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SAS® Viya™ 3.1 Statements: Reference

SAS® Documentation

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SAS® Viya™ 3.1 Statements: Reference

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Chapter 1

SAS Statements

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Definition of Statements

A *SAS statement* is a string of SAS keywords, SAS names, special characters, and operators that instructs SAS to perform an operation or that gives information to SAS. Each SAS statement ends with a semicolon.

This documentation covers two types of SAS statements:

- statements that are used in DATA step programming
- statements that are global in scope and can be used anywhere in a SAS program.

DATA Step Statements

Executable and Declarative Statements

DATA step statements are executable or declarative statements that can appear in the DATA step. **Executable statements** result in some action during individual iterations of the DATA step; **declarative statements** supply information to SAS and take effect when the system compiles program statements.

The following tables show the SAS executable and declarative statements that you can use in the CAS and SAS DATA step.

Table 1.1 *Executable Statements in the CAS and SAS DATA Step*

Executable Statements		
Array Reference	IF, Subsetting	PUT, Named
Assignment	IF-THEN/ELSE	PUT
CALL	LEAVE	PUT, ODS
CONTINUE	LINK	PUTLOG
DELETE	LIST	RETURN
DO	LOSTCARD	SELECT
DO, Iterative	MERGE	SET
DO UNTIL	OUTPUT	STOP
DO WHILE	PUT, Column	Sum
ERROR	PUT, Formatted	
FILE	PUT, List	

Table 1.2 *Declarative Statements in the CAS and SAS DATA Step*

Declarative Statements		
ARRAY	END	Labels, Statement
BY	FORMAT	LENGTH
DATA	INFORMAT	RENAME
DROP	KEEP	RETAIN

The following tables show the SAS executable and declarative statements that you can use in the SAS DATA step.

Table 1.3 *Executable Statements in the SAS DATA Step*

Executable Statements		
ABORT	INPUT, Column	REDIRECT
DESCRIBE	INPUT, Formatted	REMOVE
EXECUTE	INPUT, List	REPLACE

Executable Statements		
FILE, ODS	INPUT, Named	RESETLINE
GO TO	MODIFY	UPDATE
INFILE	Null	
INPUT	OUTPUT	

Table 1.4 *Declarative Statements in the SAS DATA Step*

Declarative Statements		
ATTRIB	DATALINES	WHERE
CARDS	DATALINES4	
CARDS4	LABEL	

DATA step statements can be grouped into five functional categories. For a list of SAS DATA step statements by category, see "DATA Step Statements by Category" on page 7.

Global Statements

Global statements generally provide information to SAS, request information or data, move between different modes of execution, or set values for system options. You can use global statements anywhere in a SAS program. Global statements are not executable; they take effect as soon as SAS compiles program statements.

Global statements can be divided into seven functional categories. For a list of global statements by category, see "Global Statements by Category" on page 13.

Other SAS software products have additional global statements that are used with those products. For information, see the SAS documentation for those products.

Statements Documented in Other SAS Publications

In addition to the statements documented in *SAS Viya Statements: Reference*, statements are also documented in the following publications:

- *SAS Viya DS2 Language Reference*
- SAS Viya Macro Language: Reference
- *SAS Viya Data Management and Utility Procedures Guide*
- *SAS/CONNECT for SAS Viya: User's Guide*

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DATA Step Statements by Category

In addition to being either executable or declarative, SAS DATA step statements for CAS can be grouped into five functional categories:

Table 2.1 *Categories of DATA Step Statements*

Statements Category	Functionality
Action	• create and modify variables • select only certain observations to process in the DATA step • look for errors in the input data • work with observations as they are being created
CAS	• Statements that run in the CAS server
Control	• skip statements for certain observations • change the order that statements are executed • transfer control from one part of a program to another
File-handling	• work with files used as input to the data set • work with files to be written by the DATA step
Information	• give SAS additional information about the program data vector • give SAS additional information about the data set or data sets that are being created.

The following table lists and briefly describes the DATA step statements by category.

Category	Language Elements	Description
Action	ABORT Statement (p. 15)	Stops executing the current DATA step, SAS job, or SAS session.
	Assignment Statement (p. 26)	Evaluates an expression and stores the result in a variable.
	CALL Statement (p. 37)	Invokes a SAS CALL routine.
	DELETE Statement (p. 57)	Stops processing the current observation.
	DESCRIBE Statement (p. 58)	Retrieves source code from a stored compiled DATA step program or a DATA step view.

Category	Language Elements	Description
	ERROR Statement (p. 69)	Sets _ERROR_ to 1. A message written to the SAS log is optional.
	EXECUTE Statement (p. 71)	Executes a stored compiled DATA step program.
	IF Statement, Subsetting (p. 127)	Continues processing only those observations that meet the condition of the specified expression.
	LIST Statement (p. 256)	Writes to the SAS log the input data record for the observation that is being processed.
	LOSTCARD Statement (p. 266)	Resynchronizes the input data when SAS encounters a missing or invalid record in data that has multiple records per observation.
	Null Statement (p. 297)	Signals the end of data lines or acts as a placeholder.
	OUTPUT Statement (p. 300)	Writes the current observation to a SAS data set.
	PUTLOG Statement (p. 335)	Writes a message to the SAS log.
	REDIRECT Statement (p. 337)	Points to different input or output SAS data sets when you execute a stored program.
	REMOVE Statement (p. 338)	Deletes an observation from a SAS data set.
	REPLACE Statement (p. 342)	Replaces an observation in the same location.
	STOP Statement (p. 377)	Stops execution of the current DATA step.
	Sum Statement (p. 378)	Adds the result of an expression to an accumulator variable.
	WHERE Statement (p. 400)	Selects observations from SAS data sets that meet a particular condition.
CAS	ARRAY Statement (p. 18)	Defines the elements of an array.
	Array Reference Statement (p. 23)	Describes the elements in an array to be processed.
	Assignment Statement (p. 26)	Evaluates an expression and stores the result in a variable.
	BY Statement (p. 32)	Controls the operation of a SET, MERGE, MODIFY, or UPDATE statement in the DATA step and sets up special grouping variables.
	CALL Statement (p. 37)	Invokes a SAS CALL routine.
	CONTINUE Statement (p. 44)	Stops processing the current DO-loop iteration and resumes processing the next iteration.
	DATA Statement (p. 45)	Begins a DATA step and provides names for any output SAS data sets, views, or programs.
	DELETE Statement (p. 57)	Stops processing the current observation.

Category	Language Elements	Description
	DO Statement (p. 59)	Specifies a group of statements to be executed as a unit.
	DO Statement, Iterative (p. 60)	Executes statements between the DO and END statements repetitively, based on the value of an index variable.
	DO UNTIL Statement (p. 64)	Executes statements in a DO loop repetitively until a condition is true.
	DO WHILE Statement (p. 66)	Executes statements in a DO-loop repetitively while a condition is true.
	DROP Statement (p. 67)	Excludes variables from output SAS data sets.
	END Statement (p. 68)	Ends a DO group or SELECT group processing.
	ERROR Statement (p. 69)	Sets _ERROR_ to 1. A message written to the SAS log is optional.
	FILE Statement (p. 71)	Specifies the current output file for PUT statements.
	FORMAT Statement (p. 121)	Associates formats with variables.
	GO TO Statement (p. 125)	Directs program execution immediately to the statement label that is specified and, if followed by a RETURN statement, returns execution to the beginning of the DATA step.
	IF Statement, Subsetting (p. 127)	Continues processing only those observations that meet the condition of the specified expression.
	IF-THEN/ELSE Statement (p. 129)	Executes a SAS statement for observations that meet specific conditions.
	INFORMAT Statement (p. 166)	Associates informats with variables.
	KEEP Statement (p. 203)	Specifies the variables to include in output SAS data sets.
	LABEL Statement (p. 205)	Assigns descriptive labels to variables.
	label: Statement (p. 207)	Identifies a statement that is referred to by another statement.
	LEAVE Statement (p. 208)	Stops processing the current loop and resumes with the next statement in the sequence.
	LENGTH Statement (p. 209)	Specifies the number of bytes for storing variables.
	LINK Statement (p. 255)	Directs program execution immediately to the statement label that is specified and, if followed by a RETURN statement, returns execution to the statement that follows the LINK statement.
	LIST Statement (p. 256)	Writes to the SAS log the input data record for the observation that is being processed.

Category	Language Elements	Description
	LOSTCARD Statement (p. 266)	Resynchronizes the input data when SAS encounters a missing or invalid record in data that has multiple records per observation.
	MERGE Statement (p. 268)	Joins observations from two or more SAS data sets into a single observation.
	Null Statement (p. 297)	Signals the end of data lines or acts as a placeholder.
	OUTPUT Statement (p. 300)	Writes the current observation to a SAS data set.
	PUT Statement (p. 303)	Writes lines to the SAS log, to the Results window, or to an external location that is specified in the most recent FILE statement.
	PUT Statement, Column (p. 321)	Writes variable values in the specified columns in the output line.
	PUT Statement, Formatted (p. 323)	Writes variable values with the specified format in the output line.
	PUT Statement, List (p. 328)	Writes variable values and the specified character strings in the output line.
	PUT Statement, Named (p. 332)	Writes variable values after the variable name and an equal sign.
	PUTLOG Statement (p. 335)	Writes a message to the SAS log.
	RENAME Statement (p. 340)	Specifies new names for variables in output SAS data sets.
	RETAIN Statement (p. 346)	Causes a variable that is created by an INPUT or assignment statement to retain its value from one iteration of the DATA step to the next.
	RETURN Statement (p. 350)	Stops executing statements at the current point in the DATA step and returns to a predetermined point in the step.
	SELECT Statement (p. 359)	Executes one of several statements or groups of statements.
	SET Statement (p. 362)	Reads an observation from one or more SAS data sets.
	STOP Statement (p. 377)	Stops execution of the current DATA step.
	Sum Statement (p. 378)	Adds the result of an expression to an accumulator variable.
Control	CONTINUE Statement (p. 44)	Stops processing the current DO-loop iteration and resumes processing the next iteration.
	DO Statement (p. 59)	Specifies a group of statements to be executed as a unit.
	DO Statement, Iterative (p. 60)	Executes statements between the DO and END statements repetitively, based on the value of an index variable.

Category	Language Elements	Description
	DO UNTIL Statement (p. 64)	Executes statements in a DO loop repetitively until a condition is true.
	DO WHILE Statement (p. 66)	Executes statements in a DO-loop repetitively while a condition is true.
	END Statement (p. 68)	Ends a DO group or SELECT group processing.
	GO TO Statement (p. 125)	Directs program execution immediately to the statement label that is specified and, if followed by a RETURN statement, returns execution to the beginning of the DATA step.
	IF-THEN/ELSE Statement (p. 129)	Executes a SAS statement for observations that meet specific conditions.
	label: Statement (p. 207)	Identifies a statement that is referred to by another statement.
	LEAVE Statement (p. 208)	Stops processing the current loop and resumes with the next statement in the sequence.
	LINK Statement (p. 255)	Directs program execution immediately to the statement label that is specified and, if followed by a RETURN statement, returns execution to the statement that follows the LINK statement.
	RETURN Statement (p. 350)	Stops executing statements at the current point in the DATA step and returns to a predetermined point in the step.
	SELECT Statement (p. 359)	Executes one of several statements or groups of statements.
File-Handling	BY Statement (p. 32)	Controls the operation of a SET, MERGE, MODIFY, or UPDATE statement in the DATA step and sets up special grouping variables.
	CARDS Statement (p. 38)	Specifies that data lines follow.
	CARDS4 Statement (p. 38)	Specifies that data lines that contain semicolons follow.
	DATA Statement (p. 45)	Begins a DATA step and provides names for any output SAS data sets, views, or programs.
	DATALINES Statement (p. 54)	Specifies that data lines follow.
	DATALINES4 Statement (p. 56)	Indicates that data lines that contain semicolons follow.
	FILE Statement (p. 71)	Specifies the current output file for PUT statements.
	INFILE Statement (p. 138)	Specifies an external file to read with an INPUT statement.
	INPUT Statement (p. 169)	Describes the arrangement of values in the input data record and assigns input values to the corresponding SAS variables.

Category	Language Elements	Description
	INPUT Statement, Column (p. 185)	Reads input values from specified columns and assigns them to the corresponding SAS variables.
	INPUT Statement, Formatted (p. 188)	Reads input values with specified informats and assigns them to the corresponding SAS variables.
	INPUT Statement, List (p. 193)	Scans the input data record for input values and assigns them to the corresponding SAS variables.
	INPUT Statement, Named (p. 199)	Reads data values that appear after a variable name that is followed by an equal sign and assigns them to corresponding SAS variables.
	MERGE Statement (p. 268)	Joins observations from two or more SAS data sets into a single observation.
	MODIFY Statement (p. 277)	Replaces, deletes, and appends observations in an existing SAS data set in place but does not create an additional copy.
	PUT Statement (p. 303)	Writes lines to the SAS log, to the Results window, or to an external location that is specified in the most recent FILE statement.
	PUT Statement, Column (p. 321)	Writes variable values in the specified columns in the output line.
	PUT Statement, Formatted (p. 323)	Writes variable values with the specified format in the output line.
	PUT Statement, List (p. 328)	Writes variable values and the specified character strings in the output line.
	PUT Statement, Named (p. 332)	Writes variable values after the variable name and an equal sign.
	SET Statement (p. 362)	Reads an observation from one or more SAS data sets.
	UPDATE Statement (p. 392)	Updates a master file by applying transactions.
Information	ARRAY Statement (p. 18)	Defines the elements of an array.
	Array Reference Statement (p. 23)	Describes the elements in an array to be processed.
	ATTRIB Statement (p. 27)	Associates a format, informat, label, and length with one or more variables.
	DROP Statement (p. 67)	Excludes variables from output SAS data sets.
	FORMAT Statement (p. 121)	Associates formats with variables.
	INFORMAT Statement (p. 166)	Associates informats with variables.

Category	Language Elements	Description
	KEEP Statement (p. 203)	Specifies the variables to include in output SAS data sets.
	LABEL Statement (p. 205)	Assigns descriptive labels to variables.
	LENGTH Statement (p. 209)	Specifies the number of bytes for storing variables.
	RENAME Statement (p. 340)	Specifies new names for variables in output SAS data sets.
	RETAIN Statement (p. 346)	Causes a variable that is created by an INPUT or assignment statement to retain its value from one iteration of the DATA step to the next.

Global Statements by Category

The following table lists and describes SAS global statements, organized by function into seven categories:

Table 2.2 *Global Statements by Category*

Statements Category	Functionality
CAS	statements that run in the CAS server
Data Access	associate reference names with SAS libraries, SAS catalogs, external files and output devices, and access remote files.
Information	give SAS additional information about the program data vector.
Log Control	alter the appearance of the SAS log.
Operating Environment	access the operating environment directly.
Output Control	add titles and footnotes to your SAS output; deliver output in a variety of formats.
Program Control	govern how SAS processes your SAS program.

The following table provides brief descriptions of SAS global statements. For more detailed information, see the individual statements.

Category	Language Elements	Description
CAS	Comment Statement (p. 42)	Specifies the purpose of the statement or program.
	RUN Statement (p. 351)	Executes the previously entered SAS statements.

Category	Language Elements	Description
Control	LOCKDOWN Statement (p. 262)	Secures the Workspace or SAS/CONNECT server by restricting access from within a server process to the host operating environment.
Data Access	CATNAME Statement (p. 38)	Logically combines two or more catalogs into one by associating them with a catref (a shortcut name); clears one or all catrefs; lists the concatenated catalogs in one concatenation or in all concatenations.
	FILENAME Statement (p. 91)	Associates a SAS fileref with an external file or an output device, disassociates a fileref and external file, or lists attributes of external files.
	FILENAME Statement, SFTP Access Method (p. 103)	Enables you to access remote files by using the SFTP protocol.
	FILENAME Statement, URL Access Method (p. 109)	Enables you to access remote files by using the URL access method.
	FILENAME Statement, ZIP Access Method (p. 114)	Enables you to access ZIP files.
	LIBNAME Statement (p. 212)	Associates or disassociates a SAS library with a libref (a shortcut name), clears one or all librefs, lists the characteristics of a SAS library, concatenates SAS libraries, or concatenates SAS catalogs.
	LIBNAME Statement, CVP Engine (p. 229)	Associates a libref for the character variable padding (CVP) engine to expand character variable lengths so that character data truncation does not occur when a file requires transcoding.
	LIBNAME Statement, JMP Engine (p. 233)	Associates a libref with a JMP data table and enables you to read and write JMP data tables.
	LIBNAME Statement, JSON Engine (p. 235)	Associates a SAS libref with a JSON document and ensures that the JSON data and an optional supplied JSON MAP are valid.
	LIBNAME Statement, WebDAV Server Access (p. 251)	Associates a libref with a SAS library and enables access to a WebDAV (Web-based Distributed Authoring And Versioning) server.
Information	MISSING Statement (p. 275)	Assigns characters in your input data to represent special missing values for numeric data.
Log Control	Comment Statement (p. 42)	Specifies the purpose of the statement or program.
	PAGE Statement (p. 303)	Skips to a new page in the SAS log.
	RESETLINE Statement (p. 344)	Restarts the program line numbers in the SAS log to 1.
	SKIP Statement (p. 376)	Creates a blank line in the SAS log.
Operating Environment	SYSTASK Statement (p. 380)	Lists asynchronous tasks.

Category	Language Elements	Description
	WAITFOR Statement (p. 398)	Suspends execution of the current SAS session until the specified tasks finish executing.
	X Statement (p. 406)	Issues an operating-environment command from within a SAS session.
Output Control	FOOTNOTE Statement (p. 118)	Writes up to 10 lines of text at the bottom of the procedure or DATA step output.
	TITLE Statement (p. 383)	Specifies title lines for SAS output.
Program Control	CHECKPOINT EXECUTE_ALWAYS Statement (p. 41)	Indicates to execute the DATA step or PROC step that immediately follows without considering the checkpoint-restart data.
	ENDSAS Statement (p. 69)	Terminates a SAS job or session after the current DATA or PROC step executes.
	%INCLUDE Statement (p. 131)	Brings a SAS programming statement, data lines, or both, into a current SAS program.
	%LIST Statement (p. 258)	Displays lines that are entered in the current session.
	LOCK Statement (p. 260)	Acquires, lists, or releases an exclusive lock on an existing SAS file.
	OPTIONS Statement (p. 299)	Specifies or changes the value of one or more SAS system options.
	RUN Statement (p. 351)	Executes the previously entered SAS statements.
	%RUN Statement (p. 352)	Ends source statements following a %INCLUDE * statement.
	SASFILE Statement (p. 353)	Opens a SAS data set and allocates enough buffers to hold the entire file in memory.
	SYSECHO Statement (p. 379)	Sends a global statement complete event and passes a text string back to the IOM client.

Dictionary

ABORT Statement

Stops executing the current DATA step, SAS job, or SAS session.

Valid in: DATA step

Category: Action

Type: Executable

Restriction: This statement is not valid in the CAS server.

Syntax

ABORT <ABEND | RETURN> <*n*>;

Without Arguments

If you specify no argument, the ABORT statement produces these results under the following methods of operation:

batch mode and noninteractive mode

- stops processing the current DATA step and writes an error message to the SAS log. Data sets can contain an incomplete number of observations or no observations, depending on when SAS encountered the ABORT statement.
- sets the OBS= system option to 0.
- continues limited processing of the remainder of the SAS job, including executing macro statements, executing system options statements, and syntax checking of program statements.
- creates output data sets for subsequent DATA and PROC steps with no observations.

SAS Studio

- stops processing the current DATA step
- creates a data set that contains the observations that are processed before the ABORT statement is encountered
- prints a message to the log that an ABORT statement terminated the DATA step
- continues processing any DATA or PROC steps that follow the ABORT statement

interactive line mode
: stops processing the current DATA step. Any further DATA steps or procedures execute normally.

Arguments

ABEND
: causes abnormal termination of the current SAS job or session. Results depend on the method of operation:

- batch mode and noninteractive mode.
  - stops processing immediately.
  - sends an error message to the SAS log that states that execution was terminated by the ABEND option of the ABORT statement.
  - does not execute any subsequent statements or check syntax.
  - returns control to the operating environment; further action is based on how your operating environment and your site treat jobs that end abnormally.
- SAS Studio and interactive line mode.
  - causes your SAS Studio and interactive line mode to stop processing immediately and return you to your operating environment.

RETURN
causes the immediate normal termination of the current SAS job or session. Results depend on the method of operation:

- batch mode and noninteractive mode
  - stops processing immediately
  - sends an error message to the SAS log stating that execution was terminated by the RETURN option in the ABORT statement
  - does not execute any subsequent statements or check syntax
  - returns control to your operating environment with a condition code indicating an error
- SAS Studio
  - causes your SAS Studio and interactive line mode to stop processing immediately and return you to your operating environment.

n
is an integer value that enables you to specify the value of the exit status code that SAS returns to the shell when it stops executing. The value of *n* can range from 0 to 255. Normally, a return code of 0 is used to indicate that the program ran with no errors. Return codes greater than 0 are used to indicate progressively more serious error conditions. Return codes of 0–6 and those codes that are greater than 977 are reserved for use by SAS.

NOLIST
suppresses the output of all variables to the SAS log.

Requirement NOLIST must be the last option in the ABORT statement.

Details

General Information

The ABORT statement causes SAS to stop processing the current DATA step. What happens next depends on

- the method that you use to submit your SAS statements
- the arguments that you use with ABORT
- your operating environment.

The ABORT statement usually appears in a clause of an IF-THEN statement or a SELECT statement that is designed to stop processing when an error condition occurs.

Note: The return code generated by the ABORT statement is ignored by SAS if the system option ERRORABEND is in effect.

Note: When you execute an ABORT statement in a DATA step, SAS does not use data sets that were created in the step to replace existing data sets with the same name.

Operating Environment Information
The only difference between the ABEND and RETURN options is that with ABEND further action is based on how your operating environment and site treat jobs that end abnormally. RETURN simply returns a condition code that indicates an error.

Comparisons

- When you use SAS Studio or interactive line mode, the ABORT statement and the STOP statement both stop processing. The ABORT statement sets the value of the automatic variable _ERROR_ to 1, and the STOP statement does not.
- In batch or noninteractive mode, the ABORT and STOP statements also have different effects. Both stop processing, but only ABORT sets the value of the automatic variable _ERROR_ to 1. Use the STOP statement, therefore, when you want to stop only the current DATA step and continue processing with the next step.

Example: Stopping Execution of SAS

This example uses the ABORT statement as part of an IF-THEN statement to stop execution of SAS when it encounters a data value that would otherwise cause a division-by-zero condition.

```
if volume=0 then abort 255;
   density=mass/volume;
```

The *n* value causes SAS to return the condition code 255 to the operating environment when the ABORT statement executes.

See Also

- "Determining the Completion Status of a SAS Job in Linux Environments" in *Batch and Line Mode Processing in SAS Viya*

Statements:

- "STOP Statement" on page 377

ARRAY Statement

Defines the elements of an array.

Valid in: DATA step

Categories: CAS
Information

Type: Declarative

Restriction: Variables with a VARCHAR data type are supported when an array is initialized.

Syntax

ARRAY *array-name* { *subscript* } <$> <<VARCHAR (*length* | **)> | *length*> <*array-elements*> <(*initial-value-list*)>;

Arguments

array-name
specifies the name of the array.

Restriction *Array-name* must be a SAS name that is not the name of a SAS variable in the same DATA step.

CAUTION **Using the name of a SAS function as an array name can cause unpredictable results.** If you inadvertently use a function name as the name of the array, SAS treats parenthetical references that involve the name as array references, not function references, for the duration of the DATA step. A warning message is written to the SAS log.

{*subscript*}
describes the number and arrangement of elements in the array by using an asterisk, a number, or a range of numbers. *Subscript* has one of these forms:

{dimension-size(s)}
specifies the number of elements in each dimension of the array. *Dimension-size* is a numeric representation of either the number of elements in a one-dimensional array or the number of elements in each dimension of a multidimensional array.

Tip You can enclose the subscript in braces ({}), brackets ([ ]) or parentheses (( )).

Examples This ARRAY statement defines a one-dimensional array that is named SIMPLE. The SIMPLE array groups together three variables that are named RED, GREEN, and YELLOW:

```
array simple{3} red green yellow;
```

An array with more than one dimension is known as a multidimensional array. You can have any number of dimensions in a multidimensional array. For example, a two-dimensional array provides a row and column arrangement of array elements. SAS places variables into a two-dimensional array by filling all rows in order, beginning at the upper left corner of the array (known as row-major order). This statement defines a two-dimensional array with five rows and three columns:

```
array x{5,3} score1-score15;
```

{<lower :>upper<, ...<lower :> upper>}
are the *lower* and *upper* bounds of each dimension of an array.

Range In most explicit arrays, the subscript in each dimension of the array ranges from 1 to *n*, where *n* is the number of elements in that dimension.

Tips Because 1 is a convenient lower bound for most arrays, you do not need to specify the lower and upper bounds. However, specifying both bounds is useful when the array dimensions have a convenient beginning point other than 1.

To reduce the computational time that is needed for subscript evaluation, specify a lower bound of 0.

Examples In the following example, by default, the value of each dimension is the upper bound of that dimension.

```
array x{5,3} score1-score15;
```

As an alternative, this ARRAY statement is a longhand version of the preceding example:

```
array x{1:5,1:3} score1-score15;
```

{*}
specifies that SAS is to determine the subscript by counting the variables in the array. When you specify the asterisk, also include *array-elements*.

Restriction You cannot use the asterisk with _TEMPORARY_ arrays or when you define a multidimensional array.

$
specifies that the elements in the array are character elements.

Tip The dollar sign is not necessary if the elements have been previously defined as character elements.

VARCHAR
specifies that the preceding variables are character variables of type VARCHAR.

length
specifies the length of elements in the array that have not been previously assigned a length.

Range 1 to 32767 for CHAR variables. 1 to 1 – ((2**31 – 1) / 4) for VARCHAR variables. Can range from 3 to 8 for numeric variables. The minimum length that you can specify for a numeric variable depends on the floating-point format used by your system. Because most systems use the IEEE floating-point format, the minimum is 3 bytes.

**
means to use the maximum length allowed, which is currently 2**31–1.

array-elements
specifies the names of the elements that make up the array. *Array-elements* must be either all numeric or all character, and they can be listed in any order. Here are the elements:

variables
lists variable names.

Range The names must be either variables that you define in the ARRAY statement or variables that SAS creates by concatenating the array name and a number. For example, when the subscript is a number (not the asterisk), you do not need to name each variable in the array. Instead, SAS creates variable names by concatenating the array name and the numbers 1, 2, 3, …*n*.

Restriction If you use _ALL_, all the previously defined variables must be of the same type.

Tips These SAS variable lists enable you to reference variables that have been previously defined in the same DATA step:

NUMERIC specifies all numeric variables.

CHARACTER specifies all character variables.

ALL specifies all variables.

Example "Example 1: Defining Arrays" on page 22

TEMPORARY
creates a list of temporary data elements.

Range Temporary data elements can be numeric or character.

Tips Temporary data elements behave like DATA step variables with these exceptions:

They do not have names. Refer to temporary data elements by the array name and dimension.

They do not appear in the output data set.

You cannot use the special subscript asterisk (*) to refer to all the elements.

Temporary data element values are always automatically retained, rather than being reset to missing at the beginning of the next iteration of the DATA step.

Arrays of temporary elements are useful when the only purpose for creating an array is to perform a calculation. To preserve the result of the calculation, assign it to a variable. You can improve performance time by using temporary data elements.

(*initial-value-list*)
gives initial values for the corresponding elements in the array. The values for elements can be numbers or character strings. You must enclose all character strings in quotation marks. To specify one or more initial values directly, use this format:

(*initial-value(s)*)

To specify an iteration factor and nested sublists for the initial values, use this format:

<*constant-iter-value**> <(>*constant value* | *constant-sublist*<)>>

Restriction If you specify both an *initial-value-list* and *array-elements*, then *array-elements* must be listed before *initial-value-list* in the ARRAY statement.

Tips You can assign initial values to both variables and temporary data elements.

Elements and values are matched by position. If there are more array elements than initial values, the remaining array elements receive missing values and SAS issues a warning.

You can separate the values in the initial value list with either a comma or a blank space.

You can also use a shorthand notation for specifying a range of sequential integers. The increment is always +1.

If you have not previously specified the attributes of the array elements (such as length or type), the attributes of any initial values that you specify are automatically assigned to the corresponding array element. Initial values are retained until a new value is assigned to the array element.

When any (or all) elements are assigned initial values, all elements behave as if they were named in a RETAIN statement.

Example

These examples show how to use the iteration factor and nested sublists. All of these ARRAY statements contain the same initial value list:

```
ARRAY x{10} x1-x10 (10*5);
ARRAY x{10} x1-x10 (5*(5 5));
ARRAY x{10} x1-x10 (5 5 3*(5 5) 5 5);
ARRAY x{10} x1-x10 (2*(5 5) 5 5 2*(5 5));
ARRAY x{10} x1-x10 (2*(5 2*(5 5)));
```

Examples

"Example 2: Assigning Initial Numeric Values" on page 22

"Example 3: Defining Initial Character Values" on page 23

Details

The ARRAY statement defines a set of elements that you plan to process as a group. You refer to elements of the array by the array name and subscript. Because you usually want to process more than one element in an array, arrays are often referenced within DO groups.

Comparisons

- Arrays in the SAS language are different from arrays in many other languages. A SAS array is simply a convenient way of temporarily identifying a group of variables. It is not a data structure, and *array-name* is not a variable.
- An ARRAY statement defines an array. An array reference uses an array element in a program statement.

Examples

Example 1: Defining Arrays

- `array rain {5} janr febr marr aprr mayr;`
- `array days{7} d1-d7;`
- `array month{*} jan feb jul oct nov;`
- `array x{*} _NUMERIC_;`
- `array qbx{10};`
- `array meal{3};`

Example 2: Assigning Initial Numeric Values

- `array test{4} t1 t2 t3 t4 (90 80 70 70);`

- `array test{4} t1-t4 (90 80 2*70);`
- `array test{4} _TEMPORARY_ (90 80 70 70);`

Example 3: Defining Initial Character Values

- `array test2{*} $ a1 a2 a3 ('a','b','c');`

Example 4: Defining More Advanced Arrays

- `array new{2:5} green jacobs denato fetzer;`
- `array x{5,3} score1-score15;`
- `array test{3:4,3:7} test1-test10;`
- `array temp{0:999} _TEMPORARY_;`
- `array x{10} (2*1:5);`

Example 5: Creating a Range of Variable Names That Have Leading Zeros

The following example shows that you can create a range of variable names that have leading zeros. Each variable name has a length of three characters, and the names sort correctly (A01, A02, … A10). Without leading zeros, the variable names would sort in the following order: A1, A10, A2, … A9.

```
data test (drop=i);
   array a{10} A01-A10;
   do i=1 to 10;
      a{i}=i;
   end;
run;
proc print noobs data=test;
run;
```

Output 2.1 *Array Names That Have Leading Zeros*

A01	A02	A03	A04	A05	A06	A07	A08	A09	A10
1	2	3	4	5	6	7	8	9	10

See Also

Statements:

- “Array Reference Statement” on page 23

Array Reference Statement

Describes the elements in an array to be processed.

Valid in: DATA step

Categories: CAS

Information

Type: Declarative

Restriction: Variables with a VARCHAR data type are not supported.

Syntax

array-name {*subscript*};

Arguments

array-name
is the name of an array that was previously defined with an ARRAY statement in the same DATA step.

{*subscript*}
specifies the subscript. Any of these forms can be used:

{variable-1< , …variable-n>}
specifies a variable, or variable list that is usually used with DO-loop processing. For each execution of the DO loop, the current value of this variable becomes the subscript of the array element being processed.

Tip You can enclose a subscript in braces ({ }), brackets ([ ]), or parentheses (( )).

Example "Example 1: Using Iterative DO-Loop Processing" on page 25

{*}
forces SAS to treat the elements in the array as a variable list.

Restriction When you define an array that contains temporary array elements, you cannot reference the array elements with an asterisk.

Tips The asterisk can be used with the INPUT and PUT statements, and with some SAS functions.

This syntax is provided for convenience and is an exception to usual array processing.

Example "Example 4: Using the Asterisk References as a Variable List" on page 26

expression-1< , …expression-n>
specifies a SAS expression.

Range The expression must evaluate to a subscript value when the statement that contains the array reference executes. The expression can also be an integer with a value between the lower and upper bounds of the array, inclusive.

Example "Example 3: Specifying the Subscript" on page 26

Details

- To refer to an array in a program statement, use an array reference. The ARRAY statement that defines the array must appear in the DATA step before any references

to that array. An array definition is only in effect for the duration of the DATA step. If you want to use the same array in several DATA steps, redefine the array in each step.

CAUTION:
Using the name of a SAS function as an array name can cause unpredictable results. If you inadvertently use a function name as the name of the array, SAS treats parenthetical references that involve the name as array references, not function references, for the duration of the DATA step. A warning message is written to the SAS log.

- You can use an array reference anywhere that you can write a SAS expression, including SAS functions and these SAS statements:
  - assignment statement
  - sum statement
  - DO UNTIL(*expression*)
  - DO WHILE(*expression*)
  - IF
  - INPUT
  - PUT
  - SELECT.
- The DIM function is often used with the iterative DO statement to return the number of elements in a dimension of an array, when the lower bound of the dimension is 1. If you use DIM, you can change the number of array elements without changing the upper bound of the DO statement. For example, because DIM(NEW) returns a value of 4, the following statements process all the elements in the array:

```
array new{*} score1-score4;
   do i=1 to dim(new);
      new{i}=new{i}+10;
   end;
```

Comparisons

An ARRAY statement defines an array, whereas an array reference defines the members of the array to process.

Examples

Example 1: Using Iterative DO-Loop Processing

In this example, the statements process each element of the array, using the value of variable I as the subscript on the array references for each iteration of the DO loop. If an array element has a value of 99, the IF-THEN statement changes that value to 100.

```
array days{7} d1-d7;
   do i=1 to 7;
      if days{i}=99 then days{i}=100;
   end;
```

Example 2: Referencing Many Arrays in One Statement

You can refer to more than one array in a single SAS statement. In this example, you create two arrays, DAYS and HOURS. The statements inside the DO loop substitute the current value of variable I to reference each array element in both arrays.

```
array days{7} d1-d7;
   array hours{7} h1-h7;
      do i=1 to 7;
         if days{i}=99 then days{i}=100;
         hours{i}=days{i}*24;
      end;
```

Example 3: Specifying the Subscript

In this example, the INPUT statement reads in variables A1, A2, and the third element (A3) of the array named ARR1:

```
array arr1{*} a1-a3;
x=1;
input a1 a2 arr1{x+2};
```

Example 4: Using the Asterisk References as a Variable List

- ```
  array cost{10} cost1-cost10;
  totcost=sum(of cost {*});
  ```
- ```
  array days{7} d1-d7;
  input days {*};
  ```
- ```
  array hours{7} h1-h7;
  put hours {*};
  ```

See Also

Functions:

- "DIM Function" in *SAS Viya Functions and CALL Routines: Reference*

Statements:

- "ARRAY Statement" on page 18
- "DO Statement, Iterative" on page 60

Assignment Statement

Evaluates an expression and stores the result in a variable.

Valid in: DATA step

Categories: Action
CAS

Type: Executable

Syntax

variable=*expression*;
  ```

Arguments

variable
names a new or existing variable.

Range *variable* can be a variable name, array reference, or SUBSTR function.

Tip Variables that are created by the Assignment statement are not automatically retained.

expression
is any SAS expression.

Tip *expression* can contain the variable that is used on the left side of the equal sign. When a variable appears on both sides of a statement, the original value on the right side is used to evaluate the expression, and the result is stored in the variable on the left side of the equal sign.

Details

Assignment statements evaluate the expression on the right side of the equal sign and store the result in the variable that is specified on the left side of the equal sign.

Example: Various Expressions in Assignment Statements

These assignment statements use different types of expressions:

- `name='Amanda Jones';`
- `WholeName='Ms. '||name;`
- `a=a+b;`

See Also

Statements:

- "Sum Statement" on page 378

ATTRIB Statement

Associates a format, informat, label, and length with one or more variables.

Valid in: DATA step
Category: Information
Type: Declarative
Restriction: This statement is not valid in the CAS server.

Syntax

ATTRIB *variable-list(s) attribute-list(s)* ;

Arguments

variable-list(s)
names the variables that you want to associate with the attributes.

Tip List the variables in any form that SAS allows.

attribute-list(s)
specifies one or more attributes to assign to *variable-list*. Specify one or more of these attributes in the ATTRIB statement:

FORMAT=*format*
associates a format with variables in *variable-list*.

Tip The format can be either a standard SAS format or a format that is defined with the FORMAT procedure.

INFORMAT=*informat*
associates an informat with variables in *variable-list*.

Tip The informat can be either a standard SAS informat or an informat that is defined with the FORMAT procedure.

LABEL='*label*'
associates a label with variables in *variable-list*.

LENGTH=<$>*length*
specifies the length of variables in *variable-list*.

Range	For character variables, the range is 1 to 32,767 bytes for all operating environments.
Restriction	You cannot change the length of a variable using LENGTH= from PROC DATASETS.
Requirement	Put a dollar sign ($) in front of the length of character variables.
Operating environment	The minimum length that you can specify for a numeric variable depends on the floating-point format used by your system. Because most systems use the IEEE floating-point format, the minimum is 3 bytes.
Tip	Use the ATTRIB statement before the SET statement to change the length of variables in an output data set when you use an existing data set as input.

TRANSCODE=YES | NO
specifies whether character variables can be transcoded. Use TRANSCODE=NO to suppress transcoding.

Default	YES
Restrictions	The TRANSCODE=NO attribute is not supported by some SAS Workspace Server clients. In SAS 9.2, if the attribute is not supported, variable values with TRANSCODE=NO are replaced (masked) with asterisks (*). Prior to SAS 9.2, variables with TRANSCODE=NO were transcoded.

Prior releases of SAS cannot access a SAS 9.1 data set that contains a variable with a TRANSCODE=NO attribute.

Transcode suppression is not supported by the V6TAPE engine.

Interactions You can use the "VTRANSCODE Function" in *SAS Viya National Language Support: Reference Guide* and "VTRANSCODEX Function" in *SAS Viya National Language Support: Reference Guide* to return a value that indicates whether transcoding is on or off for a character variable.

If the TRANSCODE= attribute is set to NO for any character variable in a data set, then PROC CONTENTS prints a transcode column that contains the TRANSCODE= value for each variable in the data set. If all variables in the data set are set to the default TRANSCODE= value (YES), then no transcode column prints.

See "Transcoding for NLS" in *SAS Viya National Language Support: Reference Guide*

Details

The Basics

Using the ATTRIB statement in the DATA step permanently associates attributes with variables by changing the descriptor information of the SAS data set that contains the variables.

You can use ATTRIB in a PROC step, but the rules are different.

How SAS Treats Variables When You Assign Informats with the INFORMAT= Option in the ATTRIB Statement

Informats that are associated with variables by using the INFORMAT= option in the ATTRIB statement behave like informats that are used with modified list input. SAS reads the variables by using the scanning feature of list input, but applies the informat. In modified list input, SAS does the following:

- does not use the value of w in an informat to specify column positions or input field widths in an external file
- uses the value of w in an informat to specify the length of previously undefined character variables
- ignores the value of w in numeric informats
- uses the value of d in an informat in the same way it usually does for numeric informats
- treats blanks that are embedded as input data as delimiters unless you change their status with the DLM= or DLMSTR= option specification in an INFILE statement

If you have coded the INPUT statement to use another style of input, such as formatted input or column input, that style of input is not used when you use the INFORMAT= option in the ATTRIB statement.

How SAS Treats Transcoded Variables When You Use the SET and MERGE Statements

When you use the SET or MERGE statement to create a data set from several data sets, SAS makes the TRANSCODE= attribute of the variable in the output data set equal to the TRANSCODE= value of the variable in the first data set. See "Example 2: Using the SET Statement with Transcoded Variables" on page 30 and "Example 3: Using the MERGE Statement with Transcoded Variables" on page 31.

Note: The TRANSCODE= attribute is set when the variable is first seen on an input data set or in an ATTRIB TRANSCODE= statement. If a SET or MERGE statement comes before an ATTRIB TRANSCODE= statement and the TRANSCODE= attribute contradicts the SET statement, a warning occurs.

Comparisons

You can use either an ATTRIB statement or an individual attribute statement such as FORMAT, INFORMAT, LABEL, and LENGTH to change an attribute that is associated with a variable.

Examples

Example 1: Examples of ATTRIB Statements with Varying Numbers of Variables and Attributes

Here are examples of ATTRIB statements that contain different numbers of variables and attributes:

- single variable and single attribute:

```
attrib cost length=4;
```

- single variable with multiple attributes:

```
attrib saleday informat=mmddyy.
format=worddate.;
```

- multiple variables with the same multiple attributes:

```
attrib x y length=$4 label='TEST VARIABLE';
```

- multiple variables with different multiple attributes:

```
attrib x length=$4 label='TEST VARIABLE'
       y length=$2 label='RESPONSE';
```

- variable list with single attribute:

```
attrib month1-month12
       label='MONTHLY SALES';
```

Example 2: Using the SET Statement with Transcoded Variables

In this example, which uses the SET statement, the variable Z's TRANSCODE= attribute in data set A is NO because B is the first data set and Z's TRANSCODE= attribute in data set B is NO.

```
data b;
   length z $4;
   z = 'ice';
   attrib z transcode = no;
data c;
   length z $4;
```

```
   z = 'snow';
   attrib z transcode = yes;
data a;
   set b;
   set c;
   /* Check transcode setting for variable Z */
   rc1 = vtranscode(z);
   put rc1=;
run;
```

Example 3: Using the MERGE Statement with Transcoded Variables

In this example, which uses the MERGE statement, the variable Z's TRANSCODE= attribute in data set A is YES because C is the first data set and Z's TRANSCODE= attribute in data set C is YES.

```
data b;
   length z $4;
   z = 'ice';
   attrib z transcode = no;
data c;
   length z $4;
   z = 'snow';
   attrib z transcode = yes;
data a;
   merge c b;
   /* Check transcode setting for variable Z */
   rc1 = vtranscode(z);
   put rc1=;
run;
```

See Also

- "Numeric Variable Length and Precision in Linux Environments" in *Batch and Line Mode Processing in SAS Viya*

Functions:

- "VTRANSCODE Function" in *SAS Viya National Language Support: Reference Guide*
- "VTRANSCODEX Function" in *SAS Viya National Language Support: Reference Guide*

Statements:

- "FORMAT Statement" on page 121
- "INFORMAT Statement" on page 166
- "LABEL Statement" on page 205
- "LENGTH Statement" on page 209

BY Statement

Controls the operation of a SET, MERGE, MODIFY, or UPDATE statement in the DATA step and sets up special grouping variables.

Valid in: DATA step or PROC step

Categories: CAS
File-Handling

Type: Declarative

Syntax

BY <DESCENDING> *variable-1* <…<DESCENDING> *variable-n*> <NOTSORTED> <GROUPFORMAT>;

Arguments

DESCENDING
specifies that the data sets are sorted in descending order by the variable that is specified. DESCENDING means largest to smallest numerically, or reverse alphabetical for character variables.

Restrictions DESCENDING is not supported in a DATA step that is running in CAS.

You cannot use the DESCENDING option with data sets that are indexed because indexes are always stored in ascending order.

Example "Example 2: Specifying Sort Order" on page 35

GROUPFORMAT
uses the formatted values, instead of the internal values, of the BY variables to determine where BY groups begin and end, and therefore how FIRST.*variable* and LAST.*variable* are assigned. Although the GROUPFORMAT option can appear anywhere in the BY statement, the option applies to *all* variables in the BY statement.

Restrictions You must sort the observations in a data set based on the value of the BY variables before using the GROUPFORMAT option in the BY statement.

You can use the GROUPFORMAT option in a BY statement only in a DATA step.

Interaction If you also use the NOTSORTED option, you can group the observations in a data set by the formatted value of the BY variables without requiring that the data set be sorted or indexed.

Note BY-group processing in the DATA step using the GROUPFORMAT option is the same as BY-group processing with formatted values in SAS procedures.

Tips Using the GROUPFORMAT option is useful when you define your own formats to display data that is grouped.

Using the GROUPFORMAT option in the DATA step ensures that BY groups that you use to create a data set match the BY groups in PROC steps that report grouped, formatted data.

Example "Example 4: Grouping Observations By Using Formatted Values" on page 35

variable

names each variable by which the data set is sorted or indexed. These variables are referred to as BY variables for the current DATA or PROC step.

Requirement If you designate a name literal as the BY variable in BY-group processing and you want to refer to the corresponding FIRST. or LAST. temporary variables, you must include the FIRST. or LAST. portion of the two-level variable name within single quotation marks. For example:

```
data sedanTypes;
   set cars;
   by 'Sedan Types'n;
   if 'first.Sedan Types'n then type=1;
run;
```

Tip The data set can be sorted or indexed by more than one variable.

Examples "Example 1: Specifying One or More BY Variables" on page 35

"Example 2: Specifying Sort Order" on page 35

"Example 3: BY-Group Processing with Nonsorted Data" on page 35

"Example 4: Grouping Observations By Using Formatted Values" on page 35

NOTSORTED

specifies that observations with the same BY value are grouped together but are not necessarily sorted in alphabetical or numeric order.

Restriction You cannot use the NOTSORTED option with the MERGE and UPDATE statements.

Tips The NOTSORTED option can appear anywhere in the BY statement.

Using the NOTSORTED option is useful if you have data that falls into other logical groupings such as chronological order or categories.

Example "Example 3: BY-Group Processing with Nonsorted Data" on page 35

Details

How SAS Identifies the Beginning and End of a BY Group

SAS identifies the beginning and end of a BY group by creating two temporary variables for each BY variable: FIRST.*variable* and LAST.*variable*. The value of these variables is either 0 or 1. SAS sets the value of FIRST.*variable* to 1 when it reads the first observation in a BY group, and sets the value of LAST.*variable* to 1 when it reads the last observation in a BY group. These temporary variables are available for DATA step programming but are not added to the output data set.

In a DATA Step

The BY statement applies only to the SET, MERGE, MODIFY, or UPDATE statement that precedes it in the DATA step, and only one BY statement can accompany each of these statements in a DATA step.

The data sets that are listed in the SET, MERGE, or UPDATE statements must be sorted by the values of the variables that are listed in the BY statement or have an appropriate index. As a default, SAS expects the data sets to be arranged in ascending numeric order or in alphabetical order. The observations can be arranged by one of the following methods:

- sort the data set
- create an index for the variables
- read in the observations in order.

Note: MODIFY does not require sorted data, but sorting can improve performance.

Note: The BY statement honors the linguistic collation of data that is sorted by using the SORT procedure with the SORTSEQ=LINGUISTIC option.

In a PROC Step

You can specify the BY statement with some SAS procedures to modify their action. For more information, see the individual procedure in the *SAS Viya Data Management and Utility Procedures Guide* for a discussion of how the BY statement affects processing for SAS procedures.

With SAS Views

If you create a DATA step view by reading from a DBMS and the SET, MERGE, UPDATE, or MODIFY statement is followed by a BY statement, the BY statement might cause the DBMS to sort the data in order to return the data in sorted order. Sorting the data could increase execution time.

Processing BY Groups

SAS assigns these values to FIRST.*variable* and LAST.*variable*:

- FIRST.*variable* has a value of 1 under the following conditions:
  - when the current observation is the first observation that is read from the data set.
  - when you do not use the GROUPFORMAT option and the internal value of the variable in the current observation differs from the internal value in the previous observation.

    If you use the GROUPFORMAT option, FIRST.*variable* has a value of 1 when the formatted value of the variable in the current observation differs from the formatted value in the previous observation.

  - FIRST.*variable* has a value of 1 for any preceding variable in the BY statement.

    In all other cases, FIRST.*variable* has a value of 0.
- LAST.*variable* has a value of 1 under the following conditions:
  - when the current observation is the last observation that is read from the data set.
  - when you use the GROUPFORMAT option and the internal value of the variable in the current observation differs from the internal value in the next observation.

    If you use the GROUPFORMAT option, LAST.*variable* has a value of 1 when the formatted value of the variable in the current observation differs from the formatted value in the next observation.
  - LAST.*variable* has a value of 1 for any preceding variable in the BY statement.

    In all other cases, LAST.*variable* has a value of 0.

Examples

Example 1: Specifying One or More BY Variables

- Observations are in ascending order of the variable DEPT:

  ```
  by dept;
  ```
- Observations are in alphabetical (ascending) order by CITY and, within each value of CITY, in ascending order by ZIPCODE:

  ```
  by city zipcode;
  ```

Example 2: Specifying Sort Order

Note: DESCENDING is not supported in a DATA step that is running in CAS.

- Observations are in ascending order of SALESREP and, within each SALESREP value, in descending order of the values of JANSALES:

  ```
  by salesrep descending jansales;
  ```
- Observations are in descending order of BEDROOMS, and, within each value of BEDROOMS, in descending order of PRICE:

  ```
  by descending bedrooms descending price;
  ```

Example 3: BY-Group Processing with Nonsorted Data

Observations are ordered by the name of the month in which the expenses were accrued:

```
by month notsorted;
```

Example 4: Grouping Observations By Using Formatted Values

The following example illustrates the use of the GROUPFORMAT option.

```
proc format;
   value range
      low -55 = 'Under 55'
      55-60   = '55 to 60'
      60-65   = '60 to 65'
      65-70   = '65 to 70'
      other   = 'Over 70';
run;
```

```
proc sort data=sashelp.class out=sorted_class;
   by height;
run;
data _null_;
   format height range.;
   set sorted_class;
      by height groupformat;
   if first.height then
      put 'Shortest in ' height 'measures ' height:best12.;
run;
```

SAS writes the following output to the log:

```
Shortest in Under 55 measures 51.3
Shortest in 55 to 60 measures 56.3
Shortest in 60 to 65 measures 62.5
Shortest in 65 to 70 measures 65.3
Shortest in Over 70 measures 72
```

Example 5: Combining Multiple Observations and Grouping Them Based on One BY Value

The following example shows how to use FIRST.*variable* and LAST.*variable* with BY-group processing.

```
data Inventory;
   length RecordID 8 Invoice $ 30 ItemLine $ 50;
   infile datalines;
   input RecordID Invoice ItemLine &;
   drop RecordID;
   datalines;
A74  A5296  Highlighters
A75  A5296  Lot # 7603
A76  A5296  Yellow Blue Green
A77  A5296  24 per box
A78  A5297  Paper Clips
A79  A5297  Lot # 7423
A80  A5297  Small Medium Large
A81  A5298  Gluestick
A82  A5298  Lot # 4422
A83  A5298  New item
A84  A5299  Rubber bands
A85  A5299  Lot # 7892
A86  A5299  Wide width, Narrow width
A87  A5299  1000 per box
;
data combined;
   array Line{4} $ 60 ;
   retain Line1-Line4;
   keep Invoice Line1-Line4;
   set Inventory;
   by Invoice;

   if first.Invoice then do;
      call missing(of Line1-Line4);
      records = 0;
   end;
```

```
   records + 1;
   Line[records]=ItemLine;

   if last.Invoice then output;
run;
proc print data=combined;
   title 'Office Supply Inventory';
run;
```

Output 2.2 *Output from Combining Multiple Observations*

Office Supply Inventory

Obs	Line1	Line2	Line3	Line4	Invoice
1	Highlighters	Lot # 7603	Yellow Blue Green	24 per box	A5296
2	Paper Clips	Lot # 7423	Small Medium Large		A5297
3	Gluestick	Lot # 4422	New item		A5298
4	Rubber bands	Lot # 7892	Wide width, Narrow width	1000 per box	A5299

See Also

Statements:

- "MERGE Statement" on page 268
- "MODIFY Statement" on page 277
- "SET Statement" on page 362
- "UPDATE Statement" on page 392

CALL Statement

Invokes a SAS CALL routine.

Valid in: DATA step

Categories: Action
CAS

Type: Executable

Syntax

CALL *routine*(*parameter-1* <, …*parameter-n*>);

Arguments

routine
specifies the name of the SAS CALL routine that you want to invoke.

See For information about available routines, see *SAS Viya Functions and CALL Routines: Reference*

(*parameter*)
is a piece of information to be passed to or returned from the routine.

Requirement Enclose this information, which depends on the specific routine, in parentheses.

Tip You can specify additional parameters, separated by commas.

Details

SAS CALL routines can assign variable values and perform other system functions.

See Also

SAS Viya Functions and CALL Routines: Reference

CARDS Statement

Specifies that data lines follow.

Valid in: DATA step
Category: File-Handling
Type: Declarative
Alias: DATALINES, LINES
Restriction: This statement is not valid in the CAS server.
See: "DATALINES Statement" on page 54

CARDS4 Statement

Specifies that data lines that contain semicolons follow.

Valid in: DATA step
Category: File-Handling
Type: Declarative
Alias: DATALINES4, LINES4
Restriction: This statement is not valid in the CAS server.
See: "DATALINES4 Statement" on page 56

CATNAME Statement

Logically combines two or more catalogs into one by associating them with a catref (a shortcut name); clears one or all catrefs; lists the concatenated catalogs in one concatenation or in all concatenations.

Valid in: Anywhere

Category: Data Access

Restriction: This statement is not valid in the CAS server.

Syntax

CATNAME <*libref.*> *catref*
< (*libref-1.catalog-1* <(ACCESS=READONLY)>
<…*libref-n.catalog–n* <(ACCESS=READONLY)>>)>;

CATNAME <*libref.*> *catref* CLEAR | _ALL_ CLEAR;

CATNAME <*libref.*> *catref* LIST | _ALL_ LIST;

Arguments

libref
is any previously assigned SAS libref. If you do not specify a libref, SAS concatenates the catalog in the Work library, using the catref that you specify.

Restriction The libref must have been previously assigned.

catref
is a unique catalog reference name for a catalog or a catalog concatenation that is specified in the statement. Separate the catref from the libref with a period, as in *libref.catref*. Any SAS name can be used for this catref.

catalog
is the name of a catalog that is available for use in the catalog concatenation.

Options

CLEAR
disassociates a currently assigned *catref* or *libref.catref*.

Tip Specify a specific *catref* or *libref.catref* to disassociate it from a single concatenation. Specify _ALL_ CLEAR to disassociate all currently assigned *catref* or *libref.catref* concatenations.

ALL CLEAR
disassociates all currently assigned *catref* or *libref.catref* concatenations.

LIST
writes the catalog names that are included in the specified concatenation to the SAS log.

Tip Specify *catref* or *libref.catref* to list the attributes of a single concatenation. Specify _ALL_ to list the attributes of all catalog concatenations in your current session.

ALL LIST
writes all catalog names that are included in any current catalog concatenation to the SAS log.

ACCESS=READONLY
assigns a read-only attribute to the catalog. SAS allows users to read from the catalog entries but not to update information or to write new information.

Details

Why Use CATNAME?

CATNAME is useful because it enables you to access entries in multiple catalogs by specifying a single catalog reference name (*libref.catref* or *catref*). After you create a catalog concatenation, you can specify the catref in any context that accepts a simple (non-concatenated) catref.

Rules for Catalog Concatenation

To use catalog concatenation effectively, you must understand the rules that determine how catalog entries are located among the concatenated catalogs:

- When a catalog entry is opened for input or update, the concatenated catalogs are searched and the first occurrence of the specified entry is used.
- When a catalog entry is opened for output, it is created in the first catalog that is listed in the concatenation.

  Note: A new catalog entry is created in the first catalog even if there is an entry with the same name in another part of the concatenation.

  Note: If the first catalog in a concatenation that is opened for update does not exist, the item is written to the next catalog that exists in the concatenation.
- When you want to delete or rename a catalog entry, only the first occurrence of the entry is affected.
- Anytime a list of catalog entries is displayed, only one occurrence of a catalog entry name is shown.

  Note: Even if the name occurs multiple times in the concatenation, only the first occurrence is shown.

Comparisons

- The CATNAME statement is like a LIBNAME statement for catalogs. The LIBNAME statement enables you to assign a shortcut name to a SAS library so that you can use the shortcut name to find the files and use the data that they contain. CATNAME enables you to assign a short name <*libref.*>*catref* (libref is optional) to one or more catalogs so that SAS can find the catalogs and use all or some of the entries in each catalog.
- The CATNAME statement *explicitly* concatenates SAS catalogs. You can use the LIBNAME statement to *implicitly* concatenate SAS catalogs.

Examples

Example 1: Assigning and Using a Catalog Concatenation

You might need to access entries in several SAS catalogs. The most efficient way to access the information is to logically concatenate the catalogs. Catalog concatenation enables access to the information without actually creating a new, separate, and possibly very large catalog.

Assign librefs to the SAS libraries that contain the catalogs that you want to concatenate:

```
libname mylib1 'data-library-1';
libname mylib2 'data-library-2';
```

Assign a catref, which can be any valid SAS name, to the list of catalogs that you want to logically concatenate:

```
catname allcats (mylib1.catalog1 mylib2.catalog2);
```

The SAS log displays this message:

Log 2.1 *Log Output from CATNAME Statement*

```
NOTE: Catalog concatenation WORK.ALLCATS has been created.
```

Because no libref is specified, the libref is Work by default. When you want to access a catalog entry in either of these catalogs, use the libref Work and the catalog reference name ALLCATS instead of the original librefs and catalog names. For example, to access a catalog entry named APPKEYS.KEYS in the catalog MYLIB1.CATALOG1, specify

```
work.allcats.appkeys.keys
```

Example 2: Creating a Nested Catalog Concatenation

After you create a concatenated catalog, you can use CATNAME to combine your concatenation with other single catalogs or other concatenated catalogs. Nested catalog concatenation is useful, because you can use a single catref to access many different catalog combinations.

```
libname local 'my_dir';
libname main  'public_dir';
catname private_catalog (local.my_application_code
                         local.my_frames
                         local.my_formats);
catname combined_catalogs (private_catalog
                         main.public_catalog);
```

In the above example, you could work on private copies of your application entries by using PRIVATE_CATALOG. If you want to see how your entries function when they are combined with the public version of the application, you can use COMBINED_CATALOGS.

See Also

Statements:

- “FILENAME Statement” on page 91
- “LIBNAME Statement” on page 212 for a discussion of implicitly concatenating SAS catalogs

CHECKPOINT EXECUTE_ALWAYS Statement

Indicates to execute the DATA step or PROC step that immediately follows without considering the checkpoint-restart data.

Valid in: Anywhere

Category: Program Control

Restriction: This statement is not valid in the CAS server.

Syntax

CHECKPOINT EXECUTE_ALWAYS;

Without Arguments

The CHECKPOINT EXECUTE_ALWAYS statement indicates to SAS that the DATA step or PROC step that immediately follows is to be executed without considering the checkpoint data.

Details

If checkpoint-restart mode is enabled and a batch program terminates without completing, the program can be rerun beginning with the DATA step or PROC step that was executing when it terminated. DATA or PROC steps that completed before the batch program terminated are not reexecuted. If a DATA step or a PROC step must be reexecuted, you can add the CHECKPOINT EXECUTE_ALWAYS statement before the step. Using the CHECKPOINT EXECUTE_ALWAYS statement ensures that SAS always executes the step without regard to the checkpoint-restart data.

See Also

System Options:

- "STEPCHKPT System Option" in *SAS Viya System Options: Reference*
- "STEPCHKPTLIB= System Option" in *SAS Viya System Options: Reference*
- "STEPRESTART System Option" in *SAS Viya System Options: Reference*

Comment Statement

Specifies the purpose of the statement or program.

Valid in: Anywhere

Categories: CAS
Log Control

Syntax

**message*;

or

*/*message*/*

Arguments

****message*;**
specifies the text that explains or documents the statement or program.

Range These comments can be any length and are terminated with a semicolon.

Restrictions	These comments must be written as separate statements.
	These comments cannot contain internal semicolons.
	A macro statement or macro variable reference that is contained inside this form of comment is processed by the SAS macro facility. This form of comment cannot be used to hide text from the SAS macro facility.
Tip	When using comments within a macro definition or to hide text from the SAS macro facility, use this style comment: `/* message */`

/**message****/**
specifies the text that explains or documents the statement or program.

Range	These comments can be any length.
Restriction	This type of comment cannot be nested.
Tips	These comments can contain semicolons and unmatched quotation marks.
	You can write these comments within statements or anywhere a single blank can appear in your SAS code.

Details

You can use the comment statement anywhere in a SAS program to document the purpose of the program, explain unusual segments of the program, or describe steps in a complex program or calculation. SAS ignores text in comment statements during processing.

CAUTION:
Avoid placing the /* comment symbols in columns 1 and 2. In some operating environments, SAS might interpret a /* in columns 1 and 2 as a request to end the SAS program or session.

Note: You can add these lines to your code to fix unmatched comment tags, unmatched quotation marks, and missing semicolons.

```
/* '; * "; */;
quit;
run;
```

Example: Using the Comment Statement

These examples illustrate the two types of comments:

- This example uses the **message*; format:

```
*This code finds the number in the BY group;
```

- This example uses the **message*; format:

```
*--------------------------------------*
|  This uses one comment statement     |
|          to draw a box.              |
*--------------------------------------*;
```

- This example uses the /*message*/ format:

```
input @1 name $20.  /* last name    */
      @200 test 8.  /* score test   */
      @50 age 3.;   /* customer age */
```

- This example uses the /*message*/ format:

```
/* For example 1 use: x=abc;
   for example 2 use: y=ghi; */
```

CONTINUE Statement

Stops processing the current DO-loop iteration and resumes processing the next iteration.

Valid in: DATA step

Categories: CAS
Control

Type: Executable

Restriction: Can be used only in a DO loop

Syntax

CONTINUE;

Without Arguments

The CONTINUE statement has no arguments. It stops processing statements within the current DO-loop iteration based on a condition. Processing resumes with the next iteration of the DO loop.

Comparisons

- The CONTINUE statement stops the processing of the current iteration of a loop and resumes with the next iteration; the LEAVE statement causes processing of the current loop to end.
- You can use the CONTINUE statement only in a DO loop; you can use the LEAVE statement in a DO loop or a SELECT group.

Example: Preventing Other Statements from Executing

This DATA step creates a report of benefits for new full-time employees. If an employee's status is PT (part-time), the CONTINUE statement prevents the second INPUT statement and the OUTPUT statement from executing.

```
data new_emp;
   drop i;
   do i=1 to 5;
      input name $ idno status $;
         /* return to top of loop  */
         /* when condition is true */
      if status='PT' then continue;
         input benefits $10.;
         output;
```

```
   end;
   datalines;
Jones 9011 PT
Thomas 876 PT
Richards 1002 FT
Eye/Dental
Kelly 85111 PT
Smith 433 FT
HMO
;
```

See Also

Statements:

- "DO Statement, Iterative" on page 60
- "LEAVE Statement" on page 208

DATA Statement

Begins a DATA step and provides names for any output SAS data sets, views, or programs.

Valid in: DATA step

Categories: CAS
File-Handling

Type: Declarative

Syntax

Form 1: **DATA** <*data-set-name-1* <(*data-set-options-1*)> >
<…*data-set-name-n* <(*data-set-options-n*)> >
</ <DEBUG> <NESTING> <STACK = *stack-size*> > <NOLIST>;

Form 2: **DATA** _NULL_ </ <DEBUG> <NESTING> <STACK = *stack-size*> > <NOLIST>;

Form 3: **DATA** *view-name* <*data-set-name-1* <(*data-set-options-1*)> >
<…*data-set-name-n* <(*data-set-options-n*)> > /
VIEW=*view-name* <(<*password-option*> <SOURCE=*source-option*>)>
<NESTING> <NOLIST>;

Form 4: **DATA** *data-set-name* / PGM=*program-name* <(<*password-option*>
<SOURCE=*source-option*>)> <NESTING> <NOLIST>;

Form 5: **DATA** VIEW=*view-name* <(*password-option*)> <NOLIST>;
DESCRIBE;

Form 6: **DATA** PGM=*program-name* <(*password-option*)> <NOLIST>;
<DESCRIBE;>
<REDIRECT INPUT | OUTPUT *old-name-1* = *new-name-1*
<… *old-name-n* = *new-name-n*> ;>
<EXECUTE;>

Form 7: **DATA** <*data-set-name-1* <(*data-set-options-1*)> >
<…*data-set-name-n* <(*data-set-options-n*)> >

/< <SESSREF=*cas-session-reference-name*> | <SESSUUID=*cas-session-uuid*> >
<THREADS=*number-of-threads*> <SINGLE= NO | YES | NOINPUT>
<NESTING> <STACK = *stack-size*> <NOLIST>;

Form 8: **DATA** _NULL_
/< <SESSREF=*cas-session-reference-name*> | <SESSUUID=*cas-session-uuid*> >
<THREADS=*number-of-threads*> <SINGLE= NO | YES | NOINPUT>
<NESTING> <STACK = *stack-size*> <NOLIST>;

Without Arguments

If you omit the arguments, the DATA step automatically names each successive data set that you create as DATA*n*, where *n* is the smallest integer that makes the name unique.

Arguments

data-set-name

names the SAS data file or DATA step view that the DATA step creates. To create a DATA step view, you must specify at least one *data-set-name* and that *data-set-name* must match *view-name*.

Restriction *data-set-name* must conform to the rules for SAS names, and additional restrictions might be imposed by your operating environment.

Tips Instead of using a data set name, you can specify the physical pathname to the file, using syntax that your operating system understands. The pathname must be enclosed in single or double quotation marks.

You can execute a DATA step without creating a SAS data set. See "Example 5: Creating a Custom Report" on page 53. For more information, see "When Not Creating a Data Set (Form 2) " on page 50.

(*data-set-options*)

specifies optional arguments that the DATA step applies when it writes observations to the output data set.

See *SAS Viya Data Set Options: Reference* for a definition and list of data set options.

Example "Example 1: Creating Multiple Data Files and Using Data Set Options" on page 52

/ DEBUG

enables you to debug your program interactively by helping identify logic errors, and sometimes data errors.

Restriction This argument is not supported in the CAS server.

/ NESTING

specifies that a note is printed to the SAS log for the beginning and end of each DO-END and SELECT-END nesting level. This option enables you to debug mismatched DO-END and SELECT-END statements and is particularly useful in large programs where the nesting level is not obvious.

/ STACK=*stack-size*

specifies the maximum number of nested LINK statements.

NULL
specifies that SAS does not create a data set when it executes the DATA step.

VIEW=*view-name*
names a view that the DATA step uses to store the input DATA step view.

Restrictions This argument is not supported in the CAS server.

Variables with a VARCHAR data type are not supported.

view-name must match one of the data set names.

SAS creates only one view in a DATA step.

Tips If you specify additional data sets in the DATA statement, SAS creates these data sets when the view is processed in a subsequent DATA or PROC step. Views have the capability of generating other data sets when the view is executed.

SAS macro variables resolve when the view is created. Use the SYMGET function to delay macro variable resolution until the view is processed.

Examples "Example 2: Creating Input DATA Step Views" on page 52

"Example 3: Creating a View and a Data File" on page 52

password-option
assigns a password to a stored compiled DATA step program or a DATA step view.

Note: To DESCRIBE a password-protected DATA step program, you must specify its password. If the program has more than one password, you must specify the most restrictive password. ALTER is the most restrictive, and READ is the least restrictive. For more information, see "DESCRIBE Statement" on page 58.

The following password options are available:

ALTER=*alter-password*
assigns an ALTER password to a SAS data file. The password enables you to protect or replace a stored compiled DATA step program or a DATA step view.

Alias PROTECT=

Requirements If you use an ALTER password in creating a stored compiled DATA step program or a DATA step view, an ALTER password is required to replace the program or view.

If you use an ALTER password in creating a stored compiled DATA step program or a DATA step view, an ALTER password is required to execute a DESCRIBE statement.

READ=*read-password*
assigns a READ password to a SAS data file. The password enables you to read or execute a stored compiled DATA step program or a DATA step view.

Alias EXECUTE=

Requirements If you use a READ password in creating a stored compiled DATA step program or a DATA step view, a READ password is required to execute the program or view.

If you use a READ password in creating a stored compiled DATA step program or a DATA step view, a READ password is required to execute DESCRIBE and EXECUTE statements. If you use an invalid password, SAS executes the DESCRIBE statement.

Tip If you use a READ password in creating a stored compiled DATA step program or a DATA step view, no password is required to replace the program or view.

PW=*password*
assigns a READ and ALTER password, both having the same value.

SOURCE=*source-option*
specifies one of the following source options:

SAVE
saves the source code that created a stored compiled DATA step program or a DATA step view.

ENCRYPT
encrypts and saves the source code that created a stored compiled DATA step program or a DATA step view.

Tip If you encrypt source code, use the ALTER password option as well. SAS issues a warning message if you do not use ALTER.

NOSAVE
does not save the source code.

CAUTION:
If you use the NOSAVE option for a DATA step view, the view cannot be migrated or copied from one version of SAS to another version.

Default SAVE

PGM=*program-name*
names the stored compiled program that SAS creates or executes in the DATA step. To create a stored compiled program, specify a slash (/) before the PGM= option. To execute a stored compiled program, specify the PGM= option without a slash (/).

Restriction This argument is not supported in the CAS server.

Tip SAS macro variables resolve when the stored program is created. Use the SYMGET function to delay macro variable resolution until the view is processed.

Example "Example 4: Storing and Executing a Compiled Program" on page 52

SESSREF=*cas-session-reference-name*
associates a DATA step with a CAS session. The value for the SESSREF= option represents the current active session.

Interaction If the DSACCEL system option is set to NONE, then either the SESSREF= or SESSUUID= option is required to run the DATA step in CAS.

SESSUUID=*cas-session-uuid*
specifies the CAS session where the DATA step runs. The *cas-session-uuid* is the universally unique identifier (UUID) that is associated with a CAS session. One way to create a session and retrieve the UUID for the session is with the CAS statement or LIBNAME statement.

Interaction If the DSACCEL system option is set to NONE, then either the SESSREF= or SESSUUID= option is required to run the DATA step in CAS.

Tip One way to create a session and retrieve the UUID for the session is with the CAS statement or LIBNAME statement.

SINGLE=NO | YES | NOINPUT
specifies whether to run the DATA step in a single thread.

NO
runs the DATA step program in all threads. If there are 4 workers and each worker supports 32 threads, the DATA step program runs in 128 threads. This is the default.

YES
runs the DATA step program in a single thread. If there are 4 workers and each worker supports 32 threads, the DATA step program runs in 1 thread. When table I/O occurs, all of the rows are moved to this single thread. It is not recommended to process large amounts of data in a single thread.

NOINPUT
runs the DATA step program in a single thread only when there are no input tables. This mode is useful when writing a DATA step that generates only output data to a table.

THREADS=*number-of-threads*
specifies the number of threads to use to run the DATA step in CAS.

Requirement This number must be greater than or equal to zero. A value of zero means to run using the maximum number of threads allowed.

NOLIST
suppresses the output of all variables to the SAS log when the value of _ERROR_ is 1.

Restriction NOLIST must be the last option in the DATA statement.

Details

Using the DATA Statement

The DATA step begins with the DATA statement. You use the DATA statement to create the following types of output: SAS data sets, data views, and stored programs. You can specify more than one output in a DATA statement. However, only one of the outputs can be a data view. You create a view by specifying the VIEW= option on page 47 and a stored program by specifying the PGM= option on page 48.

Using Both a READ and an ALTER Password

If you use both a READ and an ALTER password in creating a stored compiled DATA step program or a DATA step view, the following items apply:

- A READ or ALTER password is required to execute the stored compiled DATA step program or DATA step view.
- A READ or ALTER password is required if the stored compiled DATA step program or DATA step view contains both DESCRIBE and EXECUTE statements.
  - If you use an ALTER password with the DESCRIBE and EXECUTE statements, the following items apply:
    - SAS executes both the DESCRIBE and the EXECUTE statements.
    - If you execute a stored compiled DATA step program or DATA step view with an invalid ALTER password:

      The DESCRIBE statement does not execute.

      In batch mode, the EXECUTE statement has no effect.

      In interactive mode, SAS prompts you for a READ password. If the READ password is valid, SAS processes the EXECUTE statement. If it is invalid, SAS does not process the EXECUTE statement.
  - If you use a READ password with the DESCRIBE and EXECUTE statements, the following items apply:
    - In interactive mode, SAS prompts you for the ALTER password:

      If you enter a valid ALTER password, SAS executes both the DESCRIBE and the EXECUTE statements.

      If you enter an invalid ALTER password, SAS processes the EXECUTE statement but not the DESCRIBE statement.
    - In batch mode, SAS processes the EXECUTE statement but not the DESCRIBE statement.
    - In both interactive and batch modes, if you specify an invalid READ password SAS does not process the EXECUTE statement.
- An ALTER password is required if the stored compiled DATA step program or DATA step view contains a DESCRIBE statement.
- An ALTER password is required to replace the stored compiled DATA step program or DATA step view.

Creating an Output Data Set (Form 1)

Use the DATA statement to create one or more output data sets. You can use data set options to customize the output data set. The following DATA step creates two output data sets, EXAMPLE1 and EXAMPLE2. It uses the data set option DROP to prevent the variable IDNUMBER from being written to the EXAMPLE2 data set.

```
data example1 example2 (drop=IDnumber);
   set sample;
   . . .more SAS statements. . .
run;
```

When Not Creating a Data Set (Form 2)

Usually, the DATA statement specifies at least one data set name that SAS uses to create an output data set. However, when the purpose of a DATA step is to write a report or to write data to an external file, you might not want to create an output data set. Using the

keyword _NULL_ as the data set name causes SAS to execute the DATA step without writing observations to a data set. This example writes to the SAS log the value of Name for each observation. SAS does not create an output data set.

```
data _NULL_;
   set sample;
   put Name ID;
run;
```

Creating a DATA Step View (Form 3)

You can create DATA step views and execute them at a later time. The following DATA step example creates a DATA step view. It uses the SOURCE=ENCRYPT option to both save and encrypt the source code.

```
data phone_list / view=phone_list (source=encrypt);
   set customer_list;
   . . .more SAS statements. . .
run;
```

Creating a Stored Compiled DATA Step Program (Form 4)

The ability to compile and store DATA step programs enables you to execute the stored programs later. Stored compiled DATA step programs can reduce processing costs by eliminating the need to compile DATA step programs repeatedly. The following DATA step example compiles and stores a DATA step program. It uses the ALTER password option, which allows the user to replace an existing stored program, and to protect the stored compiled program from being replaced.

```
data testfile / pgm=stored.test_program (alter=sales);
   set sales_data;
   . . .more SAS statements. . .
run;
```

Describing a DATA Step View (Form 5)

The following example uses the DESCRIBE statement in a DATA step view to write a copy of the source code to the SAS log.

```
data view=inventory;
   describe;
run;
```

For more information, see the "DESCRIBE Statement" on page 58.

Executing a Stored Compiled DATA Step Program (Form 6)

The following example executes a stored compiled DATA step program. It uses the DESCRIBE statement to write a copy of the source code to the SAS log.

```
libname stored 'SAS library';
data pgm=stored.employee_list;
   describe;
   execute;
run;
```

```
libname stored 'SAS library';
data pgm=stored.test_program;
   describe;
   execute;
   . . .more SAS statements. . .
```

```
   run;
```

For information , see the "DESCRIBE Statement" on page 58 and the "EXECUTE Statement" on page 71.

Examples

Example 1: Creating Multiple Data Files and Using Data Set Options

This DATA statement creates more than one data set, and it changes the contents of the output data sets:

```
data error (keep=subject date weight)
     fitness(label='Exercise Study'
             rename=(weight=pounds));
```

The ERROR data set contains three variables. SAS assigns a label to the FITNESS data set and renames the variable *weight* to *pounds*.

Example 2: Creating Input DATA Step Views

This DATA step creates an input DATA step view instead of a SAS data file:

```
libname ourlib 'SAS-library';
data ourlib.test / view=ourlib.test;
   set ourlib.fittest;
   tot=sum(of score1-score10);
run;
```

Example 3: Creating a View and a Data File

This DATA step creates an input DATA step view named THEIRLIB.TEST and an additional temporary SAS data set named SCORETOT:

```
libname ourlib 'SAS-library-1';
libname theirlib 'SAS-library-2';
data theirlib.test scoretot
   / view=theirlib.test;
   set ourlib.fittest;
   tot=sum(of score1-score10);
run;
```

SAS does not create the data file SCORETOT until a subsequent DATA or PROC step processes the view THEIRLIB.TEST.

Example 4: Storing and Executing a Compiled Program

The first DATA step produces a stored compiled program named STORED.SALESFIG:

```
libname in 'SAS-library-1 ';
libname stored 'SAS-library-2 ';
data salesdata / pgm=stored.salesfig;
   set in.sales;
   qtr1tot=jan+feb+mar;
run;
```

SAS creates the data set SALESDATA when it executes the stored compiled program STORED.SALESFIG.

```
data pgm=stored.salesfig;
run;
```

Example 5: Creating a Custom Report

The second DATA step in this program produces a custom report and uses the _NULL_ keyword to execute the DATA step without creating a SAS data set:

```
data sales;
   input dept : $10. jan feb mar;
   datalines;
shoes 4344 3555 2666
housewares 3777 4888 7999
appliances 53111 7122 41333
;
data _null_;
   set sales;
   qtr1tot=jan+feb+mar;
   put 'Total Quarterly Sales: '
       qtr1tot dollar12.;
run;
```

Example 6: Using a Password with a Stored Compiled DATA Step Program

The first DATA step creates a stored compiled DATA step program called STORED.ITEMS. This program includes the ALTER password, which limits access to the program.

```
   data sample;
      input Name $ TotalItems $;
      datalines;
   Lin 328
   Susan 433
   Ken 156
   Pat 340
   ;
   proc print data=sample;
   run;

   libname stored 'SAS-library';

   data employees / pgm=stored.items (alter=klondike);
      set sample;
      if TotalItems > 200 then output;
      run;
```

This DATA step executes the stored compiled DATA step program STORED.ITEMS. It uses the DESCRIBE statement to print the source code to the SAS log. Because the program was created with the ALTER password, you must use the password if you use the DESCRIBE statement. If you do not enter the password, SAS prompts you for it.

```
   data pgm=stored.items (alter=klondike);
      describe;
      execute;
   run;
```

Example 7: Displaying Nesting Levels

The following program has two nesting levels. SAS generates four log messages, one begin and end message for each nesting level.

```
   data _null_ /nesting;
      do i = 1 to 10;
```

```
        do j = 1 to 5;
           put i= j=;
        end;
     end;
  run;
```

Log 2.2 *Nesting Level Debug (partial SAS log)*

```
6    data _null_ /nesting;
7       do i = 1 to 10;
           -
           719
NOTE 719-185: *** DO begin level 1 ***.
8          do j = 1 to 5;
              -
              719
NOTE 719-185: *** DO begin level 2 ***.
9             put i= j=;
10         end;
           ---
           720
NOTE 720-185: *** DO end level 2 ***.
11      end;
        ---
        720
NOTE 720-185: *** DO end level 1 ***.
12   run;
```

See Also

- "DATA Step Programming in Hadoop" in *SAS In-Database Products: User's Guide*
- "DATA Step Programming in SAS LASR Analytic Server" in *SAS LASR Analytic Server: Reference Guide*
- "Definition of Data Set Options" in *SAS Viya Data Set Options: Reference*

Statements:

- "DESCRIBE Statement" on page 58
- "EXECUTE Statement" on page 71
- "LINK Statement" on page 255

DATALINES Statement

Specifies that data lines follow.

Valid in: DATA step

Category: File-Handling

Type: Declarative

Alias: CARDS, LINES

Restriction: This statement is not valid in the CAS server.

See: Data lines cannot contain semicolons. Use the "DATALINES4 Statement" on page 56 when your data contain semicolons.

Syntax

DATALINES;

Without Arguments

Use the DATALINES statement with an INPUT statement to read data that you enter directly in the program, rather than data stored in an external file.

Details

Using the DATALINES Statement

The DATALINES statement is the last statement in the DATA step and immediately precedes the first data line. Use a null statement (a single semicolon) to indicate the end of the input data.

You can use only one DATALINES statement in a DATA step. Use separate DATA steps to enter multiple sets of data.

Reading Long Data Lines

SAS handles data line length with the CARDIMAGE system option. If you use CARDIMAGE, SAS processes data lines exactly like 80–byte punched card images padded with blanks. If you use NOCARDIMAGE, SAS processes data lines longer than 80 columns in their entirety.

Using Input Options with In-stream Data

The DATALINES statement does not provide input options for reading data. However, you can access some options by using the DATALINES statement in conjunction with an INFILE statement. Specify DATALINES in the INFILE statement to indicate the source of the data and then use the options that you need. For more information, see "Example 2: Reading In-stream Data with Options" on page 56.

Comparisons

- Use the DATALINES statement whenever data do not contain semicolons. If your data contain semicolons, use the DATALINES4 statement.
- The following SAS statements also read data or point to a location where data are stored:
  - The INFILE statement points to raw data lines stored in another file. The INPUT statement reads those data lines.
  - The %INCLUDE statement brings SAS program statements or data lines stored in SAS files or external files into the current program.
  - The SET, MERGE, MODIFY, and UPDATE statements read observations from existing SAS data sets.

Examples

Example 1: Using the DATALINES Statement

In this example, SAS reads a data line and assigns values to two character variables, NAME and DEPT, for each observation in the DATA step:

```
data person;
```

```
   input name $ dept $;
   datalines;
John Sales
Mary Acctng
;
```

Example 2: Reading In-stream Data with Options

This example takes advantage of options available with the INFILE statement to read in-stream data lines. With the DELIMITER= option, you can use list input to read data values that are delimited by commas instead of blanks.

