Quick Start Guide

FTSolution for APT

Version 1.x.x

FTSolution for APT - Hardware Debugger

FTSolution for APT Simulator

FTVersionTrak for APT

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Introduction

Thank you for purchasing FTSolution for APT® by FasTrak SoftWorks, Inc. FTSolution for APT is part of a family of products and services provided by FasTrak SoftWorks, Inc. to meet the needs of APT language programmers. This family includes:

- **FTSolution for APT**
  Windows-based APT language programming software. FTSolution for APT allows you to create and maintain APT-based PLC programs with a modern Microsoft Windows interface.
- **FTSolution for APT Hardware Debugger**
  Sophisticated PLC hardware debugger utilizing ladder language-based tools. FTSolution for APT - Hardware Debugger allows users to download compiled FTSolution for APT programs into Siemens 505/CTI 2500 Series processors, utilize sophisticated ladder language-based debugging tools, and limit the ability to modify existing programs.
- **FTSolution for APT Simulator**
  PLC Simulator for most APT-supporting Siemens 505 and CTI 2500 Series processors. FTSolution for APT Simulator saves time and hardware expense by running and testing APT projects without the use of a PLC.
- **FTVersionTrak for APT**
  Version control for FTSolution for APT. FTVersionTrak for APT safeguards your FTSolution project files with version management, detailed program comparison, and automatic backup.

Contact your FasTrak SoftWorks, Inc. Sales Representative at **262-238-8088** or **sales@fast-soft.com** for assistance in purchasing or upgrading these products. For assistance installing and using FTSolution for APT contact Technical Support at **262.238.8088, Option 3** or **techsupport@fast-soft.com**.

Compilation Differences

The following list describes intended differences related to compilation that exist between APT and FTSolution for APT.

- FTSolution for APT's advanced compiler

  The new compiler tests programs more thoroughly than the original APT compiler, and may detect previously unidentified errors. Depending upon their severity, you may ignore these errors or edit your programs to eliminate them.

- Programs that contain specific user-defined I/O modules

  In APT, programs can contain user-defined I/O modules with a mix of analog input (WX) and digital output (Y) that total 8. This consists of user-defined I/O modules configured in the following ways:

  - WX7 and Y1
  - WX6 and Y2
  - WX 5 and Y3
  - WX4 and Y4
  - WX3 and Y5
  - WX2 and Y6
  - WX1 and Y7

  APT compiles and downloads programs with I/O modules configured this way without a warning or an error message. FTSolution for APT will allow import of this condition, but will flag an error on compilation.

- SCL Verbs

  In APT, SCL verbs can be used as identifiers. (For example, the statement: **AUTO AUTO** is allowed in APT). FTSolution for APT does not allow SCL verbs to be used as identifiers.

- Literals of real numbers

  In APT, literal real numbers having the form of 1E6 are allowed. FTSolution for APT rejects literal real numbers in the form of 1E6 . A decimal point (".") before the E (1.E6), which distinguishes the real literal from an identifier, is required in FTSolution for APT.

- ASM Semantic Checking

  No ASM semantic checking is implemented in FTSolution for APT. For this reason, only use already semantically-valid ASM when compiling in FTSolution for APT.

- User-assigned Y address in a Boolean declaration

  APT cannot compile a program when a user-assigned Y address is used in a Boolean declaration. In FTSolution for APT, Y addresses in a Boolean declaration are allowed.

- PLC Type Checking on Download

  In FTSolution for APT, an error will occur during download if the PLC type set in the program's configuration file does not match the actual PLC to which FTSolution for APT is connected (see *PLC Type Configuration* on page 18 for additional information.)

- PLC Type Checking on Compile

  In FTSolution for APT, if an imported APT file has configured memory beyond that of a 555, FTSolution for APT will generate an error on compile. This typically occurs when using a CTI 2500 to emulate a Simatic 555. To prevent an error on compile, a CTI 2500 PLC type must be specified in the program's configuration file (see *PLC Type Configuration* on page 18 for additional information.)

  Note: There is no internationalization in FTSolution for APT. FTSolution for APT supports only United States English Regional and Language options. For example, floating-point numbers must follow US conventions: 1.5 must be used instead of 1,5. String literals must also follow US conventions: double quotes must be used to indicate a string (" ") instead of double brackets (<< >>). You may want to change your Regional and Language Options in Windows to reflect United States English while using FTSolution for APT.

Installing FTSolution for APT

Previous versions of FTSolution for APT must be uninstalled before v1.x.x can be installed. Uninstalling previous versions of FTSolution for APT removes the application only. Any APT programs that you imported, edited, or wrote will not be deleted. **When using v1.x.x, please re-import and compile any APT programs you have previously used with FTSolution for APT. Version 1.x.x requires re-importing in order to experience full functionality.**

Note for Windows XP users: FTSolution for APT requires that Windows XP Service Pack 3 is installed first.

To uninstall the previous version of FTSolution for APT:

Windows 8

1. Go to the **Start** menu by pressing the Windows key.
2. Right-click **FTSolution for APT**.
3. Click **Uninstall**.
4. In the list of installed applications, click **FTSolution for APT**.
5. Click **Uninstall**.
6. Follow the prompts. A progress bar shows you how long it will take to safely remove FTSolution for APT. When it is finished, you will see the list again.

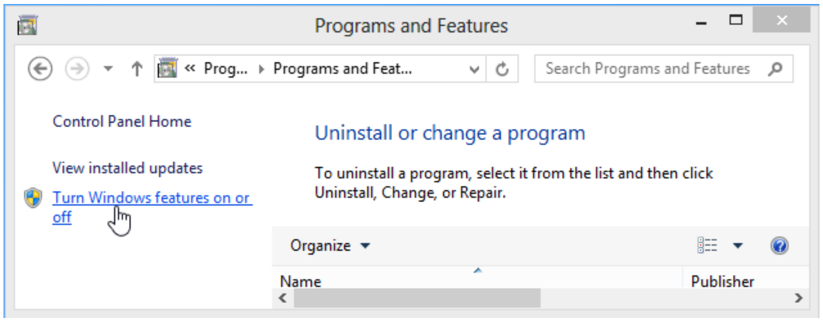
Windows XP, Windows Vista, and Windows 7

1. On the **Start** menu, click **Control Panel** and then under **Programs** do one of the following:
    a. Windows 7 and Vista users: Click **Uninstall a Program**.
    b. Windows XP users: Click **Add or Remove Programs**.
2. On the list of installed programs, click **FTSolution for APT**, then do one of the following:
    a. Windows 7 and Vista users: Click **Uninstall**.
    b. Windows XP users: Click the **Remove** or **Change/Remove** tab (to the right of the program).
3. Follow the prompts. A progress bar shows you how long it will take to safely remove FTSolution for APT. When it is finished, you will see the list again.

Download Windows 8 Prerequisites:

For Windows 8 users only: Windows 8 users must download additional components before downloading and installing FTSolution for APT with FTVersionTrak.

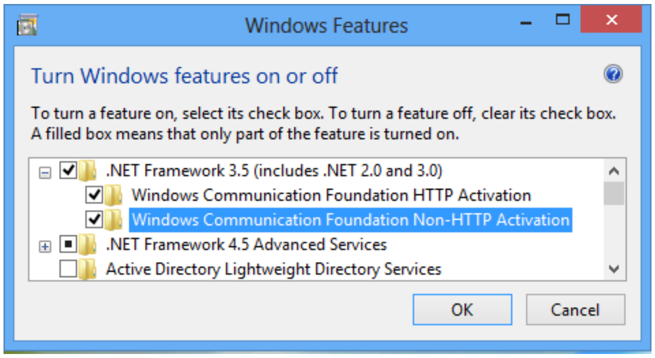
1. Go to Control Panel.
2. Click **Program and Features**. (If Control Panel is set to Category View, click **Programs** first, and then click **Program and Features**).
3. In the left panel, click **Turn Windows Features On and Off**.


Programs and Features
« Prog... › Programs and Feat...
Search Programs and Features
Control Panel Home
View installed updates
Turn Windows features on or off
Organize
Name
Publisher

Uninstall or change a program

To uninstall a program, select it from the list and then click Uninstall, Change, or Repair.

4. In the Windows Features dialog box, expand **.NET Framework 3.5**.
5. Select the **Windows Communication Foundation HTTP Activation** and the **Windows Communication Foundation Non-HTTP Activation** check boxes.

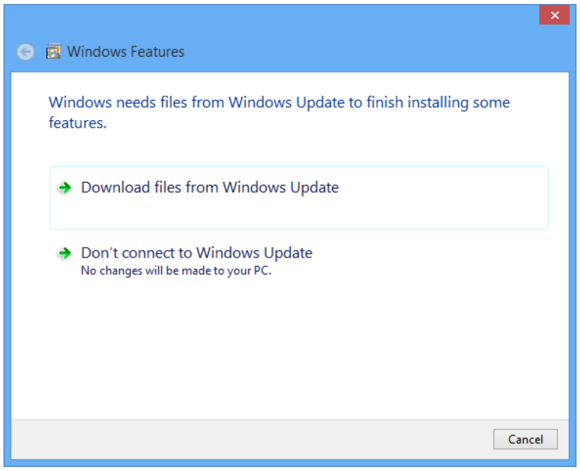


Turn Windows features on or off

To turn a feature on, select its check box. To turn a feature off, clear its check box. A filled box means that only part of the feature is turned on.

- ☑ .NET Framework 3.5 (includes .NET 2.0 and 3.0)
  - ☑ Windows Communication Foundation HTTP Activation
  - ☑ Windows Communication Foundation Non-HTTP Activation
- ■ .NET Framework 4.5 Advanced Services
- □ Active Directory Lightweight Directory Services

6. Click **OK**.
7. Click **Download files from Windows Update**.



Windows needs files from Windows Update to finish installing some features.

→ Download files from Windows Update

→ Don't connect to Windows Update
No changes will be made to your PC.

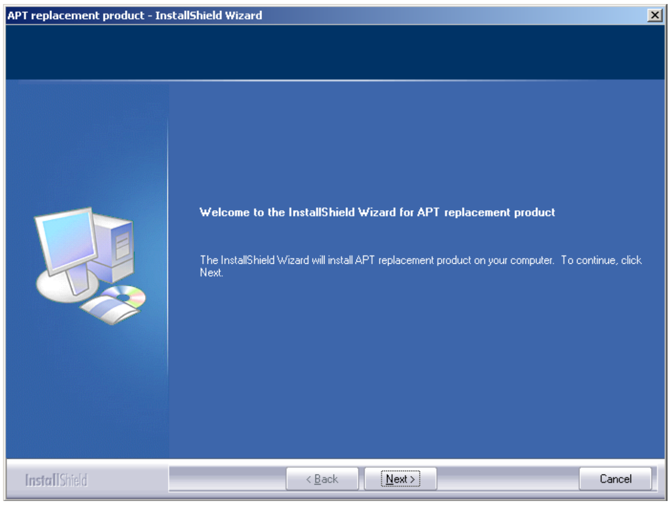
When these files have downloaded, proceed with the following instructions.

Download and Install FTSolution for APT and FTVersionTrak:

1. Access the FasTrak website: **www.fast-soft.com**.
2. Login (or register) to the FasTrak website.
3. Select **Software Upgrades** from the **Downloads** menu.
4. Click the link to **FTSolution for APT** or **FTSolution for APT Full Version** to download the self-extracting installer to your hard drive. *NOTE:* The full version includes all of the prerequisites (such as .NET framework) necessary to install the product. The regular version does not contain

any prerequisites; if needed they are downloaded on demand during the installation. Either one can be used to install FTSolution for APT. The full version is a larger file and can take longer to download. If you have already installed a previous version of FTSolution for APT, the regular version is recommended.

5. If you have purchased FTVersionTrak for APT and it was not previously installed, click the link to **FTVersionTrak** to download the self-extracting installer to your hard drive.
6. Run the FTSolution for APT installer after it downloads to your hard drive.
7. When the installer window appears, follow the prompts to complete the installation of FTSolution for APT.

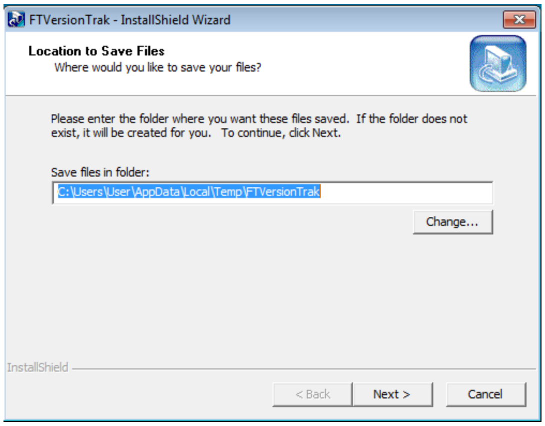


APT replacement product - InstallShield Wizard

Welcome to the InstallShield Wizard for APT replacement product

The InstallShield Wizard will install APT replacement product on your computer. To continue, click Next.

8. When the installation of FTSolution for APT is complete, run the FTVersionTrak installer.
9. When the installer window appears, follow the prompts to complete the installation of FTVersionTrak.



FTVersionTrak - InstallShield Wizard

Location to Save Files

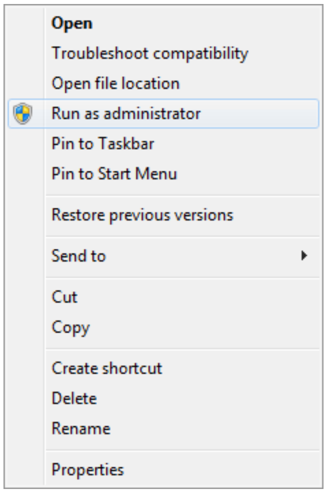
Where would you like to save your files?

Please enter the folder where you want these files saved. If the folder does not exist, it will be created for you. To continue, click Next.

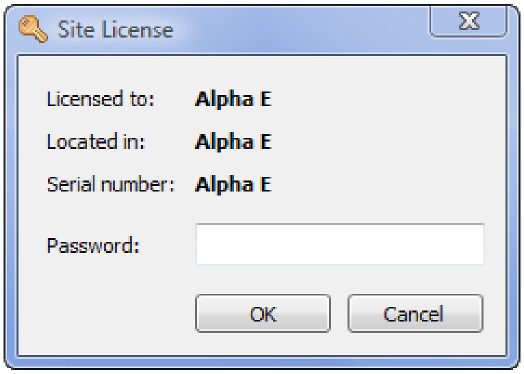
Save files in folder:

C:\Users\User\AppData\Local\Temp\FTVersionTrak

10. When FTVersionTrak has completed installing, start FTSolution for APT using the **Run As Administrator** option:
    a. Right-click the APT replacement desktop icon.
    b. Select **Run as Administrator** from the shortcut menu.



11. When FTSolution for APT starts, make sure your key is attached or enter your site license password in the **Site License** dialog box. This password is case-sensitive. Please contact FasTrak SoftWorks, Inc. if you have questions about your site license.



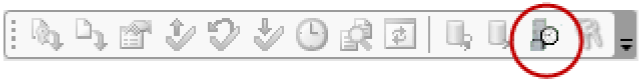
Licensed to: **Alpha E**

Located in: **Alpha E**

Serial number: **Alpha E**

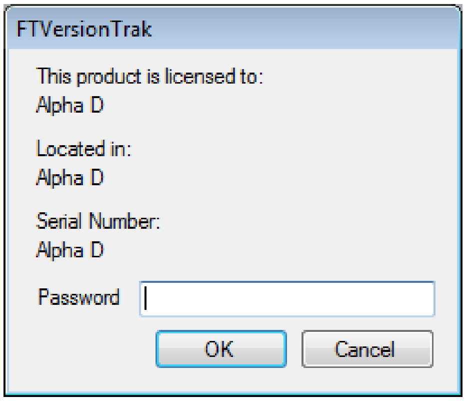
Password:

12. If applicable, Start FTVersionTrak from within FTSolution for APT by clicking the **FTVersionTrak** toolbar button on the FTVersionTrak toolbar.



(If the FTVersionTrak toolbar is not displayed in FTSolution for APT, click the **View** menu, point to **Toolbars**, and select **FTVersionTrak Toolbar**).

13. When FTVersionTrak starts, make sure your key is attached or enter your site license password in the **Site License** dialog box. This password is case-sensitive. Please contact FasTrak SoftWorks, Inc. if you have questions about your site license.

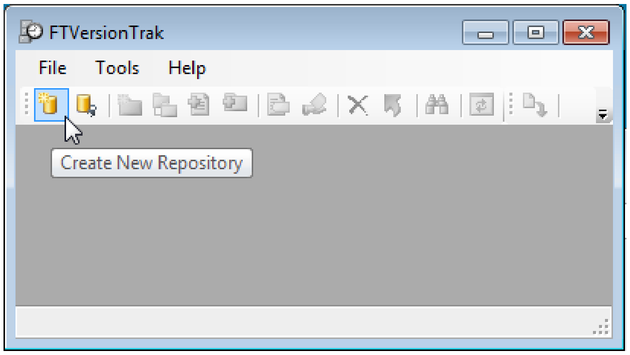


This product is licensed to:
Alpha D

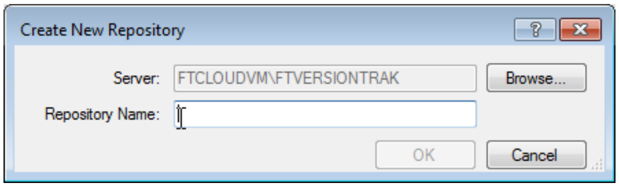
Located in:
Alpha D

Serial Number:
Alpha D

14. In FTVersionTrak, click the **Create New Repository** toolbar button.

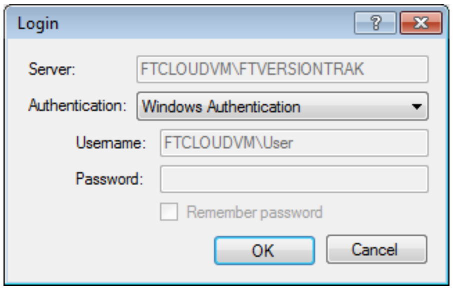


15. In the **Create New Repository** dialog box, in the **Repository Name** box, type a name for the repository.



Server: FTCLOUDVM\FTVERSIONTRAK

16. If a Login dialog box is displayed, click **OK**.



Server: FTCLOUDVM\FTVERSIONTRAK

Authentication: Windows Authentication

Username: FTCLOUDVM\User

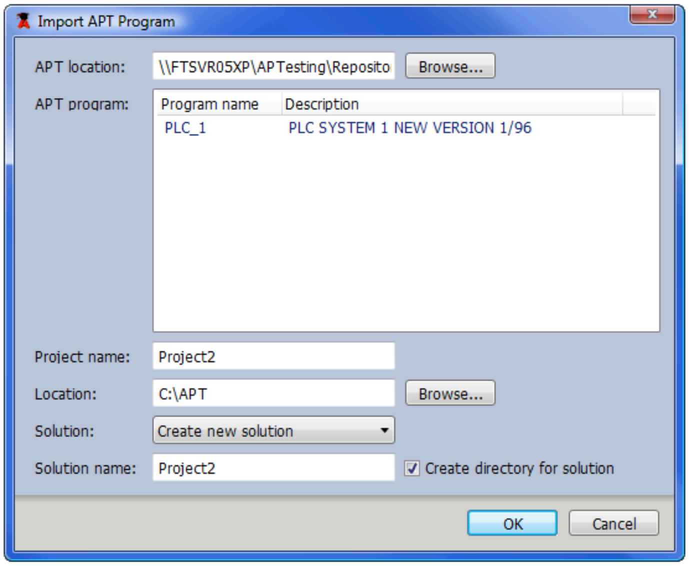
You can now use FTVersionTrak and FTSolution for APT.

Importing an Existing APT Program

When using v.1.x.x, re-import and compile any APT programs you have previously used with FTSolution for APT. Re-importing is required in order to experience full functionality.

Use the following procedure to import APT programs from an APT repository.

1. Click **Import APT Program** on the **File** menu. The Import APT Program dialog box appears.



APT location: \\FTSVR05XP\APTesting\Reposito

APT program:

Program name	Description
PLC_1	PLC SYSTEM 1 NEW VERSION 1/96

Project name: Project2

Location: C:\APT

Solution: Create new solution

Solution name: Project2

☑ Create directory for solution

2. Do one of the following:
   - In the **APT location box,** type the location of the APT repository that contains the APT program you want to import.
   - Click **Browse** to browse to the APT repository that contains the APT program you want to import.

   A list of APT programs appears in the **APT program** box after a valid repository is selected.

3. In the **APT program** box, click the APT program you want to import.
   The Project **name** and **Solution name** boxes are automatically configured to match the name of the APT program you are importing.

4. Click **OK.**

Importing .1 Archive Files

FTSolution for APT must import programs from an APT database. If your programs are stored as .1 archive files, they must first be restored to an APT database, and then imported from the database.

Use the following procedure to restore your .1 archived files to an APT database:

1. Determine the location of your .1 archive file. You will need this path in Step 4.
2. Launch APT.
3. From the main program menu in APT, press **8** or select **Restore** from the F3 context menu.
4. Set the Path to the location of the .1 archive, determined in Step 1.
5. Enter the name of the archive file that you wish to restore, and press **ENTER**. If a message indicates that the program already exists in your database, you do not need to restore the program to import it into FTSolution for APT.
6. If APT and FTSolution for APT are installed on different computers, copy APT's PROGRAM and DATABASE folders to the APT replacement computer. FTSolution for APT imports programs from these folders.

Using the Solution Explorer

FTSolution for APT stores your PLC programs as Projects. These Projects are stored within Solutions. Each Solution may contain one Project. But Solutions can hold multiple Projects. This allows related PLC programs to be grouped within the same Solution.

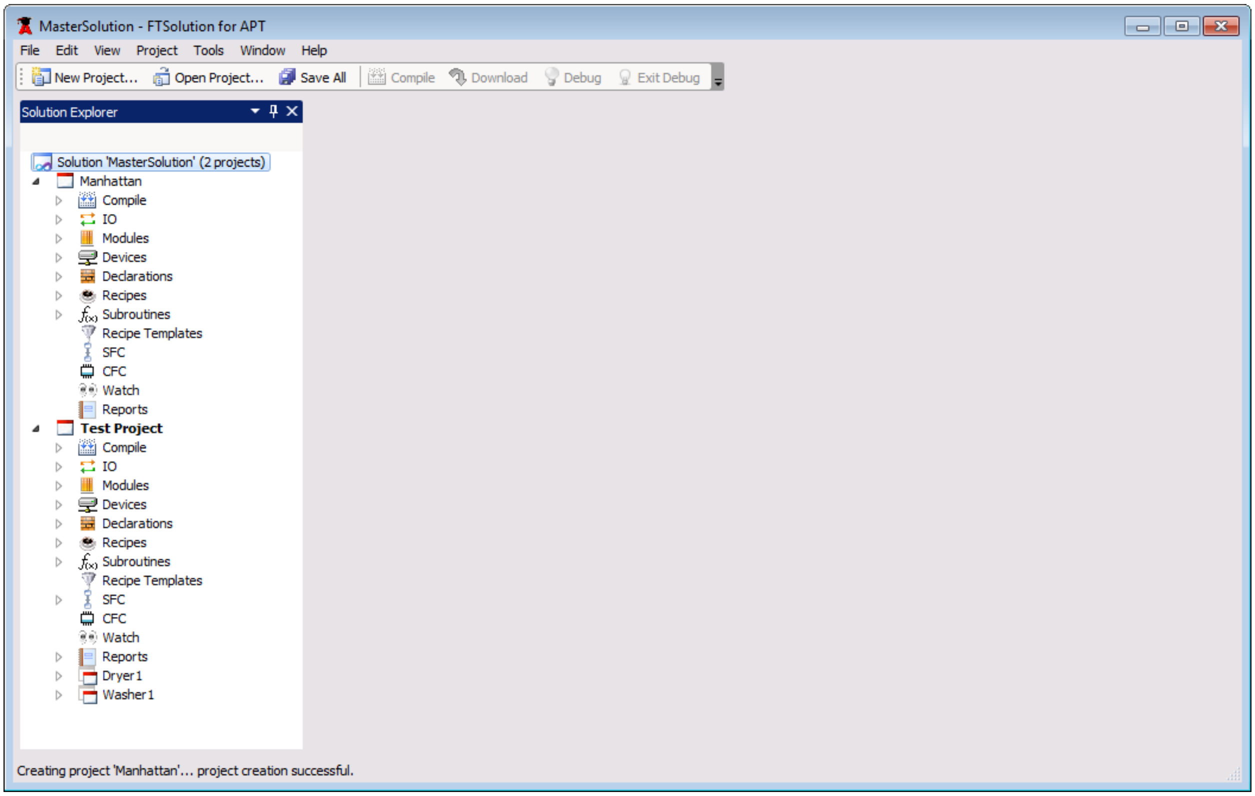
You access the Projects in a Solution with the Solution Explorer. This Windows tree-control provides direct access to every component of your PLC program Project.

You can expand and contract the nodes in the Solution Explorer to display and hide lower nodes.

Open Solutions and Programs through items in the **File** menu, or the **Open Project** button.

Selecting Projects from the Solution Explorer is similar to choosing PLC programs from the APT Program Directory Level screen. But the Solution Explorer also provides access to all PLC program components, similar to the APT Program Content Level screen.

In the following illustration, the Solution Explorer appears along the right edge. Solution **MasterSolution** contains two Projects, **Manhattan** and **Test Project**.



Creating project 'Manhattan'... project creation successful.

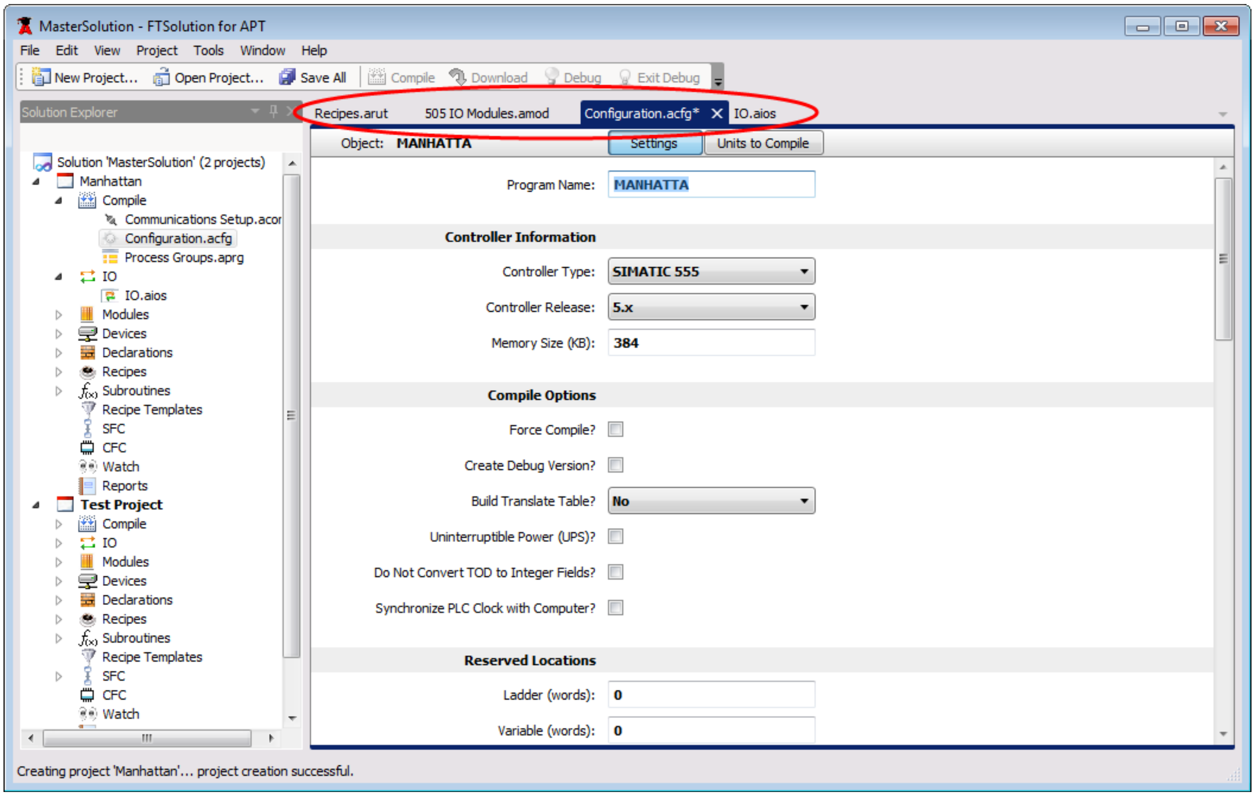
Displaying and Editing Project Components

Any component within a Project can be displayed in its own editor window.

To edit a Project component, use the up and down arrow keys to highlight the item in the Solution Explorer, and press **Enter**. Or double-click an item to select it.

Displaying Multiple Project Components

Multiple Project components can be opened at the same time, and displayed in their own editor windows. In the following illustration, the editor windows of four components are open. The red circle near the upper left corner indicates the four tabs that provide access to the four editor windows. Click on a tab, or press **Ctrl-Tab** repeatedly, to bring the desired editor window to the foreground.



Object: MANHATTA

Program Name: MANHATTA

Controller Information

Controller Type: SIMATIC 555

Controller Release: 5.x

Memory Size (KB): 384

Compile Options

Force Compile? ☐

Create Debug Version? ☐

Build Translate Table? No

Uninterruptible Power (UPS)? ☐

Do Not Convert TOD to Integer Fields? ☐

Synchronize PLC Clock with Computer? ☐

Reserved Locations

Ladder (words): 0

Variable (words): 0

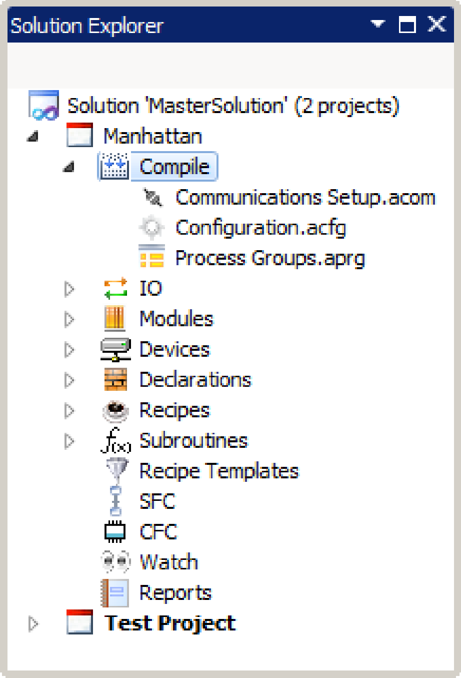
Creating project 'Manhattan'... project creation successful.

PLC Type Configuration

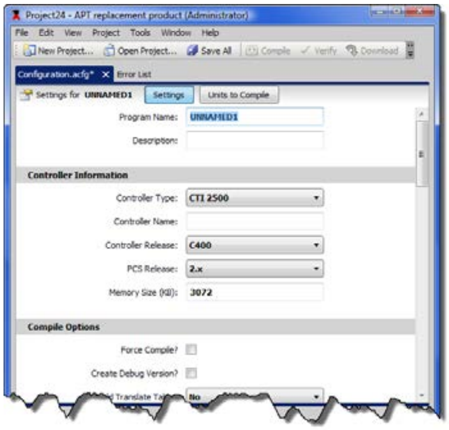
PLC type is one of the settings specified in the compile configuration file (**Configuration.acfg**). During an import, the PLC type is automatically configured. For a successful download, the configured PLC Type **must** match the target controller type.

Use the following procedure to specify the PLC type.

1. View an FTSolution for APT project in the Solution Explorer.
2. Double-click **Compile** in the Solution Explorer. You can also double-click **Configuration.acfg**.



3. In the **Controller Type** box, select the type of controller you are using.
4. In the **Controller Release** box, select the release of the controller.
5. Enter other settings as required.


Project24 - APT replacement product (Administrator)
File Edit View Project Tools Window Help
New Project... Open Project... Save All Compile Verify Download
Configuration.acfg* Error List
Settings for UNNAMED1
Settings
Units to Compile
Controller Information
Compile Options

Program Name: UNNAMED1

Description:

Controller Type: CTI 2500

Controller Name:

Controller Release: C400

PCS Release: 2.x

Memory Size (KB): 3072

Force Compile? □

Create Debug Version? □

Translate Ta No

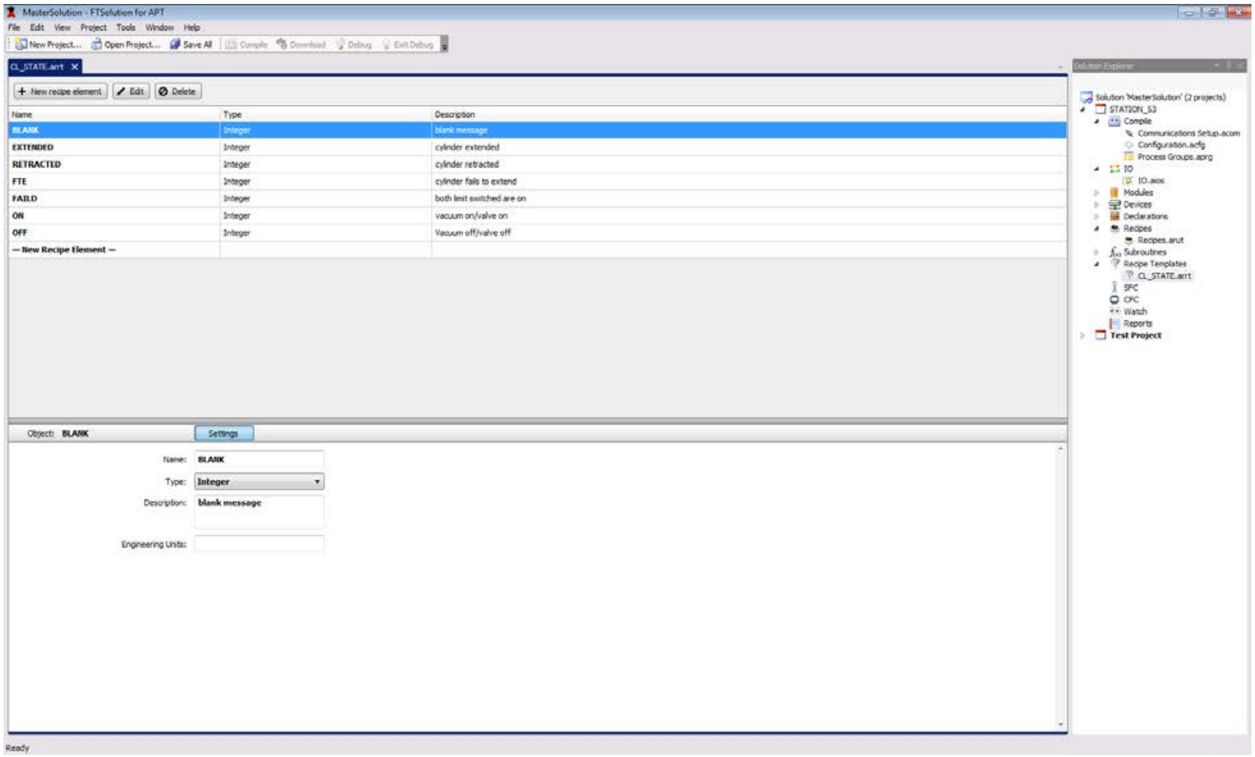
6. Save the **Configuration.acfg** file by clicking **Save Configuration.acfg** on the **File** menu.

Note: The original APT did not directly support the CTI 2500 family of PLCs. In order for the CTI 2500 Series® to work with the original APT, the CTI 2500 PLCs had to emulate the Simatic 505 series. This emulation required the use of a software patch for APT and a DIP switch setting on the CTI 2500 Series PLCs.

