

# SIEMENS

## SIMATIC 505

### SoftShop for Windows<sup>®</sup> Release 3.1

User Manual

Also Contains the following Documents:

### FTLogger and FTTrend

Order Number: PPX:SS505-8101-8  
Manual Assembly Number: 2807461-0008  
Eight Edition

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**DANGER** indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.

**DANGER** is limited to the most extreme situations.

 **WARNING**

**WARNING** indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury, and/or property damage.

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# 1 - Introduction

## Manual Design

Welcome to 505 SoftShop for Windows, a powerful Windows-based tool for programming programmable logic controllers (PLCs). Whether you are a novice or an experienced programmer, this manual has been constructed to help you begin using 505 SoftShop for Windows quickly. We at Siemens have tried to assume little about you, the user, except that when you have a question regarding this software, you will want it answered by using this manual and the online help.

Chapter topics use names that point you quickly to the specific information you want to find. Titles of Chapters are listed in the following table:

Chapter Name	Description
Introduction	Outlines manual contents, Customer Support numbers, and necessary hardware and software to run 505 SoftShop for Windows.
Installation	Guides you through the installation procedures for the software and security.
505 SoftShop for Windows Basics	Walks you through the nitty gritty by describing 505 SoftShop for Windows features and helps you move through the Windows environment.
505 SoftShop for Windows Setup	Provides specific guidelines in setting up and customizing the software.
PLC Configuration	Provides directions for configuring your processor to work with 505 SoftShop for Windows.
Programming	Gives a you solid understanding of the 505 SoftShop for Windows easy-to-use programming features.
Documentation	Shows you how to add description to your logic programs.
Alarms	Details the 505 SoftShop for Windows easy-to-use programming of Alarms features.
PID	Details the 505 SoftShop for Windows easy-to-use programming PID Loops features.
FTLogger/FTTrend	Shows you how to program the data Logger and Trender.
Appendices	Provides a quick reference to keyboard commands and troubleshooting guide.

# Customer Support

From time to time you may find that this manual and the online help cannot answer your question. Siemens' Customer Support staff will gladly help you find the answers to your questions. To obtain assistance in the United States call:

• Siemens Energy & Automation Distributor	1-800-964-4114
• Technical Support	1-423-461-2522
• Technical Support	1-800-333-7421
• Technical Support Fax	1-423-461-2231

You can also send questions, comments and suggestions to:

Attention: Technical Service  
Siemens Energy & Automation Inc.  
PO Box 1255  
Johnson City, TN 37605-1255

or

You can visit the Siemens Home Page on the World Wide Web at:

<http://www.aut.sea.siemens.com>

For detailed information on Siemens 505 CPUs and Instructions set, refer to the following manuals:

<b>Manual Name</b>	<b>Part Number</b>
505 System Manual	PPX:505-8201-X
505 Programming Reference Manual	PPX:505-8204-X
ET200 Distributed I/O Manual	PPX:505-8206-X

# 505 SoftShop for Windows Overview

## What is 505 SoftShop for Windows?

505 SoftShop for Windows is one of the world's most powerful and exciting programmable logic controller (PLC) programming software offerings. 505 SoftShop for Windows is the universal solution offering features that will save you time and money, such as:

- Symbolic Programming
- Cut, Copy, & Paste
- Instruction Toolbar and Mnemonics
- Multiple windows view and edit
- Flexible program setup
- Write, read, and force addresses from the Data Window
- Multiple documentation options
- Generous Online Help

## Package Contents

Your 505 SoftShop for Windows package includes the items listed below. If any of these items are missing or damaged, please contact Siemens' Customer Service.

- One (1) 505 SoftShop with Com Profibus v5.0 software CD
- 505 SoftShop for Windows User's Guide (this manual)
- Siemens-Key to attach to your computer's parallel port
- Com Profibus Manual
- 505 Programming Reference Manual

# System Requirements

## Hardware Requirements

To install 505 SoftShop for Windows on your computer, you need the following hardware:

- A personal computer with an Intel Pentium 100 processor or higher
- 32 Mb or more of RAM
- An 800 X 600 VGA monitor with at least 256 colors
- 100 Mb free disk space on your hard drive
- A mouse is recommended, but not required

505 SoftShop for Windows may not function properly on systems that are not 100% Intel compatible. Certain other hardware components and peripherals can create incompatibility problems. Please refer to Appendix B, *Troubleshooting Hardware Compatibility*, for a list of devices that cause compatibility problems.

## Software Requirements

You also need the following software loaded on your computer before you install 505 SoftShop for Windows:

- Windows 95, 98, NT or 2000

## Parallel Port Compatibility

Connecting the Siemens-Key to your computer's parallel printer port or USB is required to use 505 SoftShop for Windows, except when in the demo mode. Procedures for installing the Siemens-Key and 505 SoftShop for Windows are outlined in the next chapter. If your parallel port is not 100% IBM compatible, you may experience problems with the Siemens-Key which will prevent 505 SoftShop for Windows from functioning properly.

In most cases, you can correct the parallel interface incompatibilities by replacing the parallel port with a 100% IBM compatible port or by adding a second printer adapter card.

---

**NOTE** Siemens is not responsible for problems that result from using an incompatible parallel interface.

---

# 2 - Installation

## Installing 505 SoftShop

Before you begin installation, you should review the *System Requirements* section in the Introduction chapter.

To install 505 SoftShop, turn your computer on and start Windows. Usually, Windows can be started by typing "win" at the C:\> prompt. The Windows Program Manager appears on the screen. Follow these steps to install the software:

1. Insert the 505 SoftShop Disk in your computer's CD-ROM drive.
2. The CD should autostart, if not click the Windows **Start** button. Then Click **Run**, and type x:\setup.exe, where x is the letter for the CD-ROM drive.
3. Follow the instructions that appear on the screen.
4. After clicking Next, a 505 SoftShop Access Level Read/Load Only Install box appears. From the install window entitled 505 SoftShop Access Level, you can decide if you want Full-function, Read-only, or Load-only install (Figure 2.0).



Figure 2.0

## 505 SoftShop Access Level

**Full-function install** allows full access to all features of 505 SoftShop.

**Read-only install** will not allow the user to access the following:

- **File Menu operations**-New, Open (Online), Save, Save As, Import, Export, and Merge.
- **Edit Menu**-Undo, Cut, Copy, Paste, Clear, Delete, Insert, Append, and Select All.
- **View Menu**-Ladder Editor, Special Function Editor, PID Loops, Alarms, Documentation Window, Symbol Library, and Data Window are all view only.
- **Program Menu**-New Network, Select Instruction, and Validate and Enter.
- **Configuration Editing**-Memory configuration editing, set PLC Scan Time, 505 I/O Edit, Profibus I/O Edit, Watchdog Timer Edit, and Time of Day edit.
- **Utilities Menu**-PLC Operations modes (PG/RUN etc.), Profibus Operations, Diagnostics on base, Task Codes per scan, Port Lockout, Password, Clear U Memory, and Clear Memory.

**Load-only install** will not allow the user to access the following:

- **File Menu operations**-New, Save, Save As, Import, Export, and Merge.
- **Edit Menu**-Undo, Cut, Copy, Paste, Clear, Delete, Insert, Append, and Select All.
- **View Menu**-Ladder Editor, Special Function Editor, PID Loops, Alarms, Documentation Window, Symbol Library, and Data Window are all view only.
- **Program Menu**-New Network, Select Instruction, and Validate and Enter.

- **Configuration Editing**-Memory configuration editing, set PLC Scan Time, 505 I/O Edit, Profibus I/O Edit, Watchdog Timer Edit, and Time of Day edit.
  - **Utilities Menu**-Diagnostics on bases, Task Codes per scan, Port Lockout, Clear U Memory, and Password.
5. After making your selection, click Next. Installation begins and a message appears telling you that the 505 SoftShop Installation Utility is loading.

## Installing the Siemens-Key

### What is the Siemens-Key?

The 505 SoftShop software is copy protected with a device called the Siemens-Key included in your shipment. To use 505 SoftShop online and save logic programs, connect the Siemens-Key to a parallel printer port (LPT1-LPT3) on your computer.

---

**NOTE** Installation of the Siemens-Key must be completed before you can run 505 SoftShop. If a Siemens-Key is not detected, you can enter 505 SoftShop Demo mode only.

---

The Siemens-Key will not interfere with normal port data transmissions, nor will it prevent you from creating backup copies of the software.

### Connecting the Siemens-Key

To install the Siemens-Key, follow the steps below:

1. Determine to which parallel port you want to connect the Siemens-Key.
2. Disconnect other security devices or cables attached to that port.
3. Connect the Siemens-Key to the port.
4. Attach other cables to the Siemens-Key, if necessary. If the device you attach to the Siemens-Key is a parallel printer, make sure the printer is turned on before starting 505 SoftShop.

---

**NOTE** The Siemens-Key must be the first device attached to the parallel port. Other devices or cables can then attach to the Siemens-Key.

---

### Troubleshooting the Siemens-Key

The following is a list of error messages associated with the Siemens-Key, possible causes, and ways to remedy the situation.

#### Message

“Siemens-Key was not found.” Check to see if the Siemens-Key is attached to your parallel port and retry. The demo mode may be entered without a Siemens-Key.

#### Possible Cause

1. SoftShop was started without the Siemens-Key attached to the parallel port.

2. A parallel port driver may be missing.
3. If you are running Windows NT, the NT driver may not be loaded.

### **Remedy:**

Check to see that:

- The Siemens-Key is connected to a parallel port.
- The Siemens-Key is the first device attached to the computer.
- That the parallel printer attached to one of the parallel printer ports is turned on.
- Add the port driver :
  1. Go to the DOS prompt of 505 SoftShop directory.
  2. Type RNBODRVS and press enter. This will create five subdirectories and extract three files (Readme.txt, Sentinel.ddp, and Setup.exe).
  3. Type SETUP and press enter. The setup program automatically installs the proper drivers for your particular operating system.  
If there are no errors, the program immediately returns to the command line prompt. If there are errors, a report prints each error.
  4. Restart the computer to activate the driver.

### **Message**

While running 505 SoftShop, the Siemens-Key was removed from the parallel port.

### **Remedy**

Check to see that:

- The Siemens-Key is connected to a parallel port.
- The Siemens-Key is the first device attached to the computer.

### **Message**

505 SoftShop for Simatic 505 is not supported by attached Siemens-Key. Demo mode may be entered.

### **Possible Cause**

The attached key is not authorized for use with Simatic 505.

### **Remedy**

- Check to see that the correct Siemens-Key has been attached to the parallel port.
- Call Siemens Technical Support.

### **Message**

Product version is not supported by Siemens-Key. Call Siemens to update Siemens-Key.

### **Possible Cause**

The key date does not support the current software version.

### **Remedy**

- Call Siemens Technical Support.

### **Message**

Siemens-KEY is corrupt. Demo mode may be entered.

### **Possible Cause**

You purchased a partial software package, and the partial package information cannot be read from the Siemens-Key.

### **Remedy**

- Call Siemens Technical Support.

## **Connect the Communications Cable**

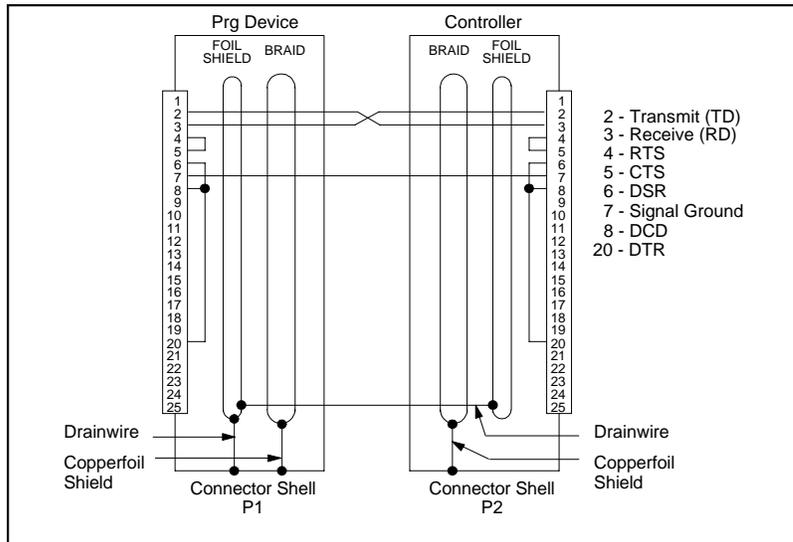
The PLC communications cable connects the serial COM port of the personal computer to the PLC. This enables you to transfer programs and data from the computer's memory (Offline) to the PLC, and vice versa. This cable has a 25-pin or 9-pin connector (computer end) and a 9-pin connector (PLC end).

If your computer has a 9-pin COM port, and you have a 25-pin cable, you can use a 9 to 25-pin converter to connect the communications cable to the processor. If your computer has a 25-pin COM port, this converter is not necessary.

The pin-outs for the communications cable are shown in the following figures.

### **Cable Pin-Outs for RS-232-C Ports**

Connect your programming device to the controller with a double-shielded null modem RS-232-C cable. Figures 2.1, 2.2, and 2.3 show pin-outs for the RS-232-C cables.



2.1 RS-232-C 25-Pin to 25-Pin Figure Cable

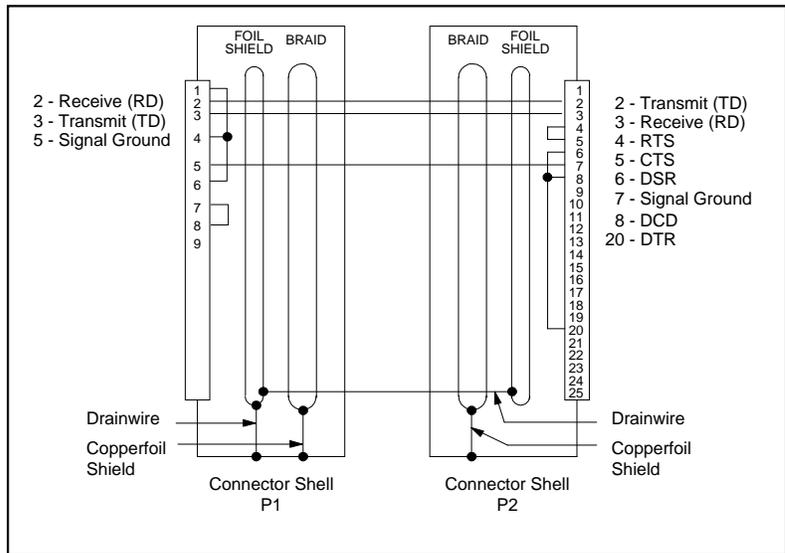


Figure 2.2 RS-232-C 9-Pin to 25-Pin Cable

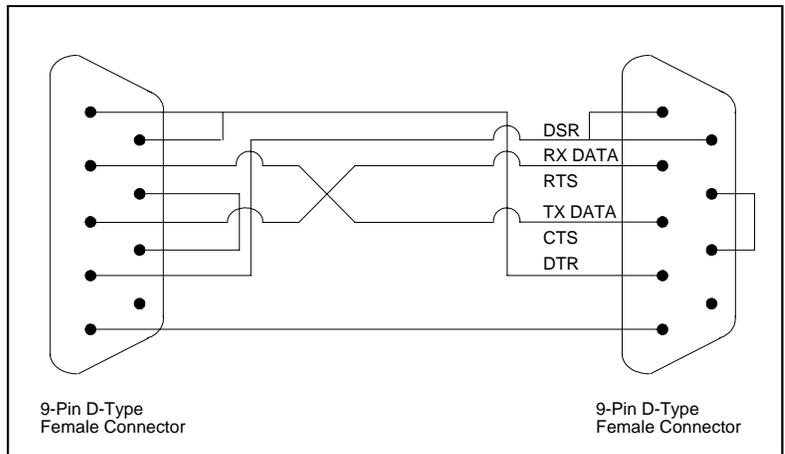


Figure 2.3 RS-232-C 9-Pin to 9-Pin Cable

## Cable Pin-Outs for RS-422 Ports

If your controller has an RS-422 port, you can connect through the RS-422 port on your programming device. Use the pin-out values shown in Figure 2.4 for the RS-422 cable.

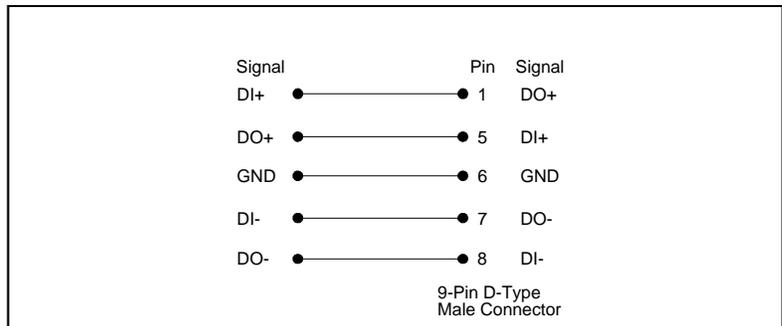


Figure 2.4 RS-422 Pin Values

## Ethernet Connection

For Ethernet connection, you need a compatible Ethernet card in your computer; a Siemens PPX:505-cp2572 TCP/IP Ethernet card installed in your 505 system; and the appropriate cabling.

For more information on setting up your Ethernet connection, refer to the *Simatic Ethernet TCP/IP Communication Processor (505-CP2572) User Manual* order number PPX:505-8132-1.

# 3 - 505 SoftShop Basics

## Welcome to 505 SoftShop

### Software Features

If you are new to the Windows environment, we suggest reading the preceding chapter before continuing with this chapter.

This chapter will get you started using 505 SoftShop. Although you should progress at a rate comfortable for you, we recommend following the manual outline in your approach to programming. Advancing through the chapters in this order will help ensure a more efficient use of the software. The remaining chapters, in order, include:

- 505 SoftShop Basics
- 505 SoftShop Setup
- PLC Configuration
- Programming
- Documentation

Approaching the software in this order will also help you discover 505 SoftShop's powerful features that include:

- Multiple windows view and edit
- Flexible program setup
- Access to ladder logic through cross-reference
- Write, read, and force addresses from the Data Window
- Multiple documentation options
- Keyboard support for every function and command

### Starting 505 SoftShop

After installing 505 SoftShop, start 505 SoftShop by doing one of the following actions:

- Double-click the 505 SoftShop icon with the left mouse button or
- Press Ctrl+F6 until the 505 SoftShop group box is active. If necessary, press the Tab key to highlight the 505 SoftShop icon and press Enter.

While 505 SoftShop loads, the 505 SoftShop copyright screen appears. When 505 SoftShop does not detect a Siemens-Key, an error message appears.

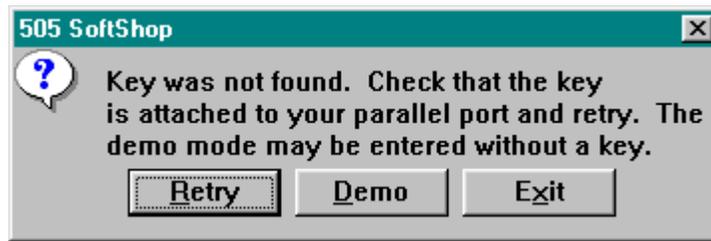


Figure 3.0

If you see this message, check to see that the Siemens-Key is:

- Connected to a parallel printer port or
- Connected to a parallel port before printers or other devices
- See *Installing the Siemens-Key* section in Chapter 2 - Installation for more information

After you have checked the key's installation, load 505 SoftShop from the icon. If 505 SoftShop continues to not detect the Siemens-Key, please call Siemens Customer Support at 1-800-964-4114 immediately.

When 505 SoftShop has loaded completely, the 505 SoftShop window appears as described and defined in the next chapter.

## The Landscape: 505 SoftShop Window

The 505 SoftShop window is the starting point for all your work. The key features of the window are designated with arrows on the sample illustrated below. Definitions of each feature are next, followed by more detailed information.

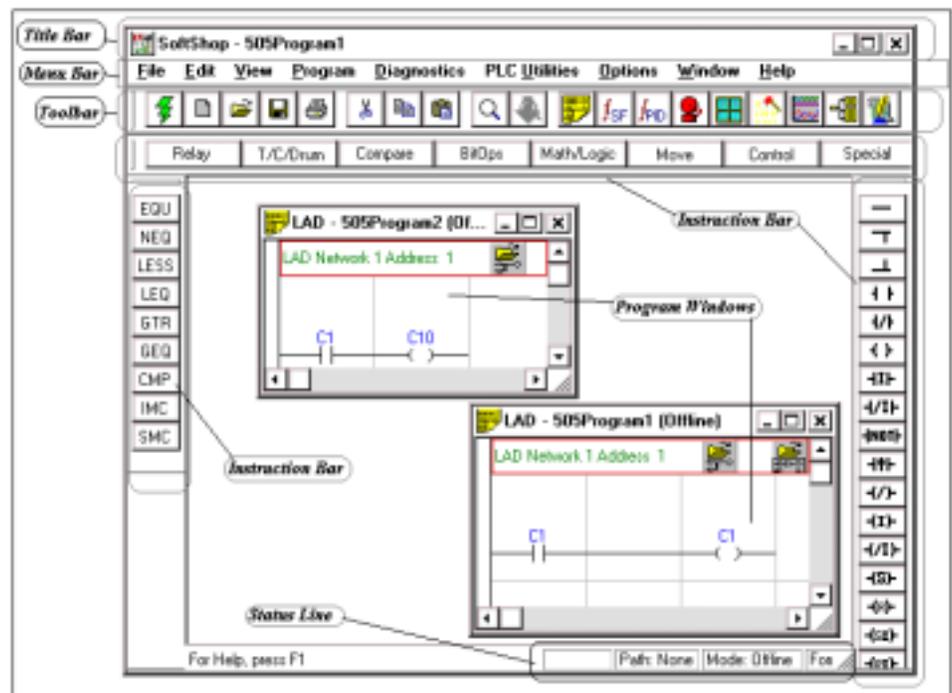


Figure 3.1

## Window Description

The key features of the 505 SoftShop window shown in Figure 3.1 are defined below. More detailed descriptions follow.

Window Feature	Function
Instruction Bars	Use to add instructions, new rows, and new networks/addresses to a logic program. See <i>Instruction Bars</i> .
Menu Bar	Use to select 505 SoftShop functions. See <i>Menu Bar</i> .
Multiple Program Windows	Displays view and edit windows of multiple logic programs at the same time, limited only by the size of your computer's memory. See <i>Program Windows</i> .
Status Line	Displays information about the operation in progress. See <i>Status Line</i> .
Title Bar	Displays the name of the application. Buttons in the upper right corners change the window's size and position. See <i>Title Bar</i> .
Toolbar	Use to quickly access frequently used menu options. See <i>Toolbar</i> .

## Instruction Bars

The instruction bars appear along the sides and the top of the 505 SoftShop window when you are programming ladder logic (Figure 3.1).

Instructions are divided into groups. To display the instructions for a group, click the group button. For example, to display the math instructions click the Math/Logic button. The instructions for that button appear and you can move the window anywhere on the screen. The Math group button remains selected until another group button is pressed.

## Inserting an Instruction Bar Item in a Program

1. Click the desired instruction group button on the upper half of the Instruction Bar.  
**Result:** Instructions for that group appear on the lower half of the bar.
2. Click the button showing the item you want to insert in the program.  
**Result:** The item attaches to the pointer when you move to the ladder editing area.
3. Move the pointer to the item insertion point on the ladder editing area and click the left mouse button.  
**Result:** The instruction is dropped into place.
4. Repeat Step 3 each time you want to add the same item.
5. Click on the arrow button in the middle of the Instruction Bar to return the pointer to an arrow.

## Menu Bar

The menu bar, located just below the title bar, identifies the names of the available 505 SoftShop functions. To display the menu options for each function, click on the function name. The menu options displayed may change depending upon the operation in progress.

Select File, New Program or Open Program and the following Menu Bar appears (Figure 3.2).



Figure 3.2

The Restore button appears on the Menu Bar when a program window is maximized. Use the Restore button to control the size of the program window.

## Multiple Program Windows

505 SoftShop displays more than one logic program window at a time. You can open as many logic program windows as your computer's memory permits.

For example, you may wish to copy part of a logic program to another program. This saves you programming time by not having to retype similar logic statements for each program. To copy a part of one logic program to another, use the following procedure:

1. Open both programs offline.
2. Arrange the logic program windows by selecting Tile or Cascade from the Window menu.
3. Highlight the data you want to copy to the other program by clicking the mouse and dragging across the data.
4. Click Copy from the toolbar or from the Edit menu.
5. Move the pointer to the place you want to insert the data in the other program. Click Paste from the toolbar or from the Edit menu.

## Status Line

The Status Line spans the bottom of the 505 SoftShop window. It displays information or describes the current operation on the left side. To display status line information for a menu item or button, click on the item or button and hold the left mouse button.

The right side of the Status Line displays the information listed below.

Status line	Function
PLC Path	The first shadowed box on the status line displays the route defined for the active program. If the PLC route is a direct serial connection to a PLC, then Direct is displayed. The online PLC route is taken directly from the controller from where you are connected. The offline PLC route informs you as to the parameter saved in the PLC setup window for this particular program.
Logic Mode	Indicates whether you are programming online or offline.
Num Lock	Indicates if Num Lock is active for the keyboard. When using the keypad, which is usually on the right side of the keyboard, numbers are active. Num Lock is not active when indicator area is blank.
Character Type	Indicates if Caps Lock is active for the keyboard. When typing, capital letters appear if Caps is indicated. Caps Lock is not active when indicator area is blank.

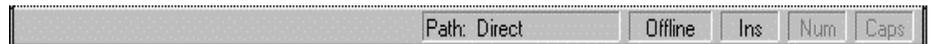


Figure 3.3

## Title Bar

The Title Bar spans the top of the 505 SoftShop window (Figure 3.4).

Use the Title Bar to:

- Identify the application you are using. In Figure 3.1, the application is SoftShop.
- Move the window. Click the title bar with the mouse pointer, hold down the left mouse button and drag to the desired location to move the window.
- Change the size or position of the window. The following buttons appear in the corner of the title bar:



Figure 3.4

Button Title	Location	Function
Minimize	Left box	Click the dash button to reduce window to an icon.
Maximize	Middle box	Click the window button to enlarge the entire screen.
Close	Right box	Click the <b>X</b> button to exit SoftShop.