```
data person;
   infile datalines delimiter=',';
   input name $ dept $;
   datalines;
John,Sales
Mary,Acctng
;
```

See Also

Statements:

- "DATALINES4 Statement" on page 56
- "INFILE Statement" on page 138

System Options:

- "CARDIMAGE System Option" in *SAS Viya System Options: Reference*

DATALINES4 Statement

Indicates that data lines that contain semicolons follow.

Valid in: DATA step

Category: File-Handling

Type: Declarative

Alias: CARDS4, LINES4

Restriction: This statement is not valid in the CAS server.

Syntax

DATALINES4;

Without Arguments

Use the DATALINES4 statement together with an INPUT statement to read data that contain semicolons that you enter directly in the program.

Details

The DATALINES4 statement is the last statement in the DATA step and immediately precedes the first data line. Follow the data lines with four consecutive semicolons that are located in columns 1 through 4.

Comparisons

Use the DATALINES4 statement when data contain semicolons. If your data do not contain semicolons, use the DATALINES statement.

Example: Reading Data Lines That Contain Semicolons

In this example, SAS reads data lines that contain internal semicolons until it encounters a line of four semicolons. Execution continues with the rest of the program.

```
data biblio;
   input number citation $50.;
   datalines4;
  KIRK, 1988
2  LIN ET AL., 1995; BRADY, 1993
3  BERG, 1990; ROA, 1994; WILLIAMS, 1992
;;;;
```

See Also

Statements:

- "DATALINES Statement" on page 54

DELETE Statement

Stops processing the current observation.

Valid in: DATA step

Categories: Action
CAS

Type: Executable

Syntax

DELETE;

Without Arguments

When DELETE executes, the current observation is not written to a data set, and SAS returns immediately to the beginning of the DATA step for the next iteration.

Details

The DELETE statement is often used in a THEN clause of an IF-THEN statement or as part of a conditionally executed DO group.

Comparisons

- Use the DELETE statement when it is easier to specify a condition that excludes observations from the data set or when there is no need to continue processing the DATA step statements for the current observation.
- Use the subsetting IF statement when it is easier to specify a condition for including observations.
- Do not confuse the DROP statement with the DELETE statement. The DROP statement excludes variables from an output data set; the DELETE statement excludes observations.

Examples

Example 1: Using the DELETE Statement as Part of an IF-THEN Statement

When the value of LEAFWT is missing, the current observation is deleted:

```
if leafwt=. then delete;
```

Example 2: Using the DELETE Statement to Subset Raw Data

```
data topsales;
   infile file-specification;
   input region office product yrsales;
   if yrsales<100000 then delete;
run;
```

See Also

Statements:

- “DO Statement” on page 59
- “DROP Statement” on page 67
- “IF Statement, Subsetting” on page 127
- “IF-THEN/ELSE Statement” on page 129

DESCRIBE Statement

Retrieves source code from a stored compiled DATA step program or a DATA step view.

Valid in: DATA step

Category: Action

Type: Executable

Restrictions: This statement is not valid in the CAS server.

Use DESCRIBE only with stored compiled DATA step programs and DATA step views.

Requirement: You must specify the PGM= or the VIEW= option in the DATA statement.

Syntax

DESCRIBE;

Without Arguments

Use the DESCRIBE statement to retrieve program source code from a stored compiled DATA step program or a DATA step view. SAS writes the source statements to the SAS log.

Details

Use the DESCRIBE statement without the EXECUTE statement to retrieve source code from a stored compiled DATA step program or a DATA step view. Use the DESCRIBE statement with the EXECUTE statement to retrieve source code and execute a stored compiled DATA step program. For information about how to use these statements with the DATA statement, see "DATA Statement" on page 45.

Note: To DESCRIBE a password-protected view or DATA step program, you must specify its password. If the view or program was created with more than one password, you must specify the most restrictive password. As with other SAS files, the ALTER password is the most restrictive, and the READ password is the least restrictive.

See Also

Statements:

- "DATA Statement" on page 45
- "EXECUTE Statement" on page 71

DO Statement

Specifies a group of statements to be executed as a unit.

Valid in: DATA step

Categories: CAS
Control

Type: Executable

Syntax

DO;
…more SAS statements…

END;

Without Arguments

Use the DO statement for simple DO group processing.

Details

The DO statement is the simplest form of DO group processing. The statements between the DO and END statements are called a *DO group*. You can nest DO statements within DO groups.

Note: The memory capabilities of your system can limit the number of nested DO statements that you can use. For more information, see the SAS documentation about how many levels of nested DO statements your system's memory can support.

A simple DO statement is often used within IF-THEN/ELSE statements to designate a group of statements to be executed depending on whether the IF condition is true or false.

Comparisons

There are three other forms of the DO statement:

- The iterative DO statement executes statements between DO and END statements repetitively based on the value of an index variable. The iterative DO statement can contain a WHILE or UNTIL clause.
- The DO UNTIL statement executes statements in a DO loop repetitively until a condition is true, checking the condition after each iteration of the DO loop.
- The DO WHILE statement executes statements in a DO loop repetitively while a condition is true, checking the condition before each iteration of the DO loop.

Example: Using the DO Statement

In this simple DO group, the statements between DO and END are performed only when YEARS is greater than 5. If YEARS is less than or equal to 5, statements in the DO group do not execute, and the program continues with the assignment statement that follows the ELSE statement.

```
if years>5 then
   do;
      months=years*12;
      put years= months=;
   end;
   else yrsleft=5-years;
```

See Also

Statements:

- “DO Statement, Iterative” on page 60
- “DO UNTIL Statement” on page 64
- “DO WHILE Statement” on page 66

DO Statement, Iterative

Executes statements between the DO and END statements repetitively, based on the value of an index variable.

Valid in: DATA step

Categories: CAS
Control

Type: Executable

Syntax

DO *index-variable*=*specification-1* <, …*specification-n*> ;
…*more SAS statements*…

END;

Arguments

index-variable
names a variable whose value governs execution of the DO group.

Tip Unless you specify to drop it, the index variable is included in the data set that is being created.

CAUTION **Avoid changing the index variable within the DO group.** If you modify the index variable within the iterative DO group, you might cause infinite looping.

specification
denotes an expression or a series of expressions in this form

start <TO *stop*> <BY *increment*> <WHILE(*expression*) | UNTIL(*expression*)>

The DO group is executed first with *index-variable* equal to *start*. The value of *start* is evaluated before the first execution of the loop.

start
specifies the initial value of the index variable.

When it is used without TO *stop* or BY *increment*, the value of *start* can be a series of items expressed in this form:

```
item-1 <, ...item-n>
```

The items can be either all numeric or all character constants, or they can be variables. Enclose character constants in quotation marks. The DO group is executed once for each value in the list. If a WHILE condition is added, it applies only to the item that it immediately follows.

Requirement When it is used with TO *stop* or BY *increment*, *start* must be a number or an expression that yields a number.

Example "Example 1: Using Various Forms of the Iterative DO Statement" on page 63

TO *stop*
specifies the ending value of the index variable.

When both *start* and *stop* are present, execution continues (based on the value of *increment*) until the value of *index-variable* passes the value of *stop*. When only *start* and *increment* are present, execution continues (based on the value of *increment*) until a statement directs execution out of the loop, or until a WHILE or UNTIL expression that is specified in the DO statement is satisfied. If neither

stop nor *increment* is specified, the group executes according to the value of *start*. The value of *stop* is evaluated before the first execution of the loop.

Requirement *Stop* must be a number or an expression that yields a number.

Tip Any changes to *stop* made within the DO group do not affect the number of iterations. To stop iteration of a loop before it finishes processing, change the value of *index-variable* so that it passes the value of *stop*, or use a LEAVE statement to go to a statement outside the loop.

Example "Example 1: Using Various Forms of the Iterative DO Statement" on page 63

BY *increment*
specifies a positive or negative number (or an expression that yields a number) to control the incrementing of *index-variable*.

The value of *increment* is evaluated before the execution of the loop. Any changes to the increment that are made within the DO group do not affect the number of iterations. If no increment is specified, the index variable is increased by 1. When *increment* is positive, *start* must be the lower bound and *stop*, if present, must be the upper bound for the loop. If *increment* is negative, *start* must be the upper bound and *stop*, if present, must be the lower bound for the loop

Example "Example 1: Using Various Forms of the Iterative DO Statement" on page 63

WHILE(*expression*) | UNTIL(*expression*)
evaluates, either before or after execution of the DO group, any SAS expression that you specify. Enclose the expression in parentheses.

A WHILE expression is evaluated before each execution of the loop, so that the statements inside the group are executed repetitively while the expression is true. An UNTIL expression is evaluated after each execution of the loop, so that the statements inside the group are executed repetitively until the expression is true.

Restriction A WHILE or UNTIL specification affects only the last item in the clause in which it is located.

See "DO WHILE Statement" on page 66 and "DO UNTIL Statement" on page 64

Example "Example 1: Using Various Forms of the Iterative DO Statement" on page 63

Requirement The iterative DO statement requires at least one *specification* argument.

Tips The order of the optional TO and BY clauses can be reversed.

When you use more than one *specification*, each one is evaluated before its execution.

Comparisons

There are three other forms of the DO statement:

- The DO statement, the simplest form of DO-group processing, designates a group of statements to be executed as a unit, usually as a part of IF-THEN/ELSE statements.
- The DO UNTIL statement executes statements in a DO loop repetitively until a condition is true, checking the condition after each iteration of the DO loop.
- The DO WHILE statement executes statements in a DO loop repetitively while a condition is true, checking the condition before each iteration of the DO loop.

Examples

Example 1: Using Various Forms of the Iterative DO Statement

- These iterative DO statements use a list of items for the value of *start*:
  - `do month='JAN','FEB','MAR';`
  - `do count=2,3,5,7,11,13,17;`
  - `do i=5;`
  - `do i=var1, var2, var3;`
  - `do i='01JAN2001'd,'25FEB2001'd,'18APR2001'd;`
- These iterative DO statements use the *start* TO *stop* syntax:
  - `do i=1 to 10;`
  - `do i=1 to exit;`
  - `do i=1 to x-5;`
  - `do i=1 to k-1, k+1 to n;`
  - `do i=k+1 to n-1;`
- These iterative DO statements use the BY *increment* syntax:
  - `do i=n to 1 by -1;`
  - ```
    do i=.1 to .9 by .1, 1 to 10 by 1,
       20 to 100 by 10;
    ```
  - `do count=2 to 8 by 2;`
- These iterative DO statements use WHILE and UNTIL clauses:
  - `do i=1 to 10 while(x<y);`
  - `do i=2 to 20 by 2 until((x/3)>y);`
  - `do i=10 to 0 by -1 while(month='JAN');`
- In this example, the DO loop is executed when I=1 and I=2; the WHILE condition is evaluated when I=3, and the DO loop is executed if the WHILE condition is true.

  ```
  DO I=1,2,3 WHILE (condition);
  ```

Example 2: Using the Iterative DO Statement without Infinite Looping

In each of the following examples, the DO group executes ten times. The first example demonstrates the preferred approach.

```
   /* correct coding */
do i=1 to 10;
```
```

```
   ...more SAS statements...
end;
```

The next example uses the TO and BY arguments.

```
do i=1 to n by m;
   ...more SAS statements...
   if i=10 then leave;
end;
if i=10 then put 'EXITED LOOP';
```

Example 3: Stopping the Execution of the DO Loop

In this example, setting the value of the index variable to the current value of EXIT causes the loop to terminate.

```
data iterate1;
   input x;
   exit=10;
   do i=1 to exit;
      y=x*normal(0);
         /* if y>25,           */
         /* changing i's value */
         /* stops execution    */
      if y>25 then i=exit;
      output;
   end;
   datalines;
5
000
2500
;
```

See Also

Statements:

- “ARRAY Statement” on page 18
- “Array Reference Statement” on page 23
- “DO Statement” on page 59
- “DO UNTIL Statement” on page 64
- “DO WHILE Statement” on page 66
- “GO TO Statement” on page 125

DO UNTIL Statement

Executes statements in a DO loop repetitively until a condition is true.

Valid in: DATA step

Categories: CAS
Control

Type: Executable

Syntax

DO UNTIL (*expression*);
…more SAS statements…

END;

Arguments

(expression)
is any SAS expression, enclosed in parentheses. You must specify at least one *expression*.

Details

The expression is evaluated at the bottom of the loop after the statements in the DO loop have been executed. If the expression is true, the DO loop does not iterate again.

Note: The DO loop always iterates at least once.

Comparisons

There are three other forms of the DO statement:

- The DO statement, the simplest form of DO-group processing, designates a group of statements to be executed as a unit, usually as a part of IF-THEN/ELSE statements.
- The iterative DO statement executes statements between DO and END statements repetitively based on the value of an index variable.
- The DO WHILE statement executes statements in a DO loop repetitively while a condition is true, checking the condition before each iteration of the DO loop. The DO UNTIL statement evaluates the condition at the bottom of the loop; the DO WHILE statement evaluates the condition at the top of the loop.

  Note: The statements in a DO UNTIL loop always execute at least one time, whereas the statements in a DO WHILE loop do not iterate even once if the condition is false.

Example: Using a DO UNTIL Statement to Repeat a Loop

These statements repeat the loop until N is greater than or equal to 5. The expression N>=5 is evaluated at the bottom of the loop. There are five iterations in all (0, 1, 2, 3, 4).

```
n=0;
   do until(n>=5);
      put n=;
      n+1;
   end;
```

See Also

Statements:

- “DO Statement” on page 59
- “DO Statement, Iterative” on page 60
- “DO WHILE Statement” on page 66

DO WHILE Statement

Executes statements in a DO-loop repetitively while a condition is true.

Valid in: DATA step

Categories: CAS
Control

Type: Executable

Syntax

DO WHILE (*expression*);
…more SAS statements…

END;

Arguments

(*expression*)
is any SAS expression, enclosed in parentheses. You must specify at least one *expression*.

Details

The expression is evaluated at the top of the loop before the statements in the DO loop are executed. If the expression is true, the DO loop iterates. If the expression is false the first time it is evaluated, the DO loop does not iterate even once.

Comparisons

There are three other forms of the DO statement:

- The DO statement, the simplest form of DO-group processing, designates a group of statements to be executed as a unit, usually as a part of IF-THEN/ELSE statements.
- The iterative DO statement executes statements between DO and END statements repetitively based on the value of an index variable.
- The DO UNTIL statement executes statements in a DO loop repetitively until a condition is true, checking the condition after each iteration of the DO loop. The DO WHILE statement evaluates the condition at the top of the loop; the DO UNTIL statement evaluates the condition at the bottom of the loop.

  Note: If the expression is false, the statements in a DO WHILE loop do not execute. However, because the DO UNTIL expression is evaluated at the bottom of the loop, the statements in the DO UNTIL loop always execute at least once.

Example: Using a DO WHILE Statement

These statements repeat the loop while N is less than 5. The expression N<5 is evaluated at the top of the loop. There are five iterations in all (0, 1, 2, 3, 4).

```
n=0;
   do while(n<5);
      put n=;
```

```
    n+1;
end;
```

See Also

Statements:

- "DO Statement" on page 59
- "DO Statement, Iterative" on page 60
- "DO UNTIL Statement" on page 64

DROP Statement

Excludes variables from output SAS data sets.

Valid in: DATA step

Categories: Information
CAS

Type: Declarative

Syntax

DROP *variable-list*;

Arguments

variable-list
specifies the names of the variables to omit from the output data set.

Tip You can list the variables in any form that SAS allows.

Details

The DROP statement applies to all the SAS data sets that are created within the same DATA step and can appear anywhere in the step. The variables in the DROP statement are available for processing in the DATA step. If no DROP or KEEP statement appears, all data sets that are created in the DATA step contain all variables. Do not use both DROP and KEEP statements within the same DATA step.

Comparisons

- The DROP statement differs from the DROP= data set option in the following ways:
  - You cannot use the DROP statement in SAS procedure steps.
  - The DROP statement applies to all output data sets that are named in the DATA statement. To exclude variables from some data sets but not from others, use the DROP= data set option in the DATA statement.
- The KEEP statement is a parallel statement that specifies a list of variables to write to output data sets. Use the KEEP statement instead of the DROP statement if the number of variables to include is significantly smaller than the number to omit.

- Do not confuse the DROP statement with the DELETE statement. The DROP statement excludes variables from output data sets; the DELETE statement excludes observations.

Examples

Example 1: Basic DROP Statement Usage

These examples show the correct syntax for listing variables with the DROP statement:

- `drop time shift batchnum;`
- `drop grade1-grade20;`

Example 2: Dropping Variables from the Output Data Set

In this example, the variables PURCHASE and REPAIR are used in processing but are not written to the output data set INVENTRY:

```
data inventry;
   drop purchase repair;
   infile file-specification;
   input unit part purchase repair;
   totcost=sum(purchase,repair);
run;
```

See Also

Data Set Options:

- "DROP= Data Set Option" in *SAS Viya Data Set Options: Reference*

Statements:

- "DELETE Statement" on page 57
- "KEEP Statement" on page 203

END Statement

Ends a DO group or SELECT group processing.

Valid in: DATA step

Categories: CAS
Control

Type: Declarative

Syntax

END;

Without Arguments

Use the END statement to end DO group or SELECT group processing.

Details

The END statement must be the last statement in a DO group or a SELECT group.

Example: Using the END Statement

This example shows a simple DO group and a simple SELECT group:

- ```
  do;
        ...more SAS statements...
  end;
  ```
- ```
  select(expression);
     when(expression) SAS statement;
     otherwise SAS statement;
  end;
  ```

See Also

Statements:

- “DO Statement” on page 59
- “SELECT Statement” on page 359

ENDSAS Statement

Terminates a SAS job or session after the current DATA or PROC step executes.

Valid in: Anywhere

Category: Program Control

Restriction: This statement is not valid in the CAS server.

Syntax

ENDSAS;

Without Arguments

The ENDSAS statement terminates a SAS job or session.

Details

ENDSAS is most useful in interactive sessions.

Note: ENDSAS statements are always executed at the point that they are encountered in a DATA step. Use the ABORT RETURN statement to stop processing when an error condition occurs (for example, in the clause of an IF-THEN statement or a SELECT statement).

ERROR Statement

Sets _ERROR_ to 1. A message written to the SAS log is optional.

Valid in: DATA step

Categories: Action
CAS

Type: Executable

Syntax

ERROR <*message*>;

Without Arguments

Using ERROR without an argument sets the automatic variable _ERROR_ to 1 writes a blank message to the log.

Arguments

message
writes a message to the log.

Tip *message* can include character literals (enclosed in quotation marks), variable names, formats, and pointer controls.

Details

The ERROR statement sets the automatic variable _ERROR_ to 1. Writing a message that you specify to the SAS log is optional. When _ERROR_ = 1, SAS writes the data lines that correspond to the current observation in the SAS log.

Using ERROR is equivalent to using these statements in combination:

- an assignment statement setting _ERROR_ to 1
- a FILE LOG statement
- a PUT statement (if you specify a message)
- a PUT; statement (if you do not specify a message)
- another FILE statement resetting FILE to any previously specified setting.

Example: Writing Error Messages

In the following examples, SAS writes the error message and the variable name and value to the log for each observation that satisfies the condition in the IF-THEN statement.

- In this example, the ERROR statement automatically resets the FILE statement specification to the previously specified setting.

```
file file-specification;
   if type='teen' & age > 19 then
      error 'type and age don"t match ' age=;
```

- This example uses a series of statements to produce the same results.

```
file file-specification;
   if type='teen' & age > 19 then
      do;
         file log;
```

```
    put 'type and age don"t match ' age=;
    _error_=1;
    file file-specification;
end;
```

See Also

Statements:

- "PUT Statement" on page 303

EXECUTE Statement

Executes a stored compiled DATA step program.

Valid in: DATA step

Category: Action

Type: Executable

Restrictions: This statement is not valid in the CAS server.
Use EXECUTE with stored compiled DATA step programs only.

Requirement: You must specify the PGM= option in the DATA step.

Syntax

EXECUTE;

Without Arguments

The EXECUTE statement executes a stored compiled DATA step program.

Details

Use the DESCRIBE statement with the EXECUTE statement in the same DATA step to retrieve the source code and execute a stored compiled DATA step program. If you do not specify either statement, EXECUTE is assumed. The order in which you use the statements is interchangeable. The DATA step program executes when it reaches a step boundary. For information about how to use these statements with the DATA statement, see the "DATA Statement" on page 45.

See Also

Statements:

- "DATA Statement" on page 45
- "DESCRIBE Statement" on page 58

FILE Statement

Specifies the current output file for PUT statements.

Valid in: DATA step

Categories: File-Handling
CAS

Type: Executable

Restrictions: LOG is the only *file-specification* available in the CAS server.
The *device-type* argument is not in available in the CAS server.
When SAS is in a locked-down state, the FILENAME statement is not available for files that are not in the locked-down path list.

Syntax

FILE *file-specification* <*device-type*> <PERMISSION='*permission-value*'>
<ENCODING='*encoding-value*' >
<*options*> ;

Required Argument

file-specification
identifies an external file that the DATA step uses to write output from a PUT statement. *File-specification* can have these forms:

'external-file'
specifies the physical name of an external file, which is enclosed in quotation marks. The physical name is the name by which the operating environment recognizes the file.

fileref
specifies the fileref of an external file.

Restriction This argument is not supported in the CAS server.

Requirement You must have associated *fileref* with an external file in a FILENAME statement or function in a previous step or in an appropriate operating environment command. The only way to assign the *fileref* at run time is to use the FILEVAR= option in the FILE statement.

See "FILENAME Statement" on page 91

fileref(file)
specifies a fileref that is previously assigned to an external file that is an aggregate grouping of files. Follow the fileref with the name of a file or member, which is enclosed in parentheses.

Restriction This argument is not supported in the CAS server.

Requirement You must previously associate *fileref* with an external file in a FILENAME statement or function, or in an appropriate operating environment command.

Note A file that is located in an aggregate storage location and has a name that is not a valid SAS name must have its name enclosed in quotation marks.

See "FILENAME Statement" on page 91

LOG
is a reserved fileref that directs the output that is produced by any PUT statements to the SAS log.

At the beginning of each execution of a DATA step, the fileref that indicates where the PUT statements write is automatically set to LOG. Therefore, the first PUT statement in a DATA step always writes to the SAS log, unless it is preceded by a FILE statement that specifies otherwise.

Tip Because output lines are by default written to the SAS log, use a FILE LOG statement to restore the default action or to specify additional FILE statement options.

PRINT
is a reserved fileref that directs the output that is produced by any PUT statements to the same file as the output that is produced by SAS procedures.

Restriction This argument is not supported in the CAS server.

Interaction When you write to a file, the value of the N= option must be either 1 or PAGESIZE.

Operating environment The carriage-control characters that are written to a file can be specific to the operating environment.

Tip When PRINT is the fileref, SAS uses carriage-control characters and writes the output with the characteristics of a print file.

Tip If the file does not exist in the directory that you specify for file-specification, SAS creates the file. If the directory specified in *file-specification* does not exist, SAS sets the SYSERR macro variable, which can be checked if the ERRORCHECK option is set to STRICT.

Optional Arguments

device-type
specifies the type of device or the access method that is used if the fileref points to an input or output device or a location that is not a physical file:

ACTIVEMQ
specifies an access method that enables you to access an ActiveMQ messaging broker.

Restriction This argument is not supported in the CAS server.

Interaction If the DATA step does not recognize the access method option, the DATA step passes the option to the access method for handling.

DISK
specifies that the device is a disk drive.

Restriction This argument is not supported in the CAS server.

Tip When you assign a fileref to a file on disk, you are not required to specify DISK.

DUMMY
specifies that the output to the file is discarded.

Restriction This argument is not supported in the CAS server.

Tip Specifying DUMMY can be useful for testing.

GTERM
indicates that the output device type is a graphics device that receives graphics data.

Restriction This argument is not supported in the CAS server.

JMS
specifies a Java Message Service (JMS) destination.

Restriction This argument is not supported in the CAS server.

PIPE
specifies an unnamed pipe.

Restriction This argument is not supported in the CAS server.

PLOTTER
specifies an unbuffered graphics output device.

Restriction This argument is not supported in the CAS server.

PRINTER
specifies a printer or printer spool file.

Restriction This argument is not supported in the CAS server.

SFTP
specifies the SFTP access method.

Restriction This argument is not supported in the CAS server.

Interaction If the DATA step does not recognize the access method option, the DATA step passes the option to the access method for handling.

See For a complete list of options that are available with the SFTP access method, see the "FILENAME Statement, SFTP Access Method" on page 103.

TAPE
specifies a tape drive.

Restriction This argument is not supported in the CAS server.

TEMP
creates a temporary file that exists only as long as the filename is assigned. The temporary file can be accessed only through the logical name and is available only while the logical name exists.

Restrictions This argument is not supported in the CAS server.

Do not specify a physical pathname. If you do, SAS returns an error.

Tip Files manipulated by the TEMP device can have the same attributes and behave identically to DISK files.

TERMINAL
specifies the user's terminal.

Restriction This argument is not supported in the CAS server.

UPRINTER
specifies a Universal Printing printer definition name.

Restriction This argument is not supported in the CAS server.

Tip If you do not specify the printer name in the FILENAME statement, the PRINTERPATH options control which Universal Printer is used and the destination of the output.

URL
specifies the URL access method.

Restriction This argument is not supported in the CAS server.

Interaction If the DATA step does not recognize the access method option, the DATA step passes the option to the access method for handling.

See For a complete list of options that are available with the URL access method, see the "FILENAME Statement, URL Access Method" on page 109.

Alias DEVICE=*device-type*

Default DISK

Requirement *device-type* or DEVICE=*device-type* must immediately follow *file-specification* in the statement.

ENCODING='*encoding-value*'
specifies the encoding to use when writing to the output file. The value for ENCODING= indicates that the output file has a different encoding from the current session encoding.

When you write data to the output file, SAS transcodes the data from the session encoding to the specified encoding.

For valid encoding values, see "Overview to SAS Language Elements That Use Encoding Values" in *SAS Viya National Language Support: Reference Guide*.

PERMISSION='*permission-value*'
specifies permissions to set for the specified fileref. To specify more than one set of permission values, separate them with a comma within quotation marks.

Provide the *permission-value* in the following format:

```
A::<trustee_type>::<permissions>
```

The 'A' indicates that these are access permissions. No other values are currently supported.

The trustee_type can take the following values:

u user

g group (group owner of the file)

o other (all other users)

The permission value takes the letters *r* (Read), *w* (Write), and *x* (Execute), in that order. If you do not want to grant one of these permissions, enter a '-' in its place (for example, *r-x* or *rw-*).

Suppose that you want to have Read, Write, and Execute permission for a fileref. You also want to specify Read and Execute permission for the group owner of the file. Finally, you want to allow all other users to have only Read permission for the file. You can specify these options as follows:

```
permission='A::u::rwx,A::g::r-x,A::o::r--'
```

Supply a permission value for all three trustee types. Any trustee type that you omit from the list of permission values is denied all access to the specified fileref. For example, suppose you used the following permission values:

```
permission='A::u::rwx,A::g::r-x'
```

In this case, only the owner and the group owner would have access to the specified file. Any user other than the owner or group owner is denied all access to the file.

Options

BLKSIZE=*block-size*
specifies the number of bytes that are physically written in one I/O operation. The default is 8K. The maximum is 1G–1.

Alias BLK=

COLUMN=*variable*
specifies a variable that SAS automatically sets to the current column location of the pointer. This variable, like automatic variables, is not written to the data set.

Alias COL=

See LINE= on page 80

DELIMITER= *delimiter(s)*
specifies an alternate delimiter (other than blank) to be used for LIST output where *delimiter* can be one of the following items.

'list-of-delimiting-characters'
specifies one or more characters to write as delimiters.

Requirement Enclose the list of characters in quotation marks.

character-variable
specifies a character variable whose value becomes the delimiter.

Alias DLM=

Default blank space

Restriction Even though a character string or character variable is accepted, only the first character of the string or variable is used as the output delimiter. The FILE DLM= processing differs from INFILE DELIMITER= processing.

Interaction Output that contains embedded delimiters requires the delimiter sensitive data (DSD) option.

Tips DELIMITER= can be used with the colon (:) modifier (modified LIST output).

The delimiter is case sensitive.

See "DLMSTR= *delimiter*" on page 77 and "DSD (delimiter sensitive data)" on page 78

DLMSOPT= 'T' |'t'
specifies a parsing option for the DLMSTR= T option that removes trailing blanks of the string delimiter.

Requirement The DLMSOPT=T option has an effect only when used with the DLMSTR= option.

Tip The DLMSOPT=T option is useful when you use a variable as the delimiter string

See DLMSTR= on page 77

DLMSTR= *delimiter*
specifies a character string as an alternate delimiter (other than a blank) to be used for LIST output, where *delimiter* can be one of the following items.

'***delimiting-string***'
specifies a character string to write as a delimiter.

Requirement Enclose the string in quotation marks.

character-variable
specifies a character variable whose value becomes the delimiter.

Default blank space

Interactions If you specify more than one DLMSTR= option in the FILE statement, the DLMSTR= option that is specified last is used. If you specify both the DELIMITER= and DLMSTR= options, the option that is specified last is used.

If you specify RECFM=N, make sure that the LRECL is large enough to hold the largest input item. Otherwise, it might be possible for the delimiter to be split across the record boundary.

See DELIMITER= on page 76, DLMSOPT= on page 77, and DSD on page 78

DROPOVER
discards data items that exceed the output line length (as specified by the LINESIZE= or LRECL= options in the FILE statement).

By default, data that exceeds the current line length is written on a new line. When you specify DROPOVER, SAS drops (or ignores) an entire item when there is not enough space in the current line to write it. When an entire item is dropped, the column pointer remains positioned after the last value that is written in the current line. Thus, the PUT statement might write other items in the current output line if they fit in the space that remains or if the column pointer is repositioned. When a data item is dropped, the DATA step continues normal execution (_ERROR_=0). At the end of the DATA step, a message is printed for each file from which data was lost.

Default FLOWOVER

Tip Use DROPOVER when you want the DATA step to continue executing if the PUT statement attempts to write past the current line length, but you do not want the data item that exceeds the line length to be written on a new line.

See "FLOWOVER" on page 79 and "STOPOVER" on page 84

DSD (delimiter sensitive data)

specifies that data values that contain embedded delimiters, such as tabs or commas, be enclosed in quotation marks. The DSD option enables you to write data values that contain embedded delimiters to LIST output. This option is ignored for other types of output (for example, formatted, column, and named). Any double quotation marks that are included in the data value are repeated. When a variable value contains the delimiter and DSD is used in the FILE statement, the variable value is enclosed in double quotation marks when the output is generated. For example, the following code

```
DATA _NULL_;
  FILE log dsd;
  x='"lions, tigers, and bears"';
  put x ' "Oh, my!"';
run;
```

results in the following output:

```
"""lions, tigers, and bears""", "Oh, my!"
```

If a quoted (text) string contains the delimiter and DSD is used in the FILE statement, then the quoted string is not enclosed in double quotation marks when used in a PUT statement. For example, the following code

```
DATA _NULL_;
  FILE log dsd;
  PUT 'lions, tigers, and bears';
run;
```

results in the following output:

```
lions, tigers, and bears
```

Interaction If you specify DSD, the default delimiter is assumed to be the comma (,). Specify the DELIMITER= or DLMSTR= option if you want to use a different delimiter.

Tip By default, data values that do not contain the delimiter that you specify are not enclosed in quotation marks. However, you can use the tilde (~) modifier to force any data value, including missing values, to be enclosed in quotation marks, even if it contains no embedded delimiter.

See DELIMITER= on page 76 and DLMSTR= on page 77

FILENAME=*variable*
defines a character variable, whose name you supply, that SAS sets to the value of the physical name of the file currently open for PUT statement output. The physical name is the name by which the operating environment recognizes the file.

Tips This variable, like automatic variables, is not written to the data set.

Use a LENGTH statement to make the variable length long enough to contain the value of the physical filename if the variable length is longer than eight bytes (the default length of a character variable).

See FILEVAR= on page 79

Example "Example 4: Identifying the Current Output File" on page 89

FILEVAR=*variable*
defines a variable whose change in value causes the FILE statement to close the current output file and open a new one the next time the FILE statement executes. The next PUT statement that executes writes to the new file that is specified as the value of the FILEVAR= variable.

Restriction The value of a FILEVAR= variable is expressed as a character string that contains a physical filename.

Interaction When you use the FILEVAR= option, the *file-specification* is just a placeholder, not an actual filename or a fileref that has been previously assigned to a file. SAS uses this placeholder for reporting processing information to the SAS log. It must conform to the same rules as a fileref.

Tips This variable, like automatic variables, is not written to the data set.

If any of the physical filenames is longer than eight bytes (the default length of a character variable), assign the FILEVAR= variable a longer length with another statement, such as a LENGTH statement or an INPUT statement.

See FILENAME= on page 79

Example "Example 5: Dynamically Changing the Current Output File" on page 90

FLOWOVER
causes data that exceeds the current line length to be written on a new line. When a PUT statement attempts to write beyond the maximum allowed line length (as specified by the LINESIZE= option in the FILE statement), the current output line is written to the file and the data item that exceeds the current line length is written to a new line.

Default FLOWOVER

Interaction If the PUT statement contains a trailing @, the pointer is positioned after the data item on the new line, and the next PUT statement writes to that line. This process continues until the end of the input data is

reached or until a PUT statement without a trailing @ causes the current line to be written to the file.

See "DROPOVER" on page 77 and "STOPOVER" on page 84

FOOTNOTES | NOFOOTNOTES
controls whether currently defined footnotes are printed.

Alias FOOTNOTE | NOFOOTNOTE

Default NOFOOTNOTES

Requirement In order to print footnotes in a DATA step report, you must set the FOOTNOTE option in the FILE statement.

HEADER=*label*
defines a statement label that identifies a group of SAS statements that you want to execute each time SAS begins a new output page.

Restrictions The first statement after the label must be an executable statement. Thereafter, you can use any SAS statement.

Use the HEADER= option only when you write to print files and when you include the PRINT= option.

Tip To prevent the statements in this group from executing with each iteration of the DATA step, use two RETURN statements: one precedes the label and the other appears as the last statement in the group.

Example "Example 1: Executing Statements When Beginning a New Page" on page 88

LINE=*variable*
defines a variable whose value is the current relative line number within the group of lines available to the output pointer. You supply the variable name; SAS automatically assigns the value.

Range 1 to the value that is specified by the N= option or with the #*n* line pointer control. If neither is specified, the LINE= variable has a value of 1.

Tips This variable, like automatic variables, is not written to the data set.

The value of the LINE= variable is set at the end of PUT statement execution to the number of the next available line.

LINESIZE=*line-size*
sets the maximum number of columns per line for reports and the maximum record length for data files.

Alias LS=

Default The default LINESIZE= value is determined by one of two options: 1) the LINESIZE= system option when you write to file that contains carriage-control characters or to the SAS log or 2) the LRECL= option in the FILE statement when you write to a file.

Range	From 64 to the maximum logical record length that is allowed in your operating environment.
Interaction	If a PUT statement tries to write a line that is longer than the value that is specified by the LINESIZE= option, the action that is taken is determined by whether FLOWOVER, DROPOVER, or STOPOVER is in effect. By default (FLOWOVER), SAS writes the line as two or more separate records.
Operating environment	The highest value allowed for LINESIZE= is dependent on your operating environment.
Note	LINESIZE= tells SAS how much of the line to use. LRECL= specifies the physical record length of the file.
See	LRECL= on page 81, "DROPOVER" on page 77, "FLOWOVER" on page 79, and "STOPOVER" on page 84
Example	"Example 6: When the Output Line Exceeds the Line Length of the Output File" on page 90

LINESLEFT=*variable*
defines a variable whose value is the number of lines left on the current page. You supply the variable name; SAS assigns the value of the number of lines left on the current page to that variable. The value of the LINESLEFT= variable is set at the end of PUT statement execution.

Alias	LL=
Tip	This variable, like automatic variables, is not written to the data set.
Example	"Example 2: Determining New Page by Lines Left on the Current Page" on page 88

LRECL=*logical-record-length*
specifies the logical record length. Its value depends on the record format in effect (RECFM). The default value for LRECL= is 32,767. If you are using fixed length records (RECFM=F), the default value for LRECL= is 256. The maximum record length is 1G.

- If RECFM=F, then the value for the LRECL= option determines the length of each output record. The output record is truncated or padded with blanks to fit the specified size.

  Note: When RECFM=F, LRECL= must be set to 256 when SAS is communicating with versions of SAS prior to SAS 9.4.

- If RECFM=N, then the value for the LRECL= option must be at least 256.
- If RECFM=V, then the value for the LRECL= option determines the maximum record length. Records that are longer than the specified length are divided into multiple records.

Default	If you omit the LRECL= option, SAS chooses a value based on the operating environment's file characteristics.
Interaction	Alternatively, you can specify a global logical record length by using the LRECL system option. The default value for the global LRECL

system option is 32767. If you are using fixed-length records (RECFM=F), the default value for LRECL is 256.

Note LINESIZE= tells SAS how much of the line to use; LRECL= specifies the physical line length of the file.

See LINESIZE= on page 80, PAD on page 83, and PAGESIZE= on page 83

MOD
indicates that data written to the file should be appended to the file.

Default OLD

See "OLD" on page 83

NEW | OLD
specifies whether a new file or an existing file is used for output. If you specify NEW, a new file is to be opened for output. If the file already exists, it is deleted and re-created. If you specify OLD, the previous contents of the file are replaced.

Default NEW

N=*available-lines*
specifies the number of lines that you want available to the output pointer in the current iteration of the DATA step. *Available-lines* can be expressed as a number (*n*) or as the keyword PAGESIZE or PS.

n
specifies the number of lines that are available to the output pointer. The system can move back and forth between the number of lines that are specified while composing them before moving on to the next set.

PAGESIZE
specifies that the entire page is available to the output pointer.

Alias PS

Restrictions N=PAGESIZE is valid only when output is printed.

If the current output file is a file that is to be printed, *available-lines* must have a value of either 1 or PAGESIZE.

Interactions In addition to use in the N= option to control the number of lines available to the output pointer, you can also use the #*n* line pointer control in a PUT statement.

If you omit the N= option and no # pointer controls are used, one line is available. That is, by default, N=1. If N= is not used but there are # pointer controls, N= is assigned the highest value that is specified for a # pointer control in any PUT statement in the current DATA step.

Tip Setting N=PAGESIZE enables you to compose a page of multiple columns one column at a time.

Example "Example 3: Arranging the Contents of an Entire Page" on page 89

ODS < = (*ODS-suboptions*) >
specifies to use the Output Delivery System to format the output from a DATA step. It defines the structure of the data component and holds the results of the DATA step and binds that component to a table definition to produce an output object. ODS sends this object to all open ODS destinations, each of which formats the output appropriately.

Defaults If you omit the ODS suboptions, the DATA step uses a default table definition (base.datastep.table) that is stored in the SASHELP.TMPLMST template store. This definition defines two generic columns: one for character variables, and one for numeric variables. ODS associates each variable in the DATA step with one of these columns and displays the variables in the order in which they are defined in the DATA step.

Without suboptions, the default table definition uses the variable's label as its column heading. If no label exists, the definition uses the variable's name as the column heading.

Restrictions You cannot use _FILE_=, FILEVAR=, HEADER=, and PAD with the ODS option.

Variables with a VARCHAR data type are not supported.

Requirement The ODS option is valid only when you use the fileref PRINT in the FILE statement.

Interaction The DELIMITER= and DSD options have no effect on the ODS option.

OLD
replaces the previous contents of the file.

Default OLD

See "MOD" on page 82

PAD | NOPAD
controls whether records written to an external file are padded with blanks to the length that is specified in the LRECL= option.

Default NOPAD is the default when writing to a variable-length file; PAD is the default when writing to a fixed-length file.

Tip PAD provides a quick way to create fixed-length records in a variable-length file.

See LRECL= on page 81

PAGESIZE=*value*
sets the number of lines per page for your reports.

Alias PS=

Default the value of the PAGESIZE= system option.

Range The value can range from 15 to 32767.

Interaction If any TITLE statements are currently defined, the lines that they occupy are included in counting the number of lines for each page.

Tips After the value of the PAGESIZE= option is reached, the output pointer advances to line 1 of a new page.

If you specify FILE LOG, the number of lines that are written on the first page is reduced by the number of lines in the SAS start-up notes. For example, if PAGESIZE=20 and there are nine lines of SAS start-up notes, only 11 lines are available on the first page.

See "PAGESIZE= System Option" in *SAS Viya System Options: Reference*

PRINT | NOPRINT
controls whether carriage-control characters are placed in the output lines.

Restriction When you write to a file, the value of the N= option must be either 1 or PAGESIZE.

Operating environment The carriage-control characters that are written to a file can be specific to the operating environment.

Tips The PRINT option is not necessary if you are using fileref PRINT.

If you specify FILE PRINT in an interactive SAS session, then the Results window interprets the form-feed control characters as page breaks, and blank lines that are output before the form feed are removed from the output. Writing the results from the Results window to a flat file produces a file without page break characters. If a file needs to contain the form-feed characters, then the FILE statement should include a physical file location and the PRINT option.

RECFM=*record-format*
specifies the record format. RECFM can have one of these values:

D	default format (same as variable).
F	fixed format. That is, each record has the same length. Do not use RECFM=F for external files that contain carriage-control characters.
N	binary format. The file consists of a stream of bytes with no record boundaries.
P	print format. SAS writes carriage-control characters.
V	variable format. Each record ends with a newline character.
S370V	variable S370 record format (V).
S370VB	variable block S370 record format (VB).
S370VBS	variable block with spanned records S370 record format (VBS).

STOPOVER
stops processing the DATA step immediately if a PUT statement attempts to write a data item that exceeds the current line length. In such a case, SAS discards the data item that exceeds the current line length, writes the portion of the line that was built before the error occurred, and issues an error message.

Default FLOWOVER

See "FLOWOVER" on page 79 and "DROPOVER" on page 77

TERMSTR=
controls the end-of-line delimiter in files that are formatted by Linux. By default, either a line feed alone or a carriage return and a line feed indicate the end of a line. To explicitly define the end-of-line delimiter, specify one of these values:

CR Carriage return.

CRLF Carriage return line feed.

LF Line feed. This parameter is used to read files that are formatted by Linux.

TITLES | NOTITLES
controls the printing of the current title lines on the pages of files. When NOTITLES is omitted, or when TITLES is specified, SAS prints any titles that are currently defined.

Alias TITLE | NOTITLE

Default TITLES

UNBUF
tells SAS not to perform buffered Writes to the file on any subsequent FILE statement. This option applies especially when you are writing to a data collection device.

FILE=*variable*
names a character variable that references the current output buffer of this FILE statement. You can use the variable in the same way as any other variable, even as the target of an assignment. The variable is automatically retained and initialized to blanks. Like automatic variables, the _FILE_= variable is not written to the data set.

Restriction *variable* cannot be a previously defined variable. Make sure that the _FILE_= specification is the first occurrence of this variable in the DATA step. Do not set or change the length of _FILE_= variable with the LENGTH or ATTRIB statements. However, you can attach a format to this variable with the ATTRIB or FORMAT statement.

Interaction The maximum length of this character variable is the logical record length (LRECL) for the specified FILE statement. However, SAS does not open the file to know the LRECL until before the execution phase. Therefore, the designated size for this variable during the compilation phase is 32,767 bytes.

Tips Modification of this variable directly modifies the FILE statement's current output buffer. Any subsequent PUT statement for this FILE statement writes the contents of the modified buffer. The _FILE_= variable accesses only the current output buffer of the specified FILE statement even if you use the N= option to specify multiple output buffers.

To access the contents of the output buffer in another statement without using the _FILE_= option, use the automatic variable _FILE_.

See "Updating the _FILE_ Variable" on page 86

Details

Overview

By default, PUT statement output is written to the SAS log. Use the FILE statement to route this output to either the same external file to which procedure output is written or to a different external file. You can indicate whether carriage-control characters should be added to the file. See the PRINT | NOPRINT option on page 84.

You can use the FILE statement in conditional (IF-THEN) processing because it is executable. You can also use multiple FILE statements to write to more than one external file in a single DATA step.

You can use the Output Delivery System with the FILE statement to write DATA step results.

Updating an External File in Place

You can use the FILE statement with the INFILE and PUT statements to update an external file in place, updating either an entire record or only selected fields within a record. Follow these guidelines:

- Always place the INFILE statement first.
- Specify the same fileref or physical filename in the INFILE and FILE statements.
- Use options that are common to both the INFILE and FILE statements in the INFILE statement. (Any such options that are used in the FILE statement are ignored.)
- Use the SHAREBUFFERS option in the INFILE statement to allow the INFILE and FILE statements to use the same buffer, which saves CPU time and enables you to update individual fields instead of entire records.

Accessing the Contents of the Output Buffer

In addition to the _FILE_= variable, you can use the automatic _FILE_ variable to reference the contents of the current output buffer for the most recent execution of the FILE statement. This character variable is automatically retained and initialized to blanks. Like other automatic variables, _FILE_ is not written to the data set.

When you specify the _FILE_= option in a FILE statement, this variable is also indirectly referenced by the automatic _FILE_ variable. If the automatic _FILE_ variable is present and you omit _FILE_= in a particular FILE statement, then SAS creates an internal _FILE_= variable for that FILE statement. Otherwise, SAS does not create the _FILE_= variable for a particular FILE.

During execution and at the point of reference, the maximum length of this character variable is the maximum length of the current _FILE_ variable. However, because _FILE_ only references other variables whose lengths are not known until before the execution phase, the designated length is 32,767 bytes during the compilation phase. For example, if you assign _FILE_ to a new variable whose length is undefined, the default length of the new variable is 32,767 bytes. You cannot use the LENGTH statement and the ATTRIB statement to set or override the length of _FILE_. You can use the FORMAT statement and the ATTRIB statement to assign a format to _FILE_.

Updating the _FILE_ Variable

Like other SAS variables, you can update the _FILE_ variable. The following two methods are available:

- Use _FILE_ in an assignment statement.
- Use a PUT statement.

You can update the _FILE_ variable by using an assignment statement that has the following form.

FILE = <*'string-in-quotation-marks'* | *character-expression*>

The assignment statement updates the contents of the current output buffer and sets the buffer length to the length of *'string-in-quotation-marks'* or *character-expression*. However, using an assignment statement does not affect the current column pointer of the PUT statement. The next PUT statement for this FILE statement begins to update the buffer at column 1 or at the last known location when you use the trailing @ in the PUT statement.

In the following example, the assignment statement updates the contents of the current output buffer. The column pointer of the PUT statement is not affected:

```
file print;
_file_ = '_FILE_';
put 'This is PUT';
```

SAS creates the following output: **`This is PUT`**

In this example,

```
file print;
_file_ = 'This is from FILE, sir.';
put @14 'both';
```

SAS creates the following output: **`This is from both, sir.`**

You can also update the _FILE_ variable by using a PUT statement. The PUT statement updates the _FILE_ variable because the PUT statement formats data in the output buffer and _FILE_ points to that buffer. However, by default SAS clears the output buffers after a PUT statement executes and outputs the current record (or N= block of records). Therefore, if you want to examine or further modify the contents of _FILE_ before it is output, include a trailing @ or @@ in any PUT statement (when N=1). For other values of N=, use a trailing @ or @@ in any PUT statement where the last line pointer location is on the last record of the record block. In the following example, when N=1

```
file ABC;
put 'Something' @;
Y = _file_||' is here';
file ABC;
put 'Nothing' ;
Y = _file_||' is here';
```

Y is first assigned **`Something is here`** then Y is assigned **`is here`**.

Any modification of _FILE_ directly modifies the current output buffer for the current FILE statement. The execution of any subsequent PUT statements for this FILE statement outputs the contents of the modified buffer.

FILE only accesses the contents of the current output buffer for a FILE statement, even when you use the N= option to specify multiple buffers. You can access all the N= buffers, but you must use a PUT statement with the # line pointer control to make the desired buffer the current output buffer.

Comparisons

- The FILE statement specifies the output file for PUT statements. The INFILE statement specifies the input file for INPUT statements.
- Both the FILE and INFILE statements enable you to use options that provide SAS with additional information about the external file being used.

Examples

Example 1: Executing Statements When Beginning a New Page

This DATA step illustrates how to use the HEADER= option:

- *Write a report.* Use DATA _NULL_ to write a report rather than create a data set.

```
data _null_;
   set sprint;
   by dept;
```

- *Route output to the Results window. Point to the header information.* The PRINT fileref routes output to the same location as procedure output. HEADER= points to the label that precedes the statements that create the header for each page:

```
file print header=newpage;
```

- *Start a new page for each department:*

```
   if first.dept then put _page_;
      put @22 salesrep @34 salesamt;
```

- *Write a header on each page.* These statements execute each time a new page is begun. RETURN is necessary before the label and as the final statement in a labeled group:

```
return;
   newpage:
   put @20 'Sales for 1989' /
       @20 dept=;
   return;
run;
```

Example 2: Determining New Page by Lines Left on the Current Page

This DATA step demonstrates using the LINESLEFT= option to determine where the page break should occur, according to the number of lines left on the current page.

- *Write a report.* Use DATA _NULL_ to write a report rather than create a data set:

```
data _null_;
   set info;
```

- *Route output to the standard Results window.* The PRINT fileref routes output to the same location as procedure output. LINESLEFT indicates that the variable REMAIN contains the number of lines left on the current page:

```
   file print linesleft=remain pagesize=20;
      put @5 name @30 phone
          @35 bldg @37 room;
```

- *Begin a new page when there are fewer than seven lines left on the current page.* Under this condition, PUT _PAGE_ begins a new page and positions the pointer at line 1:

```
if remain<7 then put _page_ ;
run;
```

Example 3: Arranging the Contents of an Entire Page

This example shows how to use N=PAGESIZE in a DATA step to produce a two-column telephone book listing, each column containing a name and a phone number:

- *Create a report and write it to a Results window.* Use DATA _NULL_ to write a report rather than create a data set. PRINT is the fileref. SAS uses carriage-control characters to write the output with the characteristics of a print file. N=PAGESIZE makes the entire page available to the output pointer:

```
data _null_;
   file 'external-file' print n=pagesize;
```

- *Specify the columns for the report.* This DO loop iterates twice on each DATA step iteration. The COL value is 1 on the first iteration and 40 on the second:

```
do col=1, 40;
```

- *Write 20 lines of data.* This DO loop iterates 20 times to write 20 lines in column 1. When finished, the outer loop sets COL equal to 40, and this DO loop iterates 20 times again, writing 20 lines of data in the second column. The values of LINE and COL, which are set and incremented by the DO statements, control where the PUT statement writes the values of NAME and PHONE on the page:

```
do line=1 to 20;
      set info;
      put #line @col name $20. +1 phone 4.;
   end;
```

- *After composing two columns of data, write the page.* This END statement ends the outer DO loop. The PUT _PAGE_ writes the current page and moves the pointer to the top of a new page:

```
end;
      put _page_;
   run;
```

Example 4: Identifying the Current Output File

This DATA step causes a file identification message to print in the log and assigns the value of the current output file to the variable MYOUT. The PUT statement, demonstrating the assignment of the proper value to MYOUT, writes the value of that variable to the output file:

```
data _null_;
   length myout $ 200;
   file file-specification filename=myout;
   put myout=;
   stop;
run;
```

The PUT statement writes a line to the current output file that contains the physical name of the file:

```
MYOUT=your-output-file
```

Example 5: Dynamically Changing the Current Output File

This DATA step uses the FILEVAR= option to dynamically change the currently opened output file to a new physical file.

- *Write a report. Create a long character variable.* Use DATA _NULL_ to write a report rather than create a data set. The LENGTH statement creates a variable with length long enough to contain the name of an external file:

```
data _null_;
   length name $ 200;
```

- *Read an in-stream data line and assign a value to the NAME variable:*

```
input name $;
```

- *Close the current output file and open a new one when the NAME variable changes.* The *file-specification* is just a place holder; it can be any valid SAS name:

```
file file-specification filevar=name mod;
      date = date();
```

- *Append a log record to currently open output file:*

```
   put 'records updated ' date date.;
```

- *Supply the names of the external files:*

```
datalines;
external-file-1
external-file-2
external-file-3
;
```

Example 6: When the Output Line Exceeds the Line Length of the Output File

Because the combined lengths of the variables are longer than the output line (80 characters), this PUT statement automatically writes three separate records:

```
file file-specification linesize=80;
   put name $ 1-50 city $ 71-90 state $ 91-104;
```

The value of NAME appears in the first record, CITY begins in the first column of the second record, and STATE in the first column of the third record.

Example 7: Specifying an Encoding When Writing to an Output File

This example creates an external file from a SAS data set. The current session encoding is Wlatin1, but the external file's encoding needs to be UTF-8. By default, SAS writes the external file using the current session encoding.

To tell SAS what encoding to use when writing data to the external file, specify the ENCODING= option. When you tell SAS that the external file is to be in UTF-8 encoding, SAS then transcodes the data from Wlatin1 to the specified UTF-8 encoding when writing to the external file.

```
libname myfiles 'SAS-library';
filename outfile 'external-file';
data _null_;
   set myfiles.cars;
   file outfile encoding="utf-8";
   put Make Model Year;
run;
```

Example 8: Using the SFTP Access Method to Write Data to an Excel Spreadsheet

The example uses the SFTP access method and the FILEVAR option to write data to several Microsoft Excel worksheets.

```
data _null_;
   do i = 1 to 3;
      sheet = cats('excel|[test-sheet.xlsx]Sheet', i, '!r1c1:r10c2');
      file area sftp filevar=sheet;
      do x = 1 to 10;
         y = 2*x;
         put x y;
         end;
      end;
run;
```

See Also

Statements:

- “FILENAME Statement” on page 91
- “INFILE Statement” on page 138
- “LABEL Statement” on page 205
- “LOCKDOWN Statement” in SAS Intelligence Platform: Application Server Administration Guide
- “PUT Statement” on page 303
- “RETURN Statement” on page 350
- “TITLE Statement” on page 383

System Options:

- “LOCKDOWN System Option in SAS Intelligence Platform: Application Server Administration Guide

FILENAME Statement

Associates a SAS fileref with an external file or an output device, disassociates a fileref and external file, or lists attributes of external files.

Valid in: Anywhere

Category: Data Access

Restrictions: This statement is not valid in the CAS server.

When SAS is in a locked-down state, the FILENAME statement is not available for files that are not in the lockdown path list.

Syntax

Form 1: **FILENAME** *fileref* <*device-type*> '*external-file*' <ENCODING='*encoding-value*'> <*options*> < *Linux-options*>;

Form 2: **FILENAME** *fileref device-type* <*options*> <*Linux-options* >;

Form 3: **FILENAME** *fileref* CLEAR | _ALL_ CLEAR;

Form 4: **FILENAME** *fileref* LIST | _ALL_ LIST ;

Form 5: **FILENAME** *fileref* ('*pathname-1*' … '*pathname-n*') <ENCODING='*encoding-value*'> <'*Linux-options*'> <LOCKINTERNAL= AUTO | SHARED>;

Form 6: **FILENAME** *fileref directory-name* <ENCODING='*encoding-value*'> <LOCKINTERNAL= AUTO | SHARED>;

Arguments

fileref

is any SAS name that you use when you assign a new fileref. When you disassociate a currently assigned fileref or when you list file attributes with the FILENAME statement, specify a fileref that was previously assigned with a FILENAME statement or an operating environment-level command.

Tip The association between a fileref and an external file lasts only for the duration of the SAS session or until you change it or discontinue it by using another FILENAME statement. Change the fileref for a file as often as you want.

device-type

specifies the type of device or the access method that is used if the fileref points to an input or output device or location that is not a physical file:

ACTIVEMQ

specifies an access method that enables you to access an ActiveMQ messaging broker.

Interaction If the DATA step does not recognize the access method option, the DATA step passes the option to the access method for handling.

DISK

specifies that the device is a disk drive.

Tip When you assign a fileref to a file on disk, you are not required to specify DISK.

DUMMY

specifies that the output to the file is discarded.

Tip Specifying DUMMY can be useful for testing.

GTERM

indicates that the output device type is a graphics device that receives graphics data.

JMS

specifies a Java Message Service (JMS) destination.

PIPE

specifies an unnamed pipe.

Note Some operating environments do not support pipes.

PLOTTER

specifies an unbuffered graphics output device.

PRINTER
specifies a printer or printer spool file.

SFTP
specifies an access method that enables you to access remote files by using the SFTP protocol.

See "FILENAME Statement, SFTP Access Method" on page 103

TAPE
specifies a tape drive.

TEMP
creates a temporary file that exists only as long as the filename is assigned. The temporary file can be accessed only through the logical name and is available only while the logical name exists.

Restriction Do not specify a physical pathname. If you do, SAS returns an error.

Tip Files manipulated by the TEMP device can have the same attributes and behave identically to DISK files.

TERMINAL
specifies the user's terminal.

UPRINTER
specifies a Universal Printing printer definition name.

Tip If you do not specify the printer name in the FILENAME statement, the PRINTERPATH options control which Universal Printer is used and the destination of the output.

URL
specifies an access method that enables you to access remote files by using the URL access method.

See "FILENAME Statement, URL Access Method" on page 109

ZIP
specifies an access method that enables you to access ZIP files.

See "FILENAME Statement, ZIP Access Method" on page 114

Requirement *device-type* must immediately follow *fileref* in the statement.

See "Device Information in the FILENAME Statement" on page 98

'external-file'
is the physical name of an external file. The physical name is the name that is recognized by the operating environment.

Tips Specify *external-file* when you assign a fileref to an external file.

You can associate a fileref with a single file or with an aggregate file storage location.

See "Specifying Pathnames in Linux" in *Batch and Line Mode Processing in SAS Viya*

"Device Information in the FILENAME Statement" on page 98

'pathname-1' ... 'pathname-n'
are pathnames for the files that you want to access with the same fileref. Use this form of the FILENAME statement when you want to concatenate filenames. Concatenation of filenames is available only for DISK files, so you do not have to specify the *device-type*. Separate the pathnames with either commas or blank spaces. Enclose each pathname in quotation marks. "Specifying Pathnames in Linux Environments" in *Batch and Line Mode Processing in SAS Viya* shows character substitutions that you can use when specifying a pathname. If the fileref that you are defining is to be used for input, then you can also use wildcards. Remember that Linux filenames are case-sensitive.

directory-name
specifies the directory that contains the files that you want to access. For more information, see "Assigning a Fileref to a Directory (Using Aggregate Syntax)" in *Batch and Line Mode Processing in SAS Viya*.

ENCODING= '*encoding-value*'
specifies the encoding to use when SAS is reading from or writing to an external file. The value for ENCODING= indicates that the external file has a different encoding from the current session encoding.

When you read data from an external file, SAS transcodes the data from the specified encoding to the session encoding. When you write data to an external file, SAS transcodes the data from the session encoding to the specified encoding.

Default SAS assumes that an external file is in the same encoding as the session encoding.

Restrictions The UPRINTER device type does not support the ENCODING= argument.

You cannot use the FILENAME statement to specify an encoding for a transport file that is created with PROC CPORT. In order for a transport file to be imported successfully, the encodings of the source and target SAS sessions must be compatible.

See For valid encoding values, see "Encoding Values in SAS Language Elements" in *SAS Viya National Language Support: Reference Guide*

Examples "Example 5: Specifying an Encoding When Reading an External File" on page 102

"Example 6: Specifying an Encoding When Writing to an External File" on page 103

LOCKINTERNAL=AUTO | SHARED
specifies the SAS system locking that is to be used for the files that are listed in a FILENAME statement. LOCKINTERNAL can have one of these values:

AUTO
locks a file so that in a SAS session, if a user has Write access to a file, then no other users can have Read or Write access to the file. If a user has Read access to a file, no other user can have Write access to the file, but multiple users can have Read access.

SHARED
locks a file so that in a SAS session, two users do not have simultaneous Write access to the file. The file can be shared simultaneously by one user who has Write access and multiple users who have Read access.

Default AUTO

CLEAR
disassociates one or more currently assigned filerefs.

Operating environment You cannot clear a fileref that is defined by an environment variable. Filerefs that are defined by environment variables are assigned for the entire SAS session.

Tip Specify *fileref* to disassociate a single fileref. Specify _ALL_ to disassociate all currently assigned filerefs.

ALL
specifies that the CLEAR or LIST argument applies to all currently assigned filerefs.

LIST
writes the attributes of one or more files to the SAS log.

Interaction Specify *fileref* to list the attributes of a single file. Specify _ALL_ to list the attributes of all files that have filerefs in your current session.

Operating environment Filerefs defined as environment variables appear only if you have already used those filerefs in a SAS statement. If you are using the Bourne shell or the Korn shell, SAS cannot determine the name of a pre-opened file, so it displays the following string instead of a filename: <File Descriptor *number*>

Options

RECFM=*record-format*
specifies the record format. RECFM can have one of these values:

D	default format (same as variable).
F	fixed format. That is, each record has the same length. Do not use RECFM=F for external files that contain carriage-control characters.
N	binary format. The file consists of a stream of bytes with no record boundaries. N is not valid for the PIPE device type. If you do not specify the LRECL option, then by default SAS reads 256 bytes at a time from the file.
P	print format. On output, SAS writes carriage-control characters.
V	variable format. Each record ends with a newline character.
S370V	variable S370 record format (V).
S370VB	variable block S370 record format (VB).
S370VBS	variable block with spanned records S370 record format (VBS). If you specify RECFM=S3270VBS, then you should specify

BLKSIZE=32,760 and LRECL=32,760 to avoid errors with records longer than 255 characters.

Interaction The default value for the global LRECL system option is 32767. If you are using fixed-length records (RECFM=F), the default value for LRECL is 256.

Linux Options

'*Linux-options*'
are specific to Linux environments. These options can be any of the following values:

BLKSIZE=
BLK=
specifies the number of bytes that are physically written or read in one I/O operation. The default is 64K. The maximum is 1G-1. If you specify RECFM=S370VBS, then you should specify BLKSIZE=32,760 to avoid errors with records longer than 255 characters.

LRECL=
specifies the logical record length. Its value depends on the record format in effect (RECFM). The default value for LRECL= is 32,767. If you are using fixed length records (RECFM=F), the default value for LRECL= is 256. The maximum length is 1G.

- If RECFM=F, then the value for the LRECL= option determines either the number of bytes to be read as one record or the length of each output record. The output record is truncated or padded with blanks to fit the specified size.

  Note: When RECFM=F, LRECL= must be set to 256 when you are reading fixed length records that were created using the default value in a previous version of SAS.

- If RECFM=N, then the value for the LRECL= option must be at least 256.
- If RECFM=V, then the value for the LRECL= option determines the maximum record length. Records that are longer than the specified length are divided into multiple records on output and truncated on input.
- If RECFM=S370VBS, then you should specify LRECL=32,760 to avoid errors with records longer than 255 characters.

MOD
indicates that data written to the file should be appended to the file.

NEW | OLD
specifies whether a new or existing file is used for output. If you specify NEW, a new file is to be opened for output. If the file already exists, it is deleted and re-created. If you specify OLD, the previous contents of the file are replaced. NEW is the default.

PERMISSION='*permission-value*'
specifies permissions to set for the specified fileref. To specify more than one set of permission values, separate them with a comma within quotation marks.

Provide the *permission-value* in the following format:

`A::<trustee_type>::<permissions>`

The ‘A’ indicates that these are access permissions. No other values are currently supported.

The trustee_type can take the following values:

u user

g group (group owner of the file)

o other (all other users)

The permission value takes the letters *r* (Read), *w* (Write), and *x* (Execute), in that order. If you do not want to grant one of these permissions, enter a '-' in its place (for example, *r-x* or *rw-*).

Suppose that you want to have Read, Write, and Execute permission for a fileref. You also want to specify Read and Execute permission for the group owner of the file. Finally, you want to allow all other users to have only Read permission for the file. You can specify these options as follows:

```
permission='A::u::rwx,A::g::r-x,A::o::r--'
```

Supply a permission value for all three trustee types. Any trustee type that you omit from the list of permission values is denied all access to the specified fileref. For example, suppose you used the following permission values:

```
permission='A::u::rwx,A::g::r-x'
```

In this case, only the owner and the group owner would have access to the specified file. Any user other than the owner or group owner is denied all access to the file.

TERMSTR=

controls the end-of-line delimiter in files that are formatted by Linux. By default, either a line feed alone or a carriage return and a line feed indicate the end of a line. To explicitly define the end-of-line delimiter, specify one of these values:

CR Carriage return.

CRLF Carriage return line feed. Use this value to read files that are formatted by a PC. CRLF is the default.

LF Line feed.

If you are writing a file that is read on Linux, specify TERMSTR=LF.

UNBUF

tells SAS not to perform buffered Writes to the file on any subsequent FILE statement. This option applies especially when you are reading from or writing to a data collection device. As explained in *SAS Viya Statements: Reference*, it also prevents buffered Reads on INFILE statements.

Details

Definitions

external file

is a file that is created and maintained in the operating environment from which you need to read data, SAS programming statements, or autocall macros, or to which you want to write output. An external file can be a single file or an aggregate storage location that contains many individual external files. See "Example 3: Associating a Fileref with an Aggregate Storage Location" on page 101.

fileref

(a file reference name) is a shorthand reference to an external file. After you associate a fileref with an external file, you can use it as a shorthand reference for

that file in SAS programming statements (such as INFILE, FILE, and %INCLUDE) and in other commands and statements in SAS software that access external files.

Reading Delimited Data from an External File

Anytime a text file originates from anywhere other than the local encoding environment, it might be necessary to specify the ENCODING= option in either EBCDIC or ASCII environments.

For example, when you read an EBCDIC text file on an ASCII platform, it is recommended that you specify the ENCODING= option in the FILENAME statement. However, if you use the DSD and DLM options in the FILENAME statement, the ENCODING= option is a requirement because these options require certain characters in the session encoding (such as quotation marks, commas, and blanks).

The use of encoding-specific informats should be reserved for use with true binary files. That is, they contain both character and non-character fields.

Associating a Fileref with an External File (Form 1)

Use this form of the FILENAME statement to associate a fileref with an external file on disk:

FILENAME *fileref* '*external-file*' <*operating-environment-options*>;

To associate a fileref with a file other than a disk file, you might need to specify a device type, depending on your operating environment, as shown in this form:

FILENAME *fileref* <*device-type*> <*operating-environment-options*>;

The association between a fileref and an external file lasts only for the duration of the SAS session or until you change it or discontinue it with another FILENAME statement. Change the fileref for a file as often as you want.

To specify a character-set encoding, use the following form:

FILENAME *fileref* <*device-type*> <*operating-environment-options*>;

Associating a Fileref with a Terminal, Printer, Universal Printer, or Plotter (Form 2)

To associate a fileref with an output device, use this form:

FILENAME *fileref device-type* <*operating-environment-options*>;

Disassociating a Fileref from an External File (Form 3)

To disassociate a fileref from a file, use a FILENAME statement, specifying the fileref and the CLEAR option.

FILENAME *fileref* CLEAR | _ALL_ CLEAR;

Writing File Attributes to the SAS Log (Form 4)

Use a FILENAME statement to write the attributes of one or more external files to the SAS log. Specify *fileref* to list the attributes of one file; use _ALL_ to list the attributes of all the files that have been assigned filerefs in your current SAS session.

FILENAME *fileref* LIST | _ALL_ LIST;

Device Information in the FILENAME Statement

The following table lists the relationship between device type or access method and the related external file.

Table 2.3 *Device Information in the FILENAME Statement*

Device or Access Method	Function	External File
ACTIVEMQ	enables SAS programs to send messages to and receive messages from an ActiveMQ message broker through the HTTP protocol.	is accessed through a URL using the ActiveMQ RESTful API. The ActiveMQ MessageServlet handles the integration between the HTTP requests and the ActiveMQ message dispatcher.
DISK	associates the fileref with a DISK file.	is either the pathname for a single file or, if you are concatenating filenames, a list of pathnames separated by spaces or commas and enclosed in parentheses. The level of specification depends on your location in the file system. "Specifying Pathnames in Linux" in *Batch and Line Mode Processing in SAS Viya*shows character substitutions that you can use when specifying a UNIX pathname.
DUMMY	associates a fileref with a null device.	None. DUMMY enables you to debug your application without reading from or writing to a device. Output to this device is discarded.
JMS	enables SAS programs to send messages to and receive messages from any JMS API-compliant message service.	is accessed through the third-party Message-Oriented Middleware vendor's JMS provider, which implements the JMS API specification. The specification must be found in the classpath.
PIPE	reads input from or writes output to a Linux command.	is a Linux command. For more information, see "Printing and Routing Output" in *SAS Viya Universal Printing*.
PLOTTER	sends output to a plotter.	is a device name and plotter options. For more information, see "Using the PRINTTO Procedure in LINUX Environments" in *SAS Viya Universal Printing*."Assigning Filerefs to External Files or Devices with the FILENAME Statement" in *Batch and Line Mode Processing in SAS Viya*.
PRINTER	sends output to a printer.	is a device name and printer option. For more information, see "Printing and Routing Output" in *SAS Viya Universal Printing*.
SFTP	reads from or writes to a file from any host computer that you can connect to on a network with an SSHD server running.	is the pathname of the external file on the remote computer, followed by SFTP options. For more information, see"FILENAME Statement, SFTP Access Method" on page 103 and

Device or Access Method	Function	External File
TEMP	associates a fileref with an external file stored in the Work library.	None
TERMINAL	associates a fileref with a terminal.	is the pathname of a terminal.
UPRINTER	sends output to the default printer that was set up through the Printer Setup dialog box.	None

URL*	enables you to use the URL of a file to access it remotely.	is the name of the file that you want to read from or write to on a URL server. The URL must be in one of these forms:
		`http://hostname/file`
		`http://hostname:portno/file`

ZIP	enables you to access ZIP files.	is the pathname of the ZIP file that enables ZIP zlib services to read from or write to a Linux machine that supports zlib. For more information, see "FILENAME Statement, ZIP Access Method" on page 114.

* This access method is not accessible (enabled) when SAS is in a locked-down state unless your system administrator has re-enabled it.

File Locking

File locking of external files is controlled at the FILENAME statement level by the LOCKINTERNAL option. If you use the AUTO (default) value for LOCKINTERNAL, then SAS locks a file exclusively for one user who has Write access. SAS locks a file non-exclusively for multiple users who have Read access. For example, if a file is opened in UPDATE or OUTPUT mode, then all other access from internal processes are blocked. If a file is opened in INPUT mode, then multiple users can read the file, but UPDATE and OUTPUT functions are blocked.

If you use the SHARED value for LOCKINTERNAL, then SAS allows one user Write access to a file as well as allowing multiple users to read the file.

Comparisons

The FILENAME statement assigns a fileref to an external file. The LIBNAME statement assigns a libref to a SAS library. Use the LIBNAME, SAS/ACCESS statement to access DBMS tables.

Examples

Example 1: Specifying a Fileref or a Physical Filename

You can specify an external file either by associating a fileref with the file and then specifying the fileref or by specifying the physical filename in quotation marks:

```
filename sales 'your-input-file';
data jansales;
   /* specifying a fileref */
   infile sales;
   input salesrep $20. +6 jansales febsales marsales;
run;
data jansales;
   /* physical filename in quotation marks */
   infile 'your-input-file';
   input salesrep $20. +6 jansales febsales marsales;
run;
```

Example 2: Using a FILENAME and a LIBNAME Statement

This example reads data from a file that has been associated with the fileref GREEN and creates a permanent SAS data set stored in a SAS library that has been associated with the libref SAVE.

```
filename green 'your-input-file';
libname save 'SAS-library';
data save.vegetable;
   infile green;
   input lettuce cabbage broccoli;
run;
```

Example 3: Associating a Fileref with an Aggregate Storage Location

If you associate a fileref with an aggregate storage location, use the fileref, followed in parentheses by an individual filename, to read from or write to any of the individual external files that are stored there.

In this example, each DATA step reads from an external file (REGION1 and REGION2, respectively) that is stored in the same aggregate storage location and that is referenced by the fileref SALES.

```
filename sales 'aggregate-storage-location';
data total1;
   infile sales(region1);
   input machine $ jansales febsales marsales;
   totsale=jansales+febsales+marsales;
run;
data total2;
   infile sales(region2);
   input machine $ jansales febsales marsales;
   totsale=jansales+febsales+marsales;
run;
```

Example 4: Routing PUT Statement Output

In this example, the FILENAME statement associates the fileref OUT with a printer that is specified with an operating environment-dependent option. The FILE statement directs PUT statement output to that printer.

```
filename out printer operating-environment-option;
data sales;
   file out print;
   input salesrep $20. +6 jansales
         febsales marsales;
   put _infile_;
   datalines;
Jones, E. A.              124357 155321 167895
Lee, C. R.                111245 127564 143255
Desmond, R. T.             97631 101345 117865
;
```

You can use the FILENAME and FILE statements to route PUT statement output to several devices during the same session. To route PUT statement output to your display monitor, use the TERMINAL option in the FILENAME statement, as shown here:

```
filename show terminal;
data sales;
   file show;
   input salesrep $20. +6 jansales
         febsales marsales;
   put _infile_;
   datalines;
Jones, E. A.              124357 155321 167895
Lee, C. R.                111245 127564 143255
Desmond, R. T.             97631 101345 117865
;
```

Example 5: Specifying an Encoding When Reading an External File

This example creates a SAS data set from an external file. The external file is in Wlatin1 character-set encoding, and the current SAS session is in UTF-8 encoding. By default, SAS assumes that an external file is in the same encoding as the session encoding, which causes the character data to be written to the new SAS data set incorrectly.

To tell SAS what encoding to use when reading the external file, specify the ENCODING= option. When you tell SAS that the external file is in Wlatin1, SAS then transcodes the external file from Wlatin1 to the current session encoding when writing to the new SAS data set. Therefore, the data is written to the new data set correctly in UTF-8.

```
libname myfiles  'SAS-library';

filename extfile 'external-file' encoding="wlatin1";
data myfiles.unicode;
   infile extfile;
   input Make $ Model $ Year;
run;
```

Note: You cannot use the FILENAME statement to specify an encoding for a transport file that is created with PROC CPORT. In order for a transport file to be imported successfully, the encodings of the source and target SAS sessions must be compatible.

Example 6: Specifying an Encoding When Writing to an External File

This example creates an external file from a SAS data set. The current session encoding is UTF-8, but the external file's encoding needs to be Wlatin1. By default, SAS writes the external file using the current session encoding.

To tell SAS what encoding to use when writing data to the external file, specify the ENCODING= option. When you tell SAS that the external file is to be in Wlatin1 encoding, SAS then transcodes the data from UTF-8 to the specified Wlatin1 encoding when writing to the external file.

```
libname myfiles  'SAS-library';
filename outfile 'external-file' encoding="wlatin1";

data _null_;
   set myfiles.cars;
   file outfile;
   put Make Model Year;
run;
```

See Also

- "Using External Files and Devices" in *Batch and Line Mode Processing in SAS Viya*
- "Printing and Routing Output" in *SAS Viya Universal Printing*

Statements:

- "FILE Statement" on page 71
- "%INCLUDE Statement" on page 131
- "INFILE Statement" on page 138
- "FILENAME Statement, SFTP Access Method" on page 103
- "FILENAME Statement, URL Access Method" on page 109
- "FILENAME Statement, ZIP Access Method" on page 114
- "LIBNAME Statement" on page 212
- "LOCKDOWN Statement" in SAS Intelligence Platform: Application Server Administration Guide

System Options:

- "LOCKDOWN System Option in SAS Intelligence Platform: Application Server Administration Guide

FILENAME Statement, SFTP Access Method

Enables you to access remote files by using the SFTP protocol.

Valid in: Anywhere

Category: Data Access

Restriction: This statement is not valid in the CAS server.

Syntax

FILENAME *fileref* SFTP '*external-file*' <*sftp-options*>;

Arguments

fileref
is a valid fileref.

Tip The association between a fileref and an external file lasts only for the duration of the SAS session or until you change it or discontinue it with another FILENAME statement. You can change the fileref for a file as often as you want.

SFTP
specifies the access method that enables you to use Secure File Transfer Protocol (SFTP) to read from or write to a file from any host computer that you can connect to on a network with an OpenSSH SSHD server running.

'*external-file*'
specifies the physical name of an external file that you want to read from or write to. The physical name is the name that is recognized by the operating environment.

Tips If you are not transferring a file but performing a task such as retrieving a directory listing, then you do not need to specify an external filename. Instead, put empty quotation marks in the statement.

You can associate a fileref with a single file or with an aggregate file storage location.

sftp-options
specifies details that are specific to your operating environment such as file attributes and processing attributes.

Operating environment For more information about some of these SFTP options, see the SAS documentation for your operating environment.

See "SFTP Options" on page 104

SFTP Options

sftp-options can be any of these values:

BATCHFILE='*path*'
specifies the fully qualified pathname and the filename of the batch file that contains the SFTP commands. These commands are submitted when the SFTP access method is executed. After the batch file processing ends, the SFTP connection is closed.

Requirement The path must be enclosed in quotation marks.

Tip After the batch file processing ends, the SFTP connection is closed and the filename assignment is no longer available. If subsequent DATA step processing requires the FILENAME SFTP statement, then another FILENAME SFTP statement is required.

Example "Example 4: Using a Batch File" on page 109

CD='*directory*'
issues a command that changes the working directory for the file transfer to the *directory* that you specify.

DEBUG
writes informational messages to the SAS log.

DIR
enables you to access directory files. Specify the directory name in the external-file argument. You must use valid directory syntax for the specified host.

Interaction The CD and DIR options are mutually exclusive. If both are specified, SFTP ignores the CD option and SAS writes an informational note to the log.

Tips If you want SFTP to create the directory, then use the NEW option in conjunction with the DIR option. The NEW option is ignored if the directory exists.

If the NEW option is omitted and you specify an invalid directory, then a new directory is not created and you receive an error message.

HOST='*host*'
where *host* is the network name of the remote host with the OpenSSH SSHD server running.

You can specify either the name of the host (for example, `server.pc.mydomain.com`) or the IP address of the computer (for example, `2001:db8::`).

LRECL=*lrecl*
where *lrecl* is the logical record length of the data.

Default 256

Interaction Alternatively, you can specify a global logical record length by using the "LRECL= System Option" in *SAS Viya System Options: Reference*. The default value for the global LRECL system option is 32767. If you are using fixed-length records (RECFM=F), the default value for LRECL is 256.

LS
issues the LS command to the SFTP server. LS returns the contents of the working directory as records with no file attributes.

Restriction The LS option does not display files with leading periods, for example, *.xAuthority*.

Interaction The LS and LSA options are mutually exclusive. If you specify both options, the LSA option takes precedence.

Tip To return a listing of a subset of files, use the LSFILE= option in addition to LS.

LSA
issues the LS command to the SFTP server. LSA returns all the contents of the working directory as records with no file attributes.

Interactions The LS and LSA options are mutually exclusive. If you specify both options, the LSA option takes precedence.

To display files without leading periods, for example, *.xAuthority*, use the LS= option.

Tip To return a listing of a subset of files, use the LSFILE= option in addition to LSA.

LSFILE='*character-string*'
in combination with the LS option, specifies a character string that enables you to request a listing of a subset of files from the working directory. Enclose the character string in quotation marks.

Restriction LSFILE= can be used only if LS or LSA is specified.

Tip You can specify a wildcard as part of '*character-string* '.

Example This statement lists all of the files that start with *sales* and end with *sas*:

```
filename myfile sftp '' ls lsfile='sales*.sas'
   other-sftp-options;
```

MGET
transfers multiple files, similar to the SFTP command MGET.

Tip The whole transfer is treated as one file. However, as the transfer of each new file is started, the EOV= variable is set to 1.

NEW
specifies that you want SFTP to create the directory when you use the DIR option.

Tip The NEW option is ignored if the directory exists.

OPTIONS='*option-string*'
specifies SFTP configuration options such as port numbers and verbose.

Note If you need to blot any information in the OPTIONS string, use the OPTIONSX option.

OPTIONSX='*option-string*'
specifies SFTP configuration options such as private keys and passphrases. All information in the *option-string* is blotted when written to the SAS log.

Requirement If the passphrase in the OPTIONSX string contains one or more spaces, then the passphrase must be enclosed in double quotation marks and the OPTIONSX string must be enclosed in single quotation marks.

Tip The passphrase is passed using the **`-pw`** parameter.

PATH
specifies the location of the SFTP executable if it is not installed in the PATH or $PATH search path.

Tip It is recommended that the OpenSSH “SFTP” executable or PUTTY “PSFTP” executable be installed in a directory that is accessible via the PATH or $PATH search path.

RECFM=*recfm*
where *recfm* is one of two record formats:

F
is fixed-record format. Thus, all records are of size LRECL with no line delimiters.

Interaction The default value for the global LRECL system option is 32767. If you are using fixed length records (RECFM=F), the default value for LRECL is 256.

S
is stream-record format. Data is transferred in image (binary) mode.

Interaction The amount of data that is read is controlled by the current LRECL value or by the value of the NBYTE= variable in the INFILE statement. The NBYTE= option specifies a variable that is equal to the amount of data to be read. This amount must be less than or equal to LRECL.

See The NBYTE= option on page 147 in the INFILE statement.

V
is variable-record format (the default). In this format, records have varying lengths, and they are separated by newlines. Data is transferred in image (binary) mode.

Default V

USER='*username*'
specifies the user name.

Tips The *username* is not typically required on LINUX hosts when using public key authentication.

Public key authentication using an SSH agent is the recommended way to connect to a remote SSHD server.

WAIT_MILLISECONDS=*milliseconds*
specifies the SFTP response time in milliseconds.

Default 1,500 milliseconds

Tip If you receive a time-out message in the log, use the WAIT_MILLISECONDS option to increase the response time.

Details

The Basics

The Secure File Transfer Protocol (SFTP) provides a secure connection and file transfers between two hosts (client and server) over a network. Both commands and data are encrypted. The client machine initiates a connection with the remote host (OpenSSH SSHD server).

With the SFTP access method, you can read from or write to any host computer that you can connect to on a network with an OpenSSH SSHD server running. The client and

server applications can reside on the same computer or on different computers that are connected by a network.

Specific implementation details are dependent on the OpenSSH SSHD server version and how that site is configured.

The SFTP access method relies on default send and reply messages to OpenSSH commands. Custom installs of OpenSSH that modify these messages disable the SFTP access method.

You must have the applicable client software installed to use the SFTP access method. The SFTP access method supports only the OpenSSH client on Linux.

Note: Password validation is not supported for the SFTP access method.

Note: Public key authentication using an SSH agent is the recommended way to connect to a remote SSHD server.

Note: If you have trouble running the SFTP access method try to manually validate SFTP client access to an OpenSSH SSHD server without involving the SAS system. Manually validating SFTP client access without involving the SAS system ensures that your SSH or SSHD configuration and key authentication is setup correctly.

SFTP Access Methods and SFTP Prompts

The SFTP access method supports only the following prompts. Changing the prompt disables the SFTP access method.

- For OpenSSH:

  sftp>

  sftp >

Comparisons

As with the SFTP **get** and **put** commands, the SFTP access method lets you download and upload files. However, this method directly reads files into your SAS session without first storing them on your system.

Examples

Example 1: Connecting to an SSHD Server at a Standard Port

This example reads a file called **test.dat** using the SFTP access method after connecting to the SSHD server a standard port:

```
filename myfile sftp '/users/xxxx/test.dat' host="linuxhost1";
data _null_;
   infile myfile truncover;
   input a $25.;
run;
```

Example 2: Connecting to an SSHD Server at a Nonstandard Port

This example reads a file called **test.dat** using the SFTP access method after connecting to the SSHD server at port 4117:

```
filename myfile sftp '/users/xxxx/test.dat' host="linuxhost1" options="-oPort=4117";
data _null_;
   infile myfile truncover;
   input a $25.;;
```

```
run;
```

Example 3: Reading Files from a Directory on the Remote Host

This example reads the files **test.dat** and **test2.dat** from a directory on the remote host.