As FTSolution for APT directly supports the CTI 2500 Series, FTSolution for APT ignores the setting of the DIP switch. However, in FTSolution for APT, **you must specify a PLC type of CTI 2500 if you are connecting to a CTI 2500 processor**. A mismatched PLC type will cause an error and prevent the program from downloading.

Displaying and Editing Recipe Templates

In the following illustration, **Recipe Templates** in the **STATION_53** Project is selected. Selecting **Recipe Templates** from the Solution Explorer along the right edge of the window opens the Recipe Templates editor on the left side.



Name	Type	Description
BLANK	Integer	blank message
EXTENDED	Integer	cylinder extended
RETRACTED	Integer	cylinder retracted
FTE	Integer	cylinder fails to extend
FAILD	Integer	both limit switched are on
ON	Integer	vacuum on/valve on
OFF	Integer	Vacuum off/valve off
— New Recipe Element —		

Object: BLANK

Name: BLANK

Type: Integer

Description: blank message

Engineering Units:

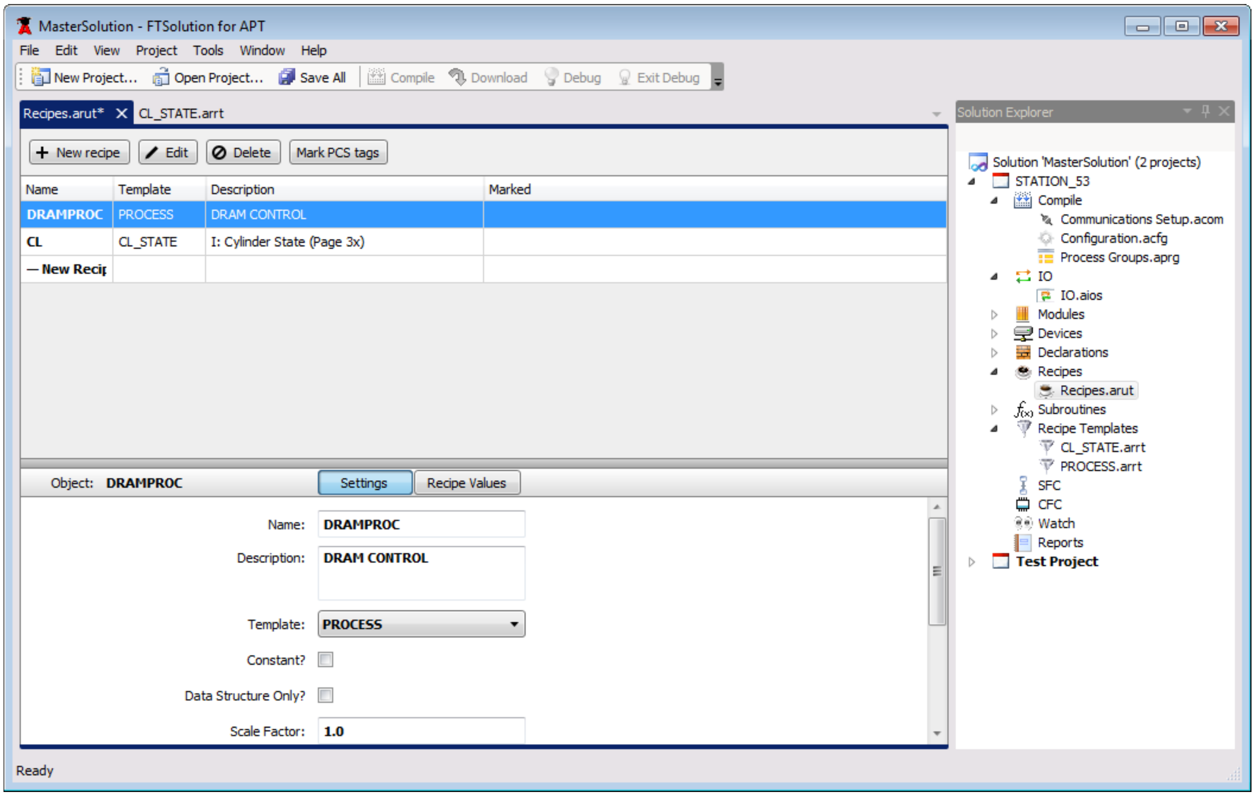
The upper portion of this editor lists all the **Recipe Templates** of the **STATION_53** Project. The lower portion of this editor displays the **Settings** of the Recipe Template that is highlighted in the upper portion.

Highlight a Recipe Template in the upper portion, to display its Settings in the lower portion.

Settings are validated as they are edited.

Displaying and Editing Recipes

In the following illustration, **Recipes** in the **STATION_53** Project is selected. Selecting **Recipes** from the Solution Explorer along the right edge of the window opens the Recipes editor on the left side.



Name	Template	Description	Marked
DRAMPROC	PROCESS	DRAM CONTROL	
CL	CL_STATE	I: Cylinder State (Page 3x)	
— New Recip			

Name: DRAMPROC

Description: DRAM CONTROL

Template: PROCESS

Constant? □

Data Structure Only? □

Scale Factor: 1.0

The upper portion of this editor lists all the **Recipes** of the **STATION_53** Project. The lower portion of this editor displays the **Settings** or **Recipe Values** of the Recipe that is highlighted in the upper portion.

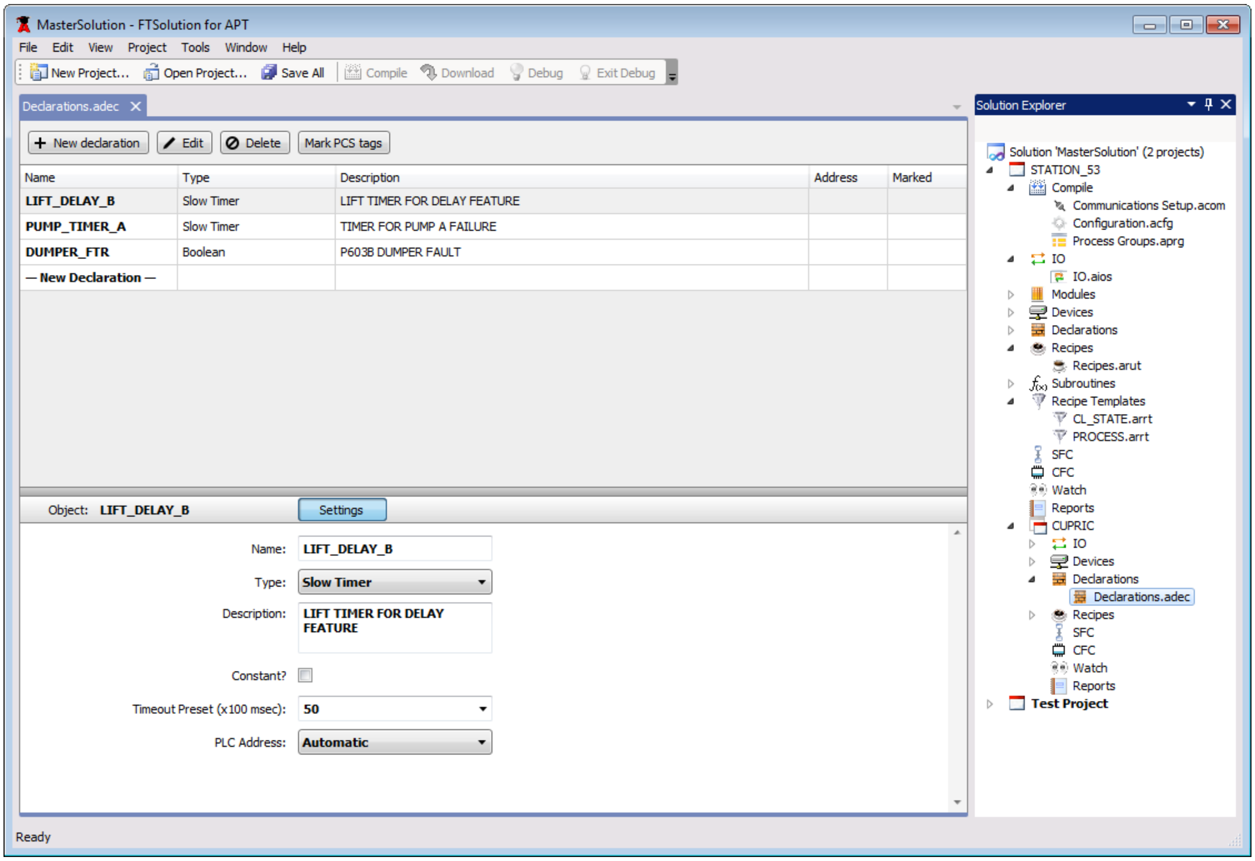
Press **F10,** or click the **Settings** and **Recipe Values** buttons, to toggle between the Settings and Recipe Values editors.

Highlight a Recipe in the upper portion, to display its Settings or Recipe Values in the lower portion.

Settings and Recipe Values are validated as they are edited.

Displaying and Editing Declarations

In the following illustration, **Declarations** of the **CUPRIC** item in the **POWERLINE** Project is selected. Selecting **Declarations** from the Solution Explorer along the right side of the window opens the Declarations editor on the left side.



Name	Type	Description	Address	Marked
LIFT_DELAY_B	Slow Timer	LIFT TIMER FOR DELAY FEATURE		
PUMP_TIMER_A	Slow Timer	TIMER FOR PUMP A FAILURE		
DUMPER_FTR	Boolean	P603B DUMPER FAULT		
— New Declaration —				

Object: LIFT_DELAY_B

Name: LIFT_DELAY_B

Type: Slow Timer

Description: LIFT TIMER FOR DELAY FEATURE

Constant? □

Timeout Preset (x100 msec): 50

PLC Address: Automatic

The upper portion of this editor lists all the **Declarations** of the **CUPRIC** item. The lower portion of this editor displays the **Settings** of the Declaration that is highlighted in the upper portion.

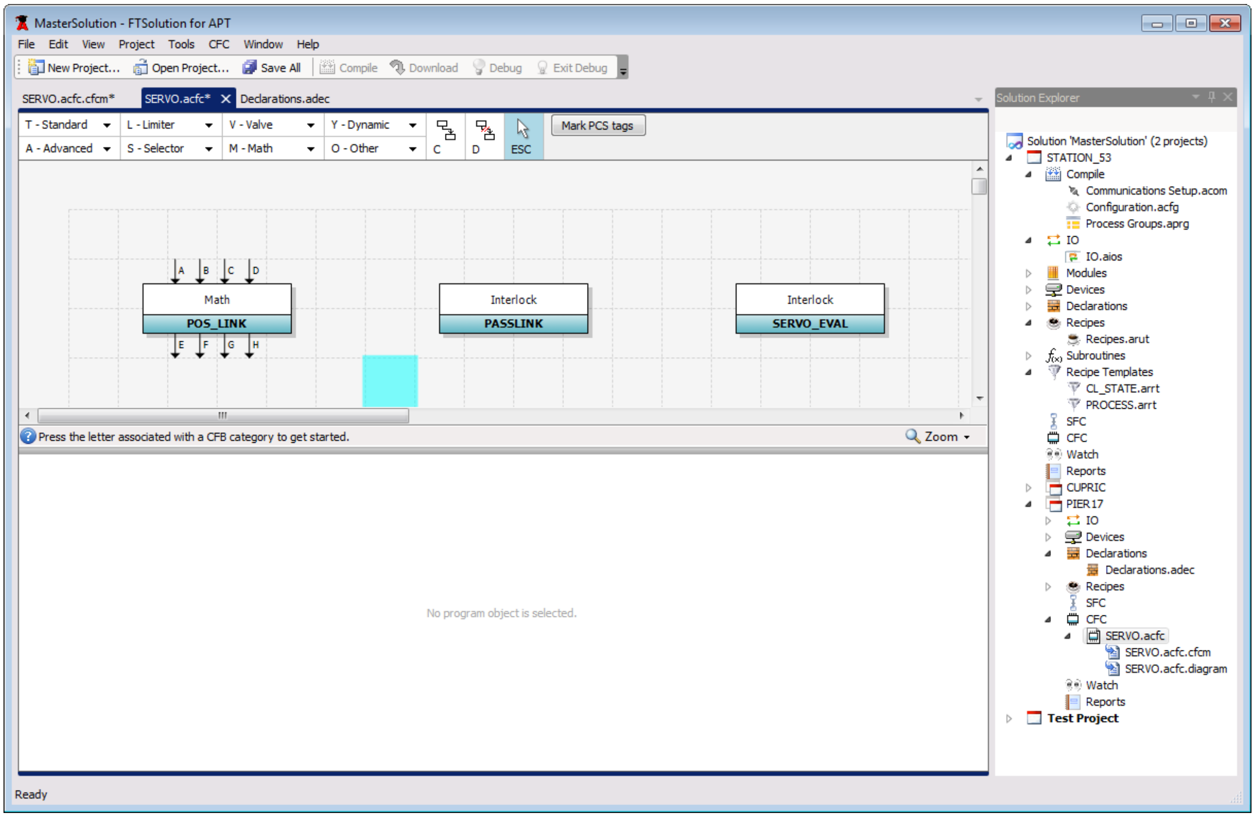
Highlight a Declaration in the upper portion to display its Settings in the lower portion.

Settings are validated as they are edited.

Displaying and Editing Continuous Function Charts

To display and edit a Continuous Function Chart, use the up and down arrow keys in the Solution Explorer to highlight a CFC, and press **Enter**. Or double click a CFC to select it.

In the following illustration, the **SERVO** CFC of the **PIER17** item was selected in the Solution Explorer. The CFC diagram appears in the upper portion of the edit window. This editor supports mouse operations, and the same keystrokes available in APT.



Press the letter associated with a CFB category to get started.

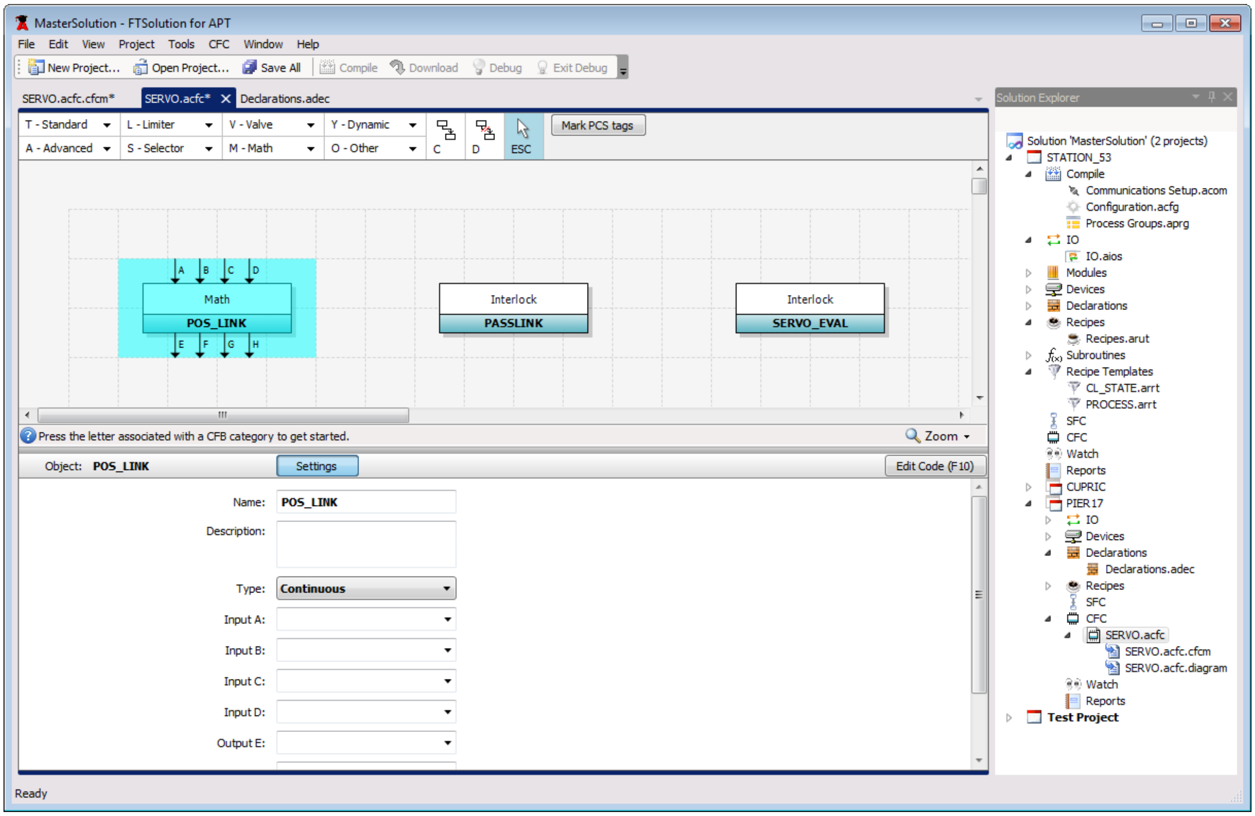
No program object is selected.

Displaying and Editing Block Settings in Continuous Function Charts

Use the arrow keys and press **Enter**, or mouse pointer to select a CFC block in the upper portion to edit its **Settings** in the lower portion.

In the following illustration, the **POS_LINK** Math block is selected, and its Settings appear.

Settings are validated as they are entered.



Press the letter associated with a CFB category to get started.

Object: POS_LINK

Name: POS_LINK

Description:

Type: Continuous

Input A:

Input B:

Input C:

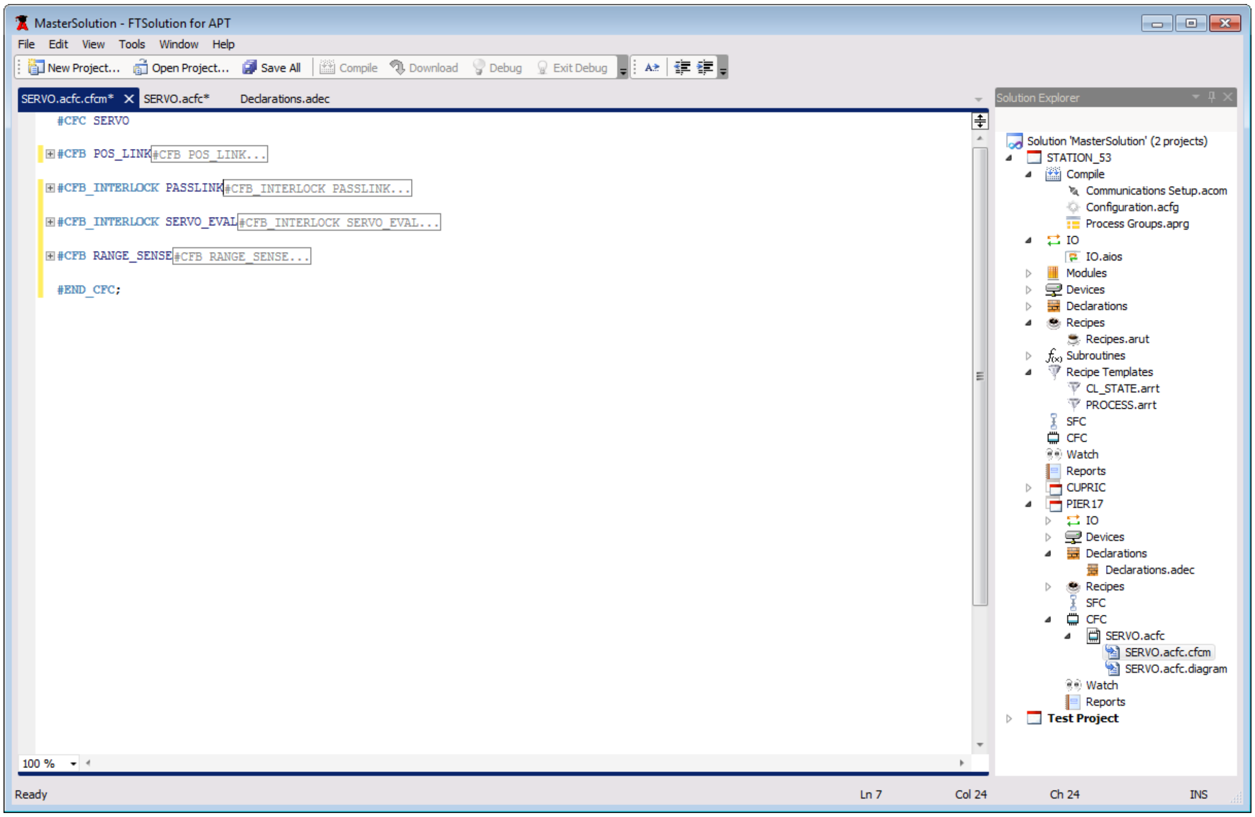
Input D:

Output E:

Ready

Displaying and Editing Math Statements in Continuous Function Charts

Press **F10** or click the **Edit Code (F10)** button in the Settings portion of the editor above to open the CFC Math Language Text Editor, as illustrated.



```
  #CFC SERVO

⊞#CFB POS_LINK#CFB POS_LINK...

⊞#CFB_INTERLOCK PASSLINK#CFB_INTERLOCK PASSLINK...

⊞#CFB_INTERLOCK SERVO_EVAL#CFB_INTERLOCK SERVO_EVAL...

⊞#CFB RANGE_SENSE#CFB RANGE_SENSE...

  #END_CFC;
```

Code Regions

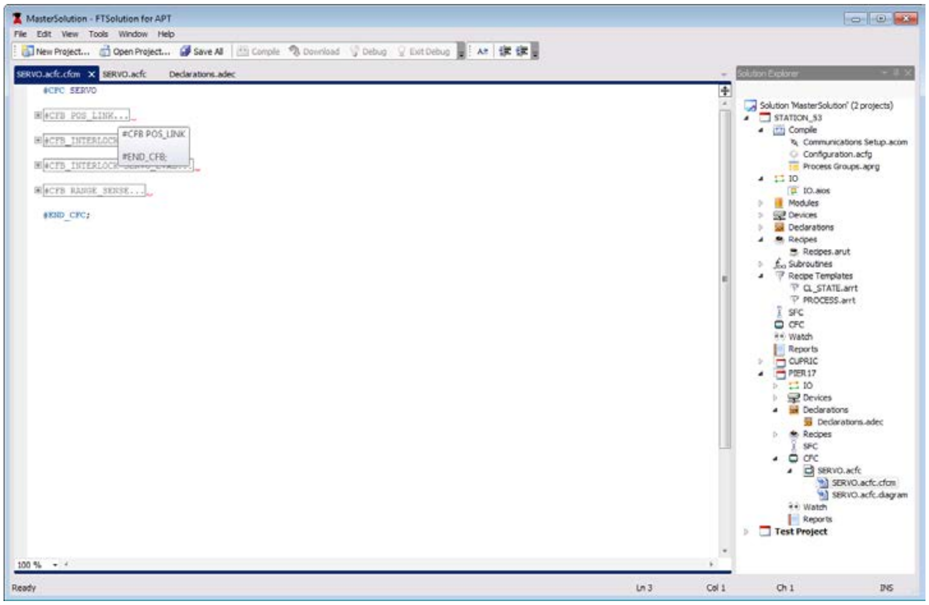
The text editor in APT displays the math statements for the selected CFC block only. However, the Math Statement Text Editor in FTSolution for APT provides access to the math statements for every block in the CFC.

This editor uses Code Regions to expand and collapse the statements for each block.

Click a + plus sign to expand the statements for that block, and click the – minus sign to collapse the statements. Or locate the cursor within a code region and press **Ctrl+MM** to toggle its expansion and collapse.

Flyby Windows Containing Statements Within a Collapsed Code Region

You can view the statements within a collapsed code region by hovering the mouse pointer over it. As illustrated, a flyby window containing the statements in the collapsed region appears. These flyby windows allow you to examine the statements in a collapsed region without expanding it.



```
#CFC SERVO

#CFB POS_LINK...

#CFB_INTERLOCK

#CFB_INTERLOCK

#CFB RANGE_SENSE...

#END_CFC;
```

```
#CFB POS_LINK

#END_CFB;
```

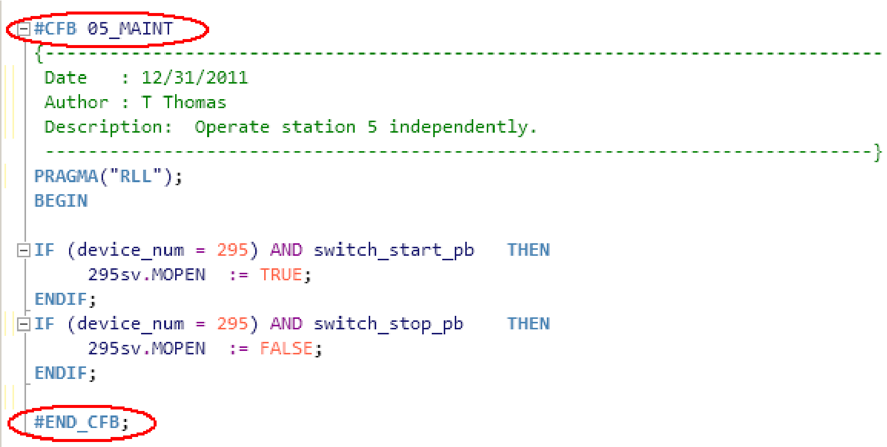
New Instructions that Separate Blocks

The text editor in APT displays the math statements for the selected CFC block only. However, the Math Statement Text Editor in FTSolution for APT provides access to the math statements for every block in the CFC.

Because the math statements of all blocks can be accessed through the same CFC Math Language Text Editor, each block must be separated from the other blocks.

To separate math statement blocks, each block must start with the **#CFB *block_name*** instruction and end with the **#END_CFB** instruction, as illustrated.

These new instructions are required to separate the math statements of all blocks from each other.



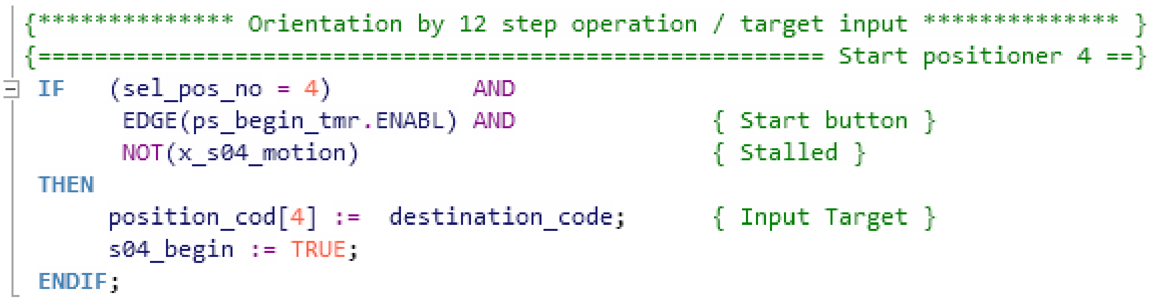
```
#CFB 05_MAINT
{-----------------------------------------------------------------------------
 Date   : 12/31/2011
 Author : T Thomas
 Description:  Operate station 5 independently.
 ------------------------------------------------------------------------------}
PRAGMA("RLL");
BEGIN

IF (device_num = 295) AND switch_start_pb   THEN
     295sv.MOPEN  := TRUE;
ENDIF;
IF (device_num = 295) AND switch_stop_pb    THEN
     295sv.MOPEN  := FALSE;
ENDIF;

#END_CFB;
```

New Text Editor Features

The CFC Math Language Text Editor provides features that increase the speed and accuracy of writing programs.

Syntax Coloring

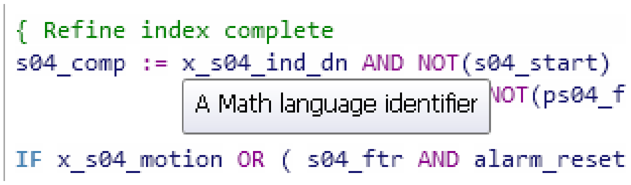
The text editor uses **Syntax Coloring**, in which keywords, variables, operators, and comments are displayed with different colors, as illustrated. This visually distinct method of displaying statements improves program readability.



```
{************** Orientation by 12 step operation / target input ************** }
{======================================================== Start positioner 4 ==}
IF    (sel_pos_no = 4)          AND
       EDGE(ps_begin_tmr.ENABL) AND                { Start button }
       NOT(x_s04_motion)                           { Stalled }
THEN
      position_cod[4] :=  destination_code;        { Input Target }
      s04_begin := TRUE;
ENDIF;
```

Hover Text

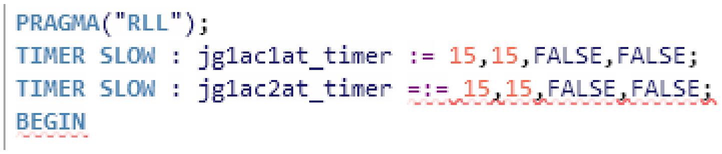
The text editor provides **Hover Text**, in descriptive tooltips that appear when the mouse pointer hovers over keywords and variables. These tooltips contain information regarding the item over which the mouse pointer hovers. In the following illustration, the tooltip appeared when the mouse hovered over the variable **x_s04_ind_dn**.



```
{ Refine index complete
s04_comp := x_s04_ind_dn AND NOT(s04_start)
           A Math language identifier NOT(ps04_f

IF x_s04_motion OR ( s04_ftr AND alarm_reset
```

Incremental Parsing

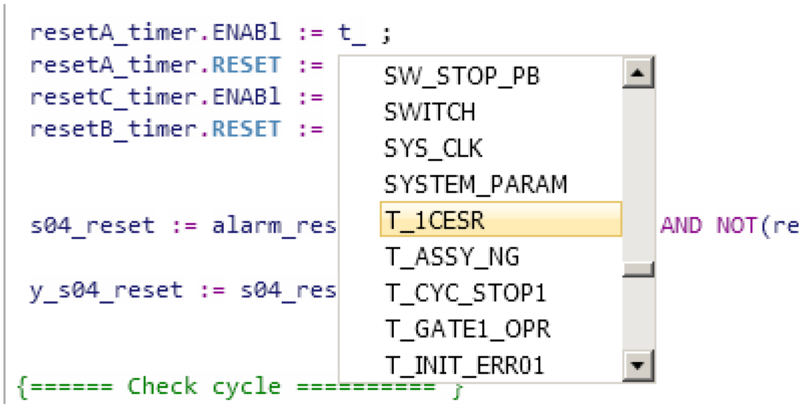
APT identifies errors only after exiting the text editor and compiling. However, FTSolution for APT editor identifies errors immediately with **Incremental Parsing**, in which each line is validated as it is typed. Errors are underlined in red and described in the **Error List** window. Select the **View \ Error List** menu item to display the Error List window. In the following illustration, the red underline in the second TIMER SLOW line identifies the "**=:=**" syntax error.



```
PRAGMA("RLL");
TIMER SLOW : jg1ac1at_timer := 15,15,FALSE,FALSE;
TIMER SLOW : jg1ac2at_timer =:= 15,15,FALSE,FALSE;
BEGIN
```

Statement Completion

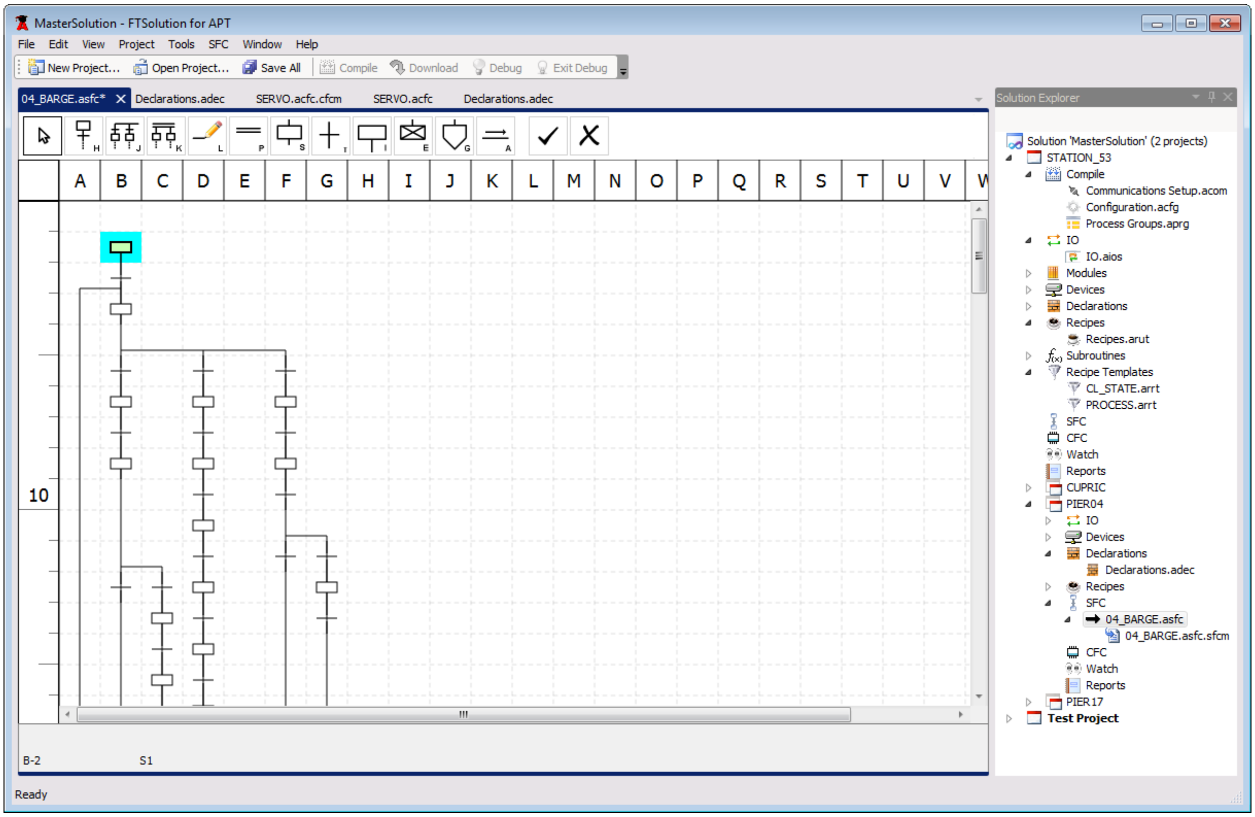
The text editor utilizes **Statement Completion**, in which lists of keywords and variables are offered, based upon the characters entered. In the following illustration, the list of keywords and variables appeared, when "**t_**" was typed into the line. The **T_1CESR** item is highlighted in the list because it is the closest match to what was typed. Continue typing the remainder of the keyword or instruction or select an item from the list to complete the entry.



```
  resetA_timer.ENABl := t_ ;
  resetA_timer.RESET :=
  resetC_timer.ENABl :=
  resetB_timer.RESET :=


  s04_reset := alarm_res                               AND NOT(re

  y_s04_reset := s04_res


{====== Check cycle ==========
```

Displaying and Editing Sequential Function Charts

To display and edit a Sequential Function Chart, use the up and down arrow keys in the Solution Explorer to highlight the desired SFC, and press **Enter**. Or double-click an SFC to select it. In the illustration, the **04_BARGE** SFC of the **PIER04** item was selected in the Solution Explorer.


