example 30 –** Restricts Joe from acquiring any new system roles when using **set proxy**:

  ```
  grant set proxy to joe
  restrict role system
  ```

  set proxy fails if the target login has system roles that Joe lacks.

- **Example 31 –** Students are allowed to view information only about their own grades:

  ```
  grant select on grades
    where user_name(uid) = USER as predicate_grades
    to public
  ```

- **Example 32 –** Allows registered students to see information about all courses. The first **grant** allows anyone to peruse the courses and sections offered. The second **grant** allows a user to see only his own enrollments in those courses.

  ```
  grant select on enrollment
    (course_id, quarter, section_id)
    to public

  grant select on enrollment as e
    (uid, with_honors)
    where e.uid in
    (select r.uid from
    registered_students r
    where USER = user_name(r.uid))
    to public
  ```

  When a registered student enters the following query, he becomes restricted to seeing his own courses (because the **with_honors** column has been selected):

  ```
  select course_id, quarter, with_honors
    from enrollment
  ```

  Similarly, when a registered student tries to see how many courses people are taking with the following query:

  ```
  select course_id, count(uid) from enrollment
    group by course_id
  ```

  The SAP ASE server returns one row giving the count of courses enrolled in by the user.

- **Example 33 –** User Smith grants **select** permission to user John on `mary.books`, with table owner Mary as the grantor:

  ```
  grant select on mary.books to john
  granted by mary
  ```

- **Example 34 –** User Smith grants **create table** permission to user John, with the dbo as the grantor:

```
grant create table to john
granted by dbo
```

- **Example 35 –** With granular permissions disabled, granting system privilege `manage any login` results in an error:

```
1>sp_configure "enable granular permissions"
2>goParameter Name  Default  Memory Used  Config Value  Run
Value  Unit   Type
--------------  -------  ----------  ------------  ---------  ---
-  ---- enable granular
permissions       0        0          0          0    switch
 dynamic (1 row affected)
(return status = 0)

>grant manage any login to smith
>go
Msg 16325, Level 15, State 87:
Line 1:
Cannot GRANT/REVOKE permission 'MANAGE ANY LOGIN'. Verify that the
granular permissions option is enabled.
```

- **Example 36 –** You must specify `on` *database* clause when granting system privilege `own database`:

```
1>grant own database to smith
2>goMsg 156, Level 15, State 2:
Line 1:
Incorrect syntax near the keyword 'to'.
1>grant own database on tdb1 to smith
2>go
```

Usage

- You can substitute the word **from** for **to** in the **grant** syntax.
- **grant dbcc** issues the following warning when you execute it while **set fipsflagger** option is enabled:

```
SQL statement on line number 1 contains Non-ANSI
text. The error is caused due to the use of DBCC.
```

- Revoking a specific permission from “public” or from a group also revokes it from users who were individually granted the permission. An exeption are grants and revokes of predicated privileges.
- **grant** fails if you attempt to grant permissions to user-defined roles in a local temporary database in shared-disk cluster.

See also:

- **proc_role**, **show_role** in *Reference Manual: Building Blocks*
- **sp_column_privileges**, **sp_table_privileges**, **sp_addgroup**, **sp_adduser**, **sp_changedbowner**, **sp_changegroup**, **sp_dropgroup**, **sp_dropuser**, **sp_helpgroup**, **sp_helprotect**, **sp_helpuser** in *Reference Manual: Procedures*

- For more information on revoking a privilege from public or a group, see *How SAP ASE Saves Predicated Privileges in sysprotects* in the *Security Administration Guide*

Standards

ANSI SQL – Compliance level: Entry-level compliant. **grant dbcc** is also a Transact-SQL extension.

grant dbcc, and granting permissions to groups and granting **set proxy** are Transact-SQL extensions. Granting **set session authorization** (identical in function to **set proxy**) follows the ANSI standard.

Permissions

The permission checks for **grant** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, in general, **grant** can be executed by a user with one of the following privilege management privileges, depending the privilege or permission being granted. For: • Server-wide privileges – you must be a user with `manage server permissions` privilege or `manage security permissions` privilege. • Database-wide privileges – you must be a user with `manage database permissions` privilege. • Object privileges – you must be the object owner or a user with `manage any object permission` privilege To execute **grant default**, you must be the database owner or a user with `own database` privilege on the database.

Setting	Description
Disabled	With granular permissions disabled, grantable system privileges are limited to **create database**, **create default**, **create function**, **create procedure**, **create rule**, **create table**, **create view**, **connect**, **set proxy**, and **set tracing** Command execution – only system administrators can grant **create database**, **connect**, and **set tracing** permissions, and only from the `master` database. Only system security officers can grant **create trigger** permission. To execute **grant default**, you must be the database owner or a user with **sa_role**. For: • Database consistency checking – only system administrators can run grant dbcc commands. • Database object grant access – permission for database objects defaults to object owners. Object owners can grant permission to other users on their own database objects. • Functions – only system administrators can grant permissions on built-in functions. • Encrypted columns – only the systems security officer and the key custodian have implicit permission to create encryption keys. • Proxy and session authorization – only system security officers can grant **set proxy** or **set session authorization**, and only from the `master` database. Granting permission to execute **set proxy** or **set session authorization** allows the grantee to impersonate another login in the server. **set proxy** and **set session authorization** are identical, except that **set session authorization** follows the ANSI92 standard, and **set proxy** is a Transact-SQL extension. • System tables – Database owners can grant default permissions on system tables.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	40
Audit option	**grant**
Command or access audited	**grant**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – Full command text of the **grant** statement • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *create role* on page 193
- *revoke* on page 559
- *setuser* on page 658
- *set* on page 607
- *create table* on page 207

grant all Object Creation Privileges

Understand how **grant all** works.

- **grant all** without an object name in a database does not grant **create encryption key**. **grant all** without an object name is only supported when granular permissions is disabled.
- When used without object names, **grant all** assigns these permissions: **create database**, **create default**, **create procedure**, **create rule**, **create table**, **create function**, and **create view** . **create database** permission can be granted only by a system administrator and only from within the `master` database.
- Only the database owner and a system administrator can use the **grant all** syntax without an object name to grant **create** command permissions to users or groups. When the **grant all** command is used by the database owner, an informational message is printed, stating that only a system administrator can grant **create database** permission. All other permissions noted above are granted.
- All object owners can use **grant all** with an object name to grant permissions on their own objects. When used with a table or view name plus user or group names, **grant all** enables **delete**, **delete statistics**, **insert**, **select**, **truncate table**, **update**, and **update statistics** permissions on the table.

Using the with grant option Parameter

Rules for using the **with grant option** parameter.

- You cannot grant permissions **with grant option** to “public” or to a group or role.
- In granting permissions, when granular permissions is disabled, a system administrator is treated as the object owner. If a system administrator grants permission on another user’s

object, the owner's name appears as the grantor in `sysprotects` and in **sp_helprotect** output. When granular permissions enabled, the grantor's name appears as the grantor in `sysobjects` and in **sp_helprotect** output.

- You cannot grant system privileges with the **grant option** parameter.
- Information for each **grant** command is kept in the `sysprotects` system table, with the following exceptions:
  - The SAP ASE server displays an informational message if a specific permission is granted to a user more than once by the same grantor. Only the first **grant** record is kept.
  - If two **grant**s are exactly same except that one of them is granted **with grant option**, the **grant with grant option**is kept.
  - If two **grant** statements from the same grantor grant the same permissions on a particular table to a specific user, but to different columns, the SAP ASE server treats the grants as if they were one statement. For example, the following **grant** statements are equivalent:

    ```
    grant select on titles (price, contract)
        to keiko
    grant select on titles (advance) to keiko
    ```

    ```
    grant select on titles (price, contract,
        advance)
    to keiko
    ```

Users and User Groups

Usage consideration for users and user groups.

- User groups allow you to **grant** or **revoke** permissions to more than one user with a single statement. Each user can be a member of one other group and is always a member of "public."
- You can add new users with **sp_adduser** and create groups with **sp_addgroup**. To allow users with logins on the SAP ASE server to use the database with limited privileges, you can add a "guest" user with **sp_adduser** and assign limited permissions to "guest." All users with logins can access the database as "guest."
- To remove a user, use **sp_dropuser**. To remove a group, use **sp_dropgroup**.

  To add a new user to a group other than "public," use **sp_adduser**. To change an established user's group, use **sp_changegroup**.

  To display the members of a group, use **sp_helpgroup**.
- When **sp_changegroup** is executed to change group membership, it clears the in-memory protection cache by executing the following, so that the cache can be refreshed with updated information from the `sysprotects` table:

  ```
   grant all to null
  ```

  To modify `sysprotects` directly, contact SAP Technical Support.

Using the grant Command's granted by Option

Usage information for using the **grant** command's `granted by` option.

- **granted by** is not allowed on granting predicated privileges.
- It is not required that the `grantor` has permission to execute the **grant** command.
- The grantor, and not the command executor, is listed under `sysprotects.grantor`.
- You need not enable **enable granular permissions** to use the **granted by** parameter.
- Users who received their **grant** permission on an object with the **with grant** option cannot issue the **granted by** parameter. All other users may issue the **granted by** parameter.

  For example, if Mary grants **select** on her table books to John with the **with grant** option, then John gets an error when he tries to issue the second **grant** command. Mary:

  ```
  grant select on mary.books
  to john with grant option
  ```

  John:

  ```
  grant select on mary.books
  to joe granted by smith
  ```

Privileges for grant

Privileges for grant differ based on the level at which you are working.

This table lists all grantable server-wide system privileges. Server-wide privileges must be granted in the master database. For operations each privilege is authorized to perform, see *Using Granular Permissions* of the *Security Administration Guide*.

Note: In the following list, when granular permissions is disabled, only privileges marked with an asterisk (*) can be granted.

dbcc privilege syntax **dbcc dbcc_subcmd on all** is alias to **dbcc dbcc_subcmd any database.** Both syntaxes are supported.

Table 5. Grantable Server-Wide System Privileges

Category	Description
Privilege Management	• `manage security permissions` • `manage server permissions`
Audit Management	• `manage auditing`

Category	Description
Login and Role Management	• `allow exceptional login` • `change password` • `manage any login` • `manage any login profile` • `manage remote login` • `manage roles`
Database Management	• `checkpoint` (on *database*) • `checkpoint any database` • `create database*` • `dump any database` • `dump database` (on *database*) • `load any database` • `load database` (on *database*) • `manage any database` • `mount any database` • `online any database` • `online database` (on *database*) • `own any database` • `own database` (on *database*) • `quiesce any database` • `unmount any database`
Server Management	• `manage any thread pool` • `manage cluster` • `manage disk` • `manage security configura-tion` • `manage server` • `manage server configuration` • `shutdown`

Category	Description
DBCC Privilege	• `dbcc checkalloc any database*` • `dbcc checkcatalog any database*` • `dbcc checkdb any database*` • `dbcc checkindex any database*` • `dbcc checkstorage any database*` • `dbcc checktable any database*` • `dbcc checkverify any database*` • `dbcc fix_text any database*` • `dbcc indexalloc any database*` • `dbcc reindex any database*` • `dbcc tablealloc any database*` • `dbcc textalloc any database*` • `dbcc tune*`
Application Management	• `manage any execution class` • `manage any ESP` • `manage data cache` • `manage dump configuration` • `manage lock promotion threshold` • `monitor qp performance` • `manage resource limit`

Category	Description
Others	• `connect*` • `kill` • `kill any process` • `map external file` • `monitor server replication` • `set proxy` • `set tracing*` • `set tracing any process` • `set switch` • `show switch` • `use any database` • `use database`

This table lists all grantable database-wide system privileges. Database-wide privilege must be granted in the database for which the privilege is intended to be exercised. For operations each privilege is authorized to perform, see *Using Granular Permissions* in the *Security Administration Guide*.

Note: In the following table, when granular permissions is disabled, only privileges marked with an asterisk (*) can be granted.

Table 6. Grantable Database-Wide Privileges

Category	Privilege
Privilege Management	• `manage any object permis-sion` • `manage database permissions`
User Management	• `manage any user`
Set User	• `setuser*`
Replication Management	• `manage replication`
Database Management	• `manage database`

Category	Privilege
Query Plan Management	• `manage abstract plans`
DBCC Privilge	• `dbcc checkalloc`* • `dbcc checkcatalog`* • `dbcc checkdb`* • `dbcc checkindex`* • `dbcc checkstorage`* • `dbcc checktable`* • `dbcc checkverify`* • `dbcc fix_text`* • `dbcc indexalloc`* • `dbcc reindex`* • `dbcc textalloc`* • `manage checkstorage` • `dbcc tablealloc`* • `report checkstorage`
System Catalog	• `select any audit table` • `select any system catalog` • `truncate any audit table`
General Object	• `alter any object owner` • `create any object` • `drop any object`
Encryption Key	• `create encryption key`* • `manage any encryption key` • `manage column encryption key` • `manage master key` • `manage service key`
Default	• `create default`* • `create any default` • `drop any default`

Category	Privilege
Function	• `create function`* • `create any function` • `drop any function` • `execute any function`
Index	• `create any index`
Procedure	• `create procedure`* • `create any procedure` • `execute any procedure` • `drop any procedure`
Rule	• `create rule`* • `create any rule` • `drop any rule`
Table	• `alter any table` • `create any table` • `create table`* • `decrypt any table` • `delete any table` • `drop any table` • `identity_insert any table` • `identity_update any table` • `insert any table` • `manage any statistics` • `references any table` • `reorg any table` • `select any table` • `transfer any table` • `truncate any table` • `update any table`

Category	Privilege
Trigger	• `create trigger`* • `create any trigger` • `drop any trigger`
View	• `create view`* • `create any view` • `drop any view`

This table lists all grantable privileges and permissions in alphabetic order. Privileges indicated with a "*" do not require that you enable granular permissions.

Table 7. Alphabetical Listing of Privileges

Privilege Name	Privilege Type	Managed by (when Granular Permissions is Enabled)	Implied by
`allow exceptional login`	server	manage server permissions	
`alter any object owner`	database	manage database permissions	
`alter any table`	database	manage database permissions	
`change password`	server	manage security permissions	
`checkpoint any database`	server	manage server permissions	
`checkpoint` (on database)	server	manage server permissions	`checkpoint any database`
`checkpoint` (on `sybsecurity`)	server	manage security permissions	
`connect*`	server	manage server permissions	
`create any default`	database	manage database permissions	`create any object`

Privilege Name	Privilege Type	Managed by (when Granular Permissions is Enabled)	Implied by
`create any function`	database	manage database permissions	`create any object`
`create any index`	database	manage database permissions	`create any object`
`create any object`	database	manage database permissions	
`create any procedure`	database	manage database permissions	`create any object`
`create any rule`	database	manage database permissions	`create any object`
`create any table`	database	manage database permissions	`create any object`
`create any trigger`	database	manage database permissions	`create any object`
`create any view`	database	manage database permissions	`create any view`
`create database*`	server	manage database permissions	
`create default*`	database	manage database permissions	`create any default`
`create encryption key*`	database	manage security permissions	`manage column encryption key`
`create function*`	database	manage database permissions	`create any function`
`create index*`	database	manage database permissions	`create any index`
`create procedure*`	database	manage database permissions	`create procedure`
`create rule*`	database	manage database permissions	`create any rule`

Privilege Name	Privilege Type	Managed by (when Granular Permissions is Enabled)	Implied by
`create table*`	database	manage database permissions	`create any table`
`create trigger*`	database	manage database permissions	`create any trigger`
`create view*`	database	manage database permissions	`create any view`
`dbcc checkalloc*`	database	manage database permissions	`dbcc checkalloc any database`
`dbcc checkalloc any database*`	server	manage server permissions	
`dbcc checkcatalog*`	database	manage database permissions	`dbcc checkcatalo any database`
`dbcc checkcatalog any database*`	server	manage server permissions	
`dbcc checkdb*`	database	manage database permissions	`dbcc checkdb any database`
`dbcc checkdb any database*`	server	manage server permissions	
`dbcc checkindex*`	database	manage database permissions	`dbcc checkindex any database`
`dbcc checkindex any database *`	server	manage server permissions	
`dbcc checkstorage*`	database	manage database permissions	`dbcc checkstorage any database`
`dbcc checkstorage any database *`	server	manage server permissions	
`dbcc checktable*`	database	manage database permissions	`dbcc checktable any database`

Privilege Name	Privi-lege Type	Managed by (when Granular Permis-sions is Enabled)	Implied by
dbcc checktable any database*	server	manage server permis-sions	
dbcc checkverify*	database	manage database permis-sions	dbcc checkverify any database
dbcc checkverify any database*	server	manage server permis-sions	
dbcc fix_text*	database	manage database permis-sions	dbcc fix_text any database
dbcc fix_text any database*	server	manage server permis-sions	
dbcc indexalloc*	database	manage database permis-sions	dbcc indexalloc any database
dbcc indexalloc any database*	server	manage server permis-sions	
dbcc reindex*	database	manage database permis-sions	dbcc reindex any database
dbcc reindex any database*	server	manage server permis-sions	
dbcc tablealloc*	database	manage database permis-sions	dbcc tablealloc any database
dbcc tablealloc any database*	server	manage server permis-sions	
dbcc textalloc*	database	manage database permis-sions	dbcc textalloc any database
dbcc textalloc any database*	server	manage server permis-sions	
dbcc tune*	server	manage server permis-sions	

Privilege Name	Privilege Type	Managed by (when Granular Permissions is Enabled)	Implied by
`decrypt*`	object (column)	manage any object permission/object owner	`decrypt any table`
`decrypt any table`	database	manage database permissions	
`delete*`	object	manage any object permission/object owner	`delete any table`
`delete any table`	database	manage database permissions	
`delete statistics*`	object	manage any object permission/object owner	`manage any statistics`
`drop any default`	database	manage database permissions	`drop any object`
`drop any function`	database	manage database permissions	`drop any object`
`drop any object`	database	manage database permissions	
`drop any procedure`	database	manage database permissions	`drop any object`
`drop any rule`	database	manage database permissions	`drop any object`
`drop any table`	database	manage database permissions	`drop any object`
`drop any trigger`	database	manage database permissions	`drop any object`
`drop any view`	database	manage database permissions	`drop any object`
`dump any database`	server	manage server permissions	
`dump database` (on database)	server	manage server permissions	`dump any database`

Privilege Name	Privilege Type	Managed by (when Granular Permissions is Enabled)	Implied by
`dump database` (on `sybsecurity`)	server	manage security permissions	
`execute*`	object	manage any object permission/object owner	`execute any function` (for udf) `execute any procedure` (for system procedures)
`execute any function`	database	manage database permissions	
`execute any procedure`	database	manage database procedures	
`identity_insert`	object	manage any object permission/object owner	
`identity_insert any table`	database	manage database permissions	
`identity_update`	object	manage any object permission/object owner	
`identity_update any table`	database	manage database permissions	
`insert*`	object	manage any object permission/object owner	`insert any table`
`insert any table`	database	manage database permissions	
`kill`	server	manage server permissions	`kill any process`
`kill any process`	server	manage server permissions	
`load any database`	server	manage server permissions	
`load database` (on database)	server	manage server permissions	`load any database`

Privilege Name	Privilege Type	Managed by (when Granular Permissions is Enabled)	Implied by
`load database` (on `sybsecurity`)	server	manage security permissions	
`manage abstract plans`	database	manage database permissions	
`manage any database`	server	manage server permissions	
`manage any encryption key`	database	manage security permissions	
`manage any ESP`	server	manage server permissions	
`manage any execution class`	server	manage server permissions	
`manage any login`	server	manage security permissions	
`manage any login profile`	server	manage security permissions	
`manage any remote login`	server	manage security permissions	
`manage any statistics`	database	manage database permissions	
`manage any thread pool`	server	manage server permissions	
`manage any user`	database	manage database permissions	
`manage auditing`	server	manage security permissions	
`manage checkstorage`	database	manage database permissions	
`manage cluster`	server	manage server permissions	

Privilege Name	Privilege Type	Managed by (when Granular Permissions is Enabled)	Implied by
`manage column encryption key`	database	manage security permissions	`manage any encryption key`
`manage data cache`	server	manage server permissions	
`manage database`	database	manage database permissions	`manage any database`
`manage database permissions`	database	manage security permissions	
`manage disk`	server	manage server permissions	
`manage dump configuration`	server	manage server permissions	
`manage lock promotion threshold`	server	manage server permissions	
`manage master key`	database	manage security permissions	`manage any encryption key`
`manage replication`	server	manage server permissions	
`manage resource limit`	server	manage server permissions	
`manage roles`	server	manage security permissions	
`manage security configuration`	server	manage security permissions	
`manage security permissions`	server	manage security permissions	
`manage server`	server	manage server permissions	
`manage server configuration`	server	manage server permissions	

Privilege Name	Privilege Type	Managed by (when Granular Permissions is Enabled)	Implied by
`manage server permissions`	server	manage server permissions	
`manage service key`	database	manage security permissions	`manage any encryption key`
`map external file`	server	manage server permissions	
`monitor qp performance`	server	manage server permissions	
`monitor server replication`	server	manage server permissions	
`mount any database`	server	manage server permissions	
`own any database`	server	manage server permissions	
`online any database`	server	manage server permissions	
`online database` (on database)	server	manage server permissions	`online any database`
`online database` (on `sybsecurity`)	server	manage security permissions	
`own database` (on database)	server	manage server permissions	
`own database` (on `sybsecurity`)	server	manage security permissions	
`quiesce any database`	server	manage server permissions	
`references*`	object (column)	manage any object permission/object owner	`references any table`

Privilege Name	Privi-lege Type	Managed by (when Granular Permis-sions is Enabled)	Implied by
`references any table`	database	manage database permissions	
`report checkstorage`	database	manage database permissions	
`reorg any table`	database	manage database permissions	
`select*`	object (column)	manage any object permission/object owner	`select any table` (for user tables or views) `select any audit table` (for audit tables) `select any system catalog` (for system tables)
`select any audit table`	database	manage database permissions	
`select any system catalog`	database	manage database permissions	
`select any table`	database	manage database permissions	
`set proxy*`	server	manage security permissions	
`set switch`	server	manage server permissions	
`set tracing*`	server	manage server permissions	`set tracing for any process`
`set tracing any process`	server	manage server permissions	
`setuser*`	database	manage database permissions	

Privilege Name	Privilege Type	Managed by (when Granular Permissions is Enabled)	Implied by
`show switch`	server	manage server permissions	
`shutdown`	server	manage server permissions	
`transfer any table`	database	manage database permissions	
`transfer table`	object	manage any object permission/object owner	`transfer any table`
`truncate any audit table`	database	manage database permissions	
`truncate any table`	database	manage database permissions	
`truncate table*`	object	manage any object permission/object owner	`truncate any table`
`unmount any database`	server	manage server permissions	
`update*`	object (column)	manage any object permission/object owner	`update any table`
`update any security catalog`	server	manage security permissions	
`update any table`	database	manage database permissions	
`update statistics`	object	manage any object permission/object owner	`manage any statistics`
`use any database`	server	manage server permissions	
`use database` (on database)	server	manage server permissions	`use any database`

Privilege Name	Privilege Type	Managed by (when Granular Permissions is Enabled)	Implied by
`use database` (on sybsecurity)	server	manage security permissions	

- Possessing one privilege may imply possessing another, more granular privilege. For example, a user with `select any table` privilege implies that the user has `select` permission on all user tables.
- When granting the following database management privileges, the `on` *database* clause must be specified for each privilege: `checkpoint`, `dump database`, `load database`, `online database`, `own database`. For example, to grant `dump database` privilege on `db1` to smith, you can use:

  ```
  grant dump database on db1 to smith
  ```

  You can grant different database management privileges on different databases in the same grant command. For example, to grant `own database` on `db1` and `load database` on `db2` to smith, you can use:

  ```
  grant own database on db1, load database on db2 to smith
  ```
- You can grant permissions only on objects in your current database.
- **grant** and **revoke** commands are order-sensitive. The command that takes effect when there is a conflict is the one issued most recently.
- A user can be granted permission on a view or stored procedure even if he or she has no permissions on objects referenced by the procedure or view. See *Managing User Permissions* in the *Security Administration Guide*.
- The SAP ASE server grants all users permission to declare cursors, regardless of the permissions defined for the base tables or views referenced in the **declare cursor** statement. Cursors are not defined as SAP ASE objects (such as tables), so no permissions can be applied against a cursor. When a user opens a cursor, the SAP ASE server determines whether the user has **select** permissions on the objects that define that cursor's result set. It checks permissions each time a cursor is opened.

  If the user has permission to access the objects defined by the cursor, the SAP ASE server opens the cursor and allows the user to **fetch** row data through the cursor. The SAP ASE server does not apply permission checking for each **fetch**. However, if the user performs a **delete** or an **update** through that cursor, the regular permission checking applies for deleting and updating the data of objects referenced in the cursor result set.
- A **grant** statement adds one row to the `sysprotects` system table for each user, group, or role that receives the permission. If you subsequently **revoke** the permission from the user or group, the SAP ASE server removes the row from `sysprotects`. If you revoke the permission from selected group members only, but not from the entire group to which it was granted, the SAP ASE server retains the original row and adds a new row for the revoked permission.

- A user, group, or role can be granted the same privilege or permission by different grantors. In this situation, there are multiple rows in `sysprotects` that represents multiple grants on the same privilege or permissions. If one or more than one grants are later revoked, the user, group, or role may still have the privilege or permission if there is one grant remain unrevoked.
- If a user inherits a particular permission by virtue of being a member of a group, and the same permission is explicitly granted to the user, no row is added to `sysprotects`. For example, if "public" has been granted **select** permission on the `phone` column in the `authors` table, then John, a member of "public," is granted **select** permission on all columns of `authors`. The row added to `sysprotects` as a result of the **grant** to John contains references to all columns in the `authors` table except for the `phone` column, on which he already had permission.
- By default, permission to issue the **create trigger** command is granted to users. When you revoke permission for a user to create triggers, a revoke row is added in the `sysprotects` table for that user. To grant permission to that user to issue **create trigger**, you must issue two **grant** commands. The first command removes the revoke row from `sysprotects`; the second inserts a grant row. If you revoke permission to create triggers, the user cannot create triggers even on tables that the user owns. Revoking permission to create triggers from a user affects only the database where the revoke command was issued.
- Use these system procedures to display information about permissions:
  - **sp_helprotect** reports permissions information for database objects, users, groups, and roles.
  - **sp_column_privileges** reports permissions information for one or more columns in a table or view.
  - **sp_table_privileges** reports permissions information for all columns in a table or view.
  - **sp_activeroles** displays all active roles—and all roles contained by those roles—for the current login session of the SAP ASE server.
  - **sp_displayroles** displays all roles granted to another role or user, or displays the entire hierarchy tree of roles in table format.
- You can view permissions using **sp_helprotect**:

```
1> use pubs2
2> go
1> sp_helprotect
2> go
```

```
grantor  grantee  type   action   object         column      gran
table
-------  -------  ----   ------   -------        -------     ----
-----
dbo     public    Grant  Select   sysalternates  All         FALSE
...
dbo     Walter    Grant  DBCC     DBCC          dbcc checkdb FALSE
```

```
(1 row affected)
(return status = 0)
```

- You cannot use the **grant with grant** option with **grant dbcc**.

Grant Access to Roles

Permissions that are granted to roles override permissions that are granted to users or groups.

For example, say John has been granted the system security officer role, and **sso_role** has been granted permission on the `sales` table. If John's individual permission on `sales` is revoked, he can still access `sales` because his role permissions override his individual permissions.

However, **grant execute** permission does not prevent users who do not have a specified role from being individually granted permission to execute a stored procedure. To ensure, for example, that only system security officers can ever be granted permission to execute a stored procedure, use the **proc_role** system function within the stored procedure itself. It checks to see whether the invoking user has the correct role to execute the procedure. See **proc_role**.

Granting Default Permissions on System Tables

System tables that you can grant and revoke the default permissions for when you issue the command from any database.

- `sysalternates`
- `sysattributes`
- `syscolumns`
- `syscomments`
- `sysconstraints`
- `sysdepends`
- `sysindexes`
- `sysjars`
- `syskeys`
- `syslogs`
- `sysobjects`
- `syspartitions`
- `sysprocedures`
- `sysprotects`
- `sysqueryplans`
- `sysreferences`
- `sysroles`
- `syssegments`
- `sysstatistics`
- `systabstats`
- `systhresholds`

- `systypes`
- `sysusermessages`
- `sysusers`
- `sysxtypes`

The command also makes the following changes:

- Revokes `syscolumns (encrkyid)` and `syscolumns (encrkydb)` permissions from public.
- Revokes `syscolumns (encrkydb)` and `syscolumns (encrkyid)` permissions from public.
- Revokes `sysobjects(audflags)` permissions from public
- Grants permissions for `sysobjects` to sso_role
- Revokes **select** on all columns of `sysencryptkeys` from public
- Grants **select** on all `sysencryptkeys` columns to sso_role
- Grants permissions for `syscolumns` to sso_role

The system tables for which you can grant and revoke the default permissions when you issue the command from the `master` database are:

- `syscharsets`
- `sysconfigures`
- `syscurconfigs`
- `sysdatabases`
- `sysdevices`
- `syslanguages`
- `syslogins`
- `syslocks`
- `sysmessages`
- `sysprocesses`
- `sysremotelogins`
- `sysresourcelimits`
- `sysservers`
- `syssessions`
- `systimeranges`
- `systransactions`
- `sysusages`

The command also:

- Revokes **select** on `sysdatabases(audflags)` from public
- Revokes **select** on `sysdatabases(deftabaud)` from public

- Revokes **select** on `sysdatabases(defvwaud)` from public
- Revokes **select** on `sysdatabases(defpraud)` from public
- Revokes **select** on `sysdatabases(audflags2)` from public
- Grants **select** on `sysdatabases` to sso_role
- Revokes **select** on `syslogins(password)` from public
- Revokes **select** on `syslogins(audflags)` from public
- Revokes **select** on `syslogins(lpid)` from public
- Grants **select** on `syslogins to` sso_role
- Revokes **select** on `syslisteners(net_type)` from public
- Revokes **select** on `syslisteners(address_info)` from public
- Grants **select** on `syslisteners` to sso_role
- Revokes **select** on `syssrvroles(srid)` from public
- Revokes **select** on `syssrvroles(name)` from public
- Revokes **select** on `syssrvroles(password)` from public
- Revokes **select** on `syssrvroles(pwdate)` from public
- Revokes **select** on `syssrvroles(status)` from public
- Revokes **select** on `syssrvroles(logincount)` from public
- Grants **select** on `syssrvroles` to public
- Revokes **select** on `sysloginroles(suid)` from public
- Revokes **select** on `sysloginroles(srid)` from public
- Revokes **select** on `sysloginroles(status)` from public
- Grants **select** on `sysloginroles` to sso_role
- Revokes **select** on `sysinstances(hostname)` from public
- Grants **select** on `sysinstances` to sso_role

Granting Permissions for update statistics, delete statistics, and truncate table

The SAP ASE server allows you to grant permissions to users, roles, and groups for the **update statistics**, **delete statistics**, and **truncate table** commands. Table owners can also provide permissions through an implicit **grant** by adding **update statistics**, **delete statistics**, and **truncate table** to a stored procedure and then granting execute permissions on that procedure to a user or role.

You cannot grant permissions for **update statistics** at the column level. You must have the **sso_role** to run **update statistics** or **delete statistics** on `sysroles`, `syssrvroles`, and `sysloginroles` security tables.

By default, users with the **sa_role** have permission to run **update statistics** and **delete statistics** on system tables other than `sysroles`, `syssrvroles`, and `sysloginroles`, and can transfer this privilege to other users.

You can also issue **grant all** to grant permissions on **update statistics**, **delete statistics**, and **truncate table**.

Note: Once you grant permission to execute **update statistics** to a user, he or she also has permission to execute variations of this command, such as **update all statistics**, **update partition statistics**, **update index statistics**, **update table statistics**, and so on. For example, the following grants Billy permission to run all variations of **update statistics** on the `authors` table:

```
grant update statistics on authors to billy
```

If you revoke a user's permission to execute **update statistics**, you also revoke his or her ability to execute the variations of this command.

You cannot grant variants of **update statistics** (for example, **update index statistics**) separately. That is, you *cannot* issue:

```
grant update all statistics to harry
```

You can, however, write stored procedures that control who executes these commands. For example, the following grants Billy execute permission for **update index statistics** on the `authors` table:

```
create proc sp_ups as
update index statistics on authors
go
revoke update statistics on authors from billy
go
grant execute on sp_ups to billy
```

You cannot grant and revoke **delete statistics** permissions at the column level.

Although the SAP ASE server audits **truncate table** as a global, miscellaneous audit, it does not audit **update statistics**. To retain clear audit trails for both **truncate table** and **update statistics**, you should include both commands in a stored procedure to which you grant users execute permission, as described above.

Granting Proxies and Session Authorizations

Granting permission to execute **set proxy** or **set session authorization** allows the grantee to impersonate another login in the SAP ASE server. **set proxy** and **set session authorization** are identical, except **set session authorization** follows the SQL standard, and **set proxy** is a Transact-SQL extension.

- To grant **set proxy** or **set session authorization** permission, you must be in the `master` database.
- The name you specify in the **grant set proxy** command must be a valid user in the database; that is, the name must be in the `sysusers` table in the database.
- **grant all** does not include the **set proxy** or **set session authorization** permissions.
- You can restrict roles incrementally using **grant set proxy**. For example, you can first restrict the **sa_role**, then the **sso_role**:

```
grant set proxy to joe
restrict role sa_role
grant set proxy to joe
restrict role sso_role
```

- You cannot unrestrict individual roles. You must revoke **set proxy** to revoke permissions from all roles.

Granting a Privilege to a Role

Permissions that are granted to roles override permissions that are granted to users or groups.

For example, say John has been granted the system security officer role, and **sso_role** has been granted permission on the `sales` table. If John's individual permission on `sales` is revoked, he can still access `sales` because his role permissions override his individual permissions.

However, **grant execute** permission does not prevent users who do not have a specified role from being individually granted permission to execute a stored procedure. To ensure, for example, that only system security officers can ever be granted permission to execute a stored procedure, use the **proc_role** system function within the stored procedure itself. It checks to see whether the invoking user has the correct role to execute the procedure. See **proc_role**.

grant role

Grants a role to the specified logins, users, or system- or user-defined roles.

Syntax

```
grant role role_name
        [where pred_expression]
    to {username | rolename | login_profile_name }
```

Parameters

- ***role_name*** **–** is the name of a system- or user-defined role that the system security officer is granting to a user or a role.
- **where *pred_expression* –** also referred to as a role-activation predicate, this is a SQL condition that must be satisfied when the named role is activated. *pred_expression* may be used only when granting a role to *username* or *login_profile_name*.If *pred_expression* evaluates to FALSE when the role is activated, the **set role** command fails and the SAP ASE server returns an error message. If the role is specified for automatic activation or is a default role, the SAP ASE server silently fails the activation but does not fail the login process.
- **to *username* | *rolename* | *login_profile_name* –** identifies the name of the login, role or login profile to which you are granting the role. When the grantee is a login profile, all users with this login profile are granted the role.

Examples

- **Example 1 –** Grants the role “doctor” to Mary:

  ```
  grant role doctor_role to mary
  ```

- **Example 2 –** By granting `intern_role` to `doctor_role`, a doctor inherits all the privileges of an intern.

  ```
  grant role intern_role to doctor_role
  ```

- **Example 3 –** User Smith, with `manage roles` privileges, grants the nurse_role to user John, with user `roleAdmin` as the grantor.

  ```
  grant role nurse_role to john
  granted by roleAdmin
  ```

- **Example 4 –** Grants role `ldap_user_role` to login profile `lp_10`:

  ```
  grant role ldap_user_role where
    get_appcontext(login_authentication) = 'LDAP'
    to login_profile lp_10
  ```

  Using the above example, when the session of a user assigned login profile `lp_10` enables `ldap_user_role`, the SAP ASE server checks that the session connected using LDAP. If there was an LDAP connection, the user assumes `ldap_user_role`; if not, `ldap_user_role` is not enabled. Configure the predicate evaluation to occur automatically during login by altering login profile `lp_10` and specifying `ldap_user_role` on the **auto activated roles** attribute. Otherwise, the evaluation of the role activation predicate occurs when the user assigned `lp_10` executes the **set role** statement.

Usage

The SAP ASE server automatically activates roles granted to logins or login profiles (after evaluating any predicate) when the user logs in if **create login**, **alter login**, **create login profile**, or **alter login profile** specify the role for automatic activation. Otherwise, the SAP ASE server activates the role when set role is executed. Adaptive automatically activates a role granted to another role when the dependent role is activated.

You can use the **grant** command to grant permissions to all users who have been granted a specified role. The role can be either a system role, like **sso_role** or **sa_role**, or a user-defined role. The system security officers must create the user-defined roles using a **create role** command.

Permissions

The permission checks for **grant role** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage roles` privilege.
Disabled	With granular permissions disabled, you must be a user with **sso_role**. To grant **sa_role**, you must be a user with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	85
Audit option	**roles**
Command or access audited	**create role**, **drop role**, **alter role**, **grant role**, or **revoke role**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – Full command text of the **grant role** statement • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

group by and having Clauses

Used in **select** statements to divide a table into groups and to return only groups that match conditions in the **having** clause. **group by** is typically used with aggregates to specify how to group the unaggregated columns of a **select** query. **having** clauses are applied to these groups.

Syntax

```
Start of select statement

[group by [all] aggregate_free_expression
    [, aggregate_free_expression]...]

[having search_conditions]

End of select statement
```

Parameters

- **group by –** specifies the groups into which the table is divided, and if aggregate functions are included in the select list, finds a summary value for each group. These summary values appear as columns in the results, one for each group. You can refer to these summary columns in the **having** clause.

  You can use the **avg**, **count**, **count_big**, **max**, **min**, and **sum** aggregate functions in the select list before **group by** (the expression is usually a column name). See *Reference Manual: Building Blocks*.

  A table can be grouped by any combination of columns—that is, groups can be nested within each other, as in Example 2.
- **all –** is a Transact-SQL extension that includes all groups in the results, even those excluded by a **where** clause. For example:

  ```
  select type, avg (price)
  from titles
  where advance > 7000
  group by all type
  ```

  ```
  type
  -----------------  ----------
  UNDECIDED                NULL
  business                 2.99
  mod_cook                 2.99
  popular_comp            20.00
  psychology               NULL
  trad_cook               14.99

   (6 rows affected)
  ```

  "NULL" in the aggregate column indicates groups that would be excluded by the **where** clause. A **having** clause negates the meaning of **all**.
- ***aggregate_free_expression* –** is an expression that includes no aggregates. A Transact-SQL extension allows grouping by an aggregate-free expression as well as by a column name.

  You cannot group by column heading or alias. This example is correct:

  ```
  select Price=avg (price), Pay=avg (advance),
  Total=price * $1.15
  from titles
  group by price * $1.15
  ```
- **having –** sets conditions for the **group by** clause, similar to the way in which **where** sets conditions for the **select** clause.

  having search conditions can include aggregate expressions; otherwise, **having** search conditions are identical to **where** search conditions. This is an example of a **having** clause with aggregates:

  ```
  select pub_id, total = sum (total_sales)
  from titles
  where total_sales is not null
  ```

```
group by pub_id
having count (*)>5
```

When the SAP ASE server optimizes queries, it evaluates the search conditions in **where** and **having** clauses, and determines which conditions are search arguments (SARGs) that can be used to choose the best indexes and query plan. All of the search conditions are used to qualify the rows. For more information on search arguments, see the *Performance and Tuning Guide: Optimizer and Abstract Plans*.

Examples

- **Example 1 –** Calculates the average advance and the sum of the sales for each type of book:

```
select type, avg (advance), sum (total_sales)
from titles
group by type
```

- **Example 2 –** Groups the results by type, then by `pub_id` within each type:

```
select type, pub_id, avg (advance), sum (total_sales)
from titles
group by type, pub_id
```

- **Example 3 –** Calculates results for all groups, but displays only groups whose type begins with “p”:

```
select type, avg (price)
from titles
group by type
having type like 'p%'
```

- **Example 4 –** Calculates results for all groups, but displays results for groups matching the multiple conditions in the **having** clause:

```
select pub_id, sum (advance), avg (price)
from titles
group by pub_id
having sum (advance) > $15000
and avg (price) < $10
and pub_id > "0700"
```

- **Example 5 –** Calculates the total sales for each group (publisher) after joining the `titles` and `publishers` tables:

```
select p.pub_id, sum (t.total_sales)
from publishers p, titles t
where p.pub_id = t.pub_id
group by p.pub_id
```

- **Example 6 –** Displays the titles that have an advance of more than $1000 and a price that is more than the average price of all titles:

```
select title_id, advance, price
from titles
```

```
where advance > 1000
having price > avg (price)
```

Usage

- You can use a column name or any expression (except a column heading or alias) after **group by**. You can use **group by** to calculate results or display a column or an expression that does not appear in the **select** list).
- The maximum number of group by columns (or expressions) is not explicitly limited. The only limit of group by results is that the width of the **group by** columns plus the aggregate results be no greater than 64K.
- Null values in the **group by** column are put into a single group.
- You cannot name `text`, `unitext`, or `image` columns in **group by** and **having** clauses.
- You cannot use a **group by** clause in the **select** statement of an updatable cursor.
- Aggregate functions can be used only in the select list or in a **having** clause. They cannot be used in a **where** or **group by** clause.

  Aggregate functions are of two types. Aggregates applied to *all the qualifying rows in a table* (producing a single value for the whole table per function) are called *scalar aggregates*. An aggregate function in the select list with no **group by** clause applies to the whole table; it is one example of a scalar aggregate.

  Aggregates applied to *a group of rows in a specified column or expression* (producing a value for each group per function) are called *vector aggregates*. For either aggregate type, the results of the aggregate operations are shown as new columns that the **having** clause can refer to.

  You can nest a vector aggregate inside a scalar aggregate. See *Reference Manual: Building Blocks* for more information.

See also *Transact-SQL Functions* in *Reference Manual: Building Blocks*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The use of columns within the **select** list that are not in the **group by** list and have no aggregate functions is a Transact-SQL extension.

The use of the **all** keyword is a Transact-SQL extension.

See also

- *Transact-SQL Extensions to group by and having* on page 464
- *compute Clause* on page 91
- *declare* on page 302
- *select* on page 579
- *where clause* on page 712

How group by and having Queries with Aggregates Work

The **where** clause excludes rows that do not meet its search conditions; its function remains the same for grouped or nongrouped queries.

The **group by** clause collects the remaining rows into one group for each unique value in the **group by** expression. Omitting **group by** creates a single group for the whole table.

Aggregate functions specified in the select list calculate summary values for each group. For scalar aggregates, there is only one value for the table. Vector aggregates calculate values for the distinct groups.

The **having** clause excludes groups from the results that do not meet its search conditions. Even though the **having** clause tests only rows, the presence or absence of a **group by** clause may make it appear to be operating on groups:

- When the query includes **group by**, **having** excludes result group rows. This is why **having** seems to operate on groups.
- When the query has no **group by**, **having** excludes result rows from the (single-group) table. This is why **having** seems to operate on rows (the results are similar to **where** clause results).

Standard group by and having Queries

All **group by** and **having** queries in the Examples section adhere to the SQL standard, which dictates that queries using **group by**, **having**, and vector aggregate functions produce one row and one summary value per group.

These guidelines apply:

- Columns in a select list must also be in the **group by** expression, or they must be arguments of aggregate functions.
- A **group by** expression can contain only column names that are in the select list. However, columns used only as arguments of aggregate functions in the select list do not qualify.
- Columns in a **having** expression must be single-valued—arguments of aggregates, for instance—and they must be in the select list or **group by** clause. Queries with a select list aggregate and a **having** clause *must* have a **group by** clause. If you omit the **group by** for a query without a select list aggregate, all the rows not excluded by the **where** clause are considered to be a single group.

In nongrouped queries, the principle that “**where** excludes rows” seems straightforward. In grouped queries, the principle expands to “**where** excludes rows before **group by**, and **having** excludes rows from the display of results.”

The SQL standard allows queries that join two or more tables to use **group by** and **having**, if they also adhere to the above guidelines. When specifying joins or other complex queries, use the standard syntax of **group by** and **having** until you fully comprehend the effect of the Transact-SQL extensions to both clauses.

To help you avoid problems with extensions, the SAP ASE server provides the **fipsflagger** option to the **set** command that issues a nonfatal warning for each occurrence of a Transact-SQL extension in a query. See **set** for more information.

Transact-SQL Extensions to group by and having

Transact-SQL extensions to standard SQL let you display data more flexibly, by allowing references to columns and expressions that are not used for creating groups or summary calculations:

- A select list that includes aggregates can include *extended* columns that are not arguments of aggregate functions and are not included in the **group by** clause. An extended column affects the display of final results, since additional rows are displayed.
- The **group by** clause can include columns or expressions that are not in the select list.
- The **group by all** clause displays all groups, even those excluded from calculations by a **where** clause. See the example for the keyword **all** in the "Parameters" section.
- The **having** clause can include columns or expressions that are not in the select list and not in the **group by** clause.

When the Transact-SQL extensions add rows and columns to a display, or if **group by** is omitted, query results may be hard to interpret. The examples that follow can help you understand how Transact-SQL extensions can affect query results.

The following examples illustrate the differences between queries that use standard **group by** and **having** clauses and queries that use the Transact-SQL extensions:

1. An example of a standard grouping query:

```
select type, avg (price)
from titles
group by type
```

```
type
----------------------  ----------
UNDECIDED                 NULL
business                 13.73
mod_cook                 11.49
popular_comp             21.48
psychology               13.50
trad_cook                15.96

 (6 rows affected)
```

2. The Transact-SQL extended column, `price` (in the select list, but not an aggregate and not in the **group by** clause), causes all qualified rows to display in each qualified group, even though a standard **group by** clause produces a single row per group. The **group by** still affects the vector aggregate, which computes the average price per group displayed on each row of each group (they are the same values that were computed for example a):

```
select type, price, avg (price)
from titles
group by type
```

```
type           price
------------ ---------------- --------------
business       19.99            13.73
business       11.95            13.73
business        2.99            13.73
business       19.99            13.73
mod_cook       19.99            11.49
mod_cook        2.99            11.49
UNDECIDED       NULL             NULL
popular_comp   22.95            21.48
popular_comp   20.00            21.48
popular_comp    NULL            21.48
psychology     21.59            13.50
psychology     10.95            13.50
psychology      7.00            13.50
psychology     19.99            13.50
psychology      7.99            13.50
trad_cook      20.95            15.96
trad_cook      11.95            15.96
trad_cook      14.99            15.96

 (18 rows affected)
```

3. The way Transact-SQL extended columns are handled can make it look as if a query is ignoring a **where** clause. This query computes the average prices using only those rows that satisfy the **where** clause, but it also displays rows that do not match the **where** clause.

   The SAP ASE server first builds a worktable containing only the type and aggregate values using the **where** clause. This worktable is joined back to the `titles` table in the grouping column `type` to include the `price` column in the results, but the **where** clause is *not* used in the join.

   The only row in `titles` that is not in the results is the lone row with `type` = "UNDECIDED" and a NULL price, that is, a row for which there were no results in the worktable. If you also want to eliminate the rows from the displayed results that have prices of less than $10.00, you must add a **having** clause that repeats the **where** clause, as shown in Example 4:

```
select type, price, avg (price)
from titles
where price > 10.00
group by type
```

```
type           price
------------ ---------------- --------------
business        19.99            17.31
business        11.95            17.31
business         2.99            17.31
business        19.99            17.31
mod_cook        19.99            19.99
mod_cook         2.99            19.99
popular_comp    22.95            21.48
popular_comp    20.00            21.48
popular_comp     NULL            21.48
psychology      21.59            17.51
psychology      10.95            17.51
psychology       7.00            17.51
psychology      19.99            17.51
psychology       7.99            17.51
trad_cook       20.95            15.96
trad_cook       11.95            15.96
trad_cook       14.99            15.96

 (17 rows affected)
```

4. If you are specifying additional conditions, such as aggregates, in the **having** clause, also include all conditions specified in the **where** clause. The SAP ASE server appears to ignore any **where** clause conditions that are missing from the **having** clause:

```
select type, price, avg (price)
from titles
where price > 10.00
group by type
having price > 10.00
```

```
type           price
------------ ----------------  --------------
business       19.99            17.31
business       11.95            17.31
business       19.99            17.31
mod_cook       19.99            19.99
popular_comp   22.95            21.48
popular_comp   20.00            21.48
psychology     21.59            17.51
psychology     10.95            17.51
psychology     19.99            17.51
trad_cook      20.95            15.96
trad_cook      11.95            15.96
trad_cook      14.99            15.96

 (12 rows affected)
```

5. This is an example of a standard grouping query using a join between two tables. It groups by `pub_id`, then by `type` within each publisher ID, to calculate the vector aggregate for each row:

```
select p.pub_id, t.type, sum (t.total_sales)
from publishers p, titles t
where p.pub_id = t.pub_id
group by p.pub_id, t.type
```

```
pub_id  type
------  ------------  --------
0736    business       18722
0736    psychology      9564
0877    UNDECIDED       NULL
0877    mod_cook       24278
0877    psychology       375
0877    trad_cook      19566
1389    business       12066
1389    popular_comp   12875

 (8 rows affected)
```

It may seem that it is only necessary to specify **group by** for the `pub_id` and `type` columns to produce the results, and add extended columns as follows:

```
select p.pub_id, p.pub_name, t.type,
    sum (t.total_sales)
from publishers p, titles t
where p.pub_id = t.pub_id
group by p.pub_id, t.type
```

However, the results for the above query are much different from the results for the first query in this example. After joining the two tables to determine the vector aggregate in a worktable, the SAP ASE server joins the worktable to the table (`publishers`) of the extended column for the final results. Each extended column from a different table invokes an additional join.

As you can see, using the extended column extension in queries that join tables can easily produce results that are difficult to comprehend. In most cases, use the standard **group by** to join tables in your queries.

6. This example uses the Transact-SQL extension to **group by** to include columns that are not in the select list. Both the `pub_id` and `type` columns are used to group the results for the vector aggregate. However, the final results do not include the type within each publisher. In this case, you may only want to know how many distinct title types are sold for each publisher:

```
select p.pub_id, sum (t.total_sales)
from publishers p, titles t
where p.pub_id = t.pub_id
group by p.pub_id, t.type
```

```
pub_id
------  --------
0736       18722
0736        9564
0877        NULL
0877        24278
0877          375
0877        19566
1389        12066
1389        12875

 (8 rows affected)
```

7. This example combines two Transact-SQL extension effects. First, it omits the **group by**clause while including an aggregate in the select list. Second, it includes an extended column. By omitting the **group by** clause:
   - The table becomes a single group. The scalar aggregate counts three qualified rows.
   - `pub_id` becomes a Transact-SQL extended column because it does not appear in a **group by** clause. No **having** clause is present, so all rows in the group are qualified to be displayed.

```
select pub_id, count (pub_id)
from publishers
```

```
pub_id
---------- ---------
0736               3
0877               3
1389               3

 (3 rows affected)
```

8. The **where** clause excludes publishers with a `pub_id` of 1000 or more from the single group, so the scalar aggregate counts two qualified rows. The extended column `pub_id` displays all qualified rows from the `publishers` table:

```
select pub_id, count (pub_id)
from publishers
where pub_id < "1000"
```

```
pub_id
-------------- -----------
0736                    2
0877                    2
1389                    2

 (3 rows affected)
```

9. This example illustrates an effect of a **having** clause used without a **group by** clause.
   - The table is considered a single group. No **where** clause excludes rows, so all the rows in the group (table) are qualified to be counted.
   - The rows in this single-group table are tested by the **having** clause.
   - These combined effects display the two qualified rows.

```
select pub_id, count (pub_id)
from publishers
having pub_id < "1000"
```

```
pub_id
-------------- ---------
0736                   3
0877                   3
 (2 rows affected)
```

10. This example uses the extension to **having** that allows columns or expressions not in the select list and not in the **group by** clause. It determines the average price for each title type, but it excludes those types that do not have more than $10,000 in total sales, even though the **sum** aggregate does not appear in the results:

```
select type, avg (price)
from titles
group by type
having sum (total_sales) > 10000
```

```
type
------------  ----------
business           13.73
mod_cook           11.49
popular_comp       21.48
trad_cook          15.96
```

```

 (4 rows affected)
```

group by and having Clauses and Sort Orders

If your server has a case-insensitive sort order, **group by** ignores the case of the grouping columns.

For example, given this data on a case-insensitive server:

```
select lname, amount
from groupdemo
```

```
lname           amount
---------- ------------------
Smith                10.00
smith                 5.00
SMITH                 7.00
Levi                  9.00
Lévi                 20.00
```

grouping by `lname` produces these results:

```
select lname, sum (amount)
from groupdemo
```

```
lname
---------- ----------------
Levi                  9.00
Lévi                 20.00
Smith                22.00
```

The same query on a case- and accent-insensitive server produces these results:

```
 lname
 ---------- ------------------
 Levi                  29.00
 Smith                 22.00
```

How group by Works With the Optimizer

There are two possible algorithms (implemented as operators) for doing **group by**: GroupHashing and GroupSorted. The optimizer chooses which operator to use based on factors such as the requirements these operators place on the input data streams.

The GroupSorted operator requires that the input rows to be aggregated are already sorted on the group by columns. Since the input rows must be sorted, the optimizer uses either of the following:

- An index on the **order by** columns to read the rows from the source table, and the maximum width of the group by columns is limited by the maximum width of an index key, which depends upon the database page size.
- Asort operator to order the rows on the group by columns before they are processed by the GroupSorted operator. The **group by** columns and the columns to be aggregated must fit into a worktable, so the maximum width of the **group by** columns is limited to the

maximum row size on a database page, minus the width of the columns to be aggregated. The maximum group by column width is limited by the database page size.

The optimizer uses the GroupHashing operator if ordering on the **group by** columns is not available or the row size limitations of the GroupSorted operator are exceeded. The GroupHashing operator applies a hashing function to the values of the group by columns to be able to put rows with the same group by column values into the same hash bucket. Once the input rows have all been hashed into buckets, the rows in the buckets are aggregated to generate the group by results. The only limitation of the GroupHashing operator is that the total row size of group by columns and aggregate results cannot be larger than 64K. There is no limitation on the number of group by columns or the number of aggregation operations, just the total row width.

if...else

Imposes conditions on the execution of a SQL statement.

Syntax

```
if logical_expression [plan "abstract plan"]
    statements
```

```
[else
    [if logical_expression] [plan "abstract plan"]
        statement]
```

Parameters

- ***logical_expression* –** is an expression (a column name, a constant, any combination of column names and constants connected by arithmetic or bitwise operators, or a subquery) that returns TRUE, FALSE, or NULL. If the expression contains a **select** statement, you must enclose the **select** statement in parentheses.
- **plan "*abstract plan*" –** specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. Plans can be specified only for optimizable SQL statements, that is, **select** queries that access tables. See *Creating and Using Abstract Plans* in the *Performance and Tuning Guide: Optimizer and Abstract Plans*.
- ***statements* –** is either a single SQL statement or a block of statements delimited by **begin** and **end**.

Examples

- **Example 1 –** Prints “yes” if 3 is larger than 2:

```
if 3 > 2
    print "yes"
```

- **Example 2 –** Tests for the presence of authors whose postal codes are 94705, then prints “Berkeley author” for the resulting set:

```
if exists (select postalcode from authors
    where postalcode = "94705")
    print "Berkeley author"
```

- **Example 3 –** Tests for the presence of user-created objects (all of which have ID numbers greater than 100) in a database. Where user tables exist, the **else** clause prints a message and selects their names, types, and ID numbers:

```
if (select max (id) from sysobjects) < 100
    print "No user-created objects in this database" else
 begin
    print "These are the user-created objects"
    select name, type, id
    from sysobjects
    where id > 100
 end
```

- **Example 4 –** Since the value for total sales for PC9999 in the `titles` table is NULL, this query returns FALSE. The **else** portion of the query is performed when the **if** portion returns FALSE or NULL. For more information on truth values and logical expressions, see *Expressions* in *Reference Manual: Building Blocks*.

```
if (select total_sales
    from titles
    where title_id = "PC9999") > 100
select "true"
else
select "false"
```

Usage

- The statement following an **if** keyword and its condition is executed if the condition is satisfied (when the logical expression returns TRUE). The optional **else** keyword introduces an alternate SQL statement that executes when the **if** condition is not satisfied (when the logical expression returns FALSE).
- The **if** or **else** condition affects the performance of only a single SQL statement, unless statements are grouped into a block between the keywords **begin** and **end** (see Example 3).

  The statement clause can be an **execute** command or any other legal SQL statement or statement block.
- If a **select** statement is used as part of the Boolean expression, it must return a single value.
- **if...else** constructs can be used either in a stored procedure (where they are often used to test for the existence of some parameter) or in *ad hoc* queries (see Examples 1 and 2).
- **if** tests can be nested either within another **if** or following an **else**. The maximum number of **if** tests you can nest varies with the complexity of any **select** statements (or other language constructs) that you include with each **if...else** construct.

Note: When an **alter table**, **create table**, or **create view** command occurs within an **if...else** block, the SAP ASE server creates the schema for the table or view before determining whether the condition is true. This may lead to errors if the table or view already exists.

- If you create tables with `varchar`, `nvarchar`, `univarchar`, or `varbinary` columns whose total defined width is greater than the maximum allowed row size, a warning message appears, but the table is created. If you try to insert more than the maximum number bytes into such a row, or to **update** a row so that its total row size is greater than the maximum length, the SAP ASE server produces an error message, and the command fails.

Note: When a **create table** command occurs within an **if...else** block or a **while** loop, the SAP ASE server creates the schema for the table before determining whether the condition is true. This may lead to errors if the table already exists. To avoid this situation, either make sure a view with the same name does not already exist in the database or use an **execute** statement, as follows:

```
if not exists
     (select * from sysobjects where name="my table")
begin
execute ("create table mytable (x int)")
end
```

For dynamically executing Transact-SQL:

- When used with the *string* or *char_variable* options, **execute** concatenates the supplied strings and variables to execute the resulting Transact-SQL command. This form of the **execute** command may be used in SQL batches, procedures, and triggers.
- You cannot supply *string* and *char_variable* options to execute the following commands: **use**, **exec(*string*)** (not the **execute** stored procedure), **connect**, **begin transaction**, **rollback**, **commit**, and **dbcc**.
- *string* and *char_variable* options can be concatenated to create new tables. Within the same SQL batch or procedure, however, the table created with **execute** is visible only to other **execute** commands. After the SQL batch or procedure has completed, the dynamically created table is persistent and visible to other commands.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **if...else**.

See also

- *if...else* on page 470
- *while* on page 719

- *begin...end* on page 82
- *create procedure* on page 169

insert

Adds new rows to a table or view.

Syntax

```
insert [into] [database.[owner.]]{table_name|view_name}
    [(column_list)]
    {values (expression [, expression]...)
        |select_statement [plan "abstract plan"]}
```

Parameters

- **into –** is optional.
- ***table_name* | *view_name* –** is the name of the table or view from which you want to remove rows. Specify the database name if the table or view is in another database, and specify the owner’s name if more than one table or view of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.
- ***column_list* –** is a list of one or more columns to which data is to be added. Enclose the list in parentheses. The columns can be listed in any order, but the incoming data (whether in a **values** clause or a **select** clause) must be in the same order. If a column has the IDENTITY property, you can substitute the **syb_identity** keyword for the actual column name.

  The column list is necessary when some, but not all, of the columns in the table are to receive data. If no column list is given, the SAP ASE server assumes that the **insert** affects all columns in the receiving table (in **create table** order).
- **values –** introduces a list of expressions.
- ***expression* –** specifies constant expressions, variables, parameters, or null values for the indicated columns. Enclose character and datetime constants in single or double quotes.

  You cannot use a subquery as an *expression*.

  The values list:

  - Must be enclosed in parentheses
  - Must match the explicit or implicit column list
  - Can use “default” as a value

  See *System and User-Defined Datatypes* in *Reference Manual: Building Blocks* for more information about data entry rules.
- ***select_statement* –** is a standard **select** statement used to retrieve the values to be inserted.
- **plan "*abstract plan*" –** specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. Plans can only be specified for

insert...select statements. See *Creating and Using Abstract Plans* in the *Performance and Tuning Guide: Optimizer and Abstract Plans* for more information.

Examples

- **Example 1 –**

```
insert titles
values ("BU2222", "Faster!", "business", "1389",
    null, null, null, "ok", "06/17/87", 0)
```

- **Example 2 –**

```
insert titles
 (title_id, title, type, pub_id, notes, pubdate,
    contract)
values ('BU1237', 'Get Going!', 'business',
    '1389', 'great', '06/18/86', 1)
```

- **Example 3 –**

```
insert newauthors
    select *
    from authors
    where city = "San Francisco"
```

- **Example 4 –**

```
insert test
    select *
    from test
    where city = "San Francisco"
```

- **Example 5 –**

```
insert table1 (col1, col2, col3, col4)
    values (10, 4, default, 34)
```

Usage

- Use **insert** only to add new rows. Use **update** to modify column values in a row you have already inserted.
- When inserting into text, unitext, and image columns, an **insert** of a NULL into a `text` , or`text`, or an `image` column simply allocates space for a text pointer. Use **update** to get a valid text pointer for that column.
- You can define a trigger that takes a specified action when an **insert** command is issued on a specified table.
- You can send an **insert** as a language event or as a parameterized dynamic statement to remote servers.

See also:

- *System and User-Defined Datatypes* in *Reference Manual: Building Blocks*

- **sp_bindefault**, **sp_bindrule**, **sp_help**, **sp_helpartition**, **sp_unbindefault**, **sp_unbindrule** in *Reference Manual: Procedures*
- **bcp** in the *Utility Guide*

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The following are Transact-SQL extensions:

- A **union** operator in the select portion of an **insert** statement.
- Qualification of a table or column name by a database name.
- Insertion through a view that contains a join.

Note: The FIPS flagger does not detect insertions through a view that contains a join.

