SAS® Studio 3.7: User's Guide

SAS® Documentation
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SAS® Studio 3.7: User’s Guide

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Contents

What’s New in SAS Studio 3.7

Overview

SAS Studio 3.7 includes these new features and enhancements:

- integration with SAS Viya. For more information, see “Integration with SAS Viya” on page v.
- ability to open a SAS Enterprise Guide project in SAS Studio. For more information, see “Opening a SAS Enterprise Guide Project in SAS Studio” on page vii.
- new SAS Studio macros. For more information, see “New SAS Studio Macro Variables” on page vii.
- new streaming log preference. For more information, see “New Streaming Log Preference” on page vii.
- new tasks. For more information, see “SAS Studio Tasks for a SAS 9.4 Environment” on page vii.

Integration with SAS Viya

Programming in SAS Studio

In SAS Studio 3.7, the code editor supports both syntax from SAS 9.4 and syntax for SAS Viya programming. The availability of specific procedures and functionality depends on what is licensed at your site. To learn more about programming in SAS Viya, see *An Introduction to SAS Viya Programming*.

New Snippets for SAS Viya

In SAS Studio 3.6, the snippets in the SAS Viya Cloud Analytic Services group used SAS/CONNECT to connect to SAS Viya. Starting in SAS 9.4M5, SAS/CONNECT is no longer a requirement. As a result, the snippets in the SAS Viya Cloud Analytic Services group have been rewritten for SAS Studio 3.7 and a new Create CAS Connection snippet has been added.

SAS Studio 3.7 also includes two new groups of snippets:

- The snippets in the SAS Viya Image Processing category enable you to manage graphic images in a SAS Viya environment.
- The snippets in the SAS Viya Machine Learning category enable you to perform data analysis.

These snippets are available only if you license and install SAS Visual Data Mining and Machine Learning.

For more information, see "Working with Code Snippets" on page 31.

SAS Viya Tasks

SAS Studio 3.7 provides more integration with SAS Viya. Starting in SAS 9.4M5, SAS/CONNECT is no longer required to connect to a SAS Viya environment. As a result, the SAS Machine Learning tasks that were available in SAS Studio 3.6 have been removed.

In SAS Studio 3.7, these task categories are available:

- SAS Viya Prepare and Explore
- SAS Viya Unsupervised Learning
- SAS Viya Supervised Learning
- SAS Viya Evaluate and Implement
- SAS Viya Network Analysis and Optimization
- SAS Viya Econometrics

Note: Included in your SAS 9.4M5 order are procedures that enable you to take advantage of additional functionality that is provided by SAS Viya. You must have a SAS Viya license to run the SAS Studio tasks for these products:

  - SAS Econometrics Procedures
  - SAS Visual Data Mining and Machine Learning Procedures
  - SAS Visual Statistics Procedures

Note: To run the SAS Viya Optimization tasks, you must license and install SAS/OR and license SAS Optimization.

If you have used SAS Studio 4.2 (which runs on SAS Viya 3.2), you might recognize most of these tasks. However, these tasks were added to the SAS Viya Network and Optimization group in SAS Studio 3.7:

- The Centrality Metrics task calculates several types of centrality metrics that indicate the relative importance of a node or link within a graph. For more information, see "SAS Viya: Centrality Metrics" in *SAS Studio: Task Reference Guide*.
- The Community Detection task partitions a graph into communities such that the nodes within the community subgraphs are more densely connected than the nodes from different communities. For more information, see "SAS Viya: Community Detection" in *SAS Studio: Task Reference Guide*.
- The Core Decomposition task decomposes a graph into cohesive subgroups. Although this method is generally not as powerful as community detection for extracting a detailed community structure, it can provide a coarse approximation of cohesive structure at a very low computational cost. For more information, see "SAS Viya: Core Decomposition" in *SAS Studio: Task Reference Guide*.

- The Reach Network task calculates the reach (ego) network of a graph. For more information, see "SAS Viya: Reach Network" in *SAS Studio: Task Reference Guide*.

New SAS Studio Macro Variables

These macro variables are new for SAS Studio 3.7:

- _CLIENTAPPABREV specifies the abbreviated name of the client application.
- _CLIENTMACHINE specifies the node name of the client machine.
- _CLIENTMODE specifies the type of SAS Studio deployment: Mid-Tier (enterprise), Single-User, or Basic.
- _CLIENTVERSION specifies the application version, including build number.
- _SASHOSTNAME specifies the server node name (IP address or DNS name).
- _SASPROGRAMFILEHOST specifies the server node name on which the current SAS program is being run.
- _SASWORKINGDIR specifies the current working directory.
- SASWORKLOCATION specifies the location of the Work library.

For more information, see "Using Macro Variables" on page 27.

Opening a SAS Enterprise Guide Project in SAS Studio

You can open your existing SAS Enterprise Guide projects in SAS Studio. SAS Enterprise Guide projects are converted to a process flow in SAS Studio. For more information, see Appendix 2, "Converting SAS Enterprise Guide Projects to SAS Studio Process Flows," on page 121.

New Streaming Log Preference

In SAS Studio 3.7, you can choose to display log updates as a procedure is processed. If you do not select the **Stream log updates while a procedure is running** option, the log is displayed when the procedure has finished running. This option is selected by default and might have a slight effect on performance. For more information, see "Setting General Preferences" on page 111.

SAS Studio Tasks for a SAS 9.4 Environment

The tasks that are shipped with SAS Studio are documented in *SAS Studio: Task Reference Guide*. All of the tasks that are available with SAS Studio are documented.

However, the tasks that are available at your site depend on whether you license and install other SAS products.

New Tasks

These new tasks are available in SAS Studio 3.7:

- The Custom Tests task calculates power or sample size for test statistics from the chi-square, Pearson correlation, normal, *F*, and *t* distributions. For more information, see "Custom Tests" in *SAS Studio: Task Reference Guide*.
- The Equivalence Tests task performs power analysis and sample size determination for equivalence tests of one-sample, paired, and two-sample means and mean ratios, and one proportion. For more information, see "Equivalence Tests" in *SAS Studio: Task Reference Guide*.
- The Heat Map task displays the magnitude of the response based on two variables. The response is represented as a color value from a color gradient. For more information, see "Heat Map" in *SAS Studio: Task Reference Guide*.
- The Recode Values task enables you to change the values of character and numeric variables. With this task, you can specify single values to be recoded as other values that you specify. For example, if your data contains a column named Gender with possible values of "M" and "F," you can substitute "Male" for values of "M" and "Female" for values of "F" in your output data set. For more information, see "Recode Values" in *SAS Studio: Task Reference Guide*.
- The Recode Ranges task enables you to specify a range of numeric values and change all of the values in the range to another value. For example, you could replace test scores from 90 to 100 with a letter grade of "A," scores from 80 to 89 with a grade of "B," and so on. For more information, see "Recode Ranges" in *SAS Studio: Task Reference Guide*.
- The Severity Models task estimates parameters of any arbitrary continuous probability distribution that is used to model the magnitude (severity) of a continuous-valued event of interest. For more information, see "SAS Viya: Severity Models" in *SAS Studio: Task Reference Guide*.

Enhanced Tasks

These tasks were enhanced in SAS Studio 3.7:

- The user interfaces for all of the graph tasks (Bar Chart, Pie Chart, Scatter Plot, and so on) have been redesigned.
- In the Tests of Proportions task, you can now select the binomial proportion test to use (equality, noninferiority, or superiority) when creating a one-proportion test. For more information, see "Create a One-Proportion Test" in *SAS Studio: Task Reference Guide*.

Chapter 1
Introduction to SAS Studio

About SAS Studio

SAS Studio is a development application for SAS that you access through your web browser. With SAS Studio, you can access your data files, libraries, and existing programs, and you can write new programs. You can also use the predefined tasks in SAS Studio to generate SAS code. When you run a program or task, SAS Studio connects to a SAS server to process the SAS code. The SAS server can be a hosted server in a cloud environment, a server in your local environment, or a copy of SAS on your local machine. After the code is processed, the results are returned to SAS Studio in your browser.

SAS Studio supports multiple web browsers, such as Microsoft Internet Explorer, Apple Safari, Mozilla Firefox, and Google Chrome.

In addition to writing and running your own SAS programs, you can use the predefined tasks that are included with SAS Studio to analyze your data. The tasks are based on SAS System procedures and provide access to some of the most commonly used graph and analytical procedures. You can also use the default task template to write your own tasks.

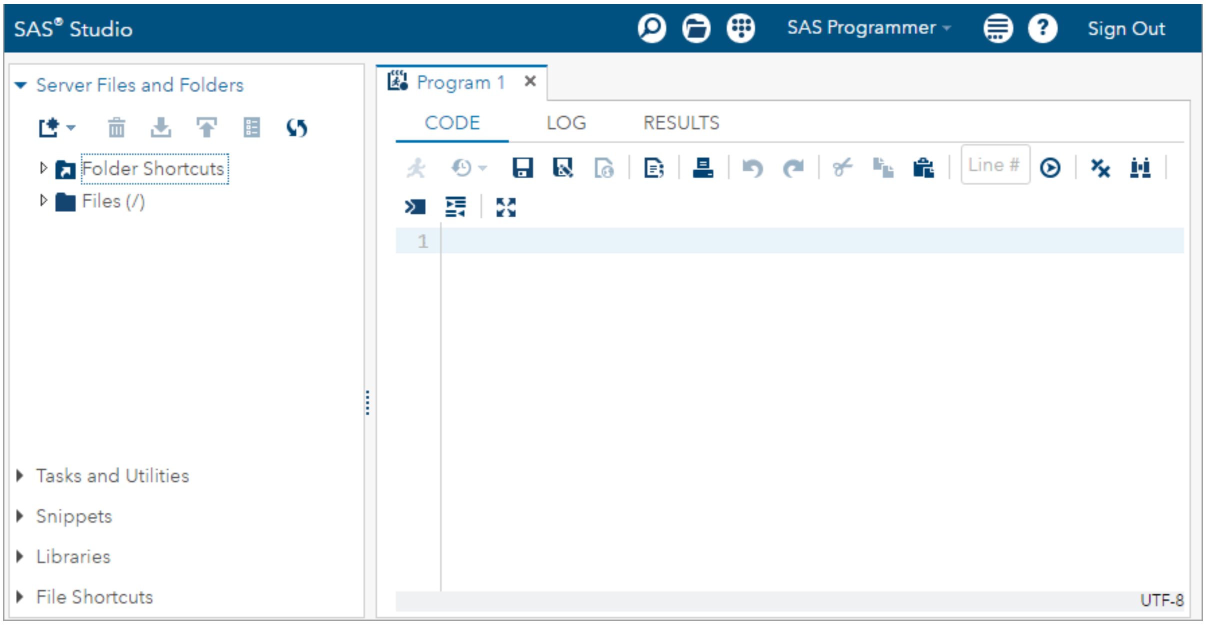
SAS Studio includes two different perspectives: the SAS Programmer perspective and the Visual Programmer perspective. A *perspective* is a predetermined set of features that is customized to meet the needs of a specific user type. By selecting a specific perspective, you can narrow the choices that are available in the interface and focus on the features that you need to use regularly. By default, when you open SAS Studio, the SAS Programmer perspective is selected. After you open SAS Studio, you can change the perspective by using the perspectives menu on the toolbar. For more information, see “Understanding Perspectives” on page 13.

Using SAS Studio

About Using SAS Studio

When you sign on to SAS Studio, the main SAS Studio window appears with a blank program window so that you can start programming immediately. You also have access to all five sections of the navigation pane.

Note: To sign out of SAS Studio, click **Sign Out** on the toolbar. Do not use the Back button on your web browser.



The main window of SAS Studio consists of a navigation pane on the left and a work area on the right. The navigation pane provides access to your server files and folder shortcuts, your tasks and snippets, the libraries that you have access to, and your file shortcuts. The **Server Files and Folders** section is displayed by default.

The work area is used to display your data, code, tasks, logs, and results. As you open these items, they are added to the work area as windows in a tabbed interface.

Using the Navigation Pane

About Using the Navigation Pane

You can expand the sections of the navigation pane by clicking the section that you want to view.

Working with Server Files and Folders

The **Server Files and Folders** section of the navigation pane enables you to access files and folders from the following locations:

- your SAS server
- any remote FTP server on which you have an account

  Note: SAS Studio supports only FTP servers that use a directory listing similar to UNIX.

The contents of the **Server Files and Folders** section depend on the type of SAS Studio deployment. The default folder shortcuts and root directories can be configured by your SAS administrator. For more information, see *SAS Studio: Administrator's Guide*.

You can open files that are saved on the SAS server or the FTP server, such as SAS program files or program package files. You can also create a folder shortcut to access your z/OS files, and you can open SAS tables that are saved on the SAS server.

Note: You cannot open SAS tables from a remote FTP server.

You can use the **Server Files and Folders** section to create folders and folder shortcuts, download and upload files, and create a new SAS program. From the folders tree, you can expand and collapse folders, copy and move items, and open items in folders by double-clicking them or dragging them to the work area. In addition, you can open files from your folders and folder shortcuts by clicking 📂 on the SAS Studio toolbar. You can also view items in a folder as text by right-clicking them and selecting **View File as Text**. If the file you are viewing is larger than 3 MB, SAS Studio truncates the portion of the file that exceeds that limit.

Note: Files and folders that are located on an FTP server and are accessible by using an FTP shortcut cannot contain double-byte characters or any of the following characters in their names:

```
? / \ * " | : ; < >
```

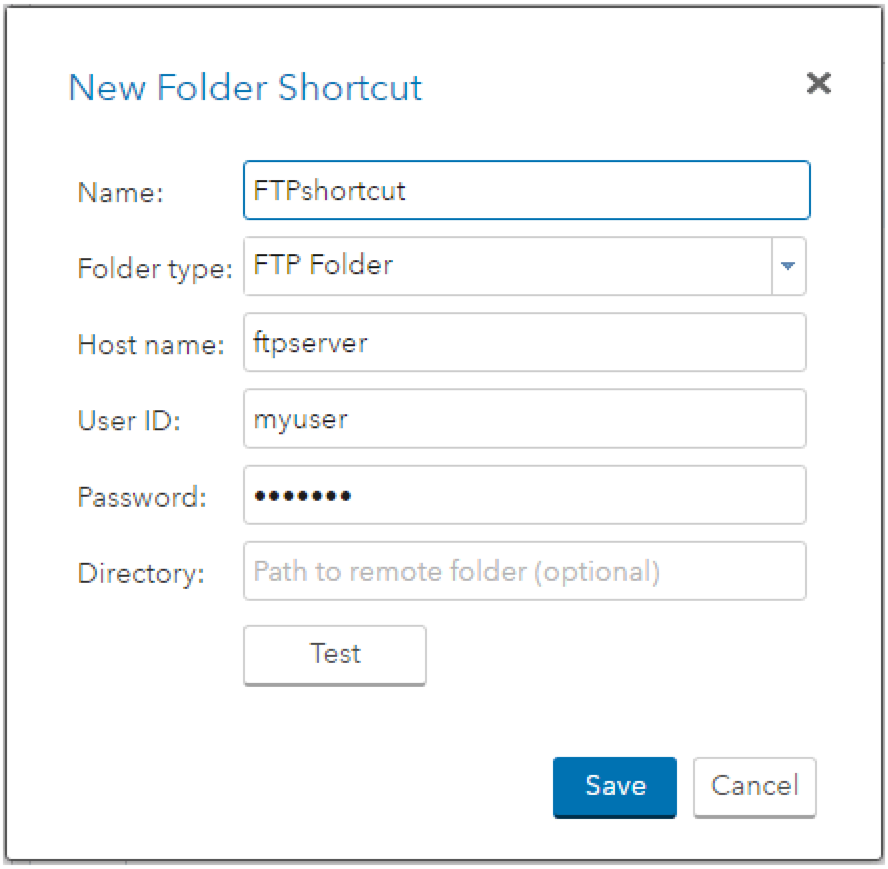
SAS Studio cannot access, move, rename, or delete files and folders on an FTP server whose names contain invalid characters. In addition, you cannot rename or delete any global folder shortcuts.

To create a new folder shortcut:

1. Click **Server Files and Folders** in the navigation pane. Then click ✚ and select **Folder Shortcut**. The New Folder Shortcut window appears.
2. In the **Name** box, enter the name of the folder.
3. From the **Folder Type** drop-down list, specify whether the shortcut refers to a SAS server folder or an FTP folder.
4. If you are creating a shortcut to a SAS server folder, enter the physical path for the directory in the **Directory** box or click **Browse** to select a directory. To create a new folder when you are selecting a directory, click 📁.

   If you are creating a shortcut to an FTP folder, enter the network address of the FTP host in the **Host Name** box as well as your user name and password. By default, the directory is the home directory of the FTP user. You can use the **Directory** box to specify another directory that is relative to the home directory. For example, if the home directory of the FTP user is **`c:\homedir`**, and you specify **`data`** in the **Directory** box, then the root directory of the shortcut is **`c:\homedir\data`** on the FTP server. You can validate your connection to the FTP server by clicking **Test**.

   Note: If your mid-tier and FTP servers are running different operating systems, you must fully qualify the name of the FTP host in the **Host Name** box. If this name is not fully qualified, then the connection might fail.



New Folder Shortcut

Name: FTPshortcut

Folder type: FTP Folder

Host name: ftpserver

User ID: myuser

Password: •••••••

Directory: Path to remote folder (optional)

5. Click **Save** to create the folder shortcut. The new shortcut is added to the list of folder shortcuts.

To create a new folder, select the folder in the **Server Files and Folders** section in which you want to create the new folder. Click and select **Folder**. The New Folder window appears. Enter the name of the new folder. The new folder is added to the list of folders.

To create a new XML file, Click and select **XML**. The new file opens in the XML editor in the work area.

To download a file, select the file that you want to download and click . You are prompted to open the file in the default application or save it to your local computer.

To upload one or more files from your local computer, select the folder to which you want to upload the files and click . The Upload Files window appears. Click **Choose Files** to browse for the files that you want to upload.

Working with Tasks

The **Tasks and Utilities** section of the navigation pane enables you to access tasks in SAS Studio. Tasks are based on SAS procedures and generate SAS code and formatted results for you. SAS Studio is shipped with several predefined tasks that you can run. You can also edit a copy of these predefined tasks, and you can create your own new tasks.

To create a new task, click and select **New Task**. SAS Studio creates a template in the work area that you can use to create custom tasks for your site. Custom tasks can be accessed from the My Tasks folder or from the **Server Files and Folders** section of the navigation pane. For more information, see Chapter 7, “Understanding Tasks in SAS Studio,” on page 103.

To edit a task that you have created, select the task from the My Tasks folder and click ✎. The XML code that is used to create the task is opened in the work area. If you want to edit a predefined task, you must first right-click the task and select **Add to My Tasks** or **Add to Folders**. For more information, see “Edit a Predefined Task” on page 107.

Working with Snippets

The **Snippets** section of the navigation pane enables you to access your code snippets. *Code snippets* are samples of commonly used SAS code that you can insert into your SAS program. SAS Studio is shipped with several predefined code snippets that you can use. You can also edit a copy of these snippets and create your own custom snippets. Your custom snippets can be accessed from the My Snippets folder. For more information, see Chapter 2, “Working with Programs,” on page 17.

To edit a snippet that you have created, select the snippet from the My Snippets folder and click ✎. If you want to edit a predefined snippet, you must first right-click the snippet and select **Add to My Snippets**.

Note: You can edit only the snippets that are in the My Snippets folder.

Working with Libraries

The **Libraries** section of the navigation pane enables you to access your SAS libraries. SAS tables are stored in SAS libraries. From the **Libraries** section, you can open SAS tables and add them to your programs. You can use the **Libraries** section to expand a table and view the columns in that table. The icon in front of the column name indicates the type.

Here are examples of common icons for the column types.

Icon	Type of Column
A	Character
123	Numeric
📅	Date
📅🕓	Datetime

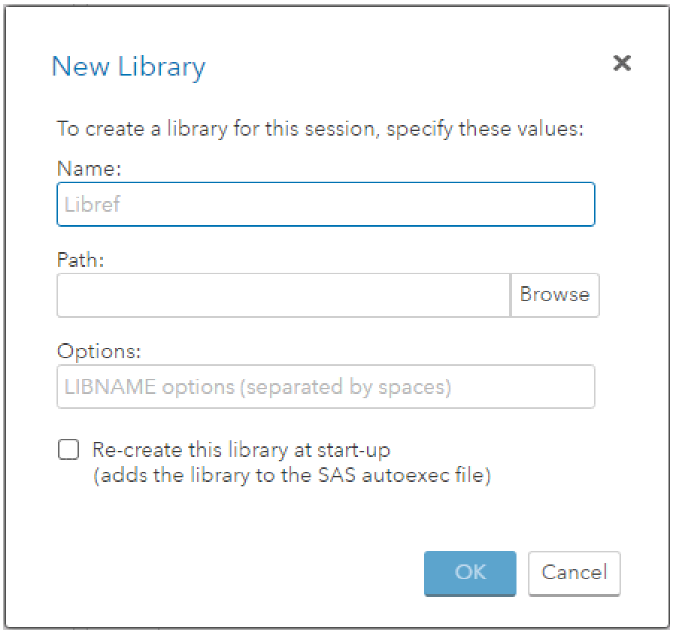
You can drag tables and columns from the **Libraries** section to a program, and SAS Studio adds code for the dragged items to your program. For more information, see “Opening and Creating Programs” on page 18.

Note: The Sasuser library is read only, as in any SAS server environment. You cannot save content to this library.

You can also create new libraries and assign existing libraries.

To create a new library:

1. Click **Libraries** in the navigation pane and then click . The New Library window appears.



New Library

To create a library for this session, specify these values:

Name: Libref

Path:

Options: LIBNAME options (separated by spaces)

□ Re-create this library at start-up
(adds the library to the SAS autoexec file)

2. In the **Name** box, enter the libref for the library. The libref must be eight characters or fewer.
3. In the **Path** box, enter the physical path where the library resides or click **Browse** to select a location. To create a new folder when you are selecting a location, click .
4. In the **Options** box, specify any configuration options that you need. For the appropriate options, see the documentation for your operating environment.
5. If you want to access this library each time you use SAS Studio, select **Re-create this library at start-up**.
6. Click **OK** to create the library. The new library is added to the list of libraries in the navigation pane.

In the SAS Studio Mid-Tier (the enterprise edition) deployment, you can assign unassigned metadata libraries by clicking . The libraries that you can assign must already be defined in your metadata. If you want to access the selected libraries each time you use SAS Studio, select **Assign selected libraries at start-up**. If a library is unassigned, then you cannot access the tables in that library.

Using File Shortcuts

File shortcuts enable you to quickly access files that you specify. You can create a file shortcut to a file on your SAS server, via a URL, or on your FTP server.

Note: You can create a file shortcut to a file on an FTP server only if you have created a folder shortcut to an FTP folder. FTP folders are not available by clicking **Browse** and using the Select File window, however. You must enter the pathname.

To create a new file shortcut, click . You can define the shortcut by specifying a complete path and filename or by specifying a URL. If you want this shortcut to be available the next time you use SAS Studio, select **Re-create this file shortcut at start-up**.

You can open a file from a file shortcut by double-clicking it or dragging it to the work area.

Customizing the Navigation Pane

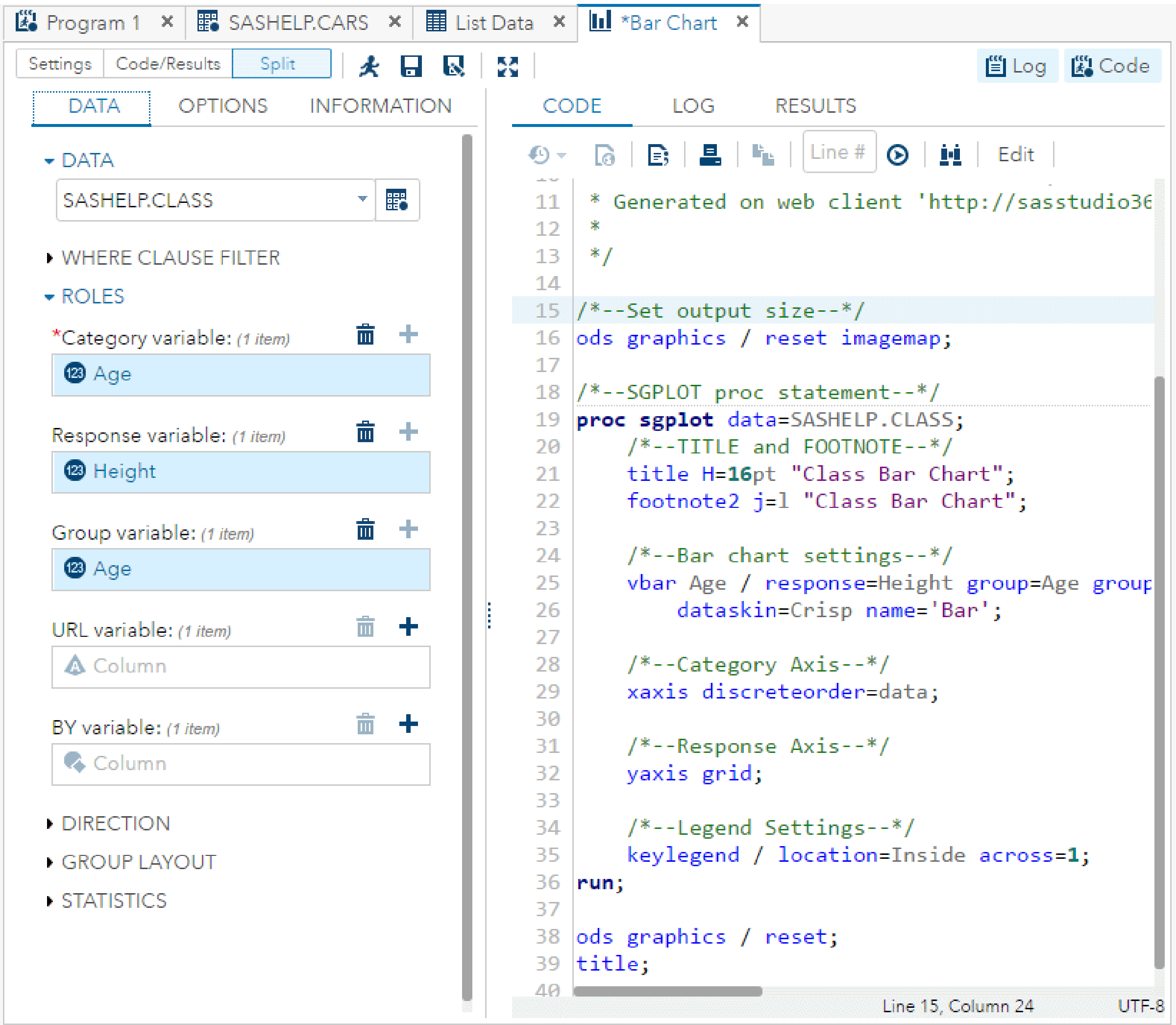
By default, all five sections of the navigation pane are displayed when you open SAS Studio in the SAS Programmer perspective. To customize which sections are displayed, click ☰ and select **View**. Select or clear any sections that you want to add or remove. The navigation pane is updated immediately.

Note: The **File Shortcuts** section is not displayed by default in the Visual Programmer perspective.

Using the Work Area

About Using the Work Area

The work area is the main portion of the SAS Studio application for accessing programs and tasks and for viewing data. The work area is always displayed and cannot be minimized. When you open a program, task, or table, the windows open as new tabs in the work area. The code, log, and results that are associated with programs and tasks are grouped together under the main tab for the program or task.



DATA: SASHELP.CLASS

*Category variable: *(1 item)*: Age

Response variable: *(1 item)*: Height

Group variable: *(1 item)*: Age

URL variable: *(1 item)*: Column

BY variable: *(1 item)*: Column

```
* Generated on web client 'http://sasstudio36
*
*/

/*--Set output size--*/
ods graphics / reset imagemap;

/*--SGPLOT proc statement--*/
proc sgplot data=SASHELP.CLASS;
    /*--TITLE and FOOTNOTE--*/
    title H=16pt "Class Bar Chart";
    footnote2 j=l "Class Bar Chart";

    /*--Bar chart settings--*/
    vbar Age / response=Height group=Age group
        dataskin=Crisp name='Bar';

    /*--Category Axis--*/
    xaxis discreteorder=data;

    /*--Response Axis--*/
    yaxis grid;

    /*--Legend Settings--*/
    keylegend / location=Inside across=1;
run;

ods graphics / reset;
title;
```

Customizing the Work Area

By default, the work area is displayed beside the navigation pane, but you can maximize the work area and hide the navigation pane. You can also close all of the tabs in the work area at once.

To maximize the work area, click ⛶ on the toolbar.

Note: To reopen the navigation pane, click ⛶ again.

To close all tabs that are open in the work area, click ⊞ and select **Close All Tabs**. You are prompted to save any unsaved programs or tasks.

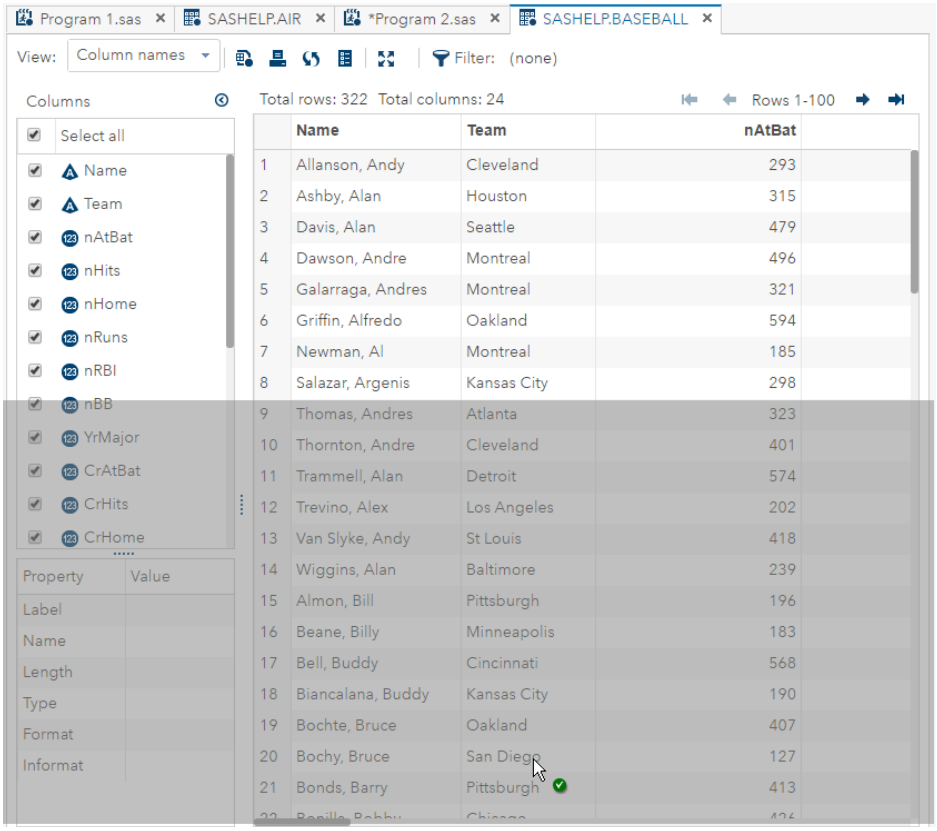
Rearranging the Tabs in the Work Area

In the work area, you can rearrange the tabs by using a drag-and-drop operation to move them to the left or right. You can also dock a tab on the right side or bottom of the work area to view more than one tab at a time.

To rearrange a tab:

1. Select the tab that you want to move.

2. Move the tab icon to the location where you want to view this content. The ✓ icon indicates a valid location.



View: Column names

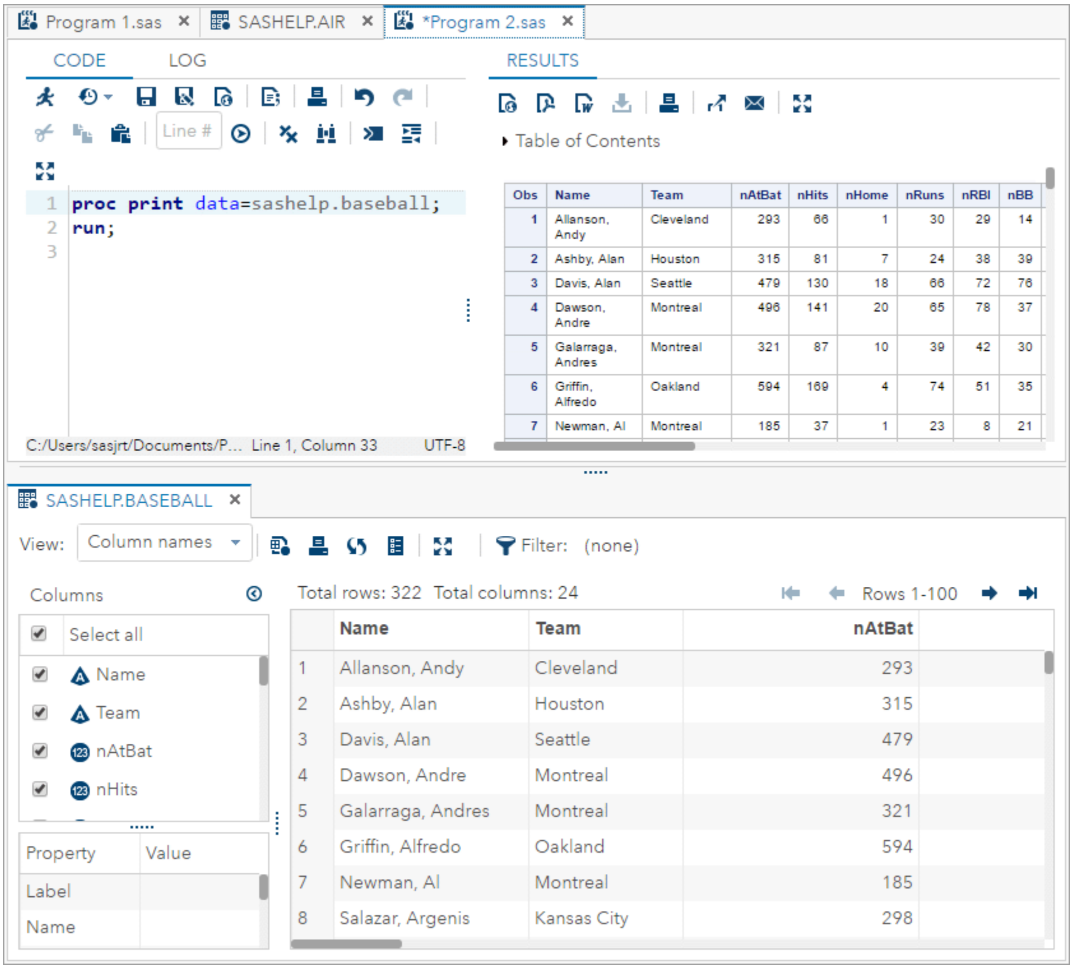
Filter: (none)

Total rows: 322 Total columns: 24

Rows 1-100

Property	Value
Label	
Name	
Length	
Type	
Format	
Informat	

	Name	Team	nAtBat
1	Allanson, Andy	Cleveland	293
2	Ashby, Alan	Houston	315
3	Davis, Alan	Seattle	479
4	Dawson, Andre	Montreal	496
5	Galarraga, Andres	Montreal	321
6	Griffin, Alfredo	Oakland	594
7	Newman, Al	Montreal	185
8	Salazar, Argenis	Kansas City	298
9	Thomas, Andres	Atlanta	323
10	Thornton, Andre	Cleveland	401
11	Trammell, Alan	Detroit	574
12	Trevino, Alex	Los Angeles	202
13	Van Slyke, Andy	St Louis	418
14	Wiggins, Alan	Baltimore	239
15	Almon, Bill	Pittsburgh	196
16	Beane, Billy	Minneapolis	183
17	Bell, Buddy	Cincinnati	568
18	Biancalana, Buddy	Kansas City	190
19	Bochte, Bruce	Oakland	407
20	Bochy, Bruce	San Diego	127
21	Bonds, Barry	Pittsburgh	413
22	Bonilla, Bobby	Chicago	426



```
proc print data=sashelp.baseball;
run;
```

C:/Users/sasjrt/Documents/P... Line 1, Column 33 UTF-8

Obs	Name	Team	nAtBat	nHits	nHome	nRuns	nRBI	nBB
1	Allanson, Andy	Cleveland	293	66	1	30	29	14
2	Ashby, Alan	Houston	315	81	7	24	38	39
3	Davis, Alan	Seattle	479	130	18	66	72	76
4	Dawson, Andre	Montreal	496	141	20	65	78	37
5	Galarraga, Andres	Montreal	321	87	10	39	42	30
6	Griffin, Alfredo	Oakland	594	169	4	74	51	35
7	Newman, Al	Montreal	185	37	1	23	8	21

Total rows: 322 Total columns: 24 Rows 1-100

	Name	Team	nAtBat
1	Allanson, Andy	Cleveland	293
2	Ashby, Alan	Houston	315
3	Davis, Alan	Seattle	479
4	Dawson, Andre	Montreal	496
5	Galarraga, Andres	Montreal	321
6	Griffin, Alfredo	Oakland	594
7	Newman, Al	Montreal	185
8	Salazar, Argenis	Kansas City	298

Note: The **Results** tab in Program 2 has also been moved to the right side of the program tab.

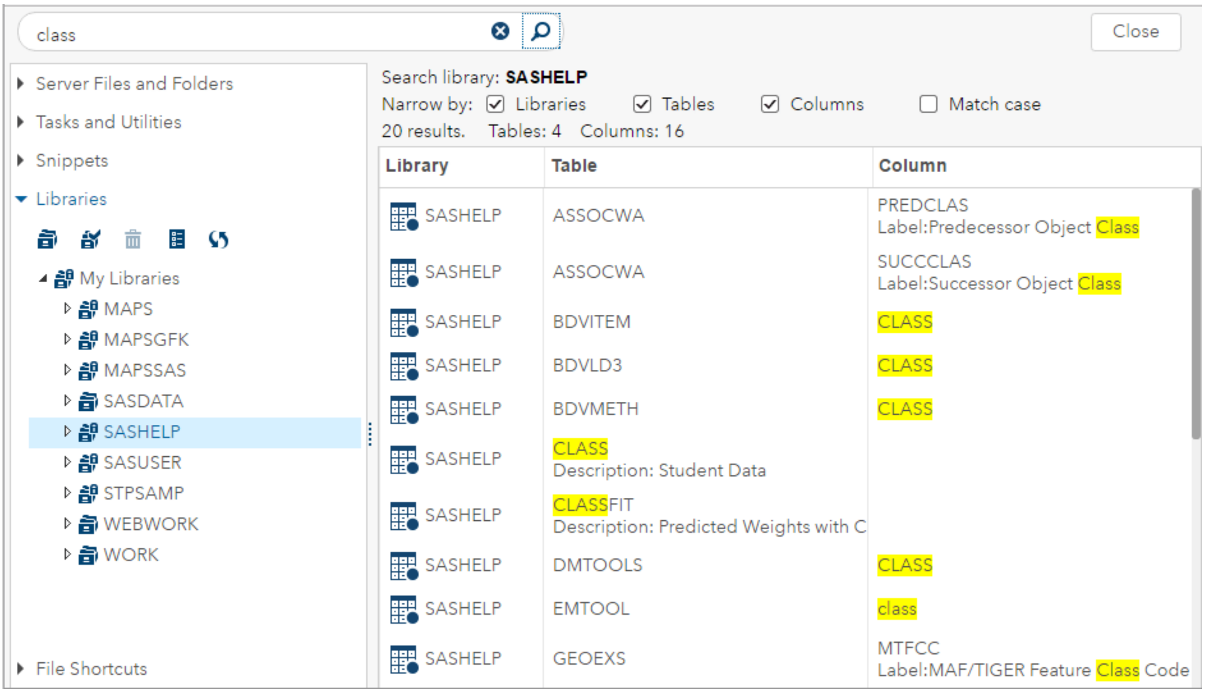
Searching in SAS Studio

You can use the Search feature to search all of the sections of the navigation pane. The types of items that you can search for depend on what is selected in the navigation pane. For example, if a folder or folder shortcut in the **Server Files and Folders** section is selected, you can search for folders and files, and you can choose whether to include subfolders in the search. If a task category in the **Tasks and Utilities** section is selected, you can search for task names, associated SAS procedures, and task descriptions.

To access the Search feature, click 🔍. The search box appears so that you can enter the text that you want to search for.

You can limit the scope of your search by selecting or clearing any of the **Narrow by** options. These options vary depending on what is selected in the navigation pane. By default, the search is case sensitive. To search for both uppercase and lowercase text, clear the **Match case** check box.

The following example shows a search for “class” in the Sashelp library. The search includes all tables and columns in the Sashelp library, and it is not case sensitive.



Search library: **SASHELP**

Narrow by: ☑ Libraries ☑ Tables ☑ Columns □ Match case

20 results. Tables: 4 Columns: 16

Library	Table	Column
SASHELP	ASSOCWA	PREDCLAS Label:Predecessor Object Class
SASHELP	ASSOCWA	SUCCCLAS Label:Successor Object Class
SASHELP	BDVITEM	CLASS
SASHELP	BDVLD3	CLASS
SASHELP	BDVMETH	CLASS
SASHELP	CLASS Description: Student Data	
SASHELP	CLASSFIT Description: Predicted Weights with C	
SASHELP	DMTOOLS	CLASS
SASHELP	EMTOOL	class
SASHELP	GEOEXS	MTFCC Label:MAF/TIGER Feature Class Code

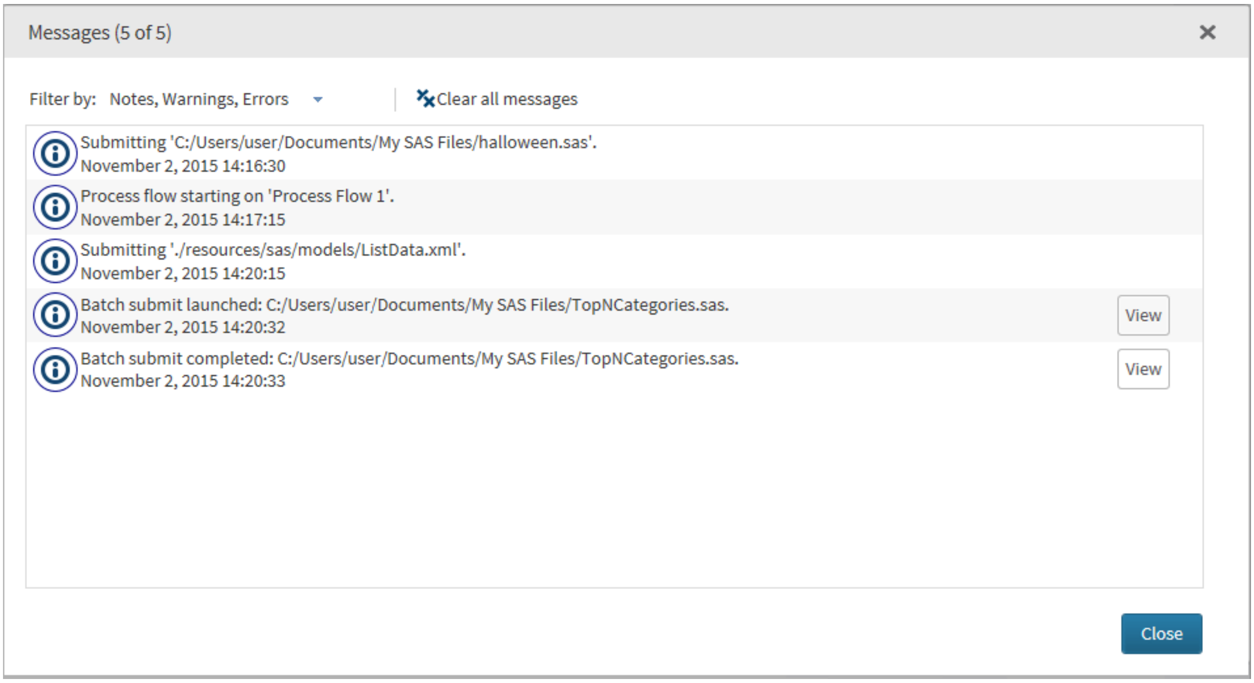
You can open an item from your results by double-clicking it. To return to your search results list, click 🔍 again.

To clear the search results, click ⊗.

Using the Messages Window

The Messages window displays information about the programs, tasks, queries, and process flows that you run in SAS Studio. To open the Messages window, click **Messages** in the lower right corner of your SAS Studio browser window. You can subset the messages that are displayed by clicking the **Filter by** drop-down list and selecting the type of message that you want to view.

If you have run a SAS program in batch mode, you can click **View** to open the Background Job Status window. For more information, see “Running a Program as a Background Job” on page 19. If you have lost your connection to a repository, a message is displayed along with a **Test** button that you can use to test the connection.



Submitting 'C:/Users/user/Documents/My SAS Files/halloween.sas'.
November 2, 2015 14:16:30

Process flow starting on 'Process Flow 1'.
November 2, 2015 14:17:15

Submitting './resources/sas/models/ListData.xml'.
November 2, 2015 14:20:15

Batch submit launched: C:/Users/user/Documents/My SAS Files/TopNCategories.sas.
November 2, 2015 14:20:32

Batch submit completed: C:/Users/user/Documents/My SAS Files/TopNCategories.sas.
November 2, 2015 14:20:33

Note: If you have selected the **Capture all log events** option, then you can also choose to display debug notifications in the Messages window. For more information, see "Setting General Preferences" on page 111.

Understanding Perspectives

Because SAS Studio can be used by a variety of people and groups within an organization, you can choose to view a specific subset of features, or perspective, that meets your needs best. Perspectives are sets of functionality that are customized to meet the needs of different types of users. SAS Studio includes two perspectives: the SAS Programmer perspective and the Visual Programmer perspective.

The SAS Programmer perspective is for users who intend to use SAS Studio mainly for writing and editing SAS programs. By default, the SAS Programmer perspective opens with a new program window and includes all five sections of the navigation pane so that you can easily manage all of your program files and code snippets.

The Visual Programmer perspective is designed for users who want to work with process flows in a project-based environment. You can use process flows in the Visual Programmer perspective to combine individual processes into one repeatable process flow that you can save, reuse, and share with other users. By default, the Visual Programmer perspective opens with a new process flow window and includes four sections in the navigation pane: Folders, Tasks, Snippets, and Libraries.

Note: If you open a process flow while you are using the SAS Programmer perspective, you are prompted to switch to the Visual Programmer perspective.

In both perspectives, you can run the predefined tasks that are shipped with SAS Studio, and you can create and edit tasks. You can also use both perspectives to create and run SAS programs and queries.

The differences between the perspectives can be viewed in the following table:

Element in SAS Studio	Available in SAS Programmer?	Available in Visual Programmer?
Navigation Pane sections		
• **Server Files and Folders**	Yes	Yes
• **Tasks and Utilities**	Yes	Yes
• **Snippets**	Yes	Yes
• **Libraries**	Yes	Yes
• **File Shortcuts**	Yes	Yes, but not displayed by default
SAS Programs	Yes	Yes
Queries	Yes	Yes
Process Flows	No	Yes

After you have started SAS Studio and selected a perspective, you can change the perspective that you are using by clicking the perspectives menu on the toolbar and selecting the perspective that you want to use.

You can specify which sections of the navigation pane are displayed in SAS Studio by clicking ☰ and selecting **View**.

Editing the Autoexec File

The autoexec.sas file includes SAS statements that run each time you start SAS Studio and connect to your SAS server. For example, you can use the autoexec.sas file to assign libraries that you want to be available every time you use SAS Studio in both interactive and noninteractive modes. The autoexec file is saved in your home directory.

Note: If you create a new library by using the New Library window, you can select the **Re-create this library at start-up** option to automatically add the LIBNAME statement to the autoexec.sas file. For more information, see “Working with Libraries” on page 6.

To edit the autoexec.sas file:

1. Click ☰ and select **Edit Autoexec File**.
2. Enter the code that you want to include in the autoexec.sas file.
3. To validate your syntax, click **Run**. The **Log** tab opens so that you can view the log.
4. Click **Save** to save and close the autoexec file.

Changing Your SAS Workspace Server

If you have access to more than one SAS workspace server, you can change the server that SAS Studio connects to. To change the server, click ☰ and select **Change SAS Workspace Server**. Select the server that you want to use. When you change servers, any libraries and file shortcuts that you created are deleted. For more information, see *SAS Studio: Administrator's Guide*.

Chapter 2
Working with Programs

About the Code Editor

SAS Studio includes a color-coded, syntax-checking editor for editing new or existing SAS programs. You can also edit SOURCE entries in SAS catalogs. The editor includes a wide variety of features such as autocompletion, automatic formatting, and pop-up syntax help. With the code editor, you can write, run, and save SAS programs. You can also modify and save the code that is automatically generated when you run a task.

SAS Studio also includes several sample code snippets that you can use to make programming common tasks easier.

In the code editor, you can use the programming language for SAS 9.4 or SAS Viya. For more information, see these resources:

- SAS 9.4 Programming Documentation
- *SAS Viya Quick Start*

Opening and Creating Programs

Opening a Program

You can open SAS programs from the **Server Files and Folders** section of the navigation pane. To open a program, expand the appropriate folder and double-click the program that you want to open, or drag it into the work area. The program opens on a new tab in the work area.

Note: Opening very large program files can affect your performance. If you open a program file that is greater than 10 MB, you are prompted to confirm whether you want to continue opening the file. If you are using Internet Explorer, you are prompted for confirmation if you open a program file that is greater than 3 MB.

Creating a Program

You can create a SAS program from the **Server Files and Folders** section of the navigation pane. To create a program, click ⊞ and select **SAS Program**. A program window appears on a new tab in the work area.

Note: You can also click ⠿ on the main application toolbar and select **New SAS Program**.

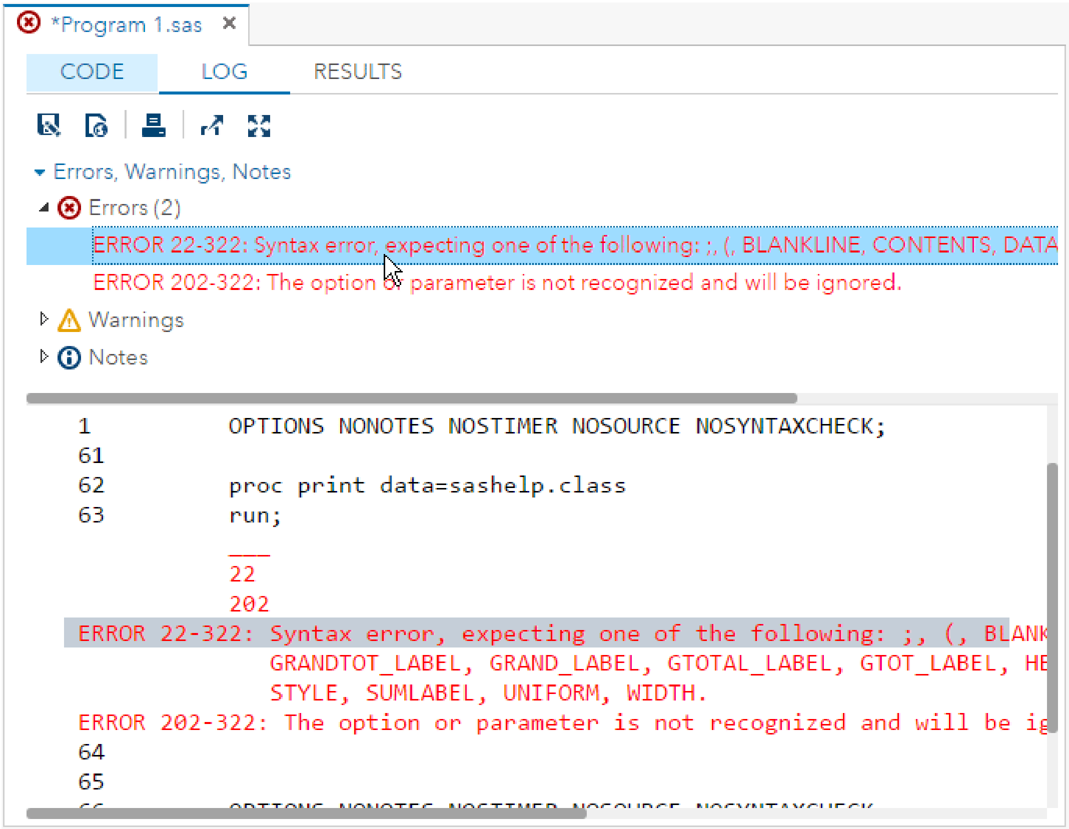
After you save your program, you can use the **Enable autosave** option to automatically create a copy of your new program as well as each previously saved program file that you are editing. You can use the auto-saved copies to recover the files if you lose your network connection or your browser closes unexpectedly. For more information, see “Setting the Editor Preferences” on page 114.