```
filename infile sftp '/users/xxxx/' host="linuxhost1" dir;
data _null_;
   infile infile(test.dat) truncover;
   input a $25.;
   infile infile(test2.dat) truncover;
   input b $25.;
run;
```

Example 4: Using a Batch File

In this example, when the INFILE statement is processed, the batch file associated with the FILENAME SFTP statement, **sftpcmds**, is executed.

```
filename process sftp ' ' host="linuxhost1" user="userid"
   batchfile="c:/stfpdir/sftpcmds.bat";
data _null_;
   infile process;
run;
```

See Also

- Barrett, Daniel J., Richard E. Silverman, and Robert G. Byrnes. 2005. “SSH, The Secure Shell: The Definitive Guide.” Sebastopol, CA: O'Reilly

Statements:

- “FILENAME Statement” on page 91
- “FILENAME Statement, URL Access Method” on page 109
- “FILENAME Statement, ZIP Access Method” on page 114
- “LIBNAME Statement” on page 212

FILENAME Statement, URL Access Method

Enables you to access remote files by using the URL access method.

Valid in: Anywhere

Category: Data Access

Restrictions: This statement is not valid in the CAS server.

When SAS is in a locked-down state, the FILENAME statement, URL access method is not available. Your server administrator can re-enable this access method so that it is accessible in the locked-down state. If the FILENAME statement, URL access method is re-enabled, the SOAP procedure is automatically re-enabled.

Syntax

FILENAME *fileref* URL '*external-file*' <*url-options*>;

Arguments

fileref
is a valid fileref.

Tip The association between a fileref and an external file lasts only for the duration of the SAS session or until you change it or discontinue it with another FILENAME statement. You can change the fileref for a file as often as you want.

URL
specifies the access method that enables you to read a file from any host computer that you can connect to on a network with a URL server running.

Alias HTTP

'*external-file*'
specifies the name of the file that you want to read from on a URL server. The Transport Layer Security (TLS) protocol, https, can also be used to access the files. The file must be specified in one of these formats:

- http://*hostname*/*file*
- https://*hostname*/*file*
- http://*hostname:portno*/*file*
- https://*hostname:portno*/*file*

URL Options

url-options can be any of these values:

ACCEPT='*header-type*'
specifies the Accept: header. The Accept: header can be used to specify certain media types, which are acceptable for the response.

Default */*

Requirement *header-type* must be enclosed in either single or double quotation marks.

BLOCKSIZE=*blocksize*
where *blocksize* is the size of the URL data buffer in bytes.

Default 8K

CONNECT
creates a connection between the client and the proxy and between the proxy and the server when accessing a URL through a proxy.

Requirement You must use the PROXY= option with the CONNECT option. No connection is made if the CONNECT option is used without the PROXY= option.

Interaction If you use "http" in the *external-file* argument, a connection is made, but the TLS protocol is not used.

See "PROXY=*url* " on page 112

DEBUG
writes debugging information to the SAS log.

Tip The result of the HELP command is returned as records.

HEADERS=*fileref*
specifies the fileref to which the header information is written when a file is opened by using the URL access method. The header information is the same information that is written to the SAS log.

Requirement The fileref must be defined in a previous FILENAME statement.

Interactions If you specify the HEADERS= option without specifying the DEBUG option, the DEBUG option is automatically turned on.

By default, log information is overwritten. To append the log information, you must specify the MOD option in the FILENAME statement that creates the fileref.

LRECL=*lrecl*
where *lrecl* is the logical record length of the data.

Default 256

Interaction Alternatively, you can specify a global logical record length by using the "LRECL= System Option" in *SAS Viya System Options: Reference*. The default value for the global LRECL system option is 32767. If you are using fixed-length records (RECFM=F), the default value is 256.

PASS='*password*'
where *password* is the password to use with the user name that is specified in the USER option.

Tips You can specify the PROMPT option instead of the PASS option, which tells the system to prompt you for the password.

To use an encoded password, use the PWENCODE procedure in order to disguise the text string, and then enter the encoded password for the PASS= option. For more information, see "PWENCODE" in *SAS Viya Data Management and Utility Procedures Guide*.

PPASS='*password*'
where *password* is the password to use with the user name that is specified in the PUSER option. The PPASS option is used to access the proxy server.

Tips You can specify the PROMPT option instead of the PPASS option, which tells the system to prompt you for the password.

To use an encoded password, use the PWENCODE procedure to disguise the text string, and then enter the encoded password for the PASS= option. For more information, see "PWENCODE" in *SAS Viya Data Management and Utility Procedures Guide*.

PROMPT
specifies to prompt for the user login password if necessary.

Tip If you specify PROMPT, you do not need to specify PASS= or PPASS=.

PROXY=*url*
specifies the Uniform Resource Locator (URL) for the proxy server in one of these forms:

http://*hostname*/

http://*hostname:portno*/

See "CONNECT" on page 110

PUSER='*username*'
where *username* is used to log on to the URL proxy server.

Interactions If you specify the PUSER option, the USER option goes to the web server regardless of whether you specify a proxy server.

If PROMPT is specified, but PUSER is not, the user is prompted for an ID as well as a password.

Tip If you specify puser='*', then the user is prompted for an ID.

RECFM=*recfm*
where *recfm* is one of three record formats:

F
is fixed-record format. Thus, all records are of size LRECL with no line delimiters. Data is transferred in image (binary) mode.

Interaction The default value for the global LRECL system option is 32767. If you are using fixed-length records (RECFM=F), the default value for LRECL is 256.

S
is stream-record format. Data is transferred in image (binary) mode.

Alias N

Tip The amount of data that is read is controlled by the current LRECL value or the value of the NBYTE= variable in the INFILE statement. The NBYTE= option specifies a variable that is equal to the amount of data to be read. This amount must be less than or equal to LRECL.

See The NBYTE= option on page 147 in the INFILE statement.

V
is variable-record format (the default). In this format, records have varying lengths, and they are transferred in text (stream) mode.

Tip Any record larger than LRECL is truncated.

Default V

TERMSTR='*eol-char*'
where *eol-char* is the line delimiter to use when RECFM=V. There are four valid values:

CR carriage return (CR).

CRLF carriage return (CR) followed by line feed (LF).

LF line feed only (the default).

NULL NULL character (0x00).

Default LF

Restriction Use this option only when RECFM=V.

USER='*username*'
where *username* is used to log on to the URL server.

Interactions If you specify the USER option but do not specify the PUSER option, where the USER option goes depends on whether you specify a proxy server. If you do not specify a proxy server, USER goes to the web server. If you do specify a proxy server, USER goes to the proxy server.

If you specify the PUSER option, the USER option goes to the web server regardless of whether you specify a proxy server.

If PROMPT is specified, but USER or PUSER is not, the user is prompted for an ID as well as a password.

Tip If you specify user='*', then the user is prompted for an ID.

Details

The Transport Layer Security (TLS) protocol is used when the URL begins with “https” instead of “http”. TLS and its predecessor, Secure Sockets Layer (SSL), are cryptographic protocols that are designed to provide communication security over the Internet. TLS and SSL are protocols that provide network data privacy, data integrity, and authentication. In addition to providing encryption services, TLS performs client and server authentication, and it uses message authentication codes to ensure data integrity. The TLS protocol allows client/server applications to communicate across a network in a way designed to prevent eavesdropping and tampering. TLS is supported by all major browser software.

Note: All discussion of TLS is also applicable to the predecessor protocol, SSL.

Operating Environment Information
Using the FILENAME statement requires information that is specific to your operating environment. The URL access method is fully documented here, but for more information about how to specify filenames, see the SAS documentation for your operating environment.

Examples

Example 1: Accessing a File at a Website

This example accesses document **`test.dat`** at site **`www.a.com`**:

```
filename foo url 'http://www.a.com/test.dat'
   proxy='http://www.gt.sas.com';
```

Example 2: Specifying a User ID and a Password

This example accesses document **`file1.html`** at site **`www.b.com`** using the TLS protocol and requires a user ID and password:

```
filename foo url 'https://www.b.com/file1.html'
    user='jones' prompt;
```

Example 3: Reading the First 15 Records from a URL File

This example reads the first 15 records from a URL file and writes them to the SAS log with a PUT statement:

```
filename foo url
   'http://support.sas.com/techsup/service_intro.html';

data _null_;
   infile foo length=len;
   input record $varying200. len;
   put record $varying200. len;
   if _n_=15 then stop;
run;
```

See Also

- "Transport Layer Security (TLS) " in *Encryption in SAS Viya*

Statements:

- "FILENAME Statement" on page 91
- "FILENAME Statement, SFTP Access Method" on page 103
- "FILENAME Statement, ZIP Access Method" on page 114
- "LOCKDOWN Statement" in SAS Intelligence Platform: Application Server Administration Guide

FILENAME Statement, ZIP Access Method

Enables you to access ZIP files.

Valid in: Anywhere

Category: Data Access

Restriction: This statement is not valid in the CAS server.

Note: The ZIP access method reads and writes only files created with the WinZip file compression.

Syntax

FILENAME *fileref* ZIP '*external-file*' <*zip-options*>;

Arguments

fileref
is a valid fileref.

Tip The association between a fileref and an external file lasts only for the duration of the SAS session or until you change the fileref or discontinue it with another

FILENAME statement. You can change the fileref for a file as often as you want.

ZIP
specifies the access method that enables you to use ZIP files.

'*external-file*'
specifies the name of the ZIP file that you want to read from or write to.

Operating environment For information about specifying the physical names of external files, see the SAS documentation for your operating environment.

Note If you write multiple entries of the same ZIP file in a DATA step, an error occurs. Multiple entries overlay each other with unpredictable results.

Tips Specify *external-file* when you assign a fileref to an external file. You can associate a fileref with a single file by using the MEMBER= syntax or with an aggregate file storage location that uses the *fileref*(*member*) syntax.

You can use a wildcard in the MEMBER= syntax. An asterisk (*) matches zero or more characters. A question mark (?) matches one character. Wildcards are supported when reading entries and for exist actions. Wildcards are not supported for write or delete actions. For example, writing entry “A*” creates an entry “A*”. Deleting an entry named “A*” deletes “A*” but not any entry that starts with “A”. Calling an exist function with “A*” returns True as long as one or more entries that start with “A” exist.

ZIP Options

zip-options can be any of the following values:

COMMENT="*comment-string*"
writes an informative comment in a ZIP file.

COMPRESSION='*compression-level*'
specifies the compression level that is used to write to the ZIP file member. Valid values for the compression level are 0 through 9. A value of 0 stores the file with no compression. A value of 9 indicates maximum compression.

Default 6

Restriction COMPRESSION= is used only when opening a file for writing.

DEBUG
writes debugging information to the SAS log.

ENCODING=*encoding-value*
specifies the encoding to use when SAS is reading from or writing to an external file. The value for ENCODING= indicates that the external file has a different encoding from the current session encoding.

When you read data from an external file, SAS transcodes the data from the specified encoding to the session encoding. When you write data to an external file, SAS transcodes the data from the session encoding to the specified encoding.

Default SAS assumes that an external file is in the same encoding as the session encoding.

See "Encoding Values in SAS Language Elements" in *SAS Viya National Language Support: Reference Guide*

FILEEXT
specifies that a file extension is automatically appended to the filename member if the extension does not exist.

Interaction The autocall macro facility always passes the extension .SAS to the file access method as the extension to use when opening files in the autocall library. The DATA step always passes the extension .DATA. If you define a fileref for an autocall macro library and the files in that library have a file extension of .SAS, use the FILEEXT option. If the files in that library do not have an extension, do not use the FILEEXT option. For example, if you define a fileref for an input file in the DATA step and the file X has an extension of .DATA, you would use the FILEEXT option to read the file X.DATA. If you use the INFILE or FILE statement, enclose the member name and extension in quotation marks to preserve the casing.

Tip The FILEEXT option is ignored if you specify a file extension on the FILE or INFILE statement.

See "LOWCASE_MEMNAME" on page 116

LOWCASE_MEMNAME
enables autocall macro retrieval of lowercase directory or member names from ZIP files.

Restriction SAS autocall macro retrieval always searches for uppercase directory member names. Mixed-case directory or member names are not supported.

See "FILEEXT" on page 116

LRECL=*lrecl*
where *lrecl* is the logical record length of the data.

Default 32767

Interaction Alternatively, you can specify a global logical record length by using the "LRECL= System Option" in *SAS Viya System Options: Reference*. The default value for the global LRECL system option is 32767.

NAMEENCODING=*encoding-value*
specifies the encoding to use for ZIP file entry names and comments. The value for NAMEENCODING= indicates that the entry name and comment have a different encoding from the current session encoding.

Default Code Page 437

Example
```
filename zs zip "yxz.zip" nameencoding=sjis member="s" termstr=lf;
```

RECFM=*recfm*
where *recfm* is one of four record formats:

F
is a fixed-record format. Each record has the same length.

N
is a binary format. The file consists of stream bytes with no record boundaries.

S
is a stream-record format.

Interaction The amount of data that is read is controlled by the current LRECL value or by the value of the NBYTE= variable in the INFILE statement. The NBYTE= option specifies a variable that is equal to the amount of data to be read. This amount must be less than or equal to LRECL.

See The NBYTE= option on page 147 in the INFILE statement.

V
is a variable-record format (the default). In this format, records have varying lengths, and they are transferred in text (stream) mode.

Interaction Any record larger than LRECL is truncated.

Default V

TERMSTR='*eol-termination-character*'
where the terminating character is the line character for Read operations and is the terminating character for a record Write operation. There are four valid values:

CR carriage return (CR).

LF line feed only (the default).

NULL NULL character (0x00).

Default LF

Examples

Example 1: Reading a ZIP File Member from a Directory

The following example reads the *test1.txt* ZIP file member from the **testzip** ZIP file.

```
filename foo ZIP 'U:\directory1\testzip.zip' member="test1.txt" ;

data _null_;
infile foo;
input a $80.;
run;
```

Example 2: Writing a ZIP File to a New Member of a Directory

The following example writes the *shoes* file to the **testzip** ZIP file.

```
filename foo ZIP 'U:\directory1\testzip.zip';

data _null_;
  file foo(shoes);
  set sashelp.shoes;
```

```
  put region $25. product $14.;
run;
```

Example 3: Reading from a Member of a Directory

This example reads the file *shoes* from the **testing1**ZIP file.

```
filename foo ZIP 'U:\directory1\testzip.zip';

data shoes;
  length region $25  product $14;
  infile foo(shoes);
  input region $25. product $14.;
run;
```

See Also

Statements:

- "FILENAME Statement" on page 91
- "FILENAME Statement, SFTP Access Method" on page 103
- "FILENAME Statement, URL Access Method" on page 109

FOOTNOTE Statement

Writes up to 10 lines of text at the bottom of the procedure or DATA step output.

Valid in: Anywhere

Category: Output Control

Restrictions: This statement is not valid in the CAS server.
The FOOTNOTE statement does not support Unicode.

Requirement: You must specify the FOOTNOTE option if you use a FILE statement.

Syntax

FOOTNOTE <*n*> <'*text*' | "*text*">;

Without Arguments

Using FOOTNOTE without arguments cancels all existing footnotes.

Arguments

n

specifies the relative line to be occupied by the footnote.

Default If you omit *n*, SAS assumes a value of 1.

Range *n* can range from 1 to 10.

Tip For footnotes, lines are pushed up from the bottom. The FOOTNOTE statement with the highest number appears on the bottom line.

ods-format-options
specifies formatting options for the ODS HTML, RTF, and PRINTER(PDF) destinations.

BOLD
specifies that the footnote text is bold font weight.

ODS destination	HTML, RTF, PRINTER

COLOR=*color*
specifies the footnote text color.

Alias	C
ODS destination	HTML, RTF, PRINTER
Example	"Example 3: Customizing Titles and Footnotes By Using the Output Delivery System" on page 389

BCOLOR=*color*
specifies the background color of the footnote block.

ODS destination	HTML, RTF, PRINTER

FONT=*font-face*
specifies the font to use. If you supply multiple fonts, then the destination device uses the first one that is installed on your system.

Alias	F
ODS destination	HTML, RTF, PRINTER

HEIGHT=*size*
specifies the point size.

Alias	H
ODS destination	HTML, RTF, PRINTER
Example	"Example 3: Customizing Titles and Footnotes By Using the Output Delivery System" on page 389

ITALIC
specifies that the footnote text is in italic style.

ODS destination	HTML, RTF, PRINTER

JUSTIFY= CENTER | LEFT | RIGHT
specifies justification.

CENTER
specifies center justification.

Alias	C

LEFT
specifies left justification.

Alias	L

RIGHT
specifies right justification.

Alias R

Alias J

ODS destination HTML, RTF, PRINTER

Example "Example 3: Customizing Titles and Footnotes By Using the Output Delivery System" on page 389

LINK='*url*'
specifies a hyperlink.

ODS destination HTML, RTF, PRINTER

Tip The visual properties for LINK= always come from the current style.

UNDERLIN= 0 | 1 | 2 | 3
specifies whether the subsequent text is underlined. 0 indicates no underlining. 1, 2, and 3 indicates underlining.

Alias U

ODS destination HTML, RTF, PRINTER

Tip ODS generates the same type of underline for values 1, 2, and 3. However, SAS/GRAPH uses values 1, 2, and 3 to generate increasingly thicker underlines.

Note The defaults for how ODS renders the FOOTNOTE statement come from style elements that relate to system footnotes in the current style. The FOOTNOTE statement syntax with *ods-format-options* is a way to override the settings that are provided by the current style. The current style varies according to the ODS destination.

Tip You can specify these options by letter, word, or words by preceding each letter or word of the *text* by the option. For example, this code makes the footnote "Red, White, and Blue" appear in different colors.

```
footnote color=red "Red," color=white "White, and" color=blue "Blue";
```

'text'* | *"text"
specifies the text of the footnote in single or double quotation marks

Tips For compatibility with previous releases, SAS accepts some text without quotation marks. When you write new programs or update existing programs, *always* enclose text in quotation marks.

You can use macro variables and macros to change the information in FOOTNOTE statements. If the footnote is enclosed in double quotation marks (""), the text indicated is substituted into the footnote. If the footnote is enclosed in single quotation marks ('), the text is not substituted.

If you use single quotation marks (') or double quotation marks ("") together (with no space in between them) as the string of text, SAS generates a single quotation mark (') or double quotation mark ("), respectively.

Details

A FOOTNOTE statement takes effect when the step or RUN group with which it is associated executes. After you specify a footnote for a line, SAS repeats the same footnote on all pages until you cancel or redefine the footnote for that line. When a FOOTNOTE statement is specified for a given line, it cancels the previous FOOTNOTE statement for that line and for all footnote lines with higher numbers.

Operating Environment Information

The maximum footnote length is 255 characters. If the length of the specified footnote is greater than the value of the LINESIZE option, SAS truncates the footnote to the line size.

Comparisons

You can also create footnotes with the FOOTNOTES window. For more information, refer to the online Help for the window.

You can modify footnotes with the Output Delivery System. See "Example 3: Customizing Titles and Footnotes By Using the Output Delivery System" on page 389.

Example: Using the FOOTNOTE Statement

These examples of a FOOTNOTE statement result in the same footnote:

- `footnote8 "Managers' Meeting";`
- `footnote8 'Managers'' Meeting';`

These are examples of FOOTNOTE statements that use some of the formatting options for the ODS HTML, RTF, and PRINTER(PDF) destinations. For the complete example, see "Example 3: Customizing Titles and Footnotes By Using the Output Delivery System" on page 389 .

```
footnote j=left height=20pt
    color=red "Prepared "
    c='#FF9900' "on";
footnote2 j=center color=blue
   height=24pt "&SYSDATE9";
footnote3 link='http://support.sas.com' "SAS";
```

See Also

Statements:

- "TITLE Statement" on page 383

FORMAT Statement

Associates formats with variables.

Valid in: DATA step or PROC step

Categories: CAS
Information

Type: Declarative

Syntax

FORMAT *variable-1* <…*variable-n*> <*format*> <DEFAULT=*default-format*>;

FORMAT *variable-1* <…*variable-n*> *format* <DEFAULT=*default-format*>;

FORMAT *variable-1* <…*variable-n*> *format variable-1* <…*variable-n*> *format*;

Arguments

variable
names one or more variables for SAS to associate with a format. You must specify at least one *variable*.

Tip To disassociate a format from a variable, use the variable in a FORMAT statement without specifying a format in a DATA step or in PROC DATASETS. In a DATA step, place this FORMAT statement after the SET statement. See "Example 3: Removing a Format" on page 125. You can also use PROC DATASETS.

format
specifies the format that is listed for writing the values of the variables.

Tip Formats that are associated with variables by using a FORMAT statement behave like formats that are used with a colon modifier in a subsequent PUT statement. For more information about using a colon modifier, see "PUT Statement, List" on page 328.

See *SAS Viya Formats and Informats: Reference*

DEFAULT=*default-format*
specifies a temporary default format for displaying the values of variables that are not listed in the FORMAT statement. These default formats apply only to the current DATA step; they are not permanently associated with variables in the output.

A DEFAULT= format specification applies to

- variables that are not named in a FORMAT or ATTRIB statement
- variables that are not permanently associated with a format within a SAS data set
- variables that are not written with the explicit use of a format.

Default If you omit DEFAULT=, SAS uses BEST*w*. as the default numeric format and $*w*. as the default character format.

Restriction Use this option only in a DATA step.

Tip A DEFAULT= specification can occur anywhere in a FORMAT statement. It can specify either a numeric default, a character default, or both.

Example "Example 1: Assigning Formats and Defaults" on page 123

Details

The FORMAT statement can use standard SAS formats or user-written formats that have been previously defined in PROC FORMAT. A single FORMAT statement can associate the same format with several variables, or it can associate different formats with different variables. If a variable appears in multiple FORMAT statements, SAS uses the format that is assigned last.

You use a FORMAT statement in the DATA step to permanently associate a format with a variable. SAS changes the descriptor information of the SAS data set that contains the variable. You can use a FORMAT statement in some PROC steps, but the rules are different. For more information, see *SAS Viya Data Management and Utility Procedures Guide*.

Comparisons

Both the ATTRIB and FORMAT statements can associate formats with variables, and both statements can change the format that is associated with a variable. You can use the FORMAT statement in PROC DATASETS to change or remove the format that is associated with a variable.

Examples

Example 1: Assigning Formats and Defaults

This example uses a FORMAT statement to assign formats and default formats for numeric and character variables. The default formats are not associated with variables in the data set but affect how the PUT statement writes the variables in the current DATA step.

```
data tstfmt;
   format W $char3.
   Y 10.3
   default=8.2 $char8.;
   W='Good morning.';
   X=12.1;
   Y=13.2;
   Z='Howdy-doody';
   put W/X/Y/Z;
run;
proc contents data=tstfmt;
run;
proc print data=tstfmt;
run;
```

The following output shows a partial listing from PROC CONTENTS, as well as the report that PROC PRINT generates.

Output 2.3 *Partial Listing from PROC CONTENTS and the PROC PRINT Report*

Alphabetic List of Variables and Attributes				
#	Variable	Type	Len	Format
1	W	Char	3	$CHAR3.
3	X	Num	8	
2	Y	Num	8	10.3
4	Z	Char	11	

Output 2.4 *PROC PRINT Report*

Obs	W	Y	X	Z
1	Goo	13.200	12.1	Howdy-doody

The default formats apply to variables X and Z while the assigned formats apply to the variables W and Y.

The PUT statement produces this result:

```
----+----1----+----2
Goo
12.10
13.200
Howdy-do
```

Example 2: Associating Multiple Variables with a Single Format

This example uses the FORMAT statement to assign a single format to multiple variables.

```
data report;
   input Item $ 1-6 Material $ 8-14 Investment 16-22 Profit 24-31;
   format Item Material $upcase9. Investment  Profit  dollar15.2;
   datalines;
shirts cotton  2256354 83952175
ties   silk    498678  2349615
suits  silk    9482146 69839563
belts  leather 7693    14893
shoes  leather 7936712 22964
;
run;
options pageno=1 nodate ls=80 ps=64;
proc print data=report;
   title 'Profit Summary: Kellam Manufacturing Company';
run;
```

Output 2.5 *Results from Associating Multiple Variables with a Single Format*

Profit Summary: Kellam Manufacturing Company

Obs	Item	Material	Investment	Profit
1	SHIRTS	COTTON	$2,256,354.00	$83,952,175.00
2	TIES	SILK	$498,678.00	$2,349,615.00
3	SUITS	SILK	$9,482,146.00	$69,839,563.00
4	BELTS	LEATHER	$7,693.00	$14,893.00
5	SHOES	LEATHER	$7,936,712.00	$22,964.00

Example 3: Removing a Format

This example disassociates an existing format from a variable in a SAS data set. The order of the FORMAT and the SET statements is important.

```
data rtest;
   set rtest;
   format x;
run;
```

See Also

- The DATSETS procedure in SAS Viya Utilities Procedures Guide

Statements:

- "ATTRIB Statement" on page 27

GO TO Statement

Directs program execution immediately to the statement label that is specified and, if followed by a RETURN statement, returns execution to the beginning of the DATA step.

Valid in: DATA step

Categories: CAS
Control

Type: Executable

Alias: GOTO

Syntax

GO TO *label*;

Arguments

label

specifies a statement label that identifies the GO TO destination. The destination must be within the same DATA step. You must specify the *label* argument.

Comparisons

The GO TO statement and the LINK statement are similar. However, a GO TO statement is often used without a RETURN statement, whereas a LINK statement is usually used with an explicit RETURN statement. The action of a subsequent RETURN statement differs between the GO TO and LINK statements. A RETURN statement after a LINK statement returns execution to the statement that follows the LINK statement. A RETURN after a GO TO statement returns execution to the beginning of the DATA step (unless a LINK statement precedes the GO TO statement. In that case, execution continues with the first statement after the LINK statement).

GO TO statements can often be replaced by DO-END and IF-THEN/ELSE programming logic.

Example: Using a RETURN Statement with the GO TO Statement

Use the GO TO statement as shown here.

- In this example, if the condition is true, the GO TO statement instructs SAS to jump to a label called ADD and to continue execution from there. If the condition is false, SAS executes the PUT statement and the statement that is associated with the GO TO label:

```
data info;
   input x;
   if 1<=x<=5 then go to add;
   put x=;
   add: sumx+x;
   datalines;
7
6
323
;
```

  Because every DATA step contains an implied RETURN at the end of the step, program execution returns to the top of the step after the sum statement is executed. Therefore, an explicit RETURN statement at the bottom of the DATA step is not necessary.

- If you do not want the Sum statement to execute for observations that do not meet the condition, rewrite the code and include an explicit return statement.

```
data info;
   input x;
   if 1<=x<=5 then go to add;
   put x=;
   return;
      /* SUM statement not executed */
      /* if x<1 or x>5              */
   add: sumx+x;
   datalines;
7
```

```
6
323
;
```

See Also

Statements:

- “DO Statement” on page 59
- “label: Statement” on page 207
- “LINK Statement” on page 255
- “RETURN Statement” on page 350

IF Statement, Subsetting

Continues processing only those observations that meet the condition of the specified expression.

Valid in: DATA step

Categories: Action
CAS

Type: Executable

Syntax

IF *expression*;

Arguments

expression
is any SAS expression.

Details

The Basics

The subsetting IF statement causes the DATA step to continue processing only those raw data records or those observations from a SAS data set that meet the condition of the expression that is specified in the IF statement. That is, if the expression is true for the observation or record (its value is neither 0 nor missing), SAS continues to execute statements in the DATA step and includes the current observation in the data set. The resulting SAS data set or data sets contain a subset of the original external file or SAS data set.

If the expression is false (its value is 0 or missing), no further statements are processed for that observation or record, the current observation is not written to the data set, and the remaining program statements in the DATA step are not executed. SAS immediately returns to the beginning of the DATA step because the subsetting IF statement does not require additional statements to stop processing observations.

Using the Equivalent of the CONTAINS and LIKE Operators in an IF Statement

The LIKE operator in a WHERE clause matches patterns in words. To get the equivalent result in an IF statement, the '=:' operator can be used. This matches patterns that occur at the beginning of a string. Here is an example:

```
data test;
   input name $;
   datalines;
John
Diana
Diane
Sally
Doug
David
;
 run;

data test;
   set test;
   if name =: 'D';
run;

proc print;
run;
```

The CONTAINS operator in a WHERE clause checks for a character string within a value. To get the equivalent result in an IF statement, the INDEX function can be used. Here is an example:

```
data test;
   set test;
   if index(name,'ian') ge 1;
run;

proc print;
run;
```

Comparisons

- The subsetting IF statement is equivalent to this IF-THEN statement:

  ```
  if not (expression)
     then delete;
  ```

- When you create SAS data sets, use the subsetting IF statement when it is easier to specify a condition for including observations. When it is easier to specify a condition for excluding observations, use the DELETE statement.
- The subsetting IF and the WHERE statements are not equivalent. The two statements work differently and produce different output data sets in some cases. The most important differences are summarized as follows:
  - The subsetting IF statement selects observations that have been read into the program data vector. The WHERE statement selects observations before they are brought into the program data vector. The subsetting IF might be less efficient than the WHERE statement because it must read each observation from the input data set into the program data vector.

- The subsetting IF statement and WHERE statement can produce different results in DATA steps that interleave, merge, or update SAS data sets.
- When the subsetting IF statement is used with the MERGE statement, the SAS System selects observations after the current observations are combined. When the WHERE statement is used with the MERGE statement, the SAS System applies the selection criteria to each input data set before combining the current observations.
- The subsetting IF statement can select observations from an existing SAS data set or from raw data that are read with the INPUT statement. The WHERE statement can select observations only from existing SAS data sets.
- The subsetting IF statement is executable; the WHERE statement is not.

Example: Limiting Observations

- This example results in a data set that contains only those observations with the value **F** for the variable SEX:

```
if sex='F';
```

- This example results in a data set that contains all observations for which the value of the variable AGE is not missing or 0:

```
if age;
```

See Also

Data Set Options:

- "WHERE= Data Set Option" in *SAS Viya Data Set Options: Reference*

Statements:

- "DELETE Statement" on page 57
- "IF-THEN/ELSE Statement" on page 129
- "WHERE Statement" on page 400

IF-THEN/ELSE Statement

Executes a SAS statement for observations that meet specific conditions.

Valid in: DATA step

Categories: CAS
Control

Type: Executable

Syntax

IF *expression* **THEN** *statement*;
<ELSE *statement*;>

Arguments

expression
is any SAS expression and is a required argument.

statement
can be any executable SAS statement or DO group.

Details

SAS evaluates the expression in an IF-THEN statement to produce a result that is either nonzero, zero, or missing. A nonzero and nonmissing result causes the expression to be true; a result of zero or missing causes the expression to be false.

If the conditions that are specified in the IF clause are met, the IF-THEN statement executes a SAS statement for observations that are read from a SAS data set, for records in an external file, or for computed values. An optional ELSE statement gives an alternative action if the THEN clause is not executed. The ELSE statement, if used, must immediately follow the IF-THEN statement.

Using IF-THEN statements *without* the ELSE statement causes SAS to evaluate all IF-THEN statements. Using IF-THEN statements *with* the ELSE statement causes SAS to execute IF-THEN statements until it encounters the first true statement. Subsequent IF-THEN statements are not evaluated.

Note: For greater efficiency, construct your IF-THEN/ELSE statement with conditions of decreasing probability.

Comparisons

- Use a SELECT group rather than a series of IF-THEN statements when you have a long series of mutually exclusive conditions.
- Use subsetting IF statements, without a THEN clause, to continue processing only those observations or records that meet the condition that is specified in the IF clause.

Example: Different Ways of Specifying the IF-THEN/ELSE Statements

These examples show different ways of specifying the IF-THEN/ELSE statement.

- ```
  if x then delete;
  ```
- ```
  if status='OK' and type=3 then count+1;
  ```
- ```
  if age ne agecheck then delete;
  ```
- ```
  if x=0 then
     if y ne 0 then put 'X ZERO, Y NONZERO';
     else put 'X ZERO, Y ZERO';
  else put 'X NONZERO';
  ```
- ```
  if answer=9 then
     do;
        answer=.;
        put 'INVALID ANSWER FOR ' id=;
     end;
  else
     do;
        answer=answer10;
  ```
  ```

```
      valid+1;
   end;
```

- ```
  data region;
     input city $ 1-30;
     if city='New York City'
        or city='Miami' then
        region='ATLANTIC COAST';
     else if city='San Francisco'
        or city='Los Angeles' then
           region='PACIFIC COAST';
     datalines;
  ...more data lines...
  ;
  ```

See Also

Statements:

- "DO Statement" on page 59
- "IF Statement, Subsetting" on page 127
- "SELECT Statement" on page 359

%INCLUDE Statement

Brings a SAS programming statement, data lines, or both, into a current SAS program.

Valid in: Anywhere

Category: Program Control

Alias: %INC

Restriction: This statement is not valid in the CAS server.

Syntax

%INCLUDE *source(s)* </<SOURCE2> <S2=*length*> <*Linux-options*> >;

Arguments

source(s)
describes the location of the information that you want to access with the %INCLUDE statement. There are three possible sources:

Source	Definition
file-specification	specifies an external file
internal-lines	specifies lines that are entered earlier in the same SAS job or session
  ```

Source	Definition
keyboard-entry	specifies statements or data lines that you enter directly from the keyboard

file-specification
identifies an entire external file that you want to bring into your program.

File-specification can have these forms:

'external-file'
specifies the physical name of an external file that is enclosed in quotation marks. The physical name is the name by which the operating environment recognizes the file.

fileref
specifies a fileref that has previously been associated with an external file.

Tip You can use a FILENAME statement or function or an operating environment command to make the association.

fileref (filename-1 <, "filename–2.xxx", ... filename-n>)
specifies a fileref that has previously been associated with an aggregate storage location. Follow the fileref with one or more filenames that reside in that location. Enclose the filenames in one set of parentheses, and separate each filename with a comma, space.

This example instructs SAS to include the files testcode1.sas, testcode2.sas and testcode3.txt. These files are located in aggregate storage location **mylib**. You do not need to specify the file extension for testcode1 and testcode2 because they are the default .SAS extension. You must enclose testcode3.txt in quotation marks with the whole filename specified because it has an extension other than .SAS:

```
%include mylib(testcode1, testcode2,
   "testcode3.txt");
```

Operating environment Different operating environments call an aggregate grouping of files by different names, such as a directory, a MACLIB, a text library, or a partitioned data set.

Note A file that is located in an aggregate storage location and has a name that is not a valid SAS name must have its name enclosed in quotation marks.

Tip You can use a FILENAME statement or function or an operating environment command to make the association.

Restriction You cannot selectively include lines from an external file.

Operating environment The character length allowed for filenames is operating environment specific.

Tips You can verify the existence of *file-specification* by using the SYSERR macro variable if the ERRORCHECK option is set to STRICT.

Including external sources is useful in all types of SAS processing: batch, interactive line, and noninteractive.

internal-lines

includes lines that are entered earlier in the same SAS job or session.

To include internal lines, use any of the following values:

n includes line *n*.

n-m or *n:m* includes lines *n* through *m*.

Note The SPOOL system option controls internal access to previously submitted lines when you run SAS in interactive line mode, noninteractive mode, and batch mode. By default, the SPOOL system option is set to NOSPOOL. The SPOOL system option must be in effect in order to use %INCLUDE statements with internal line references. Use the OPTIONS procedure to determine the current setting of the SPOOL system option on your system.

Tips Including internal lines is most useful in interactive line mode processing.

Use a %LIST statement to determine the line numbers that you want to include.

keyboard-entry

is a method for preparing a program so that you can interrupt the current program's execution, enter statements or data lines from the keyboard, and then resume program processing.

*

prompts you to enter data from the keyboard. Place an asterisk (*) after the %INCLUDE statement in your code:

```
proc print;
   %include *;
run;
```

To resume processing the original source program, enter a %RUN statement from the keyboard.

Note The fileref SASTERM must have been previously associated with an external file in a FILENAME statement or function or an operating environment command.

Tips Use this method when you run SAS in noninteractive or interactive line mode. SAS pauses during processing and prompts you to enter statements from the keyboard.

Use this argument to include source from the keyboard:

You can use a %INCLUDE * statement in a batch job by creating a file with the fileref SASTERM that contains the statements that you would otherwise enter from the keyboard. The %INCLUDE * statement causes SAS to read from the file that is referenced by SASTERM. Insert a %RUN statement into the file that is referenced by SASTERM where you want SAS to resume reading from the original source.

SOURCE2
causes the SAS log to show the source statements that are being included in your SAS program.

Tips The SAS log also displays the fileref and the filename of the source and the level of nesting (1, 2, 3, and so on).

The SOURCE2 system option produces the same results. When you specify SOURCE2 in a %INCLUDE statement, it overrides the setting of the SOURCE2 system option for the duration of the include operation.

S2=*length*
specifies the length of the record to be used for input. *Length* can have these values:

S sets S2 equal to the current setting of the S= SAS system option.

0 tells SAS to use the setting of the SEQ= system option to determine whether the line contains a sequence field. If the line does contain a sequence field, SAS determines line length by excluding the sequence field from the total length.

n specifies a number greater than zero that corresponds to the length of the line to be read, when the file contains fixed-length records. When the file contains variable-length records, *n* specifies the column in which to begin reading data.

Interaction The S2= system option also specifies the length of secondary source statements that are accessed by the %INCLUDE statement, and it is effective for the duration of your SAS session. The S2= option in the %INCLUDE statement affects only the current include operation. If you use the option in the %INCLUDE statement, it overrides the system option setting for the duration of the include operation.

Tips Text input from the %INCLUDE statement can be either fixed or variable length.

Fixed-length records are either unsequenced or sequenced at the end of each record. For fixed-length records, the value given in S2= is the ending column of the data.

Variable-length records are either unsequenced or sequenced at the beginning of each record. For variable-length records, the value given in S2= is the starting column of the data.

See For a detailed discussion of fixed- and variable-length input records, see "S= System Option" in *SAS Viya System Options: Reference* and "S2= System Option" in *SAS Viya System Options: Reference*.

Linux Arguments

ENCODING='*encoding-value*'
specifies the encoding to use when reading from the specified source. The value for ENCODING= indicates that the specified source has a different encoding from the current session encoding.

When you read data from the specified source, SAS transcodes the data from the specified encoding to the session encoding.

For valid encoding values, see "Overview to SAS Language Elements That Use Encoding Values" in *SAS Viya National Language Support: Reference Guide*.

Restriction The ENCODING= option is valid only when the INFILE statement includes a file specification that is not a reserved fileref. The ENCODING= value in the INFILE statement overrides the value of the ENCODING= system option.

BLKSIZE=*block-size*
BLK=*block-size*
specifies the number of bytes that are physically read or written in an I/O operation. The default is 8K. The maximum is 1M.

LRECL=*record-length*
specifies the logical record length (in bytes).The default value for LRECL= is 32,767. If you are using fixed length records (RECFM=F), the default value for LRECL= is 256. The value of *record-length* can range from 1 to 1,048,576 (1 MB).

RECFM=*record-format*
specifies the record format. The following values are valid under Linux:

D	default format (same as variable).
F	fixed format. That is, each record has the same length.
N	binary format. The file consists of a stream of bytes with no record boundaries.
P	print format.
V	variable format. Each record ends with a newline character.
S370V	variable S370 record format (V).
S370VB	variable block S370 record format (VB).
S370VBS	variable block with spanned records S370 record format (VBS).

The S370 values are valid with files laid out as z/OS files only. That is, files are binary, have variable-length records, and are in EBCDIC format. If you want to use a fixed-format z/OS file, first copy it to a variable-length, binary z/OS file.

Details

What %INCLUDE Does

When you execute a program that contains the %INCLUDE statement, SAS executes your code, including any statements or data lines that you bring into the program with %INCLUDE.

Operating Environment Information
Use of the %INCLUDE statement is dependent on your operating environment. See the documentation for your operating environment for more information about additional software features and methods of referring to and accessing your files. See your documentation before you run the examples for this statement.

Three Sources of Data

The %INCLUDE statement accesses SAS statements and data lines from three possible sources:

- external files

- lines entered earlier in the same job or session
- lines entered from the keyboard.

When Useful

The %INCLUDE statement is most often used when running SAS in interactive line mode, noninteractive mode, or batch mode. Although you can use the %INCLUDE statement when you run SAS using SAS Studio, it might be more practical to use the INCLUDE and RECALL commands to access data lines and program statements, and submit these lines again.

Rules for Using %INCLUDE

- You can specify any number of sources in a %INCLUDE statement, and you can mix the types of included sources. Note, however, that although it is possible to include information from multiple sources in one %INCLUDE statement, it might be easier to understand a program that uses separately coded %INCLUDE statements for each source.
- The %INCLUDE statement must begin at a statement boundary. That is, it must be the first statement in a SAS job or must immediately follow a semicolon ending another statement.

  The %INCLUDE statement can be nested within a file that has been accessed with %INCLUDE. The maximum number of nested %INCLUDE statements that you can use depends on system-specific limitations of your operating environment (such as available memory or the number of files that you can have open concurrently).
- Because %INCLUDE is a global statement and global statements are not executable, the %INCLUDE statement cannot be used in conditional logic.
- The maximum line length is 32K bytes.

Comparisons

The %INCLUDE statement executes statements immediately. The INCLUDE command brings the included lines into the SAS Studio **Code** tab but does not execute them. You must issue the SUBMIT command to execute those lines.

Examples

Example 1: Including an External File

- This example stores a portion of a program in a file and includes it in a program to be written later. This program is stored in a file named MYFILE:

```
data monthly;
   input x y month $;
   datalines;
1 1 January
2 2 February
3 3 March
4 4 April
;
```

  This program includes an external file named MYFILE and submits the DATA step that it contains before the PROC PRINT step executes:

```
%include 'MYFILE';
proc print;
```

```
run;
```

- To reference a file by using a fileref rather than the actual filename, you can use the FILENAME statement (or a command recognized by your operating environment) to assign a fileref:

  ```
  filename in1 'MYFILE';
  ```

  You can later access MYFILE with the fileref IN1:

  ```
  %inc in1;
  ```

- If you want to use many files that are stored in a directory, PDS, or MACLIB (or whatever your operating environment calls an aggregate storage location), you can assign the fileref to the larger storage unit and then specify the filename. For example, this FILENAME statement assigns the fileref STORAGE to an aggregate storage location:

  ```
  filename storage
     'aggregate-storage-location';
  ```

  You can later include a file using this statement:

  ```
  %inc storage(MYFILE);
  ```

- You can also access several files or members from this storage location by listing them in parentheses after the fileref in a single %INCLUDE statement. Separate filenames with a comma or a blank space. The following %INCLUDE statement demonstrates this method:

  ```
  %inc storage(file-1,file-2,file-3);
  ```

- When the file does not have the default .SAS extension, you can access it using quotation marks around the complete filename listed inside the parentheses.

  ```
  %inc storage("file-1.txt","file-2.dat",
     "file-3.cat");
  ```

Example 2: Including Previously Submitted Lines

This %INCLUDE statement causes SAS to process lines 1, 5, 9 through 12, and 13 through 16 as if you had entered them again from your keyboard:

```
%include 1 5 9-12 13:16;
```

Example 3: Including Input from the Keyboard

The method shown in this example is valid only when you run SAS in noninteractive mode or interactive line mode.

This example uses %INCLUDE to add a customized TITLE statement when PROC PRINT executes:

```
data report;
   infile file-specification;
   input month $ salesamt $;
run;
proc print;
   %include *;
run;
```

When this DATA step executes, %INCLUDE with the asterisk causes SAS to issue a prompt for statements that are entered at the keyboard. You can enter statements such as

```
where month= 'January';
```

```
title 'Data for month of January';
```

After you enter statements, you can use %RUN to resume processing by entering **%run;**.

The %RUN statement signals to SAS to leave keyboard-entry mode and resume reading and executing the remaining SAS statements from the original program.

Example 4: Using %INCLUDE with Several Entries in a Single Catalog

This example submits the source code from three entries in the catalog MYLIB.INCLUDE. When no entry type is specified, the default is CATAMS.

```
filename dir catalog 'mylib.include';
%include dir(mem1);
%include dir(mem2);
%include dir(mem3);
```

See Also

Statements:

- "%LIST Statement" on page 258
- "%RUN Statement" on page 352

INFILE Statement

Specifies an external file to read with an INPUT statement.

Valid in: DATA Step

Category: File-Handling

Type: Executable

Restrictions: This statement is not valid in the CAS server.

When SAS is in a locked-down state, the INFILE statement is not available for files that are not in the locked-down path list.

Syntax

INFILE *file-specification* <*device-type*> <*option(s)* > ;

Arguments

file-specification

identifies the source of the input data records, which is an external file or instream data. *File-specification* can have these forms:

'external-file'

specifies the physical name of an external file. The physical name is the name that the operating environment uses to access the file.

fileref

specifies the fileref of an external file.

Requirement You must have previously associated the fileref with an external file in a FILENAME statement, FILENAME function, or an appropriate operating environment command.

See "FILENAME Statement" on page 91

fileref(file)
specifies a fileref of an aggregate storage location and the name of a file or member, enclosed in parentheses, that resides in that location.

Requirements A file that is located in an aggregate storage location and has a name that is not a valid SAS name must have its name enclosed in quotation marks.

You must have previously associated the fileref with an external file in a FILENAME statement, a FILENAME function, or an appropriate operating environment command.

See "FILENAME Statement" on page 91

CARDS | CARDS4
for a definition, see DATALINES on page 139 .

Alias DATALINES | DATALINES4

DATALINES | DATALINES4
specifies that the input data immediately follows the DATALINES or DATALINES4 statement in the DATA step. Using DATALINES enables you to use the INFILE statement options to control how the INPUT statement reads instream data lines.

Alias CARDS | CARDS4

Example "Example 1: Changing How Delimiters Are Treated" on page 157

Tip You can verify the existence of *file-specification* by using the SYSERR macro variable if the ERRORCHECK option is set to STRICT.

device-type
specifies the type of device or the access method that is used if the fileref points to an input or output device or location that is not a physical file:

ACTIVEMQ
specifies an access method that enables you to access an ActiveMQ messaging broker.

Interaction If the DATA step does not recognize the access method option, the DATA step passes the option to the access method for handling.

DISK
specifies that the device is a disk drive.

Tip When you assign a fileref to a file on disk, you are not required to specify DISK.

DUMMY
specifies that the output to the file is discarded.

Tip Specifying DUMMY can be useful for testing.

GTERM
indicates that the output device type is a graphics device that receives graphics data.

JMS
specifies a Java Message Service (JMS) destination.

PIPE
specifies an unnamed pipe.

Note Some operating environments do not support pipes.

PLOTTER
specifies an unbuffered graphics output device.

PRINTER
specifies a printer or printer spool file.

SFTP
specifies the SFTP access method.

Interaction If the DATA step does not recognize the access method option, the DATA step passes the option to the access method for handling.

See For a complete list of options that are available with the SFTP access method, see the "FILENAME Statement, SFTP Access Method" on page 103.

TAPE
specifies a tape drive.

TEMP
creates a temporary file that exists only as long as the filename is assigned. The temporary file can be accessed only through the logical name and is available only while the logical name exists.

Restriction Do not specify a physical pathname. If you do, SAS returns an error.

Tip Files that are manipulated by the TEMP device can have the same attributes and behave identically to DISK files.

TERMINAL
specifies the user's terminal.

UPRINTER
specifies a Universal Printing printer definition name.

Tip If you do not specify the printer name in the FILENAME statement, the PRINTERPATH options control which Universal Printer is used and the destination of the output.

URL
specifies the URL access method.

Interaction If the DATA step does not recognize the access method option, the DATA step passes the option to the access method for handling.

See For a complete list of options that are available with the URL access method, see the "FILENAME Statement, URL Access Method" on page 109.

Alias DEVICE=*device-type*

Default DISK

Requirement *device-type* or DEVICE=*device-type* must immediately follow *file-specification* in the statement.

INFILE Options

BLKSIZE=*block-size*
specifies the block size of the input file in bytes.

Default 8K. Maximum is 1G–1.

COLUMN=*variable*
names a variable that SAS uses to assign the current column location of the input pointer. Like automatic variables, the COLUMN= variable is not written to the data set.

Alias COL=

See LINE= on page 145

Example "Example 8: Listing the Pointer Location" on page 162

DELIMITER= *delimiter(s)*
specifies an alternate delimiter (other than a blank) to be used for LIST input, where *delimiter(s)* can be one of the following items.

'*list-of-delimiting-characters*'
specifies one or more characters to read as delimiters.

Requirement Enclose the list of characters in quotation marks.

Example "Example 1: Changing How Delimiters Are Treated" on page 157

character-variable
specifies a character variable whose value becomes the delimiter.

Alias DLM=

Default blank space

Tips The delimiter is case sensitive.

Some common delimiters are the comma (,), verticle pipe (|), semicolon(;), and tab. The tab is specified by a hexadecimal character.

Under Linux, the value is '09'x.

See "Reading Delimited Data" on page 152, DLMSTR= on page 142, and " DSD (delimiter-sensitive data)" on page 143

Example "Example 1: Changing How Delimiters Are Treated" on page 157

DLMSTR= *delimiter*
specifies a character string as an alternate delimiter (other than a blank) to be used for LIST input, where *delimiter* can be one of the following items.

'***delimiting-string***'
specifies a character string to read as a delimiter.

Requirement Enclose the string in quotation marks.

Example "Example 1: Changing How Delimiters Are Treated" on page 157

character-variable
specifies a character variable whose value becomes the delimiter.

Default blank space

Interactions If you specify more than one DLMSTR= option in the INFILE statement, the DLMSTR= option that is specified last is used. If you specify both the DELIMITER= and DLMSTR= options, the option that is specified last is used.

If you specify RECFM=N, make sure that the LRECL is large enough to hold the largest input item. Otherwise, it might be possible for the delimiter to be split across the record boundary.

Tip The delimiter is case sensitive. To make the delimiter case insensitive, use the DLMSOPT='I' option.

See "Reading Delimited Data" on page 152, DELIMITER= on page 141, DLMSOPT= on page 142, and DSD on page 143

Example "Example 1: Changing How Delimiters Are Treated" on page 157

DLMSOPT= '*option(s)*'
specifies parsing options for the DLMSTR= option where *option(s)* can be one of these values.

I
specifies that case-insensitive comparisons are done.

T
specifies that trailing blanks of the string delimiter are removed.

Tips The *T* option is useful when you use a variable as the delimiter string.

You can specify either *I*, *T*, or both.

Requirement The DLMSOPT= option has an effect only when used with the DLMSTR= option.

See DLMSTR= on page 142

Example "Example 1: Changing How Delimiters Are Treated" on page 157

DSD (delimiter-sensitive data)
specifies that when data values are enclosed in quotation marks, delimiters within the value are treated as character data. The DSD option changes how SAS treats delimiters when you use LIST input and sets the default delimiter to a comma. When you specify DSD, SAS treats two consecutive delimiters as a missing value and removes quotation marks from character values.

Interaction Use the DELIMITER= or DLMSTR= option to change the delimiter.

Tip Use the DSD option and LIST input to read a character value that contains a delimiter within a string that is enclosed in quotation marks. The INPUT statement treats the delimiter as a valid character and removes the quotation marks from the character string before the value is stored. Use the tilde (~) format modifier to retain the quotation marks.

See "Reading Delimited Data" on page 152, DELIMITER= on page 141, and DLMSTR= on page 142

Examples "Example 1: Changing How Delimiters Are Treated" on page 157

"Example 2: Handling Missing Values and Short Records with List Input" on page 159

ENCODING= '*encoding-value*'
specifies the encoding to use when reading from the external file. The value for ENCODING= indicates that the external file has a different encoding from the current session encoding.

When you read data from an external file, SAS transcodes the data from the specified encoding to the session encoding.

Default SAS assumes that an external file is in the same encoding as the session encoding.

See For valid encoding values, see "Encoding Values in SAS Language Elements" in *SAS Viya National Language Support: Reference Guide*.

Example "Example 11: Specifying an Encoding When Reading an External File" on page 165

END=*variable*
specifies a variable that SAS sets to 1 when the current input data record is the last in the input file. Until SAS processes the last data record, the END= variable is set to 0. Like automatic variables, this variable is not written to the data set.

Restriction You cannot use the END= option with the UNBUFFERED option, the DATALINES or DATALINES4 statement, or an INPUT statement that reads multiple input data records.

Tip Use the option EOF= on page 143 when END= is invalid.

Example "Example 5: Reading from Multiple Input Files" on page 161

EOF=*label*
specifies a statement label that is the object of an implicit GO TO when the INFILE statement reaches end of file. When an INPUT statement attempts to read from a file that has no more records, SAS moves execution to the statement label indicated.

Interaction Use EOF= instead of the END= option with the UNBUFFERED option, the DATALINES or DATALINES4 statement, an INPUT statement that reads multiple input data records.

Tip The EOF= option is useful when you read from multiple input files sequentially.

See END= on page 143, EOV= on page 144, and UNBUFFERED on page 150

EOV=*variable*
specifies a variable that SAS sets to 1 when the first record in a file in a series of concatenated files is read. The variable is set only after SAS encounters the next file. Like automatic variables, the EOV= variable is not written to the data set.

Tip Reset the EOV= variable back to 0 after SAS encounters each boundary.

See END= on page 143 and EOF= on page 143

EXPANDTABS | NOEXPANDTABS
specifies whether to expand tab characters to the standard tab setting, which is set at 8-column intervals that start at column 9.

Default NOEXPANDTABS

Tip EXPANDTABS is useful when you read data that contains the tab character that is native to your operating environment.

FILENAME=*variable*
specifies a variable that SAS sets to the physical name of the currently opened input file. In a series of concatenated files, the variable is updated only after SAS encounters the next file. Like automatic variables, the FILENAME= variable is not written to the data set.

Tip Use a LENGTH statement to make the variable length long enough to contain the value of the filename.

See FILEVAR= on page 144

Example "Example 5: Reading from Multiple Input Files" on page 161

FILEVAR=*variable*
specifies a variable whose change in value causes the INFILE statement to close the current input file and open a new one. When the next INPUT statement executes, it reads from the new file that the FILEVAR= variable specifies. Like automatic variables, this variable is not written to the data set.

Restriction The FILEVAR= variable must contain a character string that is a physical filename.

Interaction When you use the FILEVAR= option, the *file-specification* is just a placeholder, not an actual filename or a fileref that has been previously assigned to a file. SAS uses this placeholder for reporting processing information to the SAS log. It must conform to the same rules as a fileref.

Tips Use FILEVAR= to dynamically change the currently opened input file to a new physical file.

When using FILEVAR=, it is not possible to know whether the input file that is currently open is the last file or not. When the DATA step comes to an end-of-file marker or the end of all open data sets, it performs an orderly shutdown. In addition, if you use FILEVAR with FIRSTOBS, a file with only a header record in a series of files triggers a normal shutdown of the DATA step. The shutdown occurs because SAS reads beyond the end-of-file marker and the DATA step terminates. You can use the EOF= option to avoid the shutdown.

See "Updating External Files in Place" on page 151

Example "Example 5: Reading from Multiple Input Files" on page 161

FIRSTOBS=*record-number*
specifies a record number that SAS uses to begin reading input data records in the input file.

Default 1

Tips Use FIRSTOBS= with OBS= to read a range of records from the middle of a file.

Use FIRSTOBS=2 to skip a header record in a file.

Example This statement processes record 50 through record 100:

```
infile file-specification firstobs=50 obs=100;
```

FLOWOVER
causes an INPUT statement to continue to read the next input data record if it does not find values in the current input line for all the variables in the statement. FLOWOVER is the default behavior of the INPUT statement.

See "Reading Past the End of a Line" on page 156, MISSOVER on page 146, STOPOVER on page 149, and TRUNCOVER on page 150

LENGTH=*variable*
specifies a variable that SAS sets to the length of the current input line. SAS does not assign the variable a value until an INPUT statement executes. Like automatic variables, the LENGTH= variable is not written to the data set.

Tip This option in conjunction with the $VARYING informat is useful when the field width varies.

Examples "Example 4: Reading Files That Contain Variable-Length Records" on page 160

"Example 7: Truncating Copied Records" on page 162

LINE=*variable*
specifies a variable that SAS sets to the line location of the input pointer in the input buffer. Like automatic variables, the LINE= variable is not written to the data set.

Range 1 to the value of the N= option

Interaction The value of the LINE= variable is the current relative line number within the group of lines that is specified by the N= option or by the #*n* line pointer control in the INPUT statement.

See COLUMN= on page 141 and N= on page 147

Example "Example 8: Listing the Pointer Location" on page 162

LINESIZE=*line-size*
specifies the record length that is available to the INPUT statement.

Alias LS=

Range up to 32767

Interaction If an INPUT statement attempts to read past the column that is specified by the LINESIZE= option, then the action that is taken depends on whether the FLOWOVER, MISSOVER, SCANOVER, STOPOVER, or TRUNCOVER option is in effect. FLOWOVER is the default.

Tip Use LINESIZE= to limit the record length when you do not want to read the entire record.

Example If your data lines contain a sequence number in columns 73 through 80, then use this INFILE statement to restrict the INPUT statement to the first 72 columns:

```
infile file-specification linesize=72;
```

LRECL=*logical-record-length*
specifies the logical record length. Its value depends on the record format in effect (RECFM).

- If RECFM=F, then the value for the LRECL= option determines the number of bytes to be read as one record.

  Note: When RECFM=F, LRECL= must be set to 256 when SAS is communicating with versions of SAS prior to SAS 9.4.

- If RECFM=N, then the value for the LRECL= option must be at least 256.
- If RECFM=V, then the value for the LRECL= option determines the maximum record length. Records that are longer than the specified length are truncated.

Default The default value for the global LRECL system option is 32767. If you are using fixed-length records (RECFM=F), the default value for LRECL is 256.

Restriction LRECL is not valid when you use the DATALINES file specification.

Interaction Alternatively, you can specify a global logical record length by using the "LRECL= System Option" in *SAS Viya System Options: Reference*.

Tip LRECL= specifies the physical line length of the file. LINESIZE= tells the INPUT statement how much of the line to read.

MISSOVER
prevents an INPUT statement from reading a new input data record if it does not find values in the current input line for all the variables in the statement. When an INPUT

statement reaches the end of the current input data record, variables without any values assigned are set to missing.

Tip Use MISSOVER if the last field or fields might be missing and you want SAS to assign missing values to the corresponding variable.

See "Reading Past the End of a Line" on page 156, FLOWOVER on page 145, SCANOVER on page 148, STOPOVER on page 149, and TRUNCOVER on page 150

Example "Example 2: Handling Missing Values and Short Records with List Input" on page 159

N=*available-lines*

specifies the number of lines that are available to the input pointer at one time.

Default The highest value following a # pointer control in any INPUT statement in the DATA step. If you omit a # pointer control, then the default value is 1.

Interaction This option affects only the number of lines that the pointer can access at a time; it has no effect on the number of lines an INPUT statement reads.

Tips When you use # pointer controls in an INPUT statement that are less than the value of N=, you might get unexpected results. To prevent unexpected results, include a # pointer control that equals the value of the N= option. Here is an example:

```
infile 'external file' n=5;
input #2 name : $25. #3 job : $25. #5;
```

The INPUT statement includes a *#5* pointer control, even though no data is read from that record.

Example "Example 8: Listing the Pointer Location" on page 162

NBYTE=*variable*

specifies the name of a variable that contains the number of bytes to read from a file when you are reading data in stream record format (RECFM=S in the FILENAME statement).

Default The LRECL value of the file

OBS=*record-number* | MAX

record-number specifies the record number of the last record to read in an input file that is read sequentially.

MAX specifies the maximum number of observations to process, which is at least as large as the largest signed, 32-bit integer. The absolute maximum depends on your host operating environment.

Default MAX

Tip Use OBS= with FIRSTOBS= to read a range of records from the middle of a file.

Example This statement processes only the first 100 records in the file:

```
infile file-specification obs=100;
```

PAD | NOPAD
controls whether SAS pads the records that are read from an external file with blanks to the length that is specified in the LRECL= option.

Default NOPAD

See LRECL= option on page 146

PRINT | NOPRINT
specifies whether the input file contains carriage-control characters.

Tip To read a file in a DATA step without having to remove the carriage-control characters, specify PRINT. To read the carriage-control characters as data values, specify NOPRINT.

RECFM=*record-format*
specifies the record format of the input file. *record-format* can be one of these values:

D	default format (same as variable).
F	fixed format. That is, each record has the same length.
N	binary format. The file consists of a stream of bytes with no record boundaries. If you do not specify the LRECL option, then, by default, SAS reads 256 bytes at a time from the file.
P	print format.
V	variable format. Each record ends with a newline character.
S370V	variable S370 record format (V).
S370VB	variable block S370 record format (VB).
S370VBS	variable block with spanned records S370 record format (VBS).

Default The default value for the global LRECL system option is 32767. If you are using fixed-length records (RECFM=F), the default value for LRECL is 256. The maximum length is 1G.

SCANOVER
causes the INPUT statement to scan the input data records until the character string that is specified in the @'*character-string*' expression is found.

Interaction The MISSOVER, TRUNCOVER, and STOPOVER options change how the INPUT statement behaves when it scans for the @'*character-string*' expression and reaches the end of the record. By default (FLOWOVER option), the INPUT statement scans the next record while these other options cause scanning to stop.

Tip It is redundant to specify both SCANOVER and FLOWOVER.

See "Reading Past the End of a Line" on page 156, FLOWOVER on page 145 , MISSOVER on page 146 , STOPOVER on page 149 , and TRUNCOVER on page 150

Example "Example 3: Scanning Variable-Length Records for a Specific Character String" on page 160

SHAREBUFFERS
specifies that the FILE statement and the INFILE statement share the same buffer.

Alias SHAREBUFS

Tips Use SHAREBUFFERS with the INFILE, FILE, and PUT statements to update an external file in place. Updating an external file in place saves CPU time because the PUT statement output is written straight from the input buffer instead of the output buffer.

Use SHAREBUFFERS to update specific fields in an external file instead of an entire record.

Example "Example 6: Updating an External File" on page 162

CAUTION **When using SHAREBUFFERS, RECFM=V, and _INFILE_, use caution if you read a record with one length and update the file with a record of a different length.** The length of the record can change by modifying _INFILE_. One option to avoid this potential problem is to pad or truncate _INFILE_ so that the original record length is maintained.

START=*variable*
specifies a variable whose value SAS uses as the first column number of the record that the PUT _INFILE_ statement writes. Like automatic variables, the START variable is not written to the data set.

See _INFILE_ option on page 305 in the PUT statement

STOPOVER
causes the DATA step to stop processing if an INPUT statement reaches the end of the current record without finding values for all variables in the statement. When an input line does not contain the expected number of values, SAS sets _ERROR_ to 1, stops building the data set as if a STOP statement has executed, and prints the incomplete data line.

Tip Use FLOWOVER to reset the default behavior.

See "Reading Past the End of a Line" on page 156, FLOWOVER on page 145 , MISSOVER on page 146 , SCANOVER on page 148 , and TRUNCOVER on page 150

Example "Example 2: Handling Missing Values and Short Records with List Input" on page 159

TERMSTR=
controls the end-of-line delimiter in files that are formatted by Linux. By default, either a line feed alone or a carriage return and a line feed indicate the end of a line. To explicitly define the end-of-line delimiter, specify one of these values:

CR Carriage return.

CRLF Carriage return line feed.

LF Line feed. This parameter is used to read files that are formatted by .

TRUNCOVER
overrides the default behavior of the INPUT statement when an input data record is shorter than the INPUT statement expects. By default, the INPUT statement automatically reads the next input data record. TRUNCOVER enables you to read variable-length records when some records are shorter than the INPUT statement expects. Variables without any values assigned are set to missing.

Tip Use TRUNCOVER to assign the contents of the input buffer to a variable when the field is shorter than expected.

See "Reading Past the End of a Line" on page 156, FLOWOVER on page 145 , MISSOVER on page 146 , SCANOVER on page 148 , and STOPOVER on page 149

Example "Example 3: Scanning Variable-Length Records for a Specific Character String" on page 160

UNBUFFERED
tells SAS not to perform a buffered ("look ahead") read.

Alias UNBUF

Interaction When you use UNBUFFERED, SAS never sets the END= variable to 1.

Tip When you read instream data with a DATALINES statement, UNBUFFERED is in effect.

INFILE=*variable*
specifies a character variable that references the contents of the current input buffer for this INFILE statement. You can use the variable in the same way as any other variable, even as the target of an assignment. The variable is automatically retained and initialized to blanks. Like automatic variables, the _INFILE_= variable is not written to the data set.

Restriction *variable* cannot be a previously defined variable. Ensure that the _INFILE_= specification is the first occurrence of this variable in the DATA step. Do not set or change the length of _INFILE_= variable with the LENGTH or ATTRIB statements. However, you can attach a format to this variable with the ATTRIB or FORMAT statement.

Interaction The maximum length of this character variable is the logical record length (LRECL= on page 146) for the specified INFILE statement. However, SAS does not open the file to know the LRECL= until before the execution phase. Therefore, the designated size for this variable during the compilation phase is 32,767 bytes.

Tips Modification of this variable directly modifies the INFILE statement's current input buffer. Any PUT _INFILE_ (when this INFILE is current) that follows the buffer modification reflects the modified buffer contents. The _INFILE_= variable accesses only the current input buffer of the specified INFILE statement even if you use the N= option to specify multiple buffers.

To access the contents of the input buffer in another statement without using the _INFILE_= option, use the automatic variable _INFILE_.

The _INFILE_ variable does not have a fixed width. When you assign a value to the _INFILE_ variable, the length of the variable changes to the length of the value that is assigned.

See "Accessing the Contents of the Input Buffer" on page 152

Examples "Example 9: Working with Data in the Input Buffer" on page 163

"Example 10: Accessing the Input Buffers of Multiple Files" on page 164

Details

How to Use the INFILE Statement

Because the INFILE statement identifies the file to read, it must execute before the INPUT statement that reads the input data records. You can use the INFILE statement in conditional processing, such as an IF-THEN statement, because it is executable. The INFILE statement enables you to control the source of the input data records.

Usually, you use an INFILE statement to read data from an external file. When data is read from the job stream, you must use a DATALINES statement. However, to take advantage of certain data-reading options that are available only in the INFILE statement, you can use an INFILE statement with the file-specification DATALINES and a DATALINES statement in the same DATA step. See "Reading Long Instream Data Records" on page 155 for more information.

When you use more than one INFILE statement for the same file specification and you use options in each INFILE statement, the effect is additive. To avoid confusion, use all the options in the first INFILE statement for a given external file.

Reading Multiple Input Files

You can read from multiple input files in a single iteration of the DATA step in one of two ways:

- to keep multiple files open and change which file is read, use multiple INFILE statements.
- to dynamically change the current input file within a single DATA step, use the FILEVAR= option in an INFILE statement. The FILEVAR= option enables you to read from one file, close it, and then open another. See "Example 5: Reading from Multiple Input Files" on page 161.

Updating External Files in Place

You can use the INFILE statement in combination with the FILE statement to update records in an external file. Follow these steps:

1. Specify the INFILE statement before the FILE statement.
2. Specify the same fileref or physical filename in each statement.
3. Use options that are common to both the INFILE and FILE statements in the INFILE statement instead of the FILE statement. (Any such options that are used in the FILE statement are ignored.)

See "Example 6: Updating an External File" on page 162.

To update individual fields within a record instead of the entire record, see the SHAREBUFFERS option on page 149.

Accessing the Contents of the Input Buffer

In addition to the _INFILE_ variable, you can use the automatic _INFILE_ variable to reference the contents of the current input buffer for the most recent execution of the INFILE statement. This character variable is automatically retained and initialized to blanks. Like other automatic variables, _INFILE_ is not written to the data set.

When you specify the _INFILE_= option in an INFILE statement, this variable is also indirectly referenced by the automatic _INFILE_ variable. If the automatic _INFILE_ variable is present and you omit _INFILE_ in a particular INFILE statement, then SAS creates an internal _INFILE_ variable for that INFILE statement. Otherwise, SAS does not create the _INFILE_ variable for a particular FILE.

During execution and at the point of reference, the maximum length of this character variable is the maximum length of the current _INFILE_ variable. However, because _INFILE_ references only variables whose lengths are not known until before the execution phase, the designated length is 32,767 bytes during the compilation phase. For example, if you assign _INFILE_ to a new variable whose length is undefined, then the default length of the new variable is 32,767 bytes. You cannot use the LENGTH statement and the ATTRIB statement to set or override the length of _INFILE_. You can use the FORMAT statement and the ATTRIB statement to assign a format to _INFILE_.

Like other SAS variables, you can update the _INFILE_ variable in an assignment statement. You can also use a format with _INFILE_ in a PUT statement. For example, the following PUT statement writes the contents of the input buffer by using a hexadecimal format.

```
put _infile_ $hex100.;
```

Any modification of the _INFILE_ directly modifies the current input buffer for the current INFILE statement. The execution of any PUT _INFILE_ statement that follows this buffer modification reflects the contents of the modified buffer.

INFILE accesses only the contents of the current input buffer for an INFILE statement, even when you use the N= option to specify multiple buffers. You can access all the N= buffers, but you must use an INPUT statement with the # line pointer control to make the desired buffer the current input buffer.

Reading Delimited Data

By default, the delimiter that is used to read input data records with list input is a blank space. The delimiter-sensitive data (DSD) option, the DELIMITER= option, the DLMSTR= option, and the DLMSOPT= option affect how list input handles delimiters. The DELIMITER= or DLMSTR= option specifies that the INPUT statement use a character other than a blank as a delimiter for data values that are read with list input. When the DSD option is in effect, the INPUT statement uses a comma as the default delimiter.

To read a value as missing between two consecutive delimiters, use the DSD option. By default, the INPUT statement treats consecutive delimiters as a unit. When you use DSD, the INPUT statement treats consecutive delimiters separately. Therefore, a value that is missing between consecutive delimiters is read as a missing value. To change the delimiter from a comma to another value, use the DELIMITER= or DLMSTR= option.

For example, this DATA step program uses list input to read data that is separated with commas. The second data line contains a missing value. Because SAS allows consecutive delimiters with list input, the INPUT statement cannot detect the missing value.

```
data scores;
   infile datalines delimiter=',';
   input test1 test2 test3;
```

```
   datalines;
91,87,95
97,,92
,1,1
;
```

With the FLOWOVER option in effect, the data set SCORES contains two, not three, observations. The second observation is built incorrectly:

OBS	TEST1	TEST2	TEST3
1	91	87	95
2	97	92	1

To correct the problem, use the DSD option in the INFILE statement.

```
data scores;
   input test1 test2 test3;
   datalines;
91,87,95
97,,92
,1,1
;
   infile datalines dsd;
```

Now the INPUT statement detects the two consecutive delimiters and therefore assigns a missing value to variable TEST2 in the second observation.

OBS	TEST1	TEST2	TEST3
1	91	87	95
2	97	.	92
3	.	1	1

The DSD option also enables list input to read a character value that contains a delimiter within a quoted string. For example, if data is separated with commas, DSD enables you to place the character string in quotation marks and read a comma as a valid character. SAS does not store the quotation marks as part of the character value. To retain the quotation marks as part of the value, use the tilde (~) format modifier in an INPUT statement. See "Example 1: Changing How Delimiters Are Treated" on page 157.

Note: Anytime a text file originates from anywhere other than the local encoding environment, it might be necessary to specify the ENCODING= option on either EBCDIC or ASCII environments. For example, when you read an EBCDIC text file on an ASCII platform, it is recommended that you specify the ENCODING= option in the INFILE statement. However, if you use the DSD and DLM options in the INFILE statement, the ENCODING= option is a requirement because these options require certain characters in the session encoding (such as quotation marks, commas, and blanks).The use of encoding-specific informats should be reserved for use with true binary files. That is, files that contain both character and noncharacter fields.

If your data is longer than the default length, you need to use informats. For example, date or time values, names, and addresses can be longer than eight characters. In such

cases, you either need to add an INFORMAT statement to the DATA step or add informats directly in the INPUT statement. If you add informats in an INPUT statement, you must add a colon (:) in front of the informat to indicate that SAS is to read from the first character after the current delimiter to the number of characters specified in the informat or to the next delimiter.

```
data a;
   infile 'c:\sas\example.csv' dlm='09'x dsd truncover;
   input fname :$20. lname :$30. address1 :$50. address2 :$50. city :$40.
         state :$2. zip phone :$12.;
run;
```

Here are some other INFILE options that you might consider using when you read delimited data:

FIRSTOBS=
: Use this option to skip a header record by specifying FIRSTOBS=2.

TERMSTR=
: Use this option to specify the end-of-line character. This option is useful when you want to share data files that are created on one operating system with another operating system. For example, if you are working in a Linux environment and you need to read a file that was created under Windows, use TERMSTR=CRLF.

TRUNCOVER=
: Use this option to specify that SAS use the available input data only in the current record to populate as many variables as possible. By default, if the INPUT statement reads past the end of a record without finding enough data to populate the variables listed, it continues to read data from the next record. Use the TRUNCOVER= option to keep SAS from reading the next record.

Here are some troubleshooting problems and solutions

Problem	Solution
The SAS log contains the following message and all of the data in the data set seems to be read:`One or more lines were truncated.`	This is most likely not a problem. This message occurs when one of the following conditions are true: 1. The maximum record length is less than the active logical record length. 2. All of the data is in the data set. 3. You are using a value for the FIRSTOBS= that is higher than 1. The message indicates that the FIRSTOBS= option has skipped a line because the line is longer than the LRECL= value. SAS recognizes that a line is longer than the LRECL= value, but it does not recognize that the line has been skipped by the FIRSTOBS= option.

Problem	Solution
Your last variable is numeric and it is missing in every observation. The most frequent cause for a missing variable is reading a Windows file in a Linux environment that uses only a line feed. The Linux operating system reads the carriage return as data. Because it is not numeric data, an invalid data message is generated.	Use the TERMSTR=CRLF option in your INFILE statement. For releases prior to SAS 9, either convert the file to the proper Linux structure or add the carriage return (<CR>) to the list of delimiters. If you are reading a CSV file, specify the carriage return as DL DLM='2C0D'x. If you are reading a tab-delimited file, use DLM='090D'x. If you have a different delimiter, contact SAS Technical Support for help.

When you read a CSV file, the records are split inside a quoted string. For example, sometime a long comment field abruptly stops and continues on the next row of the file that you are reading. You can see it if you open the file in a text editor.
 	
This problem happens most commonly in files that are created from Microsoft Excel worksheets. In Excel, the column contains soft returns to help in formatting. When you save the worksheet as a CSV file, the soft return incorrectly seems to SAS as end-of-record markers. This, in turn, causes the records to be split incorrectly.
	In releases prior to SAS 9, run the following program. It converts any line-feed character between double quotation marks into a space to enable SAS to read the file correctly. In this program, the INFILE and FILE statement refer to the same file. The SHAREBUFFERS option enables the external file to be updated in place, removing the offending characters.
	
	`data _null_;`
	`  infile 'c:\_today\mike.csf' recfm=n sharebuffers;`
	`  file 'c:\_today\mike.csv' recfm=n;`
	`  input a $char1.;`
	`  retain open 0;`
	`/* toggle the open flag */`
	`  if a='"' then open=not open;`
	`  if a='0A'x and open then put ' ';`
	`run;`
	
	The program reads the file one byte at a time and replaces the line-feed character, as needed.

Reading Long Instream Data Records

You can use the INFILE statement with the DATALINES file specification to process instream data. An INPUT statement reads the data records that follow the DATALINES statement. If you use the CARDIMAGE system option, or if this option is the default for your system, then SAS processes the data lines exactly like 80-byte punched card images that are padded with blanks. The default FLOWOVER option in the INFILE statement causes the INPUT statement to read the next record if it does not find values in the current record for all of the variables in the statement. To ensure that your data is processed correctly, use an external file for input when record lengths are greater than 80 bytes.

Note: The NOCARDIMAGE system option (see the "CARDIMAGE System Option" in *SAS Viya System Options: Reference*) specifies that data lines not be treated as if they were 80-byte card images. The end of a data line is always treated as the end of the last token, except for strings that are enclosed in quotation marks.

Reading Past the End of a Line

By default, if the INPUT statement tries to read past the end of the current input data record, then it moves the input pointer to column 1 of the next record to read the remaining values. This default behavior is specified by the FLOWOVER option. A message is written to the SAS log:

```
NOTE: SAS went to a new line when INPUT
statement reached past the end of a line.
```

Several options are available to change the INPUT statement behavior when an end of line is reached. The STOPOVER option treats this condition as an error and stops building the data set. The MISSOVERand TRUNCOVER options do not allow the input pointer to go to the next record when the current INPUT statement is not satisfied. The SCANOVER option, used with @'character-string' scans the input record until it finds the specified *character-string*. The FLOWOVER option restores the default behavior.

The TRUNCOVER and MISSOVER options are similar. The MISSOVER option causes the INPUT statement to set a value to missing if the statement is unable to read an entire field because the value is shorter than the field length that is specified in the INPUT statement. The TRUNCOVER option writes whatever characters are read to the appropriate variable.

For example, an external file with variable-length records contains these records:

```
----+----1----+----2
1
22
333
4444
55555
```

The following DATA step reads this data to create a SAS data set. Only one of the input records is as long as the informatted length of the variable TESTNUM.

```
data numbers;
   infile 'external-file';
   input testnum 5.;
run;
```

This DATA step creates the three observations from the five input records because by default the FLOWOVER option is used to read the input records.

If you use the MISSOVER option in the INFILE statement, then the DATA step creates five observations. All the values that were read from records that were too short are set to missing. Use the TRUNCOVER option in the INFILE statement if you prefer to see what values were present in records that were too short to satisfy the current INPUT statement.