Permissions

The permission checks for **insert** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner or a user with `insert` permissionon the table. Only the table owner or user with insert and **identity_insert** permissions can insert for the table's `IDENTITY` column.
Disabled	With granular permissions disabled, you must be the table owner or a user with **sa_role**. **insert** permission defaults to the table owner. **insert** permission for a table's IDENTITY column is limited to the table owner, database owner, and system administrator.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	41
Audit option	**insert**
Command or access audited	**insert** into a table

Information	Values
Information in `extra-info`	• *Roles* – current active roles • *Keywords or options*– if: • **insert** – **INSERT** • **select into** – **INSERT INTO** followed by the fully qualified object name • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

Information	Values
Event	42
Audit option	**insert**
Command or access audited	**insert** into a view
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **INSERT** • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a **set proxy** is in effect

See also

- *alter table* on page 43
- *create default* on page 117
- *create index* on page 140
- *create rule* on page 195
- *create table* on page 207
- *create trigger* on page 253
- *dbcc* on page 278
- *delete* on page 310
- *select* on page 579
- *update* on page 680

The Column List

The column list determines the order in which values are entered.

For example, suppose that you have a table called `newpublishers` that is identical in structure and content to the `publishers` table in `pubs2`. In the example below, the columns in the column list of the `newpublishers` table match the columns of the select list in the `publishers` table.

```
insert newpublishers (pub_id, pub_name)
select pub_id, pub_name
    from publishers
    where pub_name="New Age Data"
```

The `pub_id` and `pub_name` for “New Age Data” are stored in the `pub_id` and `pub_name` columns of `newpublishers`.

In the next example, the order of the columns in the column list of the `newpublishers` table does not match the order of the columns of the select list of the `publishers` table.

```
insert newpublishers (pub_id, pub_name)
    select pub_name, pub_id
    from publishers
    where pub_name="New Age Data"
```

The result is that the `pub_id` for “New Age Data” is stored in the `pub_name` column of the `newpublishers` table, and the `pub_name` for “New Age Data” is stored in the `pub_id` column of the `newpublishers` table.

You can omit items from the column and values lists as long as the omitted columns allow null values (see Example 2).

Validating Column Values

There are a variety of ways you can validate column values.

insert interacts with the **ignore_dup_key**, **ignore_dup_row**, and **allow_dup_row** options, which are set with the **create index** command.

A rule or **check** constraint can restrict the domain of legal values that can be entered into a column. Rules are created with the **create rule** command and bound with **sp_bindrule**. **check** constraints are declared with **create table**.

A default can supply a value if you do not explicitly enter one. Defaults are created with the **create default** command and bound with **sp_bindefault**, or they are declared with **create table**.

If an **insert** statement violates domain or integrity rules (see **create rule** and **create trigger**), or if it is the wrong datatype (see **create table** and *System and User-Defined Datatypes* in *Reference Manual: Building Blocks*), the statement fails, and the SAP ASE server displays an error message.

See **create index** for more information.

Treatment of Blanks

Empty strings, or blanks, are handled differently, depending on the datatype.

Inserting an empty string ("") into a variable character type or `text` column inserts a single space. `char` columns are padded to the defined length.

All trailing spaces are removed from data that is inserted into `varchar` and `univarchar` columns, except in the case of a string that contains only spaces. Strings that contain only spaces are truncated to a single space. Strings that are longer than the specified length of a `char`, `nchar`, `unichar`, `univarchar`, `varchar`, or `nvarchar` column are silently truncated unless the **string_rtruncation** option is set to **on**.

Inserting Rows Selected from Another Table

You can select rows from a table and insert them into the same table in a single statement.

To insert data with **select** from a table that has null values in some fields into a table that does not allow null values, provide a substitute value for any NULL entries in the original table. For example, to insert data into an `advances` table that does not allow null values, substitute 0 for the NULL fields:

```
insert advances
select pub_id, isnull (advance, 0) from titles
```

Without the **isnull** function, this command inserts all the rows with non-null values into the `advances` table, which produces error messages for all the rows where the `advance` column in the `titles` table contained NULL.

If you cannot make this kind of substitution for your data, you cannot insert data containing null values into the columns that have a **not null** specification.

Two tables can be identically structured, and yet be different as to whether null values are permitted in some fields. Use **sp_help** to see the null types of the columns in your table.

Inserting Rows in Bulk

The **ins_by_bulk** parameter improves performance by directly inserting data rows into newly allocated data pages by bulk for tables. You can set **ins_by_bulk** at the query level using the abstract plan for a specific insert statement.

The **ins_by_bulk** parameter improves performance by directly inserting data rows into newly allocated data pages by bulk for tables. You can set **ins_by_bulk** at the query level using the abstract plan for a specific insert statement.

The syntax is:

```
insert into. . .
select . . .
plan "(use ins_by_bulk on)"
```

For example:

```
insert into my_salesdetail (stor_id, ord_num, title_id, qty,
discount)
select stor_id, ord_num, title_id, qty, discount from salesdetail
where qty > 100
plan '(use ins_by_bulk on)'
```

Transactions and insert

When you set chained transaction mode, the SAP ASE server implicitly begins a transaction with the **insert** statement if no transaction is currently active. To complete any inserts, you must commit the transaction, or roll back the changes.

For example:

```
insert stores (stor_id, stor_name, city, state)
  values ('999', 'Books-R-Us', 'Fremont', 'AZ')
if exists (select t1.city
  from stores t1, stores t2
  where t1.city = t2.city
  and t1.state = t2.state
  and t1.stor_id < t2.stor_id)
    rollback transaction
else
    commit transaction
```

In chained transaction mode, this batch begins a transaction and inserts a new row into the `stores` table. If it inserts a row containing the same city and state information as another store in the table, it rolls back the changes to `stores` and ends the transaction. Otherwise, it commits the insertions and ends the transaction. For more information about chained transaction mode, see the *Transact-SQL User's Guide*.

Inserting Values into IDENTITY Columns

When inserting a row into a table, do not include the name of the IDENTITY column in the column list or its value in the values list. If the table consists of only one column, an IDENTITY column, omit the column list and leave the values list empty.

```
insert id_table values ()
```

- The first time you insert a row into a table, the SAP ASE server assigns the IDENTITY column a value of 1. Each new row gets a column value that is one higher than the last. This value takes precedence over any defaults declared for the column in the **create table** or **alter table** statement or defaults bound to the column with **sp_bindefault**.

  Server failures can create gaps in IDENTITY column values. The maximum size of the gap depends on the setting of the **identity burning set factor** configuration parameter. Gaps can also result from manual insertion of data into the IDENTITY column, deletion of rows, and transaction rollbacks.
- The table owner or user with insert permission on the table can explicitly insert a value into an IDENTITY column after setting **identity_insert *table_name* on** for the column's base table. Only table owner of user with **identity_insert** on the table can set **identity_insert**

table_name on for the table. A user can set **identity_insert *table_name* on** for one table at a time in a database. When **identity_insert** is **on**, each **insert** statement must include a column list and must specify an explicit value for the IDENTITY column.

Inserting a value into the IDENTITY column allows you to specify a seed value for the column or to restore a row that was deleted in error. Unless you have created a unique index on the IDENTITY column, the SAP ASE server does not verify the uniqueness of the value; you can insert any positive integer.

To insert an explicit value into an IDENTITY column, the table owner, database owner, or system administrator must set **identity_insert *table_name* on** for the column's base table, not for the view through which it is being inserted.

- The maximum value that can be inserted into an IDENTITY column is $10^{precision}$ - 1 for a numeric. For integer identities, it is the maximum permissible value of its type (such as 255 for `tinyint`, 32767 for `smallint`). Once an IDENTITY column reaches this value, any additional **insert** statements return an error that aborts the current transaction.

  When this happens, use the **create table** statement to create a new table that is identical to the old one, but that has a larger precision for the IDENTITY column. Once you have created the new table, use either the **insert** statement or the **bcp** utility to copy the data from the old table to the new one.
- Use the *@@identity* global variable to retrieve the last value that you inserted into an IDENTITY column. If the last **insert** or **select into** statement affected a table with no IDENTITY column, *@@identity* returns the value 0.
- An IDENTITY column selected into a result table observes the following rules with regard to inheritance of the IDENTITY property:
  - If an IDENTITY column is selected more than once, it is defined as **not null** in the new table. It does not inherit the IDENTITY property.
  - If an IDENTITY column is selected as part of an expression, the resulting column does not inherit the IDENTITY property. It is created as **null** if any column in the expression allows nulls; otherwise, it is created as **not null**.
  - If the select statement contains a **group by** clause or aggregate function, the resulting column does not inherit the IDENTITY property. Columns that include an aggregate of the IDENTITY column are created **null**; others are created **not null**.
  - An IDENTITY column that is selected into a table with a union or join does not retain the IDENTITY property. If the table contains the union of the IDENTITY column and a **null** column, the new column is defined as **null**; otherwise, it is defined as **not null**.

Inserting Data Through Views

If you create a view using **with check option**, each row that is inserted through the view must meet the selection criteria of the view.

For example, the `stores_cal` view includes all rows of the `stores` table for which `state` has a value of "CA":

```
create view stores_cal
as select * from stores
```

```
where state = "CA"
with check option
```

The **with check option** clause checks each **insert** statement against the view's selection criteria. Rows for which `state` has a value other than "CA" are rejected.

If a view is created **with check option**, all views derived from the *base* view must satisfy the view's selection criteria. Each new row inserted through a derived view must be visible through the base view.

Consider the view `stores_cal30`, which is derived from `stores_cal`. The new view includes information about stores in California with payment terms of "Net 30:"

```
create view stores_cal30
as select * from stores_cal
where payterms = "Net 30"
```

Because `stores_cal` was created **with check option**, all rows inserted or updated through `stores_cal30` must be visible through `stores_cal`. Any row with a `state` value other than "CA" is rejected.

`stores_cal30` does not have a **with check option** clause of its own. This means you can insert or update a row with a `payterms` value other than "Net 30" through `stores_cal30`. The following **update** statement would be successful, even though the row would no longer be visible through `stores_cal30`:

```
update stores_cal30
set payterms = "Net 60"
where stor_id = "7067"
```

insert statements are not allowed on join views created **with check option.**

If you insert or update a row through a join view, all affected columns must belong to the same base table.

Partitoning Tables for Improved Insert Performance

An unpartitioned table with no clustered index consists of a single doubly linked chain of database pages, so each insertion into the table uses the last page of the chain. The SAP ASE server holds an exclusive lock on the last page while it inserts the rows, blocking other concurrent transactions from inserting data into the table.

Partitioning a table with the **partition** clause of the **alter table** command creates additional page chains. Each chain has its own last page, which can be used for concurrent insert operations. This improves insert performance by reducing page contention. If the table is spread over multiple physical devices, partitioning also improves insert performance by reducing I/O contention while the server flushes data from cache to disk. For more information about partitioning tables for insert performance, see *Controlling Physical Data Placement* in *Performance and Tuning Guide: Basics*.

kill

Kills a process.

Syntax

```
kill spid [with (statusonly | force)]
```

Parameters

- ***spid*** **–** is the identification number of the process you want to kill. *spid* must be a constant; it cannot be passed as a parameter to a stored procedure or used as a local variable. Use **sp_who** to see a list of processes and other information.
- **with (statusonly | force) –**
    - **statusonly** – reports on the progress of a server process ID (**spid**) in rollback status. It does not terminate the **spid**. The **statusonly** report displays the percent of rollback completed and the estimated length of time in seconds before the rollback completes.
    - **force** – allows you to forcibly terminate the process when you cannot terminate it using the regular **kill *spid*** command.

Examples

- **Example 1 –** Kills process number 1378:

  ```
  kill 1378
  ```

- **Example 2 –** Reports on the process of the rollback of **spid** number 13:

  ```
  kill 13 with statusonly
  ```

  ```
  spid: 13 Transaction rollback in progress. Estimated rollback
  completion:17%
  Estimated time left: 13 seconds
  ```

  To track the progress of a rollback, you must run **kill...with statusonly** multiple times. If the rollback of the spid has completed when you issue **kill...statusonly** or if the SAP ASE server is not rolling back the specified spid, **kill...statusonly** returns the following message:

  ```
  Status report cannot be obtained. KILL spid:nn is not
  in progress.
  ```

- **Example 3 –** Terminates spid 16:

  ```
  kill 16 with force
  ```

Usage

- Execute **sp_who** to get a report on the current processes, such as:

```
fid spid status     loginame origname hostname blk dbname   cmd
--- ---- --------   -------- -------- -------- --- ------   -----
------
 0   1  recv sleep  bird     bird     jazzy     0   master  AWAIT
ING COMMAND
 0   2  sleeping    NULL     NULL               0   master  NETWO
RK HANDLER
 0   3  sleeping    NULL     NULL               0   master  MIRRO
R HANDLER
 0   4  sleeping    NULL     NULL               0   master  AUDIT
 PROCESS
 0   5  sleeping    NULL     NULL               0   master  CHECK
POINT SLEEP
 0   6  recv sleep  rose     rose     petal     0   master  AWAIT
ING COMMAND
 0   7  running     robert   sa       helos     0   master  SELECT
 0   8  send sleep  daisy    daisy    chain     0   pubs2   SELECT
 0   9  alarm sleep lily     lily     pond      0   master  WAITFOR
 0  10  lock sleep  viola    viola    cello     7   pubs2   SELECT
```

The `spid` column contains the process identification numbers used in the Transact-SQL **kill** command. The `blk` column contains the process ID of a blocking process, if there is one. A blocking process (which may have an exclusive lock) is one that is holding resources that are needed by another process. In this example, process 10 (a **select** on a table) is blocked by process 7 (a **begin transaction** followed by an **insert** on the same table).

The `status` column reports the state of the command. The status values and the effects of **sp_who** are:

Status	Description	Effect of kill command
`recv sleep`	Waiting on a network read.	Immediate.
`send sleep`	Waiting on a network send.	Immediate.
`alarm sleep`	Waiting on an alarm, such as **waitfor delay "10:00"**.	Immediate.
`lock sleep`	Waiting on a lock acquisition.	Immediate.
`sleeping`	Waiting on disk I/O or some other resource. Probably indicates a process that is running, but doing extensive disk I/O.	Process is killed when it “wakes up;” usually immediately. A few sleeping processes do not wake up, and require an SAP ASE restart to clear.

Status	Description	Effect of **kill** command
`runnable`	In the queue of runnable processes.	Immediate.
`running`	Actively running on one of the server engines.	Immediate.
`infected`	The SAP ASE server has detected a serious error condition; extremely rare.	**kill** command not recommended. A SAP ASE server restart is probably required to clear the process.
`background`	A process, such as a threshold procedure, run by an SAP ASE server rather than by a user process.	Immediate; use **kill** with extreme care. Recommend a careful check of `sysprocesses` before killing a background process.
`log suspend`	Processes suspended by reaching the last-chance threshold on the log.	Immediate.

- To get a report on the current locks and the *spid*s of the processes holding them, use **sp_lock**.
- In a clustered environment, a privileged Kerberos user can use the **kill** command to stop the spid for a DBMS task on a remote instance.
- SAP ASE issues this message if you use **with force** to terminate a spid that holds spinlocks:

```
You cannot kill spid 'spid_number' with force option as it is
holding spinlock(s).
```

- *spid* must be a constant; it cannot be passed as a parameter to a stored procedure or used as a local variable.

See also **sp_lock**, **sp_who** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **kill** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have the `kill` privilege to kill you own process, and have the `kill any process` privilege to kill another user's processes.
Disabled	With granular permissions disabled, you must be a user with **sa_role**. **kill** privilege is not transferable.

See also

- *shutdown* on page 660

load database

Loads a backup copy of a user database, including its transaction log, that was created with **dump database**, as well as materializes archive databases that have been loaded with a database dump.

The target platform of a **load database** operation need not be the same platform as the source platform where the **dump database** operation occurred. **dump database** and **load database** are performed from either a big endian platform to a little endian platform, or from a little endian platform to a big endian platform.

See *Using Backup Server with IBM Tivoli Storage Manager* for the **load database** syntax when the Tivoli Storage Manager is licensed at your site.

Syntax

Makes a routine database load:

```
load database database_name cumulative
    from [compress::[compression_level::]]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]
        with verify only [= header | full | crc]
    [stripe on stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]
    [[stripe on stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]]...]
    [with {
        listonly=load_sql | create_sql,
        density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name,
        [dismount | nodismount],
        [nounload | unload],
        passwd = password,
        until_time = datetime,
        notify = {client | operator_console},
        [override]}]]
```

Returns header or file information without loading the backup:

```
load database database_name
    from [compress::]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]
    [stripe on [compress::]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]
    [[stripe on [compress::]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]]...]
    [with {
        density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name,
        [dismount | nodismount],
        [nounload | unload],
        passwd = password,
        listonly [= full],
        headeronly,
        notify = {client | operator_console},
        verify[only]=crc
        }]]
```

Materializes an archive database:

```
load database database_name
    from dump_device
    [ [stripe on stripe_device] ... ]
    [with [norecovery,][passwd=password]
```

Generates a sequence of **load database** SQL statements to restore a database to a specified point in time:

```
load database database_name
    [from stripe_device]
    with listonly=[load_sql | create_sql | volume]
```

Loads a copy of the database when the Tivoli Storage Manager is licensed at your site:

```
load database database_name
    from syb_tsm::[[-S source_sever_name][-D source_database_name]
        ::]object_name [blocksize = number_bytes]
    [stripe on syb_tsm::[[-S source_sever_name]
        [-D source_database_name]::]object_name
        [blocksize = number_bytes]]
    [[stripe on syb_tsm::[[-S source_sever_name]
        [-D source_database_name]::]object_name
        [blocksize = number_bytes]]...]
    [with {
        blocksize = number_bytes,
        passwd = password,
        listonly [= full],
        headeronly,
        notify = {client | operator_console},
        [[verifyonly | verify] [= header | full]]
        } ]
```

Parameters

- ***database_name* –** is the name of the database to receive the backup copy. It can be either a database created with the **for load** option, or an existing database. Loading dumped data to an existing database overwrites all existing data. The receiving database must be at least as large as the dumped database. The database name can be specified as a literal, a local variable, or a stored procedure parameter.

  For archive databases, *database_name* is the name of the archive database into which you want to load.
- **cumulative –** load a backup created with the dump database cumulative keyword.
- **compress:: –** invokes the decompression of the archived database. For more information about the **compress** option, see *Backing Up and Restoring User Databases* in the *System Administration Guide*.

  Note: You should use the native **"compression = *compress_level*"** option over the older **"compress::*compression_level*"** option. If you use the native option for **dump database**, you do not need to use **"compress::*compression_level*"** when loading your database.
- **from *dump_device* –** specifies the name of the disk database dump from which you want to load the dump.
- **from *stripe_device* –** is the device from which data is being loaded. For a list of supported dump devices, see the SAP ASE installation and configuration guides.
- **at *backup_server_name* –** is the name of a remote Backup Server running on the machine to which the dump device is attached. For platforms that use interfaces files, the *backup_server_name* must appear in the interfaces file.
- **listonly = [load_sql | create_sql | volume] –** generates the following:

  - **load_sql** – sequence of **load database** or **load transaction** SQL commands to perform restore to a specified point in time.

    Do not use the `from` clause when using **with listonly=load_sql**; the server displays an error and the **load database** command does not execute.
  - **create_sql** – displays the sequence of **disk init**/**sp_cacheconfig**, **disk init**, **create**/**alter database**, and the **create**/**alter database** sequence from the latest dump image obtained from the backup history.

When you use **with listonly=create_sql** when loading a database from a stripe device, this option displays **disk init**/**sp_cacheconfig**, **disk init**, **create**, or **alter database** sequence from the dump image.

- **volume** – displays volume information from the dump image.

Note: To use the **listonly = create_sql** and **listonly = load_sql** parameters, you must first turn on the **sp_configure enable dump history** parameter:

```
sp_config "enable dump history" 1
```

- **density =** ***density_value*** **–** is ignored. See **dump database**.
- **blocksize =** ***number_bytes*** **–** overrides the default block size for a dump device. If you specify a block size on UNIX systems, it should be identical to that used to make the dump. See **dump database**.
- **dumpvolume =** ***volume_name*** **–** is the volume name field of the ANSI tape label. **load database** checks this label when the tape is opened and generates an error message if the wrong volume is loaded.

Note: When using **load database**, the **dumpvolume** option does not provide an error message if an incorrect file name is given for the **file=*filename*** option. The backup server searches the entire tape looking for that file, regardless of an incorrect tape mounted.

- **file =** ***file_name*** **–** is the name of a particular database dump on the tape volume. If you did not record the dump file names when you made the dump, use **listonly** to display information about all dump files.
- **stripe on** ***stripe_device*** **–** is an additional dump device. You can use up to 32 devices, including the device named in the **to *stripe_device*** clause. The Backup Server loads data from all devices concurrently, reducing the time and the number of volume changes required.
- **dismount | nodismount –** (on platforms that support logical dismount) determines whether tapes remain mounted. By default, all tapes used for a load are dismounted when the load completes. Use **nodismount** to keep tapes available for additional loads or dumps.
- **nounload | unload –** determines whether tapes rewind after the load completes. By default, tapes do not rewind, allowing you to make additional loads from the same tape volume. Specify **unload** for the last dump file to be loaded from a multidump volume. This rewinds and unloads the tape when the load completes.
- **with [norecovery,] –** indicates when materializing an archive database that the **load database** command does not run recovery, and that the database is brought online automatically after the **load database** command has completed.
- **passwd =** ***password*** **–** is the password you provided to protect the dump file from unauthorized users. The password must be between 6 and 30 characters long. You cannot use variables for passwords. For rules on passwords, see *Managing Adaptive Server Logins, Database Users, and Client Connections* in the *System Administration Guide, Volume 1.*
- **until_time =** ***datetime*** **–** generates a load sequence to load (to a specified point in time).

- **listonly [= full] –** displays information about all dump files on a tape volume, but *does not load the database*. **listonly** identifies the database and device, the date and time the dump was made, and the date and time it can be overwritten. **listonly = full** provides additional details about the dump. Both reports are sorted by ANSI tape label.

  After listing the files on a volume, the Backup Server sends a volume change request. The operator can either mount another tape volume or terminate the list operation for all dump devices.

  Due to current implementation, the **listonly** option overrides the **headeronly** option.

  Warning! Do not use **load database with listonly** on 1/4-inch cartridge tape.
- **with verify[only][=header | full | crc] –** performs a minimal header or structural row check on the data pages as they are being copied to the archives, but **does not load the database** . There are no structural checks done at this time to `gam`, `oam`, `allocation pages`, `indexes`, `text`, or `log` pages. The only other check is done on pages where the page number matches to the page header. Any faults found are reported in the **backupserver** error log

  Use **crc** to indicate that you are performing a cyclic redundancy check for accidental changes to raw data for compressed database or transaction dumps.
- **headeronly –** displays header information for a single dump file, but **does not load the database** . **headeronly** displays information about the first file on the tape unless you use the **file =** ***file_name*** option to specify another file name. The dump header indicates:
  - Type of dump (database or transaction log)
  - Database ID
  - File name
  - Date the dump was made
  - Character set
  - Sort order
  - Page count
  - Next object ID
- **notify = {client | operator_console} –** overrides the default message destination.
  - On operating systems that offer an operator terminal feature, volume change messages are always sent to the operator terminal on the machine on which the Backup Server is running. Use **client** to route other Backup Server messages to the terminal session that initiated the **dump database**.
  - On operating systems (such as UNIX) that do not offer an operator terminal feature, messages are sent to the client that initiated the **dump database**. Use **operator_console** to route messages to the terminal on which the Backup Server is running.
- **override –** you must use **with override** to successfully load the database containing encryption keys that encrypt columns in other databases.

- **syb_tsm::*object_name* –** is the keyword that invokes the libsyb_tsm.so module that enables communication between Backup Server and TSM.
- **-S *source_server_name* –** specifies the name of the source SAP ASE server when it is not the same as the target SAP ASE server. This parameter is required when the target server for the load operation is different from the source server used for the dump operation.
- **-D *source_database_name* –** specifies the name of the source database when it is not the same as the target database. This parameter is required when the target database for the load operation is different from the source database used for the dump operation.
- **verify[only]=crc –** performs a cyclic redundancy check as it loads the database.

Examples

- **Example 1 –** Reloads the database `pubs2` from a tape device:

```
load database pubs2
    from "/dev/nrmt0"
```

- **Example 2 –** Loads the `pubs2` database, using the Backup Server REMOTE_BKP_SERVER. This command names three devices:

```
load database pubs2
        from "/dev/nrmt4" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt5" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt0" at REMOTE_BKP_SERVER
```

- **Example 3 –** Loads the `pubs2` database from a compressed dump file called `dmp090100.dmp` located at `/opt/bin/Sybase/dumps`:

```
load database pubs2 from
    "compress::/opt/bin/Sybase/dumps/dmp090100.dmp"
```

- **Example 4 –** Loads the `key_db` database, which contains encryption keys. You must use **with override** if the encryption keys in `key_db` were used to encrypt columns in other databases:

```
load database key_db from "/tmp/key_db.dat" with override
```

- **Example 5 –** Loads the **testdb** database from "syb_tsm::obj1.2". See **dump database** for the associated **dump** command.

```
load database testdb from "syb_tsm::obj1.2"
stripe on "syb_tsm::obj1.2"
stripe on "syb_tsm::obj1.2"
stripe on "syb_tsm::obj1.2"
stripe on "syb_tsm::obj1.2"
```

- **Example 6 –** Loads the `pubs2` database from the TSM backup object "obj1.1" when the source database (`testdb`) of the associated **dump** command is different than the target database (`pubs2`) of the **load** command.

```
load database pubs2 from "syb_tsm::-D testdb::obj1.1"
```

- **Example 7 –** Creates database `testdb` on five database devices named testdata1, testdata2, testdata3, testlog4, and testlog5:

```
disk init name = 'testdata1', physname='/tmp/t_dat1',size='10M'
go
disk init name='testdata2',physname='/tmp/t_dat2',size='10M'
go
disk init name='testdata3',physname='/tmp/t_dat3',size='10M'
go
disk init name='testlog4',physname='/tmp/t_log4',size='10M'
go
disk init name='testlog5',physname='/tmp/t_log5',size='10M'
go
create database testdb on testdata1='10M', testdata2='8M',
testdata3='5M'
    log on testlog4='6M',testlog5 with override
go
alter database testdb on testdata3 = '5M'
go
alter database testdb log on testlog4 = '2M'
go
```

The dump of the database `testdb` is taken using `dump database`, which writes additional database device information in dump header.

```
dump database testdb to "test.dmp"
go
```

The load of the database **testdb** using the dump image `test.dmp` with the **with headeronly** option results in displaying dump header contents. This results in displaying additional information about the database devices:

```
1> load database testdb from "test.dmp" with headeronly
2> go

Backup Server: 6.28.1.1: Dumpfile name 'test1025109FD6   ' section
number 1
mounted on disk file '/punedbaccess3_dev3/kelkara/backupserver/
test.dmp'
…..
dbdevinfo: vdevno=1 devname=testdata1 path=/tmp/test1.dat
db_size=10485760 device_size=20967424
dbdevinfo: vdevno=2 devname=testdata2 path=/tmp/test2.dat
db_size=8388608 device_size=20967424
dbdevinfo: vdevno=3 devname=testdata3 path=/tmp/test3.dat
db_size=10485760 device_size=20967424
dbdevinfo: vdevno=4 devname=testlog4 path=/tmp/test4.dat
db_size=8388608 device_size=20967424
dbdevinfo: vdevno=5 devname=testlog5 path=/tmp/test5.dat
db_size=6291456 device_size=20967424
…..
```

The database device information consists of `vdevno`, `devname`, `path`, `db_size` and `device_size`. The `device_size` is the total size of device allocated at the time of **disk init** command. The `db_size` is the size of the device used by database `testdb`.The load of the database `testdb` using the dump image `test.dmp` with the **create_sqlgenddlonly** option displays sequence of **create**/**alter database** commands which can be used to create target database with same data/log segment layout as for the source database at the time of **dump** command. This output can be routed to a file so as to generate **isql** command script to create target the database:

```
1> load database test from "test.dmp" with
listonly=create_sql
2> go

DISK INIT
         name = 'testdata1'
         , physname = '/tmp/t_dat1'
         , size = '10M'
go
DISK INIT
         name = 'testdata2'
         , physname = '/tmp/t_dat2'
         , size = '10M'
go
DISK INIT
         name = 'testdata3'
         , physname = '/tmp/t_dat3'
         , size = '10M'
go
DISK INIT
         name = 'testlog4'
         , physname = '/tmp/t_log4'
         , size = '10M'
go
DISK INIT
         name = 'testlog5'
         , physname = '/tmp/t_log5'
         , size = '10M'
go

CREATE DATABASE testdb
ON testdata1 = '10M'
, testdata2 = '8M'
, testdata3 = '5M'
LOG ON  testlog4 = '6M'
, testlog5 = '6M'
go
ALTER DATABASE testdb
ON testdata3 = '5M'
LOG ON  testlog4 = '2M'
go
```

- **Example 8 –** Displays the load command sequence required to restore a specific database using the latest available dumps. The dump records from the dump history file are read to prepare the load sequence:

```
1> load database testdb with listonly=load_sql
2> go

LOAD DATABASE testdb FROM '/dumpdir/testdb_DB_1.1.dmp'
STRIPE ON '/dumpdir/testdb_DB_1.2.dmp'
STRIPE ON '/dumpdir/testdb_DB_1.3.dmp'
```

```
go
LOAD TRANSACTION testdb FROM '/dumpdir/testdb_XACT_2.dmp'
go
LOAD TRANSACTION testdb FROM '/dumpdir/testdb_XACT_3.dmp'
go
LOAD TRANSACTION testdb FROM '/dumpdir/testdb_XACT_4.1.dmp'
STRIPE ON '/dumpdir/testdb_XACT_4.2.dmp'
go
```

- **Example 9 –** Performs a cyclic redundancy check as it loads the `new_dump` database dump:

  ```
  load database new_dump from mydumpdev with verify[only]=crc
  ```

Usage

- If you use **sp_hidetext** followed by a cross-platform **dump** and **load**, you must manually drop and re-create all hidden objects.
- The **listonly** and **headeronly** options display information about the dump files without loading them.
- If you run **load database ... listonly=create_sql** from a database dump that includes a shrunken log device, the SAP ASE server may list an unknown device in the **create database** command. You can eliminate this unknown device from the **create database** command if you include the shrunken log device is on the last mapped segment and issue **dump database ... with shrink_log**.
- Dumps and loads are performed through Backup Server.
- To make sure databases are synchronized correctly so that all proxy tables have the correct schema to the content of the primary database you just reloaded, you may need to run the **alter database *dbname* for proxy_update** command on the server hosting the proxy database.

See also:

- *Backing Up and Restoring User Databases* in the *System Administration Guide*.
- **sp_helpdb**, **sp_helpdevice**, **sp_hidetext**, **sp_volchanged** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **load database** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the database owner, or a user with `load database` privilege or `own database` privilege on the database.
Disabled	With granular permissions disabled, you must be the database owner, or a user with any of these roles: • **sa_role**, or, • **replication_role**, or, • **oper_role**

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	43
Audit option	**load**
Command or access audited	**load database**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *Encrypted Columns and dump database* on page 390
- *dump database* on page 373
- *alter database* on page 1
- *dbcc* on page 278
- *dump transaction* on page 391
- *load transaction* on page 501
- *online database* on page 520

Commands and System Procedures to Restore Databases

Commands and system procedures for restoring databases from backups.

Command or System Procedure	Action
create database for load	Create a database for the purpose of loading a dump.
load database	Restore a database from a dump.
load transaction	Apply recent transactions to a restored database.
online database	Make a database available for public use after a normal load sequence or after upgrading the database to the current version of SAP ASE.
load {database | transaction} with {headeronly | listonly}	Identify the dump files on a tape.
sp_volchanged	Respond to the Backup Server volume change messages.

Restrictions for load database

Restrictions for using **load database**.

- CIS only – Any proxy tables in the database are part of the database save set. The content data of proxy tables is not included in the save; only the pointer is saved and restored.
- You can only load a database dump into a server with the same sort order as the source server.
- You cannot load a dump that was generated on a server earlier than version 12.5.4.
- If a database has cross-database referential integrity constraints, the `sysreferences` system table stores the *name*—not the ID number—of the external database. The SAP ASE server cannot guarantee referential integrity if you use **load database** to change the database name or to load it onto a different server.
- Each time you add or remove a cross-database constraint or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

  Warning! Loading earlier dumps of these databases can cause database corruption. Before dumping a database to load it with a different name or move it to another SAP ASE server, use **alter table** to drop all external referential integrity constraints.
- **load database** clears the suspect page entries pertaining to the loaded database from `master..sysattributes`.
- **load database** overwrites any existing data in the database.
- After a database dump is loaded, two processes may require additional time before the database can be brought online:
  - Backup Server zeroes the non-allocated pages that are in the source database's space map. This zeroing is embedded as part of the physical load, and happens during the load database.

    If the target database is larger than the source, then the space above the ceiling of the source database's space map is zeroed by the SAP ASE server after Backup Server has completed the load.

  - Recovery ignores transactions that completed before the checkpoint that was written by **dump database** at the start of its operation. Completed transactions in the active portion of the transaction log are rolled forward by recovery. In a load sequence, rollback of incomplete transactions happens at the end of that sequence, under **online database**.
- The receiving database must be as large as or larger than the database to be loaded. If the receiving database is too small, the SAP ASE server displays an error message that gives the required size.
- You cannot load from the null device (on UNIX, `/dev/null`).
- You cannot use **load database** in a user-defined transaction.
- Once you load a database, the SAP ASE server automatically identifies the endian type on the dump file and performs all necessary conversions while the **load database** and **online database** commands execute.

  After the SAP ASE server converts the index rows, the order of index rows may be incorrect. The SAP ASE server marks the following indexes on user tables as suspect indexes during execution of **online database**:
  - Nonclustered index on APL (all pages locked) table
  - Clustered index on DOL (data-only locked) table
  - Nonclustered index on DOL table

  During cross-platform dump and load operations, suspect partitions are handled as follows:
  - During the first **online database** command, after you execute **load database** across two platforms with different endian types, the hash partition is marked suspect.
  - Any global clustered index on a round-robin partition, which has an internally generated partition condition with a `unichar` or `univarchar` partition key, is marked suspect.
  - After the database is online, use **sp_post_xpload** to fix the suspect partitions and indexes.

  Note: See *Reference Manual: Procedures* for information about checking and rebuilding indexes on user tables using the **sp_post_xpload** stored procedure.
- **dump transaction** and **load transaction** are not allowed across platforms.
- **dump database** and **load database** to or from a remote `backupserver` are not supported across platforms.
- You cannot load a password-protected dump file across platforms.
- If you perform **dump database** and **load database** for a parsed XML object, you must parse the text again after the **load database** command has completed.
- You cannot perform **dump database** and **load database** across platforms on SAP ASE versions earlier than 11.9.

- SAP ASE servers cannot translate embedded data structures stored as `binary`, `varbinary`, or `image` columns.
- **load database** is not allowed on the `master database` across platforms.
- Stored procedures and other compiled objects are recompiled from the SQL text in `syscomments` at the first execution after the **load database**.

  If you do not have permission to recompile from text, then the person who does has to recompile from text using **dbcc upgrade_object** to upgrade objects.

Locking Out Users During Loads

A database cannot be in use while it is being loaded. **load database** sets the status of the database to “offline.” No one can use the database while its status is “offline.” The “offline” status prevents users from accessing and changing the database during a load sequence.

A database loaded by **load database** remains inaccessible until **online database** is issued.

Upgrading Database and Transaction Log Dumps

Restore and upgrade a user database dump from an ealier version to the most current version of the SAP ASE.

1. Load the most recent database dump.
2. Load, *in order*, all transaction log dumps made since the last database dump.

   The SAP ASE server checks the timestamp on each dump to make sure that it is being loaded to the correct database and in the correct sequence.
3. Issue **online database** to do the upgrade and make the database available for public use.
4. Dump the newly upgraded database immediately after upgrade, to create a dump consistent with the current version of SAP ASE.

Specifying Dump Devices

You can specify the dump device as a literal, a local variable, or a parameter to a stored procedure.

- You can specify a local device as:
  - A logical device name from the `sysdevices` system table
  - An absolute path name
  - A relative path name

  The Backup Server resolves relative path names using the current working directory in SAP ASE.
- When loading across the network, specify the absolute path name of the dump device. The path name must be valid on the machine on which the Backup Server is running. If the name includes characters other than letters, numbers, or the underscore (_), enclose the entire name in quotes.

- Ownership and permissions problems on the dump device may interfere with use of **load** commands.
- You can run more than one load (or dump) at the same time, as long as each load uses a different physical device.

Backup Servers

You must have a Backup Server running on the same machine as the SAP ASE server. The Backup Server must be listed in the `master..sysservers` table. This entry is created during installation or upgrade; do not delete it.

If your backup devices are located on another machine, so that you load across a network, you must also have a Backup Server installed on the remote machine.

Volume Names

Dump volumes are labeled according to the ANSI tape labeling standard. The label includes the logical volume number and the position of the device within the stripe set.

During loads, Backup Server uses the tape label to verify that volumes are mounted in the correct order. This allows you to load from a smaller number of devices than you used at dump time.

Note: When dumping and loading across the network, you must specify the same number of stripe devices for each operation.

Changing Dump Volumes

If the Backup Server detects a problem with the currently mounted volume, it requests a volume change by sending messages to either the client or its operator console. After mounting another volume, the operator notifies the Backup Server by executing **sp_volchanged** on any SAP ASE server that can communicate with the Backup Server.

Restoring the System Databases

You can only load dumps of the `master` database into the `master` database or an archive database.

See the *System Administration Guide* for step-by-step instructions for restoring the system databases from dumps.

Disk Mirroring

At the beginning of a load, the SAP ASE server passes Backup Server the primary device name of each logical database and log device. If the primary device has been unmirrored, the SAP ASE server passes the name of the secondary device instead. If any named device fails before Backup Server completes its data transfer, the SAP ASE server aborts the load.

If you attempt to unmirror any named device while a **load database** is in progress, the SAP ASE server displays a message. The user executing **disk unmirror** can abort the load or defer the **disk unmirror** until after the load completes.

Backup Server loads the data onto the primary device, then **load database** copies it to the secondary device. **load database** takes longer to complete if any database device is mirrored.

Materializing an Archive Database

An archive database is a placeholder that is useful only once it has been loaded with a database dump. The load process does not actually copy pages, however, it materializes the database using page mapping.

Note: You do not need to have Backup Server running when loading a database dump into an archive database.

Using load database with norecovery

The **with norecovery** option of the **load database** command allows a database dump to be loaded into an archive database without recovering anything, reducing the time required to load. Many database pages can be modified or allocated during recovery, causing them to be stored in the modified pages section. Therefore, skipping recovery consumes minimum space in the modified pages section. The **with norecovery** option allows a quick view into an archive database.

If you use **with norecovery**, the database is brought online automatically.

However, using **load database with norecovery** for a database that requires recovery may leave it transactionally and physically inconsistent. Running **dbcc** checks on a physically inconsistent database may produce many errors.

Once you have loaded an archive database **with norecovery,** you must have `sa_role` or database owner privileges to use it.

Using Logical Devices with an Archive Database

You can use **sp_addumpdevice** to create a logical device from which an archive database can be loaded.

```
sp_addumpdevice 'archive database', 'logical_name',
    'physical_name'
```

After you have executed this command, use the *logical_name* instead of the *physical_name* as the *dump_device* or *stripe_device* in a **load database** command.

Note: You cannot use an archive database logical device as a device specification for a load into a traditional database or when dumping a traditional database.

load database Limitations with an Archive Database

load database has limitations when used with an archive database.

- The database dump for an archive database is required to be a disk dump on a file system mounted on the local machine. This can be local storage or NFS storage. `load database ... at <remote server>` syntax is not supported, nor are database dumps on tape.
- Cross-architecture loads are not supported. The database dump and the **load database** command must be performed on the same architecture with respect to byte ordering.
- The dumped database must have the same page size as that used by the server that is hosting the archive database.
- The major version of the server on which the dump was taken must be earlier than or equal to the major version of the server hosting the archive database.
- The character set and sort order on the server on which the database dump was taken must be the same as the character set and sort order of the server hosting the archive database.

load database and Encrypted Columns

If you store keys in a database that is separate from the columns encrypted by those keys, you must load both databases from dumps that were made simultaneously, avoiding a problem where the encrypted column's key is missing after the load.

After loading the databases for keys and data, bring both databases on line simultaneously.

You should not load your key database into a database with a different name because metadata dependencies exist between encrypted columns and their keys. If you must change the name of the key database:

1. Before dumping the database containing the encrypted columns, use **alter table** to decrypt the data.
2. Dump the databases containing keys and encrypted columns.
3. After loading the databases, use **alter table** to re-encrypt the data with the keys in the newly named database.

Loading Compressed Data

You cannot create a dump of a compressed table on one platform and load the dump onto a different platform.

create index commands on compressed tables that contain any form of compressed or uncompressed rows are fully recovered during a **load transaction**.

load transaction

Loads a backup copy of the transaction log that was created with **dump transaction**.

Syntax

Makes a routine log load:

```
load tran[saction] database_name
    from [compress::]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]
    [stripe on [compress::]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]
    [[stripe on [compress::]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]]...]
    [with {
        density = density_value,
        blocksize = number_bytes,
        compression,
        dumpvolume = volume_name,
        file = file_name,
        [dismount | nodismount],
        [nounload | unload],
        notify = {client | operator_console}
        }]]
```

Returns header or file information without loading the backup log:

```
load tran[saction] database_name
    from [compress::]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]
    [stripe on [compress::]stripe_device
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]
    [[stripe on [compress::]stripe_device
```

```
        [at backup_server_name]
        [density = density_value,
        blocksize = number_bytes,
        dumpvolume = volume_name,
        file = file_name]]...]
    [with {
        density = density_value,
        blocksize = number_bytes,
        compression,
        dumpvolume = volume_name,
        file = file_name,
        [dismount | nodismount],
        [nounload | unload],
        listonly [= full],
        headeronly,
        notify = {client | operator_console}
        until_time = datetime}]]
```

Loads a transaction log into an archive database:

```
load tran[saction] database_name
    from dump_device
    [[stripe on stripe_device] ... ]
```

(Tivoli Storage Manager only) Loads a copy of the transaction log when the Tivoli Storage Manager is licensed at your site.

```
load transaction database_name
    from syb_tsm::[[-S source_sever_name][-D source_database_name]
        ::]object_name [blocksize = number_bytes]
    [stripe on syb_tsm::[[-S source_sever_name]
        [-D source_database_name]::]object_name
        [blocksize = number_bytes]]
    [[stripe on syb_tsm::[[-S source_sever_name]
        [-D source_database_name]::]object_name
        [blocksize = number_bytes]]...]
    [with {
        blocksize = number_bytes,
        passwd = password,
        listonly [= full],
        headeronly,
        notify = {client | operator_console},
        until_time = datetime
        } ]
```

Parameters

- ***database_name* –** is the name of the database to receive data from a dumped backup copy of the transaction log. The log segment of the receiving database must be at least as large as the log segment of the dumped database. The database name can be specified as a literal, a local variable, or a parameter of a stored procedure. For archive databases, *database_name* is the archive database into which you are loading the transaction log.
- **compress:: –** invokes the decompression of the archived transaction log. See *Backing Up and Restoring User Databases* in the *System Administration Guide* for more information about the **compress** option.

Note: You should use the native **"compression = *compress_level*"** option over the older **"compress::*compression_level*"** option. If you use the native option for **dump database**, you do not need to use **"compress::*compression_level*"** when loading your database.

- **from *stripe_device* –** is the name of the dump device from which you are loading the transaction log. For a list of supported dump devices, see the SAP ASE installation and configuration guides.
- **at *backup_server_name* –** is the name of a remote Backup Server running on the machine to which the dump device is attached. For platforms that use interfaces files, the *backup_server_name* must appear in the interfaces file.
- **from *dump_device* –** is the local disk transaction log dump.
- **density = *density_value* –** overrides the default density for a tape device. **This option is ignored.**
- **blocksize = *number_bytes* –** overrides the default block size for a dump device. If you specify a block size on UNIX systems, it should be identical to that used to make the dump.
- **dumpvolume = *volume_name* –** is the volume name field of the ANSI tape label. **load transaction** checks this label when the tape is opened and generates an error message if the wrong volume is loaded.
- **file = *file_name* –** is the name of a particular database dump on the tape volume. If you did not record the dump file names when you made the dump, use **listonly** to display information about all the dump files.
- **stripe on *stripe_device* –** is an additional dump device. You can use up to 32 devices, including the device named in the **to** *stripe_device* clause. The Backup Server loads data from all devices concurrently, reducing the time and the number of volume changes required.
- **compression –** indicates that the log you are loading was compressed to a file on a remote server. You do not need to specify the compression level for **load transaction**.

  The **with compression** option differs from the **compress** option, which you use to load a compressed log from a local file.

  Note: You should use the native **"compression = *compress_level*"** option over the older **"compress::*compression_level*"** option. If you use the native option for **dump database**, you do not need to use **"compress::*compression_level*"** when loading your database.
- **dismount | nodismount –** (on platforms that support logical dismount) determines whether tapes remain mounted. By default, all tapes used for a load are dismounted when the load completes. Use **nodismount** to keep tapes available for additional loads or dumps.
- **nounload | unload –** determines whether tapes rewind after the load completes. By default, tapes do not rewind, allowing you to make additional loads from the same tape volume. Specify **unload** for the last dump file to be loaded from a multidump volume. This rewinds and unloads the tape when the load completes.
- **listonly [= full] –** displays information about all the dump files on a tape volume, but **does not load the transaction log** . **listonly** identifies the database and device, the date and time

the dump was made, and the date and time it can be overwritten. **listonly = full** provides additional details about the dump. Both reports are sorted by ANSI tape label.

After listing the files on a volume, the Backup Server sends a volume change request. The operator can either mount another tape volume or terminate the list operation for all dump devices.

In the current implementation, **listonly** overrides **headeronly**.

Warning! Do not use **load transaction with listonly** on 1/4-inch cartridge tape.

- **headeronly –** displays header information for a single dump file, but **does not load the database** . **headeronly** displays information about the first file on the tape unless you use the **file =** ***file_name*** option to specify another file name. The dump header indicates:
  - Type of dump (database or transaction log)
  - Database ID
  - File name
  - Date the dump was made
  - Character set
  - Sort order
  - Page count
  - Next object ID
  - Checkpoint location in the log
  - Location of the oldest **begin transaction** record
  - Old and new sequence dates
- **notify = {client | operator_console} –** overrides the default message destination.
  - On operating systems that offer an operator terminal feature, volume change messages are always sent to the operator terminal on the machine on which the Backup Server is running. Use **client** to route other Backup Server messages to the terminal session that initiated the **dump database**.
  - On operating systems (such as UNIX) that do not offer an operator terminal feature, messages are sent to the client that initiated the **dump database**. Use **operator_console** to route messages to the terminal on which the Backup Server is running.
- **until_time –** loads the transaction log up to a specified time in the transaction log. Only transactions committed before the specified time are saved to the database.
- **syb_tsm –** is the keyword that invokes the libsyb_tsm.so module that enables communication between Backup Server and TSM.
- ***object_name* –** is the name of the backup object on TSM server.
- **-S *source_server_name* –** specifies the name of the source SAP ASE server when it is not the same as the target SAP ASE server. This parameter is required when the target server for the load operation is different from the source server used for the dump operation.

- **-D *source_database_name* –** specifies the name of the source database when it is not the same as the target database. This parameter is required when the target database for the load operation is different from the source database used for the dump operation.

Examples

- **Example 1 –** Loads the transaction log for the database `pubs2` tape:

```
load transaction pubs2
    from "/dev/nrmt0"
```

- **Example 2 –** Loads the transaction log for the `pubs2` database, using the Backup Server REMOTE_BKP_SERVER:

```
load transaction pubs2
        from "/dev/nrmt4" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt5" at REMOTE_BKP_SERVER
    stripe on "/dev/nrmt0" at REMOTE_BKP_SERVER
```

- **Example 3 –** Loads the transaction log for `pubs2`, up to March 20, 2008, at 10:51:43:866 a.m:

```
load transaction pubs2
    from "/dev/ntmt0"
    with until_time = "mar 20, 2008 10:51:43:866am"
```

- **Example 4 –** Loads transactions from the TSM backup object “demo2.1” to the **testdb** database. The source and target databases are the same. See **dump transaction** for information:

```
load transaction testdb from "syb_tsm::demo2.1"
```

- **Example 5 –** Loads transactions from the TSM backup object “obj1.1” when the target database (`pubs2`) is different from the source database (`testdb`):

```
load transaction pubs2 from "syb_tsm::
    -D testdb::obj1.1"
```

Usage

- If you use **sp_hidetext** followed by a cross-platform **dump** and **load**, you must manually drop and re-create all hidden objects.
- The **listonly** and **headeronly** options display information about the dump files without loading them.
- Dumps and loads are performed through Backup Server.

See also:

- For step-by-step instructions for restoring the system databases from dumps, see the *System Administration Guide*.
- *Backing Up and Restoring User Databases* in the *System Administration Guide*.

- **sp_dboption**, **sp_helpdb**, **sp_helpdevice**, **sp_hidetext**, **sp_volchange** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **load transaction** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the database owner, or a user with `load database` privilege or `own database` privilege on the database.
Disabled	With granular permissions disabled, you must be the database owner, or a user with any of these roles: • **sa_role**, or, • **replication_role**, or, • **oper_role**

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	44
Audit option	**load**
Command or access audited	**load transaction**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *disk unmirror* on page 339
- *dump database* on page 373

- *dump transaction* on page 391
- *load database* on page 485
- *online database* on page 520

load transaction Restrictions

Restrictions for using **load transaction**.

- You cannot load a dump that was generated on a version earlier than 11.9 server.
- The database and transaction logs must be at the same release level.
- Load transaction logs in chronological order.
- You cannot load from the null device (on UNIX, `/dev/null`).
- You cannot use **load transaction** after an **online database** command that performs an upgrade. The correct sequence for upgrading a database is **load database**, **load transaction**, **online database**.
- Do not issue **online database** until all transaction logs are loaded. The command sequence is:
    1. Load database
    2. Load transaction (repeat as needed)
    3. Online database

  However, to load additional transaction logs while retaining read-only access to the database (a typical “warm backup” situation), use the **dump tran for standby_access** option to generate the transaction dumps. You can then issue **online database for standby_access** for read-only access.
- You cannot use the **load transaction** command in a user-defined transaction.

Restoring a Database

Restore a database.

- Load the most recent database dump
- Load, *in order*, all transaction log dumps made since the last database dump
- Issue **online database** to make the database available for public use

Each time you add or remove a cross-database constraint, or drop a table that contains a cross-database constraint, dump *both* of the affected databases.

Warning! Loading earlier dumps of these databases can cause database corruption.

For more information on backup and recovery of SAP ASE databases, see the *System Administration Guide*. Alternatively, you can use the **sybrestore** utility to restore databases. See *sybrestore* in the *Utility Guide*.

Recovering a Database to a Specified Time

You can use the **until_time** option for most databases that can be loaded or dumped. **until_time** does not apply to databases such as `master`, in which the data and logs are on the same device. Also, you cannot use it on any database that has had a truncated log since the last **dump database**, such as `tempdb`.

The **until_time** option is useful for the following reasons:

- It enables you to have a database consistent to a particular time. For example, in an environment with a decision-support system (DSS) database and an online transaction processing (OLTP) database, the system administrator can roll the DSS database to an earlier specified time to compare data between the earlier version and the current version.
- If a user inadvertently destroys data, such as dropping an important table, you can use the **until_time** option to back out the errant command by rolling forward the database to a point just before the data was destroyed.

To effectively use the **until_time** option after data has been destroyed, you must know the exact time the error took place. You can find out by executing a **select getdate ()** command immediately after the error. For a more precise time using milliseconds, use the **convert** function, for example:

```
select convert (char (26), getdate (), 109)
```

```
--------------------------
Feb 26 1997 12:45:59:650PM
```

After you load a transaction log using **until_time**, the SAP ASE server restarts the database's log sequence. This means that until you dump the database again, you cannot load subsequent transaction logs after the **load transaction** using **until_time**. Dump the database before you dump another transaction log.

Only transactions that committed before the specified time are saved to the database. However, in some cases, transactions committed shortly after the **until_time** specification are applied to the database data. This may occur when several transactions are committing at the same time. The ordering of transactions may not be written to the transaction log in time-ordered sequence. In this case, the transactions that are out of time sequence are reflected in the data that has been recovered. The time should be less than a second.

For more information on recovering a database to a specified time, see the *System Administration Guide*.

Alternatively, you can use the **sybrestore** utility to restore a database to a point in time, within the range of time during which the database is backed up in the dump history files. See *sybrestore* in the *Utility Guide*.

Locking Users Out During Loads

When you are load a database, it cannot be in use.

load transaction, unlike **load database**, does not change the offline or online status of the database. **load transaction** leaves the status of the database the way it found it. **load database** sets the status of the database to "offline." No one can use the database while it is "offline." The "offline" status prevents users from accessing and changing the database during a load sequence.

Upgrading Database and Transaction Log Dumps

Restore and upgrade a user database dump from an earlier version to the most current version of SAP ASE.

1. Load the most recent database dump.
2. Load, *in order*, all transaction logs generated after the last database dump.
3. Use **online database** to do the upgrade.
4. Dump the newly upgraded database immediately after the upgrade, to create a dump that is consistent with the current version of SAP ASE.

Specifying Dump Devices

You can specify the dump device as a literal, a local variable, or a parameter to a stored procedure.

When loading from a local device, you can specify the dump device as:

- An absolute path name
- A relative path name
- A logical device name from the `sysdevices` system table

Backup Server resolves relative path names, using the current working directory in the SAP ASE server.

When loading across the network, specify the absolute path name of the dump device. (You cannot use a relative path name or a logical device name from the `sysdevices` system table.) The path name must be valid on the machine on which the Backup Server is running. If the name includes any characters other than letters, numbers or the underscore (_), you must enclose it in quotes.

Ownership and permissions problems on the dump device may interfere with use of load commands. **sp_addumpdevice** adds the device to the system tables, but does not guarantee that you can load from that device or create a file as a dump device.

You can run more than one load (or dump) at the same time, as long as each one uses a different physical device.

Backup Servers

You must have a Backup Server running on the same machine as your SAP ASE server. The Backup Server must be listed in the `master..sysservers` table. This entry is created during installation or upgrade and should not be deleted.

If your backup devices are located on another machine so that you load across a network, you must also have a Backup Server installed on the remote machine.

Volume Names

Dump volumes are labeled according to the ANSI tape-labeling standard. The label includes the logical volume number and the position of the device within the stripe set.

During loads, Backup Server uses the tape label to verify that volumes are mounted in the correct order. This allows you to load from a smaller number of devices than you used at dump time.

Note: When dumping and loading across a network, you must specify the same number of stripe devices for each operation.

Changing Dump Volumes

If Backup Server detects a problem with the currently mounted volume, it requests a volume change by sending messages to either the client or its operator console. After mounting another volume, the operator notifies Backup Server by executing **sp_volchanged** on any SAP ASE server that can communicate with Backup Server.

Disk Mirroring

Disk mirroring creates a software mirror that immediately takes over when the primary device fails.

At the beginning of a load, the SAP ASE server passes the primary device name of each logical database device and each logical log device to the Backup Server. If the primary device has been unmirrored, the SAP ASE server passes the name of the secondary device instead. If any named device fails before the Backup Server completes its data transfer, the SAP ASE server aborts the load.

- If you attempt to unmirror any of the named devices while a **load transaction** is in progress, the SAP ASE server displays a message. The user executing **disk unmirror** can abort the load, or defer **disk unmirror** until after the load completes.
- Backup Server loads the data onto the primary device, then **load transaction** copies it to the secondary device. **load transaction** takes longer to complete if any database device is mirrored.

Loading a Transaction Log into an Archive Database

When you load a transaction log into an archive database, **load tran** runs the recovery redo pass. Modified and new database pages are written to the permanent changes segment. You must have enough space in the modified pages section to accommodate these changes.

If necessary, increase space for the modified pages section by using **alter database** to increase the normal database storage allocated to the archive database.

Unlike a traditional database, an archive database can be brought online in the middle of a load sequence without breaking the load sequence. When a traditional database is loaded and then brought online without using the for **standby_access** clause, it is no longer possible to load the next transaction log in the load sequence. An archive database however, can be brought online without the for **standby_access** clause and later, loaded with the next transaction log in the load sequence. This allows read-only operations like running consistency checks, at any time during the load sequence. This is possible because when loading a transaction log into the archive database, the SAP ASE server automatically removes the disposable changes segment from the modified pages section. This effectively reverts the archive database to its state after the previous load was done, thereby allowing the next transaction log in the sequence to be loaded.

lock table

Explicitly locks a table within a transaction.

Syntax

```
lock table table_name in [partition data_partition_name] in
    {share | exclusive} mode
    [wait [numsecs] | nowait]
```

Parameters

- ***table_name*** **–** specifies the name of the table to be locked.
- **partition *data_partition*** **–** indicates you are locking a data partition.
- **share | exclusive –** specifies the type of lock, shared or exclusive, to be applied to the table or partition.
- **wait *numsecs*** **–** specifies the number of seconds to wait, if a lock cannot be acquired immediately. If *numsecs* is omitted, specifies that the **lock table** command should wait until lock is granted.
- **nowait –** causes the command to fail if the lock cannot be acquired immediately.

Examples

- **Example 1 –** Tries to acquire a shared table lock on the `titles` table. If a session-level wait has been set with **set lock wait**, the **lock table** command waits for that period of time; otherwise, the server-level wait period is used:

  ```
  begin transaction
  lock table titles in share mode
  ```

- **Example 2 –** Tries to acquire an exclusive table lock on the `authors` table. If the lock cannot be acquired within 5 seconds, the command returns an informational message. Subsequent commands within the transaction continue as they would have without **lock table**:

  ```
  begin transaction
  lock table authors in exclusive mode wait 5
  ```

- **Example 3 –** If a table lock is not acquired within 5 seconds, the procedure checks the user’s role. If the procedure is executed by a user with **sa_role**, the procedure prints an advisory message and proceeds without a table lock. If the user does not have **sa_role**, the transaction is rolled back:

  ```
  create procedure bigbatch
  as
  begin transaction
  lock table titles in share mode wait 5
  if @@error = 12207
  begin
      /*
      ** Allow SA to run without the table lock
      ** Other users get an error message
      */
      if (proc_role ("sa_role") = 0)
      begin
      print "You cannot run this procedure at
          this time, please try again later"
      rollback transaction
      return 100
      end
  else
      begin
      print "Couldn't obtain table lock,
          proceeding with default locking."
      end
  end
  /* more SQL here */
  commit transaction
  ```

Usage

- You can use **lock table** with an archive database.
- If you use **lock table** as the first statement after the **set chained on** command, this creates a new transaction.
- You cannot lock a table on which you previously executed the **dbcc tune(des_bind…)** command because the SAP ASE server does not allow shared or exclusive table locks on hot objects. For example, the SAP ASE server issues warning number 8242 if you:
  - Create a table
  - Run **dbcc tune (des_bin. . .)**. For example:

    ```
    dbcc tune(des_bin, 4, new_table)
    ```
  - Attempt to lock the table:

    ```
    begin tran
    lock table new_table in exclusive mode
    go
    ```

    ```
    Msg 8242, Level 16, State 1:
    Server 'server01', Line 2:
    The table ‘new_table’ in database 'big_db' is bound to metadata
    cache memory. Unbind the table and retry the query later.
    ```

- You can use **lock table** only within a transaction. The table lock is held for the duration of the transaction.
- The behavior of **lock table** depends on the wait-time options that are specified in the command or that are active at the session level or server level.
- If the **wait** and **nowait** option are not specified, **lock table** uses either the session-level wait period or the server-level wait period. If a session-level wait has been set using **set lock wait**, it is used, otherwise, the server-level wait period is used.
- If the table lock cannot be obtained with the time limit (if any), the **lock table** command returns message 12207. The transaction is not rolled back. Subsequent commands in the transaction proceed as they would have without the **lock table** command.
- You cannot use **lock table** on system tables or temporary tables.
- You can issue multiple **lock table** commands in the same transaction.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must be the table owner. You must have **select** access permission on the table to use **lock table in share mode**. You must have **delete**, **insert**, or **update** access permission on the table to use **lock table in exclusive mode**.

See also

- *set* on page 607

merge

Transfers rows from a source table into a target table.

- Inserts rows that are in the source and have no matching key columns in the target.
- Updates rows with key columns that already exist in the target with the values from the source row.

Syntax

```
merge
    into [[database.]owner.]identifier [as table_alias]
    using [[database.]owner.]identifier [as table_alias]
        | (select_query) as alias_name [column_list]
    on merge_search_condition
    [ when matched [and search_conditions ]
        then {update set {col_name = expression} | delete} ]
    [ when not matched [and search_conditions ]
        then insert [(column_list)] values (value_list)
```

Parameters

- **into [[*database*.]*owner*.]*identifier* [as *table_alias*] –** specifies the target object as a table or updatable view as a table alias. The target can be a fully qualified name identifier or a short name identifier—does not include the database name and the owner name—and in which case the SAP ASE server uses the current database and the user or database owner.

  You may also specify the table alias as an alternative to reference the target table.
- **using [[*database*.]*owner*.]*identifier* [as *table_alias*] | (*select_query*) as *alias_name* [*column_list*] –** specifies the source object as a table, view, or derived table. When the source object is:

  - A table or view – use **[[*database*.]*owner*.]*identifier***.
  - A derived table – reference it by the **select** query, in the form of an alias name and an optional column list that defines the derived table.
- ***merge_search_conditions* –** checks whether the row in the source table matches the row in the target table, and consists of a list of predicates such as "***col_name* = *col_name***".
- ***search_conditions* –** are well-formed Boolean expressions used in the **matched**/**not matched** clauses.
- **update set {*col_name* = *expression*} | delete –** both options are always in the **matched** clause. **update** assigns new values to the matching row, while **delete** removes the current matching row.
- **insert [(*column_list*)] values (*value_list*) –** always appears in the **not matched** clause, and inserts the nonmatching row in the target table.