Note: The **Enable autosave** option is available only for programs that you have saved at least once. This option does not apply to programs that are opened from a folder shortcut to an FTP folder.

Running a Program

After you have written your program, you can run the entire program or you can select specific lines of code to run. To run the entire program, click 🏃. To run a portion of the program, select the lines of code that you want to run and then click 🏃.

If there are no errors, the results open automatically. If there are errors, the **Log** tab opens by default. You can expand the **Errors**, **Warnings,** and **Notes** sections to view the messages. When you click a message, SAS Studio highlights it for you in the log so that you can see exactly where the message occurs in the log.



ERROR 22-322: Syntax error, expecting one of the following: ;, (, BLANKLINE, CONTENTS, DATA
ERROR 202-322: The option or parameter is not recognized and will be ignored.

```
1          OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;
61
62         proc print data=sashelp.class
63         run;
           ___
           22
           202
ERROR 22-322: Syntax error, expecting one of the following: ;, (, BLANK
              GRANDTOT_LABEL, GRAND_LABEL, GTOTAL_LABEL, GTOT_LABEL, HE
              STYLE, SUMLABEL, UNIFORM, WIDTH.
ERROR 202-322: The option or parameter is not recognized and will be ig
64
65
66         OPTIONS NONOTES NOSTIMER NOSOURCE NOSYNTAXCHECK;
```

Note: Because you are working in a server environment, do not include the ENDSAS statement in your SAS programs. If you run a program that contains ENDSAS, reset your SAS session by clicking ☰ and selecting **Reset SAS Session**.

Using the Background Submit Feature

About the Background Submit Feature

You can run a saved SAS program as a background job, which means that the program can run while you continue to use SAS Studio. You can view the status of programs that have been submitted as background jobs, and you can cancel programs that are currently running in the background.

Running a Program as a Background Job

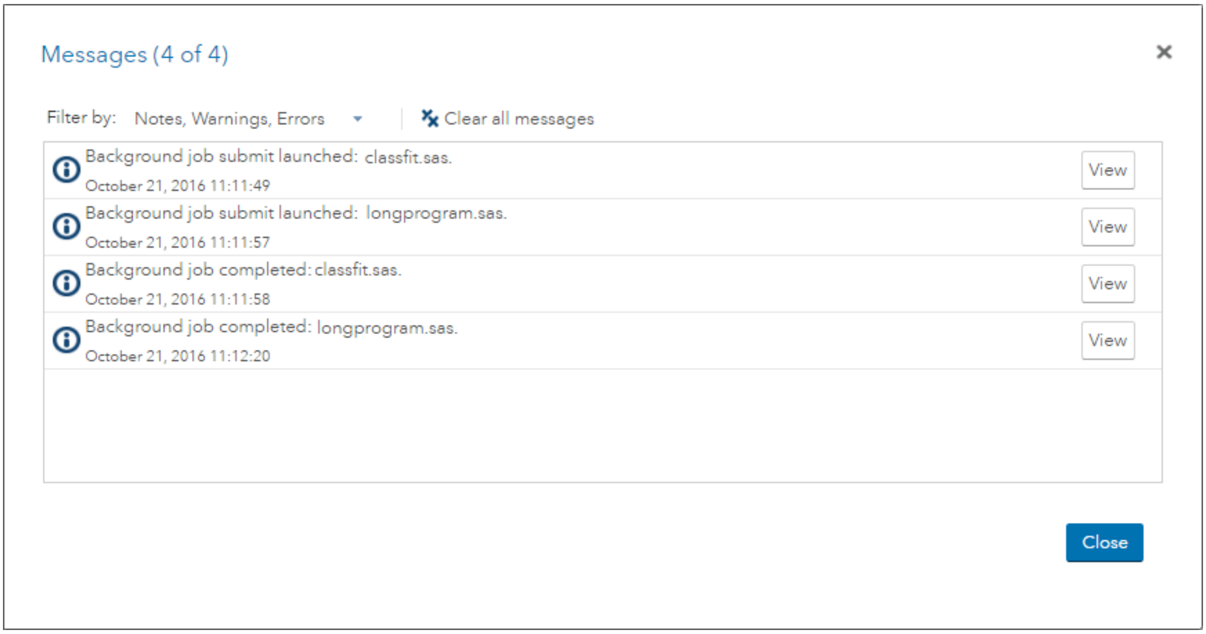
To run a program as a background job, right-click the program in the navigation pane and select **Background Submit**. Before the program is run, the background process changes the current working directory to the directory in which the program is located.

Note: You cannot run a program as a background job if the program is saved on an FTP server or on a SAS server running on the native z/OS file system. Programs that are saved on a z/OS SAS server running the HFS file system can be run as background jobs.

By default, a notification message is displayed when the program is submitted and again when the program has finished running. If you log off from SAS Studio while the program is running, the program continues to run, but the notification message that indicates when the program is finished is not displayed.

Note: Because a background job uses a separate workspace server, any libraries that are created by your program do not appear in the **Libraries** section of the navigation pane in SAS Studio.

To view the status of your background jobs, click ☰ and select **Background Job Status**.



Messages (4 of 4)

Filter by: Notes, Warnings, Errors

ⓘ Background job submit launched: classfit.sas. October 21, 2016 11:11:49	View
ⓘ Background job submit launched: longprogram.sas. October 21, 2016 11:11:57	View
ⓘ Background job completed: classfit.sas. October 21, 2016 11:11:58	View
ⓘ Background job completed: longprogram.sas. October 21, 2016 11:12:20	View

You can use the Background Job Status window to perform these tasks:

ⓘ	Display the background job properties, including file pathnames, start time, end time, and status.
🗒	Open the program log in the SAS Studio work area.
🗎	Open the program results in a separate window or download the results file.
⊘	Cancel a running background job. Any output that has been created by the job is not deleted.

After the background job completes, you must refresh the **Server Files and Folders** pane to view any output and log files.

Customizing Your Background Job Submissions

The Preferences window enables you to customize how to handle background job submissions.

To change whether existing log and output files are deleted or overwritten when you rerun a background job, click ☰ and select **Preferences**. Click **Background Jobs**.

For more information about each option, see "Setting Preferences for Background Job Submissions" on page 119.

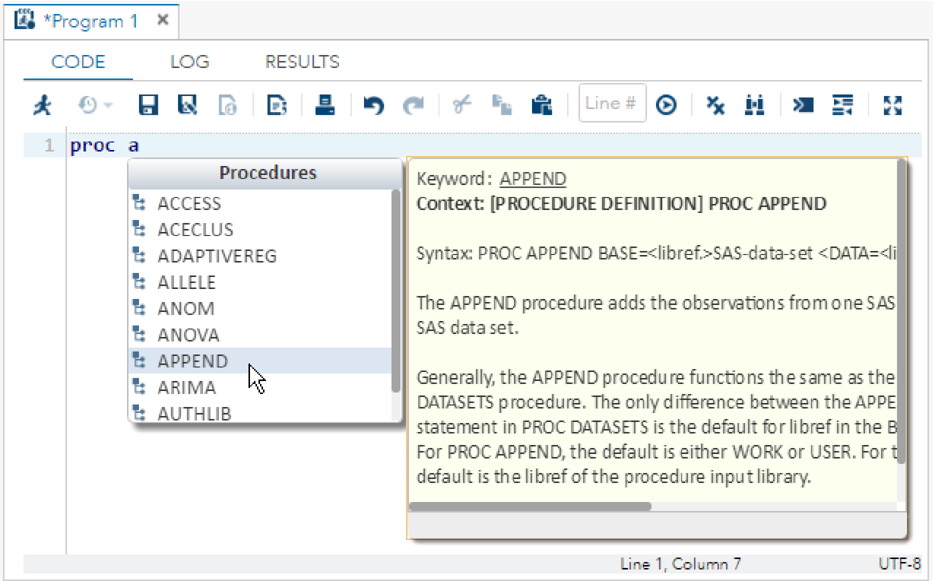
Using the Autocomplete Feature

About the Autocomplete Feature

The autocomplete, or code completion, feature in the code editor can predict the next word that you want to enter before you actually enter it completely. The autocomplete feature can complete keywords that are associated with SAS procedures, statements, macros, functions, CALL routines, formats, informats, macro variables, SAS colors, style elements, style attributes, and statistics keywords, and various SAS statement and procedure options. The autocomplete feature can also complete librefs and table names.

Note: The autocomplete feature is available only for editing SAS programs.

This example shows the keywords and help that appear when you enter **`proc a`** in the code editor.



```
proc a
```

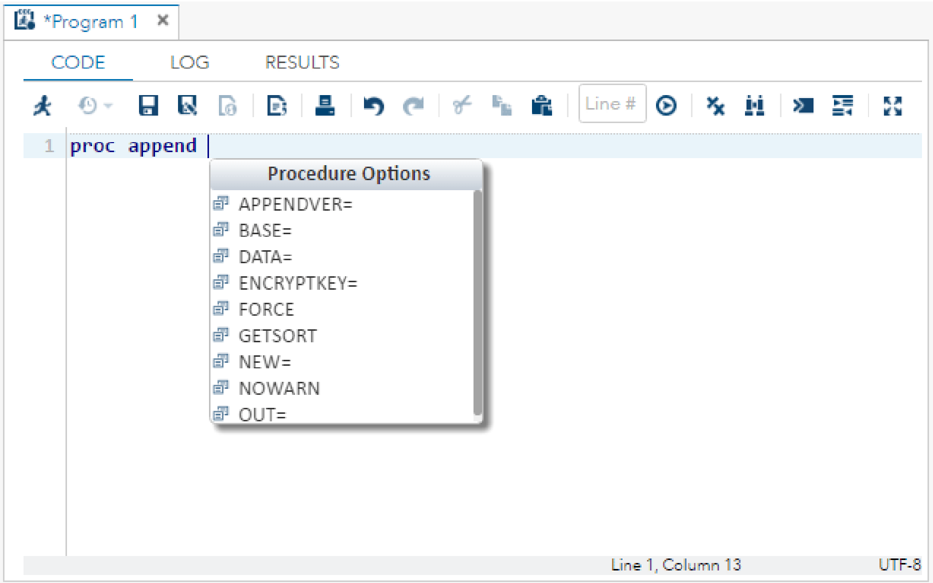
Keyword: APPEND
Context: [PROCEDURE DEFINITION] PROC APPEND

Syntax: PROC APPEND BASE=<libref.>SAS-data-set <DATA=<li

The APPEND procedure adds the observations from one SAS
SAS data set.

Generally, the APPEND procedure functions the same as the
DATASETS procedure. The only difference between the APPE
statement in PROC DATASETS is the default for libref in the B
For PROC APPEND, the default is either WORK or USER. For t
default is the libref of the procedure input library.

In this example, you select **APPEND** from the list of procedures so that `proc append` appears in the code editor. When you enter a space, the code editor displays a list of options for the APPEND procedure.



```
proc append
```

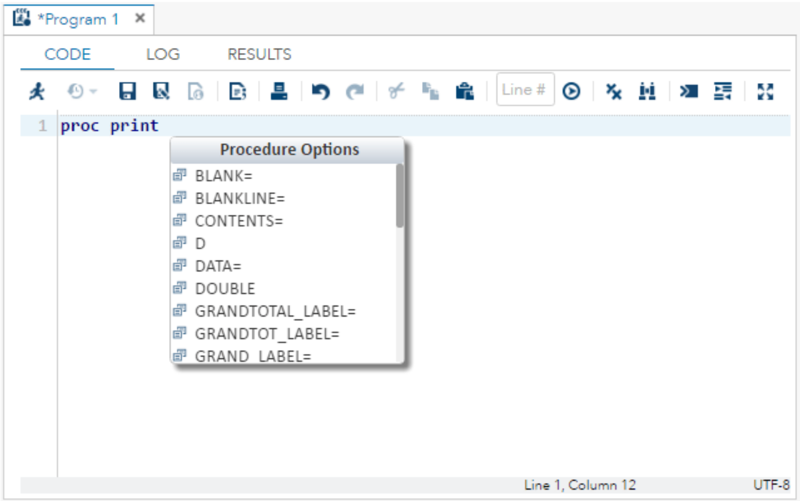
How to Use the Autocomplete Feature

To use the autocomplete feature:

1. How you open the autocomplete list depends on the keyword that you want to add.

   - If you want to add a global statement, DATA step statement, CALL routine, procedure, macro statement, or automatic macro variable, enter the first one or more letters of the keyword that you want to use.

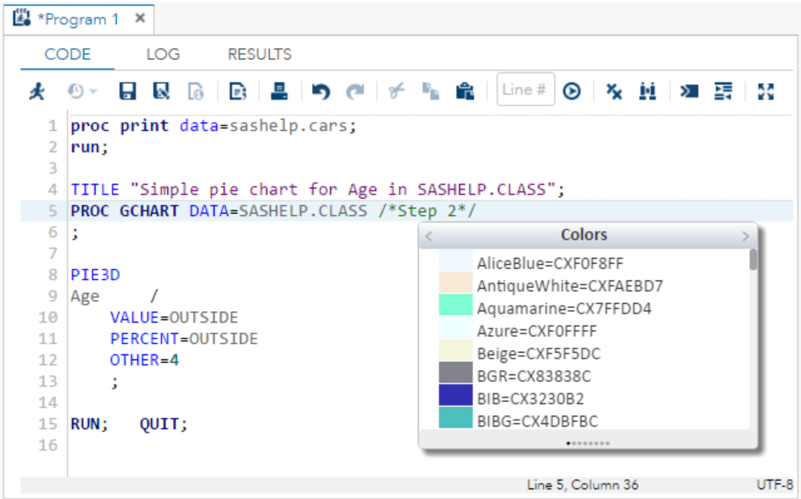
     A window appears with a list of suggested keywords that begin with those letters.



```
proc print
```

   - If you want to specify colors, formats, informats, macro functions, SAS functions, statistics keywords, style elements, or style attributes, position your mouse pointer in a comment and press Ctrl+spacebar. To navigate through the list of options backward, press Ctrl+Shift+spacebar or use the arrow keys at the top of the pop-up window.

Note: These shortcuts work even if you have deselected the **Enable autocomplete** option in the Preferences window. For more information, see "Customizing the Code Editor" on page 41.



```
proc print data=sashelp.cars;
run;

TITLE "Simple pie chart for Age in SASHELP.CLASS";
PROC GCHART DATA=SASHELP.CLASS /*Step 2*/
;

PIE3D
Age      /
     VALUE=OUTSIDE
     PERCENT=OUTSIDE
     OTHER=4
     ;

RUN;    QUIT;

```

2. You can navigate to the keyword that you want to use in several ways:
   - Continue to type until the correct keyword is selected (because the matching improves as you type).
   - Scroll through the list by using the up and down arrow keys, the Page Up and Page Down keys, or your mouse.
3. You can add the keyword to your program by double-clicking the selected keyword or by pressing the Enter key.

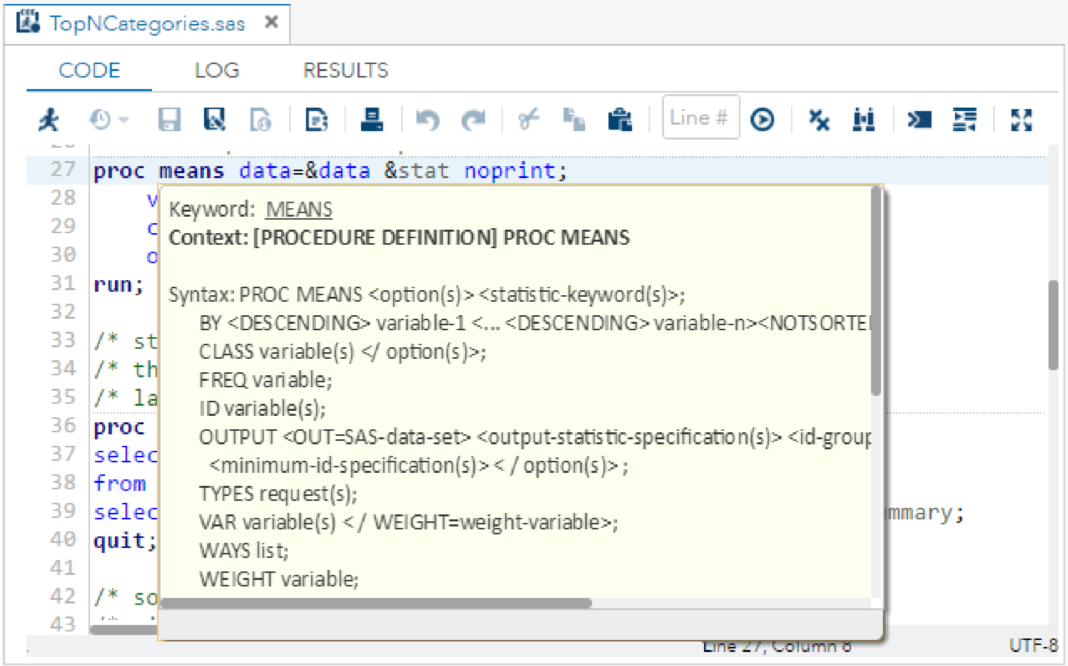
Using the Syntax Help

The code editor displays brief SAS syntax documentation as you write and edit your programs. You can display the Help in these ways:

- Right-click a keyword in your program and select **Syntax Help**.
- Start entering a valid SAS keyword, and then click a suggested keyword in the autocomplete window.
- Position the mouse pointer over a valid SAS keyword in your program. This works only if you have selected the **Enable hint** option in the Editor preferences. For more information, see "Customizing the Code Editor" on page 41.

The SAS Product Documentation provides more comprehensive usage information about the SAS language, but the syntax help in the code editor can get you started with a hint about the syntax or a brief description of the keyword. You can get additional help by clicking links in the syntax help window as follows:

- Click the keyword link at the top of the window to search the support.sas.com website for the keyword.

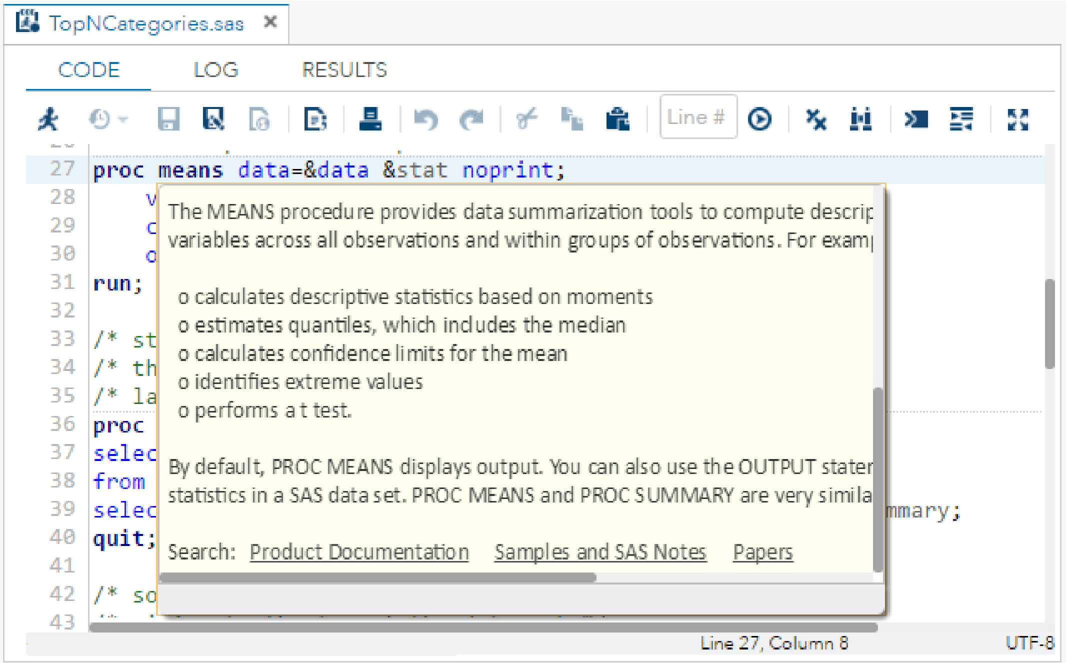


```
proc means data=&data &stat noprint;
     v
     c
     o
run;

/* st
/* th
/* la
proc
selec
from
selec                                                        mmary;
quit;

/* so
```

Keyword: MEANS
Context: [PROCEDURE DEFINITION] PROC MEANS

Syntax: PROC MEANS <option(s)> <statistic-keyword(s)>;
   BY <DESCENDING> variable-1 <... <DESCENDING> variable-n><NOTSORTE
   CLASS variable(s) </ option(s)>;
   FREQ variable;
   ID variable(s);
   OUTPUT <OUT=SAS-data-set> <output-statistic-specification(s)> <id-group
    <minimum-id-specification(s)> < / option(s)> ;
   TYPES request(s);
   VAR variable(s) < / WEIGHT=weight-variable>;
   WAYS list;
   WEIGHT variable;

- Click the links at the bottom of the window to search for the keyword in the SAS Product Documentation, Samples and SAS Notes, and SAS Technical Papers.



```
proc means data=&data &stat noprint;
     v
     c
     o
run;

/* st
/* th
/* la
proc
selec
from
selec                                                        mmary;
quit;

/* so
```

The MEANS procedure provides data summarization tools to compute descrip
variables across all observations and within groups of observations. For exam

o calculates descriptive statistics based on moments
o estimates quantiles, which includes the median
o calculates confidence limits for the mean
o identifies extreme values
o performs a t test.

By default, PROC MEANS displays output. You can also use the OUTPUT stater
statistics in a SAS data set. PROC MEANS and PROC SUMMARY are very simila

Search: Product Documentation   Samples and SAS Notes   Papers

Matching Parentheses

You can use the parenthesis matching feature to track nested parentheses within a program. The code editor highlights both the open and close parentheses. If only one parenthesis is highlighted, then you know that you are missing a parenthesis. This feature can be used to match parentheses, square brackets, and braces.

```
do y = -5 to 5 by .5;
   z = sin(sqrt(y*y + x*x));
```

To match parentheses, position the cursor in front of the open parenthesis or just after the close parenthesis that you want to match. The parenthesis and its match are highlighted. If the parenthesis does not have a match, then it is not highlighted.

Selecting Columns of Text to Edit

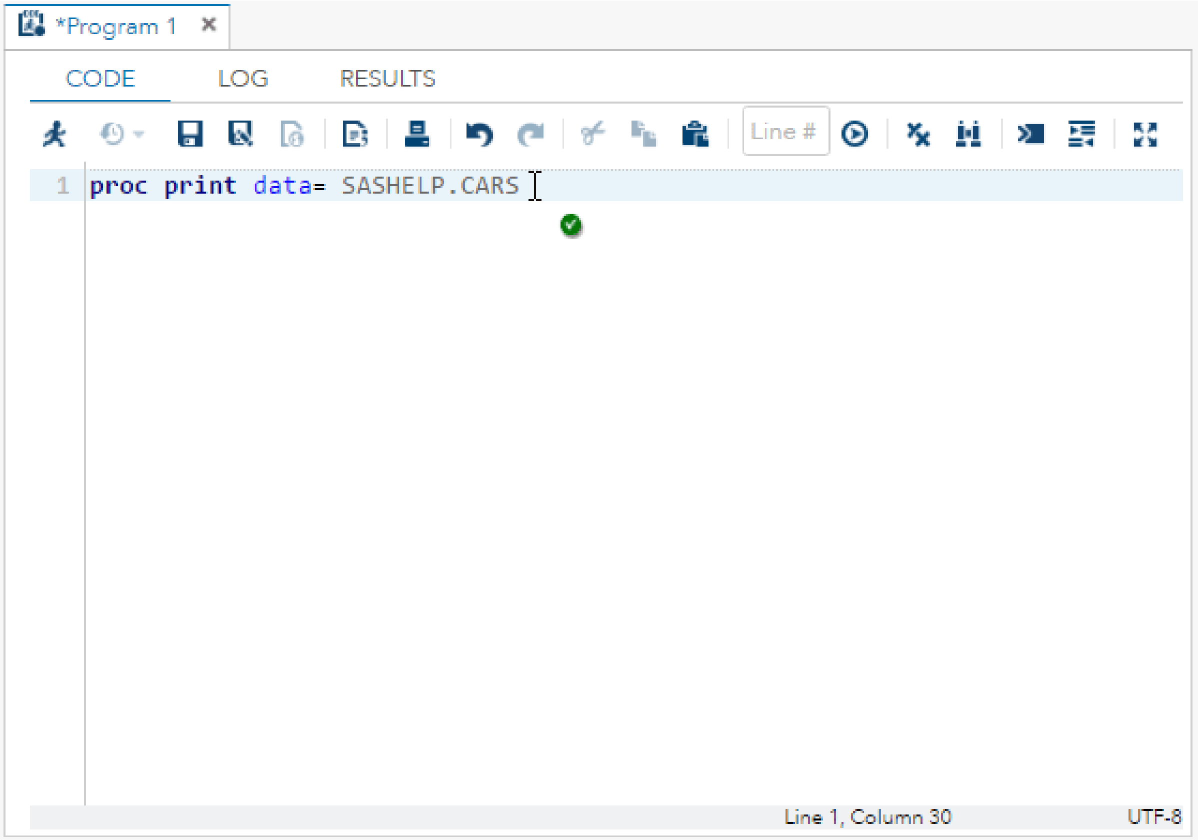
You do not have to select entire horizontal lines of text. You can select columns or vertical blocks of text.

To select a column or vertical block of text:

- In Window environments, press the ALT key while you select the text with the left mouse button.
- In Mac OS X environments, press the Option key while you select the text with the left mouse button.

Adding Table Names and Column Names

From the **Libraries** section of the navigation pane, you can use a drag-and-drop operation to move table names and column names into the SAS code. For example, you can move the Sashelp.Cars table into the DATA option for the PRINT procedure. When you release the mouse, the fully qualified name for the table appears in your code.



```
proc print data= SASHELP.CARS
```

Editing the Code from a Task

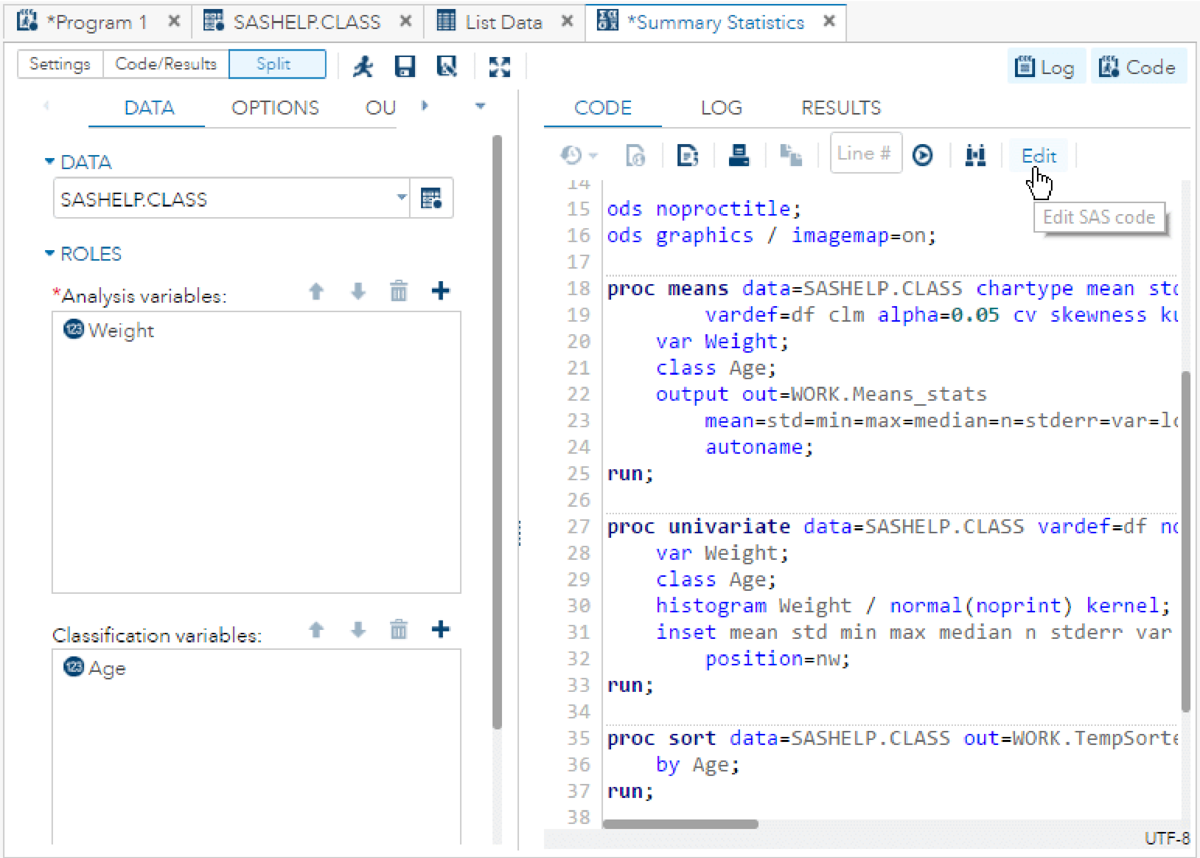
You can edit the code that is generated automatically when you run a task and then run it with your modifications. When you edit the code, SAS Studio opens it in a separate program window. The code is no longer associated with the original task.

To edit a program generated by a task:

1. On the appropriate task tab in the work area, click **Code** to display the code that is associated with the task.

   Note: In order to edit the code that is associated with a task, you must first display the code with the task. If the task code is not displayed, click ☰ and select **Preferences**. Click **Tasks**, and then select **Show Task Code**.

2. On the toolbar, click **Edit**. The code is opened in a new program window.



```
ods noproctitle;
ods graphics / imagemap=on;

proc means data=SASHELP.CLASS chartype mean stc
        vardef=df clm alpha=0.05 cv skewness ku
    var Weight;
    class Age;
    output out=WORK.Means_stats
        mean=std=min=max=median=n=stderr=var=lc
        autoname;
run;

proc univariate data=SASHELP.CLASS vardef=df nc
    var Weight;
    class Age;
    histogram Weight / normal(noprint) kernel;
    inset mean std min max median n stderr var
        position=nw;
run;

proc sort data=SASHELP.CLASS out=WORK.TempSorte
    by Age;
run;
```

Creating a SAS Program Package

A SAS Program Package is a file that contains a snapshot of a SAS program along with its log and HTML results. You can create a program package from code that you have written as well as code that is automatically generated when you run a task. When you open a program package in SAS Studio, you can access the code, log, and results without running the program again. If you make changes to the code and rerun it, the package is not automatically updated. You must save the package again to keep the changes.

Note:

- The program package does not include PDF or RTF results.
- You cannot create a program package if you are running your program in interactive mode.

To create a program package file, open the code that you want to use and click . Specify the file location and name, and then select **`SAS Program Package`** as the **Save as type** option.

Note: If you open a program package file and want to save the program or log individually or download the results as an HTML, PDF, or RTF file, you must resubmit the program after you open the program package file.

Creating a Program Summary

You can create a summary page for code that you have written as well as code that is automatically generated when you run a task. The Program Summary page is an HTML file that opens in a separate browser tab and includes information about the program execution, the complete SAS source code, the complete SAS log, and the results. To view the Program Summary page for a program, click .

Note: The Program Summary is available only after you have run the program.

You can also save a Program Summary file to a folder that you specify by clicking and selecting **`SAS Program Summary`** as the **Save as type** option. The Program Summary is saved as an HTML file.

Using Macro Variables

Macro variables can be used to add information that is obtained when a program or task is run, such as the name and version number of the application. You can reference these items within code, titles, or footnotes by preceding them with "&". When you use a macro variable, you must enclose the text in double quotation marks. The SAS macro facility resolves the macro variable only if the text is in double quotation marks.

For example, you can use macro variables in a FOOTNOTE statement:

```
footnote "Generated with &_CLIENTAPP &_CLIENTVERSION";
```

Note: In addition to the following macro variables, you can run this code to see other user-generated and automatic macro variables that are available:

```
%PUT _ALL_;
```

For information about SAS macro functions and variables, see *SAS Macro Language: Reference*.

Macro Variable	Description
_CLIENTAPP	name of the client application.
_CLIENTAPPABREV	abbreviated name of the client application.
_CLIENTMACHINE	node name of the client machine.

Macro Variable	Description
_CLIENTMODE	type of SAS Studio deployment: Mid-Tier (enterprise), Single-User, or Basic.
_CLIENTUSERID	user ID of the client user.
_CLIENTUSERNAME	full user name, if that information is available.
_CLIENTVERSION	application version, including build number.
_SASHOSTNAME	server node name (IP address or DNS name).
_SASPROGRAMFILE	the full path and filename of the SAS program that is currently being run. This macro variable is available only for SAS program files that are saved on the same server on which your SAS Studio code is running.
_SASPROGRAMFILEHOST	the server node name on which the current SAS program is being run.
_SASWORKINGDIR	current working directory.
SASWORKLOCATION	location of the Work library.
SYSPROCESSNAME	name of the current SAS process.
SYSPROCESSMODE	current SAS session run mode or server type name.
SYSVLONG4	SAS software release number, maintenance level, and four-digit year.

Note: If you specify **`%put _all_`** or **`%put _global_`** in your SAS program, the output does not include any special characters. For example, slashes are not included in directory paths. To view the output with these special characters, you must specify the individual macro variable by name, such as **`%put &_sasprogramfile;`**.

Using Your Submission History

SAS Studio maintains a log with entries for each time you run a program or task. You can use this log, or submission history, to access prior versions of your submitted code. To view your submission history, click the **Code** tab in your program or task window.

On the toolbar, click 🕘 and select the version that you want to open. The prior version of the program opens in a new window from which you can copy and paste the code as needed.

Note: The submission history is cleared when you sign off from SAS Studio.

Automatically Formatting Your SAS Code

You can use the code editor to make your programs easier to read by automatically formatting your code. When you automatically format your code, line breaks are added, and each line is correctly indented according to its nesting level. To format the code in the code editor, click ≣.

For example, the following code is difficult to read because it lacks indention and logical line breaks:

```
data topn;
length rank 8; label rank="Rank";
set topn; by &category descending &measure;
if first.&category then rank=0; rank+1;
if rank le &n then output;
run;
```

After you use the automatic code-formatting feature, the program looks like this:

```
data topn;
    length rank 8;
    label rank="Rank";
    set topn;
    by &category descending &measure;

    if first.&category then
        rank=0;
    rank+1;

    if rank le &n then
        output;
run;
```

Working in Interactive Mode

What Is Interactive Mode?

Some SAS procedures are interactive, which means they remain active until you submit a QUIT statement, or until you submit a new PROC or DATA step. In SAS Studio, you can use the code editor to run these procedures, as well as other SAS procedures, in interactive mode.

By using interactive mode, you can run selected lines of code from your SAS program and use the results to determine your next steps. For example, the OPTMODEL procedure in SAS/OR enables you to model and solve mathematical programming models. By running this procedure interactively, you can quickly check results for parts of the program and determine whether you need to make any modifications without running the entire program.

Note: Interactive mode is available only if you are running SAS 9.4M1 or later releases.

Running a Program in Interactive Mode

To run a program in interactive mode, click » on the toolbar. To turn off interactive mode, click » again. If you change modes while a program is open, the log and results for that program are cleared. You can also clear the log and results manually by clicking ✖ on the appropriate toolbar.

When you run a program in interactive mode, SAS Studio does not add any automatically generated code, such as ODS and %LET statements, to your program. In addition, results are generated only in HTML. In interactive mode, the log and results are appended to the existing log and results. Previously submitted code remains active until you terminate it.

For example, suppose you have the following program:

```
proc sql;
  select * from sashelp.cars;

  select * from sashelp.class;
  quit;
```

In noninteractive mode, if you select the first two lines of code and submit them, the code runs successfully. If you then select the last two lines of code and submit them, the code fails because the PROC SQL statement is missing.

If you switch to interactive mode and follow the same steps, the last two lines of code run successfully because the PROC SQL statement is still active.

Note: For documentation about specific procedures, see the SAS Programmer's Bookshelf on support.sas.com.

About Libraries in Interactive Mode

When you use interactive mode, you are creating a new workspace server session with its own list of libraries that are available only in that session. If you assign a new library when you are in interactive mode, the library might not be available when you turn off interactive mode. In order to share data in a library between interactive mode and noninteractive mode, the library must be included in your autoexec.sas file so that it is assigned every time you use SAS Studio. For more information, see "Editing the Autoexec File" on page 14.

Webwork is the default output library in interactive mode. If you refer to a table without specifying both the libref and the table name, SAS Studio assumes it is stored in the Webwork library. The Webwork library is shared between interactive mode and noninteractive mode. Any data that you create in the Webwork library in one mode can be accessed in the other mode.

Note: If you run a program that creates output data in interactive mode and this data is saved in a library that is available in both interactive and noninteractive mode (such as the Webwork library), you must refresh the **Libraries** section of the navigation pane to view the new data from the user interface.

The Work library is not shared between interactive mode and noninteractive mode. Each workspace server session has its own separate Work library, and data cannot be shared between them. Any data that you save to the Work library in interactive mode cannot be accessed from the Work library in noninteractive mode. In addition, you cannot view data in the Work library from the **Libraries** section of the navigation pane if the data was created in interactive mode. However, you can access that data programmatically in interactive mode.

Special Considerations When Using Interactive Mode

The following list summarizes some of the special considerations for using interactive mode:

- If you run a program that creates output data in interactive mode, you must refresh the **Libraries** section of the navigation pane to view the new data.
- You cannot view any data that you create in the Work library in interactive mode in the **Libraries** section of the navigation pane. However, you can access that data programmatically.
- Because each program that is opened in interactive mode creates a new workspace server session, any options, macros and macro variables, and other data that is specific to your workspace server session cannot be shared with other programs in either interactive or noninteractive mode. Programs that are opened in noninteractive mode use the same workspace server session and can therefore share options, macros and macro variables, and other data.
- When you run a program in interactive mode, results are generated only in HTML.
- You can turn interactive mode on and off for an individual program tab by clicking ▶. When interactive mode is turned on, the button appears to be highlighted on the toolbar. If you want to use interactive mode for all program tabs, click ≡ and select **Preferences**. Click **General**, and then select **Start new programs in interactive mode**. If you do not select this option, you must turn interactive mode on each time you want to use it.

Working with Code Snippets

Why Use Code Snippets?

Code snippets enable you to quickly insert SAS code into your program and customize it to meet your needs. SAS Studio is shipped with several code snippets. You can also create your own snippets and add snippets to your list of favorites.

Snippet Name	Description
Catalogs	
Edit a SOURCE Entry	enables you to specify the content for the SOURCE entry type in a catalog. The SOURCE entry can contain the same code as SAS programs.
List Catalog Entries	lists the contents of a specified type in a specified catalog. By default, the snippet shows how to list all types as well as only the CLASS type in the catalog Sashelp.FSP.
List Catalogs	creates and displays a SAS table that lists all of the categories in a specified library. By default, the table is saved as Work.catalogs.
Print GRSEG Entry	prints the GRSEG entry to the open destinations specified by the SAS Output Delivery System (ODS output).
Data	

Snippet Name	Description
DS2 Code	provides a template for a DS2 program. DS2 is a SAS programming language that is appropriate for advanced data manipulation. DS2 is included with Base SAS and shares core features with the SAS DATA step. DS2 exceeds the DATA step by adding variable scoping, user-defined methods, ANSI SQL data types, and user-defined packages. The DS2 SET statement accepts embedded FedSQL syntax, and the run-time-generated queries can exchange data interactively between DS2 and any supported database. This data exchange allows SQL preprocessing of input tables, which effectively combines the power of the two languages. For more information, see *SAS DS2 Language Reference*.
DS2 Package	provides a template for a DS2 package. A package is similar to a DS2 program. The package body consists of a set of global declarations and a list of methods. The main syntactical differences are the PACKAGE and ENDPACKAGE statements. These statements define a block with global scope. For more information, see *SAS DS2 Language Reference*.
DS2 Thread	provides a template for a DS2 threaded program. Typically, DS2 code runs sequentially. That is, one process runs to completion before the next process begins. It is possible to run more than one process concurrently, using threaded processing. In threaded processing, each concurrently executing section of code is said to be running in a thread. For more information, see *SAS DS2 Language Reference*.
Generate CSV File	exports SAS data as a comma-separated text file.
Generate PowerPoint Slide	streams Microsoft PowerPoint output to your web browser.
Generate XML File	exports SAS data as an XML file that you can view in your web browser.
Import CSV File	imports a comma-separated file and writes the output to a SAS data set.
Import XLSX File	imports a Microsoft XLSX file and writes the output to a SAS data set.
Simulate Linear Regression Data	creates an input data source that you can use for linear regression analysis. Linear regression analysis tries to assign a linear function to your data by using the least squares method.
Simulate One-Way ANOVA Data	creates an input data source that considers one treatment factor with three treatment levels. When you analyze this data by using the One-Way ANOVA task, the goal is to test for differences among the means of the levels and to quantify these differences.
Descriptive	

Snippet Name	Description
Custom ODS Output	provides a template for creating HTML, PDF, and RTF output by using the SAS Output Delivery System. For more information, see *SAS Output Delivery System: User's Guide*.
PROC SQL	provides a template for writing SQL queries. For more information, see *SAS SQL Procedure User's Guide*.
Graph *Note:* For more information about the SGPLOT, SGPANEL, and SGSCATTER procedures, see *SAS ODS Graphics: Procedures Guide*.	
Bar Panel	uses the VBAR statement in the SGPANEL procedure and enables you to create multiple bar charts.
Box Panel	uses the VBOX statement in the SGPANEL procedure and enables you to create multiple box plots.
Comparative Scatter Plot	uses the COMPARE statement in the SGSCATTER procedure. This code snippet creates a comparative panel of scatter plots with shared axes.
Dot Plot	uses the DOT statement in the SGPLOT procedure. Dot plots summarize horizontally the values of a category variable. By default, each dot represents the frequency for each value of the category variable.
Fit Plot	uses the REG statement in the SGPLOT procedure. This code snippet produces a regression plot with a quadratic fit and includes confidence limits.
HBar Plot	uses the HBAR statement in the SGPLOT procedure. This code snippet creates a horizontal bar chart that summarizes the values of a category variable.
HighLow Plot	uses the HIGHLOW statement in the SGPLOT procedure. High-low charts show how several values of one variable relate to one value of another variable. Typically, each variable value on the horizontal axis has several corresponding values on the vertical axis.
Histogram Plot	uses the HISTOGRAM statement in the SGPLOT procedure. This code snippet produces a histogram with two density plots. In this snippet, one density plot uses a normal density estimate and the other density plot uses a kernel density estimate.
Scatter Plot Matrix	uses the MATRIX statement in the SGSCATTER procedure. This code snippet creates a scatter plot matrix.

Snippet Name	Description
VBox Plot	uses the VBOX statement in the SGPLOT procedure. A box plot summarizes the data and indicates the median, upper and lower quartiles, and minimum and maximum values. The plot provides a quick visual summary that easily shows center, spread, range, and any outliers. The SGPLOT and the SGPANEL procedures have separate statements for creating horizontal and vertical box plots.
IML *Note:* These snippets are available only if your site licenses SAS/IML. For more information about SAS/IML, see *SAS/IML User's Guide*.	
Find Roots of Nonlinear Equation	enables you to find the roots of a function of one variable. Finding the root (or zero) of a function enables you to solve nonlinear equations.
Fit by Using Maximum Likelihood	uses maximum likelihood estimation to estimate parameters for the normal density estimate.
Generate a Bootstrap Distribution	uses the IML procedure to create and analyze a bootstrap distribution of the sample mean.
Integrate a Function	enables you to numerically integrate a one-dimensional function by using the QUAD subroutine in SAS/IML software. Use the QUAD subroutine to numerically find the definite integral of a function on a finite, semi-infinite, or infinite domain.
Simulate Multivariate Normal Data	simulates data from a multivariate normal distribution with a specified mean and covariance.
Macro *Note:* For more information about SAS macros, see *SAS Macro Language: Reference*.	
SAS Macro	provides a basic template for working with SAS macros. Macros enable you to perform many tasks, including substituting text in a program. A SAS program can contain any number of macros, and you can invoke a macro multiple times in a single program.
SAS Macro Variables	provides examples of how to create user-defined global and local macro variables. Macro variables are tools that enable you to dynamically modify the text in a SAS program through symbolic substitution. You can assign large or small amounts of text to macro variables. Then you can use that text by simply referencing the variable that contains the text. Macro variables that are defined by the macro programmer are called user-defined macro variables. Macro variables that are defined by the macro processor are called automatic macro variables. You can define and use macro variables anywhere in SAS programs, except within data lines.

Snippet Name	Description
SAS Macro Do Statement	designates the beginning of a section of a macro definition that is treated as a unit until a matching %END statement is encountered. This macro section is called a %DO group. A simple %DO statement often appears in conjunction with %IF-%THEN-%ELSE statements to designate a section of the macro to be processed depending on whether the %IF condition is true or false. *Note:* SAS also provides a %DO iterative statement, which is different from the code that is generated by this snippet. For more information, see *SAS Macro Language: Reference*.
SAS Macro If Statement	conditionally processes a portion of a macro. The expression that is the condition for the %IF-%THEN-%ELSE statement can contain only operands that are constant text or text expressions that generate text.
SAS Macro Parameters	names one or more local macro variables whose values you specify when you invoke the macro. There are two types of macro variables: positional and keyword. Parameters are local to the macro that defines them. You must supply each parameter name. You cannot use a text expression to generate it. A parameter list can contain any number of macro parameters separated by commas. The macro variables in the parameter list are usually referenced in the macro.

Snippet Name	Description
SAS Macro Quoting	provides examples of macro functions that tell the macro processor to interpret special characters and mnemonics as text rather than as part of the macro language. • The %STR function masks special characters and mnemonic operators in constant text at macro compilation. This function masks these special characters and mnemonic operators:`+ - * / < > = ¬ ^ ~ ; , # blank AND OR NOT EQ NE LE LT GE GT IN` This function also masks these characters when they occur in pairs and when they are not matched and are marked by a preceding %:`' " ()` • The %NRSTR function masks special characters and mnemonic operators in constant text at macro compilation. This function masks all of the special characters and mnemonic operators listed for the %STR function. In addition, the %NRSTR function masks these characters: `& %` • The %BQUOTE function masks special characters and mnemonic operators in a resolved value at macro execution. This function masks these special characters and mnemonic operators: `' " () + - * / < > = ¬ ^ ~ ; , # blank AND OR NOT EQ NE LE LT GE GT IN` • The %SUPERQ function masks all special characters and mnemonic operators at macro execution but prevents further resolution of the value. This function masks these special characters and mnemonic operators: `& % ' " () + - * / < > = ¬ ^ ~ ; , # blank AND OR NOT EQ NE LE LT GE GT IN` • The %QSCAN function searches for a word and masks special characters and mnemonic operators. • The %QSUBSTR function produces a substring and masks special characters and mnemonic operators. • The %QUPCASE function converts a value to uppercase and returns a result that masks special characters and mnemonic operators. • The %UNQUOTE function unmasks a value during macro execution so that any special characters and mnemonic operators are interpreted as macro language elements instead of text. For more information about macro complication and macro execution, see *SAS Macro Language: Reference*.

Snippet Name	Description
SAS Macro Char Functions	provides several examples of these SAS macros that work with character values: • The %EVAL function evaluates arithmetic and logical expressions by using integer arithmetic. This function operates by converting its argument from a character value to a numeric or logical expression. After the expression is evaluated, the result is converted back to a character value. This function is useful because the SAS Macro Facility is basically a text generator. As a result, an arithmetic expression is first converted to a numeric expression. After this numeric expression is evaluated, it is converted back to an arithmetic expression. • The %INDEX function returns the position of the first character of a string. • The %LENGTH function returns the length of a string. • The %SCAN function searches for a word that is specified by its position in a string. • The %SUBSTR function produces a substring of a character string. • The %UPCASE function converts values to uppercase.
SAS Viya Cloud Analytic Services	
Create CAS Connection	creates a connection to a CAS server. You must specify values for the CASHOST= and CASPORT= system options. The CAS statement connects the default session to the specified CAS server and CAS port.
New CAS Session	starts a new CAS session named mySession using the existing CAS server connection. When starting a new session, you can specify the CAS library to use, the time-out (in seconds) for the session, and the locale of the session.
Disconnect CAS Session	disconnects from the CAS session named mySession. Before you disconnect, you can specify a value for the time-out (in seconds). You can reconnect to the session before the time-out expires. Otherwise, the session is terminated.
Reconnect CAS Session	reconnects to a CAS session named mySession.
Terminate CAS Session	terminates the CAS session named mySession. No reconnection is possible.
List CAS Session Options	lists session options for the specified CAS session.
List CAS Sessions for SAS Client	lists all the CAS sessions and session properties that are created by the SAS client or reconnected to by the SAS client.

Snippet Name	Description
List CAS Sessions for User ID	lists all the CAS sessions that are known to the CAS server for the user ID that is associated with *yourSessionName*.
New caslib for Path	creates a CAS library (myCaslib) for the specified path (***`/filePath/`***) and session (mySession).
Generate SAS librefs for caslibs	creates a default CAS session and generates SAS librefs for existing CAS libraries so that the librefs are visible in the **Libraries** pane.
Save Table to caslib	creates a permanent copy of an in-memory table (*sourceTableName*) from a CAS library (*sourceCaslib*). The in-memory table is saved as *targetTableName* in the target caslib *targetCaslib*. *Note:* You can determine the caslib that is associated with a CAS engine libref by right-clicking the libref in the **Libraries** pane and selecting **Properties**. The **Server Session CASLIB** field displays the caslib.
Load Data to caslib	loads a table to the specified CAS library. The snippet includes the PROMOTE option so that the loaded data is available to all your active sessions.
Delete Table or File from caslib	deletes a table or file from the CAS library. You can also remove an in-memory table.
Delete caslib	deletes the specified CAS library.
SAS Viya Machine Learning You must license and install SAS Visual Data Mining and Machine Learning to use these snippets. For more information, see *SAS Visual Data Mining and Machine Learning: Statistical Procedures*.	
Load Data	demonstrates how to load local data into CAS.
Prepare and Explore Data	demonstrates various tools for assaying, assessing, modifying, and preparing data prior to modeling. This snippet uses the Hmeq data set from the Machine Learning sample data library. The Hmeq data set is used as input and creates the Hmeq_prepped data set. The Hmeq_prepped data set is used in subsequent examples. *Note:* You might see a warning message about missing values when you run this snippet. The sample data includes some missing values that can be used by other procedures.
Compare Two ML Algorithms	demonstrates fitting and comparing two Machine Learning algorithms for predicting the binary target in the Hmeq data set, which is included in the Machine Learning sample data library. You must run the Load Data and Prepare and Explore Data snippets before you run this snippet.