## Toolbar

The Toolbar displays a row of buttons. Each button represents a frequently used option. Select the option by clicking on its button, saving you the steps of selecting several options from a series of menus. Notice that when you click on the button, its purpose appears on the Status Line at the bottom of the window (Figure 3.5).



Figure 3.5

Click	To
	Fast PLC Connection.
	Create a new program. See <i>Creating New Logic Programs</i> .
	Open an existing program. See <i>Opening Logic Programs</i> .
	Save the active program. See <i>Saving Logic Programs</i> .
	Print. See <i>Printing Logic Programs</i> .
	Cut the highlighted section to the clipboard. See <i>Editing Logic Programs</i> .
	Copy the highlighted section to the clipboard. See <i>Editing Logic Programs</i> .
	Paste a section from the clipboard. See <i>Editing Logic Programs</i> .
	Find a network, address, or tag.
	Find the next occurrence of the found address or tag.
	Display Ladder Editor.
	Display Special Functions Editor.
	Display PID Loop Directory.
	Display Analog Alarm Directory.
	Display the Data Window.
	Display FTLogger (log data.)
	Display FTTrender
	Display the Cross Reference.
	Display the Documentation Window.
	Add a new network to a program.
	Add a new row to a program.
	Enter and validate the active program.

# Working With Logic Programs

505 SoftShop provides you with a number of different ways of editing programs. These include:

- Connecting to a PLC to view logic stored in the PLC
- Creating a new program offline
- Loading a file online
- Loading a file offline
- Attaching documentation to an online program

Before you can perform any editing, you must first open a logic program.

## Creating a New Logic Program

With 505 SoftShop, it's easy to create a new program.

---

**NOTE** Remember, you can create new programs in offline mode only. To connect to a processor online, use Open Program or Fast PLC Connection.

---

To create a new logic program and begin programming, do the following:

1. Click  on the Toolbar or select New Program from the File menu; or
2. Press Ctrl+N on the keyboard.
3. Select the PLC Type.
4. Press OK.

## Fast PLC Connection - Connecting to a PLC

With 505 SoftShop, you can connect to a PLC with a click of the mouse. You can then view and edit existing logic in the PLC.

Prior to connecting the first time, you need to set up the PLC connection. Refer to Chapter 4, *Fast PLC Setup*, for more details.

---

**NOTE** Remember, you cannot load a file with Fast PLC Connection. To load a file Online, use Open Program.

---

To connect to a PLC online click  on the Toolbar or select Fast PLC Connection from the File menu. You are set to begin programming.

---

**NOTE** If your controller is a 575, refer to *Connecting Online to a 575* in this chapter for information on selecting Application ID and configuring ports.

---

## Open an Existing Logic Program Offline or Online

You can open an existing logic file to edit or update program information in either online or offline mode. Logic programs may contain one or more of the following: logic and data, tags, headers, and descriptions and comments. Several programs may be open at one time without losing memory contents.



### Warning

Editing or modifying a program online may produce unexpected or hazardous results.

To open an existing program:



1. Click  on the Toolbar or select Open Program from the File menu (Ctrl+O).

Result: The Open Program dialog box appears (Figure 3.6).

---

**NOTE** The last four files that were opened are saved and listed at the bottom of the File menu. When you select one of these files, the Open Program dialog box automatically opens with the file you selected.

---

Figure 3.6

2. Click Browse.  
Result: The Open dialog box appears.
3. Type the program name in the Program Name line. Change drives and/or directories, if necessary, to find the program you wish to open. You can open \*.FSS (505 SoftShop 32 bit files), \*.FTK (505 SoftShop 16 bit files) or \*.VP5 (TISOFT V5.0 files).

---

**NOTE** For TISOFT V5.0 files (\*.vp5) loads, a new offline program is created with the logic and documentation always imported. Synonyms for JMP, GTS, and SBY are not imported. However, their associated comments are imported as Headers.

---

4. Click on the program name in the File Name scroll box and click OK.  
Result: The name of the program appears in the Program Name line of the Open Program dialog box.

The selected program's file name is put into the Address Documentation Path. If a different documentation program is desired, it must be linked via Share Address Documentation. When a file is configured you can specify a database file that holds and sorts all documentation. Multiple users can simultaneously modify documentation for the same file thus regular updates can be scheduled to get the latest documentation within the database. Documentation can be imported from \*.FSS (505 SoftShop 32 bit files), comma or tab separated. Conversely you can export from the database file into a text file or a \*.VP5 file (TISOFT V5.0 files with Headers and Tags).

5. To set up shared documentation, click the Advanced button on the Open Program dialog box.  
**Result:** The Share Address Documentation dialog box appears.
6. Enter the share address documentation program name in the Shared File and Path line or select Browse to locate an existing file.
7. Click Next and enter the refresh rate (time lag between updates from other users of the database). Valid times are from 1 to 1440 minutes.
8. Click Next and Finish.
9. In the Program Type area, select Offline or Connect to PLC. If you select Connect to PLC, you can use the previously saved communication port or select a new communication port by clicking the Setup button. If you select Connect to PLC, you can check other options such as:
  - Transfer Logic to PLC. Transfers all blocks and data areas to the PLC, and loads documentation.

---

**NOTE** To avoid overwriting the online ladder with the version stored on file and associating documentation with the online ladder; do not select Transfer Logic to PLC.

---

- Read All NOPs. Reads 30 consecutive NOP instructions and assumes the end of program logic. This can substantially increase the time to connect online to a 520, 525, 530, 535, 560, or 565 controller when selected.

---

**NOTE** If you select Read All NOPS and have more than 30 NOP instructions separating user logic, all logic past the 30 NOPS will not be read.

---

10. Click OK or press Enter to open your program.

---

**NOTE** If your controller is a 575, refer to *Connecting Online to a 575* in this chapter for information on selecting Application ID and configuring ports.

---

## Address/Network Mode

11. If there is no file transferred online when the program first opens then the ladder rungs are referenced in the old TISOFT Address Mode. When the complete program has been load the program can be converted over to network mode. To accomplished this select Switch to Network Display from the Options Menu. The rungs are now displayed in Network and Address Mode. Once rungs have been converted Network/Address mode they cannot be converted back to Address Mode only.

## Loading Parts of an Existing Logic Program Online

505 SoftShop allows you to load parts of an existing logic file to an online 505 controller. One or more of the following parts can be loaded:

- Ladder
- Special Function Programs
- Special Function Subroutines

- PID Loops
- Analog Alarms
- Force States
- Documentation (Tags, Descriptions, Comments and Headers)
- I/O Configuration
- Profibus
- V-Variables
- K-Constants
- Word I/O
- U-Memory



## Warning

**Editing or modifying a program online may produce unexpected or hazardous results.**

To Load parts of an existing program you must first established an online connection with the PLC (*see Fast PLC Connection - Connecting to a PLC*). Then:

11. Select Load **B**y Parts from the **F**ile menu (Ctrl+B).  
Result: The Load **B**y Parts dialog box appears (Figure 3.6a).

Figure 3.6a

12. In the Load Program by Parts dialog box select the parts of the program you wish to load or select Load Complete Program to load all parts.
13. To enter a different file name Click Browse.  
Result: The Open dialog box appears.
14. Type the program name in the Program Name line. Change drives and/or directories, if necessary, to find the program you wish to open. You can only open \*.FSS (505 SoftShop 32 bit files) programs.
15. Click on the program name in the File Name scroll box and click OK.  
Result: The name of the program appears in the Program Name line of the Open Program dialog box.

The selected program's file name is put into the Address Documentation Path. If a different documentation program is desired, it must be linked via Share Address Documentation. When a file is configured you can specify a database file that holds and sorts all documentation. Multiple users can simultaneously modify documentation for the same file thus regular updates can be scheduled to get the latest documentation within the database. Documentation can be imported from \*.FSS (505 SoftShop 32 bit files), comma or tab separated. Conversely you can export from the database file into a text file or a \*.VP5 file (TISOFT V5.0 files with Headers and Tags).

16. To set up shared documentation, click the Advanced button on the Open Program dialog box.  
Result: The Share Address Documentation dialog box appears.

17. Enter the share address documentation program name in the Shared File and Path line or select Browse to locate an existing file.
18. Click Next and enter the refresh rate (time lag between updates from other users of the database). Valid times are from 1 to 1440 minutes.
19. Click Next and Finish.
20. Click OK or press Enter to load.

---

**NOTE** If your controller is a 575, refer to *Connecting Online to a 575* in this chapter for information on selecting Application ID and configuring ports.

---

## Transfer Offline Program to Online

505 SoftShop allows you to transfer an existing offline logic file to an online 505 controller.



To transfer an existing offline program to online:

1. Select Transfer → Online from the File menu (Ctrl+B).  
Result: The Open Program dialog box appears (Figure 3.6).
2. Select OK to Transfer.

## Connecting Online to a 575

When connecting to a 575 controller either from Fast PLC Connect or the Open Program window, configure the Application ID and Port Settings before the online connection is made (Figure 3.7).

Figure 3.7

To connect to a 575 online:

1. Type the letter (A to Z) of the application you want to connect to in the Connect ID field.
2. Click on the Set Current Port ID and the Connect button to go online, or double-click on the highlighted Application ID in the list box to go online.

If a file is being loaded from disk to the controller and the disk file Application ID is different than the connecting PLC's ID; a warning appears describing that the loading file ID is different. Select OK to continue the load or Cancel to abort.

## Reading or Writing 575 Port Configuration

To read or write the 575 port configuration, click on the Port Settings button in the Application ID Table dialog box. The Port Settings Dialog box appears (Figure 3.8).

Figure 3.8

To make changes to the port settings:

1. Click on the item to be changed and either type in the change or click on the spin, radio button, or combo box.
2. Click on Accept to send changes to the controller, or Cancel to make no changes and return to the Applications ID Table dialog box.

---

**NOTE** If the port you are changing is the port 505 SoftShop is connected to, but the settings are not what 505 SoftShop uses, when you press Accept the following prompt appears to confirm your action:

**505 SOFTSHOP IS ATTACHED TO THE PROCESSOR THROUGH THIS PORT. THERE MAY BE A SHORT DELAY AS THE PORT IS RECONNECTED. DO YOU WANT TO CHANGE THESE PORT SETTINGS?**

Select YES to change the port configuration and 505 SoftShop may or may not continue to communicate with the controller.

Select NO to abort the operation.

---

## ***Importing Documentation***

Use the following procedure to import documentation.

1. Type the program name in the File name field, or click Browse to search from valid program names (Figure 3.9).
2. Click OK to import the program.

Figure 3.9

Use the Tag/Description Text File to merge Tags or Descriptions from the ASCII text files exported by SoftShop for Windows into the currently opened program. The default file extension is \*.TXT but alternate extensions are allowed. You must also select comma or tab delimited records with the following format:

- Characters 1 - 6 (could be greater with Loops or Alarms) contain the 6 digit Siemens address.
- Character 7 is the comma or tab character.
- Character 8 and beyond is the variable length tag followed by the comma or tab character, followed by the variable length description followed by a carriage return.

## ***Exporting Documentation***

Use the following procedure to export documentation.

1. Select Export from the file menu.
2. Select a file format to export the documentation to (Figure 3.9a).
3. Type the program name in the File name field, or click Browse to search from valid program names.
4. Select the parts of documentation to export (Tags, Descriptions or Headers). Then determine which delimiter format to use. The delimiter is used to separate the types of documentation (Tags, Descriptions or Headers). These selections are not used for TISOFT.
5. Click OK to export the program.

Figure 3.9

Use the Tag/Description Text File to merge Tags or Descriptions from the ASCII text files exported by SoftShop for Windows into the currently opened program. The default file extension is \*.TXT but alternate extensions are allowed. You must also select comma or tab delimited records with the following format:

- Characters 1 - 6 (could be greater with Loops or Alarms) contain the 6 digit Siemens address.
- Character 7 is the comma or tab character.
- Character 8 and beyond is the variable length tag followed by the comma or tab character, followed by the variable length description followed by a carriage return.

# Saving Logic Programs

## Saving Offline

Use the Save Program command to save the active program contents with its existing name. To save the active logic program:

1. Click  on the Toolbar or select Save Program from the File menu (Ctrl+S), and a previously saved logic program is saved.
2. If the program has not been previously saved, the Save As dialog box appears (Figure 3.10). Select the desired location to save the program, and type in a name for the program in the File name field.

Figure 3.10

3. Click Save or press Enter to save the program.
4. If you select a file name that already exists in that directory, a message appears with options. Select from the following options:
  - YES saves the updated program with the current name, overwriting the previous version.
  - NO cancels the save procedure.

---

**NOTE** You must validate logic before saving. If you have not done so, a message appears stating changes to logic have not been validated or entered. Changes cannot be saved until logic has been validated and

entered. Click Validate Logic on the toolbar,  or select Validate and Enter Logic from the Program menu. Complete necessary changes to logic and try to save the program again.

---

## Save/Save As Online

Use the online Save program command to save all the active program contents with its existing name or parts of an existing logic program. One or more of the following parts can be saved:

- Ladder
- Special Function Programs
- Special Function Subroutines
- PID Loops
- Analog Alarms
- Force States
- Documentation (Tags, Descriptions, Comments and Headers)
- I/O Configuration
- Profibus
- V-Variables
- K-Constants
- Word I/O
- U-Memory

To save the active logic program:

1. Click  on the Toolbar or select Save Program from the File menu (Ctrl+S).  
**Result:** The Save dialog box appears (Figure 3.11).

Figure 3.11

2. In the Save select the parts of the program you wish to load or select Load Complete Program to load all parts.
3. If the program has not been previously saved or you wish to change the file name, select the Browse button, and type in a name for the program in the File name field.
4. Click Save or press Enter to save the program.
5. If you select a file name that already exists in that directory, a message appears with options. Select from the following options:
  - YES saves the updated program with the current name, overwriting the previous version.
  - NO cancels the save procedure.

---

**NOTE** You must validate logic before saving. If you have not done so, a message appears stating changes to logic have not been validated or entered. Changes cannot be saved until logic has been validated and entered. Click Validate Logic on the toolbar,  or select Validate and Enter Logic from the Program menu. Complete necessary changes to logic and try to save the program again.

---

If you are working online and saving your changes, a warning message appears stating that logic in the active PLC program has been modified, and asks if you wish to save the logic in addition to tags and documentation.

Click Yes to save logic, tags, and documentation. Click No to save documentation and tags only. Cancel aborts the save procedure.

If you are saving documentation to an online logic program and the last network header exceeds the number of networks/addresses, an error message appears.

Click Yes to discard the extra network/address headers, or No to cancel the save procedure.

Similarly, if you attempt to save a logic program and the number of networks/addresses exceeds the saved headers, an error message appears.

Click Yes to continue saving the program. Click No to cancel the save procedure.

## **Warning**

**Editing or modifying a program online may produce unexpected or hazardous results**

## Save Program As Offline

Use Save Program As to save the active logic program with a different program name. This is useful when maintaining the original without changes. For example, open file ABC.FTK, make changes, select Save Program As, and save the program as DEF.FTK. Now you have two files, ABC.FTK retained its same condition before you opened it, and DEF.FTK that contains changes made to ABC.FTK.

---

**NOTE** You must validate logic before saving. If you have not done so, a message appears stating changes to logic have not been validated or entered. Changes cannot be saved until logic has been validated and entered.

Click Validate Logic on the toolbar,  or select Validate and Enter Logic from the Program menu. Complete necessary changes to logic and try to save the program again.

---

To save a logic program with a new file name:

1. Select Save As from the File menu.  
**Result:** The Save As dialog box appears (Figure 3.10).
2. In the Save As dialog box, click options in the necessary group boxes to designate a location to save the logic program.
3. Click OK or press Enter.  
**Result:** Your file is saved with its new name.
4. If you select a file name that already exists in that directory, a message appears with options. Select from the following options:
  - YES saves the updated program with the current name, overwriting the previous version.
  - NO cancels the save procedure.

---

**NOTE** If you are saving documentation to an online program, please see *Saving Online* under Saving Logic Programs on the preceding pages.

---

# Printing Logic Programs

505 SoftShop provides you with a number of print features that allow customization of your printouts. These include:

- Tags and Documentation
- Cross Reference
- Network/Address Range
- Margins
- Starting Page Number

Before you can print, open a logic program. Make certain that you have loaded the correct print drivers for your printer through the Windows Control Panel. If you have questions regarding loading print drivers, consult your printer's user's manual and the *Windows User's Guide*.

To print logic programs and/or documentation:

1. Click  on the toolbar or select Print from the File menu (Ctrl+P).  
Result: The Print dialog box appears (Figure 3.12).

Figure 3.12

2. Click on the check boxes that correspond to the items you want to print. For each item selected, you can choose sort options and the information you want to include for reports. The Selected Items window displays the print range of each print item to be printed.

## Print Logic and SFs

Click the Logic and SFs button to print the following:

- All logic, ladder, SFS and SFP
- Selected logic ladder, SFS or SFP
- Selected ladder in address or network mode
- Selected Special Function lines
- Inline Xref
- Ladder with Addresses, Tags, Descriptions, or Headers
- Multiple or single networks/addresses per page

The Print Logic and SFs dialog box determines which items are printed. (Figure 3.13).

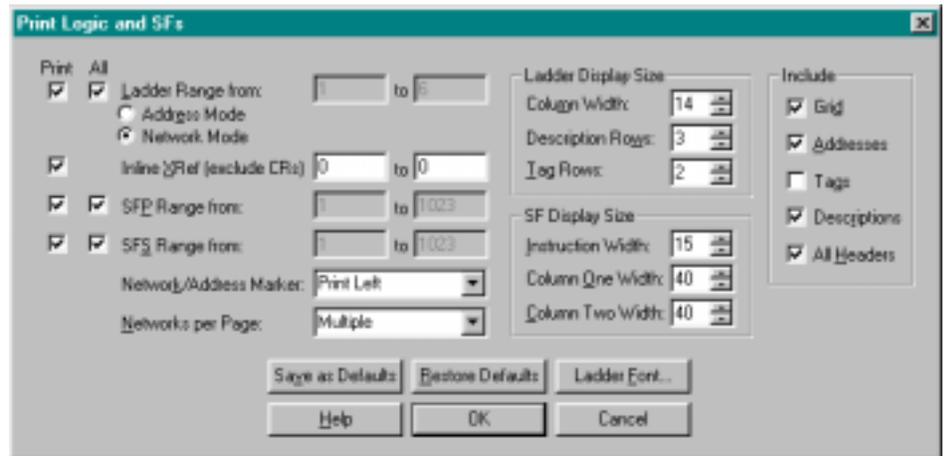


Figure 3.13

Click the All check box to print the entire range of the item selected. To print a selection, deselect the All check box and enter a range in the associated edit box.

If you selected ladder to print, the ladder reference numbering can be either PLC memory address mode or network address mode. The selected radio button below ladder range determines which mode is printed. The Network address or PLC Memory Address is printed on the top left or right of ladder and can be disabled to not print at all. The selection is made in the Network/Address Marker field.

When selecting Networks/Addresses per Page as Single or Multiple, use the following information. When printing Single Networks/addresses per Page, each network begins on a new page. When printing Multiple Networks/Addresses per Page, as many networks/addresses that can fit on a single page will be printed. However, if the network is not the first network on the page and the network is broken across more than one page but can fit on a page and if it would start a new page, then the network begins on a new page. The intent is to keep the entire network on one page whenever possible.

The Ladder Display Size determines the Column width, Description rows, and Tag row size. Column Width adjusts the size of the ladder grid. Click the up or down arrow or enter a value between 7 and 24.

Description Rows determines the number of character rows displayed for each description. Click the up or down arrow or type in a value between 1 and 12. Tag Rows determines the number of character rows displayed for each tag. Click the up or down arrow or type in a value between 1 and 4.

The SF Display Size determines the Instruction width, Column One width and Column Two width. Instruction Width determines the width allocated for display of Special Function instructions on each line. Click the up or down arrow or type in a value between 1 and 80. Column one determines the width allocated for display of SF first column variables after the instruction. Click the up or down arrow or type in a value between 1 and 300. Column Two determines the width allocated for display of SF second column variables after the instruction. Click the up or down arrow or type in a value between 1 and 300.

The ladder grid, addresses, tags, descriptions and headers can all individually be turned on or off to be included with ladder printout. To include with the ladder print out, select the appropriate check box under Include.

Ladder Font changes the font displayed in the active program. Any active Window's font can be selected. To change the font:

1. Click on the Ladder Font button.  
Result: The Font dialog box is displayed.
2. Choose a font, font style, and font size. Notice that you can see a sample of the font in the Sample box.
3. Click OK to save your changes or Cancel to cancel your changes.  
Result: The Print Logic and SFs dialog box appears.

## Print Loops

Click the Loops check box from the Print dialog box to print the following:

- All PID Loops
- PID Loops and Headers

To change the PID Loops properties click the Loops button on the Print dialog box. The Print Loops dialog box appears (Figure 3.14).

Figure 3.14

Click the All Loops check box to print the entire range loops. To print a selection, deselect the All check box and enter a range in the associated edit box. To include loop headers with the printout, click the Headers check box.

1. Click the Doc Font button to change the Header font in the active program.  
Result: The Font dialog box appears.
2. Choose a new font, font style, or font size. Notice that you can see a sample of the font in the Sample box.
3. Click OK to save your changes or Cancel to cancel changes.  
Result: The Print Loops dialog box appears.

## Print Alarms

Click the Alarms check box from the Print dialog box to print the following:

- All Alarms
- Alarms and Headers

To change the Alarms properties, click the Alarms button on the Print dialog box. The Print Alarms dialog box appears (Figure 3.15).

Figure 3.15

Click the All Alarms check box to print the entire range of alarms. To print a selection, deselect the All check box and enter a range in the associated edit box. To include loop headers with the printout, click the Headers check box.

1. Click the Doc Font button to change the Header font in the active program.  
Result: The Font dialog box appears.
2. Choose a font size. Notice that you can see a sample of the font in the Sample box.
3. Click OK to save your changes or Cancel to cancel changes.  
Result: The All Alarms dialog box appears.

## Print PLC Configuration

Click the PLC Configuration check box from the Print dialog to print the following:

- 505 Channel Base
- Profibus DP – Slave I/O
- PLC Memory Configuration
- I/O Tags and Descriptions

To change the PLC Configuration properties click the PLC Configuration button on the Print dialog box. The Print PLC Configuration dialog box appears (Figure 3.16).

Figure 3.16

Click the All check box to print the entire range of items. To print a selection, deselect the All check box and enter a range in the associated edit box. To include loop headers with the printout, click the Headers check box.

When entering a range for channel and base numbers, the first entry before the comma is the channel number. The second entry after the channel number and comma is the base number. For Example: In Figure 3.16 the printout would start at channel 1 Base 0 and end at channel 1 Base 15.

The tags and descriptions can be individually turned on or off. To include with the PLC Configuration printout, select the appropriate check box under Include.

1. Click the Doc Font button to change the Tag and Description printout font in the active program.  
Result: The Font dialog box appears.
2. Choose a new font, font style, or font size. Notice that you can see a sample of the font in the Sample box.
3. Click OK to save your changes.  
Result: The Print Loops dialog box appears.
4. Click Cancel to make no font changes.  
Result: The Print PLC Configuration dialog box appears.

## Print Registers

Click the Register check box from the Print dialog box to print the following:

- V-Memory
- K-Memory
- Register Tags and Descriptions

To change the Register properties click the Register button on the Print dialog box. The Print Register dialog box appears (Figure 3.17).

Figure 3.17

Click the All check box to print the entire range of items. To print a selection, deselect the All check box and enter a range in the associated edit box.

The tags and descriptions can be individually turned on or. To include with the Register print out select the appropriate check box under Include.

1. Click on the Doc Font button to change the Tag and Description printout font of the active program.  
Result: The Font dialog box appears.
2. Choose a new font, font style, or font size. Notice that you can see a sample of the font in the Sample box.
3. Click OK in the Font dialog box to save your changes.  
Result: The Print Loops dialog box appears.
4. Click Cancel to make no font changes.  
Result: The Print Register dialog box appears.

## Print Documentation

Click the Documentation check box from the Print dialog box to print the following:

- I/O Elements (X, Y, WX and WY)
- Control Relays (C)
- SKP, LBL, GTS, SBR, JMP, MCR and END
- Register Tags, Descriptions and Comments

To change the Documentation properties click the Documentation button on the Print dialog box. The Print Documentation dialog box appears (Figure 3.18).

Figure 3.18

Click the All check box to print the entire range of items. To print a selection, deselect the All check box and enter a range in the associated edit box.

The Register Tags, Descriptions and Comments can be individually turned on and off. To include with the Documentation print out select the appropriate check box under Include.

The sort order for documentation print can be based on address, Tag, or Description. To change the Documentation print sort orders select the appropriate check box under Sort Order.

1. Click on the Doc Font button to change the Tag, Description, and Comments printout font of the active program.  
Result: The Font dialog box appears.
2. Choose a new font, font style, or font size. Notice that you can see a sample of the font in the Sample box.
3. Click OK in the Font dialog box to save your changes or Cancel to cancel your changes.  
Result: The Print Documentation dialog box appears.

## Print Cross Reference

Click the Cross-reference check box from the Print dialog box to print the following.

- All logic, ladder, SFS and SFP
- Selected logic ladder, SFS or SFP
- Selected ladder in address or network mode
- Selected Special Function lines
- Alarms
- Loops
- I/O Elements (X, Y, WX and WY)
- Control Relays (C)
- V-Memory
- K-Memory
- I/O Elements (X, Y, WX and WY)
- Control Relays (C)
- Tags Descriptions and Comments

To change the Cross-reference properties click the Cross-reference button on the Print dialog box. The Print Cross-reference dialog box appears (Figure 3.19).