Examples

- **Example 1 –** Merges the `DailySales` table into `GlobalSales`:

```
merge into GlobalSales
        (Item_number, Description, Quantity)as G
    using DailySales as D
    ON D.Item_number = G.Item_number
    when not matched
        then
        insert (Item_number, Description, Quantity )
     values (D.Item_number, D.Description, D.Quantity)
    when matched
        then update set
            G.Quantity = G.Quantity + D.Quantity
```

- **Example 2 –** Uses a derived table as the source table with dynamic parameter markers:

```
merge into GlobalSales as G
     using (select ?, ?, ?) as
     D (Item_number, Description, Quantity)
     ON D.Item_number = G.Item_number
     when not matched
        then
        insert (Item_number, Description, Quantity )
     values (D.Item_number, D.Description, D.Quantity)
     when matched
        then update set
          G.Quantity = G.Quantity + D.Quantity
```

Usage

- The target table cannot be part of any referential integrity constraint.
- There are no specific optimization for **merge** queries with **on** clauses that reference constant Boolean expressions, such as (1=0) or (1=1) .
- The target columns referenced in the **on** clause cannot be in the **set** clause of the **update** action.
- Although you can invoke a **merge** statement from within a stored procedure, **update** and **insert** statements are not allowed within a scalar SQL function.
- The target table cannot be an updatable view with **instead of** triggers.
- The **merge** statements can be cached, and the literals in the **set** clause of the **update** action and in the **insert** value list in the **insert** action are the target of the literal parameterization process.
- The target table cannot be a proxy table.
- For each row in the source table, if the row:
  - Has a matching row in the target table and the search condition is evaluated to **true** – execute the **update** in the target table, or the corresponding row in the target table.
  - Has no matching row in the target table and the search condition is evaluated to **true** – insert the row in the target table.

  The **merge** statement can have multiple **when matched** and **when not matched** clauses with different search conditions. The first **when** in the **when** clauses that has its condition satisfied runs the corresponding action; the rest are ignored.
- For each row in the target table, **merge** generates an error if it finds more than one matching row in the source table.

Permissions

Any user who has **select** permission on the source object, and **insert**, **update**, or **delete** permission on the target object can use **merge**.

mount

Attaches a database to a destination or secondary SAP ASE server.

mount decodes the information in the *manifest file* and makes the set of databases available. **mount** differs from other copying procedures such as the **bcp** bulk copy utility in that all required supporting activities are executed, including adding database devices, if necessary, and activating them, creating the catalog entries for the new databases, and recovering them.

If you are using different device names at the destination SAP ASE server when mounting the databases, use **mount with listonly** and modify the device path names at the destination server, then use **mount** to actually mount the databases.

Note: For every login that is allowed access to a database on the original SAP ASE server, it is more convenient to have a corresponding login for the same `suid` at the destination SAP ASE server, to avoid user ID reconciliation issues.

For permissions to remain unchanged, the login maps at the destination SAP ASE server must be identical to that on the source SAP ASE server. For more information on login maps, see *Managing Remote Servers* in *System Administration Guide, Volume 1*.

Syntax

```
mount database all | database_mapping[, database_mapping, ...]
    from "manifest_file"
    [using device_mapping [, device_mapping...]
        [with listonly]
    database_mapping:
            origdbname as newdbname
        |    newdbname = origdbname
        |    origdbname
        |    newdbname
    device_mapping
            logical_device_name as new_physical_name
        |    new_physical_name = logical_device_name
        |    original_physical_name
        |    new_physical_name
```

Parameters

- ***manifest_file* –** the manifest file is the binary file that describes the databases that are present on a set of database devices.

  Operations that can perform character translations of the file contents (such as **ftp**) corrupt the manifest file unless performed in binary mode.

Examples

- **Example 1 –** Finds the path names listed on the manifest file from the source SAP ASE server:

  ```
  mount database all from "/data/sybase2/mfile1" with listonly
  go
  ```

  ```
  [database]
    mydb
  [device]
    "/data/sybase1/d0.dbs" = "1dev1"
    "/data/sybase2/d14.dbs" = "1dev13"
  ```

When you use the path names different from the source ones, verify or modify them to meet your criteria at the destination SAP ASE server.

- **Example 2 –** After the database devices are copied to the secondary SAP ASE server, you then mount it:

  ```
  mount database all from "/data/sybase2/mfile1" using     "/data/
  sybase2/d0.dbs" = "1dev1",
      "/data/sybase2/d14.dbs" = "1dev13"
  ```

  When the **mount** process has completed, the databases are still offline. Use the **online database** command to bring them online. You need not restart the server.

- **Example 3 –** The destination server can be the same as the source server. In this case, the database names must be mapped to a different name, and the logical device names are internally renamed.

  1. Create an exact copy of database `mydb` in the same server:

     ```
     1> quiesce database mydb_tag hold mydb for external dump to
        "/data/mydb.manifest"
     2> go
     ```
  2. Copy the OS file:

     ```
     $ cp /data/sybase2/mydb.dbs /data/sybase2/mydb_copy.dbs
     ```
  3. You can now mount it as a copy:

     ```
     1> quiesce database mydb_tag release
     2> go
     1> mount database mydb as mydb_copy
     2> from "/data/mydb.manifest"
     3> using mydb_dev as "/data/sybase2/mydb_copy.dbs"
     3> go
     ```

  The physical device `//data/sybase2/mydb_copy.dbs/` is automatically assigned a machine-generated logical name with the format *Cccc$<mydb_dev>* where:

  - *C* – is [A–Z]
  - *c* – is [A–Z, 0–9], and refers to the encoded logical device number
  - *mydb_dev* – contains up to 26 characters from the old logical device name.

  Database IDs for the transported databases should not exist on the destination SAP ASE server. Because the database has been mounted on the same server, the database ID had to be changed. The allocation pages in the mounted device keep the original database ID, and that information is used by the **disk refit** command. Use the **dbcc checkalloc** command to reconcile the `dbid` after running **mount database** so that **disk refit** can work on the mounted devices. Run **checkalloc** if the database is not being mounted for temporary use.

Usage

- The **using** clause allows you to define a mapping via the “**=**” sign or the “**as**” clause.

- If there are more than one device, a mapping can be one using “**=**” and another using “**as**.”
- You can map devices by name in both databases and devices, specifying both logical and physical, and by order. If a database is mapped by name, all databases must be mapped by name and vice versa. The same happens for devices.
- You cannot **mount** a subset of a transported set of databases at the destination SAP ASE server; all databases and their devices in the manifest file must be mounted together.
- When executing the **mount** command at the destination SAP ASE server:
  - The page size in the destination SAP ASE server must be equal to the page size in the source SAP ASE server.
  - There must be enough devices configured at the destination SAP ASE server to successfully add all the devices belonging to the mounted databases.
  - If the logical device you are mounting from the source SAP ASE server has the same name as the logical device on the destination SAP ASE server, these devices are automatically renamed unless you include an alias with the **mount** command.

    If the physical device name already exists on the destination SAP ASE server, you must rename the physical device name on the source SAP ASE server at the operating system level and provide the new physical device name with the **mount** command.
  - The log version must be the same in the source and destination SAP ASE servers.
  - You cannot mount a database from an SAP ASE server with a higher major version number. For example, you cannot mount a 15.0 version database on a 12.5.x version of SAP ASE.
  - The platforms of the source and destination SAP ASE servers must be the same.
  - Differences in the sort order or character set are resolved by rules followed by **load database**. A database with a different character set can be mounted only if the sort order is binary.

mount database and **unmount database** are supported in the Cluster Edition. If an instance fails while one of these commands is in progress, the command may abort. In this case, the user must reissue **mount database** or **unmount database** when the instance failover recovery is complete.

Once databases are mounted on the destination SAP ASE server, certain settings are cleared on the mounted database:

- Replication is turned off.
- Audit settings are cleared and turned off.
- CIS options, default remote location, and type are cleared.
- Cache bindings are dropped for both the mounted databases and their objects.
- Recovery order is dropped for the mounted databases and becomes the default `dbid` order.

System considerations:

- You cannot use the **mount** command in a transaction.
- You cannot **mount** a database on server configured for high availability.

When you **mount** databases onto an SAP ASE server, if you change the `dbid` of the database you are mounting, all procedures are marked for recompilation in the database. This increases the time it takes to recover the database at the destination, and delays the first execution of the procedure.

For renaming devices, the manifest file contains the device paths known to the source SAP ASE server that created the manifest file. If the destination SAP ASE server accesses the devices with a different path, you can specify the new path to the **mount** command.

1. Use the **mount** command **with listonly** to display the old path:

   ```
   mount database all from "/work2/Mpubs_file" with listonly
   go
   ```

   ```
   [database]
     mydb
   [device]
     "/work2/Devices/pubsdat.dat" = "pubs2dat"
   ```
2. If the new path for the device `pubs2dat` is `/work2/Devices/pubsdevice.dat` (the devices path in Windows), specify the new device in the **mount** command:

   ```
   mount database all from "/work2/Mpubs_file" using
      "/work2/datadevices/pubsdevice.dat" = "pubs2dat"
   ```

   If the logical device names exist in the destination server, they are renamed using an automatically generated unique name.

See also *Database Mount and Unmount* in *System Administration Guide: Volume 2*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **mount** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `mount any database` privilege.
Disabled	With granular permissions disabled, you must be a user with **sa_role** or **oper_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	101
Audit option	**mount**
Command or access audited	**mount database**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a **set proxy** is in effect

See also

- *unmount* on page 678
- *quiesce database* on page 533

online database

Marks a database available for public use after a normal load sequence; if needed, upgrades a loaded database to the current version of SAP ASE; brings a database online after loading a transaction log dumped with the **for standby_access** option. You can also use online database to bring an archive database online.

Syntax

```
online database database_name [for standby_access]
```

Parameters

- ***database_name*** **–** specifies the name of the database to be brought online.
- **for standby_access –** brings the database online on the assumption that the database contains no open transactions.

Examples

- **Example 1 –** Makes the `pubs2` database available for public use after a load sequence completes:

  ```
  online database pubs2
  ```

- **Example 2 –** Brings the database `inventory_db` online. Used after loading `inventory_db` with a transaction-log dump obtained through **dump tran...with standby_access**:

  ```
  online database inventory_db for standby_access
  ```

Usage

- **online database** brings a database online for general use after a normal database or transaction log load sequence.
- When **load database** is issued, the database's status is set to "offline." The offline status is set in the `sysdatabases` system table and remains set until **online database** completes.
- Do *not* issue **online database** until all transaction logs are loaded. The command sequence is:
  - **load database**
  - **load transaction** (there may be more than one **load transaction**)
  - **online database**
- If you execute **online database** against a currently online database, no processing occurs and no error messages are generated.
- You can only use **online database**...**for standby_access** with a transaction log that was dumped using **dump transaction**...**with standby_access**. If you use **online database**...**for standby_access** after loading a transaction log that was dumped without using **dump transaction...with standby access**, **online database** generates an error message and fails.
- You can use **sp_helpdb** to find out whether a database is currently online, online for standby access, or offline.

When upgrading databases:

- **online database** initiates, if needed, the upgrade of a loaded database and transaction log dumps to make the database compatible with the current version of SAP ASE. After the upgrade completes, the database is made available for public use. If errors occur during processing, the database remains offline.
- **online database** is required only after a database or transaction log load sequence. It is not required for new installations or upgrades. When you upgrade SAP ASE to a new version, all databases associated with that server are automatically upgraded.
- **online database** upgrades only version 12.5.4 or later user databases.
- After you upgrade a database with **online database**, dump the newly upgraded database to create a dump that is consistent with the current version of SAP ASE. You must dump the upgraded database before you can issue a **dump transaction** command.

For archive databases:

- The **online database** ***database_name*** command performs undo recovery during which modified and allocated pages may be remapped to the modified pages section.

- You do not need to bring a database online if it has been loaded **with norecovery**, since the load automatically brings the database online without running the recovery undo pass.

See also **sp_helpdb** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **online database** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the database owner, or a user with `online database` privilege or `own database` privilege on the database.
Disabled	With granular permissions disabled, you must be the database owner, or a user with any of these roles: • **sa_role**, or, • **replication_role**, or, • **oper_role**

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	83
Audit option	**security**
Command or access audited	**online database**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *dump database* on page 373
- *dump transaction* on page 391
- *load database* on page 485
- *load transaction* on page 501

open

Opens a cursor for processing.

Syntax

```
open cursor_name
```

Parameters

- ***cursor_name* –** is the name of the cursor to open.

Examples

- **Example 1 –** Opens the cursor named `authors_crsr`:

  ```
  open authors_crsr
  ```

Usage

- **open** opens a cursor. Cursors allow you to modify or delete rows on an individual basis. You must first open a cursor to use the **fetch**, **update**, and **delete** statements. For more information about cursors, see the *Transact-SQL User's Guide*.
- The SAP ASE server returns an error message if the cursor is already open or if the cursor has not been created with the **declare cursor** statement.
- Opening the cursor causes the SAP ASE server to evaluate the **select** statement that defines the cursor (specified in the **declare cursor** statement) and makes the cursor result set available for processing.
- When the cursor is first opened, it is positioned before the first row of the cursor result set.
- You can use **open** with an archive database.
- When you set the chained transaction mode, the SAP ASE server implicitly begins a transaction with the **open** statement if no transaction is currently active.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

open permission defaults to all users.

See also

- *close* on page 88
- *declare cursor* on page 304
- *fetch* on page 412

order by clause

Returns query results in the specified columns in sorted order.

Syntax

```
[Start of select statement]
```

```
[order by
    {[table_name.| view_name.]
        column_name | select_list_number | expression}
        [asc | desc]
    [,{[table_name.| view_name.]
        column_name | select_list_number | expression}
        [asc | desc]]...]
```

```
[End of select statement]
```

Parameters

- **order by –** sorts the results by columns.
- **asc –** sorts the results in ascending order. If you do not specify **asc** or **desc**, **asc** is assumed.
- **desc –** sorts the results in descending order.

Examples

- **Example 1 –** Selects the titles with a price that is greater than $19.99, and lists them with the titles in alphabetical order:

  ```
  select title, type, price
  from titles
  where price > $19.99
  order by title

  title
          type         price
  ------------------------------------------------------------
           ------------ -------------------------
  But Is It User Friendly?
           popular_comp                    22.95
  ```

```
Computer Phobic and Non-Phobic Individuals: Behavior Variations
          psychology                    21.59
Onions, Leeks, and Garlic: Cooking Secrets of the Mediterranean
         trad_cook                      20.95
Secrets of Silicon Valley
         popular_comp                  20.00
```

- **Example 2 –** Lists the books from the `titles` table, in descending alphabetical order of the type, and calculates the average price and advance for each type:

```
select type, price, advance
from titles
order by type desc
compute avg (price), avg (advance) by type
```

- **Example 3 –** Lists the title IDs from the `titles` table, with the advances divided by the total sales, ordered from the lowest calculated amount to the highest:

```

select title_id, advance/total_sales
from titles
order by advance/total_sales
 title_id
 -------- ------------------------
 MC3026                     NULL
 PC9999                     NULL
 MC2222                       0.00
 TC4203                       0.26
 PS3333                       0.49
 BU2075                       0.54
 MC3021                       0.67
 PC1035                       0.80
 PS2091                       1.11
 PS7777                       1.20
 BU1032                       1.22
 BU7832                       1.22
 BU1111                       1.29
 PC8888                       1.95
 TC7777                       1.95
 PS1372                      18.67
 TC3218                      18.67
 PS2106                      54.05
```

- **Example 4 –** Lists book titles and types in order by the type, renaming the columns in the output:

```
select title as BookName, type as Type
from titles
order by Type
```

Usage

- **order by** returns query results in the specified columns in sorted order. **order by** is part of the **select** command.
- In Transact-SQL, you can use **order by** to sort items that do not appear in the **select** list. You can sort by a column heading, a column name, an expression, an alias name (if

specified in the **select** list), or a number representing the position of the item in the **select** list (*select_list_number*).

- If you sort by *select_list_number*, the columns to which the **order by** clause refers must be included in the **select** list, and the **select** list cannot be * (asterisk).
- Use **order by** to display your query results in a meaningful order. Without an **order by** clause, you cannot control the order in which the SAP ASE server returns results.

See also **sp_configure**, **sp_helpsort**, **sp_lock**, **sp_sysmon** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Specifying new column headings in the **order by** clause of a select statement when the **union** operator is used is a Transact-SQL extension.

The behavior of **order by** when identical table column name and column alias name exist is a vendor-specific extension of the ANSI SQL standard.

See also

- *compute Clause* on page 91
- *declare* on page 302
- *group by and having Clauses* on page 459
- *select* on page 579
- *where clause* on page 712
- *set* on page 607

order by Clause Restrictions

Restrictions for using the **order by** clause.

- The maximum number of columns allowed in an **order by** clause is 400.
- You cannot use **order by** on `text`, `unitext`, or `image` datatype columns.
- Subqueries and view definitions cannot include an **order by** clause (or a **compute** clause or the keyword **into**). Conversely, you cannot use a subquery in an **order by** list.
- You cannot update the result set of a server- or language- type cursor if it contains an **order by** clause in its **select** statement. For more information about the restrictions applied to updatable cursors, see the *Transact-SQL User's Guide*.
- If you use **compute by**, you must also use an **order by** clause. The expressions listed after **compute by** must be identical to or a subset of those listed after **order by**, must be in the same left-to-right order, must start with the same expression, and must not skip any expressions. For example, if the **order by** clause is:

  ```
  order by a, b, c
  ```

  the **compute by** clause can be any (or all) of these:

```
compute by a, b, c
compute by a, b
compute by a
```

You can also use the keyword **compute** can be used without **by** to generate grand totals, grand counts, and so on. In this case, **order by** is optional.

Behavior of order by When Identical Table Column Name and Column Alias Name Exist

The SAP ASE server interprets a column name in the **order by** clause as the alias name under several specific conditions.

- The **order by** clause contains a reference to a qualified column name (that is, **order by** ***table.column***).
- Both the table column name and alias name exist.
- The names for both the table column and alias are identical to the column name in the **order by** clause.

In this example, the result set from the two queries differ, even though the **order by** clause is identical; yet, the **order by** clause refers to a different column in both cases.

```
create table t (A int, B char(3))
insert into t (A, B) values(1, 'az')
insert into t (A, B) values(2, 'bb')
go
/* t.B refers to the table column B */
select A, reverse(B) as C from t order by t.B
go
/* t.B refers to the alias column B */
select A, reverse(B) as B from t order by t.B
go
```

```
A C
----------- ---
1 za
2 bb

(2 rows affected)

A B
----------- ---
2 bb
1 za

(2 rows affected)
```

This behavior occurs because the SAP ASE server allows the **order by** clause to reference an alias column name that is qualified by the table name. When a base table column also exists with the same colum name as the alias column, the SAP ASE server gives precedence to the alias column.

Collating Sequences

The sort order (collating sequence) on your SAP ASE server determines how your data is sorted.

With **order by**, null values precede all others.

The sort order choices are binary, dictionary, case-insensitive, case-insensitive with preference, and case- and accent-insensitive. Sort orders that are specific to national languages may also be provided.

sp_helpsort reports the sort order installed on the SAP ASE server.

The effect of sort order choices are:

SAP ASE Sort Order	Effects on `order by` Results
Binary order	Sorts all data according to the numeric byte-value of each character in the character set. Binary order sorts all uppercase letters before lowercase letters. Binary sort order is the only option for multibyte character sets.
Dictionary order	Sorts uppercase letters before their lowercase counterparts (case-sensitive). Dictionary order recognizes the various accented forms of a letter and sorts them after the unaccented form.
Dictionary order, case-insensitive	Sorts data in dictionary order but does not recognize case differences.
Dictionary order, case-insensitive with preference	Sorts an uppercase letter in the preferred position, before its lowercase version. It does not recognize case difference when performing comparisons (for example, in **where** clauses).
Dictionary order, case- and accent-insensitive	Sorts data in dictionary order, but does not recognize case differences; treats accented forms of a letter as equivalent to the associated unaccented letter. This sort order intermingles accented and unaccented letters in sorting results.

Sort Rules

When two rows have equivalent values in the SAP ASE sort order, rules are used to order the rows.

- The values in the columns named in the **order by** clause are compared.
- If two rows have equivalent column values, the binary value of the entire rows is compared byte by byte. This comparison is performed on the row in the order in which the columns are stored internally, not the order of the columns as they are named in the query or in the original **create table** clause. In brief, data is stored with all the fixed-length columns, in order, followed by all the variable-length columns, in order.
- If rows are equal, row IDs are compared.

  Given this table:

```
create table sortdemo (lname varchar (20),
                       init char (1) not null)
```

And this data:

```
lname      init
---------- ----
Smith      B
SMITH      C
smith      A
```

You get these results when you order by *lname*:

```
lname      init
---------- ----
smith      A
Smith      B
SMITH      C
```

Since the fixed-length `char` data (the **init** column) is stored first internally, the **order by** sorts these rows based on the binary values "Asmith", "BSmith," and "CSMITH".

However, if the **init** is of type `varchar`, the *lname* column is stored first, and then the **init** column. The comparison takes place on the binary values "SMITHC", "SmithB", and "smithA", and the rows are returned in that order.

Descending Scans

Use of the keyword **desc** in an **order by** clause allows the query optimizer to choose a strategy that eliminates the need for a worktable and a sort step to return results in descending order.

This optimization scans the page chain of the index in reverse order, following the previous page pointers on each index page.

- To use this optimization, the columns in the **order by** clause must match the index order. They can be a subset of the keys, but must be a prefix subset, that is, they must include the first keys. You cannot use the descending scan optimization if the columns named in the **order by** clause are a superset of the index keys.

  If the query involves a join, all tables can be scanned in descending key order, as long as the requirements for a prefix subset of keys are met. You can also use descending scan optimization for one or more tables in a join, while other tables are scanned in ascending order.
- If other user processes are scanning forward to perform updates or deletes, performing descending scans can cause deadlocks. Deadlocks may also be encountered during page splits and shrinks. You can use **sp_sysmon** to track deadlocks on your server, or you can use the configuration parameter **print deadlock information** to send deadlock information to the error log.
- If your applications must return results in descending order, but the descending scans optimization creates deadlock problems, some possible workarounds are:

- Use **set transaction isolation level 0** scans for descending scans. For more information on the effect of isolation level 0 reads, see the **set** command, and *Using Locking Commands* in *Performance and Tuning Guide: Locking*.
- Disable descending scan optimization with the configuration parameter **allow backward scans** so that all queries that use **desc** scan the table in ascending order and sort the result set into descending order. See the *System Administration Guide*.
- Break problematic descending scans into two steps, selecting the required rows into a temporary table in ascending order in the first step, and selecting from the temporary table in descending order in the second step.

- If a backward scan uses a clustered index that contains overflow pages because duplicate key values are present, the result set returned by the descending scan may not be in exact reverse order of the result set that is returned with an ascending scan. The specified key values are returned in order, but the order of the rows for the identical keys on the overflow pages may be different. For an explanation of how overflow pages in clustered indexes are stored, see *Indexes* in *Performance and Tuning Guide: Basics*.

prepare transaction

Used by DB-Library in a two-phase commit application to see if a server is prepared to commit a transaction.

Syntax

```
prepare tran[saction]
```

Usage

See the *Open Client DB-Library Reference Manual*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

See also

- *begin transaction* on page 83
- *rollback* on page 574
- *save transaction* on page 577

print

Prints a user-defined message on the user's screen.

Syntax

```
print
    {format_string | @local_variable |
    @@global_variable}
        [, arg_list]
```

Parameters

- ***format_string* –** can be either a variable or a string of characters. The maximum length of *format_string* is 1023 bytes.

  Format strings can contain up to 20 unique placeholders in any order. These placeholders are replaced with the formatted contents of any arguments that follow *format_string* when the text of the message is sent to the client.

  To allow reordering of the arguments when format strings are translated to a language with a different grammatical structure, placeholders are numbered. A placeholder for an argument appears in this format: " %*nn* !"—a percent sign (%), followed by an integer from 1 to 20, followed by an exclamation point (!). The integer represents the argument number in the string in the argument list. "%1!" is the first argument in the original version, "%2!" is the second argument, and so on.

  Indicating the position of the argument in this way makes it possible to translate correctly, even when the order in which the arguments appear in the target language is different.

  For example, assume the following is an English message:

  ```
  %1! is not allowed in %2!.
  ```

  The German version of this message is:

  ```
  %1! ist in %2! nicht zulässig.
  ```

  The Japanese version of this message is:

  ```
  %2! の中で %1! は許されません。
  ```

  In this example, "%1!" represents the same argument in all three languages, as does "%2!". This example shows the reordering of the arguments that is sometimes necessary in the translated form.
- ***@local_variable* –** must be of type `char`, `nchar`, `varchar`, or `nvarchar`, and must be declared within the batch or procedure in which it is used.

- ***@@global_variable* –** must be of type `char` or `varchar`, or be automatically convertible to these types, such as ***@@version***. Currently, ***@@version*** is the only character-type global variable.
- ***arg_list* –** may be a series of either variables or constants separated by commas. *arg_list* is optional unless a format string containing placeholders of the form "*%nn* !" is provided. In that case, the *arg_list* must have at least as many arguments as the highest numbered placeholder. An argument can be any datatype except `text` or `image`; it is converted to a character datatype before being included in the final message.

Examples

- **Example 1 –** Prints "Berkeley author" if any authors in the `authors` table live in the 94705 postal code:

```
if exists (select postalcode from authors
where postalcode = '94705')
print "Berkeley author"
```

- **Example 2 –** Declares a variable, assigns a value to the variable, and prints the value:

```
declare @msg char (50)
select @msg = "What's up, doc?"
print @msg
```

```
What's up, doc?
```

- **Example 3 –** Demonstrates the use of variables and placeholders in messages:

```
declare @tabname varchar (30)
select @tabname = "titles"

declare @username varchar (30)
select @username = "ezekiel"

print "The table '%1!' is not owned by the user '%2!'.", @tabname,
@username
```

```
The table 'titles' is not owned
by the user 'ezekiel.'
```

Usage

- The maximum output string length of *format_string* plus all arguments after substitution is 1023 bytes.
- If you use placeholders in a format string, keep this in mind: for each placeholder *n* in the string, the placeholders 1 through *n*- 1 must also exist in the same string, although they do not have to be in numerical order. For example, you cannot have placeholders 1 and 3 in a format string without having placeholder 2 in the same string. If you omit a number in a format string, an error message is generated when **print** is executed.
- The *arg_list* must include an argument for each placeholder in the *format_string*, or the transaction is aborted. You can use more arguments than placeholders.

- To include a literal percent sign as part of the error message, use two percent signs (‘‘% %’’) in the *format_string*. If you include a single percent sign (‘‘%’’) in the *format_string* that is not used as a placeholder, the SAP ASE server returns an error message.
- If an argument evaluates to NULL, it is converted into a zero-length character string. If you do not want zero-length strings in the output, use the **isnull** function. For example, if ***@arg*** is null, the following statement prints `I think we have nothing here.`:

  ```
  declare @arg varchar (30)
  select @arg = isnull (col1, "nothing") from
  table_a where ...
  ```

  ```
  print "I think we have %1! here", @arg
  ```
- You can add user-defined messages to the system table `sysusermessages` for use by any application. Use **sp_addmessage** to add messages to `sysusermessages`; use **sp_getmessage** to retrieve messages for use by **print** and **raiserror**.
- Use **raiserror** instead of **print** to print a user-defined error message and have the error number stored in ***@@error***.

See also **sp_addmessage**, **sp_getmessage** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **print**.

See also

- *declare* on page 302
- *raiserror* on page 538

quiesce database

Suspends and resumes updates to a specified list of databases.

Syntax

```
quiesce database tag_name hold database_list [for external dump]
    [to manifest_file [with override]]
```

or:

```
quiesce database tag_name release
```

Parameters

- ***tag_name*** **–** is a user-defined name that designates the list of databases to **hold** or **release**. The *tag_name* must conform to the rules for identifiers.
- **hold –** when used with **to manifest_file** clause, holds the database and creates a manifest file.

  Warning! Since the manifest file is binary, operations that perform character translations of the file contents (such as ftp) corrupt the file unless performed in binary mode.
- ***database_list*** **–** is the list of the databases included in the **quiesce database hold** command.
- **for external dump –** specifies that while updates to the databases in the list are suspended, you physically copy all affected database devices, using some facility external to the SAP ASE server. The copy operation serves as a replacement for the combination of **dump database** and **load database**.
- ***manifest_file*** **–** the binary file that describes the databases that are present on a set of database devices. It can be created only if the set of databases that occupy those devices are isolated, self-contained on those devices.

  Since the manifest file is a binary file, operations that can perform character translations of the file contents (such as **ftp**) corrupt the file unless performed in binary mode.
- **with override –** overrides any restrictions that prevent you from successfully executing **quiesce database** on a database.

Examples

- **Example 1 –** Suspends update activity on `salesdb` and `ordersdb`:

  ```
  quiesce database report_dbs hold salesdb, ordersdb
  ```
- **Example 2 –** Resumes update activity on the databases labeled `report_dbs`:

  ```
  quiesce database report_dbs release
  ```
- **Example 3 –** Suspends update activity to the `pubs2` database and signifies your intent to make an external copy of this database:

  ```
  quiesce database pubs_tag hold pubs2 for external dump
  ```
- **Example 4 –** Places the database in a hold status and builds the manifest file for a database to be copied to another SAP ASE server:

  ```
  quiesce database pubs_tag hold pubs2 for external dump to
      "/work2/sybase1/mpubs_file with override
  ```

  Once the command completes, control returns to the user.
- **Example 5 –** Copies the database devices, using the **mount database with listonly** to list all of the devices to be copied to view:

  ```
  1> mount database all from "/data/sybase2/mfile1" with listonly
  2> go
  ```

```
"/data/sybase1/d0.dbs" = "1dev1"
```

You cannot create a manifest file if the set of databases that are quiesced contain references to databases outside of the set. Use **with override** option to bypass this restriction:

```
quiesce database pubs2_tag release for external dump to Mpubs_file
```

- **Example 6 –** *key_db* contains the encryption key used to encrypt columns in *col_db*:

  ```
  quiesce database key_tag hold key_db for external
           dump to "/tmp/keydb.dat"

  quiesce database encr_tag hold col_db for external dump       to
  "/tmp/col.dat" with override

  quiesce database col_tag hold key_db, col_db for
      external dump to "/tmp/col.dat"
  ```

Usage

- **quiesce database** used with the **hold** keyword suspends all updates to the specified database. Transactions cannot update data in suspended databases, and background tasks such as the checkpoint process and housekeeper process skip all databases that are in the suspended state.
- **quiesce database** used with the **release** keyword allows updates to resume on databases that were previously suspended.
- **quiesce database** used with the **for external dump** clause signifies that you intend to make an external copy of the database.
- Recovery for this database may fail or the database may not be consistent If you:
  - Quiesce a reduced-durability database (including `tempdb`)
  - Copy the device
  - Mount this database on another SAP ASE server

  Change a database's durability with **alter database** before you issue a **quiesce database** command.
- The **quiesce database hold** and **release** commands need not be executed from the same user session.
- If the databases specified in the **quiesce database hold** command contain distributed or multidatabase transactions that are in the prepared state, the SAP ASE server waits during a timeout period for those transactions to complete. If the transactions do not complete during the timeout period, **quiesce database hold** fails.
- If the SAP ASE server is executing a **dump database** or **dump transaction** command on a database specified in **quiesce database hold**, the database is suspended only after the **dump** command completes.
- If you execute a **dump database** or **dump transaction** command on a database while updates to the database are suspended, the SAP ASE server blocks those commands until the database is released with **quiesce database release**.
- If you attempt to run a query against a database that is quisced, the SAP ASE server issues error message 880:

```
Your query is blocked because it tried to write and
database '%.*s' is in quiesce state. Your query will
proceed after the DBA performs QUIESCE DATABASE
RELEASE
```

The query is run once the database is no longer in a quiescent state.

- To duplicate or copy databases, use **quiesce database** with the extension for creating the manifest file. The **quiesce database** effects the **quiesce hold** by blocking writes in the database, and then creates the manifest file. The command then returns control of the database to the user. You can now use a utility to copy the database to another SAP ASE server. These rules for **quiesce database hold** must be followed for the copy operation:
  - The copy operation cannot begin until the **quiesce database hold** process has completed.
  - Every device for every database in the **quiesce database** command must be copied.
  - The copy process must complete before you invoke **quiesce database release**.

See also **sp_helpdb**, **sp_who** in *Reference Manual: Procedures*.

Permissions

The permission checks for **quiesce database** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `quiesce any database` privilege.
Disabled	With granular permissions disabled, you must be a user with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	96
Audit option	**quiesce**
Command or access audited	**quiesce database**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a **set proxy** is in effect

See also

- *dump database* on page 373
- *dump transaction* on page 391

Encrypted Columns and quiesce database

You can use **quiesce database** when the database contains an encryption key.

- You must use **with override** to **quiesce** a database whose columns are encrypted with keys stored in other databases.
- **quiesce database** *key_db, col_db* is allowed where *key_db* is the database with the encryption key and *col_db* is the database with a table that has a column encrypted with the key in *key_db*.

quiesce database in a Clustered Environment

If you issue **shutdown instance** or **shutdown cluster**, the cluster aborts all **quiesce database** commands.

- The cluster rejects all **quiescedb** commands issued by a user if **shutdown instance** or **shutdown cluster** commands are in progress.
- The cluster aborts all **quiesce database** commands if instance failover recovery is in progress.
- The cluster rejects all **quiesce database** commands issued by a user if instance failover recovery is in progress.
- You cannot add a new instance to the cluster while the master database is part of an ongoing **quiesce database hold** command.

raiserror

Prints a user-defined error message on the user's screen and sets a system flag to record that an error condition has occurred.

Syntax

```
raiserror error_number
    [{format_string | @local_variable}] [, arg_list]
    [with errordata restricted_select_list]
```

Parameters

- ***error_number* –** is a local variable or an integer with a value greater than 17,000. If the *error_number* is between 17,000 and 19,999, and *format_string* is missing or empty (""), the SAP ASE server retrieves error message text from the `sysmessages` table in the `master` database. These error messages are used chiefly by system procedures.

  If *error_number* is 20,000 or greater and *format_string* is missing or empty, **raiserror** retrieves the message text from the `sysusermessages` table in the database from which the query or stored procedure originates. The SAP ASE server attempts to retrieve messages from either `sysmessages` or `sysusermessages` in the language defined by the current setting of *@@langid*.
- ***format_string* –** is a string of characters with a maximum length of 1024 bytes. Optionally, you can declare *format_string* in a local variable and use that variable with **raiserror** (see *@local_variable*).

  raiserror recognizes placeholders in the character string that is to be printed out. Format strings can contain up to 20 unique placeholders in any order. These placeholders are replaced with the formatted contents of any arguments that follow *format_string*, when the text of the message is sent to the client.

  To allow reordering of the arguments, when format strings are translated to a language with a different grammatical structure, the placeholders are numbered. A placeholder for an argument appears in this format: "%nn!"—a percent sign (%), followed by an integer from 1 to 20, followed by an exclamation point (!). The integer represents the argument number in the string in the argument list. "%1!" is the first argument in the original version, "%2!" is the second argument, and so on.

  Indicating the position of the argument in this way makes it possible to translate correctly, even when the order in which the arguments appear in the target language is different from their order in the source language.

  For example, assume the following is an English message:

  ```
  %1! is not allowed in %2!.
  ```

  The German version of this message is:

```
%1! ist in %2! nicht zulassig.
```

The Japanese version of this message is:

```
%2! の中で %1! は許されません。
```

In this example, "%1!" represents the same argument in all three languages, as does "%2!". This example shows the reordering of the arguments that is sometimes necessary in the translated form.

- ***@local_variable*** **–** is a local variable containing the *format_string* value. It must be of type `char` or `varchar` and must be declared within the batch or procedure in which it is used.
- ***arg_list*** **–** is a series of variables or constants separated by commas. *arg_list* is optional unless a format string containing placeholders of the form "%*nn* !" is provided. An argument can be any datatype except `text` or `image`; it is converted to the `char` datatype before being included in the final string.

  If an argument evaluates to NULL, the SAP ASE server converts it to a zero-length `char` string.
- **with errordata –** supplies extended error data for Client-Library™ programs.
- ***restricted_select_list*** **–** consists of one or more of the following items:

  - "*", representing all columns in **create table** order.
  - A list of column names in the order you want to see them. When selecting an existing IDENTITY column, you can substitute the **syb_identity** keyword, qualified by the table name, where necessary, for the actual column name.
  - A specification to add a new IDENTITY column to the result table:

    ```
    column_name = identity (precision)
    ```
  - A replacement for the default column heading (the column name), in the following forms:

    ```
    column_heading = column_name
    ```

    ```
    column_name column_heading
    ```

    ```
    column_name as column_heading
    ```

    The column heading may be enclosed in quotation marks for any of these forms. The heading must be enclosed in quotation marks if it is not a valid identifier (that is, if it is a reserved word, if it begins with a special character, or if it contains spaces or punctuation marks).
  - An expression (a column name, constant, function, or any combination of column names, constants, and functions connected by arithmetic or bitwise operators, or a subquery).
  - A built-in function or an aggregate.
  - Any combination of the items listed above.

The *restricted_select_list* can also perform variable assignment, in the form:

```
@variable = expression
[, @variable = expression ...]
```

Restrictions to *restricted_select_list* are:

- You cannot combine variable assignment with any of the other *restricted_select_list* options.
- You cannot use **from**, **where**, or other **select** clauses in *restricted_select_list*.
- You cannot use "*" to represent all columns in *restricted_select_list*.

See the *Transact-SQL User's Guide*.

Examples

- **Example 1 –** Returns an error if it does not find the table supplied with the ***@tabname*** parameter:

```
create procedure showtable_sp @tabname varchar (18)
as
if not exists (select name from sysobjects
    where name = @tabname)
    begin
        raiserror 99999 "Table %1! not found.",
        @tabname
    end
else
    begin
        select sysobjects.name, type, crdate, indid
        from sysindexes, sysobjects
        where sysobjects.name = @tabname
        and sysobjects.id = sysindexes.id
    end
```

- **Example 2 –** Adds a message to `sysusermessages`, then tests the message with **raiserror**, providing the substitution arguments:

```
sp_addmessage 25001,
"There is already a remote user named '%1!'
for remote server '%2!'."

raiserror 25001, jane, myserver
```

- **Example 3 –** Uses the **with errordata** option to return the extended error data *column* and *server* to a client application, to indicate which column was involved and which server was used:

```
raiserror 20100 "Login must be at least 5
    characters long" with errordata "column" =
    "login", "server" = @@servername
```

Usage

- User-defined messages can be generated ad hoc, as in Example 1 and Example 3, or they can be added to the system table `sysusermessages` for use by any application, as shown in Example 2. Use **sp_addmessage** to add messages to `sysusermessages`; use **sp_getmessage** to retrieve messages for use by **print** and **raiserror**.

- Error numbers for user-defined error messages must be greater than 20,000. The maximum value is 2,147,483,647 (2^{31} -1).
- The severity level of all user-defined error messages is 16. This level indicates that the user has made a nonfatal error.
- The maximum output string length of *format_string* plus all arguments after substitution is 1024 bytes.
- If you use placeholders in a format string, keep this in mind: for each placeholder *n* in the string, the placeholders *1* through *n-1* must exist in the same string, although they do not have to be in numerical order. For example, you cannot have placeholders 1 and 3 in a format string without having placeholder 2 in the same string. If you omit a number in a format string, an error message is generated when **raiserror** is executed.
- If there are too few arguments relative to the number of placeholders in *format_string*, the SAP ASE server displays an error message and aborts the currently executing statement, but does not abort any open transactions. However, if this error occurs within a stored procedure, the SAP ASE server continues with the next statement at the line that called **raiserror**, and any open transactions remain open. If the error occurs in a batch of SQL code, the SAP ASE server aborts the batch, and any open transactions remain open.
- To include a literal percent sign as part of the error message, use two percent signs (‘‘% %’’) in the *format_string*. If you include a single percent sign (‘‘%’’) in the *format_string* that is not used as a placeholder, the SAP ASE server returns an error message.
- If an argument evaluates to NULL, it is converted into a zero-length `char` string. If you do not want zero-length strings in the output, use the **isnull** function.
- When **raiserror** is executed, the error number is placed in the global variable *@@error*, which stores the error number that was most recently generated by the system.
- Use **raiserror** instead of **print** if you want an error number stored in *@@error*.
- To include an *arg_list* with **raiserror**, put a comma after *error_number* or *format_string* before the first argument. To include extended error data, separate the first *extended_value* from *error_number*, *format_string*, or *arg_list* using a space (not a comma).

See also **sp_addmessage**, **sp_getmessage** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **raiserror**.

See also

- *declare* on page 302
- *print* on page 531

readtext

Reads `text`, `unitext`, and `image` values, starting from a specified offset and reading a specified number of bytes or characters.

Syntax

```
readtext [[database.]owner.]table_name.column_name
    text_pointer offset size
    [holdlock | noholdlock] [readpast]
    [using {bytes | chars | characters}]
    [at isolation {
        [read uncommitted | 0] |
        [read committed | 1] |
        [repeatable read | 2]|
        [serializable | 3]}]
```

Parameters

- ***table_name.column_name*** **–** is the name of the `text`, `unitext`, or `image` column. You must include the table name. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.
- ***text_pointer*** **–** is a `varbinary (16)` value that stores the pointer to the `text`, `unitext`, or `image` data. Use the **textptr** function to determine this value. `text`, `unitext`, and `image` data is not stored in the same set of linked pages as other table columns. It is stored in a separate set of linked pages. A pointer to the actual location is stored with the data; **textptr** returns this pointer.
- ***offset*** **–** specifies the number of bytes or characters to skip before starting to read `text`, `unitext`, or `image` data.
- ***size*** **–** specifies the number of bytes or characters of data to read.
- **holdlock –** causes the text value to be locked for reads until the end of the transaction. Other users can read the value, but they cannot modify it.
- **noholdlock –** prevents the server from holding any locks acquired during the execution of this statement, regardless of the transaction isolation level currently in effect. You cannot specify both a **holdlock** and a **noholdlock** option in a query.
- **readpast –** specifies that **readtext** should silently skip rows with exclusive locks, without waiting and without generating a message.
- **using –** specifies whether **readtext** interprets the *offset* and *size* parameters as a number of bytes (**bytes**) or as a number of **textptr** characters (**chars** or **characters** are synonymous). This option has no effect when used with a single-byte character set or with `image` values

(**readtext** reads `image` values byte by byte). If the **using** option is not given, **readtext** interprets the *size* and *offset* arguments as bytes.

- **at isolation –** specifies the isolation level (0, 1, or 3) of the query. If you omit this clause, the query uses the isolation level of the session in which it executes (isolation level 1 by default). If you specify **holdlock** in a query that also specifies **at isolation read uncommitted**, the SAP ASE server issues a warning and ignores the **at isolation** clause. For the other isolation levels, **holdlock** takes precedence over the **at isolation** clause.
- **read uncommitted –** specifies isolation level 0 for the query. You can specify 0 instead of **read uncommitted** with the **at isolation** clause.
- **read committed –** specifies isolation level 1 for the query. You can specify 1 instead of **read committed** with the **at isolation** clause.
- **repeatable read –** specifies isolation level 2 for the query. You can specify 2 instead of **serializable** with the **at isolation** clause.
- **serializable –** specifies isolation level 3 for the query. You can specify 3 instead of **serializable** with the **at isolation** clause.

Examples

- **Example 1 –** Selects the second through the sixth character of the `copy` column:

```
declare @val varbinary (16)
select @val = textptr (copy) from blurbs
where au_id = "648-92-1872"
readtext blurbs.copy @val 1 5 readpast using chars
```

Usage

- The **textptr** function returns a 16-byte binary string (text pointer) to the `text`, `unitext`, or `image` column in the specified row or to the `text`, `unitext`, or `image` column in the last row returned by the query, if more than one row is returned. Declare a local variable to hold the text pointer, then use the variable with **readtext**.
- The value in the global variable ***@@textsize***, which is the limit on the number of bytes of data to be returned, supersedes the size specified for **readtext** if it is less than that size. Use **set textsize** to change the value of ***@@textsize***.
- When using bytes as the offset and size, the SAP ASE server may find partial characters at the beginning or end of the `text` data to be returned. If it does, and character set conversion is on, the server replaces each partial character with a question mark (?) before returning the text to the client.
- The SAP ASE server must determine the number of bytes to send to the client in response to a **readtext** command. When the *offset* and *size* are in bytes, determining the number of bytes in the returned text is simple. When the offset and size are in characters, the server must calculate the number of bytes being returned to the client. As a result, performance may be slower when using characters as the *offset* and *size*. The **using characters** option is useful only when the SAP ASE server is using a multibyte character set: it ensures that **readtext** does not return partial characters.

- You cannot use **readtext** on `text`, `unitext`, or `image` columns in views.
- If you attempt to use **readtext** on `text` values after changing to a multibyte character set, and you have not run **dbcc fix_text**, the command fails, and an error message instructs you to run **dbcc fix_text** on the table.

See also *text, image, and unitext Datatypes* in *Reference Manual: Building Blocks*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

readtext requires **select** permission on the table.

See also

- *set* on page 607
- *writetext* on page 721

Using the readpast Option

Usage information for `readpast`.

- **readpast** applies only to data-only-locked tables, and is ignored if it is specified for an allpages-locked table.
- **readpast** is incompatible with the **holdlock** option. If both are specified in a command, an error is generated and the command terminates.
- If **readtext** specifies **at isolation read uncommitted**, **readpast** generates a warning, but does not terminate the command.
- If the statement isolation level is set to 3, **readpast** generates an error and terminates the command.
- If the session-wide isolation level is 3, **readpast** is silently ignored.
- If the session-wide isolation level is 0, **readpast** generates a warning, but does not terminate the command.

Using readtext with unitext Columns

When you issue **readtext** on a column defined for the `unitext` datatype, the **readtext** ***offset*** parameter specifies the number of bytes, or Unicode values, to skip before starting to read the `unitext` data.

The **readtext** *size* parameter specifies the number of bytes, or 16-bit Unicode values, to read. If you specify **using bytes** (the default), the *offset* and *size* values are adjusted to always start and end on the Unicode character boundaries, if necessary.

If **enable surrogate processing** is on, **readtext** truncates only on the surrogate boundary, and starting/ending positions are also adjusted accordingly and returns whole Unicode characters.

For this reason, issuing **readtext** against a column defined for `unitext` may return fewer bytes than specified.

In the following example, the `unitext` column `ut` includes the string U+0101U+0041U+0042U+0043:

```
declare @val varbinary (16)
select @val = textptr (ut) from unitable
where i = 1
readtext foo.ut @val 1 5
```

This query returns the value U+0041U+0042.

The *offset* position is adjusted to 2 since **readtext** cannot start from the second byte of a Unicode character. Unicode characters are always composed of an even number of bytes. Starting at the second byte (or ending in an odd number of bytes) shifts the result by one byte, and renders the result set inaccurate.

In the example above, the *size* value is adjusted to 4 since **readtext** cannot read the partial byte of the fourth character, U+0043.

In the following query, **enable surrogate processing** is enabled, and the `ut` column contains the string U+d800dc00U+00c2U+dbffdeffU+d800dc00:

```
declare @val varbinary (16)
select @val = textptr (ut) from unitable
where i = 2
readtext foo.ut @val 1 8
```

This query returns the value U+00c2U+dbffdeff. The starting position is reset to 2, and the actual result size is 6 bytes rather than 8 since **readtext** does not break in the middle of a surrogate pair. Surrogate pairs (in this example, the first value in the range d800..dbff and the second in the range dc00..dfff) require 4-byte boundaries, and the rules of Unicode conformance for UTF-16 do not allow the division of these 4-byte characters.

reconfigure

Allows existing scripts to run without modification (currently has no effect).

Syntax

```
reconfigure
```

Usage

If you have scripts that include **reconfigure**, change them at your earliest convenience. Although **reconfigure** is included in this version, it may not continue to be supported in subsequent versions.

See also **sp_configure** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

reconfigure permission defaults to system administrators and is not transferable.

refresh precomputed result set

Refreshes the specified precomputed result set.

Syntax

```
refresh precomputed result set prs_name
```

Parameters

- ***prs_name* –** name of the precomputed result set. A fully qualified *prs_name* cannot include the server or database name.

Examples

- **Example 1 –** Refreshes the `au_prs` precomputed result set:

  ```
  refresh precomputed result set au_prs
  ```

Usage

refresh precomputed result set permission defaults to the precomputed result set owner and can be transferred to other users.

Standards

The **refresh precomputed result set** command is a Transact-SQL extension and is not covered by the SQL standard.

Permissions

You must have `create table` privilege to refresh precomputed result sets.

Auditing

Refreshing precomputed result sets is not audited.

remove java

Removes one or more Java-SQL classes, packages, or JARs from a database, when Java classes are installed in the database.

Syntax

```
remove java
    class class_name[, class_name]...
        | package package_name[, package_name]...
        | jar jar_name[, jar_name]...[retain classes]
```

Parameters

- **class *class_name* –** the name of one or more Java classes to be removed from the database. The classes must be installed in the current database.
- **package *package_name* –** the name of one or more Java packages to be removed. The packages must be stored in the current database.
- **jar *jar_name* –** either a SQL identifier or character string value of up to 30 bytes that contains a valid SQL identifier. Each *jar_name* must be equal to the name of a retained JAR in the current database.
- **retain classes –** specifies that the named JARs are no longer retained in the database, and the retained classes have no associated JAR.

Usage

- If a **remove java** statement is contained in a stored procedure, the current database is the database that is current when the procedure is created, not the database that is current when the procedure is called.

  If a **remove java** statement is not contained in a stored procedure, the current database is the database that is current when the **remove** statement is executed.
- If **class** or **package** is specified and any removed class has an associated JAR, then an exception is raised.
- If any stored procedure, table, or view contains a reference to a removed class as the datatype of a column, variable, or parameter, then an exception is raised.
- All removed classes are:
  - Deleted from the current database.
  - Unloaded from the Java Virtual Machine (Java VM) of the current connection. The removed classes are not unloaded from the Java VMs of other connections.
- If any exception is raised during the execution of **remove java**, then all actions of **remove java** are cancelled.

- You cannot remove a Java-SQL class if that class is directly referenced by a SQLJ stored procedure or function.
- To remove a Java-SQL class from the database, you must:
  1. Delete all SQLJ stored procedures or functions that directly reference the class using **drop procedure** and **drop function**.
  2. Delete the Java-SQL class from the database using **remove java**.
- When you use **remove java**, an exclusive table lock is placed on `sysxtypes`.
- If **jar** is specified, then an exclusive table lock is placed on `sysjars`.

See also:

- *Java in Adaptive Server Enterprise*
- **sp_helpjava** in *Reference Manual: Procedures*
- `sysjars`, `sysxtypes` in *Reference Manual: Tables*
- **extractjava, installjava** in the *Utility Guide*

Permissions

You must be a system administrator or database owner to use **remove java**.

The permission checks for **remove jar class** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage database` privilege.
Disabled	With granular permissions disabled, you must be the database owner.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	94
Audit option	**remove**
Command or access audited	**remove java**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a **set proxy** is in effect

reorg

Reclaims unused space on pages, removes row forwarding, or rewrites all rows in the table to new pages, depending on the option used.

Syntax

```
reorg compact table_name [partition partition_name]
    [with {resume, time = no_of_minutes, compress}]
```

```
reorg forwarded_rows table_name [partition partition_name]
    [with {resume, time = no_of_minutes, compress}]
```

```
reorg rebuild table_name [index_name [partition index_partition_name
    [with online]]]
```

```
reorg reclaim_space table_name [index_name] [partition
partition_name]
    [with {resume, time = no_of_minutes, compress}]
```

```
reorg defrag table_name [partition {partition_list}]
   [with {time = hh:mm| resume | skip_compact_extents [= pct_value]}]
```

Parameters

- **compact –** combines the functions of **reorg reclaim_space** and **reorg forwarded_rows** to both reclaim space and undo row forwarding in the same pass.
- **forwarded_rows –** removes row forwarding.

  While unforwarding or reinserting a data row on a table configured for compression, the row is compressed according to the table's compression level.
- ***index_partition_name* –** is the name of the index partition on which you are running **reorg**. **update statistics** peforms a check to validate that *index_partition_name* is an index partition. If you specify an index partition, only that index partition is rebuilt
- ***indexname* –** specifies the name of the index to be reorganized.
- ***partition_name* –** is the name of the partition on which you are running **reorg**.

- ***tablename* –** specifies the name of the table to be reorganized. If *indexname* is specified, only the index is reorganized.
- **rebuild –** if a table name is specified, rewrites all rows in a table to new pages, so that the table is arranged according to its clustered index (if one exists), with all pages conforming to current space management settings and with no forwarded rows and no gaps between rows on a page. If the table has an index, all indexes are dropped and re-created. If an index name is specified, **reorg** rebuilds that index while leaving the table accessible for read and update activities.

  New rows follow the compression level of the partition or table, regardless of the compression level of the data in the original table or partition.

  Note: reorg rebuild is not supported for system catalogs.
- **with online –** allows concurrent access to the table while **reorg rebuild** runs.
- **reclaim_space –** reclaims unused space left by deletes and updates. For each data page in a table, if there is unused space resulting from committed deletes or row-shortening updates, **reorg reclaim_space** rewrites the current rows contiguously, leaving all unused space at the end of the page. If there are no rows on the page, the page is deallocated.

  If a table is marked for compression, **reclaim_space** compresses the data.

  Note: reorg reclaim_space only affects tables with variable-length rows, and only frees up space within a page. To reduce the number of pages used, use the **reorg rebuild** command.
- **with resume –** initiates reorganization from the point at which a previous **reorg** command terminated. Used when the previous **reorg** command specified a time limit (**with time = *no_of_minutes***).
- **with time = *no_of_minutes* –** specifies the number of minutes that the **reorg** command is to run.
- **with compress –** allows you to compress the rows affected by the **reorg** operation.
- **defrag –** reorganizes each partition list or partition in the table while allowing concurrent reads or writes on the data being reorganized.
- **partition –** is the subset of the table that shares the same column definitions, constraints, and defaults as the table.
- ***partition_list* –** is the list of partition names.
- **time –** reorganizes the table or the list of partitions for the specified interval of time. *hh* is the number of hours and has no limit, and *mm* is the number of minutes 0–59.
- **resume –** resumes table reorganization from the end of the last reorganized data page invoked from the previous **reorg defrag**. **resume** continues until the entire table or list of partitions is reorganized, processing only those partitions that are currently either unvisited or partially reorganized. Running **time =** *hh:mm* with **resume** indicates that you are running reorganization from the previous position of reorganization and running it only for the specified interval of time.

- **skip_compact_extents –** skips compact extents. The compactness of an extent is measured as the percentage occupancy in that extent.
- ***pct_value* –** is the compactness of an extent measured as the percentage occupancy in that extent with a value of 1–100.

  Compactness = (Total space occupied in an extent / Total space in an extent) x 100

  If **skip_compact_extents** is used, all the extents with compactness greater than or equal to the threshold occupancy percent value specified would be skipped for reorganization. If no threshold percent value is specified, the default percent value is 80%.

Examples

- **Example 1 –** Reclaims unused page space in the **titles** table:

  ```
  reorg reclaim_space titles
  ```

- **Example 2 –** Reclaims unused page space in the index `titleind`:

  ```
  reorg reclaim_space titles titleind
  ```

- **Example 3 –** Initiates **reorg compact** on the `titles` table. **reorg** starts at the beginning of the table and continues for 120 minutes. If the **reorg** completes within the time limit, it returns to the beginning of the table and continues until the full time period has elapsed:

  ```
  reorg compact titles with time = 120
  ```

- **Example 4 –** Initiates **reorg compact** at the point where the previous **reorg compact** stopped and continues for 30 minutes:

  ```
  reorg compact titles with resume, time = 30
  ```

- **Example 5 –** Runs **reorg forwarded_rows** on the `smallsales` partition of the `titles` table:

  ```
  reorg forwarded_rows titles partition smallsales
  ```

- **Example 6 –** Runs **reorg forwarded_rows** on the `authors` table:

  ```
  reorg forwarded_rows authors
  ```

- **Example 7 –** Runs **reorg reclaim_space** on the `bigsales` partition of `titles`:

  ```
  reorg reclaim_space titles partition bigsales
  ```

- **Example 8 –** Runs **reorg compact** on the `bigsales` partition of `titles`:

  ```
  reorg compact titles partition bigsales
  ```

- **Example 9 –** Runs **reorg compact** on the `titles` table and compresses the affected rows:

  ```
  reorg compact titles with compress
  ```

- **Example 10 –** Runs **reorg rebuild** on the index partition `idx_p2` of index `local_idx` on table `sales`:

```
reorg rebuild sales local_idx partition idx_p2
```

- **Example 11 –** Reorganizes the partition list, starting from the beginning of each partition and continuing until its end:

  ```
  reorg defrag salesdetail [partition {seg1 [,seg2[, seg3]]}]
  ```

- **Example 12 –** Reorganizes the partition list, starting from the beginning of each partition and continuing until the specified time interval is reached.

  ```
  reorg defrag salesdetail [partition
     {seg1 [,seg2[,seg3]]}] with time = 01:20
  ```

- **Example 13 –** Restarts reorganization for each partition in the partition list that is either unvisited or partially reorganized, from where the previous invocation of reorganization has stopped, and if no point for resuming is available, reorganization starts from the beginning of the partition. Reorganization continues until the end of each partition.

  ```
  reorg defrag salesdetail [partition {seg1 [,seg2[,seg3]]}]
     with resume
  ```

- **Example 14 –** Reorganizes the partition list, starting from the beginning of the partition and continuing until its end, skipping the extents with more than the specified occupancy threshold. If a percentage is not specified, extents exceeding 80% occupied are considered compact, and skipped.

  ```
  reorg defrag salesdetail [partition {seg1 [,seg2[,seg3]]}]
     with skip_compact_extents [ = <1-100>]
  ```

- **Example 15 –** Reorganizes each partition in the partition list that is either unvisited or partially reorganized, starting from the point where the previous invocation of reorganization stopped. If no point is available for resuming, reorganization starts from the beginning of the partition. Reorganization continues until the specified time interval is reached.

  ```
  reorg defrag salesdetail [partition {seg1 [,seg2[,seg3]]}]
     with time = 01:20, resume
  ```

- **Example 16 –** Reorganizes the partition list, starting from the beginning of the partition and continuing until the specified interval of time completes, skipping each extent that qualifies to be compact as per the *pct_value* specified for **skip_compact_extents**. If a percentage is not specified, extents exceeding 80% occupied are considered compact, and skipped.

  ```
  reorg defrag salesdetail [partition {seg1 [,seg2[,seg3]]}]
     with time = 01:20, skip_compact_extents [ = <1-100>]
  ```

- **Example 17 –** Reorganizes each partition in the partition list that is either unvisited or partially reorganized, starting from the point where the previous invocation of reorganization stopped. If no point is available for resuming, reorganization starts from the beginning of the partition. Reorganization continues until the end of each partition. It skips extents that qualify to be compact as per the *pct_value* provided for **skip_compact_extents**. If the *pct_value* is not provided, extents exceeding 80% occupied are considered compact and hence skipped.

```
reorg defrag salesdetail [partition {seg1 [,seg2[,seg3]]}]
   with resume, skip_compact_extents[ = <1-100>]
```

- **Example 18 –** Reorganizes each partition in the partition list that is either unvisited or partially reorganized, starting from the point where the previous invocation of reorganization has stopped. If no point is available for resuming, reorganization starts from the beginning of the partition. Reorganization continues until the specified time interval completes. It skips extents that qualify to be compact as per the *pct_value* specified for **skip_compact_extents**. If a percentage is not specified, extents exceeding 80% occupied are considered compact and hence skipped.

  ```
  reorg defrag salesdetail [partition {seg1 [,seg2[,seg3]]}]
     with time = 01:20, resume, skip_compact_extents [ = <1-100>]
  ```

  For every 10% of a partition processed, this information appears:

  ```
  Examined n allocation unit(s). Processed x pages out of y
  data pages. z% completed, resulting in p% space compaction.
  ```

  At the end of processing each partition, the time elapsed in the current invocation is printed as:

  ```
  Elapsed time 1m : 56s : 623ms.
  ```

Usage

- You cannot run **reorg rebuild** on system tables.
- The table specified in **reorg**—excluding **reorg rebuild**—must have a datarows- or datapages-locking scheme.
- Index scans traverse faster after you run **reorg**.
- Running **reorg** against a table can have a negative effect on performance of concurrent queries.
- If you do not include the index or partition name, the entire table is rebuilt.
- You can perform a **dump tran** on a table after rebuilding its index. However, you cannot perform a **dump tran** if the entire table has been rebuilt.
- Although online index rebuilding is allowed on a placement index, it rebuilds only the index pages. The data pages remain untouched, which means datarows are neither sorted nor rewritten to fresh pages. You can rebuild data pages by dropping a placement index, and then re-creating it.
- You can rebuild the index for `systabstats`, but you cannot run **reorg rebuild** on the table itself.
- Versions of SAP ASE earlier than 15.0 restricted you from using **reorg rebuild** on all-pages locked tables. SAP ASE versions 15.0 and later allow you to run **reorg rebuild** on entire tables that uses allpages locking. **reorg rebuild** rebuilds the entire table, copying the data to new sets of pages, and rebuilds all indexes.
- You cannot use the **reorg rebuild** sub commands (for example, **compact**, **reclaim_space**, and **forwarded_rows**) on all-pages-locked tables.

- You cannot use **reorg rebuild** ***table_name index_name*** or *partition_name* on allpages-locked tables.
- Running **reorg rebuild** ***table_name*** updates the statistics for all leading index columns. However, running **reorg rebuild** ***table_name index_name*** does not automatically update the statistics. Instead, the SAP ASE server automatically updates index statistics when you run **reorg rebuild** ***index_name*** if the update includes a suffiecient change in data to affect its plan choice and performance.
- You can run **writetext** concurrently with the **online** parameter.
- **reorg** has no effect on space allocated to `text` or `image` columns.
- You cannot issue **reorg** within a transaction.
- **reorg rebuild** requires that you set the database option **select into/bulkcopy/pllsort** to **true** and run **checkpoint** in the database.
- **reorg rebuild** requires additional disk space equal to the size of the table and its indexes. You can find out how much space a table currently occupies by using **sp_spaceused**. You can use **sp_helpsegment** to check the amount of space available.
- After running **reorg rebuild**, you must dump the database before you can dump the transaction log.
- Requirements for using **reorg rebuild** on an index are less stringent than for tables. The following rules apply:
  - You do not need to set **select into** to rebuild an index.
  - Rebuilding a table requires space for a complete copy of the table. Rebuilding an index works in small transactions, and deallocates pages once they are copied; therefore, the process needs space only for the pages copied on each transaction.
  - You can rebuild the index on a table while transaction level scans (dirty reads) are active.