```
infile 'external-file' truncover;
```

The DATA step now reads the same input records and creates five observations. See the following table to compare the SAS data sets.

Table 2.4 *The Value of TESTNUM Using Different INFILE Statement Options*

OBS	FLOWOVER	MISSOVER	TRUNCOVER
1	22	.	1
2	4444	.	22

OBS	FLOWOVER	MISSOVER	TRUNCOVER
3	55555	.	333
4		.	4444
5		55555	55555

Comparisons

- The INFILE statement specifies the *input file* for any INPUT statements in the DATA step. The FILE statement specifies the *output file* for any PUT statements in the DATA step.
- An INFILE statement usually identifies data from an external file. A DATALINES statement indicates that data follows in the job stream. You can use the INFILE statement with the file specification DATALINES to take advantage of certain data-reading options that affect how the INPUT statement reads instream data.

Examples

Example 1: Changing How Delimiters Are Treated

By default, the INPUT statement uses a blank as the delimiter. This DATA step uses a comma as the delimiter:

```
data num;
   infile datalines dsd;
   input x y z;
   datalines;
,2,3
4,5,6
7,8,9
;
```

The argument DATALINES in the INFILE statement enables you to use an INFILE statement option to read instream data lines. The DSD option sets the comma as the default delimiter. Because a comma precedes the first value in the first data line, a missing value is assigned to variable X in the first observation, and the value **2** is assigned to variable Y.

If the data uses multiple delimiters or a single delimiter other than a comma, then simply specify the delimiter values with the DELIMITER= option. In this example, the characters **a** and **b** function as delimiters:

```
data nums;
    infile datalines dsd delimiter='ab';
    input X Y Z;
    datalines;
1aa2ab3
4b5bab6
7a8b9
;

proc print; run;
```

The output that PROC PRINT generates shows the resulting NUM data set. Values are missing for variables in the first and second observations because DSD causes list input to detect two consecutive delimiters. If you omit DSD, the characters a, b, aa, ab, ba, or bb function as the delimiter and no variables are assigned missing values.

Output 2.6 *The NUM Data Set*

Obs	X	Y	Z
1	1	.	2
2	4	5	.
3	7	8	9

If you want to use a string as the delimiter, specify the delimiter values with the DLMSTR= option. In this example, the string **PRD** is used as the delimiter. Note that the string contains uppercase characters. By using the DLMSOPT= option, **PRD**, **Prd**, **PRd**, **PrD**, **pRd**, **pRD**, **prD**, and **prd** are all valid delimiters.

```
data test;
    infile datalines dsd dlmstr='PRD' dlmsopt='i';
    input X Y Z;
    datalines;
1PRD2PRd3
4PrD5Prd6
7pRd8pRD9
;
 proc print data=test; run;
```

The output from PROC PRINT shows all the observations in the TEST data set.

Output 2.7 *The TEST Data Set*

Obs	X	Y	Z
1	1	2	3
2	4	5	6
3	7	8	9

This DATA step uses modified list input and the DSD option to read data that is separated by commas and that might contain commas as part of a character value:

```
data scores;
   infile datalines dsd;
   input Name : $9. Score
         Team  : $25. Div $;
   datalines;
Joseph,76,"Red Racers, Washington",AAA
Mitchel,82,"Blue Bunnies, Richmond",AAA
Sue Ellen,74,"Green Gazelles, Atlanta",AA
;
```

```
proc print; run;
```

The output that PROC PRINT generates shows the resulting SCORES data set. The delimiter (comma) is stored as part of the value of TEAM while the quotation marks are not.

Output 2.8 *The SCORES Data Set*

Obs	Name	Score	Team	Div
1	Joseph	76	Red Racers, Washington	AAA
2	Mitchel	82	Blue Bunnies, Richmond	AAA
3	Sue Ellen	74	Green Gazelles, Atlanta	AA

Example 2: Handling Missing Values and Short Records with List Input

This example demonstrates how to prevent missing values from causing problems when you read the data with list input. Some data lines in this example contain fewer than five temperature values. Use the MISSOVER option so that these values are set to missing.

```
data weather;
   infile datalines missover;
   input temp1-temp5;
   datalines;
97.9 98.1 98.3
98.6 99.2 99.1 98.5 97.5
96.2 97.3 98.3 97.6 96.5
;
```

SAS reads the three values on the first data line as the values of TEMP1, TEMP2, and TEMP3. The MISSOVER option causes SAS to set the values of TEMP4 and TEMP5 to missing for the first observation because no values for those variables are in the current input data record.

When you omit the MISSOVER option or use FLOWOVER, SAS moves the input pointer to line 2 and reads values for TEMP4 and TEMP5. The next time the DATA step executes, SAS reads a new line which, in this case, is line 3. This message appears in the SAS log:

```
NOTE: SAS went to a new line when INPUT statement
      reached past the end of a line.
```

You can also use the STOPOVER option in the INFILE statement. Using the STOPOVER option causes the DATA step to halt execution when an INPUT statement does not find enough values in a record of raw data:

```
 infile datalines stopover;
```

Because SAS does not find a TEMP4 value in the first data record, it sets _ERROR_ to 1, stops building the data set, and prints data line 1.

Example 3: Scanning Variable-Length Records for a Specific Character String

This example shows how to use TRUNCOVER in combination with SCANOVER to pull phone numbers from a phone book. The phone number is always preceded by the word “phone:”. Because the phone numbers include international numbers, the maximum length is 32 characters.

```
filename phonebk host-specific-path;
data _null_;
  file phonebk;
  input line $80.;
  put line;
  datalines;
    Jenny's Phone Book
    Jim Johanson phone: 619-555-9340
       Jim wants a scarf for the holidays.
    Jane Jovalley phone: (213) 555-4820
       Jane started growing cabbage in her garden.
       Her dog's name is Juniper.
    J.R. Hauptman phone: (49)12 34-56 78-90
       J.R. is my brother.
   ;
run;
```

Use @'phone:' to scan the lines of the file for a phone number and position the file pointer where the phone number begins. Use TRUNCOVER in combination with SCANOVER to skip the lines that do not contain 'phone:' and write only the phone numbers to the log.

```
data _null_;
   infile phonebk truncover scanover;
   input @'phone:' phone $32.;
   put phone=;
run;
```

The program writes the following lines to the SAS log:

```
phone=619-555-9340
phone=(213) 555-4820
phone=(49)12 34-56 78-90
```

Example 4: Reading Files That Contain Variable-Length Records

This example shows how to use LENGTH=, in combination with the $VARYING. informat, to read a file that contains variable-length records:

```
data a;
   infile file-specification length=linelen lrecl=510 pad;
   input firstvar 1-10 @;  /* assign LINELEN   */
   varlen=linelen-10;      /* Calculate VARLEN */
   input @11 secondvar $varying500. varlen;
run;
```

The following occurs in this DATA step:

- The INFILE statement creates the variable LINELEN but does not assign it a value.
- When the first INPUT statement executes, SAS determines the line length of the record and assigns that value to the variable LINELEN. The single trailing @ holds the record in the input buffer for the next INPUT statement.

- The assignment statement uses the two known lengths (the length of FIRSTVAR and the length of the entire record) to determine the length of VARLEN.
- The second INPUT statement uses the VARLEN value with the informat $VARYING500. to read the variable SECONDVAR.

See the "$VARYING Informat" in *SAS Viya Formats and Informats: Reference* for more information.

Example 5: Reading from Multiple Input Files

The following DATA step reads from two input files during each iteration of the DATA step. As SAS switches from one file to the next, each file remains open. The input pointer remains in place to begin reading from that location the next time an INPUT statement reads from that file.

```
data qtrtot(drop=jansale febsale marsale aprsale maysale junsale);
     /* identify location of 1st file */
   infile file-specification-1;
     /* read values from 1st file     */
   input name $ jansale febsale marsale;
   qtr1tot=sum(jansale,febsale,marsale);
     /* identify location of 2nd file */
   infile file-specification-2;
     /* read values from 2nd file     */
   input @7 aprsale maysale junsale;
   qtr2tot=sum(aprsale,maysale,junsale);
run;
```

The DATA step terminates when SAS reaches an end of file on the shortest input file.

This DATA step uses FILEVAR= to read from a different file during each iteration of the DATA step:

```
data allsales;
   length fileloc myinfile $ 300;
   input fileloc $ ; /* read instream data       */
  /* The INFILE statement closes the current file
     and opens a new one if FILELOC changes value
     when INFILE executes                        */
   infile file-specification filevar=fileloc
          filename=myinfile end=done;
  /* DONE set to 1 when last input record read  */
   do while(not done);
  /* Read all input records from the currently  */
  /* opened input file, write to ALLSALES       */
     input name $ jansale febsale marsale;
     output;
   end;
   put 'Finished reading ' myinfile=;
   datalines;
external-file-1
external-file-2
external-file-3
;
```

The FILENAME= option assigns the name of the current input file to the variable MYINFILE. The LENGTH statement ensures that the FILENAME= variable and FILEVAR= variable have a length that is long enough to contain the value of the

filename. The PUT statement prints the physical name of the currently open input file to the SAS log.

Example 6: Updating an External File

This example shows how to use the INFILE statement with the SHAREBUFFERS option and the INPUT, FILE, and PUT statements to update an external file in place:

```
data _null_;
     /* The INFILE and FILE statements     */
     /* must specify the same file.       */
   infile file-specification-1 sharebuffers;
   file file-specification-1;
   input state $ 1-2 phone $ 5-16;
     /* Replace area code for NC exchanges */
   if state= 'NC' and substr(phone,5,3)='333' then
     phone='910-'||substr(phone,5,8);
   put phone 5-16;
run;
```

Example 7: Truncating Copied Records

The LENGTH= option is useful when you copy the input file to another file with the PUT _INFILE_ statement. Use LENGTH= to truncate the copied records. For example, these statements truncate the last 20 columns from each input data record before the input data record is written to the output file:

```
data _null_;
   infile  file-specification-1 length=a;
   input;
   a=a-20;
   file file-specification-2;
   put _infile_;
run;
```

The START= option is also useful when you want to truncate what the PUT _INFILE_ statement copies. For example, if you do not want to copy the first 10 columns of each record, these statements copy from column 11 to the end of each record in the input buffer:

```
data _null_;
   infile file-specification start=s;
   input;
   s=11;
   file file-specification-2;
   put _infile_;
run;
```

Example 8: Listing the Pointer Location

This DATA step assigns the value of the current pointer location in the input buffer to the variables LINEPT and COLUMNPT:

```
data _null_;
   infile datalines n=2 line=Linept col=Columnpt;
   input name $ 1-15 #2 @3 id;
   put linept= columnpt=;
   datalines;
J. Brooks
  40974
```

```
T. R. Ansen
  4032
;
```

These statements produce the following line for each execution of the DATA step because the input pointer is on the second line in the input buffer when the PUT statement executes:

```
Linept=2 Columnpt=9
Linept=2 Columnpt=8
```

Example 9: Working with Data in the Input Buffer

The _INFILE_ variable always contains the most recent record that is read from an INPUT statement. This example illustrates the use of the _INFILE_ variable to perform these tasks:

- read an entire record that you want to parse without using the INPUT statement.
- read an entire record that you want to write to the SAS log.
- modify the contents of the input record before parsing the line with an INPUT statement.

The example file contains phone bill information. The numeric data, minutes, and charge are enclosed in angle brackets (< >).

```
filename phonbill host-specific-filename;
data _null_;
   file phonbill;
   input line $80.;
   put line;
   datalines;
   City Number Minutes Charge
   Jackson 415-555-2384 <25> <2.45>
   Jefferson 813-555-2356 <15> <1.62>
   Joliet 913-555-3223 <65> <10.32>
   ;
run;
```

The following code reads each record and parses the record to extract the minute and charge values.

```
data _null_;
   infile phonbill firstobs=2;
   input;
   city = scan(_infile_, 1, ' ');
   char_min = scan(_infile_, 3, ' ');
   char_min = substr(char_min, 2, length(char_min)-2);
   minutes = input(char_min, BEST12.);
   put city= minutes=;
run;
```

The program writes the following lines to the SAS log:

```
city=Jackson minutes=25
city=Jefferson minutes=15
city=Joliet minutes=65
```

The INPUT statement in the following code reads a record from the file. The automatic _INFILE_ variable is used in the PUT statement to write the record to the log.

```
data _null_;
   infile phonbill;
   input;
   put _infile_;
run;
```

The program writes the following lines to the SAS log:

```
City Number Minutes Charge
Jackson 415-555-2384 <25> <2.45>
Jefferson 813-555-2356 <15> <1.62>
Joliet 913-555-3223 <65> <10.32>
```

In the following code, the first INPUT statement reads and holds the record in the input buffer. The _INFILE_= option removes the angle brackets (< >) from the numeric data. The second INPUT statement parses the value in the buffer.

```
data _null_;
   length city number $16. minutes charge 8;
   infile phonbill firstobs=2;
   input @;
   _infile_ = compress(_infile_, '<>');
   input city number minutes charge;
   put city= number= minutes= charge=;
run;
```

The program writes the following lines to the SAS log:

```
city=Jackson number=415-555-2384 minutes=25 charge=2.45
city=Jefferson number=813-555-2356 minutes=15 charge=1.62
city=Joliet number=913-555-3223 minutes=65 charge=10.32
```

Example 10: Accessing the Input Buffers of Multiple Files

This example uses both the _INFILE_ automatic variable and the _INFILE_= option to read multiple files and access the input buffers for each of them. The following code creates four files: three data files and one file that contains the names of all the data files. The second DATA step reads the filenames file, opens each data file, and writes the contents to the log. Because the PUT statement needs _INFILE_ for the filenames file and the data file, one of the _INFILE_ variables is referenced with *fname*.

```
data _null_;
   do i = 1 to 3;
      fname= 'external-data-file' || put(i,1.) || '.dat';
      file datfiles filevar=fname;
      do j = 1 to 5;
         put i j;
      end;
      file 'external-filenames-file';
      put fname;
   end;
run;
data _null_;
   infile 'external-filenames-file' _infile_=fname;
   input;
   infile datfiles filevar=fname end=eof;
   do while(^eof);
      input;
```

```
      put fname _infile_;
   end;
run;
```

The program writes the following lines to the SAS log:

```
NOTE: The infile 'external-filenames-file' is:
      File Name=external-filenames-file,
      RECFM=V, LRECL=256
NOTE: The infile DATFILES is:
      File Name=external-data-file1.dat,
      RECFM=V, LRECL=256
external-data-file1.dat 1 1
external-data-file1.dat 1 2
external-data-file1.dat 1 3
external-data-file1.dat 1 4
external-data-file1.dat 1 5
NOTE: The infile DATFILES is
      File Name=external-data-file2.dat,
      RECFM=V, LRECL=256
external-data-file2.dat 2 1
external-data-file2.dat 2 2
external-data-file2.dat 2 3
external-data-file2.dat 2 4
external-data-file2.dat 2 5
NOTE: The infile DATFILES is
      File Name=external-data-file3.dat,
      RECFM=V, LRECL=256
external-data-file3.dat 3 1
external-data-file3.dat 3 2
external-data-file3.dat 3 3
external-data-file3.dat 3 4
external-data-file3.dat 3 5
```

Example 11: Specifying an Encoding When Reading an External File

This example creates a SAS data set from an external file. The external file's encoding is in UTF-8, and the current SAS session encoding is Wlatin1. By default, SAS assumes that the external file is in the same encoding as the session encoding, which causes the character data to be written to the new SAS data set incorrectly.

To tell SAS what encoding to use when reading the external file, specify the ENCODING= option. When you tell SAS that the external file is in UTF-8, SAS then transcodes the external file from UTF-8 to the current session encoding when writing to the new SAS data set. Therefore, the data is written to the new data set correctly in Wlatin1.

```
libname myfiles 'SAS-library';
filename extfile 'external-file';
data myfiles.unicode;
   infile extfile encoding="utf-8";
   input Make $ Model $ Year;
run;
```

See Also

Statements:

- “FILENAME Statement” on page 91
- “INPUT Statement” on page 169

- "LOCKDOWN Statement" in SAS Intelligence Platform: Application Server Administration Guide
- "PUT Statement" on page 303

System Options:

- "LOCKDOWN System Option in SAS Intelligence Platform: Application Server Administration Guide

INFORMAT Statement

Associates informats with variables.

Valid in: DATA step or PROC step

Categories: CAS
Information

Type: Declarative

Syntax

INFORMAT *variable-1* <*...variable-n*> <*informat*>;

INFORMAT <*variable-1*> <*... variable-n*> <DEFAULT=*default-informat*>;

INFORMAT *variable-1* <*...variable-n*> *informat* <DEFAULT=*default-informat*>;

Arguments

variable
specifies one or more variables to associate with an informat. You must specify at least one *variable* when specifying an *informat* or when including no other arguments. Specifying a variable is optional when using a DEFAULT= informat specification.

Tip To disassociate an informat from a variable, use the variable's name in an INFORMAT statement without specifying an informat. Place the INFORMAT statement after the SET statement. See "Example 3: Removing an Informat" on page 169.

informat
specifies the informat for reading the values of the variables that are listed in the INFORMAT statement.

Tip If an informat is associated with a variable by using the INFORMAT statement, and that same informat is not associated with that same variable in the INPUT statement, then that informat behaves like informats that you specify with a colon (:) modifier in an INPUT statement. SAS reads the variables by using list input with an informat. For example, you can use the : modifier with an informat to read character values that are longer than eight bytes, or numeric values that contain nonstandard values. For more information, see "INPUT Statement, List" on page 193.

See *SAS Viya Formats and Informats: Reference*

Example "Example 2: Specifying Numeric and Character Informats" on page 168

DEFAULT= *default-informat*
specifies a temporary default informat for reading values of the variables that are listed in the INFORMAT statement. If no *variable* is specified, then the DEFAULT= informat specification applies a temporary default informat for reading values of all the variables of that type included in the DATA step. Numeric informats are applied to numeric variables, and character informats are applied to character variables. These default informats apply only to the current DATA step.

A DEFAULT= informat specification applies to

- variables that are not named in an INFORMAT or ATTRIB statement
- variables that are not permanently associated with an informat within a SAS data set
- variables that are not read with an explicit informat in the current DATA step.

Default If you omit DEFAULT=, SAS uses *w.d* as the default numeric informat and $*w*. as the default character informat.

Restriction Use this argument only in a DATA step.

Tip A DEFAULT= specification can occur anywhere in an INFORMAT statement. It can specify either a numeric default, a character default, or both.

Example "Example 1: Specifying Default Informats" on page 168

Details

The Basics

An INFORMAT statement in a DATA step permanently associates an informat with a variable. You can specify standard SAS informats or user-written informats, previously defined in PROC FORMAT. A single INFORMAT statement can associate the same informat with several variables, or it can associate different informats with different variables. If a variable appears in multiple INFORMAT statements, SAS uses the informat that is assigned last.

CAUTION:
Because an INFORMAT statement defines the length of previously undefined character variables, you can truncate the values of character variables in a DATA step if an INFORMAT statement precedes a SET statement.

How SAS Treats Variables When You Assign Informats with the INFORMAT Statement

Informats that are associated with variables by using the INFORMAT statement behave like informats that are used with modified list input. SAS reads the variables by using the scanning feature of list input, but applies the informat. In modified list input, SAS

- does not use the value of *w* in an informat to specify column positions or input field widths in an external file
- uses the value of *w* in an informat to specify the length of previously undefined character variables

- ignores the value of *w* in numeric informats
- uses the value of *d* in an informat in the same way it usually does for numeric informats
- treats blanks that are embedded as input data as delimiters unless you change their status with a DLM= or DLMSTR= option specification in an INFILE statement.

If you have coded the INPUT statement to use another style of input, such as formatted input or column input, that style of input is not used when you use the INFORMAT statement.

Comparisons

- Both the ATTRIB and INFORMAT statements can associate informats with variables, and both statements can change the informat that is associated with a variable. You can also use the INFORMAT statement in PROC DATASETS to change or remove the informat that is associated with a variable.
- SAS changes the descriptor information of the SAS data set that contains the variable. You can use an INFORMAT statement in some PROC steps, but the rules are different. For more information, see "FORMAT Procedure" in *SAS Viya Data Management and Utility Procedures Guide*.

Examples

Example 1: Specifying Default Informats

This example uses an INFORMAT statement to associate a default numeric informat:

```
data tstinfmt;
   informat default=3.1;
   input x;
   put x;
   datalines;
111
222
333
;
```

The PUT statement produces these results:

```
11.1
22.2
33.3
```

Example 2: Specifying Numeric and Character Informats

This example associates a character informat and a numeric informat with SAS variables. Although the character variables do not fully occupy 15 column positions, the INPUT statement reads the data records correctly by using modified list input:

```
data name;
   informat FirstName LastName $15. n1 6.2 n2 7.3;
   input firstname lastname n1 n2;
   datalines;
Alexander Robinson 35 11
;
proc contents data=name;
run;
```

```
proc print data=name;
run;
```

The following output shows a partial listing from PROC CONTENTS, as well as the report PROC PRINT generates.

Output 2.9 *Associating Numeric and Character Informats with SAS Variables*

Alphabetic List of Variables and Attributes

#	Variable	Type	Len	Informat
1	FirstName	Char	15	$15.
2	LastName	Char	15	$15.
3	n1	Num	8	6.2
4	n2	Num	8	7.3

Output 2.10 *PROC PRINT Report*

Obs	FirstName	LastName	n1	n2
1	Alexander	Robinson	0.35	0.011

Example 3: Removing an Informat

This example disassociates an existing informat. The order of the INFORMAT and SET statements is important.

```
data rtest;
   set rtest;
   informat x;
run;
```

See Also

Statements:

- “ATTRIB Statement” on page 27
- “INPUT Statement” on page 169
- “INPUT Statement, List” on page 193

INPUT Statement

Describes the arrangement of values in the input data record and assigns input values to the corresponding SAS variables.

Valid in: DATA step

Category: File-Handling

Type: Executable

Restriction: This statement is not valid in the CAS server.

Syntax

INPUT <*specification(s)*> <@ | @@>;

Without Arguments

The INPUT statement with no arguments is called a *null INPUT statement*. The null INPUT statement

- brings an input data record into the input buffer without creating any SAS variables
- releases an input data record that is held by a trailing @ or a double trailing @.

For an example, see "Example 2: Using a Null INPUT Statement" on page 182.

Arguments

specification(s)

can include

variable

names a variable that is assigned input values.

(*variable-list*)

specifies a list of variables that are assigned input values.

Requirement The (*variable-list*) is followed by an (*informat-list*).

See "How to Group Variables and Informats" on page 191

$

specifies to store the variable value as a character value rather than as a numeric value.

Tip If the variable is previously defined as character, $ is not required.

Example "Example 1: Using Multiple Styles of Input in One INPUT Statement" on page 181

pointer-control

moves the input pointer to a specified line or column in the input buffer.

See "Column Pointer Controls" on page 172 and "Line Pointer Controls" on page 174

column-specifications

specifies the columns of the input record that contain the value to read.

Tip Informats are ignored. Only standard character and numeric data can be read correctly with this method.

See "Column Input" on page 175

Example "Example 1: Using Multiple Styles of Input in One INPUT Statement" on page 181

format-modifier
allows modified list input or controls the amount of information that is reported in the SAS log when an error in an input value occurs.

Tip Use modified list input to read data that cannot be read with simple list input.

See "When to Use List Input" on page 195 and "Format Modifiers for Error Reporting" on page 174

Example "Example 6: Positioning the Pointer with a Character Variable" on page 184

informat.
specifies an informat to use to read the variable value.

Tip You can use modified list input to read data with informats. Modified list input is useful when the data require informats but cannot be read with formatted input because the values are not aligned in columns.

See "Formatted Input" on page 176 and "List Input" on page 175

Example "Example 2: Using Informat Lists" on page 192

(***informat-list***)
specifies a list of informats to use to read the values for the preceding list of variables.

Restriction The (*informat-list*) must follow the (*variable-list*).

See "How to Group Variables and Informats" on page 191

@
holds an input record for the execution of the next INPUT statement within the same iteration of the DATA step. This line-hold specifier is called *trailing* @.

Restriction The trailing @ must be the last item in the INPUT statement.

Tip The trailing @ prevents the next INPUT statement from automatically releasing the current input record and reading the next record into the input buffer. It is useful when you need to read from a record multiple times.

See "Using Line-Hold Specifiers" on page 178

Example "Example 3: Holding a Record in the Input Buffer" on page 182

@@
holds the input record for the execution of the next INPUT statement across iterations of the DATA step. This line-hold specifier is called *double trailing* @.

Restriction The double trailing @ must be the last item in the INPUT statement.

Tip The double trailing @ is useful when each input line contains values for several observations, or when a record needs to be reread on the next iteration of the DATA step.

See "Using Line-Hold Specifiers" on page 178

Example "Example 4: Holding a Record across Iterations of the DATA Step" on page 183

Column Pointer Controls

@n

moves the pointer to column *n*.

Range a positive integer

Tip If *n* is not an integer, SAS truncates the decimal value and uses only the integer value. If *n* is zero or negative, the pointer moves to column 1.

Example @15 moves the pointer to column 15:

```
input @15 name $10.;
```

Example "Example 7: Moving the Pointer Backward" on page 185

@numeric-variable

moves the pointer to the column given by the value of *numeric-variable*.

Range a positive integer

Tip If *numeric-variable* is not an integer, SAS truncates the decimal value and uses only the integer value. If *numeric-variable* is zero or negative, the pointer moves to column 1.

Example The value of the variable A moves the pointer to column 15:

```
a=15;
input @a name $10.;
```

Example "Example 5: Positioning the Pointer with a Numeric Variable" on page 183

@(expression)

moves the pointer to the column that is given by the value of *expression*.

Restriction *Expression* must result in a positive integer.

Tip If the value of *expression* is not an integer, SAS truncates the decimal value and uses only the integer value. If it is zero or negative, the pointer moves to column 1.

Example The result of the expression moves the pointer to column 15:

```
b=5;
input @(b*3) name $10.;
```

@'character-string'

locates the specified series of characters in the input record and moves the pointer to the first column after *character-string*.

@character-variable

locates the series of characters in the input record that is given by the value of *character-variable* and moves the pointer to the first column after that series of characters.

Example The following statement reads in the WEEKDAY character variable. The second @1 moves the pointer to the beginning of the input line. The value

for SALES is read from the next non-blank column after the value of WEEKDAY:

```
input @1 day 1. @5 weekday $10.
   @1 @weekday sales 8.2;
```

Example "Example 6: Positioning the Pointer with a Character Variable" on page 184

@(*character-expression*)

locates the series of characters in the input record that is given by the value of *character-expression* and moves the pointer to the first column after the series.

Example "Example 6: Positioning the Pointer with a Character Variable" on page 184

+*n*

moves the pointer *n* columns.

Range a positive integer or zero

Tip If *n* is not an integer, SAS truncates the decimal value and uses only the integer value. If the value is greater than the length of the input buffer, the pointer moves to column 1 of the next record.

Example This statement moves the pointer to column 23, reads a value for LENGTH from columns 23 through 26, advances the pointer five columns, and reads a value for WIDTH from columns 32 through 35:

```
input @23 length 4. +5 width 4.;
```

Example "Example 7: Moving the Pointer Backward" on page 185

+*numeric-variable*

moves the pointer the number of columns that is given by the value of *numeric-variable*.

Range a positive or negative integer or zero

Tip If *numeric-variable* is not an integer, SAS truncates the decimal value and uses only the integer value. If *numeric-variable* is negative, the pointer moves backward. If the current column position becomes less than 1, the pointer moves to column 1. If the value is zero, the pointer does not move. If the value is greater than the length of the input buffer, the pointer moves to column 1 of the next record.

Example "Example 7: Moving the Pointer Backward" on page 185

+(*expression*)

moves the pointer the number of columns given by *expression*.

Range *expression* must result in a positive or negative integer or zero.

Tip If *expression* is not an integer, SAS truncates the decimal value and uses only the integer value. If *expression* is negative, the pointer moves backward. If the current column position becomes less than 1, the pointer moves to column 1. If the value is zero, the pointer does not move. If the value is greater than the length of the input buffer, the pointer moves to column 1 of the next record.

Line Pointer Controls

#*n*
moves the pointer to record *n*.

Range a positive integer

Interaction The N= option in the INFILE statement can affect the number of records the INPUT statement reads and the placement of the input pointer after each iteration of the DATA step. See the option N= on page 147.

Example The #2 moves the pointer to the second record to read the value for ID from columns 3 and 4:

```
input name $10. #2 id 3-4;
```

#*numeric-variable*
moves the pointer to the record that is given by the value of *numeric-variable*.

Range a positive integer

Tip If the value of *numeric-variable* is not an integer, SAS truncates the decimal value and uses only the integer value.

#(*expression*)
moves the pointer to the record that is given by the value of *expression*.

Range *expression* must result in a positive integer.

Tip If the value of *expression* is not an integer, SAS truncates the decimal value and uses only the integer value.

/
advances the pointer to column 1 of the next input record.

Example The values for NAME and AGE are read from the first input record before the pointer moves to the second record to read the value of ID from columns 3 and 4:

```
input name age / id 3-4;
```

Format Modifiers for Error Reporting

?
suppresses printing the invalid data note when SAS encounters invalid data values.

See "How Invalid Data Is Handled" on page 180

??
suppresses printing the messages and the input lines when SAS encounters invalid data values. The automatic variable _ERROR_ is not set to 1 for the invalid observation.

See "How Invalid Data Is Handled" on page 180

Details

When to Use INPUT

Use the INPUT statement to read raw data from an external file or in-stream data. If your data are stored in an external file, you can specify the file in an INFILE statement. The INFILE statement must execute before the INPUT statement that reads the data records. If your data are in-stream, a DATALINES statement must precede the data lines in the job stream. If your data contain semicolons, use a DATALINES4 statement before the data lines. A DATA step that reads raw data can include multiple INPUT statements.

You can also use the INFILE statement to read in-stream data by specifying a filename of DATALINES in the INFILE statement before the INPUT statement. Using DATALINES in the INFILE statement enables you to use most of the options available in the INFILE statement with in-stream data.

To read data that are already stored in a SAS data set, use a SET statement. To read database or PC file-format data that are created by other software, use the SET statement after you access the data with the LIBNAME statement. See the SAS/ACCESS documentation for more information.

Input Styles

Overview of Input Styles

There are four ways to describe a record's values in the INPUT statement:

- column
- list (simple and modified)
- formatted
- named.

Each variable value is read by using one of these input styles. An INPUT statement can contain any or all of the available input styles, depending on the arrangement of data values in the input records. However, once named input is used in an INPUT statement, you cannot use another input style.

Column Input

With *column input*, the column numbers follow the variable name in the INPUT statement. These numbers indicate where the variable values are found in the input data records:

```
input name $ 1-8 age 11-12;
```

This INPUT statement can read the following data records:

```
----+----1----+----2----+
Peterson  21
Morgan    17
```

Because NAME is a character variable, a $ appears between the variable name and column numbers. For more information, see “INPUT Statement, Column” on page 185.

List Input

With *list input*, the variable names are simply listed in the INPUT statement. A $ follows the name of each character variable:

```
input name $ age;
```

This INPUT statement can read data values that are separated by blanks or aligned in columns (with at least one blank between):

```
----+----1----+----2----+
Peterson  21
Morgan  17
```

For more information, see "INPUT Statement, List" on page 193.

Formatted Input

With *formatted input*, an informat follows the variable name in the INPUT statement. The informat gives the data type and the field width of an input value. Informats also enable you to read data that are stored in nonstandard form, such as packed decimal, or numbers that contain special characters such as commas.

```
input name $char8. +2 income comma6.;
```

This INPUT statement reads these data records correctly:

```
----+----1----+----2----+
Peterson  21,000
Morgan    17,132
```

The pointer control of +2 moves the input pointer to the field that contains the value for the variable INCOME. For more information, see "INPUT Statement, Formatted" on page 188.

Named Input

With *named input*, you specify the name of the variable followed by an equal sign. SAS looks for a variable name and an equal sign in the input record:

```
input name= $ age=;
```

This INPUT statement reads the following data records correctly:

```
----+----1----+----2----+
name=Peterson age=21
name=Morgan age=17
```

For more information, see "INPUT Statement, Named" on page 199.

Multiple Styles in a Single INPUT Statement

An INPUT statement can contain any or all of the different input styles:

```
input idno name $18. team $ 25-30 startwght endwght;
```

This INPUT statement reads the following data records correctly:

```
----+----1----+----2----+----3----+----
023 David Shaw         red    189 165
049 Amelia Serrano     yellow 189 165
```

The value of IDNO, STARTWGHT, and ENDWGHT are read with list input, the value of NAME with formatted input, and the value of TEAM with column input.

Note: Once named input is used in an INPUT statement, you cannot change input styles.

Pointer Controls

Overview of Pointers

As SAS reads values from the input data records into the input buffer, it keeps track of its position with a pointer. The INPUT statement provides three ways to control the movement of the pointer:

column pointer controls
: reset the pointer's column position when the data values in the data records are read.

line pointer controls
: reset the pointer's line position when the data values in the data records are read.

line-hold specifiers
: hold an input record in the input buffer so that another INPUT statement can process it. By default, the INPUT statement releases the previous record and reads another record.

With column and line pointer controls, you can specify an absolute line number or column number to move the pointer or you can specify a column or line location relative to the current pointer position. The following table lists the pointer controls that are available with the INPUT statement.

Table 2.5 *Pointer Controls Available in the INPUT Statement*

Pointer Controls	Relative	Absolute
column pointer controls	+*n*	@*n*
	+*numeric-variable*	@*numeric-variable*
	+(*expression*)	@*(expression)*
		@'*character-string*'
		@*character-variable*
		@(*character-expression*)
line pointer controls	/	#*n*
		#*numeric-variable*
		#(*expression*)
line-hold specifiers	@	(not applicable)
	@@	(not applicable)

Note: Always specify pointer controls before the variable to which they apply.

You can use the COLUMN= and LINE= options in the INFILE statement to determine the pointer's current column and line location.

Using Column and Line Pointer Controls

Column pointer controls indicate the column in which an input value starts.

Use line pointer controls within the INPUT statement to move to the next input record or to define the number of input records per observation. Line pointer controls specify which input record to read. To read multiple data records into the input buffer, use the N= option in the INFILE statement to specify the number of records. If you omit N=, you need to take special precautions. For more information, see "Reading More Than One Record per Observation" on page 179.

Using Line-Hold Specifiers

Line-hold specifiers keep the pointer on the current input record when

- a data record is read by more than one INPUT statement (trailing @)
- one input line has values for more than one observation (double trailing @)
- a record needs to be reread on the next iteration of the DATA step (double trailing @).

Use a single trailing @ to allow the next INPUT statement to read from the same record. Use a double trailing @ to hold a record for the next INPUT statement across iterations of the DATA step.

Normally, each INPUT statement in a DATA step reads a new data record into the input buffer. When you use a trailing @, the following occurs:

- The pointer position does not change.
- No new record is read into the input buffer.
- The next INPUT statement for the same iteration of the DATA step continues to read the same record rather than a new one.

SAS releases a record held by a trailing @ when

- a null INPUT statement executes:

  ```
  input;
  ```

- an INPUT statement without a trailing @ executes
- the next iteration of the DATA step begins.

Normally, when you use a double trailing @ (@@), the INPUT statement for the next iteration of the DATA step continues to read the same record. SAS releases the record that is held by a double trailing @

- immediately if the pointer moves past the end of the input record
- immediately if a null INPUT statement executes:

  ```
  input;
  ```

- when the next iteration of the DATA step begins if an INPUT statement with a single trailing @ executes later in the DATA step:

  ```
  input @;
  ```

Pointer Location After Reading

Understanding the location of the input pointer after a value is read is important, especially if you combine input styles in a single INPUT statement. With column and formatted input, the pointer reads the columns that are indicated in the INPUT statement and stops in the next column. With list input, however, the pointer scans data records to locate data values and reads a blank to indicate that a value has ended. After reading a value with list input, the pointer stops in the second column after the value.

For example, you can read these data records with list, column, and formatted input:

```
----+----1----+----2----+----3
REGION1    49670
REGION2    97540
REGION3    86342
```

This INPUT statement uses list input to read the data records:

```
input region $ jansales;
```

After reading a value for REGION, the pointer stops in column 9.

```
----+----1----+----2----+----3
REGION1    49670
        ↑
```

These INPUT statements use column and formatted input to read the data records:

- column input

  ```
  input region $ 1-7 jansales 12-16;
  ```

- formatted input

  ```
  input region $7. +4 jansales 5.;
  input region $7. @12 jansales 5.;
  ```

To read a value for the variable REGION, the INPUT statements instruct the pointer to read seven columns and stop in column 8.

```
----+----1----+----2----+----3
REGION1    49670
       ↑
```

Reading More Than One Record per Observation

Using the # Pointer Control

The highest number that follows the # pointer control in the INPUT statement determines how many input data records are read into the input buffer. Use the N= option in the INFILE statement to change the number of records. For example, in this statement, the highest value after the # is 3:

```
input @31 age 3. #3 id 3-4 #2 @6 name $20.;
```

Unless you use N= in the associated INFILE statement, the INPUT statement reads three input records each time the DATA step executes.

When each observation has multiple input records but values from the last record are not read, you must use a # pointer control in the INPUT statement or N= in the INFILE statement to specify the last input record. For example, if there are four records per observation, but only values from the first two input records are read, use this INPUT statement:

```
input name $ 1-10 #2 age 13-14 #4;
```

When you have advanced to the next record with the / pointer control, use the # pointer control in the INPUT statement or the N= option in the INFILE statement to set the number of records that are read into the input buffer. To move the pointer back to an earlier record, use a # pointer control. For example, this statement requires the #2 pointer control, unless the INFILE statement uses the N= option, to read two records:

```
input a / b #1 @52 c #2;
```

The INPUT statement assigns A a value from the first record. The pointer advances to the next input record to assign B a value. Then the pointer returns from the second

record to column 1 of the first record and moves to column 52 to assign C a value. The #2 pointer control identifies two input records for each observation so that the pointer can return to the first record for the value of C.

If the number of input records per observation varies, use the N= option in the INFILE statement to give the maximum number of records per observation. For more information, see the N= option on page 147.

Reading Past the End of a Line

When you use @ or + pointer controls with a value that moves the pointer to or past the end of the current record and the next value is to be read from the current column, SAS goes to column 1 of the next record to read it. It also writes this message to the SAS log:

```
NOTE: SAS went to a new line when INPUT statement
      reached past the end of a line.
```

You can alter the default behavior (the FLOWOVER option) in the INFILE statement.

Use the STOPOVER option in the INFILE statement to treat this condition as an error and to stop building the data set.

Use the MISSOVER option in the INFILE statement to set the remaining INPUT statement variables to missing values if the pointer reaches the end of a record.

Use the TRUNCOVER option in the INFILE statement to read column input or formatted input when the last variable that is read by the INPUT statement contains varying-length data.

Positioning the Pointer before the Record

When a column pointer control tries to move the pointer to a position before the beginning of the record, the pointer is positioned in column 1. For example, this INPUT statement specifies that the pointer is located in column −2 after the first value is read:

```
data test;
   input a @(a-3) b;
   datalines;
 2
;
```

Therefore, SAS moves the pointer to column 1 after the value of A is read. Both variables A and B contain the same value.

How Invalid Data Is Handled

When SAS encounters an invalid character in an input value for the variable indicated, it

- sets the value of the variable that is being read to missing or the value that is specified with the INVALIDDATA= system option. For more information see the "INVALIDDATA= System Option" in *SAS Viya System Options: Reference*.
- prints an invalid data note in the SAS log.
- prints the input line and column number that contains the invalid value in the SAS log. Unprintable characters appear in hexadecimal. To help determine column numbers, SAS prints a rule line above the input line.
- sets the automatic variable _ERROR_ to 1 for the current observation.

The format modifiers for error reporting control the amount of information that is printed in the SAS log. Both the ? and ?? modifier suppress the invalid data message. However, the ?? modifier also resets the automatic variable _ERROR_ to 0. For example, these two sets of statements are equivalent:

- `input x ?? 10-12;`
- `input x ? 10-12;`
  `_error_=0;`

In either case, SAS sets invalid values of X to missing values.

End-of-File

End-of-file occurs when an INPUT statement reaches the end of the data. If a DATA step tries to read another record after it reaches an end-of-file, then execution stops. If you want the DATA step to continue to execute, use the END= or EOF= option in the INFILE statement. Then you can write SAS program statements to detect the end-of-file, and to stop the execution of the INPUT statement but continue with the DATA step. For more information, see the "INFILE Statement" on page 138.

Arrays

The INPUT statement can use array references to read input data values. You can use an array reference in a pointer control if it is enclosed in parentheses. See "Example 6: Positioning the Pointer with a Character Variable" on page 184.

Use the array subscript asterisk (*) to read in all elements of a previously defined explicit array. SAS allows single or multidimensional arrays. Enclose the subscript in braces, brackets, or parentheses. The form of this statement is

`INPUT array-name{*};`

You can use arrays with list, column, or formatted input. However, you cannot read values into an array that is defined with _TEMPORARY_ and that uses the asterisk subscript. For example, these statements create variables X1 through X100 and assign data values to the variables using the 2. informat:

```
array x{100};
input x{*} 2.;
```

Comparisons

- The INPUT statement reads raw data in external files or data lines that are entered in-stream (following the DATALINES statement) that need to be described to SAS. The SET statement reads a SAS data set, which already contains descriptive information about the data values.
- The INPUT statement reads data while the PUT statement writes data values, text strings, or both to the SAS log or to an external file.
- The INPUT statement can read data from external files; the INFILE statement points to that file and has options that control how that file is read.

Examples

Example 1: Using Multiple Styles of Input in One INPUT Statement

This example uses several input styles in a single INPUT statement:

```
data club1;
   input Idno Name $18.
      Team $ 25-30 Startwght Endwght;
   datalines;
023 David Shaw         red    189 165
049 Amelia Serrano     yellow 189 165
```

```
... more data lines ...
;
```

The following table identifies the type of input styles.

Variable	Type of Input
Idno, Startwght, Endwght	list input
Name	formatted input
Team	column input

Example 2: Using a Null INPUT Statement

This example uses an INPUT statement with no arguments. The DATA step copies records from the input file to the output file without creating any SAS variables:

```
data _null_;
   infile file-specification-1;
   file file-specification-2;
   input;
   put _infile_;
run;
```

Example 3: Holding a Record in the Input Buffer

This example reads a file that contains two types of input data records and creates a SAS data set from these records. One type of data record contains information about a particular college course. The second type of record contains information about the students enrolled in the course. You need two INPUT statements to read the two records and to assign the values to different variables that use different formats. Records that contain class information have a C in column 1; records that contain student information have an S in column 1, as shown here:

```
----+----1----+----2----+
C HIST101 Watson
S Williams 0459
S Flores   5423
C MATH202 Sen
S Lee      7085
```

To know which INPUT statement to use, check each record as it is read. Use an INPUT statement that reads only the variable that tells whether the record contains class or student.

```
   data schedule(drop=type);
      retain Course Professor;
      input type $1. @;
      if type='C' then
         input course $ professor $;
      else if type='S' then
         do;
           input Name $10. Id;
           output schedule;
         end;
   datalines;
   C HIST101 Watson
```

```
   S Williams 0459
   S Flores   5423
   C MATH202 Sen
   S Lee      7085
   ;
   run;

   proc print;
   run;
```

The first INPUT statement reads the TYPE value from column 1 of every line. Because this INPUT statement ends with a trailing @, the next INPUT statement in the DATA step reads the same line. The IF-THEN statements that follow check whether the record is a class or student line before another INPUT statement reads the rest of the line. The INPUT statements without a trailing @ release the held line. The RETAIN statement saves the values about the particular college course. The DATA step writes an observation to the SCHEDULE data set after a student record is read.

The following output that PROC PRINT generates shows the resulting data set SCHEDULE.

Output 2.11 *Data Set Schedule*

Obs	Course	Professor	Name	Id
1	HIST101	Watson	Williams	459
2	HIST101	Watson	Flores	5423
3	MATH202	Sen	Lee	7085

Example 4: Holding a Record across Iterations of the DATA Step

This example shows how to create multiple observations for each input data record. Each record contains several NAME and AGE values. The DATA step reads a NAME value and an AGE value, writes an observation, and then reads another set of NAME and AGE values to output, and so on, until all the input values in the record are processed.

```
data test;
   input name $ age @@;
   datalines;
John 13 Monica 12 Sue 15 Stephen 10
Marc 22 Lily 17
;
```

The INPUT statement uses the double trailing @ to control the input pointer across iterations of the DATA step. The SAS data set contains six observations.

Example 5: Positioning the Pointer with a Numeric Variable

This example uses a numeric variable to position the pointer. A raw data file contains records with the employment figures for several offices of a multinational company. The input data records are

```
----+----1----+----2----+----3----+
8      New York    1 USA 14
5   Cary           1 USA 2274
```

```
3 Chicago          1 USA 37
22 Tokyo           5 ASIA 80
5   Vancouver      2 CANADA 6
9       Milano     4 EUROPE 123
```

The first column has the column position for the office location. The next numeric column is the region category. The geographic region occurs before the number of employees in that office.

You determine the office location by combining the *@numeric-variable* pointer control with a trailing @. To read the records, use two INPUT statements. The first INPUT statement obtains the value for the @ *numeric-variable* pointer control. The second INPUT statement uses this value to determine the column that the pointer moves to.

```
data office (drop=x);
   infile file-specification;
   input x @;
   if 1<=x<=10 then
      input @x City $9.;
   else do;
      put 'Invalid input at line ' _n_;
      delete;
   end;
run;
```

The DATA step writes only five observations to the OFFICE data set. The fourth input data record is invalid because the value of X is greater than 10. Therefore, the second INPUT statement does not execute. Instead, the PUT statement writes a message to the SAS log and the DELETE statement stops processing the observation.

Example 6: Positioning the Pointer with a Character Variable

This example uses character variables to position the pointer. The OFFICE data set, created in "Example 5: Positioning the Pointer with a Numeric Variable" on page 183, contains a character variable CITY whose values are the office locations. Suppose you discover that you need to read additional values from the raw data file. By using another DATA step, you can combine the *@character-variable* pointer control with a trailing @ and the *@character-expression* pointer control to locate the values.

If the observations in OFFICE are still in the order of the original input data records, you can use this DATA step:

```
data office2;
   set office;
   infile file-specification;
   array region {5} $ _temporary_
         ('USA' 'CANADA' 'SA' 'EUROPE' 'ASIA');
   input @city Location : 2. @;
   input @(trim(region{location})) Population : 4.;
run;
```

The ARRAY statement assigns initial values to the temporary array elements. These elements correspond to the geographic regions of the office locations. The first INPUT statement uses an *@character-variable* pointer control. Each record is scanned for the series of characters in the value of CITY for that observation. Then the value of LOCATION is read from the next non-blank column. LOCATION is a numeric category for the geographic region of an office. The second INPUT statement uses an array reference in the *@character-expression* pointer control to determine the location POPULATION in the input records. The expression also uses the TRIM function to trim

trailing blanks from the character value. In this way an exact match is found between the character string in the input data and the value of the array element.

The following output that PROC PRINT generates shows the resulting data set OFFICE2.

Output 2.12 *Data Set OFFICE2*

Obs	City	Location	Population
1	New York	1	14
2	Cary	1	2274
3	Chicago	1	37
4	Tokyo	5	80
5	Vancouver	2	6
6	Milano	4	123

Example 7: Moving the Pointer Backward

This example shows several ways to move the pointer backward.

- This INPUT statement uses the @ pointer control to read a value for BOOK starting at column 26. Then the pointer moves back to column 1 on the same line to read a value for COMPANY:

  ```
  input @26 book $ @1 company;
  ```

- These INPUT statements use +*numeric-variable* or +(*expression*) to move the pointer backward one column. These two sets of statements are equivalent.

  - ```
    m=-1;
    input x 1-10 +m y 2.;
    ```

  - ```
    input x 1-10 +(-1) y 2.;
    ```

See Also

Statements:

- "ARRAY Statement" on page 18
- "INPUT Statement, Column" on page 185
- "INPUT Statement, Formatted" on page 188
- "INPUT Statement, List" on page 193
- "INPUT Statement, Named" on page 199

INPUT Statement, Column

Reads input values from specified columns and assigns them to the corresponding SAS variables.

Valid in: DATA step
Category: File-Handling
Type: Executable
Restriction: This statement is not valid in the CAS server.

Syntax

INPUT *variable* <$> *start-column* <- *end-column*>
<.*decimals*> <@ | @@>;

Arguments

variable
specifies a variable that is assigned input values.

$
indicates that the variable has character values rather than numeric values.

Tip If the variable is previously defined as character, $ is not required.

start-column
specifies the first column of the input record that contains the value to read.

–end-column
specifies the last column of the input record that contains the value to read.

Tip If the variable value occupies only one column, omit *end-column*.

Example Because *end-column* is omitted, the values for the character variable GENDER occupy only column 16:

```
input name $ 1-10 pulse 11-13 waist 14-15 gender $ 16;
```

.decimals
specifies the number of digits to the right of the decimal if the input value does not contain an explicit decimal point.

Tip An explicit decimal point in the input value overrides a decimal specification in the INPUT statement.

Example "Example 2: Read Input Data Using Decimals" on page 188

@
holds the input record for the execution of the next INPUT statement within the same iteration of the DATA step. This line-hold specifier is called *trailing* @.

Restriction The trailing @ must be the last item in the INPUT statement.

Tip The trailing @ prevents the next INPUT statement from automatically releasing the current input record and reading the next record into the input buffer. It is useful when you need to read from a record multiple times.

See "Pointer Controls" on page 177

@@
holds the input record for the execution of the next INPUT statement across iterations of the DATA step. This line-hold specifier is called *double trailing* @.

Restriction The double trailing @ must be the last item in the INPUT statement.

Tip The double trailing @ is useful when each input line contains values for several observations.

See "Using Line-Hold Specifiers" on page 178

Details

When to Use Column Input

With column input, the column numbers that contain the value follow a variable name in the INPUT statement. To read with column input, data values must be in

- the same columns in all the input data records
- standard numeric form or character form.

Useful features of column input are that

- Character values can contain embedded blanks.
- Character values can be from 1 to 32,767 characters long.
- Input values can be read in any order, regardless of their position in the record.
- Values or parts of values can be read multiple times. For example, this INPUT statement reads an ID value in columns 10 through 15 and then reads a GROUP value from column 13:

```
input id 10-15 group 13;
```

- Both leading and trailing blanks within the field are ignored. Therefore, if numeric values contain blanks that represent zeros or if you want to retain leading and trailing blanks in character values, read the value with an informat. See the "INPUT Statement, Formatted" on page 188.

Missing Values

Missing data do not require a place-holder. The INPUT statement interprets a blank field as missing and reads other values correctly. If a numeric or character field contains a single period, the variable value is set to missing.

Reading Data Lines

SAS always pads the data records that follow the DATALINES statement (in-stream data) to a fixed length in multiples of 80. The CARDIMAGE system option determines whether to read or to truncate data past the 80th column.

Reading Variable-Length Records

By default, SAS uses the FLOWOVER option to read varying-length data records. If the record contains fewer values than expected, the INPUT statement reads the values from the next data record. To read varying-length data, you might need to use the TRUNCOVER option in the INFILE statement. The TRUNCOVER option is more efficient than the PAD option, which pads the records to a fixed length. For more information, see "Reading Past the End of a Line" on page 156.

Examples

Example 1: Read Input Records with Column Input

This DATA step demonstrates how to read input data records with column input:

```
data scores;
   input name $ 1-18 score1 25-27 score2 30-32
      score3 35-37;
   datalines;
Joseph                  11   32   76
Mitchel                 13   29   82
Sue Ellen               14   27   74
;
```

Example 2: Read Input Data Using Decimals

This INPUT statement reads the input data for a numeric variable using two decimal places:

Input Data	Statement	Results
`----+---1`		
`2314`	`input number 1-5 .2;`	`23.14`
`2`		`.02`
`400`		`4.00`
`-140`		`-1.40`
`12.234`		`12.234` *
`12.2`		`12.2` *

* The decimal specification in the INPUT statement is overridden by the input data value.

See Also

Statements:

- “INPUT Statement” on page 169

INPUT Statement, Formatted

Reads input values with specified informats and assigns them to the corresponding SAS variables.

Valid in: DATA step

Category: File-Handling

Type: Executable

Restriction: This statement is not valid in the CAS server.

Syntax

INPUT <*pointer-control*> *variable informat.* <@ | @@>;

INPUT<*pointer-control*> (*variable-list*) (*informat-list*)
<@ | @@>;

INPUT <*pointer-control*> (*variable-list*) (<*n**> *informat.*)
<@ | @@>;

Arguments

pointer-control
moves the input pointer to a specified line or column in the input buffer.

See "Column Pointer Controls" on page 172 and "Line Pointer Controls" on page 174

variable
specifies a variable that is assigned input values.

Requirement The (*variable-list*) is followed by an (*informat-list*).

Example "Example 1: Formatted Input with Pointer Controls" on page 192

(*variable-list*)
specifies a list of variables that are assigned input values.

See "How to Group Variables and Informats" on page 191

Example "Example 2: Using Informat Lists" on page 192

informat.
specifies a SAS informat to use to read the variable values.

Tip Decimal points in the actual input values override decimal specifications in a numeric informat.

See SAS Informats in *SAS Viya Formats and Informats: Reference*

Example "Example 1: Formatted Input with Pointer Controls" on page 192

(*informat-list*)
specifies a list of informats to use to read the values for the preceding list of variables

In the INPUT statement, (*informat-list*) can include

informat.
specifies an informat to use to read the variable values.

pointer-control
specifies one of these pointer controls to use to position a value: @, #, /, or +.

n*
specifies to repeat *n* times the next informat in an informat list.

Example This statement uses the 7.2 informat to read GRADES1, GRADES2, and GRADES3 and the 5.2 informat to read GRADES4 and GRADES5:

```
input (grades1-grades5)(3*7.2, 2*5.2);
```

Restriction The (*informat-list*) must follow the (*variable-list*).

See "How to Group Variables and Informats" on page 191

Example "Example 2: Using Informat Lists" on page 192

@

holds an input record for the execution of the next INPUT statement within the same iteration of the DATA step. This line-hold specifier is called *trailing* @.

Restriction The trailing @ must be the last item in the INPUT statement.

Tip The trailing @ prevents the next INPUT statement from automatically releasing the current input record and reading the next record into the input buffer. It is useful when you need to read from a record multiple times.

See "Using Line-Hold Specifiers" on page 178

@@

holds an input record for the execution of the next INPUT statement across iterations of the DATA step. This line-hold specifier is called *double trailing* @.

Restriction The double trailing @ must be the last item in the INPUT statement.

Tip The double trailing @ is useful when each input line contains values for several observations.

See "Using Line-Hold Specifiers" on page 178

Details

When to Use Formatted Input

With formatted input, an informat follows a variable name and defines how SAS reads the values of this variable. An informat gives the data type and the field width of an input value. Informats also read data that are stored in nonstandard form, such as packed decimal, or numbers that contain special characters such as commas. See "Definition of Informats" in *SAS Viya Formats and Informats: Reference* for descriptions of SAS informats.

Simple formatted input requires that the variables be in the same order as their corresponding values in the input data. You can use pointer controls to read variables in any order. For more information, see the "INPUT Statement" on page 169.

Missing Values

Generally, SAS represents missing values in formatted input with a single period for a numeric value and with blanks for a character value. The informat that you use with formatted input determines how SAS interprets a blank. For example, $CHAR.*w* reads the blanks as part of the value, whereas BZ.*w* converts a blank to zero.

Reading Variable-Length Records

By default, SAS uses the FLOWOVER option to read varying-length data records. If the record contains fewer values than expected, the INPUT statement reads the values from the next data record. To read varying-length data. you might need to use the TRUNCOVER option in the INFILE statement. For more information, see "Reading Past the End of a Line" on page 156.

How to Group Variables and Informats

When the input values are arranged in a pattern, you can group the informat list. A grouped informat list consists of two lists:

- the names of the variables to read enclosed in parentheses
- the corresponding informats separated by either blanks or commas and enclosed in parentheses.

Informat lists can make an INPUT statement shorter because the informat list is recycled until all variables are read and the numbered variable names can be used in abbreviated form. Using informat lists avoids listing the individual variables.

For example, if the values for the five variables SCORE1 through SCORE5 are stored as four columns per value without intervening blanks, this INPUT statement reads the values:

```
input (score1-score5) (4. 4. 4. 4. 4.);
```

However, if you specify more variables than informats, the INPUT statement reuses the informat list to read the remaining variables. A shorter version of the previous statement is

```
input (score1-score5) (4.);
```

You can use as many informat lists as necessary in an INPUT statement, but do not nest the informat lists. After all the values in the variable list are read, the INPUT statement ignores any directions that remain in the informat list. For an example, see "Example 3: Including More Informat Specifications Than Necessary" on page 192.

The *n** modifier in an informat list specifies to repeat the next informat *n* times. Here is an example.

```
input (name score1-score5) ($10. 5*4.);
```

How to Store Informats

The informats that you specify in the INPUT statement are not stored with the SAS data set. Informats that you specify with the INFORMAT or ATTRIB statement are permanently stored. Therefore, you can read a data value with a permanently stored informat in a later DATA step without having to specify the informat or use PROC FSEDIT to enter data in the correct format.

Comparisons

When a variable is read with formatted input, the pointer movement is similar to the pointer movement of column input. The pointer moves the length that the informat specifies and stops at the next column. To read data with informats that are not aligned in columns, use *modified list input*. Using modified list input enables you to take advantage of the scanning feature in list input. See "When to Use List Input" on page 195.

Examples

Example 1: Formatted Input with Pointer Controls

This INPUT statement uses informats and pointer controls:

```
data sales;
   infile file-specification;
   input item $10. +5 jan comma5. +5 feb comma5.
      +5 mar comma5.;
run;
```

It can read these input data records:

```
----+----1----+----2----+----3----+----4
trucks         1,382     2,789     3,556
vans           1,265     2,543     3,987
sedans         2,391     3,011     3,658
```

The value for ITEM is read from the first 10 columns in a record. The pointer stops in column 11. The trailing blanks are discarded and the value of ITEM is written to the program data vector. Next, the pointer moves five columns to the right before the INPUT statement uses the COMMA5. informat to read the value of JAN. This informat uses five as the field width to read numeric values that contain a comma. Once again, the pointer moves five columns to the right before the INPUT statement uses the COMMA5. informat to read the values of FEB and MAR.

Example 2: Using Informat Lists

This INPUT statement uses the character informat $10. to read the values of the variable NAME and uses the numeric informat 4. to read the values of the five variables SCORE1 through SCORE5:

```
data scores;
   input (name score1-score5) ($10. 5*4.);
   datalines;
Whittaker 121 114 137 156 142
Smythe    111 97  122 143 127
;
```

Example 3: Including More Informat Specifications Than Necessary

This informat list includes more specifications than are necessary when the INPUT statement executes:

```
data test;
   input (x y z) (2.,+1);
   datalines;
2 24 36
0 20 30
   ;
```

The INPUT statement reads the value of X with the 2. informat. Then, the +1 column pointer control moves the pointer forward one column. Next, the value of Y is read with the 2. informat. Again, the +1 column pointer moves the pointer forward one column. Then, the value of Z is read with the 2. informat. For the third iteration, the INPUT statement ignores the +1 pointer control.

See Also

Statements:

- "INPUT Statement" on page 169
- "INPUT Statement, List" on page 193

INPUT Statement, List

Scans the input data record for input values and assigns them to the corresponding SAS variables.

Valid in: DATA step

Category: File-Handling

Type: Executable

Restriction: This statement is not valid in the CAS server.

Syntax

INPUT <*pointer-control*> *variable* <$> <&> <@ | @@>;

INPUT <*pointer-control*> *variable* <: | & | ~>
<*informat.*> <@ | @@>;

Arguments

pointer-control
moves the input pointer to a specified line or column in the input buffer.

See "Column Pointer Controls" on page 172 and "Line Pointer Controls" on page 174

Example "Example 2: Reading Character Data That Contains Embedded Blanks" on page 197

variable
specifies a variable that is assigned input values.

$
indicates to store a variable value as a character value rather than as a numeric value.

Tip If the variable is previously defined as character, $ is not required.

Example "Example 1: Reading Unaligned Data with Simple List Input" on page 197

&
indicates that a character value can have one or more single embedded blanks. This format modifier reads the value from the next non-blank column until the pointer reaches two consecutive blanks, the defined length of the variable, or the end of the input line, whichever comes first.

Restriction The & modifier must follow the variable name and $ sign that it affects.

Tip If you specify an informat after the & modifier, the terminating condition for the format modifier remains two blanks.

See “Modified List Input ” on page 196

Example “Example 2: Reading Character Data That Contains Embedded Blanks” on page 197

:

enables you to specify an informat that the INPUT statement uses to read the variable value. For a character variable, this format modifier reads the value from the next non-blank column until the pointer reaches the next blank column, the defined length of the variable, or the end of the data line, whichever comes first. For a numeric variable, this format modifier reads the value from the next non-blank column until the pointer reaches the next blank column or the end of the data line, whichever comes first.

Tips If the length of the variable has not been previously defined, then its value is read and stored with the informat length.

The pointer continues to read until the next blank column is reached. However, if the field is longer than the formatted length, then the value is truncated to the length of variable.

See “Modified List Input ” on page 196

Examples “Example 3: Reading Unaligned Data with Informats” on page 198

“Example 5: Reading Delimited Data with Modified List Input” on page 199

~

indicates to treat single quotation marks, double quotation marks, and delimiters in character values in a special way. This format modifier reads delimiters within quoted character values as characters instead of as delimiters and retains the quotation marks when the value is written to a variable.

Restriction You must use the DSD option in an INFILE statement. Otherwise, the INPUT statement ignores this option.

See “Modified List Input ” on page 196

Example “Example 5: Reading Delimited Data with Modified List Input” on page 199

informat.

specifies an informat to use to read the variable values.

Tip Decimal points in the actual input values always override decimal specifications in a numeric informat.

See SAS Informats in *SAS Viya Formats and Informats: Reference*

Examples “Example 3: Reading Unaligned Data with Informats” on page 198

“Example 5: Reading Delimited Data with Modified List Input” on page 199

@

holds an input record for the execution of the next INPUT statement within the same iteration of the DATA step. This line-hold specifier is called *trailing* @.

Restriction The trailing @ must be the last item in the INPUT statement.

Tip The trailing @ prevents the next INPUT statement from automatically releasing the current input record and reading the next record into the input buffer. It is useful when you need to read from a record multiple times.

See "Using Line-Hold Specifiers" on page 178

@@

holds an input record for the execution of the next INPUT statement across iterations of the DATA step. This line-hold specifier is called *double trailing* @.

Restriction The double trailing @ must be the last item in the INPUT statement.

Tip The double trailing @ is useful when each input line contains values for several observations.

See "Using Line-Hold Specifiers" on page 178

Details

When to Use List Input

List input requires that you specify the variable names in the INPUT statement in the same order that the fields appear in the input data records. SAS scans the data line to locate the next value but ignores additional intervening blanks. List input does not require that the data are located in specific columns. However, you must separate each value from the next by at least one blank unless the delimiter between values is changed. By default, the delimiter for data values is one blank space or the end of the input record. List input does not skip over any data values to read subsequent values, but it can ignore all values after a given point in the data record. However, pointer controls enable you to change the order that the data values are read.

There are two types of list input:

- simple list input
- modified list input.

Modified list input makes the INPUT statement more versatile because you can use a format modifier to overcome several of the restrictions of simple list input. See "Modified List Input " on page 196.

Simple List Input

Simple list input places several restrictions on the type of data that the INPUT statement can read:

- By default, at least one blank must separate the input values. Use the DLM= or DLMSTR= option or the DSD option in the INFILE statement to specify a delimiter other than a blank.
- Represent each missing value with a period, not a blank, or two adjacent delimiters.
- Character input values cannot be longer than 8 bytes unless the variable is given a longer length in an earlier LENGTH, ATTRIB, or INFORMAT statement.

- Character values cannot contain embedded blanks unless you change the delimiter.
- Data must be in standard numeric or character format.

Modified List Input

List input is more versatile when you use format modifiers. The format modifiers are as follows:

Format Modifier	Purpose
&	reads character values that contain embedded blanks.
:	reads data values that need the additional instructions that informats can provide but that are not aligned in columns.*
~	reads delimiters within quoted character values as characters and retains the quotation marks.

* Use formatted input and pointer controls to quickly read data values that are aligned in columns.

For example, use the : modifier with an informat to read character values that are longer than 8 bytes or numeric values that contain nonstandard values.

Because list input interprets a blank as a delimiter, use modified list input to read values that contain blanks. The & modifier reads character values that contain single embedded blanks. However, the data values must be separated by two or more blanks. To read values that contain leading, trailing, or embedded blanks with list input, use the DLM= or DLMSTR= option in the INFILE statement to specify another character as the delimiter. See "Example 5: Reading Delimited Data with Modified List Input" on page 199. If your input data use blanks as delimiters and they contain leading, trailing, or embedded blanks, you might need to use either column input or formatted input. If quotation marks surround the delimited values, you can use list input with the DSD option in the INFILE statement.

Comparisons

How Modified List Input and Formatted Input Differ

Modified list input has a scanning feature that can use informats to read data which are not aligned in columns. *Formatted input* causes the pointer to move like that of column input to read a variable value. The pointer moves the length that is specified in the informat and stops at the next column.

This DATA step uses modified list input to read the first data value and formatted input to read the second:

```
data jansales;
   input item : $10. amount comma5.;
datalines;
trucks 1,382
vans 1,235
sedans 2,391
;
```

The value of ITEM is read with modified list input. The INPUT statement stops reading when the pointer finds a blank space. The pointer then moves to the second column after the end of the field, which is the correct position to read the AMOUNT value with formatted input.

Formatted input, on the other hand, continues to read the entire width of the field. This INPUT statement uses formatted input to read both data values:

```
input item $10. +1 amount comma5.;
```

To read this data correctly with formatted input, the second data value must occur after the 10th column of the first value, as shown here:

```
----+----1----+----2
trucks    1,382
vans      1,235
sedans    2,391
```

Also, after the value of ITEM is read with formatted input, you must use the pointer control +1 to move the pointer to the column where the value AMOUNT begins.

When Data Contains Quotation Marks

When you use the DSD option in an INFILE statement, which sets the delimiter to a comma, the INPUT statement removes quotation marks before a value is written to a variable. When you also use the tilde (~) modifier in an INPUT statement, the INPUT statement maintains quotation marks as part of the value.

Examples

Example 1: Reading Unaligned Data with Simple List Input

The INPUT statement in this DATA step uses simple list input to read the input data records:

```
data scores;
   input name $ score1 score2 score3 team $;
   datalines;
Joe 11 32 76 red
Mitchel 13 29 82 blue
Susan 14 27 74 green
;
```

The next INPUT statement reads only the first four fields in the previous data lines, which demonstrates that you are not required to read all the fields in the record:

```
input name $ score1 score2 score3;
```

Example 2: Reading Character Data That Contains Embedded Blanks

The INPUT statement in this DATA step uses the & format modifier with list input to read character values that contain embedded blanks.

```
   data list;
      infile file-specification;
      input name $ & score;
   run;
```

It can read these input data records:

```
----+----1----+----2----+----3----+
Joseph   11 Joergensen  red
Mitchel  13 Mc Allister  blue
Su Ellen  14 Fischer-Simon  green
```

The & modifier follows the variable that it affects in the INPUT statement. Because this format modifier follows NAME, at least two blanks must separate the NAME field from the SCORE field in the input data records.

You can also specify an informat with a format modifier, as shown here:

```
input name $ & +3 lastname & $15. team $;
```

In addition, this INPUT statement reads the same data to demonstrate that you are not required to read all the values in an input record. The +3 column pointer control moves the pointer past the score value in order to read the value for LASTNAME and TEAM.

Example 3: Reading Unaligned Data with Informats

This DATA step uses modified list input to read data values with an informat:

```
data jansales;
   input item : $10. amount;
   datalines;
trucks 1382
vans 1235
sedans 2391
;
```

The $10. informat allows a character variable of up to ten characters to be read.

Example 4: Reading Comma-Delimited Data with List Input and an Informat

This DATA step uses the DELIMITER= option in the INFILE statement to read list input values that are separated by commas instead of blanks. The example uses an informat to read the date, and a format to write the date.

```
data scores2;
   length Team $ 14;
   infile datalines delimiter=',';
   input Name $ Score1-Score3 Team $ Final_Date:MMDDYY10.;
   format final_date weekdate17.;
   datalines;
Joe,11,32,76,Red Racers,2/3/2007
Mitchell,13,29,82,Blue Bunnies,4/5/2007
Susan,14,27,74,Green Gazelles,11/13/2007
;
proc print data=scores2;
   var Name Team Score1-Score3 Final_Date;
   title 'Soccer Player Scores';
run;
```

Output 2.13 *Output from Comma-Delimited Data*

Soccer Player Scores

Obs	Name	Team	Score1	Score2	Score3	Final_Date
1	Joe	Red Racers	11	32	76	Sat, Feb 3, 2007
2	Mitchell	Blue Bunnies	13	29	82	Thu, Apr 5, 2007
3	Susan	Green Gazelles	14	27	74	Tue, Nov 13, 2007

Example 5: Reading Delimited Data with Modified List Input

This DATA step uses the DSD option in an INFILE statement and the tilde (~) format modifier in an INPUT statement to retain the quotation marks in character data and to read a character in a string that is enclosed in quotation marks as a character instead of as a delimiter.

```
data scores;
   infile datalines dsd;
   input Name : $9. Score1-Score3
         Team ~ $25. Div $;
   datalines;
Joseph,11,32,76,"Red Racers, Washington",AAA
Mitchel,13,29,82,"Blue Bunnies, Richmond",AAA
Sue Ellen,14,27,74,"Green Gazelles, Atlanta",AA
;

proc print; run;
```

The output that PROC PRINT generates shows the resulting SCORES data set. The values for TEAM contain the quotation marks.

Output 2.14 *SCORES Data Set*

Obs	Name	Score1	Score2	Score3	Team	Div
1	Joseph	11	32	76	"Red Racers, Washington"	AAA
2	Mitchel	13	29	82	"Blue Bunnies, Richmond"	AAA
3	Sue Ellen	14	27	74	"Green Gazelles, Atlanta"	AA

See Also

Statements:

- “INFILE Statement” on page 138
- “INPUT Statement” on page 169
- “INPUT Statement, Formatted” on page 188

INPUT Statement, Named

Reads data values that appear after a variable name that is followed by an equal sign and assigns them to corresponding SAS variables.

Valid in: DATA step

Category: File-Handling

Type: Executable

Restriction: This statement is not valid in the CAS server.

Syntax

INPUT <*pointer-control*> *variable*= <$> <@ | @@>;

INPUT <*pointer-control*> *variable*= *informat.* <@ | @@>;

INPUT *variable*= <$> *start-column* <-*end-column*> <.*decimals*> <@ | @@>;

Arguments

pointer-control
moves the input pointer to a specified line or column in the input buffer.

See "Column Pointer Controls" on page 172 and "Line Pointer Controls" on page 174

variable=
specifies a variable whose value is read by the INPUT statement. In the input data record, the field has the form

```
variable=value
```

Example "Example 3: Using Named Input with Another Input Style" on page 202

$
indicates to store a variable value as a character value rather than as a numeric value.

Tip If the variable is previously defined as character, $ is not required.

Example "Example 3: Using Named Input with Another Input Style" on page 202

informat.
specifies an informat that indicates the data type of the input values, but not how the values are read.

Tip Use the INFORMAT statement to associate an informat with a variable.

See SAS Informats in *SAS Viya Formats and Informats: Reference*

Example "Example 3: Using Named Input with Another Input Style" on page 202

start-column
specifies the column that the INPUT statement uses to begin scanning in the input data records for the variable. The variable name does not have to begin here.

-end-column
determines the default length of the variable.

.decimals
specifies the number of digits to the right of the decimal if the input value does not contain an explicit decimal point.

Tip An explicit decimal point in the input value overrides a decimal specification in the INPUT statement.

@
holds an input record for the execution of the next INPUT statement within the same iteration of the DATA step. This line-hold specifier is called *trailing* @.

Restriction	The trailing @ must be the last item in the INPUT statement.
Tip	The trailing @ prevents the next INPUT statement from automatically releasing the current input record and reading the next record into the input buffer. It is useful when you need to read from a record multiple times.
See	"Using Line-Hold Specifiers" on page 178

@@
holds an input record for the execution of the next INPUT statement across iterations of the DATA step. This line-hold specifier is called *double trailing @*.

Restriction	The double trailing @ must be the last item in the INPUT statement.
Tip	The double trailing @ is useful when each input line contains values for several observations.
See	"Using Line-Hold Specifiers" on page 178

Details

When to Use Named Input

Named input reads the input data records that contain a variable name followed by an equal sign and a value for the variable. The INPUT statement reads the input data record at the current location of the input pointer. If the input data records contain data values at the start of the record that the INPUT statement cannot read with named input, use another input style to read them. However, after the INPUT statement starts to read named input, SAS expects that all the remaining values are in this form. See "Example 3: Using Named Input with Another Input Style" on page 202.

You do not have to specify the variables in the INPUT statement in the same order that they occur in the data records. Also, you do not have to specify a variable for each field in the record. However, if you do not specify a variable in the INPUT statement that another statement uses (for example, ATTRIB, FORMAT, INFORMAT, LENGTH statement) and it occurs in the input data record, the INPUT statement automatically reads the value. SAS writes a note to the log that the variable is uninitialized.

When you do not specify a variable for all the named input data values, SAS sets _ERROR_ to 1 and writes a note to the log. Here is an example.

```
data list;
   input name=$ age=;
   datalines;
name=John age=34  gender=M
;
```

The note that SAS writes to the log states that GENDER is not defined and _ERROR_ is set to 1.

Restrictions

- After you start to read with named input, you cannot switch to another input style or use pointer controls. All the remaining values in the input data record must be in the form *variable=value*. SAS treats the values that are not in named input form as invalid data.

- If named input values continue after the end of the current input line, use a slash (/) at the end of the input line. The slash tells SAS to move the pointer to the next line and to continue to read with named input. For example, this INPUT statement can read this input data record:

```
input name=$ age=;

name=John /
   age=34
```

- If you use named input to read character values that contain embedded blanks, put two blanks before and after the data value, as you would with list input. See "Example 4: Reading Character Variables with Embedded Blanks" on page 203.
- You cannot reference an array with an asterisk or an expression subscript.

Examples

Example 1: Using List and Named Input

This DATA step uses list input with named input to read input data records.

```
data list;
   length name $ 20 gender $ 1;
   informat dob ddmmyy8.;
   input id name= gender= age= dob=;
   datalines;
4798 name=COLIN gender=m age=23 dob=16/02/75
2653 name=MICHELE gender=f age=46 dob=17/02/73
;
proc print data=list; run;
```

The INPUT statement uses list input to read the ID variable. The remaining variables NAME, GENDER, AGE, and DOB are read with named input. The LENGTH statement prevents the INPUT statement from truncating the character values for the variable name to a length of eight.

Example 2: Using Named Input with Variables in Random Order

Using the same data as in the previous example, this DATA step also uses list input and named input to read input data records. However, in this example, the order of the values in the data is different for the two rows, except for the ID value, which must come first.

```
data list;
   length name $ 20 gender $ 1;
   informat dob ddmmyy8.;
   input id dob= name= age= gender=;
   datalines;
4798 gender=m name=COLIN age=23 dob=16/02/75
2653 name=MICHELE dob=17/02/73 age=46 gender=f
;
proc print data=list; run;
```

Example 3: Using Named Input with Another Input Style

This DATA step uses list input and named input to read input data records:

```
data list;
   input id name=$20. gender=$;
   informat dob ddmmyy8.;
```

```
   datalines;
4798  gender=m name=COLIN age=23 dob=16/02/75
2653 name=MICHELE age=46 gender=f
;
proc print data=list; run;
```

The INPUT statement uses list input to read the first variable, ID. The remaining variables NAME, GENDER, and DOB are read with named input. These variables are not read in order. The $20. informat with NAME= prevents the INPUT statement from truncating the character value to a length of eight. The INPUT statement reads the DOB= field because the INFORMAT statement refers to this variable. It skips the AGE= field altogether. SAS writes notes to the log that DOB is uninitialized, AGE is not defined, and _ERROR_ is set to 1.

Example 4: Reading Character Variables with Embedded Blanks

This DATA step reads character variables that contain embedded blanks with named input:

```
data list2;
   informat header $30. name $15.;
   input header= name=;
   datalines;
header=  age=60 AND UP  name=PHILIP
;
```

Two spaces precede and follow the value of the variable HEADER, which is **`AGE=60 AND UP`**. The field also contains an equal sign.

See Also

Statements:

- "INPUT Statement" on page 169

KEEP Statement

Specifies the variables to include in output SAS data sets.

Valid in: DATA step

Categories: CAS
Information

Type: Declarative

Syntax

KEEP *variable-list*;

Arguments

variable-list
specifies the names of the variables to write to the output data set.

Tip List the variables in any form that SAS allows.

Details

The KEEP statement causes a DATA step to write only the variables that you specify to one or more SAS data sets. The KEEP statement applies to all SAS data sets that are created within the same DATA step and can appear anywhere in the step. If no KEEP or DROP statement appears, all data sets that are created in the DATA step contain all variables.

Note: Do not use both the KEEP and DROP statements within the same DATA step.

Comparisons

- The KEEP *statement* cannot be used in SAS PROC steps. The KEEP= *data set option* can.
- The KEEP *statement* applies to all output data sets that are named in the DATA statement. To write different variables to different data sets, you must use the KEEP= *data set option*.
- The DROP statement is a parallel statement that specifies variables to omit from the output data set.
- The KEEP and DROP statements select variables to include in or exclude from output data sets. The subsetting IF statement selects observations.
- Do not confuse the KEEP statement with the RETAIN statement. The RETAIN statement causes SAS to hold the value of a variable from one iteration of the DATA step to the next iteration. The KEEP statement does not affect the value of variables but specifies only which variables to include in any output data sets.

Examples

Example 1: KEEP Statement Basic Usage

These examples show the correct syntax for listing variables in the KEEP statement:

```
keep name address city state zip phone;

keep rep1-rep5;
```

Example 2: Keeping Variables in the Data Set

This example uses the KEEP statement to include only the variables NAME and AVG in the output data set. The variables SCORE1 through SCORE20, from which AVG is calculated, are not written to the data set AVERAGE.

```
data average;
   keep name avg;
   infile file-specification;
   input name $ score1-score20;
   avg=mean(of score1-score20);
run;
```

See Also

Data Set Options:

- "KEEP= Data Set Option" in *SAS Viya Data Set Options: Reference*

Statements:

- "DROP Statement" on page 67
- "IF Statement, Subsetting" on page 127
- "RETAIN Statement" on page 346

LABEL Statement

Assigns descriptive labels to variables.

Valid in: DATA step

Categories: CAS
Information

Type: Declarative

Syntax

LABEL *variable-1*=*label-1*…<*variable-n*=*label-n*>;

LABEL *variable-1*=' ' …<*variable-n*=' '>;

Arguments

variable
specifies the variable that you want to label.

Tip You can specify additional pairs of labels and variables.

label
specifies a label of up to 256 characters, including blank spaces.

Restrictions If the label includes a semicolon (;) or an equal sign (=), you must enclose the label in either single or double quotation marks.

If the label includes single quotation marks ('), then you must enclose the label in double quotation marks.

There is partial support for variable name substitution with the ActiveX and Java devices. When the label text for the variable exceeds the space allowed, the variable name is used instead by procedures that are labeling an axis or a legend title. With the exception of the SAS/GRAPH GPLOT procedure, the variable name is not used when ActiveX or Java devices are specified.

Note The LABEL statement expects an equal sign (=) after the first variable. An error occurs if any other character is found. The LABEL statement considers everything after the equal sign following the first variable as part of the label until it comes to another variable followed by an equal sign, regardless of quotation marks. In this example, the label for x is **`this is x y 4 =this is y`** because the next variable followed by an equal sign is z.

```
data test1;
   x=1;
   y=1;
```

```
   z=1;
   label x="this is x" y 4 ="this is y" z="This is z";
run;
```

The x variable would have the same label if the LABEL statement were

```
label x=this is x  y 4 = this is y  z=This is z;
```

Tip You can specify additional pairs of labels and variables.

''

removes a label from a variable. Enclose a single blank space in quotation marks to remove an existing label.

Details

Using a LABEL statement in a DATA step permanently associates labels with variables by affecting the descriptor information of the SAS data set that contains the variables. You can associate any number of variables with labels in a single LABEL statement.

You can use a LABEL statement in a PROC step, but the rules are different. See the *SAS Viya Data Management and Utility Procedures Guide* for more information.

Comparisons

Both the ATTRIB and LABEL statements can associate labels with variables and change a label that is associated with a variable.

Examples

Example 1: Specifying Labels

Here are several LABEL statements:

- `label compound=Type of Drug;`
- `label date="Today's Date";`
- `label n='Mark''s Experiment Number';`
- ```
  label score1="Grade on April 1 Test"
        score2="Grade on May 1 Test";
  ```

Example 2: Removing a Label

This example removes an existing label:

```
data rtest;
   set rtest;
   label x=' ';
run;
```

See Also

Statements:

- “ATTRIB Statement” on page 27
```

label: Statement

Identifies a statement that is referred to by another statement.

Valid in: DATA step

Categories: CAS
Control

Type: Declarative

Syntax

label: *statement*;

Arguments

label
specifies any SAS name, which is followed by a colon (:). You must specify the *label* argument.

statement
specifies any executable statement, including a null statement (;). You must specify the *statement* argument.

Restrictions No two statements in a DATA step can have the same label.

If a statement in a DATA step is labeled, it should be referenced by a statement or option in the same step.

Tip A null statement can have a label:

```
ABC:;
```

Details

The statement label identifies the destination of either a GO TO statement, a LINK statement, the HEADER= option in a FILE statement, or the EOF= option in an INFILE statement.