MasterSolution - FTSolution for APT
File Edit View Project Tools SFC Window Help
New Project... Open Project... Save All Compile Download Debug Exit Debug
04_BARGE.asfc* Declarations.adec SERVO.acfc.cfcm SERVO.acfc Declarations.adec
A B C D E F G H I J K L M N O P Q R S T U V W
10
B-2 S1
Ready
Solution Explorer
Solution 'MasterSolution' (2 projects)
STATION_53
Compile
Communications Setup.acom
Configuration.acfg
Process Groups.aprg
IO
IO.aios
Modules
Devices
Declarations
Recipes
Recipes.arut
Subroutines
Recipe Templates
CL_STATE.arrt
PROCESS.arrt
SFC
CFC
Watch
Reports
CUPRIC
PIER04
IO
Devices
Declarations
Declarations.adec
Recipes
SFC
04_BARGE.asfc
04_BARGE.asfc.sfcm
CFC
Watch
Reports
PIER17
Test Project

The SFC editor supports the same keystrokes that are available in APT. It also supports mouse operations. For example, attach an instruction to the mouse pointer by clicking the instruction toolbar icon at the top of the editor. Then click and drag the mouse pointer in the SFC grid to add that instruction.

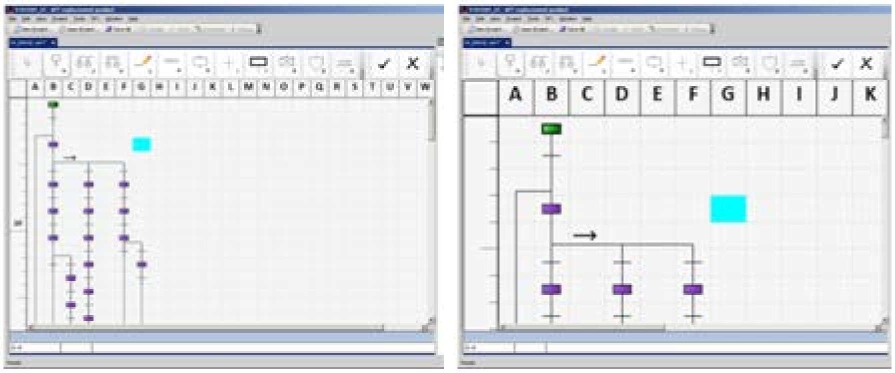
The **Pointer** toolbar icon ↖ detaches any instruction from the mouse pointer.

The **Check Mark** toolbar icon ✓ is equivalent to pressing **Enter**.

The **X** toolbar icon X is equivalent to pressing **Escape**.

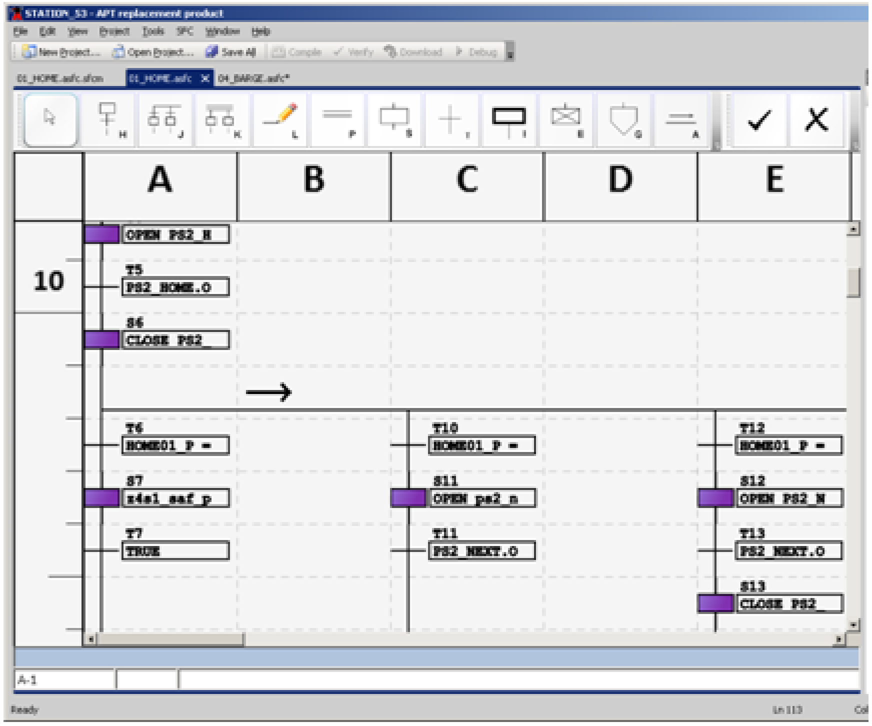
SFC Magnification

Press **Ctrl** and scroll the mouse wheel to magnify the contents of the SFC grid. In the following illustration, the right screen shot is a magnification of the SFC in the left screen shot.



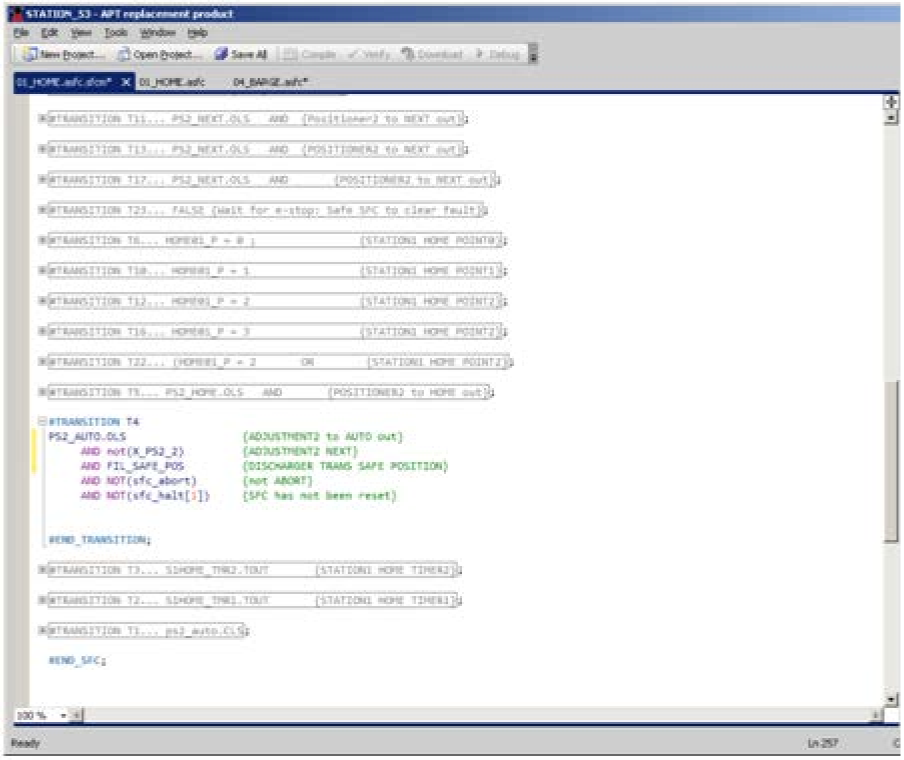
SFC Zoom Mode

Press **Alt-Z** to enable the SFC zoom mode. This displays Comments next to each step and transition, as illustrated. Comments are the first characters in the statements of each step and transition. Set the Comment width by pressing **Alt-W** and entering a value from 0 – 68.



Displaying and Editing Math Statements in Sequential Function Charts

Use the arrow keys or mouse to place the SFC cursor on a step or transition, and press **F10** to display its math block in the SFC Math Language Text Editor, as illustrated.



```
#TRANSITION T11... PS2_NEXT.OLS   AND  {Positioner2 to NEXT out};
#TRANSITION T13... PS2_NEXT.OLS   AND  {POSITIONER2 to NEXT out};
#TRANSITION T17... PS2_NEXT.OLS   AND        {POSITIONER2 to NEXT out};
#TRANSITION T23... FALSE {Wait for e-stop; Safe SFC to clear fault};
#TRANSITION T6... HOME01_P = 0 ;                  {STATION1 HOME POINT0};
#TRANSITION T10... HOME01_P = 1                   {STATION1 HOME POINT1};
#TRANSITION T12... HOME01_P = 2                   {STATION1 HOME POINT2};
#TRANSITION T16... HOME05_P = 3                   {STATION1 HOME POINT2};
#TRANSITION T22... (HOME01_P = 2         OR        {STATION1 HOME POINT2};
#TRANSITION T5... PS2_HOME.OLS   AND        {POSITIONER2 to HOME out};

#TRANSITION T4
PS2_AUTO.OLS                 {ADJUSTMENT2 to AUTO out}
     AND not(X_PS2_2)        {ADJUSTMENT2 NEXT}
     AND FIL_SAFE_POS        {DISCHARGER TRANS SAFE POSITION}
     AND NOT(sfc_abort)      {not ABORT}
     AND NOT(sfc_halt[1])    {SFC has not been reset}


#END_TRANSITION;
#TRANSITION T3... S1HOME_TMR2.TOUT       {STATION1 HOME TIMER2};
#TRANSITION T2... S1HOME_TMR1.TOUT       {STATION1 HOME TIMER1};
#TRANSITION T1... ps2_auto.CLS;

#END_SFC;
```

Code Regions

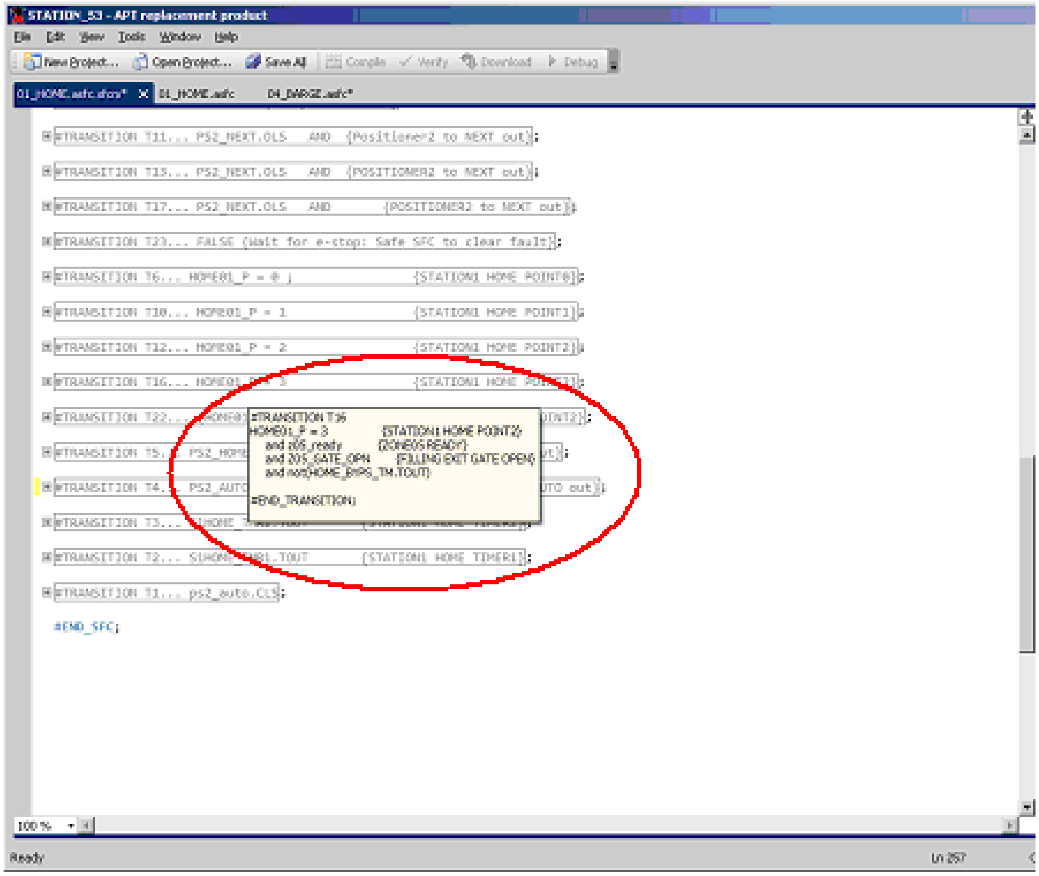
The text editor in APT displays the math statements for the selected SFC step or transition only. However, the Math Statement Text Editor in FTSolution for APT provides access to the math statements for every step and transition in the SFC.

This editor uses Code Regions to expand and collapse the statements for each step and transition.

Left click a **+** plus sign to expand the statements for that step or transition, and click the – minus sign to collapse the statements. Or locate the cursor within a code region and press **Ctrl+MM** to toggle its expansion and collapse.

Flyby Windows Containing Statements Within a Collapsed Code Region

You can view the statements within a collapsed code region by hovering the mouse pointer over it. As illustrated, a flyby window containing the statements in the collapsed region appears. These flyby windows allow you to examine the statements in a collapsed region without expanding it.


STATION_53 - APT replacement product
File Edit View Tools Window Help
New Project... Open Project... Save All Compile Verify Download Debug
01_HOME.sfc.dsn* 01_HOME.sfc 04_DARGE.sfc*
100 %
Ready
Ln 257

```
#TRANSITION T11... PS2_NEXT.OLS   AND  {Positioner2 to NEXT out};
#TRANSITION T13... PS2_NEXT.OLS   AND  {POSITIONER2 to NEXT out};
#TRANSITION T17... PS2_NEXT.OLS   AND       {POSITIONER2 to NEXT out};
#TRANSITION T23... FALSE {Wait for e-stop: Safe SFC to clear fault};
#TRANSITION T6... HOME01_P = 0 ;                {STATION1 HOME POINT0};
#TRANSITION T10... HOME01_P = 1                 {STATION1 HOME POINT1};
#TRANSITION T12... HOME01_P = 2                 {STATION1 HOME POINT2};
#TRANSITION T16... HOME01_P = 3                 {STATION1 HOME POINT3};
#TRANSITION T22... HOME01                                          OINT2};
#TRANSITION T5... PS2_HOME                                         ut};
#TRANSITION T4... PS2_AUTO                                         UTO out};
#TRANSITION T3... SUHOME_                                          };
#TRANSITION T2... SUHOME_TMR1.TOUT       {STATION1 HOME TIMER1};
#TRANSITION T1... ps2_auto.CLS;

#END_SFC;
```

```
#TRANSITION T16
HOME01_P = 3                {STATION1 HOME POINT2}
    and z05_ready           {ZONE05 READY}
    and 205_GATE_OPN         {FILLING EXIT GATE OPEN}
    and not(HOME_BYPS_TM.TOUT)

#END_TRANSITION;
```

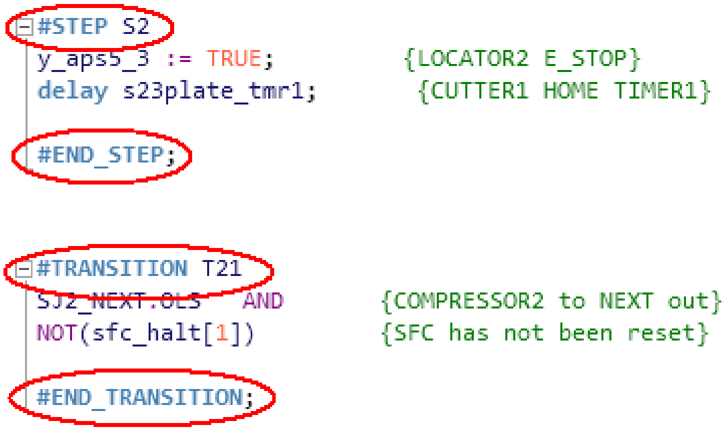
New Instructions that Separate Steps and Transitions

The text editor in APT displays the math statements for the selected SFC step or transition only. However, the Math Statement Text Editor in FTSolution for APT provides access to the math statements for every step and transition in the SFC.

Because the math statements of all steps and transitions can be accessed through the same SFC Math Language Text Editor, each step and transition must be separated from the other steps and transitions.

To separate math statements, step statements must start with the **#STEP *step_name*** instruction and end with the **#END_STEP** instruction. Similarly, transition statements must start with the **#TRANSITION *transition_name*** instruction and end with the **#END_TRANSITION** instruction, as illustrated.

These new instructions are required to separate the math statements of all steps and transitions from each other.



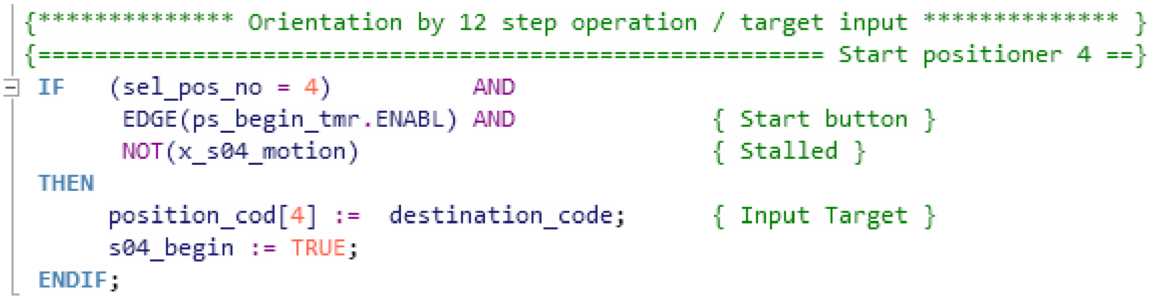
```
#STEP S2
y_aps5_3 := TRUE;          {LOCATOR2 E_STOP}
delay s23plate_tmr1;        {CUTTER1 HOME TIMER1}

#END_STEP;


#TRANSITION T21
SJ2_NEXT.OLS   AND        {COMPRESSOR2 to NEXT out}
NOT(sfc_halt[1])          {SFC has not been reset}

#END_TRANSITION;
```

New Text Editor Features

The SFC Math Language Text Editor provides features that increase the speed and accuracy of writing programs.

Syntax Coloring

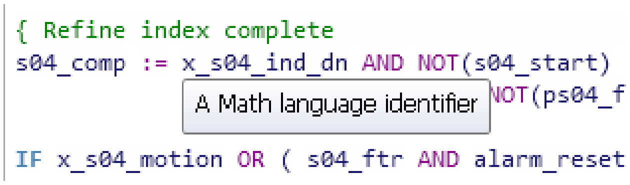
The text editor uses **Syntax Coloring**, in which keywords, variables, operators, and comments are displayed with different colors, as illustrated. This visually distinct method of displaying statements improves program readability.



```
{************** Orientation by 12 step operation / target input ************** }
{====================================================== Start positioner 4 ==}
IF    (sel_pos_no = 4)         AND
       EDGE(ps_begin_tmr.ENABL) AND              { Start button }
       NOT(x_s04_motion)                         { Stalled }
THEN
      position_cod[4] :=  destination_code;      { Input Target }
      s04_begin := TRUE;
ENDIF;
```

Hover Text

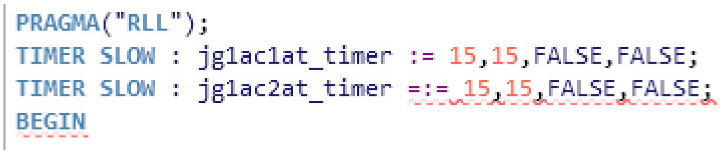
The text editor provides **Hover Text**, in descriptive tooltips that appear when the mouse pointer hovers over keywords and variables. These tooltips contain information regarding the item over which the mouse pointer hovers. In the following illustration, the tooltip appeared when the mouse hovered over the variable **x_s04_ind_dn**.



```
{ Refine index complete
s04_comp := x_s04_ind_dn AND NOT(s04_start)
                                NOT(ps04_f

IF x_s04_motion OR ( s04_ftr AND alarm_reset
```

Incremental Parsing

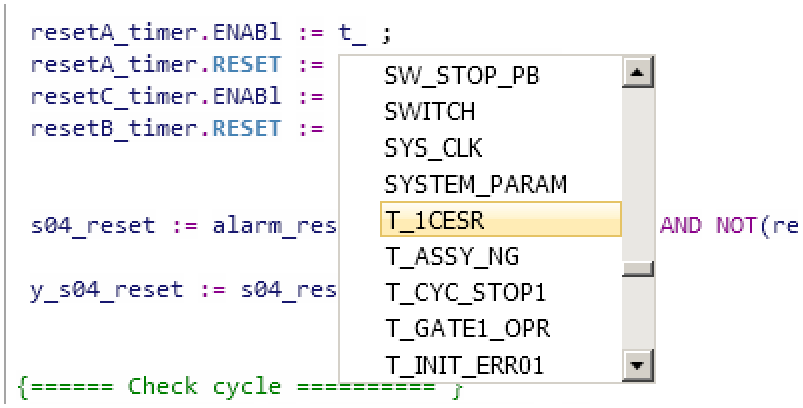
APT identifies errors only after exiting the text editor and compiling. However, the FTSolution for APT editor identifies errors immediately with **Incremental Parsing**, in which each line is validated as it is typed. Errors are underlined in red and described in the **Error List** window. Select the **View \ Error List** menu item to display the Error List window. In the following illustration, the red underline in the second TIMER SLOW line identifies the "**=:=**" syntax error.



```
PRAGMA("RLL");
TIMER SLOW : jg1ac1at_timer := 15,15,FALSE,FALSE;
TIMER SLOW : jg1ac2at_timer =:= 15,15,FALSE,FALSE;
BEGIN
```

Statement Completion

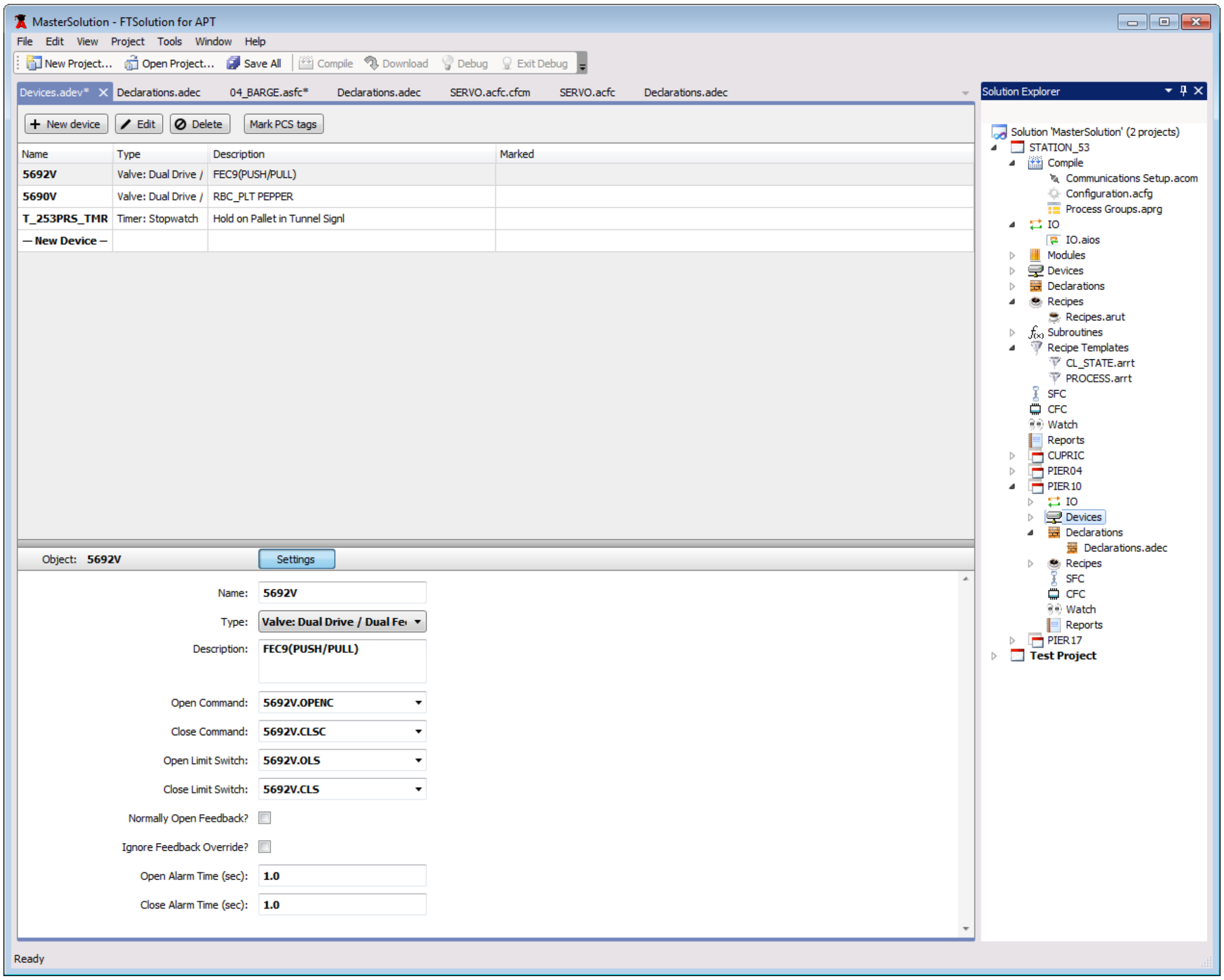
The text editor utilizes **Statement Completion**, in which lists of keywords and variables are offered, based upon the characters entered. In the following illustration, the list of keywords and variables appeared, when "**t_**" was typed into the line. The **T_1CESR** item is highlighted in the list because it is the closest match to what was typed. Continue typing the remainder of the keyword or instruction or select an item from the list to complete the entry.



```
  resetA_timer.ENABl := t_ ;
  resetA_timer.RESET :=
  resetC_timer.ENABl :=
  resetB_timer.RESET :=


  s04_reset := alarm_res                      AND NOT(re

  y_s04_reset := s04_res


{====== Check cycle ========== }
```

Displaying and Editing Devices

In the following illustration, **Devices** of the **PIER10** item in the **STATION_53** Project is selected. Selecting **Devices** from the Solution Explorer along the right edge of the window opens the Devices editor on the left side.


MasterSolution - FTSolution for APT
File Edit View Project Tools Window Help
New Project… Open Project… Save All Compile Download Debug Exit Debug
Devices.adev* Declarations.adec 04_BARGE.asfc* Declarations.adec SERVO.acfc.cfcm SERVO.acfc Declarations.adec
New device Edit Delete Mark PCS tags
Settings
Solution Explorer
Solution 'MasterSolution' (2 projects)
STATION_53
Compile
Communications Setup.acom
Configuration.acfg
Process Groups.aprg
IO
IO.aios
Modules
Devices
Declarations
Recipes
Recipes.arut
Subroutines
Recipe Templates
CL_STATE.arrt
PROCESS.arrt
SFC
CFC
Watch
Reports
CUPRIC
PIER04
PIER10
IO
Devices
Declarations
Declarations.adec
Recipes
SFC
CFC
Watch
Reports
PIER17
Test Project
Ready

Name	Type	Description	Marked
5692V	Valve: Dual Drive /	FEC9(PUSH/PULL)	
5690V	Valve: Dual Drive /	RBC_PLT PEPPER	
T_253PRS_TMR	Timer: Stopwatch	Hold on Pallet in Tunnel Signl	
— New Device —			

Object: 5692V

Name: 5692V

Type: Valve: Dual Drive / Dual Fe

Description: FEC9(PUSH/PULL)

Open Command: 5692V.OPENC

Close Command: 5692V.CLSC

Open Limit Switch: 5692V.OLS

Close Limit Switch: 5692V.CLS

Normally Open Feedback? ☐

Ignore Feedback Override? ☐

Open Alarm Time (sec): 1.0

Close Alarm Time (sec): 1.0

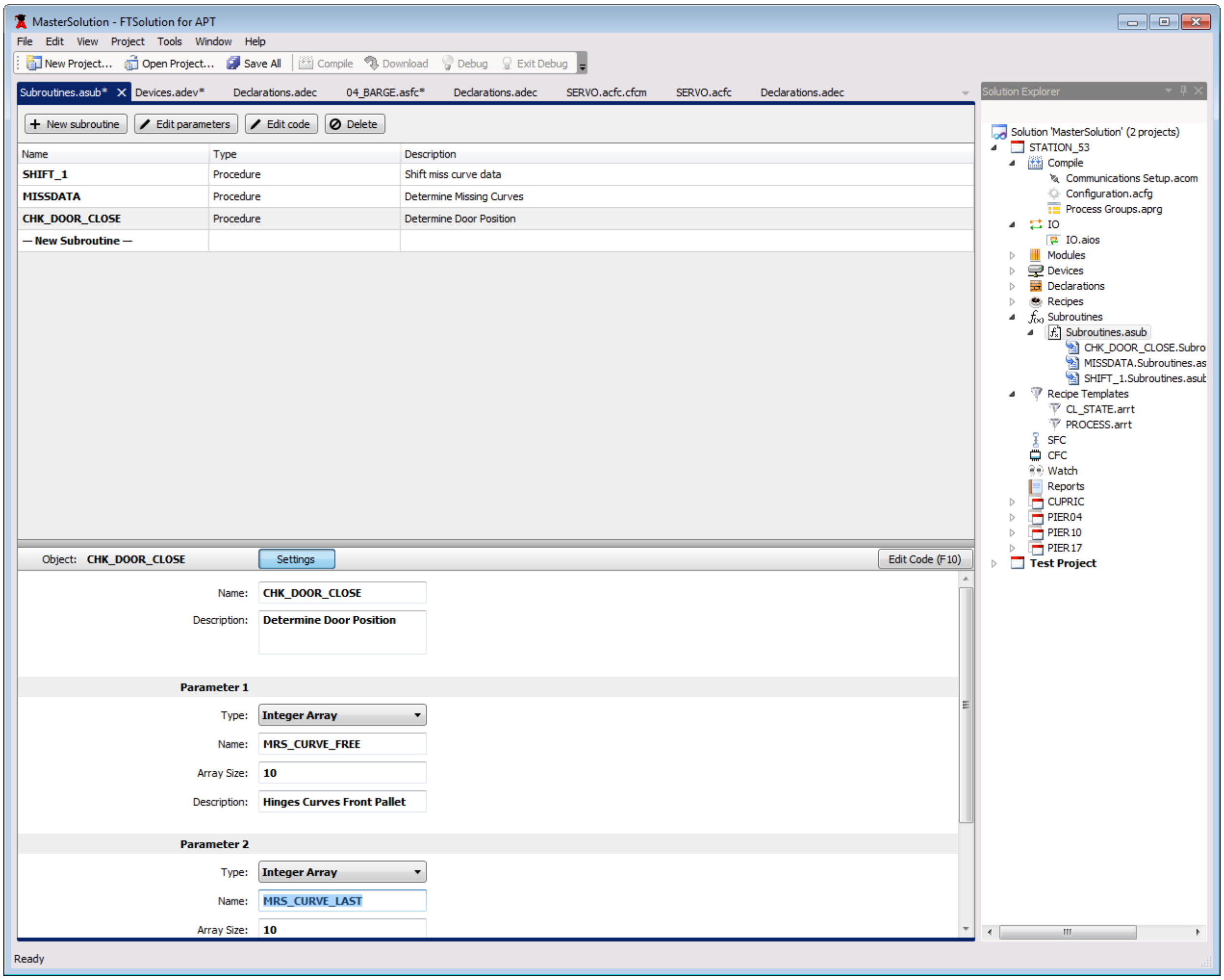
The upper portion of this editor lists all the **Devices** of the **PIER10** item. The lower portion of this editor displays the **Settings** of the Device that is highlighted in the upper portion.

Highlight a Device in the upper portion to display its Settings in the lower portion.

Settings are validated as they are edited.

Displaying and Editing Subroutines

In the following illustration, **Subroutines** in the **STATION_53** Project is selected. Selecting **Subroutines** from the Solution Explorer along the right edge of the window opens the Subroutine editor on the left side.



Name	Type	Description
SHIFT_1	Procedure	Shift miss curve data
MISSDATA	Procedure	Determine Missing Curves
CHK_DOOR_CLOSE	Procedure	Determine Door Position
— New Subroutine —		

Object: CHK_DOOR_CLOSE

Name: CHK_DOOR_CLOSE
Description: Determine Door Position

Parameter 1
Type: Integer Array
Name: MRS_CURVE_FREE
Array Size: 10
Description: Hinges Curves Front Pallet

Parameter 2
Type: Integer Array
Name: MRS_CURVE_LAST
Array Size: 10

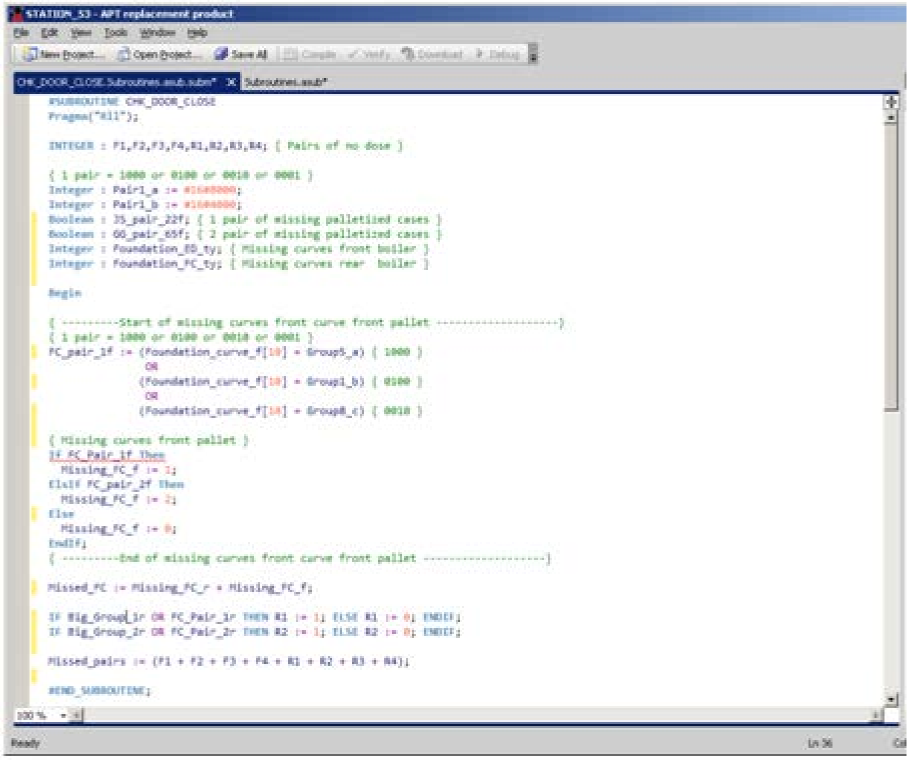
The upper portion of this editor lists all the **Subroutines** of the **STATION_53** Project. The lower portion of this editor displays the **Settings** of the Subroutine that is highlighted in the upper portion.

Highlight a Subroutine in the upper portion to display its Settings in the lower portion.

Settings are validated as they are edited.

Displaying and Editing Math Statements in Subroutines

Press **F10** or click the **Edit Code (F10)** button to display the math statements in the Subroutine Math Language Text Editor, as illustrated.