When using reclaim_space, forwarded_rows, and compact parameters:

- Minimize interference with other activities by using multiple small transactions of brief duration. Each transaction is limited to eight pages of **reorg** processing.
- Rewrite space for a single partition.
- Provide **resume** and **time** options that allow you to set a time limit on how long a **reorg** runs and to resume a **reorg** from the point at which the previous **reorg** stopped. This allows you to, for example, use a series of partial reorganizations at off-peak times to run the **reorg** command on a large table.

Garbage collection and locks:

- For datarow tables – the SAP ASE server performs garbage collection using a latch, and releases the latch on a page before moving to the next page. No locks are obtained until the garbage collection encounters a forwarded row, when it acquires an exclusive table lock, which it holds until the end of that transaction. Subsequent transaction use latches until they encounter forwarded rows.
- For data page tables – the SAP ASE server performs garbage collection using a page lock, but releases the page lock before moving to the next page. When the gargage collector

encounters a forwarded row, it acquires an exclusive table lock, which it holds until the end of the transaction. Subsequent transactions use page locks until it encounters another forwarded row.

- Use **reorg compact** if garbage collection encounters OAM pages that are allocated to the object, but do not refer to the allocation (running **reorg compact** requires a shared table lock).

The following considerations apply when using the resume and time parameters:

- If you specify only the **resume** option, the **reorg** begins at the point where the previous **reorg** stopped and continues to the end of the table.
- If you specify only the **time** option, the **reorg** starts at the beginning of the table and continues for the specified number of minutes.
- If you specify both options, the **reorg** starts at the point where the previous **reorg** stopped and continues for the specified number of minutes.

When running reorg on compressed tables:

- **reorg rebuild** – sorts the rows according to the placement index (if one exists), writing the rows to new data pages according to the space management settings currently in effect. New rows are compressed or decompressed according to individual partition's compression level, regardless of the data compression state in the original table or partition.
- **reorg reclaim_space** – compresses data rows to save more space if the table is marked for compression.

The following considerations apply when using the **reorg defrag**:

- Tables must be data-only-locking (DOL) and have at least one index to use **reorg defrag**. Sybase recommends that the table has a unique index to efficiently accommodate the movement of the forwarded locations during reorganization.
- You can run only one instance of **reorg defrag** at a time on a table.
- When **reorg defrag** is in progress, DDLs cannot run on the table, for example add/drop partition, create/drop index, add/modify/drop columns. Also, other existing **reorg** subcommands like **rebuild**/**reclaim**/**compact**/**forwarded rows** cannot run when **reorg defrag** is in progress.

See also:

- See the *System Administration Guide*.
- **sp_chgattribute** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **reorg** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner, or a user with `reorg any table` privilege.
Disabled	With granular permissions disabled, you must be the table owner or a user with **sa_role**.

return

Exits from a batch or procedure unconditionally and provides an optional return status. Statements following **return** are not executed.

Syntax

```
return [integer_expression] [plan "abstract_plan"]
```

Parameters

- ***integer_expression*** **–** is the integer value returned by the procedure. Stored procedures can return an integer value to a calling procedure or an application program.
- **plan "*abstract_plan*" –** specifies the abstract plan to use to optimize the query. The abstract plan can be a full or partial plan specified in the abstract plan language. Plans can be specified only for optimizable SQL statements, that is, queries that access tables. See *Creating and Using Abstract Plans* in the *Performance and Tuning Guide: Optimizer and Abstract Plans* for more information.

Examples

- **Example 1 –** If no user name is given as a parameter, the **return** command causes the procedure to exit after a message has been sent to the user’s screen. If a user name is given, the names of the rules created by that user in the current database are retrieved from the appropriate system tables:

```
create procedure findrules @nm varchar (30) = null as
if @nm is null
begin
    print "You must give a user name"
    return
end
else
begin
    select sysobjects.name, sysobjects.id,
    sysobjects.uid
    from sysobjects, master..syslogins
        where master..syslogins.name = @nm
        and sysobjects.uid = master..syslogins.suid
        and sysobjects.type = "R"
end
```

- **Example 2 –** If the updates cause the average price of business titles to exceed $15, the **return** command terminates the batch before any more updates are performed on `titles`:

```
print "Begin update batch"
update titles
    set price = price + $3
    where title_id = 'BU2075'
update titles
    set price = price + $3
    where title_id = 'BU1111'
if (select avg (price) from titles
      where title_id like 'BU%') > $15
begin
      print "Batch stopped; average price over $15"
    return
end
update titles
    set price = price + $2
      where title_id = 'BU1032'
```

- **Example 3 –** Creates two user-defined status codes: a value of 1 is returned if the `contract` column contains a 1; a value of 2 is returned for any other condition (for example, a value of 0 on `contract` or a `title_id` that did not match a row):

```
create proc checkcontract @param varchar (11)
as
declare @status int
if (select contract from titles where title_id = @param) = 1
    return 1
else
    return 2
```

Usage

- The return status value can be used in subsequent statements in the batch or procedure that executed the current procedure, but must be given in the form:

```
execute @retval = procedure_name
```

- The SAP ASE server reserves 0 to indicate a successful return, and negative values in the range -1 to -99 to indicate different reasons for failure. If no user-defined return value is provided, the SAP ASE value is used. User-defined return status values cannot conflict with those reserved by the SAP ASE server. Numbers 0 and -1 through -14 are currently in use:

Value	Meaning
0	Procedure executed without error

Value	Meaning
-1	Missing object
-2	Datatype error
-3	Process was chosen as deadlock victim
-4	Permission error
-5	Syntax error
-6	Miscellaneous user error
-7	Resource error, such as out of space
-8	Nonfatal internal problem
-9	System limit was reached
-10	Fatal internal inconsistency
-11	Fatal internal inconsistency
-12	Table or index is corrupt
-13	Database is corrupt
-14	Hardware error

Values -15 to -99 are reserved for future SAP ASE use.

- If more than one error occurs during execution, the status with the highest absolute value is returned. User-defined return values always take precedence over SAP ASE-supplied return values.
- The **return** command can be used at any point where you want to exit from a batch or procedure. Return is immediate and complete: statements after **return** are not executed.
- A stored procedure cannot return a NULL return status. If a procedure attempts to return a null value, for example, using **return *@status*** where ***@status*** is NULL, a warning message is generated, and a value in the range of 0 to -14 is returned.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **return**.

See also

- *execute* on page 406
- *begin...end* on page 82

- *if...else* on page 470
- *while* on page 719

revoke

Revokes permissions from users, roles, or groups.

Syntax

Revokes permission to access database objects:

```
revoke [grant option for]
    {all [privileges] | permission_list}
    on {table_name [(column_list)]
        | view_name [(column_list)]
        | stored_procedure_name | function_name
        | keyname}
    [with {pred_name | {all |no} predicates}]
    from {public | name_list | role_list}
    [cascade]
    [granted by grantor]
```

Revokes permission to select built-in functions:

```
revoke select
    on [builtin] builtin
    from {name_list | role_list}
    [granted by grantor]
```

Revokes system privileges:

```
revoke {all [privileges] | privilege_list}
    from {public | name_list | role_list}
    [granted by grantor]
```

Revokes permission to run **set proxy**

```
revoke set proxy
    from {public | name_list | role_list}
    [granted by grantor]
```

Revokes **dbcc** privileges:

```

revoke {dbcc_privilege [on database]
        [, dbcc_privilege [on database], ...]}
    from {user_list | role_list}
    [granted by grantor]
```

Revokes the default permissions from public:

```
revoke default permissions on system tables
```

Parameters

- **all –** when used to assign permission to access database objects (see syntax for "Revokes permission to access database objects"), **all** specifies that all permissions, except `decrypt`, that are applicable to the specified object are revoked. All object owners can use **revoke all** with an object name to revoke permissions on their own objects. You must revoke decrypt permissions separately.

  When granular permissions is not enabled, a system administrator or the database owner can use **revoke all** to revoke privileges to create database objects (see syntax for "Revokes system privileges"). When used by a system administrator, **revoke all** revokes all **create** privileges (**create database**, **create default**, **create procedure**, **create rule**, **create table**, **create function**, and **create view**). When the database owner uses **revoke all**, or executes **revoke all** outside the master database, the SAP ASE server revokes all **create** privileges except **create database** and prints an informational message.

  Revoking all create privileges using **revoke all** is not supported when granular permissions is enabled. For more information, see *Using Granular Permissions* in the *Security Administration Guide*.

  all cannot be used for a **revoke** statement that includes a **where** clause.
- ***permission_list* –** is a list of permissions to revoke. If more than one permission is listed, separate them with commas. The following table illustrates the access permissions that can be granted and revoked on each type of object:

Object	*permission_list* can include
Table	**select**, **insert**, **delete**, **update references**, **update statistics**, **delete statistics**, **truncate table**, **decrypt**, **identity_insert** *, **identity_update** *
View	**select**, **insert**, **delete**, **update**, **decrypt**, **identity_insert** *, **identity_update** *
Column	**select**, **update**, **references**, **decrypt** Column names can be specified in either *permission_list* or *column_list*.
Stored procedure	**execute**
Encryption key	**select**
Function	**execute** *

Note: Permissions with an asterisk (*) can only be granted when granular permissions is enabled.

- ***builtin* –** is a built-in function. Specifying built-in functions allows you to differentiate between a table and a revocable built-in function with the same name. The functions are **set_appcontext**, **get_appcontext**, **list_appcontext**, **authmech**, and **rm_appcontext**.

- ***privilege_list* –** is a list of system privileges that can be revoke. System privileges include server-wide and database-wide privileges. See the "Usage" section for details on how to revoke system privileges. Use commas to separate multiple commands.
- ***table_name* –** is the name of the table on which you are revoking permissions. The table must be in your current database.
- ***column_list* –** is a list of columns, separated by commas, to which the privileges apply. If columns are specified, only **select**, **reference**, **decrypt**, and **update** permissions can be revoked.
- ***view_name* –** is the name of the view on which you are revoking permissions. The view must be in your current database.
- ***stored _procedure_name* –** is the name of the stored procedure on which you are revoking permissions. The stored procedure must be in your current database.
- ***function_name* –** is the name of the function for which you are revoking permissions. The function must be in your current database.
- ***keyname* –** is the name of the key from which you are revoking permission. The encryption key must be in your current database. Only one object can be listed for each revoke statement. You can revoke only **select** permission from a key.
- **[with {*pred_name* | {all | no} predicates}] –** may be followed by a named predicate, the double keyword **all predicates**, or the double keyword **no predicates**.

  - *pred_name* – name of the predicated grant you are revoking. **sp_helprotect** displays the predicate names that identify row-filtering grants.
  - **no predicates** – instructs the SAP ASE server to remove only non-predicated grants for the given access from the named grantee.
  - **all predicates** - instructs the SAP ASE server to remove all the predicated grants for the given access from the named grantor. Any non-predicated grants remain.

  If you omit the **with** clause, both predicated and non-predicated **grant**s are revoked (the default behavior).
- **public –** is all users. For object access permissions, **public** excludes the object owner. For object creation permissions or **set proxy** authorizations, **public** excludes the database owner. You cannot **grant** permissions **with grant option** to "public" or to other groups or roles.
- ***name_list* –** is a list of user and group names, separated by commas.
- **set proxy –** Revokes privilege from a user to impersonate another user.
- **grant option for –** revokes **with grant option** permissions, so that the users specified in *name_list* can no longer grant the specified permissions to other users. If those users have granted permissions to other users, you must use the **cascade** option to revoke permissions from those users. The user specified in *name_list* retains permission to access the object, but can no longer grant access to other users. **grant option for** applies only to object access permissions, not to object creation permissions.
- **cascade –** revokes the specified object access permissions from all users to whom the revokee granted permissions. Applies only to object access permissions, not to object

creation permissions. When you use **revoke** without **grant option for**, permissions granted to other users by the revokee are also revoked: the cascade occurs automatically.

- **granted by *grantor* –** indicates to revoke the permission or privilege granted by *grantor* instead of the user executing the **revoke** command.
- ***grantor* –** a valid user name in current database.
- ***dbcc_privilege* –** is the name of the **dbcc** privileges you are revoking. It cannot be a variable.
- ***database* –** is the name of the database on which you are revoking permissions. It is used with database-specific **dbcc** privileges to revoke permission only on the target database. The revokee must be a valid user in the target database. *database* conforms to the rules for identifiers and cannot be a variable.

  If there are multiple revoked actions in the same command, *database* must be unique.
- ***user_list* –** is a list of users from whom you are revoking the permission, and cannot be a variable.
- ***role_list* –** is a list of the name of system or user-defined roles from whom you are revoking the permission, and cannot be a variable.

  Note: You cannot grant or revoke **dbcc** privileges to public or groups.
- **all [privileges] –** uses **all** or **all privileges** to revoke all granted and denied privileges.
- ***column_list* –** if used with **with *pred_name***, the predicated row access is removed for the named columns. If there still exist other columns referenced for this row-level privilege, the privilege and its related named predicate remain in `sysprotects` for the reduced column list.
- **default permissions on system tables –** specifies that you revoke the default permissions for the system tables listed in "Revoking Default Permissions on System Tables."

Examples

- **Example 1 –** Revokes **insert** and **delete** permissions on the `titles` table from Mary and the “sales” group:

  ```
  revoke insert, delete
  on titles
  from mary, sales
  ```
- **Example 2 –** Revokes **select** permission on the **get_appcontext** function from “public” (which includes all users):

  ```
  revoke select on builtin get_appcontext from public
  ```

  Compare this to the following, which revokes **select** permission on a table called `get_appcontext`, if a table with that name exists:

  ```
  revoke select on get_appcontext from public
  ```
- **Example 3 –** Two ways to revoke **update** permission on the `price` and `advance` columns of the `titles` table from “public”:

```
revoke update
on titles (price, advance)
from public
```

or:

```
revoke update (price, advance)
on titles
from public
```

- **Example 4 –** Revokes permission from Mary and John to use the **create database** and **create table** commands. Because **create database** permission is being revoked, this command must be executed within the `master` database. Mary's and John's **create table** permission is revoked only within the `master` database:

```
revoke create database, create table from mary, john
```

- **Example 5 –** Revokes permission from Harry and Billy to execute either **set proxy** or **set session authorization** to impersonate another user in the server:

```
revoke set proxy from harry, billy
```

- **Example 6 –** Revokes permission from users with **sso_role** to execute either **set proxy** or **set session authorization**:

```
revoke set session authorization from sso_role
```

- **Example 7 –** Revokes all object creation permissions from Mary in the current database (except **create encryption key** and **create trigger**):

```
revoke all from mary
```

- **Example 8 –** Revokes all object access permissions on the `titles` table from Mary (except decrypt permission):

```
revoke all on titles from mary
```

- **Example 9 –** Two ways to revoke Tom's permission to create a referential integrity constraint on another table that refers to the `price` and `advance` columns in the `titles` table:

```
revoke references
on titles (price, advance)
from tom
```

or:

```
revoke references (price, advance)
on titles
from tom
```

- **Example 10 –** Revokes permission to execute **new_sproc** from all users who have been granted the "operator" role:

```
revoke execute on new_sproc from oper_role
```

- **Example 11 –** Revokes John's permission to grant **insert, update**, and **delete** permissions on the `authors` table to other users. Also revokes from other users any such permissions that John has granted:

```
revoke grant option for
insert, update, delete
on authors
from john
cascade
```

- **Example 12 –** Revokes **dbcc** privileges from Frank:

  ```
  revoke dbcc checkdb on all from frank
  ```

- **Example 13 –** Revokes **truncate table** and **update statistics** privileges from Harry on the `authors` table:

  ```
  revoke truncate table on authors from harry
  revoke update statistics on authors from harry
  ```

  Users Billy and Harry can no longer run these commands on `authors`.

- **Example 14 –** Revokes **truncate table** and **update** and **delete statistics** privileges from all users with the `oper_role`:

  ```
  revoke truncate table on authors from oper_role
  revoke update statistics on authors from oper_role
  revoke delete statistics on authors from oper_role
  ```

- **Example 15 –** Revokes **decrypt** permissions from public:

  ```
  revoke decrypt on customer from public
  ```

- **Example 16 –** Revokes **create encryption key** permissions from user joe:

  ```
  revoke create encryption key from joe
  ```

- **Example 17 –** Revokes **select** permission for the `ssn_key` from the database owner.

  ```
  revoke select on ssn_key from dbo
  ```

- **Example 18 –** The following examples assume the following grants have been made for selecting from table `t1` by user1:

  - An unconditional grant to see all rows for `t1.col1` and `t1.col4`:

    ```
    grant select on t1 (col1, col4) to user1
    ```
  - A row-filtering grant to be applied when selecting `t1.col2` or `t1.col3`:

    ```
    grant select on t1 (col2, col3)
      where col1 = 1 as pred1
      to user1
    ```

  Removes **select** permission on `t1.col2` with `pred1`:

  ```
  revoke select on t1 (col2) with pred1
    from user1
  ```

  Note: After this revoke, `pred1` is still applied when `user1` selects `t1.col3`.

  If the grantor issued either of the following, then all permissions on `t1` using `pred1` would be revoked from `user1`:

  ```
  revoke select on t1 (col2, col3) with pred1
    from user1
  ```

or

```
revoke select on t1 with pred1
```

- **Example 19 –** After the grants described in the previous example, the following removes the grant on `t1.col2` and `t1.col3` with predicate `pred1` (**all predicates** revokes all row-filtering predicated grants for a given access and grantee):

  ```
  revoke select on t1 with all predicates
    from user1
  ```

- **Example 20 –** Removes all **select** access on `t1` from `user1`; that is, all predicated and nonpredicated grants on `t1` are granted to `user1` for **select** on `t1`:

  ```
  revoke select on t1 from user1
  ```

- **Example 21 –** Applies to only the non-predicated grant:

  ```
  revoke select on t1 with no predicates
  ```

- **Example 22 –** Revokes select permission on table `mary.books` from john granted by mary:

  ```
  revoke select on mary.books from john granted by mary
  ```

- **Example 23 –** Revokes system privilege `manage any login` from user smith:

  ```
  use master
  ```

  ```
  revoke manage any login from smith
  ```

Usage

- See the **grant** command for more information about permissions.
- You can revoke permissions only on objects in your current database.
- You can revoke only permissions or privileges that were granted by you without using the **granted by** *grantor* option. With the **granted by** *grantor* option, you can revoke permissions or privileges granted by other users.
- **grant** and **revoke** commands are order-sensitive. When there is a conflict, the command issued most recently takes effect. An exeption are grants and revokes of predicated privileges. See *How SAP ASE Saves Predicated Privileges in sysprotects* in the *Security Administration Guide*.
- You can substitute the word **to** for the word **from** in the **revoke** syntax.
- If you do not specify **grant option for** in a **revoke** statement, **with grant option** permissions are revoked from the user along with the specified object access permissions. In addition, if the user has granted the specified permissions to any other users, all of those permissions are revoked. In other words, the **revoke** cascades.
- A user, group, or role can be granted the same privilege or permission by different grantors. In this situation, there are multiple rows in `sysprotects` which represents multiple grants on the same privilege or permission. If one or more than one grants are revoked later, the user, group, or role may still have the privilege or permission if there is at least one grant remain unrevoked.

- A **grant** statement adds one row to the `sysprotects` system table for each user, group, or role that receives the permission. If you subsequently **revoke** the permission from the user or group, the SAP ASE server removes the row from `sysprotects`. If you revoke the permission from only selected group members, but not from the entire group to which it was granted, the SAP ASE server retains the original row and adds a new row for the revoke.
- Permission to issue **create trigger** is granted to users by default. When you revoke permission for a user to create triggers, a revoke row is added in the `sysprotects` table for that user. To grant permission to issue **create trigger**, you must issue two grant commands. The first command removes the revoke row from `sysprotects`; the second inserts a grant row. If you revoke permission to create triggers, the user cannot create triggers even on tables that the user owns. Revoking permission to create triggers from a user affects only the database where the revoke command was issued.
- In a clustered environment, **revoke** fails if you attempt to revoke permissions from user-defined roles in a local temporary database.
- Database user groups allow you to **grant** or **revoke** permissions to more than one user at a time. A user is always a member of the default group, "public" and can be a member of only one other group. The SAP ASE installation script assigns a set of permissions to "public."

  Create groups with **sp_addgroup** and remove groups with **sp_dropgroup**. Add new users to a group with **sp_adduser**. Change a user's group membership with **sp_changegroup**. To display the members of a group, use **sp_helpgroup**.

See also:

- **proc_role** in *Reference Manual: Building Blocks*
- **sp_activeroles**, **sp_adduser**, **sp_changedbowner**, **sp_changegroup**, **sp_displaylogin**, **sp_displayroles**, **sp_dropgroup**, **sp_dropuser**, **sp_helpgroup**, **sp_helprotect**, **sp_helpuser** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **revoke** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, in general, **revoke** can be executed by a user with one of the following privilege management privileges, depending the privilege or permission being revoked. For server-wide privileges, you must be a user with `manage server permissions` privilege or `manage security permissions` privilege. For database-wide privileges, you must be a user with `manage database permissions` privilege. For object privileges, you must be the object owner or be a user with `manage any object permission` privilege. To execute **revoke default**, you must be the database owner or a user with `own database` privilege on the database.
Disabled	With granular permissions enabled: • Command execution – only a system administrator can revoke **create database** permission, and only from the `master` database. Only a system security officer can revoke **create trigger** and **create encryption key** permission. • Database consistency checking – only system administrators can run **revoke dbcc** commands. Database owners cannot run **revoke dbcc**. • Database object access – revoke permission for database objects defaults to object owners. An object owner can revoke permission from other users on his or her own database objects. • Functions – only system administrators can revoke permissions on built-in functions. • Proxy and session authorization – only a system security officer can revoke set proxy or set session authorization, and only from the master database. • Roles – you can revoke roles only from the `master` database. Only a system security officer can revoke **sso_role**, , or a user-defined role from a user or a role. Only system administrators can revoke **oper_rolesa_role** from a user or a role. Only a user who has both **sa_role** and **sso_role** can revoke a role that includes **sa_role**. • Tables – database owners can revoke default permissions on system tables. Table owners and the system security officer can revoke **decrypt** permission on a table or a list of columns in a table. • Defaults – database owners and logins with **sa_role** can revoke defaults.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	47

Information	Values
Audit option	**revoke**
Command or access audited	**revoke**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – Full command text of the **revoke** statement • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *grant* on page 419
- *setuser* on page 658
- *set* on page 607

Using the revoke Command's granted by Option

Usage information for using the **revoke** command's `granted by` option.

- **granted by** is not allowed on revoking predicated privileges.
- It is not required that the `grantor` has permission to execute the **grant** command.
- The permission granted by the grantor (indicated by `sysprotects.grantor`), not the command executor, would be revoked.
- You need not enable **enable granular permissions** to use the **granted by** parameter.
- Users who received their **grant** permission on an object with the **with grant** option cannot issue the **granted by** parameter. All other users may issue the **granted by** parameter.

  For example, John gets permission on mary's table through **with grant** option. An error returns when he tries to issue the revoke statement using **granted by** option. Mary:

  ```
  grant select on mary.books to john
  with grant option
  ```

  Mary:

  ```
  grant select on mary.books to smith
  ```

  John:

  ```
  revoke select on mary.books from smith
  granted by mary
  ```

Revoking set proxy and set session authorization

To revoke **set proxy** or **set session authorization** you must be in the `master` database.

set proxy and **set session authorization** are identical, with one exception: **set session authorization** follows the SQL standard. If you are concerned about using only SQL standard commands and syntax, use **set session authorization**.

revoke all does *not* include **set proxy** or **set session authorization** permissions.

Revoking Default Permissions on System Tables

Revokes default permissions on all system tables from "public."

The system tables you can revoke the default permissions for when you issue the command from any database are:

- `sysalternates`
- `sysattributes`
- `syscolumns`
- `syscomments`
- `sysconstraints`
- `sysdepends`
- `sysindexes`
- `sysjars`
- `syskeys`
- `syslogs`
- `sysobjects`
- `syspartitions`
- `sysprocedures`
- `sysprotects`
- `sysqueryplans`
- `sysreferences`
- `sysroles`
- `syssegments`
- `sysstatistics`
- `systabstats`
- `systhresholds`
- `systypes`
- `sysusermessages`
- `sysusers`
- `sysxtypes`

The system tables you revoke the default permissions for when you issue this command from the `master` database are:

- `sysdatabases`
- `sysdevices`
- `syslocks`
- `sysmessages`
- `sysprocesses`
- `systransactions`
- `sysusages`
- `sysconfigures`
- `syscurconfigs`
- `syslanguages`
- `syscharsets`
- `sysservers`
- `systimeranges`
- `sysresourcelimits`
- `syslogins`
- `sysremotelogins`

Revoking Permissions for update statistics, delete statistics, and truncate table

The SAP ASE server allows you to revoke permissions for users, roles, and groups for the **update statistics**, **delete statistics**, and **truncate table** commands.

Table owners can also provide permissions through an implicit **grant** by adding **update statistics**, **delete statistics**, and **truncate table** to a stored procedure and then granting execute permissions on that procedure to a user or role.

You cannot revoke permissions for **update statistics** at the column level. You must have the **sso_role** to run **update statistics** or **delete statistics** on `sysroles`, `syssrvroles`, and `sysloginroles` security tables.

By default, the database owner has permission to run **update statistics** and **delete statistics** on system tables other than `sysroles`, `syssrvroles`, and `sysloginroles`, and can transfer this privilege to other users.

You can also issue **grant all** to grant permissions on **update statistics**, **delete statistics**, and **truncate table**.

Note: Once you revoke permission to execute **update statistics** from a user, they also lose permission to execute variations of this command, such as **update all statistics**, **update partition statistics**, **update index statistics**, **update statistics** *table*, and so on. For example, the following revokes Billy permission from running all variations of **update statistics** on the `authors` table:

```
revoke update statistics on authors to billy
```

If you revoke a user's permission to execute **update statistics**, you also revoke their ability to execute the variations of this command.

You cannot revoke variants of **update statistics** (for example, **update index statistics**) separately. That is, you *cannot* issue:

```
revoke update all statistics from harry
```

You cannot grant and revoke **delete statistics** permissions at the column level. See the "Usage" section of **grant**.

Using the cascade Option

revoke grant option for revokes the user's ability to grant the specified permission to other users, but does not revoke the permission itself from that user. If the user has granted that permission to others, you must use the **cascade** option; otherwise, you receive an error message and the **revoke** fails.

For example, say you revoke the **with grant option** permissions from the user Bob on `titles`, with this statement:

```
revoke grant option for select
on titles
from bob
cascade
```

- If Bob has not granted this permission to other users, this command revokes his ability to do so, but he retains **select** permission on the `titles` table.
- If Bob has granted this permission to other users, you must use the **cascade** option. If you do not, you receive an error message and the **revoke** fails. **cascade** revokes this **select** permission from all users to whom Bob has granted it, as well as their ability to grant it to others.

You cannot use **revoke** with the **cascade** option to revoke privileges granted by the table owner. For example, the owner of a table (UserA) can grant privileges to another user (UserB) as in this scenario:

```
create table T1 (...)
grant select on T1 to UserB
```

However, the system administrator cannot revoke UserB's privileges using the **revoke** privileges command with the **cascade** option as in this statement:

```
revoke select on T1 from UserA cascade
```

This statement revokes the **select** privileges of the table owner, but does not revoke those privileges from UserB.

By default, all data manipulation language (DML) operations are revoked implicitly for users other than the table owner (except for decrypt permission when **restricted decrypt permission** is enabled. See the *Encrypted Columns Users Guide*). Because the `sysprotects` table contains no records indicating that the table owner has granted and then revoked privileges, the **cascade** option is not invoked.You must revoke explicitly the **select** privilege from UserB.

revoke role

Revokes a role from a group, login, login profile, or role:

Syntax

```
revoke role {role_name [, role_list ...]} from
    {grantee [, grantee ...]}
```

Parameters

- **role –** is the name of a system or user-defined role. Use **revoke role** to revoke granted roles from roles, logins, or login profiles.
- ***role_name* –** is the name of a system or user-defined role. When revoking a role from a grantee you are revoking all permissions which that grantee has through role membership.
- ***grantee* –** is the name of a system role, user-defined role, a login profile, or the login name of a user, from whom you are revoking a role.
- ***role_list* –** is a list of the name of the system or user-defined roles you are revoking and cannot be a variable.

Examples

- **Example 1 –** Revokes “doctor_role” from “specialist_role”:

  ```
  revoke role doctor_role from specialist_role
  ```

- **Example 2 –** Revokes “doctor_role” and “surgeon_role” from “specialist_role” and “intern_role”, and from users Mary and Tom:

  ```
  revoke role doctor_role, surgeon_role from specialist_role,
  intern_role, mary, tom
  ```

- **Example 3 –** User Smith, with `manage roles` privileges, revokes the `nurse_role` from the `doctor_role`, which was originally granted by `roleAdmin`:

  ```
  revoke role nurse_role from doctor_role
  granted by roleAdmin
  ```

  Note: `manage roles` privileges is only available when granular permissions is enabled.

- **Example 4 –** Revokes the system role `oper_role` from the login profile assumed by system operators.

  ```
  revoke role oper_role from lp_operator
  ```

Usage

- You can revoke a role from a user while the user is logged in. The SAP ASE server verifies a user's activated roles before performing access checks.
- If you revoke a role from a login profile, the SAP ASE server revokes the role from all users assigned to that profile, including users currently logged in to the SAP ASE server.

See also:

- **proc_role** in *Reference Manual: Building Blocks*
- **sp_activeroles**, **sp_adduser**, **sp_changedbowner**, **sp_changegroup**, **sp_displaylogin**, **sp_displayroles**, **sp_dropgroup**, **sp_dropuser**, **sp_helpgroup**, **sp_helprotect**, **sp_helpuser** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **revoke role** differ based on your granular permissions settings.

Setting	Description
Enabled	When granular permissions is enabled, you must be a user with `manage roles` privilege.
Disabled	With granular permissions enabled:, you can revoke roles only from the `master` database. Only a system security officer can revoke **sso_role**, **oper_role**, or a user-defined role from a user or a role. Only system administrators can revoke **sa_role** from a user or a role. Only a user who has both **sa_role** and **sso_role** can revoke a role that includes **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	85
Audit option	**role**
Command or access audited	**create role**, **drop role**, **alter role**, **grant role**, or **revoke role**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – Full command text of **revoke role** statement. • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *grant* on page 419
- *setuser* on page 658
- *set* on page 607

rollback

Rolls back a user-defined transaction to the named savepoint in the transaction or to the beginning of the transaction.

Syntax

```
rollback [tran | transaction | work]
    [transaction_name | savepoint_name]
```

Parameters

- **tran | transaction | work –** specifies that you want to roll back the transaction or the work. If you specify **tran**, **transaction**, or **work**, you can also specify the *transaction_name* or the *savepoint_name*.
- ***transaction_name* –** is the name assigned to the outermost transaction. It must conform to the rules for identifiers.
- ***savepoint_name* –** is the name assigned to the savepoint in the **save transaction** statement. The name must conform to the rules for identifiers.

Examples

- **Example 1 –** Rolls back the transaction:

  ```
  begin transaction
  delete from publishers where pub_id = "9906"
  rollback transaction
  ```

Usage

- **rollback transaction** without a *transaction_name* or *savepoint_name* rolls back a user-defined transaction to the beginning of the outermost transaction.
- **rollback transaction *transaction_name*** rolls back a user-defined transaction to the beginning of the named transaction. Though you can nest transactions, you can roll back only the outermost transaction.
- **rollback transaction *savepoint_name*** rolls a user-defined transaction back to the matching **save transaction *savepoint_name***.

Restrictions for rollback are:

- If no transaction is currently active, the **commit** or **rollback** statement has no effect.
- The **rollback** command must appear within a transaction. You cannot roll back a transaction after **commit** has been entered.

To roll back an entire transaction:

- **rollback** without a savepoint name cancels an entire transaction. All the transaction's statements or procedures are undone.
- If no *savepoint_name* or *transaction_name* is given with the **rollback** command, the transaction is rolled back to the first **begin transaction** in the batch. This also includes transactions that were started with an implicit **begin transaction** using the chained transaction mode.

For rolling back to a savepoint:

- To cancel part of a transaction, use **rollback** with a *savepoint_name*. A savepoint is a marker set within a transaction by the user with the command **save transaction**. All statements or procedures between the savepoint and the **rollback** are undone.
- After a transaction is rolled back to a savepoint, it can proceed to completion (executing any SQL statements after that **rollback**) using **commit**, or it can be canceled altogether using **rollback** without a savepoint. There is no limit on the number of savepoints within a transaction.

For rollbacks within triggers and stored procedures:

- In triggers or stored procedures, **rollback** statements without transaction or savepoint names roll back all statements to the first explicit or implicit **begin transaction** in the batch that called the procedure or fired the trigger.
- When a trigger contains a **rollback** command without a savepoint name, the rollback aborts the entire batch. Any statements in the batch following the rollback are not executed.
- A remote procedure call (RPC) is executed independently from any transaction in which it is included. In a standard transaction (that is, not using Open Client™ DB-Library two-phase commit), commands executed via an RPC by a remote server are not rolled back with **rollback** and do not depend on **commit** to be executed.

- For complete information on using transaction management statements and on the effects of **rollback** on stored procedures, triggers, and batches, see the *Transact-SQL User's Guide*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Transact-SQL extensions – The **rollback transaction** and **rollback tran** forms of the statement and the use of a transaction name.

Permissions

No permission is required to use **rollback**.

See also

- *begin transaction* on page 83
- *commit* on page 89
- *create trigger* on page 253
- *save transaction* on page 577

rollback trigger

Rolls back the work done in a trigger, including the data modification that caused the trigger to fire, and issues an optional **raiserror** statement.

Syntax

```
rollback trigger
    [with raiserror_statement]
```

Parameters

- **with *raiserror_statement* –** specifies a **raiserror** statement, which prints a user-defined error message and sets a system flag to record that an error condition has occurred. This provides the ability to raise an error to the client when **rollback trigger** is executed so that the transaction state in the error reflects the rollback. For information about the syntax and rules defining **raiserror_statement**, see the **raiserror** command.

Examples

- **Example 1 –** Rolls back a trigger and issues the user-defined error message 25002:

  ```
  rollback trigger with raiserror 25002
      "title_id does not exist in titles table."
  ```

Usage

- When **rollback trigger** is executed, the SAP ASE server aborts the currently executing command and halts execution of the rest of the trigger.
- If the trigger that issues **rollback trigger** is nested within other triggers, the SAP ASE server rolls back all work done in these triggers up to and including the update that caused the first trigger to fire.
- The SAP ASE server ignores a **rollback trigger** statement that is executed outside a trigger and does not issue a **raiserror** associated with the statement. However, a **rollback trigger** statement executed outside a trigger but inside a transaction generates an error that causes the SAP ASE server to roll back the transaction and abort the current statement batch.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **rollback trigger**.

See also

- *create trigger* on page 253
- *raiserror* on page 538
- *rollback* on page 574

save transaction

Sets a savepoint within a transaction.

Syntax

```
save transaction savepoint_name
```

Parameters

- ***savepoint_name*** **–** is the name assigned to the savepoint. It must conform to the rules for identifiers.

Examples

- **Example 1 –** After updating the `royaltyper` entries for the two authors, insert the savepoint `percentchanged`, then determine how a 10 percent increase in the book's price affects the authors' royalty earnings. The transaction is rolled back to the savepoint with **rollback transaction**:

```
begin transaction royalty_change

update titleauthor
set royaltyper = 65
from titleauthor, titles
where royaltyper = 75
and titleauthor.title_id = titles.title_id
and title = "The Gourmet Microwave"

update titleauthor
set royaltyper = 35
from titleauthor, titles
where royaltyper = 25
and titleauthor.title_id = titles.title_id
and title = "The Gourmet Microwave"

save transaction percentchanged

update titles
set price = price * 1.1
where title = "The Gourmet Microwave"

select (price * total_sales) * royaltyper
from titles, titleauthor
where title = "The Gourmet Microwave"
and titles.title_id = titleauthor.title_id

rollback transaction percentchanged

commit transaction
```

Usage

- A savepoint is a user-defined marker within a transaction that allows portions of a transaction to be rolled back. **rollback *savepoint_name*** rolls back to the indicated savepoint; all statements or procedures between the savepoint and the **rollback** are undone. Statements preceding the savepoint are not undone—but neither are they committed. After rolling back to the savepoint, the transaction continues to execute statements. A **rollback** without a savepoint cancels the entire transaction. A **commit** allows it to proceed to completion.
- If you nest transactions, **save transaction** creates a savepoint only in the outermost transaction.
- There is no limit on the number of savepoints within a transaction.
- If no *savepoint_name* or *transaction_name* is given with the **rollback** command, all statements back to the first **begin transaction** in a batch are rolled back, and the entire transaction is canceled.

See also *Transact-SQL User's Guide* for using transaction statements.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **save transaction**.

See also

- *begin transaction* on page 83
- *commit* on page 89
- *rollback* on page 574

select

Retrieves rows from database objects.

Syntax

```
select ::=
    select [all | distinct]
    [top unsigned_integer]
    select_list
    [into_clause]
    [from_clause]
    [where_clause]
    [group_by_clause]
    [having_clause]
    [order_by_clause]
    [compute_clause]
    [read_only_clause]
    [isolation_clause]
    [browse_clause]
    [plan_clause]
    [for_xml_clause]
```

```
select_list ::=
```

Note: For details on *select_list*, see the “Parameters” section.

```
into_clause ::=
    into [[database.] owner.] table_name
        [(colname encrypt [with [database.[owner].]keyname] [,
            colname encrypt_clause ...]))]
            | [compressed = compression_level | not compressed]
            [in row [(length)] | off row ]
        [{[external table at]
            'server_name.[database].[owner].object_name’
            | external directory at ‘pathname’
            | external file at ‘pathname’ [column delimiter
‘string’]}]
        [on segment_name]
        dml_logging = (full | minimal)
        [partition_clause]
        [lock {datarows | datapages | allpages}]
        [with [, into_option[, into_option] ...]]]
    | into existing table table_name
```

```
    partition_clause ::=
         partition by range (column_name[, column_name]...)
             ([partition_name] values <= ({constant | MAX}
                [, {constant | MAX}] ...) [on segment_name]
                    [compression_clause] [on segment_name]
                [, [partition_name] values <= ({constant | MAX}
                    [, {constant | MAX}] ...) [on segment_name]]...)
                    [compression_clause] [on segment_name]

        | partition by hash (column_name[, column_name]...)
            { (partition_name [on segment_name]
                    [compression_clause] [on segment_name]
                [, partition_name [on segment_name]]...)
                    [compression_clause] [on segment_name]
            | number_of_partitions
                [on (segment_name[, segment_name] ...)]}

        | partition by list (column_name)
             ([partition_name] values (constant[, constant] ...)
                [compression_clause] [on segment_name]
              [, [partition_name] values (constant[, constant] ...)
                    [compression_clause] [on segment_name]

        | partition by roundrobin
            { (partition_name [on segment_name]
                [, partition_name [on segment_name]]...)
                [compression_clause] [on segment_name]
            | number_of_partitions
                [on (segment_name [, segment_name]...)]}
```

```
    into_option ::=
        | max_rows_per_page = num_rows
        | exp_row_size = num_bytes
        | reservepagegap = num_pages
        | identity_gap = gap
        | compression = {none | page | row}
        | lob_compression = off | compression_level]
```

```
from_clause ::=
    from table_reference [,table_reference]...
```

```
    table_reference ::=
        table_view_name | ANSI_join
```

```
        table_view_name ::=
            [[database.]owner.] {{table_name | view_name}
            [as] [correlation_name]
            [(index {index_name | table_name})]
            [parallel [degree_of_parallelism]]
            [prefetch size][lru | mru]}
        [holdlock | noholdlock]
        [readpast]
        [shared]
        ANSI_join ::=
            table_reference join_type join table_reference
                    join_conditions
                join_type ::= inner | left [outer] | right [outer]
                join_conditions ::= on search_conditions
```

```
compression_clause::=
        with compression = {none | page | row}
```

```
index_compression_clause::=
        with index_compression = {none | page}
```

```
where_clause ::=
    where search_conditions
    for update [of column_list
```

```
group_by_clause ::=
    group by [all] aggregate_free_expression
        [, aggregate_free_expression]...
```

```
having_clause ::=
    having search_conditions
```

```
order_by_clause ::=
    order by sort_clause [, sort_clause]...
```

```
    sort_clause ::=
        {[[[database.]owner.]{table_name.|view_name.}]column_name
        | select_list_number
        | expression }
        [asc | desc]
```

```
compute_clause ::=
    compute row_aggregate (column_name)
        [, row_aggregate (column_name)]...
    [by column_name [, column_name]...]
```

```
read_only_clause ::=
    for {read only | update [of column_name_list]}
```

```
isolation_clause ::=
    at isolation
        {read uncommitted | 0}
        | {read committed | 1}
        | {repeatable read | 2}
        | {serializable | 3}
```

```
browse_clause ::=
    for browse
```

```
plan_clause ::=
    plan "abstract plan"
```

Note: See the *XML Services* book for syntax, examples, and usage information for the **select...for_xml_clause**.

Parameters

- **all –** includes all rows in the results. **all** is the default.
- **distinct –** includes only unique rows in the results. **distinct** must be the first word in the select list. **distinct** is ignored in browse mode.

  Null values are considered equal for the purposes of the keyword **distinct**: only one NULL is selected, no matter how many are encountered.
- **top *unsigned_integer* –** is used with **select...into** statements to limit the number of rows inserted in the target table. This is different from **set rowcount**, which is ignored during a **select...into**.
  - When used with **delete**, **update**, or in a view, you cannot specify ordering. If there is an implied order on the table from a clustered index, that order applies; otherwise, the results are unpredictable, as they can be in any order.
  - *n* is an unsigned 32-bit value between 0 through 2^{32}-1 (4GB-1 or 4,294,967,295). Zero indicates “no” rows.
  - When used with cursors, **top n** limits the overall size of the result set. Specifying **set cursor rowcount** limits the results of a single fetch.
  - When a view definition contains **select top *n*** and a query with a **where clause** uses it, the results may be inconsistent.
- ***select_list* –** consists of one or more of the following items:
  - “*”, representing all columns in **create table** order.
  - A list of column names in the order in which you want to see them. When selecting an existing IDENTITY column, you can substitute the **syb_identity** keyword, qualified by the table name, where necessary, for the actual column name.
  - A specification to add a new IDENTITY column to the result table:

    ```
    column_name = identity (int | smallint | tinyint | precision)
    ```

    If you specify `int`, `smallint`, or `tinyint`, the resulting column is an integer. If you specify `precision`, the result is numeric datatype.
  - A replacement for the default column heading (the column name), in one of these forms:

    ```
    column_heading = column_name
    column_name column_heading
    ```

    ```
    column_name as column_heading
    ```

    The column heading can be enclosed in quotation marks for any of these forms. The heading must be enclosed in quotation marks if it is not a valid identifier (that is, if it is a reserved word, if it begins with a special character, or if it contains spaces or punctuation marks).
  - An expression (a column name, constant, function, or any combination of column names, constants, and functions connected by arithmetic or bitwise operators, or a subquery).

    - A built-in function or an aggregate.
    - Any combination of the items listed above.

  The *select_list* can also assign values to variables, in the form:

  ```
      @variable = expression
          [, @variable = expression ...]
  ```

  You cannot combine variable assignment with any other *select_list* option.
- **into –** except when used with **existing table**, creates a new table based on the columns specified in the select list and the rows chosen in the **where** clause.
- ***colname* encrypt –** Specifies encryption on *colname* in the target table. By default, the SAP ASE server decrypts data selected from the source table. You must use the **encrypt** keyword to preserve the data encryption or to encrypt a column in the target database that was not encrypted in the source database.
- **compression = *compression_level* | not compressed –** indicates if the large object (LOB) data in the row is compressed and to what level.
- ***compression_level* | not compressed –** indicates the compression level of the row:

    - 0 – the row is not compressed.
    - 1 through 9 – the SAP ASE server uses ZLib compression. Generally, the higher the compression number, the more the SAP ASE server compresses the LOB data, and the greater the ratio between compressed and uncompressed data (that is the greater the amount of space savings, in bytes, for the compressed data versus the size of the uncompressed data).

      However, the amount of compression depends on the LOB content, and the higher the compression level , the more CPU-intensive the process. That is, level 9 provides the highest compression ratio but also the heaviest CPU usage.
    - 100 – the SAP ASE server uses FastLZ compression. The compression ratio that uses the least CPU usage; generally used for shorter data.
    - 101 – the SAP ASE server uses FastLZ compression. A value of 101 uses slightly more CPU than a value of 100, but uses a better compression ratio than a value of 100.

  The compression algorithm ignores rows that do not use LOB data.
- ***column_list* –** is a list of columns separated by commas.
- **with database...key –** specifies the key used on the source data, or a different key.
- **in row [(*length*)] –** sets or changes the in-row chracteristics for the LOB columns in the target table. If you do not specify *length*, the SAP ASE server uses the configured default in-row length.

  By default, a LOB column in the target table inherits the storage property of the corresponding LOB column in the **select** list. If the target table's LOB column is produced as a result of an expression, such as the **convert(text, *column*)** built-in function, the column then automatically uses off-row storage unless you change the setting by specifying **in row [(*length*)]**.
- **off row –** changes the storage format of the column from in-row to off-row.

- **external [[*table*] | *directory* | *file*] –** indicates that the type of the external object is a table, directory, or file. If you do not indicate a file, directory, or table, **select into** assumes that you are using a table.

  Note: You cannot specify an external location when using any part of the *partition_clause*. Partitions can be created only on tables on the current server and database.
- **'*server_name*.[*database*].[*owner*].*object_name*' –** indicates that you are selecting into a table or view found on the remote *server_name*.
- **dml_logging –** determines the amount of logging for **insert**, **update** and **delete** operations, and for some forms of bulk inserts. One of
  - **full** – the SAP ASE server logs all transactions
  - **minimal** – the SAP ASE server does not log row or page changes
- **at '*path_name*' –** indicates the full, operating system-specific path name of the external file or directory you are selecting into. All directories in *path_name* must be accessible to the SAP ASE server.
- **column delimeter '*string*' –** indicates the delimiter that you are using to separate columns after converting the column's data to string format. *string* can have as many as 16 characters. If you do not specify a delimiter, **select into** uses the tab character.
- **existing table *table_name* –** indicates that you are selecting data into a proxy table. You cannot use this **select into** with any other table type except proxy. The column list in the **select** list must match the type, length, and number in the proxy table.
- **on *segment_name* –** specifies that the table is to be created on the named segment. Before the **on *segment_name*** option can be used, the device must be initialized with **disk init**, and the segment must be added to the database with **sp_addsegment**. See your system administrator or use **sp_helpsegment** for a list of the segment names available in your database.
- **partition by range –** specifies records are to be partitioned according values in the partitioning column or columns. Each partitioning column value is compared with sets of user-supplied upper and lower bounds to determine partition assignment.
- ***column_name* –** when used in the *partition_clause*, specifies a partition key column.
- ***partition_name* –** specifies the name of a new partition on which table records are to stored. Partition names must be unique within the set of partitions on a table or index. Partition names can be delimited identifiers if **set quoted_identifier** is on. Otherwise, they must be valid identifiers.

  If *partition_name* is omitted, the SAP ASE server creates a name in the form ***table_name_partition_id***. The SAP ASE server truncates partition names that exceed the allowed maximum length.
- **values <= *constant* | MAX –** specifies the inclusive upper bound of values for a named partition. Specifying a constant value for the highest partition bound imposes an implicit integrity constraint on the table. The keyword MAX specifies the maximum value in a given datatype.
- **on *segment_name* –** when used in the *partition_clause*, specifies the name of the segment on which to place the partition. When using **on *segment_name***, the logical device must

already have been assigned to the database with **create database** or **alter database**, and the segment must have been created in the database with **sp_addsegment**. See your system administrator or use **sp_helpsegment** for a list of the segment names available in your database.

- **partition by hash –** specifies records are to be partitioned by a system-supplied hash function. The function computes the hash value of the partition keys that specify the partition to which records are assigned.
- **partition by list –** specifies records are to be partitioned according to literal values specified in the named column. The partition key contains only one column. You can list up to 250 constants as the partition values for each list partition.
- **partition by roundrobin –** specifies records are to be partitioned in a sequential manner. A round-robin-partitioned table has no partitioning key. Neither the user nor the optimizer knows in which partition a particular record resides.
- **lock datarows | datapages | allpages –** specifies the locking scheme to be used for a table created with a **select into** command. The default is the server-wide setting for the configuration parameter **lock scheme**.
- **max_rows_per_page –** limits the number of rows on data pages for a table created with **select into**. Unlike **fillfactor**, the **max_rows_per_page** value is maintained when data is inserted or deleted. **max_rows_per_page** is not supported on data-only-locked tables.
- **exp_row_size = *num_bytes* –** specifies the expected row size for a table created with the **select into** command. Valid only for datarows and datapages locking schemes and only for tables that have variable-length rows. Valid values are 0, 1, and any value greater than the minimum row length and less than the maximum row length for the table. The default value is 0, which means that a server-wide default is used.
- **reservepagegap = *num_pages* –** specifies a ratio of filled pages to empty pages that is to be left as **select into** allocates extents to store data. This option is valid only for the **select into** command. For each specified *num_pages*, one empty page is left for future expansion of the table. Valid values are 0 – 255. The default value is 0.
- **readpast –** specifies that the query should silently skip rows with exclusive locks, without waiting and without generating a message.
- **identity_gap –** specifies the identity gap for the table. This value overrides the system identity gap setting for this table only.
- **compression = –** indicates the level of compression to be applied to the table or partition. The new compression level applies to the newly inserted or updated data:

  - **none** – the data in this table or partition is not compressed. For partitions, **none** indicates that data in this partition remains uncompressed even if the table compression is altered to **row** or **page** compression.
  - **row** – compresses one or more data items in an individual row. The SAP ASE server stores data in a **row**-compressed form only if the compressed form saves space compared to an uncompressed form. Set **row** compression at the partition or table level.

    - **page** – when the page fills, existing data rows that are row-compressed are then compressed using page-level compression to create page-level dictionary, index, and character-encoding entries. Set **page** compression at the partition or table level.

      The SAP ASE server compresses data at the page level only after it has compressed data at the row level, so setting the compression to **page** implies both **page** and **row** compression.
- **index_compression = –** creates an index compressed table by selecting from an existing table:
    - `NONE` – indexes on the specified table are not compressed. Indexes that are specifically created with **index_compression = PAGE** are compressed.
    - `PAGE` – all indexes on the specified table are compressed. Indexes that are specifically created with **index_compression = NONE** are not compressed.
- **lob_compression = *compression_level* –** determines the compression level for the table.
- ***value* –** is the identity gap amount.

  If you are creating a table in a **select into** statement from a table that has a specific identity gap setting, the new table does not inherit the identity gap setting from the parent table. Instead, the new table uses the identity burning set factor setting. To give the new table a specific **identity_gap** setting, specify the identity gap in the **select into** statement. You can give the new table an identity gap that is the same as or different from the parent table.
- **from –** indicates which tables and views to use in the **select** statement. **from** required except when the **select** list contains no column names (that is, it contains constants and arithmetic expressions only):

  ```
  select 5 x, 2 y, "the product is", 5*2 Result
  ```

  ```
  x       y                          Result
  ------- ------- ------------------ -----------
          5       2 the product is   10
  ```

  At most, a query can reference 250 tables and 46 worktables (such as those created by aggregate functions). The 250-table limit includes:
    - Tables (or views on tables) listed in the **from** clause
    - Each instance of multiple references to the same table (self-joins)
    - Tables referenced in subqueries
    - Tables being created with **into**
    - Base tables referenced by the views listed in the **from** clause
- ***view_name, table_name* –** lists tables and views used in the **select** statement. Specify the database name if the table or view is in another database, and specify the owner's name if more than one table or view of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.

  If there is more than one table or view in the list, separate their names by commas. The order of the tables and views following the keyword **from** does not affect the results.

  You can query tables in different databases in the same statement.

Table names and view names can be given correlation names (aliases), either for clarity or to distinguish the different roles that tables or views play in self-joins or subqueries. To assign a correlation name, give the table or view name, then a space, then the correlation name, like this:

```
select pub_name, title_id
    from publishers pu, titles t
    where t.pub_id = pu.pub_id
```

All other references to that table or view (for example, in a **where** clause) must use the correlation name. Correlation names cannot begin with a numeral.

- **index *index_name* –** specifies the index to use to access *table_name*. You cannot use this option when you select from a view, but you can use it as part of a **select** clause in a **create view** statement.
- **parallel –** specifies a parallel partition or index scan, if the SAP ASE server is configured to allow parallel processing.
- ***degree_of_parallelism* –** specifies the number of worker processes that scan the table or index in parallel. If set to 1, the query executes serially.
- **prefetch *size* –** specifies the I/O size, in kilobytes, for tables bound to caches with large I/Os configured. You cannot use this option when you select from a view, but you can use it as part of a **select** clause in a **create view** statement. **sp_helpcache** shows the valid sizes for the cache an object is bound to or for the default cache. To configure the data cache size, use **sp_cacheconfigure**.

  When using **prefetch** and designating the prefetch size (*size*), the minimum is 2K and any power of two on the logical page size up to 16K. **prefetch** size options in kilobytes are:

Logical Page Size	Prefetch Size Options
2	2, 4, 8 16
4	4, 8, 16, 32
8	8, 16, 32, 64
16	16, 32, 64, 128

  The **prefetch** size specified in the query is only a suggestion. To allow the size specification, configure the data cache at that size. If you do not configure the data cache to a specific size, the default **prefetch** size is used.

  If CIS is enabled, you cannot use **prefetch** for remote servers.
- **lru | mru –** specifies the buffer replacement strategy to use for the table. Use **lru** to force the optimizer to read the table into the cache on the MRU/LRU (most recently used/least recently used) chain. Use **mru** to discard the buffer from cache and replace it with the next buffer for the table. You cannot use this option when you select from a view, but you can use it as part of a **select** clause in a **create view** statement.

- **holdlock –** makes a shared lock on a specified table or view more restrictive by holding it until the transaction completes (instead of releasing the shared lock as soon as the required data page is no longer needed, whether or not the transaction has completed).

  The **holdlock** option applies only to the table or view for which it is specified, and only for the duration of the transaction defined by the statement in which it is used. Setting the **transaction isolation level 3** option of the **set** command implicitly applies a **holdlock** for each **select** statement within a transaction. The keyword **holdlock** is not permitted in a **select** statement that includes the **for browse** option. You cannot specify both a **holdlock** and a **noholdlock** option in a query.

  If CIS is enabled, you cannot use **holdlock** for remote servers.
- **noholdlock –** prevents the server from holding any locks acquired during the execution of this **select** statement, regardless of the transaction isolation level currently in effect. You cannot specify both a **holdlock** and a **noholdlock** option in a query.
- **shared –** instructs the SAP ASE server to use a shared lock (instead of an update lock) on a specified table or view. This allows other clients to obtain an update lock on that table or view. You can use the **shared** keyword only with a **select** clause included as part of a **declare cursor** statement. For example:

  ```
  declare shared_crsr cursor
  for select title, title_id
  from titles shared
  where title_id like "BU%"
  ```

  You can use the **holdlock** keyword in conjunction with **shared** after each table or view name, but **holdlock** must precede **shared**.
- ***ANSI join* –** an inner or outer join that uses the ANSI syntax. The **from** clause specifies the tables to be joined.
- **inner –** includes only the rows of the inner and outer tables that meet the conditions of the **on** clause. The result set of a query that includes an inner join does not include any null-supplied rows for the rows of the outer table that do not meet the conditions of the **on** clause.
- **outer –** includes all the rows from the outer table whether or not they meet the conditions of the **on** clause. If a row does not meet the conditions of the **on** clause, values from the inner table are stored in the joined table as null values. The **where** clause of an ANSI outer join restricts the rows that are included in the query result.
- **left –** left joins retain all the rows of the table reference listed on the left of the join clause. The left table reference is referred to as the outer table or row-preserving table.

  In the queries below, `T1` is the outer table and `T2` is the inner table:

  ```
  T1 left join T2
  T2 right join T1
  ```
- **right –** right joins retain all the rows of the table reference on the right of the join clause (see example above).
- ***search_conditions* –** used to set the conditions for the rows that are retrieved. A search condition can include column names, expressions, arithmetic operators, comparison

operators, the keywords **not**, **like**, **is null**, **and**, **or**, **between**, **in**, **exists**, **any**, and **all**, subqueries, case expressions, or any combination of these items.

- **group by –** finds a value for each group. These values appear as new columns in the results, rather than as new rows.

  When **group by** is used with standard SQL, each item in the select list must either have a fixed value in every row in the group or be used with aggregate functions, which produce a single value for each group. Transact-SQL has no such restrictions on the items in the select list. Also, Transact-SQL allows you to group by any expression (except by a column alias); with standard SQL, you can group by a column only.

  You can use the aggregates listed in this table with **group by** (*expression* is almost always a column name):

Table 8. Results of Using Aggregates with group by

Aggregate Function	Result
sum ([all | distinct] *expression*)	Total of the values in the numeric column.
avg ([all | distinct] *expression*)	Average of the values in the numeric column.
count ([all | distinct] *expression*)	Number of (distinct) non-null values in the column returned as an `integer`.
count_big ([all | distinct] *expression*)	Number of distinct non-null values in the column returned as a `bigint`.
count (*)	Number of selected rows returned as an `integer`.
count_big (*)	Number of selected rows returned as a `bigint`.
max (*expression*)	Highest value in the column.
min (*expression*)	Lowest value in the column.

  A table can be grouped by any combination of columns—that is, groups can be nested within each other. You cannot group by a column heading; you must use a column name, an expression, or a number representing the position of the item in the select list.

- **group by all –** includes all groups in the results, even those that do not have any rows that meet the search conditions.
- ***aggregate_free_expression* –** is an expression that includes no aggregates.
- **having –** sets conditions for the **group by** clause, similar to the way that **where** sets conditions for the **select** clause. There is no limit on the number of conditions that can be included.

  You can use a **having** clause without a **group by** clause.

  If any columns in the select list do not have aggregate functions applied to them and are not included in the query's **group by** clause (illegal in standard SQL), the meanings of **having** and **where** are somewhat different.

In this situation, a **where** clause restricts the rows that are included in the calculation of the aggregate, but does not restrict the rows returned by the query. Conversely, a **having** clause restricts the rows returned by the query, but does not affect the calculation of the aggregate.

- **order by –** sorts the results by columns. In Transact-SQL, you can use **order by** for items that do not appear in the select list. You can sort by a column name, a column heading (or alias), an expression, or a number representing the position of the item in the *select list* (the *select_list_number*). If you sort by select list number, the columns to which the **order by** clause refers must be included in the select list, and the select list cannot be * (asterisk).

  Using **select max** with **order by** can return more than one row in the result set.
- **asc –** sorts results in ascending order (the default).
- **desc –** sorts results in descending order.
- **compute –** used with row aggregates (**sum**, **avg**, **min**, **max**, **count**, and **count_big**) to generate control break summary values. The summary values appear as additional rows in the query results, allowing you to see detail and summary rows with one statement.

  You cannot use a **select into** clause with **compute**.

  If you use **compute by**, you must also use an **order by** clause. The columns listed after **compute by** must be identical to or a subset of those listed after **order by**, and must be in the same left-to-right order, start with the same expression, and not skip any expressions.

  For example, if the **order by** clause is `order by a, b, c`, the **compute by** clause can be any (or all) of these:

  ```
  compute by a, b, c
  compute by a, b
  compute by a
  ```

  The keyword **compute** can be used without **by** to generate grand totals, grand counts, and so on. **order by** is optional if you use **compute** without **by**.

  If CIS is enabled, **compute** is not forwarded to remote servers.
- **for {read only | update} –** specifies that a cursor result set is read-only or updatable.

  With SAP ASE versions earlier than 15.7, you can use this option only within a stored procedure, and only when the procedure defines a query for a cursor. In this case, the **select** is the only statement allowed in the procedure. It defines the **for read only** or **for update** option (instead of the **declare cursor** statement). This method of declaring cursors provides the advantage of page-level locking while fetching rows.

  Also, with SAP ASE versions earlier than 15.7, if the **select** statement in the stored procedure is not used to define a cursor, the SAP ASE server ignores the **for read only | update** option. See the Embedded SQL™ documentation for more information about using stored procedures to declare cursors.

  With SAP ASE 15.7 and later, if **select for update** is set, you can use the **for update** option at the language level outside of a stored procedure, but within a transaction. Such a **select** need not refer to a cursor. When you use **select for update** in datarows-locked tables, the selected rows are exclusively locked for the duration of the transaction.

For information about read-only or updatable cursors, see the *Transact-SQL User's Guide*.

- **of *column_name_list* –** is the list of columns from a cursor result set defined as updatable with the **for update** option.
- **at isolation –** specifies the isolation level (0, 1, 2 or 3) of the query. If you omit this clause, the query uses the isolation level of the session in which it executes (isolation level 1 by default). The **at isolation** clause is valid only for single queries or within the **declare cursor** statement. The SAP ASE server returns a syntax error if you use **at isolation**:

  - With a query using the **into** clause
  - Within a subquery
  - With a query in the **create view** statement
  - With a query in the **insert** statement
  - With a query using the **for browse** clause

  If there is a **union** operator in the query, you must specify the **at isolation** clause after the last **select**. If you specify **holdlock**, **noholdlock**, or **shared** in a query that also specifies **at isolation read uncommitted**, the SAP ASE server issues a warning and ignores the **at isolation** clause. For the other isolation levels, **holdlock** takes precedence over the **at isolation** clause. For more information about isolation levels, see the *Transact-SQL User's Guide*.