Comparisons

The LABEL statement assigns a descriptive label to a variable. A statement label identifies a statement or group of statements that are referred to in the same DATA step by another statement, such as a GO TO statement.

Example: Jumping to Another Statement

In this example, if Stock=0, the GO TO statement causes SAS to jump to the statement that is labeled reorder. When Stock is not 0, execution continues to the RETURN statement and then returns to the beginning of the DATA step for the next observation.

```
data Inventory Order;
   input Item $ Stock @;
      /* go to label reorder: */
```

```
   if Stock=0 then go to reorder;
   output Inventory;
   return;
      /* destination of GO TO statement */
   reorder: input Supplier $;
   put 'ORDER ITEM ' Item 'FROM ' Supplier;
   output Order;
   datalines;
milk  0 A
bread 3 B
;
```

See Also

Statements:

- "GO TO Statement" on page 125
- "LINK Statement" on page 255

Statement Options:

- "EOF=*label*" on page 143 in the INFILE statement
- "HEADER=*label*" on page 80 option in the FILE statement

LEAVE Statement

Stops processing the current loop and resumes with the next statement in the sequence.

Valid in: DATA step

Categories: CAS
Control

Type: Executable

Syntax

LEAVE;

Without Arguments

The LEAVE statement stops the processing of the current DO loop or SELECT group and continues DATA step processing with the next statement following the DO loop or SELECT group.

Details

You can use the LEAVE statement to exit a DO loop or SELECT group prematurely based on a condition.

Comparisons

- The LEAVE statement causes processing of the current loop to end. The CONTINUE statement stops the processing of the current iteration of a loop and resumes with the next iteration.
- You can use the LEAVE statement in a DO loop or in a SELECT group. You can use the CONTINUE statement only in a DO loop.

Example: Stop Processing a DO Loop under a Given Condition

This DATA step demonstrates using the LEAVE statement to stop the processing of a DO loop under a given condition. In this example, the IF/THEN statement checks the value of BONUS. When the value of BONUS reaches 500, the maximum amount allowed, the LEAVE statement stops the processing of the DO loop.

```
data week;
   input name $ idno start_yr status $ dept $;
   bonus=0;
   do year= start_yr to 1991;
      if bonus ge 500 then leave;
      bonus+50;
   end;
   datalines;
Jones 9011 1990 PT PUB
Thomas 876 1976 PT HR
Barnes 7899 1991 FT TECH
Harrell 1250 1975 FT HR
Richards 1002 1990 FT DEV
Kelly 85 1981 PT PUB
Stone 091 1990 PT MAIT
;
```

See Also

Statements:

- “DO Statement” on page 59
- “SELECT Statement” on page 359

LENGTH Statement

Specifies the number of bytes for storing variables.

Valid in: DATA step

Categories: CAS
Information

Type: Declarative

CAUTION: **Avoid shortening numeric variables that contain fractions.** The precision of a numeric variable is closely tied to its length, especially when the variable contains fractional values. You can safely shorten variables that contain integers according to the

rules that are given in the SAS documentation for your operating environment, but shortening variables that contain fractions might eliminate important precision.

Syntax

LENGTH *variable-specification(s)* <DEFAULT=*n*>;

Arguments

variable-specification
is a required argument and has this form:

variable(s)<$>*length* | <VARCHAR(*length* | *)>

variable
specifies one or more variables that are to be assigned a length, including any variables in the DATA step. Variables that are dropped from the output data set are also included.

Restriction Array references are not allowed.

Tip If the variable is character, the length applies to the program data vector and the output data set. If the variable is numeric, the length applies only to the output data set.

$
specifies that the preceding variables are character variables of type CHAR.

Default SAS assumes that the variables are numeric.

VARCHAR
specifies that the preceding variables are character variables of type VARCHAR.

length
specifies a numeric constant that is the number of bytes used for storing variable values.

Range 1 to 32767 for CHAR variables. 1 to 1 – ((2**31 – 1) / 4) for VARCHAR variables. Can range from 3 to 8 for numeric variables. The minimum length that you can specify for a numeric variable depends on the floating-point format used by your system. Because most systems use the IEEE floating-point format, the minimum is 3 bytes.

Restriction When assigning a character constant to a VARCHAR variable, the character constant is limited to 32767 bytes.

*****
means to use the maximum length allowed, which is currently 2**31–1.

DEFAULT=*n*
changes the default number of bytes that SAS uses to store the values of any newly created numeric variables.

Default 8

Range 3 to 8

Details

General

In general, the length of a variable depends on the following information:

- whether the variable is numeric or character
- how the variable was created
- whether a LENGTH or ATTRIB statement is present.

Subject to the rules for assigning lengths and with the exception of a VARCHAR variable, lengths that are assigned with the LENGTH statement can be changed in the ATTRIB statement and vice versa. For information about assigning lengths to variables, see the following topics:

- "SAS Cloud Analytic Services Data Types" in *SAS Cloud Analytic Services: Language Reference*
- "Create a VARCHAR Variable Using the LENGTH Statement" in *SAS Cloud Analytic Services: Accessing and Manipulating Data*
- "VARCHAR Data Type in String Functions" in *SAS Viya National Language Support: Reference Guide*

Comparisons

The ATTRIB statement can assign the length as well as other attributes of variables.

Example

This example uses a LENGTH statement to set the length of the character variable NAME to 25 bytes. The LENGTH statement also changes the default number of bytes that SAS uses to store the values of newly created numeric variables from 8 to 4 bytes. The TRIM function removes trailing blanks from LASTNAME before it is concatenated with these items:

- a comma (,)
- a blank space
- the value of FIRSTNAME

If you omit the LENGTH statement, SAS sets the length of NAME to 32 bytes.

```
data testlength;
   informat FirstName LastName $15. n1 6.2;
   input firstname lastname n1 n2;
   length name $25 default=4;
   name=trim(lastname)||', '||firstname;
   datalines;
Alexander Robinson 35 11
;
proc contents data=testlength;
run;
proc print data=testlength;
run;
```

The following output shows a partial listing from PROC CONTENTS, as well as the report that PROC PRINT generates.

Output 2.15 *Partial PROC CONTENTS for TESTLENGTH*

Alphabetic List of Variables and Attributes				
#	Variable	Type	Len	Informat
1	FirstName	Char	15	$15.
2	LastName	Char	15	$15.
3	n1	Num	4	6.2
4	n2	Num	4	
5	name	Char	25	

Output 2.16 *Setting the Length of a Variable*

Obs	FirstName	LastName	n1	n2	name
1	Alexander	Robinson	0.35000	11	Robinson, Alexander

See Also

- For information about the use of the LENGTH statement in PROC steps, see the *SAS Viya Data Management and Utility Procedures Guide*.
- "Data Representation" in *Batch and Line Mode Processing in SAS Viya*

Statements:

- "ATTRIB Statement" on page 27

LIBNAME Statement

Associates or disassociates a SAS library with a libref (a shortcut name), clears one or all librefs, lists the characteristics of a SAS library, concatenates SAS libraries, or concatenates SAS catalogs.

Valid in: Anywhere

Category: Data Access

Restrictions: This statement is not valid in the CAS server.

When SAS is in a locked-down state in Linux, the LIBNAME statement is not available for files that are not in the lockdown path list.

Syntax

Form 1: **LIBNAME** *libref* <*engine*> '*SAS-library*' < *options* > <*engine/host-options*>;

Form 2: **LIBNAME** *libref* CLEAR | _ALL_ CLEAR ;

Form 3: **LIBNAME** *libref* LIST | _ALL_ LIST;

Form 4: **LIBNAME** *libref* <*engine*> (*library-specification-1* <…*library-specification-n*>) <*options*>;

Arguments

libref
is a shortcut name or a "nickname" for the aggregate storage location where your SAS files are stored. It is any SAS name when you are assigning a new libref. When you are disassociating a libref from a SAS library or when you are listing attributes, specify a libref that was previously assigned.

Range 1 to 8 bytes

Tip The association between a libref and a SAS library lasts only for the duration of the SAS session or until you change it or discontinue it with another LIBNAME statement.

'SAS-library'
must be the physical name for the SAS library. The physical name is the name that is recognized by the operating environment. Enclose the physical name in single or double quotation marks.

library-specification
is two or more SAS libraries that are specified by physical names, previously assigned librefs, or a combination of names or librefs that you want to access with one libref. Use this form of the LIBNAME statement when you want to concatenate libraries. Separate each specification with either a blank or a comma and enclose the entire list in parentheses.

'SAS-library'
is the physical name of a SAS library, enclosed in quotation marks.

The *SAS-library* differs based on the engine that you specify and based on your current working directory. Table 2.7 on page 224 describes what each engine expects for this argument. Specify the Linux directory pathname. You cannot create directories with the LIBNAME statement. The directory that you specify must already exist, and you must have permissions to it. Remember that Linux pathnames are case sensitive.

libref
is the name of a previously assigned libref. Do not enclose librefs in quotation marks.

Restriction When concatenating libraries, you cannot specify options that are specific to an engine or an operating environment.

See "Rules for Library Concatenation" on page 226

Example "Example 2: Logically Concatenating SAS Libraries" on page 227

engine
is an engine name.

Tip Usually, SAS automatically determines the appropriate engine to use for accessing the files in the library. If you want to create a new library with an engine other than the default engine, then you can override the automatic selection.

options
are LIBNAME statement options. For information about these options, see "LIBNAME Options" on page 214.

engine/host-options
can be any of the options described in "Linux Options" on page 220.

CLEAR
clears the specified libref, or, if you specify _ALL_, clears all librefs that are currently defined. Sashelp and Work remain assigned.

Note: When you clear a libref defined by an environment variable in Linux, the variable remains defined, but it is no longer considered a libref. You can still reuse it, either as a libref or a fileref.

SAS automatically clears the association between librefs and their respective libraries at the end of your job or session. If you want to associate an existing libref with a different SAS library during the current session, you do not have to end the session or clear the libref. SAS automatically reassigns the libref when you issue a LIBNAME statement for the new SAS library.

ALL
specifies that the CLEAR or LIST argument applies to all currently assigned librefs.

LIST
writes the attributes of one or more SAS libraries to the SAS log.

Tip Specify *libref* to list the attributes of a single SAS library. Specify _ALL_ to list the attributes of all SAS libraries that have librefs in your current session.

LIBNAME Options

ACCESS=READONLY|TEMP

READONLY
assigns a read-only attribute to an entire SAS library. SAS does not allow you to open a data set in the library in order to update information or write new information.

TEMP
specifies that the SAS library be treated as a scratch library. By not consuming CPU cycles, the system ensures that the files in a Temp library do not become corrupted.

Tip Use ACCESS=TEMP to save resources only when the data is recoverable.

COMPRESS=NO | YES | CHAR | BINARY
controls the compression of observations in output SAS data sets for a SAS library.

NO
specifies that the observations in a newly created SAS data set be uncompressed (fixed-length records).

YES | CHAR
specifies that the observations in a newly created SAS data set be compressed (variable-length records) by SAS using RLE (Run Length Encoding). RLE compresses observations by reducing repeated consecutive characters (including blanks) to two-byte or three-byte representations.

Tip Use this compression algorithm for character data.

BINARY
specifies that the observations in a newly created SAS data set be compressed (variable-length records) by SAS using RDC (Ross Data Compression). RDC combines run-length encoding and sliding-window compression to compress the file.

Tip This method is highly effective for compressing medium to large (several hundred bytes or larger) blocks of binary data (numeric variables). Because the compression function operates on a single record at a time, the record length needs to be several hundred bytes or larger for effective compression.

CVPBYTES=*bytes*
specifies the number of bytes by which to expand character variable lengths when processing a SAS data file that requires transcoding. The CVP engine expands the lengths so that character data truncation does not occur. The lengths for character variables are increased by adding the specified value to the current length. You can specify a value from 0 to 32766.

For example, the following LIBNAME statement implicitly assigns the CVP engine by specifying the CVPBYTES= option.

```
libname expand 'SAS data-library' cvpbytes=5;
```

Character variable lengths are increased by adding 5 bytes. A character variable with a length of 10 is increased to 15, and a character variable with a length of 100 is increased to 105.

Default If you specify CVPBYTES=, SAS automatically uses the CVP engine in order to expand the character variable lengths according to your specification. If you explicitly assign the CVP engine but do not specify either CVPBYTES= or CVPMULTIPLIER=, then SAS uses CVPMULTIPLIER=1.5 to increase the lengths of the character variables.

Restrictions The CVP engine supports SAS data files, no SAS views, catalogs, item stores, and so on.

The CVP engine is available for input (read) processing only.

For library concatenation with mixed engines that include the CVP engine, only SAS data files are processed. For example, if you execute the COPY procedure, only SAS data files are copied.

Requirement The number of bytes that you specify must be large enough to accommodate any expansion. Otherwise, truncation occurs, which results in an error message in the SAS log.

Interaction You cannot specify both CVPBYTES= and CVPMULTIPLIER=. Specify one of these options.

See "Avoiding Character Data Truncation By Using the CVP Engine" in *SAS Viya National Language Support: Reference Guide*

CVPENGINE=*engine*
specifies the engine to use in order to process a SAS data file that requires transcoding. The CVP engine expands the character variable lengths to transcoding so that character data truncation does not occur. Then the specified engine does the actual file processing.

Alias CVPENG

Default SAS uses the default SAS engine.

See "Avoiding Character Data Truncation By Using the CVP Engine" in *SAS Viya National Language Support: Reference Guide*

CVPMULTIPLIER=*multiplier*
specifies a multiplier value in order to expand character variable lengths when you are processing a SAS data file that requires transcoding. The CVP engine expands the lengths so that character data truncation does not occur. The lengths for character variables are increased by multiplying the current length by the specified value. You can specify a multiplier value from 1 to 5.

For example, the following LIBNAME statement implicitly assigns the CVP engine by specifying the CVPMULTIPLIER= option.

```
libname expand 'SAS data-library' cvpmultiplier=2.5;
```

Character variable lengths are increased by multiplying the lengths by 2.5. A character variable with a length of 10 is increased to 25, and a character variable with a length of 100 is increased to 250.

Alias CVPMULT

Default If you specify CVPMULTIPLIER=, SAS automatically uses the CVP engine in order to expand the character variable lengths according to your specification. If you explicitly specify the CVP engine but do not specify either CVPMULTIPLIER= or CVPBYTES=, then SAS uses CVPMULTIPLIER=1.5 to increase the lengths.

Restrictions The CVP engine supports SAS data files, no SAS views, catalogs, item stores, and so on.

The CVP engine is available for input (read) processing only.

For library concatenation with mixed engines that include the CVP engine, only SAS data files are processed. For example, if you execute the COPY procedure, only SAS data files are copied.

Requirement The number of bytes that you specify must be large enough to accommodate any expansion. Otherwise, truncation occurs, which results in an error in the SAS log.

Interaction You cannot specify both CVPMULTIPLIER= and CVPBYTES=. Specify one of these options.

See "Avoiding Character Data Truncation By Using the CVP Engine" in *SAS Viya National Language Support: Reference Guide*

CVPVARCHAR=YES | NO
specifies whether to convert fixed-width character variables to variable-width characters during input file processing. The byte length of the new-width character variable is the maximum number of bytes per character from the SAS session encoding multiplied by the specified fixed-width character length.

Default No

Interaction If you specify CVPVARCHAR=YES, the CVPMULTIPLIER= and CVPBYTES= options are ignored.

Notes Trailing blanks are removed from string data that is under CHAR columns.

Fixed-width character variables with a format of TRANSCODE=NO are excluded during conversion.

EXTENDOBSCOUNTER=YES | NO
specifies whether to extend the maximum observation count in output SAS data files for a SAS library.

YES
requests an enhanced file format in a newly created SAS data file that counts observations beyond the 32-bit limitation. Although this SAS data file is created for an operating environment that stores the number of observations with a 32-bit integer, the file behaves like a 64-bit file with respect to counters. This is the default.

Restrictions A SAS data file that is created with an extended observation count is incompatible with releases prior to SAS 9.3.

Use with the BASE engine only.

The extended observation count attribute cannot be inherited by a new file. If you create a new file without an extended observation count attribute, you must specify EXTENDOBSCOUNTER=NO for the new file.

NO
specifies that the maximum observation count in a newly created SAS data file is determined by the long integer size for the operating environment. In operating environments with a 32-bit integer, the maximum number is 2^{31}–1 or approximately two billion observations (2,147,483,647). In operating environments with a 64-bit integer, the number is 2^{63}–1 or approximately 9.2 quintillion observations.

Alias EOC=

Default YES

INENCODING=ANY | ASCIIANY | EBCDICANY | *encoding-value*
overrides the encoding when you are reading (input processing) SAS data sets in the SAS library.

See "INENCODING= and OUTENCODING= Options" in *SAS Viya National Language Support: Reference Guide*

OUTENCODING=
OUTENCODING=ANY | ASCIIANY | EBCDICANY | *encoding-value*

overrides the encoding when you are creating (output processing) SAS data sets in the SAS library.

See "INENCODING= and OUTENCODING= Options" in *SAS Viya National Language Support: Reference Guide*

OUTREP=*format*

specifies the data representation for the SAS library, which is the form in which data is stored in a particular operating environment. Different operating environments use different standards or conventions for storing floating-point numbers (for example, IEEE or IBM mainframe); for character encoding (for example, ASCII or EBCDIC); for the ordering of bytes in memory (for example, big Endian or little Endian); for word alignment (for example, 4-byte boundaries or 8-byte boundaries); for integer data-type length (for example, 16-bit, 32-bit, or 64-bit); and for doubles (for example, byte-swapped or not).

By default, SAS creates a new SAS data set by using the data representation of the CPU that is running SAS. Specifying the OUTREP= option enables you to create a SAS data set with a different data representation. For example, in a Linux environment, you can create a SAS data set that uses a Windows data representation.

Values for OUTREP= are listed in the following table.

Table 2.6 *Data Representation Values for OUTREP= Option*

OUTREP= Value	Alias*	Environment
ALPHA_TRU64	ALPHA_OSF	Tru64 UNIX
ALPHA_VMS_32	ALPHA_VMS	OpenVMS Alpha
ALPHA_VMS_64		OpenVMS Alpha
HP_IA64	HP_ITANIUM	HP-UX for the Itanium Processor Family Architecture
HP_UX_32	HP_UX	HP-UX for PA-RISC
HP_UX_64		HP-UX for PA-RISC, 64-bit
INTEL_ABI		ABI for Intel architecture
LINUX_32	LINUX	Linux for Intel architecture
LINUX_IA64		Linux for Itanium-based systems
LINUX_X86_64		Linux for x64
MIPS_ABI		MIPS ABI
MVS_32	MVS	31-bit SAS on z/OS
MVS_64_BFP		64-bit SAS on z/OS
OS2		OS/2 for Intel
RS_6000_AIX_32	RS_6000_AIX	AIX
RS_6000_AIX_64		AIX
SOLARIS_32	SOLARIS	Solaris for SPARC

OUTREP= Value	Alias*	Environment
SOLARIS_64		Solaris for SPARC
SOLARIS_X86_64		Solaris for x64
VAX_VMS		OpenVMS VAX
VMS_IA64		OpenVMS on HP Integrity
WINDOWS_32	WINDOWS	32-bit SAS on Microsoft Windows
WINDOWS_64		64-bit SAS on Microsoft Windows (for both Itanium-based systems and x64)

* It is recommended that you use the current values. The aliases are available for compatibility only.

Interaction Transcoding could result in character data loss when encodings are incompatible. For more information, see the *SAS Viya National Language Support: Reference Guide*.

POINTOBS=YES | NO
specifies whether SAS creates compressed data sets whose observations can be randomly accessed or sequentially accessed.

YES
causes SAS software to produce a compressed data set that might be randomly accessed by observation number.

Note For an individual data set, the POINTOBS= data set option overrides the setting of the POINTOBS= option in the LIBNAME statement.

Tip Specifying POINTOBS=YES does not affect the efficiency of retrieving information from a data set. It does increase CPU usage by approximately 10% when creating a compressed data set and when updating or adding information to it.

NO
suppresses the ability to randomly access observations in a compressed data set by observation number.

Tip Specifying POINTOBS=NO is desirable for applications where the ability to point directly to an observation by number within a compressed data set is not important. If you do not need to access data by observation number, then you can improve performance by approximately 10% by specifying POINTOBS=NO when creating a compressed data set or when updating or adding observations to it.

Default YES

REPEMPTY=YES|NO
controls replacement of like-named temporary or permanent SAS data sets when the new one is empty.

YES
specifies that a new empty data set with a given name replace an existing data set with the same name. This is the default.

Interaction If REPEMPTY=YES and REPLACE=NO, then the data set is not replaced.

NO
specifies that a new empty data set with a given name not replace an existing data set with the same name.

Tips Use REPEMPTY=NO to prevent the following syntax error from replacing the existing data set MYLIB.B with the new empty data set MYLIB.B that is created by mistake:

```
libname libref SAS-library REPEMPTY=NO;
data mylib.a set mylib.b;
```

For both the convenience of replacing existing data sets with new ones that contain data and the protection of not overwriting existing data sets with new empty ones that are created by mistake, set REPLACE=YES and REPEMPTY=NO.

Note For an individual data set, the REPEMPTY= data set option overrides the setting of the REPEMPTY= option in the LIBNAME statement.

See "REPEMPTY= Data Set Option" in *SAS Viya Data Set Options: Reference*

Engine/Host Options

engine-host-options
are one or more options that are listed in the general form *keyword=value*.

Restriction When concatenating libraries, you cannot specify options that are specific to an engine or an operating environment.

Linux Options

ENABLEDIRECTIO
specifies that direct I/O can be available for all files that are opened in the library that is identified in the LIBNAME statement.

Interaction You must use the ENABLEDIRECTIO option with the USEDIRECTIO= option to turn on direct I/O for the file or files whose libref is listed in the LIBNAME statement. The following example uses the ENABLEDIRECTIO and USEDIRECTIO= LIBNAME options. In this case, all files that are referenced with libref test are opened for direct I/O:

```
LIBNAME test '.' ENABLEDIRECTIO USEDIRECTIO=yes;
```

Notes ENABLEDIRECTIO cannot be used with the Work directory.

A libref that is assigned to a directory with the ENABLEDIRECTIO option does not match another libref that is assigned to the same directory without the ENABLEDIRECTIO. The two librefs can point to the same directory, but the files that are opened using one libref are

read from and written to using direct I/O. Files that are opened using the other libref are read from and written to using the regular disk I/O calls.

Tip The following example uses the ENABLEDIRECTIO LIBNAME option to enable files that are associated with the libref test to be opened for direct I/O. The USEDIRECTIO= data set option opens test.file1 for direct I/O. test.file2 is not opened for direct I/O, although it is enabled for direct I/O.

```
LIBNAME test'.'ENABLEDIRECTIO;
data test.file1(USEDIRECTIO=yes);
   ... more SAS statements ...
run;
data test.file2;
   ... more SAS statements ...
run;
```

FILELOCKS=NONE | FAIL | CONTINUE

specifies whether file locking is turned on or off for the files that are opened under the libref in the LIBNAME statement. The FILELOCKS statement option works like the FILELOCKS system option, except that it applies only to the files that are associated with the libref. The following values for the FILELOCKS statement option are available:

NONE

turns file locking off. NONE specifies that SAS attempts to open the file without checking for an existing lock on the file. NONE does not place an operating system lock on the file. These files are not protected from shared Update access.

FAIL

turns file locking on. FAIL specifies that SAS attempts to place an operating system lock on the file. Access to the file is denied if the file is already locked, or if it cannot be locked.

CONTINUE

turns file locking on. CONTINUE specifies that SAS attempts to place an operating system lock on the file. If the file is already locked by someone else, an attempt to open it fails. If the file cannot be locked for some other reason, the file is opened and a warning message is sent to the log. For example, you cannot lock a file if the file system does not support locking.

The FILELOCKS option in the LIBNAME statement applies to most of the SAS I/O files, such as data sets and catalogs, that are opened under the libref that is listed in the LIBNAME statement.

For the FILELOCKS statement option, RESET is not a valid value as it is when you use the FILELOCKS system option.

Use the FILELOCKS system option instead of the FILELOCKS statement option to set the locking behavior for your files. (The FILELOCKS statement option will be deprecated in a future release of SAS.) Note that the FILELOCK option in the LIBNAME statement overrides the LIBNAME system option. For more information, see the FILELOCKS system option. You can also specify any of the options supported by the Scalable Performance Data Server. See the *Scalable Performance Data Server: User's Guide* for a description of these options.

FILELOCKWAIT=*n*
specifies the number of seconds SAS waits for a locked file to become available to another process.

If the locked file is released before the number of seconds specified by *n*, then SAS locks the file for the current process and continues. If the file is still locked when the number of seconds has been reached, then SAS writes a locked-file error to the log and the DATA step fails.

Default 0

Range 0–600

NOSETPERM
specifies that permission settings are not inherited from one library member to another when the library members are opened with the same libref. If you have two assignments to a path, one with the NOSETPERM option and the other without, the two assignments are treated as if the paths do not match. The LIBNAME statement with the NOSETPERM option does not inherit permission settings.

After the NOSETPERM option is used to turn off permission settings for a libref, the option is in effect whenever you use the libref. There is no option that turns off the NOSETPERM option. To turn off the NOSETPERM option, submit the following statement:

```
libname libref clear;
```

TRANSFERSIZE=*n*K | *n*M
specifies the size of a large block of data that is read from a file that is opened.

n
specifies an integer value.

K
specifies the size of the block in kilobytes.

M
specifies the size of the block in megabytes.

Interaction To use the TRANSFERSIZE option, you must have files open for direct I/O. That is, both the ENABLEDIRECTIO and USEDIRECTIO= options must be in effect. If you use TRANSFERSIZE without the ENABLEDIRECTIO and USEDIRECTIO= options, the option is accepted, but it has no effect.

Examples In the following example, 128k blocks of data are read from the test.file1 because this file is opened for direct I/O. test.file2 is not open for direct I/O, and the TRANSFERSIZE option has no effect on this file:

```
LIBNAME test'.'ENABLEDIRECTIO TRANSFERSIZE=128k;
data test.file1(USEDIRECTIO=yes);
   ... more SAS statements ...
run;
data test.file2;
   ... more SAS statements ...
run;
```

In the following example, all the files that are listed in the DATA statements read 128k blocks of data. This is because all the files are affected by the ENABLEDIRECTIO, USEDIRECTIO=, and TRANSFERSIZE options:

```
LIBNAME test'.'ENABLEDIRECTIO USEDIRECTIO=yes TRANSFERSIZE=128k;
data test.file1;
   ... more SAS statements ...
run;
data test.file2;
   ... more SAS statements ...
run;
data test.file3;
   ... more SAS statements ...
run;
```

USEDIRECTIO= YES | NO
if used with the ENABLEDIRECTIO statement option, turns on or turns off direct file I/O for all the files associated with the libref listed in the LIBNAME statement.

Restriction You must use a permanent library, rather than a Work library, with USEDIRECTIO. USEDIRECTIO cannot be used with the Work directory.

Requirement Use USEDIRECTIO= with the ENABLEDIRECTIO statement option to turn on direct file I/O.

Details

Types of Engines

There are two main types of engines:

View engines
enable SAS to read SAS views that are described by SAS/ACCESS software, the SQL procedure, and DATA step views. The use of SAS view engines is automatic because the name of the view engine is stored as part of the descriptor portion of the SAS data set.

Library engines
control access at the SAS library level. Every SAS library has an associated library engine, and the files in that library can be accessed only through that engine. There are two types of library engines:

native engines
access SAS files created and maintained by SAS. See the following table for a description of these engines.

interface engines
treat other vendors' files as if they were SAS files.

Table 2.7 *Engine Names and Descriptions*

Engine Type	Name (Alias)	Description	SAS Library
default	V9 (BASE) V8	enables you to create new SAS data files and to access existing SAS data files that were created with Version 8 or SAS 9. The V8 and V9 engines are identical. This engine enables Read access to data files that were created with some earlier releases of SAS, but this engine is the only one that supports SAS 9 catalogs. This engine allows for data set indexing and compression.	is the pathname of the directory containing the library.
compatibility	V6	accesses any data file that was created by Releases 6.09 through 6.12. This engine is read-only.	is the pathname of the directory containing the library.
transport	XPORT	accesses transport data sets. This engine creates computer-independent SAS transport files that can be used under all hosts running Release 6.06 or later of SAS. .	is the pathname of either a sequential device or a disk file.
XML	XML	generates (writes) and processes (reads) any XML document, which is an application- and computer-independent file.	is the pathname of the XML document.
interface	BMDP	provides Read-Only access to BMDP files. This engine is available only on AIX, HP-UX, and Solaris.	is the pathname of the data file.
	OSIRIS	provides Read-Only access to OSIRIS files.	is the pathname of the data file.
	SPSS	provides Read-Only access to SPSS files.	is the pathname of the data file.

Omitting Engine Names from the LIBNAME Statement

It is always more efficient to specify the engine name than have SAS determine the correct engine. However, if you omit an engine name in the LIBNAME statement or if you define an environment variable to serve as a libref, SAS determines the appropriate engine.

If you have specified the ENGINE= system option, SAS uses the engine name that you specified.

Note: The ENGINE= system option specifies the default engine for libraries on disk only.

If you did not specify the ENGINE= system option, SAS looks at the extensions of the files in the given directory and uses these rules to determine an engine:

- If all the SAS data sets in the library were created by the same engine, the libref is assigned using that engine.

  Note: If the engine used to create the data sets is not the same as the default engine, then you are not able to create a view or stored program.
- If there are no SAS data sets in the given directory, the libref is assigned using the default engine.
- If there are SAS data sets from more than one engine, the system issues a message about finding mixed engine types and assigns the libref using the default engine.

Associating a Libref with a SAS Library (Form 1)

The association between a libref and a SAS library lasts only for the duration of the SAS session or until you change the libref or discontinue it with another LIBNAME statement. The simplest form of the LIBNAME statement specifies only a libref and the physical name of a SAS library:

LIBNAME *libref* '*SAS-library*';

See "Example 1: Assigning and Using a Libref" on page 227.

An engine specification is usually not necessary. If the situation is ambiguous, SAS uses the setting of the ENGINE= system option to determine the default engine. If all data sets in the library are associated with a single engine, then SAS uses that engine as the default. In either situation, you can override the default by specifying another engine with the ENGINE= system option:

LIBNAME *libref engine* '*SAS-library*'
<*options*> <*engine/host-options*>;

Operating Environment Information
Using the LIBNAME statement requires host-specific information. See the SAS documentation for your operating environment before using this statement.

Disassociating a Libref from a SAS Library (Form 2)

To disassociate a libref from a SAS library, use a LIBNAME statement by specifying the libref and the CLEAR option. You can clear a single, specified libref or all current librefs.

LIBNAME *libref* CLEAR | _ALL_ CLEAR;

Writing SAS Library Attributes to the SAS Log (Form 3)

Use a LIBNAME statement to write the attributes of one or more SAS libraries to the SAS log. Specify *libref* to list the attributes of one SAS library; use _ALL_ to list the attributes of all SAS libraries that have been assigned librefs in your current SAS session.

LIBNAME *libref* LIST | _ALL_ LIST;

Concatenating SAS Libraries (Form 4)

When you logically concatenate two or more SAS libraries, you can reference them all with one libref. You can specify a library with its physical filename or its previously assigned libref.

LIBNAME *libref* <*engine*> (*library–specification-1* <*…library-specification-n*>)
< *options*>;

In the same LIBNAME statement, you can use any combination of specifications: librefs, physical filenames, or a combination of librefs and physical filenames. See "Example 2: Logically Concatenating SAS Libraries" on page 227.

Concatenating SAS Catalogs (Form 4)

When you logically concatenate two or more SAS libraries, you also concatenate the SAS catalogs that have the same name. For example, if three SAS libraries each contain a catalog named CATALOG1, then when you concatenate them, you create a catalog concatenation for the catalogs that have the same name. See "Example 3: Concatenating SAS Catalogs" on page 227.

LIBNAME *libref* <*engine*> (*library–specification-1* <*...library-specification-n*>) < *options* >;

Rules for Library Concatenation

After you create a library concatenation, you can specify the libref in any context that accepts a simple (non-concatenated) libref. These rules determine how SAS files (that is, members of SAS libraries) are located among the concatenated libraries:

- When a SAS file is opened for input or update, the concatenated libraries are searched and the first occurrence of the specified file is used.
- When a SAS file is opened for output, it is created in the first library that is listed in the concatenation.

  Note: A new SAS file is created in the first library even if there is a file with the same name in another part of the concatenation.
- When you delete or rename a SAS file, only the first occurrence of the file is affected.
- Anytime a list of SAS files is displayed, only one occurrence of a filename is shown.

  Note: Even if the name occurs multiple times in the concatenation, only the first occurrence is shown.
- A SAS file that is logically connected to another file (such as an index to a data set) is listed only if the parent file resides in that same library. For example, if library One contains A.DATA, and library Two contains A.DATA and A.INDEX, only A.DATA from library One is listed. (See the previous rule.)
- If any library in the concatenation is sequential, then all of the libraries are treated as sequential.
- The attributes of the first library that is specified determine the attributes of the concatenation. For example, if the first SAS library that is listed is "read only," then the entire concatenated library is "read only."
- If you specify any options or engines, they apply only to the libraries that you specified with the complete physical name, not to any library that you specified with a libref.
- If you alter a libref after it has been assigned in a concatenation, it does not affect the concatenation.

Automatically Creating the Library Directory

You can set the DLCREATEDIR system option to create the directory for the SAS library that is specified in the LIBNAME statement if that directory does not exist. For more information, see the "DLCREATEDIR System Option" in *SAS Viya System Options: Reference*.

Comparisons

- Use the LIBNAME statement to reference a SAS library. Use the FILENAME statement to reference an external file. Use the LIBNAME, SAS/ACCESS statement to access DBMS tables.
- Use the CATNAME statement to concatenate SAS catalogs. Use the LIBNAME statement to concatenate SAS catalogs. The CATNAME statement enables you to specify the names of the catalogs that you want to concatenate. The LIBNAME statement concatenates all like-named catalogs in the specified SAS libraries.

Examples

Example 1: Assigning and Using a Libref

This example assigns the libref SALES to an aggregate storage location that is specified in quotation marks as a physical filename. The DATA step creates SALES.QUARTER1 and stores it in that location. The PROC PRINT step references it by its two-level name, SALES.QUARTER1.

```
libname sales 'SAS-library';
data sales.quarter1;
infile 'your-input-file';
input salesrep $20. +6 jansales febsales
   marsales;
run;
proc print data=sales.quarter1;
run;
```

Example 2: Logically Concatenating SAS Libraries

- This example concatenates three SAS libraries by specifying the physical filename of each:

```
libname allmine ('file-1' 'file-2' 'file-3');
```

- This example assigns librefs to two SAS libraries, one that contains SAS 6 files and one that contains SAS 9 files. This technique is useful for updating your files and applications from SAS 6 to SAS 9 and enables you to have convenient access to both sets of files:

```
libname v6 'v6-SAS-library';
libname v9 'v9-SAS-library';
libname allmine (v9 v6);
```

- This example shows that you can specify both librefs and physical filenames in the same concatenation specification:

```
libname allmine (v9 v6 'some-filename');
```

Example 3: Concatenating SAS Catalogs

This example concatenates three SAS libraries by specifying the physical filename of each and assigns the libref ALLMINE to the concatenated libraries:

```
libname allmine ('file-1' 'file-2' 'file-3');
```

If each library contains a SAS catalog named MYCAT, then using ALLMINE.MYCAT as a libref.catref provides access to the catalog entries that are stored in all three catalogs named MYCAT. To logically concatenate SAS catalogs with different names, see the "CATNAME Statement" on page 38.

Example 4: Permanently Storing Data Sets with One-Level Names

If you want the convenience of specifying only a one-level name for permanent, not temporary, SAS files, then use the USER= system option. This example stores the data set QUARTER1 permanently without using a LIBNAME statement first to assign a libref to a storage location:

```
options user='SAS-library';
data quarter1;
infile 'your-input-file';
input salesrep $20. +6 jansales febsales
   marsales;
run;
proc print data=quarter1;
run;
```

See Also

Data Set Options:

- "ENCODING= Data Set Option" in *SAS Viya National Language Support: Reference Guide*

Statements:

- "CATNAME Statement" on page 38 for a discussion of concatenating SAS catalogs
- "FILENAME Statement" on page 91
- "LIBNAME Statement, CVP Engine" on page 229
- LIBNAME option character variable attributes used to transcode SAS files
- "LIBNAME Statement" in *SAS/CONNECT for SAS Viya: User's Guide*
- "LIBNAME Statement, SASESOCK Engine" in *SAS/CONNECT for SAS Viya: User's Guide*
- "LOCKDOWN Statement" in SAS Intelligence Platform: Application Server Administration Guide

System Options:

- "DLCREATEDIR System Option" in *SAS Viya System Options: Reference*
- "LOCKDOWN System Option in SAS Intelligence Platform: Application Server Administration Guide
- "FILELOCKS System Option" in *SAS Viya System Options: Reference*
- "USER= System Option" in *SAS Viya System Options: Reference*

LIBNAME Statement, CVP Engine

Associates a libref for the character variable padding (CVP) engine to expand character variable lengths so that character data truncation does not occur when a file requires transcoding.

Valid in: Anywhere

Category: Data Access

Restrictions: This statement is not valid in the CAS server.

The CVP engine is available for input (read) processing only.

The CVP engine supports SAS data files, but not SAS views, catalogs, and item stores.

The number of bytes that you specify must be large enough to accommodate any expansion. Otherwise, truncation occurs, which results in an error message in the SAS log.

For library concatenation with mixed engines that include the CVP engine, only SAS data files are processed. For example, if you execute the COPY procedure, only SAS data files are copied.

Tip: The CVP engine expands character variable lengths but not character format widths. A character format that is not wide enough can prevent an observation from printing correctly.

Syntax

LIBNAME *libref* CVP '*SAS-library*' <*options*>;

Arguments

libref

is a character constant, variable, or expression that specifies the libref that is assigned to a SAS library.

Range 1 to 8 bytes

SAS-library

is the physical name for the SAS library. The physical name is recognized by the operating environment. Enclose the physical name in single or double quotation marks.

LIBNAME Options

CVPBYTES=*bytes*

specifies the number of bytes by which to expand character variable lengths when processing a SAS data file that requires transcoding. The CVP engine expands the lengths so that character data truncation does not occur. The lengths for character variables are increased by adding the specified value to the current length. You can specify a value from 0 to 32766.

For example, the following LIBNAME statement implicitly assigns the CVP engine by specifying the CVPBYTES= option.

```
libname expand 'SAS data-library' cvpbytes=5;
```

Character variable lengths are increased by adding 5 bytes. A character variable with a length of 10 is increased to 15, and a character variable with a length of 100 is increased to 105.

Default If you specify CVPBYTES=, SAS automatically uses the CVP engine in order to expand the character variable lengths according to your specification. If you explicitly assign the CVP engine but do not specify either CVPBYTES= or CVPMULTIPLIER=, then SAS uses CVPMULTIPLIER=1.5 to increase the lengths of the character variables.

Restrictions The CVP engine supports SAS data files, no SAS views, catalogs, item stores, and so on.

The CVP engine is available for input (read) processing only.

For library concatenation with mixed engines that include the CVP engine, only SAS data files are processed. For example, if you execute the COPY procedure, only SAS data files are copied.

Requirement The number of bytes that you specify must be large enough to accommodate any expansion. Otherwise, truncation occurs, which results in an error message in the SAS log.

Interaction You cannot specify both CVPBYTES= and CVPMULTIPLIER=. Specify one of these options.

See "Avoiding Character Data Truncation By Using the CVP Engine" in *SAS Viya National Language Support: Reference Guide*

CVPENGINE=*engine*

specifies the engine to use in order to process a SAS data file that requires transcoding. The CVP engine expands the character variable lengths to transcoding so that character data truncation does not occur. Then the specified engine does the actual file processing.

Alias CVPENG

Default SAS uses the default SAS engine.

See "Avoiding Character Data Truncation By Using the CVP Engine" in *SAS Viya National Language Support: Reference Guide*

CVPMULTIPLIER=*multiplier*

specifies a multiplier value in order to expand character variable lengths when you are processing a SAS data file that requires transcoding. The CVP engine expands the lengths so that character data truncation does not occur. The lengths for character variables are increased by multiplying the current length by the specified value. You can specify a multiplier value from 1 to 5.

For example, the following LIBNAME statement implicitly assigns the CVP engine by specifying the CVPMULTIPLIER= option.

```
libname expand 'SAS data-library' cvpmultiplier=2.5;
```

Character variable lengths are increased by multiplying the lengths by 2.5. A character variable with a length of 10 is increased to 25, and a character variable with a length of 100 is increased to 250.

Alias	CVPMULT
Default	If you specify CVPMULTIPLIER=, SAS automatically uses the CVP engine in order to expand the character variable lengths according to your specification. If you explicitly specify the CVP engine but do not specify either CVPMULTIPLIER= or CVPBYTES=, then SAS uses CVPMULTIPLIER=1.5 to increase the lengths.
Restrictions	The CVP engine supports SAS data files, no SAS views, catalogs, item stores, and so on. The CVP engine is available for input (read) processing only. For library concatenation with mixed engines that include the CVP engine, only SAS data files are processed. For example, if you execute the COPY procedure, only SAS data files are copied.
Requirement	The number of bytes that you specify must be large enough to accommodate any expansion. Otherwise, truncation occurs, which results in an error in the SAS log.
Interaction	You cannot specify both CVPMULTIPLIER= and CVPBYTES=. Specify one of these options.
See	"Avoiding Character Data Truncation By Using the CVP Engine" in *SAS Viya National Language Support: Reference Guide*

CVPVARCHAR=YES | NO
specifies whether to convert fixed-width character variables to variable-width characters during input file processing. The byte length of the new-width character variable is the maximum number of bytes per character from the SAS session encoding multiplied by the specified fixed-width character length.

Default	No
Interaction	If you specify CVPVARCHAR=YES, the CVPMULTIPLIER= and CVPBYTES= options are ignored.
Notes	Trailing blanks are removed from string data that is under CHAR columns. Fixed-width character variables with a format of TRANSCODE=NO are excluded during conversion.

Details

The character variable padding (CVP) engine expands character variable lengths so that character data truncation does not occur when a file requires transcoding. Character data truncation can occur when the number of bytes for a character in one encoding is different from the number of bytes for the same character in another encoding. An example is when a single-byte character set (SBCS) is transcoded to a double-byte character set (DBCS) or a multi-byte character set (MBCS).

By explicitly specifying the CVP engine with the LIBNAME statement, the default character expansion is 1.5 times the character variable lengths. To specify a different expansion amount, use the CVPBYTES= or CVPMULTIPLIER= option.

Note: The expansion amount must be large enough to accommodate any expansion. Otherwise, truncation still occurs.

The CVP engine converts variables defined with the CHAR data type to a VARCHAR data type when CVPVARCHAR=YES is specified. Because CVP is available only for input processing, the VARCHAR data type is not automatically saved. Without saving the data, the conversion to VARCHAR is lost when a SAS session ends. To save the changes, use the SET statement or PROC COPY and an engine that supports VARCHAR. If the data is saved using an engine that does not support VARCHAR, the character columns in the new data set revert to the CHAR data type. The length of the CHAR variables in the new data set is the number of bytes that were needed to store the VARCHAR variables.

If the data is read by a PROC that does not support VARCHAR, CVPVARCHAR=YES is ignored. The CVP engine uses CVPBYTES, CVPMULTIPLIER, or the default multiplier to expand the length of the character columns in the data.

TIP The CVP engine might affect performance for processing that conditionally selects a subset of observations using a WHERE expression. Processing the file without using the CVP engine might be faster than processing the file using the CVP engine. For example, if you use the CVP engine with a data set that has indexes, the indexes are not used in order to optimize the WHERE expression.

Examples

Example 1

The following LIBNAME statement explicitly assigns the CVP engine. Character variable lengths are increased using the default expansion, which multiples the lengths by 1.5. For example, a character variable with a length of 10 has a new length of 15. A character variable with a length of 100 has a new length of 150:

```
libname expand cvp 'SAS-library';
```

Example 2

In this example, the CVP engine is used to expand character variable lengths by adding two bytes to each length:

```
libname expand cvp 'SAS-library' cvpbytes=2;
```

Example 3

In this example, the SPD Engine is used to access data set files. The CVP engine is used to convert CHAR variables to VARCHAR variables when the data sets are read (for example, during a PROC CONTENTS or PROC PRINT step).

```
libname cvplib cvp 'SAS-library' cvpvarchar=yes cvpengine=spde;
```

Example 4

The following example shows how to convert CHAR variables to VARCHAR using the CVP engine. The variable, ch2, is excluded from this conversion by using the TRANSCODE=NO attribute.

```
libname baselib 'c:\temp\testdata';
libname cvplib cvp 'c:\temp\testdata' cvpvarchar=yes;

data baselib.latin1;
               length ch1 $ 10 ch2 $ 20;
```

```
                attrib ch1 transcode=yes;
                attrib ch2 transcode=no;
                ch1='hello';
                ch2='hello world';
run;

proc contents data=cvplib.latin1;
run;
```

See Also

- "Avoiding Character Data Truncation By Using the CVP Engine" in *SAS Viya National Language Support: Reference Guide*

Statements:

- "LIBNAME Statement" on page 212

LIBNAME Statement, JMP Engine

Associates a libref with a JMP data table and enables you to read and write JMP data tables.

Valid in: Anywhere

Category: Data Access

Restriction: This statement is not valid in the CAS server.

See: "LIBNAME Statement" on page 212

Syntax

LIBNAME *libref* JMP '*path*' <FMTLIB=*libref.format-catalog*>;

Arguments

libref
is a character constant, variable, or expression that specifies the libref that is assigned to a SAS library.

Range 1 to 8 bytes

path
is the physical name for the SAS library. The physical name is the name that is recognized by the operating environment. Enclose the physical name in single or double quotation marks.

FMTLIB=*libref.format-catalog*
specifies where the formats are stored when a JMP data table is read and where the formats come from when a JMP data table is created.

Requirement The library that is specified in the FMTLIB argument must be a SAS data set LIBNAME statement.

Example

```
libname inv jmp "." fmtlib=seform.formats;
libname seform '.';
   data work.mine;
```

```
   set inv.suri2011;
run;
```

Details

A JMP file is a file format that the JMP software program creates. JMP is an interactive statistics package that is available for Microsoft Windows and Macintosh. For more information, see the JMP documentation that is packaged with your system.

A JMP file contains data that is organized in a tabular format of fields and records. Each field can contain one type of data, and each record can hold one data value for each field.

SAS supports access to JMP files. You can access JMP files by either of these two methods:

- the IMPORT and EXPORT procedures and the Import and Export Wizard without a license for SAS/ACCESS Interface to PC Files. SAS imports data from JMP files that are saved with version 7 or later formats, and it exports data to JMP files with version 7 or later formats. SAS no longer supports JMP files with versions 3 through 6 formats.

  For more information, see *SAS/ACCESS Interface to PC Files for SAS Viya: Reference*.

- the LIBNAME statement for the JMP engine

Note: The JMP LIBNAME engine does not support extended attributes. If you want extended attributes, either use the IMPORT procedure or use the EXPORT procedure with **dbms=jmp**.

Examples

Example 1: Using the LIBNAME Statement to Read a JMP Data Table

This example reads and prints five observations from the **bank** JMP data table.

```
libname b jmp 'c:/temp/national';
proc contents data=b.bank(drop=edlevel id age);
run;
proc print data=b.bank(obs=5 drop=edlevel id age);
run;
```

Example 2: Reading and Sorting a JMP Data Table

This example reads a JMP data table, sorts it, and stores it in a SAS data set. The formats stored on the JMP data set are put in **a.formats**.

```
libname a 'c:/temp/field';
libname b jmp '.' fmtlib=a.formats;

proc sort data=b.cars out=a.sorted;
   by category_ic;
run;
```

LIBNAME Statement, JSON Engine

Associates a SAS libref with a JSON document and ensures that the JSON data and an optional supplied JSON MAP are valid.

Valid in: Anywhere

Category: Data Access

Restriction: This statement is not valid in the CAS server.

Note: The JSON file is only read once, when the JSON engine LIBNAME is assigned. To read the JSON file again, you must reassign the JSON LIBNAME libref. See "Example 2: Using JSON from a URL Access Method Fileref" on page 251.

Syntax

LIBNAME *libref* JSON < '*JSON-document-path*' > <*options*>;

Arguments

libref
is a character constant, variable, or expression that specifies the logical name, or libref, that is assigned to a SAS library.

Range 1 to 8 bytes

JSON-document-path
is the physical location of the JSON document. Enclose the physical location in single or double quotation marks.

Note: If the physical location is not supplied, the JSON engine tries to access a fileref with the same name as the libref supplied. The fileref can be a disk file, a URL access method fileref, an FTP access method fileref, or other valid fileref.

LIBNAME Options

AUTOMAP= REUSE | CREATE
specifies the action to take. AUTOMAP can have one of the following values:

REUSE
uses the MAP fileref if the file exists. Otherwise, generates a JSON map and writes it to the MAP fileref.

CREATE
generates a JSON map and writes it to the MAP fileref.

Note: Using REPLACE or CREATE overwrites an existing file.

Alias REPLACE

Requirement If a JSON map file is specified, but does not exist, the AUTOMAP option is required.

Interaction If a JSON map file is not specified, a JSON map file is automatically created in memory and the AUTOMAP option is not required.

FILEREF=*fileref*
specifies a fileref that points to the location for the JSON input.

JSONCOMPRESS | JSONNOCOMPRESS
specifies whether to compress internal JSON information.

TIP Compression saves memory and disk space when caching information, at the expense of CPU time.

Default JSONNOCOMPRESS

MAP=*fileref*|'*map physical name*'
specifies a fileref that points to a physical location for the JSON map, or the quoted physical name of the JSON map file.

MEMLEAVE= *n* | *n*K | *n*M | *n*G | ALL
specifies the amount of memory to leave available when processing JSON. When the memory limit is hit, JSON information is cached to disk using an internally generated TEMP fileref.

n
amount of memory

***n*K**
specifies the amount of memory in Kilobytes.

***n*M**
specifies the amount of memory in Megabytes.

***n*G**
specifies the amount of memory in Gigabytes.

ALL
specifies that no memory is used to store JSON information. All JSON information is cached to disk.

Default 0.5G

NO_REOPEN_MSG | NRM
Suppresses the message, `JSON data is only read once. To read the JSON again, reassign the JSON LIBNAME.`

Note The JSON file is read once, when the JSON engine LIBNAME is assigned. To read the JSON file again, you must deassign the LIBNAME libref and reassign it. See "Example 2: Using JSON from a URL Access Method Fileref" on page 251.

ORDINALCOUNT= ALL | NONE | *n*
specifies the maximum number of ordinal variables to generate for each data set. The maximum number of possible ordinal variables for a data set depends on the position of the data in the JSON, and can be less than the number that you specify. In that case, only the maximum number of possible ordinal variables is generated. ORDINALCOUNT can have one of the following values:

ALL
creates all possible ordinal variables for the data set.

NONE
suppresses creation of ordinal variables for the data set.

n
is an integer that is greater than or equal to 0 (zero).

Default 2

RETAIN
retains values in the observation buffer between observations.

Details

The Basics

A JavaScript Object Notation (JSON) file is a file that contains a human-readable collection of data.

The JSON LIBNAME statement enables you to access JSON files using the JSON engine. A JSON map is a file that describes the data sets in a JSON engine library.

JSON MAP Details

A JSON map is a file that describes the data sets in a JSON engine library. If specified, the JSON automapper can automatically generate a map of your JSON data.

A JSON map consists of a DATASETS array.

Each object in the DATASETS array describes a data set in the library.

Each data set object requires a DSNAME string and a TABLEPATH string and usually contains an optional VARIABLES array.

Each object in the VARIABLES array describes a variable in that data set.

Required items for each VARIABLES object are a NAME string, a TYPE string, and a PATH string.

For character TYPE variables, a LENGTH item is optional.

DSNAME
The DSNAME provides a name for the data set. The automapper generates a default name. When modifying your map file, you can provide any name that conforms to the SAS data set naming standard.

TABLEPATH
A TABLEPATH path tells the engine how to delimit data set observations:

```
{
  "data" : [
    { "a" : 1 , "b" : 2, "c" : "taxes" },
    { "a" : 2 , "b" : 4, "c" : "sport" },
    { "a" : 3 , "b" : 6, "c" : "vacation" }
  ]
  }
```

In the JSON, if you want an observation every time you encounter an object in the data array, set the TABLEPATH to "/root/data". The JSON mapper automatically generates the following JSON map:

```
{
  "DATASETS": [
    {
      "DSNAME": "data",
      "TABLEPATH": "/root/data",
      "VARIABLES": [
        {
          "NAME": "ordinal_root",
```

```
      "TYPE": "ORDINAL",
      "PATH": "/root"
    },
    {
      "NAME": "ordinal_data",
      "TYPE": "ORDINAL",
      "PATH": "/root/data"
    },
    {
      "NAME": "a",
      "TYPE": "NUMERIC",
      "PATH": "/root/data/a"
    },
    {
      "NAME": "b",
      "TYPE": "NUMERIC",
      "PATH": "/root/data/b"
    },
    {
      "NAME": "c",
      "TYPE": "CHARACTER",
      "PATH": "/root/data/c",
      "CURRENT_LENGTH": 8
    }
  ]
 }
]
}
```

NAME
The NAME gives a name for the variable that conforms to the SAS naming standard.

TYPE
TYPE is ORDINAL, NUMERIC, or CHARACTER.

PATH
PATH is the path in the JSON map file for this variable.

LENGTH
The LENGTH setting is the optional length of this character variable. If no length is specified, the JSON LIBNAME engine sets this length to maximum length of all values that it has seen for this variable.

Note When reusing maps with different JSON input, particularly JSON input with longer strings, the map LENGTH remains in effect and might result in truncation.

Tip When the JSON LIBNAME engine generates an automap, it generates a CURRENT_LENGTH: n value, set to the maximum length of the variable in the current JSON data. This is just for documentation. When reading maps, the JSON LIBNAME engine ignores the CURRENT_LENGTH setting.

FORMAT
You can provide a FORMAT for a variable in a map. FORMAT is an array where the first element of the array is the format name, the second element is the width, and the third element is the decimal specification. The FORMAT variable is optional.

"FORMAT" : ["*FormatName*, "*width*", "*decimal-specification*"]

Note The JSON LIBNAME engine automapper does not currently generate FORMATs.

Example The following map specifies a format BEST that contains a total of 12 digits with 3 decimal places.

```
{
   "NAME": "c",
   "TYPE": "NUMERIC",
   "PATH": "/root/nums/c",
   "FORMAT" : [ "BEST", 12, 3 ]
 }
```

INFORMAT

You can provide an INFORMAT for a variable in a map. INFORMAT is an array where the first element of the array is the informat name, the second element is the width, and the third element is the decimal specification. The INFORMAT variable is optional.

"INFORMAT" : ["*InformatName*, "*width*", "*decimal-specification*"]

Note The JSON LIBNAME engine automapper does not currently generate INFORMATs.

Example The following map specifies the informat IS8601DT that contains 19 digits and no decimal places.

```
{
    "NAME": "d",
    "TYPE": "NUMERIC",
    "PATH": "/root/nums/d",
    "INFORMAT" : [ "IS8601DT", 19, 0 ]
 }
```

LABEL

You can provide a LABEL for a variable in a map. The LABEL variable is optional.

"LABEL" : ["*text*"]

Note The JSON LIBNAME engine automapper does not currently generate LABELs.

Example The following map specifies a label for the variable d.

```
{
    "NAME": "d",
    "LABEL": "This is the d variable.",
    "TYPE": "NUMERIC",
    "PATH": "/root/nums/d"
 }
```

OPTIONS

You can turn on or off RETAIN for an individual variable. The OPTIONS variable is optional. For more information, see "RETAIN" on page 237.

"OPTIONS" : ["RETAIN" | "NORETAIN"]

Note Setting NORETAIN on ORDINAL variables has no effect but does produce a NOTE during map validation. ORDINAL variables are always retained.

Tip Setting RETAIN on a variable in a map takes precedence over the RETAIN option in the LIBNAME statement. For example, with RETAIN set in the LIBNAME statement and NORETAIN set on JSON variable Status, all variables are retained except for Status.

Example Turning RETAIN on for the variable Status:

```
{
   "NAME": "Status",
   "TYPE": "CHARACTER",
   "PATH": "/root/info/Status",
   "OPTIONS" : ["RETAIN"]
 }
```

Creating Your Own JSON MAP

This example shows how to get a list of employee phone numbers, including all of the type, name, and age information using a JSON map. The first step is to create a JSON map from the following JSON file, example.json:

```
[
  {
   "type": "Full",
   "info" : [
      { "name" : "Eric" , "age" : 21, "phone" : [
         { "type" : "cell", "number" : "540-555-2377" },
         { "type" : "home", "number" : "540-555-0120" }
         ]
      },
      { "name" : "John",  "age" : 22, "phone" : [
         { "type" : "cell", "number" : "919-555-6665" },
         { "type" : "home", "number" : "336-555-0140" }
         ]
      }
    ]
  },
  {
   "type": "Part",
   "info" : [
      { "name" : "Bjorn" , "age" : 27, "phone" : [
         { "type" : "cell",   "number" : "720-555-8377" },
         { "type" : "burner", "number" : "720-555-2877" },
         { "type" : "home",   "number" : "720-555-0194" }
         ]
      }
    ]

  }
]
```

The following LIBNAME statement produces the JSON map file, user.map.

```
libname in json 'example.json' map='user.map' automap=create;
```

Three data sets are produced by the JSON: INFO, INFO_PHONE, and ROOT.

You can use PROC PRINT to print out the contents of the three data sets:

```
6         proc print data=in.root; run;

            ordinal_
     OBS      root      type

       1        1       Full
       2        2       Part
7         proc print data=in.info; run;

            ordinal_    ordinal_
     OBS      root        info      name     age

       1        1           1       Eric      21
       2        1           2       John      22
       3        2           3       Bjorn     27

8         proc print data=in.info_phone; run;

            ordinal_    ordinal_
     OBS      info        phone      type        number

       1        1           1       cell      540-555-2377
       2        1           2       home      540-555-0120
       3        2           3       cell      919-555-6665
       4        2           4       home      336-555-0140
       5        3           5       cell      720-555-8377
       6        3           6       burner    720-555-2877
       7        3           7       home      720-555-0194
```

You can create one data set containing all of the information by copying the user.map file, created by the JSON automapper, to user.map.all. Modify user.map.all as follows:

- Change the DSNAME of the first data set to ALL.
- Remove the ORDINAL variables from the ALL data set.
- Copy the variable descriptions of the variables that you want from the other data sets into the ALL data set. Make sure there is a comma after each variable object except the last one.
- Change the name of the type variable from the INFO_PHONE data set to PHONETYPE.
- Add a LABEL to the PHONETYPE variable.
- Set the TABLEPATH to /root/info/phone to get an observation after a phone object is encountered.
- Remove CURRENT_LENGTH from each variable.

Here is the modified map.

```
{
  "DATASETS": [
    {
      "DSNAME": "all",
      "TABLEPATH": "/root/info/phone",
      "VARIABLES": [
        {
          "NAME": "type",
          "TYPE": "CHARACTER",
          "PATH": "/root/type"
        },
```

```
            {
              "NAME": "name",
              "TYPE": "CHARACTER",
              "PATH": "/root/info/name"
            },
            {
              "NAME": "age",
              "TYPE": "NUMERIC",
              "PATH": "/root/info/age"
            },
            {
              "NAME": "phonetype",
              "TYPE": "CHARACTER",
              "LABEL": "This is the type of phone",
              "PATH": "/root/info/phone/type"
            },
            {
              "NAME": "number",
              "TYPE": "CHARACTER",
              "PATH": "/root/info/phone/number"
            }
          ]
        }
      ]
    }
```

The following results are displayed using PROC PRINT with the modified map.

```
10         filename allmap 'user.map.all';
11         libname in json 'example.json' map=allmap;
12         proc print data=in.all label; run;

                                    This is
                                    the type
     OBS    type    name     age    of phone       number

       1    Full    Eric      21     cell       540-555-2377
       2                       .     home       540-555-0120
       3            John      22     cell       919-555-6665
       4                       .     home       336-555-0140
       5    Part    Bjorn     27     cell       720-555-8377
       6                       .     burner     720-555-2877
       7                       .     home       720-555-0194
```

Notice that the observation buffer is cleared between Eric's cell phone and Eric's home phone. You can use the RETAIN option to keep the observation buffer from being cleared.

```
13         libname in json 'example.json' map=allmap RETAIN;
14         proc print data=in.all label; run;

                                    This is
                                    the type
     OBS    type    name     age    of phone       number

       1    Full    Eric      21     cell       540-555-2377
       2    Full    Eric      21     home       540-555-0120
       3    Full    John      22     cell       919-555-6665
       4    Full    John      22     home       336-555-0140
       5    Part    Bjorn     27     cell       720-555-8377
       6    Part    Bjorn     27     burner     720-555-2877
       7    Part    Bjorn     27     home       720-555-0194
```

Merging Data Sets

This example describes how to read JSON into SAS data sets and then merge the data sets together using the ordinal values.

Here is an example JSON file that we want to read into a single data set. There are two types of Type: Work and Holding. Status is: complete, in the middle, or not started. In addition, there is Name, Date, Age, Address, and Zip information.

```
[
  { "Type" : "Work",
    "info" : [{ "Status" : "complete",
                "name" : { "name" : "Eric", "Date" : "28sep15", "age": 21 },
                "add" : { "Address" : "55 Pelican Avenue", "zip" : 44442 }
               },
               { "Status" : "in the middle",
                 "name" : { "name" : "John", "Date" : "02oct15", "age": 22 },
                 "add" : { "Address" : "268 Hydrangea" , "zip" : 40207 }
                }
               ]
   },
   { "Type" : "Holding",
     "info" : [{ "Status" : "not started",
                  "name" : { "name" : "Bjorn", "Date" : "01dec15", "age": 27 },
                  "add" : { "Address" : "1217 Onslow", "zip" :"22801" }
                }
               ]
    }
]
```

The following assigns the JSON LIBNAME engine to read the input JSON document into fileref IN. Use PROC DATASETS to show the name and member type of the four data sets that are created.

```
filename in 'example.json';
filename map 'example.map';
libname in json map=map automap=replace;
proc datasets library=in;
run;
quit;
```

```
1         options nocenter;
2         filename in 'example.json';
3         filename map 'example.map';
4         libname in json map=map automap=replace;
NOTE: JSON data is only read once.  To read the JSON again, reassign the JSON
LIBNAME.
NOTE: Map file /r/example.com/mydir/work/json/example.map was replaced.
NOTE: Libref IN was successfully assigned as follows:
      Engine:        JSON
      Physical Name: /r/example.com/mydir/work/json/example.json

5         proc datasets library=in;
                                          Directory

Libref         IN
Engine         JSON
Access         READONLY
Physical Name  /r/example.com/mydir/work/json/example.json


               Member
#  Name        Type

1  INFO        DATA
2  INFO_ADD    DATA
3  INFO_NAME   DATA
4  ROOT        DATA
6         run;

7         quit;
```

You can use PROC PRINT to print out the contents of the four data sets.

```
proc print data=in.root; run;

      ordinal_
Obs     root      Type

 1        1       Work
 2        2       Holding

proc print data=in.info_name; run;

      ordinal_    ordinal_
Obs     info        name       name      Date      age

 1        1           1       Eric      28sep15     21
 2        2           2       John      02oct15     22
 3        3           3       Bjorn     01dec15     27

proc print data=in.info; run;

      ordinal_    ordinal_
Obs     root        info      Status

 1        1           1       complete
 2        1           2       in the middle
 3        2           3       not started

proc print data=in.info_add;run;

      ordinal_    ordinal_
Obs     info         add          Address          zip

 1        1           1       55 Pelican Avenue   44442
 2        2           2       268 Hydrangea       40207
 3        3           3       1217 Onslow         22801
```

The four data sets contain ordinal variables. Ordinal variables are key variables that provide a relationship between two data sets.

The second data set, INFO_NAME, has an observation with John's name and it has an ordinal_info value of 2. In the fourth data set, INFO_ADD, the address associated with the ordinal_info of 2 is 268 Hydrangea. This is the address associated with John.

The four data sets can be merged based on ordinal values. First, merge the root and info data sets by ORDINAL_ROOT.

```
data a;
   merge in.root in.info;
   by ORDINAL_root;
 run;

NOTE: There were 2 observations read from the data set IN.ROOT.
NOTE: There were 3 observations read from the data set IN.INFO.
NOTE: The data set WORK.A has 3 observations and 4 variables.

proc print data=a; run;

      ordinal_                ordinal_
Obs     root      Type          info      Status

 1        1       Work           1       complete
 2        1       Work           2       in the middle
 3        2       Holding        3       not started
```

Next, to complete the creation of a data set containing all of the JSON information, merge in name and address and drop the ORDINAL variables.

```
          data b;
            merge a in.info_name in.info_add;
             by ORDINAL_info;
            drop ORDINAL_info ORDINAL_name ORDINAL_add ORDINAL_root;
          run;

NOTE: There were 3 observations read from the data set WORK.A.
NOTE: There were 3 observations read from the data set IN.INFO_NAME.
NOTE: There were 3 observations read from the data set IN.INFO_ADD.
NOTE: The data set WORK.B has 3 observations and 7 variables.

          proc print data=b; run;

Obs Type    Status        name  Date    age Address           zip

 1  Work    complete      Eric  28sep15  21 55 Pelican Avenue 44442
 2  Work    in the middle John  02oct15  22 268 Hydrangea     40207
 3  Holding not started   Bjorn 01dec15  27 1217 Onslow       22801
```

The ALLDATA Data Set

The ALLDATA data set gives you access to all the JSON data in one data set. For example:

```
    proc print data=in.ALLDATA(obs=24); run;
```

OBS	P	P1	P2	P3	P4	V	Value
1	1	stores				0	
2	2	stores	Name			1	Bob's Mart
3	2	stores	opened			1	06-01-2001
4	2	stores	sales			0	
5	3	stores	sales	Hot_Dogs		0	
6	4	stores	sales	Hot_Dogs	count	1	39
7	4	stores	sales	Hot_Dogs	price	1	1.09
8	3	stores	sales	Salami		0	
9	4	stores	sales	Salami	count	1	20
10	4	stores	sales	Salami	price	1	5.99
11	3	stores	sales	Canteloupes		0	
12	4	stores	sales	Canteloupes	count	1	26
13	4	stores	sales	Canteloupes	price	1	1.39
14	3	stores	sales	Mustard		0	
15	4	stores	sales	Mustard	count	1	6
16	4	stores	sales	Mustard	price	1	2.19
17	2	stores	Code			1	12BMx2
18	1	stores				0	
19	2	stores	Name			1	Grab 'n' Git
20	2	stores	opened			1	06-03-2012
21	2	stores	sales			0	
22	3	stores	sales	Hot_Dogs		0	
23	4	stores	sales	Hot_Dogs	count	1	18
24	4	stores	sales	Hot_Dogs	price	1	1.19

The ALLDATA data set example contains these variables:

- P is a NUMERIC data type that shows how many of the P1–P4 variables contain information for this observation.
- P1–P4 are CHARACTER data types.
- V is a NUMERIC data type that shows whether a Value is available.
- Value is a CHARACTER data type and the JSON value.

In observation 1, P=1, V=0 indicates that P1 contains information, P2–P4 are blank, and Value is blank. In observation 6, P=4 indicates that the P1–P4 variables contain information and V=1 shows that Value contains a value.

Observations where V=0 indicate a new JSON object. For example, in observations 1 and 18, P=1 and V=1 indicate a new Stores object. Observation 5 indicates a new stores/sales/Hot_Dogs object. The V=0 observations are helpful for tracking the JSON objects.

The JSON LIBNAME engine also creates macro symbols that describe lengths of the ALLDATA data set.

Here are the macro variables and values for the JSON example. The JSON LIBNAME is **IN**.

```
IN_JADPNUM=4
IN_JADVLEN=20
IN_JADP1LEN=6
IN_JADP2LEN=6
IN_JADP3LEN=11
IN_JADP4LEN=5
```

Using the ALLDATA Data Set

Create a data set where each observation has the following variables::

- item
- item price and count
- store name and code

When you look at the ALLDATA data set, you see the Store Name, and then observations that contain the item name, count, and price. You will create two data sets from the ALLDATA data set. One data set named StoreInfo contains the store Name and Code. The other data set named ItemInfo contains the Item, Count, and Price. Each time you find a Price, an observation is written to the ItemInfo data set. Each time you find a Code, an observation is written to the StoreInfo data set. To merge the two data sets, each data set must contain a key that indicates which store the observation data came from. Here is the code for the example:

```
data
       storeinfo (keep = Key StoreName Code)
       iteminfo  (keep = Key Item Price Count)
             ;
         /*---------------------------------------------------------------------*/
         /* bring in ALLDATA                                                    */
         /*---------------------------------------------------------------------*/
         set in.ALLDATA;

         /*---------------------------------------------------------------------*/
         /* Since StoreName and Code are found in the Value variable of ALLDATA   */
         /* the length of StoreName and COde should be &IN_JADVLEN  Similarly,   */
         /* Item comes from P3, so its length is &IN_JADP3LEN.                    */
         /*---------------------------------------------------------------------*/
```

```
length StoreName $ &IN_JADVLEN  Code $ &IN_JADVLEN Item $ &IN_JADP3LEN ;

/*-------------------------------------------------------------------------*/
/* Both StoreName and Count are picked up in observations before the     */
/* observations which tell us to write and output observation.  So we    */
/* need to retain StoreName and Count                                    */
/*-------------------------------------------------------------------------*/
retain StoreName Count;

/*-------------------------------------------------------------------------*/
/* We want a Key which we'll increment each time we see a store object   */
/* (v=0 p=1 and P1="stores"                                              */
/*-------------------------------------------------------------------------*/
retain Key 0;

/*-------------------------------------------------------------------------*/
/*  increment our key each time we see a new store object                  */
/*                                                                         */
/*      OBS    P      P1        P2      P3              P4      V    Value */
/*        1    1    stores                                    0          */
/*-------------------------------------------------------------------------*/
if v=0 and p=1 and p1="stores" then key+1;

/*-------------------------------------------------------------------------------*/
/*  get StoreName, as in observation 2                                           */
/*                                                                               */
/*      OBS    P      P1        P2      P3              P4      V    Value      */
/*        2    2    stores    Name                              1    Bob's Mart */
/*-------------------------------------------------------------------------------*/
if P=2 and p2 = "Name" then StoreName = value;

/*-------------------------------------------------------------------------*/
/* get Code and write a storeinfo observation                              */
/*     OBS    P      P1        P2      P3              P4      V    Value  */
/*      17    2    stores    Code                              1    12BMx2 */
/*-------------------------------------------------------------------------*/
if p=2 and p2 = "Code" then do;
   Code = Value;
   output storeinfo;
end;

/*-------------------------------------------------------------------------------*/
/* get Count,  example observations below                                        */
/*                                                                               */
/*     OBS    P      P1        P2      P3              P4      V    Value       */
/*       6    4    stores    sales     Hot_Dogs       count    1    39          */
/*       9    4    stores    sales     Salami         count    1    20          */
/*      12    4    stores    sales     Canteloupes    count    1    26          */
/*-------------------------------------------------------------------------------*/
if P=4 and p4 = "count" then Count = input(value, 5.);

/*-------------------------------------------------------------------------------*/
/*  get Price, and from that same observation, p3 is the Item.  And each time    */
/*  we see price, we want to output an observation.                              */
/*                                                                               */
/*      OBS    P      P1        P2      P3              P4      V    Value       */
```

```
/*        7    4    stores    sales     Hot_Dogs       price    1    1.09         */
/*       10    4    stores    sales     Salami         price    1    5.99         */
/*       13    4    stores    sales     Canteloupes    price    1    1.39         */
/*       16    4    stores    sales     Mustard        price    1    2.19         */
/*-------------------------------------------------------------------------------*/
 if P=4 and p4 = "price" then do;
   Item = p3;
   Price = input(value, 5.);
   output iteminfo;
 end;


run;
```

Here are the two data sets:

```
        proc print data=storeinfo; run;


OBS    StoreName                Code     Key

 1     Bob's Mart              12BMx2     1
 2     Grab 'n' Git            10GNx9     2
 3     Larry's Quick Shoppe    17LQx2     3

        proc print data=iteminfo; run;


OBS    Item           Count    Key    Price

  1    Hot_Dogs          39      1     1.09
  2    Salami            20      1     5.99
  3    Canteloupes       26      1     1.39
  4    Mustard            6      1     2.19
  5    Hot_Dogs          18      2     1.19
  6    Salami             3      2     7.99
  7    Mustard            6      2     2.19
  8    Beer              20      2     8.99
  9    Hot_Dogs          39      3     1.09
 10    Salami            20      3     5.99
 11    Mustard            6      3     2.19
 12    Beer               7      3     8.99
 13    Wine              15      3    12.99
```

The following code merges the two data sets:

```
data a;
  merge storeinfo iteminfo;
  by key;
run;
```

Here are the merged data sets:

```
       proc print data=a;
        var Storename  Code Item Count Price;
       run;


OBS    StoreName                Code     Item           Count    Price

  1    Bob's Mart              12BMx2    Hot_Dogs         39      1.09
  2    Bob's Mart              12BMx2    Salami           20      5.99
  3    Bob's Mart              12BMx2    Canteloupes      26      1.39
  4    Bob's Mart              12BMx2    Mustard           6      2.19
  5    Grab 'n' Git            10GNx9    Hot_Dogs         18      1.19
  6    Grab 'n' Git            10GNx9    Salami            3      7.99
  7    Grab 'n' Git            10GNx9    Mustard           6      2.19
  8    Grab 'n' Git            10GNx9    Beer             20      8.99
  9    Larry's Quick Shoppe    17LQx2    Hot_Dogs         39      1.09
 10    Larry's Quick Shoppe    17LQx2    Salami           20      5.99
 11    Larry's Quick Shoppe    17LQx2    Mustard           6      2.19
 12    Larry's Quick Shoppe    17LQx2    Beer              7      8.99
 13    Larry's Quick Shoppe    17LQx2    Wine             15     12.99
```

Using the JSON Pretty Print DATA Step Function

The JSON Pretty Print DATA step function creates a readable copy of input JSON. Here is the syntax:

```
data _null_;
  rc = jsonpp("input file","output file");
run;
```

input file
is the input JSON. This can be a physical name or a fileref.

output file
is the output JSON. This can be a physical name or a fileref. If the output file is 'LOG', then the output is written to the SAS log.

The following example reads the disk file test.json and creates a disk file test.json.pp:

```
data _null_;
  rc = jsonpp('test.json', 'test.json.pp');
run;

/* read json from a url fileref and pretty print to disk fileref */

filename in url "http://example.com/~username/snip.json";
filename out 'pp.txt';
data _null_;
 rc = jsonpp('in','out');
run;
```

Examples

Example 1: Using the LIBNAME Statement to Create or Reuse a JSON Map

This example reads JSON data from a file called my.json and creates a JSON map in the file my.map. The engine creates a map if it does not exist. Otherwise, the engine uses the existing map.

```
filename in 'my.json';
filename map 'my.map';
```

```
libname in json map=map automap=reuse;
```

This example shows how to access a JSON document using the physical location of the document.

```
filename map 'my.map';
libname in json 'my.json' map=map automap=reuse;
```

Example 2: Using JSON from a URL Access Method Fileref

This example shows how to access JSON from a URL fileref.

```
filename in url "http://example.com/~username/snip.json" debug;
filename map 'snap.map';
libname in json map=map automap=replace;
proc contents data=in._all_; run;
```

To call a RESTful API a second time, you need to reassign the LIBNAME libref.

```
libname in json ... ;
```

LIBNAME Statement, WebDAV Server Access

Associates a libref with a SAS library and enables access to a WebDAV (Web-based Distributed Authoring And Versioning) server.

Valid in: Anywhere

Category: Data Access

Restriction: This statement is not valid in the CAS server.

Syntax

LIBNAME *libref* <*engine*> '*SAS-library*' < *options* > WEBDAV USER="*user-ID*" PASSWORD="*user-password*" *WEBDAV options*;

LIBNAME *libref* CLEAR | _ALL_ CLEAR ;

LIBNAME *libref* LIST | _ALL_ LIST ;

Arguments

libref

specifies a shortcut name for the aggregate storage location where your SAS files are stored.

Tip The association between a libref and a SAS library lasts only for the duration of the SAS session or until you change it or discontinue it with another LIBNAME statement.

'*SAS-library*'

specifies the URL location (path) on a WebDAV server. The URL specifies either HTTP or HTTPS communication protocols.

Restriction Only one data library is supported when using the WebDAV extension to the LIBNAME statement.

Requirement When using the HTTPS communication protocol, you must use the Transport Layer Security (TLS) protocol that provides secure

network communications. For more information, see *Encryption in SAS*.

engine
specifies the name of a valid SAS engine.

Restriction REMOTE engines are not supported with the WebDAV options.

See For a list of valid engines, see the SAS documentation for your operating environment.

CLEAR
disassociates one or more currently assigned librefs. When a libref using a WebDAV server is cleared, the cached files stored locally are deleted also.

Tip Specify *libref* to disassociate a single libref. Specify _ALL_ to disassociate all currently assigned librefs.

LIST
writes the attributes of one or more SAS libraries to the SAS log.

Tip Specify *libref* to list the attributes of a single SAS library. Specify _ALL_ to list the attributes of all SAS libraries that have librefs in your current session.

ALL
specifies that the CLEAR or LIST argument applies to all currently assigned librefs.

LIBNAME Options

For valid LIBNAME statement options, see the "LIBNAME Statement" on page 212.

WebDAV Specific Options

WEBDAV
specifies that the libref access a WebDAV server.

USER="*user-ID*"
specifies the user name for access to the WebDAV server. The user ID is case sensitive and it must be enclosed in single or double quotation marks.

Alias UID

Tip If PROMPT is specified, but USER= is not, then the user is prompted for an ID as well as a password.

PASSWORD="*user-password*"
specifies a password for the user to access the WebDAV server. The password is case sensitive and it must be enclosed in single or double quotation marks.

Alias PWD=, PW=, PASS=

Tip You can specify the PROMPT option instead of the PASSWORD= option.

PROMPT
specifies to prompt for the user login password, if necessary.

Interaction If PROMPT is specified without USER=, then the user is prompted for an ID, as well as a password.

Tip If you specify the PROMPT option, you do not need to specify the PASSWORD= option.

PROXY=*url*
specifies the Uniform Resource Locator (URL) for the proxy server in one of these forms:

- "http://*hostname*"
- "http://*hostname:port*"

LOCALCACHE="*directory name*"
specifies a directory where a temporary subdirectory is created to hold local copies of the server files. Each libref has its own unique subdirectory. If a directory is not specified, then the subdirectories are created in the SAS WORK directory. SAS deletes the temporary files when the SAS program completes.

Default SAS WORK directory

LOCKDURATION=*n*
specifies the number of minutes that the files written through the WebDAV libref are locked. SAS unlocks the files when the SAS program successfully completes. If the SAS program fails, then the locks expire after the time allotted.

Default 30

Details

Data Set Options That Function Differently with a WebDAV Server

The following table lists the data set options that have different functionality when using a WebDAV server. All other data set options function as described in the *SAS Viya Data Set Options: Reference*.

Table 2.8 *Data Set Option Functionality with a WebDAV Server*

Data Set Option	WebDAV Storage Functionality
CNTLLEV=	*LIB* locks all data sets in the library before writing the data into the local cache. All members are unlocked after the DATA step has completed and the data set has been written back to the WebDAV server. *MEM* locks the member before writing the data into the local cache. Member is unlocked after the DATA step has completed and the data has been written back to the WebDAV server. *REC* is not supported. WebDAV allows updates to the entire data set only.
FILECLOSE	The VxTAPE engine is not supported. Therefore, this option is ignored.
GENMAX=	This functionality is not supported because the maximum number of revisions to keep cannot be specified in the WebDAV server.

Data Set Option	WebDAV Storage Functionality
GENNUM=	This functionality is not supported in WebDAV.
IDXNAME=	Users can specify an index to use if one exists.
INDEX=	Indexes can be created in the local cache and saved on the WebDAV server.
TOBSNO=	Remote engines are not supported. Therefore, this option is ignored.

WebDAV File Processing

When accessing a WebDAV server, the file is pulled from the WebDAV server to your local disk storage for processing. When you complete the updating, the file is pushed back to the WebDAV server for storage. The file is removed from the local disk storage when it is pushed back.

Multiple Librefs to a WebDAV Library

When you assign a libref to a file on a WebDAV server, the path (URL location), user ID, and password are associated with that libref. After the first libref has been assigned, the user ID and password are validated on subsequent attempts to assign another libref to the same library.

Note: Lock errors that you typically would not see might occur if either a different user ID or the password, or both, are used in the subsequent attempt to assign a libref to the same library.

Locked Files on a WebDAV Server

In local libraries, SAS locks a file when you open it to prevent other users from altering the file while it is being read. WebDAV locks require Write access to a library, and there is no concept of a read lock. In addition, WebDAV servers can go down, come back up, or go offline at any time. Consequently, SAS honors a lock request on a file on a WebDAV server only if the file is already locked by another user.