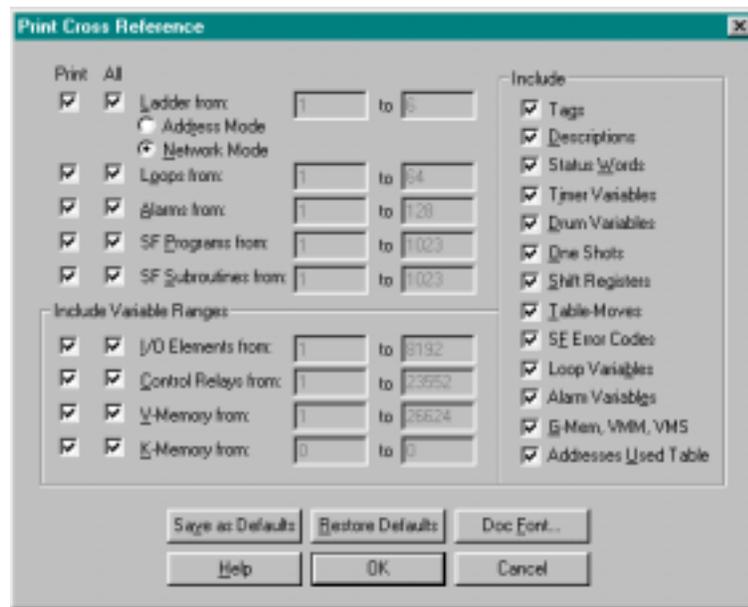


Figure 3.19

Click the All check box to print the entire range of items. To print a selection, deselect the All check box and enter a range in the associated edit box.

The following can be individually turned on and off to be included with Cross reference printout:

- Tags
- Descriptions Status Words
- Timer Variable
- Drum Variables
- One Shots Shift Registers
- Tables-Moves
- SF Error Codes
- Loop Variables
- Alarm Variables
- G-Mem/VMM/VMS

To include Addresses Used Table with the Cross-reference print out select the appropriate check box under Include.

1. Click on the Doc Font button to change the Tag, Description, and Comments printout font of the active program.  
Result: The Font dialog box appears.
2. Choose a new font, font style, or font size. Notice that you can see a sample of the font in the Sample box.
3. Click OK in the Font dialog box to save your changes or click Cancel to cancel changes.  
Result: The Print Cross-reference dialog box appears.

---

**NOTE** The print selection options are stored when saving a program.

---

## Print to a Text File

1. To print to a text file select Output To Text File from the File menu. The **Result:** The Print Output to Text File dialog box appears (Figure 3.19b). See *Printing Logic Programs* for dialog box selections.
2. Once selections are made select OK.
3. Enter a file name to save to and select OK

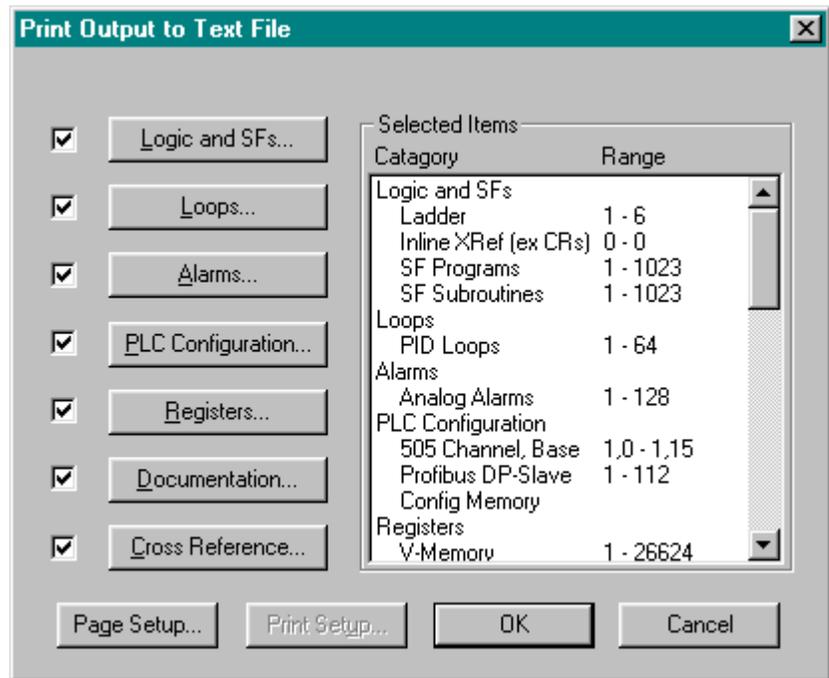


Figure 3.19b

## Editing Features

505 SoftShop uses a number of timesaving editing features to help you complete your programming tasks. These include:

- Cut
- Copy
- Paste
- Paste With Rewire
- Undo
- Clear
- Delete
- Insert

The most frequently used editing features are Cut, Copy, and Paste. Use these commands to quickly copy logic and documentation to either another location in the same program or another program. The list below describes Cut, Copy, and Paste differences.

Window Feature	Function
Cut	Removes the selection from the program and places it on the clipboard.
Copy	Copies the selection and places it on the clipboard.
Paste	Inserts clipboard contents into the program at the cursor location.
Paste With Rewire	Inserts clipboard contents into the program at the cursor location and allows the user to re-address any addressable items contained in the clipboard.
Undo	Resets the networks/addresses in a segment to their original data.

The clipboard referred to is the standard Windows clipboard. Refer to your *Windows User's Guide* for more information.

To select the information you want to cut or copy, click, hold and drag the pointer over the desired area. Selected items are highlighted with a different color than your normal workspace color.

If you want to select all logic in the current window, select Select All from the Edit menu.

Each of three editing commands, described in detail in the following paragraphs, can be accessed several ways.

## Cut

To use the cut feature:

1. Select the information you want to cut by highlighting the range instructions or networks/addresses of (SF) lines to be cut.
2. Click and hold down the left mouse button on the item, or network or (SF) lines to be cut, then drag the mouse to the end of the item range or network or (SF) lines to cut.
3. Cut your selection to the clipboard with one of the following:
  - Click  on the toolbar or
  - Select Cut from the Edit menu

---

**NOTE** If the start and ending networks/addresses or (SF) lines are known, then the cut from and cut to range can be entered directly into the Cut Range dialog box. If a partial network is selected, the Cut Range dialog box is not displayed. The items selected are cut without warning.

---

Figure 3.20

4. Select OK.  
Result: The range of networks/addresses or (SF) lines displayed are cut out of the program and placed into the clipboard.

## Copy

To use the copy feature:

1. Select the information you want to copy by highlighting the range instructions or networks/addresses or (SF) lines to be copied.

2. Click and hold down the left mouse button on the item, or network or (SF) lines to be copied, then drag the mouse to the end of the item range or network or (SF) lines to copy.
3. Copy your selection to the clipboard with one of the following:
  - Click  on the toolbar or
  - Select Copy from the Edit menu

---

**NOTE** If the start and ending networks/addresses or (SF) lines are known, then the copy from and copy to range can be entered directly into the Copy Range dialog box. If a partial network is selected, the Copy Range dialog box is not displayed. The items selected are copied without warning.

---

Figure 3.21

4. Click OK.  
Result: The range of networks/addresses or (SF) lines displayed are copied and placed into the clipboard.

## Paste

To access the paste feature:

1. Move the cursor to the desired location.
2. Paste clipboard contents into the new location with one of the following:

- Click  on the toolbar
- Select Paste from the Edit menu
- Press Ctrl+V

## Paste With Rewire

Paste With Rewire provides you with a number of timesaving editing features. These include:

- Paste multiple copies
- Paste with address offset
- Include tags and descriptions in the paste
- The ability to Rewire (change address) on an individual basis

To access the rewire feature:

1. Move the cursor to the desired location.
2. Paste clipboard contents into the new location by:
  - Selecting Paste with Rewire from the Edit menu. The Paste With Rewire dialog box (Figure 3.22) appears.
  - Choose the appropriate options.
  - Click OK.

Figure 3.22

---

**NOTE** When pasting, clipboard contents are inserted before existing items. For example, if you are pasting a network and the cursor is positioned at Network 002, click paste and the clipboard contents become Network 002. The previous Network 002 becomes Network 003.

---

## Undo

Use Undo to reset networks/addresses in a segment to their original data. Any modified or inserted rung can be reset. Deleted rungs cannot be reset.

To access the Undo feature:

1. Select Undo from the Edit menu or press Ctrl+Z.  
Result: The Undo Logic window appears (Figure 3.23).
2. Select the segments to reset and press OK, or press Undo All to reset all networks/addresses displayed.
3. Click Cancel to close the window.

Figure 3.23

## Clear

Use Clear to clear an item without removing the space it occupies. Access Clear from the Edit menu using the Logic Editor in either offline or online mode. Clear can also be accessed from the Data Window.

To clear items:

1. Select the item or items you want to clear by clicking, holding, and dragging the pointer over the desired logic.
2. Select Clear from the Edit menu or press the Delete key.  
Result: The Clear dialog box appears (Figure 3.24).
3. Click the items you want to clear.
4. Click OK or press Enter.  
Result: The selected items are cleared.

Figure 3.24 – Ladder Clear

The following table describes the clearing items.

Item	Function
Ladder	Removes all networks/addresses from the block displayed.
Network	Removes all logic from the network at the cursor position.
Instruction	This option is available if the cursor is positioned at an instruction. When cleared, the instruction is removed; however, attached branches are not affected.
Branch	This option is available if there is a branch to the right of the instruction with the cursor. Clearing removes the branch to the right of the cursor.
Row	This option is available when an instruction is selected. Clearing removes instructions from the row where the cursor is positioned. Branches in this row are cleared only if the resulting logic contains branches unconnected to logic at one or both ends.
Column	This option is available when an instruction is selected. Clearing removes instructions and branches from the current column.

### **Logic Editor - Online**

Using Clear in the Logic Editor while online works the same as in offline mode. However, row and column cannot be cleared while online.

## **Data Window**

While working in the Data Window, you can use Clear to clear all rows or one row at a time. Clear is accessed through the Edit menu or by pressing the Delete key.

## **Delete**

Use Delete to delete an item and remove the space it occupies. Access Delete from the Edit menu using the Logic Editor in either offline or online mode. Delete can also be accessed from the Data Window.

To delete:

1. Select the item or items you wish to delete.
2. Select Ddelete from the Edit menu.  
Result: The Delete box appears (Figure 3.25).
3. Click the items you want to delete.
4. Click OK or press Enter.

Figure 3.25 – Ladder Delete

The following table describes the deletion items.

<b>Item</b>	<b>Function</b>
Network	Deletes a network or a range of networks/addresses. To delete a range of networks/addresses, enter the number of the first network to delete in the From box. Then enter the number of last network to delete in the To box.
Row/Line	In Ladder, selecting a row deletes all instructions and branches from the row where the cursor is positioned. Logic below the deleted row(s) moves up. When box instructions prevent a deletion, an error message appears.
Column	Deletes instructions and branches from the column where the cursor is positioned. Logic to the right of the deleted column(s) moves left. When box instructions prevent a deletion, an error message appears.

## **Logic Editor - Online**

Using Delete in the Logic Editor while online works the same as in offline mode. However, a row or column cannot be deleted unless it is empty.

## **Data Window**

While working in the Data Window, you can use Delete to clear all rows or one row at a time. Delete is accessed through the Edit menu.

## **Insert**

Use Insert to insert a selected object (network, instruction, row, or column) at the point of the current cursor position. Access Insert from the Edit menu using the Logic Editor in either offline or online mode.

To insert an object:

1. Select Insert from the Edit menu.  
Result: The Insert dialog box appears (Figure 3.26).
2. Click on the object you want to insert.

- Click OK or press Enter.

Figure 3.26 – Ladder Insert

## Logic Editor - Offline

Item	Function
Network/ Address	Adds a new network before the current network or address where the cursor is positioned.
Row/Line	Adds a new row is before the row where the cursor is positioned. If box instructions prevent insertion, an error message appears.
Column	Adds a new column before the column where the cursor is positioned. If box instructions prevent insertion, an error message appears.

## Logic Editor - Online

Insert is accessed in the same manner online as offline. However, only a network or column can be inserted while working online.

Item	Function
Network	With the cursor positioned at a network, Insert places a new network before the current network.
Column	A new column is inserted before the column where the cursor is positioned. If box instructions prevent insertion, an error message appears.

## Importing Text or Documentation Files

Import allows you to import tags/descriptors text files or 505 SoftShop \*.fss files. For example, you can import tags/descriptors text created in a word processor. You can merge tags/descriptions from another 505 SoftShop (\*.fss) program into the currently opened program.

To import tags/descriptors from a text file:

- Select Import from the File menu.  
**Result:** The Import dialog box appears (Figure 3.27).
- Select the type of program you want to import
- Type the program name in the Filename line, or click Browse to search from valid program names.
- Select either Comma Delimited or Tab Delimited.
- Click OK to import the program.

To import tags/descriptors from another 505 SoftShop (\*.fss) program into the currently opened program.

- Select Import from the File menu.  
**Result:** The Import dialog box appears (Figure 3.27).
- Select Siemens 505 SoftShop Documentation (\*.fss) from the Import Documentation dialog Format drop down window.

3. Type the program name in the Filename line, or click Browse to search from valid program names.
4. Select Tags, Descriptions, or Headers from Include to merge in.
5. Click OK to import the documentation.

Figure 3.27

## Merge Memory

Merge allows you to merge externally developed subroutine programs into User Memory. For example, you can merge compiled C, Pascal, assembly language, and other programs into U-Memory.

Follow these steps to prepare the external subroutine for use in the controller.

1. Compile/assemble the subroutines and header to create object modules.
2. Link the object modules for the header and subroutines to create the load module. The file name must have the extension ".rec". The output must have the header at zero followed by the code and data constants, then the variables, and finally the stack.
3. Select Merge from the File menu and U-Memory from the list Window.  
Result: The Merge dialog box appears (Figure 3.28).
4. Type the program name in the Filename line, or click Browse to search from valid program names.
5. Click OK to merge the program.

Figure 3.28

# 4 - 505 SoftShop Setup

## Overview

Before you begin programming, you will probably want to spend some time configuring and customizing the software and some of the hardware attached to your computer. This chapter will help you with:

• Program Setup	Shows you how to customize 505 SoftShop to fit your preferences.
• Communications Setup	Walks you through how to tell your computer which port is attached to your PLC.
• Printer Setup	Assists you in determining the correct settings for your printer.
• Page Setup	Allows you to configure your pages for printouts.
• Fast PLC Setup	Sets up a PLC for a fast connection.

## Program Setup

Program Setup reveals different sets of tabs governing your projects layout and appearance. These settings are saved with the program; thus, each time you open this program, you do not have to reset your preferences.

To access the Program Setup options:

1. Select **Program Setup** from the **Options** menu.

**Result:** The Program Setup dialog box appears (Figure 4.1).

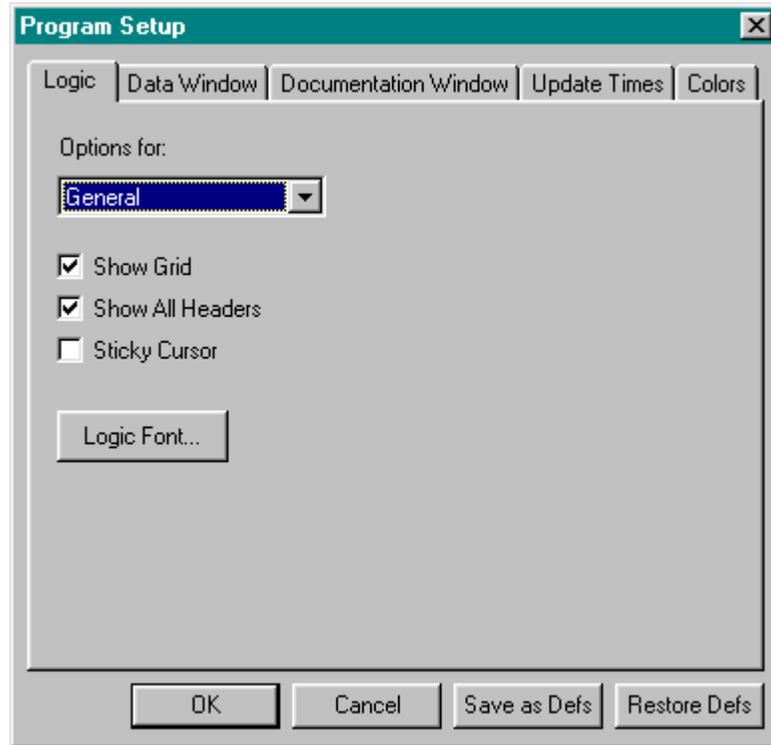


Figure 4.1

2. Click on the desired tab to display setup selections. A check in a box or radio button (circle) means that this feature or object is selected or is "turned on." A drop down window means that there are multiple options for the particular tab item selected. Table 4.1 describes each feature in the Program Setup dialog box.
3. Click **Restore Defs** to return each feature to the last Save as Defaults setting or the original "factory" setting if Save as Defs has not been used.
4. Click **OK** when you are finished making your selections or click **Save as Defs** to save the new settings as defaults. These new settings will be used for every new program created. Or Click **Cancel** to disregard changes to the settings and return to the active window.

**Result:** The screen changes based on your new settings for the current program.

<b>Logic Tab/General</b>	<b>Description</b>
Ladder Grid	Displays the ladder grid when selected.
Sticky Cursor	When selected, the current ladder instruction is saved as the cursor. You have to manually select the pointer cursor when you are done editing the current instruction. If not selected, the cursor changes back to the pointer after inserting an instruction.
All Headers	Displays ladder, network, and SF headers when selected.
Font	Changes the font displayed in the active program. Any active Windows font can be selected. To change the font: <ol style="list-style-type: none"> <li>1. Click Font and the Font dialog box is displayed.</li> <li>2. Choose a font, font style, and font size. Notice that you can see a sample of the font in the Sample box.</li> <li>3. Click OK in the Font dialog box to save your changes and return to Program Setup. Click Cancel to make no font changes and return to Program Setup.</li> </ol>
<b>Logic Tab/Ladder</b>	<b>Description</b>
Addresses	Displays addresses when selected.
Tags	Displays tags when selected.
Descriptions	Displays tag descriptions when selected.
Assign Tags	When selected, a window automatically appears if an address (that does not have a tag attached to it) is entered in ladder. It allows you to assign a tag, description, and comment to the address.
Assign Addresses	When selected, a window automatically appears if a tag (that does not match any current tags) is entered in ladder. It allows you to assign an address, description and comment to the tag.
Column Width	Adjusts the size of the ladder grid. Click the up or down arrow or type in a value between 7 and 24.
Description Rows	Determines the number of character rows displayed for each description. Click the up or down arrow or type in a value between 1 and 12.
Tag Rows	Determines the number of character rows displayed for each tag. Click the up or down arrow or type in a value between 1 and 4.
Use TISOFT Keys	Allows the use of certain TISOFT function keys to be used in windows. Such as; coils (Y, C, WY, V, G, W), contacts (X, Y, C, WX, WY, V, K, G, W), /, N, M, =, >, H, I, <, O, U, Ctrl U, J, U.
Status Thickness	Determines the line thickness of the ladder status line. Settings are between 1 and 6.

<b>Logic Tab/Special Functions</b>	<b>Description</b>
Instruction Width	Determines the width allocated for display of Special Function instructions on each line. Click the up or down arrow or type in a value between 1 and 80.
Column One	Determines the width allocated for display of SF first column variables after the instruction. Click the up or down arrow or type in a value between 1 and 300.
Column Two	Determines the width allocated for display of SF second column variables after the instruction. Click the up or down arrow or type in a value between 1 and 300.
<b>Data Window Tab</b>	<b>Description</b>
Column Display Include Address	Turns on and off the Address columns in the data window
Column Display Include Tags	Turns on and off the Tags columns in the data window
Column Display Include Descriptions	Turns on and off the Descriptions columns in the data window
Column Display Include Time Stamp	Turns on and off the Time Stamp columns in the data window
Column Display Include Status	Turns on and off the Status columns in the data window
Tag/ Descriptions Tip Display Include Address	As you scroll through the tag/ descriptions combo box in a data window the corresponding address and description (if it exists) of the highlighted tag will be displayed to the left and right respectively of the combo box. These are referred to as documentation tips and can be turned on and off by checking and un-checking these boxes.
Maximum Rows	The maximum number of data window rows to display. Default is 100. minimum is 10, maximum is 1000
Include	Select Tags, descriptions, both, or neither when the Data window is displayed.
<b>Documentation Window Tab</b>	<b>Description</b>
Column Display	Select either Tags or Descriptions (or both) for display in the Documentation Window.
Sort Order	Select Address, Tag, or Description order for display in the Documentation Window.
<b>Colors</b>	<b>Description</b>
Item	The colors of Ladder, Ladder Grid, Ladder Background, Edited Ladder Background, Address Foreground, Tags Foreground, Description Foreground, Rung Header Foreground, File Header Foreground, Status Foreground, Status Optimize Foreground and Parameter Cursor Foreground can be changed when selected from the drop down box.

*Table 4.1*

# Setting Up Communications

The Communications Setup allows pre-configure of serial ports, a modem board, or network interface boards in your computer that are used for communications with a SIMATIC 505 PLC.

To access the Communications Setup:

1. Select Communications Setup from the File menu.  
Result: The Communications Setup dialog box appears (Figure 4.2).

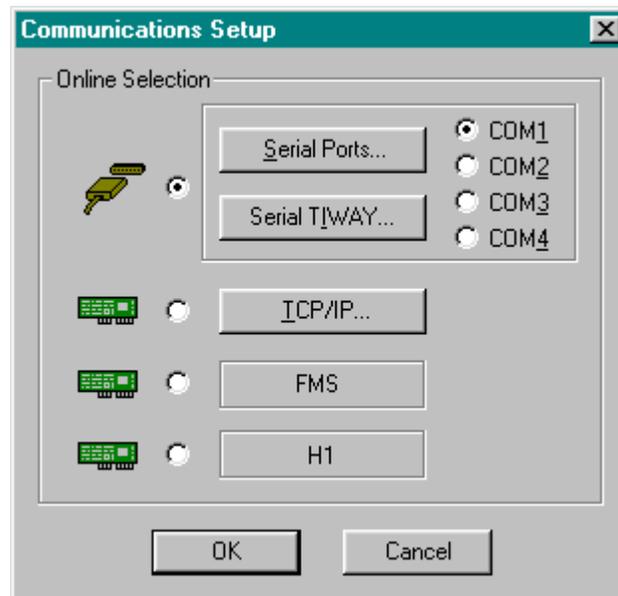


Figure 4.2

2. Select the appropriate PLC communications that you wish to set up (Serial Ports, TCP/IP, TIWAY, or Profibus FMS).

## Serial or Modem Communication

To configure your serial port or modem connection with a PLC:

1. From the Communications Setup dialog box, click the Serial Ports button.  
Result: The Settings for Serial Ports and Modem dialog box appears (Figure 4.3).

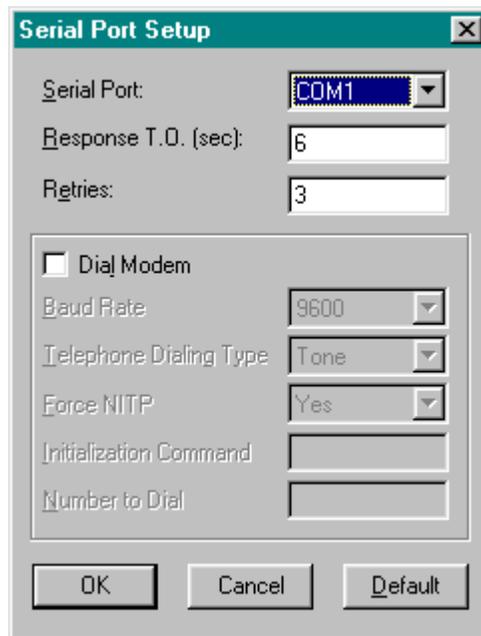


Figure 4.3

2. Select the appropriate setting for each option in the dialog box.
  - **Serial Port:** Location where the serial communication port (COM1, COM2, COM3, or COM4) is configured for communications. You do not select which port to communicate out of at this stage.
  - **Response T.O. (sec):** Specifies the amount of time, in seconds, that the software waits for a response from the PLC before returning a time-out error. Any whole number between 5 and 25 can be used.
  - **Retries specifies** Specifies the number of times the software will try to re-establish communications with the PLC after a time-out error. Any whole number between 0 and 10 can be used. Use 0 for no retries.
  - **Dial Modem:** Selected when the selected form of serial communications is through a modem. The modem parameters must be set to exactly the same communication parameters that you will use. Use the following modem parameters: eight bits, no parity, one-stop bit, and the highest baud rate that your equipment will support.
  - **Baud Rate:** The rate of communications between the computer and modem.
  - **Telephone Dialing:** Specifies which type of dialing to use. Specify pulse dialing only if this is the only type your phone line supports.
  - **Force NITP:** Specifies ASCII communications for the 545, 555, and 575.
  - **Initialization Command:** The initialization commands sent to the modem. Consult your modem manual for a list of appropriate commands.

- **Number to Dial:** Specifies the phone number to be dialed. The number format can be **dash (414-358-8088)**, **space (414 358 8088)**, **period (414.358.8088)**, or **none (4143588088)**. Commas (,) may be used if a pause is needed to gain access to an outside line before the number is dialed. For example, if 9 is used to gain access to an outside line and there is a pause between the time 9 is pressed and a dial tone, then the number entered should be 9,414-358-8088.
3. Click OK or press Enter to accept the settings. Click Cancel to disregard changes and return to the Communications Setup dialog box.

## Setting Up and Using TIWAY in 505 SoftShop

There are two versions of the host adapter hardware for TIWAY: TIWAY I Host Adapter and UNILINK™.

---

**NOTE** Since the Network Interface Module (NIM) does not support some task codes when the controller is in run mode, you cannot perform the following functions communicating through a NIM: Force/Unforce and Find (except Find Address).

---

### Setting Up the TIWAY I and UNILINK HOST Adapters

To communicate with 505 SoftShop, the TIWAY I Host Adapter or the UNILINK Host Adapter must conform to the following parameters:

- NITP protocol
- Full duplex
- Asynchronous
- Maximum Host Baud Rate: 19,200

See your *UNILINK Host Adapter User Manual* for details on setting dip switches for the UNILINK Host Adapter.

### TIWAY Setup Configuration

1. From the Communications Setup dialog box, click the **TIWAY** button.  
Result: The TIWAY Setup dialog box appears (Figure 4.4).