Snippet Name	Description
Compare Several ML Algorithms	demonstrates fitting and comparing several Machine Learning algorithms for predicting the binary target in the Hmeq data set, which is included in the Machine Learning sample data library. You must run the Load Data and Prepare and Explore Data snippets before you run this snippet.
Generalized Linear Models	demonstrates fitting and assessing generalized linear models using the GENSELECT procedure. You must run the Load Data and Prepare and Explore Data snippets before you run this snippet.
Unsupervised Learning	shows the entire workflow process, including data preparation, analysis, and visualization of the results. This snippet uses the Sashelp.Iris data set.
Supervised Learning	shows the entire workflow process, including data exploration and preparation, modeling, and evaluation. This snippet uses the Sampleml.Hmeq data set, which is included in the Machine Learning sample data library.
SAS Viya Image Processing You must license and install SAS Visual Data Mining and Machine Learning to use these snippets. For more information, see *SAS Visual Data Mining and Machine Learning: Statistical Procedures*.	
Load Images	loads the image action set from the specified path and creates a CAS table. The path parameter points to the directory that contains the images that you want to load. The path parameter can specify an image file, a directory that contains image files, or a URL. A typical workflow includes loading images and then processing them by using one of the other snippets to resize, rescale, or mutate them. The output from one snippet can be used as input for another snippet. Images can be saved to your computer for further processing by using the Save Images snippet.
Resize Images	resizes one or more images based on the HEIGHT and WIDTH parameters that you specify. The HEIGHT parameter corresponds to the number of rows, and the WIDTH parameter corresponds to the number of columns. The input is a CAS table that contains the images that you want to resize, and the output is a CAS table that contains the resized images.
Rescale Images	changes the depth of one or more images based on the options that you specify. You can specify any of these values for the TYPE parameter: “TO_8U”, “TO_32F”, or “TO_64F”. You can also use the ALPHA and BETA parameters to scale the values. The input is a CAS table that contains the images that you want to rescale, and the output is a CAS table that contains the rescaled images.

Snippet Name	Description
Mutate Images	mutates one or more images using different augmentation techniques. You can specify any of these values for the TYPE parameter: ‘COLOR_JITTERING’, ‘COLOR_SHIFTING’, ‘DARKEN’, ‘HORIZONTAL_FLIP’, ‘INVERT_PIXELS’, ‘LIGHTEN’, ‘ROTATE_LEFT’, ‘ROTATE_RIGHT’, ‘SHARPEN’, or ‘VERTICAL_FLIP’. The input is a CAS table that contains the images that you want to change, and the output is a CAS table that contains the mutated images.
Convert Color	converts the color space of one or more images. You can specify any of these values for the TYPE parameter: ‘BGR2HSV’, ‘BGR2RGB’, ‘BGR2YUV’, ‘COLOR2GRAY’, ‘GRAY2COLOR’, ‘HSV2BGR’, ‘RGB2BGR’, or ‘YUV2BGR’. The input is a CAS table that contains the images that you want to convert, and the output is a CAS table that contains the converted images.
Save Images	saves the specified images to the specified subdirectory of a previously defined caslib, such as CASUSER. You must specify the name of a subdirectory in the caslib root directory. The names of the saved images start with the value of the PREFIX parameter.
Display Image	displays an image that is saved from SAS Studio to your computer. This snippet creates an annotation data set that contains a reference to the image and uses PROC SGPLOT to display the image. Use the IMAGE= variable to specify the fully qualified name and location of the image that you want to display.

Create a Code Snippet

To create your own snippet:

1. Open your .sas file in SAS Studio and select the code that you want to save as a snippet.
2. On the **Code** tab, click . The Add to My Snippets dialog box appears.

   Note: You can also create a snippet by right-clicking the selected code and selecting **Add to My Snippets**.
3. Enter a name for the snippet and click **Save**.

This snippet is now available from the **My Snippets** folder.

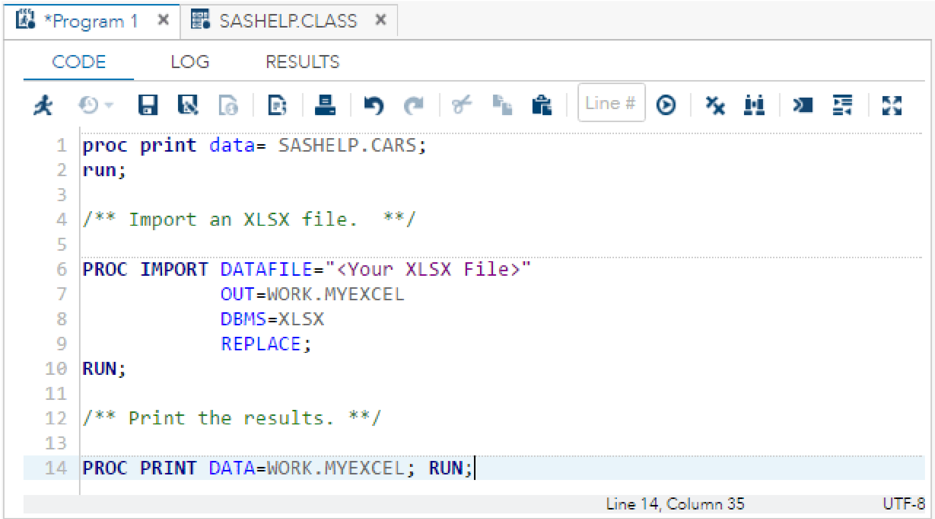
How to Insert a Code Snippet

To include a code snippet in your program:

1. Click the location in your program where you want to insert the snippet.
2. In the navigation pane, open the **Snippets** section.

3. You can add the snippet to your program in these ways:
   - use a drag-and-drop operation to move the snippet.
   - double-click the name of the snippet.
   - right-click the name of the snippet and select **Insert**. To select multiple snippets, use the Ctrl key. Then right-click and select **Insert**.

   The following example shows the Import XLSX File snippet inserted into a program.



```
proc print data= SASHELP.CARS;
run;

/** Import an XLSX file.  **/

PROC IMPORT DATAFILE="<Your XLSX File>"
            OUT=WORK.MYEXCEL
            DBMS=XLSX
            REPLACE;
RUN;

/** Print the results. **/

PROC PRINT DATA=WORK.MYEXCEL; RUN;
```

Customizing the Code Editor

The Preferences window enables you to change several options that affect the features in the code editor, including autocompletion and color coding.

To access the editor options, click ☰ and select **Preferences**. Click **Editor**.

For more information, see “Setting the Editor Preferences” on page 114.

Chapter 3
Working with Queries

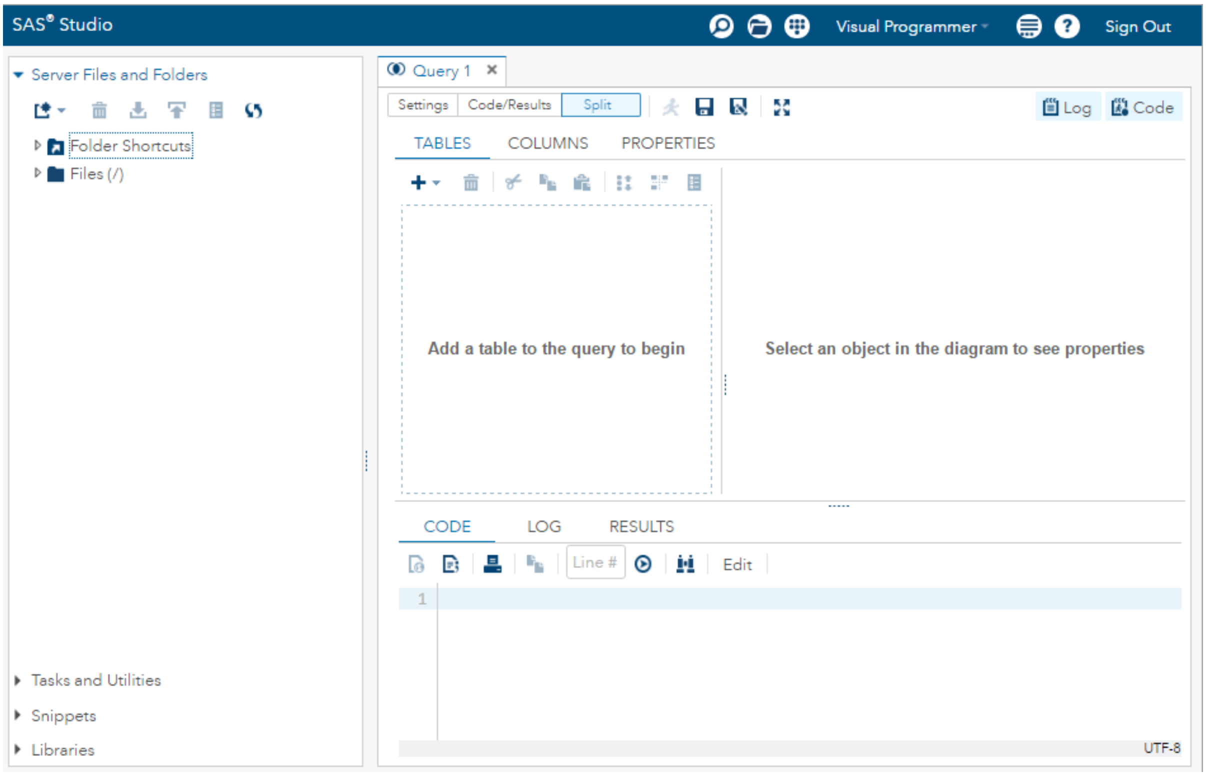
What Is a Query?

A query enables you to extract data from one or more tables according to criteria that you specify. You can create a query that is based on only one table, or you can join tables together. When you create a query, SAS Studio generates Structured Query Language (SQL) code, which you can view. You can create queries in both the SAS Programmer and the Visual Programmer perspectives.

Creating a Query

Creating a New Query

On the main SAS Studio toolbar, click and select **New Query**. A query window opens on a new tab in the work area.



Add a table to the query to begin

Select an object in the diagram to see properties

Adding Tables to a Query

On the **Tables** tab in the query window, click + and select **Table**. From the Choose a Table window, expand the appropriate library and select the table that you want to use. The table is added to the query.

Note: You can also add tables to the query by using the **Libraries** of the navigation pane. Click **Libraries** and expand the appropriate library. Drag the table that you want to use to the **Tables** tab of the query window.

Understanding Joins

Joining Tables

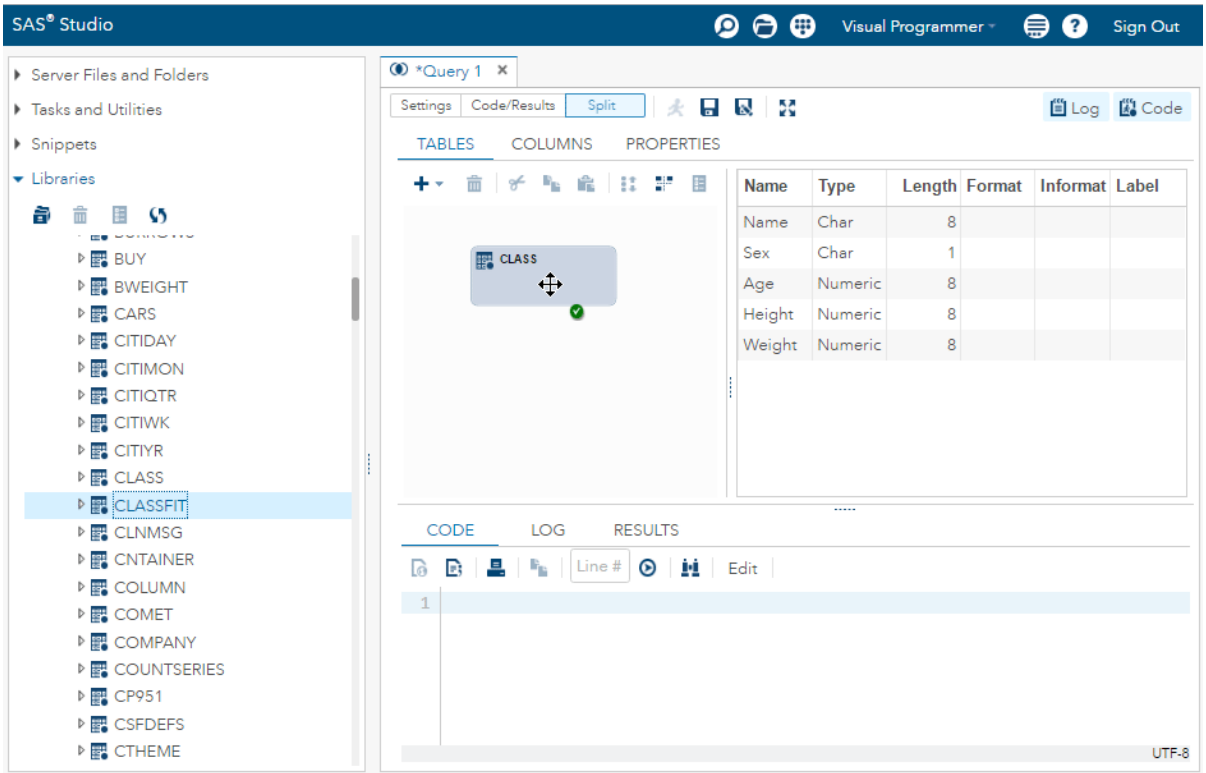
When you create a query, you can join multiple tables together. SAS Studio can automatically join the tables together for you, or you can manually create the join. SAS Studio attempts to join tables by columns that have the same name and type. If no matches for column name and type are found, then you can specify the join criteria.

Note: If you have more than one table in your query and you do not specify join criteria, then your output data includes the Cartesian product, or every possible combination, of the data values.

Creating a Join

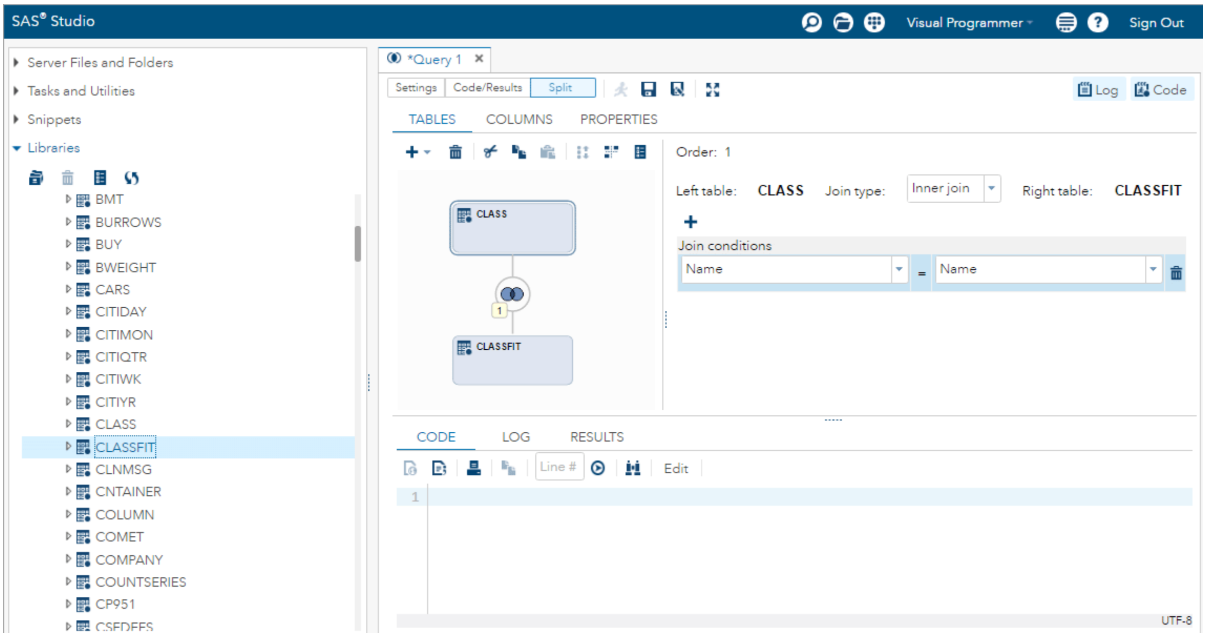
To add a table and automatically create a join:

From the **Libraries** of the navigation pane, drag the table that you want to add to the query to the **Tables** tab. Next, drop that table on top of the first table in the query to join the two.



Name	Type	Length	Format	Informat	Label
Name	Char	8			
Sex	Char	1			
Age	Numeric	8			
Height	Numeric	8			
Weight	Numeric	8			

The Join window displays the join criteria. In the following example, the Classfit table is automatically joined to the Class table by using the Name column in both tables.



Order: 1

Left table: CLASS Join type: Inner join Right table: CLASSFIT

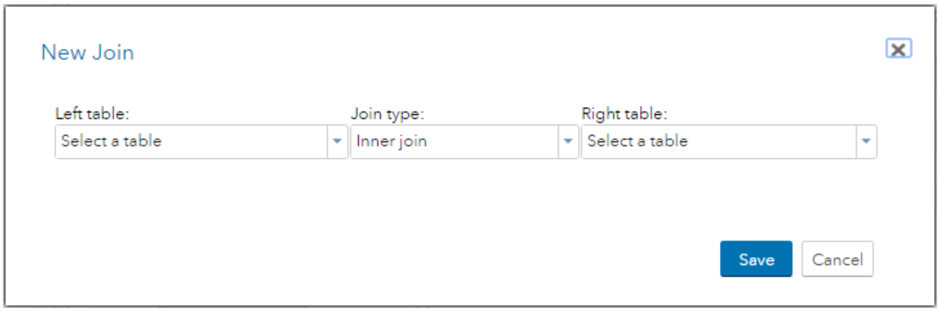
Join conditions

Name = Name

If a join cannot be created automatically, you can specify the join condition manually.

To manually create a join:

1. On the **Tables** tab of the query window, make sure that you can view the tables that you want to join.
2. Click ✚ on the toolbar and select **Join**. The New Join window opens.

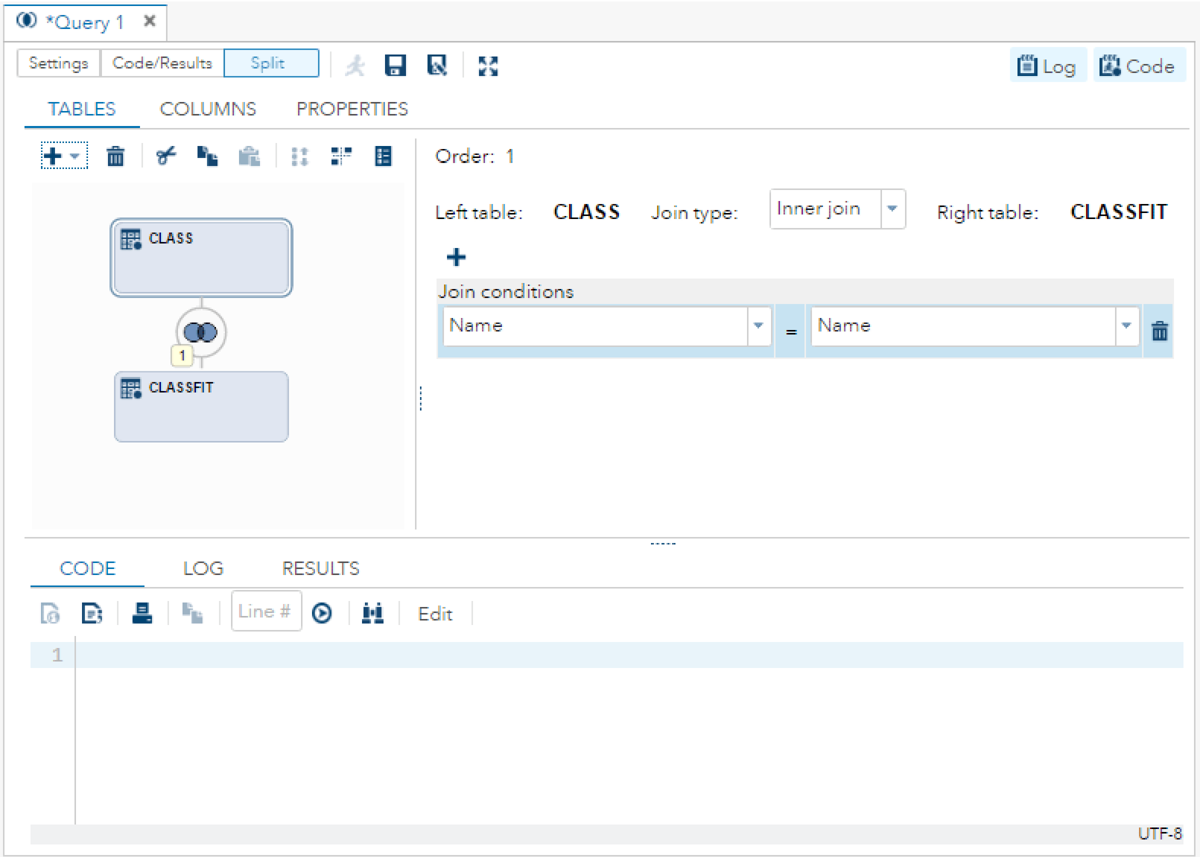


Left table: Select a table

Join type: Inner join

Right table: Select a table

3. From the **Left table** drop-down list, select the table for the left side of the join.
4. From the **Join type** drop-down list, select the type of join that you want to use. The default join type is Inner join.
5. From the **Right table** drop-down list, select the table for the right side of the join.
6. Click **Save**. A join is created between the tables. If the tables include columns with matching names and data types, then a join condition is automatically created. If the tables do not include columns with matching names and data types, then you can select the columns for the join condition from the column drop-down lists.



Order: 1

Left table: CLASS Join type: Inner join Right table: CLASSFIT

Join conditions

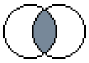
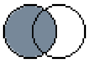
Name = Name

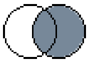
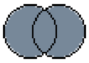
7. To add another join condition to the join, click + and select the columns that you want to use from the column drop-down lists.

Understanding the Types of Joins

SAS Studio supports four different types of joins. You can select the type of join you want by modifying an existing join.

You can select the join option that you want to use in the Join window.

SAS Studio Join Type	Join Icon	Description
Inner Join		The output rows include those for which the column in the first table matches the joining criterion of the column in the second table. Joins are inner joins by default.
Left Join		The output rows include all rows from the first table and the rows from the second table in which the joining criterion is met.

SAS Studio Join Type	Join Icon	Description
Right Join		The output rows include all rows from the second table and the rows from the first table in which the joining criterion is met.
Full Join		The output rows include all matching and nonmatching rows from both tables.

Modifying an Existing Join

You can modify an existing join by selecting a different type of join or by changing the columns that are used in the join condition. You can also add and remove join conditions or remove the entire join.

To modify a join:

1. On the **Tables** tab of the query window, click the join indicator that you want to modify. The join is displayed in the **Join** area.
2. To change the type of join, select a new type from the **Join type** drop-down list.
3. To add a new join condition, click + and specify the columns to use in the join. To remove a join condition, click 🗑 next to the appropriate condition.

To delete the entire join, right-click the join indicator and select **Delete**.

Selecting Data

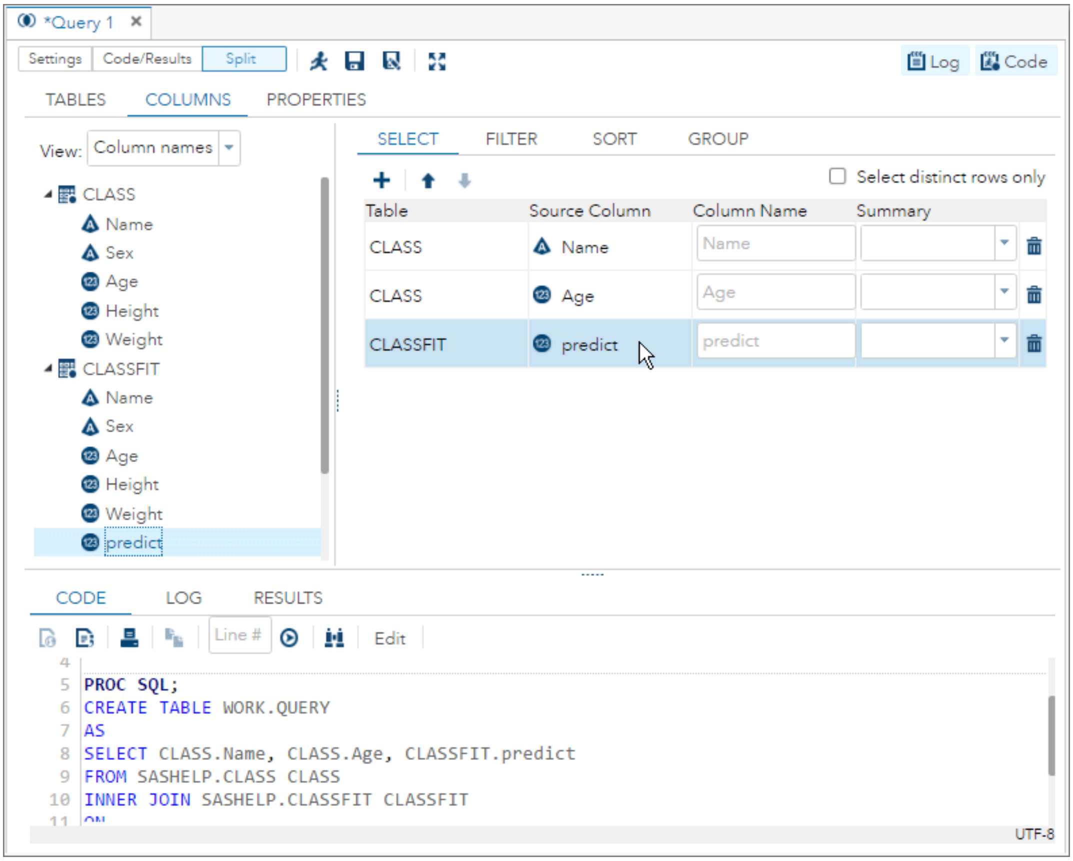
Specifying Columns in the Output

By default, no columns are included in the output. You must specify the columns that you want to appear in the output table. You can also specify an alias to use in place of the column name in the output table.

The order in which the columns are listed on the **Select** is the order in which they appear in the output table.

To select columns for the output table:

1. In the query window, click the **Columns** tab to view the list of columns from the tables in the query.
2. You can add one or more columns to the output data by dragging them from the columns list to the **Select** tab. You can also click + on the **Select** tab toolbar and select one or more columns from the Choose Column window.



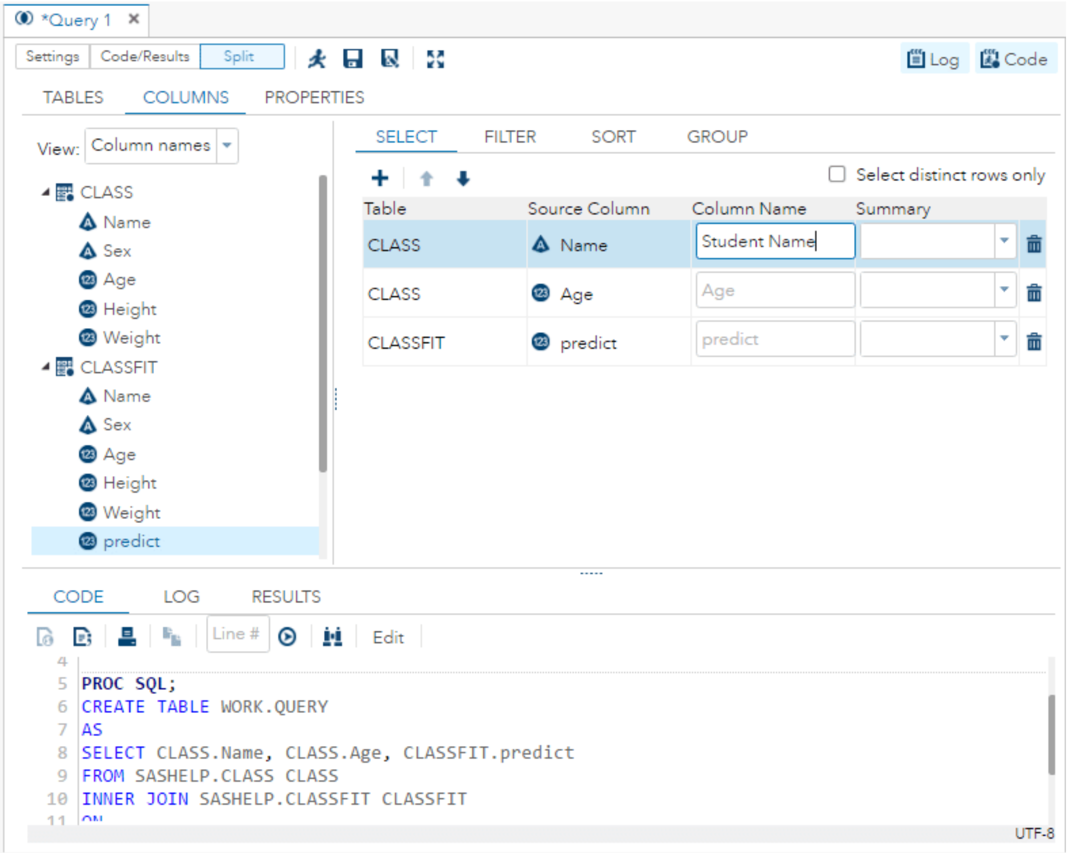
□ Select distinct rows only

Table	Source Column	Column Name	Summary
CLASS	Name	Name	
CLASS	Age	Age	
CLASSFIT	predict	predict	

```
PROC SQL;
CREATE TABLE WORK.QUERY
AS
SELECT CLASS.Name, CLASS.Age, CLASSFIT.predict
FROM SASHELP.CLASS CLASS
INNER JOIN SASHELP.CLASSFIT CLASSFIT
ON
```

To specify an alias for a column:

- On the Select tab, enter the alias that you want to use for each column. The alias is used as the column heading for the output data.



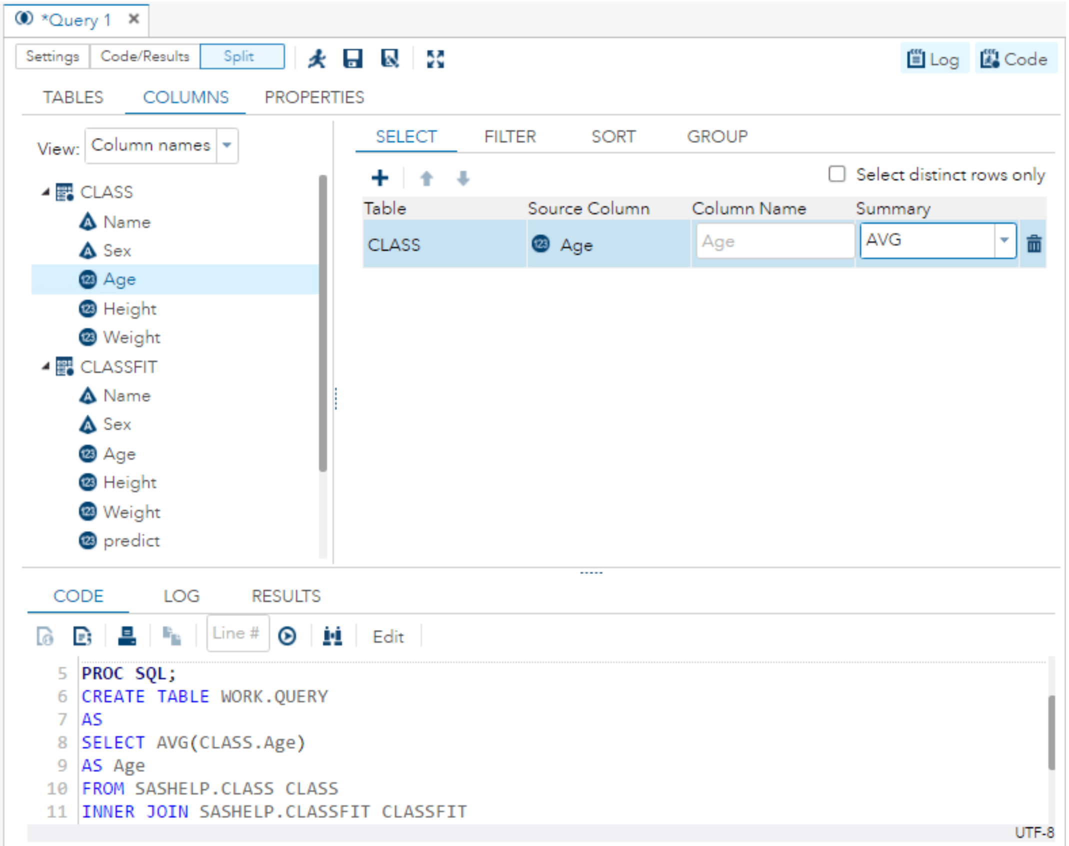
□ Select distinct rows only

Table	Source Column	Column Name	Summary
CLASS	Name	Student Name	
CLASS	Age	Age	
CLASSFIT	predict	predict	

```
PROC SQL;
CREATE TABLE WORK.QUERY
AS
SELECT CLASS.Name, CLASS.Age, CLASSFIT.predict
FROM SASHELP.CLASS CLASS
INNER JOIN SASHELP.CLASSFIT CLASSFIT
ON
```

Using Summary Functions

You can perform summary functions on any of the columns in your query. To perform a summary function, select the column on which you want to perform a summary function. Use the drop-down list in the Summary column to select the function that you want to use. By default, the query generates an output data set. The following example shows you how to find the average age of all of the students:

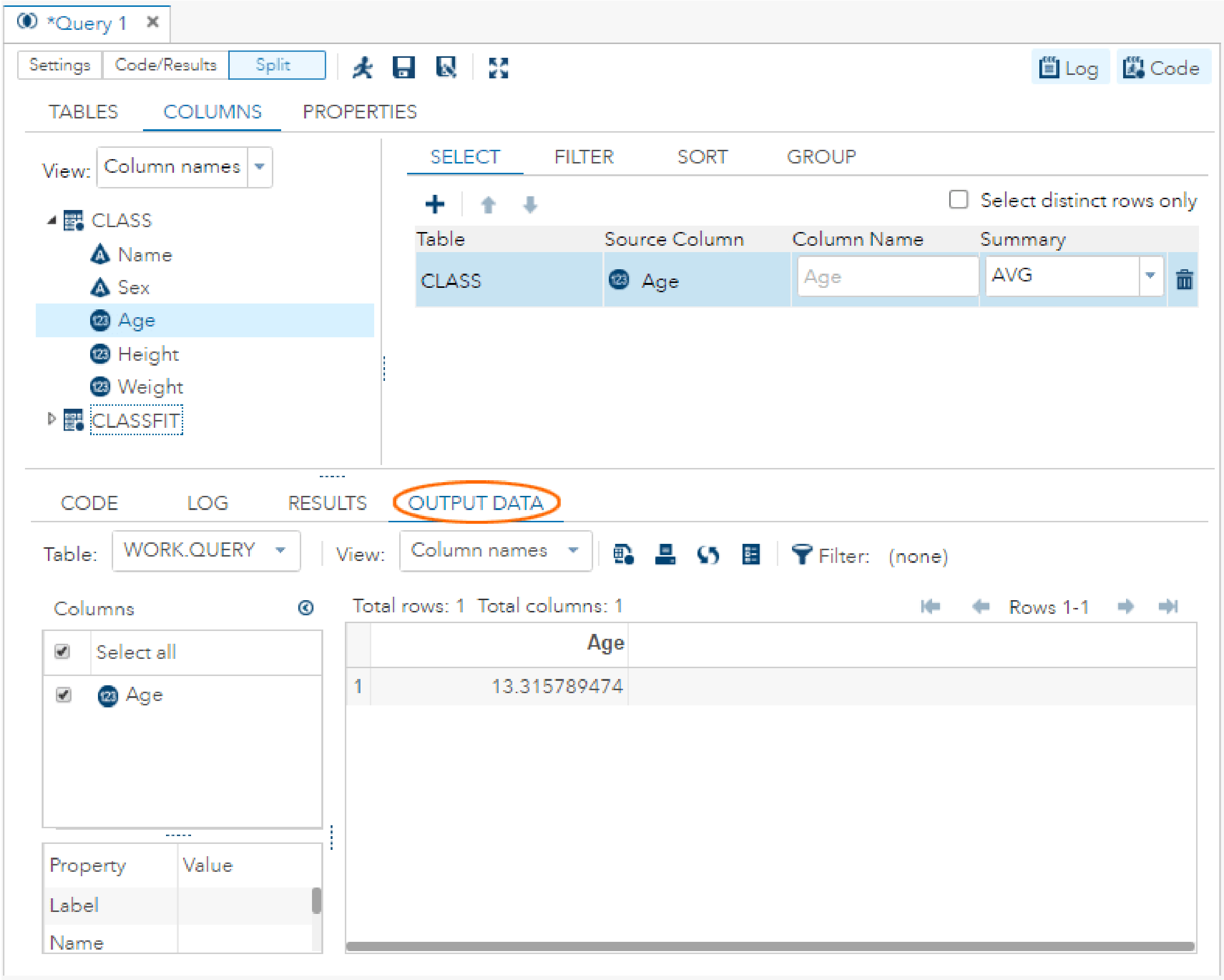


□ Select distinct rows only

Table	Source Column	Column Name	Summary
CLASS	Age	Age	AVG

```
PROC SQL;
CREATE TABLE WORK.QUERY
AS
SELECT AVG(CLASS.Age)
AS Age
FROM SASHELP.CLASS CLASS
INNER JOIN SASHELP.CLASSFIT CLASSFIT
```

By default, the query displays the results in the **Output Data** tab and generates an output table in the Work library:



View: Column names

☐ Select distinct rows only

Table	Source Column	Column Name	Summary
CLASS	Age	Age	AVG

Table: WORK.QUERY   View: Column names   Filter: (none)

☑ Select all
☑ Age

Total rows: 1 Total columns: 1   Rows 1-1

	Age
1	13.315789474

By default, when you summarize a column, your output is grouped by all of the columns without summaries. For more information, see "Grouping Your Output" on page 56.

Filtering Data

Creating a Filter

When you query data, you might want to retrieve only rows that meet certain criteria, based on values of columns in the data. The process of telling SAS Studio which rows to retrieve is called setting a filter and is done on the **Filter** tab. This corresponds to using a WHERE clause in an SQL query.

1. In the query window, click the **Columns** tab to view the list of columns from the tables in the query.

2. You can add one or more columns to the filter by dragging them from the columns list to the **Filter** tab. You can also click + on the **Filter** tab toolbar and select one or more columns from the Choose Column window.

3. Select a comparison operator from the **Operator** drop-down list. The default value is **Equals**.

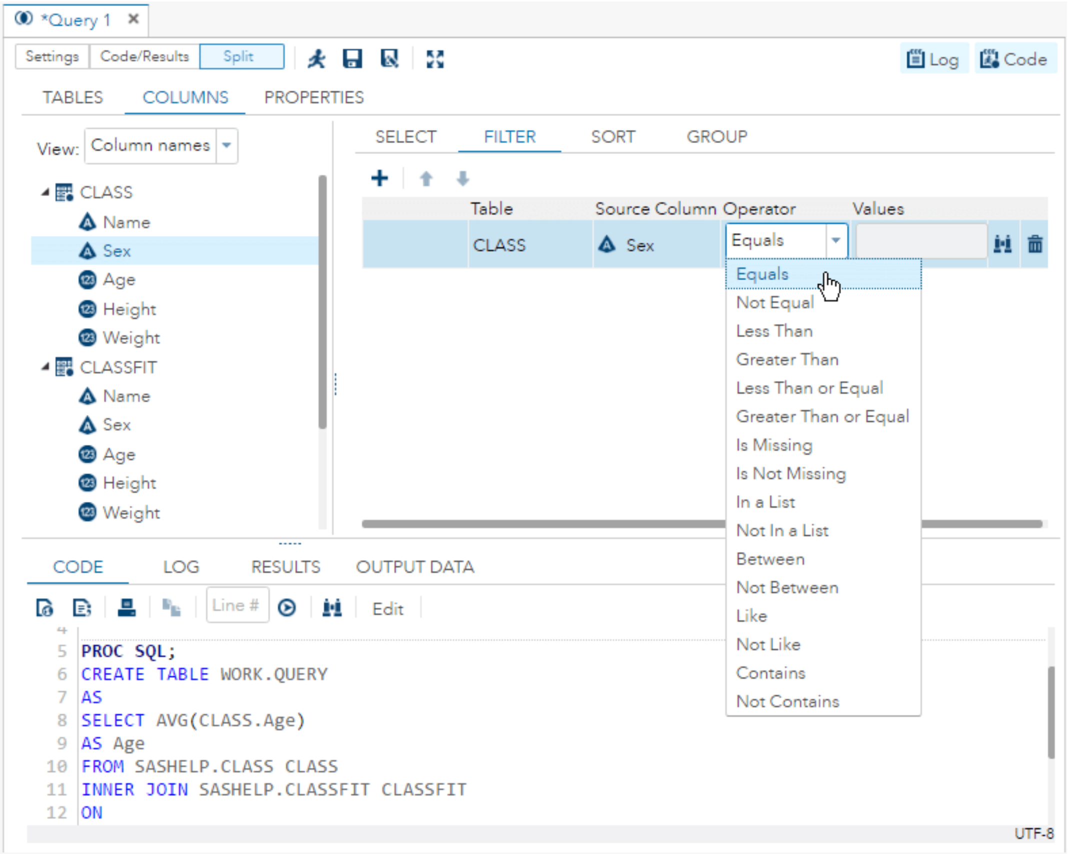


Table	Source Column	Operator	Values
CLASS	Sex	Equals	

```
PROC SQL;
CREATE TABLE WORK.QUERY
AS
SELECT AVG(CLASS.Age)
AS Age
FROM SASHELP.CLASS CLASS
INNER JOIN SASHELP.CLASSFIT CLASSFIT
ON
```

4. If the operator that you have selected requires a value, click 🔍 to enter or select a value in the Select Value window. To choose from a list of values, click ⇣ to expand the **Value** list. Select the values that you want to use and click **Add**.

   Note: If you are selecting values for a character column, and you want the values to be enclosed in single quotation marks, select the **Enclose values in quotes** option. This option is selected by default. If you are using a macro variable or other value that is evaluated when the filter is run, you should clear this option.

   If you want to choose from a list of columns, click ⇣ to expand the **Column** list. Select the column that you want to use.

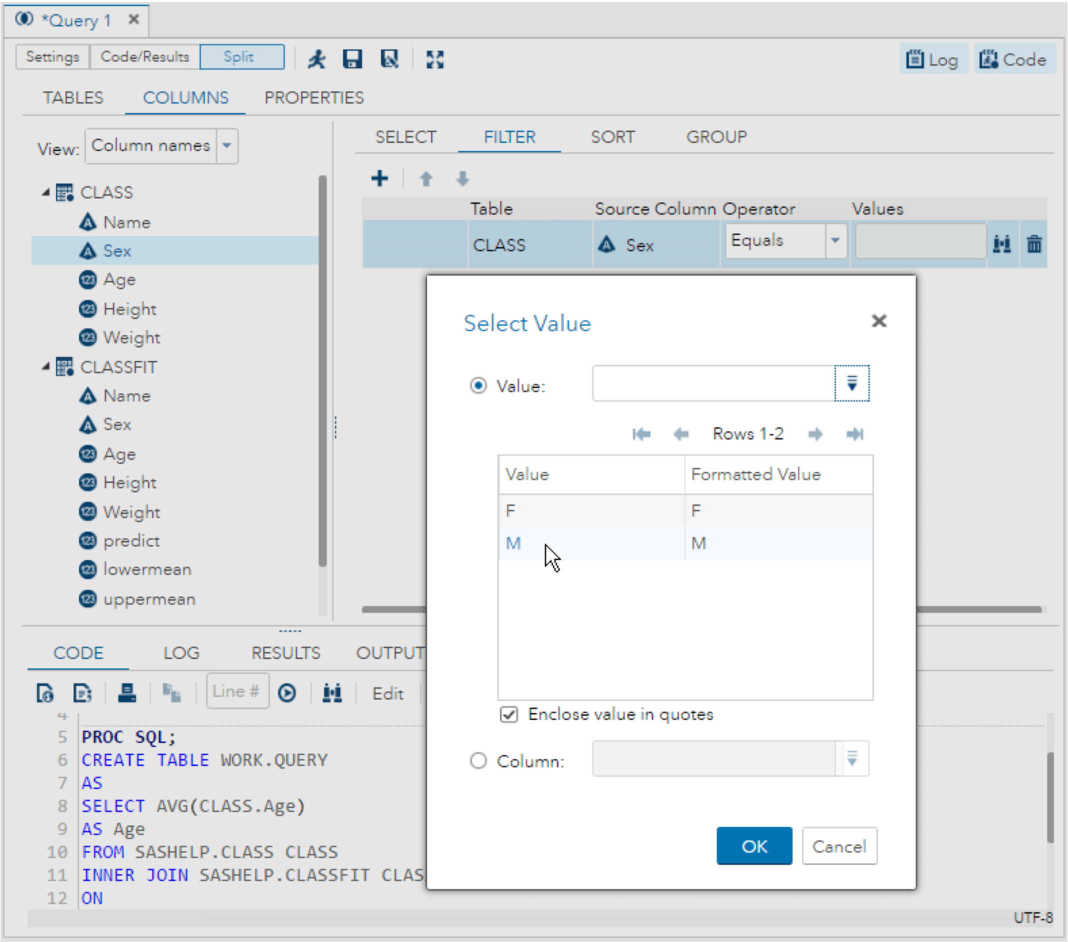


Table	Source Column	Operator	Values
CLASS	Sex	Equals	

Value	Formatted Value
F	F
M	M

☑ Enclose value in quotes

```
PROC SQL;
CREATE TABLE WORK.QUERY
AS
SELECT AVG(CLASS.Age)
AS Age
FROM SASHELP.CLASS CLASS
INNER JOIN SASHELP.CLASSFIT CLAS
ON
```

5. Click **OK** to add the values to the filter.

Changing the Relationship between Filters

You can use only one column in a filter, or you can use multiple columns to create several comparison expressions. If you create more than one comparison expression in your filter, then the default relationship between these filter elements is AND. You can change the relationship between filter elements from AND to OR.

To change the relationship between filters:

- On the Filter tab, click the relationship value and select a new value.

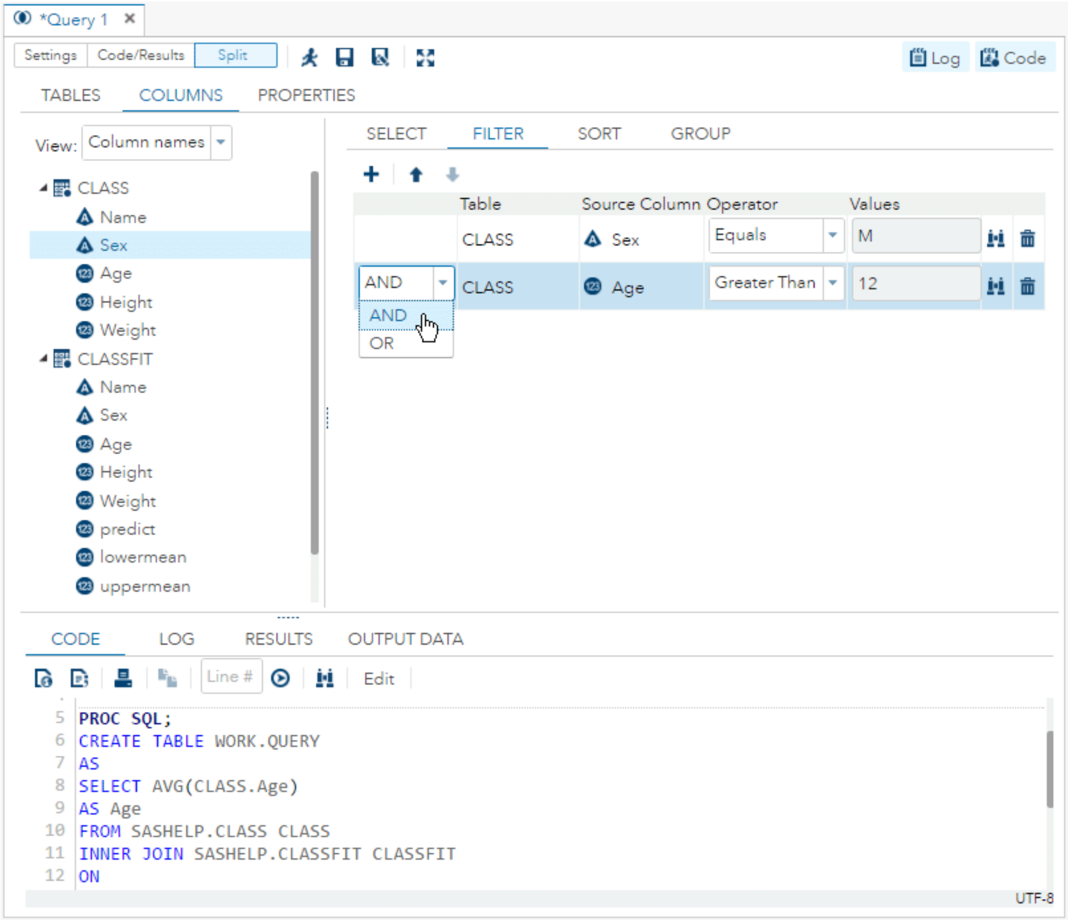


	Table	Source Column	Operator	Values
	CLASS	Sex	Equals	M
AND	CLASS	Age	Greater Than	12

```
PROC SQL;
CREATE TABLE WORK.QUERY
AS
SELECT AVG(CLASS.Age)
AS Age
FROM SASHELP.CLASS CLASS
INNER JOIN SASHELP.CLASSFIT CLASSFIT
ON
```

Managing Output

Sorting Your Output

You can sort the output from your query by one or more columns from the tables that are used in the query.

Note: It is possible to sort the output table by columns that are not selected for the output.

To sort your output:

1. In the query window, click the **Sort** tab.
2. You can add one or more columns to the **Sort** tab by dragging them from the columns list to the **Sort** tab. You can also click + on the **Sort** tab toolbar and select one or more columns from the Choose Column window.
3. Click the **Sort** box for the column on which you want to sort the data. From the drop-down list, select **Ascending** or **Descending**. The default sort direction is **Ascending**.