STATION_53 - APT replacement product
File Edit View Tools Window Help
New Project... Open Project... Save All Compile Verify Download Debug
CHK_DOOR_CLOSE.Subroutines.asub.subm* Subroutines.asub*
100 %
Ready
Ln 36
Col

```
#SUBROUTINE CHK_DOOR_CLOSE
Pragma("R11");

INTEGER : F1,F2,F3,F4,R1,R2,R3,R4; { Pairs of no dose }

{ 1 pair = 1000 or 0100 or 0010 or 0001 }
Integer : Pair1_a := #1600000;
Integer : Pair1_b := #1600000;
Boolean : 35_pair_22f; { 1 pair of missing palletized cases }
Boolean : 60_pair_65f; { 2 pair of missing palletized cases }
Integer : Foundation_8D_ty; { Missing curves front boiler }
Integer : Foundation_FC_ty; { Missing curves rear  boiler }

Begin

{ ---------Start of missing curves front curve front pallet -------------------}
{ 1 pair = 1000 or 0100 or 0010 or 0001 }
FC_pair_1f := (Foundation_curve_f[10] = Group5_a) { 1000 }
               OR
              (Foundation_curve_f[10] = Group1_b) { 0100 }
               OR
              (Foundation_curve_f[10] = Group8_c) { 0010 }

{ Missing curves front pallet }
If FC_Pair_1f Then
  Missing_FC_f := 1;
ElsIf FC_pair_2f Then
  Missing_FC_f := 2;
Else
  Missing_FC_f := 0;
EndIf;
{ ---------End of missing curves front curve front pallet ------------------}

Missed_FC := Missing_FC_r + Missing_FC_f;

If Big_Group_1r OR FC_Pair_1r THEN R1 := 1; ELSE R1 := 0; ENDIF;
If Big_Group_2r OR FC_Pair_2r THEN R2 := 1; ELSE R2 := 0; ENDIF;

Missed_pairs := (F1 + F2 + F3 + F4 + R1 + R2 + R3 + R4);

#END_SUBROUTINE;
```

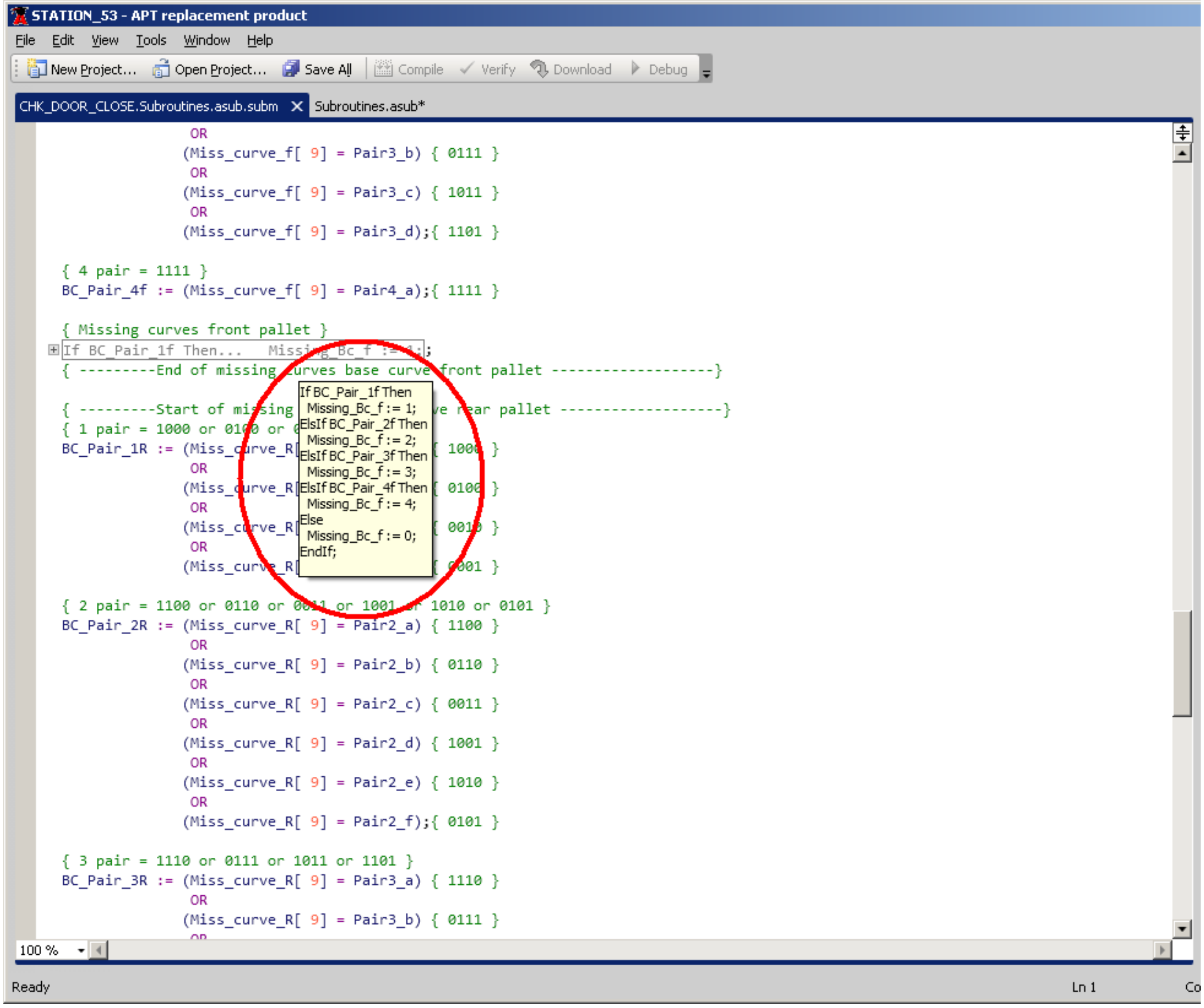
Code Regions

The Subroutine Math Text Editor in FTSolution for APT groups statements into Code Regions that can be expanded and collapsed.

Left click a **+** plus sign to expand the statements in that region, and click the – minus sign to collapse the statements. Or locate the cursor within a code region and press **Ctrl+MM** to toggle its expansion and collapse.

Flyby Windows Containing Statements Within a Collapsed Code Region

You can view the statements within a collapsed code region by hovering the mouse pointer over it. As illustrated, a flyby window containing the statements in the collapsed region appears. These flyby windows allow you to examine the statements in a collapsed region without expanding it.


STATION_53 - APT replacement product
File Edit View Tools Window Help
New Project... Open Project... Save All Compile Verify Download Debug
CHK_DOOR_CLOSE.Subroutines.asub.subm
Subroutines.asub*
100 %
Ready
Ln 1
Co

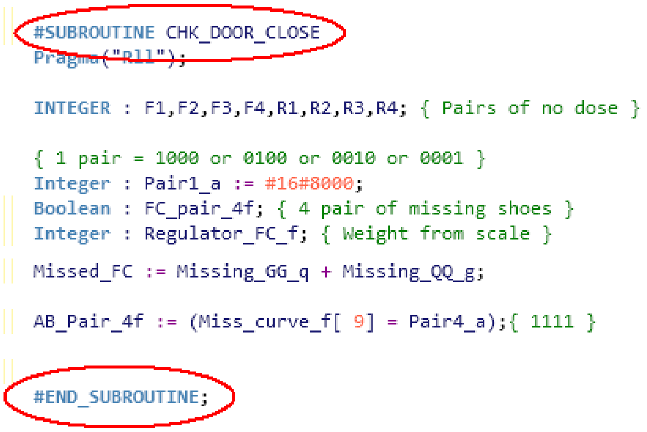
```
                  OR
                 (Miss_curve_f[ 9] = Pair3_b) { 0111 }
                  OR
                 (Miss_curve_f[ 9] = Pair3_c) { 1011 }
                  OR
                 (Miss_curve_f[ 9] = Pair3_d);{ 1101 }

  { 4 pair = 1111 }
  BC_Pair_4f := (Miss_curve_f[ 9] = Pair4_a);{ 1111 }

  { Missing curves front pallet }
 ⊞If BC_Pair_1f Then...   Missing_Bc_f := 4;;
  { ---------End of missing curves base curve front pallet ------------------}

  { ---------Start of missing                      ve rear pallet ------------------}
  { 1 pair = 1000 or 0100 or 0
  BC_Pair_1R := (Miss_curve_R[                      { 1000 }
                  OR
                 (Miss_curve_R[                      { 0100 }
                  OR
                 (Miss_curve_R[                      { 0010 }
                  OR
                 (Miss_curve_R[                      { 0001 }

  { 2 pair = 1100 or 0110 or 0011 or 1001 or 1010 or 0101 }
  BC_Pair_2R := (Miss_curve_R[ 9] = Pair2_a) { 1100 }
                  OR
                 (Miss_curve_R[ 9] = Pair2_b) { 0110 }
                  OR
                 (Miss_curve_R[ 9] = Pair2_c) { 0011 }
                  OR
                 (Miss_curve_R[ 9] = Pair2_d) { 1001 }
                  OR
                 (Miss_curve_R[ 9] = Pair2_e) { 1010 }
                  OR
                 (Miss_curve_R[ 9] = Pair2_f);{ 0101 }

  { 3 pair = 1110 or 0111 or 1011 or 1101 }
  BC_Pair_3R := (Miss_curve_R[ 9] = Pair3_a) { 1110 }
                  OR
                 (Miss_curve_R[ 9] = Pair3_b) { 0111 }
```

```
If BC_Pair_1f Then
  Missing_Bc_f := 1;
ElsIf BC_Pair_2f Then
  Missing_Bc_f := 2;
ElsIf BC_Pair_3f Then
  Missing_Bc_f := 3;
ElsIf BC_Pair_4f Then
  Missing_Bc_f := 4;
Else
  Missing_Bc_f := 0;
EndIf;
```

New Instructions in Subroutines

The Subroutine Math Language Text Editor identifies the start of each Subroutine with the **#SUBROUTINE** ***subroutine_name*** instruction and identifies the end with the **#END_SUBROUTINE** instruction, as illustrated.

These new instructions are required at the start and end of each Subroutine.



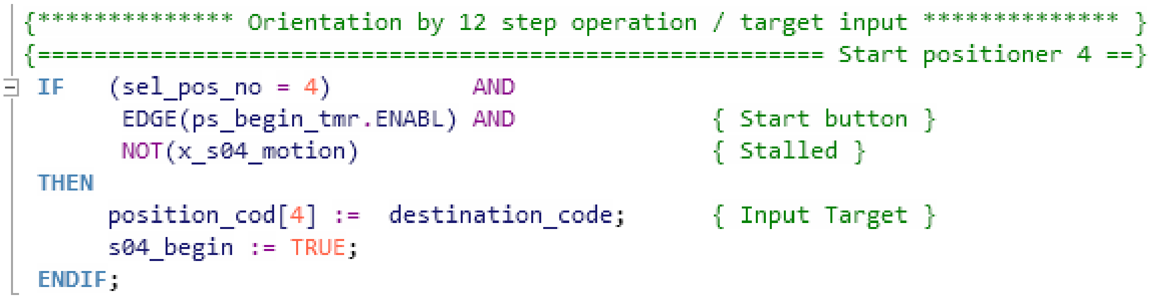
```
#SUBROUTINE CHK_DOOR_CLOSE
Pragma("R11");

INTEGER : F1,F2,F3,F4,R1,R2,R3,R4; { Pairs of no dose }

{ 1 pair = 1000 or 0100 or 0010 or 0001 }
Integer : Pair1_a := #16#8000;
Boolean : FC_pair_4f; { 4 pair of missing shoes }
Integer : Regulator_FC_f; { Weight from scale }

Missed_FC := Missing_GG_q + Missing_QQ_g;

AB_Pair_4f := (Miss_curve_f[ 9] = Pair4_a);{ 1111 }


#END_SUBROUTINE;
```

New Text Editor Features

The Subroutine Math Language Text Editor provides features that increase the speed and accuracy of writing programs.

Syntax Coloring

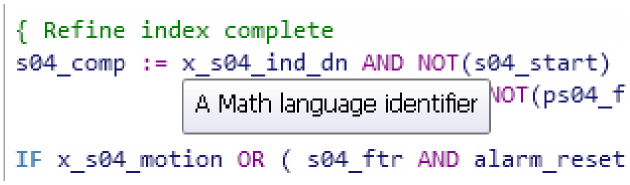
The text editor uses **Syntax Coloring**, in which keywords, variables, operators, and comments are displayed with different colors, as illustrated. This visually distinct method of displaying statements improves program readability.



```
{************** Orientation by 12 step operation / target input ************** }
{======================================================= Start positioner 4 ==}
IF    (sel_pos_no = 4)          AND
       EDGE(ps_begin_tmr.ENABL) AND            { Start button }
       NOT(x_s04_motion)                       { Stalled }
THEN
      position_cod[4] :=  destination_code;    { Input Target }
      s04_begin := TRUE;
ENDIF;
```

Hover Text

The text editor provides **Hover Text**, in descriptive tooltips that appear when the mouse pointer hovers over keywords and variables. These tooltips contain information regarding the item over which the mouse pointer hovers. In the following illustration, the tooltip appeared when the mouse hovered over the variable **x_s04_ind_dn**.

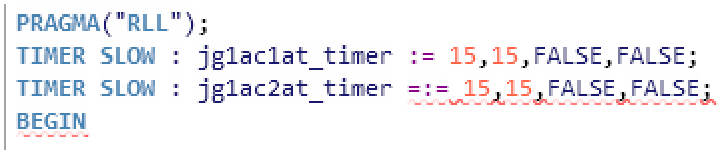


```
{ Refine index complete
s04_comp := x_s04_ind_dn AND NOT(s04_start)
                               NOT(ps04_f

IF x_s04_motion OR ( s04_ftr AND alarm_reset
```

A Math language identifier

Incremental Parsing

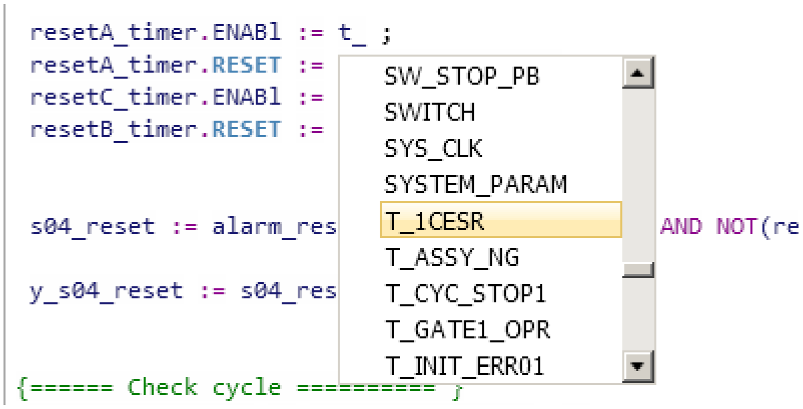
APT identifies errors only after exiting the text editor and compiling. However, the FTSolution for APT editor identifies errors immediately with **Incremental Parsing**, in which each line is validated as it is typed. Errors are underlined in red, and described in the **Error List** window. Select the **View \ Error List** menu item to display the Error List window. In the following illustration, the red underline in the second TIMER SLOW line identifies the "**=:=**" syntax error.



```
PRAGMA("RLL");
TIMER SLOW : jglaclat_timer := 15,15,FALSE,FALSE;
TIMER SLOW : jglac2at_timer =:= 15,15,FALSE,FALSE;
BEGIN
```

Statement Completion

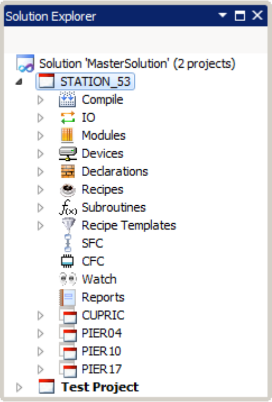
The text editor utilizes **Statement Completion**, in which lists of keywords and variables are offered, based upon the characters entered. In the following illustration, the list of keywords and variables appeared, when "**t_**" was typed into the line. The **T_1CESSR** item is highlighted in the list because it is the closest match to what was typed. Continue typing the remainder of the keyword or instruction, or select an item from the list to complete the entry.



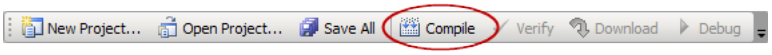
```
resetA_timer.ENABl := t_ ;
resetA_timer.RESET :=
resetC_timer.ENABl :=
resetB_timer.RESET :=


s04_reset := alarm_res                          AND NOT(re

y_s04_reset := s04_res


{====== Check cycle ==========
```

Compiling an FTSolution for APT Project

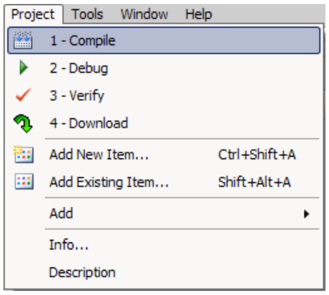
The option to compile a project is available when a project (or its compile configuration file) is selected in the Solution Explorer.



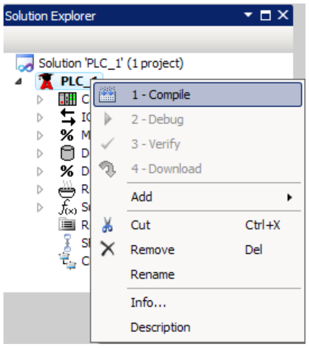
1. When a project is selected in the Solution Explorer, a compile of the project can be initiated in several ways:
   - By pressing the **1** key.
   - By clicking **Compile** on the standard toolbar.



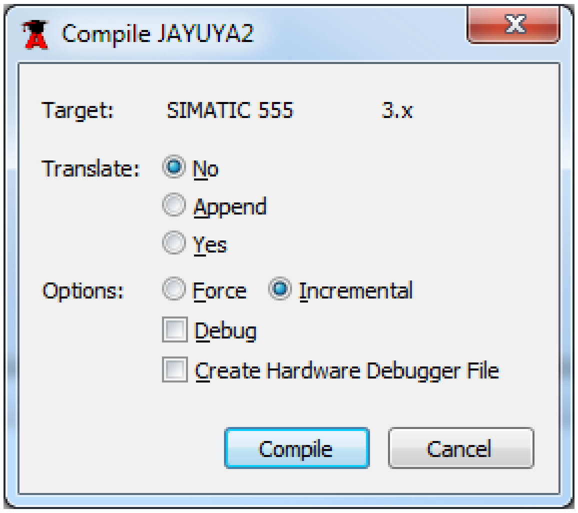
   - By clicking **Compile** on the **Project** menu.



   - By right-clicking a project in the Solution Explorer and then clicking **Compile** from the shortcut menu.



2. After a compile is initiated, the Compile dialog box is displayed.



Compile JAYUYA2

Target: SIMATIC 555 3.x

Translate: ● No ○ Append ○ Yes

Options: ○ Force ● Incremental

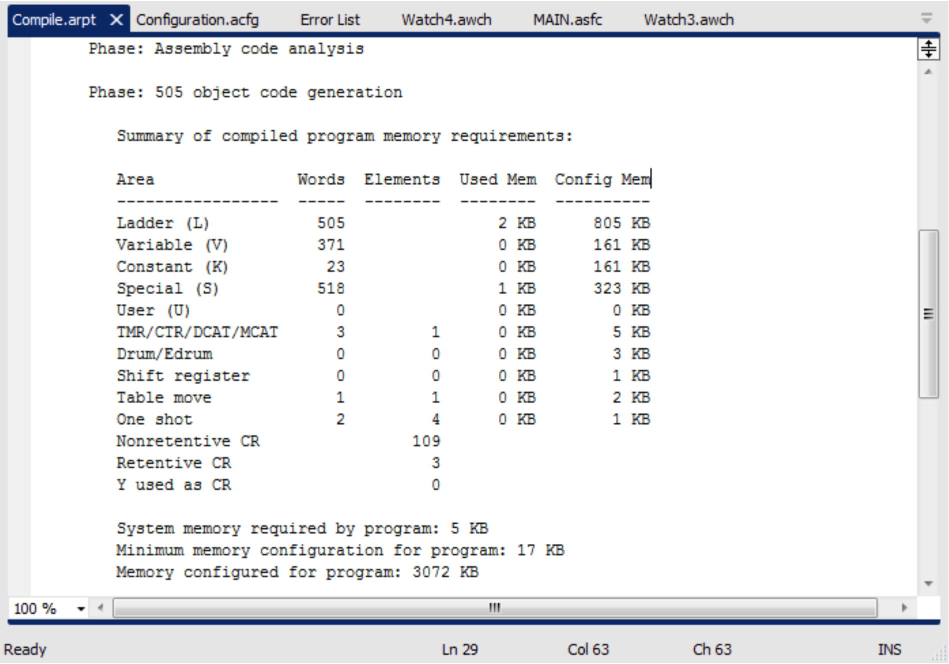
□ Debug

□ Create Hardware Debugger File

3. The **Target** represents the controller specified in the compile configuration file.
4. Under **Translate**, specify the translate option you want to use.
   - When you select **No**, existing marked tags are not modified.
   - When you select **Append**, existing marked tags are placed in the *install.tag* file. Tags marked since the last translate build and tags that were unmarked and re-marked are also placed in a separate file, *append.tag*.
   - When you select **Yes**, all marked tags are placed in the *install.tag* file.
5. Under **Options**, specify your compile options.
   - When you select **Force**, a force compile will be performed and any previous force compile and incremental compile files will be removed.
   - When you select **Incremental**, an incremental compile will be performed. The Debug option will be disabled. FTSolution will save the incremental compile file with a name suffix following the pattern "*projectname-inc-n*" where "*inc*" indicates it is an incremental compile and "*n*" indicates the number of incremental compiles that have been successfully performed since the last force compile. See the section *Preconditions for Incremental Compile and Download* for more information on incremental compile and download.
   - When you select **Debug,** you will compile for Debug mode.
   - When you select **Create Hardware Debugger File**, the compile will create an .ahd file.
6. Click **Compile** to start compiling the project.

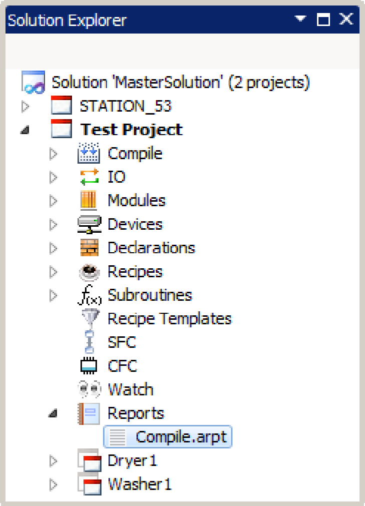
Compilation Report

The compilation report provides information about the compilation process and the compilation output. The following figure is an example of the information contained in the report.



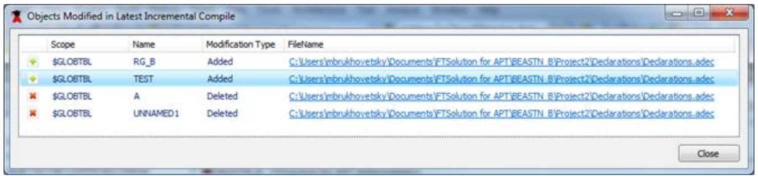
```
      Phase: Assembly code analysis

      Phase: 505 object code generation

         Summary of compiled program memory requirements:

         Area               Words  Elements  Used Mem  Config Mem
         -----------------  -----  --------  --------  ----------
         Ladder (L)           505                2 KB      805 KB
         Variable (V)         371                0 KB      161 KB
         Constant (K)          23                0 KB      161 KB
         Special (S)          518                1 KB      323 KB
         User (U)               0                0 KB        0 KB
         TMR/CTR/DCAT/MCAT      3         1      0 KB        5 KB
         Drum/Edrum             0         0      0 KB        3 KB
         Shift register         0         0      0 KB        1 KB
         Table move             1         1      0 KB        2 KB
         One shot               2         4      0 KB        1 KB
         Nonretentive CR                109
         Retentive CR                     3
         Y used as CR                     0

         System memory required by program: 5 KB
         Minimum memory configuration for program: 17 KB
         Memory configured for program: 3072 KB
```

To view the compilation report, expand **Reports** in the Solution Explorer, and double-click **compile.arpt**. Whenever you successfully complete an incremental compile, FTSolution will save a new compile report file with a name suffix following the pattern "*compile-inc-n.arpt*" where "*compile-inc*" indicates it is an incremental compile and "*n*" indicates the number of incremental compiles that have been created since the last force compile. In addition, whenever you successfully perform an incremental compile download, FTSolution will save a new compile report file with a name suffix following the pattern "*download -inc-n.arpt*" where "*download-inc*" indicates it is a downloaded incremental compile and "*n*" indicates the number of incremental compile downloads that have been performed since the last force compile.



Viewing the Objects Modified by Incremental Compile

Once FTSolution has completed an incremental compile you can view the objects that were modified by the incremental compile. The Modification Type column indicates whether the object was been added, deleted, or modified. In addition, the FileName column includes a hyperlink that will open the file that references (or referenced) the selected object.

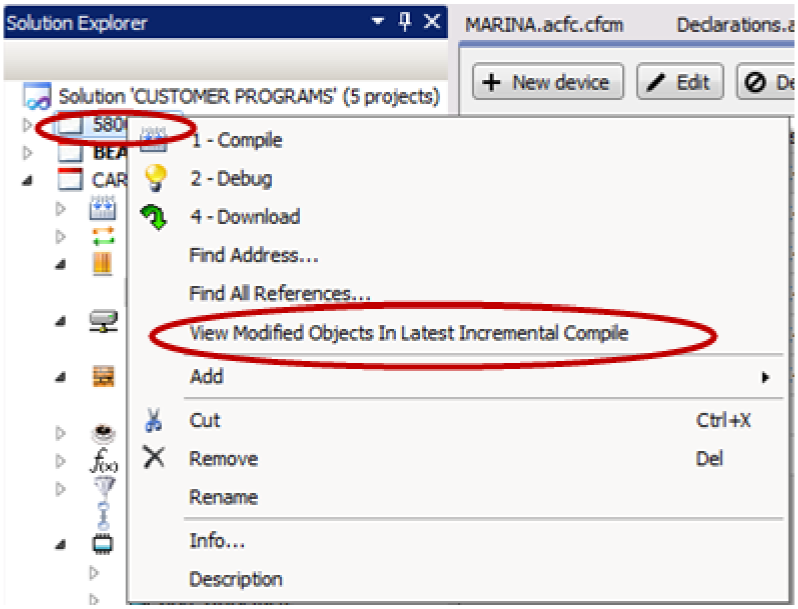


Objects Modified in Latest Incremental Compile

	Scope	Name	Modification Type	FileName
+	$GLOBTBL	RG_B	Added	C:\Users\mbrukhovetsky\Documents\FTSolution for APT\BEASTN_B\Project2\Declarations\Declarations.adec
+	$GLOBTBL	TEST	Added	C:\Users\mbrukhovetsky\Documents\FTSolution for APT\BEASTN_B\Project2\Declarations\Declarations.adec
✖	$GLOBTBL	A	Deleted	C:\Users\mbrukhovetsky\Documents\FTSolution for APT\BEASTN_B\Project2\Declarations\Declarations.adec
✖	$GLOBTBL	UNNAMED1	Deleted	C:\Users\mbrukhovetsky\Documents\FTSolution for APT\BEASTN_B\Project2\Declarations\Declarations.adec

In order to view modified objects, select a project that has been incrementally compiled and then do one of the following:

- Right-click the project in the Solution Explorer, and then click **View Modified Objects in Latest Incremental Compile** from the shortcut menu.
- Click **View Modified Objects in Latest Incremental Compile** from the **Project** menu.



Preconditions for Incremental Compile and Download

When user selects an incremental compile, it is allowed to execute under specific conditions. If any of the following conditions are true, the force compile is required:

- No object file exists.
- A change to the configuration is made in any of the following areas:
  - *Report by Exception time slice* has been edited.
  - *Network Communication time slice* (575) has been edited.
  - Reserved locations (whether the numeric value or U-Memory file field)
  - Memory size
  - Controller Type
  - Controller release
  - PCS release
  - Application Id (575)
  - Application Dependencies
  - Number of RCC Cards (56x)
  - *Uninterruptable power supply* option is selected/deselected
  - *Do not convert Time Of Day to integer fields* option is selected/deselected
  - Address allocator runs out of memory to contain a particular type of data
- An item is marked or unmarked for PCS tagging when *Build translate table* option is set to Yes
- For an item, the PCS tag is renamed when *Build translate table* option is set to Yes
- A unit is deleted from the program, whether it had been included in the *Units to Compile* or not
- New I/O assignments occupy currently allocated overflow CR addresses as Y data types
- A change to the configuration is made in one of the following areas:
  - A unit is excluded from *Units to Compile*
  - *Build translate table* option is changed from No/Append to Yes

Preconditions for Incremental Download in PROGRAM mode

Typically the incremental download will take place as long as the user has first successfully executed an incremental compile, however, there are certain conditions that can entirely prevent an incremental download from taking place. If the incremental download is prevented, a full download is the user's only option, which requires that the PLC is placed in PROGRAM mode.

An incremental download may not occur if any of the following conditions are not true:

- The program has been successfully compiled incrementally
- The resulting object file exists.

Preconditions for Incremental Download in RUN mode

APT is sending a series of task codes to the PLC to accomplish the program rewrite while the PLC is in Run mode. APT relies on the Task Code specification of the 505 Series PLCs to perform incremental download.

Ideally users would want to execute an incremental download while the controller is in RUN mode, however, there are certain conditions that prevent this from occurring.

An incremental download may not occur if any of the following conditions are not true:

- The program has been successfully compiled incrementally,
- The resulting object file exists.

If any of the following conditions are true, the PLC must be placed in PROGRAM mode when executing the incremental download:

- A re-sequencing of SFC steps has occurred.
- 575 PLC only, any of the following time line configuration settings were changed:
  - Total scan time
  - Loop time slice
  - Analog alarm time slice
  - Cyclic SF program time slice
  - Priority SF program time slice
  - Normal SF program time slice
  - Ladder SF sub time slice
  - Normal communications time slice
  - Priority communication time slice
  - Ladder SF sub zero
  - Cyclic RLL scan time
- In any PLC, any of the following were changed:
  - The constants area (K) for program objects $DP_MAKEDATE, $DP_PROGNAME, $DP_VERDATE, or $DP_VERSION.
  - The memory configuration
  - The first network in PLC
  - The last network in PLC is changed or has different RLL address location.

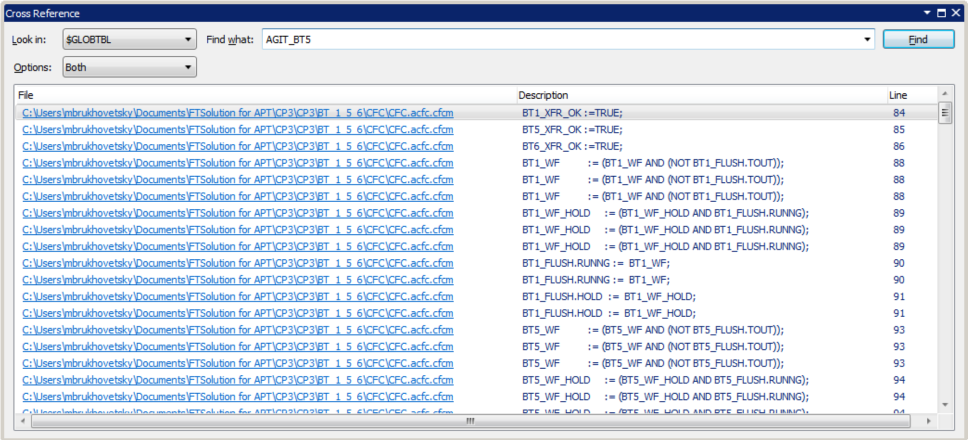
Using Cross Reference

The Cross Reference feature in FTSolution for APT is used to find where items such as declarations, recipes, I/O symbols, and direct addresses appear in your Project.

- The **Find what** field specifies the item you wish to search.
- The **Look In** drop down list specifies the areas of the Project that are searched. Select **Program-level** to search the entire Project. Select any **Unit** in the list to limit the search to only the selected unit.
- The **Options** drop down list specifies which references to find.

The search results are displayed in the Cross Reference Window.

- The **File** column displays hyperlinks to the file in which the reference is found. Double-clicking a hyperlink will open that file in its own window.
- The **Description** column displays either the name of the object, or line of code that references the **Find what** column.
- The **Line** column displays the line number of the code behind file that references the **Find what** item.



Look in: $GLOBTBL
Find what: AGIT_BT5
Options: Both

File	Description	Line
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT1_XFR_OK :=TRUE;	84
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT5_XFR_OK :=TRUE;	85
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT6_XFR_OK :=TRUE;	86
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT1_WF := (BT1_WF AND (NOT BT1_FLUSH.TOUT));	88
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT1_WF := (BT1_WF AND (NOT BT1_FLUSH.TOUT));	88
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT1_WF := (BT1_WF AND (NOT BT1_FLUSH.TOUT));	88
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT1_WF_HOLD := (BT1_WF_HOLD AND BT1_FLUSH.RUNNG);	89
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT1_WF_HOLD := (BT1_WF_HOLD AND BT1_FLUSH.RUNNG);	89
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT1_WF_HOLD := (BT1_WF_HOLD AND BT1_FLUSH.RUNNG);	89
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT1_FLUSH.RUNNG := BT1_WF;	90
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT1_FLUSH.RUNNG := BT1_WF;	90
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT1_FLUSH.HOLD := BT1_WF_HOLD;	91
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT1_FLUSH.HOLD := BT1_WF_HOLD;	91
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT5_WF := (BT5_WF AND (NOT BT5_FLUSH.TOUT));	93
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT5_WF := (BT5_WF AND (NOT BT5_FLUSH.TOUT));	93
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT5_WF := (BT5_WF AND (NOT BT5_FLUSH.TOUT));	93
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT5_WF_HOLD := (BT5_WF_HOLD AND BT5_FLUSH.RUNNG);	94
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT5_WF_HOLD := (BT5_WF_HOLD AND BT5_FLUSH.RUNNG);	94
C:\Users\mbrukhovetsky\Documents\FTSolution for APT\CP3\CP3\BT_1_5_6\CFC\CFC.acfc.cfcm	BT5_WF_HOLD := (BT5_WF_HOLD AND BT5_FLUSH.RUNNG);	94

To perform a Cross Reference:

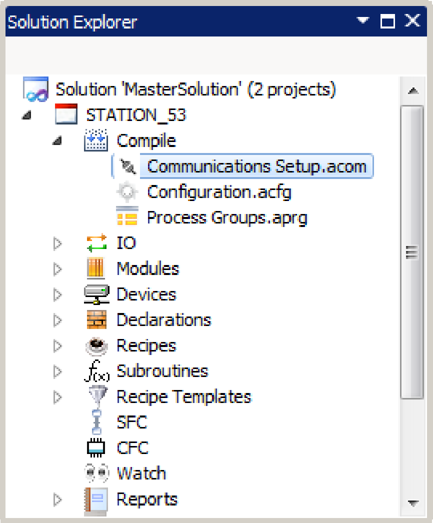
1. Select a project and then do one of the following:
   - Right-click the project or the compile object in the Solution Explorer, and then click **Cross Reference** from the shortcut menu.
   - Click **Cross Reference** from the **Project** menu.
2. Select the scope of your search from the **Look in** drop down list.
3. Select the type of reference to perform in the **Options** drop down list. The **Options** list options include:
   - **Referenced By:** the search displays all references to the object or variable in the **Find what** field.
   - **References:** the search displays all objects and variables referenced by the object or variable in the **Find what** field.
   - **Both:** the search displays both results from both **References** and **Referenced By**.
4. Enter the item to search for in the **Find What** box and click **Find**.

Communication Setup

Every FTSolution for APT project has a file that defines its communication settings. This file, named **Communications Setup.acom**, is accessible from the Solution Explorer. Communication settings define how FTSolution for APT will communicate to a PLC.

To specify the communication settings:

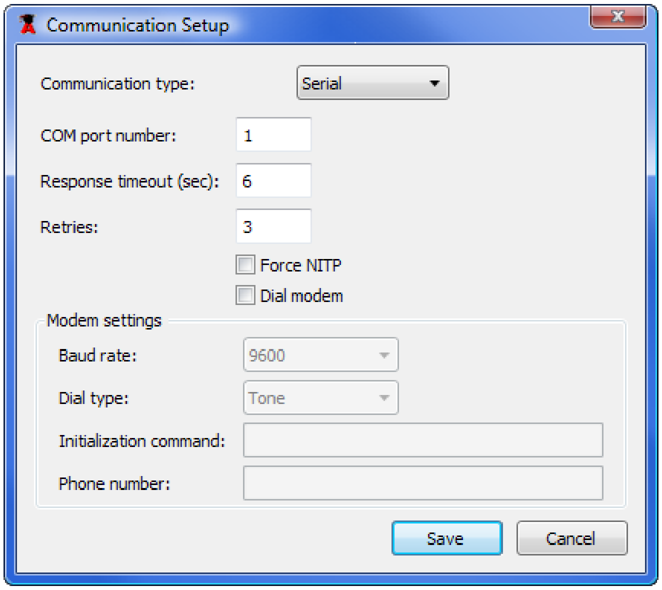
1. View a project in the Solution Explorer.
2. Expand **Compile** so that the **Communications Setup.acom** file is visible.