Example: Associating a Libref with a WebDAV Directory

The following example associates the libref **davdata** with the WebDAV directory **/users/mydir/datadir** on the WebDAV server **www.webserver.com**:

```
libname davdata v9 "https://www.webserver.com/users/mydir/datadir"
    webdav user="mydir" pw="12345";
```

See Also

Statements:

- “LIBNAME Statement” on page 212

LINK Statement

Directs program execution immediately to the statement label that is specified and, if followed by a RETURN statement, returns execution to the statement that follows the LINK statement.

Valid in: DATA step

Categories: CAS
Control

Type: Executable

Syntax

LINK *label*;

Arguments

label
specifies a statement label that identifies the LINK destination. You must specify the *label* argument.

Details

The LINK statement tells SAS to jump immediately to the statement label that is indicated in the LINK statement and to continue executing statements from that point until a RETURN statement is executed. The RETURN statement sends program control to the statement immediately following the LINK statement.

The LINK statement and the destination must be in the same DATA step. The destination is identified by a statement label in the LINK statement.

The LINK statement can branch to a group of statements that contain another LINK statement. This arrangement is known as nesting. To avoid infinite looping, SAS has set a default number of nested LINK statements. You can have up to 10 LINK statements with no intervening RETURN statements. When more than one LINK statement has been executed, a RETURN statement tells SAS to return to the statement that follows the last LINK statement that was executed. However, you can use the /STACK option in the DATA statement to increase the number of nested LINK statements.

Comparisons

The difference between the LINK statement and the GO TO statement is in the action of a subsequent RETURN statement. A RETURN statement after a LINK statement returns execution to the statement that follows LINK. A RETURN statement after a GO TO statement returns execution to the beginning of the DATA step, unless a LINK statement precedes GO TO. In that case, execution continues with the first statement after LINK. In addition, a LINK statement is usually used with an explicit RETURN statement, whereas a GO TO statement is often used without a RETURN statement.

When your program executes a group of statements at several points in the program, using the LINK statement simplifies coding and makes program logic easier to follow. If your program executes a group of statements at only one point in the program, using DO-group logic rather than LINK-RETURN logic is simpler.

Example: Diverting Program Execution

In this example, when the value of variable TYPE is **aluv**, the LINK statement diverts program execution to the statements that are associated with the label CALCU. The program executes until it encounters the RETURN statement, which sends program execution back to the first statement that follows LINK. SAS executes the assignment statement, writes the observation, and then returns to the top of the DATA step to read the next record. When the value of TYPE is not **aluv**, SAS executes the assignment statement, writes the observation, and returns to the top of the DATA step.

```
data hydro;
   input type $ depth station $;
      /* link to label calcu: */
   if type ='aluv' then link calcu;
   date=today();
      /* return to top of step */
   return;
   calcu: if station='site_1'
      then elevatn=6650-depth;
   else if station='site_2'
      then elevatn=5500-depth;
         /* return to date=today(); */
   return;
   datalines;
aluv 523 site_1
uppa 234 site_2
aluv 666 site_2
...more data lines...
;
```

See Also

Statements:

- “DATA Statement” on page 45
- “DO Statement” on page 59
- “GO TO Statement” on page 125
- “label: Statement” on page 207
- “RETURN Statement” on page 350

LIST Statement

Writes to the SAS log the input data record for the observation that is being processed.

Valid in: DATA step

Categories: Action
CAS

Type: Executable

Syntax

LIST;

Without Arguments

The LIST statement causes the input data record for the observation being processed to be written to the SAS log.

Details

The LIST statement operates only on data that is read with an INPUT statement; it has no effect on data that is read with a SET, MERGE, MODIFY, or UPDATE statement.

In the SAS log, a ruler that indicates column positions appears before the first record listed.

For variable-length records (RECFM=V), SAS writes the record length at the end of the input line. SAS does not write the length for fixed-length records (RECFM=F), unless the amount of data read does not equal the record length (LRECL).

Comparisons

The following table compares the LIST and PUT statements.

Action	LIST Statement	PUT Statement
Writes when	at the end of each iteration of the DATA step	immediately
Writes what	the input data records exactly as they appear	the variables or literals specified
Writes where	only to the SAS log	to the SAS log, the SAS output destination, or to any external file
Works with	INPUT statement only	any data-reading statement
Handles hexadecimal values	automatically prints a hexadecimal value if it encounters an unprintable character	represents characters in hexadecimal only when a hexadecimal format is given

Examples

Example 1: Listing Records That Contain Missing Data

This example uses the LIST statement to write to the SAS log any input records that contain missing data. Because of the #3 line pointer control in the INPUT statement, SAS reads three input records to create a single observation. Therefore, the LIST statement writes the three current input records to the SAS log each time a value for W2AMT is missing.

```
data employee;
   input ssn 1-9 #3 w2amt 1-6;
   if w2amt=. then list;
```

```
   datalines;
23456789
JAMES SMITH
356.79
345671234
Jeffrey Thomas
.
;
```

Output 2.17 *Log Listing of Missing Data*

```
RULE:----+----1----+----2----+----3----+----4----+----5----+----
9   345671234
10  Jeffrey Thomas
11  .
```

The numbers 9, 10, and 11 are line numbers in the SAS log.

Example 2: Listing the Record Length of Variable-Length Records

This example uses as input an external file that contains variable-length ID numbers. The RECFM=V option is specified in the INFILE statement, and the LIST statement writes the records to the SAS log. When the file has variable-length records, as indicated by the RECFM=V option in this example, SAS writes the record length at the end of each record that is listed in the SAS log.

```
data employee;
   infile 'your-external-file' recfm=v;
   input id $;
   list;
run;
```

Output 2.18 *Log Listing of Variable-Length Records and Record Lengths*

```
RULE:     ----+----1----+----2----+----3----+----4----+----5---
1         23456789 8
2         123456789 9
3         5555555555 10
4         345671234 9
5         2345678910 10
6         2345678 7
```

See Also

Statements:

- "PUT Statement" on page 303

%LIST Statement

Displays lines that are entered in the current session.

Valid in: Anywhere

Category: Program Control

Restriction: This statement is not valid in the CAS server.

Syntax

%LIST<*n* <*:m* | − *m*> >;

Without Arguments

In interactive line mode processing, if you use the %LIST statement without arguments, it displays all previously entered program lines.

Arguments

n
displays line *n*.

n–m
displays lines *n* through *m*.

Alias *n:m*

Details

Where and When to Use

The %LIST statement can be used anywhere in a SAS job except between a DATALINES or DATALINES4 statement and the matching semicolon (;) or semicolons (;;;;). This statement is useful mainly in interactive line mode sessions to display SAS program code on the monitor. It is also useful to determine lines to include when you use the %INCLUDE statement.

Interactions

CAUTION:
In all modes of execution, the SPOOL system option controls whether SAS statements are saved. When the SPOOL system option is in effect in interactive line mode, all SAS statements and data lines are saved automatically when they are submitted. You can display them by using the %LIST statement. When NOSPOOL is in effect, %LIST cannot display previous lines.

Example: Displaying Lines That Are Entered in the Current Session

This %LIST statement displays lines 10 through 20:

```
%list 10-20;
```

See Also

Statements:

- "%INCLUDE Statement" on page 131

System Options:

- "SPOOL System Option" in *SAS Viya System Options: Reference*

LOCK Statement

Acquires, lists, or releases an exclusive lock on an existing SAS file.

Valid in: Anywhere

Category: Program Control

Restrictions: This statement is not valid in the CAS server.

You cannot lock a SAS file that another SAS session is currently accessing (either from an exclusive lock or because the file is open).

The LOCK statement syntax is the same whether you issue the statement in a single-user environment or in a client/server environment. However, some LOCK statement functionality applies only to a client/server environment.

Syntax

LOCK *libref*<.*member-name*<.*member-type* | .*entry-name*.*entry-type*>>
<LIST | QUERY | SHOW | CLEAR | NOMSG>;

Arguments

libref
is a name that is associated with a SAS library. The libref (library reference) must be a valid SAS name. If the libref is Work, you must specify it.

Tip Typically, in a single-user environment, you would not issue the LOCK statement to exclusively lock a library.

member-name
is a valid SAS name that specifies a member of the SAS library that is associated with the libref.

Restriction The SAS file must be created before you can request a lock.

member-type
is the type of SAS file to be locked. For example, valid values are DATA, VIEW, CATALOG, MDDB, and so on. The default is DATA.

entry-name
is the name of the catalog entry to be locked.

Tip In a single-user environment, if you issue the LOCK statement to lock an individual catalog entry, the entire catalog is locked. Typically, you would not issue the LOCK statement to exclusively lock a catalog entry.

entry-type
is the type of catalog entry to be locked.

Tip In a single-user environment, if you issue the LOCK statement to lock an individual catalog entry, the entire catalog is locked. Typically, you would not issue the LOCK statement to exclusively lock a catalog entry.

LIST | QUERY | SHOW
writes to the SAS log whether you have an exclusive lock on the specified SAS file.

Tip This option provides more information in a client/server environment.

CLEAR
releases a lock on the specified SAS file that was acquired using the LOCK statement in your SAS session.

NOMSG
specifies that warning and error messages are not written to the SAS log. NOMSG does not suppress notes that tell you that a lock is successful or that a lock is cleared.

Interactions To suppress warnings and errors, you must specify NOMSG for each execution of the LOCK statement.

The SAS macro variable SYSLCKRC return code is not affected if NOMSG is specified.

Tip NOMSG is useful if you want a LOCK statement resubmitted in a code loop until a lock is available, but you do want error messages displayed in the SAS log each time that an exclusive lock is not available.

Details

General Information

The LOCK statement enables you to acquire, list, or release an exclusive lock on an existing SAS file. With an exclusive lock, no other operation in the current SAS session can read, write, or lock the file until the lock is released. In addition, with an exclusive lock, when the file is open, the lock ensures that another SAS session cannot access the file.

The primary use of the LOCK statement is to retain exclusive control of a SAS file across SAS statement boundaries. There are times when it is desirable to perform several operations on a file, one right after the other, without loosing exclusive control of the file. However, when a DATA or PROC step finishes executing and control flows from it to the next operation, the file is closed and becomes available for processing by another SAS session that has access to the same data storage location.

To release an exclusive lock, use the CLEAR option. In addition, an exclusive lock on a data set is released when you use the DATASETS procedure DELETE statement to delete the data set.

Return Codes for the LOCK Statement

The SAS macro variable SYSLCKRC contains the return code from the LOCK statement. The following actions result in a nonzero value in SYSLCKRC:

- You try to lock a file but cannot obtain the lock (for example, the file was in use or is locked by another SAS session).
- You use a LOCK statement with the LIST option to list a lock.
- You use a LOCK statement with the CLEAR option to release a lock that you do not have.

For more information about the SYSLCKRC SAS macro variable, see *SAS Viya Macro Language: Reference*.

Comparisons

The CNTLLEV= data set option specifies the level at which shared Update access to a SAS data set is denied.

Example: Locking a SAS File

The following SAS program illustrates the process of locking a SAS data set. Including the LOCK statement provides protection for the multistep program by acquiring exclusive access to the file.

```
libname mydata 'SAS-library';
lock mydata.census; 1
data mydata.census; 2
   modify mydata.census;
   (statements to remove obsolete observations)
run; 3
proc sort force data=mydata.census; 4
   by CrimeRate;
run;
proc datasets library=mydata; 5
   modify census;
   index create CrimeRate;
quit;
lock mydata.census clear; 6
```

1 Acquires exclusive access to the SAS data set MyData.Census.

2 Opens MyData.Census to remove observations. During the update, no other operation in the current SAS session and no other SAS session can access the file.

3 At the end of the DATA step, the file is closed. No other operation in the current SAS session can access the file. However, until the file is reopened, it can be accessed by another SAS session.

4 Opens MyData.Census to sort the file. During the sort, no other operation in the current SAS session and no other SAS session can access the file. At the end of the procedure, the file is closed, which means that no other operation in the current SAS session can access the file but it can be accessed by another SAS session.

5 Opens MyData.Census to rebuild the file's index. No other operation in the current SAS session and no other SAS session can access the file. At the end of the procedure, the file is closed.

6 Releases the exclusive lock on MyData.Census.

See Also

Data Set Options:

- "CNTLLEV= Data Set Option" in *SAS Viya Data Set Options: Reference*

LOCKDOWN Statement

Secures the Workspace or SAS/CONNECT server by restricting access from within a server process to the host operating environment.

Valid in: AUTOEXEC file or INITSTMT= system option

Category: Control

Type: Executable

Syntax

LOCKDOWN ENABLE_AMS=*access-method-1* <…*access-method-n*>;

LOCKDOWN FILE=*fileref*;

LOCKDOWN PATH='*pathname-1*' <'…*pathname-n*'>;

LOCKDOWN LIST;

Arguments

ENABLE_AMS=*access-method-1* <…*access-method-n*>;
By default, when SAS is in a locked-down state, the following access methods are not available:

- URL
- HTTP

ENABLE_AMS allows administrators to re-enable those access methods and procedures that are disabled by default in the locked-down state.

Access method names are case insensitive. Duplicate names are ignored. Separate names with spaces, and do not use quotation marks.

URL/HTTP an aliased name pair, so if one is re-enabled, the other is automatically re-enabled as well.

ENABLE_AMS= can be included only in an AUTOEXEC file or an INITSTMT= option.

FILE=*fileref*
names a file that contains a list of valid directories and files to be added into the lockdown path list. SAS automatically adds subdirectories of any valid directories in the list to the lockdown path list.

The lockdown path list specifies which files and directories a SAS session can access when in a locked-down state. (This list is often referred to as a whitelist.)

A lockdown file can contain multiple lines. Each line specifies a path string. A path string on each line can be one pathname or a concatenation of pathname specifications. If a line has only one pathname, the pathname can have spaces or the host-supported pathname characters. This pathname does not need to be enclosed in quotation marks.

If a line has a concatenation specification, enclose the entire group of concatenated path specifications in parentheses. Enclose each pathname in quotation marks. Separate pathname specifications with a space character. Do not use newline characters in a path string. For more information, see "PATH='*pathname*'" on page 264.

If there are DBCS characters in the path list in the lockdown text file, add the ENCODING option to the FILENAME statement. This addition ensures that the lockdown path list is transcoded properly to SAS session encoding. For example, if you have a text file, lockdown-text-file.txt, that includes a path list with DBCS

characters, add the following code to the server's AUTOEXEC file, appserver_autoexec.sas:

```
filename myfile "c:\lockdown-text-file.txt" encoding='euc-cn';
lockdown file=myfile;
lockdown list;
```

PATH='*pathname*'
specifies one or multiple paths to be added to the lockdown path list. Enclose pathnames in quotation marks. (Single quotation marks are preferable to avoid conflicts with SAS macro variables.) Separate multiple pathnames with a space character.

The lockdown path list specifies which files and directories a SAS session can access when in a locked-down state. (This list is often referred to as a whitelist.) SAS automatically adds subdirectories of any valid directories in the list to the lockdown path list.

A pathname can be relative or absolute. A pathname can also include operating system environment variables, SAS environment variables such as !SASROOT, the current working directory (.), and other host-specific character substitutions that are typically allowed in pathnames. Fr example, a UNIX path accepts ~/.

Note: SAS environment variables can be specified only at the beginning of a pathname.

LIST
prints the current valid paths in the lockdown path list into the SAS log.

This list is an optimized path list. Subdirectories and duplicate pathnames are not shown.

Details

The LOCKDOWN statement enables you to limit access to local files and to specific SAS features for a SAS session that executes in a server or batch processing mode.

To use the LOCKDOWN statement, you must specify the LOCKDOWN system option in the sasv9_usermods.cfg for the affected server. For more information, see "LOCKDOWN System Option" in *SAS Viya System Options: Reference*.

A SAS server in the locked-down state validates all access to the host file system through the lockdown path list.

The lockdown path list contains all the paths that are accessible to a particular server. (This list is often referred to as a whitelist.) SAS does not verify the existence of any path in the lockdown path list. The operating system permissions on directories that are included in the lockdown whitelist are still in effect.

A path declared in the whitelist does not mean that an arbitrary user can read any file in that path. As was the case before the LOCKDOWN statement, host permissions on physical files and directories always take precedence over the whitelist.

For a suggestion on how to implement the whitelist, see "Example 2: Hiding the Whitelist By Locating the Path outside the Whitelist" on page 265.

The lockdown path list is established during SAS initialization and finalized at the lockdown point.

There are two types of paths in the lockdown path list: default lockdown directories (paths from SAS configuration files) and user directories and files (added using LOCKDOWN statements in a server autoexec file).

Any modifications made to the whitelist (including defining a new stored process repository) do not affect servers currently running. After making changes, stop or quiesce any currently running processes on the affected pooled workspace server or stored process server. Your changes take effect the next time SAS starts a server session.

For more information, see "Lock Down Workspace Servers" in *SAS Viya Administration: Workspace Server and Object Spawner* and "Lock Down the SAS/CONNECT Server" in *SAS Viya Administration: SAS/CONNECT Server and Spawner*.

By default, SAS adds the following predefined paths from the SAS configuration file and the SAS server metadata definition:

- paths of all stored process, source code repositories
- SASROOT path
- current working directory (not User home directory)
- SASAUTOS option path or environment variable path
- UTILLOC option path
- LOGPARM defined LOG file path
- MAPS option path
- JAVA_HOME/lib/fonts

Note: Pre-assigned library paths are not automatically added to the lockdown list. Users can access pre-assigned libraries through metadata-established or autoexec-established librefs.

Other valid paths can be added by issuing LOCKDOWN statements in the server's AUTOEXEC files or INITSTMT statement. Statements are typically added in the server autoexec_usermods.sas file.

Different types of SAS servers might require different lockdown path lists. For example, you might want a workspace server to have access only to an individual user's home directory. Alternatively, a stored process server might require access to locations that require greater privileges. Of course, librefs created by pre-assigned libraries in the metadata or autoexec are also available to users.

Examples

Example 1: Enabling Access to a User's Files via a Workspace or SAS/CONNECT Server

For workspace or SAS/CONNECT servers launched under the client user's personal account, an administrator can enable access to the user's personal files but prohibit access to other users. It is not necessary to establish separate server definitions or implement special logic to submit a customized LOCKDOWN statement in the server's autoexec file. Instead, an administrator can specify a special form of the lockdown path that refers to the home directory of the user under whose account the server was launched. This form is specific to the host platform under which the server is running. The declaration for Linux is `lockdown path='~';`.

Example 2: Hiding the Whitelist By Locating the Path outside the Whitelist

The SAS administrator can hide the contents of the whitelist by locating the whitelist file in a path that is not on the whitelist.

In your whitelist file, define all valid paths. For example, in whitelist.txt, add this code:

```
/valid/path1
/valid/path2
```

Modify the server autoexec file by adding a **LOCKDOWN file=** statement to point to the whitelist file. In this example, **/opt/sas/viya/config/etc/lockdown** is *not* defined in the lockdown whitelist:

```
filename lkdn "/opt/sas/viya/config/etc/lockdown/whitelist.txt";
lockdown file = lkdn;
```

Example 3: Enabling FTP While in Lockdown Mode

In this example, an administrator allows users access to certain public FTP sites while SAS is in LOCKDOWN mode. To do this, the administrator adds the following global statement to the server autoexec:

```
lockdown enable_ams = FTP;
```

See Also

- "Lock Down Workspace Servers" in *SAS Viya Administration: Workspace Server and Object Spawner*
- "Lock Down the SAS/CONNECT Server" in *SAS Viya Administration: SAS/CONNECT Server and Spawner*
- "Types of Sign-ons" in *SAS/CONNECT for SAS Viya: User's Guide*

System Options

- "LOCKDOWN System Option" in *SAS Viya System Options: Reference*

LOSTCARD Statement

Resynchronizes the input data when SAS encounters a missing or invalid record in data that has multiple records per observation.

Valid in: DATA step

Categories: Action
CAS

Type: Executable

Syntax

LOSTCARD;

Without Arguments

The LOSTCARD statement prevents SAS from reading a record from the next group when the current group has a missing record.

Details

When to Use LOSTCARD

When SAS reads multiple records to create a single observation, it does not discover that a record is missing until it reaches the end of the data. If there is a missing record in your data, the values for subsequent observations in the SAS data set might be incorrect. Using LOSTCARD prevents SAS from reading a record from the next group when the current group has fewer records than SAS expected.

LOSTCARD is most useful when the input data have a fixed number of records per observation and when each record for an observation contains an identification variable that has the same value. LOSTCARD usually appears in conditional processing such as in the THEN clause of an IF-THEN statement, or in a statement in a SELECT group.

When LOSTCARD Executes

When LOSTCARD executes, SAS takes several steps:

1. Writes three items to the SAS log: a lost card message, a ruler, and all the records that it read in its attempt to build the current observation.
2. Discards the first record in the group of records being read, does not write an observation, and returns processing to the beginning of the DATA step.
3. Does not increment the automatic variable _N_ by 1. (Normally, SAS increments _N_ by 1 at the beginning of each DATA step iteration.)
4. Attempts to build an observation by beginning with the second record in the group, and reads the number of records that the INPUT statement specifies.
5. Repeats steps 1 through 4 when the IF condition for a lost card is still true. To make the log more readable, SAS prints the message and ruler only once for a given group of records. In addition, SAS prints each record only once, even if a record is used in successive attempts to build an observation.
6. Builds an observation and writes it to the SAS data set when the IF condition for a lost card is no longer true.

Example: Resynchronizing Input Data

This example uses the LOSTCARD statement in a conditional construct to identify missing data records and to resynchronize the input data:

```
data inspect;
   input id 1-3 age 8-9 #2 id2 1-3 loc
         #3 id3 1-3 wt;
   if id ne id2 or id ne id3 then
    do;
      put 'DATA RECORD ERROR: ' id= id2= id3=;
      lostcard;
    end;
   datalines;
301    32
301    61432
301    127
302    61
302    83171
400    46
409    23145
```

```
400    197
411    53
411    99551
411    139
;
```

The DATA step reads three input records before writing an observation. If the identification number in record 1 (variable ID) does not match the identification number in the second record (ID2) or third record (ID3), a record is incorrectly entered or omitted. The IF-THEN DO statement specifies that if an identification number is invalid, SAS prints the message that is specified in the PUT statement message and executes the LOSTCARD statement.

In this example, the third record for the second observation (ID3=400) is missing. The second record for the third observation is incorrectly entered (ID=400 while ID2=409). Therefore, the data set contains two observations with ID values 301 and 411. There are no observations for ID=302 or ID=400. The PUT and LOSTCARD statements write these statements to the SAS log when the DATA step executes:

```
DATA RECORD ERROR: id=302 id2=302 id3=400
NOTE: LOST CARD.
RULE:----+----1----+----2----+----3----+----4----+----5----+----
14   302    61
15   302    83171
16   400    46
DATA RECORD ERROR: id=302 id2=400 id3=409
NOTE: LOST CARD.
17   409    23145
DATA RECORD ERROR: id=400 id2=409 id3=400
NOTE: LOST CARD.
18   400    197
DATA RECORD ERROR: id=409 id2=400 id3=411
NOTE: LOST CARD.
19   411    53
DATA RECORD ERROR: id=400 id2=411 id3=411
NOTE: LOST CARD.
20   411    99551
```

The numbers 14, 15, 16, 17, 18, 19, and 20 are line numbers in the SAS log.

See Also

Statements:

- “IF-THEN/ELSE Statement” on page 129

MERGE Statement

Joins observations from two or more SAS data sets into a single observation.

Valid in: DATA step

Categories: CAS
File-Handling

Type: Executable

Note: The variables that are read using the MERGE statement are retained in the PDV. The data types of the variables that are read are also retained. "RETAIN Statement" on page 346.

Syntax

MERGE *SAS-data-set-1* <(*data-set-options*)>
SAS-data-set-2 <(*data-set-options*) >
<…*SAS-data-set-n*<(*data-set-options*)> >
<END=*variable*>;

Arguments

SAS-data-set
specifies at least two existing SAS data sets from which observations are read. You can specify individual data sets, data set lists, or a combination of both.

Tips Instead of using a data set name, you can specify the physical pathname to the file, using syntax that your operating system understands. The pathname must be enclosed in single or double quotation marks.

You can specify additional SAS data sets.

See "Using Data Set Lists with MERGE" on page 270

(*data-set-options*)
specifies one or more SAS data set options in parentheses after a SAS data set name.

Note The data set options specify actions that SAS is to take when it reads observations into the DATA step for processing. For a list of data set options, see the *SAS Viya Data Set Options: Reference*

Tip Data set options that apply to a data set list apply to all of the data sets in the list.

END=*variable*
names and creates a temporary variable that contains an end-of-file indicator.

Note The variable, which is initialized to 0, is set to 1 when the MERGE statement processes the last observation. If the input data sets have different numbers of observations, the END= variable is set to 1 when MERGE processes the last observation from all data sets.

Tip The END= variable is not added to any SAS data set that is being created.

Details

Overview

The MERGE statement is flexible and has a variety of uses in SAS programming. This section describes basic uses of MERGE. Other applications include using more than one BY variable, merging more than two data sets, and merging a few observations with all observations in another data set.

Using Data Set Lists with MERGE

You can use data set lists with the MERGE statement. Data set lists provide a quick way to reference existing groups of data sets. These data set lists must be either name prefix lists or numbered range lists.

Name prefix lists refer to all data sets that begin with a specified character string. For example, **`merge SALES1:;`** tells SAS to merge all data sets starting with "SALES1" such as SALES1, SALES10, SALES11, and SALES12.

Numbered range lists require you to have a series of data sets with the same name, except for the last character or characters, which are consecutive numbers. In a numbered range list, you can begin with any number and end with any number. For example, these lists refer to the same data sets:

```
sales1 sales2 sales3 sales4
sales1-sales4
```

Note: If the numeric suffix of the first data set name contains leading zeros, the number of digits in the numeric suffix of the last data set name must be greater than or equal to the number of digits in the first data set name. Otherwise, an error occurs. For example, the data set lists sales001–sales99 and sales01–sales9 causes an error. The data set list sales001–sales999 is valid. If the numeric suffix of the first data set name does not contain leading zeros, the number of digits in the numeric suffix of the first and last data set names do not have to be equal. For example, the data set list sales1–sales999 is valid.

Some other rules to consider when using numbered data set lists are as follows:

- You can specify groups of ranges.

  ```
  merge cost1-cost4 cost11-cost14 cost21-cost24;
  ```

- You can mix numbered range lists with name prefix lists.

  ```
  merge cost1-cost4 cost2: cost33-37;
  ```

- You can mix single data sets with data set lists.

  ```
  merge cost1 cost10-cost20 cost30;
  ```

- Quotation marks around data set lists are ignored.

  ```
  /* these two lines are the same */
  merge sales1-sales4;
  merge 'sales1'n-'sales4'n;
  ```

- Spaces in data set names are invalid. If quotation marks are used, trailing blanks are ignored.

  ```
  /* blanks in these statements will cause errors */
  merge sales 1-sales 4;
  merge 'sales 1'n - 'sales 4'n;
  /* trailing blanks in this statement will be ignored */
  merge 'sales1'n - 'sales4'n;
  ```

- The maximum numeric suffix is 2147483647.

  ```
  /* this suffix will cause an error */
  merge prod2000000000-prod2934850239;
  ```

- Physical pathnames are not allowed.

  ```
  /* physical pathnames will cause an error */
  %let work_path = %sysfunc(pathname(WORK));
  merge "&work_path\dept.sas7bdat"-"&work_path\emp.sas7bdat" ;
  ```

One-to-One Merging

One-to-one merging combines observations from two or more SAS data sets into a single observation in a new data set. To perform a one-to-one merge, use the MERGE statement without a BY statement. SAS combines the first observation from all data sets that are named in the MERGE statement into the first observation in the new data set, the second observation from all data sets into the second observation in the new data set, and so on. In a one-to-one merge, the number of observations in the new data set is equal to the number of observations in the largest data set named in the MERGE statement. See Example 1 for an example of a one-to-one merge.

CAUTION:

Use care when you combine data sets with a one-to-one merge. One-to-one merges can sometimes produce undesirable results. Test your program on representative samples of the data sets before you use this method.

Match-Merging

Match-merging combines observations from two or more SAS data sets into a single observation in a new data set according to the values of a common variable. The number of observations in the new data set is the sum of the largest number of observations in each BY group in all data sets. To perform a match-merge, use a BY statement immediately after the MERGE statement. The variables in the BY statement must be common to all data sets. Only one BY statement can accompany each MERGE statement in a DATA step. The data sets that are listed in the MERGE statement must be sorted in order of the values of the variables that are listed in the BY statement, or they must have an appropriate index. See Example 2 for an example of a match-merge.

Note: The MERGE statement does not produce a Cartesian product on a many-to-many match-merge. Instead, it performs a one-to-one merge while there are observations in the BY group in at least one data set. When all observations in the BY group have been read from one data set and there are still more observations in another data set, SAS performs a one-to-many merge until all observations have been read for the BY group.

Comparisons

- MERGE combines observations from two or more SAS data sets. UPDATE combines observations from exactly two SAS data sets. UPDATE changes or updates the values of selected observations in a master data set as well. UPDATE also might add observations.
- Like UPDATE, MODIFY combines observations from two SAS data sets by changing or updating values of selected observations in a master data set.
- The results that are obtained by reading observations using two or more SET statements are similar to the results that are obtained by using the MERGE statement with no BY statement. However, with the SET statements, SAS stops processing before all observations are read from all data sets if the number of observations are not equal. In contrast, SAS continues processing all observations in all data sets named in the MERGE statement.

Examples

Example 1: One-to-One Merging

This example shows how to combine observations from two data sets into a single observation in a new data set:

```
data benefits.qtr1;
   merge benefits.jan benefits.feb;
run;
```

Example 2: Match-Merging

This example shows how to combine observations from two data sets into a single observation in a new data set according to the values of a variable that is specified in the BY statement:

```
data inventry;
   merge stock orders;
   by partnum;
run;
```

Example 3: Merging with a Data Set List

This example uses a data list to define the data sets that are merged.

```
data d008; job=3; emp=19; run;
data d009; job=3; sal=50; run;
data d010; job=4; emp=97; run;
data d011; job=4; sal=15; run;
data comb;
   merge d008-d011;
   by job;
run;
proc print data=comb;
run;
```

Example 4: Three Table Merge with BY Values and the IN= Data Set Option

This example merges data in three tables

```
DATA CAFE(KEEP=NAME PLACE CNUM);
   INPUT NAME $ ;
   PLACE = 'CAFE   ';
   CNUM = 'C' || LEFT(PUT(_N_,2.));
   DATALINES;
ANDERSON
COOPER
DIXON
FREDERIC
FREDERIC
PALMER
RANDALL
RANDALL
SMITH
SMITH
SMITH
;
RUN;

DATA VENDING (KEEP=NAME PLACE VNUM);
   INPUT NAME $ ;
   PLACE = 'VENDING ';
   VNUM = 'V' || LEFT(PUT(_N_,2.));
   DATALINES;
```

```
CARTER
DANIELS
GARY
GARY
HODGE
PALMER
RANDALL
RANDALL
SMITH
SMITH
SPENCER
SPENCER
SPENCER
SPENCER
;
RUN;

DATA SNACK (KEEP=NAME PLACE SNUM);
   INPUT NAME $ ;
   PLACE = 'SNACK   ';
   SNUM = 'S' || LEFT(PUT(_N_,2.));
   DATALINES;
BARRETT
COOPER
DANIELS
DIXON
DIXON
FREDERIC
GARY
HODGE
HODGE
PALMER
RANDALL
RANDALL
SMITH
SMITH
SMITH
SMITH
SPENCER
SPENCER
;
RUN;

DATA ALL;
   MERGE CAFE(IN=CAFEIN) SNACK(IN=SNACKIN) VENDING(IN=VENDIN);
   BY NAME;
   CIN=CAFEIN; SIN=SNACKIN; VIN=VENDIN;
RUN;

PROC PRINT;
     TITLE 'MERGED DATA';
RUN;
```

MERGED DATA

Obs	NAME	PLACE	CNUM	SNUM	VNUM	CIN	SIN	VIN
1	ANDERSON	CAFE	C1			1	0	0
2	BARRETT	SNACK		S1		0	1	0
3	CARTER	VENDING			V1	0	0	1
4	COOPER	SNACK	C2	S2		1	1	0
5	DANIELS	VENDING		S3	V2	0	1	1
6	DIXON	SNACK	C3	S4		1	1	0
7	DIXON	SNACK	C3	S5		1	1	0
8	FREDERIC	SNACK	C4	S6		1	1	0
9	FREDERIC	CAFE	C5	S6		1	1	0
10	GARY	VENDING		S7	V3	0	1	1
11	GARY	VENDING		S7	V4	0	1	1
12	HODGE	VENDING		S8	V5	0	1	1
13	HODGE	SNACK		S9	V5	0	1	1
14	PALMER	VENDING	C6	S10	V6	1	1	1
	ANDALL	VENDING	C7	S11		1	1	1

Example 5: Two Table Merge with a BY Variable and the IN= Data Set Option

```
data have_a;
   input ID amount_a;
   datalines;
1 10
3 15
4 20
7 15
9 12
10 14
;

data have_b;
   input ID amount_b;
   datalines;
2 15
3 20
4 10
5 12
7 20
8 15
9 10
11 20
;
```

```
data want;
  merge have_a(in=inA) have_b(in=inb);
  by id;
  length joinType $ 2;
  joinType = cats(inA, inB);
run;

proc print data=want;
run;
quit;
```

MERGED DATA

Obs	ID	amount_a	amount_b	joinType
1	1	10	.	10
2	2	.	15	01
3	3	15	20	11
4	4	20	10	11
5	5	.	12	01
6	7	15	20	11
7	8	.	15	01
8	9	12	10	11
9	10	14	.	10
10	11	.	20	01

See Also

Statements:

- “BY Statement” on page 32
- “MODIFY Statement” on page 277
- “SET Statement” on page 362
- “UPDATE Statement” on page 392

MISSING Statement

Assigns characters in your input data to represent special missing values for numeric data.

Valid in: Anywhere

Category: Information

Restriction: This statement is not valid in the CAS server.

Syntax

MISSING *character(s)*;

Arguments

character
is the value in your input data that represents a special missing value.

Range Special missing values can be any of the 26 letters of the alphabet (uppercase or lowercase) or the underscore (_).

Tip You can specify more than one character.

Details

The MISSING statement usually appears within a DATA step, but it is global in scope.

Comparisons

The MISSING= system option enables you to specify a character to be printed when numeric variables contain ordinary missing values (.). If your data contain characters that represent special missing values, such as **a** or **z**, do not use the MISSING= option to define them; simply define these values in a MISSING statement.

Example: Identifying Certain Types of Missing Data

With survey data, you might want to identify certain types of missing data. For example, in the data, an **A** can mean that the respondent is not at home at the time of the survey; an **R** can mean that the respondent refused to answer. Use the MISSING statement to identify to SAS that the values **A** and **R** in the input data lines are to be considered special missing values rather than invalid numeric data values:

```
data survey;
   missing a r;
   input id answer;
   datalines;
001 2
002 R
003 1
004 A
005 2
;
```

The resulting data set SURVEY contains exactly the values that are coded in the input data.

See Also

Statements:

- “UPDATE Statement” on page 392

System Options:

- “MISSING= System Option” in *SAS Viya System Options: Reference*

MODIFY Statement

Replaces, deletes, and appends observations in an existing SAS data set in place but does not create an additional copy.

Valid in: DATA step

Category: File-Handling

Type: Executable

Restrictions: This statement is not valid in the CAS server.

Cannot modify the descriptor portion of a SAS data set, such as adding a variable

Notes: If you modify a password-protected data set, specify the password with the appropriate data set option (ALTER= or PW=) in the MODIFY statement, and not in the DATA statement.

The variables that are read using the MODIFY statement are retained in the PDV. The data types of the variables that are read are also retained. For more information, see the "RETAIN Statement" on page 346.

CAUTION: **Damage to the SAS data set can occur if the system terminates abnormally during a DATA step that contains the MODIFY statement.** Observations in native SAS data files might have incorrect data values, or the data file might become unreadable. DBMS tables that are referenced by views are not affected.

Syntax

Form 1: **MODIFY** *master-data-set* <(*data-set-options*)> *transaction-data-set* <(*data-set-options*)>
<CUROBS=*variable*> <NOBS=*variable*> <END=*variable*>
<UPDATEMODE=MISSINGCHECK | NOMISSINGCHECK>;
BY *by-variable*;

Form 2: **MODIFY** *master-data-set* <(*data-set-options*)> KEY=*index* </ UNIQUE>
<KEYRESET=*variable*> <NOBS=*variable*> <END=*variable*>;

Form 3: **MODIFY** *master-data-set* <(*data-set-options*)> <NOBS=*variable*> POINT=*variable*;

Form 4: **MODIFY** *master-data-set* <(*data-set-options*)> <NOBS=*variable*> <END=*variable*>;

Arguments

master-data-set
specifies the SAS data set that you want to modify.

Restrictions This data set must also appear in the DATA statement.

For sequential and matching access, the master data set can be a SAS data file, a SAS/ACCESS view, an SQL view, or a DBMS engine for the LIBNAME statement. It cannot be a DATA step view or a pass-through view.

For random access using POINT=, the master data set must be a SAS data file or an SQL view that references a SAS data file.

For direct access using KEY=, the master data set can be a SAS data file or the DBMS engine for the LIBNAME statement. If it is a SAS file, it must be indexed and the index name must be specified on the KEY= option.

For a DBMS, the KEY= is set to the keyword DBKEY and the column names to use as an index must be specified on the DBKEY= data set option. These column names are used in constructing a WHERE expression that is passed to the DBMS.

Tip Instead of using a data set name, you can specify the physical pathname to the file, using syntax that your operating system understands. The pathname must be enclosed in single or double quotation marks.

(*data-set-options*)
specifies one or more SAS data set options in parentheses after a SAS data set name.

Note The data set options specify actions that SAS is to take when it reads observations into the DATA step for processing. For a list of data set options, see the *SAS Viya Data Set Options: Reference*

Tip Data set options that apply to a data set list apply to all of the data sets in the list.

transaction-data-set
specifies the SAS data set that provides the values for matching access. These values are the values that you want to use to update the master data set.

Restriction Specify this data set *only* when the DATA step contains a BY statement.

Tip Instead of using a data set name, you can specify the physical pathname to the file, using syntax that your operating system understands. The pathname must be enclosed in single or double quotation marks.

by-variable
specifies one or more variables by which you identify corresponding observations.

Restriction Variables with a VARCHAR data type are not supported.

CUROBS=*variable*
creates and names a variable that contains the observation number that was just read from the data set.

END=*variable*
creates and names a temporary variable that contains an end-of-file indicator.

Restriction Do not use this argument in the same MODIFY statement with the POINT= argument. POINT= indicates that MODIFY uses random access. The value of the END= variable is never set to 1 for random access.

Notes The variable, which is initialized to zero, is set to 1 when the MODIFY statement reads the last observation of the data set being modified (for sequential access) or the last observation of the transaction data set

(for matching access). It is also set to 1 when MODIFY cannot find a match for a KEY= value (random access).

This variable is not added to any data set.

KEY=*index*

specifies a simple or composite index of the SAS data file that is being modified. The KEY= argument retrieves observations from that SAS data file based on index values that are supplied by like-named variables in another source of information.

Default If the KEY= value is not found, the automatic variable _ERROR_ is set to 1, and the automatic variable _IORC_ receives the value corresponding to the SYSRC autocall macro's mnemonic _DSENOM. See "Automatic Variable _IORC_ and the SYSRC Autocall Macro" on page 283.

Restrictions KEY= processing is different for SAS/ACCESS engines. See the SAS/ACCESS documentation for more information.

Variables with a VARCHAR data type are not supported.

Tips Use the KEYRESET= option to control whether a KEY= search should begin at the top of the index for the data set that is being read.

Examples of sources for index values include a separate SAS data set named in a SET statement and an external file that is read by an INPUT statement.

If duplicates exist in the master file, only the first occurrence is updated unless you use a DO-LOOP to execute a SET statement for the data set that is listed on the KEY=option for all duplicates in the master data set.

If duplicates exist in the transaction data set, and they are consecutive, use the UNIQUE option to force the search for a match in the master data set to begin at the top of the index. Write an accumulation statement to add each duplicate transaction to the observation in master. Without the UNIQUE option, only the first duplicate transaction observation updates the master.

If the duplicates in the transaction data set are not consecutive, the search begins at the beginning of the index each time, so that each duplicate is applied to the master. Write an accumulation statement to add each duplicate to the master.

See "KEYRESET=*variable*" on page 280

UNIQUE on page 281

Examples "Example 5: Modifying Observations Located by an Index" on page 291

"Example 6: Handling Duplicate Index Values" on page 292

"Example 7: Controlling I/O" on page 294

KEYRESET=*variable*
controls whether a KEY= search should begin at the top of the index for the data set that is being read. When the value of the KEYRESET variable is 1, the index lookup begins at the top of the index. When the value of the KEYRESET variable is 0, the index lookup is not reset and the lookup continues where the prior lookup ended.

Restriction Variables with a VARCHAR data type are not supported.

Interaction The KEYRESET= option is similar to the UNIQUE option, except the KEYRESET= option enables you to determine when the KEY= search should begin at the top of the index again.

See "KEY=*index*" on page 279

" UNIQUE" on page 281

NOBS=*variable*
creates and names a temporary variable whose value is usually the total number of observations in the input data set. For certain SAS views and sequential engines such as the TAPE and XML engines, SAS cannot determine the number of observations. In these cases, SAS sets the value of the NOBS= variable to the largest positive integer value available in the operating environment.

Note At compilation time, SAS reads the descriptor portion of the data set and assigns the value of the NOBS= variable automatically. Thus, you can refer to the NOBS= variable before the MODIFY statement. The variable is available in the DATA step but is not added to the new data set.

Tip The NOBS= and POINT= options are independent of each other.

Example "Example 4: Modifying Observations Located by Observation Number" on page 290

POINT=*variable*
reads SAS data sets using random (direct) access by observation number. *variable* names a variable whose value is the number of the observation to read. The POINT= variable is available anywhere in the DATA step, but it is not added to any SAS data set.

Restrictions You cannot use the POINT= option with any of these items:

- BY statement
- WHERE statement
- WHERE= data set option
- transport format data sets
- sequential data sets (on tape or disk)
- a table from another vendor's relational database management system

Variables with a VARCHAR data type are not supported.

You can use POINT= with compressed data sets only if the data set was created with the POINTOBS= data set option set to YES, the default value.

You can use the random access method on compressed files only with SAS version 7 and beyond.

Requirements When using the POINT= argument, include one or both of the following programming constructs:

- a STOP statement
- programming logic that checks for an invalid value of the POINT= variable

Because POINT= reads only the specified observations, SAS cannot detect an end-of-file condition as it would if the file were being read sequentially. Because detecting an end-of-file condition terminates a DATA step automatically, failure to substitute another means of terminating the DATA step when you use POINT= can cause the DATA step to go into a continuous loop.

Tip If the POINT= value does not match an observation number, SAS sets the automatic variable _ERROR_ to 1.

Example "Example 4: Modifying Observations Located by Observation Number" on page 290

UNIQUE

causes a KEY= search always to begin at the top of the index for the data file being modified.

Restriction UNIQUE can appear only with the KEY= option.

Tip Use UNIQUE when there are consecutive duplicate KEY= values in the transaction data set, so that the search for a match in the master data set begins at the top of the index file for each duplicate transaction. You must include an accumulation statement or the duplicate values overwrite each other causing only the last transaction value to be the result in the master observation.

See "KEYRESET=*variable*" on page 280

Example "Example 6: Handling Duplicate Index Values" on page 292

UPDATEMODE=MISSINGCHECK | NOMISSINGCHECK

specifies whether missing variable values in a transaction data set are to be allowed to replace existing variable values in a master data set.

MISSINGCHECK

prevents missing variable values in a transaction data set from replacing values in a master data set.

NOMISSINGCHECK

allows missing variable values in a transaction data set to replace values in a master data set by preventing the check from being performed.

Default MISSINGCHECK

Requirement The UPDATEMODE argument must be accompanied by a BY statement that specifies the variables by which observations are matched.

Tip However, special missing values are the exception and they replace values in the master data set even when MISSINGCHECK is in effect.

Details

Matching Access (Form 1)

The matching access method uses the BY statement to match observations from the transaction data set with observations in the master data set. The BY statement specifies a variable that is in the transaction data set and the master data set.

When the MODIFY statement reads an observation from the transaction data set, it uses dynamic WHERE processing to locate the matching observation in the master data set. The observation in the master data set can be either

- replaced in the master data set with the value from the transaction data set
- deleted from the master data set
- appended to the master data set.

"Example 3: Modifying Observations Using a Transaction Data Set" on page 288 shows the matching access method.

Duplicate BY Values (Form 1)

Duplicates in the master and transaction data sets affect processing.

- If duplicates exist in the master data set, only the first occurrence is updated because the generated WHERE statement always finds the first occurrence in the master.
- If duplicates exist in the transaction data set, the duplicates are applied one on top of another unless you write an accumulation statement to add all of them to the master observation. Without the accumulation statement, the values in the duplicates overwrite each other so that only the value in the last transaction is the result in the master observation.

Direct Access by Indexed Values (Form 2)

This method requires that you use the KEY= option in the MODIFY statement to name an indexed variable from the data set that is being modified. Use another data source (typically a SAS data set named in a SET statement or an external file read by an INPUT statement) to provide a like-named variable whose values are supplied to the index. MODIFY uses the index to locate observations in the data set that is being modified.

"Example 5: Modifying Observations Located by an Index" on page 291 shows the direct-access-by-indexed-values method.

Duplicate Index Values (Form 2)

- If there are duplicate values of the indexed variable in the master data set, only the first occurrence is retrieved, modified, or replaced. Use a DO LOOP to execute a SET statement with the KEY= option multiple times to update all duplicates with the transaction value.
- If there are duplicate, *nonconsecutive* values in the like-named variable in the data source, MODIFY applies each transaction cumulatively to the first observation in the master data set whose index value matches the values from the data source. Therefore, only the value in the last duplicate transaction is the result in the master observation unless you write an accumulation statement to accumulate each duplicate transaction value in the master observation.
- If there are duplicate, *consecutive* values in the variable in the data source, the values from the first observation in the data source are applied to the master data set, but the DATA step terminates with an error when it tries to locate an observation in the master data set for the second duplicate from the data source. To avoid this error, use

the UNIQUE option in the MODIFY statement. The UNIQUE option causes SAS to return to the top of the master data set before retrieving a match for the index value. You must write an accumulation statement to accumulate the values from all the duplicates. If you do not, only the last one applied is the result in the master observation.

"Example 6: Handling Duplicate Index Values" on page 292 shows how to handle duplicate index values.

- If there are duplicate index values in both data sets, you can use SQL to apply the duplicates in the transaction data set to the duplicates in the master data set in a one-to-one correspondence.

Direct (Random) Access by Observation Number (Form 3)

You can use the POINT= option in the MODIFY statement to name a variable from another data source (not the master data set), whose value is the number of an observation that you want to modify in the master data set. MODIFY uses the values of the POINT= variable to retrieve observations in the data set that you are modifying. (You can use POINT= on a compressed data set only if the data set was created with the POINTOBS= data set option.)

It is good programming practice to validate the value of the POINT= variable and to check the status of the automatic variable _ERROR_.

"Example 4: Modifying Observations Located by Observation Number" on page 290 shows the direct (random) access by observation number method.

CAUTION:

POINT= can result in infinite looping. Be careful when you use POINT=, as failure to terminate the DATA step can cause the DATA step to go into a continuous loop. Use a STOP statement, programming logic that checks for an invalid value of the POINT= variable, or both.

Sequential Access (Form 4)

The sequential access method is the simplest form of the MODIFY statement, but it provides less control than the direct access methods. With the sequential access method, you can use the NOBS= and END= options to modify a data set; you do not use the POINT= or KEY= options.

Automatic Variable _IORC_ and the SYSRC Autocall Macro

The automatic variable _IORC_ contains the return code for each I/O operation that the MODIFY statement attempts to perform. The best way to test for values of _IORC_ is with the mnemonic codes that are provided by the SYSRC autocall macro. Each mnemonic code describes one condition. The mnemonics provide an easy method for testing problems in a DATA step program. These codes are useful:

_DSENMR
: specifies that the transaction data set observation does not exist on the master data set (used only with MODIFY and BY statements). If consecutive observations with different BY values do not find a match in the master data set, both of them return _DSENMR.

_DSEMTR
: specifies that multiple transaction data set observations with a given BY value do not exist on the master data set (used only with MODIFY and BY statements). If consecutive observations with the same BY values do not find a match in the master data set, the first observation returns _DSENMR and the subsequent observations return _DSEMTR.

_DSENOM
specifies that the data set being modified does not contain the observation that is requested by the KEY= option or the POINT= option.

_SENOCHN
specifies that SAS is attempting to execute an OUTPUT or REPLACE statement on an observation that contains a key value which duplicates one already existing on an indexed data set that requires unique key values.

_SOK
specifies that the observation was located.

Note: The IORCMSG function returns a formatted error message associated with the current value of _IORC_.

"Example 7: Controlling I/O" on page 294 shows how to use the automatic variable _IORC_ and the SYSRC autocall macro.

Writing Observations When MODIFY Is Used in a DATA Step

The way SAS writes observations to a SAS data set when the DATA step contains a MODIFY statement depends on whether certain other statements are present. The possibilities are

no explicit statement
writes the current observation to its original place in the SAS data set. The action occurs as the last action in the step (as if a REPLACE statement were the last statement in the step).

OUTPUT statement
if no data set is specified in the OUTPUT statement, writes the current observation to the end of all data sets that are specified in the DATA step. If a data set is specified, the statement writes the current observation to the end of the data set that is indicated. The action occurs at the point in the DATA step where the OUTPUT statement appears.

REPLACE <*data-set-name*> statement
rewrites the current observation in the specified data set or data sets, or, if no argument is specified, rewrites the current observation in each data set specified in the DATA statement. The action occurs at the point of the REPLACE statement.

REMOVE <*data-set-name*> statement
deletes the current observation in the specified data set or data sets, or, if no argument is specified, deletes the current observation in each data set specified in the DATA statement. The deletion can be a physical one or a logical one, depending on the characteristics of the engine that maintains the data set.

Remember the following as you work with these statements:

- When no OUTPUT, REPLACE, or REMOVE statement is specified, the default action is REPLACE.
- The OUTPUT, REPLACE, and REMOVE statements are independent of each other. You can code multiple OUTPUT, REPLACE, and REMOVE statements to apply to one observation. However, once an OUTPUT, REPLACE, or REMOVE statement executes, the MODIFY statement must execute again before the next REPLACE or REMOVE statement executes.

  You can use OUTPUT and REPLACE in the following example of conditional logic because only one of the REPLACE or OUTPUT statements executes per observation:

  ```
  data master;
  ```

```
   modify master trans; by key;
   if _iorc_=0 then replace;
   else
      output;
run;
```

But you should not use multiple REPLACE operations on the same observation as in this example:

```
data master;
   modify master;
   x=1;
   replace;
   replace;
run;
```

You can code multiple OUTPUT statements per observation. However, be careful when you use multiple OUTPUT statements. It is possible to go into an infinite loop with just one OUTPUT statement.

```
data master;
   modify master;
   output;
run;
```

- Using OUTPUT, REPLACE, or REMOVE in a DATA step overrides the default replacement of observations. If you use any one of these statements in a DATA step, you must explicitly program each action that you want to take.
- If both an OUTPUT statement and a REPLACE or REMOVE statement execute on a given observation, perform the OUTPUT action last to keep the position of the observation pointer correct.

"Example 8: Replacing and Removing Observations and Writing Observations to Different SAS Data Sets" on page 296 shows how to use the OUTPUT, REMOVE, and REPLACE statements to write observations.

Missing Values and the MODIFY Statement

By default, the UPDATEMODE=MISSINGCHECK option is in effect, so missing values in the transaction data set do *not* replace existing values in the master data set. Therefore, if you want to update some but not all variables and if the variables that you want to update differ from one observation to the next, set to missing those variables that are not changing. If you want missing values in the transaction data set to replace existing values in the master data set, use UPDATEMODE=NOMISSINGCHECK.

Even when UPDATEMODE=MISSINGCHECK is in effect, you can replace existing values with missing values by using special missing value characters in the transaction data set. To create the transaction data set, use the MISSING statement in the DATA step. If you define one of the special missing values **A** through **Z** for the transaction data set, SAS updates numeric variables in the master data set to that value.

If you want the resulting value in the master data set to be a regular missing value, use a single underscore (_) to represent missing values in the transaction data set. The resulting value in the master data set is a period (.) for missing numeric values and a blank for missing character values.

For more information about defining and using special missing value characters, see the "MISSING Statement" on page 275.

Using MODIFY with Data Set Options

If you use data set options (such as KEEP=) in your program, then use the options in the MODIFY statement for the master data set. Using data set options in the DATA statement might produce unexpected results.

Comparisons

- When you use a MERGE, SET, or UPDATE statement in a DATA step, SAS creates a new SAS data set. The data set descriptor of the new copy can be different from the old one (variables added or deleted, labels changed, and so on). When you use a MODIFY statement in a DATA step, however, SAS does not create a new copy of the data set. As a result, the data set descriptor cannot change.

  For information about DBMS replacement rules, see the SAS/ACCESS documentation.

- If you use a BY statement with a MODIFY statement, MODIFY works much like the UPDATE statement, except for these conditions:

  - neither the master data set nor the transaction data set needs to be sorted or indexed. (The BY statement that is used with MODIFY triggers dynamic WHERE processing.)

    Note: Dynamic WHERE processing can be costly if the MODIFY statement modifies a SAS data set that is not in sorted order or has not been indexed. Having the master data set in sorted order or indexed and having the transaction data set in sorted order reduces processing overhead, especially for large files.

  - both the master data set and the transaction data set can have observations with duplicate values of the BY variables. MODIFY treats the duplicates as described in "Duplicate BY Values (Form 1)" on page 282.

  - MODIFY cannot make any changes to the descriptor information of the data set as UPDATE can. Thus, it cannot add or delete variables, change variable labels, and so on.

Examples

Example 1: Input Data Set for Examples

The examples modify the INVTY.STOCK data set. INVTY.STOCK contains these variables:

PARTNO
: is a character variable with a unique value identifying each tool number.

DESC
: is a character variable with the text description of each tool.

INSTOCK
: is a numeric variable with a value describing how many units of each tool the company has in stock.

RECDATE
: is a numeric variable containing the SAS date value that is the day for which INSTOCK values are current.

PRICE
: is a numeric variable with a value that describes the unit price for each tool.

In addition, INVTY.STOCK contains a simple index on PARTNO. This DATA step creates INVTY.STOCK:

```
libname invty 'SAS-library';

data invty.stock(index=(partno));
   input PARTNO $ DESC $ INSTOCK @17
         RECDATE date7. @25 PRICE;
   format  recdate date7.;
   datalines;
K89R seal   34  27jul95 245.00
M4J7 sander 98  20jun95 45.88
LK43 filter 121 19may96 10.99
MN21 brace 43   10aug96 27.87
BC85 clamp 80   16aug96 9.55
NCF3 valve 198  20mar96 24.50
KJ66 cutter 6   18jun96 19.77
UYN7 rod  211   09sep96 11.55
JD03 switch 383 09jan97 13.99
BV1E timer 26   03jan97 34.50
;
```

Example 2: Modifying All Observations

This example replaces the date on all of the records in the data set INVTY.STOCK with the current date. It also replaces the value of the variable RECDATE with the current date for all observations in INVTY.STOCK:

```
data invty.stock;
   modify invty.stock;
   recdate=today();
run;
proc print data=invty.stock noobs;
   title 'INVTY.STOCK';
run;
```

Output 2.19 *Results of Updating the RECDATE Field*

INVTY.STOCK

PARTNO	DESC	INSTOCK	RECDATE	PRICE
K89R	seal	34	08DEC10	245.00
M4J7	sander	98	08DEC10	45.88
LK43	filter	121	08DEC10	10.99
MN21	brace	43	08DEC10	27.87
BC85	clamp	80	08DEC10	9.55
NCF3	valve	198	08DEC10	24.50
KJ66	cutter	6	08DEC10	19.77
UYN7	rod	211	08DEC10	11.55
JD03	switch	383	08DEC10	13.99
BV1E	timer	26	08DEC10	34.50

The MODIFY statement opens INVTY.STOCK for update processing. SAS reads one observation of INVTY.STOCK for each iteration of the DATA step and performs any operations that the code specifies. In this case, the code replaces the value of RECDATE with the result of the TODAY function for every iteration of the DATA step. An implicit REPLACE statement at the end of the step writes each observation to its previous location in INVTY.STOCK.

Example 3: Modifying Observations Using a Transaction Data Set

This example adds the quantity of newly received stock to its data set INVTY.STOCK as well as updating the date on which stock was received. The transaction data set ADDINV in the Work library contains the new data.

The ADDINV data set is the data set that contains the updated information. ADDINV contains these variables:

PARTNO
: is a character variable that corresponds to the indexed variable PARTNO in INVTY.STOCK.

NWSTOCK
: is a numeric variable that represents quantities of newly received stock for each tool.

ADDINV is the second data set in the MODIFY statement. SAS uses it as the transaction data set and reads each observation from ADDINV sequentially. Because the BY statement specifies the common variable PARTNO, MODIFY finds the first occurrence of the value of PARTNO in INVTY.STOCK that matches the value of PARTNO in ADDINV. For each observation with a matching value, the DATA step changes the value of RECDATE to today's date and replaces the value of INSTOCK with the sum of INSTOCK and NWSTOCK (from ADDINV). MODIFY does not add NWSTOCK to the INVTY.STOCK data set because that would modify the data set descriptor. Thus, it is not necessary to put NWSTOCK in a DROP statement.

This example specifies ADDINV as the transaction data set that contains information to modify INVTY.STOCK. A BY statement specifies the shared variable whose values locate the observations in INVTY.STOCK.

This DATA step creates ADDINV:

```
data addinv;
   input PARTNO $ NWSTOCK;
   datalines;
K89R 55
M4J7 21
LK43 43
MN21 73
BC85 57
NCF3 90
KJ66 2
UYN7 108
JD03 55
BV1E 27
;
```

This DATA step uses values from ADDINV to update INVTY.STOCK.

```
libname invty 'SAS-library';

data invty.stock;
   modify invty.stock addinv;
   by partno;
   RECDATE=today();
   INSTOCK=instock+nwstock;
   if _iorc_=0 then replace;
run;

proc print data=invty.stock noobs;
   title 'INVTY.STOCK';
run;
```

Output 2.20 *Results of Updating the INSTOCK and RECDATE Fields*

INVTY.STOCK

PARTNO	DESC	INSTOCK	RECDATE	PRICE
K89R	seal	89	08DEC10	245.00
M4J7	sander	119	08DEC10	45.88
LK43	filter	164	08DEC10	10.99
MN21	brace	116	08DEC10	27.87
BC85	clamp	137	08DEC10	9.55
NCF3	valve	288	08DEC10	24.50
KJ66	cutter	8	08DEC10	19.77
UYN7	rod	319	08DEC10	11.55
JD03	switch	438	08DEC10	13.99
BV1E	timer	53	08DEC10	34.50

Example 4: Modifying Observations Located by Observation Number

This example reads the data set NEWP, determines which observation number in INVTY.STOCK to update based on the value of TOOL_OBS, and performs the update. This example explicitly specifies the update activity by using an assignment statement to replace the value of PRICE with the value of NEWP.

The data set NEWP contains two variables:

TOOL_OBS
: contains the observation number of each tool in the tool company's master data set, INVTY.STOCK.

NEWP
: contains the new price for each tool.

This DATA step creates NEWP:

```
data newp;
   input TOOL_OBS NEWP;
   datalines;
 1 251.00
 2 49.33
 3 12.32
 4 30.00
 5 15.00
 6 25.75
 7 22.00
 8 14.00
 9 14.32
10 35.00
;
```

This DATA step updates INVTY.STOCK:

```
libname invty 'SAS-library';

data invty.stock;
   set newp;
   modify invty.stock point=tool_obs
          nobs=max_obs;
   if _error_=1 then
      do;
        put 'ERROR occurred for TOOL_OBS=' tool_obs /
        'during DATA step iteration' _n_ /
        'TOOL_OBS value might be out of range.';
        _error_=0;
        stop;
      end;
   PRICE=newp;
   RECDATE=today();
run;

proc print data=invty.stock noobs;
   title 'INVTY.STOCK';
run;
```

Output 2.21 *Results of Updating the RECDATE and PRICE Fields*

INVTY.STOCK

PARTNO	DESC	INSTOCK	RECDATE	PRICE
K89R	seal	34	08DEC10	251.00
M4J7	sander	98	08DEC10	49.33
LK43	filter	121	08DEC10	12.32
MN21	brace	43	08DEC10	30.00
BC85	clamp	80	08DEC10	15.00
NCF3	valve	198	08DEC10	25.75
KJ66	cutter	6	08DEC10	22.00
UYN7	rod	211	08DEC10	14.00
JD03	switch	383	08DEC10	14.32
BV1E	timer	26	08DEC10	35.00

Example 5: Modifying Observations Located by an Index

This example uses the KEY= option to identify observations to retrieve by matching the values of PARTNO from ADDINV with the indexed values of PARTNO in INVTY.STOCK. ADDINV is created in "Example 3: Modifying Observations Using a Transaction Data Set" on page 288.

KEY= supplies index values that allow MODIFY to access directly the observations to update. No dynamic WHERE processing occurs. In this example, you specify that the

value of INSTOCK in the master data set INVTY.STOCK increases by the value of the variable NWSTOCK from the transaction data set ADDINV.

```
libname invty 'SAS-library';

data invty.stock;
   set addinv;
   modify invty.stock key=partno;
   INSTOCK=instock+nwstock;
   RECDATE=today();
   if _iorc_=0 then replace;
run;

proc print data=invty.stock noobs;
   title 'INVTY.STOCK';
run;
```

Output 2.22 *Results of Updating the INSTOCK and RECDATE Fields By Using an Index*

INVTY.STOCK

PARTNO	DESC	INSTOCK	RECDATE	PRICE
K89R	seal	89	08DEC10	245.00
M4J7	sander	119	08DEC10	45.88
LK43	filter	164	08DEC10	10.99
MN21	brace	116	08DEC10	27.87
BC85	clamp	137	08DEC10	9.55
NCF3	valve	288	08DEC10	24.50
KJ66	cutter	8	08DEC10	19.77
UYN7	rod	319	08DEC10	11.55
JD03	switch	438	08DEC10	13.99
BV1E	timer	53	08DEC10	34.50

Example 6: Handling Duplicate Index Values

This example shows how MODIFY handles duplicate values of the variable in the SET data set that is supplying values to the index on the master data set.

The NEWINV data set is the data set that contains the updated information. NEWINV contains these variables:

PARTNO
: is a character variable that corresponds to the indexed variable PARTNO in INVTY.STOCK. The NEWINV data set contains duplicate values for PARTNO; **M4J7** appears twice.

NWSTOCK
: is a numeric variable that represents quantities of newly received stock for each tool.

This DATA step creates NEWINV:

```
   data newinv;
      input PARTNO $ NWSTOCK;
      datalines;
   K89R 55
   M4J7 21
   M4J7 26
   LK43 43
   MN21 73
   BC85 57
   NCF3 90
   KJ66 2
   UYN7 108
   JD03 55
   BV1E 27
   ;
```

This DATA step terminates with an error when it tries to locate an observation in INVTY.STOCK to match with the second occurrence of **M4J7** in NEWINV:

```
libname invty 'SAS-library';

   /* This DATA step terminates with an error! */
data invty.stock;
   set newinv;
   modify invty.stock key=partno;
   INSTOCK=instock+nwstock;
   RECDATE=today();
run;
```

This message appears in the SAS log:

```
ERROR: No matching observation was found in MASTER data set.
PARTNO=M4J7 NWSTOCK=26 DESC=sander INSTOCK=166 RECDATE=08DEC10 PRICE=45.88
_ERROR_=1
_IORC_=1230015 _N_=3
NOTE: The SAS System stopped processing this step because of errors.
NOTE: There were 3 observations read from the data set WORK.NEWINV.
NOTE: The data set INVTY.STOCK has been updated.  There were 2 observations
rewritten, 0
      observations added and 0 observations deleted.
```

Adding the UNIQUE option to the MODIFY statement avoids the error in the previous DATA step. The UNIQUE option causes the DATA step to return to the top of the index each time it looks for a match for the value from the SET data set. Thus, it finds the **M4J7** in the MASTER data set for each occurrence of **M4J7** in the SET data set. The updated result for **M4J7** in the output shows that both values of NWSTOCK from NEWINV for **M4J7** are added to the value of INSTOCK for **M4J7** in INVTY.STOCK. An accumulation statement sums the values; without it, only the value of the last instance of **M4J7** would be the result in INVTY.STOCK.

```
data invty.stock;
   set newinv;
   modify invty.stock key=partno / unique;
   INSTOCK=instock+nwstock;
   RECDATE=today();
   if _iorc_=0 then replace;
run;
proc print data=invty.stock noobs;
   title 'Results of Using the UNIQUE Option';
```

```
run;
```

Output 2.23 *Results of Updating the INSTOCK and RECDATE Fields By Using the UNIQUE Option*

Results of Using the UNIQUE Option

PARTNO	DESC	INSTOCK	RECDATE	PRICE
K89R	seal	89	08DEC10	245.00
M4J7	sander	145	08DEC10	45.88
LK43	filter	164	08DEC10	10.99
MN21	brace	116	08DEC10	27.87
BC85	clamp	137	08DEC10	9.55
NCF3	valve	288	08DEC10	24.50
KJ66	cutter	8	08DEC10	19.77
UYN7	rod	319	08DEC10	11.55
JD03	switch	438	08DEC10	13.99
BV1E	timer	53	08DEC10	34.50

Example 7: Controlling I/O

This example uses the SYSRC autocall macro and the _IORC_ automatic variable to control I/O condition. This technique helps prevent unexpected results that could go undetected. This example uses the direct access method with an index to update INVTY.STOCK. The data in the NEWSHIP data set updates INVTY.STOCK.

This DATA step creates NEWSHIP:

```
data newship;
   input PARTNO $ DESC $ NWSTOCK @17
         SHPDATE date7. @25 NWPRICE;
   datalines;
K89R seal 14    14nov96 245.00
M4J7 sander 24  23aug96 47.98
LK43 filter 11  29jan97 14.99
MN21 brace 9    09jan97 27.87
BC85 clamp 12   09dec96 10.00
ME34 cutter 8   14nov96 14.50
;
```

Each WHEN clause in the SELECT statement specifies actions for each input/output return code that is returned by the SYSRC autocall macro:

- _SOK indicates that the MODIFY statement executed successfully.
- _DSENOM indicates that no matching observation was found in INVTY.STOCK. The OUTPUT statement specifies that the observation be appended to INVTY.STOCK. See the last observation in the output.

- If any other code is returned by SYSRC, the DATA step terminates and the PUT statement writes the message to the log.

```
libname invty 'SAS-library';

data invty.stock;
   set newship;
   modify invty.stock key=partno;
   select (_iorc_);
      when (%sysrc(_sok)) do;
         INSTOCK=instock+nwstock;
         RECDATE=shpdate;
         PRICE=nwprice;
         replace;
      end;
      when (%sysrc(_dsenom)) do;
         INSTOCK=nwstock;
         RECDATE=shpdate;
         PRICE=nwprice;
         output;
         _error_=0;
      end;
      otherwise do;
         put
         'An unexpected I/O error has occurred.'/
         'Check your data and your program';
         _error_=0;
         stop;
       end;
   end;
run;

proc print data=invty.stock noobs;
   title 'INVTY.STOCK Data Set';
run;
```

Output 2.24 *The Updated INVTY.STOCK Data Set*

INVTY.STOCK Data Set

PARTNO	DESC	INSTOCK	RECDATE	PRICE
K89R	seal	48	14NOV96	245.00
M4J7	sander	122	23AUG96	47.98
LK43	filter	132	29JAN97	14.99
MN21	brace	52	09JAN97	27.87
BC85	clamp	92	09DEC96	10.00
NCF3	valve	198	20MAR96	24.50
KJ66	cutter	6	18JUN96	19.77
UYN7	rod	211	09SEP96	11.55
JD03	switch	383	09JAN97	13.99
BV1E	timer	26	03JAN97	34.50
ME34	cutter	8	14NOV96	14.50

Example 8: Replacing and Removing Observations and Writing Observations to Different SAS Data Sets

This example shows that you can replace and remove (delete) observations and write observations to different data sets. Further, this example shows that if an OUTPUT, REPLACE, or REMOVE statement is present, you must specify explicitly what action to take because no default statement is generated.

The parts that were received in 1997 are written to INVTY.STOCK97 and are removed from INVTY.STOCK. Likewise, the parts that were received in 1995 are written to INVTY.STOCK95 and are removed from INVTY.STOCK. Only the parts that were received in 1996 remain in INVTY.STOCK, and the PRICE is updated only in INVTY.STOCK.

```
libname invty 'SAS-library';

data invty.stock invty.stock95 invty.stock97;
   modify invty.stock;
   if recdate>'01jan97'd then do;
       output invty.stock97;
       remove invty.stock;
   end;
   else if recdate<'01jan96'd then do;
       output invty.stock95;
       remove invty.stock;
   end;
   else do;
      price=price*1.1;
      replace invty.stock;
   end;
```

```
run;

proc print data=invty.stock noobs;
   title 'New Prices for Stock Received in 1996';
run;
```

Output 2.25 *Output from Writing Observations to a SpecificSAS Data Set*

New Prices for Stock Received in 1996

PARTNO	DESC	INSTOCK	RECDATE	PRICE
LK43	filter	121	19MAY96	12.089
MN21	brace	43	10AUG96	30.657
BC85	clamp	80	16AUG96	10.505
NCF3	valve	198	20MAR96	26.950
KJ66	cutter	6	18JUN96	21.747
UYN7	rod	211	09SEP96	12.705

See Also

- *SAS Viya SQL Procedure User's Guide*

Statements:

- "MISSING Statement" on page 275
- "OUTPUT Statement" on page 300
- "REMOVE Statement" on page 338
- "REPLACE Statement" on page 342
- "UPDATE Statement" on page 392

Null Statement

Signals the end of data lines or acts as a placeholder.

Valid in: Anywhere

Categories: Action
CAS

Type: Executable

Syntax

;

or

;;;;

Without Arguments

The Null statement signals the end of the data lines that occur in your program.

Details

The primary use of the Null statement is to signal the end of data lines that follow a DATALINES or CARDS statement. In this case, the Null statement functions as a step boundary. When your data lines contain semicolons, use the DATALINES4 or CARDS4 statement and a Null statement of four semicolons.

Although the Null statement performs no action, it is an executable statement. Therefore, a label can precede the Null statement, or you can use it in conditional processing.

Example: Marking the End of Data Lines

- The Null statement in this program marks the end of data lines and functions as a step boundary.

```
data test;
   input score1 score2 score3;
   datalines;
55 135 177
44 132 169
;
```

- The input data records in this example contain semicolons. Use the Null statement following the DATALINES4 statement to signal the end of the data lines.

```
data test2;
   input code1 $ code2 $ code3 $;
   datalines4;
55;39;1  135;32;4  177;27;3
78;29;1  149;22;4  179;37;3
;;;;
```

- The Null statement is useful while you are developing a program. For example, use it after a statement label to test your program before you code the statements that follow the label.

```
data _null_;
   set dsn;
   file print header=header;
   put 'report text';
     ...more statements...
   return;
   header:;
run;
```

See Also

Statements:

- “DATALINES Statement” on page 54
- “DATALINES4 Statement” on page 56
- “GO TO Statement” on page 125
- “LABEL Statement” on page 205

OPTIONS Statement

Specifies or changes the value of one or more SAS system options.

Valid in: Anywhere

Category: Program Control

Restriction: This statement is not valid in the CAS server.

Syntax

OPTIONS *option(s)*;

Arguments

option
specifies one or more SAS system options to be changed.

Details

The change that is made by the OPTIONS statement remains in effect for the rest of the job, session, SAS process, or until you issue another OPTIONS statement to change the options again. You can specify SAS system options through the OPTIONS statement, at SAS invocation, and at the initiation of a SAS process.

If you attempt to set an option that is restricted by your site administrator, SAS issues a note that the option is restricted and cannot be changed. For more information, see "Restricted Options" in *SAS Viya System Options: Reference*.

Note: If you want a particular group of options to be in effect for all your SAS jobs or sessions, store an OPTIONS statement in an autoexec file or list the system options in a configuration file or custom_option_set.

Note: For a system option with a null value, the GETOPTION function returns a value of '' (single quotation marks with a blank space between them), for example, **EMAILID=' '**. This GETOPTION value can then be used in the OPTIONS statement.

An OPTIONS statement can appear at any place in a SAS program, except within data lines.

Example: Changing the Value of a System Option

This example suppresses the date that is normally written to SAS output and sets a line size of 72:

```
options nodate linesize=72;
```

See Also

"Definition of System Options" in *SAS Viya System Options: Reference*

OUTPUT Statement

Writes the current observation to a SAS data set.

Valid in: DATA step

Categories: Action
CAS

Type: Executable

Syntax

OUTPUT <*data-set-name(s)*>;

Without Arguments

Using OUTPUT without arguments causes the current observation to be written to all data sets that are named in the DATA statement.

If a MODIFY statement is present, OUTPUT with no arguments writes the current observation to the end of the data set that is specified in the MODIFY statement.

Arguments

data-set-name
specifies the name of a data set to which SAS writes the observation.

Restriction All names specified in the OUTPUT statement must also appear in the DATA statement.

Tips Instead of using a data set name, you can specify the physical pathname to the file, using syntax that your operating system understands. The pathname must be enclosed in single or double quotation marks.

You can specify up to as many data sets in the OUTPUT statement as you specified in the DATA statement for that DATA step.

Details

When and Where the OUTPUT Statement Writes Observations

The OUTPUT statement tells SAS to write the current observation to a SAS data set immediately, not at the end of the DATA step. If no data set name is specified in the OUTPUT statement, the observation is written to the data set or data sets that are listed in the DATA statement.

Implicit versus Explicit Output

By default, every DATA step contains an implicit OUTPUT statement at the end of each iteration that tells SAS to write observations to the data set or data sets that are being created. Placing an explicit OUTPUT statement in a DATA step overrides the automatic output, and SAS adds an observation to a data set only when an explicit OUTPUT statement is executed. Once you use an OUTPUT statement to write an observation to any one data set, however, there is no implicit OUTPUT statement at the end of the

DATA step. In this situation, a DATA step writes an observation to a data set only when an explicit OUTPUT executes. You can use the OUTPUT statement alone or as part of an IF-THEN or SELECT statement or in DO-loop processing.

When Using the MODIFY Statement

When you use the MODIFY statement with the OUTPUT statement, the REMOVE and REPLACE statements override the implicit write action at the end of each DATA step iteration. See "Comparisons " on page 301 for more information. If both the OUTPUT statement and a REPLACE or REMOVE statement execute on a given observation, perform the output action last to keep the position of the observation pointer correct.

Comparisons

- OUTPUT writes observations to a SAS data set; PUT writes variable values or text strings to an external file or the SAS log.
- To control when an observation is written to a specified output data set, use the OUTPUT statement. To control which variables are written to a specified output data set, use the KEEP= or DROP= data set option in the DATA statement, or use the KEEP or DROP statement.
- When you use the OUTPUT statement with the MODIFY statement, the following items apply.
  - Using an OUTPUT, REPLACE, or REMOVE statement overrides the default write action at the end of a DATA step. (OUTPUT is the default action; REPLACE becomes the default action when a MODIFY statement is used.) If you use any of these statements in a DATA step, you must explicitly program output for the new observations that are added to the data set.
  - The OUTPUT, REPLACE, and REMOVE statements are independent of each other. More than one statement can apply to the same observation, as long as the sequence is logical.
  - If both an OUTPUT and a REPLACE or REMOVE statement execute on a given observation, perform the OUTPUT action last to keep the position of the observation pointer correct.

Examples

Example 1: Sample Uses of OUTPUT

These examples show how you can use an OUTPUT statement:

- This line of code writes the current observation to a SAS data set.

```
output;
```

- This line of code writes the current observation to a SAS data set when a specified condition is true.

```
if deptcode gt 2000 then output;
```

- This line of code writes an observation to the data set MARKUP when the PHONE value is missing.

```
if phone=. then output markup;
```

Example 2: Creating Multiple Observations from Each Line of Input

You can create two or more observations from each line of input data. This SAS program creates three observations in the data set RESPONSE for each observation in the data set SULFA:

```
data response(drop=time1-time3);
   set sulfa;
   time=time1;
   output;
   time=time2;
   output;
   time=time3;
   output;
run;
```

Example 3: Creating Multiple Data Sets from a Single Input File

You can create more than one SAS data set from one input file. In this example, OUTPUT writes observations to two data sets, OZONE and OXIDES:

```
data ozone oxides;
   infile file-specification;
   input city $ 1-15 date date9.
      chemical $ 26-27 ppm 29-30;
   if chemical='O3' then output ozone;
   else output oxides;
run;
```

Example 4: Creating One Observation from Several Lines of Input

You can combine several input observations into one observation. In this example, OUTPUT creates one observation that totals the values of DEFECTS in the first ten observations of the input data set:

```
data discards;
   set gadgets;
   drop defects;
   reps+1;
   if reps=1 then total=0;
   total+defects;
   if reps=10 then do;
      output;
      stop;
   end;
run;
```

See Also

Statements:

- “DATA Statement” on page 45
- “MODIFY Statement” on page 277
- “PUT Statement” on page 303
- “REMOVE Statement” on page 338
- “REPLACE Statement” on page 342

PAGE Statement

Skips to a new page in the SAS log.

Valid in: Anywhere

Category: Log Control

Restriction: This statement is not valid in the CAS server.

Syntax

PAGE;

Without Arguments

The PAGE statement skips to a new page in the SAS log.

Details

You can use the PAGE statement when you run SAS in a batch, or noninteractive mode. The PAGE statement itself does not appear in the log. When you run SAS in interactive line mode, PAGE might print blank lines to the display monitor (or to the alternate log file).

See Also

Statements:

- "LIST Statement" on page 256

System Options:

- "LINESIZE= System Option" in *SAS Viya System Options: Reference*
- "PAGESIZE= System Option" in *SAS Viya System Options: Reference*

PUT Statement

Writes lines to the SAS log, to the Results window, or to an external location that is specified in the most recent FILE statement.

Valid in: DATA step

Categories: CAS
File-Handling

Type: Executable

Syntax

PUT <*specification(s)*> <_ODS_> <@ | @@>;

Without Arguments

The PUT statement without arguments is called a *null PUT statement*. The null PUT statement

- writes the current output line to the current location, even if the current output line is blank
- releases an output line that is being held with a trailing @ by a previous PUT statement.

For an example, see "Example 5: Holding and Releasing Output Lines" on page 318.
For more information, see "Using Line-Hold Specifiers" on page 312.

Arguments

specification(s)
specifies what is written, how it is written, and where it is written. The specification can include

variable
specifies the variable whose value is written.

Note: Beginning with Version 7, you can specify column-mapped Output Delivery System variables in the PUT statement. This functionality is described briefly here in _ODS_ on page 305.

(*variable-list*)
specifies a list of variables whose values are written.

Requirement The (*format-list*) must follow the (*variable-list*).

See "PUT Statement, Formatted" on page 323

'character-string'
specifies a string of text, enclosed in quotation marks, to write.

Tips To write a hexadecimal string in EBCDIC or ASCII, follow the ending quotation mark with an **x**.

If you use single quotation marks (') or double quotation marks ("") together (with no space in between them) as the string of text, SAS generate a single quotation mark (') or double quotation mark ("), respectively.

See "List Output" on page 310

Example This statement writes HELLO when the hexadecimal string is converted to ASCII characters:

```
put '68656C6C6F'x;
```

n*
specifies to repeat *n* times the subsequent character string.

Example This statement writes a line of 132 underscores.

```
put 132*'_';
```

Example "Example 4: Underlining Text" on page 318

pointer-control
moves the output pointer to a specified line or column in the output buffer.

See "Column Pointer Controls " on page 306

"Line Pointer Controls " on page 308

column-specifications
specifies which columns of the output line the values are written.

See "Column Output" on page 310

Example "Example 2: Moving the Pointer within a Page" on page 315

format.
specifies a format to use when the variable values are written.

See "Formatted Output" on page 310

Example "Example 1: Using Multiple Output Styles in One PUT Statement" on page 314

(*format-list*)
specifies a list of formats to use when the values of the preceding list of variables are written.

Restriction The (*format-list*) must follow the (*variable-list*).

See "PUT Statement, Formatted" on page 323

INFILE
writes the last input data record that is read either from the current input file or from the data lines that follow a DATELINES statement.

Tips _INFILE_ is an automatic variable that references the current INPUT buffer. You can use this automatic variable in other SAS statements.

If the most recent INPUT statement uses line-pointer controls to read multiple input data records, PUT _INFILE_ writes only the record that the input pointer is positioned on.