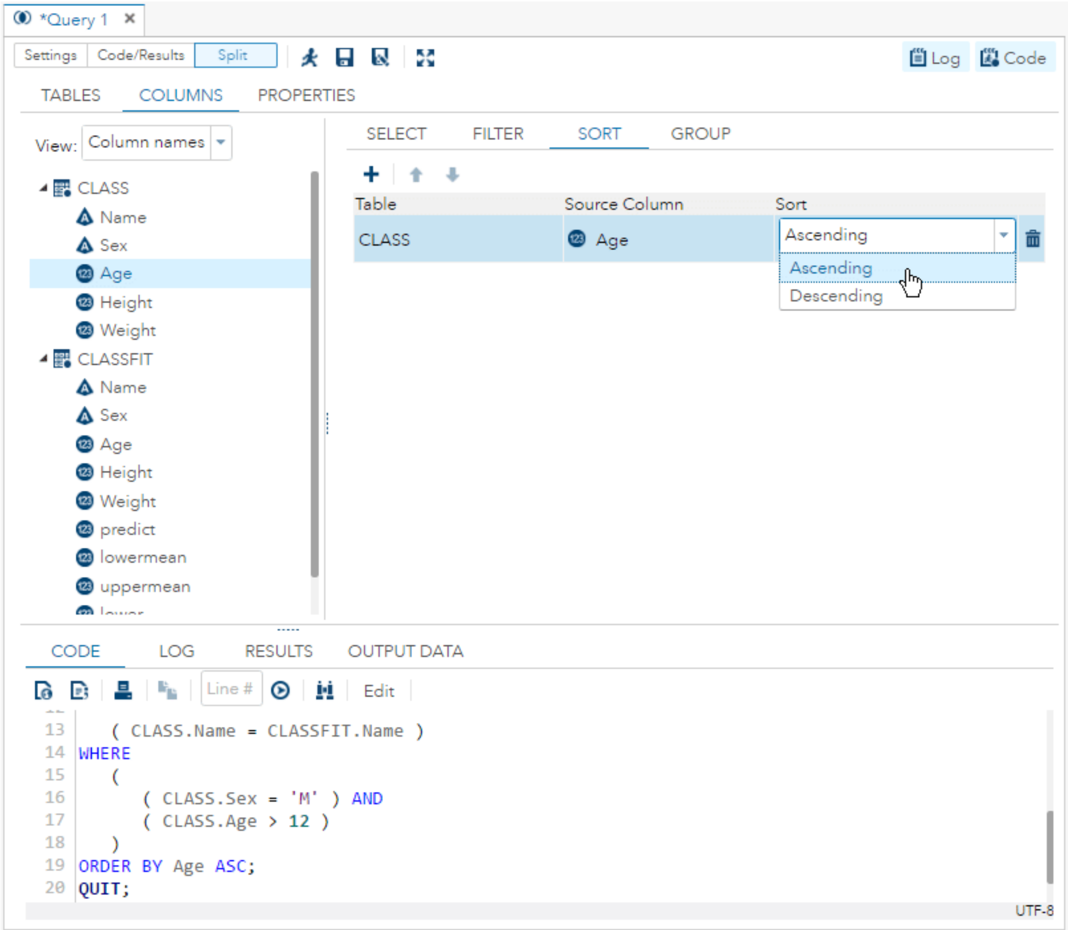


Table	Source Column	Sort
CLASS	Age	Ascending

```
    ( CLASS.Name = CLASSFIT.Name )
WHERE
    (
       ( CLASS.Sex = 'M' ) AND
       ( CLASS.Age > 12 )
    )
ORDER BY Age ASC;
QUIT;
```

4. If you are sorting by multiple columns, the output table is sorted first by the column that is listed first. Within each level of the first column, the rows are sorted by the second column in the list, and so on. You can change the sort order by selecting a column and clicking 🡅 and 🡇 to move the column up and down the list.

Eliminating Duplicate Rows in Output

Some types of queries output multiple, identical rows. Because these duplicate rows are generally not useful, SAS Studio enables you to keep only one of the identical rows and eliminate the duplicates.

To eliminate duplicate rows, click the **Select** tab and select the **Select distinct rows only** check box.

Grouping Your Output

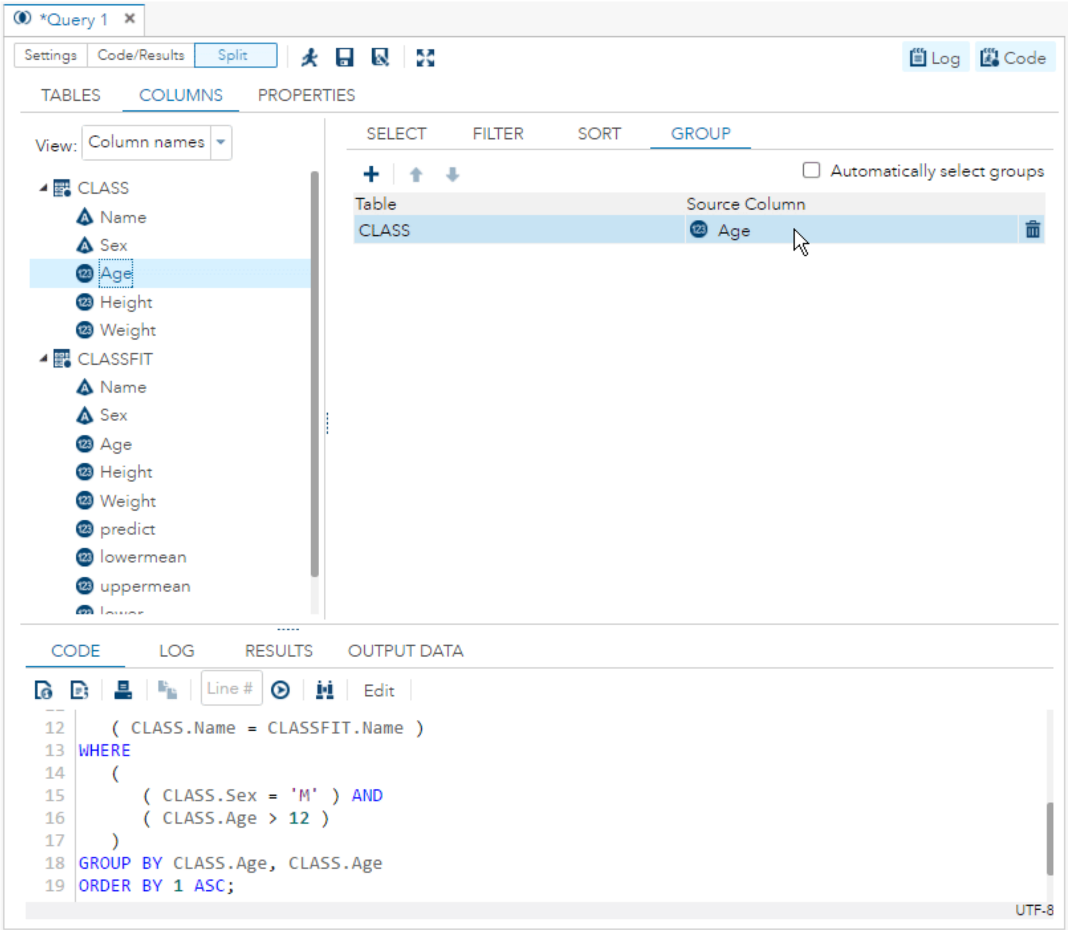
If you have created a summarized column, you can choose to classify your data into groups based on the values in a column. This is equivalent to using the GROUP BY clause in an SQL query. For example, if you are calculating the average height of a group of students, you might want to group the results by age so that you can see the average height for each age group.

By default, the **Automatically select groups** option is selected on the **Group** tab. When this option is selected and you have performed a summary function on a column, your query is automatically grouped by all columns without summary functions. You can choose to edit the list of columns that the query is grouped by.

To group your output:

1. In the query window, click the **Group** tab.
2. You can add one or more columns to the **Group** tab by dragging them from the columns list to the **Group** tab. You can also click + on the **Group** tab toolbar and select one or more columns from the Choose Column window.

   Note: To remove all of the automatically selected columns from the **Group** tab, clear the **Automatically select groups** option.



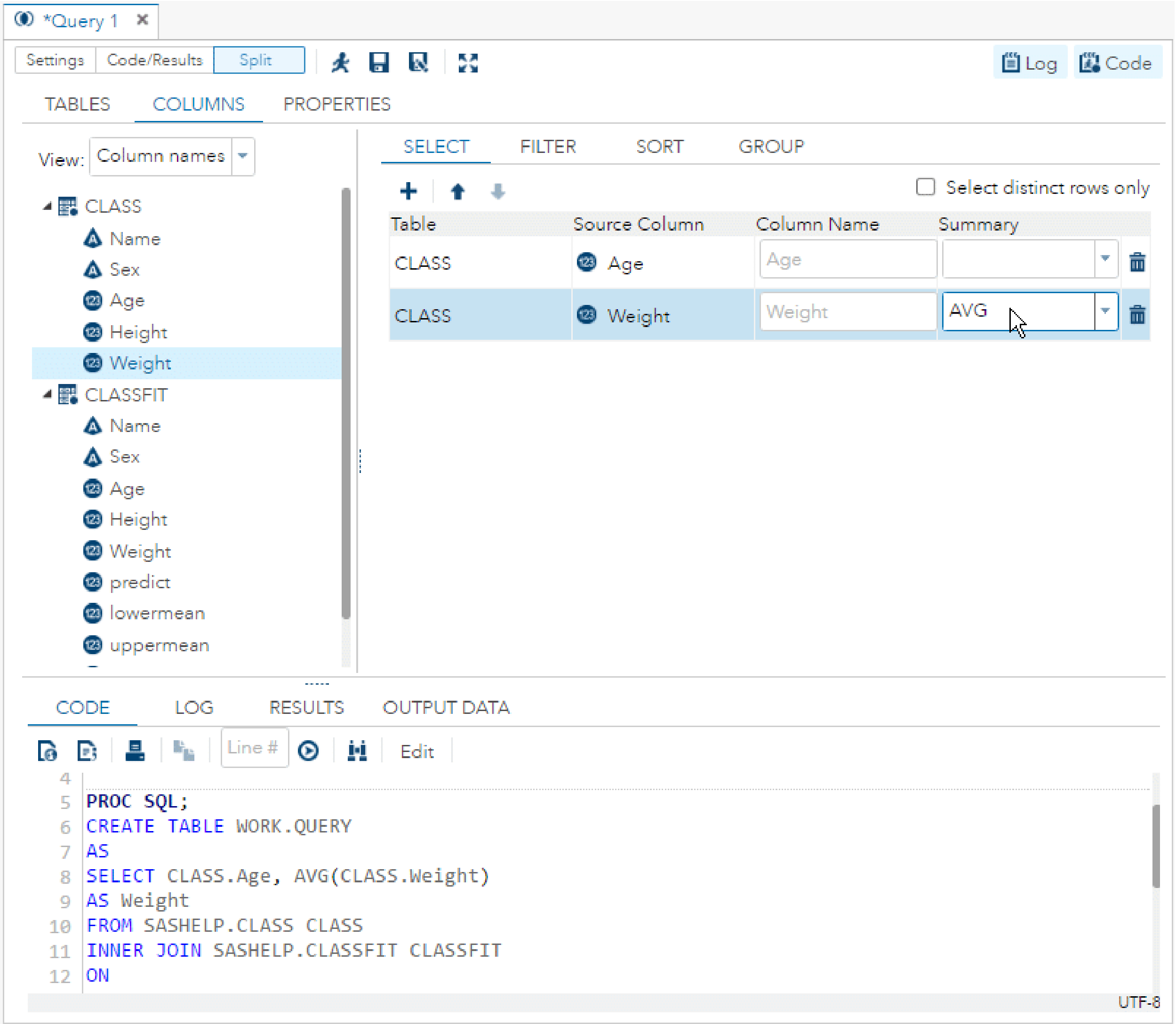
□ Automatically select groups

Table	Source Column
CLASS	Age

```
   ( CLASS.Name = CLASSFIT.Name )
WHERE
   (
      ( CLASS.Sex = 'M' ) AND
      ( CLASS.Age > 12 )
   )
GROUP BY CLASS.Age, CLASS.Age
ORDER BY 1 ASC;
```

3. To change the order in which the columns are used to group the data, select the column that you want to move and click ⬆ and ⬇ .

The following example shows you how to find the average weight of students in each age group. First, add the Age and Weight columns to the Select tab, and then select the AVG summary function for the Weight column:

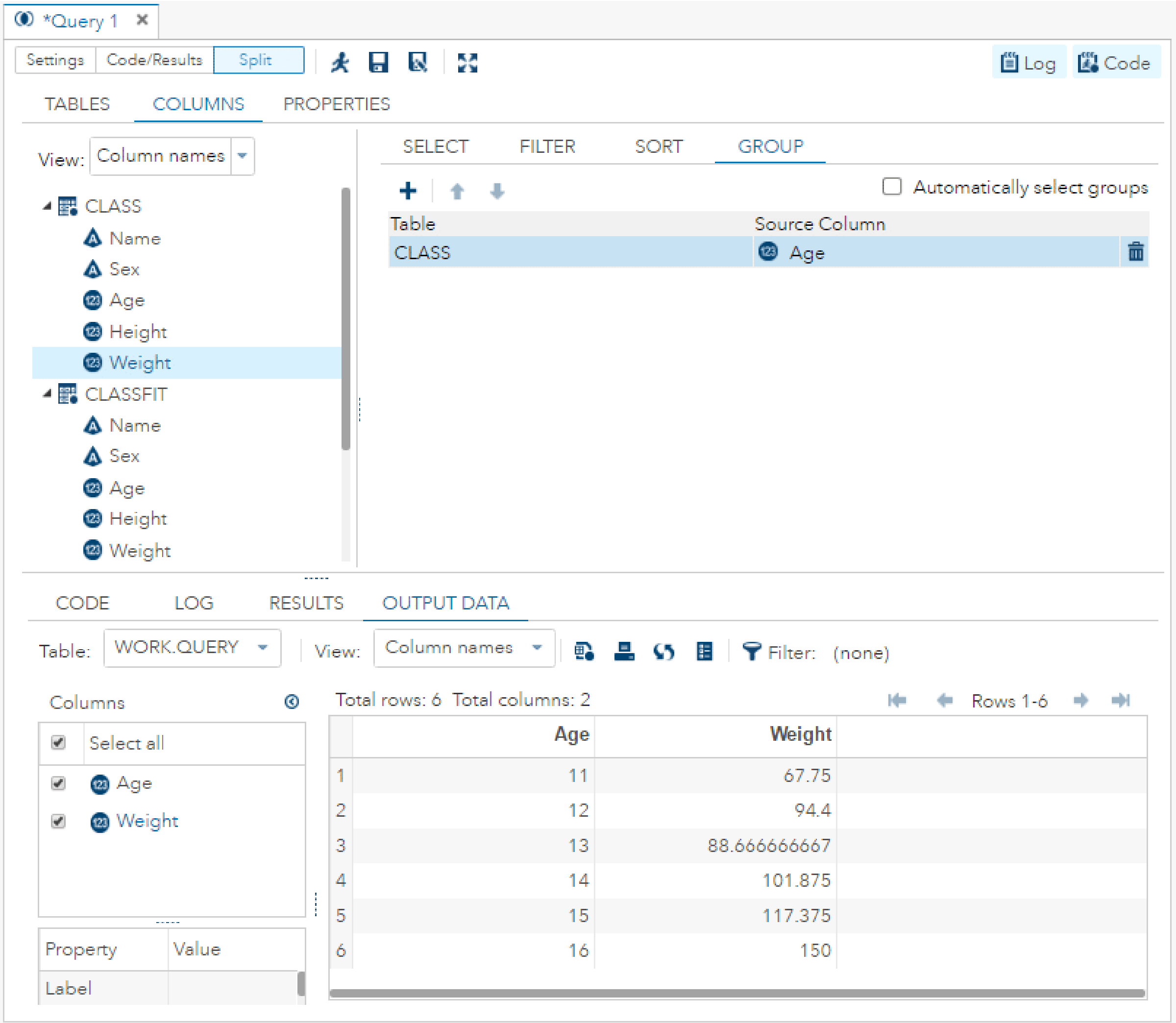


□ Select distinct rows only

Table	Source Column	Column Name	Summary
CLASS	Age	Age	
CLASS	Weight	Weight	AVG

```
PROC SQL;
CREATE TABLE WORK.QUERY
AS
SELECT CLASS.Age, AVG(CLASS.Weight)
AS Weight
FROM SASHELP.CLASS CLASS
INNER JOIN SASHELP.CLASSFIT CLASSFIT
ON
```

To see the average weight of students by age, the query is grouped by the Age column. The results show the average weight for each age group:



☐ Automatically select groups

Table	Source Column
CLASS	Age

Table: WORK.QUERY View: Column names Filter: (none)

☑ Select all
☑ Age
☑ Weight

Total rows: 6 Total columns: 2 Rows 1-6

	Age	Weight
1	11	67.75
2	12	94.4
3	13	88.666666667
4	14	101.875
5	15	117.375
6	16	150

Note: By default, the query generates a table of the result. To generate a report of the results (which is displayed in **Results** tab), you must specify report as the output type for the query. For more information, see “Saving Your Results” on page 59.

Saving Your Results

You can choose to generate your results in any one of three formats: data table, data view, or report.

If you save your results as a data table or data view, you can specify the library and filename that you want to use. If you don’t specify the library and filename, the results are saved in the Work library.

To specify the results format:

1. In the query window, click the **Settings** tab.
2. Click the **Properties** tab. In the Results area, select the format that you want to use from the **Output type** drop-down list.

   Report
      saves the query results as a report that you can download as an HTML, PDF, or RTF file. Query results in this format are not updated until you rerun the query. You cannot run SAS tasks against query results in this format.

Table

saves the query results as a static data table against which you can run SAS tasks. Query results in this format are not updated until you rerun the query. By default, the data table is stored in the Work library.

View

saves the query results as a dynamic data view against which you can run SAS tasks. Each time you open query results in the data view format, the results are updated with any changes to the data that is used in the query. By default, the data view is stored in the Work library.

To save your results to a specific location:

1. In the query window, click the **Settings** tab.
2. Click the **Properties** tab. In the Results area, enter the name of the library in which you want to save your results in the **Output location** box.
3. To specify a name for the results, enter the name that you want to use in the **Output name** box.

Running a Query

After you specify all the criteria for your query, you can generate your results by clicking 🏃 on the query window toolbar. The output data opens in the workspace on a separate tab.

Chapter 4
Working with Process Flows

Understanding Process Flows

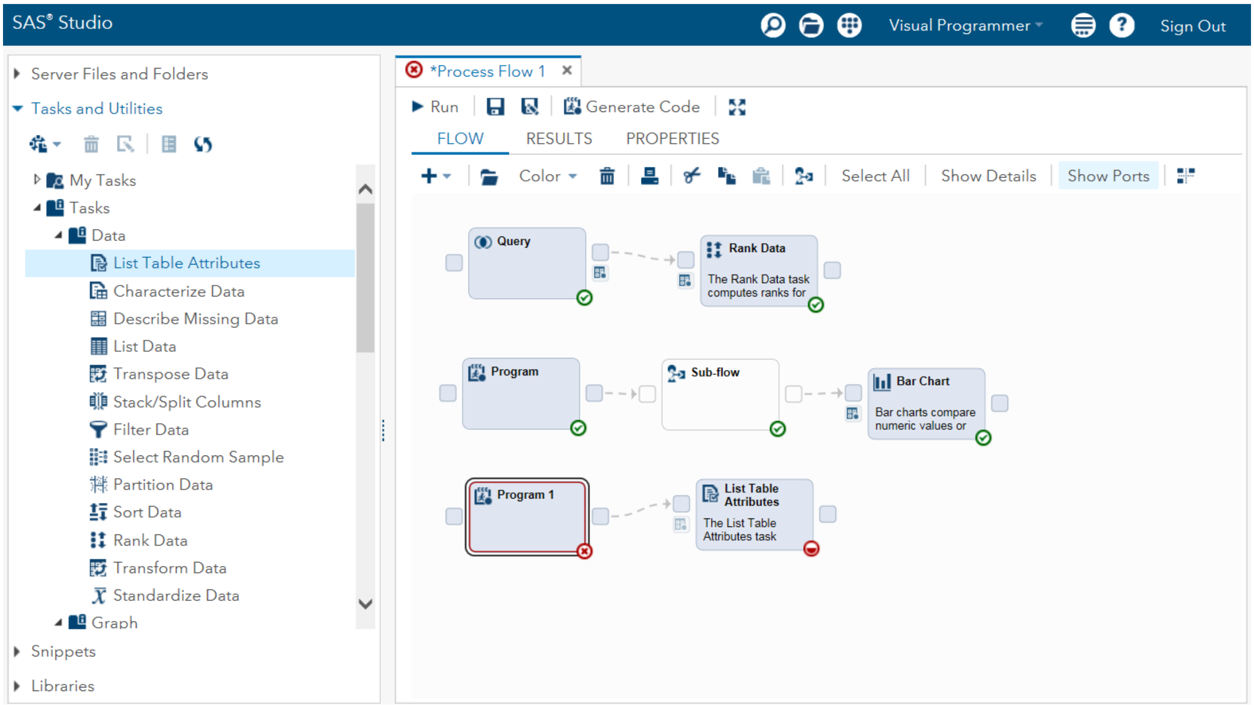
What Is a Process Flow?

You must be working in the Visual Programming perspective to work with process flows. For more information about the Visual Programming perspective, see "Understanding Perspectives" on page 13.

A process flow consists of one or more objects. Each object is represented by a node in the process flow. The process flow shows the relationship between two or more objects, such as a SAS program, a task, a query, and so on.

This sample process flow contains three branches.

- In the first branch, a query is created for the Sashelp.Classfit data set. As a result of this query, only observations where Sex=M are included in the output data set (called Work.Query). The Rank Data task ranks the Height and Weight values by Age.
- In the second branch, you write a SAS program that generates an output data set. After this program runs, a subflow that contains more program and task nodes runs. Then, the Bar Chart node runs.
- In the third branch, the SAS program generates an error. The information for the **List Table Attributes** node is incomplete. SAS Studio cannot run the process flow until you provide the required data.



Creating Process Flows

In SAS Studio, you can have multiple process flows. These process flows run independently of each other. To create a new process flow, click ⊞ and select **New Process Flow**. A new **Process Flow** tab appears in the interface.

What Are Ports?

In a process flow, you can have two types of ports:

control ports

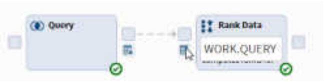
In the process flow, these types of ports appear as □. You use these ports to specify the order in which nodes run in the process flow. For more information, see "Linking Nodes in a Process Flow" on page 75.

data ports

In the process flow, these types of ports appear as ▦.

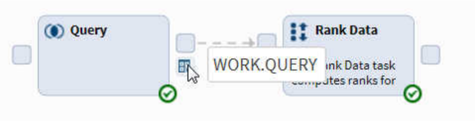
When you run a task, you must specify an input data source. You specify the input data source in the task interface. From the process flow, you can determine the name of the input data source by positioning your mouse pointer over the input data port. To view the data source on a separate tab, double-click ▦.

In this example, the input data source for the Rank Data task is Work.Query.



Some nodes, such as queries, might have an output data source. You can use the output data port to determine the name of the output data source. To view the data source, double-click ▦.

In this example, the output data source for the query node is Work.Query.

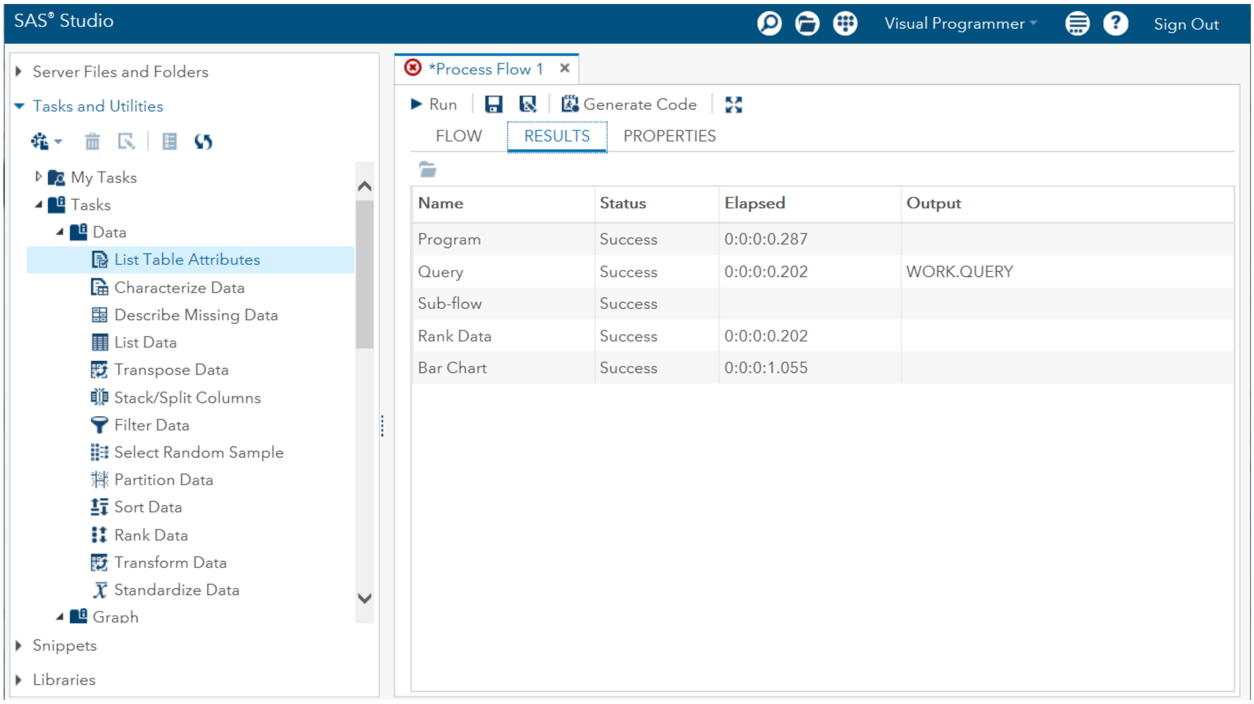


By default, ports are displayed in the process flow. To turn off the ports, click **Show Ports**.

Understanding the Status of Each Node

When you run a process flow, some nodes might run successfully, and others might not. To see the status of each node, how long it took to run the node, and whether any output data was created, click the **Results** tab.

Here are the contents of the **Results** tab for the previous process flow.



Name	Status	Elapsed	Output
Program	Success	0:0:0:0.287	
Query	Success	0:0:0:0.202	WORK.QUERY
Sub-flow	Success		
Rank Data	Success	0:0:0:0.202	
Bar Chart	Success	0:0:0:1.055	

You can use these icons to determine the status of each node in the process flow:

Icon	Description
⊖	specifies that more information is needed before SAS Studio can run the node. For example, if you see this icon on a task node, you must specify values for the required options in the task. This icon can also appear on an empty subflow node after SAS Studio tries to run it.
●	specifies that the node is in the queue to run.
✓	specifies that the code for the node was submitted successfully. No warnings or errors were returned.
⚠	specifies that the code for the node generated a warning. Review the log for that node for more information.
⊗	specifies that the code for the node generated an error. Review the log for that node for more information.

Customizing a Process Flow

You can customize your process flow in these ways.

- To specify a color for a node or a group of nodes, select the nodes and click **Color**. From the drop-down list, select the color that you want to use.
- By default, you can arrange objects in the process flow any way you like. However, your process flow might become confusing if it contains many objects. Click ▦ for SAS Studio to arrange the objects in your process flow. When arranging the nodes, SAS Studio considers any dependencies and the order in which the nodes were added to the process flow.

Viewing the Properties of a Process Flow

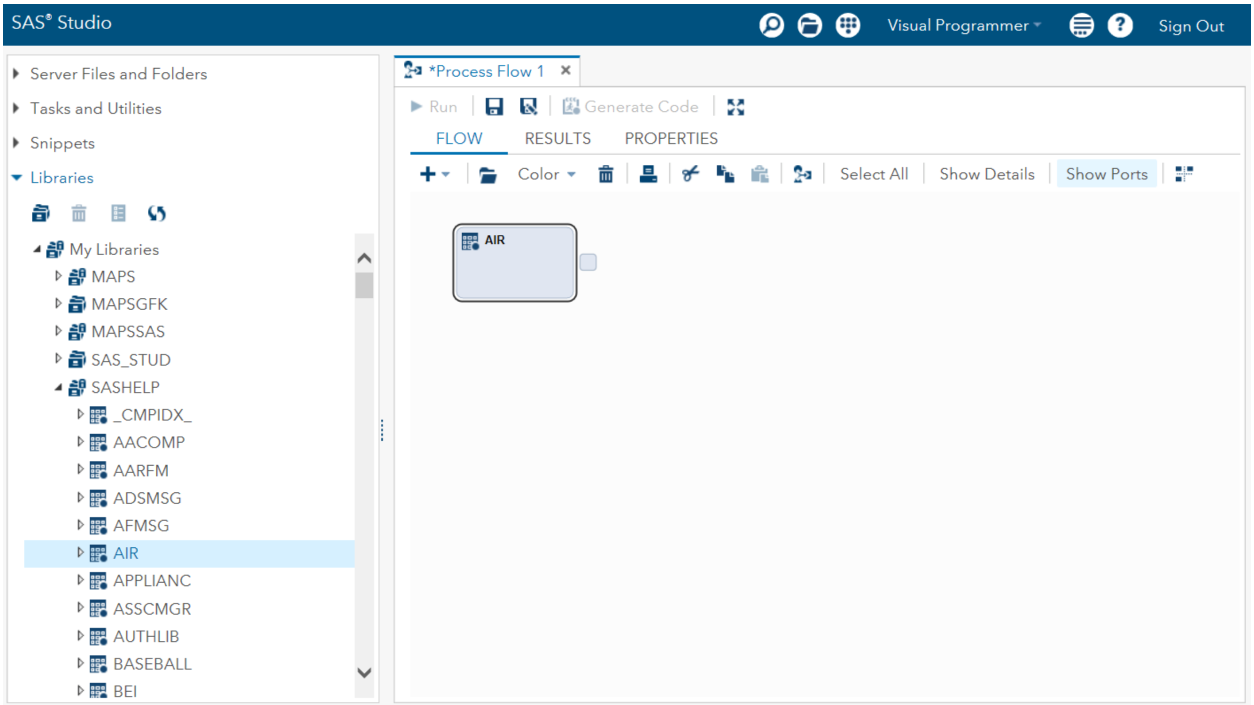
To view the properties of the current process flow, click the **Properties** tab. From the properties, you can specify the priority of execution of the nodes. The process flow runs the nodes in the order in which the nodes are added to the process flow. If node 1 is dependent on another node 2, node 2 must run completely before node 1 will run. You can also run the nodes in parallel, which means that multiple workspace servers are used to run the nodes. As a result, the nodes might not share a common Work library.

Add Data to the Process Flow

To add data to a process flow from an existing library:

1. In the navigation pane, click the **Libraries** section.
2. Expand the library that contains the data set that you want to add. Select the data set and drag it to the process flow.

In this example, the Sashelp.Air data set is now available from the process flow. You can now use this data set as the input data for a task.

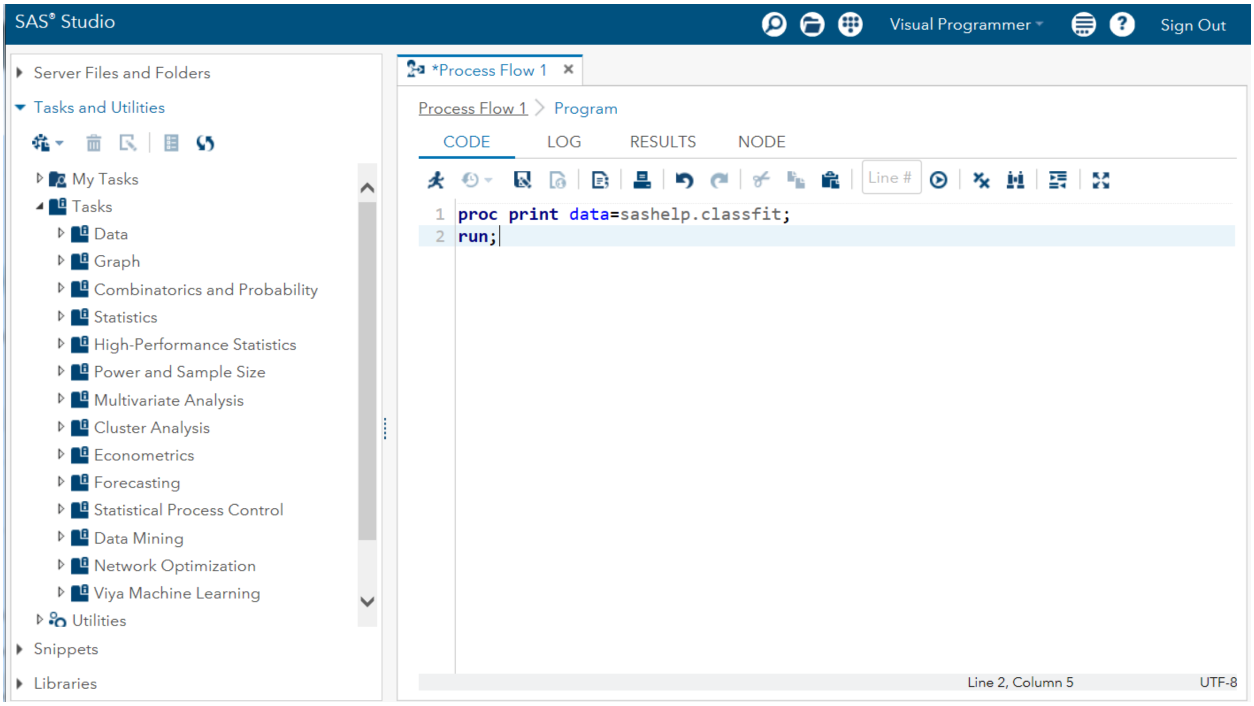


Adding a SAS Program to the Process Flow

Create a New SAS Program

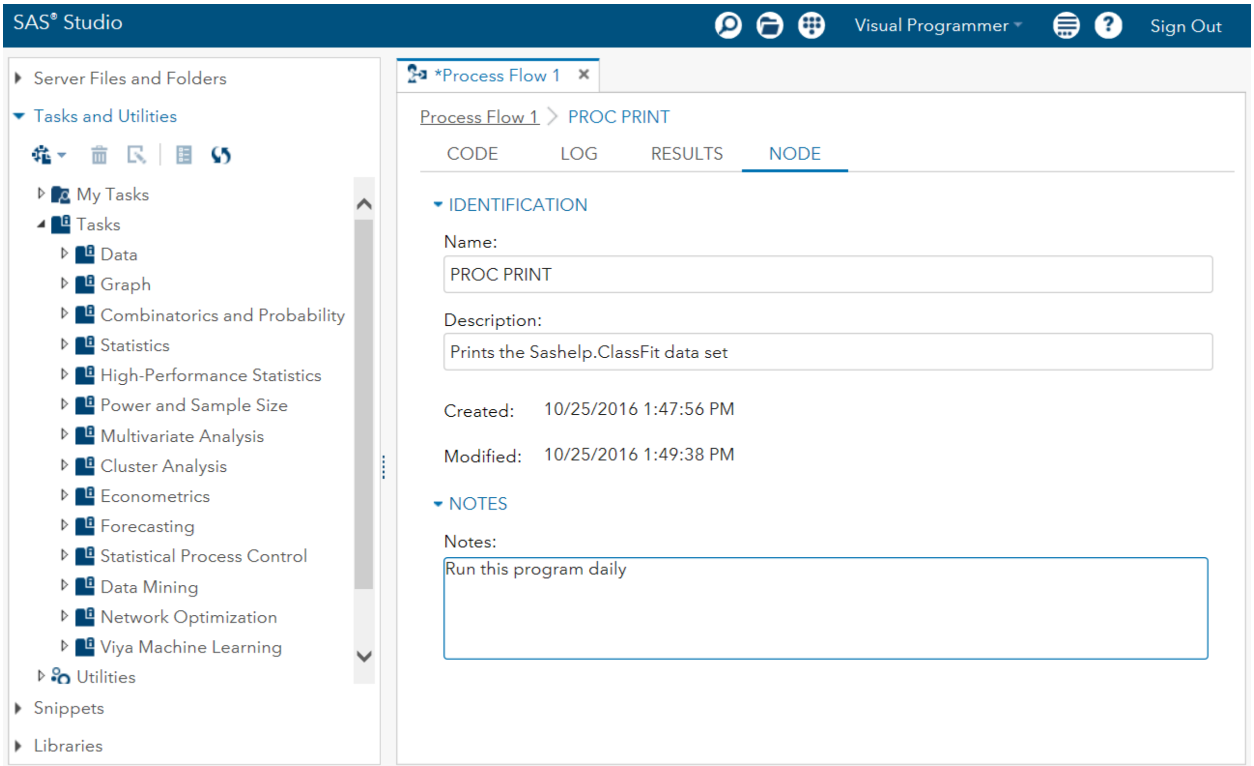
To add a new SAS program to a process flow:

1. Click ✚ and select **SAS program**. A node for the SAS program is added to the process flow.
2. Select the node and click 📂. (You can also select the node and press Enter.) The code editor appears.
3. Enter the code for your program.



```
proc print data=sashelp.classfit;
run;
```

4. To name the program, to provide a brief description for the program, and to include any notes, click the **Node** tab.



Name: PROC PRINT

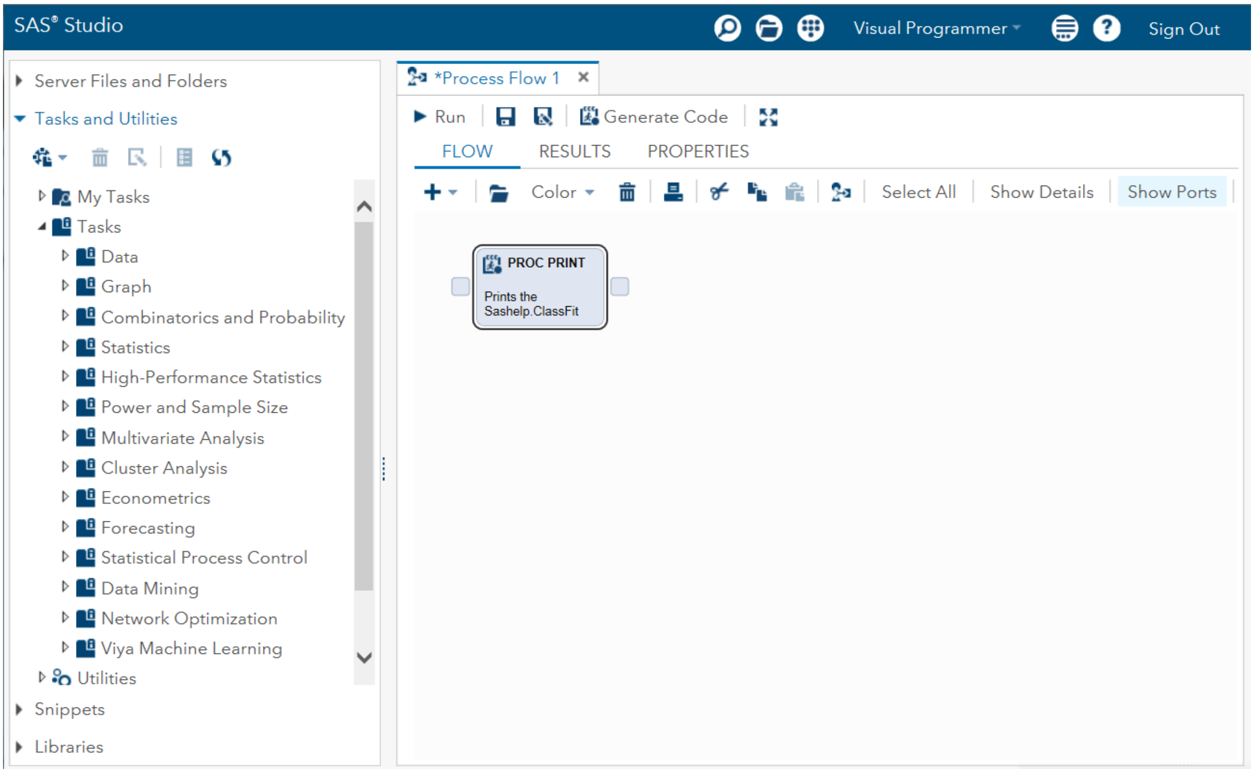
Description: Prints the Sashelp.ClassFit data set

Created: 10/25/2016 1:47:56 PM

Modified: 10/25/2016 1:49:38 PM

Notes: Run this program daily

The SAS program node in the process flow now contains the name and description that you specified on the **Node** tab.



Add an Existing SAS Program

You might have already written a SAS program that you want to include in the process flow. To add this program:

1. In the navigation pane, click the **Server Files and Folders** section.
2. Expand the folders in the **Server Files and Folders** section until you find the program that you want to add.
3. Select the program that you want to add, and then drag it to the process flow. (A green check mark indicates that you can add this file to the process flow.)

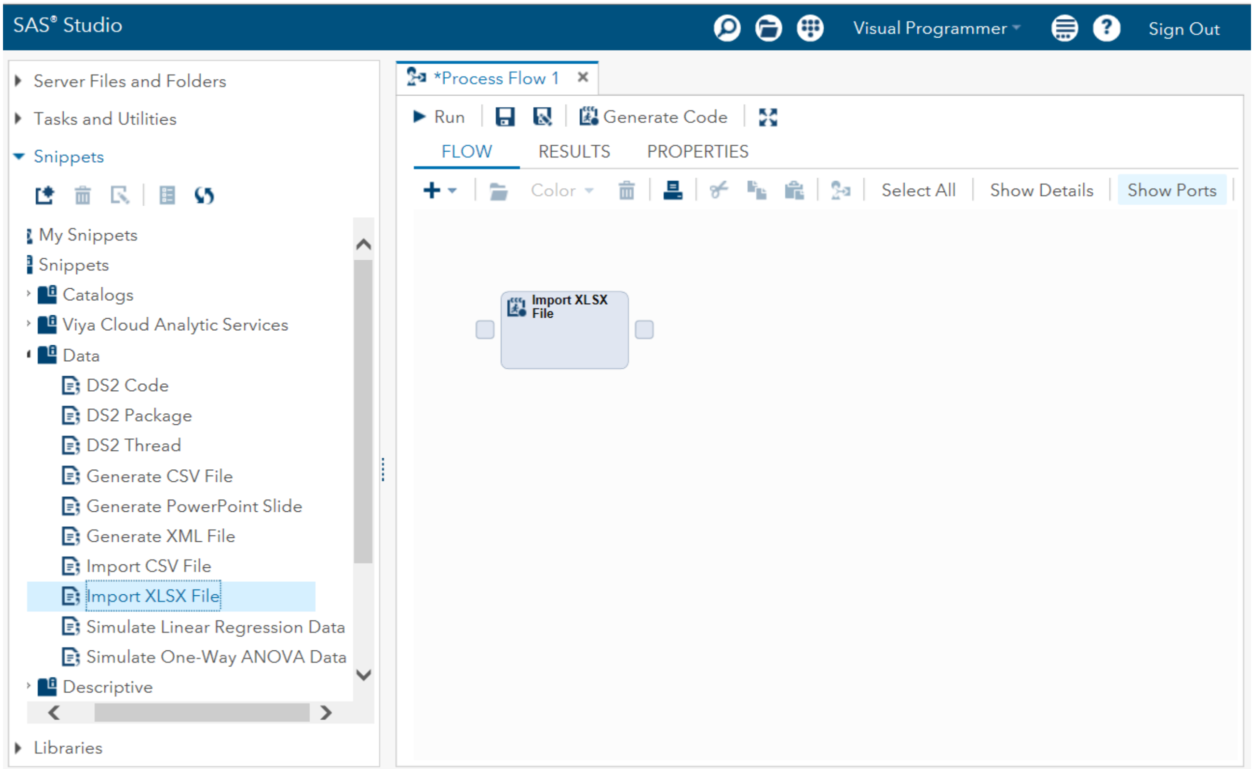
Add a Snippet

You can use snippets as the starting point for your SAS programs.

To add a snippet to a process flow:

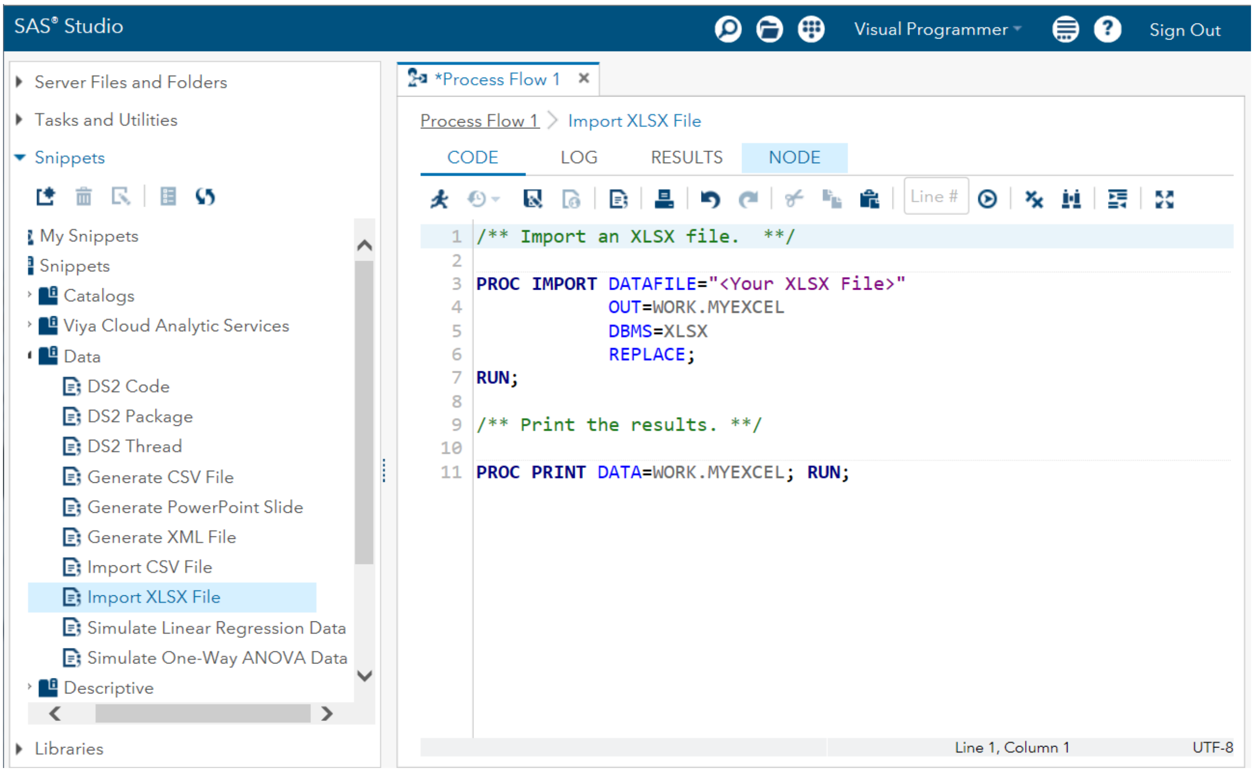
1. In the navigation pane, select **Snippets**.
2. In the **Snippets** section, select the snippet that you want to add, and then drag it to the process flow.

In this example, the Import XLSX file snippet is added to the process flow.



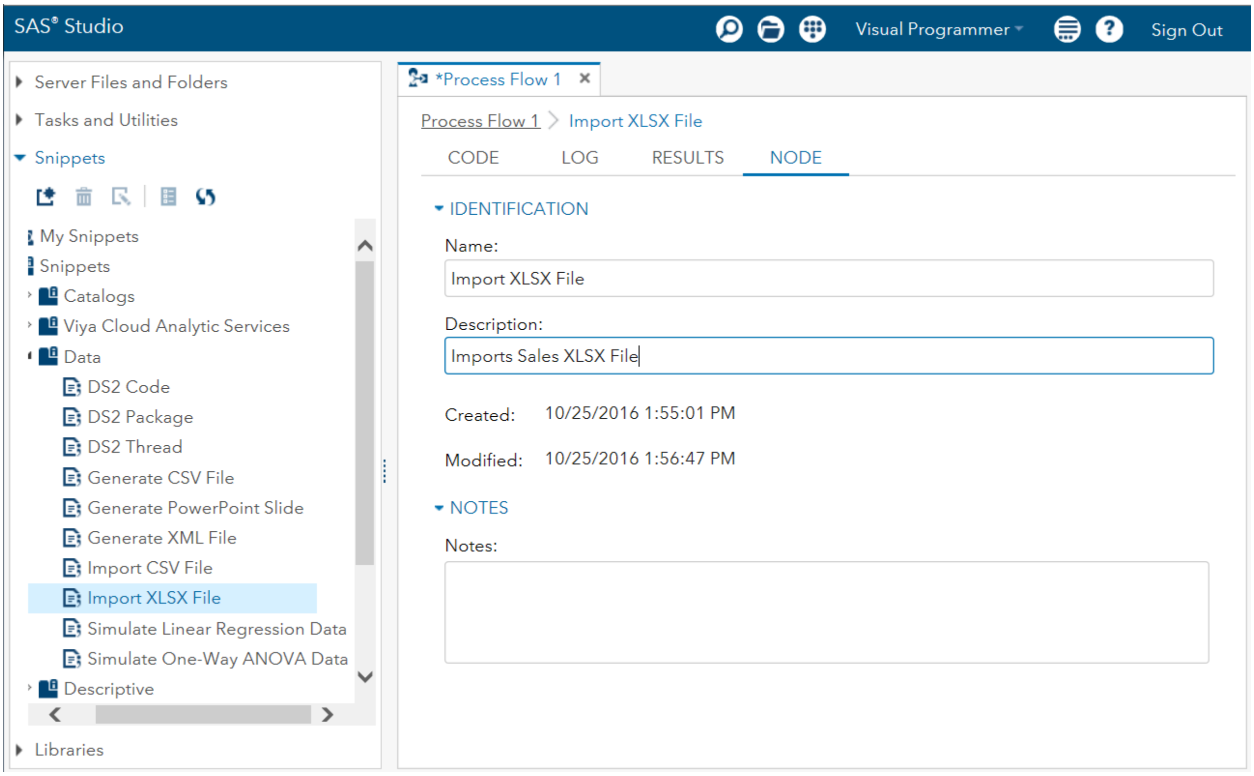
3. To view the code for the snippet, select the snippet node and click 📂. (You can also select the node and press Enter.) Edit the code to meet your needs.

   Here is the code for the Import XLSX file snippet. In this example, specify in the code the location of the XLSX file that you want to import.



```
/** Import an XLSX file.  **/

PROC IMPORT DATAFILE="<Your XLSX File>"
            OUT=WORK.MYEXCEL
            DBMS=XLSX
            REPLACE;
RUN;

/** Print the results. **/

PROC PRINT DATA=WORK.MYEXCEL; RUN;
```

4. To name the program that you created, to provide a brief description for the program, and to include any notes, click the **Node** tab.