*Figure 4.4*

### Secondary Addresses

1. From the TIWAY Setup screen dialog box, click the **ADD** button to enter a new controller secondary address, or the **Modify** button to change the controller secondary address information.  
Result: The TIWAY Path dialog box appears (Figure 4.5).

*Figure 4.5*

2. Enter the controller secondary address for the associated controller. A controller secondary address is a unique number

from 1 to 254 that is used to identify a controller on the TIWAY link. Each PLC on TIWAY has a controller secondary address.

3. Enter the controller secondary address Path Description. A Path Description is a 32-character alphanumeric description for the controller secondary address.
4. Click OK or press Enter to accept the settings. Click Cancel to disregard changes and return to the TIWAY Setup dialog box.

## Using TCP/IP in 505 SoftShop and Setting Up TCP/IP Communications

### Connect Your PC to Ethernet

Your system administrator must determine what type of cable is best suited for your installation because it affects your choice of Ethernet card for your PC.

---

**NOTE** The PPX:505-CP2572 module directly supports 10BaseT (UTP) cabling. If your existing network does not use UTP, but the cabling medium is IEEE 802.3 compliant, you can purchase a transceiver that connects that media to the AUI port on the module. If you are installing a new network, discuss your cabling requirements with your network administrator or your local Siemens distributor. Your Ethernet card purchase should be guided by the type of cabling medium that is best suited for your network. There are really only three PC card options: 10BaseT(UTP), 10Base2(Thin Ethernet), and AUI. Some cards are combinations. The most commonly used are either 10bT or AUI with Fiber Optics cable. 10Base2 is not as widely used, and is not recommended as highly because of the potential network problems. 10Base5 (Thick Ethernet) cable, which also requires the use of transceivers, is sometimes used and can be obtained through your Siemens distributor.

---

In order to communicate to a 505 PLC, which is connected to a TCP/IP network, a TCP/IP stack needs to be installed on your Windows machine. Windows 95 and Windows NT ship with a TCP/IP stack - WINSOCK.DLL.

If TCP/IP is not listed under the protocol section of your network settings, it needs to be added. You may be asked to insert a Windows disk or CD-ROM. After it has been added, click on properties and enter an IP address, subnet mask, and possibly a default gateway. See your network administrator for more information on these fields if you are not sure what to enter. Every machine on your network must have a unique IP address.

At this point, the 505 TCP/IP Ethernet board needs to be configured (see the following section). Make sure the IP address does not conflict with other devices on the network. A sample configuration appears below:

Devices	IP Address	SubNet Mask
PC #1:	201.98.1.1	255.255.255.0
PC #2:	201.98.1.2	255.255.255.0
505 TCP/IP #1:	201.98.1.8	255.255.255.0

505 TCP/IP #2:	201.98.1.9	255.255.255.0
----------------	------------	---------------

To use 505 SoftShop over an Ethernet network with the TCP/IP protocol, you need to purchase and install the PPX:505-CP2572 module in a Series 505 base. Refer to the *SIMATIC 505 Ethernet TCP/IP Communication Processor (505-CP2572) User Manual*, PPX:505-8132-x, for instructions.

### Assign an IP Address to the Module

There are two ways to configure the IP address for your PPX:505-CP2572 module. Each procedure has different advantages, as outlined in Table 4.2.

Procedure	Pros	Cons
Autostart	<p>Communications are functional any time CPU GOOD LED is on.</p> <p>Can re-use same ladder logic program for multiple controllers.</p>	<p>Must reprogram EEPROM whenever CP2572 module is replaced.</p> <p>A CP2572 module programmed in one application and installed in another would respond to the wrong IP address, unless reprogrammed.</p> <p>Cannot swap CP2572 modules without reprogramming EPROMs through serial port by a PC.</p>
PLC Start	<p>Easy to troubleshoot problems by swapping CP2572 modules; proper IP address is loaded from ladder logic program as soon as CPU enters RUN mode.</p>	<p>IP Address is not loaded unless CPU enters RUN mode; if power is lost when CPU is not in RUN mode, you must manually bring CPU back to RUN mode (via programming device in CPU's RS-232 port) to restore Ethernet communications.</p> <p>If multiple controllers perform the same function, you must modify ladder logic program for each one so that it contains a unique IP address.</p>

Table 4.2 Alternatives for Loading IP Address

The *SIMATIC 505 Ethernet TCP/IP Communication Processor (505-CP2572) User Manual* describes the Autostart and PLC Start procedures in detail; follow the instructions in the manual to configure the IP address for your module.

---

**NOTE** New or modified IP address configurations do not take effect until you power cycle the base containing the PPX:505-CP2572 module.

---

## Tips for Using the PLC Start Option

The *SIMATIC 505 Ethernet TCP/IP Communication Processor (505-CP2572) User Manual* describes how to build a Startup Network Command Block table, used with the PLC Start option, in the chapter on *Installation* (Chapter 2). An easy way to construct this table is to open a Data window (see *Using The Data Window*) and enter the desired V-memory address. (For instance, the Ladder Logic Example in the TCP/IP manual assumes that the command block is located in V-memory, starting at location V500.) From the desired location, you can simply key in the values from the Startup Network Command Block example table in the manual, supplying the correct IP address, IP route address, and subnet mask for your network.

For even more permanency, you can put the table into K-memory instead of V-memory. If you use the example ladder program from the TCP/IP manual, you can just add a MOVW box to move the values in K to V, as shown in Figure 4.6. You can also trigger your logic from the first-scan flag bit in status word 201, instead of creating a lock with coil C1.

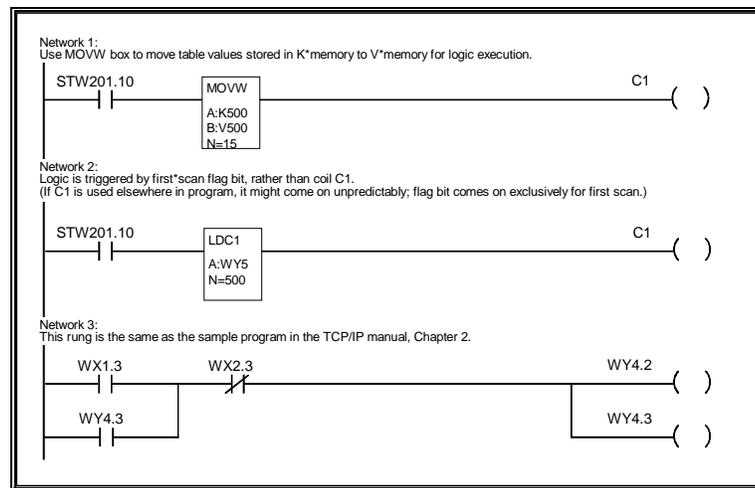


Figure 4.6

## Connect the Module to the Ethernet

The PPX:505-CP2572 module directly supports 10BaseT (UTP) cabling. If your existing network does not use UTP, but the cabling medium is IEEE 802.3 compliant, you can purchase a transceiver that connects the media to the AUI port on the module. Consult the *SIMATIC 505 Ethernet TCP/IP Communication Processor (505-CP2572) User Manual* for information about how to connect cables to the 10bT or AUI port of your module. Consult the Siemens IK 10 catalog for information about how to purchase a Siemens transceiver if you need to use it with the AUI port.

## Testing the Connection with PING

Once the board has been configured, you can test the settings by using a DOS command line utility called PING (comes with the TCP/IP stack). The program sends several test messages to the IP address that you specify on the command line. For example, PING 201.98.1.8; will test the

connection to 505 TCP/IP #1 shown above. There should be four successful replies to the PING command. If PING is not successful, there is a problem with the network settings or the 505 TCP/IP board configuration. If PING does not work, 505 SoftShop will not be able to connect to the PLC.

After PING has successful replies, you can configure a TCP/IP connection in 505 SoftShop and open an online window.

## TCP/IP Communication Settings

To configure your interface board port for communication with a PLC:

1. From the Communications Setup dialog box, click the **TCP/IP** button.

Result: The Settings for the TCP/IP Setup dialog box appear (Figure 4.7).



Figure 4.7

2. Enter a unique IP Port protocol number, the response Timeout, and Retries Number. Then Click the **Accept** button.
  - **IP Port:** Any number is acceptable as long as it does not interfere with other protocol numbers. This number must match the IP port configured in the 2572 Ethernet TCP/IP module
  - **Response T.O. (sec):** Specifies the amount of time, in seconds, that the software waits for a response from the PLC before returning a time-out error. Any whole number between 5 and 25 can be used.
  - **Retries:** Specifies the number of times the software will try to re-establish communications with the PLC after a time-out error. Any whole number between 0 and 10 can be used. Use 0 for no retries.

## IP Addresses

1. From the IP Addresses section of the TCP/IP Setup dialog box, click the **ADD** button to enter a new IP address, or select an existing IP address and click the **Modify** button to change the IP information.

Result: The IP Addresses dialog box appears (Figure 4.8).

Figure 4.8

---

**NOTE** The 505 SoftShop allows 1,000 different IP Addresses and Path Descriptions.

---

2. Enter the IP Address for the associated Interface Board. An IP Address is a 32-bit value that is divided into four 8-bit fields, each separated by a period. For example, 192.3.2.1 is an IP Address. Each computer on a network has a unique IP Address. You should consult your network administrator for the correct IP Addresses for your computer and board.
3. Enter the IP Address Path Description. A Path Description is a 32-character alphanumeric description for the IP Address.
4. Click OK or press Enter to accept the settings. Click Cancel to disregard changes and return to the TCP/IP Setup dialog box.

---

**NOTE** Refer to the *2572 Ethernet TCP/IP Module* manual for proper settings.

---

## Setting Up and Using PROFIBUS–FMS in 505 SoftShop

### Installing the PROFIBUS–FMS Communications Processor

The SIMATIC 505-CP5434-FMS Communications Processor module (referred to hereafter as the FMS CP module) provides the interface required for a SIMATIC 505 programmable logic controller system to communicate with other devices over a common PROFIBUS network.

To install the FMS CP module in a SIMATIC 505 base, follow the installation instructions in the *SIMATIC 505 PROFIBUS–FMS Communication Processor (505-CP5434-FMS) User Manual*.

The FMS CP module must be configured with the COM5434 Configuration software included with the module. The COM5434 Configuration software operates in Windows 95 or Windows NT only.

To install the software, follow the installation instructions in the *SIMATIC 505 PROFIBUS–FMS Communication Processor (505-CP5434-FMS) User Manual*.

Each FMS CP module in a 505 base must be configured to communicate over the PROFIBUS network. The “module local configuration” for each FMS CP module identifies its station address and the network communication parameters it uses to operate on the network.

---

**NOTE** You must define the module local configuration for each FMS CP module using the RS-232 port with the standard 505 SoftShop programming cable before you can communicate with it using the PROFIBUS-FMS port.

---

Refer to the *SIMATIC 505 PROFIBUS-FMS Communication Processor (505-CP5434-FMS) User Manual* for complete information on configuring the FMS CP module with the COM5434 Configuration software.

---

**NOTE** Make sure to select the bus parameters, the baud rate, and the highest station address (HSA) that match those of all the other modules on the network. Also be sure to select a unique station address for each FMS CP module on the network.

---

Once each FMS CP module has been configured to operate on the network, connect each FMS CP station and the CP 5412 card in your PC to the PROFIBUS network, using the PROFIBUS cables and connectors described in the *SIMATIC 505 PROFIBUS-FMS Communication Processor (505-CP5434-FMS) User Manual*.

## FMS Profibus Communication Settings

### Access FMS Profibus Devices Using 505 SoftShop

To access the *FMS Profibus* network with 505 SoftShop:

From the **File** menu, chose **Fast PLC Setup**.

1. Select FMS from the Fast PLC Connection Setup dialog box.
2. Click **OK** on the Setup dialog box.
3. From the **File** menu, chose **Fast PLC Connection** (FMS communications can also be established via open program).  
Result: The FMS Network Access screen appears (Figure 4.9).
4. Select a node name. These are the node names you configured using the COML S7 software prior to rebooting. Using the arrow keys or mouse, select an FMS node name and Click **OK**.  
Result: 505 SoftShop is online.

Figure 4.9

---

**NOTE** The 505 SoftShop allows 112 different Station Addresses and Path Descriptions.

---

## 505 SoftShop with H1 Communications

Before H1 Communications can be established with 505 SoftShop the following procedures must be completed:

- Install CP 1413 card.
- Select I/O range.
- Select unique interrupt address.
- Select dual-port ram address.
- Install TF-1413 software drivers using Simatic Net Software CD.
- Configure the CP 1413 hardware and software.

## Access H1 Devices Using 505 SoftShop

To access the H1 network with 505 SoftShop:

From the **File** menu, chose **Fast PLC Setup**.

4. Select H1 from the Fast PLC Connection Setup dialog box.
5. Click **OK** on the Setup dialog box.
6. From the **File** menu, chose **Fast PLC Connection** (H1 communications can also be established via open program).  
Result: The H1 Network Names screen appears (Figure 4.14).
5. Select a node name. These are the node names you configured using the COML 1413-TF-software prior to rebooting. Using the arrow keys or mouse, select an H1 network node name and Click **OK**.  
Result: 505 SoftShop is online.

Figure 4.14

---

**NOTE** The CP1413 driver does not run in protected mode. If you want to run more than one application (e.g., H1 Configurator or 505 SoftShop over H1) close one of the applications before running the other application.

---

## Printer Setup

Use Print Setup to select a printer and determine where and how your printouts appear.

To access the Print Setup:

1. Start or open a logic program. Select Print Setup from the File menu.  
Result: The Print Setup dialog box appears.
2. Depending on which printer you want to print to, choose either Default printer or Specific printer. If you select Specific Printer, choose a printer or device from the drop-down box.
3. Additional setup options may be available depending on the printer you selected. If an Options button is available, click it and another dialog box appears. Make your selections and select the OK button to return to the Print Setup dialog box.
4. Other options in the Print Setup dialog box include Orientation and Paper Source. Click the desired settings.
5. Click OK in the Print Setup dialog box to save your settings and return to the active logic window.

---

**NOTE** The print setup options can also be accessed from the Print box that appears after selecting Print from the File menu.

---

# Page Setup

Use Page Setup to select page margins, starting page number, and whether to include a Title page in your printout.

To access the Page Setup:

1. Start or open a logic program.
2. Select Page Setup from the File menu or click on Page Setup in the Print Window.  
Result: The Page Setup dialog box appears.
3. Depending on which features you need to customize, choose left, right, top and bottom margin. To change the size of the margins, type the measurement (in inches) for the margin you want to adjust in the Top, Bottom, Left or Right boxes.
4. If you would like to start your printout with a page number other than 1, change the Starting Page number.
5. Normally a title page does not print. The title page contains the information you entered in the Title Page Print Editor. If you would like to include this page as the first page in your printouts, click on Include Title Page.
6. Click OK in the Page Setup dialog box to save your page settings and return to the active logic window.

---

**NOTE** The page setup options can also be accessed from the Print box that appears after selecting Print from the File menu. The page setup options are stored when saving a logic program file.

---

# Fast PLC Setup

The Fast PLC Setup allows you to configure a single PLC Connection when using Fast PLC Connection.

To access the Fast PLC Setup:

1. Select **F**ast PLC Setup from the **F**ile menu.

**Result:** The Fast PLC Setup dialog box appears (Figure 4.17).

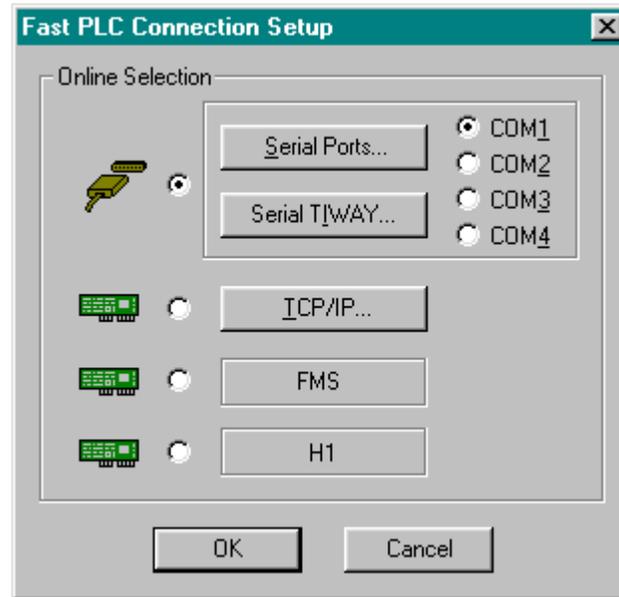


Figure 4.17

2. To configure and select your serial port or board for communication with a PLC:
  - Select the appropriate Communication Port from the list in the Fast PLC Connection Setup dialog box. If you need to configure a port, click Serial Ports (Refer to *Communications Setup* for more information.)
  - Click OK or press Enter to accept the settings. Click Cancel to disregard changes.

---

**NOTE** The connection options for your Fast PLC Connection is stored in the 505-registry. If you attempt to use Fast PLC Connection and the Fast PLC Setup has not been configured, the Fast PLC Connection Setup window automatically displays before continuing. Connecting to a PLC using Fast PLC Connection does not load any documentation or tag information. If you need to load documentation or tags, use Open Program.

---

# 5 - PLC Memory & I/O Configuration

## Overview

This chapter shows you how to set up and configure your Siemens family PLC. You must configure your PLC before you can create a ladder logic program. Configuration is part of the program; it performs the important function of relating the hardware components to the logic components.

The setup and configuration process is completed in three steps in recommended order:

1. PLC Type Setup
  - PLC Type
  - Memory Size
2. PLC Memory Configuration
  - Ladder
  - Variable
  - Constant
  - Special
  - User Sub
  - Timer/Counter
  - Drums
  - Shift Register
  - Table Move
  - One Shots
3. I/O Configuration

PLC Type Setup, available in offline mode only, is how you tell 505 SoftShop what Siemens processor you are creating a logic program for. PLC Memory Configuration and I/O Configuration allow you to configure your PLC. These are available in online and offline mode.

# PLC Type Setup (Offline)

The setup and configuration process begins with PLC Type Setup. You must tell 505 SoftShop what processor you are using before you can configure the processor.

Valid PLC types are:

- Simatic 520 revision 1101.
- Simatic 520c revision 1101 and 1102.
- Simatic 525 revision 1102 and 1104.
- Simatic 530 revision 1102, 1104, and 1108.
- Simatic 530c revision 1104, 1108, and 1112.
- Simatic 535 revision 1104, 1108, and 1112.
- Simatic 560 revision 2120.
- Simatic 560/565 revision 2120.
- Simatic 560T revision 2820.
- Simatic 560/565T revision 2820.
- Simatic 545 revision 1101, 1102, 1103, 1104, 1105 and 1106.
- Simatic 555 revision 1101, 1102, 1103, 1104, 1105, and 1106.
- Simatic 575 revision 2102, 2103, 2104, 2105, and 2106.

To set up the PLC:

1. Select PLC Type Setup from the File menu.

Result: The PLC Type Setup dialog box appears (Figure 5.1).

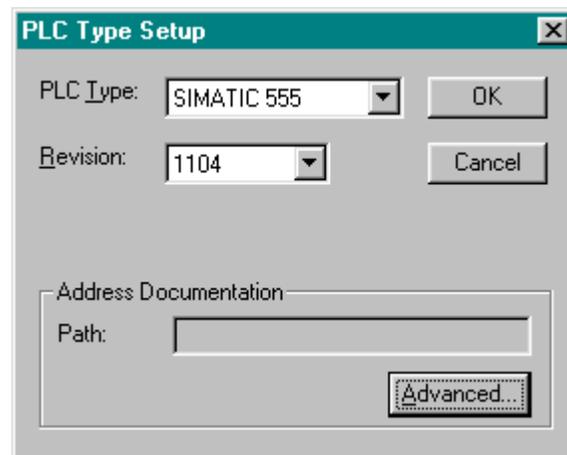


Figure 5.1

2. Note, to access a 545-1101 extended memory offline the extended memory check box must be selected at this point, as shown in figure 5.1a.

Figure 5.1a

3. Select the appropriate PLC Type and PLC Memory Size. A detailed explanation of each setup option is described on the following table (Table 5.1). If shared documentation is to be associated with the new program it must be setup at this stage *see Shared Documentation*.

PLC Setup Option	Description
PLC Type	Specifies the type of processor. Selection of PLC type determines choices available for remaining setup options in the PLC Type Setup dialog box.
PLC Memory Size	Specifies the PLC's memory size. Only the valid memory sizes for the PLC selected in PLC Type are displayed.

Table 5.1

- Click OK or press Enter to save your settings and return to the active logic program.

## Changing PLC Types

The PLC type can be changed even after programming has been initiated. Various error or warning messages can occur when changing from one PLC type to another. These error messages indicate the block and segment of the error. The errors must be fixed before the new PLC's logic can be validated.

To change the PLC type:

- Select **PLC Type Setup** from the **PLC Utilities** menu.  
**Result:** The PLC Type Setup dialog box appears (Figure 5.1).
- Select the appropriate PLC Type and PLC Memory Size.

### PLC Memory Configuration

Controller memory is composed of several functional types (refer to Table 5.2). You can configure the amount of memory that is allotted to some these areas. This is dependent upon your application and PLC type. The configurable memory sizes are given in the *SIMATIC 545/555/575 System Reference Manual*.

Ladder	<p><b>User Program Memory</b></p> <ul style="list-style-type: none"> <li>Ladder Memory stores RLL program.</li> <li>Special Memory stores loops, analog alarms, and SF Programs.</li> <li>User Memory stores user-defined subroutines.</li> </ul>
User Data	<p><b>Data Area Memory</b></p> <ul style="list-style-type: none"> <li>Variable Memory stores variable data.</li> <li>Constant Memory stores constant data.</li> <li>Global and VME Memory are used for VME data transfer (applies to 575 only).*</li> </ul>

System Operation	<p><b>System Memory</b></p> <ul style="list-style-type: none"> <li>• RLL instruction tables: drum, timer/counter, shift register, etc.</li> <li>• Image registers and control and relays.*</li> <li>• Subroutine parameter area.*</li> <li>• SF program temporary memory.*</li> <li>• Status Word memory.*</li> </ul>
* Not Configurable	

Table 5.2

The configuration process begins with PLC Configuration.

## Accessing PLC Configuration

1. Select PLC Configuration from the PLC Utilities menu.  
Result: The PLC Configuration dialog box appears (Figure 5.2).

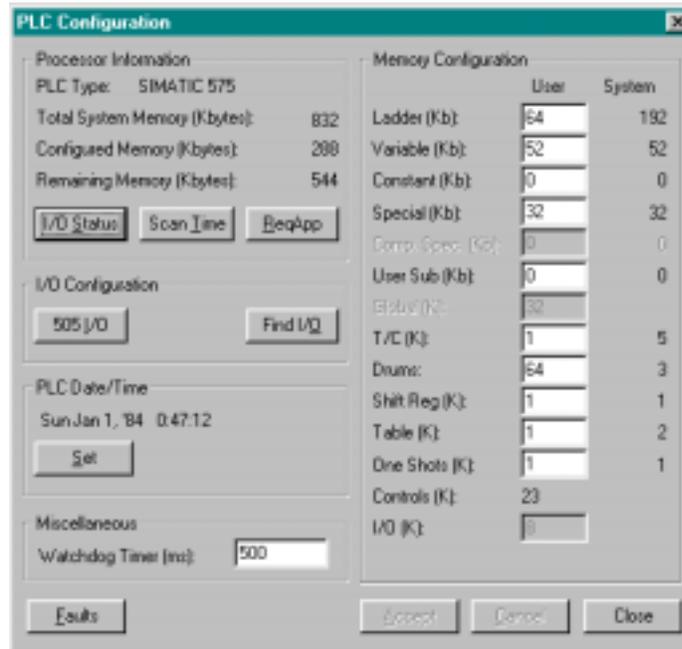


Figure 5.2

2. Enter the appropriate ranges for the selected PLC memory type.

---

**NOTE** The processor type must be selected before configuration.

---

The various memory types are described in the pages that follow. Memory types are classified for RLL programming purposes in the following ways:

- Writeable - This memory type is read/write. It can be used for both input and output fields of RLL instructions.
  - Readable - This memory type is read only. It can be used only for the input fields of RLL instructions.
  - No access - RLL instructions has no access to this memory.
3. Click Accept to save your settings and return to the active logic program.

## Controller Memory Types

### Ladder Memory

A block of memory within the controller is reserved for the RLL program. This memory type is called Ladder Memory (L-Memory). Each

RLL instruction used in the program requires one or more 16-bit words of L-Memory.

### **Image Register Memory**

A block of memory within the controller is reserved for maintaining the status of discrete inputs/outputs. This memory type is called the discrete image register. A word image register holds the values of word inputs/outputs.

### **Control Relay Memory**

A block of memory within the controller is reserved for control relays. Control relays are single-bit internal memory locations and do not represent actual hardwired devices.

### **Special Memory**

A block of memory within the controller may be allocated for loops, analog alarms, and Special Function programs. This memory type is called Special Memory (S-Memory). All loop and analog alarm parameters are stored in S-Memory when you program the loop or analog alarm. Likewise, when you create a Special Function program or subroutine, the program is stored in S-Memory.

### **Temporary Memory**

A block of memory within the controller is temporarily reserved during run time whenever a Special Function program is run. One block is allocated for each SF program that is being run. This memory type is 16 words in length and is called Temporary Memory (T-Memory) since it is not saved when the program has completed running. The controller writes data related to the Special Function program to the first 7 words. You can read this data and/or write over it if you choose. You can use all 16 words just as you would use Variable Memory, except no data is saved when the program has completed.

### **Variable Memory**

A block of memory within the controller may be allocated for user operations. This memory type is called Variable Memory (V-Memory). For example, you can do a math operation and store the result in V-Memory. You can enter values directly into V-Memory with a programming unit.

### **Constant Memory**

A block of memory within the controller may be allocated for constants (unchanging data). This memory type is called Constant Memory (K-Memory). You can use a programming unit to load a table of data into K-Memory and read the table during run time whenever you need the data for an operation.

### **Status Word Memory**

A block of memory within the controller is allocated for storing status information relating to controller operations. This information is stored in one or more status words: STW1, STW2, etc. These status words can be used in the RLL program to signal and/or correct alarm conditions.