  If CIS is enabled, you cannot use **at isolation** for remote servers.
- **read uncommitted | 0 –** specifies isolation level 0 for the query.
- **read committed | 1 –** specifies isolation level 1 for the query.
- **repeatable read | 2 –** specifies transaction isolation level 2 for the query.
- **serializable | 3 –** specifies isolation level 3 for the query.
- **for browse –** must be attached to the end of a SQL statement sent to the SAP ASE server in a DB-Library browse application. See the *Open Client DB-Library Reference Manual* for details.
- **plan "*abstract plan*" –** specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. See *Creating and Using Abstract Plans* in the *Performance and Tuning Guide* for more information.

Examples

- **Example 1 –** Selects all rows and columns from the `publishers` table:

```
select * from publishers

pub_id pub_name                    city                 state
------ --------------------------- -------------------- -----
0736    New Age Books              Boston               MA
```

```
0877    Binnet & Hardley            Washington           DC
1389    Algodata Infosystems        Berkeley             CA
```

- **Example 2 –** Selects all rows from specific columns of the `publishers` table:

```
select pub_id, pub_name, city, state from publishers
```

- **Example 3 –** Selects all rows from specific columns of the `publishers` table, substituting one column name and adding a string to the output:

```
select "The publisher's name is",
Publisher = pub_name, pub_id
from publishers

                       Publisher                     pub_id
----------------------- ----------------------------- ------
The publisher’s name is New Age Books                 0736
The publisher’s name is Binnet & Hardley              0877
The publisher’s name is Algodata Infosystems          1389
```

- **Example 4 –** Selects all rows from specific columns of the `titles` table, substituting column names:

```
select type as Type, price as Price
from titles
```

- **Example 5 –** Specifies the locking scheme and the reserve page gap for **select into**:

```
select title_id, title, price
into bus_titles
lock datarows with reservepagegap = 10
from titles
where type = "business"
```

- **Example 6 –** Encrypts the `creditcard` column when selecting into the `bigspenders` table:

```
select creditcard, custid, sum(amount)
     into #bigspenders (creditcard
     encrypt with cust.database.new_cc_key) from daily_xacts
     group by creditcard having sum(amount) > $5000
```

- **Example 7 –** Selects only the rows that are not exclusively locked. If any other user has an exclusive lock on a qualifying row, that row is not returned:

```
select title, price
from titles readpast
    where type = "news"
    and price between $20 and $30
```

- **Example 8 –** Selects specific columns and rows, placing the results into the temporary table `#advance_rpt`:

```
select pub_id, total = sum (total_sales)
    into #advance_rpt
from titles
where advance < $10000
    and total_sales is not null
```

```
group by pub_id
having count (*) > 1
```

- **Example 9 –** Selects the top 3 rows from `au_lname` from the authors table:

```
select top 3 au_lname from authors
```

- **Example 10 –** Concatenates two columns and places the results into the temporary table `#tempnames`:

```
select "Author_name" = au_fname + " " + au_lname
    into #tempnames
    from authors
```

- **Example 11 –** Selects specific columns and rows, returns the results ordered by type from highest to lowest, and calculates summary information:

```
select type, price, advance from titles
order by type desc
compute avg (price), sum (advance) by type
compute sum (price), sum (advance)
```

- **Example 12 –** Selects specific columns and rows, and calculates totals for the `price` and `advance` columns:

```
select type, price, advance from titles compute sum (price), sum
(advance)
```

- **Example 13 –** Creates the `coffeetabletitles` table, a copy of the `titles` table which includes only books priced over $20:

```
select * into coffeetabletitles from titles
where price > $20
```

- **Example 14 –** Creates the `newtitles` table, an empty copy of the `titles` table:

```
select * into newtitles from titles
where 1 = 0
```

- **Example 15 –** Gives an optimizer hint:

```
select title_id, title
    from titles (index title_id_ind prefetch 16)
    where title_id like "BU%"
```

- **Example 16 –** Selects the IDENTITY column from the `sales_east` and `sales_west` tables by using the `syb_identity` keyword:

```
select sales_east.syb_identity, sales_west.syb_identity
from sales_east, sales_west
```

- **Example 17 –** Creates the `newtitles` table, a copy of the `titles` table with an IDENTITY column:

```
select *, row_id = identity (10)
into newtitles from titles
```

- **Example 18 –** Specifies a transaction isolation level for the query:

```
select pub_id, pub_name
from publishers
at isolation read uncommitted
```

- **Example 19 –** Selects from `titles` using the **repeatable read** isolation level. No other user can change values in or delete the affected rows until the transaction completes:

```
begin tran
select type, avg (price)
    from titles
    group by type
at isolation repeatable read
```

- **Example 20 –** Gives an optimizer hint for the parallel degree for the query:

```
select ord_num from salesdetail
     (index salesdetail parallel 3)
```

- **Example 21 –** Joins the `titleauthor` and the `titles` tables on their `title_id` columns. The result set only includes those rows that contain a `price` greater than 15:

```
select au_id, titles.title_id, title, price
from titleauthor inner join titles
on titleauthor.title_id = titles.title_id
and price > 15
```

- **Example 22 –** The result set contains all the authors from the `authors` table. The authors who do not live in the same city as their publishers produce null values in the `pub_name` column. Only the authors who live in the same city as their publishers, Cheryl Carson and Abraham Bennet, produce a non-null value in the `pub_name` column:

```
select au_fname, au_lname, pub_name
from authors left join publishers
on authors.city = publishers.city
```

- **Example 23 –** Create a new table with an identity gap (`newtable`) from an existing table (`oldtable`). The table is specify using the **select into** statement:

```
select identity into newtable
with identity_gap = 20
from oldtable
```

  For more information about identity gaps, see *Managing Identity Gaps in Tables* in the *Transact-SQL Users Guide*.

- **Example 24 –** Creates a new table, `bay_area_authors` with row-level compression, and populates it with information about authors that live in the San Francisco Bay Area:

```
select * into bay_area_authors
with compression = row
from authors
where postalcode like '94%'
```

- **Example 25 –** Creates a new table named `titles_2` that compresses all columns except `title` and `advance`:

```
select * into titles_2
(title not compressed,
advance not compressed)
with compression = page
from titles
```

- **Example 26 –** Set the **select for update** configuration parameter, perform a **select for update**, then an **update** within the same transaction:

```
sp_configure 'select for update', 1

Parameter Name             Default  Memory Used  Config Value  Run
Value
    Unit             Type
-------------------------- --------  ----------  -----------  --
--------
    ------------------- --------------------
select for update       0            0           1             1
    not applicable   dynamic
(1 row affected)
Resulting configuration value and memory use have not changed from
previous values: new configuration value 1, previous value 1.
(return status = 0)
```

```
begin tran
```

```
select c_int, c_bigdatetime from basetbl1 where c_int > 90 for
update of c_bigint
```

```
c_int           c_bigdatetime
-----------     -----------------------------
91              Sep 14 2009  9:00:00.000000PM
92              Sep 15 2009  9:00:00.000000PM
93              Sep 16 2009  9:00:00.000000PM
94              Sep 17 2009  9:00:00.000000PM
95              Sep 18 2009  9:00:00.000000PM
96              Sep 19 2009  9:00:00.000000PM
97              Sep 20 2009  9:00:00.000000PM
98              Sep 21 2009  9:00:00.000000PM
99              Sep 22 2009  9:00:00.000000PM
100             Sep 23 2009  9:00:00.000000PM
(10 rows affected)
```

```
update basetbl1 set c_bigint = 5000 where c_int > 90
```

```
(10 rows affected)
commit tran
go
```

- **Example 27 –** Creates a new table `sales_report` from an existing table `sales_detail`. The new table is partitioned by range on the `qty` column.

```
select * into sales_report partition by range (qty)
 (smallorder values <= (500) on seg1,
bigorder values <= (5000) on seg2)
from sales_detail
```

- **Example 28 –** Finds the statements that incur too many I/Os as candidates for tuning:

```
select lio_avg, qtext from sysquerymetrics order by
lio_avg
```

- **Example 29 –** Selects the `titles` table into the `pubs3` database:

  ```
  select title_id, title, price
  into bus_titles
  with dml_logging = minimal
  from titles
  ```

Usage

- The keywords in the **select** statement, as in all other statements, must be used in the order shown in the syntax statement.
- The maximum number of expressions in a select statement is 4096.
- The keyword **all** can be used after **select** for compatibility with other implementations of SQL. **all** is the default. Used in this context, **all** is the opposite of **distinct**. All retrieved rows are included in the results, whether or not some are duplicates.
- Except in **create table**, **create view**, and **select into** statements, column headings may include any characters, including blanks and SAP ASE keywords, if the column heading is enclosed in quotes. If the heading is not enclosed in quotes, it must conform to the rules for identifiers.
- The character string indicated by **like** cannot be longer than 255 bytes.
- You cannot use the **select...for browse** option on tables containing more than 255 columns.
- Column headings in **create table**, **create view**, and **select into** statements, as well as table aliases, must conform to the rules for identifiers.
- To insert data with **select** from a table that has null values in some fields into a table that does not allow null values, you must provide a substitute value for any NULL entries in the original table. For example, to insert data into an `advances` table that does not allow null values, this example substitutes "0" for the NULL fields:

  ```
  insert advances
  select pub_id, isnull (advance, 0) from titles
  ```

  Without the **isnull** function, this command would insert all the rows with non-null values into the `advances` table, and produce error messages for all rows where the `advance` column in the `titles` table contained NULL.

  If you cannot make this kind of substitution for your data, you cannot insert data containing null values into the columns with the NOT NULL specification.

  Two tables can be identically structured, and yet be different as to whether null values are permitted in some fields. Use **sp_help** to see the null types of the columns in your table.
- The default length of the `text`, `unitext`, or `image` data returned with a **select** statement is 32K. Use **set textsize** to change the value. The size for the current session is stored in the global variable ***@@textsize***. Certain client software may issue a **set textsize** command on logging in to the SAP ASE server.

- Data from remote SAP ASE servers can be retrieved through the use of remote procedure calls. See **create procedure** and **execute** for more information.
- A **select** statement used in a cursor definition (through **declare cursor**) must contain a **from** clause, but it cannot contain a **compute**, **for browse**, or **into** clause. If the **select** statement contains any of the following constructs, the cursor is considered read-only and not updatable:
  - **distinct** option
  - **group by** clause
  - Aggregate functions
  - **union** operator

  If you declare a cursor inside a stored procedure with a **select** statement that contains an **order by** clause, that cursor is also considered read-only. Even if it is considered updatable, you cannot delete a row using a cursor that is defined by a **select** statement containing a join of two or more tables. See **declare cursor** for more information.
- If a **select** statement that assigns a value to a variable returns more than one row, the last returned value is assigned to the variable. For example:

```
declare @x varchar (40)
select @x = pub_name from publishers
print @x
```

```
 (3 rows affected)
Algodata Infosystems
```

Before you write queries using the ANSI inner and outer join syntax, read *Outer Joins* in the *Transact-SQL Users Guide*.

See also:

- **avg**, **count**, **isnull**, **max**, **min**, **sum** in *Reference Manual: Building Blocks*
- **sp_cachestrategy**, **sp_chgattribute**, **sp_dboption** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Transact-SQL extensions include:

- **select into** to create a new table
- **lock** clauses
- **compute** clauses
- Global and local variables
- **index** clause, **prefetch, parallel** and **lru | mru**
- **holdlock**, **noholdlock**, and **shared** keywords
- **“*column_heading = column_name*”**
- Qualified table and column names
- **select** in a **for browse** clause

- The use, within the select list, of columns that are not in the **group by** list and have no aggregate functions
- **at isolation repeatable read | 2** option

Permissions

The permission checks for **select** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table or view owner. You must be a user with `select` permission on the table or view.
Disabled	With granular permissions disabled, you must be the table or view owner or a user with **sa_role**. You must be a user with **select** permission on the table or view. **select** permission defaults to the owner of the table or view, who can transfer it to other users.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	62
Audit option	**select**
Command or access audited	**select** from a table
Information in `extrain-fo`	• *Roles* – current active roles • *Keywords or options* – **select**, **select into**, or **readtext** • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

Information	Values
Event	63
Audit option	**select**
Command or access audited	**select** from a view

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **select**, **select into**, or **readtext** • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *alter database* on page 1
- *compute Clause* on page 91
- *create database* on page 104
- *create index* on page 140
- *create table* on page 207
- *create trigger* on page 253
- *delete* on page 310
- *disk init* on page 319
- *group by and having Clauses* on page 459
- *insert* on page 473
- *order by clause* on page 524
- *set* on page 607
- *union operator* on page 674
- *update* on page 680
- *where clause* on page 712

Using select into

select into is a two-step operation. The first step creates the new table, and the second step inserts the specified rows into the new table.

Note: You can **select into** a CIS existing table.

- Because the rows inserted by **select into** operations are not logged, **select into** commands cannot be issued within user-defined transactions, even if the **ddl in tran** database option is set to **true**. Page allocations during **select into** operations are logged, so large **select into** operations may fill the transaction log.

  If a **select into** statement fails after creating a new table, the SAP ASE server does *not* automatically drop the table or deallocate its first data page. This means that any rows inserted on the first page before the error occurred remain on the page. Check the value of the ***@@error*** global variable after a **select into** statement to be sure that no error occurred.

Use the **drop table** statement to remove the new table, then reissue the **select into** statement.

- The name of the new table must be unique in the database and must conform to the rules for identifiers. You can also **select into** temporary tables (see Examples 7, 8, and 11).
- Any rules, constraints, or defaults associated with the base table are not carried over to the new table. Bind rules or defaults to the new table using **sp_bindrule** and **sp_bindefault**.
- **select into** does not carry over the base table's **max_rows_per_page** value, and it creates the new table with a **max_rows_per_page** value of 0. Use **sp_chgattribute** to set the **max_rows_per_page** value.
- The **select into/bulkcopy/pllsort** option must be set to **true** (by executing **sp_dboption**) in order to **select into** a permanent table. You do not have to set the **select into/bulkcopy/pllsort** option to **true** in order to **select into** a temporary table, since the temporary database is never recovered.

  After you have used **select into** in a database, you must perform a full database dump before you can use the **dump transaction** command. **select into** operations log only page allocations and not changes to data rows. Therefore, changes are not recoverable from transaction logs. In this situation, issuing the **dump transaction** statement produces an error message instructing you to use **dump database** instead.

  By default, the **select into/bulkcopy/pllsort** option is set to **false** in newly created databases. To change the default situation, set this option to **true** in the `model` database.
- **select into** can be used with an archive database.
- **select into** runs more slowly while a **dump database** is taking place.
- You can use **select into** to create a duplicate table with no data by having a false condition in the **where** clause (see Example 12).
- You must provide a column heading for any column in the select list that contains an aggregate function or any expression. The use of any constant, arithmetic or character expression, built-in functions, or concatenation in the select list requires a column heading for the affected item. The column heading must be a valid identifier or must be enclosed in quotation marks (see Examples 7 and 8).
- Datatypes and nullability are implicitly assigned to literal values when **select into** is used, such as:

  ```
  select x = getdate () into mytable
  ```

  This results in a non-nullable column, regardless of whether **allow nulls by default** is on or not. It depends upon how the **select** commands are used and with what other commands within the syntax.

  The **convert** syntax allows you to explicitly specify the datatype and nullability of the resulting column, not the default.

  Wrap **getdate** with a function that does result in a null, such as:

  ```
  select x = nullif (getdate (), "1/1/1900") into mytable
  ```

  Or, use the **convert** syntax:

  ```
  select x = convert (datetime null, getdate ()) into mytable
  ```

- You cannot use **select into** inside a user-defined transaction or in the same statement as a **compute** clause.
- To select an IDENTITY column into a result table, include the column name (or the **syb_identit**y keyword) in the **select** statement's *column_list*. The new column observes the following rules:
  - If an IDENTITY column is selected more than once, it is defined as NOT NULL in the new table. It does not inherit the IDENTITY property.
  - If an IDENTITY column is selected as part of an expression, the resulting column does not inherit the IDENTITY property. It is created as NULL if any column in the expression allows nulls; otherwise, it is created as NOT NULL.
  - If the **select** statement contains a **group by** clause or aggregate function, the resulting column does not inherit the IDENTITY property. Columns that include an aggregate of the IDENTITY column are created NULL; others are NOT NULL.
  - An IDENTITY column that is selected into a table with a union or join does not retain the IDENTITY property. If the table contains the union of the IDENTITY column and a NULL column, the new column is defined as NULL. Otherwise, it is defined as NOT NULL.
- You cannot use **select into** to create a new table with multiple IDENTITY columns. If the **select** statement includes both an existing IDENTITY column and a new IDENTITY specification of the form *column_name =* **identity** *(precision)*, the statement fails.
- If CIS is enabled, and if the **into** table resides on the SAP ASE server, the SAP ASE server uses bulk copy routines to copy the data into the new table. Before doing a **select into** with remote tables, set the **select into/bulkcopy** database option to **true**.
- For information about the Embedded SQL command **select into** *host_var_list*, see the *Open Client Embedded SQL Reference Manual*.

Converting the NULL Properties of a Target Column with select...into

Use the **convert** command to change the nullability of a target column into which you are selecting data.

For example, the following selects data from the `titles` table into a target table named `temp_titles`, but converts the `total_sales` column from **null** to **not null**:

```
select title, convert (char (100) not null, total_sales)
total_sales
into #tempsales
from titles
```

Specifying a Compression Level

Destination tables you create with **select into** do not inherit any configuration from the source table. That is, if the table from which you pull data is configured for row-level compression, the table that results from the **select into** is not configured for compression unless you explicitly state the compression level.

- You can indicate column-, partition-, and table-level compression for the destination table (the compression level of the partition overrides the compression level of the table).
- When you compress the target table, the SAP ASE server selects the compression level for columns (if they qualify), regardless of the compression level of the corresponding columns in the source table.
- The **select into** command can include a list of columns that are not compressed on the target table.
- You cannot encrypt compressed columns on a target table.

Parameter Interactions with Data Compression

The various **select** parameters behave differently when working with compression.

- **max_rows_per_page** applies only to allpages-locked compressed tables; you cannot use it on data-only-locked tables.
- You can use **exp_row_size** on allpages- and data-only-locked tables with variable-length columns. However, the table must be able to expand updates on the same page without causing page splits on allpages-locked tables or or row forwarding on data-only-locked tables.

  exp_row_size computes space limits identically for compressed and uncompressed tables. However, because compression results in a page with a lot of free space, the space set aside for **exp_row_size** may cause far fewer rows to fit on the page than would fit on this page if you did not set **exp_row_size**.

  You cannot use **exp_row_size** on tables with fixed-length columns, even though the SAP ASE server may convert some fixed-length columns to variable-length columns during the compression process.
- **fillfactor** applies determines the space used on the data pages after compression. This is relevant only when you are creating clustered indexes, an operation which requires a sort of the data pages.

Using select for update

If the configuration parameter **select for update** is set to 1, the rows selected by **select for update** are exclusively locked provided that the command is executed on a datarows-locked table within a transaction context, or in chained mode. If **select for update** is run within a cursor context, the cursor **open** and **fetch** statements must be within the context of a transaction.

Rows selected with **select for update**, within or outside of a cursor context, retain an exclusive lock until the transaction is complete.

Limitations of **select for update**:

- **select for update** is not valid in a subquery block.

- **select for update** is applicable only when the **select** returns rows directly from a base table and not from a work table. You cannot use **select for update** with queries that have aggregates or **group by**, **computed**, **union**, **having**, or **distinct** clauses.
- More rows may qualify for the actual transaction **update** than with **select for update**. These rows may appear in the updated set. Prevent such "phantom" rows by using isolation level 3.
- During **select** processing, concurrent **select for update** tasks may attempt to lock the the same set of rows in different order, causing application deadlocks. However, once **select for update** completes, subsequent updates to the set of rows are not blocked, and encounter no deadlocks.
- All existing restrictions on updateable cursors apply to **select for update** both within and outside of the cursor context. The only difference is that with **select for update**, the **order by** clause is supported with an updateable cursor. The limitations and restrictions on updateable cursors apply to both language and execute cursors.
- All tables referenced by **select for update** must be from the same database.
- **select for update** is supported only on tables with datarows locked.

Specifying in-row LOB Columns

By default, LOB columns in the target table inherit the storage property of the corresponding LOB columns in the **select** list. If the target table's LOB column is produced as a result of an expression, such as the **convert(text, *column*)** built-in function, then the column automatically uses off-row storage.

Specifying a Lock Scheme Using select...into

The **lock** option, used with **select...into**, allows you to specify the locking scheme for the table created by the command. If you do not specify a locking scheme, the default locking scheme, as set by the configuration parameter **lock scheme**, is applied.

When you use the **lock** option, you can also specify the space management properties **max_rows_per_page**, **exp_row_size**, and **reservepagegap**.

You can change the space management properties for a table created with **select into**, using **sp_chgattribute**.

Specifying a Partition Strategy Using select...into

The **partitions_clause**, when used with **select...into**, allows you to specify the partition properties of the table created by the command. If you do not specify a partition type, the SAP ASE server creates an unpartitioned table. If any row to be inserted does not satisfy the criteria for any partition in the target table, **select...into** fails.

Using index, prefetch, and lru | mru

The **index**, **prefetch** and **lru | mru** options specify the index, cache and I/O strategies for query execution. These options override the choices made by the SAP ASE optimizer. Use them with caution, and always check the performance impact with **set statistics io on**.

For more information about using these options, see the *Performance and Tuning Guide*.

Using Encrypted Columns

Considerations for using encrypted columns.

If you use the encrypt clause without specifying a key name, the SAP ASE server uses the database default key to encrypt the data in the target column.

If a column in the source table is encrypted and you do not specify the **encrypt** clause for the target column, the SAP ASE server decrypts the data in the source table and inserts plain text data in the target column.

If you specify encryption for the target column with the same key used for the source column data, and if the key does not use an initialization vector or random padding, then the SAP ASE server copies the data from the source column to the target column as cipher text, without intermediate decryption and reencryption operations.

If, however, you specify encryption for the target column using a different key from that used for the source column, or if the key uses an initialization vector or padding during encryption, the SAP ASE server performs a decryption and encryption operation for each selected row of the encrypted column.

Using parallel

The **parallel** option reduces the number of worker threads that the SAP ASE optimizer can use for parallel processing. The *degree_of_parallelism* cannot be greater than the configured **max parallel degree**. If you specify a value that is greater than the configured **max parallel degree**, the optimizer ignores the **parallel** option.

When multiple worker processes merge their results, the order of rows that the SAP ASE server returns may vary from one execution to the next. To get rows from partitioned tables in a consistent order, use an **order** by clause, or override parallel query execution by using **parallel 1** in the **from** clause of the query.

A **from** clause specifying **parallel** is ignored if any of the following conditions is true:

- The select statement is used for an update or insert.
- The **from** clause is used in the definition of a cursor.
- **parallel** is used in the **from** clause within any inner query blocks of a subquery.
- The select statement creates a view.
- The table is the inner table of an outer join.

- The query specifies **min** or **max** on the table and specifies an index.
- An unpartitioned clustered index is specified or is the only **parallel** option.
- The query specifies **exists** on the table.
- The value for the configuration parameter **max scan parallel degree** is 1 and the query specifies an index.
- A nonclustered index is covered. For information on index covering, see *Indexes* in the *Performance and Tuning Guide*.
- The table is a system table or a virtual table.
- The query is processed using the OR strategy. For an explanation of the OR strategy, see the *Performance and Tuning Guide*.
- The query returns a large number of rows to the user.

Using readpast

The **readpast** option allows a **select** command to access the specified table without being blocked by incompatible locks held by other tasks. You can perform **readpast** queries only on data-only-locked tables.

If the **readpast** option is specified for an allpages-locked table, the **readpast** option is ignored. The command operates at the isolation level specified for the command or session. If the isolation level is 0, dirty reads are performed, and the command returns values from locked rows and does not block. If the isolation level is 1 or 3, the command blocks when pages with incompatible locks must be read.

This table shows the interactions of session-level isolation levels and **readpast** on a table in a **select** command:

Table 9. Effects of Session-Level Isolation Levels and readpast

Session Isolation Level	Effects
0, **read uncommitted** (dirty reads)	**readpast** is ignored, and rows containing uncommitted transactions are returned to the user. A warning message is printed.
1, read committed	Rows or pages with incompatible locks are skipped; no locks are held on the rows or pages read Using **readpast** may produce duplicates and adding the **distinct** clause does not clear this problem. To resolve this, when using **readpast**, use a **group by** clause *in addition to* a **distinct** clause to avoid duplicates.

Session Isolation Level	Effects
2, **repeatable read**	Rows or pages with incompatible locks are skipped; shared locks are held on all rows or pages that are read until the end of the statement or transaction; holds locks on all pages read by the statement until the transaction completes.
3, **serializable**	**readpast** is ignored, and the command executes at level 3. The command blocks on any rows or pages with incompatible locks.

select commands that specify **readpast** fail with an error message if they also include any of the following:

- An **at isolation** clause, specifying **0** or **read uncommitted**
- An **at isolation** clause, specifying **3** or **serializable**
- The **holdlock** keyword on the same table

If **at isolation 2** or **at isolation repeatable read** is specified in a **select** query that specifies **readpast**, shared locks are held on the **readpast** tables until the statement or transaction completes.

If a **select** command with the **readpast** option encounters a text column that has an incompatible lock on it, **readpast** locking retrieves the row, but returns the text column with a value of **null**. No distinction is made, in this case, between a text column containing a null value and a null value returned because the column is locked.

Expanded select * Syntax

When the source text of a stored procedure or trigger is stored in the system table `syscomments`, a query using **select *** is stored in `syscomments` expanding the column list referenced in the **select ***.

For example, a **select *** from a table containing the columns `col1` and `col2` is stored as:

```
select <table>.col1, <table>.col2 from <table>
```

The expanding of the column-list checks whether identifiers (table-names, column-names and so on) comply with the rules for identifiers.

For example, if a table includes the columns `col1` and `2col`, the second column-name starts with a number, which can only be included by using brackets in the **create table** statement.

When performing a **select *** in a stored procedure or trigger from this table, the text in `syscomments` looks similar to:

```
select <table>.col1, <table>[2col] from <table>
```

For all identifiers used in the text that exands a `select *`, brackets are added when the identifier does not comply with the rules for identifiers.

You must add brackets around identifiers to make sure the SAP ASE server can use the SQL text while performing an upgrade to a more recent release.

Using select with Variables, Global Variables, and Constants

Issuing **select** statements that reference only @variables, @@global variables, and constants in chained mode do not start new transactions.

This enables you to create SQL constructs similar to:

```
set chained ON
<... Perform some DML or other commands ...>
select @@error, @@trancount, @@transtate
```

In some circumstances, SAP ASE may rollback the active transaction if an error occurs while executing DML or other statements. Use the **select** statement to check the state of the transaction while the server is in chained mode, and—without automatically starting a new transaction—collect the date and time the error occurred that triggered the rollback.

Although most functions start new transactions when used in **select** statements, these diagnostic functions do not:

- **getdate**
- **getutcdate**
- **current_date**
- **current_time**
- **current_bigdatetime**
- **current_bigtime**
- **abs**
- **asehostname**
- **hostname**
- **switchprop**

set

Sets SAP ASE query-processing options for the duration of the user's work session; sets some options inside a trigger or stored procedure.

Syntax

```
set advanced_aggregation on/off
```

```
set @variable = expression [, @variable = expression...]
```

```
set ansinull {on | off}
```

```
set ansi_permissions {on | off}
```

```
set arithabort [arith_overflow | numeric_truncation] {on | off}
set arithignore [arith_overflow] {on | off}
```

```
set bulk array size number
```

```
set bulk batch size number
```

```
set builtin_date_strings number
```

```
set {chained, close on endtran, nocount, noexec, parseonly,
    self_recursion, showplan, sort_resources} {on | off}
```

```
set char_convert {off | on [with {error | no_error}] |
    charset [with {error | no_error}]}
```

```
set cis_rpc_handling {on | off}
```

```
set [clientname client_name | clienthostname host_name
    | clientapplname application_name]
```

```
set compression {on | off | default}
```

```
set cursor rows number for cursor_name
```

```
set {datefirst number, dateformat format, language language}
```

```
set delayed_commit {on | off | default}
```

```
set deferred_name_resolution { on | off }
```

```
set dml_logging {minimal | default}
```

```
set encryption passwd 'password_phrase'
    for {key | column} {keyname | column_name}
```

```
set erase_residual_data {on | off}
```

```
set export_options {on | off}
```

```
set fipsflagger {on | off}
```

```
set flushmessage {on | off}
```

```
set fmtonly {on | off}
```

```
set forceplan {on | off}
```

```
set identity_insert [database.[owner.]]table_name {on | off}
```

```
set identity_update table_name {on | off}
```

```
set index_union {on | off}
```

```
set ins_by_bulk {on | off}
```

```
set join_bloom_filter {on | off}
```

```
set literal_autoparam {on | off}
```

```
set lock {wait [numsecs] | nowait | default}
```

```
set logbulkcopy {on | off }
```

```
set materialized_view_optimization {disable | fresh | stale}
set metrics_capture {on | off}
```

```
set mon_stateful_history {on | off}
```

```
set nodata
```

```
set offsets {select, from, order, compute, table,
    procedure, statement, param, execute} {on | off}
```

```
set option show
```

```
set opttimeoutlimit
```

```
set parallel_degree number
```

```
set plan {dump | load} [group_name] {on | off}
```

```
set plan exists check {on | off}
```

```
set plan for show
```

```
set plan optgoal {allrows_oltp | allrows_mix | allrows_dss |
    user_defined_goal_identifier}
```

```
set plan optlevel value
```

```
set plan opttimeoutlimit number
```

```
set plan replace {on | off}
```

```
set prefetch [on|off]
```

```
set proc_output_params {on | off}
```

```
set proc_return_status {on | off}
```

```
set process_limit_action {abort | quiet | warning}
```

```
set proxy login_name
```

```
set quoted_identifier {on | off}
```

```
set repartition_degree number
```

```
set repthreshold number
```

```
set resource_granularity number
```

```
set role {"sa_role" | "sso_role" | "oper_role" |
    role_name [with passwd "password"]} {on | off}
```

```
set {rowcount number, textsize number}
```

```
set scan_parallel_degree number
```

```
set send_locator {on | off }
```

```
set session authorization login_name
```

```
set switch [serverwide] {on | off} print_minlogged_mode_override
```

```
set switch [serverwide] {on | off} trace_flag ,[trace_flag,] [with
option [, option]
```

```
set show_exec_info [“on” | “off”]
```

```
set show_permission_source ["on" | "off" ]
```

```
set show_permission_source, {on|off}
```

```
set show_sqltext {on | off}
```

```
set show_transformed_sql, {on|off}
```

```
set spinlock_aggregation {on | off}
```

```
set statement_cache on | off
```

```
set statistics {io, subquerycache, time, plancost} {on | off}
```

```
set statistics plan_detail_html {on | off}
```

```
set statistics plan_directory_html {dir_name | on | off}
```

```
set statistics plan_html {on | off}
```

```
set statistics parallel_plan_detail_html {on | off}
```

```
set statistics query_name_html {queryname | on | off}
```

```
set statistics simulate {on | off}
```

```
set strict_dtm_enforcement {on | off}
```

```
set string_rtruncation {on | off}
```

```
set system_view {instance | cluster | clear}
```

```
set textsize {number}
```

```
set statistics timing_html  {on | off}
```

```
set tracefile [filename] [off] [for spid]
```

```
set transaction isolation level {
    [read uncommitted | 0] |
    [read committed | 1] |
    [repeatable read | 2] |
    [serializable | 3]}
```

```
set transactional_rpc {on | off}
```

Parameters

- **set advanced_aggregation –** enables and disables advanced aggregation at the session level.
- **set *@variable* = *expression* –** allows multiple variable assignments in one statement. The **set *@variable* = *expression*** command is an identical—and an alternative—command to **select *@variable* = *expression*** in Transact-SQL.

  expression includes constant, function, any combination of constants, and functions connected by arithmetic or bitwise operators, or a subquery.

- **set ansinull {on | off} –** impacts on both aggregate and comparison behaviors.
- **set ansi_permissions {on | off} –** determines whether ANSI SQL permission requirements for **delete** and **update** statements are checked. The default is **off**.

Table 10. Permissions Required with set ansi_permissions for update and delete

Command	Off	On
update	• **update** permission on columns where values are being set	• **update** permission on columns where values are being set • **select** permission on all columns appearing in **where** clause • **select** permission on all columns on right side of **set** clause
delete	• **delete** permission on table	• **delete** permission on table • **select** permission on all columns appearing in **where** clause

- **set arithabort [arith_overflow | numeric_truncation] {on | off} –** determines how the SAP ASE server behaves when an arithmetic error occurs. The two **arithabort** options, **arithabort arith_overflow** and **arithabort numeric_truncation**, handle different types of arithmetic errors. You can set each option independently or set both options with a single **set arithabort on** or **set arithabort off** statement.
    - **arithabort arith_overflow** – specifies the SAP ASE server behavior following a divide-by-zero error, range overflow during an explicit or implicit datatype converson, or a domain error. This type of error is serious. The default setting, **arithabort arith_overflow on**, rolls back the entire transaction in which the error occurs. If the error occurs in a batch that does not contain a transaction, **arithabort arith_overflow on** does not roll back earlier commands in the batch; however, the SAP ASE server does not execute any statements in the batch that follow the error-generating statement.

      Setting **arith_overflow** to **on** refers to the execution time, not to the level of normalization to which the SAP ASE server is set.

      If you set **arithabort arith_overflow off**, the SAP ASE server aborts the statement that causes the error, but continues to process other statements in the transaction or batch.
    - **arithabort numeric_truncation** – specifies the SAP ASE behavior following a loss of scale by an exact numeric type during an implicit datatype conversion. (When an explicit conversion results in a loss of scale, the results are truncated without warning.) The default setting, **arithabort numeric_truncation on**, aborts the statement that causes the error, but the SAP ASE server continues to process other statements in the transaction or batch. If you set **arithabort numeric_truncation off**, the SAP ASE server truncates the query results and continues processing.

- **set arithignore [arith_overflow] {on | off} –** determines whether the SAP ASE server displays a message after a divide-by-zero error or a loss of precision. By default, the **arithignore** option is set to **off**. This causes the SAP ASE server to display a warning message after any query that results in numeric overflow. To have the SAP ASE server ignore overflow errors, use **set arithignore on**. You can omit the optional **arith_overflow** keyword without any effect.
- **set bulk array size *number* –** establishes the number of rows that are buffered in local server memory before being transferred using the bulk copy interface.

  Use this option only with CIS for transferring rows to a remote server using **select into**.

  View your current setting using the *@@bulkarraysize* global variable.

  number – indicates the number of rows to buffer. If the rows being transferred contain `text`, `unitext` , `image` or `java ADTs`, then the bulk copy interface ignores the current setting for array size and uses a value of 1. Also, the array size actually used never exceeds the value of *@@bulkbatchzise*. If *@@bulkbatchsize* is smaller than array size, then the smaller value is used.

  The initial value of the array size is inherited by new connections from the current setting of the configuration property **cis bulk insert array size**, which defaults to 50. Setting this value to 0 resets the value to the default.
- **set bulk batch size *number* –** establishes the number of rows transferred to a remote server via **select into *proxy_table*** when the bulk interface is used. The bulk interface is available to all SAP ASE servers, as well as DirectConnect for Oracle version 12.5.1.

  Use this option only with CIS for transferring rows to a remote server using **select into**.

  View your current setting using the *@@bulkbatchsize* global variable.

  The bulk interface allows a **commit** after a specified number of rows. This allows the remote server to free any log space being consumed by the bulk transfer operation, and enables the transfer of large data sets from one server to another without filling the transaction log.

  The initial value of the batch size is inherited by new connections from the current setting of the configuration property **cis bulk insert batch size**, which by default is 0. A value of 0 indicates that no rows should be committed until after the last row is transferred.
- **set builtin_date_strings *number* –** if a string is given as an argument in place of the chronological value the server interprets it as a **datetime** value regardless of its apparent precision. This is the default behavior and indicated by a **builtin_date_strings** value of 0.

  Changing the builtin_date_strings value to 1 makes the server interpret the argument strings as bigdatetimes. This affects the result of chronological builtins.
- **set {chained, close on endtran, nocount, noexec, parseonly, self_recursion, showplan, sort_resources} {on | off} –**

  - **chained** – begins a transaction just before the first data retrieval or data modification statement at the beginning of a session and after a transaction ends. In chained mode,

  the SAP ASE server implicitly executes a **begin transaction** command before the following statements: **delete**, **fetch**, **insert**, **lock table**, **open**, **select**, and **update**. You cannot execute **set chained** within a transaction.
  - **close on endtran** – causes the SAP ASE server to close all cursors opened within a transaction at the end of that transaction. A transaction ends by the use of either the **commit** or **rollback** statement. However, only cursors declared within the scope that sets this option (stored procedure, trigger, and so on) are affected. For more information about cursor scopes, see the *Transact-SQL User's Guide*.

    For more information about the evaluated configuration, see the *System Administration Guide*.
  - **nocount** – controls the display of rows affected by a statement. **set nocount on** disables the display of rows; **set nocount off** reenables the count of rows.
  - **noexec** – compiles each query but does not execute it. **noexec** is often used with **showplan**. After you set **noexec on**, no subsequent commands are executed (including other **set** commands) until you set **noexec off**.
  - **parseonly** – checks the syntax of each query and returns any error messages without compiling or executing the query. Do not use **parseonly** inside a stored procedure or trigger.
  - **self_recursion** – determines whether the SAP ASE server allows triggers to cause themselves to fire again (this is called *self recursion*). By default, the SAP ASE server does not allow self recursion in triggers. You can turn this option on only for the duration of a current client session; its effect is limited by the scope of the trigger that sets it. For example, if the trigger that sets **self_recursion on** returns or causes another trigger to fire, this option reverts to **off**. This option works only within a trigger and has no effect on user sessions.
  - **showplan** – generates a description of the processing plan for the query. The results of **showplan** are of use in performance diagnostics. **showplan** does not print results when it is used inside a stored procedure or trigger. For parallel queries, **showplan** output also includes the adjusted query plan at runtime, if applicable. See the *Performance and Tuning Guide*.
  - **sort_resources** – generates a description of the sorting plan for a **create index** statement. The results of **sort_resources** are of use in determining whether a sort operation is done serially or in parallel. When **sort_resouces** is **on**, the SAP ASE server prints the sorting plan but does not execute the **create index** statement. See *Parallel Sorting* in the *Performance and Tuning Guide*.
- **set char_convert {off | on [with {error | no_error}] | *charset* [with {error | no_error}]} –** enables or disables character set conversion between the SAP ASE server and a client. If the client is using Open Client DB-Library release 4.6 or later, and the client and server use different character sets, conversion is turned on during the login process and is set to a default based on the character set the client is using. You can also use **set char_convert *charset*** to start conversion between the server character set and a different client character set.

charset can be either the character set's ID or a name from `syscharsets` with a `type` value of less than 2000.

set char_convert off turns conversion off so that characters are sent and received unchanged. **set char_convert on** turns conversion on if it is turned off. If character set conversion was not turned on during the login process or by the **set char_convert** command, **set char_convert on** generates an error message.

If you request character set conversion with **set char_convert *charset***, and the SAP ASE server cannot perform the requested conversion, the conversion state remains the same as it was before the request. For example, if conversion is set to **off** prior to the **set char_convert *charset*** command, conversion remains turned off if the request fails.

When the **with no_error** option is included, the SAP ASE server does not notify an application when characters from the SAP ASE server cannot be converted to the client's character set. Error reporting is initially turned on when a client connects with the SAP ASE server: if you do not want error reporting, you must turn it off for each session with **set char_convert {on | charset} with no_error**. To turn error reporting back on within a session, use **set char_convert {on | charset} with error**.

Whether or not error reporting is turned on, the bytes that cannot be converted are replaced with ASCII question marks (?).

See the *System Administration Guide* for more about error handling in character set conversion.

- **set cis_rpc_handling {on | off} –** makes CIS the default mechanism for handling RPCs in a clustered environment.
- **set [clientname *client_name* | clienthostname *host_name* | clientapplname *application_name*] –** assigns names to the client.
  - **clientname *client_name*** – assigns a client an individual name. This is useful for differentiating among clients in a system where many clients connect to the SAP ASE server using the same client name. After you assign a new name to a user, they appear in the `sysprocesses` table under the new name.

    client_name is the new name you assign to the user.
  - **clienthostname *host_name*** – assigns a host an individual name. This is useful for differentiating among clients in a system where many clients connect to the SAP ASE server using the same host name. After you assign a new name to a host, it appears in the `sysprocesses` table under the new name.

    host_name is the new name you assign to the host.
  - **clientapplname *application_name*** – assigns an application an individual name. This is useful for differentiating among clients in a system where many clients connect to the SAP ASE server using the same application name. After you assign a new name to an application, it appears in the `sysprocesses` table under the new name.

    application_name is the new name you assign to the application.
- **set compression {on | off | default} –** enables or disables compression for the session:

- **on** – enables data compression on new data for tables and partitions on which compression is configured. The SAP ASE server compresses all rows that qualify.
- **off** – inserts and updates all new data as uncompressed. Inserts that trigger a page compression ignore the uncompressed rows. Updated rows remain uncompressed. Uncompressed rows that are compressed during an **update** (rows inserted as **uncompressed** remain uncompressed until explicitly compressed).
- **default** – resets the compression level to the default setting (inserts and updates are compressed according to the table or partition setting).

Note: Unlike most **set** parameters, if you execute **set export_options** before issuing **set compression** in a nested procedure, the SAP ASE server does not export the compression level to the parent procedure's context.

- **set cursor rows *number* for *cursor_name* –** causes the SAP ASE server to return the *number* of rows for each cursor **fetch** request from a client application. The *number* can be a numeric literal with no decimal point or a local variable of type `integer`. If the *number* is less than or equal to zero, the value is set to 1. You can set the **cursor rows** option for a cursor, whether it is open or closed. However, this option does not affect a **fetch** request containing an **into** clause. *cursor_name* specifies the cursor for which to set the number of rows returned.
- **set {datefirst *number*, dateformat *format*, language *language*} –** specifies the following settings:

  - **datefirst *number*** – uses numeric settings to specify the first day of the week. The us_english language default is Sunday.

To Set the First Day of the Week as	Use
Monday	1
Tuesday	2
Wednesday	3
Thursday	4
Friday	5
Saturday	6
Sunday (us_english language default)	7

Note: Regardless of which day you set as the first day of the week, the value of that first day becomes 1. This value is not the same as the numeric setting you use in **set datefirst *n***. For example, if you set Sunday as your first day of the week, its value is 1. If you set Monday as your first day of the week, Monday's value becomes 1. If you set Wednesday as your first day of the week, Wednesday's value becomes 1, and so on.

  - **dateformat** ***format*** – sets the order of the date parts ***month/day/year*** for entering `datetime`, `smalldatetime`, `date` or `time` data. Valid arguments are *mdy*, *dmy*, *ymd*, *ydm*, *myd*, and *dym*. The us_english language default is *mdy*.
  - **language** ***language*** – is the official name of the language that displays system messages. The language must be installed on the SAP ASE server. The default is us_english.
- **set deferred_name_resolution –** sets deferred name resolution on for the current session only.

  This option works only at the session level if you set the server level `deferred_name_resolution` option off. If server level `deferred_name_resolution` is OFF, **set deferred_name_resolution on** takes effect at the session level and can be switched off again at session level. If, however, `deferred_name_resolution` is set `on` at server level, **set deferred_name_resolution off** does not take effect on the session, because it cannot override the server setting.
- **set delayed_commit {on | off | default} –** determines when log records are written to disk. With the **delayed_commit** parameter set to true, the log records are asynchronously written to the disk and control is returned to the client without waiting for the IO to complete.

  The session-level setting overrides any existing the database-level setting. Change **delayed_commit** to its default to revert back to the database-level setting.

  Note: Use **delayed_commit** only after careful consideration of your application.
- **set dml_logging {minimal | default} –** determines the amount of logging for **insert**, **update**, and **delete** (DML) operations. Valid values are:

  - **minimal** – the SAP ASE server attempts to log no changes for the DML statements. In most cases, the SAP ASE server generates little or no logging to `syslogs`.
  - **default** – the SAP ASE server disables session-specific minimal logging and uses the logging mode you enabled for individual tables based on table-specific and database-wide logging levels.

  Changes to logging apply only to objects owned by the user in this session, when applicable. In addition, only the tables owned by the session owner are affected by **set dml_logging**:

  - Any user can execute **set dml_logging** for **minimal** logging and for returning to the **default** mode of logging. Once this **set** succeeds, DML on all tables owned by the user executing the statement in any database is minimally logged for the current session, until **set dml_logging default** is executed.
  - DML logging defaults to the database- and table-level settings when **minimal** logging is enabled for the session but the DML operates on tables not owned by the session's user.

    - The DML logging setting in a session or procedure is inherited by procedures, however, only the tables owned by the user running the session are affected.
- **set encryption passwd '*password_phrase*' for {key | column} {*keyname* | *column_name*} –** creates the encryption key's password to encrypt or decrypt data on an **insert**, **update**, **delete**, **select**, **alter table**, or **select into** statement.
    - *password_phrase* – is the explicit password specified with the **create encryption key** or **alter encryption key** command to protect the key.
    - **key** – indicates that the SAP ASE server uses this password to decrypt the key when accessing any column encrypted by the named key
    - *keyname* – may be supplied as a fully qualified name. For example:

      ```
      [[database.][owner].]keyname
      ```
    - **column** – specifies that the SAP ASE server use this password only in the context of encrypting or decrypting the named column. End users do not necessarily know the name of the key that encrypts a given column.
    - *column_name* – name of the column on which you are setting an encryption password. Supply *column_name* as:

      ```
      [[ database.][ owner ]. ]table_name.column_name
      ```
- **set erase_residual_data {on | off} –** allows you to enable or disable the removal of residual data based on your needs.

  When you enable the option at a session level, residual data is removed from all the page deallocations that occur during that session. This includes page deallocations of tables that have the "`erase residual data`" option turned `OFF` explicitly.

  This option can be set by any user for the particular session; no special permissions are required.
- **set export_options [on | off] –** the SAP ASE server's default behavior is to reset any set parameter changes that are set by a trigger or system procedure after they finish running. Enabling **set export_options** allows you to retain the session settings that are set by a system procedure or trigger for the duration of the session.

  For example, this enables **set export_options**:

  ```
  set export_options on
  ```

  This disables **set export_options** and returns the SAP ASE server to the default behavior:

  ```
  set export_options off
  ```
- **set fipsflagger {on | off} –** determines whether the SAP ASE server displays a warning message when Transact-SQL extensions to entry-level ANSI SQL are used. By default, the SAP ASE server does not tell you when you use nonstandard SQL. This option does not disable SQL extensions. Processing completes when you issue the non-ANSI SQL command.
- **set flushmessage {on | off} –** determines when the SAP ASE server returns messages to the user. By default, messages are stored in a buffer until the query that generated them is

completed or the buffer is filled to capacity. Use **set flushmessage on** to return messages to the user immediately, as they are generated.

- **set fmtonly {on | off} –** captures plans in stored procedures without actually executing them.
- **set forceplan {on | off} –** causes the query optimizer to use the order of the tables in the **from** clause of a query as the join order for the query plan. **forceplan** is generally used when the optimizer fails to choose a good plan. Forcing an incorrect plan can have severely bad effects on I/O and performance. See the *Performance and Tuning Guide*.

Note: The query optimizer ignores attempts to force illegal join orders with outer joins, such as in the following:

```
1> set forceplan on
2> select * from table1, table2
    where table2.id *= table1.id
```

- **set identity_insert [*database*.[*owner*.]]*table_name* {on | off} –** determines whether explicit inserts into a table's IDENTITY column are allowed. This option can be used only with base tables. It cannot be used with views or set within a trigger.

  After setting **identity_insert on** for the table, the table owner or users with `insert` permission on the column can manually insert any legal value greater than 5. For example, inserting a value of 55 would create a large gap in IDENTITY column values:

  ```
  insert stores_cal
   (syb_identity, stor_id, stor_name)
  values (55, "5025", "Good Reads")
  select syb_identity from stores_cal
  ```

  ```
  id_col
  -------
        1
        5
       55

   (3 rows affected)
  ```

  If **identity_insert** is then set to **off**, the SAP ASE server assigns an IDENTITY column value of 55 + 1, or 56, for the next insertion. If the transaction that contains the **insert** statement is rolled back, the SAP ASE server discards the value 56 and uses a value of 57 for the next insertion.

  Unless you have created a unique index on the IDENTITY column, the SAP ASE server does not verify the uniqueness of the inserted value; you can insert any positive integer.

  Setting **identity_insert *table_name* off** restores the default behavior by prohibiting explicit inserts to IDENTITY columns. At any time, you can use **set identity_insert *table_name* on** for a single database table within a session.

  The permission checks for **set identity_insert table_name on|off** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner or a user with `identity_insert` permission on the table. Table owner or user with `manage any object permission` privilege can grant the permission to others.
Disabled	With granular permissions disabled, you must the the table owner, database owner, or a user with sa_role. `identity_insert` permission is not transferable.

- **set identity_update *table_name* {on | off} –** With **set identity_update** on, you can explicitly update the value of the IDENTITY column on a table. **identity_update** changes the identity column value for the qualified rows. When **identity_update** is enabled, you can update the identity value to any value greater than 0. However, if the input value is greater than the **identity burn max** value, a new set of ID values is allocated, and the **identity burn max** value on the OAM page is updated accordingly. If **update** is included in a transaction, the new **identity burn max** value cannot be rolled back. You can use `syb_identity` to point to the identity column for **update**. For example:

```
update table_name set syb_identity = value
where clause
```

  The SAP ASE server does not check for duplicates entries or verify that entries are unique. You can update an existing value to any positive integer within the range allowed by the column's declared precision. You can check for duplicate entries by creating a unique index on the identity column.

  The permission checks for **set identity_update table_name on|off** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner or a user with `identity_update` permission on the table. Table owner or user with `manage any object permission` privilege can grant the permission to others.
Disabled	With granular permissions disabled, you must the the table owner, database owner, or a user with sa_role. `identity_update` permission is not transferable.

- **set index_union on | off –** when enabled, sets limits the scan of a table with an **or** clause.

  Index unions (also known as an **or** strategy) are used for queries that contain **or** clauses. For example:

```
select * from titleauthor where au_id = "409-56-7008" or title_id
 = "PC8888"
```

  If **index_union** is:

  - Enabled – this example uses an index on `au_id` to find the row IDs (RIDs) of all `titleauthor` tuples with `au_id = "409-56-7008"`, and uses an index on `title_id` to find the RIDs of all `titleauthor` tuples with `title_id = "PC8888"`. The SAP ASE server then performs a union on all RIDs

  to eliminate duplicates. The resulting RIDs are joined with a **RidJoin** to access the data tuples.
  - Disabled – the SAP ASE server does not use an index union strategy in a query to limit the table scan. Instead, it uses other access paths on the table (in the example above, it would use a table scan for table `titleauthor`), and applies the **or** clause as a filter in the scan operator.
- **ins_by_bulk –** provides faster data loading by using parallel index updates for insert statements into a data rows-locked table with non-clustered indexes.
- **set literal_autoparam on | off –** is **on** by default. If the server-level setting for **literal_autoparam** is **on**, this option enables and disables use of that feature. If the server level setting is **off**, this setting has no effect.
- **set join_bloom_filter –** enables or disables the use of bloom filters for query plan optimization.
- **set lock {wait [*numsecs*] | nowait | default} –** specifies the settings for a lock.
  - **wait** – specifies the length of time that a command waits to acquire locks before aborting and returning an error.
  - *numsecs* – specifies the number of seconds a command is to wait to acquire a lock. Valid values are from 0 to 2147483647, the maximum value for an integer.
  - **lock nowait** – specifies that if a command cannot acquire a lock immediately, it returns an error and fails. **set lock nowait** is equivalent to **set lock wait 0**.
  - **default** – disables the current session-level lock wait settings, and instead uses the current server-wide **lock wait period** configuration parameter setting.
- **set logbulkcopy {on | off} –** configures fast-logged **bcp** for the session.
- **set materialized_view_optimization {disable | fresh | stale} –** determines which precomputed result sets are considered during query optimization. One of:
  - **disabled** – (the default) the SAP ASE server does not use any precomputed result sets in query optimization.
  - **fresh** – the SAP ASE server considers only the precomputed result sets with an **immediate refresh** policy.
  - **stale** – the SAP ASE server considers all enabled precomputed result sets for query optimization, even if they are stale.
- **set metrics_capture {on | off} –** enables the capture of query processing (QP) metrics at the session level, and sets the capture to on. QP metrics identify and compare empirical metric values in query execution. When a query is executed, it is associated with a set of defined metrics that are the basis for comparison in QP metrics.
- **set mon_stateful_history on | off –** When disabled, queries to the historical monitoring tables (`monSysStatement`, `monErrorLog`, `monSysSQLText`, `monSysPlanText`, and `monDeadLock`) return all rows in the table buffer.

  When enabled, queries to the historical monitoring tables return only rows that were added to the tables since **mon_stateful_history** was disabled.

- **set nodata –** specifies that no data be routed to the client when a query is executed to completion. When you specify set nodata on, only the TDS format stream is sent to the client, and the query behaves as if no rows qualified.
- **set offsets {select, from, order, compute, table, procedure, statement, param, execute} {on | off} –** returns the position of specified keywords (with relation to the beginning of the query) in Transact-SQL statements. The keyword list is a comma-separated list that can include any of the following Transact-SQL constructs: **select**, **from**, **order**, **compute**, **table**, **procedure**, **statement, param**, and **execute**. The SAP ASE server returns offsets if there are no errors.

  This option is used in Open Client DB-Library only.
- **set option *show_option* {normal | brief | long | on | off} –** generates diagnostics output in text format.

  The valid values for *show_option* are:

  - **show** – shows the basic syntax common to all modules
  - **show_lop** – shows the logical operators (scans, joins, etc.) used
  - **show_managers** – shows data structure managers used during optimization.
  - **show_log_props** – shows the logical properties (row count, selectivity, etc.) evaluated.
  - **show_parallel** – shows details of parallel query optimization
  - **show_histograms** – shows the processing of histograms associated with SARG/Join columns
  - **show_abstract_plan** – shows the details of an abstract plan
  - **show_search_engine** – shows the details of the join ordering algorithm
  - **show_counters** – shows the optimization counters
  - **show_best_plan** – shows the details of the best query plan selected by the optimizer
  - **show_pio_costing** – shows estimates of physical input/output (reads/writes from/to the disk)
  - **show_lio_costing** – shows estimates of logical input/output (reads/writes from/to memory)
  - **show_elimination** – shows partition elimination
  - **show_missing_stats {brief | long}** – shows details of useful statistics missing from SARG/Join columns. Set to:
    - **brief** – the SAP ASE server creates minimal statistics for each query, and **show_missing_stats** does not report warnings on user created temporary tables.
    - **long** – the SAP ASE server creates full statistics for each query, including user-created temporary tables.

  See *Displaying Query Optimization Strategies and Estimates* in *Query Optimizer* for more information.

  The permission checks for **set option *show_option*** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with either `set tracing` privilege or `monitor qp performance` privilege.
Disabled	With granular permissions disabled, you must be a user with `set tracing` privilege or a user with sa_role.

- **set opttimeoutlimit –** sets the timeout limit for the optimizer. The valid range of values for **opttimeoutlimit** 0 to 4000 ms, with 0 indicating no optimization limit.
- **set parallel_degree *number* –** specifies an upper limit for the number of worker processes used in the parallel execution of a query. This number must be less than or equal to the number of worker processes per query, as set by the **max parallel degree** configuration parameter. The **@@*parallel_degree*** global variable stores the current setting.
- **set plan {dump | load} [*group_name*] {on | off} –** introduces an abstract plan command.
  - **dump** – enables or disables capturing abstract plans for the current connection. If a *group_name* is not specified, the plans are stored in the default group, `ap_stdout`.
  - **load** – enables or disables loading abstract plans for the current connection. If a *group_name* is not specified, the plans are loaded from the default group, `ap_stdin`.
  - *group_name* – is the name of the abstract plan group to use for loading or storing plans.

  See *Creating and Using Abstract Plans* in the *Performance and Tuning Guide*.
- **set plan exists check {on | off} –** when used with **set plan load**, stores hash keys for up to 20 queries from an abstract plan group in a per-user cache.
- **set plan for *show* –** generates an XML document for the diagnostic output. The valid values for *show* are:
  - **show_exec_xml** – gets the compiled plan output in XML, showing each of the query plan operators.
  - **show_execio_xml** – gets the plan output along with estimated and actual IOs. This also includes the query text.
  - **show_opt_xml** – gets optimizer diagnostic output, which shows all of the different components like logical operators, output from the managers, some of the search engine diagnostics, and the best query plan.
  - **show_lop_xml** – gets the output logical operator tree in XML.
  - **show_managers_xml** – shows the output of the different component managers during the preparation phase of the query optimizer.
  - **show_log_props_xml** – shows the logical properties for a given equivalence class (one or more group of relations in the query).
  - **show_parallel_xml** – shows the diagnostics related to the optimizer while generating parallel query plans.

- **show_histograms_xml** – shows diagnostics related to histograms and the merging of histograms.
- **show_abstract_plan_xml** – shows the AP generation/application.
- **show_search_engine_xml** – shows the search engine related diagnostics.
- **show_counters_xml** – shows plan object construction/destruction counters.
- **show_best_plan_xml** – shows the best plan in XML.
- **show_pio_costing_xml** – shows actual PIO costing in XML.
- **show_lio_costing_xml** – shows actual LIO costing in XML.
- **show_elimination_xml** – shows partition elimination in XML.
- **client** – when specified, output goes to the client.
- **message** – when specified, output goes to an internal message buffer.

See *Displaying Query Optimization Strategies and Estimates* in *Performance and Tuning Series: Query Processing and Abstract Plans* for more information.

The permission checks for **set plan for** *show* differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with either `set tracing` privilege or `monitor qp performance` privilege.
Disabled	With granular permissions disabled, you must be a user with `set tracing` privilege or a user with sa_role.

- **set plan optgoal {allrows_oltp | allrows_mix | allrows_dss | user_defined_goal_identifier} –** sets the optimization goal.

  - **allrows_mix** – is the default optmization goal, and the most useful goal in a mixed-query environment. It balances the needs of OLTP and DSS query environments.
  - **allrows_dss** – is the most useful goal for operational DSS queries of medium to high complexity. Currently, this goal is provided on an experimental basis.

  See *Understanding Query Processing in SAP ASE* in *Performance and Tuning Series: Query Processing and Abstract Plans* for more information about optimization plans.
- **set plan optlevel *value* –** sets the optimization level for the session. Each SAP ASE release or ESD may include a new optimization level. For example:

  - **ase_current** – enables all optimizer changes through the current release.
  - **ase_default** – disables all optimizer changes since version 15.0.3 ESD #1.
  - **ase1503esd2** – enables all optimizer changes through version 15.0.3 ESD #2.
  - **ase1503esd3** – enables all optimizer changes through version 15.0.3 ESD #3.

  See *Controlling Optimization* in *Performance and Tuning Series: Query Processing and Abstract Plans*.

- **set plan opttimeoutlimit *number* –** sets the timeout at the session level, where *n* is any integer between 0 and 1000. See *Understanding Query Processing in Adaptive Server* in *Performance and Tuning Series: Query Processing and Abstract Plans* for more information about optimization plans.
- **set plan replace {on | off} –** enables or disables replacing existing abstract plans during plan capture mode. By default, plan replacement is off.
- **set prefetch {on | off} –** enables or disables large I/Os to the data cache.
- **set statistics query_name_html [queryname | on | off] –** helps differentiate or identify files related to the execution of same query.
- **set switch [serverwide] {on | off} print_minlogged_mode_override –** generates trace information to session output, reporting on the statement for which the minimally logged mode of a table was overridden by some other rules, such as presence of referential integrity constraints, deferred mode choice, name of the table affected and a description of the affecting rules, and so on.
- **set proc_output_params {on | off} –** controls sending of output parameters that a stored procedure generates back to the client. **set proc_output_params off** suppresses sending the output parameters back to the client. The default for this parameter is **on**.
- **set proc_return_status {on | off} –** controls sending of a return status TDS token back to the client. **set proc_return_status off** suppresses sending the return status token to the client, and **isql** client does not display the `(return status = 0)` message. The default for this parameter is **on**.

  Warning! If the client application that executes a procedure relies on the success or failure of the procedure based on the return status, then do not use the **set proc_return_status off** option.
- **set process_limit_action {abort | quiet | warning} –** specifies whether the SAP ASE server executes parallel queries when an insufficient number of worker processes is available. Under these circumstances, if:

  - **process_limit_action** is set to **quiet**, the SAP ASE server silently adjusts the plan to use a degree of parallelism that does not exceed the number of available processes.
  - **process_limit_action** is set to **warning** when an insufficient number of worker processes are available, the SAP ASE server issues a warning message when adjusting the plan
  - **process_limit_action** is set to **abort**, the SAP ASE server aborts the query and issues an explanatory message an insufficient number of worker processes are available.
- **set proxy *login_name* –** allows you to assume the permissions, login name, and `suid` (server user ID) of *login_name*. For *login_name*, specify a valid login from `master..syslogins`, enclosed in quotation marks. To revert to your original login name and `suid`, use **set proxy** with your original *login_name*.

Note: To use **set proxy** *login_name*, the user, including the system security officer, must have explicitly granted permission. Without explicit permission, neither the “sa_role” nor the “sso_role” can issue the **set proxy login_name** command.

- **set quoted_identifier {on | off} –** determines whether the SAP ASE server recognizes delimited identifiers within double quotation marks. By default, **quoted_identifier** is **off** and all identifiers must either:

  - Conform to the rules for valid identifiers.
  - Be enclosed in brackets.

  If you use **set quoted_identifier on**, double quotation marks behave the way brackets do, and you can use table, view, and column names that begin with a nonalphabetic character, including characters that would not otherwise be allowed, or are reserved words, by enclosing the identifiers within double quotation marks. Delimited identifiers cannot exceed 28 bytes, may not be recognized by all front-end products, and may produce unexpected results when used as parameters to system procedures.