Name: Import XLSX File

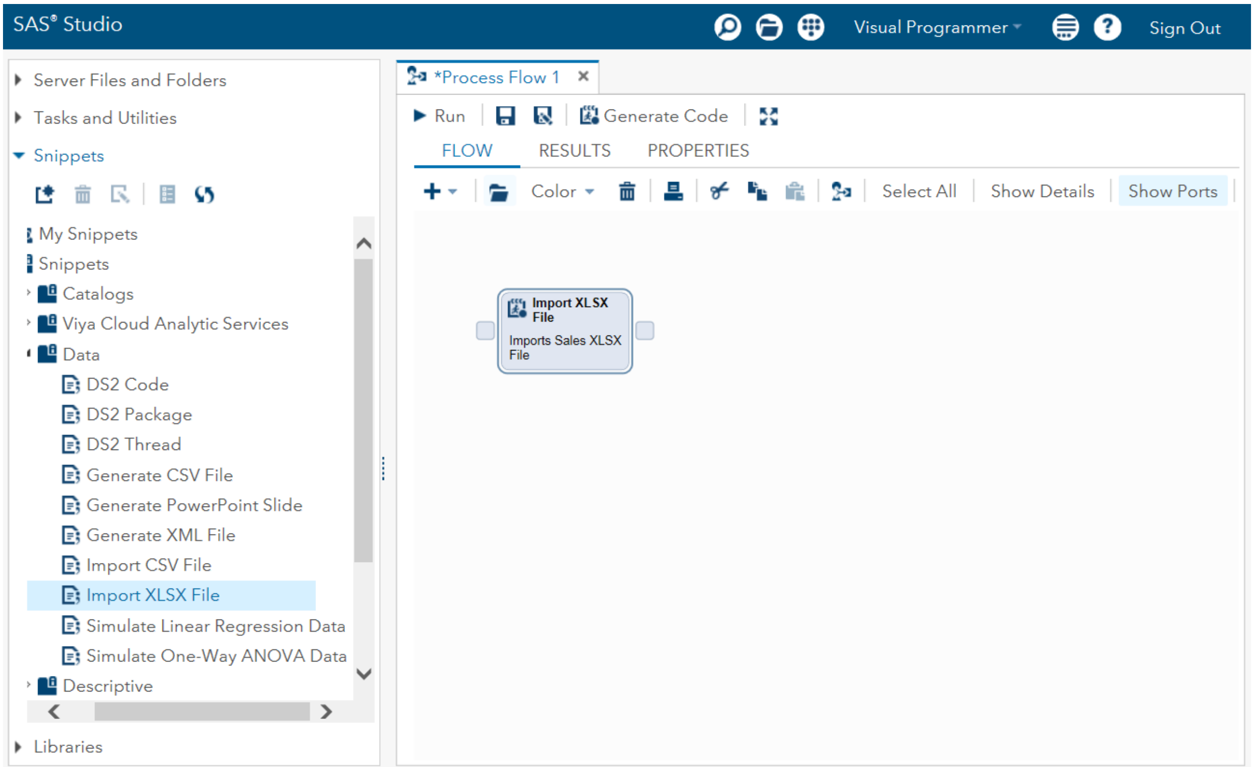
Description: Imports Sales XLSX File

Created: 10/25/2016 1:55:01 PM

Modified: 10/25/2016 1:56:47 PM

Notes:

The **Import XLSX File** node in the process flow now includes the description that you provided.



Import XLSX File

Imports Sales XLSX File

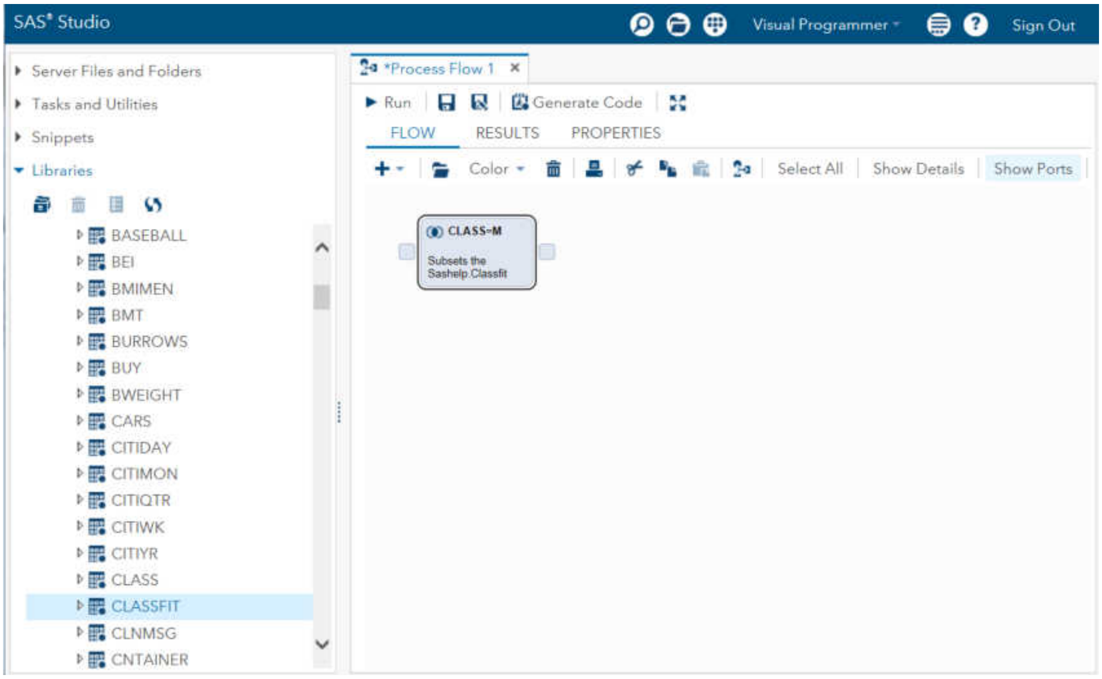
Adding a Query to a Process Flow

Create a New Query

To create a new query:

1. Click + and select **Query**. A node for the query is added to the process flow.
2. Select the node and click 📂. The Query Builder appears.
3. Use the Query Builder to define your query. For more information, see "Creating a New Query" on page 44.
4. To define the type of results for the query, use the **Properties** tab. For more information, see "Saving Your Results" on page 59.
5. To name the query node, to provide a brief description for the query, and to include any notes, click the **Node** tab.

   To return to the view of the process flow, select the name of the process flow in the breadcrumbs. The query node in the process flow now contains the name and description that you specified on the **Node** tab.



Add an Existing Query to a Process Flow

You might have already written a query that you want to include in the process flow. To add this query:

1. In the navigation pane, click the **Server Files and Folders** section.
2. Expand the folders in the **Server Files and Folders** section until you find the query that you want to add.

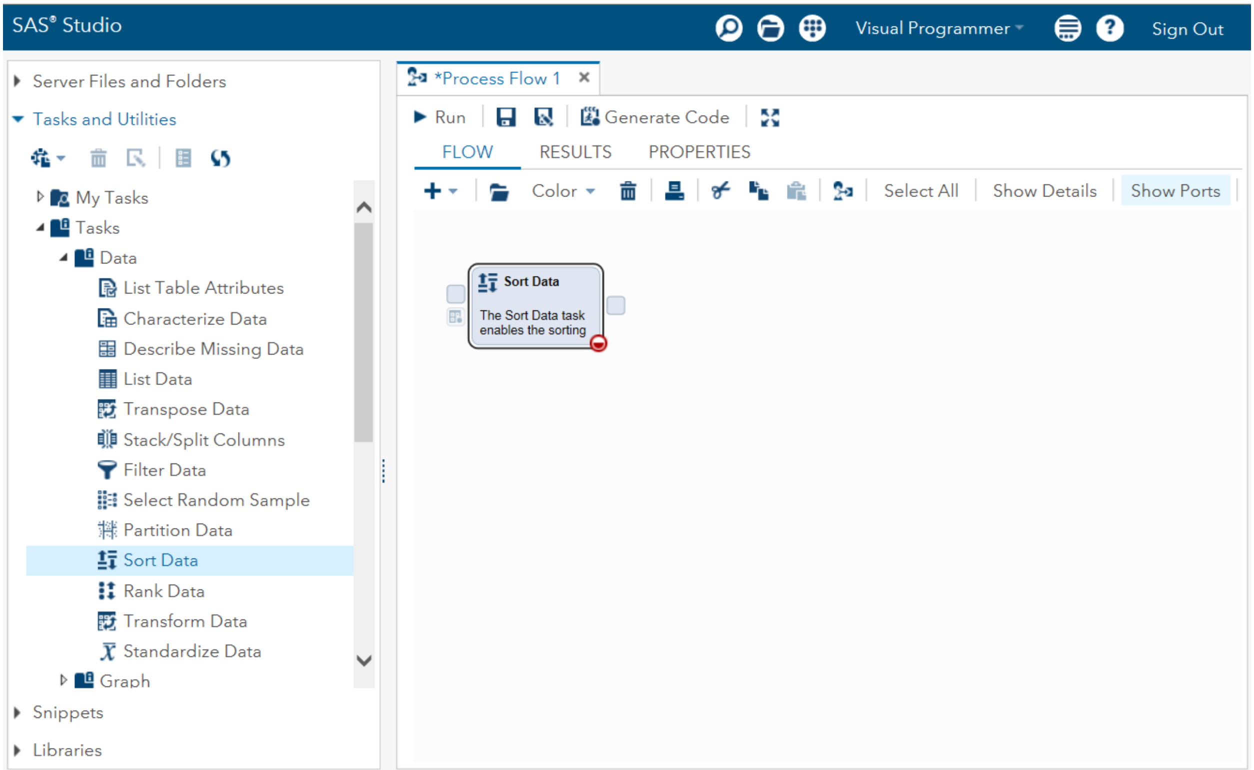
3. Select the query that you want to add, and then drag it to the process flow. (A green check mark indicates that you can add this file to the process flow.)

Add a Task to a Process Flow

You can add custom tasks and tasks that shipped with SAS Studio to your process flow.

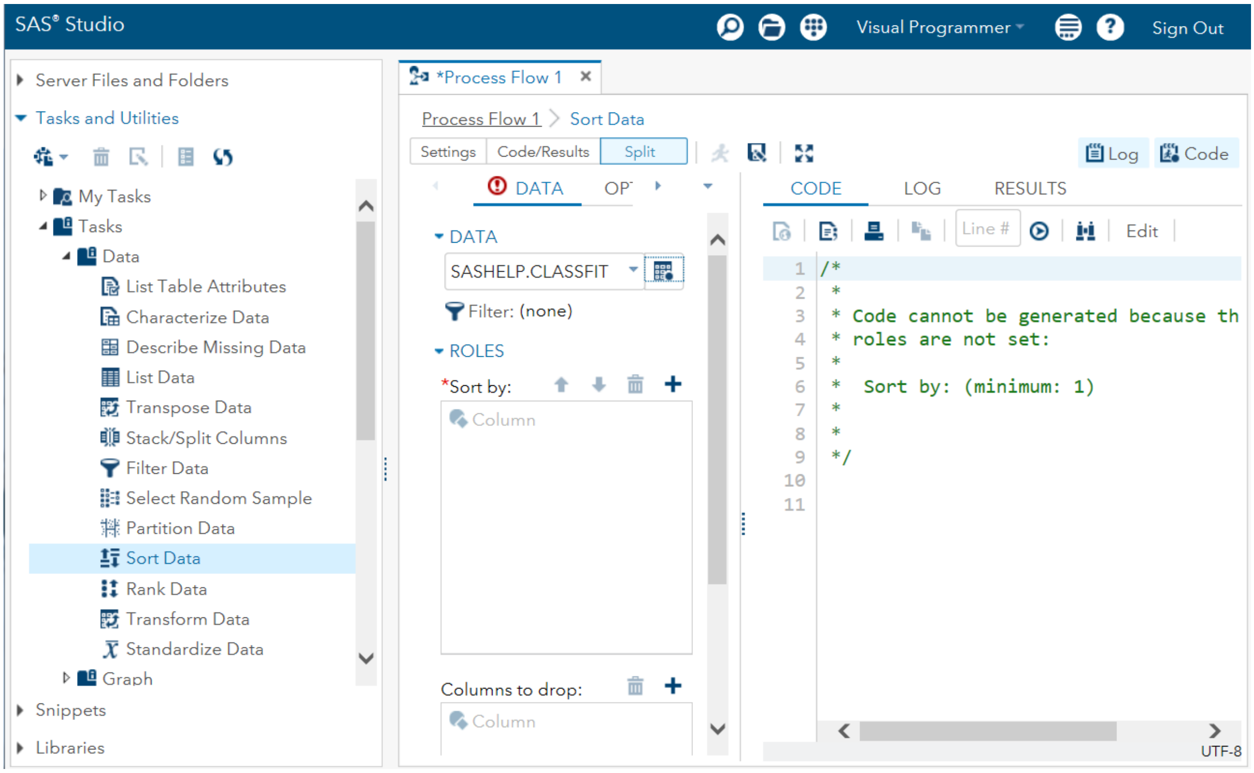
1. In the navigation pane, click the **Tasks and Utilities** section.
2. Select the task that you want to add, and then drag it to the process flow.

   Here is an example of a process flow that contains the Sort Data task.



3. Select the task node and click 🗁. To run the task, you must specify values for any required options.

Here is the user interface for the Sort Data task.



DATA

SASHELP.CLASSFIT

Filter: (none)

*Sort by:

```
/*
 *
 * Code cannot be generated because th
 * roles are not set:
 *
 *  Sort by: (minimum: 1)
 *
 *
 */
```

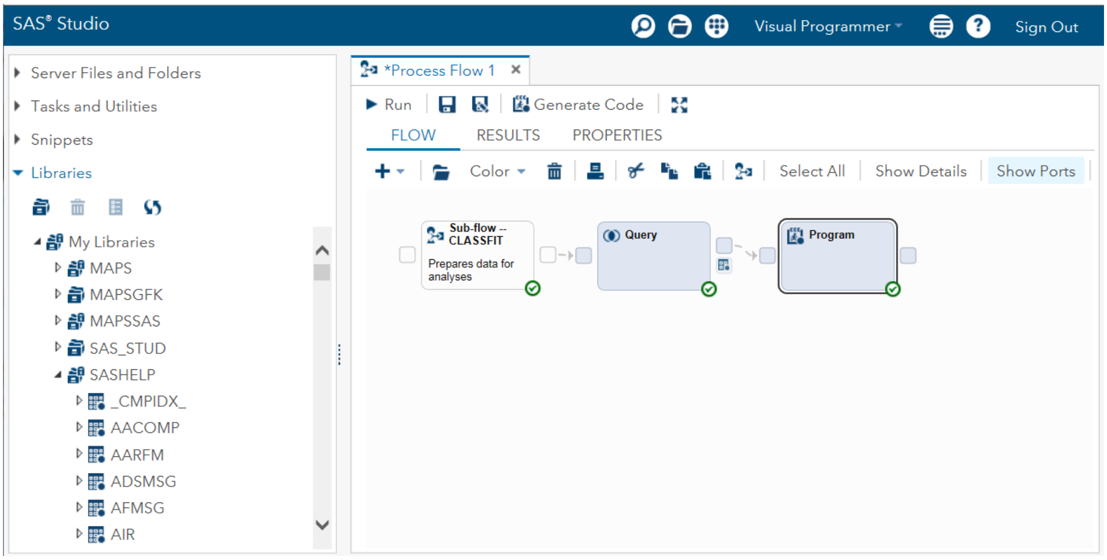
When you run the task, SAS Studio uses the values that you specified for the task options.

Understanding Subflows

What Is a Subflow?

Within a process flow, you could have subflows. These subflows contain one or more objects. The advantage to creating a subflow is that you can easily run the nodes within a subflow without running the entire process flow. If the subflow links to another node in the entire process flow, the subflow must run to completion before SAS Studio runs the subsequent node.

In this example, there are three nodes: a node for a subflow, a query node, and a programming node. All of the nodes in the subflow node must run before the query node can run. By default, the node for a subflow is white.

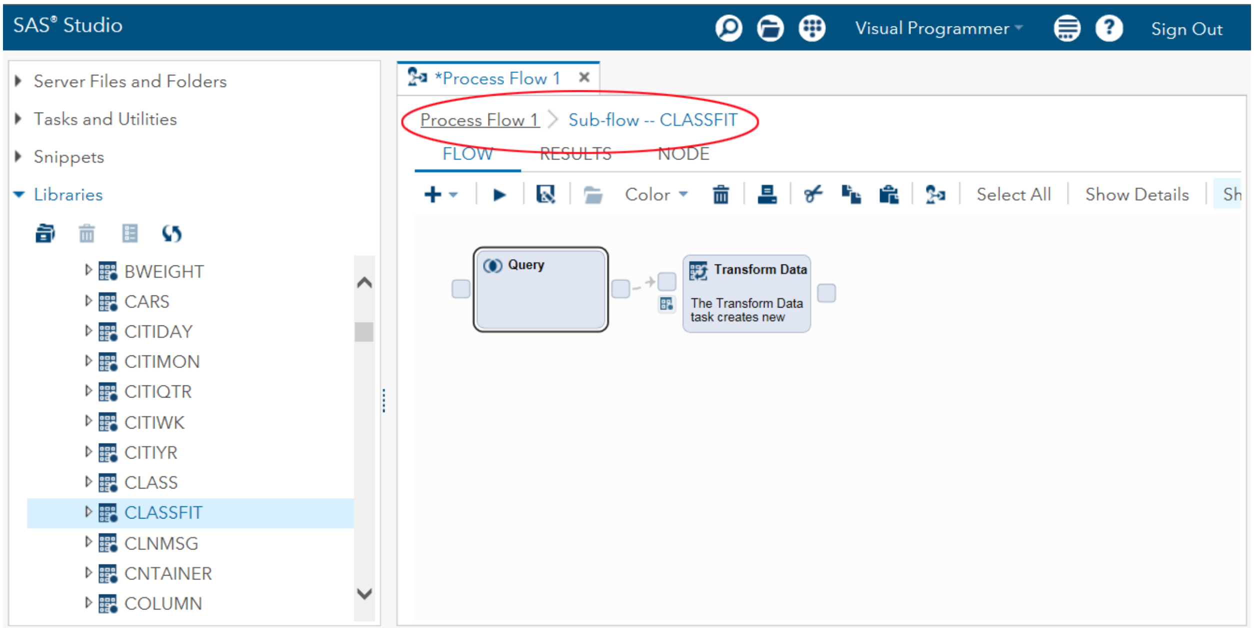


Note: SAS Studio cannot run a process flow that contains an empty subflow. An error message appears instead.

Create a New Subflow

To add a subflow to a process flow:

1. Click + and select **Sub-Flow**. A node for the subflow appears in the process flow.
2. Select the subflow node and click 📂. Use the breadcrumbs to verify that you are working in the subflow.



3. Add the content for the subflow. A subflow can contain other subflows.
4. To name the subflow node, to provide a brief description for the subflow, and to include any notes, click the **Node** tab.

   After you enter this information, the subflow node in the process flow contains the name and description that you specified on the **Node** tab.

Add a Subflow to an Existing Process Flow

You might want to add an existing process flow as a subflow to another process flow. Process flow files have a CPF extension.

To add an existing process flow as a subflow:

1. In the navigation pane, click the **Server Files and Folders** section.
2. Expand the folders in the **Server Files and Folders** section until you find the program that you want to add.
3. Select the subflow that you want to add, and then drag it to the process flow. (A green check mark indicates that you can add this file to the process flow.)

Linking Nodes in a Process Flow

In a process flow, you can specify the order in which each node runs. Generally, each node has an input port and an output port. To view the ports for the nodes in your process flow, click **Show Ports**.

To link nodes in the process flow:

1. Select the node that you want to link from.
2. Click ✚ and select **Link**. The Add Link window appears.
3. Select the nodes that you want to link to and click **OK**.

   If a link is allowed between the two nodes, the two nodes are connected by a dotted line in the process flow.

Generating Code from a Process Flow

You can create a SAS program from the nodes in a process flow. The code is listed in the program in the order in which it runs in the process flow.

To create a SAS program from a process flow, click **Generate Code** on the process flow toolbar. The code is added to a new program tab in the work area.

Running a Process Flow

To run all the nodes in the process flow, click ▶ **Run**.

To run a select group of nodes, use the mouse to draw a box around the nodes that you want to run. Right-click your selection. From the pop-up menu, select **Run Selected**.

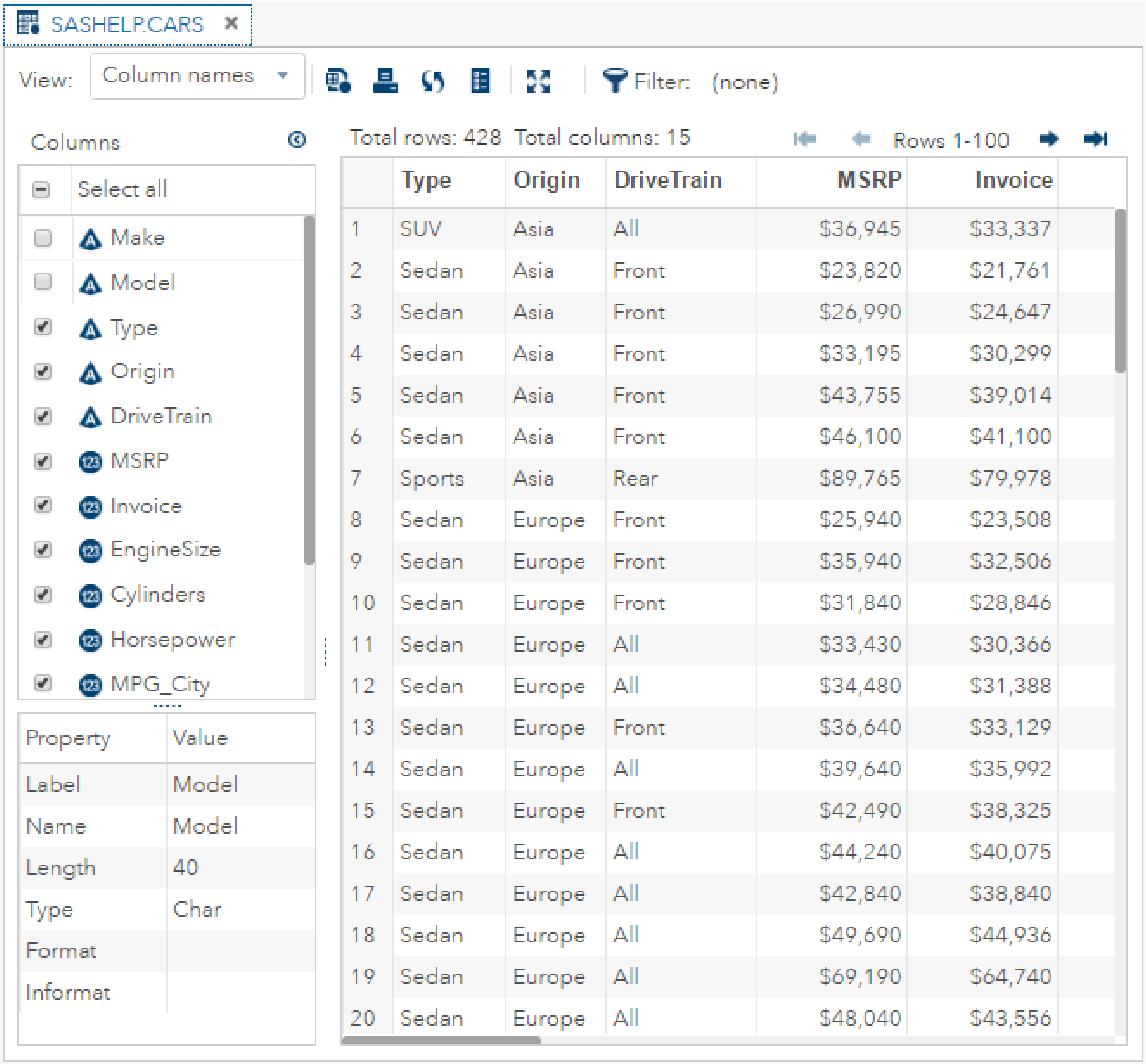
Save a Process Flow

To save the current process flow, click 💾. The process flow is saved as a CPF file.

Chapter 5
Working with Data

About the Table Viewer

When you open a table in SAS Studio, you use the table viewer.



SASHELP.CARS ×

View: Column names ▾ Filter: (none)

Columns

- ⊟ Select all
- ☐ Make
- ☐ Model
- ☑ Type
- ☑ Origin
- ☑ DriveTrain
- ☑ MSRP
- ☑ Invoice
- ☑ EngineSize
- ☑ Cylinders
- ☑ Horsepower
- ☑ MPG_City

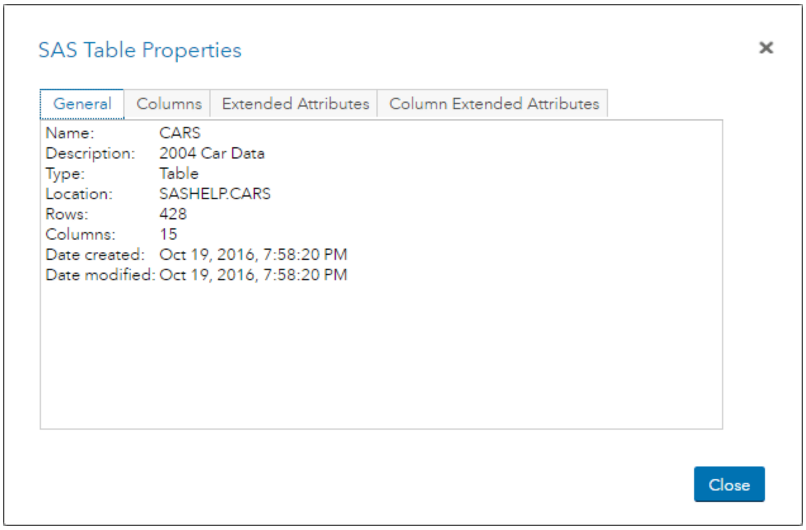
Property	Value
Label	Model
Name	Model
Length	40
Type	Char
Format	
Informat	

Total rows: 428 Total columns: 15 Rows 1-100

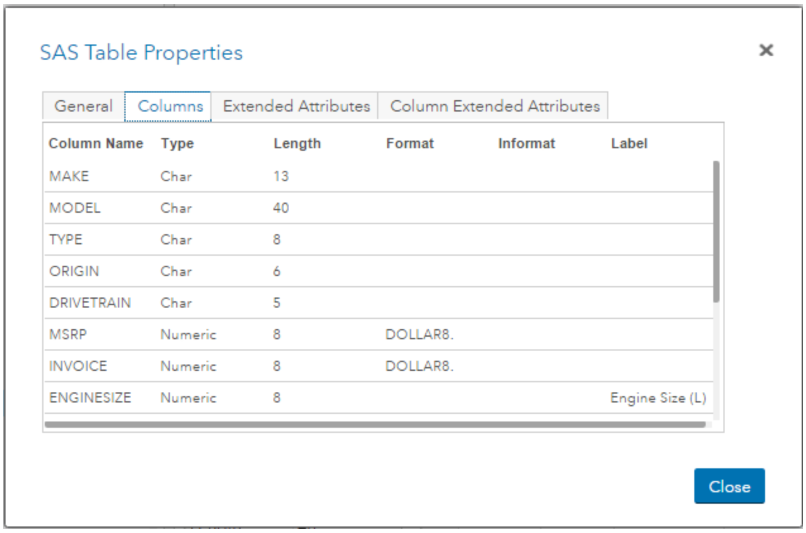
	Type	Origin	DriveTrain	MSRP	Invoice
1	SUV	Asia	All	$36,945	$33,337
2	Sedan	Asia	Front	$23,820	$21,761
3	Sedan	Asia	Front	$26,990	$24,647
4	Sedan	Asia	Front	$33,195	$30,299
5	Sedan	Asia	Front	$43,755	$39,014
6	Sedan	Asia	Front	$46,100	$41,100
7	Sports	Asia	Rear	$89,765	$79,978
8	Sedan	Europe	Front	$25,940	$23,508
9	Sedan	Europe	Front	$35,940	$32,506
10	Sedan	Europe	Front	$31,840	$28,846
11	Sedan	Europe	All	$33,430	$30,366
12	Sedan	Europe	All	$34,480	$31,388
13	Sedan	Europe	Front	$36,640	$33,129
14	Sedan	Europe	All	$39,640	$35,992
15	Sedan	Europe	Front	$42,490	$38,325
16	Sedan	Europe	All	$44,240	$40,075
17	Sedan	Europe	All	$42,840	$38,840
18	Sedan	Europe	All	$49,690	$44,936
19	Sedan	Europe	All	$69,190	$64,740
20	Sedan	Europe	All	$48,040	$43,556

Note: The table viewer displays the first 100 rows of the table. If the structure or data values of the table change while the table is open, you must refresh the table viewer to see the changes. If the structure of the table changes and you do not refresh the table, the columns that are listed in the **Libraries** section of the navigation pane might be different from the columns that are displayed in the table viewer.

You can view the properties of the table and its columns by clicking ▤ on the toolbar.



Name: CARS
Description: 2004 Car Data
Type: Table
Location: SASHELP.CARS
Rows: 428
Columns: 15
Date created: Oct 19, 2016, 7:58:20 PM
Date modified: Oct 19, 2016, 7:58:20 PM



Column Name	Type	Length	Format	Informat	Label
MAKE	Char	13			
MODEL	Char	40			
TYPE	Char	8			
ORIGIN	Char	6			
DRIVETRAIN	Char	5			
MSRP	Numeric	8	DOLLAR8.		
INVOICE	Numeric	8	DOLLAR8.		
ENGINESIZE	Numeric	8			Engine Size (L)

The extended attributes tabs enable you to associate additional user-defined characteristics with the table and columns in the table. For example, you could create extended attributes that contain a URL with information about your table or the formula that is used to create a column. For more information about creating extended attributes, see *Base SAS 9.4 Procedures Guide*.

Note: You can add extended attributes only to SAS tables that were created on a SAS 9.4 (or later) server.

Opening and Viewing Data

You can open files in SAS Studio in several ways:

- You can double-click a file in the **Server Files and Folders** and **Libraries** sections.
- You can drag a file from the **Server Files and Folders** and **Libraries** sections to the work area.
- You can search for a file and open it from the search results. You can open the file by double-clicking it or by dragging it to the work area.

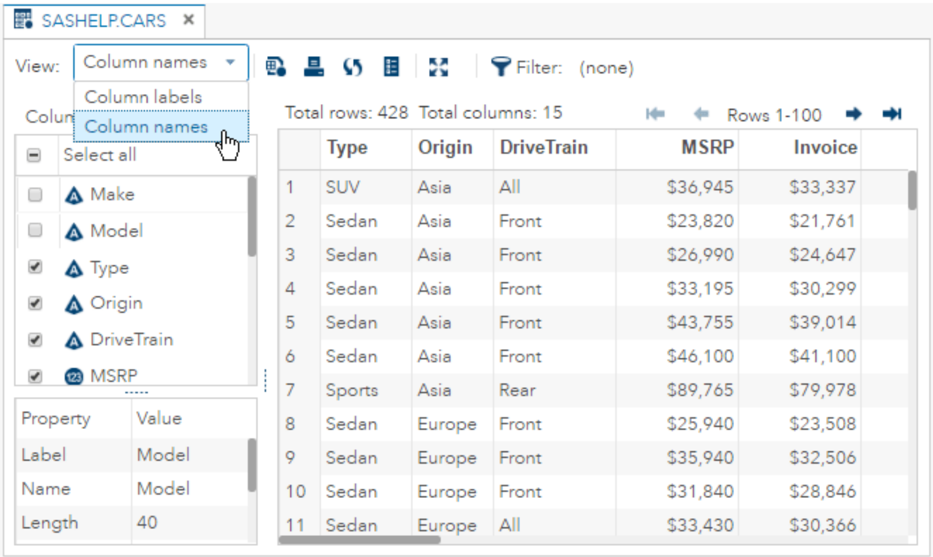
- You can open a file by using a file shortcut in the **File Shortcuts** section. You can open the file by double-clicking it or by dragging it to the work area.

Note: SAS Studio provides native file support for z/OS. For more information about SAS in z/OS environments, see *SAS Companion for z/OS*.

When you open a table, the first 30 columns in the table are displayed. You can use the Columns area to specify which columns you want to include in the table viewer. If your table has more than 100 columns and you select **Select all**, you are prompted to confirm that you want to display all of the columns. Displaying more than 100 columns can affect your performance.

Note: If you are using Internet Explorer and you display more than 100 columns in a table, SAS Studio reverts to displaying only 30 columns when you close and reopen the table.

By default, the column names are displayed, but you can choose to display the column labels by selecting **Column labels** from the **View** drop-down list.



⊟ Select all
□ Make
□ Model
☑ Type
☑ Origin
☑ DriveTrain
☑ MSRP

Property	Value
Label	Model
Name	Model
Length	40

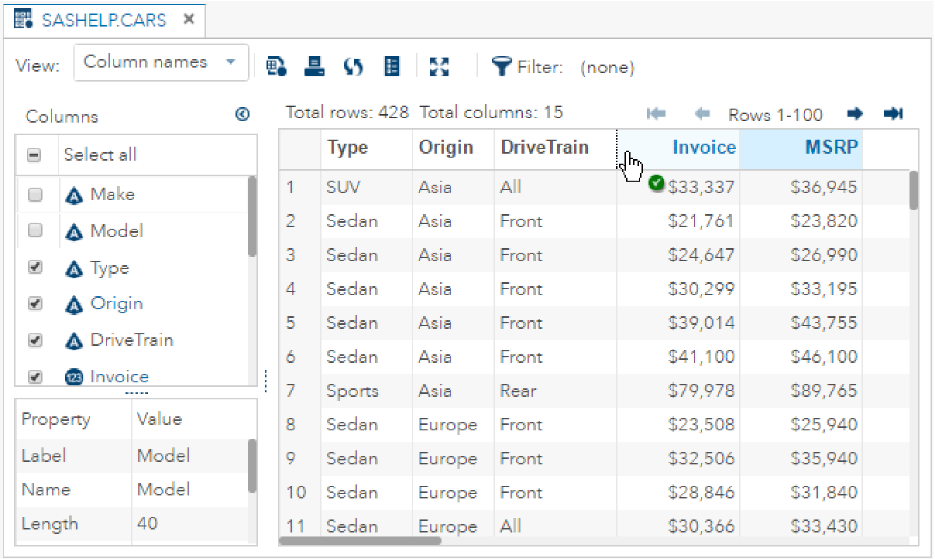
	Type	Origin	DriveTrain	MSRP	Invoice
1	SUV	Asia	All	$36,945	$33,337
2	Sedan	Asia	Front	$23,820	$21,761
3	Sedan	Asia	Front	$26,990	$24,647
4	Sedan	Asia	Front	$33,195	$30,299
5	Sedan	Asia	Front	$43,755	$39,014
6	Sedan	Asia	Front	$46,100	$41,100
7	Sports	Asia	Rear	$89,765	$79,978
8	Sedan	Europe	Front	$25,940	$23,508
9	Sedan	Europe	Front	$35,940	$32,506
10	Sedan	Europe	Front	$31,840	$28,846
11	Sedan	Europe	All	$33,430	$30,366

Note: By default, the table viewer displays the total number of rows in the table and the total number of filtered rows, if you have filtered the data. However, if SAS Studio is unable to determine the row counts without affecting performance, then the row counts are listed as “Unavailable.”

You can automatically resize the column widths to fit the current size of the column content. To resize the column widths, right-click any column heading and select **Size grid columns to content**. To set the columns back to their default widths, right-click any column heading and select **Restore original column widths**. You can choose to always resize the column widths when you open data by selecting **Size grid columns to content** in the General preferences. For more information, see “Setting General Preferences” on page 111.

Note: The column widths might need to be recalculated when the column content changes due to filtering, sorting, or paging through the data and can affect performance.

You can change the order of the columns in the table viewer by dragging a column to a new position in the table viewer or in the Columns area.



View: Column names

Filter: (none)

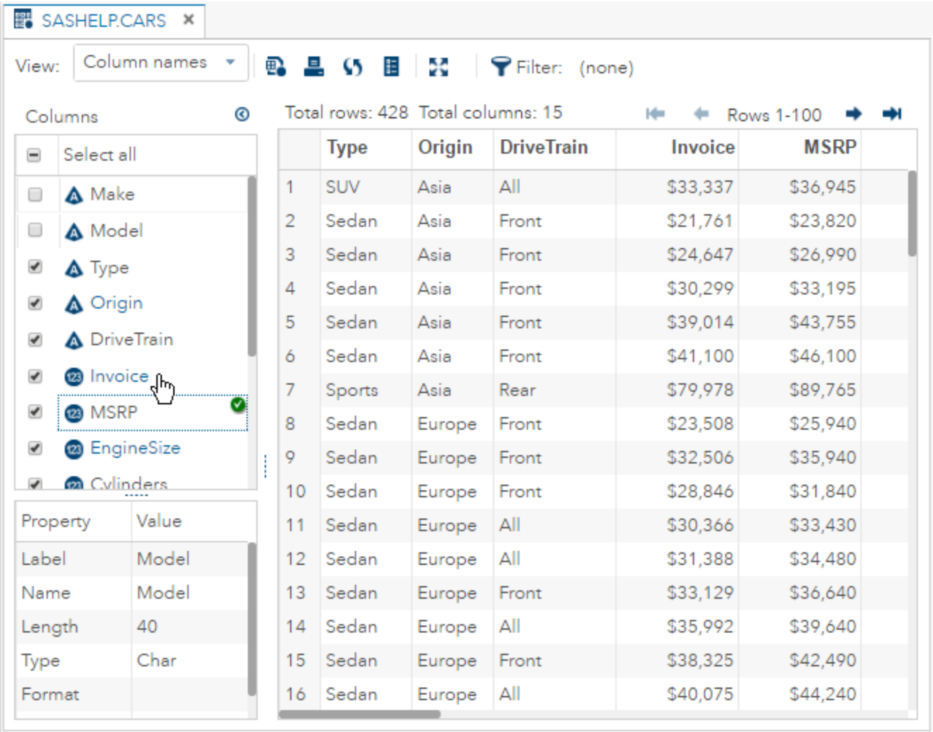
Total rows: 428 Total columns: 15

Rows 1-100

☐	Select all
☐	Make
☐	Model
☑	Type
☑	Origin
☑	DriveTrain
☑	Invoice

Property	Value
Label	Model
Name	Model
Length	40

	Type	Origin	DriveTrain	Invoice	MSRP
1	SUV	Asia	All	$33,337	$36,945
2	Sedan	Asia	Front	$21,761	$23,820
3	Sedan	Asia	Front	$24,647	$26,990
4	Sedan	Asia	Front	$30,299	$33,195
5	Sedan	Asia	Front	$39,014	$43,755
6	Sedan	Asia	Front	$41,100	$46,100
7	Sports	Asia	Rear	$79,978	$89,765
8	Sedan	Europe	Front	$23,508	$25,940
9	Sedan	Europe	Front	$32,506	$35,940
10	Sedan	Europe	Front	$28,846	$31,840
11	Sedan	Europe	All	$30,366	$33,430



View: Column names

Filter: (none)

Total rows: 428 Total columns: 15

Rows 1-100

☐	Select all
☐	Make
☐	Model
☑	Type
☑	Origin
☑	DriveTrain
☑	Invoice
☑	MSRP
☑	EngineSize
☑	Cylinders

Property	Value
Label	Model
Name	Model
Length	40
Type	Char
Format	

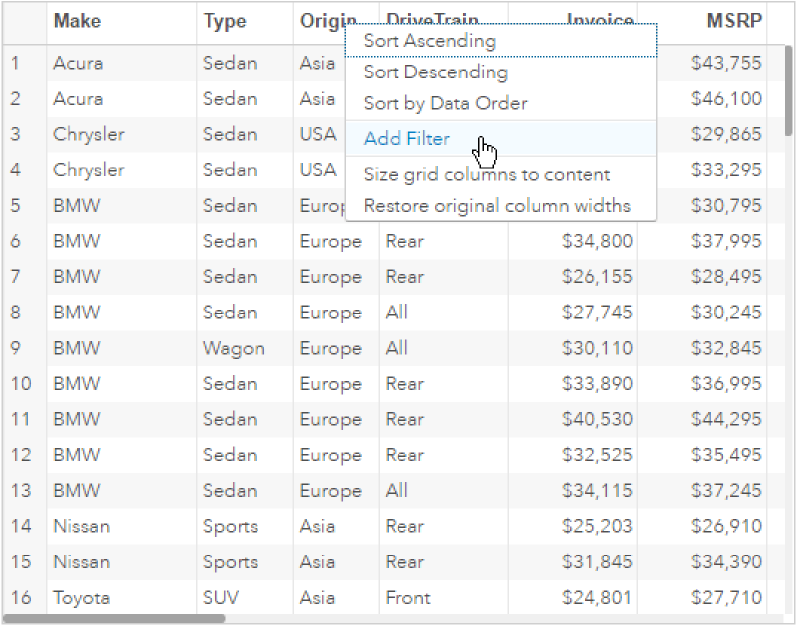
	Type	Origin	DriveTrain	Invoice	MSRP
1	SUV	Asia	All	$33,337	$36,945
2	Sedan	Asia	Front	$21,761	$23,820
3	Sedan	Asia	Front	$24,647	$26,990
4	Sedan	Asia	Front	$30,299	$33,195
5	Sedan	Asia	Front	$39,014	$43,755
6	Sedan	Asia	Front	$41,100	$46,100
7	Sports	Asia	Rear	$79,978	$89,765
8	Sedan	Europe	Front	$23,508	$25,940
9	Sedan	Europe	Front	$32,506	$35,940
10	Sedan	Europe	Front	$28,846	$31,840
11	Sedan	Europe	All	$30,366	$33,430
12	Sedan	Europe	All	$31,388	$34,480
13	Sedan	Europe	Front	$33,129	$36,640
14	Sedan	Europe	All	$35,992	$39,640
15	Sedan	Europe	Front	$38,325	$42,490
16	Sedan	Europe	All	$40,075	$44,240

Viewing the Code That Is Used to Create a Table

While you select options and customize the table to look the way you want it to, SAS Studio is generating SAS code that you can use. To view the code, click ⊞ on the toolbar. A new program window appears with the code that was used to create the view of the table in the table viewer. The program is a copy of the code and is no longer associated with the original code. Editing the code does not affect the data that is displayed in the table viewer, and modifying the table viewer does not affect the contents of the code.

Filtering and Sorting Data

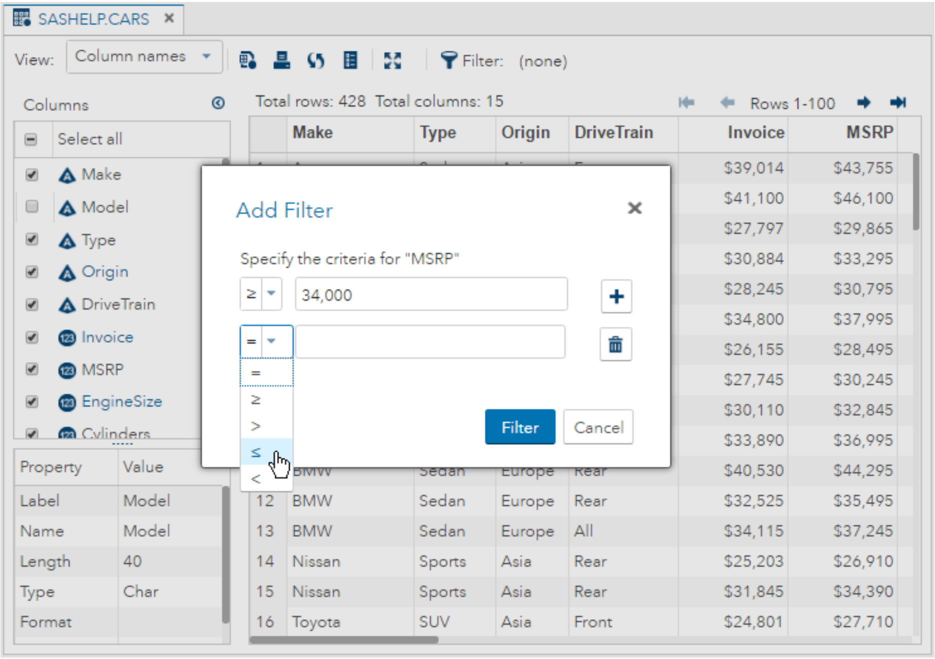
In the table viewer, you can right-click a column heading to filter and sort the data by that column. You can sort the data in ascending or descending alphabetical order or display the columns in the order in which they appear in the data table.



	Make	Type	Origin	DriveTrain	Invoice	MSRP
1	Acura	Sedan	Asia			$43,755
2	Acura	Sedan	Asia			$46,100
3	Chrysler	Sedan	USA			$29,865
4	Chrysler	Sedan	USA			$33,295
5	BMW	Sedan	Euro			$30,795
6	BMW	Sedan	Europe	Rear	$34,800	$37,995
7	BMW	Sedan	Europe	Rear	$26,155	$28,495
8	BMW	Sedan	Europe	All	$27,745	$30,245
9	BMW	Wagon	Europe	All	$30,110	$32,845
10	BMW	Sedan	Europe	Rear	$33,890	$36,995
11	BMW	Sedan	Europe	Rear	$40,530	$44,295
12	BMW	Sedan	Europe	Rear	$32,525	$35,495
13	BMW	Sedan	Europe	All	$34,115	$37,245
14	Nissan	Sports	Asia	Rear	$25,203	$26,910
15	Nissan	Sports	Asia	Rear	$31,845	$34,390
16	Toyota	SUV	Asia	Front	$24,801	$27,710

You can also filter the data in order to display only rows that meet certain criteria, based on values in the data. The filter options vary depending on the type of column that you have selected and the number of distinct values that a column has.

The Add Filter window for a numeric column enables you to specify one or two filter criteria for each column. To add a second filter criterion, click +.



⊟ Select all
☑ Make
□ Model
☑ Type
☑ Origin
☑ DriveTrain
☑ Invoice
☑ MSRP
☑ EngineSize
☑ Cylinders

Property	Value
Label	Model
Name	Model
Length	40
Type	Char
Format	

	Make	Type	Origin	DriveTrain	Invoice	MSRP
					$39,014	$43,755
					$41,100	$46,100
					$27,797	$29,865
					$30,884	$33,295
					$28,245	$30,795
					$34,800	$37,995
					$26,155	$28,495
					$27,745	$30,245
					$30,110	$32,845
					$33,890	$36,995
	BMW	Sedan	Europe	Rear	$40,530	$44,295
12	BMW	Sedan	Europe	Rear	$32,525	$35,495
13	BMW	Sedan	Europe	All	$34,115	$37,245
14	Nissan	Sports	Asia	Rear	$25,203	$26,910
15	Nissan	Sports	Asia	Rear	$31,845	$34,390
16	Toyota	SUV	Asia	Front	$24,801	$27,710

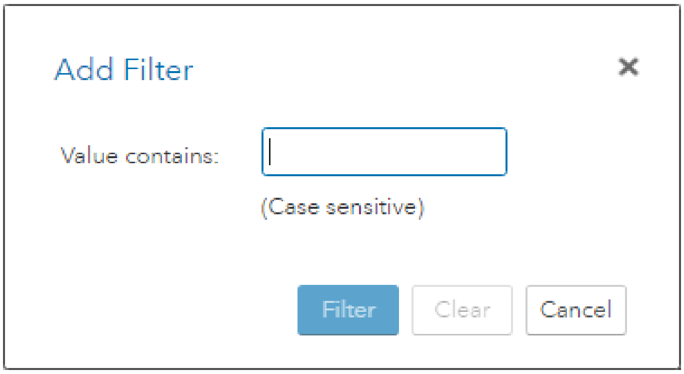
Add Filter

Specify the criteria for "MSRP"

≥ 34,000

=

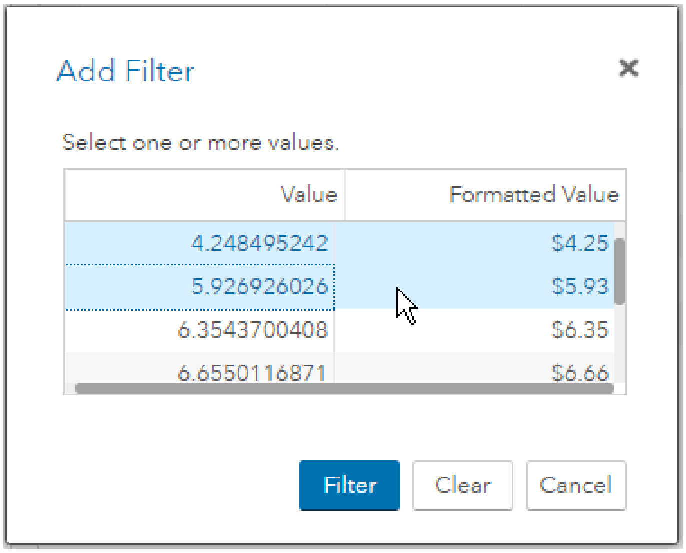
The Add Filter window for a character column is case sensitive and searches for values that contain the text that you enter.


Add Filter

Value contains:

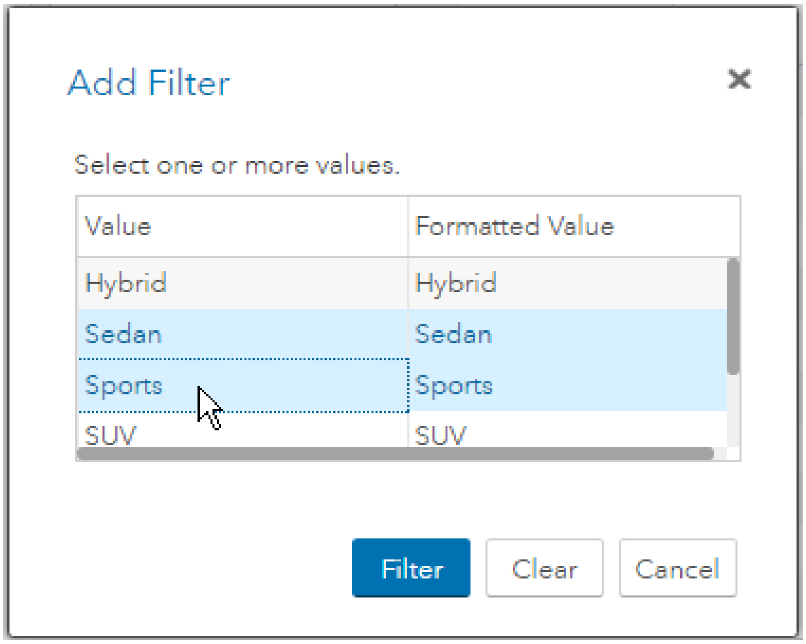
(Case sensitive)

When a numeric column has 10 or fewer distinct values or a character column has 30 or fewer distinct values, the Add Filter window displays a list of values to choose from. The list of values includes both the unformatted and formatted values. If no format has been applied to the data, then the unformatted and formatted values are the same.



Select one or more values.

Value	Formatted Value
4.248495242	$4.25
5.926926026	$5.93
6.3543700408	$6.35
6.6550116871	$6.66



Select one or more values.

Value	Formatted Value
Hybrid	Hybrid
Sedan	Sedan
Sports	Sports
SUV	SUV

Note: SAS Studio always uses the unformatted values in the filter expression.

When you create a filter on a numeric column by selecting values from a list, SAS Studio filters the data differently depending on whether any of the values in the column have a fractional component.

If the values are all integers, then SAS Studio creates the filter by using the equality operator. For example, suppose your data includes integer values between **12** and **17**, and you want to create a filter for all values equal to **15**. SAS Studio creates the following filter expression:

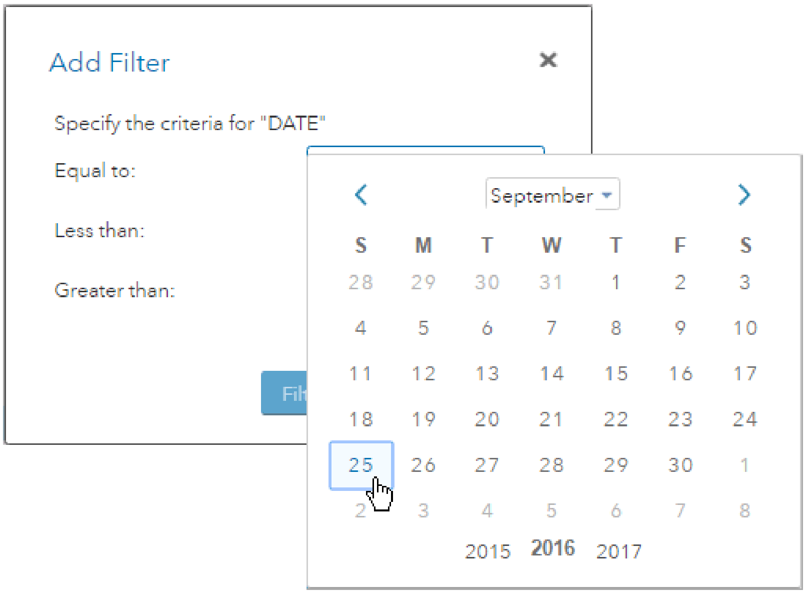
```
column-name = 15
```

If any of the values include a fractional component, then SAS Studio creates the filter by using a range of values to ensure that there are no rounding errors that might exclude the selected value. For example, suppose your data includes a value of **123.45678**. If you select that value to use in a filter, SAS Studio creates the following filter expression:

```
(column-name >= 123.456775 and column-name < 123.456785)
```

Note: Generating a list of values for a filter can take a long time for large tables and Hadoop tables and can affect performance. If you are creating a filter on a very large table or on a Hadoop table, you cannot select the filter values. You must enter them in the value box. By default, if a table has more than 50,000 rows or the total number of rows is unknown, then you must enter filter values for it. The default value is controlled by a setting in the config.properties file. For more information, see *SAS Studio: Administrator's Guide*.