## Timer/Counter Memory

A block of memory within the controller is reserved for the operation of the timer/counter group of RLL instructions, including the following:

Timer (TMR, TMRF)	Counter (CTR)
Discrete Control Alarm Timer(DCAT)	Motor Control Alarm Timer(MCAT)
Up/Down Counter (UDC)	



### Warning

**When you assign a number to a timer, counter, up/down counter, or discrete/motor control alarm timer, be sure that you do not use that number for any other timer, counter, up/down counter, or discrete/motor control alarm timer. For example, if you configure a Timer 6 (TMR6), do not configure any other operation, e.g., a counter (CTR) or a discrete control alarm timer (DCAT) with the number 6.**

**Assigning the same number more than once could cause unpredictable operation by the controller, which could result in death or serious injury to personnel and/or damage to equipment.**

**Do not use the same reference number more than once for timer, counter, up/down counter, and discrete/motor control alarm timer instructions.**

---

**NOTE** If you use an operator interface to change the time/counter values, the new values are not changed in the original RLL program. If the RLL presets are ever downloaded, e.g., as the result of a complete restart or an edit of the network containing the Timer/Counter instruction, the changes made with the operator interface are replaced by the values in the RLL program.

---

This memory type is divided into areas for storing two types of information. This information consists of Timer/Counter Preset (TCP) data and Timer/Counter Current (TCC) data. When you designate a preset value for one of the instructions in this group, this value is stored as a 16-bit word in TCP-Memory. When the instruction is actually operating, the current time or count is stored as a 16-bit word in TCC-Memory.

## Table Move Memory

A block of memory within the controller is reserved for the operation of the table move instructions, including the following:

- Move Word To Table (MWTT).
- Move Word From Table (MWFT).

### Warning

**When you assign a number to a table move instruction, be sure that you do not use that number for any other table move instruction. For example, if you configure a Move Word To Table #1 (MWTT1), do not configure a Move Word From Table #1 (MWFT1).**

**Assigning the same reference number to more than one table move instruction could cause unpredictable operation by the controller, which could result in death or serious injury to personnel and/or damage to equipment.**

**Do not use the same reference number more than once for a table move instruction.**

This memory type consists of one word per table move instruction configured. This word is used to maintain the current count of moves done since the MWTT or MWFT instruction was last reset.

## One Shot Memory

A block of memory within the controller is reserved for the operation of the various instructions of the One Shot group, including the following:

- One Shot
- Time Set
- Date Set

### Warning

**When you assign a number to a One Shot instruction, be sure that you do not use that number for any other One Shot instruction type. For example, do not configure more than one OS11.**

**Assigning the same number for more than one One Shot instruction type can cause unpredictable operation by the controller, which could result in death or serious injury to personnel and/or damage to equipment.**

**Do not use the same number more than once for the same instruction type (e.g., use it only once in One Shot, in Timer Set, etc.).**

This memory type consists of one byte per configured One Shot instruction. This byte is used to save the previous state of the instruction input.

Because the instructions in the One Shot group use different bits of one byte, these instructions can be assigned identical reference numbers. That is, if you configure a One Shot #11 (OS11), you can configure a Date Set #11.

## Shift Register Memory

A block of memory within the controller is reserved for the operation of the shift registers, which include the following:

- Bit Shift Register (SHRB).
- Word Shift Register (SHRW).

### Warning

**When you assign a number to a shift register, be sure that you do not use that number for any other shift register type. For example, do not configure SHRB11 and SHRW11.**

**Assigning the same number for more than one shift register could cause unpredictable operation by the controller, which could result in death or serious injury to personnel and/or damage to equipment.**

**Do not assign the same reference number to more than one shift register instruction.**

This memory type consists of one byte per shift register. This byte is used to save the previous state of the instruction input.

## Drum Memory

A block of memory within the controller is reserved for the operation of the various drum types, including the following:

Drum (DRUM)	Event Drum (EDRUM)
Maskable Event Drum Discrete(MDRMD)	Maskable Event Drum Word(MDRMW)

### Warning

**When you assign a number to a drum type instruction, be sure that you do not use that number for any other drum type instruction. For example, if you configure a Maskable Event Drum Word #1 (MDRMW1), do not configure an Event Drum #1 (EDRUM1).**

**Assigning the same reference number to more than one drum type instruction could cause unpredictable operation by the controller, which could result in death or serious injury to personnel and/or damage to equipment.**

**Do not assign the same reference number to more than one drum type instruction.**

Drum memory is divided into areas for storing the following types of information:

Drum Step Preset (DSP)	Drum Step Current (DSC)
Drum Count Preset (DCP)	Drum Count Current (DCC)

When you specify step and counts-per-step (count preset) values for a drum type, the step preset is stored as a 16-bit word in DSP-Memory, and

the counts-per-step values are stored as 16 consecutive 16-bit words in DCP-Memory (except for the DRUM). For the DRUM instruction, counts-per-step values are stored in L-Memory; DCP is not used.

---

**NOTE** If you use an operator interface to change the drum preset values (DSP or DCP), the new values are not changed in the original RLL program. If the RLL presets are ever downloaded, e.g., as the result of a complete restart or an edit of the network containing the drum instruction, the changes made with the operator interface are replaced by the values in the RLL program.

---

When the instruction is actually operating, the current step is stored as a 16-bit word in DSC-Memory. The current count for this step is stored as a 16-bit word in DCC-Memory.

### PGTS Discrete Parameter Area

The Parameter Go To Subroutine (PGTS) discrete parameter area (Figure 5.3) is an area of memory within the controller that is reserved for holding the status of discrete bits referenced as parameters in a PGTS RLL instruction. Because up to 32 PGTS subroutines can be programmed, the controller has 32 discrete parameter areas, each capable of storing the status for 20 discrete parameters. When you use a parameter in the subroutine, refer to discrete points as  $B_n$  where  $n$  = the parameter number.

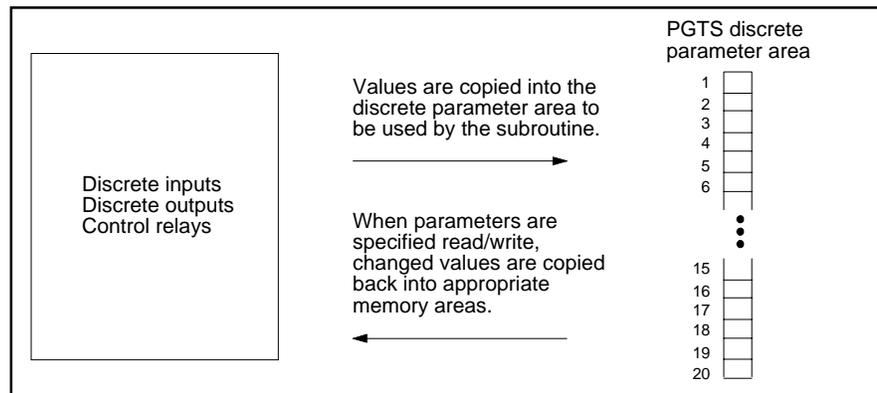


Figure 5.3

### PGTS Word Parameter Area

The PGTS word parameter area (Figure 5.4) is an area of memory within the controller that is reserved for holding the contents of 16-bit words referenced as parameters in a PGTS RLL instruction. Because up to 32 PGTS subroutines can be programmed, the controller has 32 word parameter areas, each capable of storing the status for 20 word parameters. When you use a parameter in the subroutine, refer to words as  $W_n$ , where  $n$  = the parameter number.

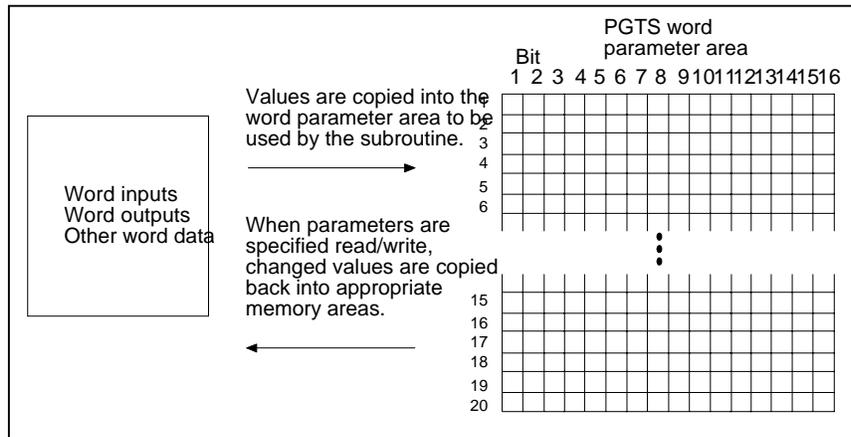


Figure 5.4

## User External Subroutine Memory

A block of memory within the controller may be allocated for storing externally developed programs written in C, Pascal, Assembly language, etc. This memory type is called User Memory (U-Memory). The size of U-Memory is user configurable.

## Global Memory: 575 Only

The 575 CPU allocates a 32K-word block of memory that allows you to transfer data over the VME back-plane. This memory type is called Global Memory (G-Memory). Refer to Appendix I of the processor manual for more information about G-Memory.

## VME Memory: 575 Only

The 575 controller also allows access to physical VME addresses using the VMM-Memory or VMS-Memory.

- VMM corresponds to VME address modifier 39 (standard non-privileged data access).
- VMS corresponds to VME address modifier 29 (short non-privileged access).

## Warning

The 575 controller allows you to use a VME address (VMM or VMS) as a parameter to most word-oriented RLL instructions, e.g., ADD, SUB, or MOVW, etc.

When a VME address is used and is not recognized by any installed board, a VMEbus error occurs. If the instruction that used the address was other than MOVE or XSUB (with the U-Memory header's E bit set to 1--see Appendix H in the Programming Reference Manual), the controller enters the Fatal Error mode, freezes analog outputs and clears discrete outputs.

Use the XSUB or MOVE instruction to access the VME address.

# I/O Configuration

## Controller Functionality in Configuration

Keep in mind that, while you can configure I/O either online (with the controller) or offline (programming device only), functional differences exist between the two modes. When online, you can perform those functions that require interfacing with the controller. For instance, you must be online to write your I/O configuration to the controller or to read the configuration of a base from the base itself. Configurations saved offline go to the selected program on disk.

## I/O Configuration Guidelines

Before entering your I/O configuration, be sure that the I/O points you select conform to the following guidelines:

- The number for the I/O address must begin on an 8-point boundary. An 8-point boundary is  $(n*8) + 1$ , e.g., 1, 9, 17, etc. Addresses not starting on an 8-point boundary are changed to do so when you write the values.
- Refer to the I/O module manual for the number of bit and/or word I/O points required for each module. Valid entries for modules with more than 8 points are even numbers from 2 through 28, 32, and 64.
- Locations assigned to an I/O module cannot cross I/O channel boundaries. See your controller manual for details.
- 505 SoftShop does not flag duplicate I/O points.

## Accessing I/O Configuration

1. Select PLC Configuration from the Options menu.  
Result: The PLC Configuration dialog box appears (Figure 5.2).

---

**NOTE** You can Enable or Disable a base by highlighting the desired base number in the display screen, then clicking on the Enable or Disable button

---

2. Select the **505 I/O** button under I/O configuration on the PLC Configuration dialog box.  
Result: The I/O Configuration dialog box appears (Figure 5.5).

Figure 5.5

## I/O Configuring Procedure

1. Use the mouse or arrow keys to highlight the desired base number on the I/O Configuration dialog box to edit or configure.
2. Then select the Edit Base button on the I/O Configuration dialog box.  
Result: The Edit I/O Base dialog box appears (Figure 5.6).

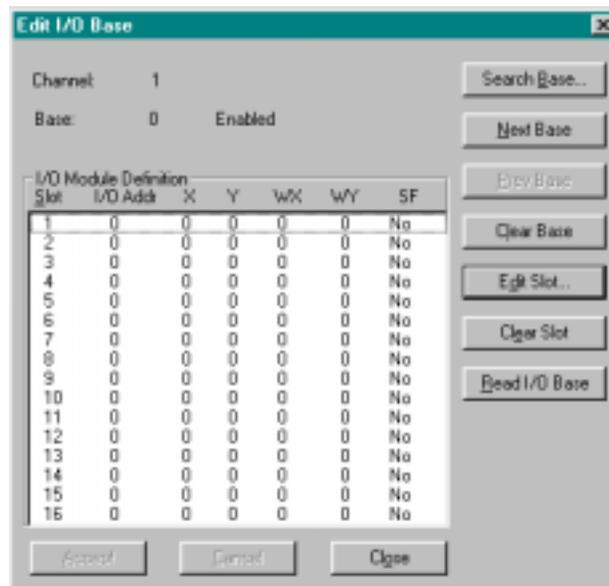


Figure 5.6

---

**NOTE** If you need to select a different Base number, you can do so by clicking on the **N**ext Base or **P**rev Base button on the Edit I/O Base dialog box. You can also click on the **S**earch Base button on the Edit I/O Base dialog box and enter a different base number.

---

3. Use the mouse or arrow keys to highlight the desired slot number to be configured.
4. Click on the **E**dit Slot button on the dialog box or press Enter.  
Result: The Edit I/O Slot dialog box appears (Figure 5.6).

Figure 5.6

5. Enter the beginning I/O address.
6. Enter the number of I/O points (X, Y, WX, or WY) required for the type of module being configured.
7. If a special function module is to be configured, click the Yes Special Function radio button.
8. Click on the OK button of the Edit I/O Slot dialog box.
9. The Edit I/O Base dialog box becomes the active dialog box (Figure 5.6).
10. To accept the changes, click on the **A**cept button on Edit I/O Base dialog box.

---

**NOTE** If you are online and have not yet accepted the changes to the base, you can select the **R**ead I/O Base button on the Edit I/O Base dialog box to reset the base display to the readings in the controller. All prior changes will be lost.

---

## Clearing a Base I/O Configuration

1. Start from Edit I/O Base dialog box (Figure 5.6).
2. Click on the Clear Base button on the Edit I/O Base dialog box.

You have finished setting up the software and the hardware. The next step is programming. The *Programming* chapter discusses 505 SoftShop's many different features for developing ladder logic. You can program in online or offline mode.

## Profibus-DP I/O Configuration

To configure I/O used on the PROFIBUS-DP channel for your Series 505 system, you must use two configuration utilities.

The first utility you use is COM PROFIBUS that allows you to perform the following tasks:

- Select a master and host, thereby determining communication parameters.
- Configure and parameterize the I/O slaves (including any 505 PROFIBUS-DP RBCs) that you wish to use on the PROFIBUS-DP I/O channel.
- Save your configuration. (This file should be archived in case you want to make configuration changes at a later time.)
- Export your configuration to a binary file. 505 SoftShop uses information from this binary file to perform further I/O configuration.
- If you need to add or delete slaves or modules or modify bus parameters later, you must use COM PROFIBUS to modify the configuration file and adjust the necessary information before exporting and merging it into 505 SoftShop again.

The second program you use is 505 SoftShop. 505 SoftShop allows you to perform the following tasks:

- Use the Merge function to import information from the binary file that you created with COM PROFIBUS.
- Assign or modify starting I/O addresses for the modules of all PROFIBUS-DP slaves used by your Series 505 CPU.
- Load bus parameters and slaves.
- Toggle between operate and stop mode, and between synchronous and asynchronous communications.
- Enable or disable slaves.

### Configuring I/O Modules in COM PROFIBUS

This section is not intended as a tutorial in COM PROFIBUS. The *SIMATIC S5 ET 200 Distributed I/O System Manual* describes how to use COM PROFIBUS; consult that manual for detailed information. Also, COM PROFIBUS has extensive, context-sensitive help.

Your objective in creating a configuration file with COM PROFIBUS is to define module types for each slave. Once you accomplish that, you can export the configuration file in binary form to 505 SoftShop, where you assign starting I/O addresses to each module.

Table 5.3 provides the information you need in order to configure your slave devices in COM PROFIBUS.

<b>Task</b>	<b>Comment</b>
Open a file in COM PROFIBUS.	You can modify an existing configuration file, if appropriate, or create a new file.
Select a master.	<b>Required.</b> Choose the 505-CP5434-DP.
Select a host.	<b>Required.</b> Choose the appropriate Series 505 CPU.
Modify bus parameters.	<b>Optional.</b> You can accept the default settings, unless you wish to modify one, such as baud rate.
Assign slave(s).	<b>Required.</b> Choose slave(s), such as the 505 PROFIBUS-DP RBC, up to 112.
Parameterize slave(s).	<b>Optional.</b> (Note: If you are configuring a 505 PROFIBUS-DP RBC, PPX:505-6870, you may want to change the settings for I/O mismatch handling and RS-232 port communications; consult the <i>SIMATIC 505 PROFIBUS-DP RBC User Manual</i> for a description of the software parameters of the RBC.)
Configure slave(s).	<b>Required.</b> You can use either the “ID” or the “Order Number” list to select I/O module types and assign them to the appropriate slots in your slave device. The “Comment” field is optional. Do not fill in the “I. Addr.” or “O. Addr.” fields; you will assign starting I/O addresses to each module in 505 SoftShop, and any data you assign to these fields in COM PROFIBUS is overwritten.
Save the file.	<b>Optional.</b> Allows you to add or delete slaves from your configuration later, without re-entering all data into COM PROFIBUS.
Export binary file to 505 SoftShop.	<b>Required.</b> For convenience, you can select the disk drive and directory where your 505 SoftShop program is stored, and assign the binary file the same name as the program where you intend to use the I/O. An extension (.2BF) is automatically assigned to the binary file; do not change this extension.
Exit COM PROFIBUS.	You are ready to perform configuration tasks in 505 SoftShop.

Table 5.3

## Importing Configuration Data From COM PROFIBUS Into 505 SoftShop

The 505 SoftShop Profibus-DP I/O dialog box allows you to import configuration data from the binary file that you created with COM PROFIBUS (described above). The steps you take are the same regardless of whether you are importing data from an entirely new configuration, or merely importing selected items that have been modified from a previous configuration session in COM PROFIBUS. The Merge function performs a comparison between the current configuration information and the contents of the selected binary file exported from COM PROFIBUS. Only new information is written to 505 SoftShop; pre-existing, unchanged configuration information (e.g., I/O addresses) is not lost.

To import and/or configure data from the COM PROFIBUS software, you must be running 505 SoftShop, and the binary file (with its .2BF extension) that you created with COM PROFIBUS must be in a known location. Follow the steps below to execute:

1. Select PLC Configuration from the PLC Utilities menu.  
Result: The PLC Configuration dialog box appears (Figure 5.2).
2. Select the **Profibus I/O** button under I/O configuration on the PLC Configuration dialog box.  
Result: The Profibus-DP I/O dialog box appears.

The Profibus-DP I/O dialog box Slave Status window shows the following information:

1. Slave numbers programmed from 1 to 112 or 1 to 32 for the 545L.
2. The Enabled state.
3. The Assigned state:
  - Yes, if all slave modules have I/O addresses assigned to them.
  - No, if some or all slave modules do not have I/O addresses assigned to them.
4. Online:
  - Yes, if in operate mode and PROFIBUS slave is connected.
  - No, if in stop mode or PROFIBUS slave is not connected.
5. Status:
  - Match, if the configuration and the I/O assignments match the online controller or the offline program.
  - \*Match, if the configuration matches the online controller or the offline program and the I/O assignments do not match online controller or the offline program.
  - New, if the slave is programmed in the .2bf file but not in the online controller or the offline program.
  - Mismatch, if the slave number exists in the .2bf file and in the online controller or the offline program, but has been configured differently.
  - Delete, if the slave is in the online controller or the offline program, but not in the .2bf file. When the program is written to the online controller or the offline program, the slave will be deleted.

The Profibus-DP I/O dialog box allows you to execute the following functions:

- Merge.
- Write All.
- Write Slave(s).
- Enable Slaves.
- Disable Slaves.
- Delete all slaves.
- Edit slave.
- Profibus operations (online only).

## Merge COM PROFIBUS

Follow the steps below to merge in the COM PROFIBUS:

1. Click on the Merge button to execute the merge function. You are prompted to supply the name of the binary file from which you wish to import configuration data.
2. At the prompt, either type in the name of the binary file, or click the browse button to search other drives or directories.

Result: The PROFIBUS-DP Slave Status screen displays configuration information obtained from the COM PROFIBUS binary file that you have just merged into 505 SoftShop.

---

**NOTE** The merged information has not been loaded into the controller or the offline program at this stage. You must first enter the I/O assignments, then use the **Write All** button on the Profibus -DP I/O dialog box to load the program.

---

## Updating Online/Offline Profibus Configuration

To update bus parameters and any previously-configured data slaves to the online controller or the offline program, you must use the Write All or Write Slave(s) button on the Profibus-DP I/O dialog box.

To write all configured slaves to the online controller or the offline program at one time, click on the Write All button.

To write selected slaves to the online controller or the offline program, click on the Write Slave(s). You can only Write Slave(s) with a Match or \*Match under status in the slave status window.

## Enable/Disable Profibus Slaves

To Enable or Disable a PROFIBUS slave status, you must use the Enable Slave(s) or Disable Slave(s) button on the Profibus-DP I/O dialog box.

## Deleting or Adding Slaves

To add or delete slaves or modules, you must return to COM PROFIBUS, modify your configuration file as appropriate, and export it again. Follow the procedure outlined in Merge COM PROFIBUS to import the new information by running Merge. You can, however, delete all slaves by clicking on the Delete All button on the Profibus-DP I/O dialog box.

## Assigning or Modifying Profibus I/O Addresses

To assign or modify the starting module addresses of your PROFIBUS-DP slaves, you must import either configuration data from the binary file that you created with COM PROFIBUS (described above); or connect to a 505 controller that contains PROFIBUS-DP slaves; or open an existing 505 SoftShop program from disk that contains PROFIBUS-DP slaves.

Follow the steps below to execute edit slaves:

1. Select **PLC Configuration** from the PLC Utilities menu.  
Result: The PLC Configuration dialog box appears (Figure 5.2).
2. Select the **Profibus I/O** button under I/O configuration on the PLC Configuration dialog box.  
Result: The Profibus-DP I/O dialog box appears (Figure 5.7).
3. Select the **Edit Slave** button on the Profibus-DP I/O dialog box.  
Result: The Edit Slave dialog box appears (Figure 5.8).

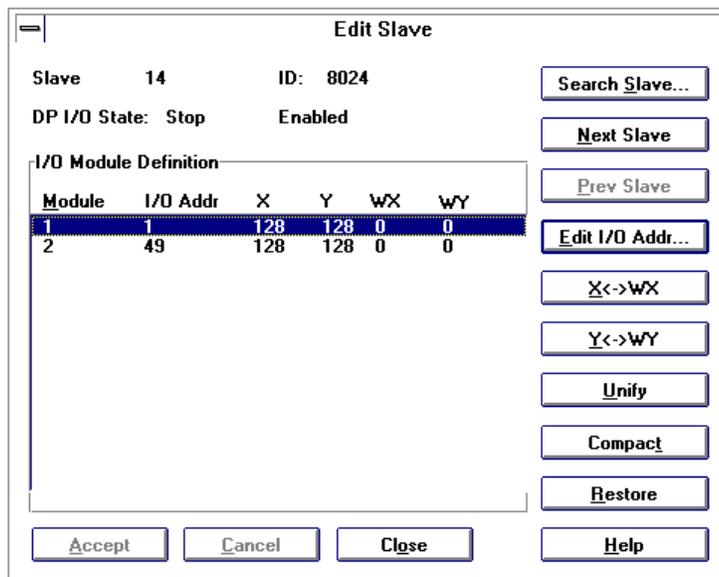


Figure 5.8

The Edit Slave dialog box allows you to perform the following tasks:

- The Search Slave button allows you to go to and edit other slave addresses without going back to the Profibus-DP I/O dialog box.
- The Next Slave button allows you to go to and edit the next slave address in numerical increasing order without going back to the Profibus-DP I/O dialog box.
- The Prev Slave button allows you to go to and edit the previous slave address in numerical decreasing order without going back to the Profibus-DP I/O dialog box.
- The Edit I/O Addr button allows you to change or program a slave's module's I/O address.
- The X<->WX button toggles 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.
- The Y<->WY button toggles 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.
- The Unify button moves 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.
- The Compact button moves all discrete image register types to word image register types for every module of the selected slave. It then unifies all the modules 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.
- The Restore button restores modules for the selected slave according to the COM PROFIBUS configuration, including the image register types. Zero addresses are assumed for all but the first address, which is kept.

Before entering your I/O configuration, be aware of the following restrictions:

- For bit or bit-and-word modules (but not for word-only modules), the number for the I/O address must begin on an 8-point boundary. An 8-point boundary is  $(n*8) + 1$ , e.g., 1, 9, 17, etc. Addresses not starting on an 8-point boundary are changed to do so when you write the values.
- SoftShop does not flag duplicate I/O points. However, the Find I/O functions under the PLC Configuration dialog box can be used to search for duplicate I/O points.

### To Edit the I/O Address:

1. Select the slave module number address to be edited by double-clicking on the module number, or by highlighting the module number and then clicking on the Edit I/O Addr. button.
2. Enter an I/O address that is a multiple of  $(n*8) + 1$ .
3. After entering the I/O address click on the Accept button, then the Close.
4. Click on the Write All button to send the configuration for all the slaves to the online controller or the offline program. Or click the Write Slave(s) button to send the selected slave number configuration to the online controller or the offline program.

---

**NOTE** The standard for PROFIBUS-DP I/O (DIN 19245, Part 3) stipulates certain bus parameters that cannot be changed while communications are in OPERATE mode. If you modified those bus parameters when you set up your configuration file in COM PROFIBUS, set communications to STOP mode before you execute Write All or Write Slave(s), in order to prevent bus errors.

---

## Profibus Operations

Profibus Operations allows you to change the operations mode from Operate to Stop, or Stop to Operate. You can also select from Synchronous to Asynchronous, or Asynchronous to Synchronous.

The Profibus Operations mode can be selected from the Profibus-DP I/O dialog box (Figure 5.7) by:

1. Clicking on the Profibus Ops. Button or selecting Profibus Operations from the PLC Utilities menu.  
**Result:** The Profibus Operations dialog box appears (Figure 5.9).