Solution Explorer

Solution 'MasterSolution' (2 projects)
STATION_53
Compile
Communications Setup.acom
Configuration.acfg
Process Groups.aprg
IO
Modules
Devices
Declarations
Recipes
Subroutines
Recipe Templates
SFC
CFC
Watch
Reports

3. Double-click **Communications Setup.acom**. The Communication Setup dialog box is displayed.

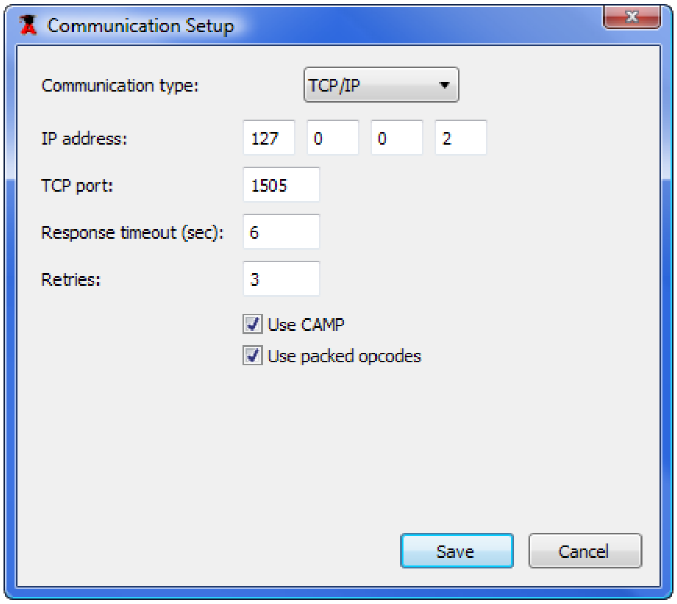


Communication Setup

Communication type: Serial
COM port number: 1
Response timeout (sec): 6
Retries: 3
□ Force NITP
□ Dial modem
Modem settings
Baud rate: 9600
Dial type: Tone
Initialization command:
Phone number:

4. In **Communication Type**, select **Serial** to connect to a PLC using serial communication; select **TCP/IP** to connect to a PLC/Ethernet adapter using TCP/IP.

5. If the **Communication Type** is **Serial**, specify the following settings:
   - In the **Com Port Number** box, enter the communication port you want to use.
   - In the **Response Time Out** box, enter the response time out you want to use. The response time out specifies the amount of time, in seconds, the software waits for a response from the PLC before returning a time out error.
   - In the **Retries** box, enter the number of times the software will try to re-establish communications with the PLC after a time-out error.
   - To force the use of NITP, select the **Force NITP** check box. (This specifies ASCII communication for use with Simatic 545, 555, and 575 PLCs.)
   - When the selected form of serial communications is through a modem, select the **Dial Modem** check box, and then specify the following modem settings:
     - In the **Baud Rate** box, select the rate of communications between the computer and modem.
     - In the **Dial Type** box, select the type of dialing you want to use. Select Pulse dialing only if this is the only type of dialing supported by your phone line.
     - In the **Initialization Command** box, enter any initialization commands required by your modem. Consult your modem manual for a list of appropriate commands.
     - In the **Phone Number** box, enter the phone number to be dialed.
6. If the **Communication Type** is **TCP/IP**, specify the following settings:



Communication Setup

Communication type: TCP/IP

IP address: 127 0 0 2

TCP port: 1505

Response timeout (sec): 6

Retries: 3

☑ Use CAMP

☑ Use packed opcodes

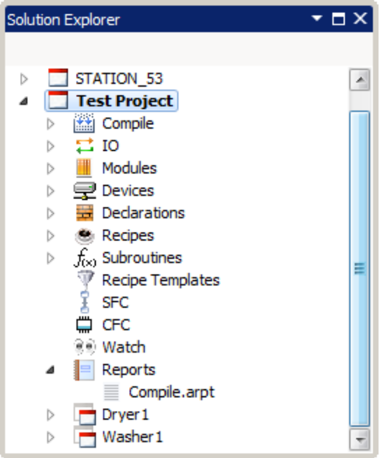
   - In the **IP Address** box, enter the IP address of the PLC/Ethernet adapter to which you want to connect.
   - In the **TCP Port** box, enter the TCP port used by the PLC/Ethernet adapter to which you are connecting.
   - In the **Response Time Out** box, enter the response time out you want to use. The response time out specifies the amount of time, in seconds, the software waits for a response from the PLC before returning a time out error.

- In the **Retries** box, enter the number of times the software will try to re-establish communications with the PLC after a time-out error.
- If the PLC/Ethernet adapter to which you are connecting supports CAMP protocol, select the **Use CAMP** check box.
- If the PLC/Ethernet adapter to which you are connecting supports Packed Opcodes, select the **Use Packed Opcodes** check box.

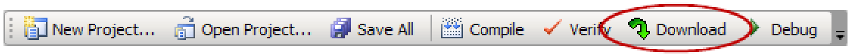
7. Click **Save** to save the communication settings.

Downloading a Compiled FTSolution for APT Project

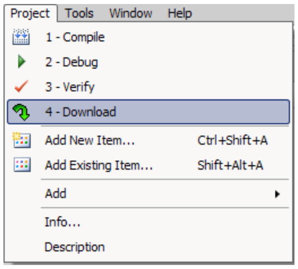
The option to download a project is only available when a project (or its compile configuration file) is selected in the Solution Explorer and the project has already been compiled.



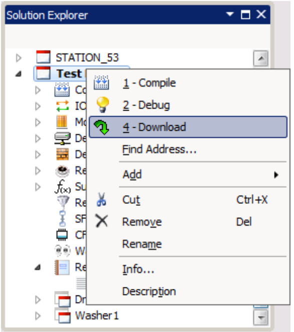
1. If a project is currently selected and it has already been compiled, initiate a download by doing one of the following:
   - Pressing the **4** key.
   - Clicking **Download** on the standard toolbar.



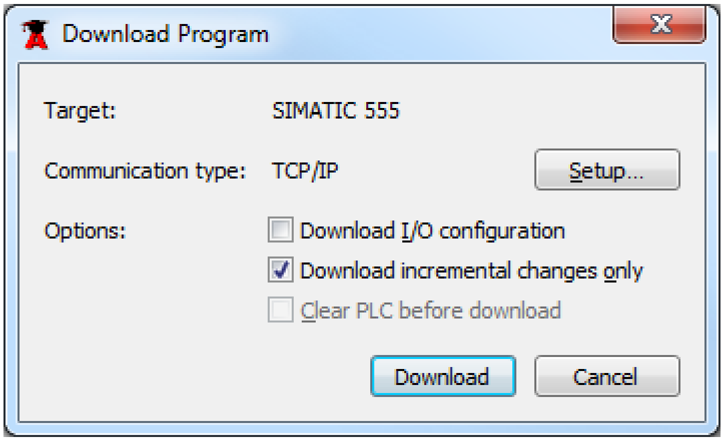
   - Clicking **Download** on the **Project** menu.



   - Right-clicking a project in the Solution Explorer and then clicking **Download** from the shortcut menu.



2. After a download has been initiated, the Download Program dialog box is displayed.



Download Program

Target: SIMATIC 555

Communication type: TCP/IP

Options:
☐ Download I/O configuration
☑ Download incremental changes only
☐ Clear PLC before download

- The **Target** reflects the controller type defined in the compiler configuration file.
- The **Communication type** displays the currently selected communication type.

  Note: If communication settings have not been configured, **Not configured** is displayed for the **Communication type**, and the **Download** button cannot be selected. To set or modify the current communication settings, click **Setup**. (Detailed information about communication setup is provided in the previous section)
- To download the I/O configuration, select the **Download I/O configuration** check box.
- To download an incremental compile, select the **Download incremental changes only** check box.
- To clear the PLC before downloading, select the **Clear PLC before download** check box. The Clear PLC before download option will be disabled when Download incremental changes only is selected.

3. Click **Download** to begin the download.

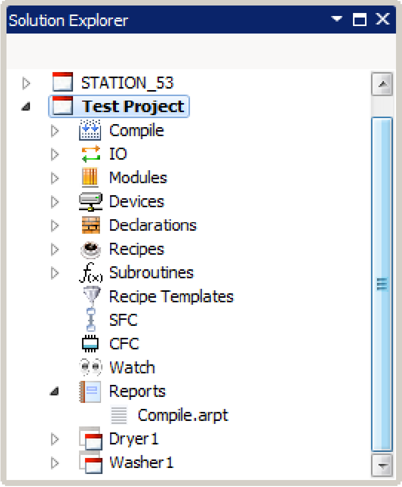
Debug Mode

Warning About Debug Mode

Debug mode enables transitioning from Run to Program mode. When using Debug Mode, be aware of the consequences when you transition from Run to Program Mode and outputs are cleared.

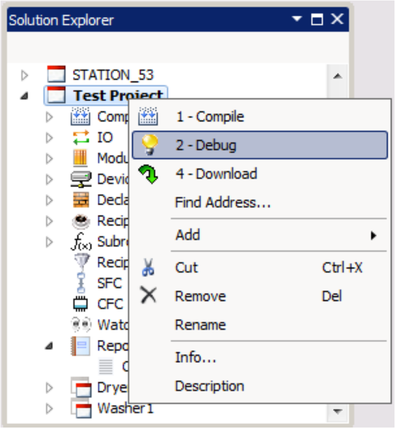
Starting Debug Mode

Once an FTSolution for APT solution has been compiled with the Debug Mode option enabled and downloaded to a PLC, Debug Mode can be activated whenever a project or the Compile object is selected in the Solution Explorer. In the following figure, the project named **flipper1** is selected in the Solution Explorer.

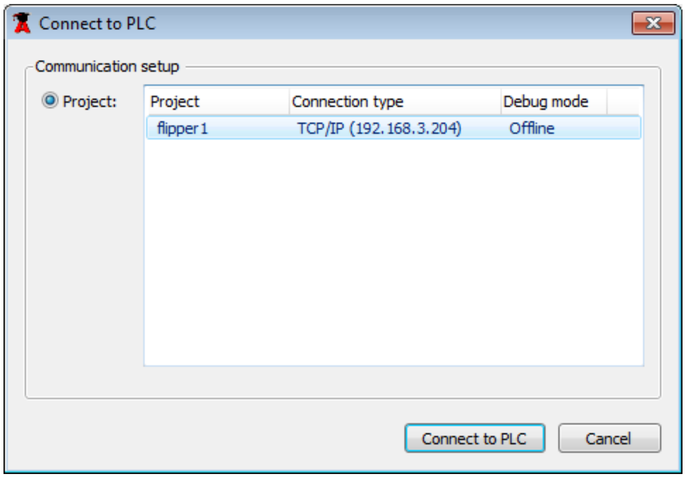


If a project or Compile object is selected, activate Debug Mode by doing one of the following:

- Right-clicking the project or the compile object in the Solution Explorer, and then clicking **2-Debug** from the shortcut menu.
- Clicking the **Debug Mode** toolbar button on the Standard toolbar.
- Clicking **2-Debug** from the **Project** menu.



After activating debug mode, the Connect to PLC dialog box appears.



Project	Connection type	Debug mode
flipper1	TCP/IP (192.168.3.204)	Offline

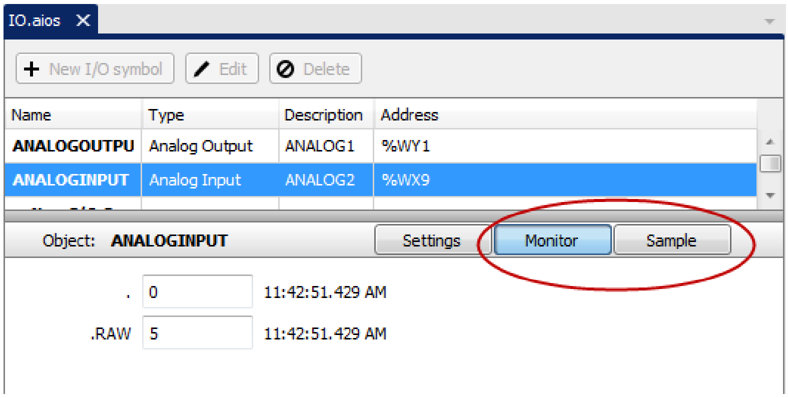
In the Connect to PLC dialog box, select the project you want to debug and then click **Connect to PLC**.

Monitoring Variables in Debug Mode

Watch windows in FTSolution for APT are analogous to the charts used to monitor variables in APT.

Built-In Watches

When Debug Mode is active, FTSolution for APT provides built-in Watch window capabilities. While in Debug Mode, selecting an object in a table editor or the CFC editor causes a **Monitor** tab and a **Sample** tab to be displayed in the Settings Editor.



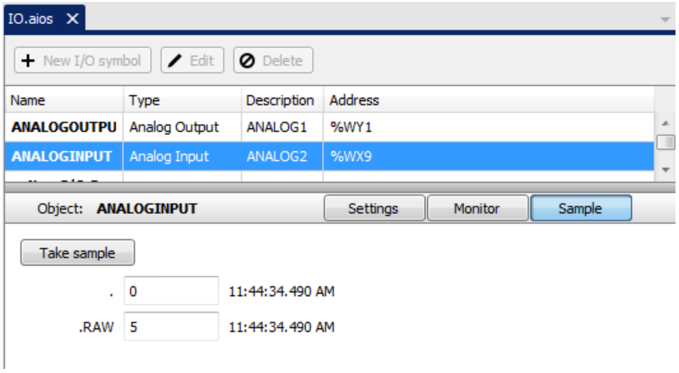
Name	Type	Description	Address
ANALOGOUTPU	Analog Output	ANALOG1	%WY1
ANALOGINPUT	Analog Input	ANALOG2	%WX9

Object: ANALOGINPUT

. 0 11:42:51.429 AM

.RAW 5 11:42:51.429 AM

- Select the **Monitor** tab to display continuously updating data about the object's settings.
- Select the **Sample** tab to display a single instance of data about the object's settings. Click the **Take Sample** button on the **Sample** tab to update the data.



Name	Type	Description	Address
ANALOGOUTPU	Analog Output	ANALOG1	%WY1
ANALOGINPUT	Analog Input	ANALOG2	%WX9

Object: ANALOGINPUT

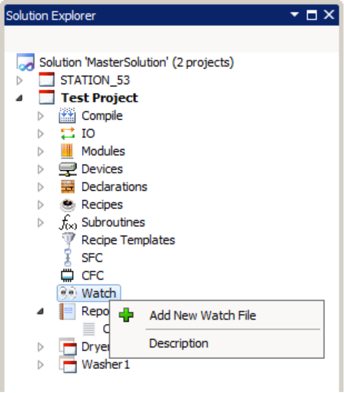
. 0 11:44:34.490 AM

.RAW 5 11:44:34.490 AM

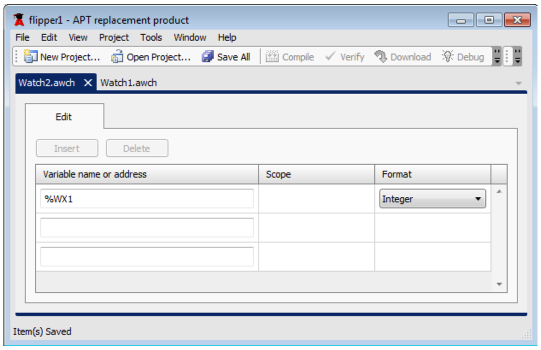
Custom Watches

To create a custom watch in FTSolution for APT, do the following:

1. Right-click the Watch object in Solution Explorer and select **Add New Watch File** from the shortcut menu.



2. In the Add New Item dialog box, enter a name for the Watch file and click **Add**. The Watch file should now be visible in the Solution Explorer.
3. Double-click the Watch file in Solution Explorer.
4. Enter the variables or addresses you want to add to this Watch window.


flipper1 - APT replacement product
File Edit View Project Tools Window Help
New Project... Open Project... Save All Compile Verify Download Debug
Watch2.awch
Watch1.awch
Edit
Insert
Delete

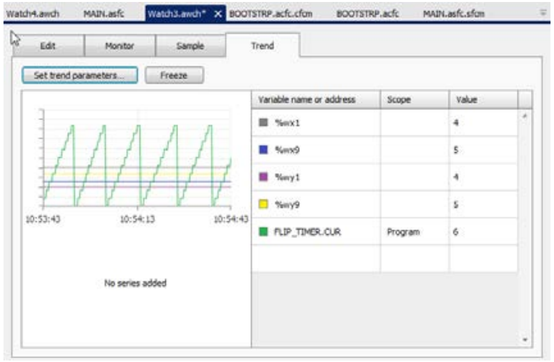
Variable name or address	Scope	Format
%WX1		Integer

Item(s) Saved

5. Save the Watch window.

In Debug mode, a custom Watch window display a **Monitor** tab, a **Sample** tab, and a **Trend** tab. Clicking the **Trend** tab displays a graphical representation of the data monitored in the Watch window.

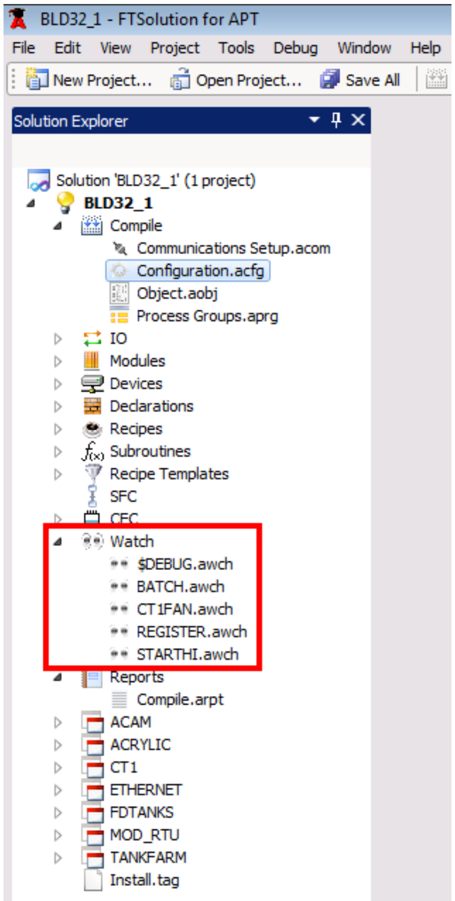
The following figure is an example of the information in the Trend tab.



Variable name or address	Scope	Value
■ %wx1		4
🟦 %wx9		5
🟪 %wy1		4
🟨 %wy9		5
🟩 FLIP_TIMER.CUR	Program	6

Automatically Generated Watches

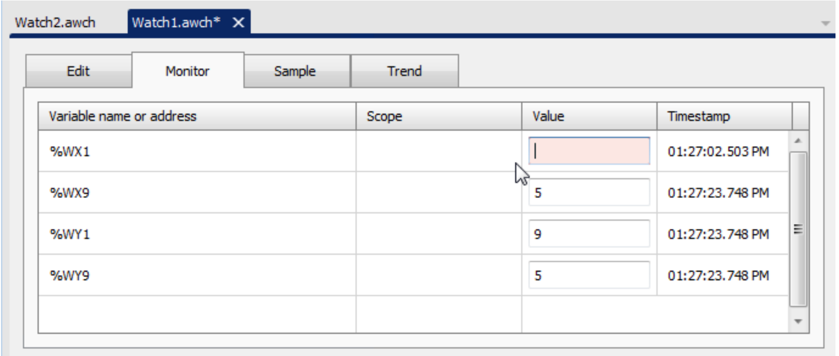
Watch files are created at the project level automatically from the project-level Declaration, I/O Symbol, CFC, SFC, and Subroutine files. These Watch files can be viewed from the Solution Explorer by expanding the Watch menu within your project.



Modifying I/O in a Watch Window

To modify the value of an input/output point or a variable:

1. Add the input/output point or variable to a Watch window. Or, you can open a built-in Watch by selecting an object’s editor or a CFC editor.
2. In the Watch window, select the input/output point or variable you want to modify, select the **Monitor** tab, and enter the value you want to use in the **Value** box.

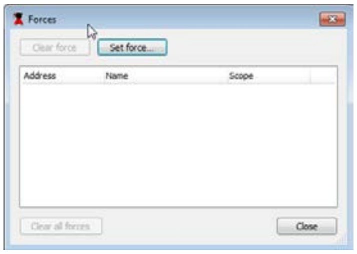


Variable name or address	Scope	Value	Timestamp
%WX1			01:27:02.503 PM
%WX9		5	01:27:23.748 PM
%WY1		9	01:27:23.748 PM
%WY9		5	01:27:23.748 PM

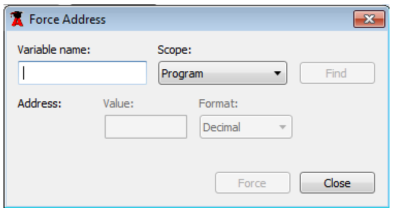
Forcing I/O

1. To force the value of input/output point or a variable, click **Forces** on the **Debug** menu.

2. In the Forces dialog box, click **Set Force**.

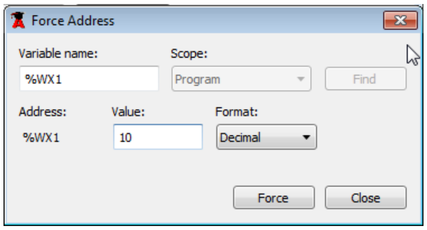


3. In the Force Address dialog box, enter the input/output point or variable you want to force in the **Variable name** box, and then click **Find**.



Variable name:
Scope: Program
Address:
Value:
Format: Decimal

4. In the **Value** box, enter the value you want to use.

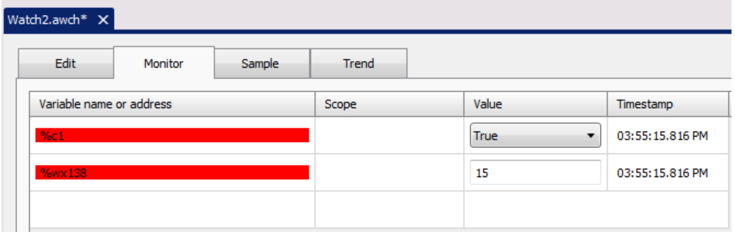


Variable name: %WX1
Scope: Program
Address: %WX1
Value: 10
Format: Decimal

5. Click **Force**. This input/output point or variable is now forced. A list of all forced items is displayed in the Forces dialog box.

Viewing Forced Addresses in a Watch Window

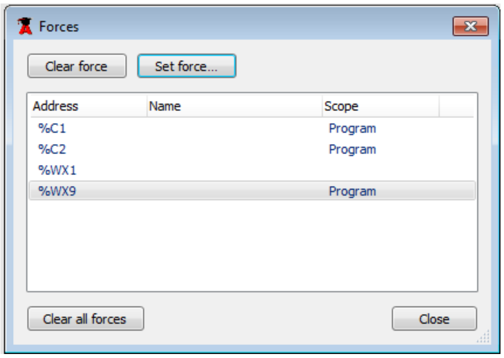
When Debug mode is active, select the Monitor tab from a Watch window. Forced addresses are highlighted in red.



Variable name or address	Scope	Value	Timestamp
%c1		True	03:55:15.816 PM
%wx138		15	03:55:15.816 PM

Clearing Forced I/O

1. Click **Forces** on the **Debug** menu. A list of all forced items appears in the Forces dialog box.



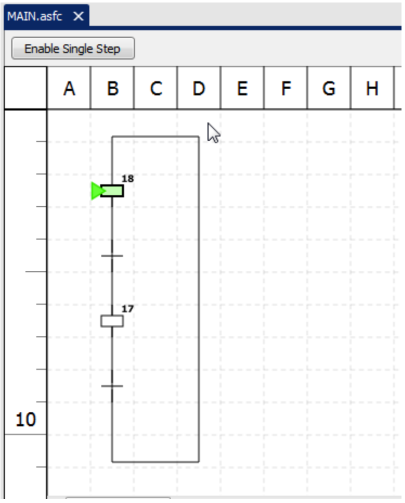
Address	Name	Scope
%C1		Program
%C2		Program
%WX1		
%WX9		Program

2. To clear all forced items, click **Clear all forces**.

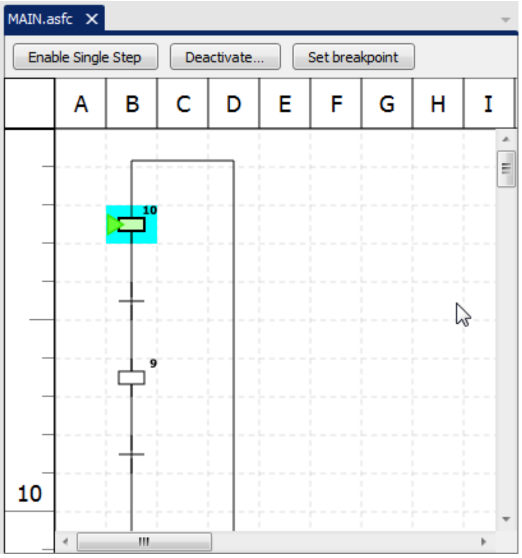
3. To clear a single force, select the force you want to clear and then click **Clear Force**.

Tracing SFC Program Flow

In Debug Mode, SFC program flow is automatically displayed in the SFC editor. The current SFC step is indicated by a green arrow.

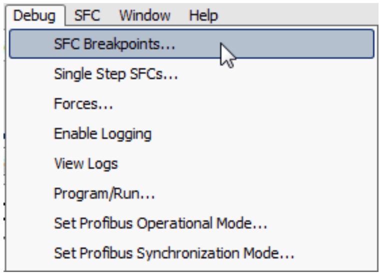


Additional operations, such as the ability to activate and deactivate a step, set and remove break points, and enable and disable Single Step Mode, are accessible using the buttons along the top of the SFC editor. The buttons are displayed whenever a step in the SFC editor is selected.

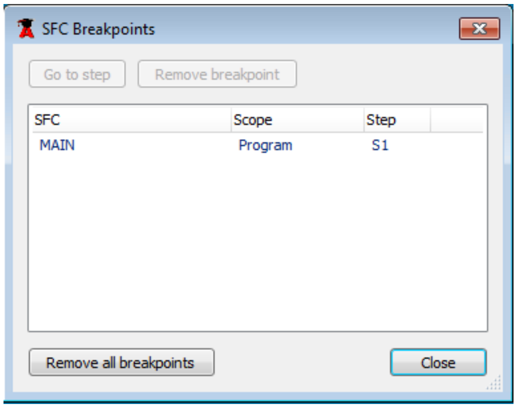


Additional debug operations related to SFC can be accessed using the **Debug** menu.

- To view a list of SFC breakpoints, click **SFC Breakpoints** on the **Debug** menu.

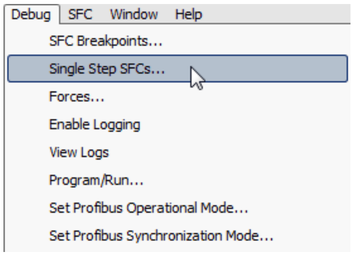


A SFC Breakpoints dialog box is displayed.

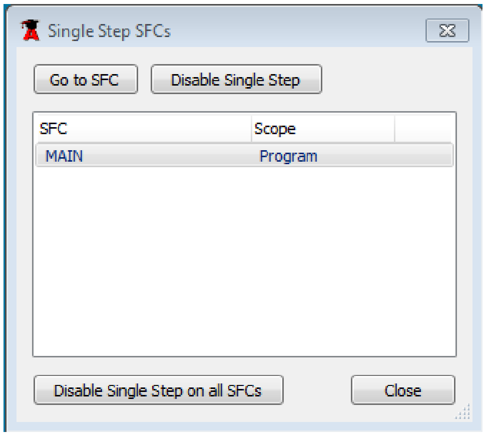


SFC	Scope	Step
MAIN	Program	S1

- To view single step SFCs, click **Single Step SFCs** on the **Debug** menu.



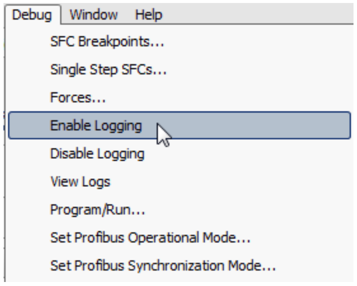
A Single Step SFCs dialog box is displayed.



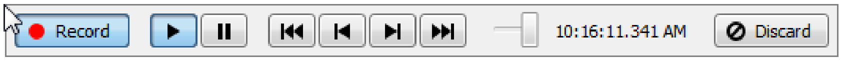
SFC	Scope
MAIN	Program

Logging

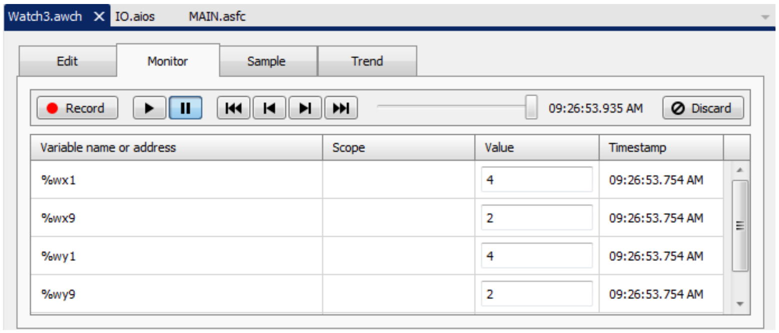
Logging is enabled by clicking **Enable Logging** on the **Debug** menu.



Once Logging is enabled, a Logging Timeline Control bar is accessible from table editors, CFC and SFC editors, and Watch windows.

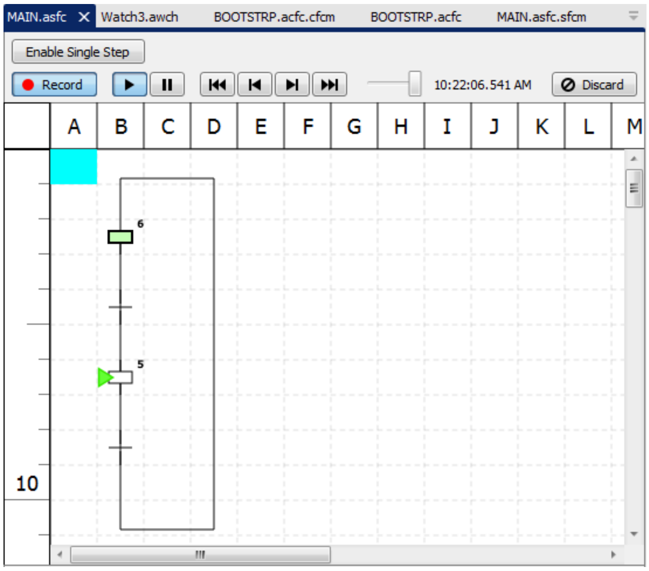


The Logging Timeline Control bar is used to start or stop recording, begin playback, pause playback data, and jump to a step. The following figure shows the Logging Timeline Control bar in a custom Watch window.



Variable name or address	Scope	Value	Timestamp
%wx1		4	09:26:53.754 AM
%wx9		2	09:26:53.754 AM
%wy1		4	09:26:53.754 AM
%wy9		2	09:26:53.754 AM

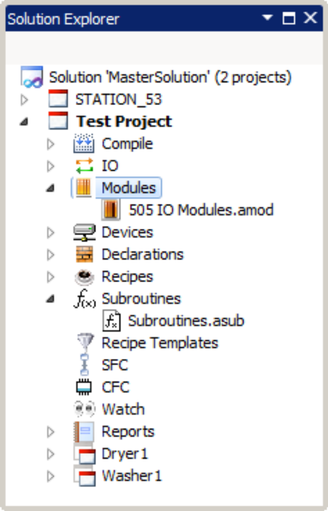
The following figure shows the Logging Timeline Control bar in a SFC editor.



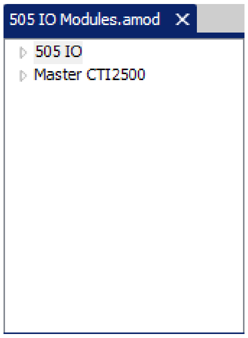
Adding an I/O Module for a 505 Series / CTI Controller

Use the following procedure to define an I/O module for a 505 Series or CTI controller: (Note: A controller type must be defined in FTSolution for APT solution order to define an I/O module).

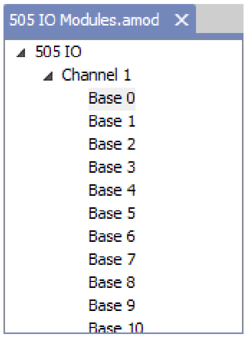
1. View a project in Solution Explorer.
2. Expand % **Modules**.



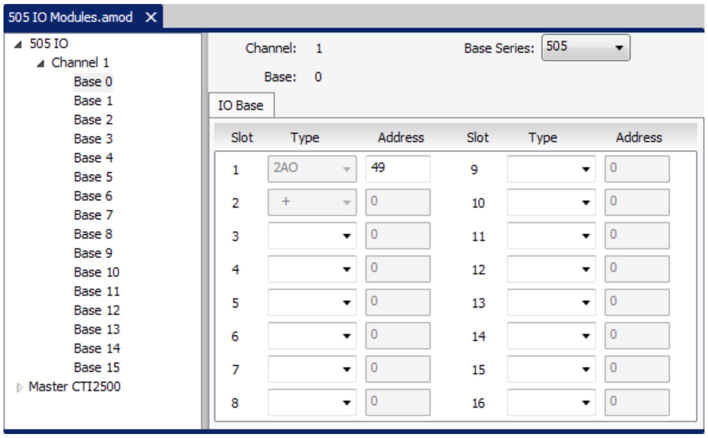
3. Double-click a modules table definition file (the default table definition file is named *505 IO Modules.amod*). A .amod window is displayed.



4. In the .amod window, expand **505 IO**.
5. Expand a channel.
6. Select a base.



7. In a slot you want to define or edit, select or type a module name in the **Type** box. For example, click **2AO** in slot 1 to add an analog output module.



505 IO Modules.amod

- 505 IO
  - Channel 1
    - Base 0
    - Base 1
    - Base 2
    - Base 3
    - Base 4
    - Base 5
    - Base 6
    - Base 7
    - Base 8
    - Base 9
    - Base 10
    - Base 11
    - Base 12
    - Base 13
    - Base 14
    - Base 15
  - Master CTI2500

Channel: 1 Base Series: 505

Base: 0

IO Base

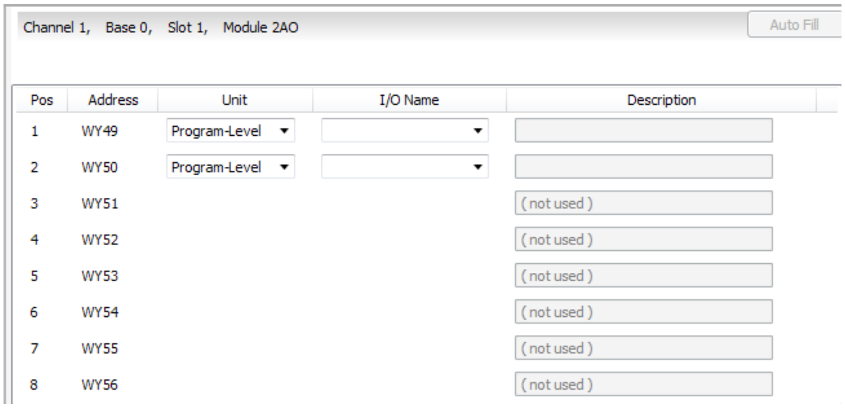
Slot	Type	Address	Slot	Type	Address
1	2AO	49	9		0
2	+	0	10		0
3		0	11		0
4		0	12		0
5		0	13		0
6		0	14		0
7		0	15		0
8		0	16		0

8. Press **TAB** to move to the **Address** box. The address of the first available I/O eight-point boundary is automatically calculated and displayed in the **Address** box. You can accept the default address or enter a different address in the **Address** box.