The Add Filter window for a date column enables you to select a date value from a pop-up calendar.



When you create a filter on your data, the filter criteria are displayed at the top of the workspace. You can click ▼ to edit the filter and ⊗ to delete the filter. SAS Studio remembers any filters that you create each time you open the data.

Importing Data

About Importing Data to SAS Studio

You can import these types of data files into SAS Studio:

- Microsoft Access database files.
- delimited files, such as files with comma-separated values.
- dBASE 5.0, IV, III+, and III.
- Stata files.
- Microsoft Excel files. To import XLSB and XLSM files, you must use the SAS LIBNAME statement.
- JMP files.
- Paradox DB files.
- SPSS files.

- Lotus 1-2-3 files from Releases 2, 3, 4, or 5.

If you are using the SAS Studio Enterprise Edition or the SAS Studio Basic Edition, your data file might be saved to your local computer. In this case, you must upload the file to SAS Studio before you can import it.

Whether data from another locale imports correctly depends on whether the SAS server supports the locale of the data that is being imported. If you are importing data that contains characters that are different from the current locale, use a Unicode (UTF–8) server to import your data. If you do not use a UTF–8 server and the locale of the data is not supported, unsupported values might appear as questions marks (?) in your imported data. For more information about how to set the **Default text encoding** option, see "Setting General Preferences" on page 111.

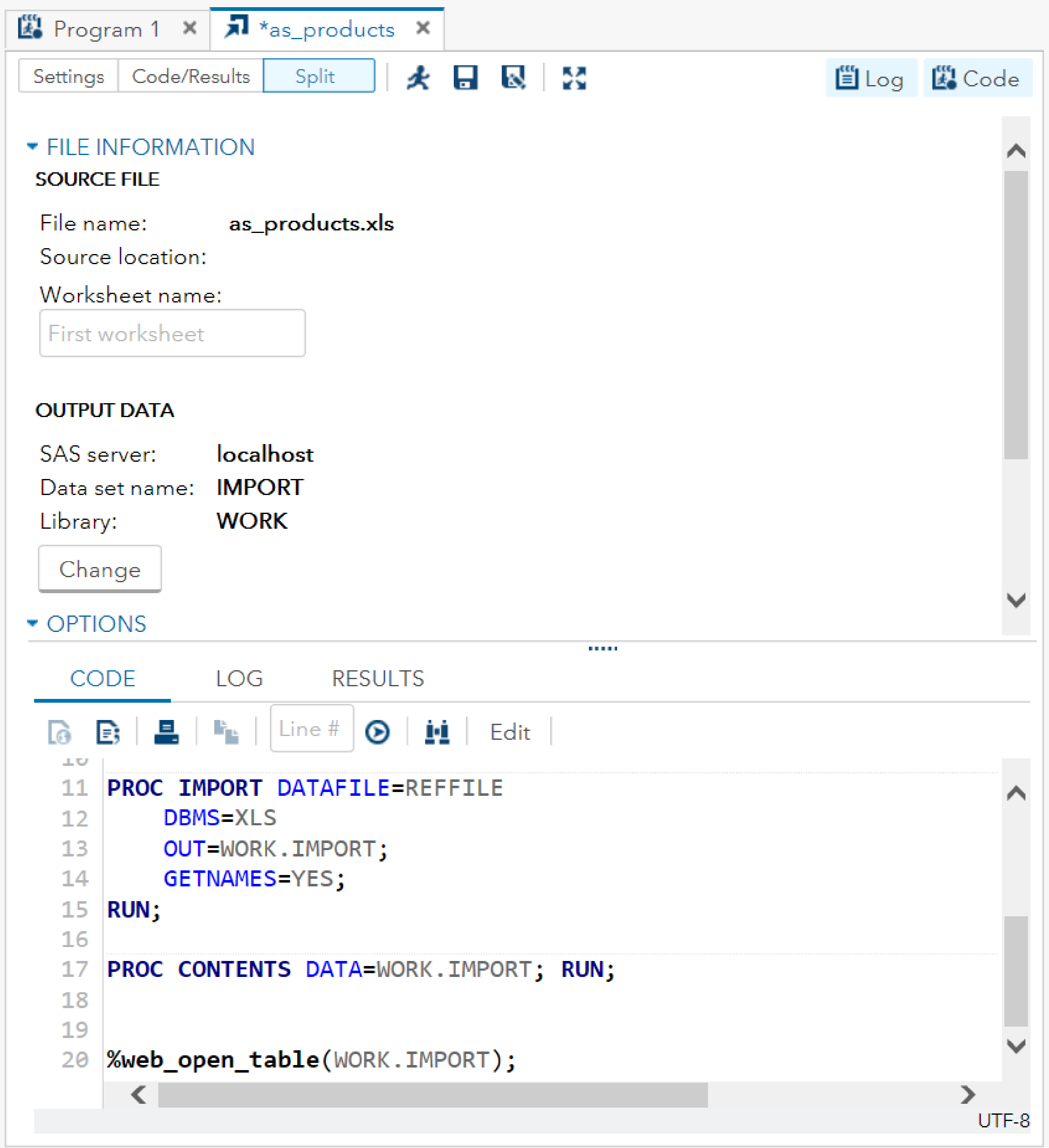
Note: You cannot import remote files (files that are available through FTP file shortcuts).

Import an Excel Worksheet

To import an Excel worksheet:

1. Click **Server Files and Folders** in the navigation pane and browse to find the file that you want to import.
2. Right-click the file that you want to import and select **Import Data**. The top of the **Import Data** tab shows the name and location of this Excel file. It also shows several options that you can customize.

This example shows importing the as_products.xls file.



FILE INFORMATION

SOURCE FILE

File name: as_products.xls

Source location:

Worksheet name: First worksheet

OUTPUT DATA

SAS server: localhost

Data set name: IMPORT

Library: WORK

Change

OPTIONS

```
PROC IMPORT DATAFILE=REFFILE
    DBMS=XLS
    OUT=WORK.IMPORT;
    GETNAMES=YES;
RUN;

PROC CONTENTS DATA=WORK.IMPORT; RUN;


%web_open_table(WORK.IMPORT);
```

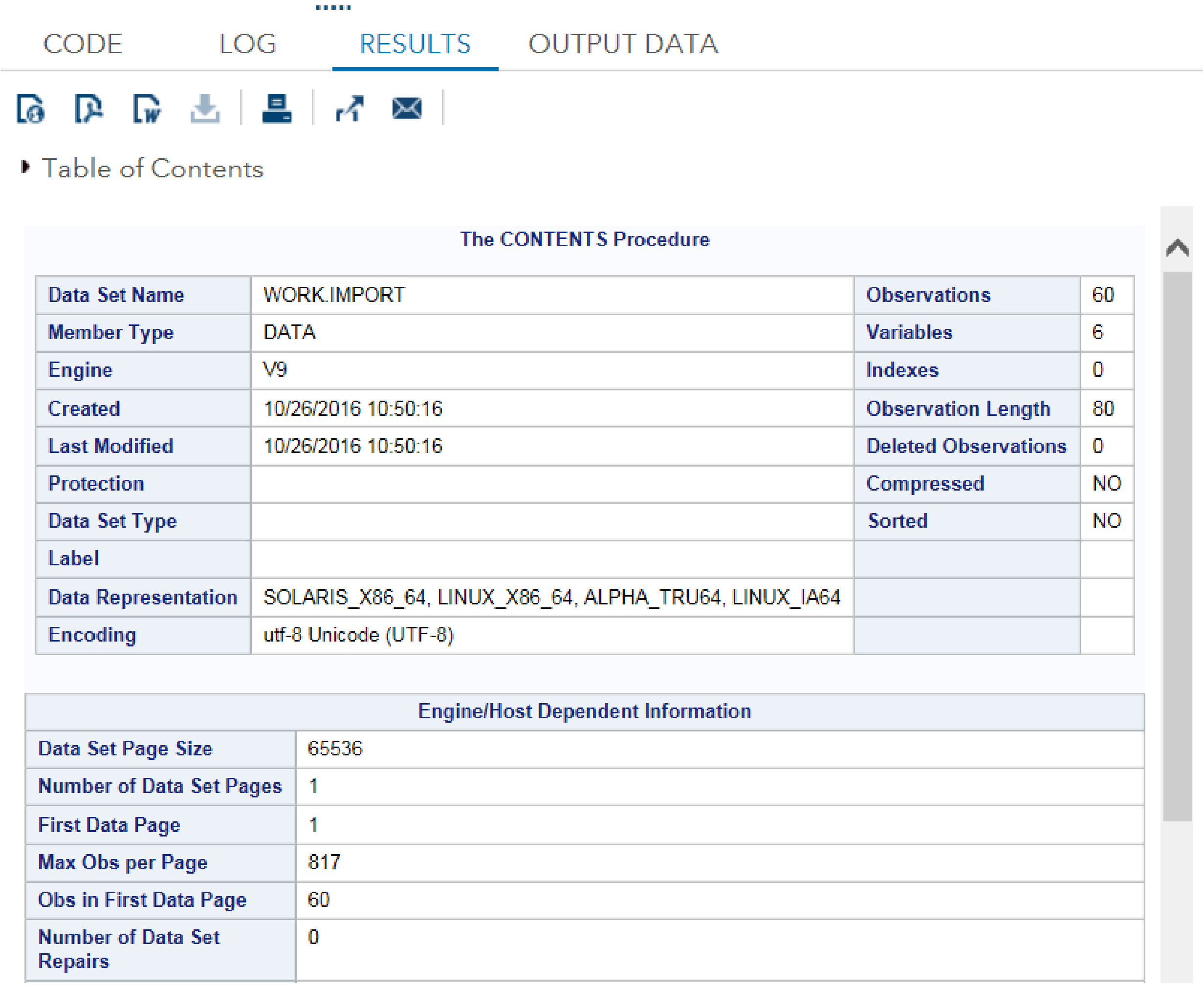
3. To import the data from a specific worksheet, enter the name of that worksheet in the **Worksheet name** box. By default, SAS Studio imports the data from the first worksheet.

4. To specify the location to save the output data set, click **Change**. By default, the output data set is saved to the Work library, which is a temporary location. The contents in this library are deleted when you exit SAS Studio.

5. To generate SAS variable names from the data values in the first row of the worksheet, select **Generate SAS variable names**. If a data value in the first row in the input file is read and it contains special characters that are not valid in a SAS name, such as a blank, then SAS converts the character to an underscore.

6. To import the Excel worksheet, click 🏃.

The **Results** tab shows the attributes of the new SAS data set.



The CONTENTS Procedure

Data Set Name	WORK.IMPORT	Observations	60
Member Type	DATA	Variables	6
Engine	V9	Indexes	0
Created	10/26/2016 10:50:16	Observation Length	80
Last Modified	10/26/2016 10:50:16	Deleted Observations	0
Protection		Compressed	NO
Data Set Type		Sorted	NO
Label			
Data Representation	SOLARIS_X86_64, LINUX_X86_64, ALPHA_TRU64, LINUX_IA64		
Encoding	utf-8 Unicode (UTF-8)		

Engine/Host Dependent Information	
Data Set Page Size	65536
Number of Data Set Pages	1
First Data Page	1
Max Obs per Page	817
Obs in First Data Page	60
Number of Data Set Repairs	0

The **Output Data** tab shows the contents of the new data set. If this data set is in the Work library (as shown in this example), you might want to save it to a more permanent location. Data in the Work library is temporary and is deleted when you exit SAS Studio.

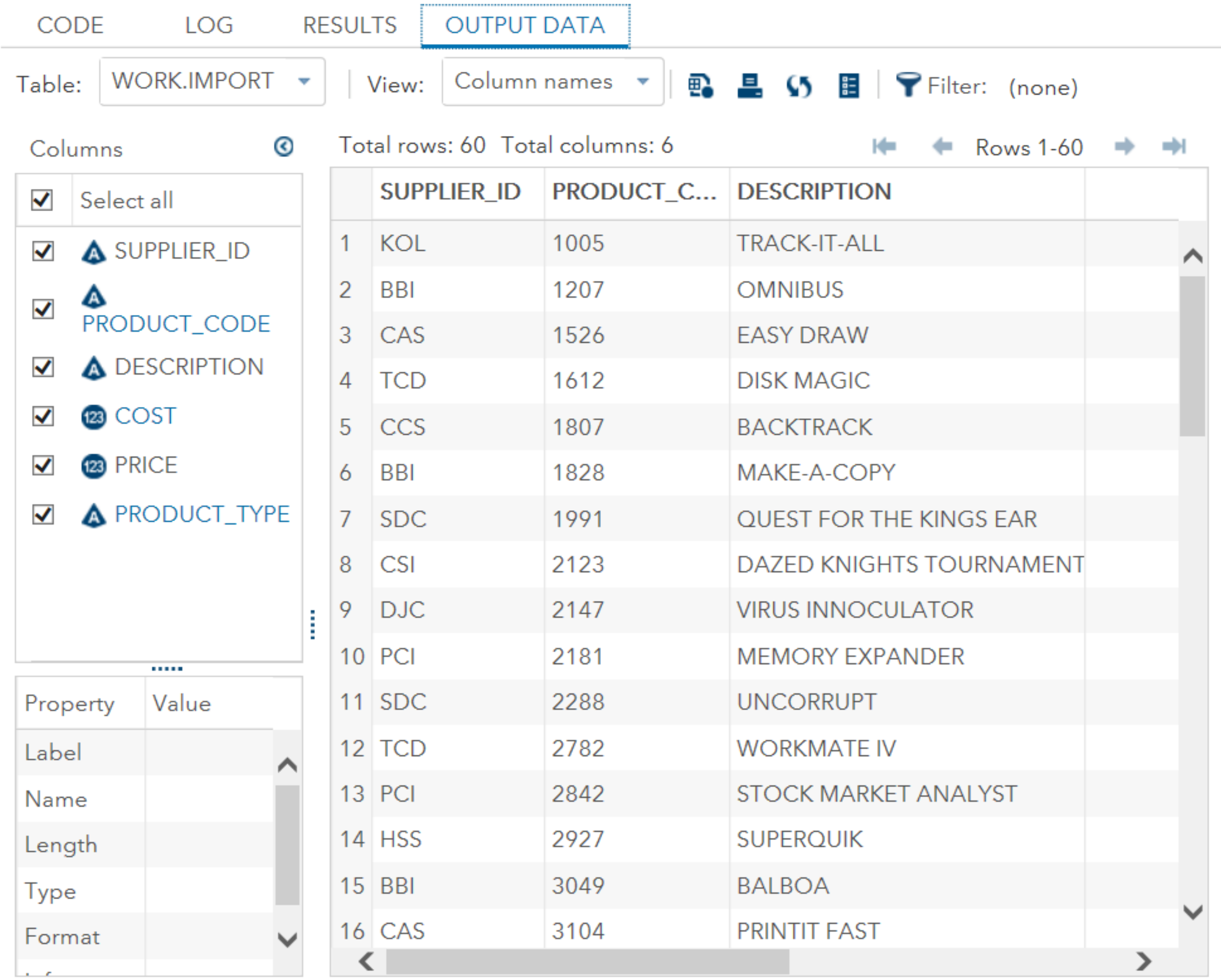


Table: WORK.IMPORT | View: Column names | Filter: (none)

☑ Select all
☑ SUPPLIER_ID
☑ PRODUCT_CODE
☑ DESCRIPTION
☑ COST
☑ PRICE
☑ PRODUCT_TYPE

Property	Value
Label	
Name	
Length	
Type	
Format	

Total rows: 60 Total columns: 6 Rows 1-60

	SUPPLIER_ID	PRODUCT_C...	DESCRIPTION
1	KOL	1005	TRACK-IT-ALL
2	BBI	1207	OMNIBUS
3	CAS	1526	EASY DRAW
4	TCD	1612	DISK MAGIC
5	CCS	1807	BACKTRACK
6	BBI	1828	MAKE-A-COPY
7	SDC	1991	QUEST FOR THE KINGS EAR
8	CSI	2123	DAZED KNIGHTS TOURNAMENT
9	DJC	2147	VIRUS INNOCULATOR
10	PCI	2181	MEMORY EXPANDER
11	SDC	2288	UNCORRUPT
12	TCD	2782	WORKMATE IV
13	PCI	2842	STOCK MARKET ANALYST
14	HSS	2927	SUPERQUIK
15	BBI	3049	BALBOA
16	CAS	3104	PRINTIT FAST

Import a Delimited File

Note: For some delimited files (such as files with a .dat extension), the Import Tool might not be available. To import these delimited files, save the file as a text file. Then you can use the Import Tool. To import a tab-delimited file, the filename must have a TAB extension.

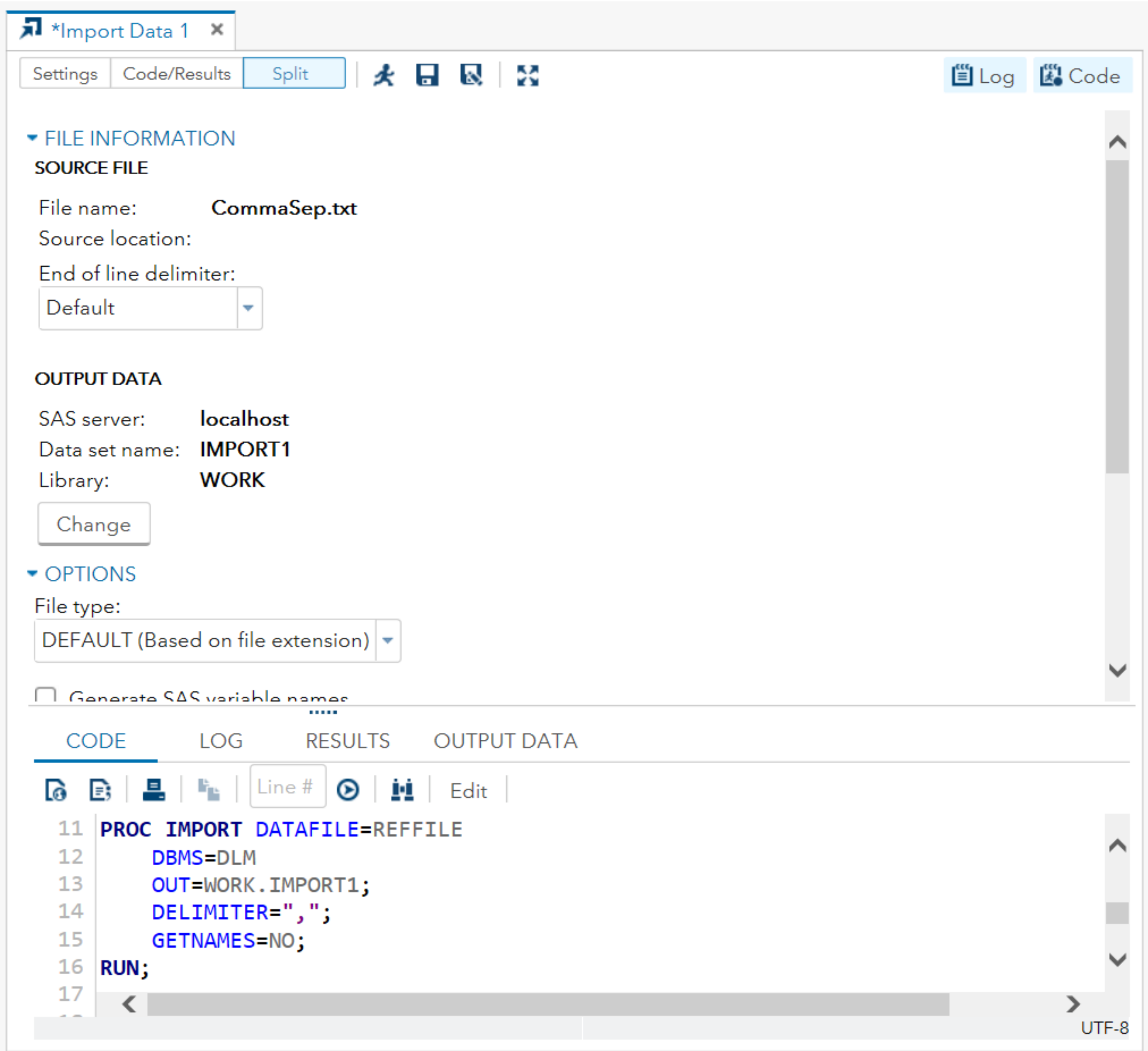
To import a delimited file:

1. Click **Server Files and Folders** in the navigation pane and browse to find the file that you want to import.
2. To determine the delimiter for the file, right-click the filename and select **View File as Text**. The contents of the file open in a text editor. Note the delimiter that is used between values and whether the first row of the data includes headings.
3. After determining the delimiter of this file, click and select **New Import Data**.

   The **Import Data** tab opens in the SAS Studio workspace.

4. Drag the selected text file from **Server Files and Folders** in the navigation pane to the **Import Data** tab. The top of the **Import Data** tab now shows the properties of the file (such as the filename and location of the saved file), the name of the imported data source, and any options that you can specify. The bottom of the **Import Data** tab shows the SAS code that has been generated.

   This example shows importing a text file called CommaSep.txt.



FILE INFORMATION

SOURCE FILE

File name: CommaSep.txt

Source location:

End of line delimiter: Default

OUTPUT DATA

SAS server: localhost

Data set name: IMPORT1

Library: WORK

Change

OPTIONS

File type: DEFAULT (Based on file extension)

□ Generate SAS variable names

```
PROC IMPORT DATAFILE=REFFILE
    DBMS=DLM
    OUT=WORK.IMPORT1;
    DELIMITER=",";
    GETNAMES=NO;
RUN;
```

5. To specify the location to save the output data set, click **Change**. By default, the output data set is saved to the Work library, which is a temporary location. The contents in this library are deleted when you exit SAS Studio.

6. To generate SAS variable names from the data values in the first row in the text file, select **Generate SAS variable names**. If a data value in the first row in the input file is read and it contains special characters that are not valid in a SAS name (such as a blank), SAS converts the character to an underscore.

7. In the **Delimiter** box, enter the delimiter for the values in the file. The default delimiter is a space.

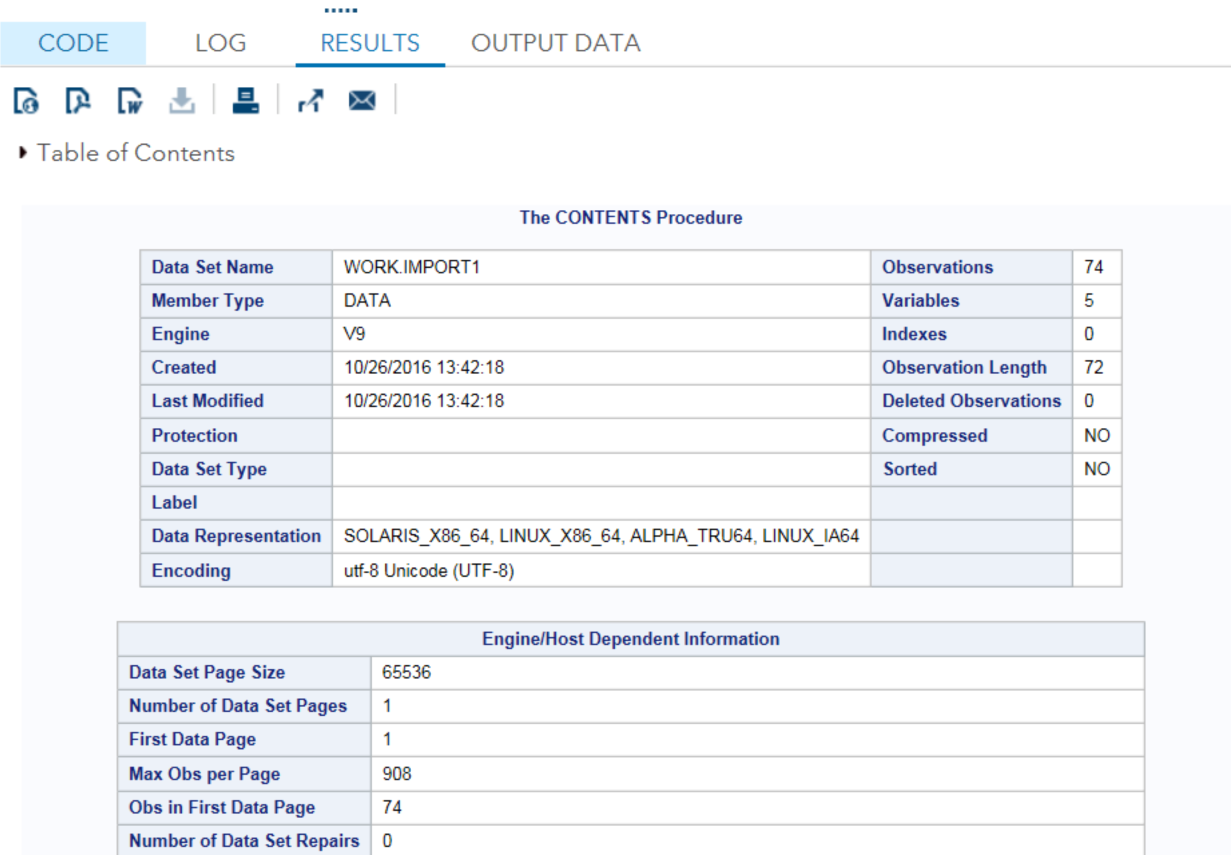
   Note: If you use a hexadecimal value to specify the delimiter, you do not need to select the **Quote delimiter** check box.

8. (Optional) To start reading data from a specified row in the delimited text file, enter the starting row in the **Start reading data at row** box. You might want to use this option if you have comments at the top of the text file or the first row of the file is column headings.

9. (Optional) For SAS Studio to determine the appropriate data type and length of the variables, enter a value in the **Guessing rows** box. The task scans the input data file from row 1 to the number that you specified. By default, the first 20 rows are scanned.

10. To import the data, click 🏃.

Click the **Results** tab to see the attributes of the imported data set.



The CONTENTS Procedure

Data Set Name	WORK.IMPORT1	Observations	74
Member Type	DATA	Variables	5
Engine	V9	Indexes	0
Created	10/26/2016 13:42:18	Observation Length	72
Last Modified	10/26/2016 13:42:18	Deleted Observations	0
Protection		Compressed	NO
Data Set Type		Sorted	NO
Label			
Data Representation	SOLARIS_X86_64, LINUX_X86_64, ALPHA_TRU64, LINUX_IA64		
Encoding	utf-8 Unicode (UTF-8)		

Engine/Host Dependent Information	
Data Set Page Size	65536
Number of Data Set Pages	1
First Data Page	1
Max Obs per Page	908
Obs in First Data Page	74
Number of Data Set Repairs	0

Click the **Output Data** tab to view the new SAS data set. If this data set is in the Work library (as shown in this example), you might want to save it to a more permanent location. Data in the Work library is temporary and is deleted when you exit SAS Studio.

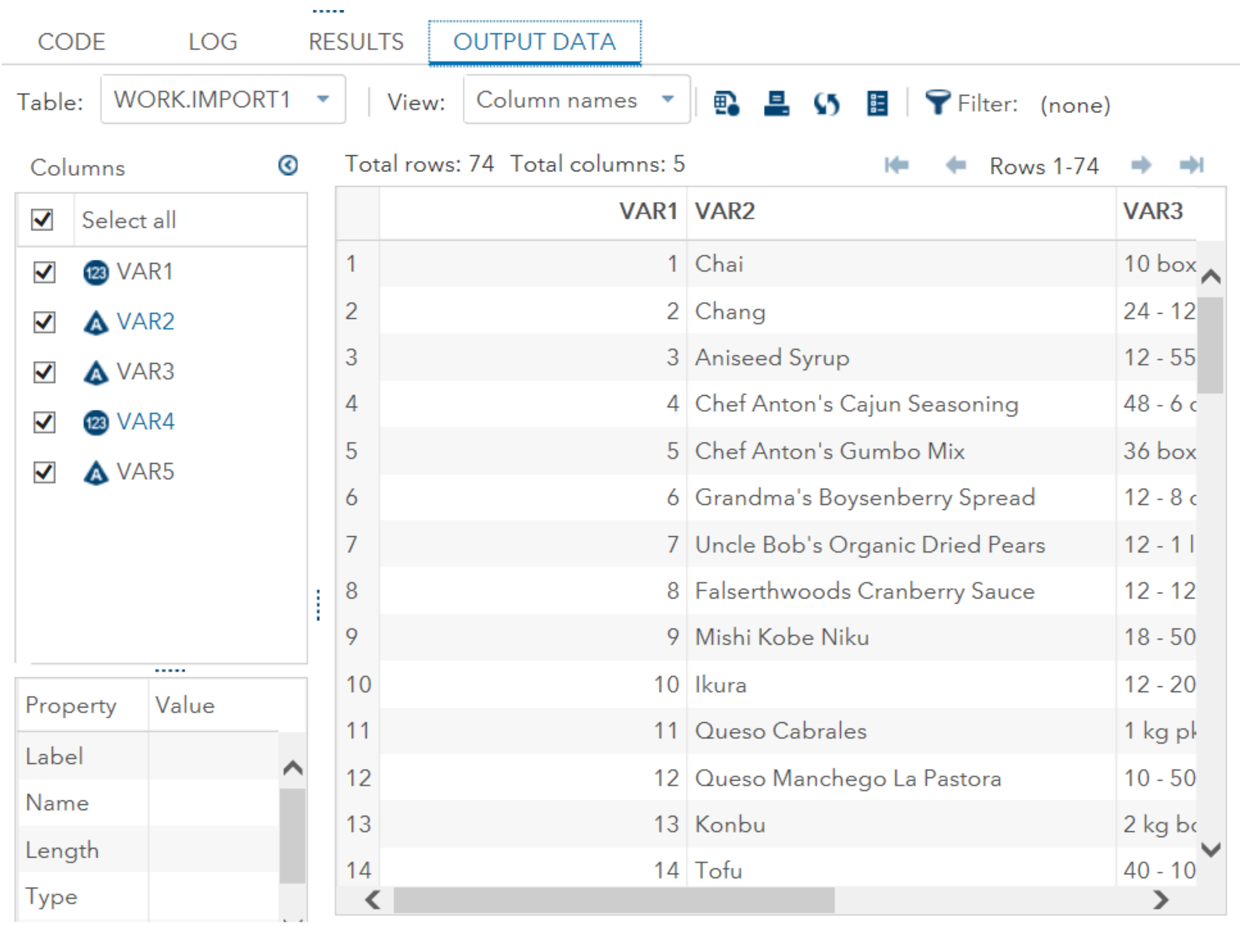


Table: WORK.IMPORT1 View: Column names Filter: (none)

☑ Select all
☑ VAR1
☑ VAR2
☑ VAR3
☑ VAR4
☑ VAR5

Total rows: 74 Total columns: 5 Rows 1-74

	VAR1	VAR2	VAR3
1	1	Chai	10 box
2	2	Chang	24 - 12
3	3	Aniseed Syrup	12 - 55
4	4	Chef Anton's Cajun Seasoning	48 - 6 c
5	5	Chef Anton's Gumbo Mix	36 box
6	6	Grandma's Boysenberry Spread	12 - 8 c
7	7	Uncle Bob's Organic Dried Pears	12 - 1 l
8	8	Falserthwoods Cranberry Sauce	12 - 12
9	9	Mishi Kobe Niku	18 - 50
10	10	Ikura	12 - 20
11	11	Queso Cabrales	1 kg pk
12	12	Queso Manchego La Pastora	10 - 50
13	13	Konbu	2 kg bo
14	14	Tofu	40 - 10

Property	Value
Label	
Name	
Length	
Type	

Import a DBMS File

When you import a file from a database management system (DBMS), the available options depend on the file type. For a list of the supported file types, see "About Importing Data to SAS Studio" on page 85.

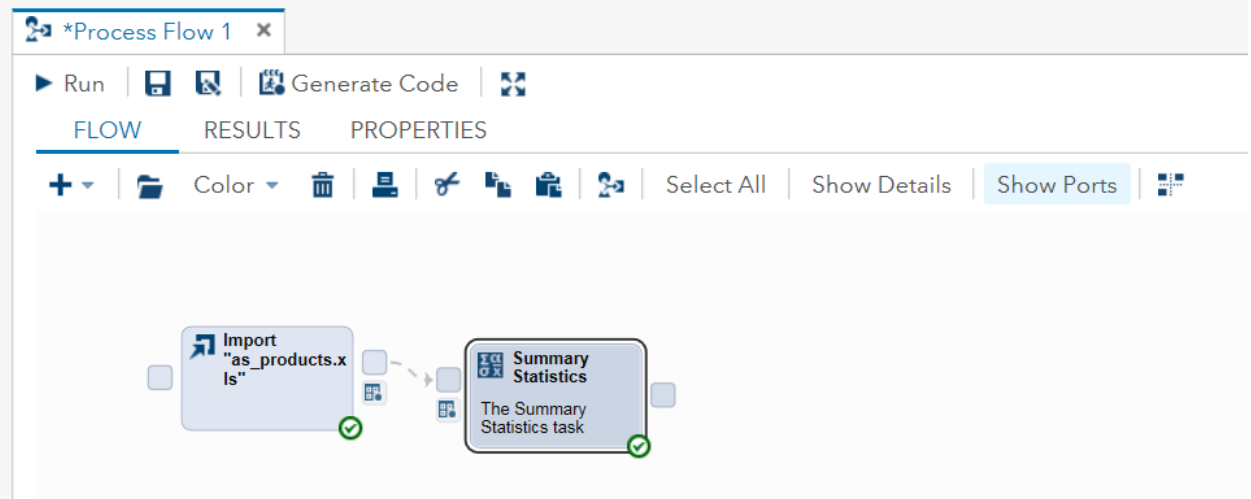
1. Click **Server Files and Folders** in the navigation pane and browse to find the file that you want to import.
2. Right-click the file that you want to import and select **Import Data**. The **Import Data** tab opens. The options that are available on this tab depend on the file type.
3. To specify the location to save the output data set, click **Change**. By default, the output data set is saved to the Work library, which is a temporary location. The contents in this library are deleted when you exit SAS Studio.
4. (Optional) To generate SAS variable names from the data values in the first row of the worksheet, select **Generate SAS variable names**. If a data value in the first row in the input file is read and it contains special characters that are not valid in a SAS name, such as a blank, then SAS converts the character to an underscore.
5. To import the file, click 🏃.

Importing Data in a Process Flow

If you are using the SAS Visual Programmer perspective, you can also import data by using the process flow. You might want to add an import node if the file that you want to import is updated frequently.

To create the import node, drag the filename that you want to import into the process flow.

Here is an example of an import node (called Import as_products.xls) in a process flow. The imported data is then used in the Summary Statistics task.

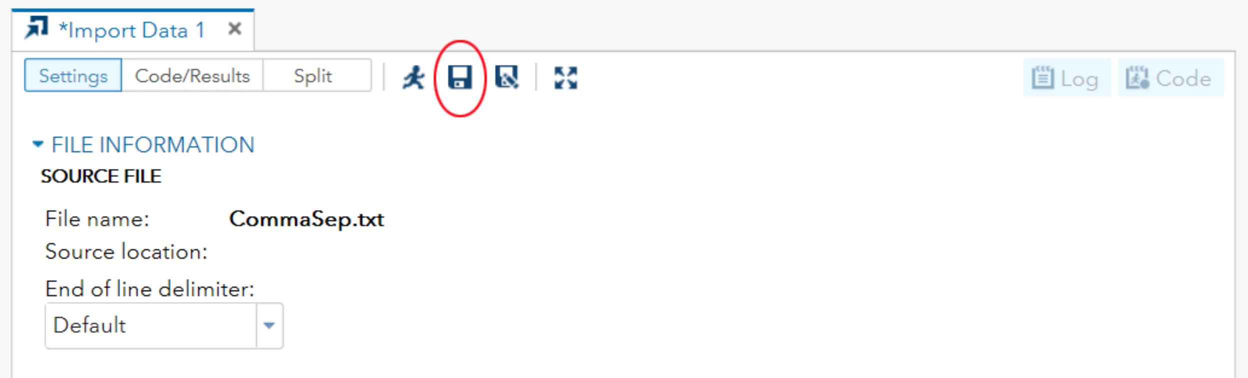


Save the Import Task

You might want to save an instance of the Import Data tool so that you can share these settings for importing a specific file with others at your site. SAS Studio saves these instances as a CTL file. CTL files must be run in the same operating environment where they were created. For example, if you create a CTL file using Windows, this CTL file must be run in Windows.

To save the import task:

1. Click 🖫.



File name: CommaSep.txt
Source location:
End of line delimiter:
Default

2. In the Save As window, specify the name and location, and then click **Save**. The file is saved with a CTL extension.

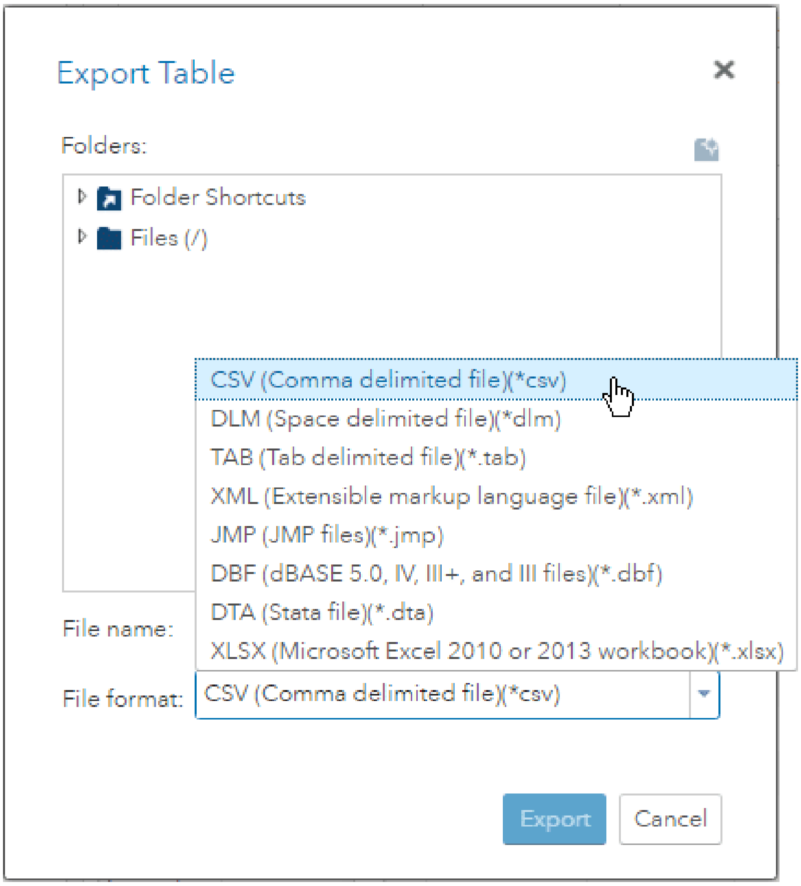
Exporting Data

You can use SAS Studio to export your data as another file type to a folder that you specify.

Note: You cannot export your data to an FTP folder.

To export your data:

1. Click **Libraries** in the navigation pane and browse to find the file that you want to export.
2. Right-click the file that you want to export and select **Export**. The Export Table window opens.
3. Select the folder in which you want to save the exported file.
4. In the **Filename** box, enter the name of the exported file.
5. From the **File format** drop-down list, select the format of the exported file.



Export Table
×
Folders:
Folder Shortcuts
Files (/)
CSV (Comma delimited file)(*csv)
DLM (Space delimited file)(*dlm)
TAB (Tab delimited file)(*.tab)
XML (Extensible markup language file)(*.xml)
JMP (JMP files)(*.jmp)
DBF (dBASE 5.0, IV, III+, and III files)(*.dbf)
DTA (Stata file)(*.dta)
XLSX (Microsoft Excel 2010 or 2013 workbook)(*.xlsx)
File name:
Export
Cancel

File format: CSV (Comma delimited file)(*csv)

6. Click **Export** to export the file.

Chapter 6
Working with Results

Viewing Results

When you run a task or a program in SAS Studio, the results are displayed in the work area. Here are ways that you can manage your results:

- Generate HTML5, PDF, and RTF output by default, and view the HTML5 output on the **Results** tab.
- Download your generated output. There is a download button for each of the three default output types.
- Change the default output style for each destination by using the Preferences window.
- Send results to another user.

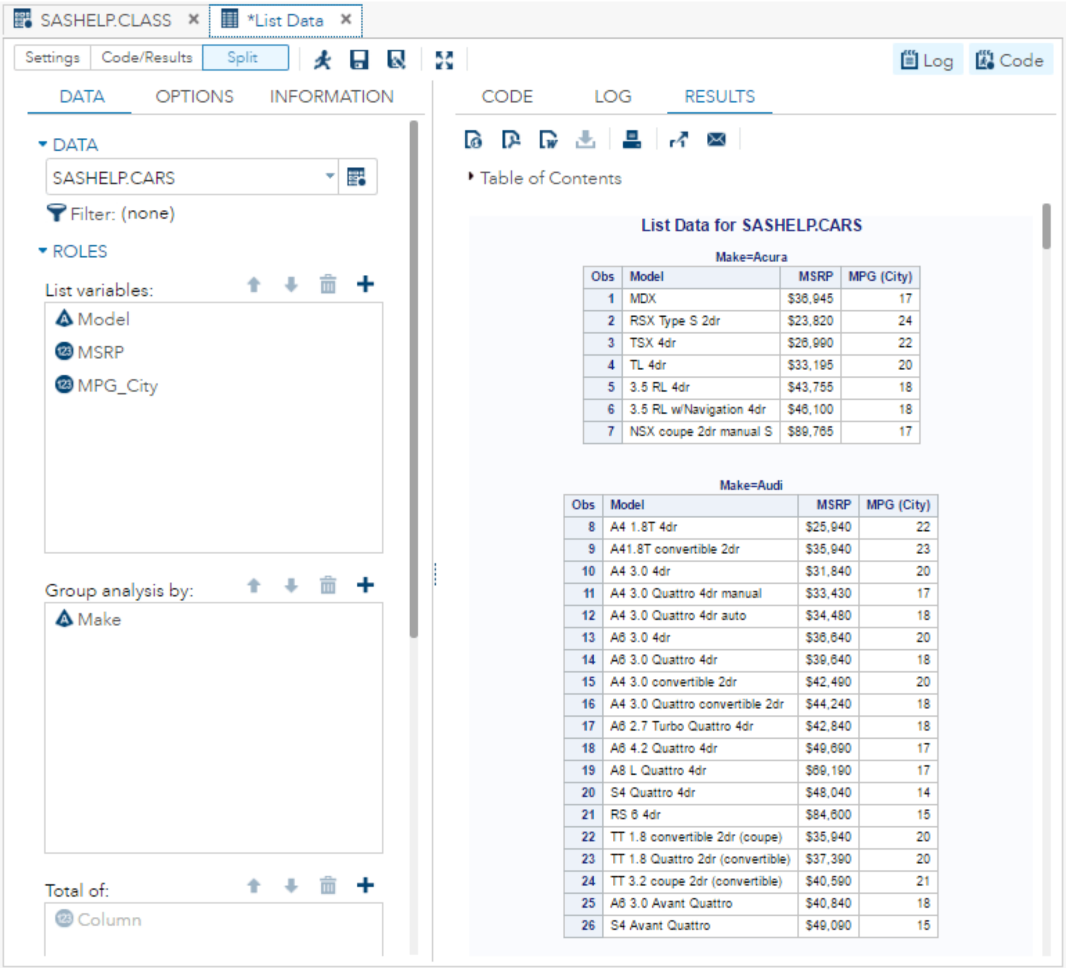
Default SAS Studio Output

Viewing Default Results

In SAS Studio, by default, output is generated in the HTML5, PDF, and RTF formats.

If you want to change the default output, you can use the Preferences window to disable results in PDF or RTF format. You can also change the default style for your output to any of the ODS styles that are available. For more information, see "Setting the Result Preferences" on page 116.

By default, the HTML5 results are the only results that are displayed on the **Results** tab.



DATA

SASHELP.CARS

Filter: (none)

ROLES

List variables:
- Model
- MSRP
- MPG_City

Group analysis by:
- Make

Total of:
- Column

List Data for SASHELP.CARS

Make=Acura

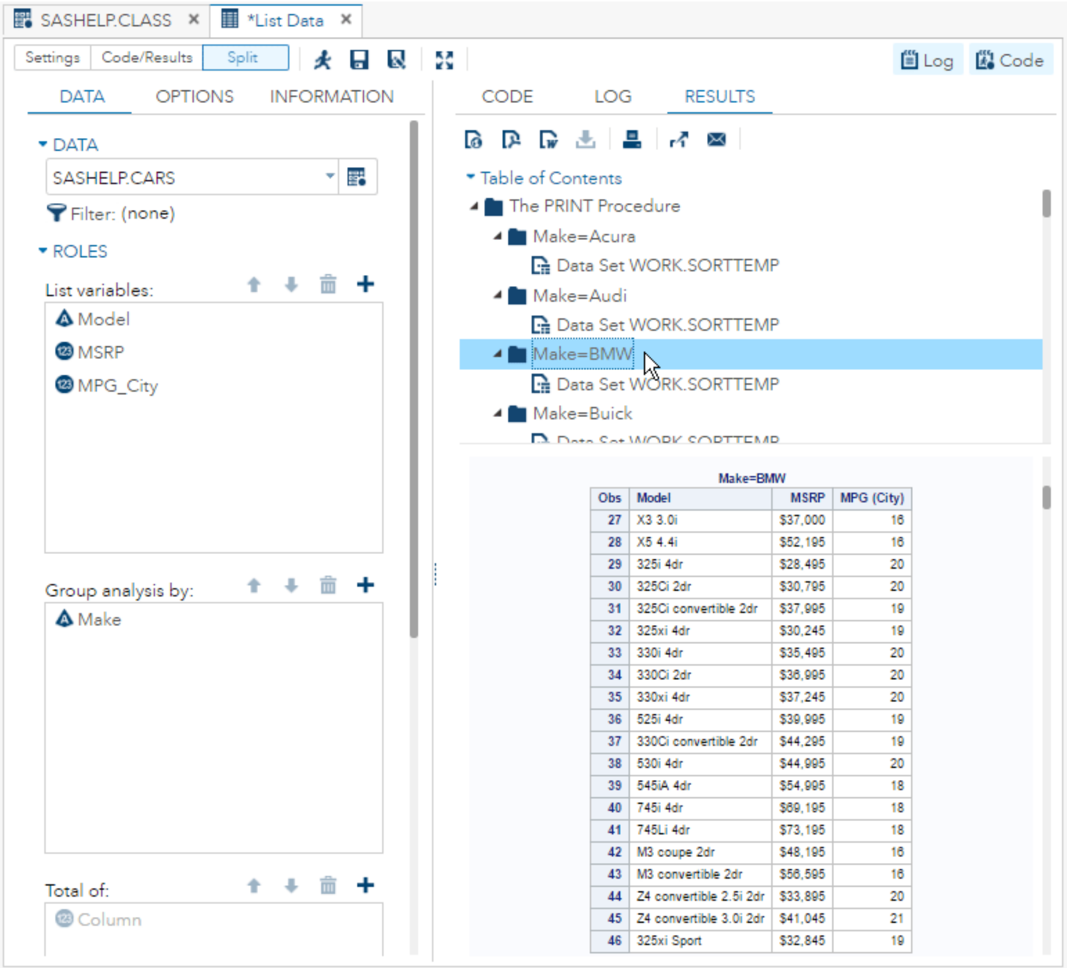
Obs	Model	MSRP	MPG (City)
1	MDX	$36,945	17
2	RSX Type S 2dr	$23,820	24
3	TSX 4dr	$26,990	22
4	TL 4dr	$33,195	20
5	3.5 RL 4dr	$43,755	18
6	3.5 RL w/Navigation 4dr	$46,100	18
7	NSX coupe 2dr manual S	$89,765	17

Make=Audi

Obs	Model	MSRP	MPG (City)
8	A4 1.8T 4dr	$25,940	22
9	A41.8T convertible 2dr	$35,940	23
10	A4 3.0 4dr	$31,840	20
11	A4 3.0 Quattro 4dr manual	$33,430	17
12	A4 3.0 Quattro 4dr auto	$34,480	18
13	A6 3.0 4dr	$36,640	20
14	A6 3.0 Quattro 4dr	$39,640	18
15	A4 3.0 convertible 2dr	$42,490	20
16	A4 3.0 Quattro convertible 2dr	$44,240	18
17	A6 2.7 Turbo Quattro 4dr	$42,840	18
18	A6 4.2 Quattro 4dr	$49,690	17
19	A8 L Quattro 4dr	$69,190	17
20	S4 Quattro 4dr	$48,040	14
21	RS 6 4dr	$84,600	15
22	TT 1.8 convertible 2dr (coupe)	$35,940	20
23	TT 1.8 Quattro 2dr (convertible)	$37,390	20
24	TT 3.2 coupe 2dr (convertible)	$40,590	21
25	A6 3.0 Avant Quattro	$40,840	18
26	S4 Avant Quattro	$49,090	15

The PDF and RTF output is generated but is not displayed.

When you view your results, you can use the table of contents to navigate through the different sections. Click **Table of Contents** at the top of your results, and then click the section that you want to navigate to.