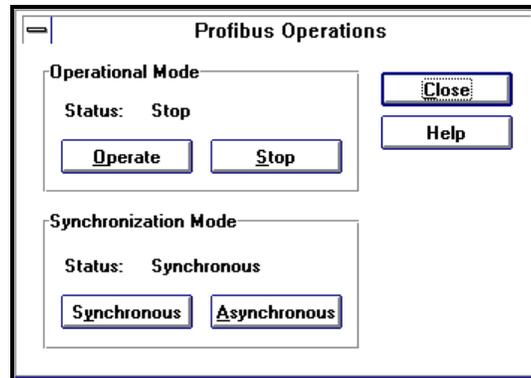


Figure 5.9

## Find Configured I/O

To find configured I/O:

1. Select PLC Configuration from the PLC Utilities menu.  
**Result:** The PLC Configuration dialog box appears (Figure 5.2).
2. Select the **Find I/O** button under I/O configuration on the PLC Configuration dialog box.  
**Result:** The Find I/O Address dialog box appears (Figure 5.10).

Figure 5.10

3. Enter an X, Y, WX, or WY address and click on the Find Next button.
4. Find will first search 505 I/O, then search PROFIBUS I/O. When the address is found, you can click on the Find Next button to find the next location of the address.

# 6 - Programming

## Overview

In this chapter, you will discover how to enter and modify logic using 505 SoftShop's features. Remember, in the Windows environment there is usually more than one way to complete a task. 505 SoftShop provides keyboard support to access all commands. You may find that the most efficient method of programming will be through a combination of keyboard and mouse techniques.

Refer to Appendix A for a concise list of keyboard supported commands.

## Online Versus Offline Programming

Before you begin programming, it is important that you understand the differences between programming online and programming offline.

While programming online, you are connected to a PLC, which may be running. Changing logic in one network may affect logic in another network. These changes may create unexpected or hazardous results.



### **Warning**

**Editing or modifying a program online may produce unexpected or hazardous results.**

In the online mode, PLC Status in Ladder can be displayed. However, some editing features are not available, including Cut and Paste.

## Using the Logic Editor

The Logic Editor is where to begin programming since it allows you to display, access, and/or modify logic in the active logic program. You can view existing programs, or you can create a new one.

To view an existing program:

1. Open or Import a logic program (see open program).
2. If there is logic in the program but does not appear, click  on the toolbar or select Logic Editor from the View menu.

## Programming Ladder

Several logic program windows can be displayed simultaneously. However, only one window is active at a time. In the active logic window, the ladder editor allows you to enter and modify ladder logic.

To make a logic window active, simply place the pointer on the desired window and click the left mouse button. From the keyboard, press Alt+W and press the number of the corresponding logic window. You will notice that the active window comes to the front of all other windows.

### Insert a New Network

In the active logic program window, you can insert a new network using the mouse or the keyboard.

To insert a new network using the mouse:

1. Click  (new network button) on the Toolbar. Notice that the new network attaches to the pointer.
2. Bring the pointer into the active logic window. Position the pointer where you want the new network.
3. Click the left mouse button. The new network is inserted. For example, if the cursor is positioned in Network 002, the new network becomes Network 002 and existing Network (002) becomes 003.
4. Repeat Step 3 to insert additional networks.
5. Remove the new network from the pointer by clicking the arrow on the Instruction Bar.

To insert a new network using the keyboard:

1. Press Alt+P and the Program menu drops down.
2. Press S or use the down arrow keys to highlight New Network and press Enter. The New Network dialog box appears.
3. Enter the number of the network you wish to enter. If a network 002 exists and you enter 2 in the Network Number box, the existing Network 002 becomes Network 003 and the new network becomes 002.
4. Press Enter and the new network is inserted.

5. Repeat Step 3 to enter additional networks.

## Insert a New Row

You can insert a new row to a network similar to inserting a new network. In the active logic program window, use the mouse or keyboard to place the cursor on an existing row in the network.

To enter a new row using the mouse:

1. Click  (new row) on the Toolbar. Notice that the new row attaches to the pointer.
2. Place the pointer in the position where you want the new row to appear.
3. Click the left mouse button and the new row is inserted.
4. Repeat Step 3 to insert additional rows.
5. Remove the new row from the pointer by clicking the arrow on the Instruction Bar.

To insert a new row using the keyboard:

1. Press the Insert key to turn the Ins mode on. See the Status Line near the bottom of the screen.
2. Use the arrow keys to position the parameter cursor (red or highlighted box) in the last row of the network.
3. Press Enter and the new row appears as the last row.
4. Repeat Step 3 to enter additional networks.

## Ladder Instructions

You can enter instructions into your ladder logic program efficiently using either the Instruction Bar (mouse) or the Menu Bar (mouse and/or keyboard). See Chapter 6 of the *545/555/575 Programming Reference Manual* (Order Number: PPXSS505-8101-1) for all RLL instructions.

### ***To enter instructions using the mouse and Instruction Bar:***

1. Move the pointer to the Instruction bar. If the instruction or Item bar is
2. Click with the left mouse button on the desired instruction on the lower half of the Instruction Bar. If the desired instruction is not displayed, click the appropriate instruction group on the top half of the instruction bar.
3. Move the pointer over the logic program. Notice that the instruction is attached to the pointer.
4. Position the pointer where you wish to place the instruction.
5. Click the left mouse button, and the instruction is placed in that location. If an instruction cannot be placed in that location, an error message is displayed.
6. If the sticky cursor has been turned on in the Program Setup under General then the instruction will remain attached to the pointer. Click the left mouse button once for each additional instruction you want to insert. Click the arrow in the middle of the Instruction Bar or another instruction to remove the instruction from the pointer.

7. If the sticky cursor has not been turned on in the Program Setup then after the instruction has been dropped into place the pointer returns to an arrow.

**To Enter Mnemonic Instructions with the Keyboard:**

1. In the active logic program, position the cursor (by using the arrow keys) where the instruction is to be located.
2. Type in the instruction mnemonic at the cursor location and press ENTER. If you forget an instruction mnemonic just enter a ? and press enter. The following mnemonic pick list will be displayed. Pick the mnemonic you desire by double clicking on the mnemonic or arrow to the mnemonic and press ENTER. The mnemonic pick list will also display if an illegal mnemonic is entered.

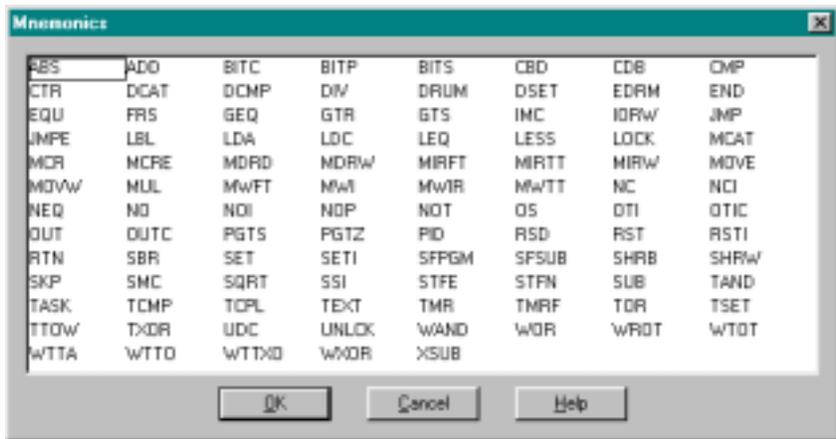


Figure 6.1

3. The following is a list of all 505 ladder instruction mnemonics:

Mnemonic	Instruction
ABS	Take absolute value of a word.
ADD	Addition.
BITC	Clears a specified bit.
BITP	Examines status of a specified bit.
BITS	Sets a specified bit.
J	Creates Down line
U	Creates Up line
H	Draws horizontal line
CBD	Converts binary to BCD value.
CDB	Converts BCD inputs to binary.
CMP	Compare.
CTR	Counts recurring events.
DCAT	Discrete control alarm timer.
DCMP	Compares current date with a specified date.
DIV	Division

<b>Mnemonic</b>	<b>Instruction</b>
DRUM	Simulates electro-mechanical stepper switch.
DSET	Sets date in real-time clock.
EDRUM	Simulates electro-mechanical stepper switch. Can be indexed by timer, event, or timer and event.
END	Unconditionally terminates a scan.
EQU	Equal to.
FRS	Force role swap
GEQ	Greater than or equal to.
GTR	Greater than.
GTS	Calls a subroutine.
IMC	Compares status of discrete points with a specified bit pattern in a set of patterns.
IORW	Does immediate read or write to discrete or word I/O.
JMP	Freezes outputs in zone of control.
JMPE	Freezes outputs in zone of control.
LBL	Selectively enable/disable program segments during scan.
LDA	Copies the logical address of a memory location into a memory location.
LDC	Copies the logical address of a memory location into a memory location.
LEQ	Less than or equal to.
LESS	Less than
LOCK	Used together with UNLOCK and provide a mechanism whereby multiple applications in the 575 system can coordinate access to shared resources.
MCAT	Motor control alarm timer.
MCR	Master control relay.
MCRE	Master control relay.
MDRMD	Drum; uses configurable mask to control coils.
MDRMW	Drum; uses configurable mask to write to words.
MIRF	Copies a table into the control relay memory or discrete image register.
MIRT	Copies status of control relays or discrete image register bits to table.
MIRW	Copies bit status from control relays or discrete image register to a word.
MOVE	Copies bytes, words, or long words from a source location to a

<b>Mnemonic</b>	<b>Instruction</b>
	destination location.
MOVW	Copies words from one location to another.
MUL	Multiplication
MWFT	Move word from table.
MWI	Copies words from one location to another using indexed addresses.
MWIR	Copies bits of a word to the discrete image register, or the control relay memory.
MWTT	Copies a word to a table.
NC	Normally closed contact.
NEQ	Not equal to.
NO	Normally open contact.
NOP	No operation.
NOT	Inverts power flow.
OS	Turns on output for a single scan.
OTI	Immediate coil
OTIC	Immediate closed coil
OUT	Coil
OUTNC	Coil Normally Closed .
PGTS	Calls an RLL subroutine and passes parameters to it.
PGTSZ	Calls an RLL subroutine and passes parameters to it. Discrete parameters indicated as outputs are cleared when the subroutine is not executed.
RET	
RSD	Transfers a PROFIBUS-DP slave's current diagnostic to user memory.
RST	Reset coil/bit.
RSTI	Immediate reset of a coil/bit.
SBR	Designates the beginning of an RLL subroutine.
RTN	Returns control from an RLL subroutine to the main RLL program.
SET	Set coil/bit.
SETI	Immediate set of a coil/bit.
SFPGM	Calls a special function program from RLL.
SFSUB	Calls a special function subroutine from RLL.
SHRB	Bit shift register.
SHRW	Word shift register.
SHT	
SKP	Selectively enable/disable program

<b>Mnemonic</b>	<b>Instruction</b>
	segments during scan.
SMC	Compares status of discrete points with a set of specified bit patterns.
SQRT	Square Root.
SSI	Scan synchronization inhibit
STFE	Searches for a word in a table equal to a specified word.
STFN	Searches for a word in a table not equal to a specified word.
SUB	Subtraction
TAND	ANDs the corresponding bits in two tables.
TASK	Start a new RLL program segment.
TCMP	Compares current time with a specified time.
TCPL	Inverts status of each bit in a table.
TEXT	Places textual information into L-Memory.
TMR	Times events.
TMRF	Times events.
TOR	ORs the corresponding bits in two tables.
TSET	Sets time in real-time clock.
TTOW	Copies a word from a table.
TXOR	Does an EXCLUSIVE OR on the corresponding bits in two tables.
UDC	Counts events up or down.
UNLCK	Used together with LOCK and provide a mechanism whereby multiple applications in the 575 system can coordinate access to shared resources.
WAND	Does logical bit-by-bit AND on two words.
WOR	Does logical bit-by-bit OR on two words.
WROT	Rotates the 4-segment bits of a word.
WTOT	Copies a word into a table.
WTTA	ANDs bits of a word with the bits of a word in a table.
WTOO	ORs bits of a word with the bits of a word in a table.
WTTXO	Does an EXCLUSIVE OR on the bits of a word with the bits of a word in a table.
WXOR	Does logical bit-by-bit EXCLUSIVE OR on two words.
XSUB	Calls an externally developed subroutine and passes parameters to

Mnemonic	Instruction
	it.

If the TISOFT mode is turned on in the program setup (see Ladder options under LOGIC tab in Program Setup) the following list of the function key alternatives and the CTRL/ALT functions are available.

Key	Comment
Y	COILS Valid if cursor is in an output column
C	COILS Valid if cursor is in an output column
WY	COILS Valid if cursor is in an output column
V	COILS Valid if cursor is in an output column
G	COILS Valid if cursor is in an output column
W	COILS Valid if cursor is in an output column
X	CONTACTS Valid if cursor is in an input column
Y	CONTACTS Valid if cursor is in an input column
C	CONTACTS Valid if cursor is in an input column
WX/WY	CONTACTS Valid if cursor is in an input column
V	CONTACTS Valid if cursor is in an input column
K	CONTACTS Valid if cursor is in an input column
G	CONTACTS Valid if cursor is in an input column
W	CONTACTS Valid if cursor is in an input column
/	Open/closed contact/coil toggle
DEL	Delete current element
END	Moves to last column/row 1 of current rung
ENTER	Edit: moves to next row, current rung, or to next rung
	Display: moves to next row or rung
=	Equal-to Relational Contact
ESC	Deletes current address and puts you into edit mode for address.

TAB	Deletes current address and puts you into edit mode for address.
>	Greater-than-or-Equal-to Relational Contact
? or \	List mnemonics for current field
HOME	Moves to column 1, row 1 of current rung
H	Draws horizontal line

Key	Comment
N	Deletes horizontal line
I	Immediate contact and coil
INS	Insert Mode
<	Less-than Relational Contact
!	Not-Equal Relational Contact
O	Create/edit output coil
PgUp	Page Up
PgDn	Page Down
Ctrl L	Edits synonym/descriptor
U	UNFORCE
Ctrl U	Usage Table
J	Creates Down line
U	Creates Up line
M	Deletes vertical line

# Using the SF Program and Subroutine Editor

The SF Program and Subroutine Editor gives you the ability to display, access, and/or modify program using special functions. See Chapter 7 of the *545/555/575 Programming Reference Manual* (Order Number: PPXSS505-8101-1) for all Special Function instructions.

To access the Special Function Program Editor:

1. Click Special Function Program Editor from the View menu (Alt+V, F). The Special Function Program dialog box appears (see Figure 6.1a).

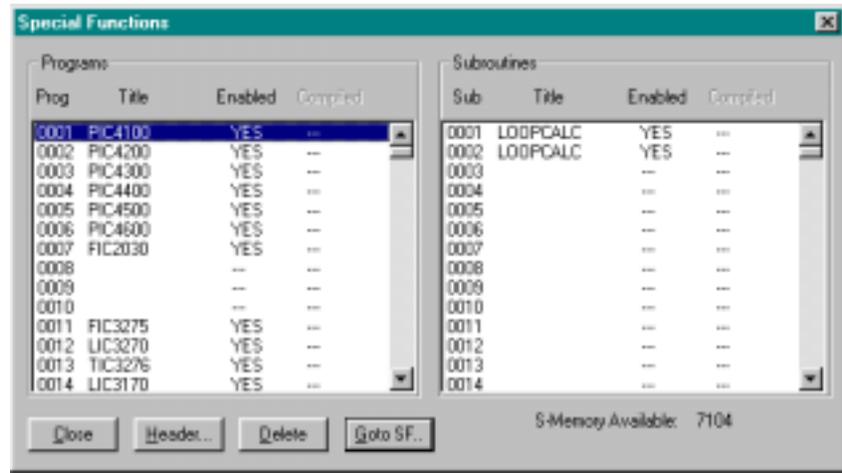


Figure 6.1a

2. Select the Special Function Program that you want to enter (Program 1, Program 2, etc.) by using the left mouse button or the Tab and Arrow keys on the keyboard. (Note: If a Header has already been programmed, skip ahead to item number 10.)
3. Now Click on the Header button and the following dialog box appears (see Figure 6.2).

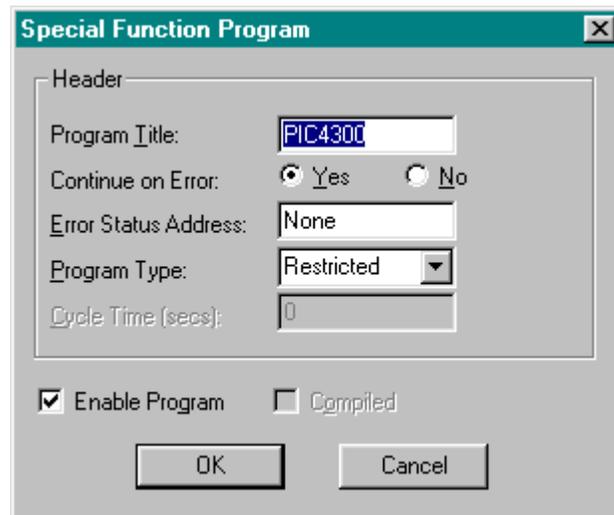


Figure 6.2

4. Enter a title for the program in the Program Title window. The title is optional and can be left blank.
5. Click Yes or No in the Continue On Error selection to have the program continue or stop when an error occurs.
6. Select the Program Type from the Combo Box.
7. Enter the cycle time in seconds (0.5-6553.5).
8. Check the Enable Program to allow execution of the SF program.
9. For the 555-1105/-1106 and 575-2105/-2106 CPUs, the compile mode is selectable. When compiled mode is selected, the SF program or subroutine is translated to the native instruction set of the CPU's microprocessor. The compiled code is then executed whenever the program or subroutine is scheduled for execution. The advantages of compiled execution are:
  - Significant execution speed improvement. For example, a MATH statement that adds two floating-point values will execute in less than 10  $\mu$ s when compiled, versus more than 100  $\mu$ s when executed by the SF interpreter. Depending on the program's size and the placement of the target LABEL within the program, a GOTO statement may take 1 ms or more when executed by the interpreter. Compiled execution of a GOTO statement takes less than 1 microsecond no matter where in the program the LABEL is located. This represents a 1,000x improvement.
  - A compiled SF program or subroutine can be executed in-line to the user RLL program. This means that when the enable input to the SFPGM or SFSUB box instruction is on, the program or subroutine is executed immediately and its result is available for use in the next rung of the current RLL scan.
10. There are several reasons to choose interpreted mode for a SF program. The primary reasons are as follows:
  - If the program has one or more statements that are not allowed in a compiled program, or if it calls a subroutine that is not compiled, then it may not be compiled.
  - A compiled program requires both S-Memory and Compiled Special (CS)-Memory, while an interpreted program requires only S-Memory. As a rule of thumb, the compiled code for a SF program requires twice as much CS-Memory as S-Memory. For example, a SF program that uses 1 Kbyte of S-Memory also uses 2 Kbytes of CS-Memory.
  - A second SF program or subroutine on the same execution queue cannot pre-empt a compiled SF program or subroutine. This may present a scheduling problem for a cyclic, loop, or analog alarm queue. For example, if a compiled program is executing on a loop setpoint, a higher priority loop will not execute until the compiled program completes. This is not a problem if the program's execution time is small. However, if the program requires significant execution time, this could cause unnecessary loop overruns.

---

**NOTE** Most SF programs and subroutines can be compiled. However, an SF program or subroutine which contains any of the following instructions cannot be compiled: The data compacting instructions: PACK, PACKLOOP, PACKRS, and PACKAA The shift register instructions: SSR, FTSR-IN and FTSR-OUT The PRINT instruction The BCD instructions: BCDBIN and BINBCD Additionally, the CDT and SDT instructions, when used in a compiled SF program or subroutine, must specify a static table; that is, the table's base address must be a V, K, G, VMS, or VMM address and the table's size must be specified as a constant.

---

11. Save Header changes and return to the SF Programs Subroutines dialog box by clicking on OK. To disregard changes and return to the SF Programs Subroutines dialog box, click Cancel.

## Insert a New Row

You can insert a new row to a Special Function Program similar to inserting a new network. In the active logic program window, use the mouse, or keyboard to place the cursor on an existing row in the Special Function Program.

To enter a new row using the mouse:

1. Click  (new row) on the Toolbar. Notice that the new row attaches to the pointer.
2. Place the pointer in the position where you want the new row to appear.
3. Click the left mouse button, and the new row is inserted.
4. Repeat Step 3 to insert additional rows.
5. Remove the new row from the pointer by clicking the arrow on the Instruction Bar.

To insert a new row using the keyboard:

1. Press the Insert key to turn the Ins mode on. See the Status Line near the bottom of the screen.
2. Use the arrow keys to position the parameter cursor (red or highlighted box) in the last row of the Special Function Program.
3. Press Enter and the new row appears as the last row.
4. Repeat Step 3 to enter additional rows.

## Entering Special Function Program Instructions

You can enter instructions into your Special Function Program efficiently using either the Instruction Bar or Menu Bar.

To enter instructions using the Instruction Bar:

1. Move the pointer to the Instruction bar.
2. Click with the left mouse button on the desired instruction on the lower half of the Instruction Bar. If the desired instruction is not displayed, click the appropriate instruction group on the top half of the instruction bar.
3. Move the pointer over the Special Function Program. Notice that the instruction is attached to the pointer.

4. Position the pointer where you wish to place the instruction.
5. Click the left mouse button, and the instruction is placed in that location. If an instruction cannot be placed in that location, an error message is displayed.
6. The instruction remains attached to the pointer. Click the left mouse button once for each additional instruction you want to insert. Click the arrow in the middle of the Instruction Bar or another instruction to remove the instruction from the pointer.

Using the menu to enter instructions with the keyboard:

1. In the active Special Function Program, use the arrow keys to move the cursor to the spot you wish to place the instruction.
2. Type in the character numonic for the instruction or Press Alt+P, I to open the Selection Instruction dialog box from the Program menu.
3. Use the arrow keys to move up and down the Group and Instruction scroll boxes, and the Tab key to move between the boxes.
4. Highlight desired instruction, and press Enter to insert the instruction.
5. Repeat Steps 1 through 5 for each instruction you want to enter.

## Editing Logic

505 SoftShop uses a number of time-saving editing features to help you complete your programming tasks. These include:

- Cut
- Copy
- Paste
- Paste with Rewire
- Insert
- Clear
- Delete

These editing features are accessed through the Edit menu and keyboard commands. Please see Chapter 3, *505 SoftShop Basics*, for a more complete description of the editing features.

Cut, Copy, and Paste are probably the most frequently used editing features. The list below describes Cut, Copy, and Paste differences.

Cut	Removes the selection from the program and places it in the clipboard.
Copy	Copies the selection and places it in the clipboard.
Paste	Inserts clipboard contents into the program at the cursor location.
Paste With Rewire	Inserts clipboard contents into the program at the cursor location and allows the user to re-address any addressable items contained in the clipboard. You can also copy tags and descriptions.

### Cut

To use the cut feature:

1. Select the information you want to cut. You can cut parts of a network, all of a network or multiple networks.
2. Cut your selection to the clipboard with one of the following:
  - Click  on the toolbar.
  - Select Cut from the Edit menu.
  - Press Ctrl+X.

## Copy

To use the copy feature:

1. Select the information you want to cut. You can cut parts of a network, all of a network or multiple networks.
2. Copy your selection onto the clipboard with one of the following:
  - Click  on the toolbar.
  - Select Copy from the Edit menu.
  - Press Ctrl+C.

## Paste

To access the paste feature:

1. Move the cursor to the desired location.
2. Paste clipboard contents into the new location with one of the following:
  - Click  on the toolbar.
  - Select Paste from the Edit menu.
  - Press Ctrl+V.

---

**NOTE** When pasting, clipboard contents are inserted before existing items. For example, if you are pasting a network and the cursor is positioned at Network 2, click paste and the clipboard contents become Network 2. The previous Network 2 becomes Network 3.

---

## Paste With Rewire

Paste With Rewire allows you to past the contents of the clipboard and change the elements address at the same time.

To access the rewire feature:

1. Move the cursor to the desired location.
2. Paste clipboard contents into the new location.
3. Select Paste with Rewire from the Edit menu.
4. Choose the appropriate options. You can select the number of copies you wish to copy and/or you can select to offset each address by a certain value. If the addresses you select have descriptions or tags associated with them, you can choose to paste those also.

---

**NOTE** When pasting with rewire, valid addresses for instructions are not checked until you “Validate and Enter Logic.”

---

5. Choose OK.

---

**NOTE** When pasting with rewire, clipboard contents are inserted before existing items. For example, if you are pasting a network and the cursor is positioned at Network 2, click paste and the clipboard contents become Network 2. The previous Network 2 becomes Network 3.

---

## Clear

Use Clear to clear an item without removing the space it occupies.

To clear an item or items:

1. Select the item or items you want to clear by clicking, holding and dragging the pointer over the desired logic.
2. Select **C**lear from the **E**dit menu or press the Delete key.
3. Click the items you want to clear.
4. Click OK or press Enter and the selected items are cleared.



## Warning

**Editing or modifying a program online may produce unexpected or hazardous results.**

## Delete

Use Delete to clear an item and remove the space it occupies.

To delete:

1. Select the item or items you wish to delete.
2. Select **D**efine from the **E**dit menu. The Delete box appears.
3. Click the items you want to delete.
4. Click OK or press Enter.

## Insert

Use Insert to insert a selected object (network, row or column) at the point of the current cursor position.

To insert an object:

1. Select **I**nsert from the **E**dit menu. The Insert dialog box will appear.
2. Click on the object you want to insert.
3. Click OK or press Enter.