9. Verify that the configured I/O matches the physical I/O. You can press **ALT+S** to change the width of the slot if necessary, **ALT+I** to search for I/O symbol names, **ALT+M** to move the module, and **ALT+D** to delete the module.

Defining I/O Points for 505 I/O

The I/O point editor is displayed below the module editor. When a slot is selected in the I/O module editor, its associated points are displayed in the I/O point editor.



Channel 1, Base 0, Slot 1, Module 2AO

Pos	Address	Unit	I/O Name	Description
1	WY49	Program-Level		
2	WY50	Program-Level		
3	WY51			(not used)
4	WY52			(not used)
5	WY53			(not used)
6	WY54			(not used)
7	WY55			(not used)
8	WY56			(not used)

To define or edit an I/O point, select the appropriate point and then enter the following information.

- In the **Unit** box, select the unit you want to use, or select **Program-Level**.
- In the **I/O Name** box, select or enter the I/O symbolic name you want to use.
- In the **Description** box, type a description.

Save the I/O configuration, and the associated I/O points, by clicking **Save** on the **File** menu.

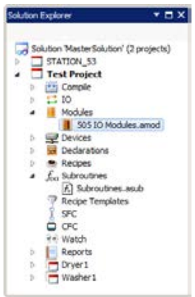
Profibus Configuration

You can use FTSolution for APT to create and manage Profibus networks and devices. A compatible PLC serves as the host of a Profibus master module. (Note: A controller type must be defined in FTSolution for APT solution in order to configure a Profibus network).

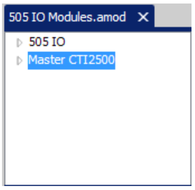
If you are importing an APT program that contains Profibus configuration, the Profibus configuration will be automatically generated as part of the import process. You will not be able to edit the Profibus configuration within FTSolution for APT, however, without first adding the required .gsd files to the hardware directory and then performing a merge using the associated .2bf file. (Detailed information about performing a merge can be found on page 79).

Use the following procedure to open Profibus configuration screens within FTSolution for APT:

1. View a project in Solution Explorer.
2. Expand % **Modules**.

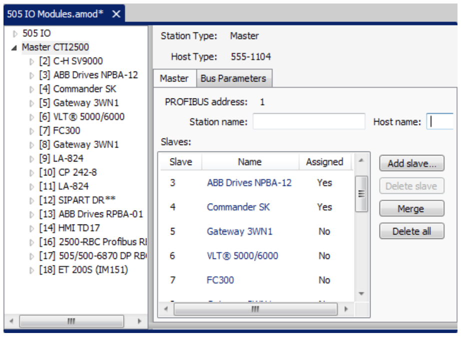


3. Open a modules table definition file (the default table definition file is named *505 IO Modules.amod*). A .amod window is displayed.



4. In the .amod window, select the PLC type that is acting as the master module. For example, if you have configured a CTI 2500 controller, select **Master CTI2500**. At this point you can add .gsd files to the Hardware Directory and then add slaves to your Profibus network.

   - The master module has a PROFIBUS address of 1.
   - You can enter a **Station name** and **Host name**. These names can help identify this Profibus network when used with other Profibus networks.



Station Type: Master

Host Type: 555-1104

PROFIBUS address: 1

Station name:

Host name:

Slaves:

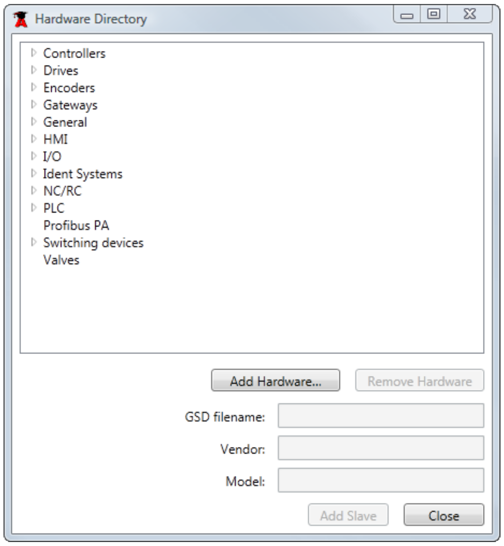
Slave	Name	Assigned
3	ABB Drives NPBA-12	Yes
4	Commander SK	Yes
5	Gateway 3WN1	No
6	VLT® 5000/6000	No
7	FC300	No

Adding GSD files to the Hardware Directory

The Hardware directory displays and organizes the Profibus slave devices available for configuration. Each device in the Hardware Directory is a representation of a device master file (.gsd) that has been added to the directory. The information contained in the .gsd determines how and where the device is displayed in the directory. Once the .gsd associated with a device has been added to the hardware directory, that device may be assigned to the Profibus network as a slave.

When a master module is selected in the 505 IO Modules.amod window, use the following procedure to add .gsd files to the Hardware Directory within FTSolution for APT.

1. Click **Add slave.** The Hardware Directory window appears.

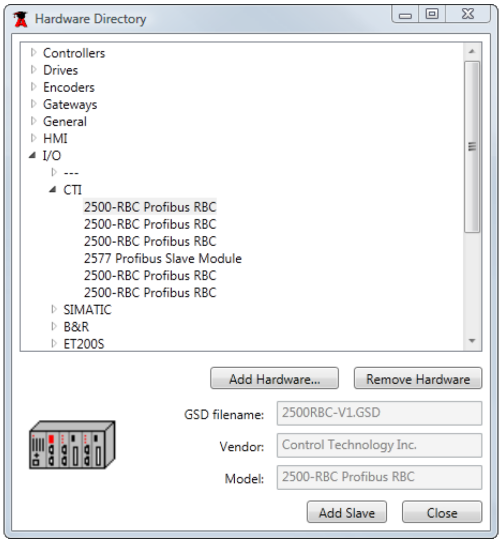


2. Click **Add Hardware.**
3. **Browse** to the location that contains the .gsd file(s) of the devices you want to add and select them.
4. Click **Open** to add the .gsd file(s) to the Hardware Directory. When adding one or more .gsd files to the Hardware Directory, the files are scanned for unsupported or unrecognized information. If any unsupported information is found, a warning message appears, allowing you to view an event log for more details about the problem. In most cases, the device is still added to the Hardware Directory, with any unsupported features ignored. Contact your device manufacturer for more information.

Assigning Slaves to the Profibus Configuration

When a master module is selected in the 505 IO Modules.amod window, use the following procedure to assign slaves to the Profibus configuration:

1. Click **Add Slave**. The Hardware Directory appears.



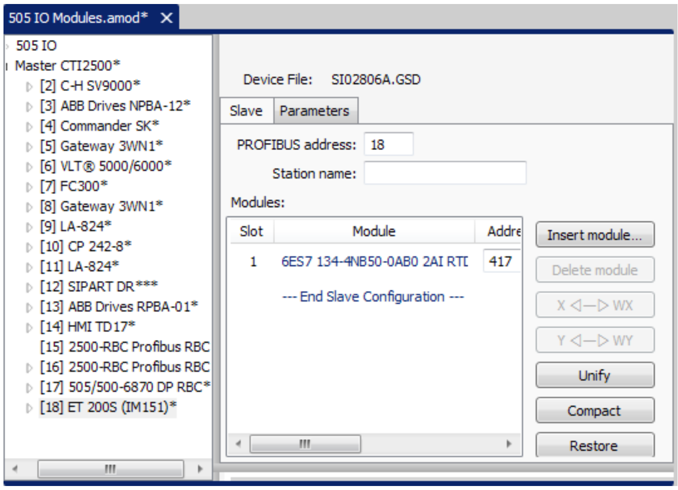
GSD filename: 2500RBC-V1.GSD

Vendor: Control Technology Inc.

Model: 2500-RBC Profibus RBC

2. Browse the Hardware Directory to find and select the slave device you want to add. When you select a device, information about the device is displayed in the **GSD filename**, **Vendor**, and **Model** boxes.

3. Click **Add Slave** to add the selected device to the Profibus Configuration.



Device File: SI02806A.GSD

PROFIBUS address: 18

Station name:

Modules:

Slot	Module	Addre
1	6ES7 134-4NB50-0AB0 2AI RTI	417
	--- End Slave Configuration ---	

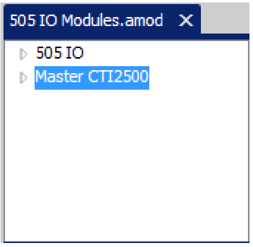
- The first available PROFIBUS address is automatically entered in the **PROFIBUS address** box. If you want, you can type a **Station name** to help identify this device.

4. To configure parameters for the device, select the device you just added under the Master module, click the **Parameters** tab, and then enter the necessary information. Not all devices will have configurable parameters.

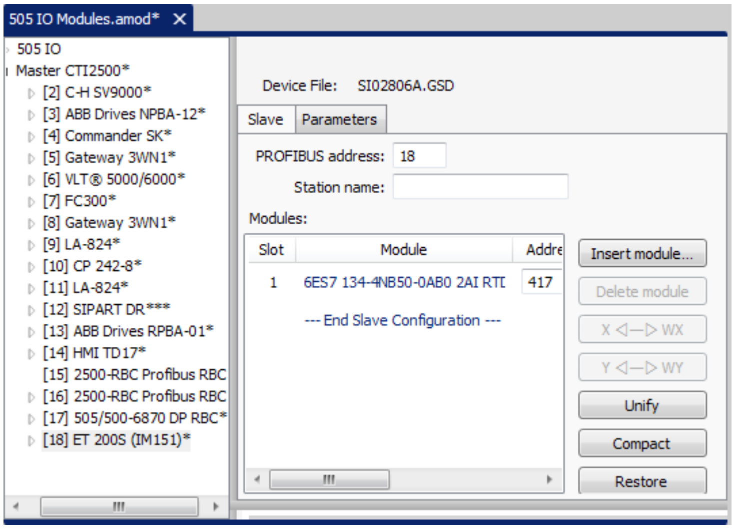
Once a slave is added, you need to configure the modules installed in the slave, and specify the addresses used by the slave's modules.

Configuring and Addressing Profibus I/O Modules

1. Expand the master module in the 505 IO Modules.amod window.



2. Select the slave device you want to configure.



505 IO Modules.amod*

505 IO
Master CTI2500*
[2] C-H SV9000*
[3] ABB Drives NPBA-12*
[4] Commander SK*
[5] Gateway 3WN1*
[6] VLT® 5000/6000*
[7] FC300*
[8] Gateway 3WN1*
[9] LA-824*
[10] CP 242-8*
[11] LA-824*
[12] SIPART DR***
[13] ABB Drives RPBA-01*
[14] HMI TD17*
[15] 2500-RBC Profibus RBC
[16] 2500-RBC Profibus RBC
[17] 505/500-6870 DP RBC*
[18] ET 200S (IM151)*

Device File: SI02806A.GSD

Slave | Parameters

PROFIBUS address: 18

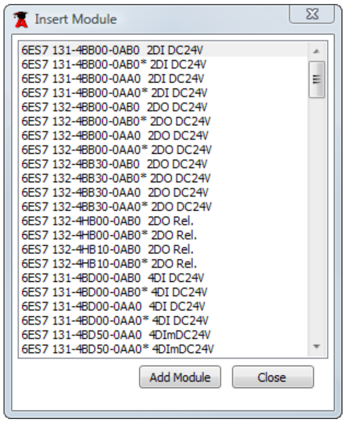
Station name:

Modules:

Slot	Module	Addre
1	6ES7 134-4NB50-0AB0 2AI RTI	417
	--- End Slave Configuration ---	

3. Click the **Slave** tab.

4. Click **Insert Module** to add a module for the selected slave device. An Insert Module dialog box appears, which displays modules for the slave.

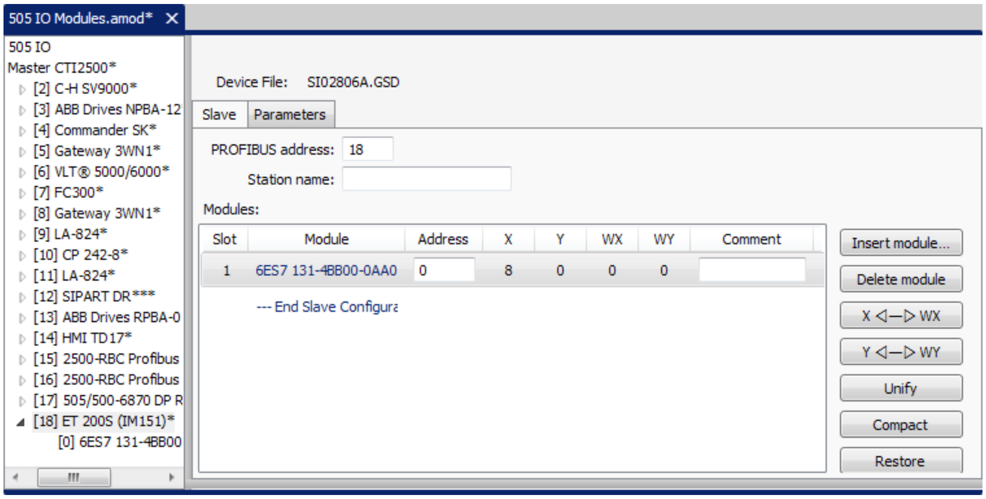


Insert Module

6ES7 131-4BB00-0AB0 2DI DC24V
6ES7 131-4BB00-0AB0* 2DI DC24V
6ES7 131-4BB00-0AA0 2DI DC24V
6ES7 131-4BB00-0AA0* 2DI DC24V
6ES7 132-4BB00-0AB0 2DO DC24V
6ES7 132-4BB00-0AB0* 2DO DC24V
6ES7 132-4BB00-0AA0 2DO DC24V
6ES7 132-4BB00-0AA0* 2DO DC24V
6ES7 132-4BB30-0AB0 2DO DC24V
6ES7 132-4BB30-0AB0* 2DO DC24V
6ES7 132-4BB30-0AA0 2DO DC24V
6ES7 132-4BB30-0AA0* 2DO DC24V
6ES7 132-4HB00-0AB0 2DO Rel.
6ES7 132-4HB00-0AB0* 2DO Rel.
6ES7 132-4HB10-0AB0 2DO Rel.
6ES7 132-4HB10-0AB0* 2DO Rel.
6ES7 131-4BD00-0AB0 4DI DC24V
6ES7 131-4BD00-0AB0* 4DI DC24V
6ES7 131-4BD00-0AA0 4DI DC24V
6ES7 131-4BD00-0AA0* 4DI DC24V
6ES7 131-4BD50-0AA0 4DImDC24V
6ES7 131-4BD50-0AA0* 4DImDC24V

5. Select the module you want to add, and then click **Add Module**. The Module is added to the slave.

6. For each slot, enter the address you want to use in the **Address** box.



505 IO
Master CTI2500*
[2] C-H SV9000*
[3] ABB Drives NPBA-12
[4] Commander SK*
[5] Gateway 3WN1*
[6] VLT® 5000/6000*
[7] FC300*
[8] Gateway 3WN1*
[9] LA-824*
[10] CP 242-8*
[11] LA-824*
[12] SIPART DR***
[13] ABB Drives RPBA-0
[14] HMI TD17*
[15] 2500-RBC Profibus
[16] 2500-RBC Profibus
[17] 505/500-6870 DP R
[18] ET 200S (IM151)*
[0] 6ES7 131-4BB00

Device File: SI02806A.GSD

PROFIBUS address: 18

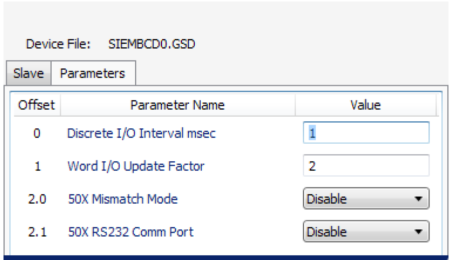
Station name:

Modules:

Slot	Module	Address	X	Y	WX	WY	Comment
1	6ES7 131-4BB00-0AA0	0	8	0	0	0	
	--- End Slave Configura						

- Click **X <-> WX** to toggle the image register type for the selected module between discrete and word inputs. To ensure that discrete are toggled to words, the discrete must be on a 16-bit boundary.
- Click **Y <-> WY** to toggle the image register type for the selected module between discrete and word outputs. To ensure that discrete are toggled to words, the discrete must be on a 16-bit boundary.
- Click **Unify** to move all modules for the selected slave into the first module. Unification is only allowed if all modules are either discrete or words. Only the first address is retained.
- Click **Compact** to move all discrete image register types to word image register types for every module of the selected slave. Then, all modules are unified into the first module. To ensure that discrete are toggled to words, the discrete must be on a 16-bit boundary. Only the first address is retained.
- Click **Restore** to restore modules for the selected slave to their initial configuration, including the image register types. Zero addresses are assumed for all but the first address, which is kept.
- If you have added a Smart Connect slave device, click **Smart connect** to configure it.
- You can press **ALT+I** to search for I/O symbol names and **ALT+D** to delete the module.

7. Optional: Enter a comment in the **Comment** box.
8. To configure parameters for the module, click the **Parameters** tab, and then enter the necessary information. Not all modules will have configurable parameters.

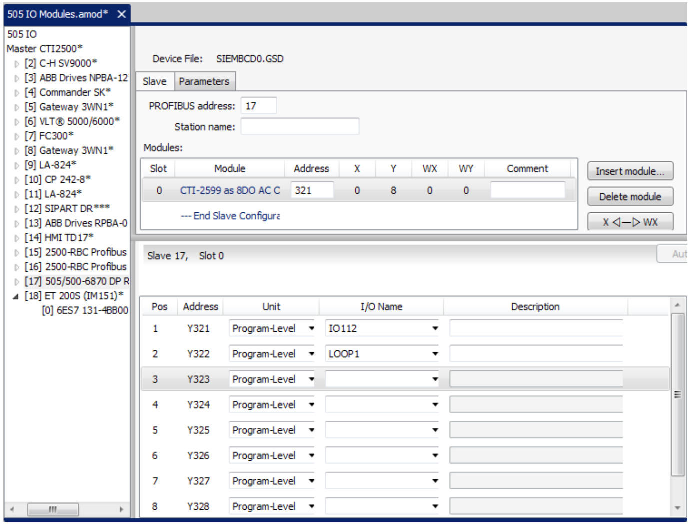


Device File: SIEMBCD0.GSD

Offset	Parameter Name	Value
0	Discrete I/O Interval msec	1
1	Word I/O Update Factor	2
2.0	50X Mismatch Mode	Disable
2.1	50X RS232 Comm Port	Disable

Defining I/O Points in Profibus I/O

Defining an I/O point consists of entering an I/O symbolic name and information for each address you want to access. To begin defining an I/O point go to the I/O Module editor and select a module to display the I/O Point Editor.



505 IO
Master CTI2500*
- [2] C-H SV9000*
- [3] ABB Drives NPBA-12
- [4] Commander SK*
- [5] Gateway 3WN1*
- [6] VLT® 5000/6000*
- [7] FC300*
- [8] Gateway 3WN1*
- [9] LA-824*
- [10] CP 242-8*
- [11] LA-824*
- [12] SIPART DR***
- [13] ABB Drives RPBA-0
- [14] HMI TD17*
- [15] 2500-RBC Profibus
- [16] 2500-RBC Profibus
- [17] 505/500-6870 DP R
- [18] ET 200S (IM151)*
  - [0] 6ES7 131-4BB00

Device File: SIEMBCD0.GSD

PROFIBUS address: 17

Station name:

Modules:

Slot	Module	Address	X	Y	WX	WY	Comment
0	CTI-2599 as 8DO AC C	321	0	8	0	0	
	--- End Slave Configur						

Slave 17, Slot 0

Pos	Address	Unit	I/O Name	Description
1	Y321	Program-Level	IO112	
2	Y322	Program-Level	LOOP1	
3	Y323	Program-Level		
4	Y324	Program-Level		
5	Y325	Program-Level		
6	Y326	Program-Level		
7	Y327	Program-Level		
8	Y328	Program-Level		

To define or edit an I/O point, select the appropriate point and then enter the following information.

- In the **Unit** box, select the unit you want to use, or select **Program-Level**.
- In the **I/O Name** box, select or enter the I/O symbolic name you want to use.
- In the **Description** box, type a description.

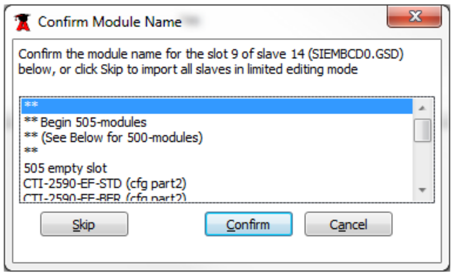
Save the I/O configuration, and the associated I/O points, by clicking **Save** on the **File** menu.

Merging a .2bf File

After importing a program with Profibus configuration, the Profibus I/O editor will be in limited editing mode. The Profibus configuration cannot be changed in this mode. To enable full editing, the original .2bf file must be merged after the required .gsd files are added to the hardware directory.

To merge a .2bf file:

1. Import an APT program.
2. Expand %**Modules** in the Solution Explorer and open the 505 IO Modules.amod file.
3. Select the PLC that is acting as the master module.
4. Click **Merge**.
5. During the merge, you may be asked to confirm the name of modules. Select the appropriate module in the Confirm Module Name dialog box.

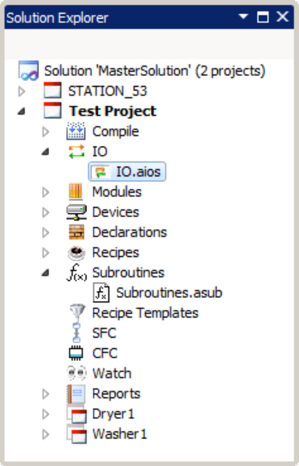


Confirm the module name for the slot 9 of slave 14 (SIEMBCD0.GSD) below, or click Skip to import all slaves in limited editing mode

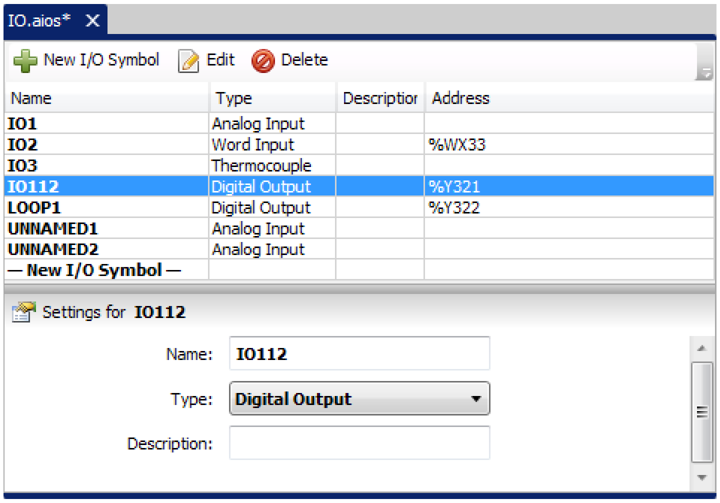
**
** Begin 505-modules
** (See Below for 500-modules)
**
505 empty slot
CTI-2590-EF-STD (cfg part2)
CTI-2590-EF-BFR (cfg part2)

Viewing and Editing I/O Symbolic Names

You can use FTSolution for APT to view and edit the I/O symbolic names used in your FTSolution for APT project. When a project is displayed in the Solution Explorer, you can open the default IO table definition file (named IO.aios), by expanding **IO** and then opening **IO.aios**.



You can then add new I/O symbols, edit existing symbols, or delete symbols that are not needed.



Name	Type	Descriptior	Address
IO1	Analog Input		
IO2	Word Input		%WX33
IO3	Thermocouple		
IO112	Digital Output		%Y321
LOOP1	Digital Output		%Y322
UNNAMED1	Analog Input		
UNNAMED2	Analog Input		
— New I/O Symbol —			

Settings for **IO112**

Name: **IO112**

Type: **Digital Output**

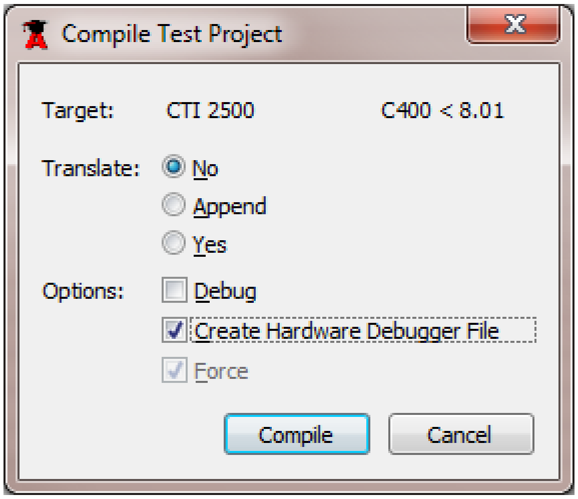
Description:

FTSolution for APT Hardware Debugger

FTSolution for APT Hardware Debugger is a sophisticated PLC hardware debugger utilizing ladder language-based tools. FTSolution for APT Hardware Debugger allows users to download compiled FTSolution for APT programs into Siemens 505/CTI 2500 Series processors, utilize sophisticated ladder language-based debugging tools, and limit the ability to modify existing programs.

Creating an .AHD file in FTSolution for APT

To use FTSolution for APT Hardware Debugger you must create a Hardware Debugger file (.ahd file) from within FTSolution for APT. To create an .ahd file for use within Hardware Debugger you must compile your project. During a compile select the option **Create Hardware Debugger file**.



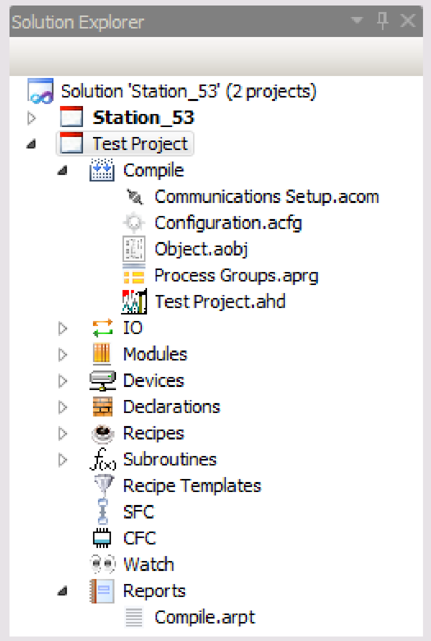
Compile Test Project

Target: CTI 2500 C400 < 8.01

Translate: ● No ○ Append ○ Yes

Options: □ Debug ☑ Create Hardware Debugger File ☑ Force

The .ahd file will automatically be placed within the Compile folder of the applicable Solution and Project. For example, the Test Project.ahd file picture below for **Test Project** is located within the folder **\Station_53 \Test Project\Compile**.

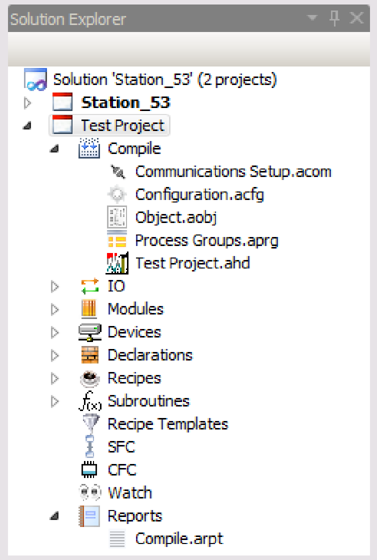


Solution Explorer

- Solution 'Station_53' (2 projects)
  - **Station_53**
  - Test Project
    - Compile
      - Communications Setup.acom
      - Configuration.acfg
      - Object.aobj
      - Process Groups.aprg
      - Test Project.ahd
    - IO
    - Modules
    - Devices
    - Declarations
    - Recipes
    - Subroutines
    - Recipe Templates
    - SFC
    - CFC
    - Watch
    - Reports
      - Compile.arpt

Opening an .AHD file in FTSolution for APT

To open the .ahd file within FTSolution for APT open the **Compile** item within the Solution Explorer and double click the **.ahd** file. The Hardware Debugger will launch. In the example below the .ahd file is **Test Project.ahd**.



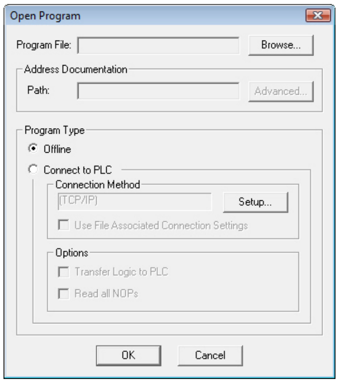
Opening an .AHD file in Hardware Debugger

You can also open the file within Hardware Debugger.

1. Select the **File/Open** menu click the toolbar icon, or press [Ctrl-O]. The Open Program dialog appears.

2. Click **Browse** and select the *.AHD file.

3. Select the **Offline** radio button or enter information into **Connect to PLC**. Click **Ok**.



WARNING: DO NOT use *Hardware Debugger* to modify an FTSolution for APT-created .AHD file. An FTSolution for APT-created .AHD file contains unique elements which must be downloaded to a PLC to correctly run an APT language program. Saving an .AHD file with *Hardware Debugger* omits these critical changes.

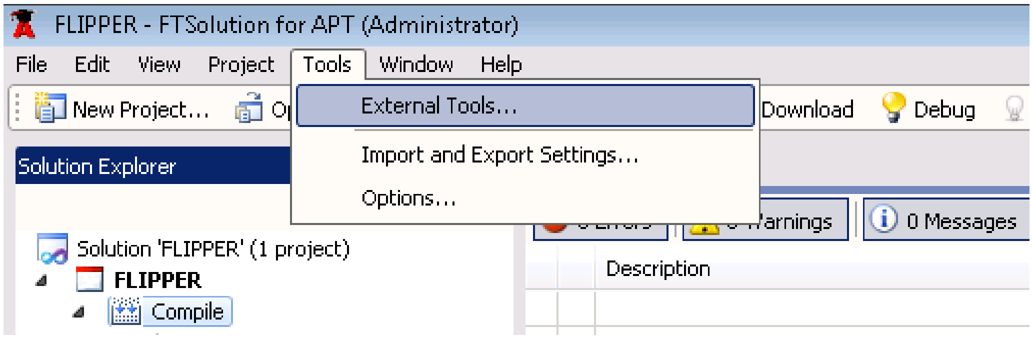
FTSolution for APT Simulator (505 Simulator)

FTSolution for APT Simulator (505 Simulator) is designed to run and test FTSolution for APT projects without the use of a PLC.

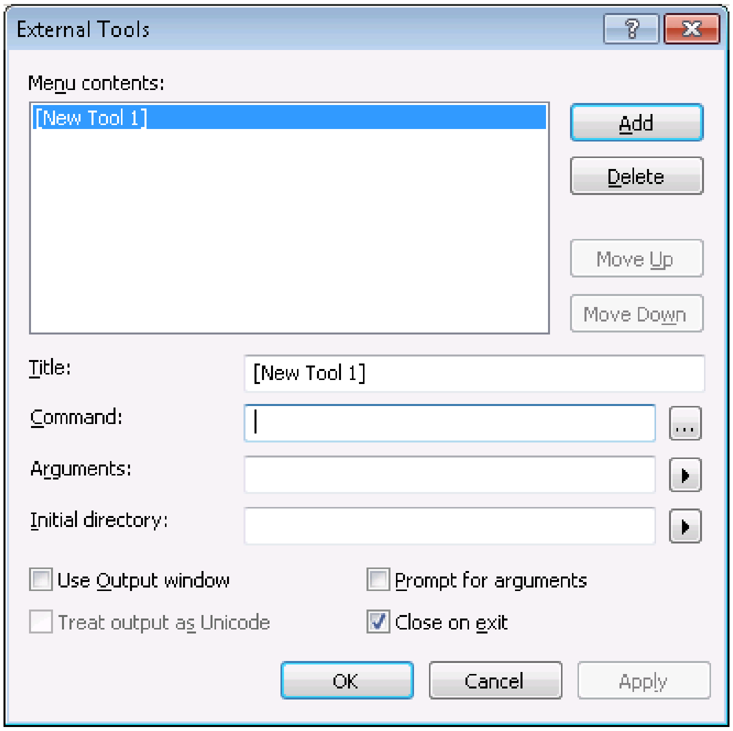
Setting Up 505 Simulator as an External Tool

505 Simulator can be started from inside FTSolution for APT by adding it to the list of External Tools. This is a one-time setup on each FTSolution for APT installation. To add 505 Simulator as an External Tool:

1. In FTSolution for APT, open the Tools menu and click on **External Tools...**



2. The External Tools window will be shown as follows with a default entry in the Title field.


External Tools

Menu contents:

[New Tool 1]

Title: [New Tool 1]

Command:

Arguments:

Initial directory:

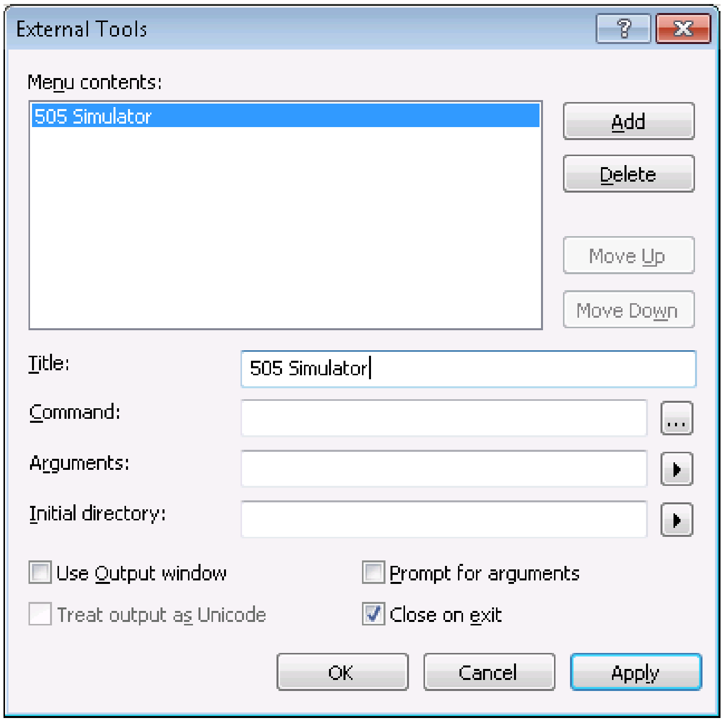
□ Use Output window

□ Prompt for arguments

□ Treat output as Unicode

☑ Close on exit

3. Change the Title to “505 Simulator”



Menu contents: 505 Simulator

Title: 505 Simulator

Command:

Arguments:

Initial directory:

□ Use Output window

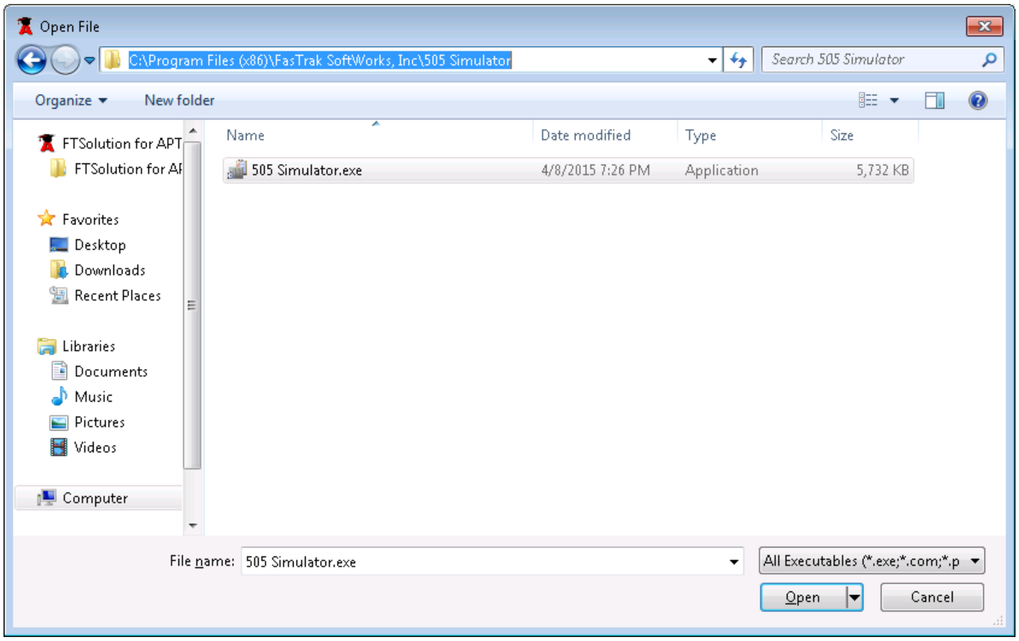
□ Prompt for arguments

□ Treat output as Unicode

☑ Close on exit

4. In the **Command** field, either type in the full file path to the 505 Simulator executable or click the browse button … to the right of the field to search for the executable. The 505 Simulator executable in typically located at C:\Program Files\FasTrak SoftWorks, Inc\ 505 Simulator.