DATA

SASHELP.CARS

Filter: (none)

ROLES

List variables:

- Model
- MSRP
- MPG_City

Group analysis by:

- Make

Total of:

- Column

Table of Contents

- The PRINT Procedure
  - Make=Acura
    - Data Set WORK.SORTTEMP
  - Make=Audi
    - Data Set WORK.SORTTEMP
  - Make=BMW
    - Data Set WORK.SORTTEMP
  - Make=Buick
    - Data Set WORK.SORTTEMP

Make=BMW

Obs	Model	MSRP	MPG (City)
27	X3 3.0i	$37,000	16
28	X5 4.4i	$52,195	16
29	325i 4dr	$28,495	20
30	325Ci 2dr	$30,795	20
31	325Ci convertible 2dr	$37,995	19
32	325xi 4dr	$30,245	19
33	330i 4dr	$35,495	20
34	330Ci 2dr	$36,995	20
35	330xi 4dr	$37,245	20
36	525i 4dr	$39,995	19
37	330Ci convertible 2dr	$44,295	19
38	530i 4dr	$44,995	20
39	545iA 4dr	$54,995	18
40	745i 4dr	$69,195	18
41	745Li 4dr	$73,195	18
42	M3 coupe 2dr	$48,195	16
43	M3 convertible 2dr	$56,595	16
44	Z4 convertible 2.5i 2dr	$33,895	20
45	Z4 convertible 3.0i 2dr	$41,045	21
46	325xi Sport	$32,845	19

Downloading Default HTML5, PDF, and RTF Results from SAS Studio

If you want to save results from SAS Studio, you can download your results in the HTML5, PDF, or RTF output formats and save them or open them in the default application for that format:

- HTML5 file
- PDF file
- RTF file

Downloading Generated Data

You can download results that were generated as other types of data, such as a .cvs, .pptx, or .xml file, by clicking

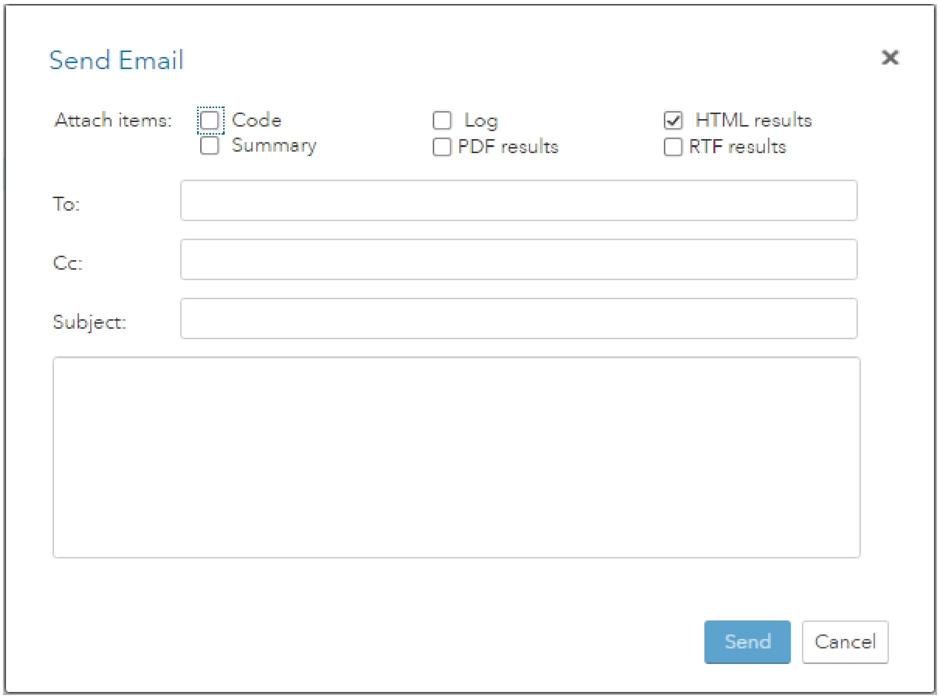
Sending Your Results to Another User

You can send a copy of your results and the associated code and log files to another user through electronic mail. Files that you can send include results in HTML5, RTF, and PDF formats as well as the code and log files that are associated with the results. You can also send a Program Summary file, which includes information about the program execution, the complete SAS source code, the complete SAS log, and the results. The code is sent as a SAS program file, and the log and program summary files are sent as HTML5 files. To send files through email, you need access to an SMTP server. For more information, contact your site administrator.

Note: If your SAS Studio email messages are being marked as junk mail, see *SAS Studio: Administrator's Guide* for information about your configuration file.

To send results by email:

1. On the toolbar for your results, click ✉. The Send Email window appears.



Send Email

Attach items: □ Code □ Summary □ Log □ PDF results ☑ HTML results □ RTF results

To:

Cc:

Subject:

2. Select the items that you want to include as attachments to your email. By default, the HTML results are selected.

3. In the **To** box, enter the email addresses to which you want to send the files. Separate addresses with a semicolon.

4. If you want to send a copy of the email to another address, enter the address in the **Cc** box.

5. In the **Subject** box, enter a subject for the email. You can also add a message to include in the body of the email.

6. Click **Send** to send the message and attachments.

About the SAS Output Delivery System

The SAS Output Delivery System (ODS) gives you greater flexibility in generating, storing, and reproducing SAS procedure and DATA step output along with a wide range of formatting options. ODS provides formatting functionality that is not available when using individual procedures or the DATA step without ODS.

SAS Studio uses very specific ODS options and the GOPTIONS statements so that the output is displayed properly in the web environment. To view all of the ODS options in your code, click ☰ and select **Preferences**. In the Preferences window, click **General** and select the **Show generated code in the SAS log** option.

Note: To ensure that your output is displayed properly, do not change the settings of the ODS options or GOPTIONS statements in the generated code.

About SAS ODS Statistical Graphics

About SAS ODS Statistical Graphics

SAS ODS Statistical Graphics, more commonly referred to as SAS ODS Graphics, is an extension of the SAS Output Delivery System (ODS). ODS manages all output that is created by procedures and enables you to display the output in a variety of forms, including HTML and PDF.

Many SAS analytical procedures use ODS Graphics functionality to produce graphs. ODS Graphics uses the Graph Template Language (GTL) syntax, which provides the power and flexibility to create many complex graphs. The GTL is a comprehensive language for defining statistical graphics.

In SAS Studio, you can use the ODS Graphics Designer to define these statistical graphics without knowing the GTL. After a graph definition is created, you can use that graph definition to create an ODS statistical graph in SAS Studio.

SAS ODS Graphics Designer

What Is the SAS ODS Graphics Designer?

The SAS ODS Graphics Designer is an interactive graphical application that you can use to create and design custom graphs. The designer creates graphs that are based on the Graph Template Language (GTL), which is the same language that is used by SAS analytical procedures and SAS ODS Graphics procedures. The ODS Graphics Designer provides a graphical user interface so that you can design graphs easily without knowing the details of templates and the GTL.

Using point-and-click interaction, you can create simple or complex graphical views of data for analysis. The ODS Graphics Designer enables you to design sophisticated graphs by using a wide array of plot types. You can design multi-cell graphs, classification panels, and scatter plot matrices. Your graphs can have titles, footnotes, legends, and other graphics elements. You can save the results as an image for inclusion in a report or as an ODS Graphics Designer file (SGD) that you can later edit.

For more information, see *SAS ODS Graphics Designer: User's Guide*, which is available from support.sas.com.

How to Install the SAS ODS Graphics Designer

If you have SAS Foundation installed on your machine, the SAS ODS Graphics Designer is already available. For example, if you are using the single-user edition of SAS Studio, the SAS ODS Graphics Designer is already installed because you are running SAS Foundation and SAS Studio on the same machine.

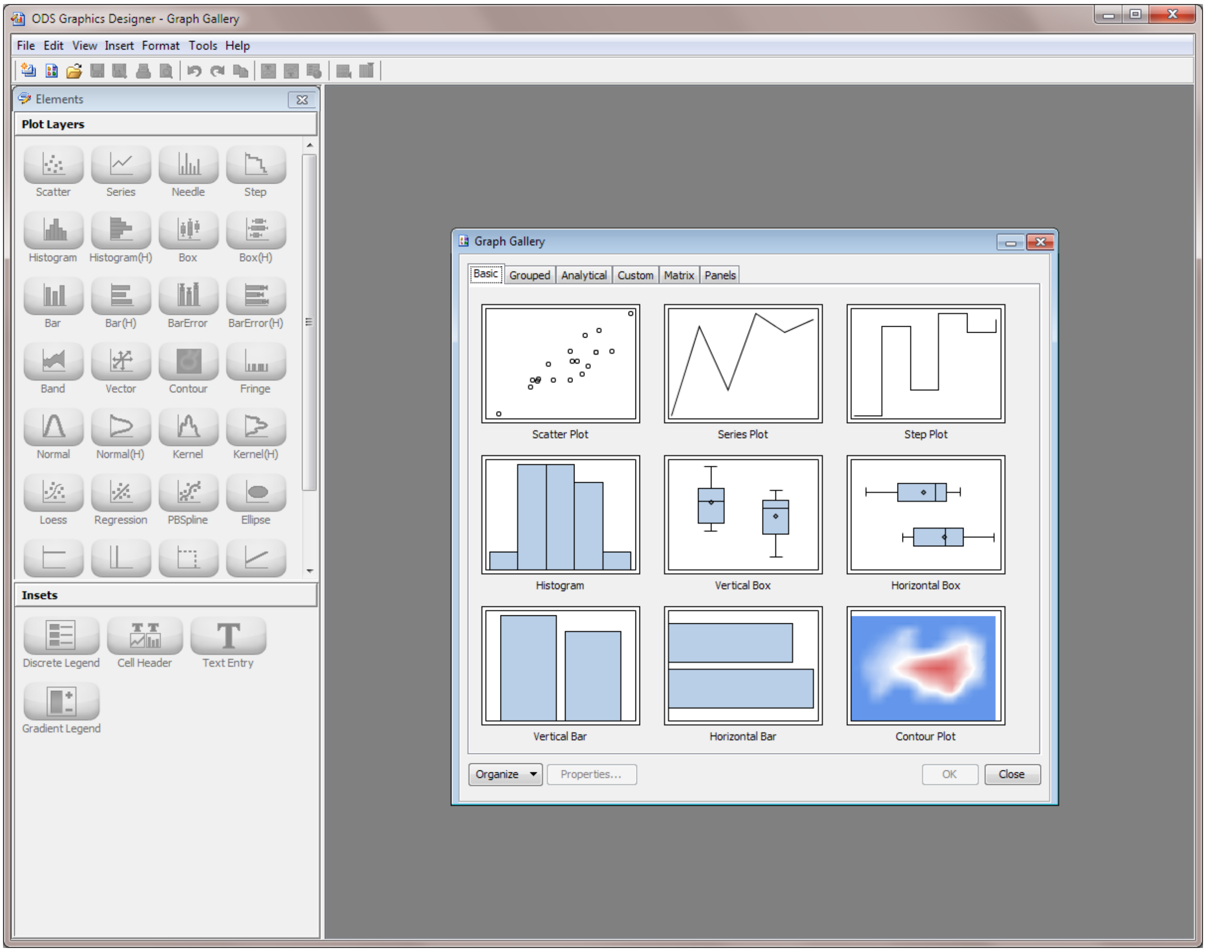
Note: Only the Windows version of the SAS ODS Graphics Designer is supported when you are running SAS Studio. The SAS ODS Graphics Designer must be installed on the same machine as the browser that you are using to access SAS Studio. (SAS Studio might be installed on a different machine.) If multiple users are accessing SAS Studio and these users are on different machines, SAS ODS Graphics Designer must be installed on each user's machine.

To install the SAS ODS Graphics Designer:

1. Click ☰. Select **Tools** ⇨ **Install ODS Graphics Designer**. The software page for SAS Studio opens.
2. In the right navigation pane under the **Software Downloads** heading, click **SAS ODS Graphics Designer**. The downloads page for SAS ODS Graphics Designer opens.
3. From the table, click the link in the **Request download** column for your operating environment and follow the subsequent installation steps.

Open the SAS ODS Graphics Designer

After the SAS ODS Graphics Designer is installed, you can open it by using a menu option in SAS Studio. To open SAS ODS Graphics Designer, click ☰. Then select **Tools** ⇨ **ODS Graphics Designer**.



SAS ODS Graphics Editor

What Is the SAS ODS Graphics Editor?

The ODS Graphics Editor enables you to edit the various elements in the output graph while keeping the underlying data unchanged. In addition, you can annotate a graph by inserting text, lines, arrows, images, and other items in a layer above the graph. You can save the results of your customization as an ODS Graphics Editor (SGE) file and make incremental changes to the file. You can also save the results as a Portable Network Graphics (PNG) image file for inclusion in other documents.

For more information about the SAS ODS Graphics Editor, see *SAS ODS Graphics Editor: User's Guide*, which is available from support.sas.com.

How to Install the SAS ODS Graphics Editor

Note: If you are running the single-user edition of SAS Studio, then the SAS ODS Graphics Editor is already installed.

To install the SAS ODS Graphics Editor:

1. Click ☰. Then select **Tools** ⇨ **Install ODS Graphics Editor**. The software page for SAS Studio opens.
2. In the right navigation pane under the **Software Downloads** heading, click **SAS ODS Graphics Editor**. The downloads page for SAS ODS Graphics Editor opens.

3. From the table, click the link in the **Request download** column for your operating environment and follow the subsequent installation steps.

How to Edit Your Graphics Output

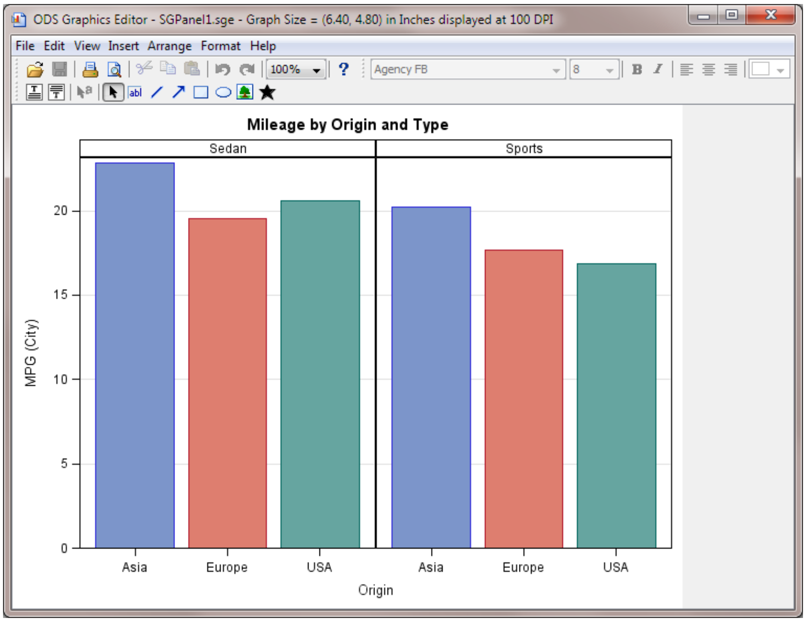
1. Include this statement in your SAS code so that you can edit your graphics output:

   ```
   ods listing sge=on gpath="directory-path";
   ```

   When you run this program, the graphical output is saved as an SGE file in the directory specified by the GPATH= option.

2. In the **Server Files and Folders** section of the navigation pane, double-click the filename (with SGE extension) to open the graph in the SAS ODS Graphics Editor.

For example, here is the SGPanel1.sge file in the SAS ODS Graphics Editor.


ODS Graphics Editor - SGPanel1.sge - Graph Size = (6.40, 4.80) in Inches displayed at 100 DPI
File Edit View Insert Arrange Format Help
100%
Agency FB
8
Mileage by Origin and Type
Sedan
Sports
MPG (City)
0
5
10
15
20
Asia
Europe
USA
Asia
Europe
USA
Origin

Chapter 7
Understanding Tasks in SAS Studio

What Is a Task?

A task is an XML and Apache Velocity code file that generates SAS code and formats results for you. Tasks include SAS procedures from simple data listings to complex analytical procedures. SAS Studio is shipped with several predefined tasks. The tasks are organized into categories.

Note: Some categories and their tasks might not be available at your site because you do not have the required SAS product. For example, if you do not have SAS/ETS installed, then the Econometrics category is not available.

This table lists the task categories and their product dependencies.

Task Category in SAS Studio	Required SAS Product
Data	Base SAS
Graph	Base SAS
Combinatorics and Probability	Base SAS
Statistics	SAS/STAT
High-Performance Statistics	SAS/STAT
Power and Sample Size	SAS/STAT

Task Category in SAS Studio	Required SAS Product
Multivariate Analysis	SAS/STAT
Cluster Analysis	SAS/STAT
Econometrics	SAS/ETS
Forecasting	SAS/ETS
Statistical Process Control	SAS/QC
Data Mining	SAS Enterprise Miner
Network Optimization	SAS/OR
SAS Viya Prepare and Explore	SAS 9.4M5, SAS Visual Statistics
SAS Viya Unsupervised Learning	SAS 9.4M5, SAS Visual Data Mining and Machine Learning
SAS Viya Supervised Learning	SAS 9.4M5, SAS Viya, SAS Visual Statistics, SAS Visual Data Mining and Machine Learning
SAS Viya Evaluate and Implement	SAS 9.4M5, SAS Visual Data Mining and Machine Learning, SAS Optimization
SAS Viya Network Analysis and Optimization	SAS/OR, SAS Optimization
SAS Viya Econometrics	SAS 9.4M5, SAS Econometrics Procedures

Note: Included in your SAS 9.4M5 order are procedures that enable you to take advantage of additional functionality that is provided by SAS Viya. You must have a SAS Viya license to run the SAS Studio tasks for these products:

- SAS Econometrics Procedures
- SAS Visual Data Mining and Machine Learning Procedures
- SAS Visual Statistics Procedures

For more information about the SAS Studio tasks, see *SAS Studio: Task Reference Guide*.

You can edit a copy of these predefined tasks in order to customize the tasks for your site. You can also build your own tasks.

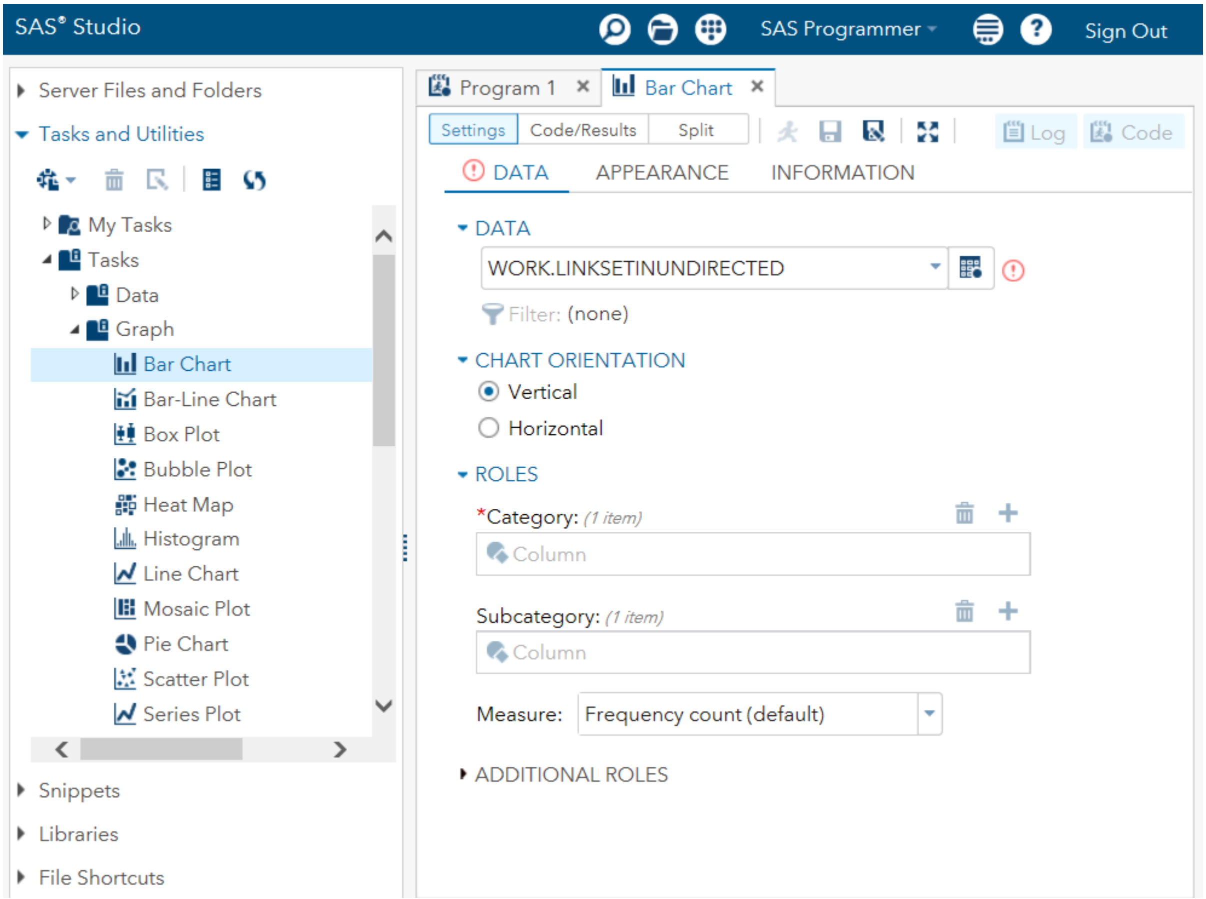
How to Run a Task

To run a predefined task:

1. In the navigation pane, click the **Tasks and Utilities** section.

2. Expand the folder that contains the task.
3. Right-click the task name and select **Open**. Alternatively, you can double-click the task to open it.

   The task opens to the right of the work area.



DATA

WORK.LINKSETINUNDIRECTED

Filter: (none)

CHART ORIENTATION

● Vertical

○ Horizontal

ROLES

*Category: *(1 item)*

Column

Subcategory: *(1 item)*

Column

Measure: Frequency count (default)

4. If the **Data** tab is available, specify an input data source and select columns for the roles in the data source. A role is a description of a variable's purpose in the task. To add a column to a role, click +. A list of available columns for that role appears. If only one column can be assigned to the role, you select a column and the list disappears. If multiple columns can be assigned, you can press Ctrl or Shift to select multiple columns from the list and click **OK**.
5. On the remaining tabs, specify any other required options, which are denoted with a red asterisk. As you assign values to the task, the relevant SAS code is generated. For more information about the options available for each task, see *SAS Studio: Task Reference Guide*.
6. To run the task, click 🏃.

If the task generates output data, the table opens in the **Output Data** tab.

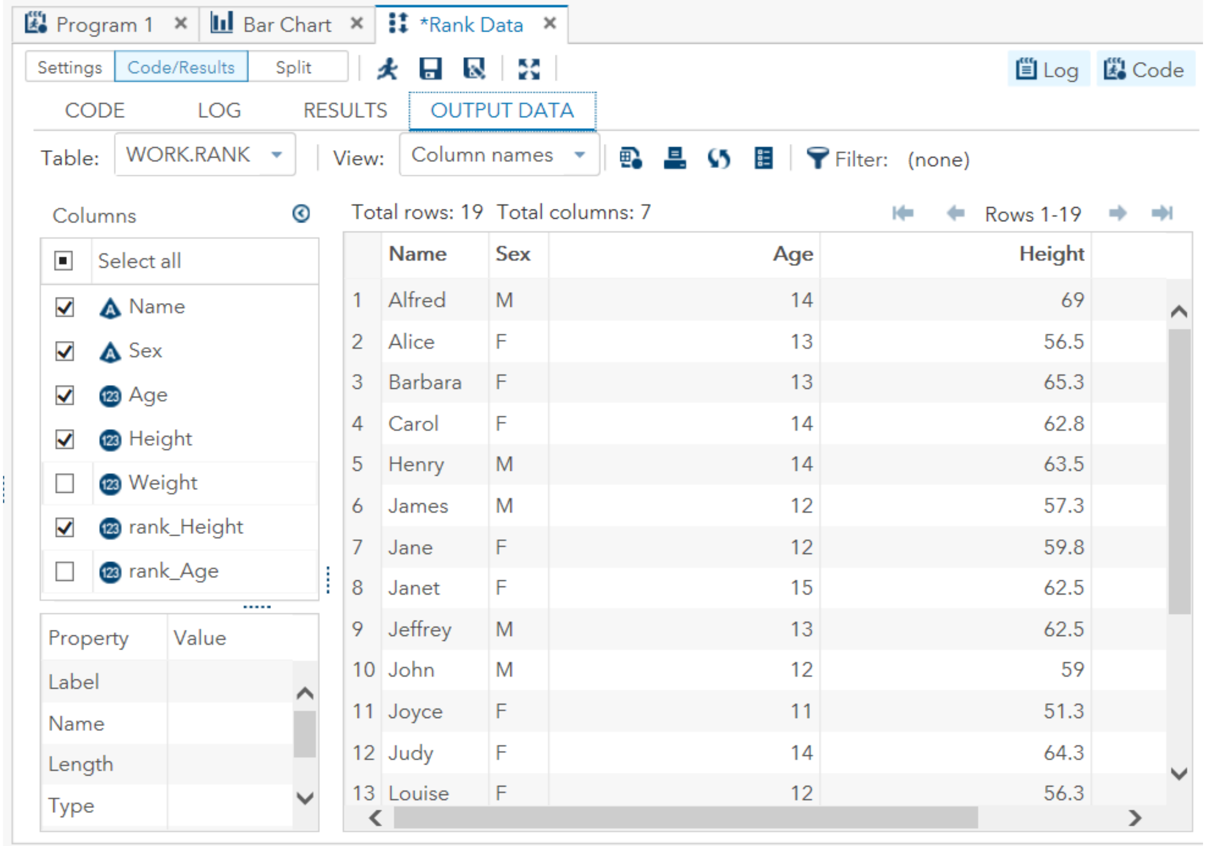


Table: WORK.RANK

View: Column names

Filter: (none)

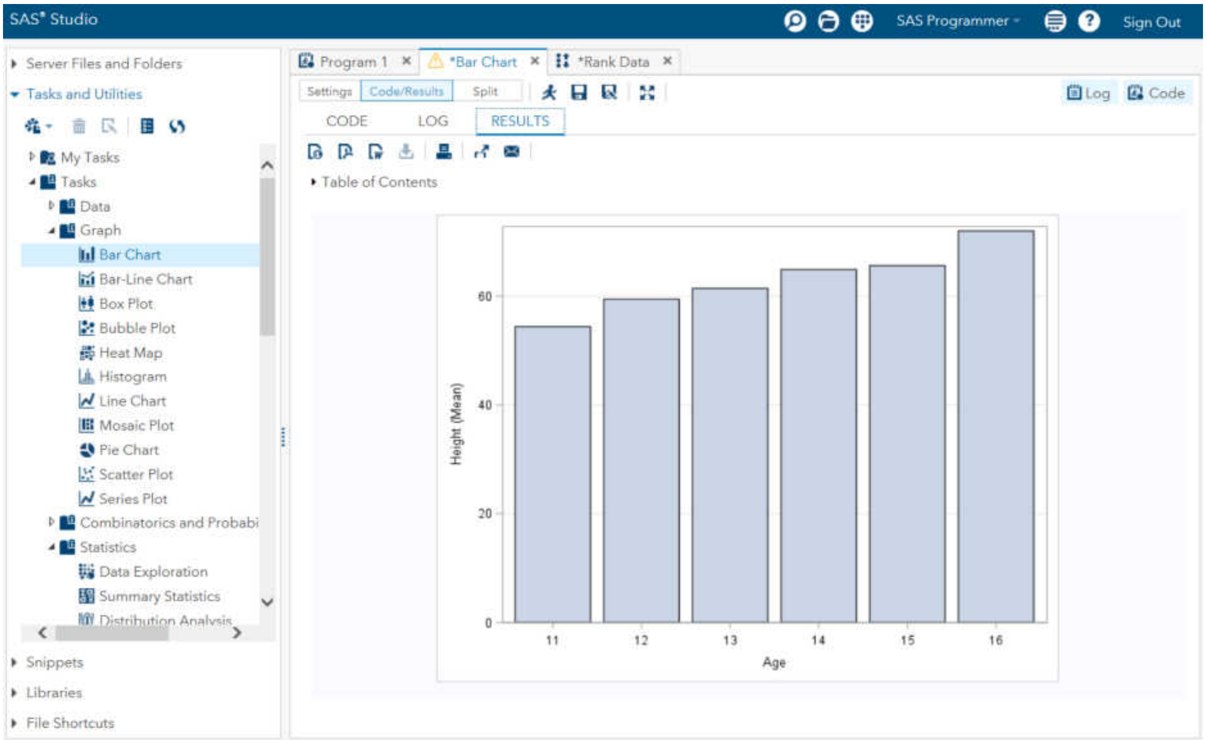
Columns

- ■ Select all
- ☑ Name
- ☑ Sex
- ☑ Age
- ☑ Height
- □ Weight
- ☑ rank_Height
- □ rank_Age

Total rows: 19 Total columns: 7 Rows 1-19

	Name	Sex	Age	Height
1	Alfred	M	14	69
2	Alice	F	13	56.5
3	Barbara	F	13	65.3
4	Carol	F	14	62.8
5	Henry	M	14	63.5
6	James	M	12	57.3
7	Jane	F	12	59.8
8	Janet	F	15	62.5
9	Jeffrey	M	13	62.5
10	John	M	12	59
11	Joyce	F	11	51.3
12	Judy	F	14	64.3
13	Louise	F	12	56.3

If the task generates results, the output appears on the **Results** tab.



Save a Task and Its Option Settings

If you use a task frequently, you might want to save the task after you specify the input data source and the option settings. In SAS Studio, you can save a task as a CTK file on the server or in your **My Tasks** folder. The next time you need to run the task, double-click the task in the navigation pane, and the task appears with all of your previous settings.

Note: Before you can save a task, you must specify an input data set and all the options that are required to run the task.

To save a task:

1. Click . The Save As window appears.
2. Select the location where you want to save the task file. You can save this file in the **Server Files and Folders** section or in your **My Tasks** folder. Specify a name for this file. For the file type, select **CTK Files (*.CTK)**. Click **Save**.

Note: When you save a task as a CTK file, the task is no longer attached to a corresponding task in the **Tasks and Utilities** section. For example, if you run the Bar Chart task that is available in the **Tasks and Utilities** section, no changes are made to the Bar Chart.ctk file in the **Server Files and Folders** section.

Edit a Predefined Task

To customize the predefined tasks for your site, you can edit the XML code that is used to create the task.

To edit a predefined task:

1. In the navigation pane, open the **Tasks and Utilities** section.
2. Expand the folder that contains the task.
3. Right-click the name of the task that you want to edit and select **Add to My Tasks**. The Add to My Tasks window appears.
4. Specify a name and description for the task. By default, the name and description from the predefined task is used. Using the **Category** drop-down list, you can also specify where to save a copy of this task in the **My Tasks** folder. If you select **(none)**, the task is added directly to the **My Tasks** folder.

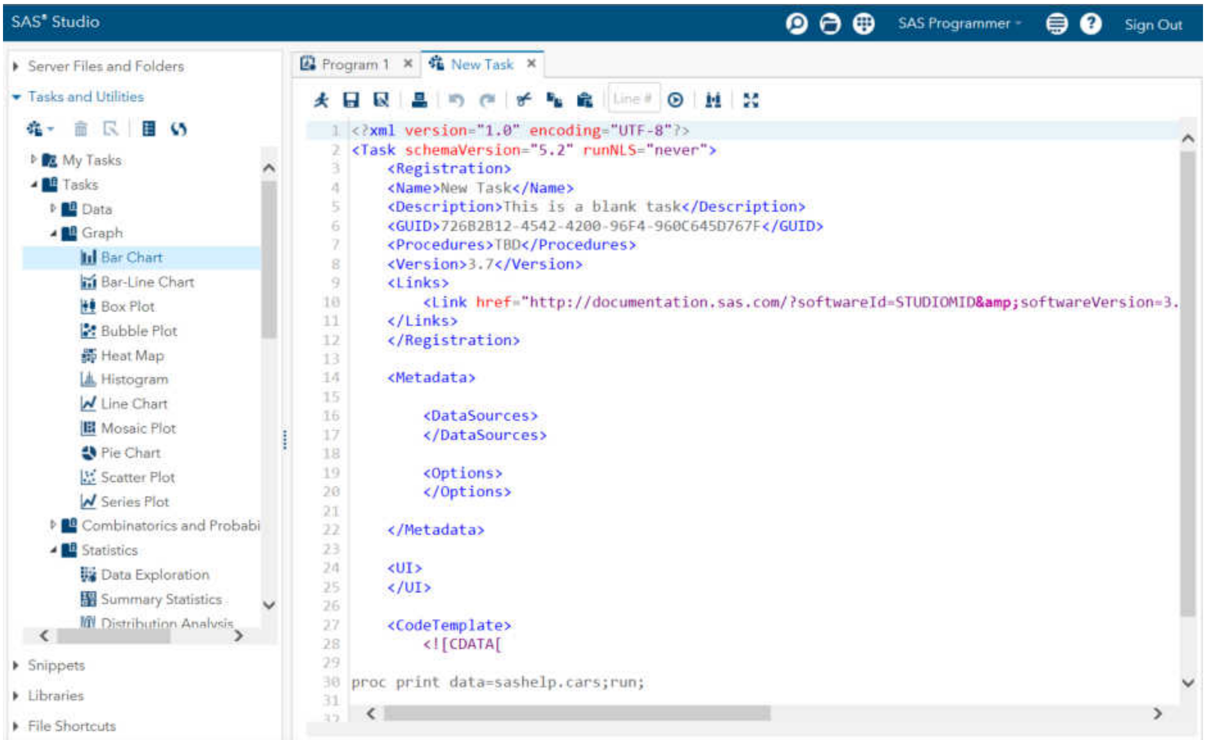
   Click **Add**.
5. Open the **My Tasks** folder and select the copied task.
6. Click . The XML file for the task appears.
7. Edit the XML file and save your changes. To preview your changes, click .

Create a New Task

SAS Studio provides a template that you can use to create custom tasks for your site. For help with writing your first custom task, see *SAS Studio: Writing Your First Custom Task*.

To create a custom task:

1. In the navigation pane, open the **Tasks and Utilities** section.
2. Click and select **New Task**. A blank task template opens.



```
<?xml version="1.0" encoding="UTF-8"?>
<Task schemaVersion="5.2" runNLS="never">
    <Registration>
    <Name>New Task</Name>
    <Description>This is a blank task</Description>
    <GUID>726B2B12-4542-4200-96F4-960C645D767F</GUID>
    <Procedures>TBD</Procedures>
    <Version>3.7</Version>
    <Links>
        <Link href="http://documentation.sas.com/?softwareId=STUDIOMID&amp;softwareVersion=3.
    </Links>
    </Registration>

    <Metadata>

        <DataSources>
        </DataSources>

        <Options>
        </Options>

    </Metadata>

    <UI>
    </UI>

    <CodeTemplate>
        <![CDATA[

proc print data=sashelp.cars;run;
```

3. Edit the code in the task template to create your task. To view the user interface for the task template, click . In the user interface for the task template, you can see examples of radio buttons, check boxes, combination boxes, and other types of options. For more information about this file, see *SAS Studio: Developer's Guide to Writing Custom Tasks*.
4. Click .

   Note: The name of the task cannot include these special characters:

   `[ ] { } , ? / \ * # " % + | < > :`

Customizing the Task Code and the Task Layout in the Workspace

The Preferences window enables you to change several options that affect what and how the task code is displayed.

To access these options, click ☰ and select **Preferences**. Click **Tasks**.

For more information, see “Setting Task Preferences” on page 118.

Appendix 1

Customizing SAS Studio

About Setting Your Preferences

The Preferences window enables you to customize several options in SAS Studio.

To change your preferences, click ☰ and select **Preferences**.

Setting General Preferences

From the **General** page, you can set these options.

Option	Description
Show generated code in the SAS log	displays the ODS statements, %LET statements, and any other code that is automatically generated by SAS in the log file. This option applies to both SAS tasks and SAS program files.

Option	Description
Stream log updates while a procedure is running	displays log updates as a procedure is processed. If you do not select this option, the log is displayed when the procedure has finished running. This option is selected by default and might have a slight effect on performance.
Include a Show Details button in error messages	adds a Show Details button to any error messages that SAS Studio generates.
Size grid columns to content	automatically adjusts the width of the columns in the table viewer to fit the size of the column content.
Start new programs in interactive mode	opens new programs with the interactive mode on. This option is available only if you are running the first maintenance release for SAS 9.4 or later. For more information, see “Working in Interactive Mode” on page 29.
Automatically refresh libraries after each submission	refreshes the Libraries section of the navigation pane after you submit a program, task, or query so that any changes to the libraries are displayed immediately. However, selecting this option can cause you to lose your place in the list of libraries and affect performance. This option is selected by default.
Automatically refresh files and folders after each submission	refreshes the Server Files and Folders section of the navigation pane after you submit a program, task, or query so that any changes to the files and folders are displayed immediately. However, selecting this option can cause you to lose your place in the list of files and folders and affect performance. This option is selected by default.

Option	Description
SAS variable name policy	enables you to specify one of the following sets of rules to apply to SAS variable names. • **ANY** specifies that the variable names can begin with or contain any characters, including blanks, must contain at least one character, and cannot contain any null bytes. Variable names can contain mixed-case letters as well as special and multi-byte characters. Names can be up to 32 bytes in length. This option is selected by default. Leading blanks are preserved, but trailing blanks are ignored. • **V7** specifies that the variable names must begin with a letter of the Latin alphabet (A-Z, a-z) or the underscore character. They cannot contain blanks or special characters except for the underscore and cannot be assigned the names of special SAS automatic variables or variable list names. Variable names can contain mixed-case letters and can be up to 32 bytes in length.
Default text encoding	specifies the character-set encoding that is used when text files are read or written. The default value is UTF-8. This option is not available for SAS servers running on z/OS. For a list of some of the encoding options and the languages that they are associated with, see Appendix 3, " Text Encoding Options and Language Mappings," on page 135. *Note:* You can also specify the text encoding when you open a single file by right-clicking the file and selecting **Open with text encoding**. The Choose Text Encoding window appears and you can select the encoding. This option applies to SAS program files (*.SAS).
Display a message on arrival	Displays a message generated by SAS Studio, such as when background jobs are started and when they are complete or when your SAS Studio session is reset. SAS Studio application errors or warnings are displayed as messages, but SAS program errors and warnings continue to be displayed in SAS log files. You can adjust the number of seconds that the message is displayed. The range of time that a message can be displayed is between 3 seconds and 30 seconds. The default value is 5 seconds.

Option	Description
Capture all log events	Records all diagnostic messages each time you run a program, task, or query. You can view the diagnostic messages by clicking **Messages** in the lower right corner of your SAS Studio browser window. In the Messages window, click the **Filter by** drop-down list and select **Debug**. The debug messages are available in the Messages window only when you have selected this option.

Setting the Start Up Preferences

From the Start Up page, you can specify these options for starting SAS Studio.

On startup	specifies the tabs to be displayed when you start the SAS Studio application. You can choose from these options: • **Open a new program/process flow tab** opens a new program tab in the SAS Programmer perspective and a new process flow tab in the Visual Programmer perspective. • **Continue where you left off** restores the tabs that were open in your prior session of SAS Studio. This option is selected by default.
Time-out interval	specifies the amount of time in hours that SAS Studio allows you to be logged on without any activity. The default value is one hour.

Note: For information about how these options affect the auto-save feature, see "Setting the Editor Preferences" on page 114.

Setting the Editor Preferences

From the **Editor** page, you can specify these options for the code editor.

Option	Description
Enable autocomplete	turns on the autocomplete feature of the code editor. This feature can predict the next keyword that you want to type before you actually type it completely. For more information, see "Using the Autocomplete Feature" on page 21.
Enable hint	displays the syntax help window when you position the mouse pointer over a valid SAS keyword in your program. If this option is not selected, then you can view the syntax help by right-clicking a keyword and selecting **Syntax Help**. This option is not selected by default.
Tab width	displays the number of spaces that are inserted into your text when you insert a tab character. The default value is four spaces for each tab character. *Note:* In Microsoft Internet Explorer and Apple Safari, spaces are used instead of Tab characters. If you are using those browsers, you must select the **Substitute spaces for tabs** check box in order for the value of the tab width to be used.
Substitute spaces for tabs	inserts the number of spaces listed in the **Tab width** box instead of a single tab character. This option applies to both text that you type in the code editor and text that you paste into the code editor.
Enable color coding	displays the text in the code editor in different colors to help you identify different elements in the syntax.
Show line numbers	displays line numbers in the leftmost column of the program and log windows.
Font size	specifies the font size of the text in the code editor and log window.

Option	Description
Enable autosave	automatically creates auto-saved copies of each previously saved program file that you are editing so that you can recover the files if you lose your network connection or your browser closes unexpectedly. *Note:* New program files are not auto-saved until you save them first. The files are saved at the interval specified in the **Autosave Interval** option. The default interval is 30 seconds. *Note:* • The auto-saved file is deleted if you sign out of SAS Studio and click **Yes** when you are prompted about losing unsaved changes. • If you lose your network connection or your browser closes unexpectedly and you have selected the **Open a new program/process flow tab** option in the Start Up preferences, the auto-saved file is saved as ***`filename.sas~`***. You can open the auto-saved file in the code editor and save it. • If you lose your network connection or your browser closes unexpectedly and you have selected the **Continue where you left off** option in the Start Up preferences, you are prompted to open the auto-saved file when you sign back on to SAS Studio. For more information, see "Setting the Start Up Preferences" on page 114.

Setting the Result Preferences

From the **Results** page, you can specify these options.

Option	Description
HTML output style	displays the style that is applied to results in HTML. To change the style that is applied to the results, select another style from the drop-down list.
Generate HTML graphs as SVG	creates SVG graphs instead of PNG graphs in HTML output. SVG graphs maintain clarity when you zoom in and out.

Option	Description
Display warning if results are larger than *n* MB	displays a warning message when you attempt to open a results file that is larger than `n` megabytes (MB). The default value is 3 MB.
Enable accessible graph option	adds accessibility metadata to graphs that are created by ODS Graphics. Users with disabilities will access the accessibility metadata using SAS Graphics Accelerator. This option is available only if you are running SAS 9.4M4 or later. For more information, see the ODS HTML5 Statement in *SAS Output Delivery System: User's Guide*. *Note:* The SAS code that is associated with this option is displayed in the log file only if you have selected the **Show generated code in the SAS log** option in the General preferences.
Produce PDF output	generates results in PDF format. This option is selected by default.
PDF output style	displays the style that is applied to results in PDF. To change the style that is applied to the results, select another style from the drop-down list.
Generate the default table of contents	creates a table of contents in the PDF file.
Enable accessible PDF option	adds accessibility metadata to the PDF file that enables the file to be accessed by assistive technology such as a screen reader. When metadata is added, the file is often called a "tagged PDF" and follows the PDF/Universal Accessibility (PDF/UA) format. This option is available only if you are running SAS 9.4M4 or later. *Note:* The SAS code that is associated with this option is displayed in the log file only if you have selected the **Show generated code in the SAS log** option in the General preferences.
Produce RTF output	generates results in RTF format. This option is selected by default.
RTF output style	displays the style that is applied to results in RTF. To change the style that is applied to the results, select another style from the drop-down list.
Automatically open generated output data	displays the output data that is created when you run a task or submit code. By default, only the first 30 columns are displayed.

Note: If you want to use a custom style, you must customize the SAS Studio output environment. For more information, see Appendix 4, "Customized Output Environment," on page 137.

Setting Task Preferences

From the **Tasks** page, you can set the options for the generated SAS code and the task layout in the SAS Studio workspace.

Option	Description
Trim all leading and trailing spaces in generated code	removes any blank spaces that appear before or after the generated code.
Generate header comments for task code	adds comments before the generated code for a SAS task.
Automatically format generated code	automatically formats any code that is generated by a task and displayed in the code editor.
View	specifies how to lay out the task options, task code, and task results in your workspace. You can choose from these options: • **Split** displays the task settings, the code, and the results for the task. • **Settings** displays only the options for the task in the workspace. • **Code/Results** displays the SAS code, the log, and any results in the workspace.
Show task code	specifies whether to display the SAS code for the task when you select the **Split** view or the **Code/Results** view.
Show task log	specifies whether to display the log that is generated when you run the task. This option is available only if you select the **Split** view or the **Code/Results** view.
Display task settings on right	displays the task option to the right of the SAS Studio workspace. By default, the task options are displayed to the left.

Access Repositories in SAS Studio

Administrators can create global repositories. These repositories are available to everyone at your site. Global repositories are automatically available from the **Tasks and Utilities** and **Snippets** sections when you first open SAS Studio.

If your administrator allows it, you can also set your preferences to access additional repositories. For more information about repositories, see *SAS Studio: Developer's Guide to Repositories*.

Setting Preferences for Background Job Submissions

From the **Background Jobs** page, you can set preferences for background job submissions.

If the background job log or output file already exists

specifies how to handle the background job submission if a log and output file already exist. You can choose from these options:

- **Delete existing log and output** deletes the existing log and output files and replaces them with new files when you resubmit the program as a background job.
- **Fail background job submission** cancels the background job submission. You must delete the existing log and output files and resubmit the program.
- **Prompt for fail or overwrite** displays a message window to confirm that you want to delete or rename the existing log and output files before submitting the background job. If you select **`No`**, the background job submission is canceled. This is the default value.
- **Number log/output** saves all log and output files by creating a unique filename for each file. The log and output files are saved as **_program-name_(_userid_-YYYY-MM-DD HHMMSS)**.

Output and log destination	specifies where to save the output and log files. You can choose from these options: • **Same folder as .sas file** saves the log and output files to the same folder as the .sas code file. • **Use folder** enables you to specify a location in which to save the log and output files. Click **Browse** to search for a folder. • **Prompt for output and log file names** prompts you to specify a location in which to save the log and output files. By default, the log and output are saved in the same location as the .sas code file. Click **Browse** to search for a folder and specify a filename.

You can change the length of time that the background job notification messages are displayed by using the **Display a message on arrival** option on the **General** page of the Preferences window. For more information, see "Setting General Preferences" on page 111.

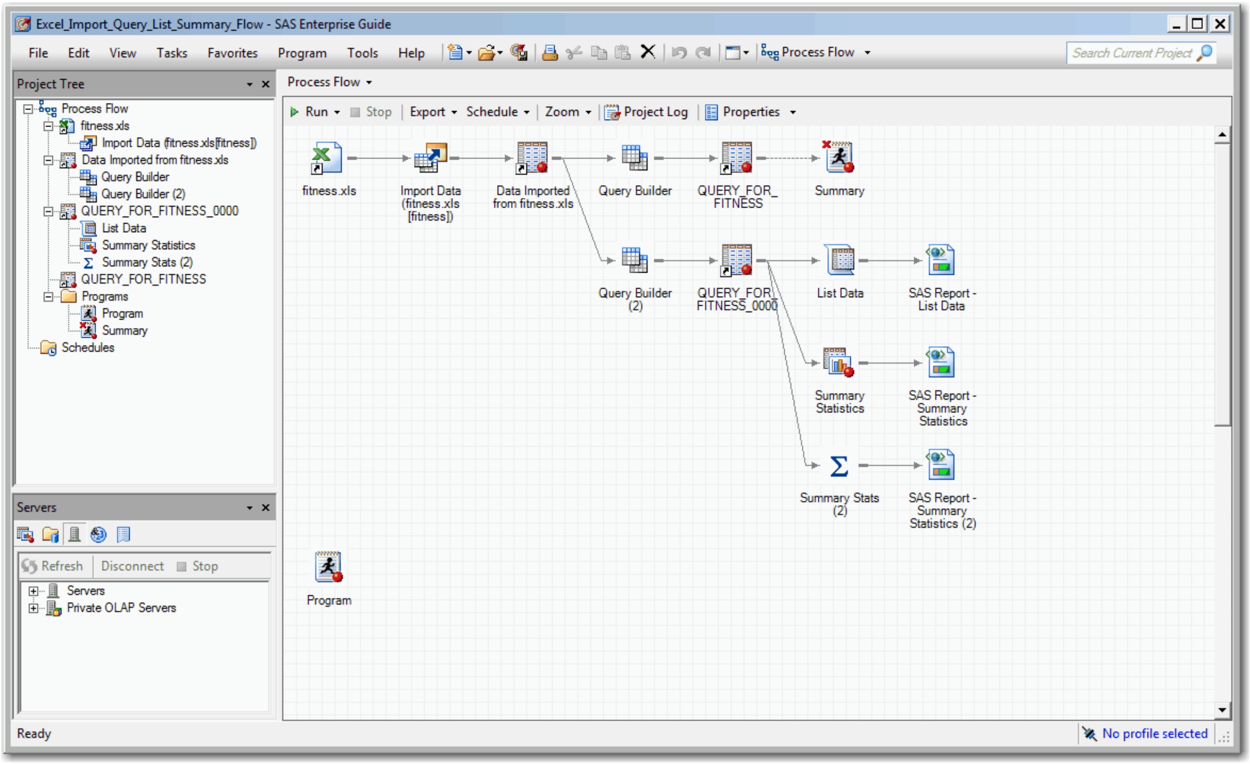
Appendix 2
Converting SAS Enterprise Guide Projects to SAS Studio Process Flows

Opening SAS Enterprise Guide Projects in SAS Studio

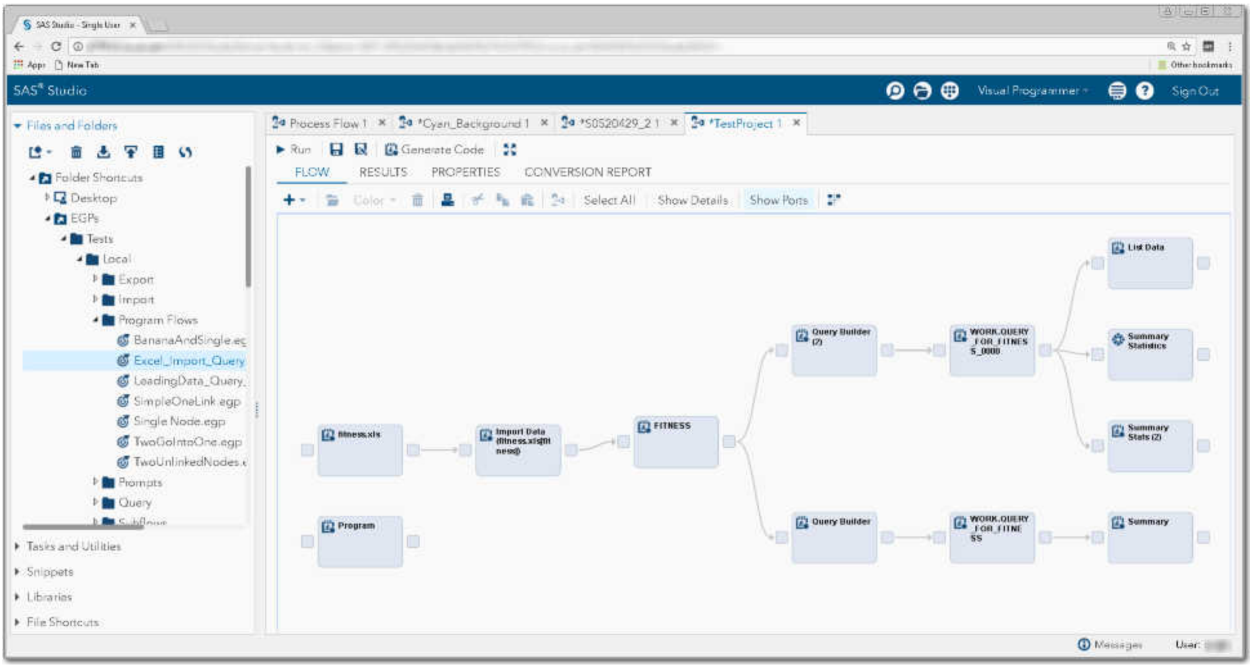
Note: This functionality is available only if your site administrator has set the **`webdms.allowEGPOpen`** property to **`true`**. For more information, see "Configuration Properties for SAS Studio" in *SAS Studio: Administrator's Guide*.

When you open a SAS Enterprise Guide project in SAS Studio, the process flows in the project are extracted and converted to process flows in SAS Studio. Any elements from the SAS Enterprise Guide project that are not supported by SAS Studio are either converted to different node types or are omitted from the process flow. SAS Studio creates a conversion report that lists the status of each node in the SAS Enterprise Guide process flow.

Here is a project in SAS Enterprise Guide.



Here is the converted process flow in SAS Studio.



Your Server Environments Must Match

In SAS Enterprise Guide, a profile defines the connection between SAS Enterprise Guide and a SAS Metadata Server. The SAS Metadata Server contains metadata definitions for objects such as workspace servers, libraries, and users. In SAS Enterprise Guide, only one profile can be active at a time. (If you do not select a profile, you can access only the SAS server installed on your machine. You cannot define libraries or share SAS resources with other SAS applications.)