Example This PUT statement writes all the values of the first input data record:

```
input #3 score #1 name $ 6-23;
put _infile_;
```

Example "Example 6: Writing the Current Input Record to the Log" on page 319

ALL
writes the values of all variables, which includes automatic variables, that are defined in the current DATA step by using named output.

See "Named Output" on page 310

ODS
moves data values for all columns (as defined by the ODS option in the FILE statement) into a special buffer, from which it is eventually written to the data component. The ODS option in the FILE statement defines the structure of the data component that holds the results of the DATA step.

Restrictions When writing to ODS, the PUT statement does not support VARCHAR variables in SAS Viya.

Use _ODS_ only if you have previously specified the ODS option in the FILE statement.

Interaction _ODS_ writes data to a specific column only if a PUT statement has not already specified a variable for that column with a column pointer. That is, a variable specification for a column overrides the _ODS_ option.

Tip You can use the _ODS_ specification in conjunction with variable specifications and column pointers, and it can appear anywhere in a PUT statement.

@|@@
holds an output line for the execution of the next PUT statement even across iterations of the DATA step. These line-hold specifiers are called *trailing* @ and *double trailing* @.

Restriction The trailing @ or double trailing @ must be the last item in the PUT statement.

Tip Use an @ or @@ to hold the pointer at its current location. The next PUT statement that executes writes to the same output line rather than to a new output line.

See "Using Line-Hold Specifiers" on page 312

Example "Example 5: Holding and Releasing Output Lines" on page 318

Column Pointer Controls

@n
moves the pointer to column *n*.

Range a positive integer

Example @15 moves the pointer to column 15 before the value of NAME is written:

```
put @15 name $10.;
```

Examples "Example 2: Moving the Pointer within a Page" on page 315 and

"Example 4: Underlining Text" on page 318

@numeric-variable
moves the pointer to the column given by the value of *numeric-variable*.

Range a positive integer

Tip If *n* is not an integer, SAS truncates the decimal portion and uses only the integer value. If *n* is zero or negative, the pointer moves to column 1.

Example The value of the variable A moves the pointer to column 15 before the value of NAME is written:

```
a=15;
```

```
put @a name $10.;
```

Example "Example 2: Moving the Pointer within a Page" on page 315

@(expression)
moves the pointer to the column that is given by the value of *expression*.

Range a positive integer

Tip If the value of *expression* is not an integer, SAS truncates the decimal value and uses only the integer value. If it is zero, the pointer moves to column 1.

Example The result of the expression moves the pointer to column 15 before the value of NAME is written:

```
b=5;
put @(b*3) name $10.;
```

+n
moves the pointer *n* columns.

Range a positive integer or zero

Tip If *n* is not an integer, SAS truncates the decimal portion and uses only the integer value.

Example This statement moves the pointer to column 23, writes a value of LENGTH in columns 23 through 26, advances the pointer five columns, and writes the value of WIDTH in columns 32 through 35:

```
put @23 length 4. +5 width 4.;
```

+numeric-variable
moves the pointer the number of columns given by the value of *numeric-variable*.

Range a positive or negative integer or zero

Tip If *numeric-variable* is not an integer, SAS truncates the decimal value and uses only the integer value. If *numeric-variable* is negative, the pointer moves backward. If the current column position becomes less than 1, the pointer moves to column 1. If the value is zero, the pointer does not move. If the value is greater than the length of the output buffer, the current line is written out and the pointer moves to column 1 on the next line.

+(expression)
moves the pointer the number of columns given by *expression*.

Range *expression* must result in an integer

Tip If *expression* is not an integer, SAS truncates the decimal value and uses only the integer value. If *expression* is negative, the pointer moves backward. If the current column position becomes less than 1, the pointer moves to column 1. If the value is zero, the pointer does not move. If the value is greater than the length of the output buffer, the current line is written out and the pointer moves to column 1 on the next line.

Example "Example 2: Moving the Pointer within a Page" on page 315

Line Pointer Controls

#n

moves the pointer to line *n* and column 1.

Range a positive integer

Example The #2 moves the pointer to the second line before the value of ID is written in columns 3 and 4:

```
put @12 name $10. #2 id 3-4;
```

#numeric-variable

moves the pointer to the line given by the value of *numeric-variable* and to column 1.

Range a positive integer

Tip If the value of *numeric-variable* is not an integer, SAS truncates the decimal value and uses only the integer value.

#(expression)

moves the pointer to the line that is given by the value of *expression* and to column 1.

Range *Expression* must result in a positive integer.

Tip If the value of *expression* is not an integer, SAS truncates the decimal value and uses only the integer value.

/

advances the pointer to column 1 of the next line.

Note If you try to use one or more "/" line pointer controls to add blank lines to the SAS log, SAS suppresses the blank lines. For other forms of output, the blank lines are produced.

Example The values for NAME and AGE are written on one line, and then the pointer moves to the second line to write the value of ID in columns 3 and 4:

```
put name age / id 3-4;
```

Example "Example 3: Moving the Pointer to a New Page" on page 317

OVERPRINT

causes the values that follow the keyword OVERPRINT to print on the most recently written output line.

Requirement You must direct the output to a file. Set the N= option in the FILE statement to 1 and direct the PUT statements to a file.

Tips OVERPRINT has no effect on lines that are written to a display.

Use OVERPRINT in combination with column pointer and line pointer controls to overprint text.

Example This statement overprints underscores, starting in column 15, which underlines the title:

```
put @15 'Report Title' overprint
```

```
@15 '___________';
```

Example "Example 4: Underlining Text" on page 318

BLANKPAGE
advances the pointer to the first line of a new page, even when the pointer is positioned on the first line and the first column of a new page.

Tip If the current output file contains carriage-control characters, _BLANKPAGE_ produces output lines that contain the appropriate carriage-control character.

Example "Example 3: Moving the Pointer to a New Page" on page 317

PAGE
advances the pointer to the first line of a new page. SAS automatically begins a new page when a line exceeds the current PAGESIZE= value.

Tips If the current output file is printed, _PAGE_ produces an output line that contains the appropriate carriage-control character. _PAGE_ has no effect on a file that is not printed.

If you specify FILE PRINT in an interactive SAS session, then the Results window interprets the form-feed control characters as page breaks, and they are removed from the output. The resulting file is a flat file without page break characters. If a file needs to contain the form-feed characters, then the FILE statement should include a physical file location and the PRINT option.

Example "Example 3: Moving the Pointer to a New Page" on page 317

Details

When to Use PUT

Use the PUT statement to write lines to the SAS log, to the Results window, or to an external location. If you do not execute a FILE statement before the PUT statement in the current iteration of a DATA step, SAS writes the lines to the SAS log. If you specify the PRINT option in the FILE statement, SAS writes the lines to the Results window.

The PUT statement can write lines that contain variable values, character strings, and hexadecimal character constants. With specifications in the PUT statement, you specify what to write, where to write it, and how to format it.

Output Styles

Overview of Output Styles

There are four ways to write variable values with the PUT statement:

- column
- list (simple and modified)
- formatted
- named

A single PUT statement might contain any or all of the available output styles, depending on how you want to write lines.

Column Output

With *column output,* the column numbers follow the variable in the PUT statement. These numbers indicate where in the line to write the following value:

```
put name 6-15 age 17-19;
```

These lines are written to the SAS log.

Note: The ruled line is for illustrative purposes only; the PUT statement does not generate it.

```
----+----1----+----2----+
     Peterson    21
     Morgan      17
```

The PUT statement writes values for NAME and AGE in the specified columns.See "PUT Statement, Column" on page 321 for more information.

List Output

With *list output,* list the variables and character strings in the PUT statement in the order in which you want to write them. For example, this PUT statement writes the values for NAME and AGE to the SAS log.

```
put name age;
```

Here is the SAS log.

```
----+----1----+----2----+
Peterson 21
Morgan 17
```

Note: The ruled line is for illustrative purposes only; the PUT statement does not generate it.

See "PUT Statement, List" on page 328 for more information.

Formatted Output

With *formatted output*, specify a SAS format or a user-written format after the variable name. The format gives instructions on how to write the variable value. Formats enable you to write in a nonstandard form, such as packed decimal, or numbers that contain special characters such as commas. You can also override the default alignment of the formatted output by using -L, -C, or -R.

For example, this PUT statement writes the values for NAME, AGE, and DATE to the SAS log.

```
put name $char10. age 2. +1 date mmddyy10.;
```

Here is the SAS log.

```
----+----1----+----2----+
Peterson  21 07/18/1999
Morgan    17 11/12/1999
```

Note: The ruled line is for illustrative purposes only; the PUT statement does not generate it.

Using a pointer control of +1 inserts a blank space between the values of AGE and DATE. For more information, see "PUT Statement, Formatted" on page 323.

Named Output

With *named output*, list the variable name followed by an equal sign. For example, this PUT statement writes the values for NAME and AGE to the SAS log.

```
put name= age=;
```

Here is the SAS log.

```
----+----1----+----2----+
name=Peterson age=21
name=Morgan age=17
```

Note: The ruled line is for illustrative purposes only; the PUT statement does not generate it.

See "PUT Statement, Named" on page 332 for more information.

Using Multiple Output Styles in a Single PUT Statement

A PUT statement can combine any or all of the different output styles. Here is an example.

```
put name 'on ' date mmddyy8. ' weighs '
    startwght +(-1) '.' idno= 40-45;
```

See "Example 1: Using Multiple Output Styles in One PUT Statement" on page 314 for an explanation of the lines written to the SAS log.

When you combine different output styles, it is important to understand the location of the output pointer after each value is written. For more information about the pointer location, see "Pointer Location After a Value Is Written" on page 313.

Avoiding a Common Error When Writing Both a Character Constant and a Variable

When using a PUT statement to write a character constant that is followed by a variable name, always put a blank space between the closing quotation mark and the variable name:

```
put 'Player:' name1 'Player:' name2 'Player:' name3;
```

Otherwise, SAS might interpret a character constant that is followed by a variable name as a special SAS constant as illustrated in this table.

Table 2.9 *Characters That Cause Misinterpretation When They Follow a Character Constant*

Starting Letter of Variable	Represents	Examples
b	bit testing constant	'00100000'b
d	date constant	'01jan04'd
dt	datetime constant	'18jan2003:9:27:05am'dt
n	name literal	'My Table'n
t	time constant	'9:25:19pm't
x	hexadecimal notation	'534153'x

"Example 7: Avoiding a Common Error When Writing a Character Constant Followed by a Variable" on page 320 shows how to use character constants followed by variables.

Pointer Controls

As SAS writes values with the PUT statement, it keeps track of its position with a pointer. The PUT statement provides three ways to control the movement of the pointer:

column pointer controls
: reset the pointer's column position when the PUT statement starts to write the value to the output line.

line pointer controls
: reset the pointer's line position when the PUT statement writes the value to the output line.

line-hold specifiers
: hold a line in the output buffer so that another PUT statement can write to it. By default, the PUT statement releases the previous line and writes to a new line.

With column and line pointer controls, you can specify an absolute line number or column number to move the pointer or you can specify a column or line location that is relative to the current pointer position. The following table lists all pointer controls that are available in the PUT statement.

Table 2.10 *Pointer Controls Available in the PUT Statement*

Pointer Controls	Relative	Absolute
column pointer controls	+*n*	@*n*
	+*numeric-variable*	@*numeric-variable*
	+(*expression*)	@(*expression*)
line pointer controls	/ , _PAGE_ , _BLANKPAGE_	#*n* #*numeric-variable* #(*expression*)
	OVERPRINT	none
line-hold specifiers	@	(not applicable)
	@@	(not applicable)

Note: Always specify pointer controls before the variable for which they apply.

See "Pointer Location After a Value Is Written" on page 313 for more information about how SAS determines the pointer position.

Using Line-Hold Specifiers

Line-hold specifiers keep the pointer on the current output line when

- more than one PUT statement writes to the same output line
- a PUT statement writes values from more than one observation to the same output line.

Without line-hold specifiers, each PUT statement in a DATA step writes a new output line.

In the PUT statement, trailing @ and double trailing @@ produce the same effect. Unlike the INPUT statement, the PUT statement does not automatically release a line that is held by a trailing @ when the DATA step begins a new iteration. SAS releases the current output line that is held by a trailing @ or double trailing @ when it encounters

- a PUT statement without a trailing @
- a PUT statement that uses _BLANKPAGE_ or _PAGE_
- the end of the current line (determined by the current value of the LRECL= or LINESIZE= option in the FILE statement, if specified, or the LINESIZE= system option)
- the end of the last iteration of the DATA step.

Using a trailing @ or double trailing @ can cause SAS to attempt to write past the current line length because the pointer value is unchanged when the next PUT statement executes. See "When the Pointer Goes Past the End of a Line" on page 313.

Pointer Location After a Value Is Written

Understanding the location of the output pointer after a value is written is important, especially if you combine output styles in a single PUT statement. The pointer location after a value is written depends on which output style you use and whether a character string or a variable is written. With column or formatted output, the pointer is located in the first column after the end of the field that is specified in the PUT statement. These two styles write only variable values.

With list output or named output, the pointer is located in the second column after a variable value because PUT skips a column automatically after each value is written. However, when a PUT statement uses list output to write a character string, the pointer is located in the first column after the string. If you do not use a line pointer control or column output after a character string is written, add a blank space to the end of the character string to separate it from the next value.

After an _INFILE_ specification, the pointer is located in the first column after the record is written from the current input file.

When the output pointer is in the upper left corner of a page,

- PUT _BLANKPAGE_ writes a blank page and moves the pointer to the top of the next page.
- PUT _PAGE_ leaves the pointer in the same location.

You can determine the current location of the pointer by examining the variables that are specified with the COLUMN= option and the LINE= option in the FILE statement.

When the Pointer Goes Past the End of a Line

SAS does not write an output line that is longer than the current output line length. The line length of the current output file is determined by

- the value of the LINESIZE= option in the current FILE statement
- the value of the LINESIZE= system option (for the Results window)
- the LRECL= option in the current FILE statement (for external files).

You can inadvertently position the pointer beyond the current line length with one or more of these specifications:

- a + pointer control with a value that moves the pointer to a column beyond the current line length

- a column range that exceeds the current line length (for example, PUT X 90 – 100 when the current line length is 80)
- a variable value or character string that does not fit in the space that remains on the current output line.

By default, when PUT attempts to write past the end of the current line, SAS withholds the entire item that overflows the current line, writes the current line, and then writes the overflow item on a new line, starting in column 1. See the FLOWOVER, DROPOVER, and STOPOVER options in the "FILE Statement" on page 71.

Arrays

You can use the PUT statement to write an array element. The subscript is any SAS expression that results in an integer when the PUT statement executes. You can use an array reference in a *numeric-variable* construction with a pointer control if you enclose the reference in parentheses, as shown here:

- @(*array-name*{i})
- +(*array-name*{i})
- #(*array-name*{i})

Use the array subscript asterisk (*) to write all elements of a previously defined array to an external location. SAS allows one-dimensional or multidimensional arrays, but it does not allow a _TEMPORARY_ array. Enclose the subscript in braces, brackets, or parentheses, and print the array using list, formatted, column, or named output. With list output, the form of this statement is

```
PUT array-name{*};
```

With formatted output, the form of this statement is

```
PUT array-name{*}(format|format.list)
```

The format in parentheses follows the array reference.

Comparisons

- The PUT statement writes variable values and character strings to the SAS log or to an external location while the INPUT statement reads raw data in external files or data lines entered instream.
- Both the INPUT and the PUT statements use the trailing @ and double trailing @ line-hold specifiers to hold the current line in the input or output buffer, respectively. In an INPUT statement, a double trailing @ holds a line in the input buffer from one iteration of the DATA step to the next. In a PUT statement, however, a trailing @ has the same effect as a double trailing @; both hold a line across iterations of the DATA step.
- Both the PUT and OUTPUT statements create output in a DATA step. The PUT statement uses an output buffer and writes output lines to an external location, the SAS log, or your monitor. The OUTPUT statement uses the program data vector and writes observations to a SAS data set.

Examples

Example 1: Using Multiple Output Styles in One PUT Statement

This example uses several output styles in a single PUT statement:

```
data club1;
```

```
   input idno name $ startwght date : date7.;
   put name 'on ' date mmddyy8. ' weighs '
       startwght +(-1) '.' idno= 32-40;
   datalines;
032 David 180 25nov99
049 Amelia 145 25nov99
219 Alan 210 12nov99
;
```

The following table shows the output style used for each variable in the example:

Variables	Output Style
NAME, STARTWGHT	list output
DATE	formatted output
IDNO	named output

The PUT statement also uses pointer controls and specifies both character strings and variable names.

The program writes the following lines to the SAS log:

```
----+----1----+----2----+----3----+----4
David on 11/25/99 weighs 180.  idno=1032
Amelia on 11/25/99 weighs 145. idno=1049
Alan on 11/12/99 weighs 210.   idno=1219
```

Note: The ruled line is for illustrative purposes only; the PUT statement does not generate it.

Blank spaces are inserted at the beginning and the end of the character strings to change the pointer position. These spaces separate the value of a variable from the character string. The +(-1) pointer control moves the pointer backward to remove the unwanted blank that occurs between the value of STARTWGHT and the period. For more information about how to position the pointer, see "Pointer Location After a Value Is Written" on page 313.

Example 2: Moving the Pointer within a Page

These PUT statements show how to use column and line pointer controls to position the output pointer.

- To move the pointer to a specific column, use @ followed by the column number, variable, or expression whose value is that column number. For example, this statement moves the pointer to column 15 and writes the value of TOTAL SALES using list output:

  ```
  put @15 totalsales;
  ```

  This PUT statement moves the pointer to the value that is specified in COLUMN and writes the value of TOTALSALES with the COMMA6 format:

  ```
  data _null_;
     set carsales;
     column=15;
     put @column totalsales comma6.;
  run;
  ```

- This program shows two techniques to move the pointer backward:

```
data carsales;
   input item $10. jan : comma5.
         feb : comma5. mar : comma5.;
   saleqtr1=sum(jan,feb,mar);
/* an expression moves pointer backward */
   put '1st qtr sales for ' item
       'is ' saleqtr1 : comma6. +(-1) '.';
/* a numeric variable with a negative
    value moves pointer backward.      */
   x=-1;
   put '1st qtr sales for ' item
       'is ' saleqtr1 : comma5. +x '.';
   datalines;
trucks         1,382     2,789     3,556
vans           1,265     2,543     3,987
sedans         2,391     3,011     3,658
;
```

Because the value of SALEQTR1 is written with modified list output, the pointer moves automatically two spaces. For more information, see "How Modified List Output and Formatted Output Differ" on page 330. To remove the unwanted blank that occurs between the value and the period, move the pointer backward by one space.

The program writes the following lines to the SAS log:

```
----+----1----+----2----+----3----+----4
st qtr sales for trucks is 7,727.
st qtr sales for trucks is 7,727.
st qtr sales for vans is 7,795.
st qtr sales for vans is 7,795.
st qtr sales for sedans is 9,060.
st qtr sales for sedans is 9,060.
```

Note: The ruled line is for illustrative purposes only; the PUT statement does not generate it.

- This program uses a PUT statement with the / line pointer control to advance to the next output line:

```
data _null_;
   set carsales end=lastrec;
   totalsales+saleqtr1;
   if lastrec then
     put @2 'Total Sales for 1st Qtr'
         / totalsales 10-15;
run;
```

After the DATA step calculates TOTALSALES using all the observations in the CARSALES data set, the PUT statement executes. It writes a character string beginning in column 2 and moves to the next line to write the value of TOTALSALES in columns 10 through 15:

```
----+----1----+----2----+----3
 Total Sales for 1st Qtr
          24582
```

Note: The ruled line is for illustrative purposes only; the PUT statement does not generate it.

Example 3: Moving the Pointer to a New Page

This example creates a data set called STATEPOP, which contains information from the 1990 U.S. census about the population of metropolitan and non-metropolitan areas. It executes the FORMAT procedure to group the 50 states and the District of Columbia into four regions. It then uses the IF and PUT statements to control the printed output.

```
title1;
data statepop;
   input state $ cityp90 ncityp90 region @@;
   label cityp90= '1990 metropolitan population
                        (million)'
         ncityp90='1990 nonmetropolitan population
                        (million)'
         region=  'Geographic region';
   datalines;
ME    .443    .785  1   NH    .659    .450  1
VT    .152    .411  1   MA   5.788    .229  1
RI    .938    .065  1   CT   3.148    .140  1
NY  16.515   1.475  1   NJ   7.730     .A   1
PA  10.083   1.799  1   DE    .553    .113  2
MD   4.439    .343  2   DC    .607      .   2
VA   4.773   1.414  2   WV    .748   1.045  2
NC   4.376   2.253  2   SC   2.423   1.064  2
GA   4.352   2.127  2   FL  12.023    .915  2
KY   1.780   1.906  2   TN   3.298   1.579  2
AL   2.710   1.331  2   MS    .776   1.798  2
AR   1.040   1.311  2   LA   3.160   1.060  2
OK   1.870   1.276  2   TX  14.166   2.821  2
OH   8.826   2.021  3   IN   3.962   1.582  3
IL   9.574   1.857  3   MI   7.698   1.598  3
WI   3.331   1.561  3   MN   3.011   1.364  3
IA   1.200   1.577  3   MO   3.491   1.626  3
ND    .257    .381  3   SD    .221    .475  3
NE    .787    .791  3   KS   1.333   1.145  3
MT    .191    .608  4   ID    .296    .711  4
WY    .134    .319  4   CO   2.686    .608  4
NM    .842    .673  4   AZ   3.106    .559  4
UT   1.336    .387  4   NV   1.014    .183  4
WA   4.036    .830  4   OR   1.985    .858  4
CA  28.799    .961  4   AK    .226    .324  4
HI    .836    .272  4
;
proc format;
   value regfmt 1='Northeast'
                2='South'
                3='Midwest'
                4='West';
run;
data _null_;
   set statepop;
   by region;
   pop90=sum(cityp90,ncityp90);
   file print;
   put state 1-2 @5 pop90 7.3 ' million';
   if first.region then
      regioncitypop=0;      /* new region */
```

```
      regioncitypop+cityp90;
      if last.region then
         do;
            put // '1990 US CENSUS for ' region regfmt.
                 / 'Total Urban Population: '
                    regioncitypop' million' _page_;
         end;
   run;
```

Output 2.26 *PUT Statement Output for the Northeast Region*

```
                                                                        1
ME    1.228 million
NH    1.109 million
VT    0.563 million
MA    6.017 million
RI    1.003 million
CT    3.288 million
NY   17.990 million
NJ    7.730 million
PA   11.882 million
1990 US CENSUS for Northeast
Total Urban Population: 45.456  million
```

PUT _PAGE_ advances the pointer to line 1 of the new page when the value of LAST.REGION is 1. The example prints a footer message before exiting the page.

Example 4: Underlining Text

This example uses OVERPRINT to underscore a value written by a previous PUT statement:

```
data _null_;
   input idno name $ startwght;
   file file-specification print;
   put name 1-10 @15 startwght 3.;
   if startwght > 200 then
     put overprint @15 '___';
   datalines;
032 David 180
049 Amelia 145
219 Alan 210
;
```

The second PUT statement underlines weights above 200 on the output line the first PUT statement prints.

This PUT statement uses OVERPRINT with both a column pointer control and a line pointer control:

```
   put @5 name $8. overprint @5 8*'_'
     / @20 address;
```

The PUT statement writes a NAME value, underlines it by overprinting eight underscores, and moves the output pointer to the next line to write an ADDRESS value.

Example 5: Holding and Releasing Output Lines

This DATA step demonstrates how to hold and release an output line with a PUT statement:

```
data _null_;
   input idno name $ startwght 3.;
   put name @;
   if startwght ne . then
     put @15 startwght;
   else put;
   datalines;
032 David 180
049 Amelia 145
126 Monica
219 Alan 210
;
```

In this example,

- the trailing @ in the first PUT statement holds the current output line after the value of NAME is written
- if the condition is met in the IF-THEN statement, the second PUT statement writes the value of STARTWGHT and releases the current output line
- if the condition is not met, the second PUT never executes. Instead, the ELSE PUT statement executes. The ELSE PUT statement releases the output line and positions the output pointer at column 1 in the output buffer.

The program writes the following lines to the SAS log:

```
----+----1----+----2
David         180
Amelia        145
Monica
Alan          210
```

Note: The ruled line is for illustrative purposes only; the PUT statement does not generate it.

Example 6: Writing the Current Input Record to the Log

When a value for ID is less than 1000, PUT _INFILE_ executes and writes the current input record to the SAS log. The DELETE statement prevents the DATA step from writing the observation to the TEAM data set.

```
data team;
   input id team $ score1 score2;
   if id le 1000 then
     do;
       put _infile_;
       delete;
     end;
   datalines;
032 red 180 165
049 yellow 145 124
219 red 210 192
;
```

The program writes the following line to the SAS log:

```
----+----1----+----2
219 red 210 192
```

Note: The ruled line is for illustrative purposes only; the PUT statement does not generate it.

Example 7: Avoiding a Common Error When Writing a Character Constant Followed by a Variable

This example illustrates how to use a PUT statement to write character constants and variable values without causing them to be misinterpreted as SAS name literals. A SAS name literal is a name token that is expressed as a string within quotation marks, followed by the letter n.

In the program below, the PUT statement writes the constant 'n' followed by the value of the variable NVAR1, and then writes another constant 'n':

```
data _null_;
   n=5;
   nvar1=1;
   var1=7;
   put @1 'n' nvar1 'n';
run;
```

This program writes the following line to the SAS log:

```
----+----1----+----2
n1 n
```

Note: The ruled line is for illustrative purposes only; the PUT statement does not generate it.

If all the spaces between the constants and the variables are removed from the previous PUT statement, SAS interprets 'n' as a name literal instead of reading 'n' as a constant. The next variable is read as VAR1 instead of NVAR1. The final 'n' constant is interpreted correctly.

```
   put @1 'n'nvar1'n';
```

This PUT statement writes the following line to the SAS log:

```
----+----1----+----2
5 7 n
```

To print character constants and variable values without intervening spaces, and without potential misinterpretation, you can add spaces between them and use pointer controls where necessary. For example, the following PUT statement uses a pointer control to write the correct character constants and variable values but does not insert blank spaces. Note that +(-1) moves the PUT statement pointer backward by one space.

```
   put @1 'n' nvar1 +(-1) 'n';
```

This PUT statement writes the following line to the SAS log:

```
----+----1----+----2
n1n
```

Example 8: Creating Multi-Column Output

This example uses the #n and @n column and pointer controls to create multi-column output.

```
   /*
    * Use #i and @j to position name and weight information into
    *  four columns in column-major order.  That is print down column 1
    *  first, then print down column 2, etc.
    * This example highlights the need to specify # before @ because
    *  # sets the column pointer to 1.
    */
   data _null_;
```

```
      file print n=ps notitles header=hd;

      do i = 1 to 80 by 20;
         do j = 1 to ceil(num_students/4);
            set sashelp.class nobs=num_students;
            put #(j+3) @i name $8. '-' +1 weight 5.1;
         end;
      end;
      stop;

   hd:
      put @26 'Student Weight in Pounds' / @26 24*'-';
      return;
   run;
```

The program creates the following output:

```
                        Student Weight in Pounds
                        ------------------------

Alfred  - 112.5     James   -  83.0     Joyce   -  50.5     Robert  - 128.0
Alice   -  84.0     Jane    -  84.5     Judy    -  90.0     Ronald  - 133.0
Barbara -  98.0     Janet   - 112.5     Louise  -  77.0     Thomas  -  85.0
Carol   - 102.5     Jeffrey -  84.0     Mary    - 112.0     William - 112.0
Henry   - 102.5     John    -  99.5     Philip  - 150.0
```

See Also

Statements:

- “FILE Statement” on page 71
- “PUT Statement, Column” on page 321
- “PUT Statement, Formatted” on page 323
- “PUT Statement, List” on page 328
- “PUT Statement, Named” on page 332

System Options:

- “LINESIZE= System Option” in *SAS Viya System Options: Reference*
- “PAGESIZE= System Option” in *SAS Viya System Options: Reference*

PUT Statement, Column

Writes variable values in the specified columns in the output line.

Valid in: DATA step

Categories: CAS
File-Handling

Type: Executable

Syntax

PUT *variable start-column* <- *end-column*>
<.*decimal–places*> <@ | @@>;

Arguments

variable
specifies the variable whose value is written.

start-column
specifies the first column of the field where the value is written in the output line.

-end-column
specifies the last column of the field for the value.

Tip If the value occupies only one column in the output line, omit *end-column*.

Example Because *end-column* is omitted, the values for the character variable GENDER occupy only column 16:

```
put name 1-10 gender 16;
```

.decimal-places
specifies the number of digits to the right of the decimal point in a numeric value.

Range positive integer

Tip If you specify 0 for *d* or omit *d*, the value is written without a decimal point.

Example "Example: Using Column Output in the PUT Statement" on page 323

@| @@
holds an output line for the execution of the next PUT statement even across iterations of the DATA step. These line-hold specifiers are called *trailing* @ and *double trailing* @.

Requirement The trailing @ or double trailing @ must be the last item in the PUT statement.

See "Using Line-Hold Specifiers" on page 312

Details

With column output, the column numbers indicate the position that each variable value occupies in the output line. If a value requires fewer columns than specified, a character variable is left-aligned in the specified columns, and a numeric variable is right-aligned in the specified columns.

There is no limit to the number of column specifications that you can make in a single PUT statement. You can write anywhere in the output line, even if a value overwrites columns that were written earlier in the same statement. You can combine column output with any of the other output styles in a single PUT statement. For more information, see "Using Multiple Output Styles in a Single PUT Statement" on page 311.

Example: Using Column Output in the PUT Statement

Use column output in the PUT statement as shown here.

- This PUT statement uses column output:

```
data _null_;
   input name $ 1-18 score1 score2 score3;
   put name 1-20 score1 23-25 score2 28-30
       score3 33-35;
   datalines;
Joseph                  11   32   76
Mitchel                 13   29   82
Sue Ellen               14   27   74
;
```

  The program writes the following lines to the SAS log:

```
----+----1----+----2----+----3----+----4
Joseph                 11   32   76
Mitchel                13   29   82
Sue Ellen              14   27   74
```

  Note: The ruled line is for illustrative purposes only; the PUT statement does not generate it.

  The values for the character variable NAME begin in column 1, the left boundary of the specified field (columns 1 through 20). The values for the numeric variables SCORE1 through SCORE3 appear flush with the right boundary of their field.

- This statement produces the same output lines, but writes the SCORE1 value first and the NAME value last:

```
put score1 23-25 score2 28-30
    score3 33-35 name $ 1-20;
```

- This DATA step specifies decimal points with column output:

```
data _null_;
    x=11;
    y=15;
    put x 10-18 .1 y 20-28 .1;
run;
```

  This program writes the following line to the SAS log:

```
----+----1----+----2----+----3----+----4
             11.0      15.0
```

See Also

Statements:

- "PUT Statement" on page 303

PUT Statement, Formatted

Writes variable values with the specified format in the output line.

Valid in: DATA step

Categories: CAS
File-Handling

Type: Executable

Syntax

PUT <*pointer-control*> *variable format.* <@ | @@>;

PUT <*pointer-control*> (*variable-list*) (*format-list*) <@ | @@>;

Arguments

pointer-control
moves the output pointer to a specified line or column.

See "Column Pointer Controls " on page 306

"Line Pointer Controls " on page 308

Example "Example 1: Writing a Character between Formatted Values" on page 326

variable
specifies the variable whose value is written.

(*variable-list*)
specifies a list of variables whose values are written.

Requirement The (*format-list*) must follow the (*variable-list*).

See "How to Group Variables and Formats" on page 326

Example "Example 1: Writing a Character between Formatted Values" on page 326

format.
specifies a format to use when the variable values are written. To override the default alignment, you can add an alignment specification to a format:

-L left aligns the value.

-C centers the value.

-R right aligns the value.

Tip Ensure that the format width provides enough space to write the value and any commas, dollar signs, decimal points, or other special characters that the format includes.

Examples This PUT statement uses the format dollar7.2 to write the value of X:

```
put x dollar7.2;
```

When X is 100, the formatted value uses seven columns:

```
$100.00
```

Example "Example 2: Overriding the Default Alignment of Formatted Values" on page 327

(*format-list*)
specifies a list of formats to use when the values of the preceding list of variables are written. In a PUT statement, a *format-list* can include

format.
specifies the format to use to write the variable values.

Tip You can specify either a SAS format or a user-written format.

See *SAS Viya Formats and Informats: Reference*

pointer-control
specifies one of these pointer controls to use to position a value: @, #, /, +, and OVERPRINT.

Example "Example 1: Writing a Character between Formatted Values" on page 326

character-string
specifies one or more characters to place between formatted values.

Example This statement places a hyphen between the formatted values of CODE1, CODE2, and CODE3:

```
put bldg $ (code1 code2 code3) (3. '-');
```

Example "Example 1: Writing a Character between Formatted Values" on page 326

*n**
specifies to repeat *n* times the next format in a format list.

Restriction The (*format-list*) must follow (*variable-list*).

See "How to Group Variables and Formats" on page 326

Example This statement uses the 7.2 format to write GRADES1, GRADES2, and GRADES3 and the 5.2 format to write GRADES4 and GRADES5:

```
put (grades1-grades5) (3*7.2, 2*5.2);
```

@| @@
holds an output line for the execution of the next PUT statement even across iterations of the DATA step. These line-hold specifiers are called *trailing* @ and *double trailing* @.

Restriction The trailing @ or double trailing @ must be the last item in the PUT statement.

See "Using Line-Hold Specifiers" on page 312

Details

Using Formatted Output

The Formatted output describes the output lines by listing the variable names and the formats to use to write the values. You can use a SAS format or a user-written format to control how SAS prints the variable values. For a complete description of the SAS formats, see "Definition of Formats" in *SAS Viya Formats and Informats: Reference*.

With formatted output, the PUT statement uses the format that follows the variable name to write each value. SAS does not automatically add blanks between values. If the value uses fewer columns than specified, character values are left-aligned and numeric values are right-aligned in the field that is specified by the format width.

Formatted output, combined with pointer controls, makes it possible to specify the exact line and column location to write each variable. For example, this PUT statement uses the dollar7.2 format and centers the value of X starting at column 12:

```
put @12 x dollar7.2-c;
```

How to Group Variables and Formats

When you want to write values in a pattern on the output lines, use format lists to shorten your coding time. A format list consists of the corresponding formats separated by either blanks or commas and enclosed in parentheses. It must follow the names of the variables enclosed in parentheses.

For example, this statement uses a format list to write the five variables SCORE1 through SCORE5, one after another, using four columns for each value with no blanks in between:

```
put (score1-score5) (4. 4. 4. 4. 4.);
```

A shorter version of the previous statement is

```
put (score1-score5) (4.);
```

You can include any of the pointer controls (@, #, /, +, and OVERPRINT) in the list of formats, as well as *n**, and a character string. You can use as many format lists as necessary in a PUT statement, but do not nest the format lists. After all the values in the variable list are written, the PUT statement ignores any directions that remain in the format list. For an example, see “Example 3: Including More Format Specifications Than Necessary” on page 327.

You can also specify a reference to all elements in an array as (*array-name* {*}), followed by a list of formats. However, you cannot specify the elements in a _TEMPORARY_ array in this way. This PUT statement specifies an array name and a format list:

```
put (array1{*}) (4.);
```

For more information about how to reference an array, see “Arrays” on page 314.

Examples

Example 1: Writing a Character between Formatted Values

This example formats some values and writes a - (hyphen) between the values of variables BLDG and ROOM:

```
data _null_;
   input name & $15. bldg $ room;
   put name @20 (bldg room) ($1. "-" 3.);
   datalines;
Bill Perkins  J 126
Sydney Riley  C 219
;
```

These lines are written to the SAS log:

```
Bill Perkins       J-126
```

```
Sydney Riley       C-219
```

Example 2: Overriding the Default Alignment of Formatted Values

This example includes an alignment specification in the format:

```
data _null_;
   input name $ 1-12 score1 score2 score3;
   put name $12.-r +3 score1 3. score2 3.
       score3 4.;
   datalines;
Joseph                  11   32   76
Mitchel                 13   29   82
Sue Ellen               14   27   74
;
```

These lines are written to the SAS log:[1]

```
----+----1----+----2----+----3----+----4
      Joseph    11 32  76
     Mitchel    13 29  82
   Sue Ellen    14 27  74
```

The value of the character variable NAME is right-aligned in the formatted field. (Left alignment is the default for character variables.)

Example 3: Including More Format Specifications Than Necessary

This format list includes more specifications than are necessary when the PUT statement executes:

```
data _null_;
   input x y z;
   put (x y z) (2.,+1);
   datalines;
2 24 36
0 20 30
;
```

The PUT statement writes the value of X using the 2. format. Then, the +1 column pointer control moves the pointer forward one column. Next, the value of Y is written with the 2. format. Again, the +1 column pointer moves the pointer forward one column. Then, the value of Z is written with the 2. format. For the third iteration, the PUT statement ignores the +1 pointer control.

These lines are written to the SAS log: [2]

```
----+----1----+
2 24 36
0 20 30
```

See Also

Statements:

- “PUT Statement” on page 303

1 The ruled line is for illustrative purposes only; the PUT statement does not generate it.

2 The ruled line is for illustrative purposes only; the PUT statement does not generate it.

PUT Statement, List

Writes variable values and the specified character strings in the output line.

Valid in: DATA step

Categories: CAS
File-Handling

Type: Executable

Syntax

PUT <*pointer-control*> *variable* <@ | @@>;

PUT <*pointer-control*> <*n**> *'character-string'* <@ | @@>;

PUT <*pointer-control*> *variable* < : | ~> *format.*<@ | @@>;

Arguments

pointer-control
moves the output pointer to a specified line or column.

See "Column Pointer Controls " on page 306

"Line Pointer Controls " on page 308

Example "Example 2: Writing Character Strings and Variable Values" on page 331

variable
specifies the variable whose value is written.

Example "Example 1: Writing Values with List Output" on page 331

n*
specifies to repeat *n* times the subsequent character string.

Example This statement writes a line of 132 underscores:

```
put 132*'_';
```

'*character-string*'
specifies a string of text, enclosed in quotation marks, to write.

Interaction When insufficient space remains on the current line to write the entire text string, SAS withholds the entire string and writes the current line. Then it writes the text string on a new line, starting in column 1. For more information, see "When the Pointer Goes Past the End of a Line" on page 313.

Tips To avoid misinterpretation, always put a space after a closing quotation mark in a PUT statement.

If you follow a quotation mark with X, SAS interprets the text string as a hexadecimal constant.

If you use single quotation (`) or double quotation marks (“) together (with no space in between them) as the string of text, SAS generates a single quotation mark (') or double quotation mark (“), respectively.

See “How List Output Is Spaced” on page 330

Example “Example 2: Writing Character Strings and Variable Values” on page 331

:

enables you to specify a format that the PUT statement uses to write the variable value. All leading and trailing blanks are deleted, and each value is followed by a single blank.

Requirement You must specify a format.

See “How Modified List Output and Formatted Output Differ” on page 330

Example “Example 3: Writing Values with Modified List Output (:)” on page 332

~

enables you to specify a format that the PUT statement uses to write the variable value. SAS displays the formatted value in quotation marks even if the formatted value does not contain the delimiter. SAS deletes all leading and trailing blanks, and each value is followed by a single blank. Missing values for character variables are written as a blank (" ") and, by default, missing values for numeric variables are written as a period (".").

Requirement You must specify the DSD option in the FILE statement.

Example “Example 4: Writing Values with Modified List Output and ~” on page 332

format.

specifies a format to use when the data values are written.

Tip You can specify either a SAS format or a user-written format. See *SAS Viya Formats and Informats: Reference*

Example “Example 3: Writing Values with Modified List Output (:)” on page 332

@ | @@

holds an output line for the execution of the next PUT statement even across iterations of the DATA step. These line-hold specifiers are called *trailing* @ and *double trailing* @.

Restriction The trailing @ or double-trailing @ must be the last item in the PUT statement.

See “Using Line-Hold Specifiers” on page 312

Details

Using List Output

With list output, you list the names of the variables whose values you want written, or you specify a character string in quotation marks. The PUT statement writes a variable value, inserts a single blank, and then writes the next value. Missing values for numeric variables are written as a single period. Character values are left-aligned in the field; leading and trailing blanks are removed. To include blanks (in addition to the blank inserted after each value), use formatted or column output instead of list output.

There are two types of list output:

- simple list output
- modified list output.

Modified list output increases the versatility of the PUT statement because you can specify a format to control how the variable values are written. See "Example 3: Writing Values with Modified List Output (:)" on page 332.

How List Output Is Spaced

List output uses different spacing methods when it writes variable values and character strings. When a variable is written with list output, SAS automatically inserts a blank space. The output pointer stops at the second column that follows the variable value. However, when a character string is written, SAS does not automatically insert a blank space. The output pointer stops at the column that immediately follows the last character in the string.

To avoid spacing problems when both character strings and variable values are written, you might want to use a blank space as the last character in a character string. When a character string that provides punctuation follows a variable value, you need to move the output pointer backward. Moving the output pointer backward prevents an unwanted space from appearing in the output line. See "Example 2: Writing Character Strings and Variable Values" on page 331.

How Modified List Output and Formatted Output Differ

List output and formatted output use different methods to determine how far to move the pointer after a variable value is written. Therefore, modified list output, which uses formats, and formatted output produce different results in the output lines. Modified list output writes the value, inserts a blank space, and moves the pointer to the next column. Formatted output moves the pointer the length of the format, even if the value does not fill that length. The pointer moves to the next column; an intervening blank is not inserted.

The following DATA step uses modified list output to write each output line:

```
data _null_;
   input x y;
   put x : comma10.2 y : 7.2;
   datalines;
2353.20 7.10
6231 121
;
```

These lines are written to the SAS log:

```
----+----1----+----2
2,353.20 7.10
```

```
6,231.00 121.00
```

In comparison, the following example uses formatted output:

```
put x comma10.2 y 7.2;
```

These lines are written to the SAS log, with the values aligned in columns:

```
----+----1----+----2
  2,353.20   7.10
  6,231.00 121.00
```

Examples

Example 1: Writing Values with List Output

This DATA step uses a PUT statement with list output to write variable values to the SAS log:

```
data _null_;
   input name $ 1-10 sex $ 12 age 15-16;
   put name sex age;
   datalines;
Joseph     M  13
Mitchel    M  14
Sue Ellen  F  11
;
```

These lines are written to the SAS log:

```
----+----1----+----2----+----3----+----4
Joseph M 13
Mitchel M 14
Sue Ellen F 11
```

By default, the values of the character variable NAME are left-aligned in the field.

Example 2: Writing Character Strings and Variable Values

This PUT statement adds a space to the end of a character string and moves the output pointer backward to prevent an unwanted space from appearing in the output line after the variable STARTWGHT:

```
data _null_;
   input idno name $ startwght;
   put name 'weighs ' startwght +(-1) '.';
   datalines;
032 David 180
049 Amelia 145
219 Alan 210
;
```

These lines are written to the SAS log:

```
David weighs 180.
Amelia weighs 145.
Alan weighs 210.
```

The blank space at the end of the character string changes the pointer position. This space separates the character string from the value of the variable that follows. The +(-1)

pointer control moves the pointer backward to remove the unwanted blank that occurs between the value of STARTWGHT and the period.

Example 3: Writing Values with Modified List Output (:)

This DATA step uses modified list output to write several variable values in the output line using the : argument:

```
data _null_;
   input salesrep : $10. tot : comma6. date : date9.;
   put 'Week of ' date : worddate15.
       salesrep : $12. 'sales were '
       tot : dollar9.  + (-1) '.';
   datalines;
Wong 15,300 12OCT2004
Hoffman 9,600 12OCT2004
;
```

These lines are written to the SAS log:

```
Week of Oct 12, 2004 Wong sales were $15,300.
Week of Oct 12, 2004 Hoffman sales were $9,600.
```

Example 4: Writing Values with Modified List Output and ~

This DATA step uses modified list output to write several variable values in the output line using the ~ argument:

```
data _null_;
   input salesrep : $10. tot : comma6. date : date9.;
   file log delimiter=" " dsd;
   put 'Week of ' date ~ worddate15.
       salesrep ~ $12. 'sales were '
       tot ~ dollar9.  + (-1) '.';
   datalines;
Wong 15,300 12OCT2004
Hoffman 9,600 12OCT2004
;
```

These lines are written to the SAS log:

```
Week of "Oct 12, 2004" "Wong" sales were "$15,300".
Week of "Oct 12, 2004" "Hoffman" sales were "$9,600".
```

See Also

Statements:

- “PUT Statement” on page 303
- “PUT Statement, Formatted” on page 323

PUT Statement, Named

Writes variable values after the variable name and an equal sign.

Valid in: DATA step

Categories: CAS

File-Handling

Type: Executable

Syntax

PUT <*pointer-control*> *variable*= <*format.*> <@ | @@>;

PUT *variable*= *start-column* <-*end-column*> <.*decimal-places*> <@ | @@>;

Arguments

pointer-control
moves the output pointer to a specified line or column in the output buffer.

See "Column Pointer Controls " on page 306

"Line Pointer Controls " on page 308

variable=
specifies the variable whose value is written by the PUT statement in the form

```
variable=value
```

format.
specifies a format to use when the variable values are written.

Tip Ensure that the format width provides enough space to write the value and any commas, dollar signs, decimal points, or other special characters that the format includes.

See "Formatting Named Output" on page 334

Examples This PUT statement uses the format DOLLAR7.2 to write the value of X:

```
put x= dollar7.2;
```

When X=100, the formatted value uses seven columns:

```
X=$100.00
```

start-column
specifies the first column of the field where the variable name, equal sign, and value are to be written in the output line.

– end-column
determines the last column of the field for the value.

Tip If the variable name, equal sign, and value require more space than the columns specified, PUT writes past the end column rather than truncate the value. You must leave enough space before beginning the next value.

.decimal-places
specifies the number of digits to the right of the decimal point in a numeric value. If you specify 0 for *d* or omit *d*, the value is written without a decimal point.

Range positive integer

@ | @@
holds an output line for the execution of the next PUT statement even across iterations of the DATA step. These line-hold specifiers are called *trailing* @ and *double trailing* @.

Restriction The trailing @ or double trailing @ must be the last item in the PUT statement.

See "Using Line-Hold Specifiers" on page 312

Details

Using Named Output

With named output, follow the variable name with an equal sign in the PUT statement. You can use either list output, column output, or formatted output specifications to indicate how to position the variable name and values. To insert a blank space between each variable value automatically, use list output. To align the output in columns, use pointer controls or column specifications.

Formatting Named Output

You can specify either a SAS format or a user-written format to control how SAS prints the variable values. The width of the format does *not* include the columns required by the variable name and equal sign. To align a formatted value, SAS deletes leading blanks and writes the variable value immediately after the equal sign. SAS does not align on the right side of the formatted length, as in unnamed formatted output.

For a complete description of the SAS formats, see "Definition of Formats" in *SAS Viya Formats and Informats: Reference*.

Example: Using Named Output in the PUT Statement

Use named output in the PUT statement as shown here.

- This PUT combines named output with column pointer controls to align the output:

```
data _null_;
   input name $ 1-18 score1 score2 score3;
   put name = @20 score1= score3= ;
   datalines;
Joseph                  11   32   76
Mitchel                 13   29   82
Sue Ellen               14   27   74
;
```

  The program writes the following lines to the SAS log:

```
----+----1----+----2----+----3----+----4
NAME=Joseph         SCORE1=11 SCORE3=76
NAME=Mitchel        SCORE1=13 SCORE3=82
NAME=Sue Ellen      SCORE1=14 SCORE3=74
```

- This example specifies an output format for the variable AMOUNT:

```
put item= @25 amount= dollar12.2;
```

  When the value of ITEM is binders and the value of AMOUNT is 153.25, this output line is produced:

```
----+----1----+----2----+----3----+----4
ITEM=binders            AMOUNT=$153.25
```

See Also

Statements:

- "PUT Statement" on page 303

PUTLOG Statement

Writes a message to the SAS log.

Valid in: DATA step

Categories: Action
CAS

Type: Executable

Syntax

PUTLOG '*message*';

Arguments

message
specifies the message that you want to write to the SAS log. *Message* can include character literals (enclosed in quotation marks), variable names, formats, and pointer controls.

Tip You can precede your message text with WARNING, MESSAGE, or NOTE to better identify the output in the log.

Details

The PUTLOG statement writes a message that you specify to the SAS log. The PUTLOG statement is also helpful when you use macro-generated code because you can send output to the SAS log without affecting the current file destination.

Comparisons

The PUTLOG statement is similar to the ERROR statement except that PUTLOG does not set _ERROR_ to 1.

Example: Writing Messages to the SAS Log Using the PUTLOG Statement

The following program creates the computeAverage92 macro, which computes the average score, validates input data, and uses the PUTLOG statement to write error messages to the SAS log. The DATA step uses the PUTLOG statement to write a warning message to the log.

```
data ExamScores;
```

```
   input Name $ 1-16 Score1 Score2 Score3;
   datalines;
Sullivan, James   86 92 88
Martinez, Maria   95 91 92
Guzik, Eugene     99 98 .
Schultz, John     90 87 93
van Dyke, Sylvia  98 . 91
Tan, Carol        93 85 85
;

filename outfile 'path-to-your-output-file';
   /* Create a macro that computes the average score, validates  */
   /* input data, and uses PUTLOG to write error messages to the */
   /* SAS log.                                                   */
%macro computeAverage92(s1, s2, s3, avg);
   if &s1 < 0 or &s2 < 0 or &s3 < 0 then
      do;
            putlog 'ERROR: Invalid score data ' &s1= &s2= &s3=;
         &avg = .;
         end;
      else
         &avg = mean(&s1, &s2, &s3);
%mend;
data _null_;
set ExamScores;
   file outfile;
   %computeAverage92(Score1, Score2, Score3, AverageScore);
   put name Score1 Score2 Score3 AverageScore;
      /* Use PUTLOG to write a warning message to the SAS log. */
   if AverageScore < 92 then
         putlog 'WARNING: Score below the minimum ' name= AverageScore= 5.2;
run;

proc print;
run;
```

The following lines are written to the SAS log.

```
WARNING: Score below the minimum Name=Sullivan, James AverageScore=88.67
ERROR: Invalid score data Score1=99 Score2=98 Score3=.
WARNING: Score below the minimum Name=Guzik, Eugene AverageScore=.
WARNING: Score below the minimum Name=Schultz, John AverageScore=90.00
ERROR: Invalid score data Score1=98 Score2=. Score3=91
WARNING: Score below the minimum Name=van Dyke, Sylvia AverageScore=.
WARNING: Score below the minimum Name=Tan, Carol AverageScore=87.67
```

SAS creates the following output file.

Output 2.27 *Individual Examination Scores*

Obs	Name	Score1	Score2	Score3
1	Sullivan, James	86	92	88
2	Martinez, Maria	95	91	92
3	Guzik, Eugene	99	98	.
4	Schultz, John	90	87	93
5	van Dyke, Sylvia	98	.	91
6	Tan, Carol	93	85	85

See Also

Statements:

- "ERROR Statement" on page 69

REDIRECT Statement

Points to different input or output SAS data sets when you execute a stored program.

Valid in: DATA step

Category: Action

Type: Executable

Restriction: This statement is not valid in the CAS server.

Requirement: You must specify the PGM= option in the DATA statement.

Syntax

REDIRECT INPUT | OUTPUT *old-name-1*=*new-name-1* <…*old-name-n*=*new-name-n*>;

Arguments

INPUT | OUTPUT
specifies whether to redirect input or output data sets. When you specify INPUT, the REDIRECT statement associates the name of the input data set in the source program with the name of another SAS data set. When you specify OUTPUT, the REDIRECT statement associates the name of the output data set with the name of another SAS data set.

old-name
specifies the name of the input or output data set in the source program.

new-name
specifies the name of the input or output data set that you want SAS to process for the current execution.

Details

The REDIRECT statement is available only when you execute a stored program.

CAUTION:
Use care when you redirect input data sets. The number and attributes of variables in the input data sets that you read with the REDIRECT statement should match the number and attributes of variables in the input data sets in the MERGE, SET, MODIFY, or UPDATE statements of the source code. If the variable type attributes differ, the stored program stops processing and an appropriate error message is written to the SAS log. If the variable length attributes differ, the length of the variable in the source code data set determines the length of the variable in the redirected data set. Extra variables in the redirected data sets cause the stored program to stop processing and an error message is written to the SAS log.

TIP The DROP or KEEP data set options can be added in the stored program if the input data set that you read with the REDIRECT statement has more variables than are in the data set used to compile the program.

Comparisons

The REDIRECT statement applies only to SAS data sets. To redirect input and output stored in external files, include a FILENAME statement to associate the fileref in the source program with different external files.

Example: Executing a Stored Program

This example executes the stored program called STORED.SAMPLE. The REDIRECT statement specifies the source of the input data as BASE.SAMPLE. The output data set from this execution of the program is redirected and stored in a data set named SUMS.SAMPLE.

```
libname stored 'SAS-library';
libname base 'SAS-library';
libname sums 'SAS-library';
data pgm=stored.sample;
   redirect input in.sample=base.sample;
   redirect output out.sample=sums.sample;
run;
```

See Also

Statements:

- “DATA Statement” on page 45

REMOVE Statement

Deletes an observation from a SAS data set.

Valid in: DATA step

Category: Action

Type: Executable

Restrictions: This statement is not valid in the CAS server.

Use only with a MODIFY statement.

Syntax

REMOVE <*data-set-name(s)*>;

Without Arguments

If you specify no argument, the REMOVE statement deletes the current observation from all data sets that are named in the DATA statement.

Arguments

data-set-name

specifies the data set in which the observation is deleted.

Restriction The data set name must also appear in the DATA statement and in one or more MODIFY statements.

Tip Instead of using a data set name, you can specify the physical pathname to the file, using syntax that your operating system understands. The pathname must be enclosed in single or double quotation marks.

Details

The deletion of an observation can be physical or logical, depending on the engine that maintains the data set. Using REMOVE overrides the default replacement of observations. If a DATA step contains a REMOVE statement, you must explicitly program all output for the step.

Comparisons

- Using an OUTPUT, REPLACE, or REMOVE statement overrides the default write action at the end of a DATA step. (OUTPUT is the default action; REPLACE becomes the default action when a MODIFY statement is used.) If you use any of these statements in a DATA step, you must explicitly program all output for new observations.
- The OUTPUT, REPLACE, and REMOVE statements are independent of each other. More than one statement can apply to the same observation, as long as the sequence is logical.
- If both an OUTPUT and a REPLACE or REMOVE statement execute on a given observation, perform the OUTPUT action last to keep the position of the observation pointer correct.
- Because the REMOVE statement can perform a physical or a logical deletion, REMOVE is available with the MODIFY statement for all SAS data set engines. Both the DELETE and subsetting IF statements perform only physical deletions. Therefore, they are not available with the MODIFY statement for certain engines.

Example: Removing an Observation from a Data Set

This example removes one observation from a SAS data set.

```
libname perm 'SAS-library';

data perm.accounts;
   input AcctNumber Credit;
   datalines;
1001 1500
1002 4900
1003 3000
;
data perm.accounts;
   modify perm.accounts;
   if AcctNumber=1002 then remove;
run;
proc print data=perm.accounts;
   title 'Edited Data Set';
run;
```

Here are the results of the PROC PRINT statement:

Output 2.28 *Edited Data Set*

Edited Data Set

Obs	AcctNumber	Credit
1	1001	1500
3	1003	3000

See Also

Statements:

- “DELETE Statement” on page 57
- “IF Statement, Subsetting” on page 127
- “MODIFY Statement” on page 277
- “OUTPUT Statement” on page 300
- “REPLACE Statement” on page 342

RENAME Statement

Specifies new names for variables in output SAS data sets.

Valid in: DATA step

Categories: CAS
Information

Type: Declarative

Syntax

RENAME *old-name-1*=*new-name-1* <…*old-name-n*=*new-name-n*>;

Arguments

old-name
specifies the name of a variable or variable list as it appears in the input data set, or in the current DATA step for newly created variables.

new-name
specifies the name or list to use in the output data set.

Details

The RENAME statement enables you to change the names of one or more variables, variables in a list, or a combination of variables and variable lists. The new variable names are written to the output data set only. Use the old variable names in programming statements for the current DATA step. RENAME applies to all output data sets.

Note: The RENAME statement has an effect on data sets opened in output mode only.

Comparisons

- RENAME cannot be used in PROC steps, but the RENAME= data set option can.
- The RENAME= data set option enables you to specify the variables that you want to rename for each input or output data set. Use it in input data sets to rename variables before processing.
- If you use the RENAME= data set option in an output data set, you must continue to use the old variable names in programming statements for the current DATA step. After your output data is created, you can use the new variable names.
- The RENAME= data set option in the SET statement renames variables in the input data set. You can use the new names in programming statements for the current DATA step.
- To rename variables as a file management task, use the DATASETS procedure or access the variables through SAS Studio. These methods are simpler and do not require DATA step processing.

Example: Renaming Data Set Variables

- These examples show the correct syntax for renaming variables using the RENAME statement:

```
rename street=address;
rename time1=temp1 time2=temp2 time3=temp3;
rename name=Firstname score1-score3=Newscore1-Newscore3;
```

- This example uses the old name of the variable in program statements. The variable Olddept is named Newdept in the output data set, and the variable Oldaccount is named Newaccount.

```
rename Olddept=Newdept Oldaccount=Newaccount;
if Oldaccount>5000;
```

```
keep Olddept Oldaccount items volume;
```

- This example uses the old name OLDACCNT in the program statements. However, the new name NEWACCNT is used in the DATA statement because SAS applies the RENAME statement before it applies the KEEP= data set option.

```
data market(keep=newdept newaccnt items volume);
   rename olddept=newdept oldaccnt=newaccnt;
   set sales;
   if oldaccnt>5000;
run;
```

- The following example uses both a variable and a variable list to rename variables. New variable names appear in the output data set.

```
data temp;
   input (score1-score3) (2.,+1) name $;
   rename name=Firstname
       score1-score3=Newscore1-Newscore3;
   datalines;
12 24 36 Lisa
22 44 66 Fran
;
```

See Also

Data Set Options:

- "RENAME= Data Set Option" in *SAS Viya Data Set Options: Reference*

REPLACE Statement

Replaces an observation in the same location.

Valid in: DATA step

Category: Action

Type: Executable

Restrictions: This statement is not valid in the CAS server.
Use only with a MODIFY statement.

Syntax

REPLACE <*data-set-name-1*> <…*data-set-name-n*>;

Without Arguments

If you specify no argument, the REPLACE statement writes the current observation to the same physical location from which it was read in all data sets that are named in the DATA statement.

Arguments

data-set-name
specifies the data set to which the observation is written.

Requirement	The data set name must also appear in the DATA statement and in one or more MODIFY statements.
Tip	Instead of using a data set name, you can specify the physical pathname to the file, using syntax that your operating system understands. The pathname must be enclosed in single or double quotation marks.

Details

Using an explicit REPLACE statement overrides the default replacement of observations. If a DATA step contains a REPLACE statement, explicitly program all output for the step.

Comparisons

- Using an OUTPUT, REPLACE, or REMOVE statement overrides the default write action at the end of a DATA step. (OUTPUT is the default action; REPLACE becomes the default action when a MODIFY statement is used.) If you use any of these statements in a DATA step, you must explicitly program output of a new observation for the step.
- The OUTPUT, REPLACE, and REMOVE statements are independent of each other. More than one statement can apply to the same observation, as long as the sequence is logical.
- If both an OUTPUT and a REPLACE or REMOVE statement execute on a given observation, perform the OUTPUT action last to keep the position of the observation pointer correct.
- REPLACE writes the observation to the same physical location. OUTPUT writes a new observation to the end of the data set.
- REPLACE can appear only in a DATA step that contains a MODIFY statement. You can use OUTPUT with or without MODIFY.

Example: Replacing Observations

This example updates phone numbers in data set MASTER with values in data set TRANS. It also adds one new observation at the end of data set MASTER. The SYSRC autocall macro tests the value of _IORC_ for each attempted retrieval from MASTER. (SYSRC is part of the SAS autocall macro library.) The resulting SAS data set appears after the code:

```
data master;
   input FirstName $ id $ PhoneNumber;
   datalines;
Kevin ABCjkh 904
Sandi defsns 905
Terry ghitDP 951
Jason jklJWM 962
;
data trans;
   input FirstName $ id $ PhoneNumber;
   datalines;
. ABCjkh 2904
. defsns 2905
Madeline mnombt 2983
```

```
;
data master;
   modify master trans;
   by id;
      /* obs found in master  */
      /* change info, replace */
   if _iorc_ = %sysrc(_sok) then replace;
      /* obs not in master    */
   else if _iorc_ = %sysrc(_dsenmr) then
      do;
         /* reset _error_        */
         _error_=0;
         /* reset _iorc_         */
         _iorc_=0;
         /* output obs to master */
      output;
      end;
run;
proc print data=master;
   title 'MASTER with New Phone Numbers';
run;
```

Output 2.29 *Data Set with Replaced Observations*

MASTER with New Phone Numbers

Obs	FirstName	id	PhoneNumber
1	Kevin	ABCjkh	2904
2	Sandi	defsns	2905
3	Terry	ghitDP	951
4	Jason	jklJWM	962
5	Madeline	mnombt	2983

See Also

Statements:

- “MODIFY Statement” on page 277
- “OUTPUT Statement” on page 300
- “REMOVE Statement” on page 338

RESETLINE Statement

Restarts the program line numbers in the SAS log to 1.

Valid in: Anywhere

Category: Log Control

Type: Executable

Restriction: This statement is not valid in the CAS server.

Syntax

RESETLINE;

Without Arguments

Use the RESETLINE statement to reset the program line numbers in the SAS log to 1.

Details

Program statements are identified by line numbers in the SAS log. The line numbers start with 1 and continue with the sequence of line numbering until the end of the SAS session or batch program.

You use the RESETLINE statement in your program to restart the program line numbering at 1.

Note: If you use the SPOOL system option, you can use only the %INCLUDE statement to resubmit lines of code that were submitted after the most recent RESETLINE statement.

Example: Resetting Line Numbers in the SAS Log

The following example resets the program line numbers between DATA steps.

```
data a;
   a=1;
run;
resetline;
data b;
   b=2;
run;
```

The following lines are written to the SAS log:

```
1    data a;
2       a=1;
3    run;

NOTE: The data set WORK.A has 1 observations and 1 variables.
NOTE: DATA statement used (Total process time):
      real time           4.79 seconds
      cpu time            0.28 seconds


4
5    resetline;
1
2    data b;
3       b=2;
4    run;

NOTE: The data set WORK.B has 1 observations and 1 variables.
NOTE: DATA statement used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds
```

RETAIN Statement

Causes a variable that is created by an INPUT or assignment statement to retain its value from one iteration of the DATA step to the next.

Valid in: DATA step

Categories: CAS
Information

Type: Declarative

Syntax

RETAIN <*element-list(s)* <*initial-value(s)* | (*initial-value-1*) | (*initial-value-list-1*)> <… *element-list-n* <*initial-value-n* | (*initial-value-n*) | (*initial-value-list-n*)> >> ;

Without Arguments

If you do not specify an argument, the RETAIN statement causes the values of all variables that are created with INPUT or assignment statements to be retained from one iteration of the DATA step to the next.

Arguments

element-list
specifies variable names, variable lists, or array names whose values you want retained.

Tips If you specify _ALL_, _CHAR_, or _NUMERIC_, only the variables that are defined before the RETAIN statement are affected.

If a variable name is specified *only* in the RETAIN statement and you do not specify an initial value, the variable is *not* written to the data set, and a note stating that the variable is uninitialized is written to the SAS log. If you specify an initial value, the variable *is* written to the data set.

initial-value
specifies an initial value, numeric or character, for one or more of the preceding elements.

Tip If you omit *initial-value*, the initial value is missing. *Initial-value* is assigned to all the elements that precede it in the list. All members of a variable list, therefore, are given the same initial value.

See (*initial-value*) and (*initial-value-list*)

(*initial-value*)
specifies an initial value, numeric or character, for a single preceding element or for the first in a list of preceding elements.

(*initial-value-list*)
specifies an initial value, numeric or character, for individual elements in the preceding list. SAS matches the first value in the list with the first variable in the list of elements, the second value with the second variable, and so on.

Element values are enclosed in quotation marks. To specify one or more initial values directly, use the following format:

(*initial-value(s)*)

To specify an iteration factor and nested sublists for the initial values, use the following format:

<*constant-iter-value**> <(>*constant value* | *constant-sublist*<)>>

Restriction If you specify both an *initial-value-list* and an *element-list*, then *element-list* must be listed before *initial-value-list* in the RETAIN statement.

Tips You can separate initial values by blank spaces or commas.

You can also use a shorthand notation for specifying a range of sequential integers. The increment is always +1.

You can assign initial values to both variables and temporary data elements.

If there are more variables than initial values, the remaining variables are assigned an initial value of missing and SAS issues a warning message.

Details

Default DATA Step Behavior

Without a RETAIN statement, SAS automatically sets variables that are assigned values by an INPUT or assignment statement to missing before each iteration of the DATA step.

Assigning Initial Values

Use a RETAIN statement to specify initial values for individual variables, a list of variables, or members of an array. If a value appears in a RETAIN statement, variables that appear before it in the list are set to that value initially. (If you assign different initial values to the same variable by naming it more than once in a RETAIN statement, SAS uses the last value.) You can also use RETAIN to assign an initial value other than the default value of 0 to a variable whose value is assigned by a sum statement.

Redundancy

It is redundant to name any of these items in a RETAIN statement, because their values are automatically retained from one iteration of the DATA step to the next:

- variables that are read with a SET, MERGE, MODIFY or UPDATE statement
- a variable whose value is assigned in a sum statement
- the automatic variables _N_, _ERROR_, _I_, _CMD_, and _MSG_
- variables that are created by the END= or IN= option in the SET, MERGE, MODIFY, or UPDATE statement or by options that create variables in the FILE and INFILE statements
- data elements that are specified in a temporary array
- array elements that are initialized in the ARRAY statement

- elements of an array that have assigned initial values to any or all of the elements in the ARRAY statement.

However, you can use a RETAIN statement to assign an initial value to any of the previous items, with the exception of _N_ and _ERROR_.

Comparisons

The RETAIN statement specifies variables whose values are *not set to missing* at the beginning of each iteration of the DATA step. The KEEP statement specifies variables that are to be included in any data set that is being created.

Examples

Example 1: Basic Usage

- This RETAIN statement retains the values of variables MONTH1 through MONTH5 from one iteration of the DATA step to the next:

  ```
  retain month1-month5;
  ```

- This RETAIN statement retains the values of nine variables and sets their initial values:

  ```
  retain month1-month5 1 year 0 a b c 'XYZ';
  ```

  The values of MONTH1 through MONTH5 are set initially to 1; YEAR is set to 0; variables A, B, and C are each set to the character value **XYZ**.

- This RETAIN statement assigns the initial value 1 to the variable MONTH1 only:

  ```
  retain month1-month5 (1);
  ```

  Variables MONTH2 through MONTH5 are set to missing initially.

- This RETAIN statement retains the values of all variables that are defined earlier in the DATA step but not the values that are defined *afterwards*:

  ```
  retain _all_;
  ```

- All of these statements assign initial values of 1 through 4 to VAR1 through VAR4:

  - `retain var1-var4 (1 2 3 4);`
  - `retain var1-var4 (1,2,3,4);`
  - `retain var1-var4(1:4);`

Example 2: Overview of the RETAIN Operation

This example shows how to use variable names and array names as elements in the RETAIN statement and shows assignment of initial values with and without parentheses:

```
data _null_;
   array City{3} $ City1-City3;
   array cp{3} Citypop1-Citypop3;
   retain Year Taxyear 1999 City ' '
          cp (10000,50000,100000);
   file file-specification print;
   put 'Values at beginning of DATA step:'
       / @3 _all_ /;
   input Gain;
   do i=1 to 3;
      cp{i}=cp{i}+Gain;
```

```
   end;
   put 'Values after adding Gain to city populations:'
       / @3 _all_;
   datalines;
5000
10000
;
```

Here are the initial values assigned by RETAIN:

- Year and Taxyear are assigned the initial value 1999.
- City1, City2, and City3 are assigned missing values.
- Citypop1 is assigned the value 10000.
- Citypop2 is assigned 50000.
- Citypop3 is assigned 100000.

Here are the lines written by the PUT statements:

```
Values at beginning of DATA step:
  City1=  City2=  City3=  Citypop1=10000
  Citypop2=50000 Citypop3=100000
Year=1999 Taxyear=1999 Gain=. i=.
_ERROR_=0 _N_=1
Values after adding GAIN to city populations:
  City1=  City2=  City3=  Citypop1=15000
  Citypop2=55000 Citypop3=105000
Year=1999 Taxyear=1999 Gain=5000 i=4
_ERROR_=0 _N_=1
Values at beginning of DATA step:
  City1=  City2=  City3=  Citypop1=15000
  Citypop2=55000 Citypop3=105000
Year=1999 Taxyear=1999 Gain=. i=.
_ERROR_=0 _N_=2
Values after adding GAIN to city populations:
  City1=  City2=  City3=  Citypop1=25000
  Citypop2=65000 Citypop3=115000
Year=1999 Taxyear=1999 Gain=10000 i=4
_ERROR_=0 _N_=2
Values at beginning of DATA step:
  City1=  City2=  City3=  Citypop1=25000
  Citypop2=65000 Citypop3=115000
Year=1999 Taxyear=1999 Gain=. i=.
_ERROR_=0 _N_=3
```

The first PUT statement is executed three times, whereas the second PUT statement is executed only twice. The DATA step ceases execution when the INPUT statement executes for the third time and reaches the end of the file.

Example 3: Selecting One Value from a Series of Observations

In this example, the data set ALLSCORES contains several observations for each identification number and variable ID. Different observations for a particular ID value might have different values of the variable GRADE. This example creates a new data set, CLASS.BESTSCORES, which contains one observation for each ID value. The observation must have the highest GRADE value of all observations for that ID in BESTSCORES.

```
   libname class 'SAS-library';
   proc sort data=class.allscores;
      by id;
```

```
run;
data class.bestscores;
   drop grade;
   set class.allscores;
   by id;
      /* Prevents HIGHEST from being reset*/
      /* to missing for each iteration.   */
   retain highest;
      /* Sets HIGHEST to missing for each */
      /* different ID value.              */
   if first.id then highest=.;
      /* Compares HIGHEST to GRADE in     */
      /* current iteration and resets     */
      /* value if GRADE is higher.        */
   highest=max(highest,grade);
   if last.id then output;
run;
```

See Also

Statements:

- “Assignment Statement” on page 26
- “BY Statement” on page 32
- “INPUT Statement” on page 169

RETURN Statement

Stops executing statements at the current point in the DATA step and returns to a predetermined point in the step.

Valid in: DATA step

Categories: CAS
Control

Type: Executable

Syntax

RETURN;

Without Arguments

The RETURN statement causes execution to stop at the current point in the DATA step, and returns control to a previous DATA step statement.

Details

The point to which SAS returns depends on the order in which statements are executed in the DATA step.

The RETURN statement is often used with the

- GO TO statement

- HEADER= option in the FILE statement
- LINK statement.

When RETURN causes a return to the beginning of the DATA step, an implicit OUTPUT statement writes the current observation to any new data sets (unless the DATA step contains an explicit OUTPUT statement, or REMOVE or REPLACE statements with MODIFY statements). Every DATA step has an implied RETURN as its last executable statement.

Example: Basic Usage

In this example, when the values of X and Y are the same, SAS executes the RETURN statement and adds the observation to the data set. When the values of X and Y are not equal, SAS executes the remaining statements and then adds the observation to the data set.

```
data survey;
   input x y;
   if x=y then return;
   put x= y=;
   datalines;
21 25
20 20
7 17
;
```

See Also

Statements:

- “FILE Statement” on page 71
- “GO TO Statement” on page 125
- “LINK Statement” on page 255

RUN Statement

Executes the previously entered SAS statements.

Valid in: Anywhere

Categories: CAS
Program Control

Syntax

RUN <CANCEL>;

Without Arguments

Without arguments, the RUN statement executes the previously entered SAS statements.

Arguments

CANCEL
terminates the current step without executing it. SAS prints a message that indicates that the step was not executed.

CAUTION:
The CANCEL option does not prevent execution of a DATA step that contains a DATALINES or DATALINES4 statement.

CAUTION:
The CANCEL option has no effect when you use the KILL option with PROC DATASETS.

Details

Although the RUN statement is not required between steps in a SAS program, using it creates a step boundary and can make the SAS log easier to read.

Examples

Example 1: Executing SAS Statements

This RUN statement marks a step boundary and executes this PROC PRINT step:

```
proc print data=report;
   title 'Status Report';
run;
```

Example 2: Using the CANCEL Option

This example shows the usefulness of the CANCEL option in a line prompt mode session. The fourth statement in the DATA step contains an invalid value for PI (4.13 instead of 3.14). RUN with CANCEL ends the DATA step and prevents it from executing.

```
data circle;
   infile file-specification;
   input radius;
   c=2*4.13*radius;
run cancel;
```

The following message is written to the SAS log:

```
WARNING: DATA step not executed at user's request.
```

%RUN Statement

Ends source statements following a %INCLUDE * statement.

Valid in: Anywhere
Category: Program Control
Restriction: This statement is not valid in the CAS server.

Syntax

%RUN;

Without Arguments

The %RUN statement causes SAS to stop reading input from the keyboard (including subsequent SAS statements on the same line as %RUN) and resume reading from the previous input source.

Details

Using the %INCLUDE statement with an asterisk specifies that you enter source lines from the keyboard.

Comparisons

The RUN statement executes previously entered DATA or PROC steps. The %RUN statement ends the prompting for source statements and returns program control to the original source program, when you use the %INCLUDE statement to allow data to be entered from the keyboard.

The type of prompt that you use depends on how you run the SAS session. The include operation is most useful in interactive line and noninteractive modes, but it can also be used in batch mode. When you are running SAS in batch mode, include the %RUN statement in the external file that is referenced by the SASTERM fileref.

Example: Entering Source Lines from the Keyboard

To request keyboard-entry source in a %INCLUDE statement, follow the statement with an asterisk:

```
%include *;
```

When it executes this statement, SAS prompts you to enter source lines from the keyboard. When you finish entering code from the keyboard, enter the following statement to return processing to the program that contains the %INCLUDE statement.

```
%run;
```

See Also

Statements:

- "%INCLUDE Statement" on page 131
- "RUN Statement" on page 351

SASFILE Statement

Opens a SAS data set and allocates enough buffers to hold the entire file in memory.

Valid in: Anywhere

Category: Program Control

Restrictions: This statement is not valid in the CAS server.

A SAS data set opened by the SASFILE statement can be used for subsequent input (read) or update processing but not for output or utility processing.

Syntax

SASFILE <*libref*.> *member-name*<.*member-type*> <(*password-option(s)*)>
OPEN | LOAD | CLOSE;

Arguments

libref
a name that is associated with a SAS library. The libref (library reference) must be a valid SAS name. The default libref is either User (if assigned) or Work (if User is not assigned).

Restriction The libref cannot represent a concatenation of SAS libraries that contain a library in sequential format.

member-name
a valid SAS name that is a SAS data file that is a member of the SAS library associated with the libref.

Restriction The SAS data set must have been created with the V7, V8, or V9 SAS engine.

member-type
the type of SAS file to be opened. Valid value is DATA, which is the default.

password-option(s)
specifies one or more of the following password options:

ENCRYPTKEY=*key-value*
enables the SASFILE statement to open an AES-encrypted SAS data file. If a SAS data file is encrypted with the AES (Advanced Encryption Standard) algorithm, a key value is assigned to the file and must be specified in order to access the file. The key value can be up to 64 bytes long.

Interaction If you do not specify the ENCRYPTKEY= option for an AES-encrypted SAS data file, a dialog box prompts you to specify the key value.

READ=*password*
enables the SASFILE statement to open a read-protected file. The *password* must be a valid SAS name.

WRITE=*password*
enables the SASFILE statement to use the WRITE password to open a file that is both read-protected and write-protected. The *password* must be a valid SAS name.

ALTER=*password*
enables the SASFILE statement to use the ALTER password to open a file that is both read-protected and alter-protected. The *password* must be a valid SAS name.

PW=*password*
enables the SASFILE statement to use the password to open a file that is assigned for all levels of protection. The *password* must be a valid SAS name.

Tip When SASFILE is executed, SAS checks whether the file is read-protected. Therefore, if the file is read-protected, you must include the READ= password in the SASFILE statement. If the file is either write-protected or alter-protected, you can use a WRITE=, ALTER=, or PW= password. However, the file is opened only in input (read) mode. For subsequent processing, you must specify the necessary password or passwords. See "Example 2: Specifying Passwords with the SASFILE Statement" on page 358.

OPEN
opens the file, allocates the buffers, but defers reading the data into memory until a procedure, statement, or application is executed.

LOAD
opens the file, allocates the buffers, and reads the data into memory.

Note: If the total number of allowed buffers is less than the number of buffers required for the file based on the number of data set pages and index file pages, SAS issues a warning about how many pages are read into memory.

CLOSE
frees the buffers and closes the file.

Details

General Information

The SASFILE statement opens a SAS data set and allocates enough buffers to hold the entire file in memory. After the file is read, data is held in memory, available to subsequent DATA and PROC steps or applications, until either a second SASFILE statement closes the file and frees the buffers or the program ends, which automatically closes the file and frees the buffers.

Using the SASFILE statement can improve performance by reducing the following:

- multiple open or close operations (including allocation and freeing of memory for buffers) to process a SAS data set to one open or close operation
- I/O processing by holding the data in memory

If your SAS program consists of steps that read a SAS data set multiple times and you have an adequate amount of memory so that the entire file can be held in real memory, the program should benefit from using the SASFILE statement. However, it is recommended that you set up a test in your environment to measure performance with and without the SASFILE statement.

Processing a SAS Data Set Opened with SASFILE

When the SASFILE statement executes, SAS opens the specified file. When subsequent DATA and PROC steps execute, SAS does not open the file for each request; the file remains open until a second SASFILE statement closes it or the program or session ends.

When a SAS data set is opened by the SASFILE statement, the file is opened for input processing and can be used for subsequent input or update processing. However, the file cannot be used for subsequent utility or output processing, because utility and output processing requires exclusive access to the file (member-level locking). For example, you cannot replace the file or rename its variables.

The following table provides a list of several SAS procedures and statements and specifies whether they are allowed if the file is opened by the SASFILE statement:

Table 2.11 *Processing Requests for a File Opened by SASFILE*

Processing Request	Open Mode	Allowed
APPEND procedure	update	Yes
DATA step that creates or replaces the file	output	No
DATASETS procedure to rename or add a variable, add or change a label, or add or remove integrity constraints or indexes	utility	No
DATASETS procedure with AGE, CHANGE, or DELETE statements	does not open the file but requires exclusive access	No
FSEDIT procedure	update	Yes
PRINT procedure	input	Yes
SORT procedure that replaces original data set with sorted one	output	No
SQL procedure to modify, add, or delete observations	update	Yes
SQL procedure with CREATE TABLE or CREATE VIEW statement	output	No
SQL procedure to create or remove integrity constraints or indexes	utility	No

Buffer Allocation

A buffer is a reserved area of memory that holds a segment of data while it is processed. The number of allocated buffers determines how much data can be held in memory at one time.

The number of buffers is not a permanent attribute of a SAS file. That is, it is valid only for the current SAS session or job. When a SAS file is opened, a default number of buffers for processing the file is set. The default depends on the operating environment but is typically a small number. To specify a different number of buffers, use the BUFNO= data set option or system option.

When the SASFILE statement is executed, SAS automatically allocates the number of buffers based on the number of data set pages and index file pages (if an index file exists). For example:

- If the number of data set pages is five and there is not an index file, SAS allocates five buffers.

- If the number of data set pages is 500 and the number of index file pages is 200, SAS allocates 700 buffers.

If a file that is held in memory increases in size during processing, the number of allocated buffers increases to accommodate the file. If SASFILE is executed for a SAS data set, the BUFNO= option is ignored.

I/O Processing

An I/O (input/output) request reads a segment of data from a storage device (such as a disk) and transfers the data to memory, or conversely transfers the data from memory and writes it to the storage device. When a SAS data set is opened by the SASFILE statement, data is read once and held in memory, which should reduce the number of I/O requests.

CAUTION:

I/O processing can be reduced only if there is sufficient real memory. If the SAS data set is very large, you might not have sufficient real memory to hold the entire file. If insufficient memory exists, your operating environment can simulate more memory than actually exists, which is virtual memory. If virtual memory occurs, data access I/O requests are replaced with swapping I/O requests, which could result in no performance improvement. In addition, both SAS and your operating environment have a maximum amount of memory that can be allocated, which could be exceeded by the needs of your program. If your program needs exceed the memory that is available, the number of allocated buffers might be decreased to the default allocation in order to free memory.

TIP To determine how much memory a SAS data set requires, execute the CONTENTS procedure for the file to list its page size, the number of data set pages, the index file size, and the number of index file pages.

Comparisons

Use the BUFNO= system option or data set option to specify a specific number of buffers.