5. If browse option is used, go to the installed location of the 505 Simulator then select the executable and click **Open**.



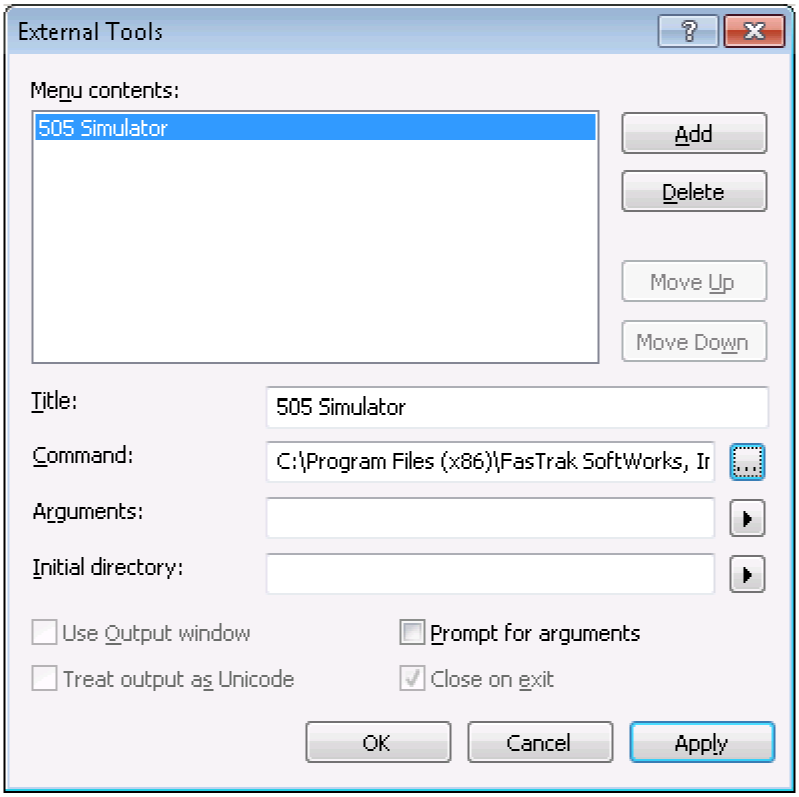
C:\Program Files (x86)\FasTrak SoftWorks, Inc\505 Simulator

Name	Date modified	Type	Size
505 Simulator.exe	4/8/2015 7:26 PM	Application	5,732 KB

File name: 505 Simulator.exe

All Executables (*.exe;*.com;*.p

6. In the External Tools window, click **Apply** and then **OK** to close the window.



Menu contents: 505 Simulator

Title: 505 Simulator

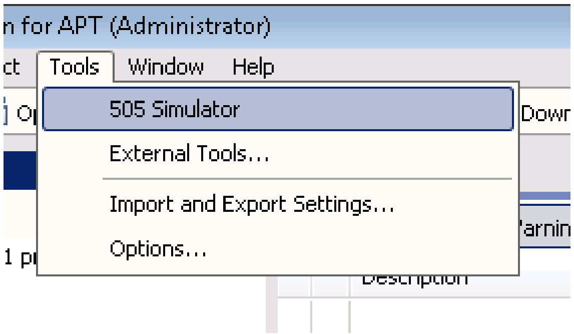
Command: C:\Program Files (x86)\FasTrak SoftWorks, Ir

Arguments:

Initial directory:

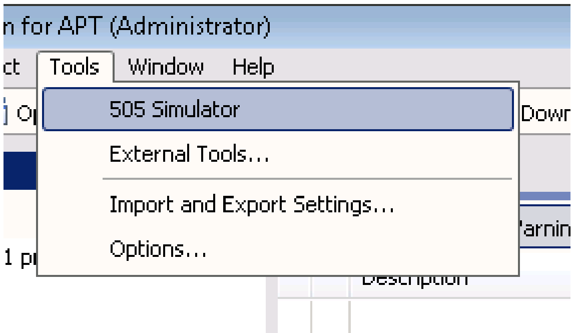
□ Use Output window
□ Prompt for arguments
□ Treat output as Unicode
☑ Close on exit

7. Open the **Tools** menu and click **505 Simulator** to launch the simulator from FTSolution for APT.

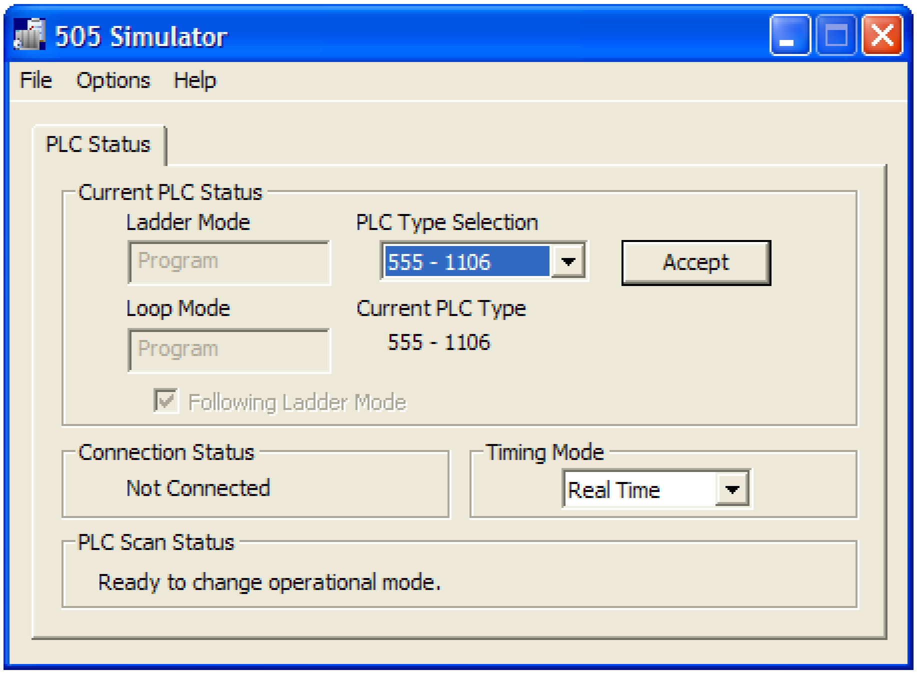


Starting 505 Simulator

To start the 505 Simulator click the **Start** button, click **All Programs**, click **FasTrak SoftWorks**, and then click **505 Simulator**. Alternatively, 505 Simulator can be started from inside FTSolution for APT (see Setting up 505 Simulator as an External Tool). To start 505 Simulator from FTSolution for APT, go to the Tools menu and click **505 Simulator**.



After starting, the 505 Simulator Window is displayed:



Current PLC Status

Ladder Mode: Program

Loop Mode: Program

☑ Following Ladder Mode

PLC Type Selection: 555 - 1106

Current PLC Type: 555 - 1106

Connection Status: Not Connected

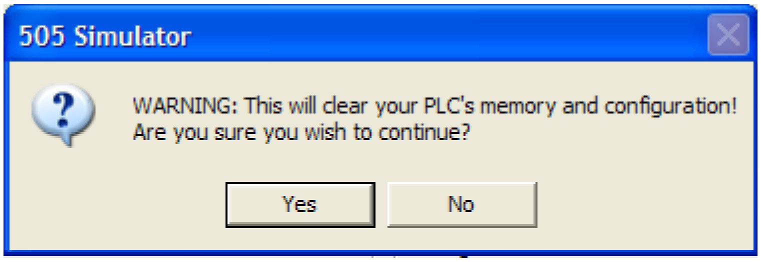
Timing Mode: Real Time

PLC Scan Status: Ready to change operational mode.

Selecting PLC Type

1. In the **PLC Type** Selection box, select the PLC type you want to simulate.

2. Click **Accept**. The following warning appears:



505 Simulator

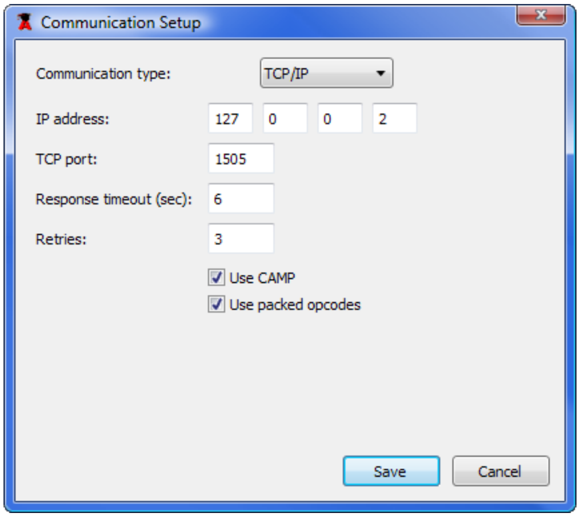
WARNING: This will clear your PLC's memory and configuration!
Are you sure you wish to continue?

3. Click **Yes**. The simulator is now simulating the PLC type you selected.

Setting Up Communications with 505 Simulator in FTSolution for APT

505 Simulator uses the TCP/IP communication method to communicate with FTSolution for APT. Do the following to create a new TCP/IP connection in FTSolution for APT to connect to the 505 Simulator:

In FTSolution for APT, open the project and click **Communications Setup.acom** from the Solution Explorer. The Communication Setup dialog box appears. Select **TCP/IP** from the **Communication Type** list. The TCP/IP setup information appears.



Communication Setup

Communication type: TCP/IP

IP address: 127 0 0 2

TCP port: 1505

Response timeout (sec): 6

Retries: 3

☑ Use CAMP

☑ Use packed opcodes

In the **IP Address** box, enter **127.0.0.1**. In the **TCP port** box, enter **1505** in the TCP Port box. The TCP Port must be set to 1505 to enable connection with the simulator. The other communication settings can be changed as needed; refer to the FTSolution for APT online help for additional information.

Click **Save**.

Connecting to 505 Simulator

Prerequisites

In order to connect to the 505 Simulator, both FTSolution for APT and 505 Simulator must be currently running. In addition, within FTSolution for APT, a TCP/IP communication method that uses an IP address of 127.0.0.1 must be created.

Connecting

Once these prerequisites have been met, connecting to the simulator is identical to going online with an actual PLC. See *Starting Debug Mode* on page 53 for additional information on how to enter run mode.

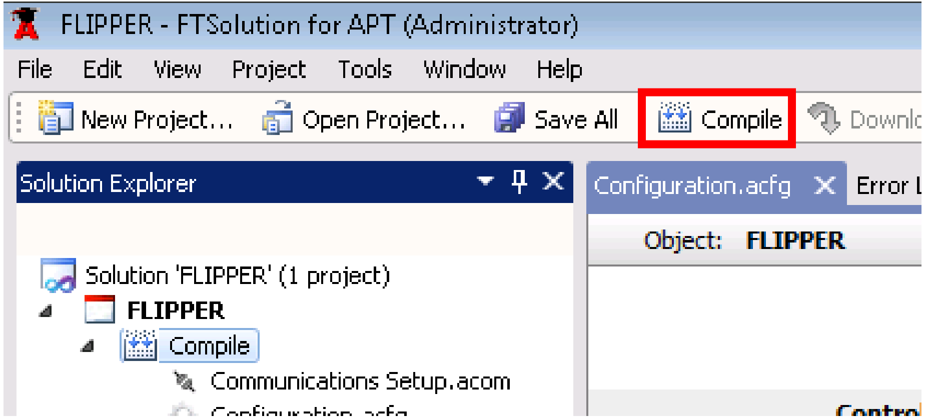
Note: 505 Simulator must be running before attempting to connect to it.

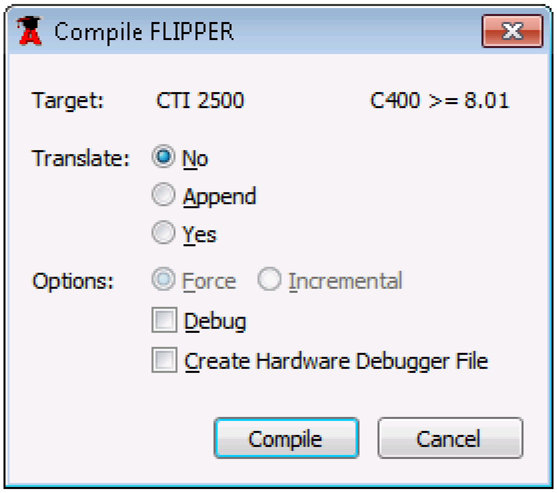
Performing an Incremental Download to 505 Simulator in Run Mode

Users who wish to perform an incremental compile may benefit from attempting the incremental compile using the 505 Simulator. The 505 Simulator can be used to determine if a program can be incrementally downloaded to a running PLC without the need to reload and restart the PLC. This can avoid costly and unwanted production stoppages.

To attempt an incremental download to 505 Simulator in run mode:

1. Begin the process by force compiling your project. Click the **Compile** option from the toolbar with the project node or the compile node in the project. In the compile options window, ensure that the Force radio button is selected and click the **Compile** button.




Compile FLIPPER

Target: CTI 2500 C400 >= 8.01

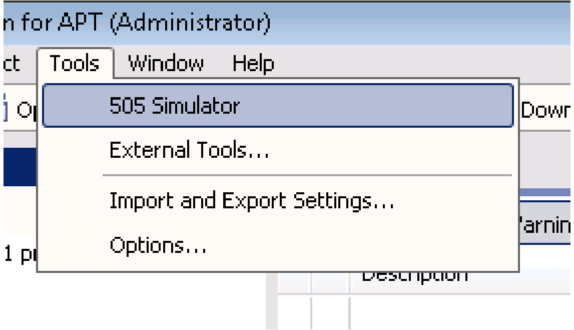
Translate: ● No ○ Append ○ Yes

Options: ● Force ○ Incremental

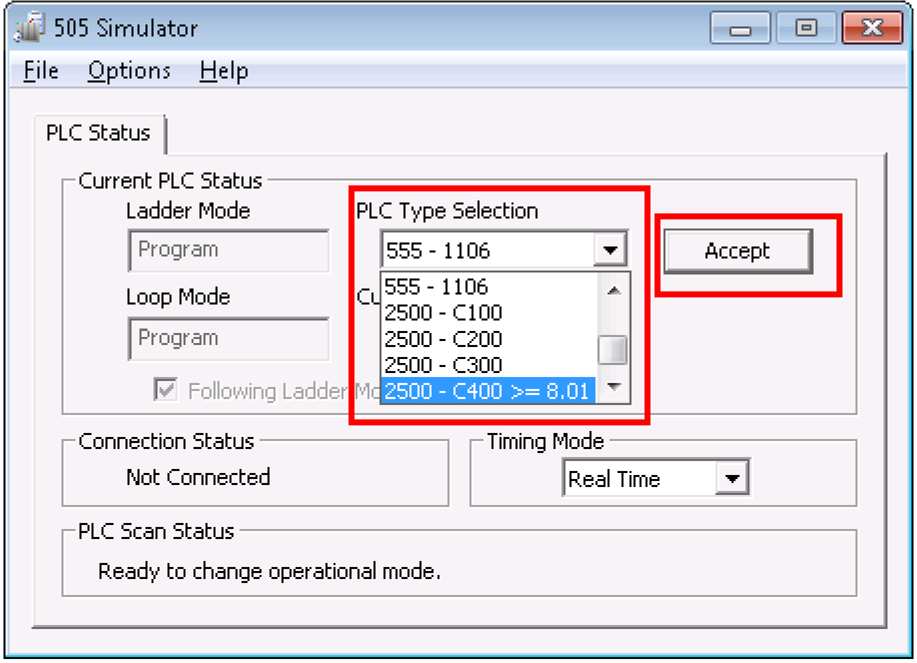
☐ Debug

☐ Create Hardware Debugger File

2. Launch simulator by opening the **Tools** menu and selecting **505 Simulator**
   Note: If this option is not shown see *Setting Up 505 Simulator as an External Tool*



3. In the 505 Simulator window, change the PLC Type Selection to match type set in the FTSolution for APT project and then click the **Accept** button. Click **Yes** in the Warning dialog to confirm the change.



Ladder Mode: Program

Loop Mode: Program

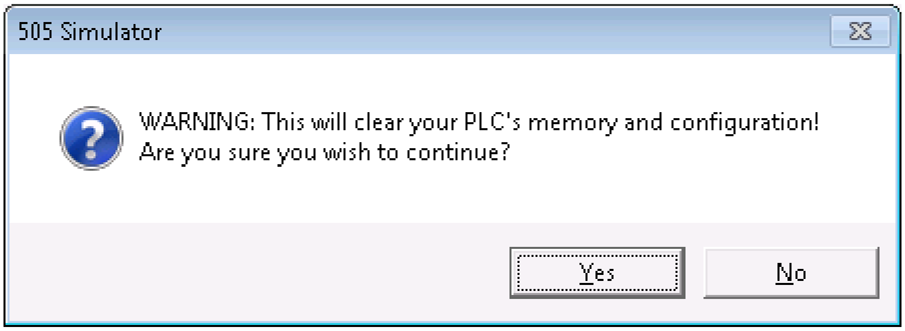
PLC Type Selection: 555 - 1106

555 - 1106
2500 - C100
2500 - C200
2500 - C300
2500 - C400 >= 8.01

Connection Status: Not Connected

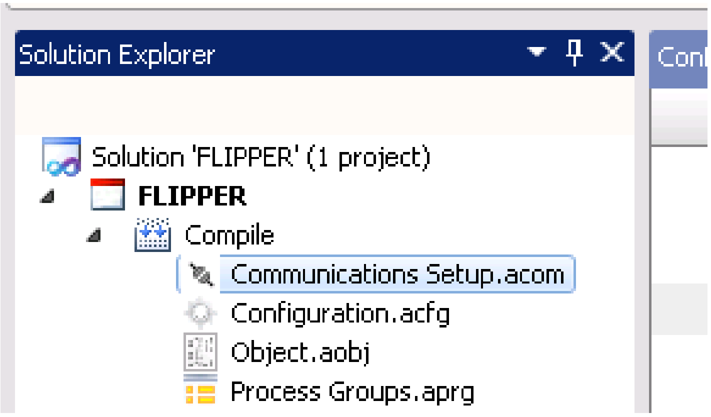
Timing Mode: Real Time

PLC Scan Status: Ready to change operational mode.

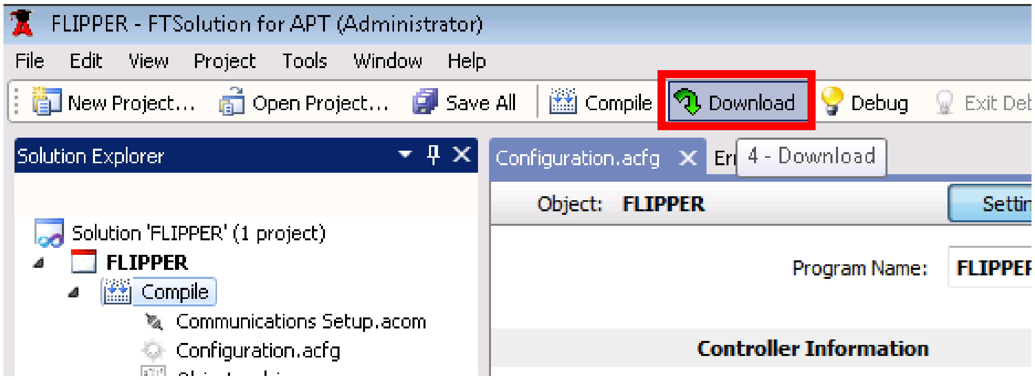


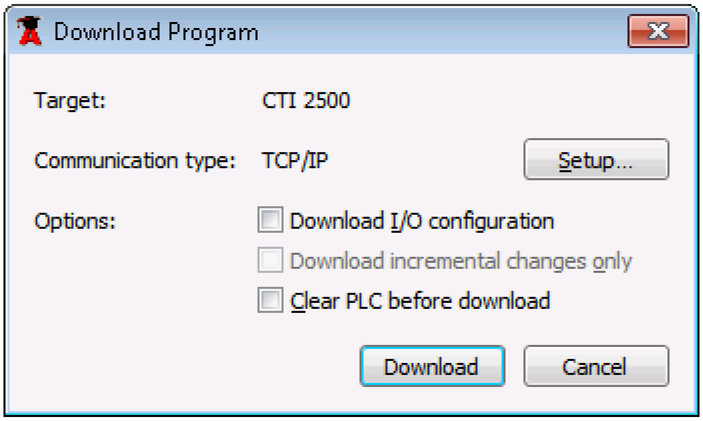
WARNING: This will clear your PLC's memory and configuration!
Are you sure you wish to continue?

4. In FTSolution for APT, open the Communications Setup. Change the Communication Type to TCP/IP and set the IP Address to 127.0.0.1. Click Save.



5. Select **Download** from the toolbar with the project node or the compile node in the project. Click **Download** in the Download Program options window.





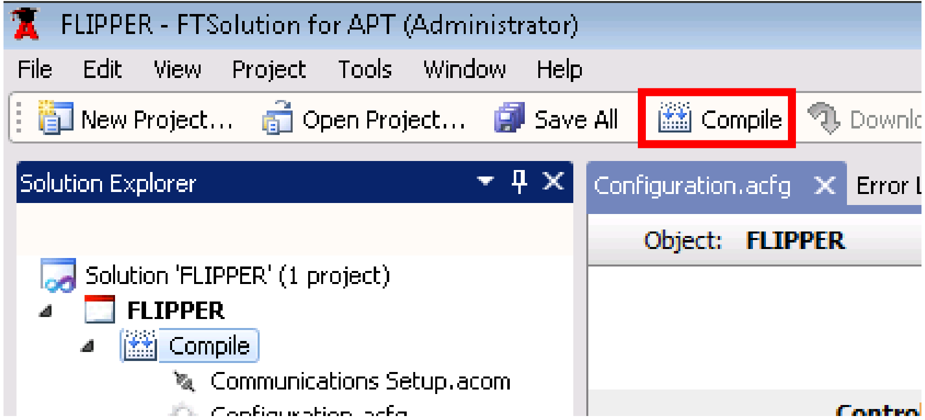
Target: CTI 2500

Communication type: TCP/IP

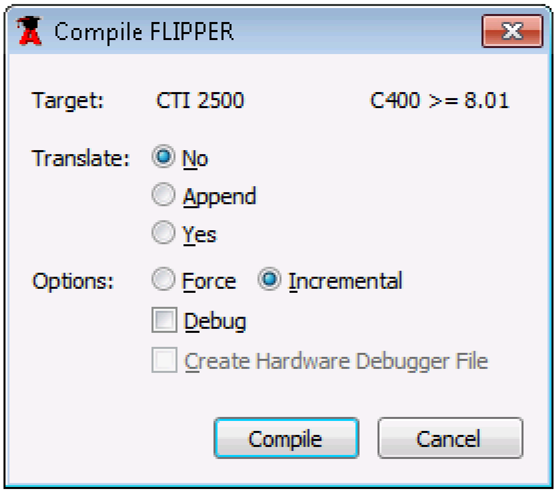
Options:
☐ Download I/O configuration
☐ Download incremental changes only
☐ Clear PLC before download

6. Make the desired changes to your program.

7. After you have made your program changes, click the **Compile** from the toolbar with the project node or the compile node in the project. In the compile options window, select the Incremental radio button and click **Compile**.


FLIPPER - FTSolution for APT (Administrator)
File Edit View Project Tools Window Help
New Project… Open Project… Save All Compile Downlo
Solution Explorer
Solution 'FLIPPER' (1 project)
FLIPPER
Compile
Communications Setup.acom
Configuration.acfg
Configuration.acfg
Error L
Contro

Object: FLIPPER



Target: CTI 2500 C400 >= 8.01

Translate: ● No ○ Append ○ Yes

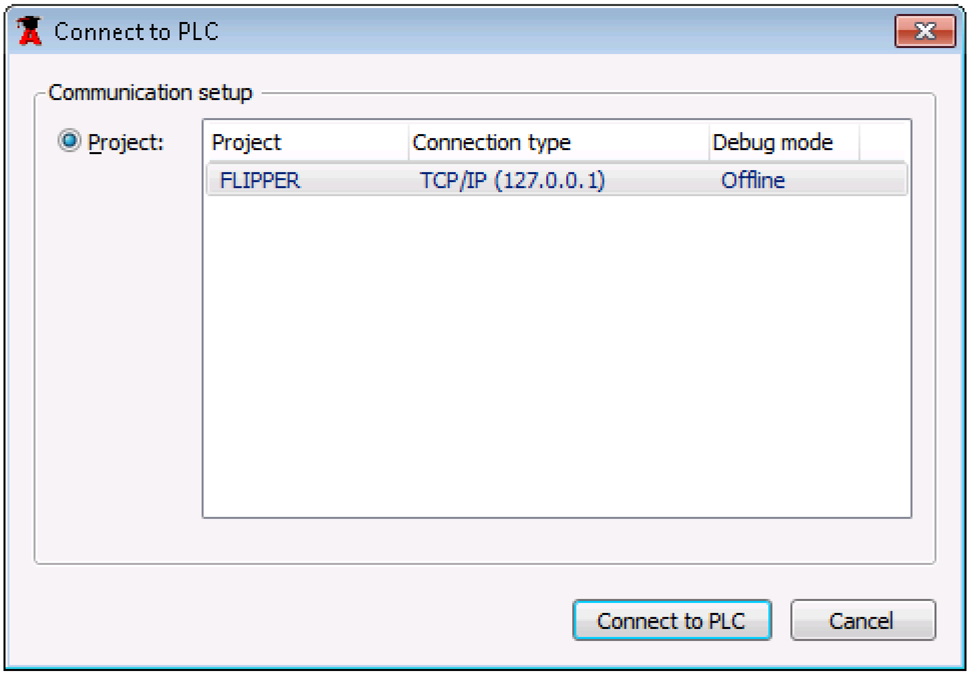
Options: ○ Force ● Incremental

□ Debug

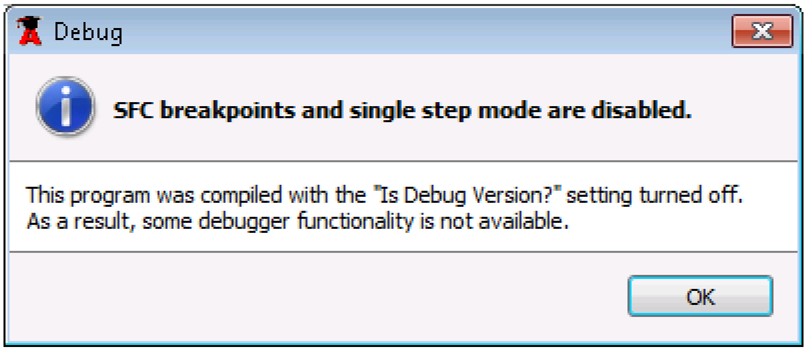
□ Create Hardware Debugger File

8. Click **Debug** from the toolbar. In the Connect to PLC window, click Connect to PLC button. A Debug prompt will be shown. Click **OK** to continue.

   Note: The Debug prompt is shown because the Debug option was not selected in the compile options. This is ok because full debug functionality is not necessary to put the simulator into run mode.



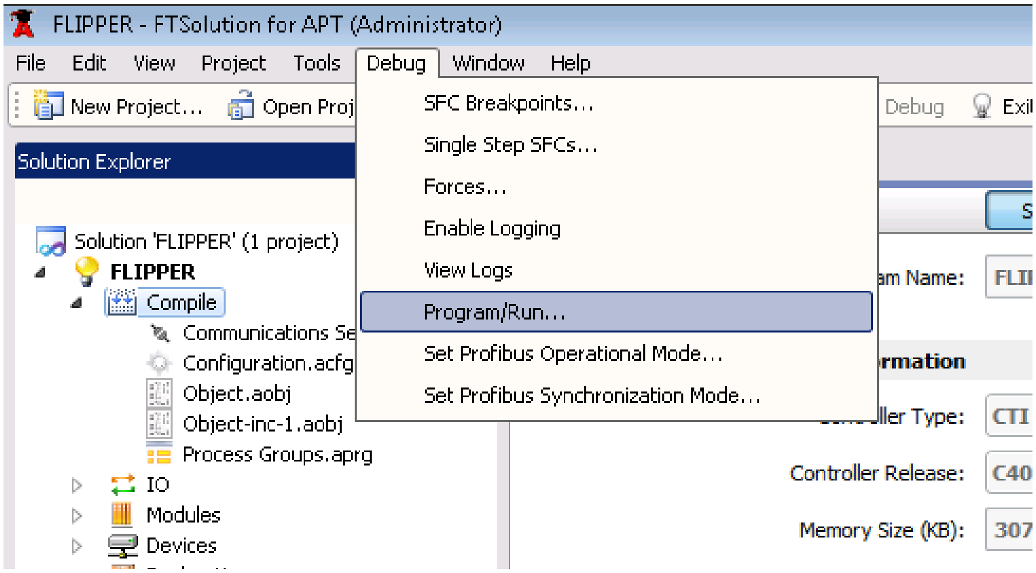
Project	Connection type	Debug mode
FLIPPER	TCP/IP (127.0.0.1)	Offline

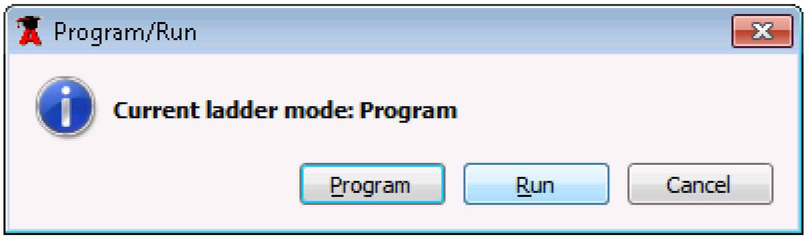


SFC breakpoints and single step mode are disabled.

This program was compiled with the "Is Debug Version?" setting turned off.
As a result, some debugger functionality is not available.

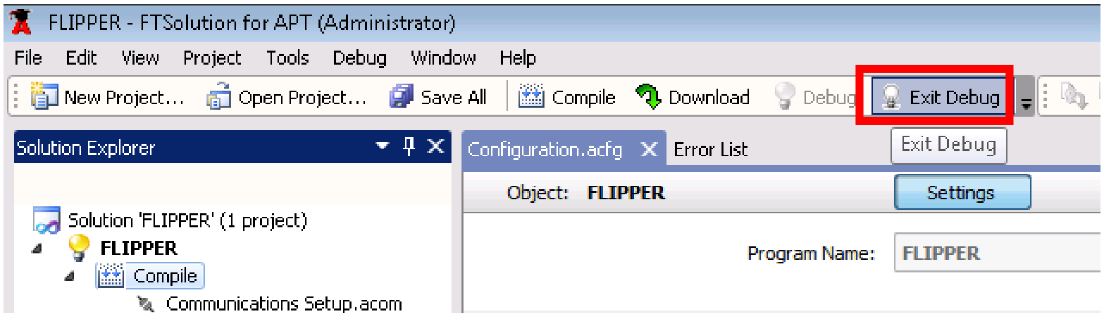
9. Open the **Debug** menu and select **Program/Run…**. In the Program/Run window, click the **Run** button.





Current ladder mode: Program

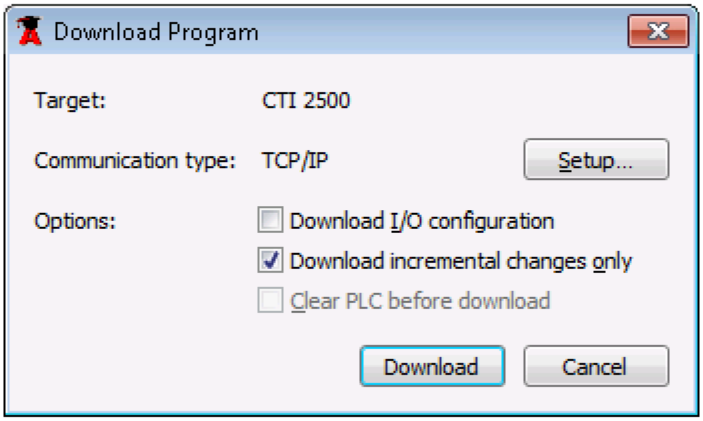
10. A Download cannot proceed while the project is in debug mode. Click the **Exit** Debug button in the toolbar.