## Right Mouse Button Pop-Up Menu

The menu items available with the right mouse button are as follows:

<u>U</u> ndo	Ctrl+Z
Cu <u>t</u>	Ctrl+X
<u>C</u> opy	Ctrl+C
<u>P</u> aste	Ctrl+V
C <u>l</u> ear...	Del
<u>D</u> elete...	
<u>I</u> nsert...	F3
<u>A</u> ppend	F4
<u>F</u> ind...	Ctrl+F
Find <u>N</u> ext	
<u>R</u> eplace...	Ctrl+R
<u>N</u> etwork Cross Reference..	
Address Trace...	
<u>U</u> nique Address...	
<u>S</u> ticky Cursor	
PLC <u>O</u> perations	

Figure 6.5

## Validate and Enter

While programming in online or offline mode, logic must be validated and entered before it can be saved to disk or transferred online. To validate and check your logic:

1. Press function key F8, click  on the toolbar or select Validate and Enter from the Program menu.
2. The message "Validating and Enter" appears on the screen.
3. After logic is validated and entered and, if necessary, problems fixed, the logic program can be saved or transferred online.

## Finding Logic

You can use the Find command on the Edit menu to search for the following functions within the active logic window.

- Find elements in ladder, SF programs, and SF subroutines with designated elements and identifiers.
- Find a Specific network number, network address, address/tag, instruction, or instruction number.

Use the following steps to conduct a search for the desired item.

### To Find a Network, Network Address or Line Number

1. Click  on the toolbar or select Find from the Edit menu (Ctrl+F), and the Find dialog box appears (Figure 6.6).

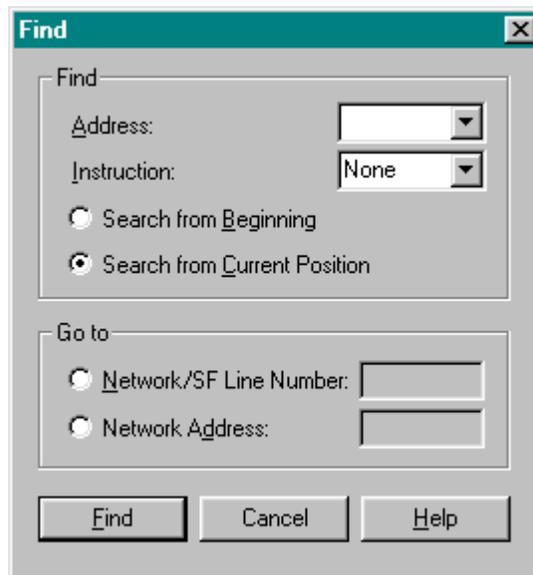


Figure 6.6

2. Click in the Go to group **Network/SF Line Number** radial button to find a specific network number or special function line number. Click the **Network Address** radial button to find a specific network address.
3. In the **Network/SF Line Number** or **Network Address** enter box; type the number of the network, network address or line number you wish to find.
4. Click **Find** to begin the search. If the item is found, the Find box disappears, and the cursor moves to the network, network address or line number you wanted to find.
5. Click Cancel to disregard the search and return to the active logic program.

## To Find an Address or Tag

1. Click  on the toolbar or select **F**ind from the **E**dit menu (Ctrl+F), and the Find dialog box appears (Figure 6.6).
2. In the Search box, identify where you want to start the search from, either the Beginning of the program or Current position of the cursor.
3. In the Address box, type the address or tag you wish to find. If no address or tag is entered, the Find will locate all instruction identified in the Instruction selection box.

---

**NOTE** The last five address/tags searched for are saved. Click on the down arrow within the address field to display and/or select them.

---

4. In the Insurrection field, select the instruction group to search on:
  - Contact, coil, timer, etc. for ladder.

If none is selected, the Find will locate all Instruction items with the selected address or tag.

5. Click OK to begin the search. If the item is found, the Find box disappears, and the cursor is positioned over the address.

6. Click Cancel to disregard the search and return to the active logic program.

### Find Next



Click  on the toolbar or select Find Next on the Edit menu to find the next occurrence of an address or tag.

## Search and Replace Address

You can use the Replace command on the Edit menu to search for a specified address and replace them with another address. The following logic windows support Search and Replace by address:

- SF programs
- SF subroutines
- Ladder Editor
- Alarms
- PID Loops

Use the following steps to conduct a Search and Replace Address:

1. From the Edit menu (Ctrl+R), select **Replace**, and the Replace dialog box appears (Figure 6.6a).

Figure 6.6a

2. Specify the address number to be replaced in the Find What field and the address replacing it in the Replace With field. For example, to replace C1 with C2, simply type these two address numbers in the Find What and Replace With field respectively. With this setting, all occurrences of address C1 are Changed to address C2 for the selected logic type range.
3. Specify the logic type by clicking on the drop-down box in the **Where** field and selecting one of the 5 logic types.
4. In the From Rung To Rung fields, specify the search range for the replacement address. If no range is selected, the software defaults to the total number of networks/lines in the target logic type.
5. **Confirm.** When the Confirm check box is not chosen on the Replace dialog box, the program automatically changes all Find What addresses to Replace With addresses. When the Confirm check box is chosen on the Replace dialog box, the program displays each address where the Replace is to occur. The address to be replaced is surrounded by a red outlined rectangle and the following options are displayed in Figure 6.6b.



Figure 6.6b

- Click the **Replace** button to perform the specified replacement.
  - Click the **Skip** button to skip the address and go on to the next item to be replaced.
  - Click the **Stop** button to Cancel the Replace operation and return to the specified logic window.
6. **Skip on Error.** When the Skip on Error's check box is chosen on the Replace dialog box. The program will skip illegal replacements and go on to the next item to be replaced automatically. If skip is not chosen the program will flag illegal replacements and the following options are displayed in Figure 6.6c.



Figure 6.6c

- Click the **Skip** button to skip the address and go on to the next item to be replaced.
- Click the **Stop** button to Cancel the Replace operation and return to the specified logic window.

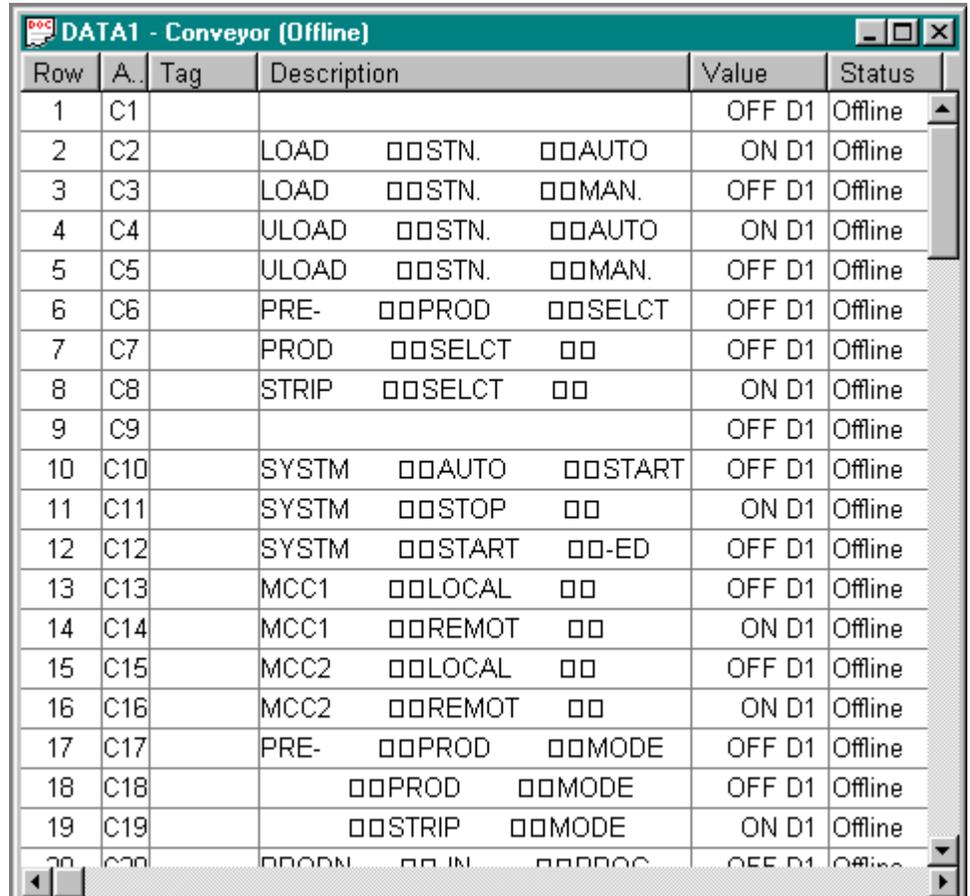
## Using the Data Window

The Data Window menu item opens a new window and allows you to view and change the data values of your program.

Once you display addresses in the Data Window, you can enter specific values. If monitoring data online, you can enter a value for a particular address, send it directly to the processor, and you can force I/O address on and off.

You can also create tables of addresses, store them on a disk, and transfer them to the PLC at a later time.

1. With a logic program open, click  on the toolbar or select Data Window from the View menu. The Data Window dialog box appears (Figure 6.7).
2. Use the Program Setup from the Options menu or the right mouse menu to change which columns are displayed in the Data Window. See *Program Setup* in Chapter 4.



Row	A.	Tag	Description	Value	Status
1	C1			OFF D1	Offline
2	C2		LOAD <input type="checkbox"/> STN. <input type="checkbox"/> AUTO	ON D1	Offline
3	C3		LOAD <input type="checkbox"/> STN. <input type="checkbox"/> MAN.	OFF D1	Offline
4	C4		UNLOAD <input type="checkbox"/> STN. <input type="checkbox"/> AUTO	ON D1	Offline
5	C5		UNLOAD <input type="checkbox"/> STN. <input type="checkbox"/> MAN.	OFF D1	Offline
6	C6		PRE- <input type="checkbox"/> PROD <input type="checkbox"/> SELCT	OFF D1	Offline
7	C7		PROD <input type="checkbox"/> SELCT <input type="checkbox"/>	OFF D1	Offline
8	C8		STRIP <input type="checkbox"/> SELCT <input type="checkbox"/>	ON D1	Offline
9	C9			OFF D1	Offline
10	C10		SYSTEM <input type="checkbox"/> AUTO <input type="checkbox"/> START	OFF D1	Offline
11	C11		SYSTEM <input type="checkbox"/> STOP <input type="checkbox"/>	ON D1	Offline
12	C12		SYSTEM <input type="checkbox"/> START <input type="checkbox"/> -ED	OFF D1	Offline
13	C13		MCC1 <input type="checkbox"/> LOCAL <input type="checkbox"/>	OFF D1	Offline
14	C14		MCC1 <input type="checkbox"/> REMOT <input type="checkbox"/>	ON D1	Offline
15	C15		MCC2 <input type="checkbox"/> LOCAL <input type="checkbox"/>	OFF D1	Offline
16	C16		MCC2 <input type="checkbox"/> REMOT <input type="checkbox"/>	ON D1	Offline
17	C17		PRE- <input type="checkbox"/> PROD <input type="checkbox"/> MODE	OFF D1	Offline
18	C18		<input type="checkbox"/> PROD <input type="checkbox"/> MODE	OFF D1	Offline
19	C19		<input type="checkbox"/> STRIP <input type="checkbox"/> MODE	ON D1	Offline
20	C20		<input type="checkbox"/> PROD <input type="checkbox"/> MODE	OFF D1	Offline

Figure 6.7

3. Type an address or tag in the address field.
4. Press Enter to accept the address/tag.
5. Press Ctrl L on the Description or Tag column to bring up the documentation editor.
6. Repeat Steps 2 and 3 for each value you want to view. After entering a value, use Next Address (F5) to move down one cell and fill in the next address or tag, or Previous Address (F6) to move up one cell and fill in the previous address or tag. Both Next Address and Previous Address are located in the Data menu or by clicking the right mouse button.
7. Select Clear from the Edit menu if you want to clear a row or rows. Select Delete from the Edit menu to delete a row or rows; subsequent rows will move up.
8. Windows selection techniques can be employed here. See Chapter 3, "Some Things You Should Know About Windows."
9. You can create tables of addresses, store them to a file, and load them again offline or online. To save a list of addresses,

- select **S**ave Template from the **D**ata menu. To load a list of addresses, select **L**oad Template from the **D**ata menu.
10. Select **O**n/**O**ff from the right mouse menu to set or reset bit addresses.
  11. Select **F**orce **O**n/**O**ff from the right mouse menu to force on or off bit addresses.
  12. Select **F**orce **W**ord from the right mouse menu to force a word address.
  13. Select **C**lear **F**orce from the right mouse menu to clear the forced address.
  14. Use **C**lear **A**ll **F**orces from the right mouse menu to clear all forced addresses.
  15. Press **S**how forces from the right mouse menu to display all forced addresses. You will be prompted to enter a starting address, and any addresses that are forced will be displayed.
  16. Press **S**tatus **O**n/**O**ff from the right mouse menu to turn off the status updates.
  17. Select **F**ill from the right mouse menu to enter addresses from the current location with the next addresses, until the end of the window is reached. For instance, if your current address location is 3000 in the fifth row, pressing **F**ill will enter the addresses starting in row 6 with address 30002, etc.
  18. Double-click the **C**ontrol **M**enu box in the upper left corner of the active window to exit the **D**ata **W**indow.

## Customizing the Display

The **D**ata **W**indow can be customized to display **T**ags, **D**escriptions, both **T**ags and **D**escriptions, or neither. These columns can be displayed if selected in the **P**rogram **S**etup.

To modify the display, select **O**ptions, **P**rogram **S**etup (**A**lt+**O**, **P**). In the **D**ata **W**indow **T**ab dialog section, click on **T**ag to include tags and/or click **D**escriptions to include **D**escriptions. **D**e-select both if you do not want to include **T**ags and **D**escriptions. For more **D**ata **W**indow display options See *Program Setup* in Chapter 4.

## Data Format

1. **D**ata **F**ormat is available for byte, word and double word addresses. Select **F**ormat from the **D**ata menu while in the **D**ata **W**indow. The **D**ata menu is available only while in the **D**ata **W**indow. The **F**ormat dialog box appears (Figure 6.8).

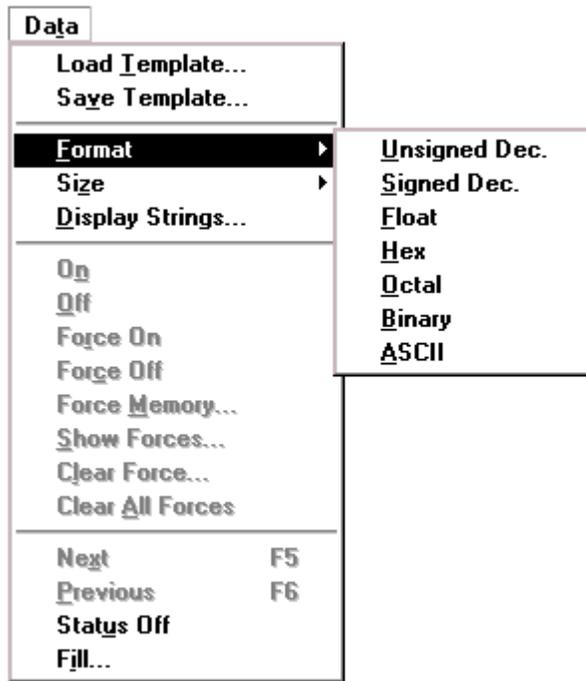


Figure 6.8

2. Click the desired data format. For the String field, you can enter the number of characters to be displayed (from 1-64).
3. Click OK to select the format and return to the Data Window.

## Forcing an Element

As a troubleshooting tool, control relays can be forced. The force attribute bit, also shown in Figure 6.8a, provides a single-bit memory location for storing the forced status of control relays. If a control relay has been forced, the control relay retains that forced status during a power cycle as long as the battery is good.

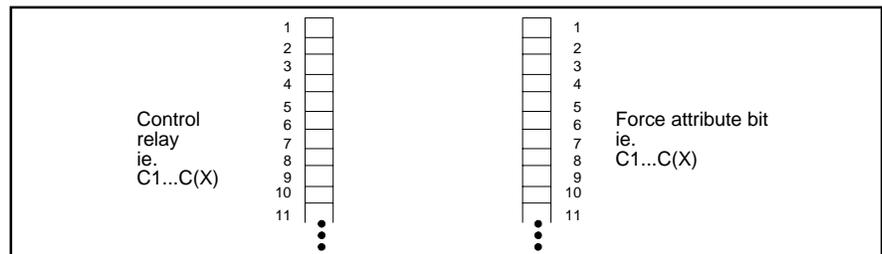


Figure 6.8a

You can force an element from either Data Window or Ladder logic editor complete the following steps.

From the Data Window:

1. Click on the right mouse button while in the Data field of an Element or the Data menu while in the Data field of an Element.

2. From the menu select the type of forcing action you would like to do.

From the Ladder Logic:

1. From the Ladder Editor select the element to force.
2. While on the element select the Diagnostics menu. From the menu select the type of forcing action you would like to do.

## Show Forces

To show all forced elements complete the following steps.

1. Select the Data Window from the View menu.
2. Once in the Data Window click on the right mouse button or left click on the Data menu.
3. Select Show Forces from the menu.

## Clear a Forced Element

To Clear a Forced Element from either Data Window or Ladder logic editor complete the following steps.

From the Data Window:

1. Click on the right mouse button while in the Data field of an Element or the Data menu while in the Data field of an Element.
2. From the menu select the type of forcing action you would like to do.

From the Ladder Logic:

1. From the Ladder Editor select the element to force.
2. While on the element select the Diagnostics menu. From the menu select the type of forcing action you would like to do.

# Complete Cross Reference

In both online (network mode only) and offline programming, you can track addresses in a program by viewing the Cross Reference table.



Click  on the toolbar or select Cross Reference from the View menu. The Cross Reference window appears, Figure 6.8b. If you have more than one program loaded, the information displayed is for the program in the active window. The cross reference can be based on address or networks by checking the desired radio button on the cross-reference dialog box.

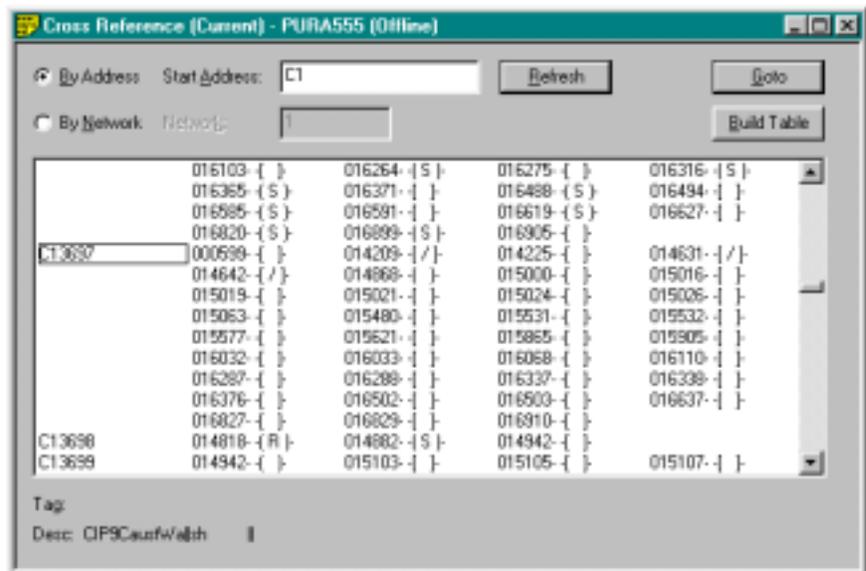


Figure 6.8b

---

**NOTE** Only validated and entered logic is considered part of the current program. Thus, logic not entered and validated will not show in the Cross Reference Table. See Validate and Enter Logic in this chapter.

---

2. Type in the starting address in the corresponding address box or network number in the corresponding network box, if selected. Click on the Refresh button. The cross-reference will display the selected information in the view window. The address is displayed on the left side with the network number next to the element. The Tag and Description of the selected address are displayed on the bottom left of the screen.
3. Select the logic item you want to view from the view window. Click the Goto button to jump to the first occurrence of the address you have highlighted or you can double click on the item to do the same.

---

**NOTE** If the Cross-Reference Table Status is not current, the title line gives the current status of the cross-reference, click the Build Table button to update the table.

---

4. Close the Cross Reference window by double clicking on the Control-menu box in the upper right corner of the Cross Reference window.

---

**NOTE** If you have Table Update checked in the Program Setup, all changes made to segments that are validated and entered are automatically updated in the Cross Reference window.

---

# Ladder Network Cross Reference

In both online and offline programming, you can track addresses in a program by viewing the Cross Reference table.

1. Position the cursor over the instruction address to cross-reference. Select **N**etwork Cross Reference from the **V**iew menu. The Network Cross Reference window appears (see Figure 6.9). If you have more than one program loaded, the information displayed is for the program in the active window.

---

**NOTE** Only validated and entered logic is considered part of the current program. Thus, logic not entered and validated will not show in the Cross Reference Table. See *Validate and Enter Logic* in this chapter.

---

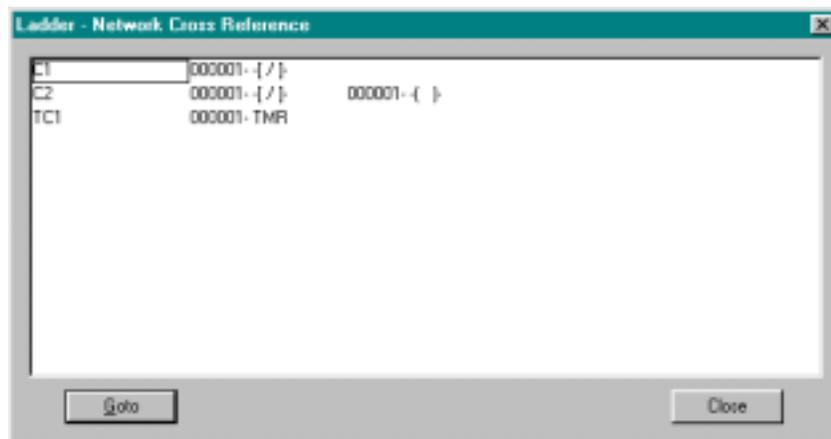


Figure 6.9

2. The complete address information appears in the Ladder - Network Cross Reference Item box.

---

**NOTE** To get a complete Cross-Reference list (including tags and descriptions), use the Cross-Reference feature in *Print*. Refer to *Print* in Chapter 3 for more information.

---

3. Scroll through the list of addresses in the Cross Reference dialog box and pick the instruction address of the logic you want to view more closely.
4. Click the Goto button to jump to the logic of the first occurrence of the address you have highlighted.
5. Close the Cross Reference window by double clicking on the Control-menu box in the upper right corner of the Cross Reference window.

# Address Used

To show if specific elements are used in your program, you can build an element usage listing. The following element types can be shown in the Ladder Element Used Table.

X	WX	C	K	TC	SHR	OS
Y	WY	V	STW	DRM	MWT	

## Creating an Address Used Listing

To create an element usage listing both online and offline programming, you can track addresses in a program by viewing the Address Used Listing.

1. Select Address Used Listing from the View menu. The Address Used Listing window appears (Figure 6.09b). If you have more than one program loaded, the information displayed is for the program in the active window. The Address Used Listing uses information from the Cross Reference Table. If the Cross Reference Table is not current, a warning will appear to build the table.

**NOTE** Only validated and entered logic is considered part of the current program. Thus, logic not entered and validated will not show in the Address Usage Listing. See Validate and Enter Logic in this chapter.

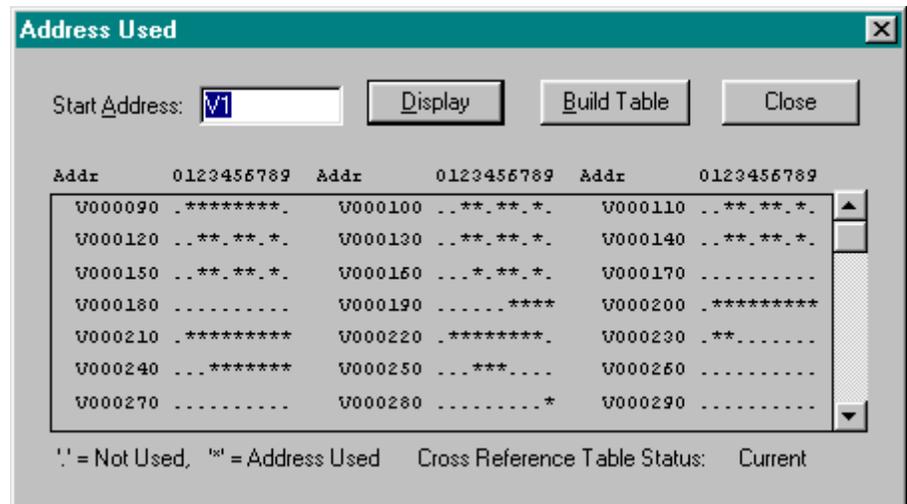


Figure 6.09b

2. Type in the address or tag in the corresponding Address box. The starting address will default to C1 or the last address selected in the active program window. Whether Address or Tag is displayed is determined in the Program Setup. The box below the Address/Tag input box contains all addresses used in the active program. Elements are shown on the display in increments of 10 (C0, C10, C20, etc.). Usage of the points between is shown in the adjacent column from 0 through 9 (C1 under 1, C2 under 2, etc.). You receive a display showing use of the selected elements according to the following table:

Blank	Point does not exist.
Dot (.)	Point is not used in the program.
Asterisk (*)	Point is used in the program

3. Scroll through the list of addresses on the right side of the Address Used Listing dialog box to select the next grouping of addresses.
4. Click on the Address input box to start usage list from another address or tag. Repeat Steps 2 through 4 for each item you want to find.
5. Close the Address Used Listing window by double clicking on the Control-menu box in the upper right corner of the Address Used Listing.

---

**NOTE** If you have Table Update checked in the Program Setup, all changes made to logic that are validated and entered are automatically updated in the Address Used Listing.

---

## Address Trace

The Address Trace is an online or off-line ladder scan for a specific address. The search address is based on the cursor position.

The Trace scans for address instances based on the type of instruction the address is found. If the cursor is located on an input instruction, then the corresponding address for the output instruction is searched for. If the cursor is located on an output instruction then the corresponding address for the input instruction is searched for. Each time the Trace function is selected a new addresses search is invoked.

The address supported by trace are: X, Y, C, WX, WY, K, V, TCP, TCC, STW, DSP, DCP, DSC, DCC, all Gs, VMM, VMS, DRUM, MOVE, OS, TIMER and COUNTER. Trace does not work however, on expression parameters in SFSUB.