Examples

Example 1: Using SASFILE in a Program with Multiple Steps

The following SAS program illustrates the process of opening a SAS data set, transferring its data to memory, and reading that data held in memory for multiple tasks. The program consists of steps that read the file multiple times.

```
libname mydata 'SAS-library';
sasfile mydata.census.data open;1
data test1;
   set mydata.census;2
run;
data test2;
   set mydata.census;3
run;
proc summary data=mydata.census print;4
run;
data mydata.census;5
   modify mydata.census;
   .
```

```
   . (statements to modify data)
   .
run;
sasfile mydata.census close; 6
```

1 Opens SAS data set MyData.Census and allocates the number of buffers based on the number of data set pages and index file pages.

2 Reads all pages of MyData.Census and transfers all data from disk to memory.

3 Reads MyData.Census a second time, but this time from memory without additional I/O requests.

4 Reads MyData.Census a third time, again from memory without additional I/O requests.

5 Reads MyData.Census a fourth time, again from memory without additional I/O requests. If the MODIFY statement successfully changes data in memory, the changed data is transferred from memory to disk at the end of the DATA step.

6 Closes MyData.Census, and frees allocated buffers.

Example 2: Specifying Passwords with the SASFILE Statement

The following SAS program illustrates using the SASFILE statement and specifying passwords for a SAS data set that is both read-protected and alter-protected:

```
libname mydata 'SAS-library';
sasfile mydata.census (read=gizmo) open; 1
proc print data=mydata.census (read=gizmo); 2
run;
data mydata.census;
   modify mydata.census (alter=luke); 3
   .
   . (statements to modify data)
   .
run;
```

1 The SASFILE statement specifies the READ password, which is sufficient to open the file.

2 In the PRINT procedure, the READ password must be specified again.

3 The ALTER password is used in the MODIFY statement, because the data set is being updated.

Note: It is acceptable to use the higher-level ALTER password instead of the READ password in the preceding example.

See Also

Data Set Options:

- "BUFNO= Data Set Option" in *SAS Viya Data Set Options: Reference*

System Options:

- "BUFNO= System Option" in *SAS Viya System Options: Reference*

SELECT Statement

Executes one of several statements or groups of statements.

Valid in: DATA step

Categories: CAS
Control

Type: Executable

Syntax

SELECT <(*select-expression*)> ;
WHEN-1 (*when-expression-1* <…, *when-expression-n*>) *statement*;
<… WHEN-*n* (*when-expression-1* <…,*when-expression-n*>) *statement*;>
< OTHERWISE *statement*;>

END;

Arguments

(select-expression)
specifies any SAS expression that evaluates to a single value.

See "Evaluating the when-expression When a select-expression Is Included" on page 360

(when-expression)
specifies any SAS expression, including a compound expression. SELECT requires you to specify at least one *when-expression*.

Tips Separating multiple *when-expressions* with a comma is equivalent to separating them with the logical operator OR.

The way a *when-expression* is used depends on whether a *select-expression* is present.

See "Evaluating the when-expression When a select-expression Is Not Included" on page 360

statement
can be any executable SAS statement, including DO, SELECT, and null statements. You must specify the *statement* argument.

Details

Using WHEN Statements in a SELECT Group

The SELECT statement begins a SELECT group. SELECT groups contain WHEN statements that identify SAS statements that are executed when a particular condition is true. Use at least one WHEN statement in a SELECT group. An optional OTHERWISE statement specifies a statement to be executed if no WHEN condition is met. An END statement ends a SELECT group.

Null statements that are used in WHEN statements cause SAS to recognize a condition as true without taking further action. Null statements that are used in OTHERWISE statements prevent SAS from issuing an error message when all WHEN conditions are false.

Evaluating the when-expression When a select-expression Is Included

If the *select-expression* is present, SAS evaluates the *select-expression* and *when-expression*. SAS compares the two for equality and returns a value of true or false. If the comparison is true, *statement* is executed. If the comparison is false, execution proceeds either to the next *when-expression* in the current WHEN statement, or to the next WHEN statement if no more expressions are present. If no WHEN statements remain, execution proceeds to the OTHERWISE statement, if one is present. If the result of all SELECT-WHEN comparisons is false and no OTHERWISE statement is present, SAS issues an error message and stops executing the DATA step.

Evaluating the when-expression When a select-expression Is Not Included

If no *select-expression* is present, the *when-expression* is evaluated to produce a result of true or false. If the result is true, *statement* is executed. If the result is false, SAS proceeds to the next *when-expression* in the current WHEN statement, or to the next WHEN statement if no more expressions are present, or to the OTHERWISE statement if one is present. (That is, SAS performs the action that is indicated in the first true WHEN statement.) If the result of all *when-expressions* is false and no OTHERWISE statement is present, SAS issues an error message. If more than one WHEN statement has a true *when-expression*, only the first WHEN statement is used. Once a *when-expression* is true, no other *when-expressions* are evaluated.

Processing Large Amounts of Data with %INCLUDE Files

One way to process large amounts of data is to use %INCLUDE statements in your DATA step. Using %INCLUDE statements enables you to perform complex processing while keeping your main program manageable. The %INCLUDE files that you use in your main program can contain WHEN statements and other SAS statements to process your data. See "Example 5: Processing Large Amounts of Data" on page 361 for an example.

Comparisons

Use IF-THEN/ELSE statements for programs with few statements. Use subsetting IF statements without a THEN clause to continue processing only those observations or records that meet the condition that is specified in the IF clause.

The SELECT statement works much like the CASE statement in the SQL procedure.

Examples

Example 1: Using Statements

```
select (a);
   when (1) x=x*10;
   when (2);
   when (3,4,5) x=x*100;
   otherwise;
end;
```

Example 2: Using DO Groups

```
select (payclass);
   when ('monthly') amt=salary;
   when ('hourly')
      do;
         amt=hrlywage*min(hrs,40);
         if hrs>40 then put 'CHECK TIMECARD';
      end;         /* end of do     */
   otherwise put 'PROBLEM OBSERVATION';
end;               /* end of select */
```

Example 3: Using a Compound Expression

```
select;
   when (mon in ('JUN', 'JUL', 'AUG')
   and temp>70) put 'SUMMER ' mon=;
   when (mon in ('MAR', 'APR', 'MAY'))
   put 'SPRING ' mon=;
   otherwise put 'FALL OR WINTER ' mon=;
end;
```

Example 4: Making Comparisons for Equality

```
      /* INCORRECT usage to select value of 2 */
select (x);
   /* evaluates T/F and compares for       */
   /* equality with x                      */
   when (x=2) put 'two';
end;
   /* correct usage */
select(x);
   /* compares 2 to x for equality */
   when (2) put 'two';
end;
   /* correct usage */
select;
   /* compares 2 to x for equality         */
   when (x=2) put 'two';
end;
```

Example 5: Processing Large Amounts of Data

In the following example, the %INCLUDE statements contain code that includes WHEN statements to process new and old items in the inventory. The main program shows the overall logic of the DATA step.

```
data test (keep=ItemNumber);
   set ItemList;
   select;
      %include NewItems;
      %include OldItems;
      otherwise put 'Item ' ItemNumber ' is not in the inventory.';
   end;
run;
```

See Also

Statements:

- "DO Statement" on page 59
- "IF Statement, Subsetting" on page 127
- "IF-THEN/ELSE Statement" on page 129

SET Statement

Reads an observation from one or more SAS data sets.

Valid in: DATA step

Categories: CAS
File-Handling

Type: Executable

Note: The variables that are read using the SET statement are retained in the PDV. The data types of the variables that are read are also retained. For more information, see the "RETAIN Statement" on page 346.

Tip: The SAS Tutorial video Reading a SAS Data Set shows you how to use the SET statement to read data.

Syntax

SET<*SAS-data-set(s)* <(*data-set-options(s)*)> >
<*options*>;

Without Arguments

When you do not specify an argument, the SET statement reads an observation from the most recently created data set.

Arguments

SAS-data-set (s)
specifies a one-level name, a two-level name, or one of the special SAS data set names.

Tips You can specify data set lists. For more information, see "Using Data Set Lists with SET" on page 368.

Instead of using a data set name, you can specify the physical pathname to the file, using syntax that your operating system understands. The pathname must be enclosed in single or double quotation marks.

Example "Example 13: Using Data Set Lists" on page 373

(*data-set-options*)
specifies actions SAS is to take when it reads variables or observations into the program data vector for processing.

Tip Data set options that apply to a data set list apply to all of the data sets in the list.

See For more information, see "Definition of Data Set Options" in *SAS Viya Data Set Options: Reference* for a list of the data set options to use with input data sets.

SET Options

CUROBS=*variable*
creates and names a variable that contains the observation number that was just read from the data set.

Example "Example 14: Finding the Current Observation Number" on page 375

END=*variable*
creates and names a temporary variable that contains an end-of-file indicator. The variable, which is initialized to zero, is set to 1 when SET reads the last observation of the last data set listed. This variable is not added to any new data set.

Restriction END= cannot be used with POINT=. When random access is used, the END= variable is never set to 1.

Interaction If you use a BY statement, END= is set to 1 when the SET statement reads the last observation of the interleaved data set. For more information, see "BY-Group Processing with SET" on page 369.

Example "Example 11: Writing an Observation Only After All Observations Have Been Read" on page 372

KEY=*index*</UNIQUE>
provides nonsequential access to observations in a SAS data set, which are based on the value of an index variable or a key.

Range Specify the name of a simple or a composite index of the data set that is being read.

Restrictions This option is not supported in the CAS server.

Variables with a VARCHAR data type are not supported.

KEY= cannot be used with POINT=.

Tips Using the _IORC_ automatic variable in conjunction with the SYSRC autocall macro provides you with more error-handling information than was previously available. When you use the SET statement with the KEY= option, the new automatic variable _IORC_ is created. This automatic variable is set to a return code that shows the status of the most recent I/O operation that is performed on an observation in a SAS data set. If the KEY= value is not found, the _IORC_ variable returns a value that corresponds to the SYSRC autocall macro's mnemonic _DSENOM and the automatic variable _ERROR_ is set to 1.

When using the SET statement with the KEY= option and a non-unique index, it is often desirable to force the SET statement to start reading again with the first observation that matches the key value.

Use the KEYRESET= option to control whether a KEY= search should begin at the top of the index for the data set that is being read.

See For more information, see the description of the autocall macro SYSRC in *SAS Viya Macro Language: Reference*.

"KEYRESET=*variable*" on page 364

UNIQUE option on page 367

Examples

"Example 7: Performing a Table Lookup" on page 371

"Example 8: Performing a Table Lookup When the Master File Contains Duplicate Observations" on page 371

CAUTION **Continuous loops can occur when you use the KEY= option.** If you use the KEY= option without specifying the primary data set, you must include either a STOP statement to stop DATA step processing, or programming logic that uses the _IORC_ automatic variable in conjunction with the SYSRC autocall macro and checks for an invalid value of the _IORC_ variable, or both.

KEYRESET=*variable*

controls whether a KEY= search should begin at the top of the index for the data set that is being read. When the value of the KEYRESET variable is 1, the index lookup begins at the top of the index. When the value of the KEYRESET variable is 0, the index lookup is not reset and the lookup continues where the prior ended.

Restriction Variables with a VARCHAR data type are not supported.

Interaction The KEYRESET= option is similar to the UNIQUE option, except the KEYRESET= option enables you to determine when the KEY= search should begin at the top of the index again.

See

"KEY=*index*</UNIQUE>" on page 363

"UNIQUE" on page 367

Example

"Example 15: Using the KEYRESET Option" on page 375

INDSNAME=*variable*

creates and names a variable that stores the name of the SAS data set from which the current observation is read. The stored name can be a data set name or a physical name. The physical name is the name by which the operating environment recognizes the file.

Tips For data set names, SAS adds the library name to the variable value (for example, WORK.PRICE) and converts the two-level name to uppercase.

Unless previously defined, the length of the variable is set to 41 bytes. Use a LENGTH statement to make the variable length long enough to contain the value of the physical filename if the filename is longer than 41 bytes.

If the variable is previously defined as a character variable with a specific length, that length is not changed. If the value placed into the

INDSNAME variable is longer than that length, then the value is truncated.

If the variable is previously defined as a numeric variable, an error occurs.

The variable is available in the DATA step, but the variable is not added to any output data set.

Example "Example 12: Retrieving the Name of the Data Set from Which the Current Observation Is Read" on page 372

NOBS=*variable*

creates and names a temporary variable whose value is usually the total number of observations in the input data set or data sets. If more than one data set is listed in the SET statement, NOBS= the total number of observations in the data sets that are listed. The number of observations includes those observations that are marked for deletion but are not yet deleted.

Restriction For certain SAS views and sequential engines such as the TAPE and XML engines, SAS cannot determine the number of observations. In these cases, SAS sets the value of the NOBS= variable to the largest positive integer value that is available in your operating environment.

Interaction The NOBS= and POINT= options are independent of each other.

Tip At compilation time, SAS reads the descriptor portion of each data set and assigns the value of the NOBS= variable automatically. Thus, you can refer to the NOBS= variable before the SET statement. The variable is available in the DATA step but is not added to any output data set.

Example "Example 10: Performing a Function until the Last Observation Is Reached" on page 372

OPEN=(IMMEDIATE | DEFER)

enables you to delay the opening of any concatenated SAS data sets until they are ready to be processed.

IMMEDIATE

during the compilation phase, opens all data sets that are listed in the SET statement.

Restriction When you use the IMMEDIATE option KEY=, POINT=, and BY statement processing are mutually exclusive.

Tip If a variable on a subsequent data set is of a different type (for example, character versus numeric) than the type of the same-named variable on the first data set, the DATA step stops processing and produces an error message.

DEFER

opens the first data set during the compilation phase, and opens subsequent data sets during the execution phase. When the DATA step reads and processes all observations in a data set, it closes the data set and opens the next data set in the list.

Restriction When you specify the DEFER option, you cannot use the KEY= statement option, the POINT= statement option, or the BY statement. These constructs imply either random processing or interleaving of observations from the data sets, which is not possible unless all data sets are open.

Requirement You can use the DROP=, KEEP=, or RENAME= data set options to process a set of variables, but the set of variables that are processed for each data set must be identical. In most cases, if the set of variables defined by any subsequent data set differs from the variables defined by the first data set, SAS prints a warning message to the log but does not stop execution.

- If a variable on a subsequent data set is of a different type (for example, character versus numeric) than the type of the same-named variable on the first data set, the DATA step stops processing and produces an error message.
- If a variable on a subsequent data set was not defined by the first data set in the SET statement, but was defined previously in the DATA step program, the DATA step stops processing and produces an error message. In this case, the value of the variable in previous iterations might be incorrect because the semantic behavior of SET requires this variable to be set to missing when processing the first observation of the first data set.

Default IMMEDIATE

POINT=*variable*

specifies a temporary variable whose numeric value determines which observation is read. POINT= causes the SET statement to use random (direct) access to read a SAS data set.

Restrictions Variables with a VARCHAR data type are not supported.

This option is not supported in the CAS server.

You cannot use POINT= with a BY statement, a WHERE statement, or a WHERE= data set option. In addition, you cannot use it with transport format data sets, data sets in sequential format on tape or disk, and SAS/ACCESS views or the SQL procedure views that read data from external files.

You cannot use POINT= with KEY=.

Requirement a STOP statement

Note Remember that _N_ is an iteration count and not the observation number of the last observation that was read.

Tips You must supply the values of the POINT= variable. For example, you can use the POINT= variable as the index variable in some form of the DO statement.

The POINT= variable is available anywhere in the DATA step, but it is not added to any new SAS data set.

Examples "Example 6: Combining One Observation with Many" on page 371

"Example 9: Reading a Subset By Using Direct Access" on page 372

CAUTION **Continuous loops can occur when you use the POINT= option.** When you use the POINT= option, you must include a STOP statement to stop DATA step processing, programming logic that checks for an invalid value of the POINT= variable, or both. Because POINT= reads only those observations that are specified in the DO statement, SAS cannot read an end-of-file indicator as it would if the file were being read sequentially. Because reading an end-of-file indicator ends a DATA step automatically, failure to substitute another means of ending the DATA step when you use POINT= can cause the DATA step to go into a continuous loop. If SAS reads an invalid value of the POINT= variable, it sets the automatic variable _ERROR_ to 1. Use this information to check for conditions that cause continuous DO-loop processing, or include a STOP statement at the end of the DATA step, or both.

UNIQUE

causes a KEY= search always to begin at the top of the index for the data set that is being read.

Restriction UNIQUE can appear only with the KEY= argument and must be preceded by a slash.

Notes By default, SET begins searching at the top of the index only when the KEY= value changes.

If the KEY= value does not change on successive executions of the SET statement, the search begins by following the most recently retrieved observation. In other words, when consecutive duplicate KEY= values appear, the SET statement attempts a one-to-one match with duplicate indexed values in the data set that is being read. If more consecutive duplicate KEY= values are specified than exist in the data set that is being read, the extra duplicates are treated as not found.

When KEY= is a unique value, only the first attempt to read an observation with that key value succeeds; subsequent attempts to read the observation with that value of the key fail. The _IORC_ variable returns a value that corresponds to the SYSRC autocall macro's mnemonic _DSENOM. If you add the /UNIQUE option, subsequent attempts to read the observation with the unique KEY= value succeed. The _IORC_ variable returns a 0.

See For extensive examples, see *Combining and Modifying SAS Data Sets: Examples*

"KEYRESET=*variable*" on page 364

Example "Example 8: Performing a Table Lookup When the Master File Contains Duplicate Observations" on page 371

Details

What SET Does

Each time the SET statement is executed, SAS reads one observation into the program data vector. SET reads all variables and all observations from the input data sets unless you tell SAS to do otherwise. A SET statement can contain multiple data sets; a DATA step can contain multiple SET statements. See *Combining and Modifying SAS Data Sets: Examples*.

Note: When the DATA step comes to an end-of-file marker or the end of all open data sets, it performs an orderly shutdown. For example, if you use SET with FIRSTOBS, a file with only a header record in a series of files triggers a normal shutdown of the DATA step. The shutdown occurs because SAS reads beyond the end-of-file marker and the DATA step terminates. You can use the END= option to avoid the shutdown.

Uses

The SET statement is flexible and has a variety of uses in SAS programming. These uses are determined by the options and statements that you use with the SET statement:

- reading observations and variables from existing SAS data sets for further processing in the DATA step
- concatenating and interleaving data sets, and performing one-to-one reading of data sets
- reading SAS data sets by using direct access methods.

Using Data Set Lists with SET

You can use data set lists with the SET statement. Data set lists provide a quick way to reference existing groups of data sets. These data set lists must be either name prefix lists or numbered range lists.

Name prefix lists refer to all data sets that begin with a specified character string. For example, **`set SALES1:;`** tells SAS to read all data sets starting with "SALES1" such as SALES1, SALES10, SALES11, and SALES12.

Numbered range lists require you to have a series of data sets with the same name, except for the last character or characters, which are consecutive numbers. In a numbered range list, you can begin with any number and end with any number. For example, these lists refer to the same data sets:

```
sales1 sales2 sales3 sales4
sales1-sales4
```

Note: If the numeric suffix of the first data set name contains leading zeros, the number of digits in the numeric suffix of the last data set name must be greater than or equal to the number of digits in the first data set name. Otherwise, an error occurs. For example, the data set lists sales001–sales99 and sales01–sales9 cause an error. The data set list sales001–sales999 is valid. If the numeric suffix of the first data set name does not contain leading zeros, the number of digits in the numeric suffix of the first and last data set names do not have to be equal. For example, the data set list sales1–sales999 is valid.

Some other rules to consider when using numbered data set lists are as follows:

- You can specify groups of ranges.

  ```
  set cost1-cost4 cost11-cost14 cost21-cost24;
  ```

- You can mix numbered range lists with name prefix lists.

```
set cost1-cost4 cost2: cost33-37;
```

- You can mix single data sets with data set lists.

```
set cost1 cost10-cost20 cost30;
```

- Quotation marks around data set lists are ignored.

```
/* these two lines are the same */
set sales1 - sales4;
set 'sales1'n - 'sales4'n;
```

- Spaces in data set names are invalid. If quotation marks are used, trailing blanks are ignored.

```
/* blanks in these statements will cause errors */
set sales 1 - sales 4;
set 'sales 1'n - 'sales 4'n;
/* trailing blanks in this statement will be ignored */
set 'sales1   'n - 'sales4   'n;
```

- The maximum numeric suffix is 2147483647.

```
/* this suffix will cause an error */
set prod2000000000-prod2934850239;
```

BY-Group Processing with SET

Only one BY statement can accompany each SET statement in a DATA step. The BY statement should immediately follow the SET statement to which it applies. The data sets that are listed in the SET statement must be sorted by the values of the variables that are listed in the BY statement, or they must have an appropriate index. SET, when it is used with a BY statement, interleaves data sets. The observations in the new data set are arranged by the values of the BY variable or variables, and within each BY group, by the order of the data sets in which they occur. See "Example 2: Interleaving SAS Data Sets" on page 370 for an example of BY-group processing with the SET statement.

Combining SAS Data Sets

Use a single SET statement with multiple data sets to concatenate the specified data sets. That is, the number of observations in the new data set is the sum of the number of observations in the original data sets, and the order of the observations is all the observations from the first data set followed by all the observations from the second data set, and so on. See "Example 1: Concatenating SAS Data Sets" on page 370 for an example of concatenating data sets.

Use a single SET statement with a BY statement to interleave the specified data sets. The observations in the new data set are arranged by the values of the BY variable or variables, and within each BY group, by the order of the data sets in which they occur. See "Example 2: Interleaving SAS Data Sets" on page 370 for an example of interleaving data sets.

Use multiple SET statements to perform one-to-one reading (also called one-to-one matching) of the specified data sets. The new data set contains all the variables from all the input data sets. The number of observations in the new data set is the number of observations in the smallest original data set. If the data sets contain common variables, the values that are read in from the last data set replace the values that were read in from earlier ones. For examples of one-to-one reading of data sets, see

- "Example 6: Combining One Observation with Many" on page 371
- "Example 7: Performing a Table Lookup" on page 371

- "Example 8: Performing a Table Lookup When the Master File Contains Duplicate Observations" on page 371

For extensive examples, see *Combining and Modifying SAS Data Sets: Examples*.

Comparisons

- SET reads an observation from an existing SAS data set. INPUT reads raw data from an external file or from in-stream data lines in order to create SAS variables and observations.
- Using the KEY= option with SET enables you to access observations nonsequentially in a SAS data set according to a value. Using the POINT= option with SET enables you to access observations nonsequentially in a SAS data set according to the observation number.

Examples

Example 1: Concatenating SAS Data Sets

If more than one data set name appears in the SET statement, the resulting output data set is a concatenation of all the data sets that are listed. SAS reads all observations from the first data set, then all from the second data set, and so on, until all observations from all the data sets have been read. This example concatenates the three SAS data sets into one output data set named FITNESS:

```
data fitness;
   set health exercise well;
run;
```

Example 2: Interleaving SAS Data Sets

To interleave two or more SAS data sets, use a BY statement after the SET statement:

```
data april;
   set payable recvable;
   by account;
run;
```

Example 3: Reading a SAS Data Set

In this DATA step, each observation in the data set NC.MEMBERS is read into the program data vector. Only those observations whose value of CITY is **Raleigh** are written to the new data set RALEIGH.MEMBERS:

```
data raleigh.members;
   set nc.members;
   if city='Raleigh';
run;
```

Example 4: Merging a Single Observation with All Observations in a SAS Data Set

An observation to be merged into an existing data set can be one that is created by a SAS procedure or another DATA step. In this example, the data set AVGSALES has only one observation:

```
data national;
      if _n_=1 then set avgsales;
```

```
      set totsales;
run;
```

Example 5: Reading from the Same Data Set More Than Once

In this example, SAS treats each SET statement independently. That is, it reads from one data set as if it were reading from two separate data sets:

```
data drugxyz;
   set trial5(keep=sample);
   if sample>2;
   set trial5;
run;
```

For each iteration of the DATA step, the first SET statement reads one observation. The next time the first SET statement is executed, it reads the next observation. Each SET statement can read different observations with the same iteration of the DATA step.

Example 6: Combining One Observation with Many

You can subset observations from one data set and combine them with observations from another data set by using direct access methods, as follows:

```
data south;
   set revenue;
   if region=4;
   set expense point=_n_;
run;
```

Example 7: Performing a Table Lookup

This example illustrates using the KEY= option to perform a table lookup. The DATA step reads a primary data set that is named INVTORY and a lookup data set that is named PARTCODE. It uses the index PARTNO to read PARTCODE nonsequentially, by looking for a match between the PARTNO value in each data set. The purpose is to obtain the appropriate description, which is available only in the variable DESC in the lookup data set, for each part that is listed in the primary data set:

```
data combine;
   set invtory(keep=partno instock price);
   set partcode(keep=partno desc)  key=partno;
run;
```

Example 8: Performing a Table Lookup When the Master File Contains Duplicate Observations

This example uses the KEY= option to perform a table lookup. The DATA step reads a primary data set that is named INVTORY, which is indexed on PARTNO, and a lookup data set named PARTCODE. PARTCODE contains quantities of new stock (variable NEW_STK). The UNIQUE option ensures that, if there are any duplicate observations in INVTORY, values of NEW_STK are added only to the first observation of the group:

```
data combine;
   set partcode(keep=partno new_stk);
   set invtory(keep=partno instock price)
   key=partno/unique;
   instock=instock+new_stk;
run;
```

Example 9: Reading a Subset By Using Direct Access

These statements select a subset of 50 observations from the data set DRUGTEST by using the POINT= option to access observations directly by number:

```
data sample;
   do obsnum=1 to 100 by 2;
      set drugtest point=obsnum;
      if _error_ then abort;
      output;
   end;
   stop;
run;
```

Example 10: Performing a Function until the Last Observation Is Reached

These statements use NOBS= to set the termination value for DO-loop processing. The value of the temporary variable LAST is the sum of the observations in SURVEY1 and SURVEY2:

```
do obsnum=1 to last by 100;
   set survey1 survey2 point=obsnum nobs=last;
   output;
end;
stop;
```

Example 11: Writing an Observation Only After All Observations Have Been Read

This example uses the END= variable LAST to tell SAS to assign a value to the variable REVENUE and write an observation only after the last observation of RENTAL has been read:

```
set rental end=last;
totdays + days;
if last then
   do;
      revenue=totdays*65.78;
      output;
   end;
```

Example 12: Retrieving the Name of the Data Set from Which the Current Observation Is Read

This example creates three data sets and stores the data set name in a variable named *dsn*. The name is split into three parts and the example prints out the results.

```
/* Create some data sets to read */
data gas_price_option; value=395; run;
data gas_rbid_option; value=840; run;
data gas_price_forward; value=275; run;
/* Create a data set D */
data d;
   set gas_price_option gas_rbid_option gas_price_forward indsname=dsn;
   /* split the data set names into 3 parts */
   commodity = scan (dsn, 2, "._");
   type = scan (dsn, 3, "._");
   instrument = scan (dsn, 4, "._");
   run;
```

```
proc print data=d;
run;
```

Output 2.30 *Data Set Name Split into Three Parts*

Obs	value	commodity	type	instrument
1	395	GAS	PRICE	OPTION
2	840	GAS	RBID	OPTION
3	275	GAS	PRICE	FORWARD

Example 13: Using Data Set Lists

This example uses a numbered range list to read in the data sets.

```
data dept008; emp=13; run;
data dept009; emp=9; run;
data dept010; emp=4; run;
data dept011; emp=33; run;
data _null_;
  set dept008-dept010;
  put _all_;
run;
```

The following lines are written to the SAS log.

Log 2.3 *Using a Data Set List with the SET Statement*

```
1    data dept008; emp=13; run;
NOTE: The data set WORK.DEPT008 has 1 observations and 1 variables.
NOTE: DATA statement used (Total process time):
      real time           0.06 seconds
      cpu time            0.03 seconds

2    data dept009; emp=9; run;
NOTE: The data set WORK.DEPT009 has 1 observations and 1 variables.
NOTE: DATA statement used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds

3    data dept010; emp=4; run;
NOTE: The data set WORK.DEPT010 has 1 observations and 1 variables.
NOTE: DATA statement used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds

4    data dept011; emp=33; run;
NOTE: The data set WORK.DEPT011 has 1 observations and 1 variables.
NOTE: DATA statement used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds

5
6   data _null_;
7     set dept008-dept010;
8     put _all_;
9   run;
emp=13 _ERROR_=0 _N_=1
emp=9 _ERROR_=0 _N_=2
emp=4 _ERROR_=0 _N_=3
NOTE: There were 1 observations read from the data set WORK.DEPT008.
NOTE: There were 1 observations read from the data set WORK.DEPT009.
NOTE: There were 1 observations read from the data set WORK.DEPT010.
NOTE: DATA statement used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds
```

In addition, you could use data set lists to find missing data sets. This example uses a numbered range list to locate the missing data sets. An error occurs for each data set that does not exist. Once you know which data sets are missing, you can correct the SET statement to reflect the data sets that actually exist.

```
data dept008; emp=13; run;
data dept009; emp=9; run;
data dept011; emp=4; run;
data dept014; emp=33; run;
data _null_;
  set dept008-dept014;
  put _all_;
run;
```

The following lines are written to the SAS log.

Log 2.4 *Finding Missing Data Sets Using the SET Statement*

```
1    data dept008; emp=13; run;
NOTE: The data set WORK.DEPT008 has 1 observations and 1 variables.
NOTE: DATA statement used (Total process time):
      real time           0.04 seconds
      cpu time            0.04 seconds

2    data dept009; emp=9; run;
NOTE: The data set WORK.DEPT009 has 1 observations and 1 variables.
NOTE: DATA statement used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds

3    data dept011; emp=4; run;
NOTE: The data set WORK.DEPT011 has 1 observations and 1 variables.
NOTE: DATA statement used (Total process time):
      real time           0.03 seconds
      cpu time            0.01 seconds

4    data dept014; emp=33; run;
NOTE: The data set WORK.DEPT014 has 1 observations and 1 variables.
NOTE: DATA statement used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds

5    data _null_;
6    set dept008-dept014;
ERROR: File WORK.DEPT010.DATA does not exist.
ERROR: File WORK.DEPT012.DATA does not exist.
ERROR: File WORK.DEPT013.DATA does not exist.
7    put _all_;
8    run;
NOTE: The SAS System stopped processing this step because of errors.
NOTE: DATA statement used (Total process time):
      real time           0.00 seconds
      cpu time            0.00 seconds
```

Example 14: Finding the Current Observation Number

The following example uses the CUROBS option to return the number of the current observation.

```
data women;
  set sashelp.class curobs=cobs;
  where sex = 'F';
  orig_obs = cobs;
run;
```

Example 15: Using the KEYRESET Option

This example uses the KEYRESET= option to look up all the values when I=3 two times.

```
data a(index=(i));
   do i = 1,2,3,3,3,4,5;
      j=ranuni(4);
      output;
   end;
run;
data _null_;
   input i;
   reset = 1;
```

```
   do while (_iorc_ = 0);
      set a key=i keyreset=reset;
      put _all_;
   end;
   _error_ = 0; _iorc_ = 0;
   datalines;
3
3
;
```

See Also

- *Combining and Modifying SAS Data Sets: Examples*
- "Definition of Data Set Options" in *SAS Viya Data Set Options: Reference*
- *SAS Viya Macro Language: Reference*

Statements:

- "BY Statement" on page 32
- "DO Statement" on page 59
- "INPUT Statement" on page 169
- "MERGE Statement" on page 268
- "STOP Statement" on page 377
- "UPDATE Statement" on page 392

SKIP Statement

Creates a blank line in the SAS log.

Valid in: Anywhere

Category: Log Control

Restriction: This statement is not valid in the CAS server.

Syntax

SKIP <*n*>;

Without Arguments

Using SKIP without arguments causes SAS to create one blank line in the log.

Arguments

n

specifies the number of blank lines that you want to create in the log.

Tip If the number specified is greater than the number of lines that remain on the page, SAS goes to the top of the next page.

Details

The SKIP statement itself does not appear in the log. You can use this statement in all methods of operation.

See Also

Statements:

- "PAGE Statement" on page 303

System Options:

- "LINESIZE= System Option" in *SAS Viya System Options: Reference*
- "PAGESIZE= System Option" in *SAS Viya System Options: Reference*

STOP Statement

Stops execution of the current DATA step.

Valid in: DATA step

Categories: Action
CAS

Type: Executable

Syntax

STOP;

Without Arguments

The STOP statement causes SAS to stop processing the current DATA step immediately and resume processing statements after the end of the current DATA step.

Details

SAS writes a data set for the current DATA step. However, the observation being processed when STOP executes is not added. The STOP statement can be used alone or in an IF-THEN statement or SELECT group.

Use STOP with any features that read SAS data sets using random access methods, such as the POINT= option in the SET statement. Because SAS does not detect an end-of-file with this access method, you must include program statements to prevent continuous processing of the DATA step.

Comparisons

- When you use SAS Studio or other interactive methods of operation, the ABORT statement and the STOP statement both stop processing. The ABORT statement sets the value of the automatic variable _ERROR_ to 1, but the STOP statement does not.
- In batch or noninteractive mode, the two statements also have different effects. Use the STOP statement in batch or noninteractive mode to continue processing with the next DATA or PROC step.

Examples

Example 1: Basic Usage

- ```
  stop;
  ```
- ```
  if idcode=9999 then stop;
  ```
- ```
  select (a);
     when (0) output;
     otherwise stop;
  end;
  ```

Example 2: Avoiding an Infinite Loop

This example shows how to use STOP to avoid an infinite loop within a DATA step when you are using random access methods:

```
data sample;
   do sampleobs=1 to totalobs by 10;
      set master.research point=sampleobs nobs=totalobs;
      output;
   end;
   stop;
run;
```

See Also

Statements:

- "ABORT Statement" on page 15
- POINT= option in the SET statement on page 366

Sum Statement

Adds the result of an expression to an accumulator variable.

Valid in: DATA step

Categories: Action
CAS

Type: Executable

Syntax

variable+*expression*;

Arguments

variable
specifies the name of the accumulator variable, which contains a numeric value.

Tips The variable is automatically set to 0 before SAS reads the first observation. The variable's value is retained from one iteration to the next, as if it had appeared in a RETAIN statement.
```

To initialize a sum variable to a value other than 0, include it in a RETAIN statement with an initial value.

expression
is any SAS expression.

Tips The expression is evaluated and the result added to the accumulator variable.

SAS treats an expression that produces a missing value as zero.

Comparisons

The sum statement is equivalent to using the SUM function and the RETAIN statement, as shown here:

```
retain variable 0;
variable=sum(variable,expression);
```

Example: Using the Sum Statement

Here are examples of sum statements that illustrate various expressions:

- `balance+(-debit);`
- `sumxsq+x*x;`
- `nx+(x ne .);`
- `if status='ready' then OK+1;`

See Also

Functions:

- "SUM Function" in *SAS Viya Functions and CALL Routines: Reference*

Statements:

- "RETAIN Statement" on page 346

SYSECHO Statement

Sends a global statement complete event and passes a text string back to the IOM client.

Valid in: Anywhere
Category: Program Control
Restrictions: This statement is not valid in the CAS server.
Has an effect only in objectserver mode

Syntax

SYSECHO <"*text*"> ;

Without Arguments

Using SYSECHO without arguments sends a global statement complete event to the IOM client.

Arguments

"*text*"
specifies a text string that is passed back to the IOM client.

Range	1–64 characters
Requirement	The text string must be enclosed in double quotation marks.

Details

The SYSECHO statement enables IOM clients to manually track the progress of a segment of a submitted SAS program.

When the SYSECHO statement is executed, a global statement complete event is generated and, if specified, the text string is passed back to the IOM client.

SYSTASK Statement

Lists asynchronous tasks.

Valid in: Anywhere
Category: Operating Environment
Restriction: This statement is not valid in the CAS server.

Syntax

SYSTASK COMMAND "*operating-environment-command*" <WAIT | NOWAIT> <TASKNAME=*taskname*> <MNAME=*name-variable*> <STATUS=*status-variable*> <SHELL<="*shell-command*"> > <CLEANUP>;

SYSTASK LIST <_ALL_ | *taskname*> <STATE> <STATVAR>;

SYSTASK KILL *taskname* <*taskname*...>;

Required Arguments

COMMAND
executes the *operating-environment-command*.

LIST
lists either a specific active task or all the active tasks in the system.

KILL
forces the termination of the specified task or tasks.

operating-environment-command
specifies the name of a Linux command (including any command-specific options) or the name of an X window system application. Enclose the command in either single or double quotation marks. If the command-specific options require quotation marks, repeat the quotation marks for each option. For example:

```
SYSTASK COMMAND "xdialog -m ""There was an error."" -t ""Error"" -o";
```

If the command name is a shell alias, or if you use the shell special characters tilde (~) and asterisk (*) in a pathname within a command, you need to specify the SHELL option so that the shell processes the alias or special characters:

```
SYSTASK COMMAND "mv ~usr/file.txt /tmp/file.txt" shell;
```

In this example, by using the SHELL option, the **~usr** path is expanded on execution and is not executed directly. The *operating-environment-command* that you specify cannot require input from the keyboard. If using a shell alias results in an error even though the SHELL option is used, then the shell is not processing your shell initialization files. Use the actual SHELL command instead of the SHELL alias.

Optional Arguments

WAIT | NOWAIT
determines whether SYSTASK COMMAND suspends execution of the current SAS session until the task has completed. NOWAIT is the default. For tasks that start with the NOWAIT option, you can use the WAITFOR statement when necessary to suspend execution of the SAS session until the task has finished.

For more information, see "WAITFOR Statement" on page 398.

TASKNAME=*taskname*
specifies a name that identifies the task. Task names must be unique among all active tasks. A task is active if it is running, or if it has completed and has not been waited for using the WAITFOR statement. Duplicate task names generate an error in the SAS log. If you do not specify a task name, SYSTASK automatically generates a name. If the task name contains a blank character, enclose the task name in quotation marks.

Task names cannot be reused, even if the task has completed, unless you either issue the WAITFOR statement for the task or you specify the CLEANUP option.

MNAME=*name-variable*
specifies a macro variable in which you want SYSTASK to store the task name that it automatically generated for the task. If you specify both the TASKNAME option and the MNAME option, SYSTASK copies the name that you specified with TASKNAME into the variable that you specified with MNAME.

STATUS=*status-variable*
specifies a macro variable in which you want SYSTASK to store the status of the task. Status variable names must be unique among all active tasks.

SHELL<="*shell-command*"
specifies that the *operating-environment-command* should be executed with the operating system shell command. If you specify a *shell-command*, SYSTASK uses that shell command to invoke the shell. Otherwise, SYSTASK uses the default shell. Enclose the shell command in quotation marks.

Operating Environment Information
The shell expands shell special characters that are contained in the *operating-environment-command*.

Note: The SHELL option assumes that the SHELL command that you specify uses the -i option to pass statements. Usually, your shell command is **sh**, **csh**, **ksh**, or **bash**.

CLEANUP
specifies that the task should be removed from the LISTTASK output when the task completes. After the task is removed, you can reuse the task name without issuing the WAITFOR statement.

If you have long-running jobs that use the SYSTASK command multiple times, use the WAITFOR statement or the CLEANUP option in the SYSTASK command to clear the memory. The WAITFOR statement releases memory by removing the information for all completed processes that were started by the SYSTASK command. The CLEANUP option clears memory when a specific job completes, and releases memory for further use. If you use the WAITFOR statement after a job has completed, the statement is ineffective because the job has already been cleaned up by the CLEANUP option.

Details

General Information

SYSTASK enables you to execute operating system-specific commands from within your SAS session or application. Unlike the X statement, SYSTASK runs these commands as asynchronous tasks, which means that these tasks execute independently of all other tasks that are currently running. Asynchronous tasks run in the background, so you can perform additional tasks while the asynchronous task is still running.

Information Specific to Linux

For example, to start a new shell and execute the Linux **cp** command in that shell, you might use this statement:

```
systask command "cp /tmp/sas* ~/archive/" taskname="copyjob1"
                status=copysts1 shell;
```

The return code from the **cp** command is saved in the macro variable COPYSTS1.

The output from the command is displayed in the SAS log.

Because the syntax between Linux and a PC can be different, converting PC SAS jobs to run on Linux might result in an error in the conversion process. For example, entering the following command results in an error:

```
systask command "md directory-name" taskname="mytask";
```

An error occurs because **md** is a “make directory” command on a PC, but that command has no meaning in Linux. In the conversion process, **md** becomes **mkdir**. You must use the SHELL option in the SYSTASK statement because **mkdir** is built into the Linux shell; **mkdir**, is not a separate command as it is on a PC.

SAS writes the error message to the log.

Note: Program steps that follow the SYSTASK statements in SAS applications usually depend on the successful execution of the SYSTASK statements. Therefore, syntax errors in some SYSTASK statements can cause your SAS application to end abnormally.

There are two types of asynchronous processes that can be started from SAS:

Task
All tasks started with SYSTASK COMMAND are of type Task. For these tasks, if you do not specify STATVAR or STATE, then SYSTASK LIST displays the task name, type, and state, and the name of the status macro variable. You can use SYSTASK KILL to kill only tasks of type Task.

SAS/CONNECT Process
: Tasks started from SAS/CONNECT with the SIGNON statement or command and RSUBMIT statement are of type SAS/CONNECT Process. To display SAS/CONNECT processes, use the LISTTASK statement to display the task name, type, and state. To terminate a SAS/CONNECT process, use the KILLTASK statement. For information about SAS/CONNECT processes, see *SAS/CONNECT for SAS Viya: User's Guide*.

  Note: The preferred method for displaying any task (not just SAS/CONNECT processes) is to use the LISTTASK statement instead of SYSTASK LIST. The preferred method for ending a task is to use the KILLTASK statement instead of SYSTASK KILL.

The SYSRC macro variable contains the return code for the SYSTASK statement. The status variable that you specify with the STATUS option contains the return code of the process started with SYSTASK COMMAND. To ensure that a task executes successfully, you should monitor the status of both the SYSTASK statement and the process that is started by the SYSTASK statement.

If a SYSTASK statement cannot execute successfully, the SYSRC macro variable contains a nonzero value. For example, there might be insufficient resources to complete a task or the SYSTASK statement might contain syntax errors. With the SYSTASK KILL statement, if one or more of the processes cannot be killed, SYSRC is set to a nonzero value.

When a task is started, its status variable is set to NULL. You can use the status variables for each task to determine which tasks failed to complete. Any task whose status variable is NULL did not complete execution. If a task terminates abnormally, then its status variable is set to `-1`. For more information about the status variables, see "WAITFOR Statement" on page 398.

Unlike the X statement, you cannot use the SYSTASK statement to start a new interactive session.

See Also

Statements:

- "WAITFOR Statement" on page 398
- "X Statement" on page 406

Other References:

- "Executing Operating System Commands from Your SAS Session" in *Batch and Line Mode Processing in SAS Viya*

TITLE Statement

Specifies title lines for SAS output.

Valid in: Anywhere

Category: Output Control

Restrictions: This statement is not valid in the CAS server.

The TITLE statement does not support Unicode.

Operating environment: Maximum length of the title

Syntax

TITLE <*n*> <*ods-format-options*> <'*text*' | "*text*">;

Without Arguments

Using TITLE without arguments cancels all existing titles.

Arguments

n

specifies the relative line that contains the title line.

Range 1–10

Tips The title line with the highest number appears on the bottom line. If you omit *n*, SAS assumes a value of 1. Therefore, you can specify TITLE or TITLE1 for the first title line.

You can create titles that contain blank lines between the lines of text. For example, if you specify text with a TITLE statement and a TITLE3 statement, there is a blank line between the two lines of text.

ods-format-options

specifies formatting options for the ODS HTML, RTF, and PRINTER destinations.

BOLD

specifies that the title text is bold font weight.

ODS destination HTML, RTF, PRINTER

COLOR=*color*

specifies the title text color.

Alias C

ODS destination HTML, RTF, PRINTER

Example "Example 3: Customizing Titles and Footnotes By Using the Output Delivery System" on page 389

BCOLOR=*color*

specifies the background color of the title block.

ODS destination HTML, RTF, PRINTER

FONT=*font-face*

specifies the font to use. If you supply multiple fonts, then the destination device uses the first one that is installed on your system.

Alias F

ODS destination HTML, RTF, PRINTER

HEIGHT=*dimension* | *size*
specifies size of the font for titles.

dimension
is a nonnegative number.

Units of Measure for Dimension

cm	Centimeters
em	Standard typesetting measurement unit for width
ex	Standard typesetting measurement unit for height
in	Inches
mm	Millimeters
pt	A printer's point

Restriction If you specify *dimension*, then specify a unit of measure. Without a unit of measure, the number becomes a relative size.

size
The value of *size* is relative to all other font sizes in the HTML document.

Range 1 to 7

Alias H

ODS destination HTML, RTF, PRINTER

Example "Example 3: Customizing Titles and Footnotes By Using the Output Delivery System" on page 389

ITALIC
specifies that the title text is in italic style.

ODS destination HTML, RTF, PRINTER

JUSTIFY= CENTER | LEFT | RIGHT
specifies justification.

CENTER
specifies center justification.

Alias C

LEFT
specifies left justification.

Alias L

RIGHT
specifies right justification.

Alias R

Alias J

ODS destination HTML, RTF, PRINTER

Example "Example 3: Customizing Titles and Footnotes By Using the Output Delivery System" on page 389

LINK='*url*'
specifies a hyperlink.

ODS destination HTML, RTF, PRINTER

Tip The visual properties for LINK= always come from the current style.

UNDERLIN= 0 | 1 | 2 | 3
specifies whether the subsequent text is underlined. 0 indicates no underlining. 1, 2, and 3 indicates underlining.

Alias U

ODS destination HTML, RTF, PRINTER

Tip ODS generates the same type of underline for values 1, 2, and 3. However, SAS/GRAPH uses values 1, 2, and 3 to generate increasingly thicker underlines.

Note The defaults for how ODS renders the TITLE statement come from style elements relating to system titles in the current style. The TITLE statement syntax with *ods-format-options* is a way to override the settings provided by the current style. The current style varies according to the ODS destination.

Tips You can specify these options by letter, word, or words by preceding each letter or word of the *text* by the option.

For example, this code makes the title "Red, White, and Blue" appear in different colors.

```
title color=red "Red," color=white "White, and" color=blue "Blue";
```

'text' | "text"
specifies text that is enclosed in single or double quotation marks.

You can customize titles by inserting BY variable values (#BYVAL*n*), BY variable names (#BYVAR*n*), or BY lines (#BYLINE) in titles that are specified in PROC steps. Embed the items in the specified title text string at the position where you want the substitution text to appear.

#BYVAL*n* | #BYVAL(*variable-name*)
substitutes the current value of the specified BY variable for #BYVAL in the text string and displays the value in the title.

Follow these rules when you use #BYVAL in the TITLE statement of a PROC step:

- Specify the variable that is used by #BYVAL in the BY statement.
- Insert #BYVAL in the specified title text string at the position where you want the substitution text to appear.

- Follow #BYVAL with a delimiting character, either a space or other non-alphanumeric character (for example, a quotation mark) that ends the text string.
- If you want the #BYVAL substitution to be followed immediately by other text, with no delimiter, use a trailing dot (as with macro variables).

Specify the variable with one of the following values:

n
specifies which variable in the BY statement #BYVAL should use. The value of *n* indicates the position of the variable in the BY statement.

Example **`#BYVAL2`** specifies the second variable in the BY statement.

variable-name
names the BY variable.

Tip *Variable-name* is not case sensitive.

Example **`#BYVAL(YEAR)`** specifies the BY variable, YEAR.

#BYVAR*n* | #BYVAR(*variable-name*)
substitutes the name of the BY variable or label that is associated with the variable (whatever the BY line would normally display) for #BYVAR in the text string and displays the name or label in the title.

Follow these rules when you use #BYVAR in the TITLE statement of a PROC step:

- Specify the variable that is used by #BYVAR in the BY statement.
- Insert #BYVAR in the specified title text string at the position where you want the substitution text to appear.
- Follow #BYVAR with a delimiting character, either a space or other non-alphanumeric character (for example, a quotation mark) that ends the text string.
- If you want the #BYVAR substitution to be followed immediately by other text, with no delimiter, use a trailing dot (as with macro variables).

Specify the variable with one of the following values:

n
specifies which variable in the BY statement #BYVAR should use. The value of *n* indicates the position of the variable in the BY statement.

Example **`#BYVAR2`** specifies the second variable in the BY statement.

variable-name
names the BY variable.

Tip *variable-name* is not case sensitive.

Example **`#BYVAR(SITES)`** specifies the BY variable SITES.

#BYLINE
substitutes the entire BY line without leading or trailing blanks for #BYLINE in the text string and displays the BY line in the title.

Tip #BYLINE produces output that contains a BY line at the top of the page unless you suppress it by using NOBYLINE in an OPTIONS statement.

See For more information about NOBYLINE, see the "BYLINE System Option" in *SAS Viya System Options: Reference*.

Tips For compatibility with previous releases, SAS accepts some text without quotation marks. When writing new programs or updating existing programs, always enclose text in quotation marks.

You can use macro variables and macros to change the information in TITLE statements. If the title is enclosed in double quotation marks (""), the text indicated is substituted into the title. If the title is enclosed in single quotation marks ('), the text is not substituted.

You can use macro variables and macros to change the information in TITLE statements. The SAS macro facility resolves the macro variable.

Details

A TITLE statement takes effect when the step or RUN group with which it is associated executes. Once you specify a title for a line, it is used for all subsequent output until you cancel the title or define another title for that line. A TITLE statement for a given line cancels the previous TITLE statement for that line and for all lines with larger *n* numbers.

Operating Environment Information

In interactive modes, the maximum title length is 254 characters. Otherwise, the maximum length is 200 characters. If the length of the specified title is greater than the value of the LINESIZE option, the title is truncated to the line size.

Examples

Example 1: Using the TITLE Statement

The following examples show how you can use the TITLE statement:

- This statement suppresses a title on line *n* and all lines after it:

```
titlen;
```

- These code lines are examples of TITLE statements:
  - `title 'First Draft';`
  - `title2 "Year's End Report";`
  - `title2 'Year''s End Report';`

Example 2: Customizing Titles By Using BY Variable Values

You can customize titles by inserting BY variable values in the titles that you specify in PROC steps. The following examples show how to use #BYVAL*n*, #BYVAR*n*, and #BYLINE:

- `title 'Quarterly Sales for #byval(site)';`
- `title 'Annual Costs for #byvar2';`
- `title 'Data Group #byline';`

Example 3: Customizing Titles and Footnotes By Using the Output Delivery System

You can customize titles and footnotes with ODS. The following example shows you how to use PROC TEMPLATE to change the color, justification, and size of the text for the title and footnote.

```
/*****************************************
 *The following program creates the data set *
 *grain_production and the $cntry format.    *
 *****************************************/
data grain_production;
   length Country $ 3 Type $ 5;
   input Year country $ type $ Kilotons;
   datalines;
1995 BRZ  Wheat    1516
1995 BRZ  Rice     11236
1995 BRZ  Corn     36276
1995 CHN  Wheat    102207
1995 CHN  Rice     185226
1995 CHN  Corn     112331
1995 IND  Wheat    63007
1995 IND  Rice     122372
1995 IND  Corn     9800
1995 INS  Wheat    .
1995 INS  Rice     49860
1995 INS  Corn     8223
1995 USA  Wheat    59494
1995 USA  Rice     7888
1995 USA  Corn     187300
1996 BRZ  Wheat    3302
1996 BRZ  Rice     10035
1996 BRZ  Corn     31975
1996 CHN  Wheat    109000
1996 CHN  Rice     190100
1996 CHN  Corn     119350
1996 IND  Wheat    62620
1996 IND  Rice     120012
1996 IND  Corn     8660
1996 INS  Wheat    .
1996 INS  Rice     51165
1996 INS  Corn     8925
1996 USA Wheat    62099
1996 USA  Rice     7771
1996 USA  Corn     236064
;
run;
  proc format;
   value $cntry 'BRZ'='Brazil'
                'CHN'='China'
                'IND'='India'
                'INS'='Indonesia'
                'USA'='United States';
run;

/*************************************
 *This PROC TEMPLATE step creates the    *
 *table definition TABLE1 that is used   *
```

```
 *in the DATA step.                        *
 ****************************************/
proc template;
   define table table1;
      mvar sysdate9;
      dynamic colhd;
      classlevels=on;
   define column char_var;
      generic=on;
      blank_dups=on;
      header=colhd;
      style=cellcontents;
   end;

   define column num_var;
      generic=on;
      header=colhd;
      style=cellcontents;
   end;

   define footer table_footer;
   end;
 end;
run;

/*************************************************************************
  *The ODS HTML statement creates HTML output created with              *
 *the style defintion D3D.                                              *
 *                                                                      *
 *The TITLE statement specifies the text for the first title            *
 *and the attributes that ODS uses to modify it.                        *
 *The J= style attribute left-justifies the title.                      *
 *The COLOR= style attributes change the color of the title text        *
 *"Leading Grain" to blue and "Producers in" to green.                  *
 *                                                                      *
 *The TITLE2 statement specifies the text for the second title          *
 *and the attributes that ODS uses to modify it.                        *
 *The J= style attribute center justifies the title.                    *
 *The COLOR= attribute changes the color of the title text  "2010"      *
 *to red.                                                               *
 * The HEIGHT= attributes change the size of each                       *
 *individual number in "2010".                                          *
 *                                                                      *
 *The FOOTNOTE statement specifies the text for the first footnote      *
 *and the attributes that ODS uses to modify it.                        *
 *The J=left style attribute left-justifies the footnote.               *
 *The HEIGHT=20 style attribute changes the font size to 20pt.          *
 *The COLOR= style attributes change the color of the footnote text     *
 *"Prepared" to red and "on" to green.                                  *
 *                                                                      *
 *The FOOTNOTE2 statement specifies the text for the second footnote    *
 *and the attributes that ODS uses to modify it.                        *
 *The J= style attribute centers the footnote.                          *
 *The COLOR= attribute changes the color of the date                    *
 *to blue,                                                              *
 *The HEIGHT= attribute changes the font size                           *
```

```
 *of the date specified by the sysdate9 macro.                          *
 ************************************************************************/
ods html body='newstyle-body.htm'
         style=d3d;

title j=left
      font= 'Times New Roman' color=blue bcolor=red "Leading Grain "
      c=green bold italic "Producers in";
title2 j=center color=red underlin=1
       height=28pt "1"
       height=24pt "9"
       height=20pt "9"
       height=16pt "6";

footnote j=left height=20pt
       color=red "Prepared "
       c='#FF9900' "on";
footnote2 j=center color=blue
          height=24pt "&sysdate9";
footnote3 link='http://support.sas.com' "SAS";
/************************************************************
 *This step uses the DATA step and ODS to produce          *
 *an HTML report. It uses the default table definition     *
 *(template) for the DATA step and writes an output object *
 *to the HTML destination.                                 *
 ************************************************************/
 data _null_;
   set grain_production;
   where type  in ('Rice', 'Corn') and year=1996;
   file print ods=(
                 template='table1'
                 columns=(
                    char_var=country(generic=on format=$cntry.
                    dynamic=(colhd='Country'))
                 char_var=type(generic dynamic=(colhd='Year'))
              num_var=kilotons(generic=on format=comma12.
              dynamic=(colhd='Kilotons'))
           )
        );

put _ods_;
run;
```

Output 2.31 *Output with Customized Titles and Footnotes*

See Also

Statements:

- "FOOTNOTE Statement" on page 118

System Options:

- "LINESIZE= System Option" in *SAS Viya System Options: Reference*

UPDATE Statement

Updates a master file by applying transactions.

Valid in: DATA step

Category: File-Handling

Type: Executable

Restriction: This statement is not valid in the CAS server.

Note: The values that are read using the UPDATE statement are retained in the PDV. The data types of the variables that are read are also retained. For more information, see "RETAIN Statement" on page 346.

CAUTION: **If you add an OUTPUT statement when using an UPDATE statement, the results that are generated are predictable but can be undesired.**

Syntax

UPDATE *master-data-set* <(*data-set-options*)> *transaction-data-set* <(*data-set-options*)>

<END=*variable*>

<UPDATEMODE=MISSINGCHECK | NOMISSINGCHECK>;

BY *by-variable*;

Arguments

master-data-set

specifies the SAS data set used as the master file.

Range The name can be a one-level name (for example, FITNESS), a two-level name (for example, IN.FITNESS), or one of the special SAS data set names.

Tip Instead of using a data set name, you can specify the physical pathname to the file, using syntax that your operating system understands. The pathname must be enclosed in single or double quotation marks.

(data-set-options)

specifies actions SAS is to take when it reads variables into the DATA step for processing.

Requirement *Data-set-options* must appear within parentheses and follow a SAS data set name.

Tip Dropping, keeping, and renaming variables is often useful when you update a data set. Renaming like-named variables prevents the second value that is read from over-writing the first one. By renaming one variable, you make the values of both of them available for processing, such as comparing.

See A list of data set options to use with input data sets in *SAS Viya Data Set Options: Reference*

Example "Example 2: Updating By Renaming Variables" on page 395

transaction-data-set

specifies the SAS data set that contains the changes to be applied to the master data set.

Range The name can be a one-level name (for example, HEALTH), a two-level name (for example, IN.HEALTH), or one of the special SAS data set names.

Tip Instead of using a data set name, you can specify the physical pathname to the file, using syntax that your operating system understands. The pathname must be enclosed in single or double quotation marks.

END=*variable*
creates and names a temporary variable that contains an end-of-file indicator. This variable is initialized to 0 and is set to 1 when UPDATE processes the last observation. This variable is not added to any data set.

UPDATEMODE=MISSINGCHECK
UPDATEMODE=NOMISSINGCHECK
specifies whether missing variable values in a transaction data set are to be allowed to replace existing variable values in a master data set.

MISSINGCHECK
prevents missing variable values in a transaction data set from replacing values in a master data set.

NOMISSINGCHECK
allows missing variable values in a transaction data set to replace values in a master data set.

Default MISSINGCHECK

Tip However, special missing values are the exception and replace values in the master data set even when MISSINGCHECK (the default) is in effect.

Details

Requirements

- The UPDATE statement must be accompanied by a BY statement that specifies the variables by which observations are matched.
- The BY statement should immediately follow the UPDATE statement to which it applies.
- The data sets listed in the UPDATE statement must be sorted by the values of the variables listed in the BY statement, or they must have an appropriate index.
- Each observation in the master data set should have a unique value of the BY variable or BY variables. If there are multiple values for the BY variable, only the first observation with that value is updated. The transaction data set can contain more than one observation with the same BY value. (Multiple transaction observations are all applied to the master observation before it is written to the output file.)

Transaction Data Sets

Usually, the master data set and the transaction data set contain the same variables. However, to reduce processing time, you can create a transaction data set that contains only those variables that are being updated. The transaction data set can also contain new variables to be added to the output data set.

The output data set contains one observation for each observation in the master data set. If any transaction observations do not match master observations, they become new

observations in the output data set. Observations that are not to be updated can be omitted from the transaction data set.

Missing Values

By default the UPDATEMODE=MISSINGCHECK option is in effect, so missing values in the transaction data set do *not* replace existing values in the master data set. Therefore, if you want to update some but not all variables and if the variables that you want to update differ from one observation to the next, set to missing those variables that are not changing. If you want missing values in the transaction data set to replace existing values in the master data set, use UPDATEMODE=NOMISSINGCHECK.

Even when UPDATEMODE=MISSINGCHECK is in effect, you can replace existing values with missing values by using special missing value characters in the transaction data set. To create the transaction data set, use the MISSING statement in the DATA step. If you define one of the special missing values **A** through **Z** for the transaction data set, SAS updates numeric variables in the master data set to that value.

If you want the resulting value in the master data set to be a regular missing value, use a single underscore (_) to represent missing values in the transaction data set. The resulting value in the master data set is a period (.) for missing numeric values and a blank for missing character values.

For more information about defining and using special missing value characters, see the "MISSING Statement" on page 275.

Comparisons

- Both UPDATE and MERGE can update observations in a SAS data set.
- MERGE automatically replaces existing values in the first data set with missing values in the second data set. UPDATE, however, does not do so by default. To cause UPDATE to overwrite existing values in the master data set with missing ones in the transaction data set, you must use UPDATEMODE=NOMISSINGCHECK.
- UPDATE changes or updates the values of selected observations in a master file by applying transactions. UPDATE can also add new observations.

Examples

Example 1: Basic Updating

These program statements create a new data set (OHIO.QTR1) by applying transactions to a master data set (OHIO.JAN). The BY variable STORE must appear in both OHIO.JAN and OHIO.WEEK4, and its values in the master data set should be unique:

```
data ohio.qtr1;
   update ohio.jan ohio.week4;
   by store;
run;
```

Example 2: Updating By Renaming Variables

This example shows renaming a variable in the FITNESS data set so that it does not overwrite the value of the same variable in the program data vector. Also, the WEIGHT variable is renamed in each data set and a new WEIGHT variable is calculated. The master data set and the transaction data set are listed before the code that performs the update:

```
Master Data Set
```

```
            HEALTH
OBS     ID      NAME      TEAM     WEIGHT
 1     1114     sally     blue       125
 2     1441     sue       green      145
 3     1750     joey      red        189
 4     1994     mark      yellow     165
 5     2304     joe       red        170

  Transaction Data Set
              FITNESS
  OBS    ID      NAME      TEAM     WEIGHT
   1    1114     sally     blue       119
   2    1994     mark      yellow     174
   3    2304     joe       red        170
  /***************************************/

  data health;
     input ID NAME $ TEAM $ WEIGHT;
     length team $ 6;
     cards;
  1114 sally blue   125
  1441 sue green   145
  1750 joey red    189
  1994 mark yellow 165
  2304 joe red     170
  ;
  data fitness;
   input ID NAME $ TEAM $ WEIGHT;
     length team $ 6;
     cards;
  1114 sally blue  119
  1994 mark yellow 174
  2304 joe red     170
  ;


     /* Sort both data sets by ID */
  proc sort data=health;
     by id;
  run;
  proc sort data=fitness;
     by id;
  run;
     /* Update Master with Transaction */
  data health2;
     length STATUS $11;
     update health(rename=(weight=ORIG) in=a)
            fitness(drop=name team in=b);
     by id ;
     if a and b then
        do;
           CHANGE=abs(orig - weight);
           if weight<orig then status='loss';
           else if weight>orig then status='gain';
           else status='same';
        end;
     else status='no weigh in';
```

```
run;

proc print data=health2;
   title 'Weekly Weigh-in Report';
run;
```

Output 2.32 *Updating By Renaming Variables*

Weekly Weigh-in Report

Obs	STATUS	ID	NAME	TEAM	ORIG	WEIGHT	CHANGE
1	loss	1114	sally	blue	125	119	6
2	no weigh in	1441	sue	green	145	.	.
3	no weigh in	1750	joey	red	189	.	.
4	gain	1994	mark	yellow	165	174	9
5	same	2304	joe	red	170	170	0

Example 3: Updating with Missing Values

This example illustrates the DATA steps used to create a master data set PAYROLL and a transaction data set INCREASE that contains regular and special missing values. Note the following after the update is made:

- The salary for ID 1026 remains the same.
- The salary for ID 1034 is a special missing value.
- The salary for ID 1057 is a regular missing value.

```
   /* Create the Master Data Set */
data payroll;
   input ID SALARY;
   datalines;
1011 245
1026 269
1028 374
1034 333
1057 582
;
   /* Create the Transaction Data Set */
data increase;
   input ID SALARY;
   missing A _;
   datalines;
1011 376
1026 .
1028 374
1034 A
1057 _
;
   /* Update Master with Transaction */
data newpay;
   update payroll increase;
```

```
   by id;
run;
proc print data=newpay;
   title 'Updating with Missing Values';
run;
```

Output 2.33 *Updating with Missing Values*

Updating with Missing Values

Obs	ID	SALARY
1	1011	376
2	1026	269
3	1028	374
4	1034	A
5	1057	.

See Also

- "Definition of Data Set Options" in *SAS Viya Data Set Options: Reference*

Statements:

- "BY Statement" on page 32
- "MERGE Statement" on page 268
- "MISSING Statement" on page 275
- "MODIFY Statement" on page 277
- "SET Statement" on page 362

System Options:

- "MISSING= System Option" in *SAS Viya System Options: Reference*

WAITFOR Statement

Suspends execution of the current SAS session until the specified tasks finish executing.

Valid in: Anywhere

Category: Operating Environment

Restriction: This statement is not valid in the CAS server.

Syntax

WAITFOR <_ANY_ | _ALL_> *taskname* <*taskname*...> <TIMEOUT=*seconds*>;

Required Argument

taskname
specifies the name of the tasks that you want to wait for. For information about task names, see "SYSTASK Statement" on page 380. The task names that you specify must match exactly the task names assigned through the SYSTASK COMMAND statement. You cannot use wildcards to specify task names.

Optional Arguments

ANY | _ALL_
suspends execution of the current SAS session until either one or all of the specified tasks finish executing. The default setting is _ANY_, which means that as soon as one of the specified tasks completes executing, the WAITFOR statement finishes executing.

TIMEOUT=*seconds*
specifies the maximum number of seconds that WAITFOR should suspend the current SAS session. If you do not specify the TIMEOUT option, WAITFOR suspends execution of the SAS session indefinitely.

Details

The WAITFOR statement suspends execution of the current SAS session until the specified tasks finish executing or until the TIMEOUT= interval has elapsed. If the specified task was started with the WAIT option, then the WAITFOR statement ignores that task. For a description of the WAIT option, see "SYSTASK Statement" on page 380.

For example, these statements start three different X client programs and wait for them to complete:

```
systask command "xv" taskname=pgm1;
systask command "xterm" taskname=pgm2;
systask command "xcalc" taskname=pgm3;
waitfor _all_ pgm1 pgm2 pgm3;
```

The WAITFOR statement can be used to execute multiple concurrent SAS sessions. The following statements start three different SAS jobs and suspend the execution of the current SAS session until those three jobs have finished executing:

```
systask command "sas myprog1.sas" taskname=sas1;
systask command "sas myprog2.sas" taskname=sas2;
systask command "sas myprog3.sas" taskname=sas3;
waitfor _all_ sas1 sas2 sas3;
```

Note: With this method, SAS terminates after each command, which can result in reduced performance. SAS/CONNECT can also be used for executing parallel SAS sessions. For more information, see *SAS/CONNECT for SAS Viya: User's Guide*.

If you have long-running jobs that use the SYSTASK command multiple times, use the WAITFOR statement or the CLEANUP option in the SYSTASK command to clear the memory. The WAITFOR statement releases memory by removing the information for all completed processes that were started by the SYSTASK command. The CLEANUP option clears memory when a specific job completes, and releases memory for further use. If you use the WAITFOR statement after a job has completed, the statement is ineffective because the job has already been cleaned up by the CLEANUP option.

The SYSRC macro variable contains the return code for the WAITFOR statement. If a WAITFOR statement cannot execute successfully, the SYSRC macro variable contains a nonzero value. For example, the WAITFOR statement might contain syntax errors. If the

number of seconds specified with the TIMEOUT option elapses, then the WAITFOR statement finishes executing, and SYSRC is set to a nonzero value if one of these actions occurs:

- you specify a single task that does not finish executing
- you specify more than one task and the _ANY_ option (which is the default setting), but none of the tasks finishes executing
- you specify more than one task and the _ALL_ option, and any one of the tasks does not finish executing

Any task whose status variable is still NULL after the WAITFOR statement has executed did not complete execution. For a description of status variables for individual tasks, see "SYSTASK Statement" on page 380.

See Also

- *SAS/CONNECT for SAS Viya: User's Guide*
- "Executing Operating System Commands from Your SAS Session" in *Batch and Line Mode Processing in SAS Viya*

Statements:

- "SYSTASK Statement" on page 380
- "X Statement" on page 406

WHERE Statement

Selects observations from SAS data sets that meet a particular condition.

Valid in: DATA step and PROC step

Category: Action

Type: Declarative

Restriction: This statement is not valid in the CAS server.

Tip: The SAS Tutorial video Filtering Data shows you how to filter data using the WHERE statement.

Syntax

WHERE *where-expression-1*
< *logical-operator where-expression-n*>;

Arguments

where-expression
is an arithmetic or logical expression that generally consists of a sequence of operands and operators.

Tips The operands and operators described in the next several sections are also valid for the WHERE= data set option.

You can specify multiple where-expressions.

logical-operator
can be AND, AND NOT, OR, or OR NOT.

Details

The Basics

Using the WHERE statement might improve the efficiency of your SAS programs because SAS is not required to read all observations from the input data set.

The WHERE statement cannot be executed conditionally. That is, you cannot use it as part of an IF-THEN statement.

WHERE statements can contain multiple WHERE expressions that are joined by logical operators.

Note: Using indexed SAS data sets can significantly improve performance when you use WHERE expressions to access a subset of the observations in a SAS data set.

In DATA Steps

The WHERE statement applies to all data sets in the preceding SET, MERGE, MODIFY, or UPDATE statement, and variables that are used in the WHERE statement must appear in all of those data sets. You cannot use the WHERE statement with the POINT= option in the SET and MODIFY statements.

You can apply OBS= and FIRSTOBS= processing to WHERE processing.

You cannot use the WHERE statement to select records from an external file that contains raw data, nor can you use the WHERE statement within the same DATA step in which you read in-stream data with a DATALINES statement.

For each iteration of the DATA step, the first operation SAS performs in each execution of a SET, MERGE, MODIFY, or UPDATE statement is to determine whether the observation in the input data set meets the condition of the WHERE statement. The WHERE statement takes effect immediately after the input data set options are applied and before any other statement in the DATA step is executed. If a DATA step combines observations using a WHERE statement with a MERGE, MODIFY, or UPDATE statement, SAS selects observations from each input data set before it combines them.

WHERE and BY in a DATA Step

If a DATA step contains both a WHERE statement and a BY statement, the WHERE statement executes *before* BY groups are created. Therefore, BY groups reflect groups of observations in the subset of observations that are selected by the WHERE statement, not the actual BY groups of observations in the original input data set.

In PROC Steps

You can use the WHERE statement with any SAS procedure that reads a SAS data set. The WHERE statement is useful in order to subset the original data set for processing by the procedure. The *SAS Viya Data Management and Utility Procedures Guide* documents the action of the WHERE statement only in those procedures for which you can specify more than one data set. In all other cases, the WHERE statement performs as documented here.

Use of Indexes

A DATA or PROC step attempts to use an available index to optimize the selection of data when an indexed variable is used in combination with one of the following operators and functions:

- the BETWEEN-AND operator
- the comparison operators, with or without the colon modifier
- the CONTAINS operator
- the IS NULL and IS NOT NULL operators
- the LIKE operator
- the TRIM function
- the SUBSTR function, in some cases.

SUBSTR requires the following arguments:

```
where substr(variable,position,length)
 ='character-string';
```

An index is used in processing when the arguments of the SUBSTR function meet all of the following conditions:

- *position* is equal to 1
- *length* is less than or equal to the length of *variable*
- *length* is equal to the length of *character-string*.

Operands Used in WHERE Expressions

Operands in WHERE expressions can contain the following values:

- constants
- time and date values
- values of variables that are obtained from the SAS data sets
- values created within the WHERE expression itself.

You cannot use variables that are created within the DATA step (for example, FIRST.*variable*, LAST.*variable*, _N_, or variables that are created in assignment statements) in a WHERE expression because the WHERE statement is executed before the SAS System brings observations into the DATA or PROC step. When WHERE expressions contain comparisons, the unformatted values of variables are compared.

Here are examples of using operands in WHERE expressions:

- `where score>50;`
- `where date>='01jan1999'd and time>='9:00't;`
- `where state='Mississippi';`

As in other SAS expressions, the names of numeric variables can stand alone. SAS treats values of 0 or missing as false; other values are true. These examples are WHERE expressions that contain the numeric variables EMPNUM and SSN:

- `where empnum;`
- `where empnum and ssn;`

Character literals or the names of character variables can also stand alone in WHERE expressions. If you use the name of a character variable by itself as a WHERE expression, SAS selects observations where the value of the character variable is not blank.

Operators Used in the WHERE Expression

You can include both SAS operators and special WHERE-expression operators in the WHERE statement. For a complete list of the operators, see Table 2.12 on page 403.

The following table lists the operators for the WHERE statement.

Table 2.12 *WHERE Statement Operators*

Operator Type	Symbol or Mnemonic	Description
Arithmetic		
	*	multiplication
	/	division
	+	addition
	−	subtraction
	**	exponentiation
Comparison †		
	= or EQ	equal to
	^=, ¬=, ~=, or NE*	not equal to
	> or GT	greater than
	< or LT	less than
	>= or GE	greater than or equal to
	<= or LE	less than or equal to
	IN	equal to one of a list
Logical (Boolean)		
	& or AND	logical and
	| or OR**	logical or
	~,^ , ¬, or NOT*	logical not
Other		
	||***	concatenation of character variables
	( )	indicate order of evaluation

Operator Type	Symbol or Mnemonic	Description
	+ prefix	positive number
	− prefix	negative number
WHERE Expression Only		
	BETWEEN–AND	an inclusive range
	? or CONTAINS	a character string
	IS NULL or IS MISSING	missing values
	LIKE	match patterns
	=*	sounds-like
	SAME-AND	add clauses to an existing WHERE statement without retyping original one

* The caret (^), tilde (~), and the not sign (¬) all indicate a logical not. Use the character available on your keyboard, or use the mnemonic equivalent.

** The OR symbol (|), broken vertical bar (|), and exclamation point (!) all indicate a logical or. Use the character available on your keyboard, or use the mnemonic equivalent.

*** Two OR symbols (| |), two broken vertical bars (| |), or two exclamation points (!!) indicate concatenation. Use the character available on your keyboard.

† You can use the colon modifier (:) with any of the comparison operators in order to compare only a specified prefix of a character string.

Comparisons

- To select observations from individual data sets when a SET, MERGE, MODIFY, or UPDATE statement specifies more than one data set, apply a WHERE= data set option to each data set. In the DATA step, if a WHERE statement and a WHERE= data set option apply to the same data set, SAS uses the data set option and ignores the statement for that data set. Other data sets without a WHERE data set option use the statement.
- The most important differences between the WHERE statement in the DATA step and the subsetting IF statement are as follows:
  - The WHERE statement selects observations *before* they are brought into the program data vector, making it a more efficient programming technique. The subsetting IF statement works on observations after they are read into the program data vector.
  - The WHERE statement can produce a different data set from the subsetting IF when a BY statement accompanies a SET, MERGE, or UPDATE statement. The different data set occurs because SAS creates BY groups before the subsetting IF statement selects but after the WHERE statement selects.
  - The WHERE statement cannot be executed conditionally as part of an IF statement, but the subsetting IF statement can.

  - The WHERE statement selects observations in SAS data sets only, whereas the subsetting IF statement selects observations from an existing SAS data set or from observations that are created with an INPUT statement.
  - The subsetting IF statement cannot be used in SAS windowing procedures to subset observations for browsing or editing.
- Do not confuse the WHERE statement with the DROP or KEEP statement. The DROP and KEEP statements select variables for processing. The WHERE statement selects observations.

Examples

Example 1: Basic WHERE Statement Usage

This DATA step produces a SAS data set that contains only observations from data set CUSTOMER in which the value for NAME begins with **`Mac`** and the value for CITY is **`Charleston`** or **`Atlanta`**.

```
data testmacs;
   set customer;
   where substr(name,1,3)='Mac' and
      (city='Charleston' or city='Atlanta');
run;
```

Example 2: Using Operators Available Only in the WHERE Statement

- Using BETWEEN-AND:

  ```
  where empnum between 500 and 1000;
  ```

- Using CONTAINS:

  ```
  where company ? 'bay';
  where company contains 'bay';
  ```

- Using IS NULL and IS MISSING:

  ```
  where name is null;
  where name is missing;
  ```

- Using LIKE to select all names that start with the letter D:

  ```
  where name like 'D%';
  ```

- Using LIKE to match patterns from a list of the following names:

  Diana
  Diane
  Dianna
  Dianthus
  Dyan

WHERE Statement	Name Selected
`where name like 'D_an';`	Dyan
`where name like 'D_an_';`	Diana, Diane

WHERE Statement	Name Selected
`where name like 'D_an__';`	Dianna
`where name like 'D_an%';`	all names from list

- Using the Sounds-like Operator to select names that sound like “Smith”:

  ```
  where lastname=*'Smith';
  ```

- Using SAME-AND:

  ```
  where year>1991;
  ...more SAS statements...
  where same and year<1999;
  ```

  In this example, the second WHERE statement is equivalent to the following WHERE statement:

  ```
  where year>1991 and year<1999;
  ```

See Also

Data Set Options:

- “WHERE= Data Set Option” in *SAS Viya Data Set Options: Reference*

Statements:

- “IF Statement, Subsetting” on page 127

X Statement

Issues an operating-environment command from within a SAS session.

Valid in: Anywhere

Category: Operating Environment

Restriction: This statement is not valid in the CAS server.

Syntax

X <'*operating-environment-command*'>;

Without Arguments

Using X without arguments places you in your operating environment, where you can issue commands that are specific to your environment.

Arguments

'*operating-environment-command*'
specifies an operating environment command that is enclosed in quotation marks.

Operating Environment Information

specifies the Linux command. If you specify only one Linux command, you do not need to enclose it in quotation marks. Also, if you are running SAS from the Korn shell, you cannot use aliases.

Details

General Information

In all operating environments, you can use the X statement when you run SAS in windowing or interactive line mode. In some operating environments, you can use the X statement when you run SAS in batch or noninteractive mode. Keep in mind that the way you return from operating environment mode to the SAS session is dependent on your operating environment and the commands that you use with the X statement are specific to your operating environment.

You can use the X statement with SAS macros to write a SAS program that can run in multiple operating environments. See the *SAS Viya Macro Language: Reference* for information.

Linux Specific Information

The X statement issues a Linux command from within a SAS session. SAS executes the X statement immediately.

Neither the X statement nor the %SYSEXEC macro program statement is intended for use during the execution of a DATA step. The CALL SYSTEM routine, however, can be executed within a DATA step.

Note: The X statement is not supported without arguments under the X Window System.

Comparisons

In a windowing session, the X command works exactly like the X statement except that you issue the command from a command line. You submit the X statement from the Program Editor window.

The X statement is similar to the SYSTEM function, the X command, and the CALL SYSTEM routine. In most cases, the X statement, X command or %SYSEXEC macro statement are preferable because they require less overhead. However, the SYSTEM function can be executed conditionally. The X statement is a global statement and executes as a DATA step is being compiled.

See Also

"Executing Operating System Commands from Your SAS Session" in *Batch and Line Mode Processing in SAS Viya*

Recommended Reading

Here is the recommended reading list for this title:

- *SAS Viya Data Management and Utility Procedures Guide*
- *Learning SAS by Example: A Programmer's Guide*
- *Output Deliver System: The Basics and Beyond*
- *Batch and Line Mode Processing in SAS Viya*
- *SAS Viya Component Objects: Reference*
- *SAS Viya Data Set Options: Reference*
- *SAS Viya Formats and Informats: Reference*
- *SAS Viya Functions and CALL Routines: Reference*
- *SAS Functions by Example*
- *SAS Viya National Language Support: Reference Guide*
- *SAS Viya ODS Graphics: Procedures Guide*
- *SAS Viya System Options: Reference*

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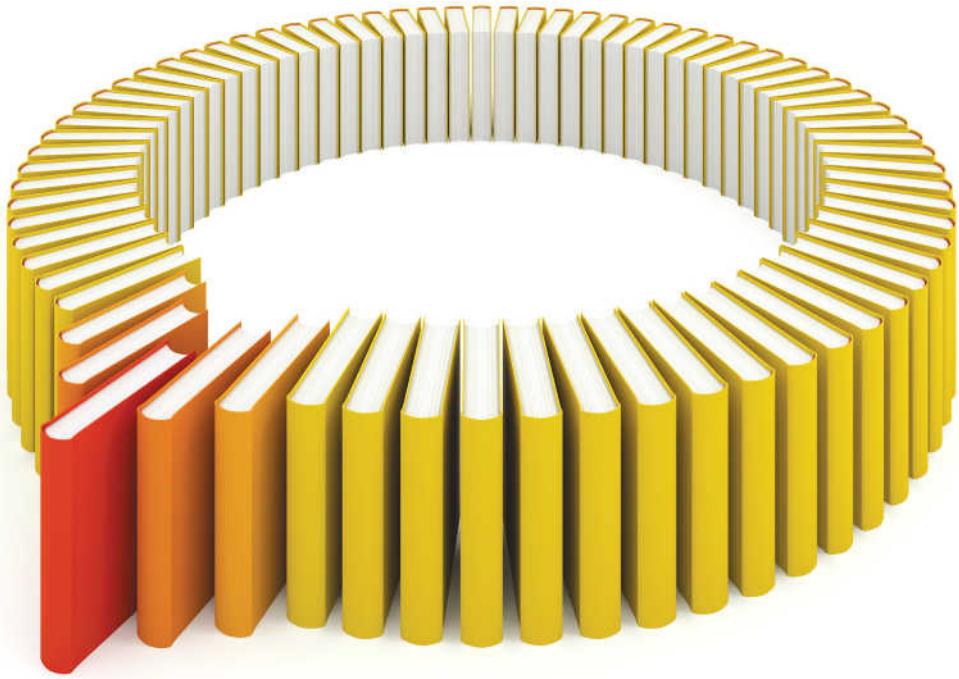

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