Object: **FLIPPER**

Program Name: FLIPPER

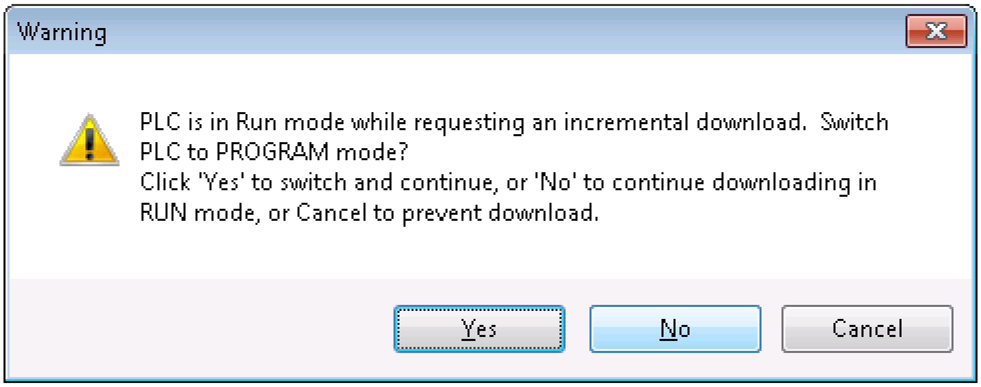
11. Select **Download** from the toolbar with the project node or the compile node in the project to download incrementally. In the Download Program window, ensure that **Download incremental changes only** is checked and click **Download**. In the Warning prompt, click **No** to continue downloading to the PLC in Run mode



Target: CTI 2500

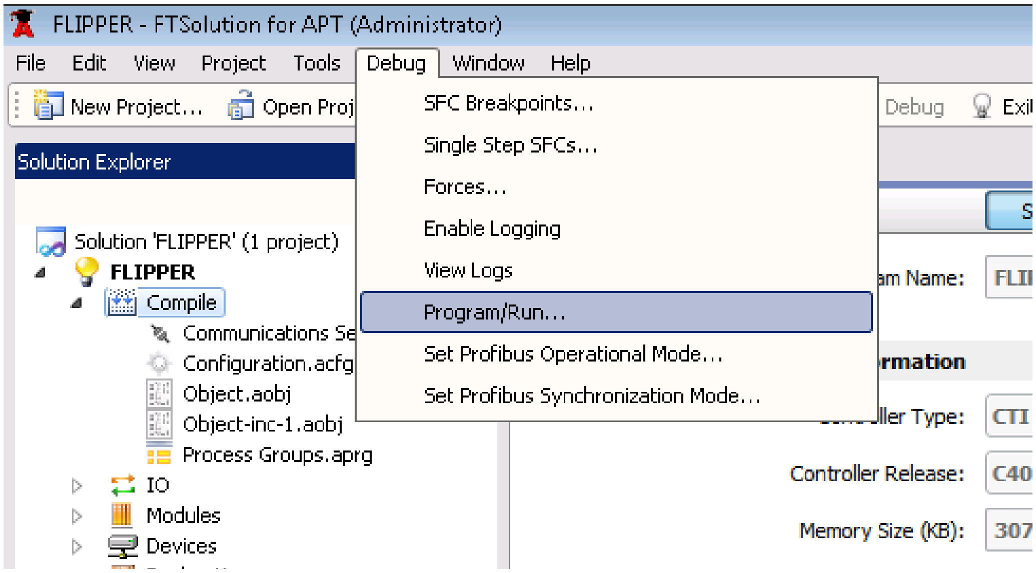
Communication type: TCP/IP

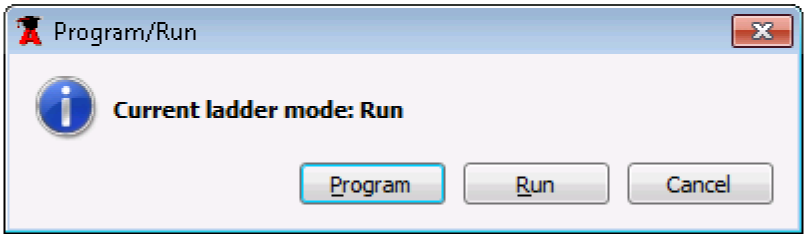
Options:
□ Download I/O configuration
☑ Download incremental changes only
□ Clear PLC before download



PLC is in Run mode while requesting an incremental download. Switch PLC to PROGRAM mode?
Click 'Yes' to switch and continue, or 'No' to continue downloading in RUN mode, or Cancel to prevent download.

12. At the end of this process, it is recommended that you confirm the Simulator is still in Run mode. To do so, click **Debug** from the toolbar. In the Connect to PLC window, click **Connect to PLC button**. In the Debug prompt click **OK** to continue. Open the **Debug** menu and select **Program/Run…**. Observe in the Program/Run window the Current ladder mode status is Run.





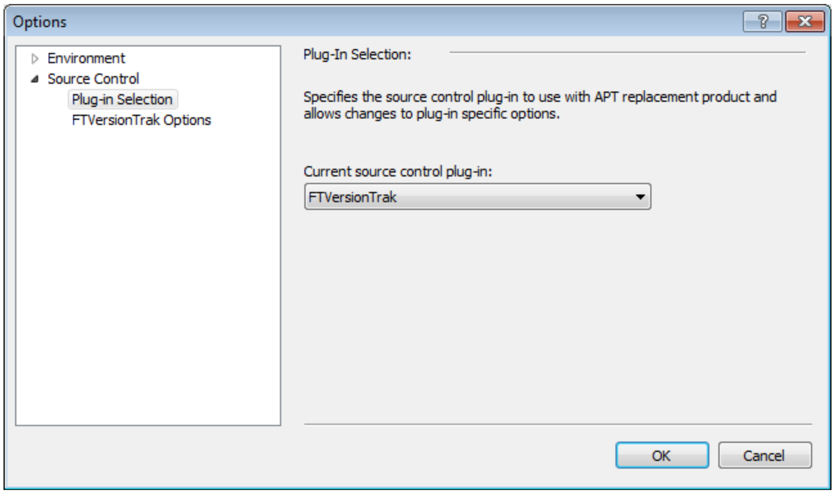
Current ladder mode: Run

FTVersionTrak for APT

FTSolution for APT provides for integration with source control, or version control, software through the use of FTVersionTrak for APT. Contact your FasTrak SoftWorks, Inc. Sales Representative at **262-238-8088** or **sales@fast-soft.com** to purchase FTVersionTrak for APT. To use the functionality provided by FTVersionTrak, make sure that FTVersionTrak is listed as the designated source control plug-in for FTSolution for APT.

To specify the source control plug-in:

1. Start FTSolution for APT.
2. Click **Options** on the **Tools** menu.
3. In the Options dialog box, select **Source Control**.
4. Select **FTVersionTrak** as the **Current source control plug-in** and click **OK**.



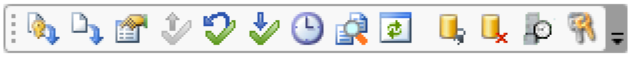
Plug-In Selection:

Specifies the source control plug-in to use with APT replacement product and allows changes to plug-in specific options.

Current source control plug-in: FTVersionTrak

FTVersionTrak Toolbar

Most of the source control-related operations you will need to perform in FTSolution for APT can be accomplished using the FTVersionTrak toolbar. If the toolbar is not displayed, click the **View** menu, point to **Toolbars**, and select **FTVersionTrak Toolbar**.



Get Latest Version. Use this button to retrieve the latest repository version of the selected items in the Solution Explorer.

Get. Use this button to retrieve a user-specified repository version of the selected item in the Solution Explorer.

View Repository Properties. Use this button to view the repository properties of the selected item in the Solution Explorer.

Check Out. Use this button to check out the selected items in the Solution Explorer.

Undo Check Out. Use this button to undo a check out.

Check In. Use this button to check in the selected items in the Solution Explorer.

History. Use this button to view the history of the selected items in the Solution Explorer.

Compare. Use this button to compare the item currently selected in the Solution Explorer.

Refresh. Use this button to refresh the display.

Disconnect. Use this button to disconnect from the repository.

Launch FTVersionTrak. Use this button to launch FTVersionTrak.

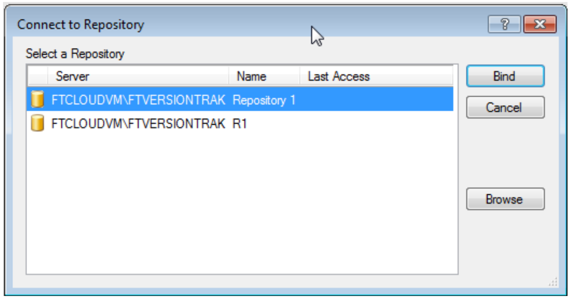
Bind. Use this button to bind an FTSolution for APT project to a repository.

Binding to a Repository

The first step in using FTVersionTrak with FTSolution for APT is to bind an APT project to an FTVersionTrak repository. Binding a project creates a link between the working files of a solution and a repository in the FTVersionTrak database. Instructions for creating a repository were provided earlier in this document, in the procedure for installing FTVersionTrak.

To bind an FTSolution for APT project to a repository:

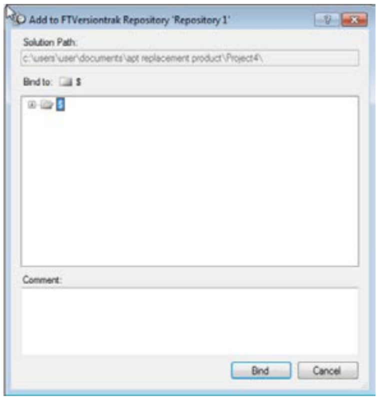
1. Open the solution you want to bind.
2. Click the **Bind** toolbar button on the FTVersionTrak toolbar.
3. In the Connect to Repository dialog box, select a repository and click **Bind**. You will bind the FTSolution for APT project to this repository.



Select a Repository

Server	Name	Last Access
FTCLOUDVM\FTVERSIONTRAK	Repository 1	
FTCLOUDVM\FTVERSIONTRAK	R1	

4. In the Add to FTVersionTrak Repository dialog box, click **Bind** to bind the FTSolution for APT project to the root folder of the repository. If you want, you have the ability to bind the project to another folder on the repository.

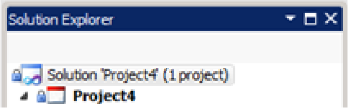


Solution Path: c:\users\user\documents\apt replacement product\Project4\

Bind to: $

Comment:

Additional icons are displayed in the Solution Explorer of an APT replacement project that has been successfully bound to a repository. These icons are used to indicate the status of the files under FTVersionTrak control. The following figure shows icons that represent the checked-in and checked-out status of the project, solution, and files.



🔒 **Checked-in.**

✓ **Checked-out.**

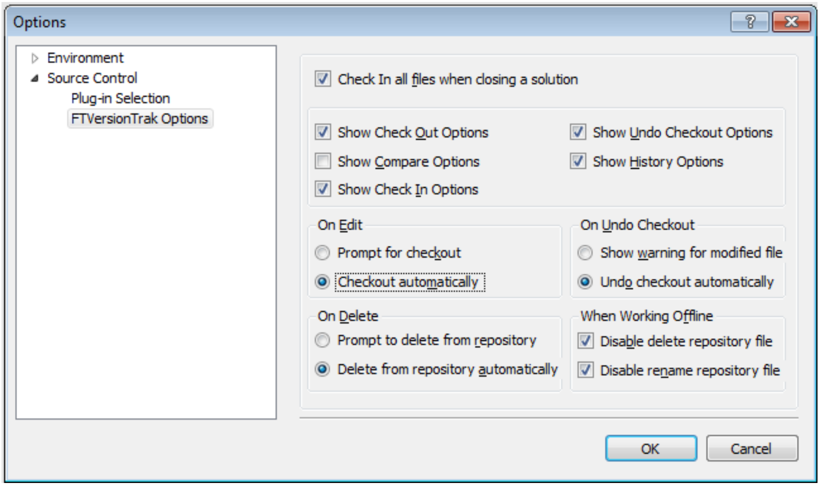
Additional icons are used to represent other statuses.

Setting FTVersionTrak Options

There are many customizable settings that determine how FTVersionTrak operates within FTSolution for APT. Examples of these settings include whether check-ins and check-outs are performed automatically, what occurs when files are deleted, and what restrictions are in place when working offline.

To specify FTVersionTrak options:

1. Click **Options** on the **Tools** menu in FTSolution for APT.
2. In the Options dialog box, in the left pane, expand **Source Control**.
3. Select **FTVersionTrak Options**.



☑ Check In all files when closing a solution

☑ Show Check Out Options
☐ Show Compare Options
☑ Show Check In Options
☑ Show Undo Checkout Options
☑ Show History Options

On Edit
○ Prompt for checkout
● Checkout automatically

On Undo Checkout
○ Show warning for modified file
● Undo checkout automatically

On Delete
○ Prompt to delete from repository
● Delete from repository automatically

When Working Offline
☑ Disable delete repository file
☑ Disable rename repository file

4. Select the options you want to use.

Using Solution Explorer with FTVersionTrak

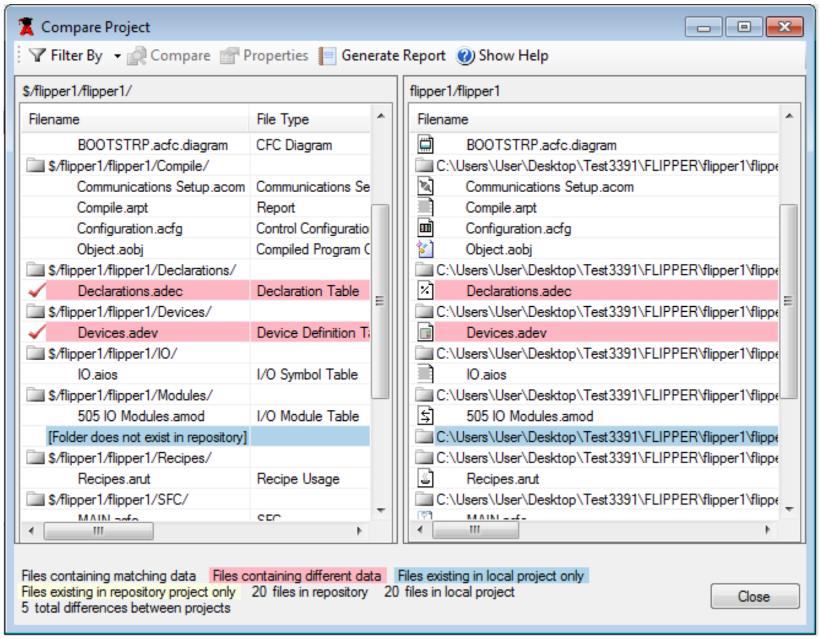
The operation of many FTVersionTrak operations will vary depending on what is selected in the Solution Explorer. When a project, solution, or unit is selected in the Solution Explorer, the history and compare commands will show information about the entire project, solution, or unit. When an individual file is selected, the history and compare commands will show detailed information about that specific file.

Similarly, the Check-In and Check-Out commands will also work on a project, solution, object, and unit level. For example, when a solution is selected, all of the files contained in that solution will be checked in or checked out at once. If only a single file is selected in Solution Explorer, only that file will be checked in or out.

Example of Compare: Comparing at the Project Level

If a project or solution is selected in the Solution Explorer, clicking the **Compare** toolbar button provides a way to compare the current version of a project or solution with the most recent version in the repository.

The following figure shows the result of a compare project done on a project named **flipper1**. In this comparison, the **Declarations.adec** and **Devices.adev** files do no match the latest repository versions.



$/flipper1/flipper1/

	Filename	File Type
	BOOTSTRP.acfc.diagram	CFC Diagram
	$/flipper1/flipper1/Compile/	
	Communications Setup.acom	Communications Se
	Compile.arpt	Report
	Configuration.acfg	Control Configuratio
	Object.aobj	Compiled Program C
	$/flipper1/flipper1/Declarations/	
✓	Declarations.adec	Declaration Table
	$/flipper1/flipper1/Devices/	
✓	Devices.adev	Device Definition T:
	$/flipper1/flipper1/IO/	
	IO.aios	I/O Symbol Table
	$/flipper1/flipper1/Modules/	
	505 IO Modules.amod	I/O Module Table
	[Folder does not exist in repository]	
	$/flipper1/flipper1/Recipes/	
	Recipes.arut	Recipe Usage
	$/flipper1/flipper1/SFC/	
	MAIN.acfc	SFC

flipper1/flipper1

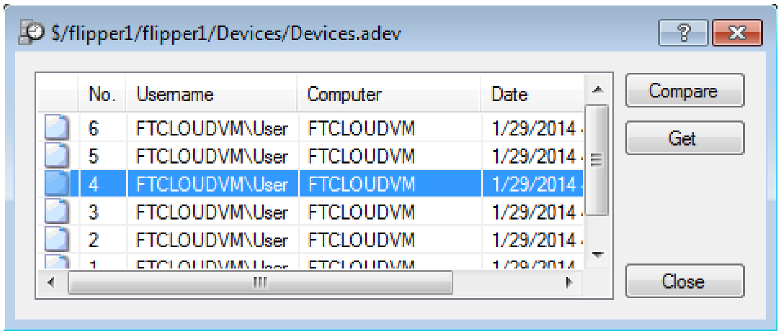
Filename
BOOTSTRP.acfc.diagram
C:\Users\User\Desktop\Test3391\FLIPPER\flipper1\flippe
Communications Setup.acom
Compile.arpt
Configuration.acfg
Object.aobj
C:\Users\User\Desktop\Test3391\FLIPPER\flipper1\flippe
Declarations.adec
C:\Users\User\Desktop\Test3391\FLIPPER\flipper1\flippe
Devices.adev
C:\Users\User\Desktop\Test3391\FLIPPER\flipper1\flippe
IO.aios
C:\Users\User\Desktop\Test3391\FLIPPER\flipper1\flippe
505 IO Modules.amod
C:\Users\User\Desktop\Test3391\FLIPPER\flipper1\flippe
C:\Users\User\Desktop\Test3391\FLIPPER\flipper1\flippe
Recipes.arut
C:\Users\User\Desktop\Test3391\FLIPPER\flipper1\flippe
MAIN.acfc

Files containing matching data Files containing different data Files existing in local project only
Files existing in repository project only 20 files in repository 20 files in local project
5 total differences between projects

Example of History: Historical Information for a Single File

When a single file is selected in the Solution Explorer, such as **Devices.adev**, clicking the **History** toolbar button provides detailed historical information for that file.

The following illustration shows the historical information for the **Devices.adev** file.



$/flipper1/flipper1/Devices/Devices.adev

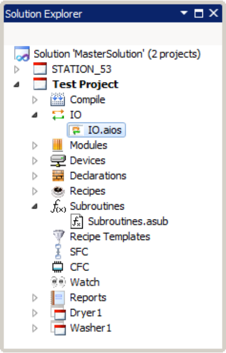
No.	Username	Computer	Date
6	FTCLOUDVM\User	FTCLOUDVM	1/29/2014
5	FTCLOUDVM\User	FTCLOUDVM	1/29/2014
4	FTCLOUDVM\User	FTCLOUDVM	1/29/2014
3	FTCLOUDVM\User	FTCLOUDVM	1/29/2014
2	FTCLOUDVM\User	FTCLOUDVM	1/29/2014
1	FTCLOUDVM\User	FTCLOUDVM	1/29/2014

From this dialog box, it is possible to compare versions of **Devices.adev**. For instance, selecting **No. 4** and then clicking **Compare** will compare the current version with the **No. 4** version in the repository. It is also possible to perform a get operation from this dialog box. Selecting **No. 4** and then clicking **Get** will retrieve the **No. 4** version from the repository and place it in the working folder.

PCS Tagging – Marking Objects for Translation

FTSolution for APT supports the ability to mark simple objects (such as declarations) as well as complex objects (such as CFBs, recipes, or declarations with more than one extension). When marking a complex object, you are able to edit the object and mark the individual extensions that require translation. You are also able to specify an object's attributes and specify the process group to which a tag belongs.

To mark an object for translation, select the item in Solution Explorer and then type the letter **K**. In the following example illustration, the file **IO.aios** is selected in Solution Explorer.

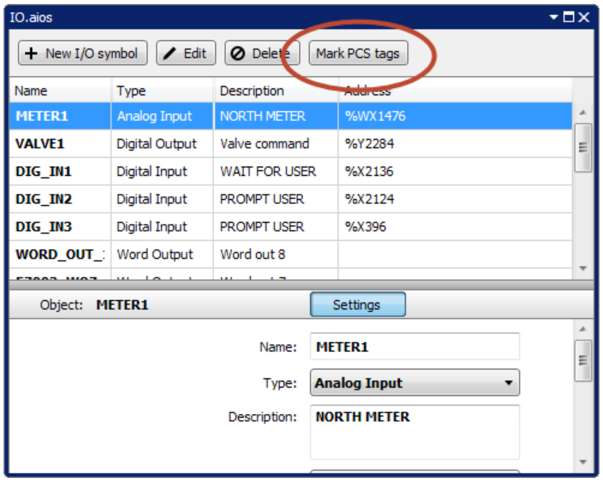


- Solution 'MasterSolution' (2 projects)
  - STATION_53
  - **Test Project**
    - Compile
    - IO
      - IO.aios
    - Modules
    - Devices
    - Declarations
    - Recipes
    - Subroutines
      - Subroutines.asub
    - Recipe Templates
    - SFC
    - CFC
    - Watch
    - Reports
    - Dryer1
    - Washer1

The following items may contain objects that can be marked for translation:

- .aios files (**IO.aios** is the default)
- .adev files (**Devices.adev** is the default)
- .adec files (**Declarations.adec** is the default)
- .arut files (**Recipes.arut** is the default)
- .acfc files (only CFCs files that certain CFC blocks can be marked for translation)

You can also click the **Mark PCS tags** button to mark an object for translation. The **Mark PCS tags** button appears on several table file definition and configuration screens, as well as the graphical editor for CFCs. The following illustration shows the **Mark PCS tags** button in the **IO.aios** configuration screen.



Name	Type	Description	Address
METER1	Analog Input	NORTH METER	%WX1476
VALVE1	Digital Output	Valve command	%Y2284
DIG_IN1	Digital Input	WAIT FOR USER	%X2136
DIG_IN2	Digital Input	PROMPT USER	%X2124
DIG_IN3	Digital Input	PROMPT USER	%X396
WORD_OUT_:	Word Output	Word out 8	

Object: METER1

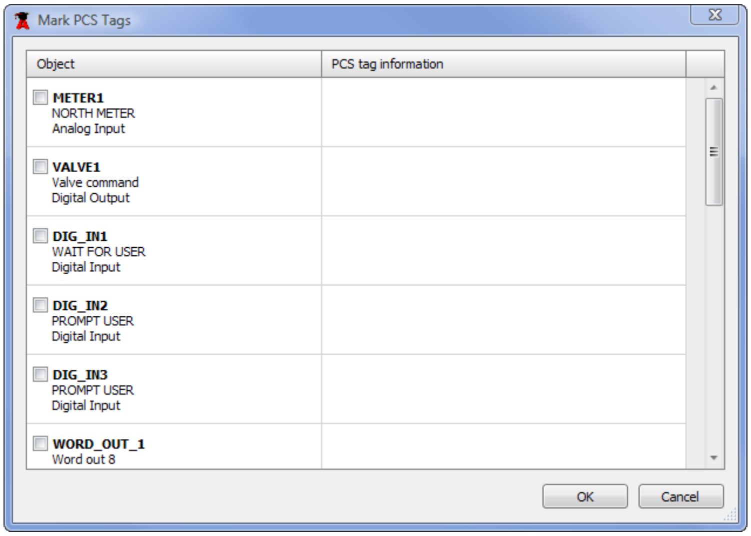
Name: METER1

Type: Analog Input

Description: NORTH METER

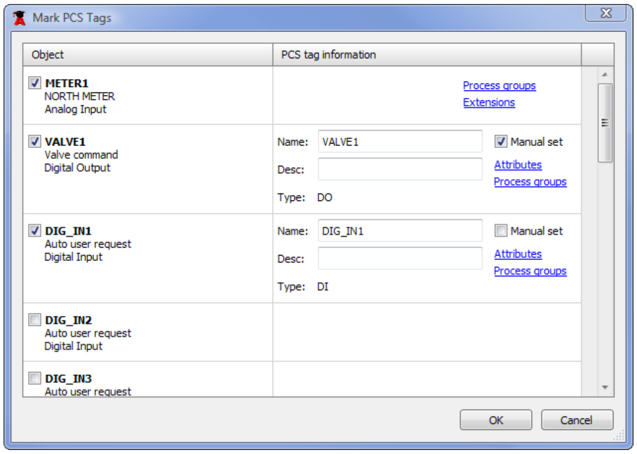
*Note: To mark an item that is part of a unit, open the unit in Solution Explorer, select the item, and then type the letter **K.** Or, click the **Mark PCS tags** button within the appropriate Unit configuration screen.*

After pressing the letter **K** (or clicking the **Mark PCS tags button)**, the **Mark PCS Tags** dialog box is displayed. In this dialog box, select the check boxes of the objects you wish to mark for translation. The **Mark PCS Tags** dialog box is equivalent to the Tag Translate editor and sub-editor in APT.



Object	PCS tag information
□ **METER1** NORTH METER Analog Input	
□ **VALVE1** Valve command Digital Output	
□ **DIG_IN1** WAIT FOR USER Digital Input	
□ **DIG_IN2** PROMPT USER Digital Input	
□ **DIG_IN3** PROMPT USER Digital Input	
□ **WORD_OUT_1** Word out 8	

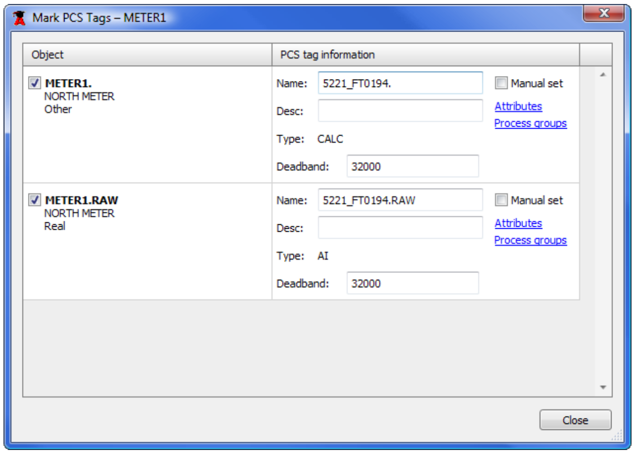
After selecting the check box of an object, you can enter additional information in the **PCS tag information** column. The information you are able to enter will vary depending on the type of object selected. For example, the following illustration shows the **Mark PCS Tags** dialog box for objects in the **IO.aios** file.



Object	PCS tag information
☑ **METER1** NORTH METER Analog Input	Process groups Extensions
☑ **VALVE1** Valve command Digital Output	Name: VALVE1 ☑ Manual set Desc: Attributes Process groups Type: DO
☑ **DIG_IN1** Auto user request Digital Input	Name: DIG_IN1 □ Manual set Desc: Attributes Process groups Type: DI
□ **DIG_IN2** Auto user request Digital Input	
□ **DIG_IN3** Auto user request	

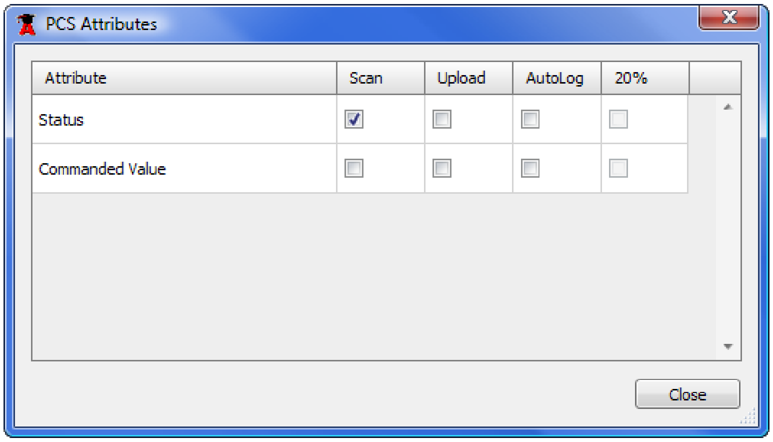
In the **Mark PCS tags** dialog box, the objects named METER1, VALVE1, and DIG_IN1 are all marked for translation. For the VALVE1 and DIG_IN1 objects, you can type a new name for the PCS tag in the **Name** box and a description for the PCS tag in the **Desc** box.

The first object, METER1, is a complex object. Click the **Extensions** link to mark the individual extensions associated with the complex object. The following illustration shows the extensions associated with the METER1 object.



Object	PCS tag information	
☑ **METER1.** NORTH METER Other	Name: 5221_FT0194. Desc: Type: CALC Deadband: 32000	□ Manual set
☑ **METER1.RAW** NORTH METER Real	Name: 5221_FT0194.RAW Desc: Type: AI Deadband: 32000	□ Manual set

To specify the attributes of an object or an object's extension, click the **Attributes** link. After clicking the **Attributes** link, select the check boxes of the attributes you want to use in the **PCS Attributes** dialog box. The PCS Attributes dialog box is equivalent to the tag attributes sub-editor in APT.



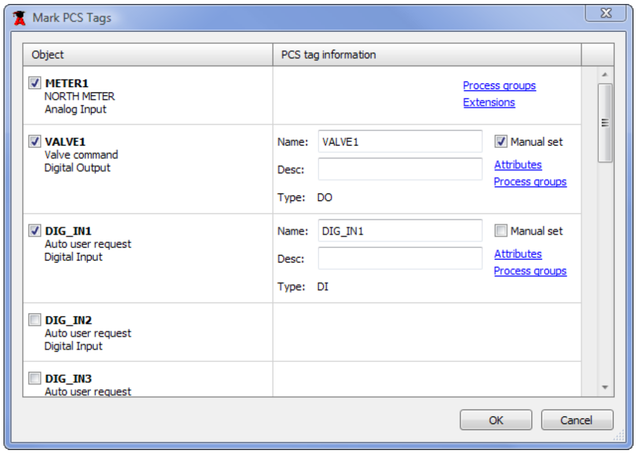
Attribute	Scan	Upload	AutoLog	20%
Status	☑	□	□	□
Commanded Value	□	□	□	□

The attributes you can specify consist of the following:

- Scan
- Upload
- Autolog
- 20% offset

By default, certain attributes may already be selected, depending on the type of object.

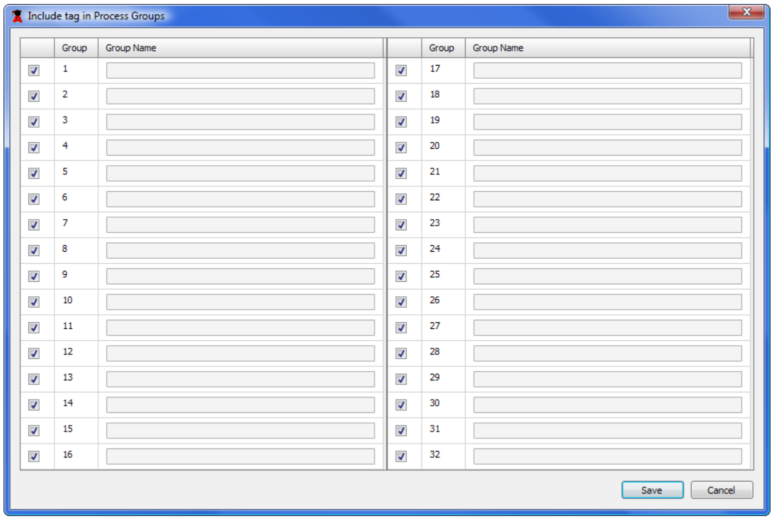
To specify the use of manual settings, select the **Manual set** check box.



Mark PCS Tags

Object	PCS tag information
☑ **METER1** NORTH METER Analog Input	Process groups Extensions
☑ **VALVE1** Valve command Digital Output	Name: VALVE1 ☑ Manual set Desc: Attributes Process groups Type: DO
☑ **DIG_IN1** Auto user request Digital Input	Name: DIG_IN1 □ Manual set Desc: Attributes Process groups Type: DI
□ **DIG_IN2** Auto user request Digital Input	
□ **DIG_IN3** Auto user request	

To indicate the process groups to which the object is a member, click the **Process groups** link.



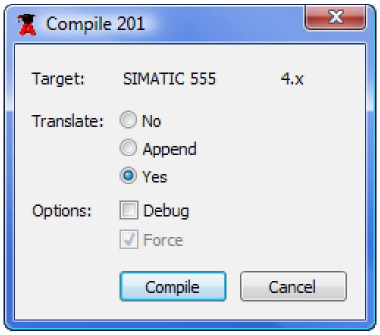
Include tag in Process Groups

	Group	Group Name		Group	Group Name
☑	1		☑	17	
☑	2		☑	18	
☑	3		☑	19	
☑	4		☑	20	
☑	5		☑	21	
☑	6		☑	22	
☑	7		☑	23	
☑	8		☑	24	
☑	9		☑	25	
☑	10		☑	26	
☑	11		☑	27	
☑	12		☑	28	
☑	13		☑	29	
☑	14		☑	30	
☑	15		☑	31	
☑	16		☑	32	

In the **Include tag in Process Groups** dialog box, the check boxes associated with the groups where the tag will be included are selected. By default, all tags are initially assigned to all 32 process groups. To remove a tag from a process group, clear the check box. The **Include tag in Process Groups** dialog box is equivalent to the process groups sub-editor in APT.

Tag Translation and Compile Options

The compile options under **Translate** in the Compile dialog box have a direct effect on PCS tagging. Under **Translate**, specify the translate option you want to use:



Compile 201

Target: SIMATIC 555 4.x

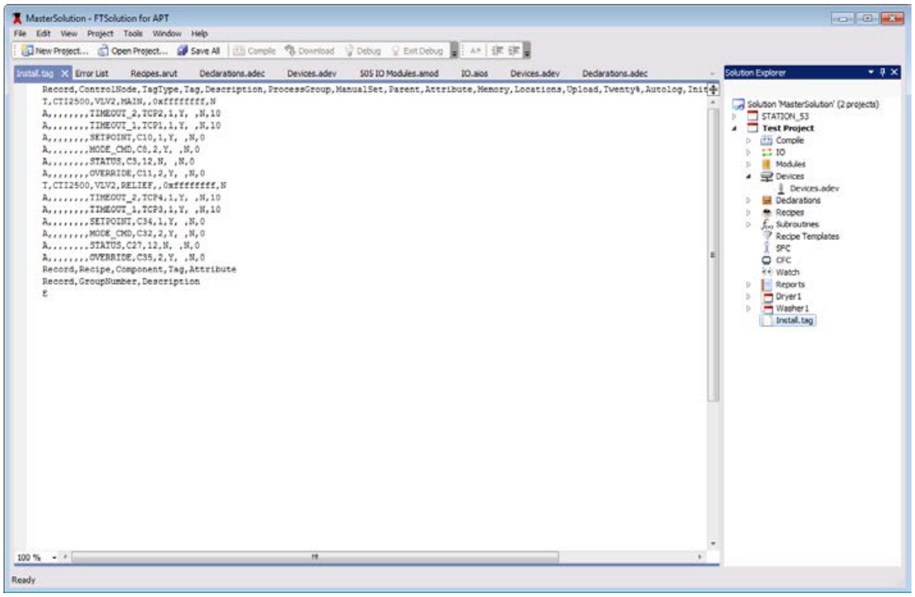
Translate: ○ No ○ Append ● Yes

Options: □ Debug ☑ Force

- When you select **No**, existing marked tags are not modified.
- When you select **Append**, existing marked tags are placed in the *install.tag* file. Tags marked since the last translate build and tags that were unmarked and re-marked are also placed in a separate file, *append.tag*.
- When you select **Yes**, all marked tags are placed in the *install.tag* file.

Location of Install.tag and Append.tag Reports

Once created, the *install.tag* and *append.tag* files appear in the Solution Explorer within FTSolution for APT. The *install.tag* file is displayed in the following illustration.



```
Record,ControlNode,TagType,Tag,Description,ProcessGroup,ManualSet,Parent,Attribute,Memory,Locations,Upload,Twenty%,Autolog,Init
T,CTI2500,VLV2,MAIN,,0xffffffff,N
A,,,,,,,,TIMEOUT_2,TCP2,1,Y, ,N,10
A,,,,,,,,TIMEOUT_1,TCP1,1,Y, ,N,10
A,,,,,,,,SETPOINT,C10,1,Y, ,N,0
A,,,,,,,,MODE_CMD,C8,2,Y, ,N,0
A,,,,,,,,STATUS,C3,12,N, ,N,0
A,,,,,,,,OVERRIDE,C11,2,Y, ,N,0
T,CTI2500,VLV2,RELIEF,,0xffffffff,N
A,,,,,,,,TIMEOUT_2,TCP4,1,Y, ,N,10
A,,,,,,,,TIMEOUT_1,TCP3,1,Y, ,N,10
A,,,,,,,,SETPOINT,C34,1,Y, ,N,0
A,,,,,,,,MODE_CMD,C32,2,Y, ,N,0
A,,,,,,,,STATUS,C27,12,N, ,N,0
A,,,,,,,,OVERRIDE,C35,2,Y, ,N,0
Record,Recipe,Component,Tag,Attribute
Record,GroupNumber,Description
E
```

Using File Explorer, the *install.tag* and *append.tag* files are also accessible from the Reports folder within the project's folder.

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