  When **quoted_identifier** is **on**, all character strings enclosed within double quotes are treated as identifiers. Use single quotes around character or binary strings.
- **set repartition_degree *number* –** is the maximum degree to which any intermediate data stream is re-partitioned for semantic purposes. See *Parallel Query Processing* in *Performance and Tuning Series: Query Processing and Abstract Plans* for more information about setting the value of **max repartition degree** for a session.
- **set repthreshold *number* –** sets the SQL replication threshold at the session level. If set repthreshold is invoked in a stored procedure, its scope is that of the procedure. If it is invoked in a user session, its scope is that of the session.

  A user can alter the scope of the threshold and set the session threshold using a login trigger, in which case you need not explicitly set the session threshold at login.

  For example,

```
create proc myproc
as
    set repthreshold 777
---------------------

alter login sa modify login script 'myproc'
----------------------
option changed.
```

```
(Return status = 0
```

  The procedure ’myproc’ is invoked each time the user **sa** logs in, and ensures that the replication threshold is set at 777 for the whole session.

  Another way to alter the scope of the threshold is to use **set export_options**:

```
create proc p2
as
    set repthreshold222
    set export_options on
---------------------------
```

After `p2` is executed the threshold remains set at 222.The hierarchy of thresholds is Session > Table > Database

When you set the session threshold to 0, the only replication thresholds that still matter are table and database thresholds, if they have been specified, in that order. If you set no threshold, the threshold defaults to 50 rows.

To set the table level threshold, see **sp_setrepdbmode**; to set the database level threshold, see **sp_setrepdefmode**, both in the *Reference Manual: Procedures*.

The session threshold is exportable; a stored procedure can set the threshold and turn the **export options** setting ON. The SAP ASE server enforces the new threshold in the invoking procedure or session.

The permission checks for **set repthreshold** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `manage replication` privilege.
Disabled	With granular permissions disabled, you must be a user with `replication_role`.

- **set resource_granularity *number* –** overrides the global value `max resource granularity` and sets it to a session specific value, which influences whether the SAP ASE server uses memory-intensive operation or not. See *Parallel Query Processing* in *Query Processor* for more information.
- **set role {*role_name* [with passwd "*password*"]} {on | off} –** Use **set role *role_name* off** to turn a role off, and **set role *role_name* on** to turn it back on again, as needed.

  - *role_name* can be the name of a system role or a user-defined role. When you log in, all system roles that have been granted to you are automatically activated. If you have been granted `sa_role` or `sso_role`, you cannot set these roles off unless you are a named or aliased user in the database or there exists a "guest" user.
  - *role_name* – is the name of any user-defined role created by the system security officer. User-defined roles are not turned on by default. To set user-defined roles to activate at login, system security officer must specify the role as a default or auto activated role when creating or altering a login or a login profile.
  - **with *passwd*** – specifies the password to activate the role. If a user-defined role has an attached password, you must specify the password to activate the role.

  To use **set role**, the role must have been granted to you. If you gain entry to a database only because you have a certain role, you cannot turn that role off while you are using the database.

If you were granted a role using an activation predicate, the SAP ASE server evaluates the predicate when you execute **set role on**. If the predicate evaluates to **false**, the SAP ASE server returns an error and does not activate the role.

- **set {rowcount *number*, textsize *number*} –** causes the SAP ASE server to stop processing the query (**select**, **insert**, **update**, or **delete**) after the specified number of rows are affected. The *number* can be a numeric literal with no decimal point or a local variable of type `integer`. To turn this option off, use:

  ```
  set rowcount 0
  ```

  You can determine the current value for **set rowcount** with the *@@setrowcount* global variable. For example:

  ```
  select @@setrowcount
  ___________
           37
  ```
- **set scan_parallel_degree *number* –** specifies the maximum session-specific degree of parallelism for hash-based scans (parallel index scans and parallel table scans on nonpartitioned tables). This number must be less than or equal to the current value of the **max scan parallel degree** configuration parameter. The **@@*scan_parallel_degree*** global variable stores the current setting.
- **set send_locator {on | off } –** specifies whether the SAP ASE server sends the LOB or the locator that references the LOB in a result set sent to the client. When the option is **off** (the default), the SAP ASE server sends the LOB.
- **set session authorization *login_name* –** is identical to **set proxy**, with this exception: **set session authorization** follows the SQL standard, while **set proxy** is a Transact-SQL extension.
- **set show_exec_info –** generates additional information when a command executes.
  - **on** – generates extra diagnostics about the logging mode for a DML statement. Displays the selected logging mode for the current statement and session, and the user executing the DML.
  - **off** – disables **show_exec_info**.
- **set show_permission_source, {on|off} –** display the grantee, type of grantee, grantor, action, object, and predicate in tabular form. The grantee can be *user_name*, *role_name*, or *group_name*. The `Type of grantee` column displays whether the grantee is user, role, or group. If there are no predicates, the SAP ASE server resturns a NULL.

  When using **set show_permission_source, {on|off}**, consider:

  - If you grant permission to a role that is part of a hierarchy the permission is not granted directly to the user. For example, if you granted permissions for role1 to role2, which in turn is granted to role3, and that permission is granted to a user. **set show_permission_source** displays "role1" in the `grantee` column and not role3 because role1 was granted the permission and not role3. Use **sp_displayroles ... expand_up** to see information about role3.

    - If more than one grantor grants permission for a particular action, **set show_permission_source** displays the permission associated with the grantor with the highest user ID.
    - **set show_permission_source** displays information at the object level and not the column level because there may be more than one row for the same object from different grantors on different columns.
    - If more than one permission exists with different predicates on an object for a combination of actions and grantors, **set show_permission_source** displays all the predicate names, with a separate row for each predicate.
- **set show_sqltxt {on | off} –** allows you to print the SQL text for ad-hoc queries, stored procedures, cursors, and dynamic prepared statements.

  You do not need to enable the **set show_sqltext** before you execute the query (as you do with commands like **set showplan on**) to collect diagnostic information for a SQL session. Instead you can enable it while the commands are running to help determine which query is performing poorly and diagnose their problems.

  Before you enable **show_sqltext**, you must first enable **dbcc traceon** to display the output to standard out:

  ```
  dbcc traceon(3604)
  ```

  The syntax for **set show_sqltext** is:

  ```
  set show_sqltext {on | off}
  ```

  For example, this enables **show_sqltext**:

  ```
  set show_sqltext on
  ```

  Once **set show_sqltext** is enabled, the SAP ASE server prints all SQL text to standard out for each command or system procedure you enter. Depending on the command or system procedure you run, this output can be extensive.

  To disable **show_sqltext**, enter:

  ```
  set show_sqltext off
  ```
- **set statement_cache on | off –** is **on** by default. If the server-level setting for **statement_cache** is **on**, this option enables and disables use of that feature. If the server level setting is **off**, this setting has no effect.
- **set show_transformed_sql, {on|off} –** displays the an intermediate form of the query as SQL text during SAP ASE query processing–that is, after query transformations for views, predicated privileges, encryption, and so on, have been made, but before query transformations for subqueries have occurred.
- **set spinlock_aggregation {on | off} –** determines whether SAP ASE aggregates the spinlock metrics reported in `monSpinlockActivity` when the result set includes multiple rows with the same value for `SpinlockName`.

  By default, SAP ASE aggregates the values for `Grabs`, `Waits`, and `Spins` for all spinlocks with the same value. Set **set spinlock_aggregation** to off to configure SAP ASE to return a separate row for each spinlock instance in the `monSpinlockActivity` table.

- **set statistics {io, subquerycache, time, plancost, simulate} {on | off} –** displays various types of statistics information
    - **io** – displays statistics for each table referenced in the statement:
        - The number of times the table is accessed (scan count)
        - The number of logical reads (pages accessed in memory)
        - The number of physical reads (database device accesses)

      For each command, **statistics io** displays the number of buffers written.

      If the SAP ASE server has been configured to enforce resource limits, **statistics io** also displays the total I/O cost.
    - **subquerycache** – displays the number of cache hits, misses, and the number of rows in the subquery cache for each subquery.
    - **time** – displays the amount of time the SAP ASE server used to parse and compile for each command. For each step of the command, **statistics time** displays the amount of time the SAP ASE server used to execute the command. Times are given in milliseconds and timeticks, the exact value of which is machine-dependent.
    - **plancost** – displays the query statistics in a tree format.

      Note: When you enable **set statistics plancost**, the SAP ASE server abbreviates the names for `lio`, `pio`, and `row` to `l`, `p`, and `r`, respectively.
    - **simulate** – specifies that the optimizer should use simulated statistics to optimize the query.

  See *Using the set statistics Command* in *Performance and Tuning Series: Improving Performance with Statistical Analysis*.
- **set statistics {plan_detail_html, parallel_plan_detail_html, plan_directory_html, plan_html, timing_html} –** displays various types of statistics information in HTML format.
    - **plan_detail_html {on | off}** – generates a graphical query plan in HTML format containing information about details per thread and plan fragments for query plans that are executed in parallel using several worked threads. Use this option to diagnose the behavior of specific threads and plan fragments in comparison with the global execution of the query.
    - **parallel_plan_detail_html {on | off}** – generates a graphical query plan in HTML format containing information details of plan operators, such as the name, different timestamps captured during the execution, number of rows affected, number of estimated rows, elapsed time, and so on.
    - **plan_directory_html "dirName" {on | off}** – specifies the directory path name into which to write the HTML query plans. The file name is identified by a combination of user name, spid, and timestamp. When set to off, the dumping of the HTML data to an external file is stopped.When set to on, the dumping of HTML data to an external file in

a directory previously indicated is resumed. No output is generated if a directory name was not previously provided.

- **plan_html {on | off}** – generates a graphical query plan in HTML format containing information about the number of rows and number of threads per operator.
- **timing_html {on | off}** – generates a graphical query plan in HTML format containing execution statistics related to the timing spent in each operator per execution phase. CPU usage and Wait distribution is generated for queries executed in parallel.

See *Using the set statistics Command* in *Performance and Tuning Series: Improving Performance with Statistical Analysis*.

- **set strict_dtm_enforcement {on | off} –** determines whether the server propagates transactions to servers that do not support SAP ASE transaction coordination services. The default value is inherited from the value of the **strict dtm enforcement** configuration parameter.
- **set string_rtruncation {on | off} –** determines whether the SAP ASE server raises a SQLSTATE exception when an **insert** or **update** command truncates a `char`, `unichar`, `varchar` or `univarchar` string. If the truncated characters consist only of spaces, no exception is raised. The default setting, **off**, does not raise the SQLSTATE exception, and the character string is silently truncated.
- **set system_view {instance | cluster | clear} –** (clusters only) specifies the system view for a session, and controls the materialization of fake tables, which impact the output of stored procedures such as **sp_who**.
  - **instance** – sets the system view for the current instance.
  - **cluster** – sets the system view for the cluster.
  - **clear** – clears any session-level setting, reverting to the **system_view** setting for the logical cluster hosting that spid. Enter `select @@system_view` to check the current value.
- **set switch [serverwide] {on | off} *trace_flag*[,*trace_flag*] [,with *option* [, *option*]> –** allows you to set trace flags and switch names locally and server-wide.
  - **serverwide** – (optional) sets a switch serverwide ON or OFF. The default is session-specific.
  - **on** – trace flags are switched on.
  - **off** – trace flags are switched off.
  - *trace_flag* – a sequence of numbers (the old traceflag numbers) and/or switch names.
  - *option* – (optional) a sequence of switch options. Valid values are:
    - **override** – this option is necessary to enable a non-documented switch names or trace flags
    - **no_info** – this option is used to surpress any informational warnings

  The permission checks for **set switch** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled: • To set traceflag 3604/3605, you must have either `monitor qp performance` privilege or `set switch` privilege. For all other traceflags, you must have `set switch` privilege.
Disabled	With granular permissions disabled, you must have sa_role.

- **set textsize [*number*] –** specifies the maximum size in bytes of `text`, `unitext`, or `image` type data that is returned with a **select** statement. The *@@textsize* global variable stores the current setting.

  The default setting is 32K in **isql**. Some client software sets other default values. To reset **textsize** to the default size (32K), use:

  ```
  set textsize 0
  ```

- **set tracefile [*filename*] [off] [for *spid*] –** once enabled, saves all SQL text for the current session to the specified file, each SQL text batch appending to the previous batch.

  The syntax to enable tracing is:

  ```
  set tracefile file_name [off] [for spid
  ```

  The syntax to disable tracing is:

  ```
  set tracefile off [for spid]
  ```

  where:

  - *file_name* – is the full path to the file in which you are saving the SQL text. If you do not specify a directory path, the SAP ASE server creates the file in `$SYBASE`.

    Note: If *file_name* contains special characters (":", "/", and so on) other than numbers and letters, you must include *file_name* in quotes. For example, this *file_name* must be in quotes because of the "/" for the directory structure:

    ```
    set tracefile '/tmp/mytracefile.txt' for 25
    ```

    If *file_name* does not contain special characters and you want to save it to `$SYBASE`, it does not require quotes. For example, this *file_name* does not need to be in quotes:

    ```
    set tracefile mytracefile.txt
    ```

  - **off** – disables the tracing for this session or spid.
  - *spid* – server process ID whose SQL text you want saved to a trace file. Only the users with the SA or systems security officer role can enable tracing for other spids. You cannot save the SQL text for system tasks (such as the housekeeper or the port manager).

Note: After you use **set tracefile** for a particular session, the diagnostic output of all successive set commands or DBCC traces are then redirected to a tracefile.

Make sure to switch off all the diagnostic commands you turned on before issuing **set tracefile off**, or else the output that should go to the tracefile instead goes to the client.

The permission checks for **set tracefile** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, setting tracefile for your own session requires either `set tracing` privilege or `monitor qp performance` privilege. To set tracefile for other user's session you must have either `set tracing any process` privilege or `monitor qp performance` privilege.
Disabled	With granular permissions disabled, setting tracefile for your own session requires `set tracing` privilege; to set tracefile for other user's session you must have either sa_role or sso_role.

- **set transaction isolation level {[read uncommitted | 0] | [read committed | 1] | [repeatable read | 2] | [serializable | 3]} –** sets the transaction isolation level for your session. After you set this option, any current or future transactions operate at that isolation level.
  - **read uncommitted | 0** – scans at isolation level 0 do not acquire any locks. Therefore, the result set of a level 0 scan may change while the scan is in progress. If the scan position is lost due to changes in the underlying table, a unique index is required to restart the scan. In the absence of a unique index, the scan may be aborted.

    By default, a unique index is required for a level 0 scan on a table that does not reside in a read-only database. You can override this requirement by forcing the SAP ASE server to choose a nonunique index or a table scan, as follows:

    ```
    select * from table_name (index table_name)
    ```

    Activity on the underlying table may cause the scan to be aborted before completion.
  - **read committed | 1** – by default, the SAP ASE transaction isolation level is **read committed** or **1**, which allows shared read locks on data.
  - **repeatable read | 2** – prevents nonrepeatable reads.
  - **serializable | 3** – specifies isolation level 3, the SAP ASE server applies a **holdlock** to all **select** and **readtext** operations in a transaction, which holds the queries' read locks until the end of that transaction. If you also set chained mode, that isolation level remains in effect for any data retrieval or modification statement that implicitly begins a transaction.
- **set transactional_rpc {on | off} –** controls the handling of remote procedure calls. If this option is set to **on**, when a transaction is pending, the RPC is coordinated by the SAP ASE server. If this option is set to **off**, the remote procedure call is handled by the SAP ASE site handler. The default value is inherited from the value of the **enable xact coordination** configuration parameter.

Examples

- **Example of ansinull –** Tells the SAP ASE server to evaluate NULL-valued operands of equality (=) and inequality (!=) comparisons and aggregate functions in compliance with the entry level ANSI SQL standard:

  ```
  set ansinull on
  ```

  When you use **set ansinull on**, aggregate functions and row aggregates raise the following SQLSTATE warning when the SAP ASE server finds null values in one or more columns or rows:

  ```
  Warning - null value eliminated in set function
  ```

  If the value of either the equality or the inequality operands is NULL, the comparison's result is UNKNOWN. For example, the following query returns no rows in **ansinull** mode:

  ```
  select * from titles where price = null
  ```

  If you use **set ansinull off**, the same query returns rows in which `price` is NULL.

- **Example of char_convert –** Activates character set conversion, setting it to a default based on the character set the client is using. The SAP ASE server also notifies the client or application when characters cannot be converted to the client's character set:

  ```
  set char_convert on with error
  ```

- **Example of cis_rpc_handling –** Specifies that CIS handles outbound RPC requests by default:

  ```
  set cis_rpc_handling on
  ```

- **Example of clientname –** Assigns this user the client name alison, the host name money1, and the application name webserver2:

  ```
  set clientname 'alison'
  set clienthostname 'money1'
  set clientapplname 'webserver2'
  ```

- **Example of cursor rows –** Returns five rows for each succeeding **fetch** statement requested by a client using **test_cursor**:

  ```
  set cursor rows 5 for test_cursor
  ```

- **Example of dml_logging –** This example shows how the DML logging mode for multiple statements on the same table remains unchanged if the table was initially operated with minimal logging in a transaction.

  1. Begin the transaction and set the DML logging to minimal:

     ```
     begin tran
     set dml_logging minimal
     ```
  2. Run an **insert** command:

     ```
     insert into tab1 values(1)
     ```
  3. Set DML logging back to the default:

     ```
     set dml_logging default
     ```

Even though you reset DML logging to the default, because `t1` was previously run with minimal logging in this transaction, this **insert** is executed with minimal logging:

```
insert into tab1 values(1)
```

The error log includes reasons the logging mode choice was overridden.

- **Example of export_options –** Tells the SAP ASE server to retain the session settings that are set by a system procedure or trigger for the duration of the session:

  ```
  set export_options on
  ```

  To disable **set export_options** and return the SAP ASE server to the default behavior, use:

  ```
  set export_options off
  ```

  You can export these optimization settings using **set export_options on**.

  Note: By default, **set export_options** are enabled for login triggers.

- **Example of fipsflagger –** Tells the SAP ASE server to display a warning message if you use a Transact-SQL extension:

  ```
  set fipsflagger on
  ```

  Then, if you use nonstandard SQL, like this:

  ```
  use pubs2
  go
  ```

  The SAP ASE server displays:

  ```
  SQL statement on line number 1 contains Non-ANSI text.
  The error is caused due to the use of use database.
  ```

- **Example of identity_insert –** Inserts a value of 100 into the IDENTITY column of the `stores_south` table, then prohibits further explicit inserts into this column. Note the use of the **syb_identity** keyword; the SAP ASE server replaces the keyword with the name of the IDENTITY column:

  ```
  set identity_insert stores_south on
  go
  insert stores_south (syb_identity)
  values (100)
  go
  set identity_insert stores_south off
  go
  ```

- **Example of identity_update –** Enables **idenity_update** and updates tables with values 1 and 10, respectively, then disables **identity_update**:

  ```
  set identity_update t1 on
  update t1 set c2 = 10 where c1 =1
  select * from t1

  c1              c2
  --------     -------
  1                 10
  ```

```
set identity_update t1 off
```

- **Example of lock nowait –** Subsequent commands in the session or stored procedure return an error and fail if they cannot get requested locks immediately:

```
set lock nowait
```

- **Example of lock wait –** Subsequent commands in the current session or stored procedure wait indefinitely long to acquire locks:

```
set lock wait
```

Alternatively, in this example, subsequent commands in the session or stored procedure wait 5 seconds to acquire locks before generating an error message and failing:

```
set lock wait 5
```

- **Example of plan dump –** Enables capturing abstract plans to the `dev_plans` group:

```
set plan dump dev_plans on
```

- **Example of plan load –** Enables loading of abstract plans from the `dev_plans` group for queries in the current session:

```
set plan load dev_plans on
```

- **Example of proc_output_params –** Suppresses the output of parameter information:

```
1> create procedure sp_pout (@x int output) as select
    @x = @x + 1
2> go

1> set proc_output_params off
2> go
1> declare @x int
2> select @x = 1
3> exec sp_pout @x output
4> print "Value of @x returned from sproc is: %1!", @x
5> go

 (1 row affected)
 (return status = 0)

Value of @x returned from sproc is: 1
```

If you do not perform **set proc_output_params off**, the output after `(return status = 0)` includes the following:

```
Return parameters:

 -----------
           2
```

- **Example of proc_return_status –** Suppresses the output of both parameters and the return status TDS token:

```
set proc_output_params off
go

set proc_return_status OFF
```

```
go

declare @x int
select @x = 2
exec sp_pout @x output
print "Value of @x returned from sproc is: %1!", @x
go (1 row affected)
Value of @x returned from sproc is: 2
 (1 row affected)
```

In addition, you can also suppress the lines reporting the number of rows affected to generate output with no extra messages using the **set nocount on** option before running this batch.

- **Example of proxy –** The user executing this command now operates within the server as the login "mary" and Mary's server user ID:

```
set proxy "mary"
```

- **Example of rowcount –** For each **insert**, **update**, **delete**, and **select** statement, the SAP ASE server stops processing the query after it affects the first four rows. For example:

```
select title_id, price from titles

title_id  price
--------  ----------
BU1032         19.99
BU1111         11.95
BU2075          2.99
BU7832         19.99

 (4 rows affected)
```

```
set rowcount 4
```

- **Example of quoted_identifier on –** Tells the SAP ASE server to treat any character string enclosed in double quotes as an identifier. The table name "`!*&strange_table`" and the column name "`emp's_name`" are legal identifier names while **quoted_identifier** is **on**:

```
set quoted_identifier on
go
create table "!*&strange_table"
      ("emp's_name" char (10), age int)
go
set quoted_identifier off
go
```

- **Example of quoted_identifier off –** Treats a character string enclosed in brackets as an identifier. The table name `[!*&strange_table]` and the column name `[emp's_name]` are legal identifier names because they are enclosed in brackets, even though **quoted_identifier** is **off**:

```
set quoted_identifier off
go
create table [!*&strange_table]
```

```
      ([emp’s_name] char (10), age int)
go
```

- **Example of role –** Activates the “doctor” role. This command is used by users to specify the roles they want activated:

```
set role doctor_role on
```

- **Example of role off –** Deactivates the user’s system administrator role for the current session:

```
set role "sa_role" off
```

- **Example of role with password on –** Activates the “doctor” role when the user enters the password:

```
set role doctor_role with passwd "physician" on
```

- **Example of scan_parallel_degree –** Specifies a maximum degree of parallelism of 4 for parallel index scans and parallel table scans on nonpartitioned tables:

```
set scan_parallel_degree 4
```

- **Example of session authorization –** Sets session authorization for a user:

```
set session authorization "mary"
```

- **Example of showplan –** Returns a description of the processing plan for each query, but does not execute it:

```
set showplan, noexec on
go
select * from publishers
go
```

- **Example of spinlock_aggregation –** Shows a result set from `monSpinlockActivity` with **set spinlock_aggregation** disabled:

```
1> set spinlock_aggregation off
2> go
1> select * from monSpinlockActivity
2> where SpinlockName like "default data cache%"
3> order by Contention
4> go
Grabs              Spins              Waits              OwnerPID
         LastOwnerPID Contention                 InstanceID
SpinlockSlotID
         SpinlockName
 -------------------- -------------------- --------------------
-----------
         ------------ --------------------------- ----------
--------------

------------------------------------------------------------------
-----
             37697                978                  1         0
            1638413                0.000027        0
2338
        default data cache                16396
15
```

```
              2          0
            1638413                  0.000122         0
2340
         default data cache
             17317                24                 3          0
            1638413                  0.000173         0
2339
         default data cache
             27533               629                 5          0
            1638413                  0.000182         0
2341
         default data cache
```

When you select the number of rows from this instance of `monSpinlockActivity`:

```
select count(*) from monSpinlockActivity
-----------
        2384
```

However, if you enable **set spinlock_aggregation** and perform the same query:

```
1> set spinlock_aggregation on
2> go
1> select * from monSpinlockActivity
2> where SpinlockName like "default data cache%"
3> order by Contention
4> go

Grabs              Spins              Waits              OwnerPID
         LastOwnerPID Contention                 InstanceID
SpinlockSlotID
         SpinlockName
 -------------------- -------------------- --------------------
-----------
         ------------ --------------------------- ----------
--------------

-----------------------------------------------------------------
--
             99235              1646                11          0
            1769486                  0.000111         0
2338
         default data cache
```

This instance of `monSpinlockActivity` now shows much fewer rows:

```
select count(*) from monSpinlockActivity
-----------
         324
```

- **Example of statistics –** Displays the statistics for the query in a tree format:

```
set statistics plancost on
```

```
select * from authors

au_id       au_lname     au_fname     phone        address
city    state       country         postalcode
----------- -----------  -----------  ------------ --------------
```

```
-------
------------
-----  ----------      -----------------------------------172-32
-1176  White        Johnson      408 496-7223 10932 Bigge Rd.
Menlo Park      CA     USA         94025
213-46-8915  Green        Marjorie     415 986-7020  309 63rd St.
#411
Oakland         CA     USA          94618

. . .

998-72-3567  Ringer        Albert       801 826-0752   67 Seventh
Av.
Salt Lake City  UT      USA          84152

==================== Lava Operator Tree =====================

            Emit
            (VA = 1)
            23 rows est: 23
            cpu: 0

/
TableScan
authors
 (VA = 0)
23 rows est: 23
lio: 1 est: 2
pio: 0 est: 2

============================================================

 (23 rows affected)
```

- **Example of statistics plan_directory_html –** Writes HTML generated query plan and execution statistics to a file in a specified directory in an external file:

```
 set statistics plan_directory_html "/usr/myDir/HTML"
go
set statistics plan_directory_html on
go
```

- **Example of string_rtruncation –** Causes the SAP ASE server to generate an exception when truncating a `char`, `unichar`, or `nchar` string:

```
set string_rtruncation on
```

If an **insert** or **update** statement would truncate a string, the SAP ASE server displays:

```
string data, right truncation
```

- **Example of textsize –** Sets the limit on `text`, `unitext`, or `image` data returned with a **select** statement to 100 bytes:

```
set textsize 100
```

- **Example of switch on –** Sets the serverwide switch on to generate trace information to session output:

```
set switch on print_minlogged_mode_override
go
```

```
Switch 'print_minlogged_mode_override' is turned on.
All supplied switches are successfully turned on.
```

You can also set the serverwide switch on to set traceflags for 110, an undocumented traceflag, with no additional informational warnings:

```
set switch serverwide on 110 with override, no_info
```

- **Example of tracefile –** Opens a trace file named `sql_text_file` for the the current session:

  ```
  set tracefile '/var/sybase/REL1502/text_dir/sql_text_file'
  ```

  Subsequent outputs from **set showplan**, **set statistics io**, and **dbcc traceon(100)** are saved in `sql_text_file`.

  You can also choose not to specify a directory path, so the trace file is saved in `$SYBASE/sql_text_file`:

  ```
  set tracefile 'sql_text_file' for 11
  ```

  Any SQL run on spid 11 is saved to this tracefile.

  The following saves the SQL text for spid 86:

  ```
  set tracefile '/var/sybase/REL1502/text_dir/sql_text_file' for 86
  ```

- **Example of transactional_rpc –** Specifies that when a transaction is pending, the RPC is handled by the CIS access methods rather than by the SAP ASE site handler:

  ```
  set transactional_rpc on
  ```

- **Examples of transaction isolation levels –** All subsequent queries in the session run at the repeatable reads transaction isolation level:

  ```
  set transaction isolation level 2
  ```

  This example implements read-locks with each **select** statement in a transaction for the duration of that transaction:

  ```
  set transaction isolation level 3
  ```

- **Example of show_exec_info –** Changes the **show_exec_info** from **minimal** to **full** within the same session:

  1. Log in to the SAP ASE server:

     ```
     isql -Ubob -Pbob123
     use myimdb
     ```

  2. Create table `tab1`:

     ```
     create table tab1(col1 int)
     ```

  3. Enable **show_exec_info** and set DML logging to **minimal**:

     ```
     set show_exec_info on
     set dml_login minimal
     ```

4. Insert values into **tab1**:

   ```
   insert into tab1 values(1)
   ```
5. The SAP ASE server displays the name of the table and database, the user ID running the command, and the logging mode used:

   ```
   Operating on the table 'tab1', database 'myimdb' (owner ID 3) in
   'minimal' logging mode by user ID 3.
   ```
6. Set the DML logging back to default:

   ```
   set dml_logging default
   ```
7. Insert more values into tab1:

   ```
   insert into tab1 values(1)
   ```
8. The SAP ASE server displays the name of the table and database, the user ID running the command, and the logging mode used:

   ```
   Operating on the table 'tab1', database 'myimdb' (owner ID 3) in
   'full' logging mode by user ID 3.
   ```

Usage

- **fipsflagger**, **string_rtruncation**, **ansinull**, **ansi_permissions**, **arithabort**, and **arithignore** affect aspects of SAP ASE error handling and compliance to SQL standards.
- You can use the **cis_rpc_handling** and **transactional_rpc** options only when CIS is enabled.
- The **async log service** option and **delayed_commit** are mutually exclusive. **delayed_commit** does not work if **async log service** is set to “true.”
- **parallel_degree** and **scan_parallel_degree** limit the degree of parallelism for queries, if the SAP ASE server is configured for parallelism. When you use these options, you give the optimizer a hint to limit parallel queries to use fewer worker processes than allowed by the configuration parameters. Setting these parameters to 0 restores the server-wide configuration values.

  If you specify a number that is greater than the numbers allowed by the configuration parameters, the SAP ASE server issues a warning message and uses the value set by the configuration parameter.
- If you use the **set** command inside a trigger or stored procedure, most **set** options revert to their former settings after the trigger or procedure executes.

  The following options do not revert to their former settings after the procedure or trigger executes, but remain for the entire SAP ASE session or until you explicitly reset them:
  - **datefirst**
  - **dateformat**
  - **identity_insert**
  - **language**
  - **quoted_identifier**

- If you specify more than one **set** option, the first syntax error causes all following options to be ignored. However, the options specified before the error are executed, and the new option values are set.
- If you assign a user a client name, host name, or application name, these assignments are only active for the current session. You must reassign these the next time the user logs in. Although the new names appear in `sysprocesses`, they are not used for permission checks, and **sp_who** still shows the client connection as belonging to the original login. For more information about setting user processes, see the *System Administration Guide*.
- All **set** options except **showplan** and **char_convert** take effect immediately. **showplan** takes effect in the following batch. Here are two examples that use **set showplan on**:

```
set showplan on
select * from publishers
go

pub_id  pub_name              city        state
------- --------------------- ----------- ---
0736    New Age Books         Boston      MA
0877    Binnet & Hardley      Washington  DC
1389    Algodata Infosystems  Berkeley    CA

 (3 rows affected)
```

  But:

```
set showplan on
go
select * from publishers
go
```

```
QUERY PLAN FOR STATEMENT 1 (at line 1).
    STEP 1
        The type of query is SELECT

        FROM TABLE
            publishers
        Nested iteration
        Table Scan
        Ascending Scan.
        Positioning at start of table.

pub_id  pub_name             city        state
------  -------------------- ----------  ----
0736    New Age Books        Boston      MA
0877    Binnet & Hardley     Washington  DC
1389    Algodata Infosystems Berkeley    CA

 (3 rows affected)
```

- The SAP ASE server automatically stores one or more spaces in `clientname`, `clienthostname`, and `clientapplname` columns. For this reason, a query using any of these three columns that includes "`is null`" does not return an expected result set.

- **set proxy** issue the following warning when they are issued while **set fipsflagger** option is enabled:

```
SQL statement on line number 1 contains Non-ANSI
text. The error is caused due to the use of DBCC.
```

- If you use a login trigger to set current execution properties, any exportable **set** option that you enable or disable inside a login trigger takes affect in the current process.

See also:

- **convert** in *Reference Manual: Building Blocks*
- **isql**, **optdiag** in the *Utility Guide*
- **sp_setrepdbmode**, **sp_setrepdefmode** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

The ANSI SQL standard specifies behavior that differs from Transact-SQL behavior in versions of SAP ASE earlier than 15.7. Compliant behavior is enabled, by default, for all Embedded-SQL precompiler applications. Other applications needing to match this standard of behavior can use these **set** options:

Table 11. Options to set for Entry-Level ANSI SQL Compliance

Option	Setting
ansi_permissions	**on**
ansinull	**on**
arithabort	**off**
arithabort numeric_truncation	**on**
arithignore	**off**
chained	**on**
close on endtran	**on**
fipsflagger	**on**
quoted_identifier	**on**
string_rtruncation	**on**
transaction isolation level	**3**

Permissions

Permission checks may differ based on your granular permission settings. In general, **set** permission defaults to all users and no special permissions are required to use it. Exceptions include **set identity_insert**, **set identity_update**, **set option show_option**, **set plan for show**, **set proxy**, **set repthreshold**, **set role**, **set session authorization**, **set tracefile**, and **set switch**. See command description above for permission requirements for each exception.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	88
Audit option	**security**
Command or access audited	**set proxy** or **set session authorization**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – Previous `suid` • *Current value* – New `suid` • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** or **set session authorization** had no parameters; otherwise, NULL.

See also

- *Aggregate Behavior* on page 647
- *Using Proxies* on page 651
- *Delimited Identifiers* on page 657
- *create trigger* on page 253
- *fetch* on page 412
- *grant* on page 419
- *insert* on page 473
- *lock table* on page 511
- *revoke* on page 559

set Options That Can Be Grouped Together

Some **set** options can be grouped together.

- **parseonly**, **noexec**, **prefetch**, **showplan**, **rowcount**, and **nocount** control the way a query is executed. It does not make sense to set both **parseonly** and **noexec** on. The default setting for **rowcount** is 0 (return all rows); the default for the others is **off**.
- The **statistics** options display performance statistics after each query. The default setting for the **statistics** options is **off**. For more information about **noexec**, **prefetch**, **showplan** and **statistics**, see the *Performance and Tuning Guide*.
- You can update up to 1024 columns in the **set** clause using literals, variables, or expressions returned from a subquery.
- **offsets** is used in DB-Library to interpret results from the SAP ASE server. The default setting for this option is **on**.
- **datefirst**, **dateformat**, and **language** affect date functions, date order, and message display. If used within a trigger or stored procedure, these options do not revert to their previous settings.

  In the default language, us_english, **datefirst** is 1 (Sunday), **dateformat** is *mdy*, and messages are displayed in us_english. Some language defaults (including us_english) produce Sunday=1, Monday=2, and so on; others produce Monday=1, Tuesday=2, and so on.

  set language implies that the SAP ASE server should use the first weekday and date format of the language it specifies, but does not override an explicit **set datefirst** or **set dateformat** command issued earlier in the current session.
- **cursor rows** and **close on endtran** affect the way the SAP ASE server handles cursors. The default setting for **cursor rows** with all cursors is 1. The default setting for **close on endtran** is **off**.
- **chained** and **transaction isolation level** allow the SAP ASE server to handle transactions in a way that is compliant with the SQL standards.

Compile-Time Changes for Some set Parameters

In version 15.0.2 and later, the SAP ASE server changes the compile-time behavior for some abstract plan **set** parameters when you use them to create stored procedures or run them in Transact-SQL batches.

In earlier versions of SAP ASE, the **set** parameters took effect after the stored procedure was executed or recompiled. SAP ASE 15.0.2 allows you to use optimizer **set** parameters at compile time to affect the optimizer in stored procedures or batches.

Note: This changed behavior may effect the composition of the result set. You should review the result set created by the 15.0.2 versions of the **set** parameters before using them in your production systems.

You must reset the **set** parameter before returning from the stored procedure or the execution of subsequent stored procedures may be affected. If you intend to propogate this change to subsequent stored procedures, use **export_options** parameter.

The optimizer options that you can export when you use **set export_options on** are:

- **addend_union_all**
- **auto_query_tuning**
- **basic_optimization**
- **bushy_space_search**
- **distinct_hashing**
- **distinct_sorted**
- **distinct_sorting**
- **group_hashing**
- **group_inserting**
- **group_sorted**
- **hash_join**
- **hash_union_distinct**
- **index_intersection**
- **index_union**
- **merge_join**
- **merge_union_all**
- **merge_union_distinct**
- **multi_gt_store_index**
- **nary_nl_join**
- **nl_join**
- **opportunistic_distinct**
- **opportunistic_grouping**
- **optgoal**
- **opttimeout**
- **order_sorting**
- **parallel_query**
- **query_tuning_mem_limit**
- **query_tuning_time_limit**
- **replicated_partitioning**
- **showabstractplan**
- **showbestplan**
- **showcodegen**
- **showcounters**
- **showelimination**

- **showexecio**
- **showfinalplan**
- **showhistograms**
- **showliocosting**
- **showlogprops**
- **showlop**
- **showmanagers**
- **shownostats**
- **showparallel**
- **showpiocosting**
- **showpllcosting**
- **showsearchengine**
- **store_index**
- **streaming_sort**

Aggregate Behavior

ansinull determines whether NULL-valued operands in aggregate functions are evaluated in compliance with the ANSI SQL standard. If you use **set ansinull on**, the SAP ASE server generates a warning when an aggregate function eliminates a null-valued operand from the calculation.

For example, if you perform the following query on the `titles` table with **set ansinull off** (the default value):

```
select avg (total_sales) from titles
```

The SAP ASE server returns:

```
-----------
       6090
```

However, if you perform the same query with **set ansinull on**, the SAP ASE server returns the following:

```
1> use pubs2
2> go
1> select avg (total_sales) from titles
2> go
```

```
 -----------
        6090
 (1 row affected)
```

```
1> set ansinull on
2> go
1> select avg (total_sales) from titles
2> go
```

```
 -----------
        6090
```

```
Warning - null value eliminated in set function
(1 row affected)
```

This message indicates that some entries in `total_sales` contain NULL instead of a real amount, so you do not have complete data on total sales for all books in this table. However, of the available data, the value returned is the highest.

Comparison Behavior

The SQL standard requires that if either one of the two operands of an equality comparison is NULL, the result is UNKNOWN. Transact-SQL treats NULL values differently.

If one of the operands is a column, parameter, or variable, and the other operand is the NULL constant or a parameter or variable whose value is NULL, the result is either TRUE or FALSE:

- Sybase NULL mode – “`val = NULL`” is true when “`val`” is NULL
- ANSI NULL mode – “`val = NULL`” is unknown when “`val`” is NULL

The ANSI rule for the **where** and **on** clauses return rows that are true, and rejects rows that are both false and unknown.

The ANSI rule for a **check** constraint rejects values that are false. For this reason, unknown or true results are not rejected.

If you:

- Enable **ansinull** mode – do not use the Sybase NULL comparisons (`val = NULL` or `val != NULL`).
- Expect to use ANSI-null mode during **insert** and **update** – do not use the Sybase NULL comparisons in **check** constraints.

Instead, use the **ANSI IS NULL** or **IS NOT NULL** syntax to prevent from having unexpected results.

Roles and set Options

When a user logs in to SAP ASE, the user’s roles are not necessarily active, depending upon how the role is set up as a default role.

A system security officer can change role automatic activation using **alter login** or **alter login profile**

Use **set role *role_name* on** or **set role *role_name* off** to turn roles on and off.

For example, if you have been granted the system administrator role, you assume the identity (and user ID) of database owner in the current database. To assume your real user ID, execute this command:

```
set role "sa_role" off
```

If you are not a user in the current database, and if there is no “guest” user, you cannot set **sa_role off**.

If the user-defined role you intend to activate has an attached password, you must specify the password to turn the role on. Thus, you would enter:

```
set role "role_name" with passwd "password" on
```

During **set role**, the SAP ASE server locks the role if your failed role activation attempts reach the number you set in **max failed_logins**. When this happens, `locksuid`, `locdate`, and `lockreason` in are updated in `syssrvroles`.

In-Memory and Relaxed-Durability Databases

Data copied into a table created with **select into** is minimally logged. **with dml_logging = minimal** specifies the logging mode for future DML operations on this table.

- Setting the logging level to **minimal** affects the logging mode only on objects owned by the current user. However, if the user has system administrator privileges, setting the logging to **minimal** affects the logging mode for all objects in the user's session.
- **show_exec_info** does not display the reason the SAP ASE server overrides a minimally logged mode selected by a user. Use **set switch on print_minlogged_mode_override** to view the reasons for this override.
- Session-specific settings for the logging mode override the logging options set at the table and database level, and include these restrictions:
  - Database-wide settings
  - Disabling DML logging for the current session based on the logging mode:
    - Database-wide logging mode settings
    - Table-specific logging mode settings
    - The ownership of the tables being updated
- If you set the session-specific DML logging to **minimal**, running **set dml_logging default** returns the logging mode for the affected tables to their default logging mode, based on the table and database-wide settings.
- You cannot use **set dml_logging** to perform fully logged DML if the database or table owner has already configured the table to run with minimal logging.

Setting Compression for a Session

Enabling or disabling compression for a session does not change the compression level for existing data.

- Updated rows remain uncompressed. The SAP ASE server uncompresses any compressed rows during the update.
- If **set compression** is set to **off**, commands that require a data copy (for example, **reorg rebuild** and **alter table**) uncompress data rows.
- After you configure **set compression on**, subsequent updates use the partition or tables' compression level.

Using Predicated Privileges

Use **set show_transformed_sql** to display the SQL text.

- Use **set show_transformed_sql** with **set noexec** to display the text of an SQL query, but not execute the query.
- When you enable **show_transformed_sql** for a session, DML or **select** commands displays the SQL text of:
  - Predicate text, if predicates exist on tables in the SQL command. If no predicates exist, **show_transformed_sql** displays NULL.
  - User query text
  - SQL text of the query after aggregate processing, view processing, encryption, and predicate merging. For queries that do not access any predicates, the SQL text denotes the text after view processing, encryption, and so on.
  - SQL text of the query after subquery processing.

Distributed Transactions, CIS, and set Options

When the SAP ASE server distributed transaction management services are enabled, you can place RPCs within transactions. These RPCs are called *transactional RPCs*.

A transactional RPC contains work that can be included in the context of a current transaction. This remote unit of work can be committed or rolled back along with the work performed by the local transaction.

- The behavior of the **cis rpc handling** configuration property and the **set transactional_rpc** commands changed with the introduction of ASTC. In versions earlier than 12.0, enabling **cis rpc handling** caused *all* RPCs to be routed through CIS's Client-Library connection. As a result, whenever **cis rpc handling** was enabled, **transactional_rpc** behavior occurred whether or not it had been specifically set. As of SAP ASE 12.0, this behavior has changed. If **cis rpc handling** is enabled and **transactional_rpc** is **off**, RPCs within a transaction are routed through the site handler. RPCs executed outside a transaction are sent via CIS's Client-Library connection.
- To use transactional RPCs, enable CIS and distributed transaction management with **sp_configure**, then issue the **set transactional_rpc** command. When **set transactional_rpc** is **on** and a transaction is pending, the SAP ASE server (as opposed to the SAP ASE site handler) coordinates the RPC.

  The **set transactional_rpc** command default is **off**. The **set cis_rpc_handling** command overrides the **set transactional_rpc** command. If you set **cis_rpc_handling on**, all outbound RPCs are handled by CIS.
- See the *Component Integration Services User's Guide* for a discussion of using **set transactional_rpc**, **set cis_rpc_handling**, and **sp_configure**.

Using Proxies

Considerations for using proxies.

Note: Without explicit permission, neither the sa_role nor the sso_role can issue the **set proxy login_name** command. To use **set proxy login_name**, any user, including the system security officer, must have permission explicitly granted by the system security officer.

- Before you can use the **set proxy** or **set session authorization** command, you must be granted `set proxy` privilege or `set session authorization` privilege in `master`.
- You can switch your server user identity to any other server login and limit its use based on the target login roles by using:

```
grant set proxy to user_or_role_list
[restrict role role_list | all | system]
```

- Executing **set proxy** or **set session authorization** with the original *login_name* reestablishes your previous identity.
- You cannot execute **set proxy** or **set session authorization** from within a transaction.
- The SAP ASE server permits only one level of login identity change. Therefore, after you use **set proxy** or **set session authorization** to change identity, you must return to your original identity before changing it again. For example, assume that your login name is "ralph". To create a table as "mary", create a view as "joe", then return to your own login identity. Use the following statements:

```
set proxy "mary"
    create table mary_sales
     (stor_id  char (4),
    ord_num   varchar (20),
    date      datetime)
grant select on mary_sales to public
set proxy "ralph"
set proxy "joe"
    create view joes_view (publisher, city,
        state)
    as select stor_id, ord_num, date
    from mary_sales
set proxy "ralph"
```

- If a user issues **set proxy** to assume the permissions, login name, and `suid` of another user, the SAP ASE server checks the proxy user's access to database objects, rather than the original user's access.

  The SAP ASE server uses the name and password information of the user who logged in to check for automatic access to encryption keys using login credentials. The SAP ASE server does not have access to the proxy user's password. Access to keys through the login password is on behalf of the user who logs in, not on behalf of the user assumed through an alias, **set proxy**, or **setuser**. Access to copies of encryption keys that were set up for login association, but which are still encrypted by the system encryption password or the master key, is treated similarily.

Using lock wait

Considerations for using **lock wait**.

- By default, an SAP ASE task that cannot immediately acquire a lock waits until incompatible locks are released, then continues processing. This is equivalent to **set lock wait** with no value specified in the *numsecs* parameter.
- You can set a server-wide lock wait period by using **sp_configure** with the **lock wait period** option.
- **lock wait period**, with the session-level setting **set lock wait nnn**, is only applicable for user-defined tables. These settings have no influence on system tables.
- A lock wait period defined at the session level or in a stored procedure with the **set lock** command overrides a server-level lock-wait period.
- If **set lock wait** is used by itself, with no value for *numsecs*, all subsequent commands in the current session wait indefinitely to acquire requested locks.
- **sp_sysmon** reports the number of times that tasks waiting for a lock could not acquire the lock within the waiting period.

Repeatable-Reads Transaction Isolation Level

The repeatable-reads isolation level, also known as transaction isolation level 2, holds locks on all pages read by a statement until the transaction completes.

A nonrepeatable read occurs when one transaction reads rows from a table and a second transaction can modify the same rows and commit the changes before the first transaction completes. If the first transaction rereads the rows, they now have different values, so the initial read is not repeatable. Repeatable reads hold shared locks for the duration of a transaction, blocking transactions that update the locked rows or rows on the locked pages.

Using Simulated Statistics

You can load simulated statistics into a database using the **simulate** mode of the **optdiag** utility program. If **set statistics simulate on** has been issued in a session, queries are optimized using simulated statistics, rather than the actual statistics for a table.

Global Variables Affected by set Options

Global variables that contain information about the session options controlled by the **set** command.

Table 12. Global Variables Containing Session Options

Global Variable	Description
@@char_convert	Contains 0 if character set conversion not in effect. Contains 1 if character set conversion is in effect.

Global Variable	Description
@@client_csexpan-sion	Returns the expansion factor used when converting from the server character set to the client character set. For example, if *@@client_csexpansion* contains a value of 2, a character in the server character set could take up to twice the number of bytes after translation to the client character set.
@@cursor_rows	A global variable designed specifically for scrollable cursors. Displays the total number of rows in the cursor result set. Returns the value -1:
@@datefirst	Set using **set datefirst n** where **n** is a value between 1 and 7. Returns the current value of *@@datefirst*, indicating the specified first day of each week, expressed as `tinyint`. The default value in SAP ASE is Sunday (based on the us_language default), which you set by specifying `set datefirst 7`. See the **datefirst** option of the **set** command for more information on settings and values.
@@isolation	Contains the current isolation level of the Transact-SQL program. *@@isolation* takes the value of the active level (0, 1, or 3).
@@lock_timeout	Set using **set lock wait n.** Returns the current *lock_timeout* setting, in milliseconds. *@@lock_timeout* returns the value of **n**. The default value is no timeout. If no **set** l**ock wait n** is executed at the beginning of the session, *@@lock_timeout* returns -1.
@@options	Contains a hexadecimal representation of the session's **set** options.
@@parallel_degree	Contains the current maximum parallel degree setting.
@@rowcount	Contains the number of rows affected by the last query. *@@rowcount* is set to 0 by any command that does not return rows, such as an **if**, **update**, or **delete** statement. With cursors, *@@rowcount* represents the cumulative number of rows returned from the cursor result set to the client, up to the last **fetch** request. *@@rowcount* is updated even when **nocount** is on.
@@scan_parallel_de-gree	Contains the current maximum parallel degree setting for nonclustered index scans.
@@textsize	Contains the limit on the number of bytes of `text`, `unitext` or `image` data a **select** returns. Default limit is 32K bytes for **isql**; the default depends on the client software. Can be changed for a session with **set textsize**. If you use **enable surrogate processing**, Unicode surrogates (two 16-bit values) are returned as single characters, even though the actual return size may be less than the *@@text* size value.

Global Variable	Description
@@tranchained	Contains the current transaction mode of the Transact-SQL program. *@@tranchained* returns 0 for unchained or 1 for chained.

Table 13. set Options and Values for @@options

Numeric value	Hexidecimal value	*set* option
4	0x04	**showplan**
5	0x05	**noexec**
6	0x06	**arithignore**
8	0x08	**arithabort**
13	0x0D	**control**
14	0x0E	**offsets**
15	0x0F	**statistics io** and **statistics time**
16	0x10	**parseonly**
18	0x12	**procid**
20	0x14	**rowcount**
23	0x17	**nocount**
77	0x4D	**opt_sho_fi**
78	0x4E	**select**
79	0x4F	**set tracefile**

Using fipsflagger with Java in the Database

When **fipsflagger** is on, the SAP ASE server displays a warning message when some extensions are used.

- The **installjava** utility
- The **remove java** command
- Column and variable declarations that reference Java classes as datatypes
- Statements that use Java-SQL expressions for member references

The status of **fipsflagger** does not affect arithmetic expressions performed by Java methods.

For more information about Java in the database, see *Java in Adaptive Server Enterprise*.

Restrictions for set tracefile

Restrictions for using **set tracefile**.

- You cannot save the SQL text for system tasks (such as the housekeeper or the port manager).
- You must have the sa or sso roles, or be granted **set tracing** permission, to run enable or disable tracing.
- **set tracefile** is not allowed to open an existing file as a tracefile.
- During an SA or systems security officer session, if you enable **set tracefile** for a specific spid, all subsequent tracing commands executed take effect on that spid, not the system administrator or systems security officer spid.
- If the SAP ASE server runs out of file space while writing the tracefile, it closes the file and disables the tracing.
- If an **isql** session starts tracing for a spid, but the **isql** session quits without disabling the tracing, another **isql** session can begin tracing this spid.
- Tracing occurs for the session for which it is enabled only, not for the session that enabled it.
- You cannot trace more than one session at a time from a single sa or sso session. If you attempt to open a tracefile for a session for which there is already a trace file open, the SAP ASE server issues this error message: `tracefile is already open for this session.`
- You cannot trace the same session from multiple sa or sso sessions.
- The file storing the trace output is closed when the session being traced quits or when you disable tracing.
- Before you allocate resources for tracing, keep in mind that each tracing requires one file descriptor per engine.

set Options That Save Diagnostic Information to a Trace File

You can use **set tracefile** in combination with other **set** commands and options that provide diagnostic information for a better understanding of slow-running queries.

These are the **set** commands and options that save diagnostic information to a file:

- **set show_sqltext [on | off]**
- **set showplan [on | off]**
- **set statistics io [on | off]**
- **set statistics time [on | off]**
- **set statistics plancost [on | off]**

These are the **set** options:

- **set option show [normal | brief | long | on | off]**
- **set option show_lop [normal | brief | long | on | off]**

- **set option show_parallel [normal | brief | long | on | off]**
- **set option show_search_engine [normal | brief | long | on | off]**
- **set option show_counters [normal | brief | long | on | off]**
- **set option show_managers [normal | brief | long | on | off]**
- **set option show_histograms [normal | brief | long | on | off]**
- **set option show_abstract_plan [normal | brief | long | on | off]**
- **set option show_best_plan [normal | brief | long | on | off]**
- **set option show_code_gen [normal | brief | long | on | off]**
- **set option show_pio_costing [normal | brief | long | on | off]**
- **set option show_lio_costing [normal | brief | long | on | off]**
- **set option show_log_props [normal | brief | long | on | off]**
- **set option show_elimination [normal | brief | long | on | off]**

Restrictions for show_sqltext

Restrictions for using **show_sqltext**.

- You must have the sa or sso roles to run **show_sqltext**.
- You cannot use **show_sqltext** to print the SQL text for triggers.
- You cannot use **show_sqltext** to show a binding variable or a view name.

Exporting set Options from a Login Trigger

The SAP ASE server enables **set** options inside login triggers to remain valid for the entire user session.

The following **set** options are automatically exported:

- **altnames**
- **ansi_permissions**
- **ansinull**
- **arithabort [overflow | numeric_truncation]**
- **arithignore [overflow]**
- **cis_rpc_handling**
- **close on endtran**
- **colnames**
- **command_status_reporting**
- **dup_in_subquery**
- **explicit_transaction_required**
- **fipsflagger**
- **flushmessage**
- **fmtonly**
- **forceplan**

- **format**
- **nocount**
- **or_strategy**
- **prefetch**
- **proc_output_params**
- **proc_return_status**
- **procid**
- **quoted_identifier**
- **raw_object_serialization**
- **remote_indexes**
- **replication**
- **rowcount**
- **self_recursion**
- **showplan**
- **sort_resources**
- **statistics io**
- **statement_cache**
- **strict_dtm_enforcement**
- **string_rtruncation**
- **textptr_parameters**
- **transactional_rpc**
- **triggers**

Delimited Identifiers

When the **quoted_identifier** option is set to **on**, you do not need to use double quotes around an identifier if the syntax of the statement requires that a quoted string contain an identifier.

For example:

```
set quoted_identifier on
create table "1one" (c1 int)
```

However, **object_id** requires a string, so you must include the table name in quotes to select the information:

```
select object_id ('1one')
```

```
-----------------------
  896003192
```

You can include an embedded double quote in a quoted identifier by doubling the quote:

```
create table "embedded""quote" (c1 int)
```

However, there is no need to double the quote when the statement syntax requires the object name to be expressed as a string:

```
select object_id ('embedded"quote')
```

Bracketed Identifiers

The SAP ASE server supports an alternative to quoted identifiers that uses brackets to surround an identifier. The behavior of bracketed identifiers is identical to that of quoted identifiers, with the exception that you do not have to use **set quoted_identifier on** to use them.

When you use bracketed identifiers instead of quoted identifiers to create objects, your objectname should have at least one valid character, such as:

- `create table [table name]`
- `create database [database name]`

All trailing spaces are removed from the objectname, so the following are all treated identically:

```
[tab1<space><space>]
[tab1<space><space>]
[tab1]
[tab1<space><space><space>]
tab1
```

This applies to all objects that can be created using bracketed identifiers.

The following are restrictions when using delimited identifiers in SAP ASE servers:

- A dot (.) cannot appear in an identifier name, however delimited
- Object names as stored procedure parameters – SAP ASE stored procedure object names can be treated as strings, and do not need delimiters. For example, the following gives correct results if a table named `table` actually exists:

  ```
   exec sp_help 'dbo.table'
  ```

  However, the brackets are not stripped from the object name in the following:

  ```
   exec sp_help 'dbo.[table]'
  ```

setuser

Allows a database owner to impersonate another user.

Syntax

```
setuser ["user_name"]
```

Examples

- **Example 1 –** The database owner temporarily adopts Mary's identity in the database in order to grant Joe permissions on `authors`, a table owned by Mary:

  ```
  setuser "mary"
  go
  ```

```
grant select on authors to joe
setuser
go
```

Usage

- The database owner uses **setuser** to adopt the identity of another user in order to use another user's database object, to grant permissions, to create an object, or for some other reason.
- Except for sessions run by login account "sa," when the database owner uses the **setuser** command, the SAP ASE server checks the permissions of the user being impersonated instead of the permissions of the database owner. The user being impersonated must be listed in the `sysusers` table of the database.
- **setuser** affects permissions only in the local database. It does not affect remote procedure calls or accessing objects in other databases.
- **setuser** remains in effect until another **setuser** command is given or until the current database is changed with the **use** command.
- **setuser** has no effect when creating a database.
- Executing **setuser** with no user name reestablishes the database owner's original identity.
- system administrators can use **setuser** to create objects that are owned by another user. However, since a system administrator operates outside the permissions system, she or he cannot use **setuser** to acquire another user's permissions.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **setuser** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must have `setuser` privilege to run **setuser**. `setuser` privilege is granted to the database owner by default.
Disabled	With granular permissions disabled, `setuser` privilege defaults to the database owner and is not transferable.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	84

Information	Values
Audit option	**setuser**
Command or access audited	**setuser**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – Name of the user being set • *Proxy information* – original login name, if a **set proxy** is in effect

See also

- *grant* on page 419
- *revoke* on page 559
- *use* on page 708

shutdown

Shuts down the SAP ASE server from which the command is issued, its local Backup Server, or a remote Backup Server.

Syntax

```
shutdown [srvname] [with {wait [="hh:mm:ss"] | nowait}]]
```

Syntax for clusters:

```
shutdown {cluster | [instance_name]} [with {wait | nowait}]
```

Parameters

- ***srvname*** **–** is the logical name by which the Backup Server is known in the SAP ASE `sysservers` system table. This parameter is not required when shutting down the local SAP ASE server.
- **with wait –** is the default. This shuts down the SAP ASE server or Backup Server gracefully.
- ***hh:mm:ss*** **–** is an optional setting that specifies the maximum time the server waits for all running or sleeping processes to finish their job.
- **with nowait –** shuts down the SAP ASE server or Backup Server immediately, without waiting for currently executing statements to finish.

Warning! Use **shutdown with nowait** only in extreme circumstances. In the SAP ASE server, issue a **checkpoint** command before executing a **shutdown with nowait.** Use of **shutdown with nowait** can lead to gaps in IDENTITY column values.

- **cluster –** (shared disk clusters only) specifies that all instances in the cluster are to shut down.
- ***instance_name* –** (shared disk clusters only) is the name of a specific instance to shut down.

Examples

- **Example 1 –** Shuts down the SAP ASE server from which the **shutdown** command is issued:

  ```
  shutdown
  ```

- **Example 2 –** Shuts down the SAP ASE server immediately:

  ```
  shutdown with nowait
  ```

- **Example 3 –** Shuts down the local Backup Server:

  ```
  shutdown SYB_BACKUP
  ```

- **Example 4 –** Shuts down the remote Backup Server REM_BACKUP:

  ```
  shutdown REM_BACKUP
  ```

- **Example 5 –** Shuts down the current cluster:

  ```
  shutdown cluster
  ```

- **Example 6 –** Shuts down the instance “ase1”, but leaves the cluster running:

  ```
  shutdown ase1
  ```

Usage

- Unless you use the **nowait** option, **shutdown** attempts to bring the SAP ASE server down gracefully by:
  - Disabling logins (except for the system administrator)
  - Performing a checkpoint in every database
  - Waiting for currently executing SQL statements or stored procedures to finish

  ---

  Note: Attempting a normal shutdown on a dataserver does not terminate batches of SQL that include infinite looping and Transact-SQL that include **waitfor delay** commands.

  Shutting down the server without the **nowait** option minimizes the amount of work that must be done by the automatic recovery process.

  A graceful shutdown waits for the currently executing statement to complete, under the assumption that many statements are be atomic transactions that commit on completion. However, a graceful shutdown does not wait for a longer transaction to commit if the session would go into “awaiting command” state within a transaction. Instead, shutdown commences and the transaction rolls back on recovery.

You should check the `master..syslogshold` table for any long-running open transaction and deal with it before you issue a shutdown. You may deal with such transactions by contacting the users running them to see they can commit the transactions, or kill them and wait for a rollback. Rolling back an active transaction is faster before a shutdown rather than after recovery, as many pages may still be in cache, and there is less scanning of the log involved. If there are multiple long-running transaction, check `syslogshold` repeatedly until you see no very old transactions.

Note: Shutting down with a long-running open transaction on the server can result in a lengthy recovery time.

- Unless you use the **nowait** option, **shutdown *backup_server*** waits for active dumps and loads to complete. Once you issue a **shutdown** command to a Backup Server, no new dumps or loads that use this Backup Server can start.
- You can halt only the local SAP ASE server with **shutdown**; you cannot halt a remote SAP ASE server.
- You can halt a Backup Server only if:
  - It is listed in your `sysservers` table. Use **sp_addserver** to add entries to `sysservers`.
  - It is listed in the interfaces file for the SAP ASE server where you execute the command.
- Use **sp_helpserver** to determine the name by which a Backup Server is known to the SAP ASE server. Specify the Backup Server's `name`— not its *network_name*—as the *srvname* parameter. For example:

```
sp_helpserver
```

```
name        network_name   status                              id
----------  -------------  ------------------------------------
--
REM_BACKUP  WHALE_BACKUP   timeouts, no net password encryption 3
SYB_BACKUP  SLUG_BACKUP   timeouts, net password encryption    1
eel         eel                                                0
whale       whale         timeouts, no net password encryption 2
```

  To shut down the remote Backup Server named WHALE_BACKUP, use:

```
shutdown REM_BACKUP
```

In a clustered environment, the **shutdown** command with no options is invalid in a clustered environment, as for example:

```
shutdown
go
```

See also **sp_addserver**, **sp_helpserver** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **shutdown** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled: • To shutdown a SMP server, a cluster instance, or a backup server, you must be a user with `shutdown` privilege. • To shutdown a cluster, you must be a user with `shutdown` privilege and `manage cluster` privilege.
Disabled	With granular permissions disabled, you must be a user with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	51
Audit option	**security**
Command or access audited	Server shutdown
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **shutdown** • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *alter database* on page 1
- *checkpoint* on page 86

Specifying a Wait Time

When you use **with wait** with the *hh:mm:ss* option, the time you specify is not the maximum total time the server takes to shut itself down. Instead, the server takes into account the time it takes to perform the first **checkpoint**, and automatically subtracts this from the time you specified.

For example, if you specify a maximum wait time of 20 minutes and the first checkpoint takes 3 minutes, the server allows up to 17 minutes for the processes to finish. If for some reason the second **checkpoint** takes longer, however, this is not calculated into the **with wait *hh:mm:ss*** parameter you specify.

The server also accommodates a **checkpoint** that takes longer than the time you specify in **with wait *hh:mm:ss***. For example, if you specify a wait time of 10 minutes but the first **checkpoint** takes 20 minutes to complete, the server does not interrupt **checkpoint** midway, but instead waits for **checkpoint** to complete. When this occurs, the server immediately begins to shut down after **checkpoint** is complete, since the time you specified has passed, and runs the last **checkpoint** with the flag informing you of the flushes you must perform.