If the active profile for the current SAS Enterprise Guide session does not match the profile for the project file that you are trying to open, you are prompted to change profiles. Because SAS Enterprise Guide is a desktop application, you can easily access both your local files as well as any SAS Workspace Servers that your SAS Enterprise Guide session is configured to use.

SAS Studio is a web interface that can have only one SAS server configuration at a time. You can access local files from SAS Studio only if you are using the Single-User edition.

- The Enterprise edition of SAS Studio can be configured to use multiple workspace servers that are defined in the SAS Metadata Server, but you can connect to only one workspace server at a time in SAS Studio.
- The Basic edition of SAS Studio can access only the single workspace server that it is configured to use and the file system available to that server.
- The Single-User edition of SAS Studio can access the local file system and the SAS installation on the desktop.

These differences are important to understand when you open a SAS Enterprise Guide project file in SAS Studio. If the environment for the SAS Enterprise Guide project and the environment for SAS Studio do not match, you cannot run the converted process flow in SAS Studio. In addition, you cannot access any nodes within the SAS Enterprise Guide project that are associated with an environment that is not accessible to SAS Studio. The conversion report provides warnings about the mismatches.

Open a SAS Enterprise Guide Project File

To open a SAS Enterprise Guide project in SAS Studio:

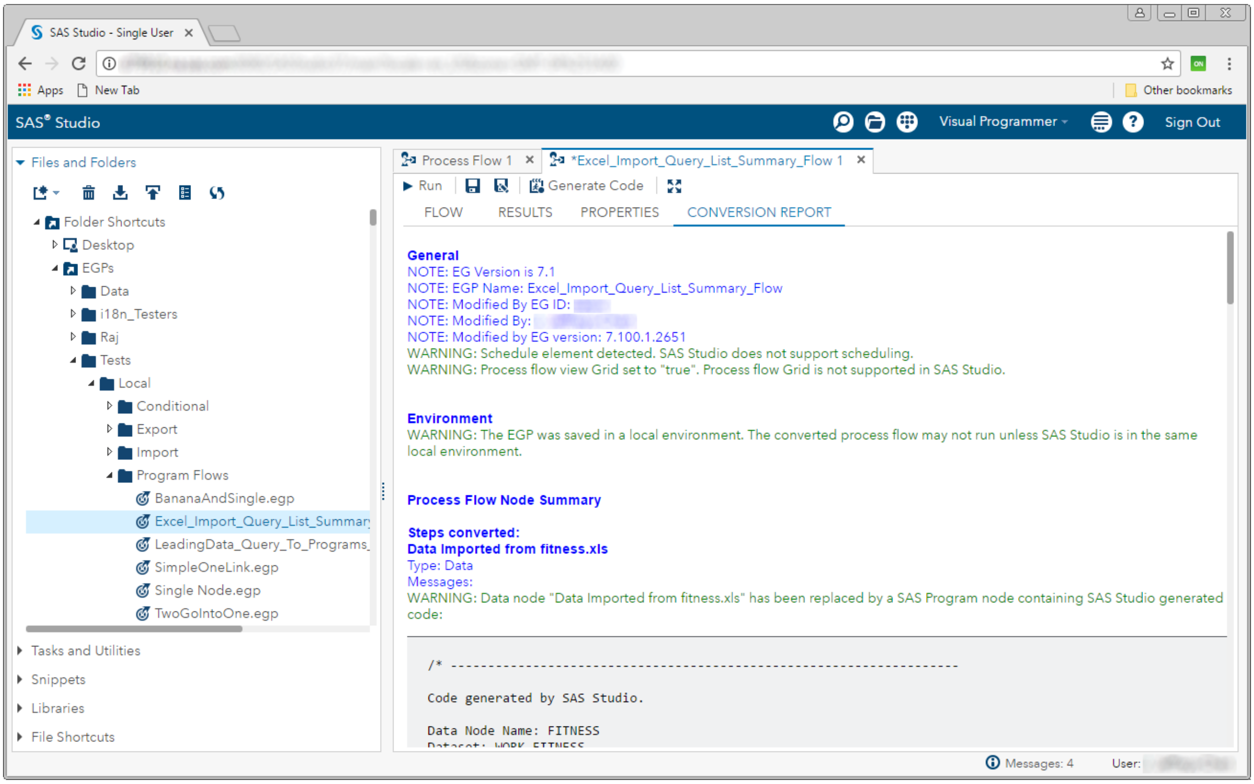
1. Open the Visual Programmer perspective in SAS Studio.
2. In the **Server Files and Folders** section, expand the appropriate folder and double-click the project that you want to open. You could also drag this project file to the SAS Studio workspace.

   Note: Your SAS Enterprise Guide project file must be in a location that can be accessed by SAS Studio. Before opening the project, you might need to move the file to this location.

3. Review any errors or warnings in the conversion report. Errors indicate that the process flow cannot execute as expected. Warnings indicate that the process flow might not execute as expected or might need some user modification to run.
4. To view the process flow in SAS Studio, click the **Flow** tab.

Understanding the Conversion Report

When you open the project file in SAS Studio, the conversion report is displayed. This report lists how each node of the SAS Enterprise Guide process flow was converted and notes any potential problems with the converted SAS Studio process flow.



General
NOTE: EG Version is 7.1
NOTE: EGP Name: Excel_Import_Query_List_Summary_Flow
NOTE: Modified By EG ID: [redacted]
NOTE: Modified By: [redacted]
NOTE: Modified by EG version: 7.100.1.2651
WARNING: Schedule element detected. SAS Studio does not support scheduling.
WARNING: Process flow view Grid set to "true". Process flow Grid is not supported in SAS Studio.

Environment
WARNING: The EGP was saved in a local environment. The converted process flow may not run unless SAS Studio is in the same local environment.

Process Flow Node Summary

Steps converted:
Data Imported from fitness.xls
Type: Data
Messages:
WARNING: Data node "Data Imported from fitness.xls" has been replaced by a SAS Program node containing SAS Studio generated code:

```
/* ------------------------------------------------------------------

Code generated by SAS Studio.

Data Node Name: FITNESS
Dataset: WORK.FITNESS
```

The conversion report includes these sections:

Section Heading	Description
General	This section provides information about the SAS Enterprise Guide project from the project metadata. It might contain warnings about features that are not available in SAS Studio, such as the grid view and zoom features.
Environment	This section provides information about the SAS Enterprise Guide connection environment. The report displays an error message if the SAS server environment is not the same in SAS Studio.
Process Flow Node Summary	This section provides a list of nodes that are included in the converted process flow and a list of nodes that are not included. The lists are in alphabetical order.
Conditions	This section provides a list of conditions from the SAS Enterprise Guide project. Conditional processing is not supported in SAS Studio.

Section Heading	Description
Debug	This section provides debugging information. To include this information, you must select the **Enable logging** option in the **Application Logging** section. (This option is in the Options dialog box in SAS Enterprise Guide.)

Supported Nodes

Assuming that the connection environments are the same for the SAS Enterprise Guide project file and your SAS Studio session, the nodes in the SAS Enterprise Guide process flow should convert as follows:

Program

Program nodes are converted directly to SAS Program nodes in SAS Studio. If the contents of the program node are stored in a file, the file must be available in order for the contents of the file to be read into the converted program node.

SAS Studio Tasks

SAS Studio tasks in SAS Enterprise Guide are converted directly to SAS Studio tasks in SAS Studio. Any options that are specified in SAS Enterprise Guide are included in the converted task in SAS Studio. You can improve the conversion process by updating your project to use SAS Studio tasks where possible rather than SAS Enterprise Guide tasks. For more information, see “Accessing SAS Studio tasks” in the SAS Enterprise Guide Help.

Data

Data nodes in SAS Enterprise Guide are converted to program nodes in SAS Studio. SAS Studio does not currently support data nodes. The converted program node contains SAS code that includes the following information:

- Comments about the data location.
- SAS code that samples the contents of the data. The generated code depends on the type of data in the data node.
  - The first 50 lines of any directly readable text file, including CSV files, fixed-length text files, HTML files, and tab-delimited text files are displayed in the program output.
  - Data nodes that represent Microsoft Excel files do not sample the data. The nodes include only comments about the original Excel file.
  - SAS programs that represent SAS data sets create a view of the rows in the data set. You cannot edit the table or perform any other functions in this view.

SAS Enterprise Guide Tasks

The code that is generated by a SAS Enterprise Guide task is converted to a program node in SAS Studio. This code sometimes includes references to macro variables. For more information about the macro variables that are available in SAS Studio, see "Using Macro Variables" on page 27.

Queries

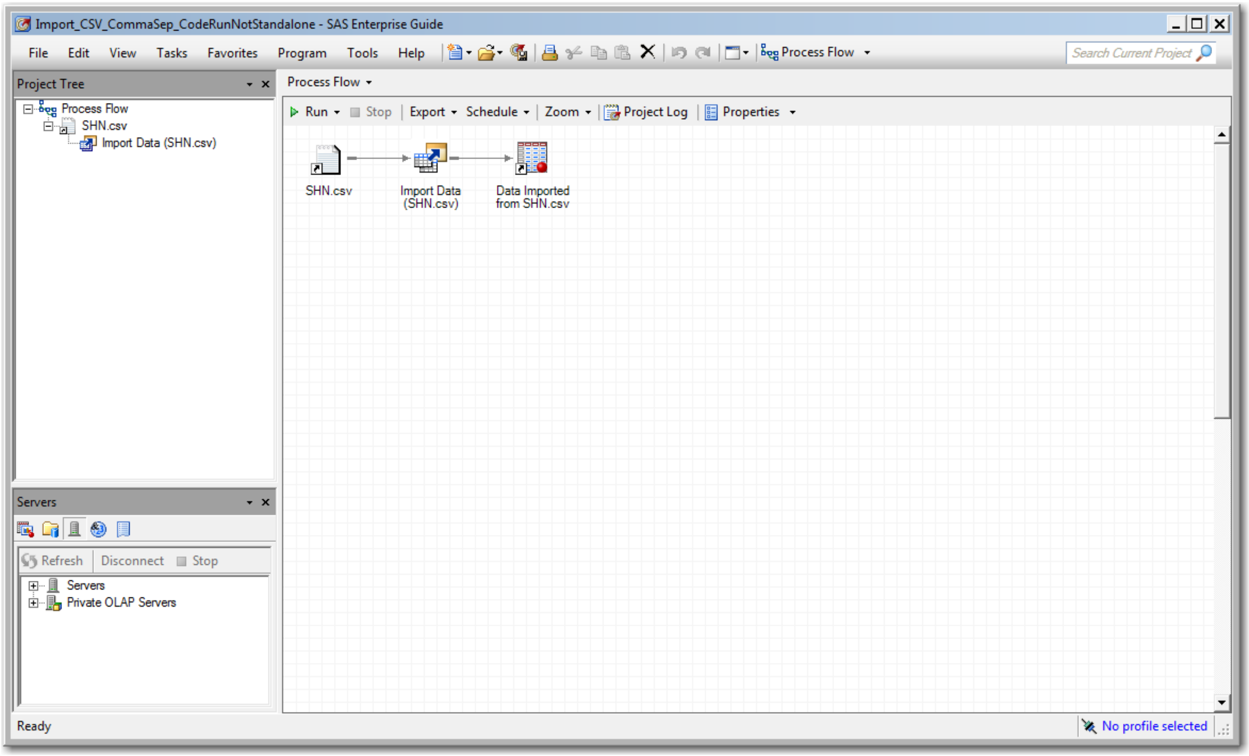
The code that is generated by a SAS Enterprise Guide query is converted to a program node in SAS Studio. This code sometimes includes a reference to the _eg_conditional_dropds macro. This macro is also available in SAS Studio.

Import Data

The Import Data node in SAS Enterprise Guide does not convert directly to an Import Data task node in SAS Studio.

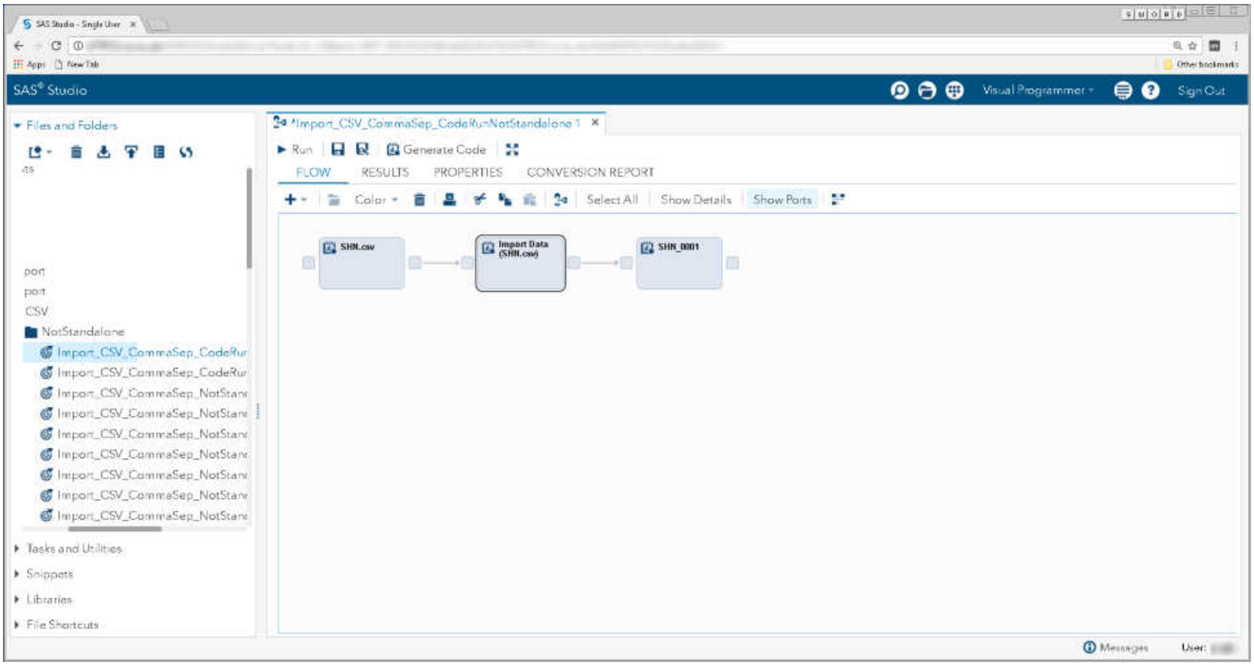
When you import a file in SAS Enterprise Guide, three nodes are created in the SAS Enterprise Guide process flow:

- the input data
- Import Data
- the generated output SAS data set



Here is how these nodes appear in the SAS Studio process flow:

SAS Enterprise Guide Node	SAS Studio Node	Limitations
input data node	program node that samples the file contents	Data nodes that represent Excel files do not sample the data. The nodes include only comments about the original Excel file.
Import Data node	program node that contains the code that is used to create the output SAS data set	Some options in the SAS Enterprise Guide Import Data wizard are not supported in SAS Studio: • SAS Studio does not support importing data from HTML files. • The **Use SAS/ACCESS Interface** option is ignored. The code that is generated by SAS Studio always uses PROC IMPORT to read an Excel file and then a DATA step to format the data appropriately. All other data types are imported using a DATA step. • SAS Studio does not remove characters that cause transmission errors from the automatically generated code.
output SAS data set	program node that samples the output data set	None.



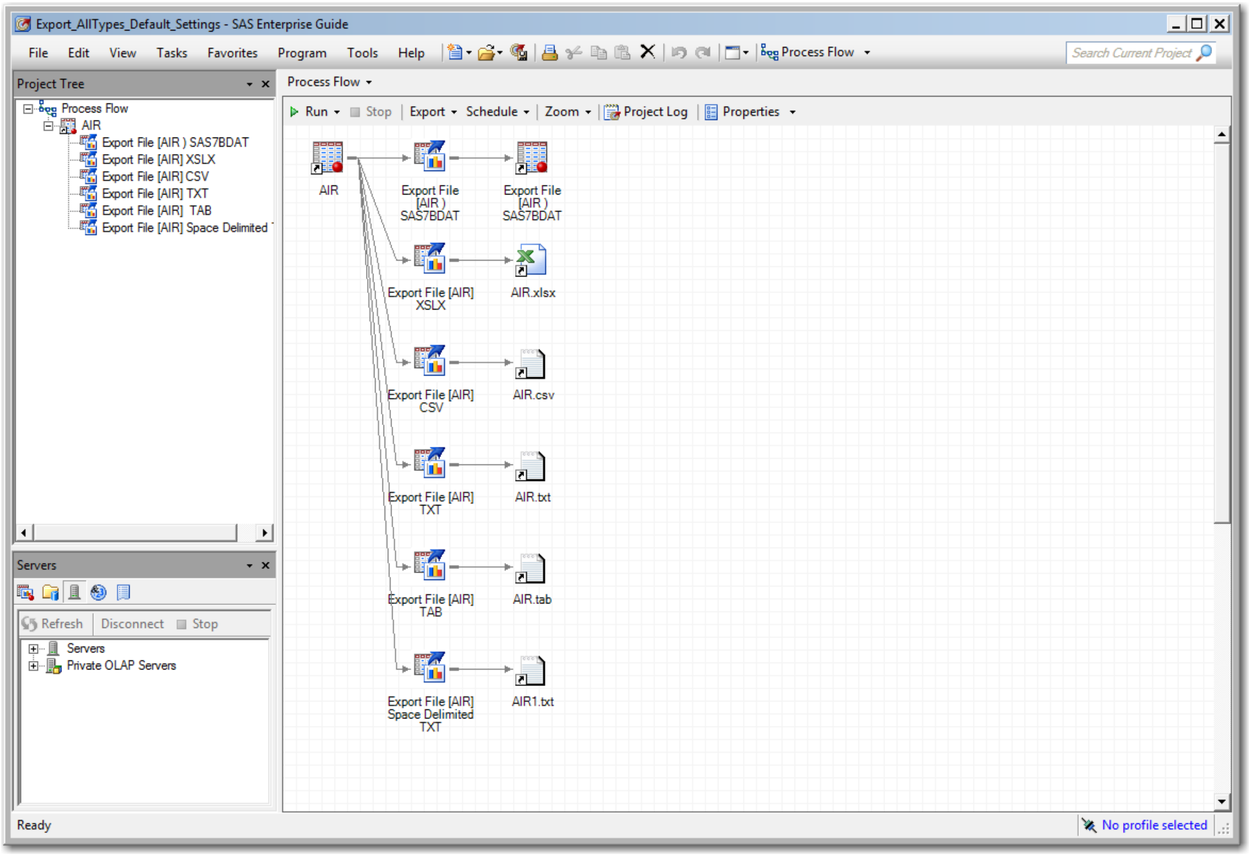
Because the import functionality is different in SAS Enterprise Guide and SAS Studio, you might have to update your import code to make it work exactly the same in SAS Studio.

Export File

The Export File node in SAS Enterprise Guide does not convert directly to a node in SAS Studio.

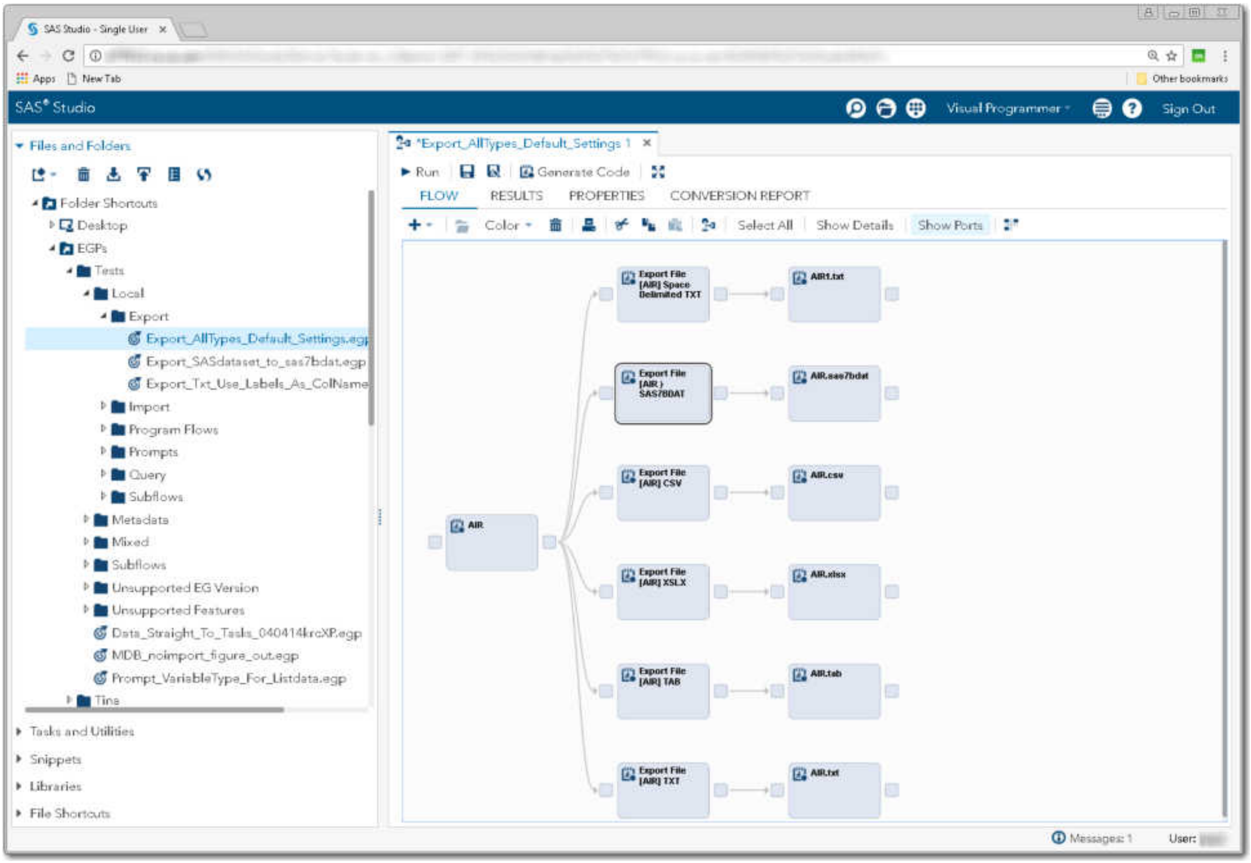
When you export a file in SAS Enterprise Guide, three nodes are created in the SAS Enterprise Guide process flow:

- the input data
- Export File
- the output data



Here is how these nodes are converted in SAS Studio:

SAS Enterprise Guide Node	SAS Studio Node
input data node	program node that displays the contents of the SAS data set
Export File node	program node that uses the metadata that is stored in the SAS Enterprise Guide project to generate code that can export the input data set
output data node	program node that samples the output data



Unsupported Nodes

These node types are not currently supported in a SAS Studio process flow:

- Notes

  Note: The contents of any Note nodes are written to the Conversion Report in SAS Studio.

- Stored processes
- OLAP cubes
- Code (last submitted code)
- Logs
- Project logs
- ODS results
- SAS Web Report Studio (WRS) reports
- Send email as a step in a project

SAS Enterprise Guide Project Items That Are Not Supported

These items in a SAS Enterprise Guide project are not currently supported in SAS Studio:

- Project log
- Decision Manager elements
- Data Exploration elements
- Scheduling
- Conditions
- Ordered lists
- Explore Data list
- Git source control

In addition, the following attributes of a SAS Enterprise Guide process flow are not currently supported in a SAS Studio process flow:

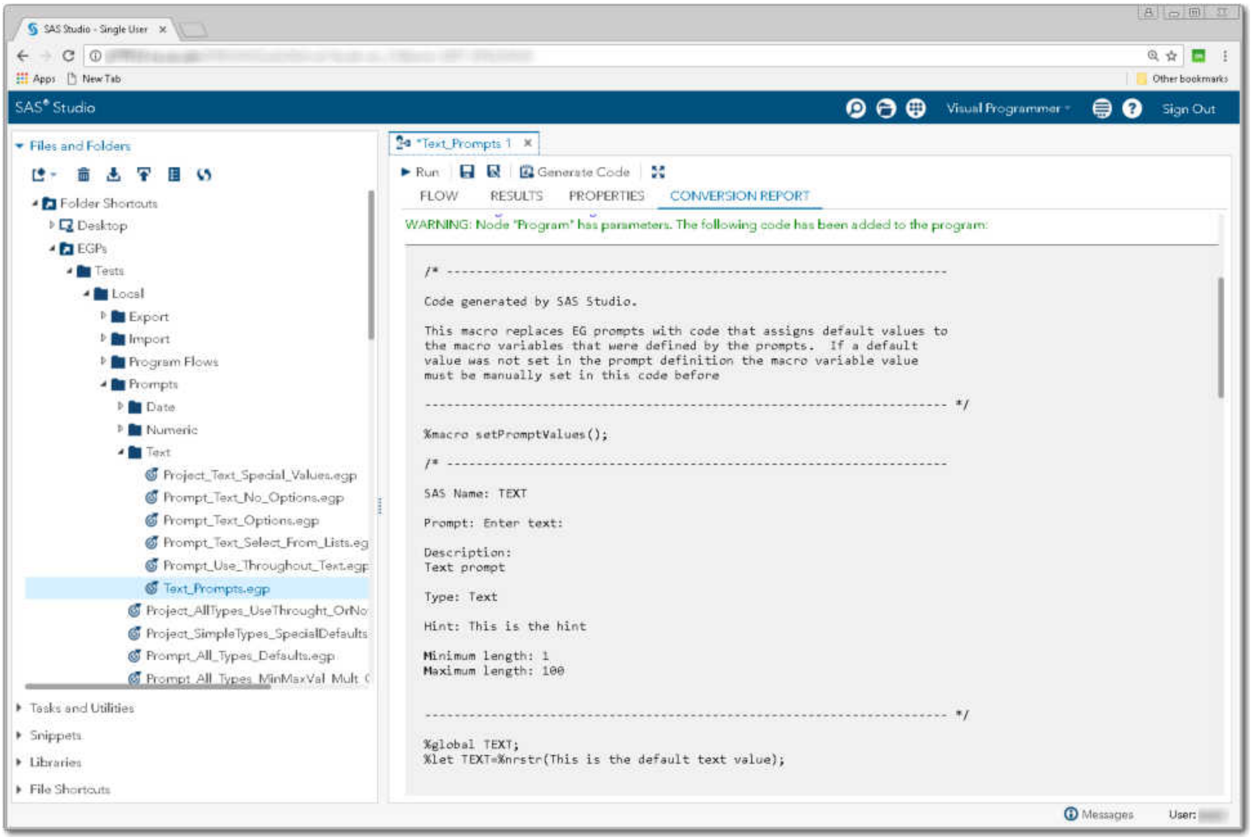
- background color
- process flow zoom

  Note: In SAS Studio, use the zoom functionality in your browser.
- grid view
- submit to grid

Prompts

SAS Studio process flows do not currently support prompts. When you convert a SAS Enterprise Guide process flow that contains prompts, code is added to the converted program or task nodes that use prompts. To view the added code, open the conversion report. The added code includes these elements:

- Comments about the values that are expected for the macro variables that are created by the prompt, such as types, minimums, and maximums.

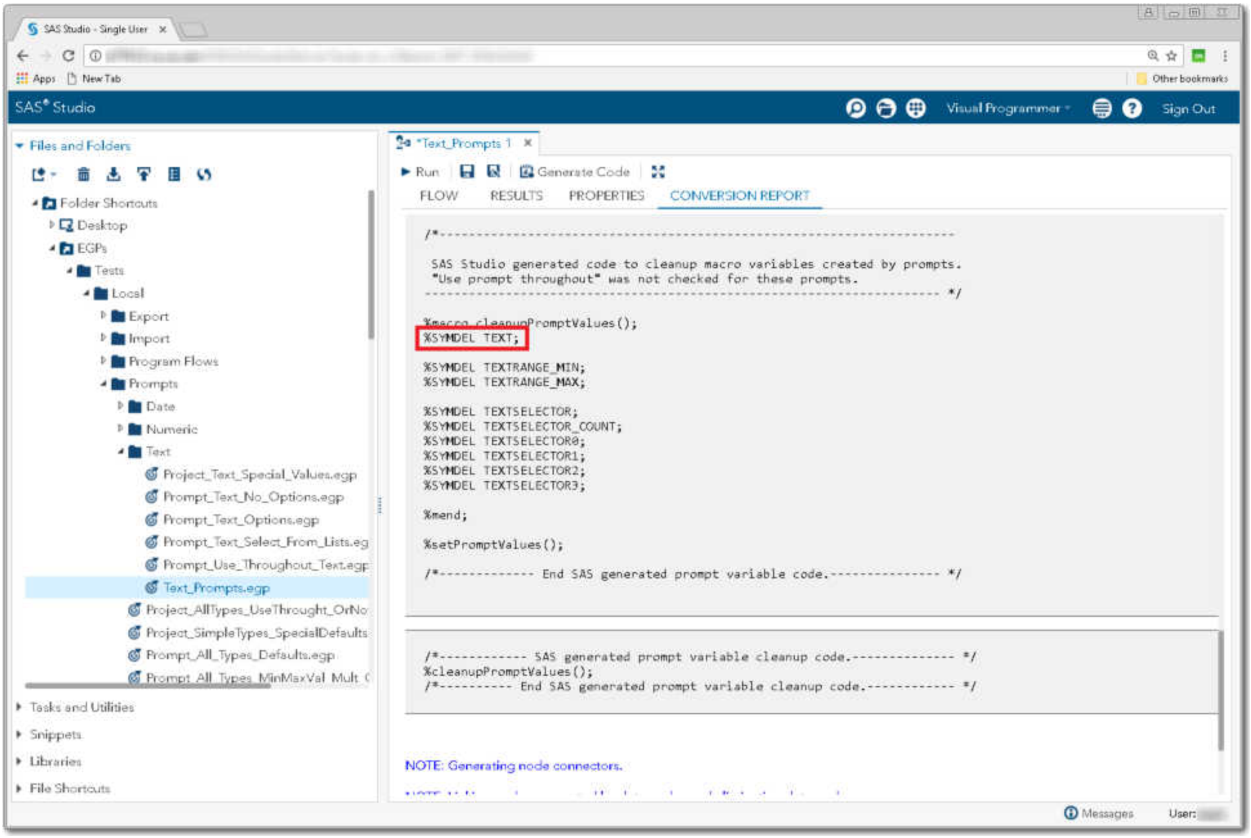


WARNING: Node "Program" has parameters. The following code has been added to the program:

```
/* --------------------------------------------------------------------

Code generated by SAS Studio.

This macro replaces EG prompts with code that assigns default values to
the macro variables that were defined by the prompts.  If a default
value was not set in the prompt definition the macro variable value
must be manually set in this code before

-------------------------------------------------------------------- */

%macro setPromptValues();

/* --------------------------------------------------------------------

SAS Name: TEXT

Prompt: Enter text:

Description:
Text prompt

Type: Text

Hint: This is the hint

Minimum length: 1
Maximum length: 100


-------------------------------------------------------------------- */

%global TEXT;
%let TEXT=%nrstr(This is the default text value);
```

- Macro variable definitions that the prompts would have created.
- Default or blank default values for the macro variables based on the prompt definition.
- Deletion of the macro variables at the end of the program unless the prompt definition includes the **Use prompt value throughout project** option. (You can select this check box in the Prompt Manager in SAS Enterprise Guide.)

In this example, the **Use prompt value throughout project** option was not selected, so the %SYMDEL statement deletes the macro variables.



```
/*-----------------------------------------------------------------

 SAS Studio generated code to cleanup macro variables created by prompts.
 "Use prompt throughout" was not checked for these prompts.
----------------------------------------------------------------- */

%macro cleanupPromptValues();
%SYMDEL TEXT;

%SYMDEL TEXTRANGE_MIN;
%SYMDEL TEXTRANGE_MAX;

%SYMDEL TEXTSELECTOR;
%SYMDEL TEXTSELECTOR_COUNT;
%SYMDEL TEXTSELECTOR0;
%SYMDEL TEXTSELECTOR1;
%SYMDEL TEXTSELECTOR2;
%SYMDEL TEXTSELECTOR3;

%mend;

%setPromptValues();

/*------------- End SAS generated prompt variable code.--------------- */
```

```
/*------------ SAS generated prompt variable cleanup code.-------------- */
%cleanupPromptValues();
/*---------- End SAS generated prompt variable cleanup code.------------ */
```

NOTE: Generating node connectors.

If you want to run your prompt-dependent code against different prompt values, you must manually change the values in the generated macro variables. If a prompt is used for more than one node, the values of the macro variables must be manually changed in each node to simulate the prompt. Editing the values can be a lot of work if there are many nodes that depend on a single prompt.

If a SAS Enterprise Guide task node has a prompt defined, the converted SAS Studio task node includes the generated macro code. If you want to change the values in the converted task node, you must edit the task's CTM file. If you want to change these prompt values with a user interface, you can create a SAS Studio task node that contains input controls for each of the macro variables that the prompt would have created. For more information and examples, see SAS Studio Tasks Resembling SAS Enterprise Guide Prompts.

Limitations

SAS Studio process flows contain a subset of all the functionality of a SAS Enterprise Guide project.

Before you convert a SAS Enterprise Guide project to a SAS Studio process flow, note these limitations:

- You can convert only SAS Enterprise Guide projects that are saved with SAS Enterprise Guide 7.1 or later.

- You cannot open password-protected SAS Enterprise Guide projects in SAS Studio. You must remove the password protection before you convert the file.
- The ActiveX graphics output format in SAS Enterprise Guide does not look the same in SAS Studio. SAS Studio does not support ActiveX for ODS output.
- When you open a process flow for the first time in SAS Studio, the nodes are arranged using the same functionality of the **Arrange** button.
- If multiple process flows are defined in a SAS Enterprise Guide project, they appear as subflows when the project is converted to a SAS Studio process flow.
- SAS Enterprise Guide can be configured to generate different result types, including SAS Report, HTML, PDF, RTF, text output, PowerPoint, and Excel. These settings do not persist with a SAS Enterprise Guide project file, and there are no appearance or advanced settings related to those results. In addition, there are no nodes for these result types in the SAS Studio process flows that are extracted from SAS Enterprise Guide project files. Messages in the conversion report indicate when those nodes have been omitted.

  You can configure SAS Studio to generate HTML, PDF, and RTF output for SAS programs, and you can configure the styles for this output. These options are available in SAS Studio by selecting **Preferences** from the main SAS Studio menu. Use the **Results** tab to set your preferred results locations and style settings.
- SAS Enterprise Guide has options for Graph Format and Graph Format for Built-in Graph Tasks. These options include ActiveX, Java, GIF, JPEG, ActiveX image, Java image, SAS EMF, and PNG. These options do not persist with the SAS Enterprise Guide project file.

  SAS Studio uses HTML5 for graphics. In SAS Studio, you have the option of generating HTML graphs as SVG. You can change this setting by selecting **Preferences** from the main SAS Studio menu. Click the **Results** tab and select **Generate HTML graphs as SVG**.

  These setting differences can have a very noticeable effect on the look of your converted graphs.
- SAS Enterprise Guide can be configured to insert custom code at the beginning and end of programs, tasks, and queries. SAS Studio does not include this feature. However, if you open a SAS Enterprise Guide project that contains programs, tasks, or queries with custom code in SAS Studio, SAS Studio inserts the custom code in the converted programs, tasks, and queries. Notes are added to the conversion report for each inserted custom code segment before and after programs, tasks, and queries.

Appendix 3

Text Encoding Options and Language Mappings

About the Text Encoding to Language Mappings

The following table lists some of the text encoding options and the languages they are associated with. For more information about specifying a text encoding option, see “Setting General Preferences” on page 111.

Text Encoding Options and Language Mappings

Text Encoding Option	Language
Windows-1250	(Central European languages): Polish, Czech, Slovak, Hungarian, Slovenian, Serbian Latin, Croatian, Bosnian, Romanian, Albanian
Windows-1251	(Cyrillic languages): Russian, Byelorussian, Bulgarian, Serbian Cyrillic, Macedonian, Ukrainian
Windows-1252	(Western European languages): Afrikaans, Basque, Catalan, Valencian, Welsh, Danish, German, English, Spanish, Basque, Finnish, Faroese, French, Western Frisian, Irish, Galician, Indonesian, Icelandic, Italian, Inuktitut, Luxembourgish, Malay, Norwegian Bokmål, Dutch, Norwegian Nynorsk, Portuguese, Quechua, Romansh, Northern Sami, Swedish, Swahili, Tswana, Xhosa, Zulu
Windows-1253	Greek
Windows-1254	Turkish

Text Encoding Option	Language
Windows-1255	Hebrew
Windows-1256	Arabic
Windows-1257	(Baltic languages): Estonian, Latvian, Lithuanian
Windows-1258	Vietnamese

Appendix 4
Customized Output Environment

Overview

You must customize the SAS Studio output environment to perform any of these tasks:

- generate output for other output destinations
- send your results to another location
- use a custom style for your output
- use an image format other than the default
- create a drill-down graph
- create an animated GIF or SVG image

To customize the SAS Studio output environment, first disable the default output environment in order to conserve system resources. Next, establish your own output environment, and then execute the SAS statements that are required to generate your output. Use ODS statements, ODS procedures, or ODS options in your SAS program to define the environment that you need.

As a best practice, if your SAS program requires a customized output environment in SAS Studio, your program should always perform these steps:

1. Create a file reference for your ODS output. You can use the &_SASWS_ macro variable that is defined in SAS Studio to reference your home directory as shown in the following statement:

   ```
   filename odsout "&_SASWS_/charts";
   ```

If you want to store your image files in a separate directory, create a second file reference for your image files as shown in the following statement:

```
filename ods1out "&_SASWS_/charts/images";
```

Note: The directories that you specify must already exist, and you must have Write access to the directories.

2. To conserve system resources, disable the default output environment by using the following statement:

   ```
   ods _all_ close;
   ```

3. Open the desired ODS destination. Use the PATH= option to specify the file reference that you created for your ODS output. If you created a separate file reference for your image files, use the GPATH= option to specify the image output file reference. Here is an example:

   ```
   ods html path=odsout gpath=ods1out file="saleschart.html";
   ```

4. Execute the SAS statements that are required to generate your output.
5. Close your ODS destination.

When you disable the default SAS Studio output environment, results are no longer displayed on the **Results** tab for the duration of your program. The results are generated only by the ODS destination that you open.

Generate Output for Other Output Destinations

If you need to generate output other than the default HTML5, PDF, or RTF output, you must open your own ODS destination. Examples of output destinations include HTML, PowerPoint, and LISTING. After you disable the default output environment, use an ODS statement to open your own output destination. Here is an example:

```
filename odsout "&_SASWS_/charts";
ods _all_ close;
ods powerpoint path=odsout file="filename";
```

To access the dictionary of ODS statements, see *SAS Output Delivery System: User's Guide*.

Send Your Results to Another Location

When you execute a program in SAS Studio, you can download the output from the **Results** tab to your local machine. If you want to send your output directly to another location, you must open your own ODS destination. By default, output files that are generated by the ODS destinations that you open are written to your home directory.

In SAS Studio Single-User deployments, the output is written to your home directory on your local machine.

In SAS Studio Basic and in SAS Studio Mid-Tier deployments, the output is written to your home directory on the remote SAS server. Your home directory appears in the navigation pane under **Files and Folders** or **Server Files and Folders**.

If you want to send the results to a specific location, use a FILENAME statement to define a file reference to the desired location. You can use the &_SASWS_ macro variable to reference your home directory. After you create the file reference, use the PATH=*file-reference* option in your ODS statement. Here is an example:

```
filename odsout "&_SASWS_/charts";
ods _all_ close;
ods html path=odsout file="sales.htm";
```

In this case, file sales.htm and any image files that are generated are written to subdirectory **`charts`** in your home directory.

Use a Custom Style for Your Output

When you need to use a custom ODS style such as a corporate style for your results in SAS Studio, you must open your own ODS destination. You cannot specify a custom style for the default results. Use the STYLE= option in your ODS statement to specify your custom style. Here is an example:

```
filename odsout ="&_SASWS_/charts";
ods _all_ close;
ods html path=odsout file="filename.htm" style=style-name;
```

To create a custom style, use the ODS TEMPLATE procedure, CSSStyles, or the STYLE= option. For more information, see *SAS Output Delivery System: User's Guide*.

Use an Image Format Other Than the Default

When you need to use an image format other than the default, you must specify the desired output format, and then open your own ODS destination. To specify the image format:

- If you are using SAS/GRAPH to create your graphs, specify the DEVICE= option in an OPTIONS or GOPTIONS statement. For more information, see *SAS/GRAPH: Reference*.
- If you are using ODS Graphics to create your graphs, specify the OUTPUTFMT= option in an ODS GRAPHICS statement. For more information, see *SAS Output Delivery System: User's Guide*.

Create a Drill-down Graph

When you need to create a drill-down graph in SAS Studio, you must open your own ODS destination. Drill-down graphs provide a convenient means for users to explore complex data. In a drill-down graph, certain elements of the graph contain active links. When a user clicks a linked element, the linked resource appears in a new browser window by default.

For more information, see the following documents:

- If you are using SAS/GRAPH to create the graph, see *SAS/GRAPH: Reference*.

- If you are using the Graph Template Language to create the graph, see *SAS Graph Template Language: User's Guide*.

Create an Animated GIF or SVG Image

When you need to create an animated graph in SAS Studio, you must open your own ODS destination. An animated graph displays a series of charts automatically when the graph is viewed in a web browser or other viewer that supports animation. The animation plays as a sequence of graphs in a slide-show fashion with a delay between each graph. The sequence can play only one time, loop a fixed number of times and then stop, or loop indefinitely.

For more information, see the following documents:

- If you are using SAS/GRAPH to create the graph, see *SAS/GRAPH: Reference*.
- If you are using the Graph Template Language to create the graph, see *SAS Graph Template Language: User's Guide*.

Appendix 5
Keyboard Shortcuts

Keyboard Shortcuts in SAS Studio Workspace

Action	Keyboard Shortcut for Microsoft Windows	Keyboard Shortcut for Mac OS X
Zoom in. *Note:* When you zoom into SAS Studio, no scroll bars are displayed for the browser window.	Ctrl+plus sign	Cmd+plus sign
Zoom out.	Ctrl+minus sign	Cmd+minus sign
Reset the zoom state.	Ctrl+0	Cmd+0
Maximize the view of the currently displayed tab or exit the maximized view.	Alt+F11	Fn+Shift+F11
Open a pop-up menu in the navigation pane.	Select an item, and press Shift +F10. *Note:* If you use Shift+F10 to display the pop-up menu, then it is always displayed in the top left corner of the user interface control that you are using.	Select an item, and press Fn +Shift+F10.
Create a new SAS program.	F4	Fn+F4

Action	Keyboard Shortcut for Microsoft Windows	Keyboard Shortcut for Mac OS X
Save the SAS program.	Ensure that the **Code** tab for a SAS program is displayed, and press Ctrl+S. *Note:* This shortcut does not work for the **Code** tab that displays a task's XML code.	Ensure that the **Code** tab for a SAS program is displayed, and press Cmd+S. *Note:* This shortcut does not work for the **Code** tab that displays a task's XML code.
Run the code.	Ensure that a **Code** tab is displayed, and press F3. *Note:* In JAWS, F3 is the keyboard shortcut for the find functionality. Therefore to run SAS code, you first must press Insert+3 and then press F3. Alternatively, turn off the JAWS virtual PC cursor by pressing Insert+Z.	Ensure that a **Code** tab is displayed, and press Fn+F3.
Reset the SAS session. *Note:* When you reset the SAS session, all libraries and file shortcuts that you created during the current session are deleted.	F9	Fn+F9
Download the log or results as an HTML file.	Ensure that the **Log** or **Results** tab is displayed, and press Ctrl+S.	Ensure that the **Log** or **Results** tab is displayed, and press Cmd+S.
Print the SAS program, log, or results.	Ctrl+P *Note:* This shortcut does not work for the **Log** and **Results** tabs when you use Internet Explorer. This shortcut requires Internet Explorer 10 or later.	Cmd+P to open the content in a new tab. Then press Cmd+P again to print the content.
Close the selected primary tab. *Note:* You cannot close the **Code**, **Log**, and **Results** tabs.	Ensure that the focus is on the tab label (press Alt+3 if necessary), and then press Delete.	Ensure that the focus is on the tab label (press Option+3 if necessary), and then press Delete. *Note:* If your keyboard does not contain a key for deleting forward, then press Fn +Delete.
Move the focus to the **Server Files and Folders** section label.	Alt+1 *Note:* This shortcut requires Internet Explorer 10 or later.	Option+1

Action	Keyboard Shortcut for Microsoft Windows	Keyboard Shortcut for Mac OS X
Move the focus to the label of the currently displayed secondary tab. In the SAS Programmer perspective, the secondary tabs are **Code**, **Log**, or **Results**.) In the Visual Programmer perspective, the secondary tabs are **Flow**, **Results**, and **Properties**.	Alt+2	Option+2
Move the focus to the label of the currently displayed primary tab and then navigate among all open tabs in the work area.	Alt+3	Option+3
Move the focus to the body of the **Code** tab on the currently displayed primary tab.	Alt+4	Option+4
Move the focus to the selected item in the **Log** tab on the currently displayed primary tab.	Alt+5	Option+5

Keyboard Shortcuts for the Code Editor

This table contains keyboard shortcuts for the code editor in SAS Studio.

Action	Keyboard Shortcut for Microsoft Windows	Keyboard Shortcut for Mac OS X
Open a pop-up menu in the code editor.	Shift+F10	Fn+Shift+F10
Create a new snippet from SAS code. *Note:* The snippet is saved to your **My Snippets** folder.	In the code editor, select the code and press Shift+Alt+A.	In the code editor, select the code and press Cmd+ Option +A.
Insert an existing snippet. *Note:* Only snippets saved to your **My Snippets** folder are available.	Alt+I	Cmd+Option+I

Action	Keyboard Shortcut for Microsoft Windows	Keyboard Shortcut for Mac OS X
Add or remove comment tags for SAS code in the code editor.	Ctrl+/ *Note:* This shortcut might not work if your keyboard does not have the forward slash (/) character on the same key as the question mark (?) character. Use Ctrl+Shift+C instead.	Cmd+/ *Note:* This shortcut might not work if your keyboard does not have the forward slash (/) character on the same key as the question mark (?) character. Use Control+Shift+C instead.
In the code editor, display the currently applicable list of SAS keywords (autocomplete feature).	Ctrl+Spacebar (This shortcut also navigates to the next list if more than one is available.) Ctrl+Shift+Spacebar (This shortcut also navigates to the previous list if more than one is available.) *Note:* These shortcuts do not work when JAWS is on. *Note:* If you use Ctrl+Spacebar to switch the input method editor (IME) in Windows, complete these steps to use a different shortcut for switching the IME: • First, in the region and language options of the Control Panel, select the option for changing your keyboard or input method. • Next, select the option or button for changing your keyboard. • Then, in the advanced key settings section, select the row that contains the Ctrl+Spacebar key sequence and change it to use a different shortcut. • Finally, restart any application that needs to use the new shortcut. (You might need to also restart your computer.)	Control+Spacebar (This shortcut also navigates to the next list if more than one is available.) Control+Shift+Spacebar (This shortcut also navigates to the previous list if more than one is available.)

Action	Keyboard Shortcut for Microsoft Windows	Keyboard Shortcut for Mac OS X
Navigate between an autocomplete list and its associated Help pop-up window in the code editor.	Tab, Shift+Tab	Tab, Shift+Tab
Select all text in the code editor.	Ctrl+A	Cmd+A
Copy text in the code editor.	Ctrl+C	Cmd+C
Cut text in the code editor.	Ctrl+X	Cmd+X
Paste text in the code editor.	Ctrl+V	Cmd+V
Undo an action in the code editor.	Ctrl+Z	Cmd+Z
Redo an action in the code editor.	Ctrl+Y	Cmd+Shift+Z
Find and replace text in the code editor.	Ensure that the focus is in the body of the code editor, and then press Ctrl+F.	Ensure that the focus is in the body of the code editor, and then press Cmd+F.
Move the cursor to the beginning of the word on the left of the cursor.	Ctrl+left arrow	Option+left arrow
Move the cursor to the beginning of the word on the right of the cursor.	Ctrl+right arrow	
Move the cursor to the end of the word on the right of the cursor.		Option+right arrow
Move the cursor to the beginning of the previous paragraph.		Option+up arrow
Move the cursor to the beginning of the next paragraph.		Option+down arrow
Scrolls the editor (the cursor does not move).	Ctrl+down arrow, Ctrl+up arrow	
Scrolls a page down or up (moves cursor).	Page Down, Page Up	Page Down, Page Up *Note:* If you are not using the full extension keyboard, use Fn+down and Fn+up to page down and page up.

Action	Keyboard Shortcut for Microsoft Windows	Keyboard Shortcut for Mac OS X
Move the cursor to the end of the line.	End	Cmd+right arrow
Move the cursor to the beginning of the line.	Home	Cmd+left arrow
Move to the bottom of the currently displayed section of the navigation pane.	End	Fn+right arrow
Move to the top of the currently displayed section of the navigation pane.	Home	Fn+left arrow
Move the cursor to the top of the document.	Ctrl+Home	Cmd+up arrow
Move the cursor to the bottom of the document.	Ctrl+End	Cmd+down arrow
Select (highlight) text to the left of the cursor character-by-character.	Shift+left arrow	Shift+left arrow
Select (highlight) text to the right of the cursor character-by-character.	Shift+right arrow	Shift+right arrow
Select (highlight) text from the cursor to the same location on the previous line.	Shift+up arrow	Shift+up arrow
Select (highlight) text from the cursor to same location on the next line.	Shift+down arrow	Shift+down arrow
Delete the word on the left of the cursor.	Ctrl+Backspace	Option+Delete (backward) *Note:* If your keyboard does not contain a key for deleting backward, then press Fn +Delete.
Delete the word on the right of the cursor.	Ctrl+Delete	Option+Delete (forward) *Note:* If your keyboard does not contain a key for deleting forward, then press Fn +Delete.

Action	Keyboard Shortcut for Microsoft Windows	Keyboard Shortcut for Mac OS X
Delete the current line.		Cmd+Delete (backward) *Note:* If your keyboard does not contain a key for deleting backward, then press fn +delete.
Select (highlight) the word on the left of the cursor.	Ctrl+Shift+left arrow	Option+Shift+left arrow
Select (highlight) the word on the right of the cursor.	Ctrl+Shift+right arrow	Option+Shift+right arrow
Select (highlight) text from the cursor to the beginning of the document.		Cmd+Shift+up arrow
Select (highlight) text from the cursor to the end of the document.		Cmd+Shift+down arrow
Select a column or vertical block of text.	Alt+left mouse button. Then drag the mouse pointer to select the text.	Option+left mouse button. Then drag the mouse pointer to select the text.
Change case of selected text.	Ctrl+Shift+U cycles among initial capital, uppercase, and lowercase. Ctrl+U converts the selected text to uppercase. Ctrl+L converts the selected text to lowercase.	Cmd+Shift+U cycles among initial capital, uppercase, and lowercase. Cmd+U converts the selected text to uppercase. Cmd+L converts the selected text to lowercase.

Recommended Reading

- *An Introduction to SAS University Edition*
- *Biostatistics by Example Using SAS Studio*
- *Elementary Statistics Using SAS*
- *Essential Statistics Using SAS University Edition*
- *Getting Started with Programming in SAS Studio*
- *Learning SAS by Example: A Programmer's Guide*
- *The Little SAS Book: A Primer*
- *SAS Statistics by Example*

For a complete list of SAS publications, go to sas.com/store/books. If you have questions about which titles you need, please contact a SAS Representative:

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