The server performs a number of tasks as it prepares to shut down:

1. Performs **checkpoint** on all the databases
2. Prevents any new user from logging in
3. Waits for all running or sleeping processes to finish their job
4. Performs another **checkpoint** on the databases, this time with a flag that informs you that you need to flush:
   - All the dynamic thresholds in mixed log-data databases
   - All the object statistics
   - The values of the identity fields to avoid holes after recovery

transfer table

Initiates an incremental table transfer.

Syntax

```
transfer table [[db.]owner.]table [to | from] destination_file
    [ for { ase | bcp | iq | csv } ]
    [ with {column_separator=string}, {column_order=option},
    {encryption=option}, {row_separator=string},
    {resend=id}, {progress=sss}, {tracking_id=nnn}
    {sync = true | false]}, {fixed_length = true | false}
        , null_byte = true | false}]
```

Parameters

- ***table*** **–** is any valid table within the SAP ASE server. **transfer table** requires **sa_role**, or ownership of the table. Table owners can grant **transfer table** privileges for tables they own.
- **to | from –** indicates the direction of the transfer. You cannot use all the parameters for the **transfer table...from** that you use with **transfer table. . .to**. The parameters for the **from** parameter are:

  - **column_order=*option*** (does not apply to a load using **for ase**; reserved for future use)

- **column_separator=*string*** (does not apply to a load using **for ase**; reserved for future use)
- **encryption={true | false}** (does not apply to a load using **for ase**; reserved for future use)
- **progress=*nnn***
- **row_separator=*string*** (does not apply to a load using **for ase**; reserved for future use)

- ***destination_file* –** any file or path name that is valid for the operating system, and that the SAP ASE server can access. If the file is a relative file path, the SAP ASE server provides its absolute path. If the SAP ASE server cannot open *destination_file*, it issues an error message.

  The SAP ASE server removes a destination file if all these conditions apply:

  - The file is a regular file, not a named pipe, symbolic link, or other special file.
  - The SAP ASE server opens the file as part of this transfer.
  - The transfer fails, or sends no rows.
- **for clause –** names one of the destination data formats. If you omit the **for** clause, the default value of the first transfer of a specified table is **for ase**. Subsequent transfers default to the format used by the previous successful transfer, unless the command specifies format **with resend = id**, in which case the default is the specified prior transfer format.

  - **ase** – a format for importing data into the SAP ASE server. This output format is a licensed feature, available to RAP customers and to customers with licenses for in-memory databases. No data transformations are applied. This file format includes a header that describes the table, including the source computer’s byte order, character set, and default sort order. This is the default value for tables that have had no successful prior transfers.
  - **bcp** – a format for importing data as **bcp** binary-formatted data. Rows are output as binary data that can be loaded using **bcp**. No data transformations are applied. As part of the transfer, the SAP ASE server creates a format file that **bcp** uses to describe the data and appears in the same directory as the output file.

    You cannot use **for bcp** to transfer to a named pipe.

    If the output file is any file type other than a named pipe, the SAP ASE server uses this naming convention for the format file:

    ```
    {table_name},{database_id},{object_id}.fmt
    ```
  - **iq** – writes data in a form suitable for loading into SAP IQ using IQ’s **load table** command. The SAP ASE server writes data to the file in a binary format, and applies any necessary data transformations to convert its datatypes to versions that are compatible with IQ. Unless you include the **with fixed_length='true'** or **with null_byte='true'** modifiers, **for iq** writes data in a default format:
    - Default format – nullable data includes a following “null byte,” a one-byte indicator containing a:
      - 0 if the column is not null
      - 1 if the column is null

Non-nullable data does not include this null byte (see IQ's documentation for **load table**). Variable-length strings are preceded by one or two bytes indicating the length of the string, where the number of prefix bytes is determined by the column's maximum length: one byte for strings up to 255 bytes, or two bytes for strings 256 bytes or longer (SAP ASE supports strings up to about 16000 bytes). Except for strings, every column is transmitted as a fixed width, padded if necessary to expand it to this fixed-width size.

    - Use these modifiers to determine the data's format:
        - **with fixed_length='true'** – all columns, including strings, are padded to their full width. Strings are padded with blanks; other columns are padded with `<NUL>` or `0x00`. No column has a length indicator
        - **with null_byte='true'** – all columns must have a null byte, whether or not the column is nullable. This qualifier forces **for iq** to use the **fixed_length='true'** modifier, regardless of what the command specifies
- **csv** – a format of character-coded values. Rows are output as character-coded data. Columns are separated by a designated column separator, and rows are terminated by a designated row terminator. Separators and terminators are user-defined.

- **with clause –** provides options that modify the command's operation.
- **column_separator = *string* –** declares a string written between output columns in **csv** format, replacing the default. The string written for subsequent transfers defaults to the previously specified **column_separator**.
- **column_order = *option* –** declares the order in which column data is written to the output. These options are:

    - **id** – order by column ID, as given in `syscolumns`. This is the only acceptable column order when the transfer is **for bcp**, and is the default value for those transfers.
    - **name** – order by column name as given in `syscolumns`, using the SAP ASE server's current character set and sort order.
    - **name_utf8** – order by column name as given in `syscolumns`, translating the column name to UTF8 characters before sorting.
    - **offset** – order by column offset within the data row. This is the only acceptable column order when the transfer is **for ase**, and is the default value for those transfers.

    The SAP ASE server issues an error message if you use a **column_order** that does not match the **for** clause format. The column orders are:

    - **for ase** – use the **offset** column order
    - **for bcp** – use the **id** column order
- **encryption = *option* –** specifies how the command handles encrypted columns. Options are:

    - **true** – decrypt columns before transmission. This is the default value. The user must have permission to decrypt any encrypted columns.
    - **false** – transmit columns encrypted exactly as they appear in the data row.

Note: To recover the data, the receiver must know the encryption key and algorithm used to encrypt it. If the SAP ASE server writes encrypted data to a file, it writes the data as it was encrypted when it was first stored in the table. Transferring the data does not alter it. To recover that data, the receiver must know the key that encrypted the data, and any special features of the encryption algorithm (for example, whether it used an initialization vector).

- **progress =** ***sss*** **–** indicates that the transfer should generate progress messages every *sss* seconds during its operation. The default is to omit progress messages.
- **row_separator =** ***string*** **–** declares a string to be written at the end of each output row in **csv** format, replacing the default. This option has no effect unless the transfer is **for csv**. As with **column_separator**, the default for all transfers in **csv** mode after the first is the default value of the most recent successful transfer.The default row separator is platform-dependent: a line feed (Ctrl+J) on Linux and UNIX, or a carriage return and line feed (Ctrl+M Ctrl+J) on Windows.
- **resend =*id*** **–** identifies a history entry from a table whose sequence ID column obtains the starting timestamp for this data transfer.This option resends previously sent data. **resend =***id* is ignored unless the table named in the command is marked for incremental transfer. If the specified `sequence ID` does not exist for this table, the SAP ASE server resends the entire table.

  The SAP ASE server selects the indicated entry's starting timestamp as the starting timestamp for this transfer, and the indicated entry's destination type (**ase**, **bcp**, and so on) as the transfer's default destination type.

  Negative values for **id** retrieve history entries for previously completed successful transfers of the specified table. -1 names the most recently complete successful transfer, -2 the next most recent, and so forth. The transfer history table stores entries for both successful and failed transfers.
- **tracking_id =*nnn*** **–** specifies an optional integer identifier that helps track a given transfer. Use the `spt_TableTransfer.tracking_id` column to determine the value for *nnn* and use the value in queries. This example returns the ending status and sequence ID of tracking ID number 123, along with the complete path to the output data file (returns NULL if these values do not exist):

  ```
  select end_code, sequence_id, pathname from spt_TableTransfer
  where id = object_id('mytable') and tracking_id = 123
  ```

  The SAP ASE server does not control the `tracking_id` or require that it be unique.

  Note: This tracking ID is not the sequence ID used for **resend =***id*.
- **sync = true | false –** determines how the transfer reacts with transactions. Options are:
  - **true** – the transfer is synchronized so that rows from the table included in the transfer are captured as a group. **transfer** waits until all transactions affecting this table end before it starts. New transactions that affect this table cannot modify the table while **transfer** waits to start. Instead, they wait until **transfer** begins. While **transfer** is in

progress, transactions cannot modify rows in this table until they are inspected by **transfer**.

- **false** – the transfer is not synchronized. **transfer** sends rows that are within the selected timestamp range, regardless of whether it can send other rows from the table. This is the default behavior.

Note: sync affects only the tables you are transferring. **transfer** does not consider cross-table constraints.

- **fixed_length = true | false –** determines whether **transfer. . .for iq** transfers all columns as fixed-length fields in the output file. Typically, the SAP ASE server transfers varying-length strings with a 1- or 2-byte prefix length. Setting **fixed_length** to **true** causes the SAP ASE server to pad strings with blanks until they reach column's maximum width. You must use the parameter with the **for iq** parameter. Setting **fixed_length** to:
  - **true** – the SAP ASE server pads strings to their full width instead of using a prefix length.
  - **false** – the SAP ASE server sends the string using the default behavior—sending the string with the prefix length.
- **null_byte = true | false –** determines whether **transfer. . .for iq** appends a byte to the end of each transmitted column, indicating whether the column is null. Typically, the SAP ASE server provides this byte only for nullable columns. Options are:
  - **true** – the SAP ASE server includes a null byte at the end of all columns—0 if the column is null, 1 if it is not—whether or not the column is nullable. **true** forces **for iq** to use the **fixed_length='true'** modifier, regardless of what you specified with the **transfer** command.
  - **false** – the SAP ASE server provides a null byte only for nullable columns.

Note: Regardless of whether it is set to **true** or **false**, **null_byte** only applies to transfers that include **for iq** clause.

Examples

- **Example 1 –** Grants permission for user "john" to transfer table `mytable`:

```
grant transfer table on mytable to john
```

- **Example 2 –** Transfers `mytable` to an output file, formatted for loading into SAP IQ. If this example did not include **name_utf8**, the default order would default to the column ID order:

```
transfer table mytable to '/path/to/file' for iq
with column_order = 'name_utf8'
```

- **Example 3 –** Transfers `mytable`, formatted for the SAP ASE file format, which uses a column output order of **offset**. This example requests **resend** from a history entry that does not exist; therefore, the entire table is transferred:

```
transfer table mytable to '/path/to/file3/'for ase
with resend=10
```

The example changes the default column order for a **for ase** transfer. After the transfer, the default receiver is **ase**, the column order is offset, and column and row separators are null.

Usage

- **transfer table** sends only committed data that has changed since the previous transfer.
- The *string* argument to **column_separator** and **row_separator** in the **with** clause may be up to 64 bytes long, and may contain formatting instructions:
  - "\b"indicates a backspace, <BS> (Ctrl+H).
  - "\n" indicates a newline, <LF> (Ctrl+J).
  - "\r" indicates a carriage return, <CR> (Ctrl+M).
  - "\t" indicates a <TAB> (Ctrl+I).
  - "\\" indicates a backslash.
  - Any "\" in the string that is not part of one of these sequences is an actual backslash, and appears as such in the string.
- **transfer table .. from** does not fire triggers during updates or inserts.
- When **transfer table** runs into an error (such as a duplicate key), the SAP ASE server displays just an error number, making it difficult to understand the cause of the error. For example:

  ```
  Msg 2633, Level 20, State 1
  Server 'SYB155', Line 1
  TRANSFER TABLE failed to insert a row to table 'my_tab'.
  The indicated error was 2601.
  Msg 16025, Level 16, State 1
  Server 'SYB155', Line 1
  TRANSFER TABLE my_tab: command failed with status 2633.
  ```

  To retrieve the error message, manually query `master..sysmessages`. For example, if 2601 is your error number, enter:

  ```
  select * from master..sysmessages where error = 2601
  ```

  See the *Troubleshooting Guide* for more information about error 2601.

You can use **transfer table** for tables that are not marked for incremental transfer, with these restrictions:

- Not all rows are always transferred. If a user updates the table while the transfer is in progress, the updated rows may not be transferred.
- The transfer is not incremental; you can transfer only the entire table, and later transfers are not notified of this transfer.
- No history entry is written to `spt_TableTransfer`. The transfer appears in `monTableTransfer` for the duration of the transfer, but once the transfer is complete the record vanishes.

Permissions

Permission to transfer a table does not automatically grant permission to decrypt data within that table. To decrypt any encrypted columns, you must gain specific permission from the table owner.

The following describes permission checks for **transfer table** that differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner or a user with `tranfer table` permission on the table.
Disabled	With granular permissions disabled, you must be the table owner, be a user with `transfer table` permission, or a user with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	136
Audit option	**transfer table**
Command or access audited	**transfer table**
Information in `extrainfo`	

See also

- *alter table* on page 43
- *create table* on page 207

truncate lob

Truncates an LOB to a specified length.

Syntax

```
truncate lob locator_descriptor [ ( result_length)]
```

Parameters

- ***locator_descriptor*** **–** is a valid locator: a host variable, a local variable, or the literal binary value of a locator.

- ***result_length*** **–** is a length, in characters, for `text` and `unitext` locators, and in bytes for `image` locators.

Examples

- **Example 1 –** Truncates the LOB referenced by text locator *@w* to 20 characters:

```
truncate lob @w (20)
```

Usage

If *result_length* is not specified or is 0 (zero), the SAP ASE server deallocates the LOB memory, and points the locator to a null LOB.

See also**locator_valid**, **return_lob**, **create_locator** in *Reference Manual: Building Blocks* .

Permissions

Any user can execute **truncate lob**.

See also

- *deallocate locator* on page 301

truncate precomputed result set

Truncates the data in a precomputed result set.

Syntax

```
truncate {precomputed result set | materialized view}
    [owner_name.]prs_name
```

Parameters

- **precomputed result set | materialized view –** specifies whether to truncate the data in a materialized view or precomputed result set.
- ***prs_name*** **–** name of the precomputed result set. A fully qualified *prs_name* cannot include the server or database name.

Examples

- **Example 1 –** Truncates the `authors_prs` precomputed result set:

```
truncate precomputed result set authors_prs
```

Usage

truncate precomputed result set automatically alters the precomputed result set to **disable**. To reenable the precomputed result set, issue **refresh precomputed result set**.

Permissions

You must be the precomputed result set owner to run **truncate precomputed result set**.

truncate table

Removes all rows from a table or partition.

Syntax

```
truncate table [[database.]owner.]table_name
    [partition partition_name]
```

Parameters

- ***table_name*** **–** is the name of the table to truncate. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.
- ***partition_name*** **–** specifies the name of the partition to truncate.

Examples

- **Example 1 –** Removes all data from the `authors` table:

  ```
  truncate table authors
  ```
- **Example 2 –** Removes all data from the `smallsales` partition of the `titles` table:

  ```
  truncate table titles partition smallsales
  ```

Usage

- **truncate table** deletes all rows from a table. The table structure and all the indexes continue to exist until you issue a **drop table** command. The rules, defaults, and constraints that are bound to the columns remain bound, and triggers remain in effect.
- The SAP ASE server no longer uses distribution pages; statistical information is now stored in the tables `sysstatistics` and `systabstats`.

  During **truncate table**, statistical information is no longer deleted (deallocated), so you need not run **update statistics** after adding data.

  truncate table does not delete statistical information for the table.
- **truncate table** is equivalent to—but faster than—a **delete** command without a **where** clause. **delete** removes rows one at a time and logs each deleted row as a transaction;

truncate table deallocates whole data pages and makes fewer log entries. Both **delete** and **truncate table** reclaim the space occupied by the data and its associated indexes.

- Truncating a partition does not affect the data in other partitions.
- You can truncate only one partition at a time.
- Truncating a table locks the entire table until the truncation process is complete.
- Because the deleted rows are not logged individually, **truncate table** cannot fire a trigger.
- You cannot use **truncate table** if another table has rows that reference it. Delete the rows from the foreign table, or truncate the foreign table, then truncate the primary table.
- You can grant and revoke permissions to users and roles to use **truncate table** on tables with the **grant** and **revoke** commands.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Permissions

The permission checks for **truncate table** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table owner or a user with `truncate table` permission on the table. To truncate an auditing table, you must have `manage auditing` privilege or `truncate any audit table` privilege.
Disabled	With granular permissions disabled, you must be the table owner, a user with **truncate table** permission on the table, a user with **replication_role**, or a user with **sa_role**.To truncate an auditing table, you must be a user with **sso_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	64
Audit option	**truncate**
Command or access audited	**truncate table**

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *alter table* on page 43
- *create table* on page 207
- *create trigger* on page 253
- *delete* on page 310
- *drop table* on page 363
- *grant* on page 419
- *revoke* on page 559

union operator

Returns a single result set that combines the results of two or more queries. Duplicate rows are eliminated from the result set unless the **all** keyword is specified.

Syntax

```
select [top unsigned_integer] select_list
    [into clause] [from clause] [where clause]
    [group by clause] [having clause]
    [union [all]
    select [top unsigned_integer] select_list
    [from clause] [where clause]
    [group by clause] [having clause]]...
    [order by clause]
    [compute clause]
```

Parameters

- **top *unsigned_integer* –** The top limit applies to the individual selects that form a union, not to the union as a whole.
- **into –** creates a new table based on the columns specified in the select list and the rows chosen in the **where** clause. The first query in the union operation is the only one that can contain an **into** clause.

- **union –** creates the union of data specified by two **select** statements.
- **all –** includes all rows in the results; duplicates are not removed.

Examples

- **Example 1 –** The result set includes the contents of the `stor_id` and `stor_name` columns of both the `sales` and `sales_east` tables:

```
select stor_id, stor_name from sales
union
select stor_id, stor_name from sales_east
```

- **Example 2 –** The **into** clause in the first query specifies that the `results` table holds the final result set of the union of the specified columns of the `publishers`, `stores`, and `stores_east` tables:

```
select pub_id, pub_name, city into results
from publishers
union
select stor_id, stor_name, city from stores
union
select stor_id, stor_name, city from stores_east
```

- **Example 3 –** First, the **union** of the specified columns in the `sales` and `sales_east` tables is generated. Then, the **union** of that result with `publishers` is generated. Finally, the **union** of the second result and `authors` is generated:

```
select au_lname, city, state from authors
union
 ((select stor_name, city, state from sales
union
select stor_name, city, state from sales_east)
union
select pub_name, city, state from publishers)
```

- **Example 4 –** Returns six rows. The top limit applies to the individual **select**s that form a union, not to the union as a whole:

```
select top 3 au_lname from authors
union all
select top 3 title from titles
```

Usage

- Restrictions:
  - You cannot use the **union** operator in a a subquery
  - You cannot use the **union** operator with the **for browse** clause
  - You cannot use an **identity** function in a **select into** statement with the **union** operator.
- The maximum number of subqueries within a single side of a union is 250.
- The total number of tables that can appear on all sides of a **union** query is 256.
- You can use **union** in **select** statements, for example:

```
create view
select * from Jan1998Sales
union all
select * from Feb1998Sales
union all
```

- The **order by** and **compute** clauses are allowed only at the end of the **union** statement to define the order of the final results or to compute summary values.
- The **group by** and **having** clauses can be used only within individual queries and cannot be used to affect the final result set.
- The default evaluation order of a SQL statement containing **union** operators is left-to-right.
- Since **union** is a binary operation, parentheses must be added to an expression involving more than two queries to specify evaluation order.
- The first query in a **union** statement may contain an **into** clause that creates a table to hold the final result set. The **into** statement must be in the first query, or you receive an error message (see Example 2).
- The **union** operator can appear within an **insert**...**select** statement. For example:

```
insert into sales.overall
  select * from sales
  union
  select * from sales_east
```

- All select lists in a SQL statement must have the same number of expressions (column names, arithmetic expressions, aggregate functions, and so on). For example, the following statement is invalid because the first select list contains more expressions than the second:

```
/* Example of invalid command--shows imbalance */ /* in select
list items */
select au_id, title_id, au_ord from titleauthor
union
select stor_id, date from sales
```

- Corresponding columns in the select lists of **union** statements must occur in the same order, because **union** compares the columns one-to-one in the order given in the individual queries.
- The column names in the table resulting from a **union** are taken from the *first* individual query in the **union** statement. To define a new column heading for the result set, do it in the first query. Also, to refer to a column in the result set by a new name (for example, in an **order by** statement), refer to it by that name in the first **select** statement. For example, the following query is correct:

```
select Cities = city from stores
union
select city from stores_east
order by Cities
```

- The descriptions of the columns that are part of a **union** operation do not have to be identical. The rules for the datatypes and the corresponding column in the result table are:

Table 14. Resulting Datatypes in Union Operations

Datatype of Columns in union operation	Datatype of Corresponding Column in Result Table
Not datatype-compatible (data conversion is not handled implicitly by the SAP ASE server)	Error returned by the SAP ASE server.
Both are fixed-length character with lengths L1 and L2	Fixed-length character with length equal to the greater of L1 and L2.
Both are fixed-length binary with lengths L1 and L2	Fixed-length binary with length equal to the greater of L1 and L2.
Either or both are variable-length character	Variable-length character with length equal to the maximum of the lengths specified for the column in the union.
Either or both are variable-length binary	Variable-length binary with length equal to the maximum of the lengths specified for the columns in the union.
Both are numeric datatypes (for example, `smallint`, `int`, `float`, `money`)	A datatype equal to the maximum precision of the two columns. For example, if a column in table A is of type `int` and the corresponding column in table B is of type `float`, then the datatype of the corresponding column of the result table is `float`, because `float` is more precise than `int`.
Both column descriptions specify NOT NULL	Specifies NOT NULL.

See also **convert** in *Reference Manual: Building Blocks*.

Standards

ANSI SQL – Compliance level: Entry-level compliant

The following are Transact-SQL extensions:

- The use of **union** in the select clause of an **insert** statement
- Specifying new column headings in the **order by** clause of a **select** statement when the **union** operator is present in the **select** statement

See also

- *compute Clause* on page 91
- *declare* on page 302
- *group by and having Clauses* on page 459
- *order by clause* on page 524
- *select* on page 579
- *where clause* on page 712

unmount

Shuts down the database and drops it from the SAP ASE server. The devices are also deactivated and dropped.

The database and its pages are not altered when they are unmounted. The database pages remain on the OS devices. Once the **unmount** command completes, you can disconnect and move the devices at the source SAP ASE server if necessary. Use the *manifest_file* extension to create the manifest file for use at the secondary SAP ASE server.

The **unmount** command limits the number of databases to eight in a single command.

Warning! The **unmount** command removes a database and all its information from the SAP ASE server. Use the **unmount** command only when you want to remove the database from one SAP ASE server to another SAP ASE server.

Syntax

```
unmount database dbname_list to manifest_file
```

Parameters

- ***dbname_list* –** the database being unmounted. You can **unmount** more than one database.
- ***manifest_file* –** the binary file that describes the databases that are present on a set of database devices. It can be created only if the set of databases that occupy those devices are isolated and self-contained on those devices.

  Since the manifest file is a binary file, operations that perform character translations of the file contents (such as **ftp**) corrupt the file unless done in binary mode.

Examples

- **Example 1 –** Unmounts a database from a server and creates the manifest file for the database:

  ```
  unmount database pubs2 to "/work2/Devices/Mpubs2_file"
  ```

- **Example 2 –** The encryption key created in **key_db** has been used to encrypt columns in `col_db`. These commands successfully unmount the named databases:

  ```
  unmount database key_db, col_db
  ```

  ```
  unmount database key_db with override
  ```

  ```
  unmount database col_db with override
  ```

Usage

Unmount a database if **sp_configure "disable disk mirroring"** is set to off.

You cannot:

- Unmount system databases. However, you can unmount `sybsystemprocs`.
- Unmount proxy databases or user created temporary databases.
- Use the **unmount** command in a transaction.
- Unmount a database on an HA-configured server.

In the Cluster Edition, **mount database** and **unmount database** are supported in the Cluster Edition. If an instance fails while one of these commands is in progress, the command may abort. In this case, the user must re-issue **mount database** or **unmount database** when the instance failover recovery is complete.

When using encrypted columns with **unmount database**:

- When columns are encrypted by keys from other databases, unmount all related databases as a set. The interdependency of the databases containing the encrypted columns and the databases containing the keys is similar to the interdependency of databases that use referential integrity.
- Use the **override** option to **unmount** a database containing columns encrypted by a key in another database (the SAP ASE server issues a warning message, but the operation is successful).
- If you do not include **with override**, commands fail with an error message

These commands fail with an error message without the **override**:

```
unmount database key_db
```

```
unmount database col_db
```

Standards

ANSI SQL – Compliance level: Entry-level compliant.

Permissions

The permission checks for **unmount** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be a user with `unmount any database` privilege.
Disabled	With granular permissions disabled, you must be a use with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	102
Audit option	**unmount**
Command or access audited	**unmount database**
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – NULL • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if a **set proxy** is in effect

See also

- *mount* on page 515
- *quiesce database* on page 533

update

Changes data in existing rows, either by adding data or by modifying existing data.

Syntax

```
update [top unsigned_integer]
    [[database.]owner.]{table_name | view_name}
    set [[[database.]owner.]{table_name.|view_name.}]
    column_name1 =
    {expression1 | NULL | (select_statement)} |
    variable_name1 =
    {expression1 | NULL | (select_statement)}
    [, column_name2 =
    {expression2 | NULL | (select_statement)}]... |
    [, variable_name2 =
    {expression2 | NULL | (select_statement)}]...

    [from [[database.]owner.]{view_name [readpast]|
        table_name
            [(index {index_name | table_name}
                [prefetch size][lru|mru])]}
            [readpast]
        [,[[database.]owner.]{view_name [readpast] | table_name
            [(index {index_name | table_name}
                [prefetch size][lru|mru])]}]
            [readpast] ...]
    [where search_conditions]
    [plan "abstract plan"]
```

```
update [[database.]owner.]{table_name | view_name}
    set [[[database.]owner.]{table_name.|view_name.}]
        column_name1 =
            {expression1 | NULL | (select_statement)} |
        variable_name1 =
            {expression1 | NULL | (select_statement)}
        [, column_name2 =
            {expression2 | NULL | (select_statement)}]... |
        [, variable_name2 =
            {expression2 | NULL | (select_statement)}]...
    where current of cursor_name
```

Parameters

- ***table_name* | *view_name*** **–** is the name of the table or view to update. Specify the database name if the table or view is in another database, and specify the owner's name if more than one table or view of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.
- **top *unsigned_integer*** **–** inserts the **top *n*** clause immediately after the keyword, and limits the number of rows updated.
- **set –** specifies the column name or variable name and assigns the new value. The value can be an expression or a NULL. When more than one column name or variable name and value are listed, they must be separated by commas.
- **from –** uses data from other tables or views to modify rows in the table or view you are updating.
- **readpast –** causes the **update** command to modify unlocked rows only on datarows-locked tables, or rows on unlocked pages, for datapages-locked tables. **update...readpast** silently skips locked rows or pages rather than waiting for the locks to be released.
- **where –** is a standard **where** clause (see **where clause**).
- **index {*index_name* | *table_name*} –** *index_name* specifies the index to be used to access *table_name*. You cannot use this option when you update a view.
- **prefetch *size*** **–** specifies the I/O size, in kilobytes, for tables bound to caches with large I/Os configured. You cannot use this option when you update a view. **sp_helpcache** shows the valid sizes for the cache to which an object is bound or for the default cache. To configure the data cache size, use **sp_cacheconfigure**.

  When using **prefetch** and designating the prefetch size (*size*), the minimum is 2K and any power of two on the logical page size up to 16K. **prefetch** size options in kilobytes are:

Logical Page Size	Prefetch Size Options
2	2, 4, 8 16
4	4, 8, 16, 32
8	8, 16, 32, 64
16	16, 32, 64, 128

The **prefetch** size specified in the query is only a suggestion. To allow the size specification configure the data cache at that size. If you do not configure the data cache to a specific size, the default **prefetch** size is used.

If CIS is enabled, you cannot use **prefetch** for remote servers.

- **lru | mru –** specifies the buffer replacement strategy to use for the table. Use **lru** to force the optimizer to read the table into the cache on the MRU/LRU (most recently used/least recently used) chain. Use **mru** to discard the buffer from cache and replace it with the next buffer for the table. You cannot use this option when you update a view.
- **where current of –** causes the SAP ASE server to update the row of the table or view indicated by the current cursor position for *cursor_name*.
- ***index_name* –** is the name of the index to be updated. If an index name is not specified, the distribution statistics for all the indexes in the specified table are updated.
- **plan "*abstract plan*" –** specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. See *Creating and Using Abstract Plans* in the *Performance and Tuning Series: Query Processing and Abstract Plans* for more information.

Examples

- **Example 1 –** Changes all the McBaddens in the `authors` table to MacBaddens:

```
update authors
set au_lname = "MacBadden"
where au_lname = "McBadden"
```

- **Example 2 –** Modifies the `total_sales` column to reflect the most recent sales recorded in the `sales` and `salesdetail` tables. This assumes that only one set of sales is recorded for a given title on a given date, and that updates are current:

```
update titles
set total_sales = total_sales + qty
from titles, salesdetail, sales
where titles.title_id = salesdetail.title_id
    and salesdetail.stor_id = sales.stor_id
    and salesdetail.ord_num = sales.ord_num
    and sales.date in
         (select max (sales.date) from sales)
```

- **Example 3 –** Changes the price of the book in the `titles` table that is currently pointed to by `title_crsr` to $24.95:

```
update titles
set price = 24.95
where current of title_crsr
```

- **Example 4 –** Finds the row for which the IDENTITY column equals 4 and changes the price of the book to $18.95. The SAP ASE server replaces the **syb_identity** keyword with the name of the IDENTITY column:

```
update titles
set price = 18.95
where syb_identity = 4
```

- **Example 5 –** Updates the `titles` table using a declared variable:

```
declare @x money
select @x = 0
update titles
    set total_sales = total_sales + 1,
    @x = price
    where title_id = "BU1032"
```

- **Example 6 –** Updates rows on which another task does not hold a lock:

```
update salesdetail set discount = 40
        from salesdetail readpast
    where title_id like "BU1032"
        and qty > 100
```

Usage

- Use **update** to change values in rows that have already been inserted. Use **insert** to add new rows.
- You can refer to as many as 15 tables in an **update** statement.
- **update** interacts with the **ignore_dup_key**, **ignore_dup_row**, and **allow_dup_row** options set with the **create index** command. See **create index** for more information.
- You can define a trigger that takes a specified action when an **update** command is issued on a specified table or on a specified column in a table.
- In pre-12.5.2 versions of SAP ASE, queries that used **update** and **delete** on views with a **union all** clause were sometimes resolved without using worktables, which occasionally lead to incorrect results. In SAP ASE 12.5.2, queries that use **update** and **delete** on views with a **union all** clause are always resolved using worktables in `tempdb`.

See also **sp_bindefault**, **sp_bindrule**, **sp_help**, **sp_helppartition**, **sp_helpindex**, **sp_unbindefault**, **sp_unbindrule** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Entry-level compliant.

The following are Transact-SQL extensions:

- The use of a **from** clause or a qualified table or column name are Transact-SQL extensions detected by the FIPS flagger. Updates through a join view or a view of which the target list contains an expression are Transact-SQL extensions that cannot be detected until run time and are not flagged by the FIPS flagger.
- The use of variables.
- **readpast**

Permissions

If **set ansi_permissions** is **on**, you need **update** permission on the table being updated and, in addition, you must have **select** permission on all columns appearing in the **where** clause and on all columns following the **set** clause. By default, **ansi_permissions** is **off**.

The following describes permission checks for **update** that differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions enabled, you must be the table or view owner, or a user with `update` permission..
Disabled	With granular permissions disabled, you must be the table or view owner, a user with `update` permission, or a user with **sa_role**.

Auditing

Values in `event` and `extrainfo` columns of `sysaudits` are:

Information	Values
Event	70
Audit option	**update**
Command or access audited	**update** to a table
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **update** or **writetext** • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

Information	Values
Event	71
Audit option	**update**
Command or access audited	**update** to a view

Information	Values
Information in `extrainfo`	• *Roles* – current active roles • *Keywords or options* – **update** or **writetext** • *Previous value* – NULL • *Current value* – NULL • *Other information* – NULL • *Proxy information* – original login name, if **set proxy** is in effect

See also

- *alter table* on page 43
- *create default* on page 117
- *create index* on page 140
- *create rule* on page 195
- *create trigger* on page 253
- *insert* on page 473
- *where clause* on page 712

Using update with Transactions

When you set **chained transaction mode on**, and no transaction is currently active, the SAP ASE server implicitly begins a transaction with the **update** statement. To complete the update, you must either **commit** the transaction or **rollback** the changes.

For example:

```
update stores set city = 'Concord'
    where stor_id = '7066'
if exists (select t1.city, t2.city
    from stores t1, stores t2
    where t1.city = t2.city
    and t1.state = t2.state
    and t1.stor_id < t2.stor_id)
        rollback transaction
else
        commit transaction
```

This batch begins a transaction (using chained transaction mode) and updates a row in the `stores` table. If it updates a row containing the same city and state information as another store in the table, it rolls back the changes to the `stores` table and ends the transaction. Otherwise, it commits the updates and ends the transaction.

The SAP ASE server does not prevent you from issuing an **update** statement that updates a single row more than once in a given transaction. For example, both of these updates affect the price of the book with `title_id` MC2022, since its type id “mod_cook”:

```
begin transaction
update titles
```

```
set price = price + $10
where title_id = "MC2222"
update titles
set price = price * 1.1
where type = "mod_cook"
```

Using Joins in Updates

Performing joins in the **from** clause of an **update** is an Transact-SQL extension to the ANSI standard SQL syntax for updates.

Because of the way an **update** statement is processed, updates from a single statement do not accumulate. That is, if an **update** statement contains a join, and the other table in the join has more the one matching value in the join column, the second update is not based on the new values from the first update but on the original values. The results are unpredictable, since they depend on the order of processing.

Consider this join:

```
update titles set total_sales = total_sales + qty
    from titles t, salesdetail sd
    where t.title_id = sd.title_id
```

The `total_sales` value is updated only once for each `title_id` in `titles`, for *one* of the matching rows in `salesdetail`. Depending on the join order for the query, on table partitioning, or on the indexes available, the results can vary each time. But each time, only a single value from `salesdetail` is added to the `total_sales` value.

If the intention is to return the sum of the values that match the join column, the following query, using a subquery, returns the correct result:

```
update titles set total_sales = total_sales +
     (select isnull (sum (qty),0)
        from salesdetail sd
        where t.title_id = sd.title_id)
    from titles t
```

Using update with Character Data

Updating variable-length character data, or `text` or `unitext` columns, with the empty string ("") inserts a single space. Fixed-length character columns are padded to the defined length.

All trailing spaces are removed from variable-length column data, except when a string contains only spaces. Strings that contain only spaces are truncated to a single space. Strings longer than the specified length of a `char`, `nchar`, `unichar`, `varchar`, `univarchar`, or `nvarchar` column are silently truncated unless you set **string_rtruncation on**.

An **update** to a `text` or `unitext` column initializes the `text` or `unitext` column, assigns it a valid text pointer, and allocates at least one text page.

Using update with Cursors

Considerations for using **update** with cursors.

- You cannot update a scrollable cursor.
- To update a row using a cursor, define the cursor with **declare cursor**, then open it. The cursor name cannot be a Transact-SQL parameter or a local variable. The cursor must be updatable, or the SAP ASE server returns an error. Any update to the cursor result set also affects the base table row from which the cursor row is derived.
- The *table_name* or *view_name* specified with an **update**...**where current of** must be the table or view specified in the first **from** clause of the **select** statement that defines the cursor. If that **from** clause references more than one table or view (using a join), you can specify only the table or view being updated.

  After the update, the cursor position remains unchanged. You can continue to update the row at that cursor position, provided another SQL statement does not move the position of that cursor.
- The SAP ASE server allows you to update columns that are not specified in the list of columns of the cursor's *select_statement*, but that are part of the tables specified in the *select_statement*. However, when you specify a *column_name_list* with **for update**, and you are declaring the cursor, you can update only those specific columns.
- You can see the behavior of a cursor closing implicitly when the cursor is defined by a join operation, and another **update** command from the same client session deletes a row (updated in deferred mode) in the current position of the cursor. If:
  - A searched or positioned update in an allpages-locked table changes a value of an index key – a subsequent **fetch** command may fail.
  - A searched or positioned update in a data-only-locked table or data-row-locked table changes a value of an index key – the cursor remains positioned on the row, and the next fetch returns the next qualifying row.

    If the data-only-locked tables are semantic-partitioned tables and the udpate is being done in deferred mode, however, the row moves to a different partition as a result of the update, and a subsequent **fetch** command may fail.

Updating IDENTITY Columns

You cannot update a column with the IDENTITY property, either through its base table or through a view. To determine whether a column was defined with the IDENTITY property, use **sp_help** on the column's base table.

An IDENTITY column selected into a result table observes the following rules with regard to inheritance of the IDENTITY property:

- If an IDENTITY column is selected more than once, it is defined as NOT NULL in the new table. It does not inherit the IDENTITY property.

- If an IDENTITY column is selected as part of an expression, the resulting column does not inherit the IDENTITY property. It is created as NULL if any column in the expression allows nulls; otherwise, it is NOT NULL.
- If the **select** statement contains a **group by** clause or aggregate function, the resulting column does not inherit the IDENTITY property. Columns that include an aggregate of the IDENTITY column are created NULL; others are created NOT NULL.
- An IDENTITY column that is selected into a table with a union or join does not retain the IDENTITY property. If the table contains the union of the IDENTITY column and a NULL column, the new column is defined as NULL. Otherwise, it is defined as NOT NULL.

Updating Data Through Views

Considerations for updating data through views.

- You cannot **update** views defined with the **distinct** clause.
- If a view is created **with check option**, each row that is updated through the view must remain visible through the view. For example, the `stores_cal` view includes all rows of the `stores` table where `state` has a value of “CA”. The **with check option** clause checks each **update** statement against the view’s selection criteria:

  ```
  create view stores_cal
  as select * from stores
  where state = "CA"
  with check option
  ```

  An **update** statement such as this one fails if it changes `state` to a value other than “CA”:

  ```
  update stores_cal
  set state = "WA"
  where store_id = "7066"
  ```
- If a view is created **with check option**, all views derived from the base view must satisfy the view’s selection criteria. Each row updated through a *derived* view must remain visible through the base view.

  Consider the view `stores_cal30`, which is derived from `stores_cal`. The new view includes information about stores in California with payment terms of “Net 30”:

  ```
  create view stores_cal30
  as select * from stores_cal
  where payterms = "Net 30"
  ```

  Because `stores_cal` was created **with check option**, all rows updated through `stores_cal30` must remain visible through `stores_cal`. Any row that changes `state` to a value other than “CA” is rejected.

  Notice that `stores_cal30` does not have a **with check option** clause of its own. Therefore, you can update a row with a *payterms* value other than “Net 30” through `stores_cal30`. For example, the following **update** statement would be successful, even though the row would no longer be visible through `stores_cal30`:

```
update stores_cal30
set payterms = "Net 60"
where stor_id = "7067"
```

- You cannot update a row through a view that joins columns from two or more tables, unless both of the following conditions are true:
  - The view has no **with check option** clause, and
  - All columns being updated belong to the same base table.
- **update** statements are allowed on join views that contain a **with check option** clause. The update fails if any of the affected columns appear in the **where** clause in an expression that includes columns from more than one table.
- If you update a row through a join view, all affected columns must belong to the same base table.

Using index, prefetch, or lru | mru

index, **prefetch**, and **lru | mru** override the choices made by the SAP ASE optimizer. Use them with caution, and always check the performance impact with **set statistics io on**.

For more information about using these options, see the *Performance and Tuning Guide*.

Using readpast

The **readpast** option applies only to data-only-locked tables. **readpast** is ignored if it is specified for an allpages-locked table.

- The **readpast** option is incompatible with the **holdlock** option. If both are specified in the same **select** command, an error is generated and the command terminates.
- If the session-wide isolation level is 3, the **readpast** option is ignored.
- If the transaction isolation level for a session is 0, **update** commands using **readpast** do not issue warning messages. For datapages-locked tables, these commands modify all rows on all pages that are not locked with incompatible locks. For datarows-locked tables, they affect all rows that are not locked with incompatible locks.
- If an **update** command with **readpast** applies to two or more text columns, and the first text column checked has an incompatible lock on it, readpast locking skips the row. If the column does not have an incompatible lock, the command acquires a lock and modifies the column. Then, if any subsequent text column in the row has an incompatible lock on it, the command blocks until it can obtain a lock and modify the column.
- See the *Performance and Tuning Guide* for more on **readpast**.

Using Variables in update Statements

Considerations for using variables in update statements.

- You can assign variables in the **set** clause of an **update** statement, similarly to setting them in a **select** statement.
- Before you use a variable in an **update** statement, you must declare the variable using **declare**, and initialize it with **select**, as shown in Example 5.

- Variable assignment occurs for every qualified row in the update.
- When a variable is referenced on the right side of an assignment in an **update** statement, the current value of the variable changes as each row is updated. The *current value* is the value of the variable just before the update of the current row. The following example shows how the current value changes as each row is updated.

  Suppose you have the following statement:

  ```
  declare @x int
  select @x=0
  update table1
      set C1=C1+@x, @x=@x+1
      where column2=xyz
  ```

  The value of C1 before the update begins is 1. This table shows how the current value of the *@x* variable changes after each update:

Row	Initial C1 value	Initial @*x* value	Calculations: C1+@*x*= updated C1	Updated C1 value	Calculations: @*x* +1= updated @*x*	Updates value
A	1	0	1+0	1	0+1	1
B	1	1	1+1	2	1+1	2
C	2	2	2+2	4	2+1	3
D	4	3	4+3	7	3+1	4

- When multiple variable assignments are given in the same **update** statement, the values assigned to the variables can depend on their order in the assignment list, but they might not always do so. For best results, do not rely on placement to determine the assigned values.
- If multiple rows are returned and a non-aggregating assignment of a column to a variable occurs, then the final value of the variable is the last row processed; therefore, it might not be useful.
- An **update** statement that assigns values to variables need not set the value of any qualified row.
- If no rows qualify for the update, the variable is not assigned.
- A variable that is assigned a value in the **update** statement cannot be referenced in subquery in that same **update** statement, regardless of where the subquery appears in that **update** statement.
- A variable that is assigned a value in the **update** statement cannot be referenced in a **where** or **having** clause in that same **update** statement.
- In an update driven by a join, a variable that is assigned a value in the right hand side of the **update** statement uses columns from the table that is not being updated. The result value depends on the join order chosen for the update and the number of rows that qualify from the joined table.

- Updating a variable is not affected by a rollback of the **update** statement because the value of the updated variable is not stored on disk.

update all statistics

Updates all statistics information for a given table, including histograms on all columns, regardless of whether they are indexed. You can run **update all statistics** on a single data partition.

Syntax

```
update all statistics
    table_name [partition data_partition_name]
    [using step values]
    [with consumers = consumers]
    [, sampling=N [percent]]
    [, no_hashing | partial_hashing | hashing]
        [, max_resource_granularity = N [percent]]
        [, histogram_tuning_factor = int ]
        [, print_progress = int]
```

Parameters

- ***table_name*** **–** is the name of the table for which statistics are being updated.
- ***data_partition_name*** **–** is the name of the partition to be updated. Statistics for each local index partition on the data partition is updated. Does not update statistics for global indexes.
- **using *step* values –** specifies the number of histogram steps. The default value is 20, for columns where no statistics exist. To change the default, use **sp_configure** to modify the *number of histogram steps* parameter. If statistics for a column already exist in `sysstatistics`, the default value is the current number of steps.

  The steps are applied to each partition of a partitioned table—for example, **update index statistics** uses the default value of 20 steps for each data and index partition involved in the scan for updating statistics. If global statistics are generated through an index scan of a global index, then 20 steps are applied by default. If partition statistics are generated, either through a data scan or local index scan, then by default, 20 steps are applied for each partition.

  If the histogram steps specified through **using *step* values** is M, and the **histogram_tuning_factor** parameter is N, then **update index statistics** uses between 0 and M*N steps, depending on the number of frequency cells that **update index statistics** isolates and whether any range cells exist.
- **with consumers = *consumers* –** specifies the number of consumer processes to be used for a sort when *column_list* is provided and parallel query processing is enabled. The **consumers** option specifies the degree of parallelism applied to a sort performed for statistics update on a single data partition. For example, if **update statistics** with a column

list is applied to a table with three data partitions, data from each of the three partitions is sorted separately and the **consumers** option is applied during each of the sort. The three sorts themselves are not performed in parallel.

Note: The value for the **max utility parallel degree** configuration parameter must be greater than the value for **with consumers**. For example, if **with consumers** is set to 2, then **max utility parallel degree** must be at least 3.

- **with sampling = *N* percent –** specifies the percentage of the column to be randomly sampled to gather statistics. The value for *N* is any number between 1 and 100.
- **[no_hashing | partial_hashing | hashing –** indicates the level of hash-based statistics **update all statistics** gathers. One of:
    - **no_hashing** – **updates all statistics** uses the algorithm from SAP ASE versions earlier than 15.7, gathering sort-based statistics.
    - **partial_hashing** – **updates all statistics** uses the algorithm for columns with fewer than 65536 unique values. If **updates all statistics** encounters unique column counts greater or equal to the 65536 threshold, it uses an extra scan with a sort.
    - **hashing** – **updates all statistics** uses low-domain and high-domain hashing to create the histograms.

  The default for these parameters is the configured value for **update statistics hashing**.
- **max_resource_granularity = *N* percent –** limits the amount of `tempdb` buffer cache used with the **update all statistics** and hashing.
- **histogram_tuning_factor = *integer* –** determines **update all statistics**’s distribution granularity.
- **print_progress = *int* –** Determines if **update all statistics** displays progress messages.
    - 0 – (the default) command does not display any progress messages
    - 1 – command displays progress messages

Examples

- **Example 1 –** Updates all statistics for the `salesdetail` table:

```
update all statistics salesdetail
```

- **Example 2 –** Updates all statistics for the `smallsales` partition on `salesdetail` table:

```
update all statistics salesdetail partition smallsales
```

- **Example 3 –** Updates hash-based statistics for the `authors` table:

```
update all statistics authors with hashing
```

Usage

- **update all statistics** updates all the statistics information for a given table. The SAP ASE server keeps statistics about the distribution of pages within a table, and uses these statistics when considering whether or not to use a parallel scan in query processing on partitioned tables, and which index (es) to use in query processing. The optimization of your queries depends on the accuracy of the stored statistics.

- Histogram statistics are created on each column, either through an index scan of a leading column, a projection of the column into a work table followed by a sort, or by using hashing to concurrently generate histograms on several columns for respective scans.
- Density statistics are created for all the prefix subsets of the columns of index (es) whose statistics is being updated. For example, if an index is on columns `c1`, `c2` and `c3`, then the prefix subsets are (`c1`,`c2`) and (`c1`, `c2`, `c3`).
- When you run **update all statistics** on a single data partition, histograms are generated for each leading column of the local indexes using an index scan. If hash-based statistics gathering is enabled, then statistics are gathered on all the minor attributes as well during the index scans. For all other columns, including leading columns of a global index, **update all statistics** performs either a data scan followed by a sort or performs a data scan that uses hash-based statistics gathering.

  The advantage of hash-based statistics is that one data scan can collect histograms on all columns, whereas sort-based statistics uses a separate scan for each column.
- **update statistics** commands create partition-specific statistics. Global statistics are implicitly created during partition statistics creation. The partition statistics serve as input to global statistics creation and enable per-partition DDL operations. Global statistics are used by the optimizer.
- **update all statistics** regenerates and update the table statistics stored in `systabstats` for each data and index partition of the table. If the **update all statistics** command is run for a specific data partition, the table statistics are generated and updated only for that data partition and any local index partitions. Global indexes are skipped.

When using hash-based statistics:

- The **partial_hashing** parameter uses hashing on columns only when it produces histograms that are as accurate and of equivalent quality as those produced by sorting (low domain cases), otherwise, the **partial_hashing** parameter uses sorting for high-domain cases.
- Hashing may produce less accurate histograms than sorting in some cases (high-domain cases).
- Although hash-based statistics do not require the `tempdb` disk space or procedure cache memory used by sorting, it may use a significant amount of `tempdb` buffer cache memory.
- Large sorts used for the **no_hashing** parameter may scavenge statements in the statement cache and stored procedures to release procedure cache memory to support the sort.
- **max_resource_granularity** limits the amount of `tempdb` buffer cache memory used for **hashing** or **partial_hashing**. It does not affect the amount of memory used by the **no_hashing** parameter or sorting.
- If you include the **partial_hashing** parameter, and a previous histogram on a column exists that indicates a high-domain column, then the SAP ASE server assumes that sort-based

statistics are required on this column. If no previous histogram exists on a column, then the SAP ASE server assumes this column is low-domain until the high domain limit is reached.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must be the table owner or a user with `update statistics` permission on the table to run **update all statistics**.

See also

- *update statistics* on page 698
- *update index statistics* on page 694
- *update table statistics* on page 707

update index statistics

Updates the statistics for all columns in an index.

Syntax

```
update index statistics
    table_name [[partition data_partition_name] |
    [ [index_name [partition index_partition_name]]]
    [using step values]
    [with consumers = consumers] [, sampling=N [percent]]
        [, no_hashing | partial_hashing | hashing]
         [, max_resource_granularity = N percent]]
         [, histogram_tuning_factor = int]
        [, print_progress = int]
```

Parameters

- ***table_name –*** when used with **update statistics**, *table_name* is the name of the table with which the index is associated. *table_name* is required, since Transact-SQL does not require index names to be unique in a database.
- ***data_partition_name –*** is the name of the partition to be updated. Statistics for each local index partition on the data partition is updated. Does not update statistics for global indexes.
- ***index_name –*** is the name of the index to be updated. If an index name is not specified, the distribution statistics for all the indexes in the specified table are updated.
- ***index_partition_name –*** is the name of the index partition to be updated.

- **using *step* values –** specifies the number of histogram steps. The default value is 20, for columns where no statistics exist. If you need to change the default for this, use **sp_configure** to modify the *number of histogram steps* parameter. If statistics for a column already exist in `sysstatistics`, the default value is the current number of steps.

  The steps are applied to each partition of a partitioned table—for example, **update index statistics** uses the default value of 20 steps for each data and index partition involved in the scan for updating statistics. If global statistics are generated through an index scan of a global index, then 20 steps are applied by default. If partition statistics are generated, either through a data scan or local index scan, then 20 steps are applied by default for each partition.

  If the histogram steps specified through **using *step* values** is M, and the **histogram_tuning_factor** parameter is N, then **update index statistics** uses between 0 and M*N steps, depending on the number of frequency cells that **update index statistics** isolates and whether any range cells exist.
- **with consumers = *consumers* –** specifies the number of consumer processes to be used for a sort when *column_list* is provided and parallel query processing is enabled. The **consumers** option specifies the degree of parallelism applied to a sort performed for statistics update on a single data partition. For example, if **update statistics** with a column list is applied to a table with three data partitions, data from each of the three partitions is sorted separately and the **consumers** option is applied during each of the sort. The three sorts themselves are not performed in parallel.

  Note: The value for the **max utility parallel degree** configuration parameter must be greater than the value for **with consumers**. For example, if **with consumers** is set to 2, then **max utility parallel degree** must be at least 3.
- **with sampling = *N* percent –** specifies the percentage of the column to be randomly sampled in order to gather statistics. The value for *N* is any number between 1 and 100.

  Note: Hashing does not currently support sampling.
- **[no_hashing | partial_hashing | hashing] –** indicates the level of hash-based statistics **update index statistics** gathers. One of:
  - **no_hashing** – (the default) **update index statistics** uses the algorithm from SAP ASE versions earlier than 15.7, gathering sort-based statistics.
  - **partial_hashing** – **update index statistics** uses the algorithm for columns with fewer than 65536 unique values. If **update index statistics** encounters unique column counts that are greater than or equal to the 65536 threshold, it uses an extra scan with a sort.
  - **hashing** – **update index statistics** uses low-domain and high-domain hashing to create the histograms.
- **max_resource_granularity = *N* percent –** limits the amount of `tempdb` buffer cache used with **update index statistics** and hashing.
- **with histogram_tuning_factor = *integer* –** determines **update index statistics**’s distribution granularity.

- **print_progress** = ***int*** **–** Determines if **update index statistics** displays progress messages.
  - 0 – (the default) command does not display any progress messages
  - 1 – command displays progress messages

Examples

- **Example 1 –** Generates statistics for all columns in all indexes of the `authors` table:

  ```
  update index statistics authors
  ```

- **Example 2 –** Generates statistics for all columns in the `au_names_ix` index of the `authors` table:

  ```
  update index statistics authors au_names_ix
  ```

- **Example 3 –** Generates statistics on all inner columns of the `au_names_ix` index using a sampling rate of 20 percent.

  ```
  update index statistics authors au_names_ix
      with sampling = 20 percent
  ```

  The statistics for the leading column of `au_names_ix` is gathered using a full scan of the index pages; sampling is not applied on this column.

- **Example 4 –** Shows the progress messages when **update index statistics** is run on table `bigtable`:

  ```
  update index statistics bigtable with partial_hashing,
  print_progress=1
  ```

  ```
  Update Statistics STARTED.
  Update Statistics index scan started on index 'bigtable_NC1'.
  ...It is using existing index scan to hash minor column 'a2'
  (column id = 2).
  ...Column 'a2' (column id = 2) is moved from hashing to sorting.
  Update Statistics table scan started on table 'bigtable' for
  summary statistics.
  Update Statistics table scan started on table 'bigtable'.
  ...Sorting started for column 'a2' (column id = 2).
  Update Statistics FINISHED.
  ```

- **Example 5 –** Generates statistics for all the columns of an index partition:

  ```
  update index statistics publishers publish1_idx
      partition p1
  ```

Usage

- **update index statistics**, when used with a table name and an index name, updates statistics for all columns in the specified index. If **update index statistics** is used with just a table name, it updates statistics for all columns in all indexes of the table.

- If you run **update index statistics** against large tables, the command fails with error number 1105 if `tempdb` is not large enough to process the command.
- Specifying the name of an unindexed column or the nonleading column of an index generates statistics for that column without creating an index.
- Histogram statistics are created for each column of indexes whose statistics is being updated.
- Density statistics are created for all the prefix subsets of the columns of index (es) whose statistics are being updated.
- If you use **update index statistics** on a specific partition, you update global statistics implicitly as well.
- The partition statistics serve as input to global statistics creation and enable per-partition DDL operations. Global statistics are used by the optimizer.
- **update index statistics** also regenerates and updates the table statistics stored in `systabstats` for each data and index partition of the table the command updates. If you run the **update index statistics** command for a specific data partition, the table statistitics are generated and updated only for that data partition and for any local index partitions. Global indexes are skipped. If you run the **update index statistics** for a specific index partition, only the table statistics for that index partition are updated.
- The **with consumers** clause is designed for use on partitioned tables on RAID devices, which appear to the SAP ASE server as a single I/O device, but which are capable of producing the high throughput required for parallel sorting.
- The **update index statistics** command generates a series of update statistics operations that use the same locking, scanning, and sorting as the equivalent index-level and column-level command. For example, if the `salesdetail` table has a nonclustered index named `sales_det_ix` on `salesdetail (stor_id, ord_num, title_id)`, the **update index statistics salesdetail** command performs these **update statistics** operations:

```
update statistics salesdetail sales_det_ix
update statistics salesdetail (ord_num)
update statistics salesdetail (title_id)
```

When using hash-based statistics:

- The **partial_hashing** parameter uses hashing on columns only when it produces histograms that are as accurate and of equivalent quality as those produced by sorting (low-domain cases), otherwise, the **partial_hashing** parameter uses sorting for high-domain cases.
- Hashing in high-domain cases may produce histograms with up to a 50 percent fewer steps compared to sorting.
- Although hash-based statistics do not require the `tempdb` disk space or procedure cache memory used by sorting, it may use a significant amount of `tempdb` buffer cache memory.

- Large sorts used for the **no_hashing** parameter may scavenge statements in the statement cache and stored procedures to release procedure cache memory to support the sort.
- **max_resource_granularity** limits the amount of `tempdb` buffer cache memory used for hashing or `partial_hashing`. It does not affect the amount of memory used by the **no_hashing** parameter or sorting.
- If you include the **partial_hashing** parameter, and a previous histogram on a column exists that indicates a high-domain column, then the SAP ASE server assumes that sort-based statistics are required on this column. If no previous histogram exists on a column, then the SAP ASE server assumes this column is low-domain until the high-domain limit is reached.

See also *Parallel Sorting* in the *Performance and Tuning Guide*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must be the table owner or a user with `update statistics` permission on the table to run **update index statistics**.

See also

- *delete statistics* on page 317
- *update all statistics* on page 691
- *update statistics* on page 698
- *update table statistics* on page 707

update statistics

Updates information about the distribution of key values in specified indexes, for all columns in an index, table, or partition, and resets the data change counters for global nonclustered indexes.

Syntax

```
update statistics table_name
    [[partition data_partition_name]
        [ (column1, column2, …) | (column1), (column2), …] |
    index_name [partition index_partition_name]]
    [using step values | [out_of_range [on | off| default]]]
    [with consumers = consumers][, sampling=N percent]
        [, no_hashing | partial_hashing | hashing]
        [, max_resource_granularity = N [percent]]
        [, histogram_tuning_factor = int ]
        [, print_progress = int]
```

Parameters

- ***table_name* –** when used with **update statistics**, *table_name* is the name of the table with which the index is associated. *table_name* is required, since Transact-SQL does not require index names to be unique in a database.
- ***index_name* –** is the name of the index to be updated. If an index name is not specified, the distribution statistics for all the indexes in the specified table are updated.
- ***data_partition_name* –** is the name of the partition to be updated. Statistics for each local index partition on the data partition is updated. Does not update statistics for global indexes.
- ***index_partition_name* –** is the name of the index partition to be updated.
- ***(column1, column2, ...)* –** creates the same statistics that are created if a local index is created and included on this column tuple. That is, creates a histogram on `column1`, and create multiattribute distributions on all column prefixes (`column1`, `column2`), (`column1`, `column2`, `column3`).
- **(*column1*), (*column2*) –** comma-separated list of columns on which you are running **update statistics**. Allows for a single **update statistics** command to create a histogram on each column in the list, but does not create any multi-attribute distributions.
- **using *step* values –** specifies the number of histogram steps. The default value is 20, for columns where no statistics exist. If you need to change the default for this, use **sp_configure** to modify the *number of histogram steps* parameter. If statistics for a column already exist in `sysstatistics`, the default value is the current number of steps.

  The steps are applied to each partition of a partitioned table—for example, **update statistics** uses the default value of 20 steps for each data and index partition involved in the scan for updating statistics. If global statistics are generated through an index scan of a global index, then 20 steps are applied by default. If partition statistics are generated, either through a data scan or local index scan, then 20 steps are applied by default for each partition.

  If the histogram steps specified through **using *step* values** is M, and the **histogram_tuning_factor** parameter is N, then **update statistics** uses between 0 and M*N steps, depending on the number of frequency cells that **update statistics** isolates and whether any range cells exist.
- **out_of_range [on | off | default] –** Column statistics for rapidly growing tables may become out-of-date when **update statistics** completes, resulting in out-of-range SARGs (search clauses) that select a greater range of values than described by the column's histogram. Out-of-range SARGS have a selectivity of 0. The **out_of_range]** histogram adjustment feature adjusts a column's histogram, and assigns an appropriate selectivity value to such SARGs.

  Histogram adjustment for out of range SARGS is enabled server wide by default.

  out_of_range [on | off | default] specifies an out-of-range histogram adjustment at the column level. One of:

    - **on** – Enables out-of-range histogram adjustment for column_name.
    - **off** – Disables out-of-range histogram adjustment for column_name.
    - **default** – Affects the out-of-range histogram adjustment depending on the value of trace flag 15355:
        - Disables out-of-range histogram adjustment when Traceflag 15355 is on.
        - Enables out-of-range histogram adjustment when Traceflag 15355 is off.
- **with consumers = *consumers* –** specifies the number of consumer processes to be used for a sort when *column_list* is provided and parallel query processing is enabled. The **consumers** option specifies the degree of parallelism applied to a sort performed for statistics update on a single data partition. For example, if **update statistics** with a column list is applied to a table with three data partitions, data from each of the three partitions is sorted separately and the **consumers** option is applied during each of the sort. The three sorts themselves are not performed in parallel.

  Note: The value for the **max utility parallel degree** configuration parameter must be greater than the value for **with consumers**. For example, if **with consumers** is set to 2, then **max utility parallel degree** must be at least 3.
- **with sampling = *N* percent –** specifies the percentage of the column to be randomly sampled in order to gather statistics. The value for *N* is any number between 1 and 100. Sampling applies to all **update statistics** types:
    - **update statistics *table_name* (*col_name*)**
    - **update index statistics**
    - **update all statistics**
- **index –** specifies that statistics for all columns in an index are to be updated.
- **[no_hashing | partial_hashing | hashing] –** indicates the level of hash-based statistics **update statistics** gathers. One of:
    - **no_hashing** – (the default) **update statistics** uses the algorithm from SAP ASE versions earlier than 15.7, gathering sort-based statistics.
    - **partial_hashing** – **update statistics** uses the algorithm for columns with fewer than 65536 unique values. If **update statistics** encounters unique column counts that are greater than or equal to the 65536 threshold, it uses an extra scan with a sort.
    - **hashing** – **update statistics** uses low-domain and high-domain hashing to create the histograms.
- **max_resource_granularity = *N* percent –** limits the amount of `tempdb` buffer cache used with **update statistics** and hashing.
- **with histogram_tuning_factor = *integer* –** determines **update statistics**’s distribution granularity.
- **print_progress = *int* –** Determines if **update statistics** displays progress messages.
    - 0 – (the default) command does not display any progress messages
    - 1 – command displays progress messages

Examples

- **Example 1 –** Generates statistics for the `price` column of the `titles` table:

  ```
  update statistics titles (price) using 40 values
  ```

- **Example 2 –** Updates statistics on the data partition `smallsales` the SAP ASE server creates histograms for each leading column and densities for the composite columns of each local index of the data partition. Statistics are not updated for global indexes:

  ```
  update statistics titles partition smallsales
  ```

- **Example 3 –** Updates statistics on the data partition `smallsales`. The SAP ASE server creates histograms on column `col1` and creates densities for the composite columns `col1` and `col2`:

  ```
  update statistics titles partition smallsales (col1, col2)
  ```

- **Example 4 –** When an **out_of_range** SARG is detected for a column, the optimizer adjusts the column's histogram and assigns an appropriate selectivity value to the out-of-range clause:

  ```
  update statistics TOFO_FUOP_ORD(OrdDt) using
  out_of_range on
  ```

- **Example 5 –** If trace flag 15355 is turned on, the column's histogram is not adjusted for out-of-range SARGs:

  ```
  update statistics TOFO_FUOP_ORD(OrdDt) using
  out_of_range default
  ```

- **Example 6 –** Shows the progress messages when **update statistics** is run on table `bigtable`:

  ```
  update statistics bigtable with print_progress=1

  Update Statistics STARTED.
  Update Statistics index scan started on index 'bigtable_NC1'.
  Update Statistics table scan started on table 'bigtable' for
  summary statistics.
  Update Statistics FINISHED.
  ```

- **Example 7 –** Shows the progress messages when **update statistics ... with hashing** is run on table `bigtable`:

  ```
  update statistics bigtable (a1), (a2), (a3) with hashing,
  print_progress=1

  Update Statistics STARTED.
  Update Statistics table scan started on table 'bigtable'.
  ...Column 'a3' (column id = 3) is picked as hash victim due to
  limited resource.
  Update Statistics table scan started on table 'bigtable'.
  ```

- **Example 8 –** Runs **update statistics** on the `authors` table with a **histogram_tuning_factor** of 5 percent:

```
update statistics authors with histogram_tuning_factor = 5
```

Usage

- The SAP ASE server keeps statistics about the distribution of the key values in each index, and uses these statistics in its decisions about which index (es) to use in query processing.
- When you create a nonclustered index on a table that contains data, **update statistics** is automatically run for the new index. When you create a clustered index on a table that contains data, **update statistics** is automatically run for all indexes.
- Running **update statistics** on an empty table does not affect the system tables.
- The optimization of your queries depends on the accuracy of the statistics. If there is significant change in the key values in your index, you should rerun **update statistics** on that index or column. Use the **update statistics** command if a great deal of data in an indexed column has been added, changed, or removed (that is, if you suspect that the distribution of key values has changed).
- You should also run **update statistics** on system tables with a large number of rows. If you have permission to run the command on a user table, it is no different with respect to system table. Without statistics, there is always a chance for system stored procedures to perform poorly.
- **update statistics** skips global indexes when you run the command on a data partition.
- **update statistics**, when used with a table name and an index name, updates statistics for the leading column of an index. If **update statistics** is used with just a table name, it updates statistics for the leading columns of all indexes on the table.
- If a comma-separated list, `(col1), (col2)...`, is used and hashing is enabled, then one scan can be used to gather statistics, if you do not exceed the resource granularity. If sorting is enabled, then one scan for each is used. If you use partial hashing, one scan can be used for low-domain columns, if you do not exceed the resource granularity, and one scan is used for the sort for each of the high-domain columns (that is, if you have three columns, you have three sorts).
- Specifying the name of an unindexed column or the nonleading column of an index generates statistics for that column without creating an index.
- Specifying more than one column in a column list (for example `(col1, col2, ... )`) generates or updates a histogram for the first column, and density statistics for all prefix subsets of the list of columns. Hash-based statistics cannot be used in this case.
- If you use **update statistics** to generate statistics for nonleading columns of clustered indexes and nonindexed columns, **update statistics** must scan the table and perform a sort.

  The SAP ASE server ignores sampling for **update statistics** unless you specify a column list (such as `(col1), (col2)...`, or `(col1, col2, col3)`). Use **update all statistics** or **update index statistics** if you require sampling in situations other than a column list. If you specify a column list, and these columns are nonleading columns of clustered indexes and nonindexed columns, **update statistics** must scan the table and perform a sort, or use hash-based algorithms.

- If you use **update statistics** on a specific partition, you update global statistics implicitly as well.
- The SAP ASE server raises error 16015 if you attempt to use **out_of_range** options for **update statistics** alongside other options such as **consumers** or **sampling**.

  The SAP ASE server raises error 16016 if you specify **out_of_range** options for a column that currently has no column level statistics.
- **update statistics** regenerates and updates the table statistics stored in `systabstats` for each data and index partition of the table the command updates. If you run the `update statistics` command for a specific data partition, the table statistitics are generated and updated only for that data partition and for any local index partitions. Global indexes are skipped. If you run the **update statistics** for a specific index partition, only the table statistics for that index partition are updated.
- The **with consumers** clause is designed for use on partitioned tables on RAID devices, which appear to the SAP ASE server as a single I/O device, but which are capable of producing the high throughput required for parallel sorting. See *Using Statistics to Improve Performance* in the *Performance and Tuning Series: Query Processing and Abstract Plans*.
- The **update index statistics** command generates a series of update statistics operations that use the same locking, scanning, and sorting as the equivalent index-level and column-level command. For example, if the `salesdetail` table has a nonclustered index named `sales_det_ix` on `salesdetail (stor_id, ord_num, title_id)`, the **update index statistics salesdetail** command performs these **update statistics** operations:

  ```
  update statistics salesdetail sales_det_ix
  update statistics salesdetail (ord_num)
  update statistics salesdetail (title_id)
  ```
- **update statistics** is not run on system tables in the master database during upgrade from earlier versions. Indexes exist on columns queried by most system procedures, and running **update statistics** on these tables is not required for normal usage. However, running **update statistics** is allowed on all system tables in all databases, except those that are not normal tables. These tables, which are built from internal structures when queried, include `syscurconfigs`, `sysengines`, `sysgams`, `syslisteners`, `syslocks`, `syslogs`, `syslogshold`, `sysmonitors`, `sysprocesses`, `syssecmechs`, `systestlog` and `systransactions`.

  You do not need to run **update statistics** on Replication Server RSSD tables. Running **updates statistics** on these tables can result in Replication Server errors if you run it while Replication Server attempts to access the RSSD tables. RSSD tables and their format are specific to Replication Server processing.
- **update statistics** acquires memory from the default data cache instead of `tempdb` buffer cache if the session is using a `tempdb` bound to an inmemory device.

- These **update statistics** parameters retain their values on all affected columns and override any configuration settings until the statistics for the columns are deleted, or until you run **sp_modifystats ... REMOVE_STICKINESS** on the columns:
    - **using step values**
    - **out_of_range**
    - **no_hashing**
    - **partial_hashing**
    - **hashing**
    - **histogram_tuning_factor**
    - **sampling = *N* percent**

  Note: consumers and **max_resource_granularity** do not retain their values.

  For example, if you issue:

  ```
  update statistics table_name(column1) with no_hashing
  ```

  Subsequent **update statistics** commands on this table use the default configuration value for **update statistics hashing** on all columns except `column1`, which continues to use **no_hashing** until you delete the `column1` statistics.
- **with consumers** and **with sampling** apply to sorts and not to hashing. You may include the **partial_hashing** parameter with **with consumers** and **with sampling** parameters, but **with consumers** and **with sampling** apply only to sorts on the high-domain columns. If you explicitly include the **with hashing** parameter with the **with consumers** or **with sampling** parameters, the SAP ASE server ignores those parameters.

See also:

- *Performance and Tuning Guide*

  For **optdiag** syntax and usage, see *Statistics Tables and Displaying Statistics with optdiag* in *Performance and Tuning Series: Monitoring and Analyzing*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must be the table owner or a user with `update statistics` permission on the table to run **update statistics**.

See also

- *delete statistics* on page 317
- *update all statistics* on page 691
- *update index statistics* on page 694
- *update table statistics* on page 707

Types of Scans Performed During update statistics

The types of scans performed during **update statistics**, the types of locks acquired, and when sorts are needed.

For leaf level index scans, see *When Does SAP ASE Perform Scans and Sorts* in the *Performance and Tuning Series: Query Processing and Abstract Plans* to determine which indexes get scanned if the column for which the statistics is being sampled exists in two or more indexes.

Table 15. Table Name

update statistics Specifying	Scans and Sorts Performed	Locking
Allpages-locked table	Table scan, plus a leaf-level scan of each nonclustered index	Level 1; shared intent table lock, shared lock on current page
Data-only-locked table	Table scan, plus a leaf-level scan of each nonclustered index and the clustered index, if one exists	Level 0; dirty reads

Table 16. Table Name and Clustered Index Name

update statistics Specifying	Scans and Sorts Performed	Locking
Allpages-locked table	Table scan	Level 1; shared intent table lock, shared lock on current page
Data-only-locked table	Leaf level index scan[1]	Level 0; dirty reads

Table 17. Table Name and Nonclustered Index Name

update statistics Specifying	Scans and Sorts Performed	Locking
Allpages-locked table	Leaf level index scan	Level 1; shared intent table lock, shared lock on current page
Data-only-locked table	Leaf level index scan[1]	Level 0; dirty reads

Table 18. Table Name and Column Name

update statistics Specifying	Scans and Sorts Performed	Locking
Allpages-locked table	Table scan; creates a worktable and sorts the worktable	Level 1; shared intent table lock, shared lock on current page
Data-only-locked table	Table scan; creates a worktable and sorts the worktable	Level 0; dirty reads

update statistics and Sampling

The SAP ASE server scans samples of data pages. You can use update statistics to create and update statistics on the leading column of all indexes on the specified table, or the leading column of a specified index.

```
update statistics table_name [index_name] with sampling = N percent
```

When you use the **sampling =** ***N*** **percent** option with the **using** ***steps*** **value** , you must specify the **sampling =** ***N*** **percent** option last:

```
update statistics titles (type)
    using 40 value
    with sampling = 10 percent
```

If you do not, you get an error message:

```
update statistics titles (type)
    with sampling = 10 percent
    using 40 value
```

```
Msg 156, Level 15, State 2:
Line 1:
Incorrect syntax near the keyword 'using'.
```

create index and Stored Procedures

The SAP ASE server automatically recompiles stored procedures after executing **update statistics** statements. Although ad hoc queries that you start before executing **update statistics** still continue to work, they do not take advantage of the new statistics.

Using Hash-Based Statistics

The **partial_hashing** parameter uses hashing on columns only when it produces histograms that are as accurate and of equivalent quality as those produced by sorting (low-domain cases), otherwise, the **partial_hashing** parameter uses sorting for high-domain cases.

Hashing may produce less accurate histograms than sorting in some cases (high-domain cases).

Although hash-based statistics do not require the `tempdb` disk space or procedure cache memory used by sorting, it may use a significant amount of `tempdb` buffer cache memory.

Large sorts used for the **no_hashing** parameter may scavenge statements in the statement cache and stored procedures to release procedure cache memory to support the sort.

max_resource_granularity limits the amount of `tempdb` buffer cache memory used for hashing or `partial_hashing`. It does not affect the amount of memory used by **no_hashing** parameter or sorting.

If you include the **partial_hashing** parameter, and a previous histogram on a column exists that indicates a high-domain column, the SAP ASE server assumes that sort-based statistics are required on this column. If no previous histogram exists on a column, then the SAP ASE server assumes this column is low-domain until the high-domain limit is reached.

update table statistics

Updates statistics that are stored in `systabstats` table, such as rowcount, cluster ratios, and so on. Does not affect column statistics stored in `sysstatistics`.

Syntax

```
update table statistics table_name
   [partition data_partition_name]
   [index_name [partition index_partition_name]]
```

Parameters

- ***table_name*** **–** is the name of the table you are updating the statistics for.
- ***data_partition_name*** **–** is the name of the data partition for which you are updating the statistics for. If you do not include this, table statistics for all the the data partitions are updated.
- ***index_name*** **–** is the name of index associated with the partition.
- ***index_partition_name*** **–** is the name of the index partition.

Examples

- **Example 1 –** Performs a table statistics update on the `smallsales` partition:

  ```
  update table statistics titles partition smallsales
  ```

- **Example 2 –** Performs a table statistics update on all of the partitions in the `titles` table:

  ```
  update table statistics titles
  ```

Usage

- **update table statistics** does not update statistics for index partitions. To generate table-level statistics for index partitions, use **update statistics**.

- Because running **update table statistics** incurs the I/O cost of running **update statistics**, use **update statistics** to generate both column and table statistics.

  You can create, and then drop, a global index to generate global statistics.

  When you run **update statistics** on a single partition, you create global statistics by merging partition statistics. However, these merged global statistics are less accurate than the global statistics created as a side-effect of global index creation. Avoid generating column statistics that overwrite more accurate, earlier versions of column statistics.

  When you specify:

  - *index_name* – **update table statistics** updates statistics for all the index partitions of the index.
  - *index_partition* – **update table statistics** updates statistics for the specific index partition.

See also *Performance and Tuning Guide*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must be the table owner or a user with `update statistics` permission on the table to run **update table statistics**.

See also

- *update all statistics* on page 691
- *update index statistics* on page 694
- *update statistics* on page 698

use

Specifies the database with which you want to work.

Syntax

```
use database_name
```

Parameters

- ***database_name*** **–** is the name of the database to open.

Examples

- **Example 1 –** Specifies to use `pubs2` as the working database:

```
use pubs2
go
```

Usage

- Allowed with an archive database.
- The **use** command must be executed before you can reference objects in a database.
- **use** cannot be included in a stored procedure or a trigger.
- **sp_addalias** adds an alias, which permits a user to use a database under another name to gain access to that database.

See also **sp_addalias** and **sp_adduser** in *Reference Manual: Procedures*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

The permission checks for **use** differ based on your granular permissions settings.

Setting	Description
Enabled	With granular permissions diabled, you must be a valid, alias, or guest user, or, a user with `own database` privilege or `use database` privilege on the database. If the database has a guest account, all users can use the database. If the database does not have a guest account, you must be a valid user in the database, have an alias in the database, or have `own database` privilege or `use database` privilege on the database.
Disabled	With granular permissions diabled, you must be a valid, alias, or guest user, or, a user with **sa_role** or **sso_role**. If the database has a "guest" account, all users can use the database. If the database does not have a "guest" account, you must be a valid user in the database, have an alias in the database, or be a system administrator or system security officer.

See also

- *create database* on page 104
- *drop database* on page 342

waitfor

Specifies a specific time, a time interval, or an event for the execution of a statement block, stored procedure, or transaction.

Syntax

```
waitfor {delay time | time time | errorexit | processexit |
mirrorexit}
```

Parameters

- **delay –** instructs the SAP ASE server to wait until the specified amount of time has passed, up to a maximum of 24 hours.
- **time –** instructs the SAP ASE server to wait until the specified time.
- ***time* –** a time in one of the acceptable formats for `date/time` data, or a variable of character type. You cannot specify dates—the date portion of the `date/time` value is not allowed. You can use the datatype `time` for this information.
- **errorexit –** instructs the SAP ASE server to wait until a kernel or user process terminates abnormally.
- **processexit –** instructs the SAP ASE server to wait until a kernel or user process terminates for any reason.
- **mirrorexit –** instructs the SAP ASE server to wait for a mirror failure.

Examples

- **Example 1 –** At 2:20 p.m., the `chess` table is updated with my next move, and a procedure called **sendmail** inserts a row in a table owned by Judy, notifying her that a new move now exists in the `chess` table:

```
begin
    waitfor time "14:20"
    insert chess (next_move)
        values ('Q-KR5')
    execute sendmail 'judy'
end
```

- **Example 2 –** After 10 seconds, the SAP ASE server prints the message specified:

```
declare @var char (8)
select @var = "00:00:10"
begin
    waitfor delay @var
    print "Ten seconds have passed.  Your time
        is up."
end
```

- **Example 3 –** After any process exits abnormally, the SAP ASE server prints the message specified:

  ```
  begin
      waitfor errorexit
      print "Process exited abnormally!"
  end
  ```

Usage

- After issuing the **waitfor** command, you cannot use your connection to the SAP ASE server until the time or event that you specified occurs.
- You can use **waitfor errorexit** with a procedure that kills the abnormally terminated process, to free system resources that would otherwise be taken up by an infected process.
- To find out which process terminated, check the `sysprocesses` table with **sp_who**.
- The time you specify with **waitfor time** or **waitfor delay** can include hours, minutes, and seconds. Use the format "hh:mi:ss", as described in *Date and Time Datatypes* in *Reference Manual: Building Blocks*.

  The following example instructs the SAP ASE server to wait until 4:23 p.m:

  ```
  waitfor time "16:23"
  ```

  This statement instructs the SAP ASE server to wait for 1 hour and 30 minutes:

  ```
  waitfor delay "01:30"
  ```
- Changes in system time (such as setting the clock back for Daylight Savings Time) can delay the **waitfor** command.
- You can use **waitfor mirrorexit** within a DB-Library program to notify users when there is a mirror failure.

See also:

- *Date and Time Datatypes* in *Reference Manual: Building Blocks*
- **sp_who** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **waitfor**.

See also

- *begin...end* on page 82

where clause

Sets the search conditions in a **select**, **insert**, **update**, or **delete** statement.

Syntax

Search conditions immediately follow the keyword **where** in a **select, insert, update,** or **delete** statement. If you use more than one search condition in a single statement, connect the conditions with **and** or **or**.

```
where [not] expression comparison_operator expression
```

```
where {[not] expression comparison_operator expression} | {...}
```

```
where [not] expression [not] like "match_string"
    [escape "escape_character "]
```

```
where [not] expression is [not] null
```

```
where [not] expression [not] between expression and expression
```

```
where [not] expression [not] in ({value_list | subquery})
```

```
where [not] exists (subquery)
```

```
where [not] expression comparison_operator {any | all} (subquery)
```

```
where [not] column_name join_operator column_name
```

```
where [not] logical_expression
```

```
where [not] expression {and | or} [not] expression
```

```
where column_name is [not] null
```

Parameters

- **not –** negates any logical expression or keywords such as **like**, **null**, **between**, **in**, and **exists**.
- ***expression* –** is a column name, a constant, a function, a subquery, or any combination of column names, constants, and functions connected by arithmetic or bitwise operators. For more information about expressions, see *Expressions* in *Reference Manual: Building Blocks*.
- ***comparison_operator* –** is one of the following:

Operator	Meaning
=	Equal to
>	Greater than
<	Less than

Operator	Meaning
>=	Greater than or equal to
<=	Less than or equal to
!=	Not equal to
<>	Not equal to
!>	Not greater than
!<	Not less than

In comparing `char`, `nchar`, `unichar`, `varchar`, `univarchar`, and `nvarchar` data, **<** means closer to the beginning of the alphabet and **>** means closer to the end of the alphabet.

Case and special character evaluations depend on the collating sequence of the operating system on the machine on which the SAP ASE server is located. For example, lowercase letters may be greater than uppercase letters, and uppercase letters may be greater than numbers.

Trailing blanks are ignored for the purposes of comparison. For example, "Dirk" is the same as "Dirk ".

In comparing dates, **<** means earlier and **>** means later. Put quotes around all character and date data used with a comparison operator. For example:

```
 = "Bennet"
 > "94609"
```

See *User-Defined Datatypes* in *Reference Manual: Building Blocks* for more information about data entry rules.

- **like –** is a keyword indicating that the following character string (enclosed by single or double quotes) is a matching pattern. **like** is available for `char`, `varchar`, `unichar`, `univarchar`, `nchar`, `nvarchar`, `datetime, date and time`, `text`, and `unitext` columns, but not to search for seconds or milliseconds.

  You can use the keyword **like** and wildcard characters with `datetime` and `date` data as well as with `char` and `varchar`. When you use **like** with `datetime` or `date and time` values, the SAP ASE server converts the dates to standard `datetime` format, then to `varchar`. Since the standard storage format does not include seconds or milliseconds, you cannot search for seconds or milliseconds with **like** and a pattern.

  It is a good idea to use **like** when you search for `date/ time` values, since `date/time` entries may contain a variety of date parts. For example, if you insert the value "9:20" into a column named `arrival_time`, the following clause would not find it because the SAP ASE server converts the entry into "Jan 1, 1900 9:20AM.":

```
where arrival_time = '9:20'
```

However, the following clause would find it:

```
where arrival_time like '%9:20%'
```

- ***match_string* –** is a string of characters and wildcard characters enclosed in quotes. The wildcard characters are:

Wildcard Character	Meaning
%	Any string of 0 or more characters
_	Any single character
[ ]	Any single character within the specified range ([a-f]) or set ([abcdef])
[^]	Any single character that is not within the specified range ([^a-f]) or set ([^abcdef])

- **escape –** specifies an escape character with which you can search for literal occurrences of wildcard characters.
- ***escape_character* –** is any single character. See *Using the escape Clause* in *Reference Manual: Building Blocks*.
- **is null –** searches for null values.
- **between –** is the range-start keyword. Use **and** for the range-end value. The following range is inclusive:

  ```
  where @val between x and y
  ```

  The following range is not:

  ```
  x and @val < y
  ```

  Queries using **between** return no rows if the first value specified is greater than the second value.
- **and –** joins two conditions and returns results when both of the conditions are true.

  When more than one logical operator is used in a statement, **and** operators are usually evaluated first. However, you can change the order of execution with parentheses.
- **in –** allows you to select values that match any one of a list of values. The comparator can be a constant or a column name, and the list can be a set of constants or, more commonly, a subquery. For information on using**in** with a subquery, see the *Transact-SQL User's Guide*. Enclose the list of values in parentheses.
- ***value_list* –** is a list of values. Put single or double quotes around character values, and separate each value from the following one with a comma (see example 7). The list can be a list of variables, for example:

  ```
  in (@a, @b, @c)
  ```

  However, you cannot use a variable containing a list, such as the following, for a values list:

  ```
  @a = "'1', '2', '3'"
  ```

- **exists –** is used with a subquery to test for the existence of some result from the subquery. See the *Transact-SQL User's Guide*.
- ***subquery* –** is a restricted **select** statement (**order by** and **compute** clauses and the keyword **into** are not allowed) inside the **where** or **having** clause of a **select**, **insert**, **delete**, or **update** statement, or a subquery. See the *Transact-SQL User's Guide*.
- **any –** is used with **>**, **<**, or **=** and a subquery. It returns results when any value retrieved in the subquery matches the value in the **where** or **having** clause of the outer statement. See the *Transact-SQL User's Guide*.
- **all –** is used with **>** or **<** and a subquery. It returns results when all values retrieved in the subquery match the value in the **where** or **having** clause of the outer statement. See the *Transact-SQL User's Guide*.
- ***column_name* –** is the name of the column used in the comparison. Qualify the column name with its table or view name if there is any ambiguity. For columns with the IDENTITY property, you can specify the **syb_identity** keyword, qualified by a table name where necessary, rather than the actual column name.

  column_name allows `text`, `unitext`, or `image` datatypes.
- ***join_operator* –** is a comparison operator or one of the join operators **=*** or ***=**. See the *Transact-SQL User's Guide*.
- ***logical_expression* –** is an expression that returns TRUE or FALSE.
- **or –** joins two conditions and returns results when either of the conditions is true.

  When more than one logical operator is used in a statement, **or** operators are normally evaluated after **and** operators. However, you can change the order of execution with parentheses.

Examples

- **Example 1 –**
  ```
  where advance * $2 > total_sales * price
  ```
- **Example 2 –** Finds all the rows in which the phone number does not begin with 415:
  ```
  where phone not like '415%'
  ```
- **Example 3 –** Finds the rows for authors named Carson, Carsen, Karsen, and Karson:
  ```
  where au_lname like "[CK]ars[eo]n"
  ```
- **Example 4 –** Finds the row of the `sales_east` table in which the IDENTITY column has a value of 4:
  ```
  where sales_east.syb_identity = 4
  ```
- **Example 5 –**
  ```
  where advance < $5000 or advance is null
  ```
- **Example 6 –**

```
where (type = "business" or type = "psychology") and advance >
$5500
```

- **Example 7 –**

```
where total_sales between 4095 and 12000
```

- **Example 8 –** Finds the rows in which the state is one of the three in the list:

```
where state in ('CA', 'IN', 'MD')
```

- **Example 9 –** Selects data based on null values of `text`, `unitext`, and `image` columns:

```
create table temp1(c1 int, c2 text null, c3 unitext null, c4 image
null)
    insert into temp1 values(1, null, replicate("u",5), null)
    insert into temp1 values(2, replicate("x",3), null, null)
go
select * from temp1 where c2 is null
go
```

```
c1    c2          c3                         c4
----- ----------  -------------------------  ------------
    1       NULL      0x7500750075007500007500          NULL
(1 row affected)
```

```
select * from temp1 where c2 is not null and c3 is null and c4 is
null
go
```

```
c1    c2           c3           c4
----- ----------   ----------   ----------
    2        xxx          NULL         NULL
```

- **Example 10 –** Updates data based on non-null values of `text` column:

```
insert into temp1 values(3, replicate("y", 3), null,
0x858585847474)
insert into temp1 values(4, replicate("z",3),"aaa", 0x75)
go
update temp1 set c2 = "updated" where c2 is not null
select * from temp1 where c2 is not null
go
```

```
(3 rows affected)
c1          c2          c3          c4
----- ----------   ----------   ----------
2        updated       NULL   NULL
3        updated       NULL   0x858585847474
4        updated       0x610061006100   0x75
```

- **Example 11 –** Selects data into table `temp2` based on null values of `text` column in `temp1`:

```
select c1, c2 into temp2 from temp1 where c2 is null
select * from temp2
go
```

```
(1 row affected)
c1      c2
```

```
-----  ----------
1       NULL
```

- **Example 12 –** Inserts data into table `temp2`, selecting from `temp1`, based on non-null values of `text` column in `temp1`:

  ```
  insert into temp2 select c1, c2 from temp1 where c2 is not null
  select * from temp2
  go
  ```

  ```
  (3 rows affected)
  c1          c2
  -----  ----------
  1        NULL
  2        updated
  3        updated
  4        updated
  (4 rows affected)
  ```

- **Example 13 –** Selects data in a subquery based on null value of `text` column:

  ```
  select count(*) from temp2
  where c1 in (select c1 from temp1 where c2 is null and c3 is not
  null)
  ```

  ```
   -----------
            1
   (1 row affected)
  ```

- **Example 14 –** Deletes data based on null value of `unitext` column:

  ```
  delete from temp1 where c3 is null
  go
  ```

  ```
  (2 rows affected)
  ```

Usage

- **where** and **having** search conditions are identical, except that aggregate functions are not permitted in **where** clauses. For example, this clause is legal:

  ```
  having avg (price) > 20
  ```

  This clause is not legal:

  ```
  where avg (price) > 20
  ```

  For examples, see *Transact-SQL Functions* in *Reference Manual: Building Blocks* for information on the use of aggregate functions, and **group by and having clauses**.
- Joins and subqueries are specified in the search conditions; see the *Transact-SQL User's Guide* for full details.
- You can use the keyword **like** to search a `unitext` column for a specific pattern. However, the **like** clause is not optimized when it is used with a `unitext` column. **like** pattern matching for `unitext` depends on the default Unicode sort order, which is also used for **like** pattern matching for `unichar` and `univarchar` datatypes.

- The **where** clause accepts `text` and `unitext` LOB locators, but not `image` LOB locators, for the variables *expression* and *match_string*.

  ```
  ...
  where expression like 'match_string'
  ...
  ```

  When *match_string* is a locator, the SAP ASE server uses only up to 16KB of the corresponding LOB.
- Specifying the null condition selects only those rows with a null value in the specified LOB column. The LOB value may be null either because it was explicitly assigned a null value, or because the LOB was not initialized.
- The number of **and** and **or** conditions in a **where** clause is limited only by the amount of memory available to run the query.
- The pattern string included in the **like** predicate is limited only by the size of string that can be placed in a `varchar`.
- There are two ways to specify literal quotes within a `char` or `varchar` entry. The first method is to use two quotes. For example, if you began a character entry with a single quote, and you want to include a single quote as part of the entry, use two single quotes:

  ```
  'I don''t understand.'
  ```

  Or use double quotes:

  ```
  "He said, ""It's not really confusing."""
  ```

  The second method is to enclose a quote in the opposite kind of quotation mark. In other words, surround an entry containing double quotes with single quotes (or vice versa). Here are some examples:

  ```
  'George said, "There must be a better way."'
  "Isn't there a better way?"
  'George asked, "Isn"t there a better way?"'
  ```
- To enter a character string that is longer than the width of your screen, enter a backslash (\) before going to the next line.
- If a column is compared to a constant or variable in a **where** clause, the SAP ASE server converts the constant or variable into the datatype of the column so that the optimizer can use the index for data retrieval. For example, `float` expressions are converted to `int` when compared to an `int` column. For example:

  ```
  where int_column = 2
  ```

  selects rows where *int_column* = 2.
- When the SAP ASE server optimizes queries, it evaluates the search conditions in **where** and **having** clauses, and determines which conditions are search arguments (SARGs) that can be used to choose the best indexes and query plan. All of the search conditions are used to qualify the rows. For more information on search arguments, see the *Performance and Tuning Guide*.

See also:

- *Date and Time Datatypes* in *Reference Manual: Building Blocks*
- **sp_helpjoins** in *Reference Manual: Procedures*

Standards

ANSI SQL – Compliance level: Entry-level compliant.

See also

- *group by and having Clauses* on page 459
- *delete* on page 310
- *execute* on page 406
- *insert* on page 473
- *select* on page 579
- *update* on page 680

while

Sets a condition for the repeated execution of a statement or statement block. The statements are executed repeatedly, as long as the specified condition is true.

Syntax

```
while logical_expression [plan "abstract plan"] statement
```

Parameters

- ***logical_expression* –** is any expression that returns TRUE, FALSE, or NULL.
- **plan "*abstract plan*" –** specifies the abstract plan to use to optimize the query. It can be a full or partial plan, specified in the abstract plan language. Plans can only be specified for optimizable SQL statements, that is, queries that access tables. See *Creating and Using Abstract Plans* in the *Performance and Tuning Series: Query Processing and Abstract Plans* for more information.
- ***statement* –** can be a single SQL statement, but is usually a block of SQL statements delimited by **begin** and **end.**

Examples

- **Example 1 –** If the average price is less than $30, double the prices of all books in the `titles` table. As long as it is still less than $30, the **while** loop keeps doubling the prices. In addition to determining the titles whose price exceeds $20, the **select** inside the **while** loop indicates how many loops were completed (each average result returned by the SAP ASE server indicates one loop):

```
while (select avg (price) from titles) < $30
begin
```

```
    select title_id, price
        from titles
        where price > $20
    update titles
        set price = price * 2
end
```

Usage

- The execution of statements in the **while** loop can be controlled from inside the loop with the **break** and **continue** commands.
- The **continue** command causes the **while** loop to restart, skipping any statements after the **continue**. The **break** command causes an exit from the **while** loop. Any statements that appear after the keyword **end**, which marks the end of the loop, are executed. The **break** and **continue** commands are often activated by **if** tests.

  For example:

  ```
  while (select avg (price) from titles) < $30
  begin
          update titles
          set price = price * 2
      if (select max (price) from titles) > $50
          break
      else
          if (select avg (price) from titles) > $30
             continue
          print "Average price still under $30"
  end

  select title_id, price from titles
          where price > $30
  ```

  This batch continues to double the prices of all books in the `titles` table as long as the average book price is less than $30. However, if any book price exceeds $50, the **break** command stops the **while** loop. The **continue** command prevents the **print** statement from executing if the average exceeds $30. Regardless of how the **while** loop terminates (either normally or because of the **break** command), the last query indicates which books are priced over $30.
- If two or more **while** loops are nested, the **break** command exits to the next outermost loop. All the statements after the end of the inner loop run, then the next outermost loop restarts.

Warning! If a or **create view** command occurs within a **while** loop, the SAP ASE server creates the schema for the table or view before determining whether the condition is true. This may lead to errors if the table or view already exists.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

No permission is required to use **while**.

See also

- *begin...end* on page 82
- *break* on page 84
- *continue* on page 101
- *goto label* on page 418

writetext

Permits minimally logged, interactive updating of an existing `text`, `unitext` or `image` column.

Syntax

```
writetext [[database.]owner.]table_name.column_name
    text_pointer [readpast] [with log] data
```

Parameters

- ***table_name.column_name*** – is the name of the table and `text`, `unitext` or `image` column to update. Specify the database name if the table is in another database, and specify the owner's name if more than one table of that name exists in the database. The default value for *owner* is the current user, and the default value for *database* is the current database.
- ***text_pointer*** – a `varbinary (16)` value that stores the pointer to the `text`, `unitext` or `image` data. Use the **textptr** function to determine this value. `text`, `unitext` or `image` data is not stored in the same set of linked pages as other table columns. It is stored in a separate set of linked pages. A pointer to the actual location is stored with the data; **textptr** returns this pointer.
- **readpast** – specifies that the command should modify only unlocked rows. If the **writetext** command finds locked rows, it skips them, rather than waiting for the locks to be released.

  The **readpast** option applies only to data-only-locked tables. **readpast** is ignored if it is specified for an allpages-locked table.

  If the session-wide isolation level is 3, the **readpast** option is silently ignored.

  If the transaction isolation level for a session is 0, **writetext** commands using **readpast** do not issue warning messages. These commands at session isolation level 0 modify the specified text column if the text column is not locked with incompatible locks.
- **with log** – logs the inserted `text`, `unitext` or `image` data. The use of this option aids media recovery, but logging large blocks of data quickly increases the size of the

transaction log, so make sure that the transaction log resides on a separate database device. See **create database**, **sp_logdevice**, and the *System Administration Guide* for details.

- ***data*** **–** is the data to write into the `text`, `unitext` or `image` column. `text` and `unitext` data must be enclosed in quotes. `image` data must be preceded by "0x". Check the information about the client software you are using to determine the maximum length of `text`, `unitext` or `image` data that can be accommodated by the client.

Examples

- **Example 1 –** Puts the text pointer into the local variable *@val*. Then, **writetext** places the text string "hello world" into the text field pointed to by *@val*:

```
declare @val varbinary (16)
select @val = textptr (copy) from blurbs
    where au_id = "409-56-7008"
writetext blurbs.copy @val with log "hello world"
```

- **Example 2 –**

```
declare @val varbinary (16)
select @val = textptr (copy)
from blurbs readpast
    where au_id = "409-56-7008"
writetext blurbs.copy @val readpast with log "hello world"
```

- **Example 3 –** **writetext** includes information about `unitext` datatypes, and places the string "Hello world" into the `unitext` field that *@val* points to:

```
declare @val varbinary (16)
select @val = textptr (ut) from unitable
where i = 100
writetext unitable.ut @val with log "Hello world"
```

The `varchar` constant is implicitly converted to `unitext` before the column is updated.

Usage

- The maximum length of text that can be inserted interactively with **writetext** is approximately 120K bytes for `text`, `unitext` or `image` data.
- By default, **writetext** is a minimally logged operation; only page allocations and deallocations are logged, but the `text`, `unitext` or `image` data is not logged when it is written into the database. To use **writetext** in its default, minimally logged state, a system administrator must use **sp_dboption** to set **select into/bulkcopy/pllsort** to **true**.
- **writetext** logs operations on in-row LOB columns.
- You can run the **writetext** command (with or without the **with log** parameter) simultaneously with the **online** parameter.
- **writetext** updates `text` data in an existing row. The update completely replaces all of the existing text.

- **writetext** operations are not caught by an **insert** or **update** trigger and for this reason, updating with **writetext** does not result in an update of the row timestamp.
- **writetext** requires a valid text pointer to the `text`, `unitext` or `image` column. For a valid text pointer to exist, a `text`, or `unitext` column must contain either actual data or a null value that has been explicitly entered with **update**.

  Given the table `textnull` with columns `textid` and *x*, where *x* is a `text` column that permits nulls, this **update** sets all the `text` values to NULL and assigns a valid text pointer in the `text` column:

  ```
  update textnull
  set x = null
  ```

  No text pointer results from an **insert** of an explicit null:

  ```
  insert textnull values (2,null)
  ```

  And, no text pointer results from an **insert** of an implicit null:

  ```
  insert textnull (textid)
  values (2)
  ```
- **insert** and **update** on `text` columns are logged operations.
- You cannot use **writetext** on `text` and `image` columns in views.
- If you attempt to use **writetext** on `text` values after changing to a multibyte character set, and you have not run **dbcc fix_text**, the command fails, and an error message is generated, instructing you to run **dbcc fix_text** on the table.
- **writetext** in its default, non-logged mode runs more slowly while a **dump database** is taking place.
- The Client-Library functions **dbwritetext** and **dbmoretext** are faster and use less dynamic memory than **writetext**. These functions can insert up to 2GB of `text` data.

See also *Converting text and image Datatypes* in *Reference Manual: Building Blocks*.

Standards

ANSI SQL – Compliance level: Transact-SQL extension.

Permissions

You must be the table owner or a user with `update` permission to run **writetext**.

See also

- *readtext* on page 542

CHAPTER 2 Interactive SQL Commands

Enter Interactive SQL commands in the top pane of the Interactive SQL display. These commands are intended only for Interactive SQL and are not sent to the SAP ASE server for execution.

For information about Interactive SQL, see *Using Interactive SQL* in the *Utility Guide*.

clear

Clears the Interactive SQL panes.

Syntax

```
clear
```

Usage

Use the **clear** statement to clear the SQL Statements and Messages panes and the Results, Messages, Plan, and Plan tabs in the Results pane.

clear closes the cursor associated with the data being cleared.

Permissions

Any user can execute this command.

configure

Opens the Interactive SQL Options dialog.

Syntax

```
configure
```

Usage

The **configure** statement opens the Interactive SQL Options dialog and displays the current settings of all Interactive SQL options. It does not display or allow you to modify database options.

You can configure Interactive SQL settings in this dialog. If you select Make Permanent, the options are saved for use in subsequent Interactive SQL sessions. If you do not choose Make

Permanent, and instead click OK, the options are set temporarily and remain in effect for the current database connection only.

Permissions

Any user can run **configure**.

See also

- *set* on page 607

connect

Establishes a connection to a database.

Syntax

```
connect
    [to engine_name]
    [database database_name]
    [as connection_name]
    [user] user_id identified by password
    engine_name, database_name, connection_name, user_id,
        password : {identifier | string | hostvar}
```

```
connect using connect_string : {identifier | string | hostvar}
```

Parameters

- ***engine_name* –** is the name of the engine to which you are connecting.
- ***database_name* –** is the name of the database to which you are connecting. It must conform to the rules for identifiers and cannot be a variable.
- **as –** you can optionally name a connection by specifying the **as** clause. This allows multiple connections to the same database, or multiple connections to the same or different database servers, all simultaneously. Each connection has its own associated transaction. You may get locking conflicts between your transactions if, for example, you modify the same record in the same database from two different connections.
- ***connection_name* –** is the login name you are using to make the connection.
- **user –** indicates that you are connecting to the SAP ASE server as a user.
- ***user_id* –** is the ID of the user who is connecting.
- **identified by password –** indicates that the user needs to include a password when they connect.
- ***password* –** is the password of the user connecting to the SAP ASE server.
- ***identifier* –** is the identifier you are using for the connection information.
- ***string* –** is the string you are using for the connection information.

- ***hostvar* –** is the variable information for the host name and port.
- ***connect_string* –** is a list of parameter settings of the form ***keyword* = *value***, separated by semicolons, and must be enclosed in single quotes.

Examples

- **Example 1 –** Connects to a database from Interactive SQL. Interactive SQL prompts for a user ID and a password:

  ```
  connect
  ```

- **Example 2 –** Connects to the default database as DBA from Interactive SQL. Interactive SQL prompts for a password:

  ```
  connect user "DBA"
  ```

- **Example 3 –** As user `dba`, with password `sql`, connects to the `pubs2` database of an SAP ASE server running on host “tribble” at port number 5000:

  ```
  connect to "tribble:5000"
  database pubs2
  user dba
  identified by sql
  ```

- **Example 4 –** As user `dba`, with password `sql`, connects to an SAP ASE server named “tribble” (defined in `interfaces` file):

  ```
  connect to tribble
  user dba
  identified by sql
  ```

Usage

- **connect** establishes a connection to the database identified by *database_name* running on the server identified by *engine_name*.
- No statements are allowed until a successful **connect** statement has been executed.
- Interactive SQL behavior – if you do not specify a database or server in the **connect** statement, Interactive SQL remains connected to the current database, rather than to the default server and database. If you do specify a database name without a server name, Interactive SQL attempts to connect to the specified database on the current server. If you specify a server name without a database name, Interactive SQL connects to the default database on the specified server.
- In the user interface, if the password or the user ID and password are not specified, the user is prompted to type the missing information.
- When Interactive SQL is running in command-prompt mode (`-nogui` is specified when you start Interactive SQL from a command prompt) or batch mode, or if you execute **connect** without an **as** clause, an unnamed connection is opened. If there is another unnamed connection already opened, the old one is automatically closed. Otherwise, existing connections are not closed when you run **connect**.

- Multiple connections are managed through the concept of a current connection. After a successful **connect** statement, the new connection becomes the current one. To switch to a different connection, use the **set connection** statement. Use the **disconnect** statement to drop connections.
- In Interactive SQL, the connection information (including the database name, your user ID, and the database server) appears in the title bar above the SQL Statements pane. If you are not connected to a database, Not Connected appears in the title bar.

Permissions

Any user can execute this command.

See also

- *disconnect* on page 728
- *set connection* on page 739

disconnect

Drops the current connection to a database.

Syntax

```
disconnect [{identifier | string | hostvar} | current | all]
```

Parameters

- ***{identifier | string | hostvar}* –** is the login name you are using to make the connection.
  - *identifier* – is the identifier you are using for the connection information.
  - *string* – is the string you are using for the connection information.
  - *hostvar* – is the variable information for the host name and port.
- **current –** indicates that you are disconnecting the current connection.
- **all –** indicates that you are disconnecting all connections.

Examples

- **Example 1 –** Disconnects all connections:
  ```
  disconnect all
  ```

Usage

disconnect drops a connection to the database server and releases all resources used by it. If the connection to be dropped was named on the **connect** statement, the name can be specified.

Specifying **all** drops all of the application's connections to all database environments. **current** is the default, and drops the current connection.

An implicit **rollback** is executed on connections that are dropped.

Permissions

Any user can execute this command.

See also

- *connect* on page 726
- *set connection* on page 739

exit

Leaves Interactive SQL.

Syntax

```
{exit | quit | bye} [{number | connection_variable}]
```

Parameters

- **exit | quit | bye –** closes your connection with the database, then closes the Interactive SQL environment.
- **{*number* | *connection_variable*} –** can be used in batch files to indicate success or failure of the commands in an Interactive SQL command file. The default return code is 0.
    - *number* – is the number of the return code.
    - *connection_varible* – is a variable indicating a specific connection.

Usage

Before closing the database connection, Interactive SQL automatically executes a **commit** statement if the **commit_on_exit** option is set to on. If this option is set to off, Interactive SQL performs an implicit **rollback**. By default, the **commit_on_exit** option is set to on.

Permissions

Any user can execute this command.

input

Imports data into a database table from an external file or from the keyboard.

Syntax

```
input into [ owner.]table_name
    [ from filename | prompt]
    [ format { ascii | dbase | dbasell | dbaselll | excel | fixed |
foxpro | lotus }]
    [ escape character character]
    [ escapes { on | off }
    [ by order | by name ]
    [ delimited by string ]
    [ column widths (integer , . . . ) ]
    [ nostrip ]
    [ ( column_name, . . . ) ]
    [ encoding {identifier | string}]
```

Parameters

- **from clause –** is the file name that is passed to the server as a quoted string. The string is therefore subject to the same formatting requirements as other SQL strings. In particular:
  - To indicate directory paths, you must represent the backslash character (\) by two backslashes. To load data from the file `c: emp\input.dat` into the `employee` table:

    ```
    input into employee
    from 'c: nn temp nn input.dat'
    ```
  - The path name is relative to the machine on which Interactive SQL is running.
- **prompt –** allows the user to enter values for each column in a row. When running in windowed mode, a dialog appears where the user can enter the values for the new row. If the user is running Interactive SQL on the command line, Interactive SQL prompts the user to type the value for each column on the command line.
- **format –** each set of values must be in the format specified by the **format** clause, or the **set option input_format** statement if the **format** clause is not specified. When input is entered by the user, a dialog is provided for the user to enter one row per line in the input format.

  Certain file formats contain information about column names and types.

  Using this information, the **input** statement creates the database table if it does not already exist. This is a very easy way to load data into the database. The formats that have enough information to create the table are: **dbasell**, **dbaselll**, **foxpro**, and **lotus**.

  Input from a command file is terminated by a line containing **end**. Input from a file is terminated at the end of the file.

  Allowable **input** formats are:

- **ascii** – input lines are assumed to be ASCII characters, one row per line, with values separated by commas. Alphabetic strings may be enclosed in apostrophes (single quotes) or quotation marks (double quotes). Strings containing commas must be enclosed in either single or double quotes. If the string itself contains single or double quotes, double the quote character to use it within the string. Optionally, you can use the **delimited by** clause to specify a delimiter string other than the default, which is a comma.

  Three other special sequences are also recognized. The two characters represent a new line character, "\", represents a single (\), and the sequence \xDD represents the character with hexadecimal code DD.
- **dbase** – the file is in DBASEll or DBASElll format. Interactive SQL attempts to determine which format, based on information in the file. If the table does not exist, it is created.
- **dbasell** – the file is in DBASEll format. If the table does not exist, it is created.
- **dbaselll** – the file is in DBASElll format. If the table does not exist, it is created.
- **excel** – input file is in the format of Microsoft Excel 2.1. If the table does not exist, it is created.
- **fixed** – input lines are in fixed format. Use the **column widths** clause to specify column widths. If they are not specified, column widths in the file must be the same as the maximum number of characters required by any value of the corresponding database column's type.

  You cannot use the **fixed** format with binary columns that contain embedded new line and End of File character sequences.
- **foxpro** – the file is in FoxPro format. If the table does not exist, it is created.
- **lotus** – the file is a Lotus WKS format worksheet. **input** assumes that the first row in the Lotus WKS format worksheet is column names. If the table does not exist, it is created. In this case, the types and sizes of the columns created may not be correct because the information in the file pertains to a cell, not to a column.

- **escape character –** is the default escape character for hexadecimal codes and symbols is a backslash (\), so \x0A is the linefeed character, for example.

  You can change the escape character using the **escape character** clause. For example, to use the exclamation mark as the escape character, enter:

  ```
  ... escape character '|'
  ```

  Only one single-byte character can be used as an escape character.
- **escapes –** with **escapes** enabled (the default), characters following the backslash character are recognized and interpreted as special characters by the database server. New line characters can be included as the combination \n, other characters can be included in data as hexadecimal ASCII codes, such as \x09 for the tab character. A sequence of two backslash characters (\) is interpreted as a single backslash. A backslash followed by any character other than n, x, X or \is interpreted as two separate characters. For example, \q inserts a backslash and the letter q.

- **by –** allows the user to specify whether the columns from the input file should be matched up with the table columns based on their ordinal position in the lists (**order**, the default) or by their names (**name**). Not all input formats have column name information in the file. **name** is allowed only for those formats that do. They are the same formats that allow automatic table creation: **dbaseII**, **dbaseIII**, **foxpro**, and **lotus**.
- **delimited –** allows you to specify a string to be used as the delimiter in ASCII input format.
- **column widths –** can be specified for **fixed** format only; it specifies the widths of the columns in the input file. If **column widths** is not specified, the widths are determined by the database column types. Do not use this clause if you are inserting `long varchar` or `binary` data in **fixed** format.
- **nostrip –** normally, for ASCII input format, trailing blanks are stripped from unquoted strings before the value is inserted. **nostrip** can be used to suppress trailing blank stripping. Trailing blanks are not stripped from quoted strings, regardless of whether the option is used. Leading blanks are stripped from unquoted strings, regardless of the **nostrip** option setting.

  If the ASCII file has entries such that a column appears to be null, it is treated as NULL. If the column in that position cannot be NULL, a zero is inserted in numeric columns, and an empty string in character columns.
- **encoding –** allows you to specify the encoding that is used to read the file. **encoding** can be used only with the ASCII format.

  If **encoding** is not specified, Interactive SQL determines the code page that is used to read the file as follows, where code page values occurring earlier in the list take precedence over those occurring later in the list:

  - The code page specified with the **default_isql_encoding** option (if this option is set)
  - The code page specified with the `-codepage` option when Interactive SQL was started
  - The default code page for the computer Interactive SQL is running on

Examples

- **Example 1 –** Imports data into the table `employees` from the ASCII text file `new_emp.inp`:

```
input into employee
from new_emp.inp
format ASCII
```

Usage

- The **input** statement allows efficient mass insertion into a named database table. Lines of input are read either from the user via an input window (if **prompt** is specified) or from a file (if you specify **from *file_name***). If neither is specified, the input is read from the command file that contains the **input** statement. In Interactive SQL, this can even be directly from the SQL Statements pane. In this case, input is ended with a line containing only the string **end**.

- If a column list is specified for any input format, the data is inserted into the specified columns of the named table. By default, the **input** statement assumes that column values in the input file appear in the same order in which they appear in the database table definition. If the input file's column order is different, you must list the input file's actual column order at the end of the **input** statement.

  In this example, you create a table called inventory. To import ASCII data from the input file that contains the name value before the quantity value, you must list the input file's actual column order at the end of the **input** statement for the data to be inserted correctly:

  ```
  create table inventory (
  quantity int,
  item varchar(60)
  )
  ```

  The ASCII data from the input file `stock.txt` that contains the name value before the quantity value:

  ```
  'Shirts', 100
  'Shorts', 60
  ```

  The input file's actual column order at the end of the **input** statement for the data to be inserted correctly:

  ```
  input into inventory
  from stock.txt
  FORMAT ASCII
  (item, quantity)
  ```

- By default, **input** stops when it attempts to insert a row that causes an error. Errors can be treated in different ways by setting the **on_error** and **conversion_error** options. Interactive SQL prints a warning in the Messages pane if any string values are truncated on **input**. Missing values for NOT NULL columns are set to zero for numeric types and to the empty string for non-numeric types. If **input** attempts to insert a NULL row, the input file contains an empty row.

Permissions

You must have **insert** permission on the table or view.

output

Imports data into a database table from an external file or from the keyboard.

Syntax

```
output to filename
    [ append ]
    [ verbose ]
    [ format {ascii | dbase | dbaseII| dbaseIII
```

```
        | excel | fixed | foxpro | lotus | sql | xml}]
    [ escape character character ]
    [ escapes { on | off}
    [ delimited by string ]
    [ quote string [ all ] ]
    [ column widths (integer , . . . ) ]
    [ hexidecimal { on | off | asis } ]
    [ encoding {string | identifier}]
```

Parameters

- **append –** appends the results of the query to the end of an existing output file without overwriting the previous contents of the file. If the **append** clause is not used, the **output** statement overwrites the contents of the output file by default. The **append** keyword is valid if the output format is ASCII, **fixed**, or SQL.
- **verbose –** Writes error messages about the query, the SQL statement used to select the data, and the data itself to the output file. Lines that do not contain data are prefixed by two hyphens. If you omit **verbose** (the default) only the data is written to the file. **verbose** is valid if the output format is ASCII, **fixed**, or SQL. Allowable output formats are:

  - **ascii** – the output is an ASCII format file with one row per line in the file. All values are separated by commas, and strings are enclosed in apostrophes (single quotes). You can change the delimiter and quote strings using the **delimited by** and **quote** clauses. If **all** is specified in the **quote** clause, all values (not just strings) are quoted.

    Three other special sequences are also used. The two characters represent a new line character, "\", represents a single \, and the sequence \xDD represents the character with hexadecimal code DD. This is the default output format.
  - **dbaseII** – the output is in DBASEll, which includes column definitions. A maximum of 32 columns can be output. Column names are truncated to 11 characters, and each row of data in each. If the table does not exist, it is created.
  - **dbaseIII** – the output is a dBASE III format file, which includes column definitions. A maximum of 128 columns can be output. Column names are truncated to 11 characters, and each row of data in each column is truncated to 255 characters.
  - **excel** – the output is an Excel 2.1 worksheet. The first row of the worksheet contains column labels (or names if there are no labels defined). Subsequent worksheet rows contain the actual table data.
  - **fixed** – the output is fixed format with each column having a fixed width. You can specify the width for each column with **column widths**. No column headings are output in this format.

    If the **column widths** clause is omitted, the width for each column is computed from the datatype for the column, and is large enough to hold any value of that datatype. The exception is that `long varchar` and `long binary` data default to 32K.
  - **foxpro** – the output is a FoxPro format file, which includes column definitions. A maximum of 128 columns can be output. Column names are truncated to 11 characters.

Column names are truncated to 11 characters, and each row of data in each column is truncated to 255 characters.

- **html** – the output is in the HyperText Markup Language format.
- **lotus** – the output is a Lotus WKS format worksheet. Column names are placed as the first row in the worksheet. There are certain restrictions on the maximum size of Lotus WKS format worksheets that other software (such as Lotus 1-2-3) can load. There is no limit to the size of file Interactive SQL can produce.
- **SQL** – the output is an Interactive SQL input statement required to recreate the information in the table.
- **XML** – the output is an XML file encoded in UTF-8 and containing an embedded DTD. Binary values are encoded in CDATA blocks with the binary data rendered as 2-hex-digit strings. The **input** statement does not accept XML as a file format.

- **escape character –** is the default escape character for characters\ stored as hexadecimal codes and symbols is a backslash (\), so, for example, \x0A is the linefeed character.

  You can change the default escape character using **escape character**. For example, to use the exclamation mark as the escape character, enter:

  ```
  ... escape character '!'
  ```

- **escapes –** if enabled (the default), characters following the backslash character are recognized and interpreted as special characters by the database server. New line characters can be included as the combination \n, and other characters can be included in data as hexadecimal ASCII codes, such as \x09 for the tab character. A sequence of two backslash characters (\) is interpreted as a single backslash. A backslash followed by any character other than n, x, X or \ is interpreted as two separate characters. For example, \q inserts a backslash and the letter q.
- **delimited by –** for the ASCII output format only. The delimiter string is placed between columns (default comma).
- **quote –** for the ASCII output format only. The quote string is placed around string values. The default is a single quote character. If **all** is specified in the **quote** clause, the quote string is placed around all values, not just around strings.
- **column width –** specifies the column widths for the **fixed** format output
- **hexidecimal –** specifies how binary data is to be unloaded for the ASCII format only. When set to on, binary data is unloaded in the format 0xabcd. When set to off, binary data is escaped when unloaded (\xab\xcd). When set to **asis**, values are written as is, that is, without any escaping–even if the value contains control characters. **asis** is useful for text that contains formatting characters such as tabs or carriage returns.
- **encoding –** allows you to specify the encoding that is used to write the file. **encoding** can be used only with the ASCII format.

  If **encoding** is not specified, Interactive SQL determines the code page that is used to write the file as follows, where code page values occurring earlier in the list take precedence over those occurring later in the list:

  - The code page specified with **default_isql_encoding** (if this option is set)

- The code page specified with the `-codepage` option when Interactive SQL was started
- The default code page for the computer Interactive SQL is running

Examples

- **Example 1 –** Places the contents of the employee table in a file in ASCII format:

  ```
  select *
      from employee
  go
  output to employee.txt
      format ASCII
  ```

- **Example 2 –** Places the contents of the employee table at the end of an existing file, and includes any messages about the query in this file as well:

  ```
  select *
      from employee
  go
  output to employee.txt append verbose
  ```

- **Example 3 –** In this example, you need to export a value that contains an embedded line feed character. A line feed character has the numeric value 10, which you can represent as the string '\x0a' in a SQL statement. If you execute the following statement, with **hexidecimal** set to **on**:

  ```
  select 'line1 n x0aline2'
  go
  output to file.txt hexidecimal on
  ```

  You see a file with one line in it containing the following text:

  ```
  line10x0aline2
  ```

  However, if you execute the same statement with **hexidecimal** set to **off**, you see the following:

  ```
  line1 n x0aline2
  ```

  Finally, if you set **hexidecimal** to **asis**, you see a file with two lines:

  ```
  line1
  line2
  ```

  You get two lines when you use **asis** because the embedded line feed character has been exported without being converted to a two-digit hexidecimal representation, and without being prefixed by anything.

Usage

- The **output** statement copies the information retrieved by the current query to a file.
- You can specify the output format with the optional **format** clause. If you do not specify the **format** clause, the Interactive SQL **output_format** option setting is used.

- The current query is the **select** or **input** statement that generated the information appearing on the Results tab in the Results pane. The **output** statement reports an error if there is no current query.
- In Interactive SQL, the Results tab displays only the results of the current query. All previous query results are replaced with the current query results.

Permissions

Any user can execute this command.

parameters

Specifies parameters to an Interactive SQL command file.

Syntax

```
parameters parameter1, parameter2, . . .
```

Examples

- **Example 1 –** Specifies two parameters to an Interactive SQL command file:

  ```
  parameters department_id, file;
  select emp_lname
      from employee
      where dept_id = {department_id}
      >#{file}.dat
  ```

  If you save this script in a file named `test.sql`, you can run it from Interactive SQL using the following command:

  ```
  read test.SQL [100] [data]
  ```

Usage

- The **parameters** statement names the parameters for a command file, so that they can be referenced later in the command file.
- Parameters are referenced by putting `{parameter1}` into the file where you want the named parameter to be substituted. There cannot be any spaces between the braces and the parameter name.
- If a command file is invoked with less than the required number of parameters, Interactive SQL prompts for values of the missing parameters.

Permissions

Any user can execute this command.

See also

- *read* on page 738

read

Reads Interactive SQL statements from a file.

Syntax

```
read [ encoding {identifier | string}] file_name [ parameters ]
```

Parameters

- **encoding {*identifier* | *string*} –** allows you to specify the encoding that is used to write the file. **encoding** can be used only with the ASCII format.
  - *identifier* – is the identifier you are using to indicate the file you are reading.
  - *string* – is the string you are using to indicate the file you are reading.
- ***file_name* –** is the name of the file you are reading.
- ***parameters* –** correspond to the parameters listed in the statement file.

Examples

- **Example 1 –** Reads a file called `status.rpt` and another file called `birthday.SQL`:

  ```
  READ status.rpt '160'

  READ birthday.SQL [>= '1988-1-1'] [<= '1988-1-30']
  ```

Usage

- The **read** statement reads a sequence of Interactive SQL statements from the named file. This file can contain any valid Interactive SQL statement, including other **read** statements. **read** statements can be nested to any depth. If the file name does not contain an absolute path, Interactive SQL searches for the file. Interactive SQL first searches the current directory, and then the directories specified in the environment variable SQLPATH, and then the directories specified in the environment variable PATH. If the named file has no file extension, Interactive SQL searches each directory for the same file name with the extension `.SQL`.
- The encoding argument allows you to specify the encoding that is used to read the file. The **read** statement does not process escape characters when it reads a file. It assumes that the entire file is in the specified encoding. If encoding is not specified, Interactive SQL determines the code page that is used to read the file as follows, where code page values occurring earlier in the list take precedence over those occurring later in the list:

  - The code page specified with the **default_isql_encoding** option (if this option is set)
  - The code page specified with the `-codepage` option when Interactive SQL was started
  - The default code page for the computer Interactive SQL is running on
- Parameters can be listed after the name of the command file. These parameters correspond to the parameters named on the **parameters** statement at the beginning of the statement file. Interactive SQL substitutes the corresponding parameter wherever the source file contains **{*parameter_name*}**, where *parameter_name* is the name of the appropriate parameter.
- The parameters passed to a command file can be identifiers, numbers, quoted identifiers, or strings. When quotes are used around a parameter, the quotes are placed into the text during the substitution. You must enclose in square brackets ([ ]) parameters that are not identifiers, numbers, or strings (contain spaces or tabs). This allows for arbitrary textual substitution in the command file.
- If not enough parameters are passed to the command file, Interactive SQL prompts for values for the missing parameters.

Permissions

Any user can execute this command.

set connection

Changes the current database connection to another server.

Syntax

```
set connection {identifier | string | hostvar}
```

Parameters

- ***identifier* –** is the login name identifier you are using for the connection information.
- ***string* –** is the string you are using for the connection information.
- ***hostvar* –** is the variable information for the host name and port.

Usage

The **set connection** statement changes the active database connection to another server. The current connection state is saved, and resumes again when it again becomes the active connection. If you omit *connection_name* and there is a connection that was not named, that connection becomes the active connection.

Permissions

Any user can execute this command.

See also

- *connect* on page 726
- *disconnect* on page 728

start logging

Starts logging executed SQL statements to a log file.

Syntax

```
start logging file_name
```

Parameters

- **file_name –** is the file to which you are logging the session.

Examples

- **Example 1 –** Starts logging to a file called `filename.sql`, located in the c: directory:

  ```
  start logging 'c: n filename.sql'
  ```

Usage

The **start logging** statement starts copying all subsequent executed SQL statements to the log file that you specify. If the file does not exist, Interactive SQL creates it. Logging continues until you explicitly stop the logging process with the **stop logging** statement, or until you end the current Interactive SQL session. You can also start and stop logging by selecting SQL | Start Logging and SQL | Stop Logging.

Permissions

Any user can execute this command.

See also

- *stop logging* on page 740

stop logging

Stops logging of executed SQL statements in the current session.

Syntax

```
stop logging
```

Examples

- **Example 1 –** Stops the current logging session:

  ```
  stop logging
  ```

Usage

The **stop logging** statement stops Interactive SQL from writing each SQL statement you execute to a log file. You can start logging with the **start logging** statement. You can also start and stop logging by selecting SQL | Start Logging and SQL | Stop Logging.

Permissions

Any user can execute this command.

See also

- *start logging* on page 740

system

Launches an executable file from within Interactive SQL.

Syntax

```
system '[path] file_name'
```

Parameters

- ***path* –** is the path to the Notepad program.
- ***file_name* –** is the file name of the program you are launching.

Examples

- **Example 1 –** Launches the Notepad program, assuming that the Notepad executable is in your path.

  ```
  system 'notepad.exe'
  ```

Usage

- The **system** statement must be entirely contained on one line.
- Comments are not allowed at the end of a **system** statement.
- Enclose the path and file name in single quotation marks.

Permissions

Any user can execute this command.

See also

- *connect* on page 726