### Invoking Address Trace

To create an Address Trace both online and offline:

Select Address Trace from the **V**iew menu. The Address Trace window appears (Figure 6.09c). If you have more than one program loaded, the information displayed is for the program in the active window.

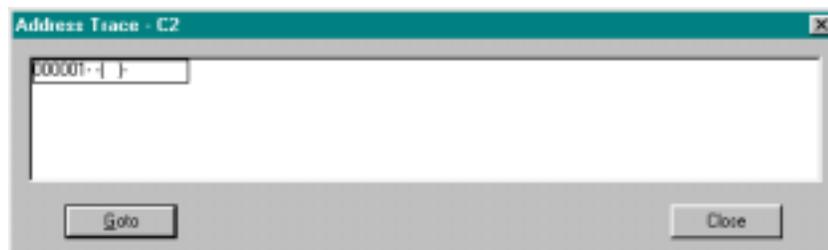


Figure 6.09c

The list box has five columns each one holds a location. The location consists of rung number and item found. The list box displays the locations in order of rung number.

The GOTO button closes the Address Trace window and places the cursor in ladder logic window at the network number selected in the Address Trace list box.

Close or ESC or clicking on the X in the upper right corner of the dialog closes the dialog.

## Unique Address

Unique determines if an element already exists in your ladder program and, if so, gives you the location. For example, if a TIMER is needed for a new feature, you can use the Unique function to see if TMR $nnnn$  is already used. Since a TMR is a global memory box, 505 SoftShop also checks to see if any TMR, TMRF, CTR, UDC, MCAT, or DCAT has the same  $nnnn$  designator.

---

**NOTE:** Unique checks only for occurrences of the designated element in L-memory. It does not search for an element in Loops, Analog Alarms, SFPGMs, SFSUBs, Intelligent I/O, or Operator Interface devices.

---

To access the Unique function: Select an item in the logic window to search on. Then select Unique Address from the View menu. The Unique Address window appears.

The two results of the search are:

- Address exists only at current network.
- Address exist at network number XXXX.

If you have more than one program loaded, the information displayed is for the program in the active window only.

## Compare

File Program Compare compares,

- Ladder
- Forced Word I/O
- Forced Discrete I/O
- Forced Control Relays
- Sequencer Scan Time
- Loops
- Alarms
- Special Function Programs
- Special Function Subroutines
- U-Memory
- V and K Memory

data of the selected program on disk to the data in the controller (online) or offline.

To perform a File Program Compare you must first have an opened online or offline program *see Chapter 3 Open an Existing Logic Program Offline or Online*.

Select File Program Compare from the File menu.

Result: The File Program Compare window appears (Figure 6.09d).

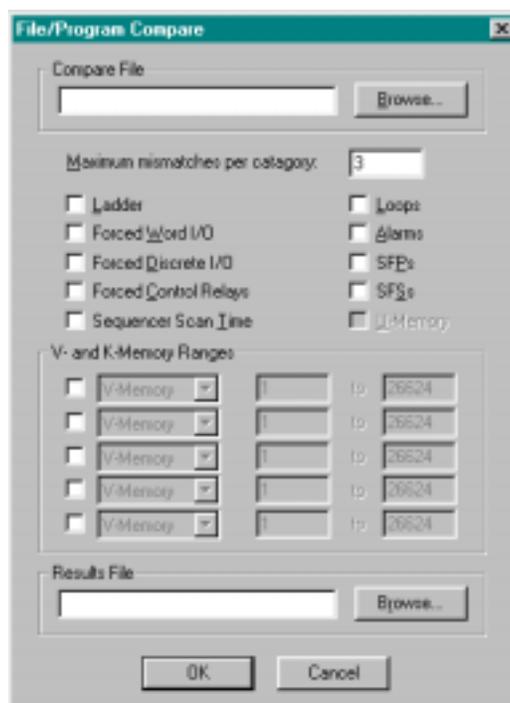


Figure 6.09d

1. Click the Browse button to locate the disk file to compare or type in the file extension and file name in the Compare File box.
2. Next, enter the Maximum mismatches per category. Maximum mismatches per category allows you to abort the compare process if the number of mismatches exceeds the number entered in the Maximum mismatches per category selection box.
3. Now click on the check boxes that correspond to the items you want to compare. For each of the V or K memory address, you can also choose the range for the comparison.
4. Then enter a result file path and name in the Result File box if the results of the compare are to be saved to a file.
5. Click OK to start the compare process.

---

**NOTE** If there are more than one program opened, the File Program Compare compares the program in the active window.

---

When the compare finishes, you receive a display such as that shown in (Figure 6.09E). The display highlights any mismatches between the File and controller or offline program.

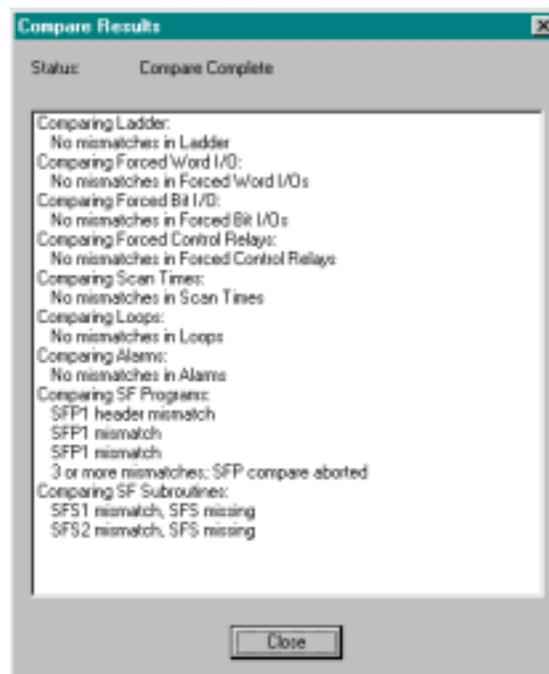


Figure 6.09e

## Displaying Processor Faults

You can display the Faults of your processor while online.

To display the processor faults:

1. Click Faults from the Diagnostics menu (Alt+D, A).
2. The online Faults are displayed (see Figures 6.10f).

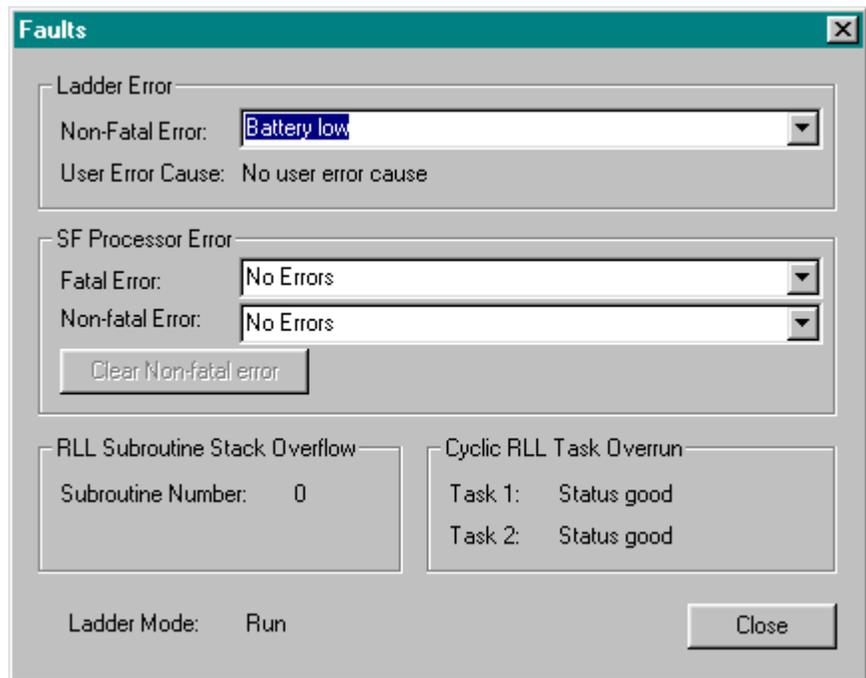


Figure 6.09f

## Auxiliary PLC Functions and Displays

### Displaying Processor Status

You can display the status of your processor while online or offline.

To display the processor status:

3. Click PLC Status from the PLC Utilities menu (Alt+U, P).
4. Either the PLC Status for online or offline is displayed (see Figures 6.10 and 6.11).
5. Click Close to close the PLC Status box, and return to the active logic program.

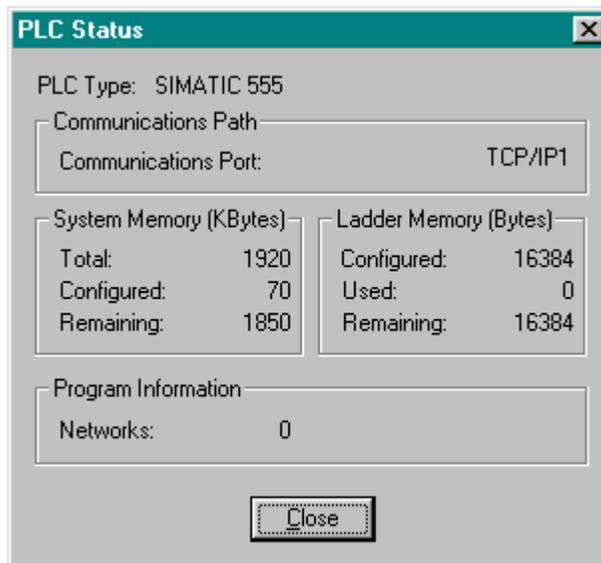


Figure 6.10 Offline PLC Status



Figure 6.11 Online PLC Status

## PLC Operations

This menu item allows you to view and modify PLC operations while online.

To access PLC Operations:

1. Click PLC Operations from the PLC Utilities menu (Alt+U, O). The PLC Operations dialog box appears (Figure 6.12).
2. When you have S-memory configured, you receive a display with three fields, as shown in Figure 6.12, to change operating mode. Use the mouse or arrow keys to select the desired field.

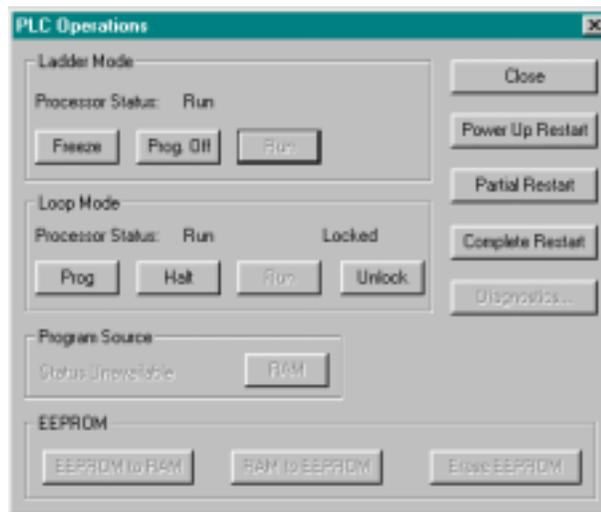


Figure 6.12

## Changing Ladder Mode

Without S-memory configured, the **LADDERS** field is the only option for changing program mode.

**Freeze** places the controller in PROGRAM FREEZE mode. All outputs are frozen in their current states. However, intelligent I/O modules still can update outputs.

1. To select PROGRAM FREEZE mode, Click on the Freeze button on the PLC Operations dialog box. The following message appears, **Stop the PLC with outputs frozen?** Select either YES or NO.

**Prog\_Off** places the controller in PROGRAM OFF mode. Discrete outputs are set to zero, and all word outputs are frozen. However, intelligent I/O modules still can update outputs.

1. To select PROGRAM OFF mode, Click on the Prog\_Off button on the PLC Operations dialog box. The following message appears, **Stop the PLC with outputs cleared?** Select either YES or NO.

### **Warning**

When you elect to go to PROGRAM OFF mode, you receive the message, **Stop the PLC with outputs cleared?** Select either YES or NO.

Intelligent I/O modules (e.g., the 386/ATM module, the Programmable BASIC module, the Servo Axis module, or the High Speed Pulse Input module) can update outputs even when the controller is in PROGRAM mode, if your code permits.

If an intelligent I/O module writes directly to an image register point, its write takes precedence even when PGMFRZ/PGMOFF is in effect. This could cause unexpected control action, resulting in death or serious injury to personnel, and/or damage to equipment.

Do not write directly to output image register points from an intelligent I/O module. Instead, write to a control relay or V-memory location and have your RLL program copy this location to the output point.

**Run** places the controller in RUN mode, beginning execution of the ladder program.

1. To select PROGRAM RUN mode, Click on the **RUN** button on the PLC Operations dialog box. The following message appears: **Run PLC?** Select either YES or NO.

## Changing Loop Mode

When you select Loop Mode, you have the following options available.

---

**NOTE** Your loop card cannot be in PROGRAM mode while the discrete CPU is in RUN mode.

---

**Prog** places the loop card in PROGRAM mode, and control blocks are neither running nor being queued for running.

1. To select LOOP PROGRAM mode, Click on the **Prog** button on the PLC Operations dialog box. The following message

appears: **Set the loop processor to program mode?** Select either YES or NO.

**Halt** places the loop card in HOLD mode; enabled control blocks are being queued to run, but are not running. Upon returning to RUN mode, execution resumes where it was halted.

1. To select LOOP HALT mode, Click on the **Halt** button on the PLC Operations dialog box. The following message appears: **Set the loop processor to halt mode?** Select either YES or NO.

**Run** places the loop card in the RUN mode; enabled control blocks are being queued and are running.

1. To select LOOP RUN mode, Click on the **Run** button on the PLC Operations dialog box. The following message appears: **Set the loop processor to run mode?** Select either YES or NO.

The loop mode can either follow that of the discrete CPU or be in RUN mode independent of the ladder program. To invoke this option, select the **LOCKED** or **UNLOCKED** field.

- **Unlock** frees the loop card for selection of RUN operating mode independent of the ladder CPU.
- **Lock** locks the loop card to follow the operating mode selected for ladders.

To select LOOP LOCK/UNLOCK mode:

1. Click on the **Lock/Unlock** button on the PLC Operations dialog box. The following message appears, **Lock or Unlock loop processor from ladder operation mode?** Select either YES or NO.

## Run Controller Diagnostics

Use Diagnostics to run diagnostics on your controller. To execute Diagnostics:

1. Click **Diagnostics** from the PLC Operations dialog box.
2. When you receive the message, **Execute Diagnostics?** Select either YES or NO.

## Programming EEPROMS

To perform the following **EEPROM** tasks, your controller must be in PROGRAM mode.

1. Copy the contents of RAM to EEPROM.
2. Copy the contents of EEPROM to RAM.
3. Erase the contents of EEPROM.

To execute the above EEPROMS tasks:

1. Click on one of the above EEPROM tasks from the PLC Operations dialog box.
2. When you receive the message, **Do you want to copy EEPROM to RAM?** Select either YES or NO.

## Programming Port Lockout

Use Port Lockout to prevent program changes from being made at different ports simultaneously.

If the controller is unlocked, the Port Lockout button will display Locked. If the controller is locked, the Port Lockout button will display Unlock.

To execute Port Lockout:

1. Click **P**ort Lockout from the PLC **U**tilities menu (Alt+U, O). The Port Lockout dialog box appears (Figure 6.12a). Click **L**ock or **U**nlock from the Port Lockout on the Port Lockout dialog box.

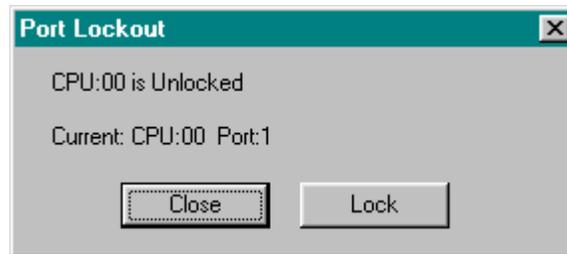


Figure 6.12a

---

**NOTE** Programming devices connected through the same Dual Communication Port (DCP) cannot lock each other out.

---

2. When you receive the message, **Lock or Unlock communication ports?** Select either YES or NO.

## System Part Number

Use System Part Number to read the software part number and the release number of the cards installed in your controller.

To execute System Part Number:

1. Click **S**ystem Part **N**umber from the PLC **U**tilities menu (Alt+U, N). The System Part Number dialog box appears (Figure 6.12b). The part number and release for each card, along with the slot number and name of the card, displays as shown.

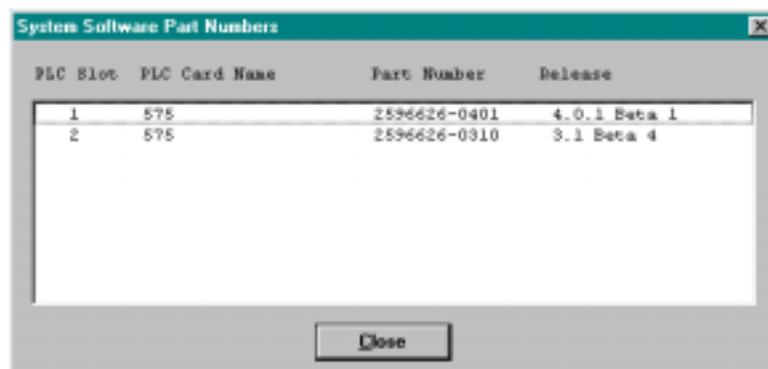


Figure 6.12b

## Performing Syntax Check

Use the Syntax Check to check your RLL program for errors that will prevent the controller from entering RUN mode (such as **UNKNOWN INSTRUCTION, LADDER ELEMENT OUT OF RANGE, NO CORRESPONDING PAIR, or OUT OF MEMORY**). Syntax Check is currently available only on 545, 555, and 575 controllers.

To execute the Syntax Checker:

1. Click **Syntax Checker** on the Diagnostics menu (Alt+D, Y). The Syntax Checker menu dialog box is displayed (Figure 6.12a).

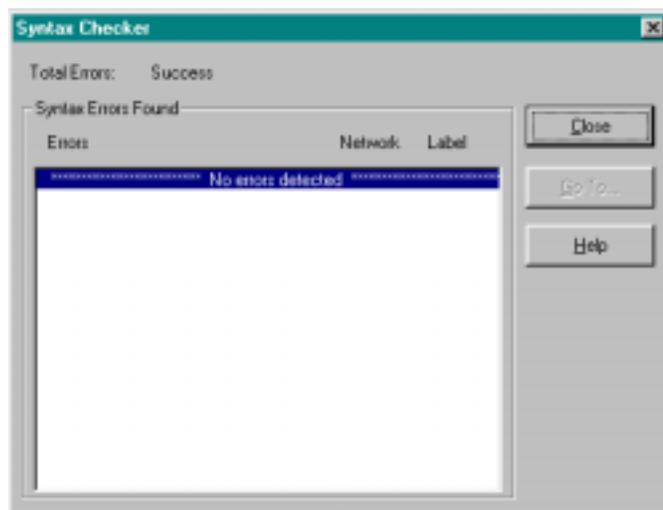


Figure 6.12a

Up to 16 errors can be displayed on the Syntax Check screen; if more than 16 errors are detected, the prompt line announces **ADDITIONAL ERRORS DETECTED**. To display the additional errors, use the scroll bar on the dialog box.

If no errors are detected, Syntax Check reports "**No errors detected**" on the bottom line.

If errors are detected, they will be listed within the dialog box. The logic errors can be viewed by selecting the error and pressing the go to error button on the dialog box.

## Ladder Status (Online)

You can display the values of your addressees in the PLC by using Status. Status can be displayed for Ladder networks. Status is an online feature only.

Status will continue to update when you scroll and cursor within the program.

To display Ladder status:

1. Click **Status** on the Diagnostics menu (Alt+D, S). The Status menu item displays a check if Status has been turned on.
2. Ladder status is indicated by the following features:
  - Contacts and Coils, when on, are displayed in Red.
  - Addresses in box instructions indicate the current value for each address.

---

**NOTE** Status mode is automatically exited when an attempt is made to edit a network. When the network is validated and entered, Status is automatically displayed again.

---

3. Click Status on the Diagnostics menu to stop displaying status.

## Initiating a Single Scan

Using a single scan allows you to view a single execution of your program. You must have the controller in program mode in order to execute a single scan.

To perform a single scan of your program, complete the following steps.

1. Place the controller in program mode.
2. Click Single Scan Setup on the Diagnostics menu (Alt+D, I). The Single Scan Setup menu dialog box is displayed (Figure 6.12dd). If your programmable controller supports the Single Scan pop-up task box for more than one task, you can select which tasks to execute during the single scan.



Figure 6.12dd

3. Click in the task number radial box to include a task in the scan., followed by clicking **OK** to save the task box selection.
4. Click Single Scan on the Diagnostics menu (Alt+Q) to execute a single scan according to the single scan task configuration.

## RBC Part Number

You can display the RBC Software part number and release number while online by:

1. Click PLC RBC Part Number from the PLC Utilities menu (Alt+U, R).
2. The RBC software number(s) and release numbers are displayed in the format shown in Figure 6.12b.
3. Click Close to exit the RBC Part Number box and return to the active logic program.

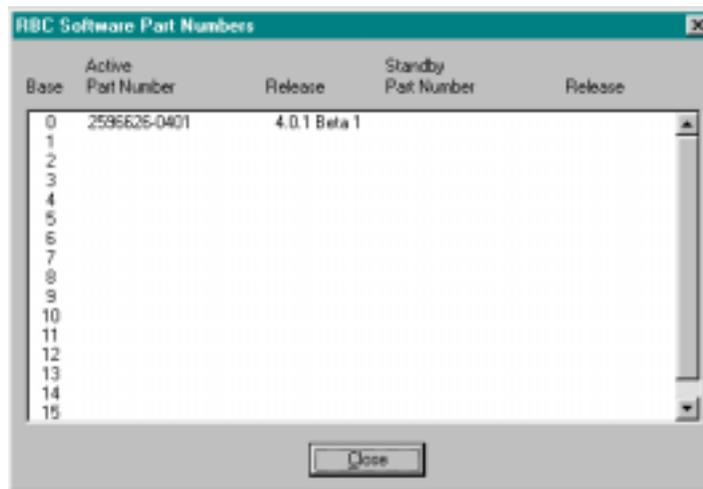


Figure 6.12b

### Task Codes Per Scan

Task Codes Per Scan is used to set the number of task codes processed per scan for SF modules on each channel. To invoke the function:

1. Click Task Codes Per Scan from the PLC Utilities menu (Alt+U, A).
2. The Task Codes Per Scan dialog box is displayed in the format shown in Figure 6.12c. Only numbers for the channels you have configured are displayed; e.g., if you have four channels, the number goes to 4.
3. Type in the data field the number of task codes for SF modules per scan.
4. Click on the Write button to enter the numbers.
5. Click Close to exit the Task Codes Per Scan and return to the active logic program.

Figure 6.12c

### Diagnostics on Base

Diagnostics on Base is used to run diagnostics on one or all the I/O bases. To invoke the operation:

1. Click Diagnostics on Base from the PLC Utilities menu (Alt+U, D).
2. The Diagnostics on Base dialog box is displayed in the format shown in Figure 6.12d.
3. To run base diagnostics on one base:
  - Type in the channel and base number in their associated data field.
  - Click on the Run Current button, and the data will be displayed in the dialog box.
4. To locate the Dual Media base:
  - Type in the channel and base number in their associated data field.

- Click on the Next DM button, and the data will be displayed in the dialog box.
5. To change the active and standby roles of RBCs on a particular base:
    - Type in the channel and base number in their associated data field.
    - Click on the Swap RBCs.
  6. To run base diagnostics on all bases:
    - Click on the Run All button and the data will be displayed in the dialog box.
  7. Click Close to exit the Task Codes Per Scan and return to the active logic program.

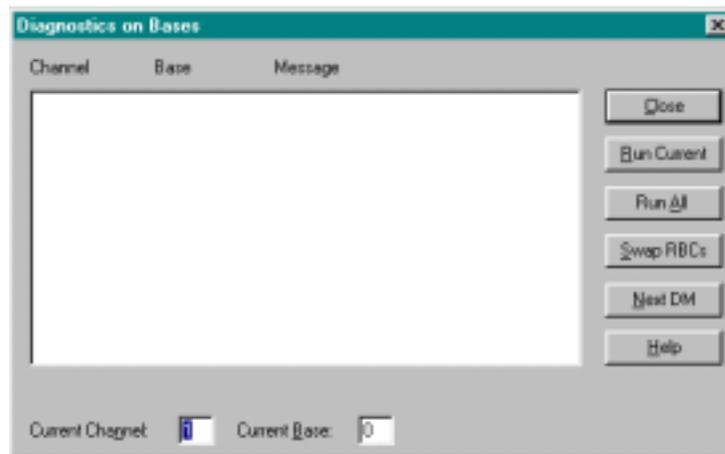


Figure 6.12d

## Hot Backup

Hot Backup is used to select the status of a hot backup unit. Hot Backup is only valid for the 565 controller. To execute the function:

1. Click Hot Backup from the PLC Utilities menu (Alt+U, H).
2. The Hot Backup dialog box is displayed, with the status of the Hot Backup.
3. There are three status modes to select from while in the Hot Backup.
  - Standby to Offline: Puts the standby unit in PROGRAM mode.
  - Standby to Online: Puts the standby unit in RUN mode.
  - Switch: Switches the roles of the active unit and standby unit.
4. Click Close to exit the Hot Backup and return to the active logic program.

## Password

The password feature provides protection for areas of memory that are part of the program. There are two passwords, one for the selected

program on disk and one for the controller. They do not have to be the same.

---

**NOTE** You do not need to enter a password to go online. However, if the selected program on disk is protected, you must enter a password to go offline.

---

A password value consists of 1 to 8 alphanumeric digits (for example, 0-9 or uppercase A-Z). Online, you can be prompted for the password for the controller program and/or for the selected program on disk. Offline, you are prompted for a password only for the selected program on disk.

The selected program on disk may be in one of two states of password protection:

- **No Password:** The selected program on disk is not protected. Any authorized user may enter an initial password.
- **Disabled Password:** The selected program on disk is not protected. Any authorized user may change or delete the password.

The programmable controller may be in one of three states of password protection:

- **No Password:** The controller program is not protected. Any authorized user may enter an initial password.
- **Disabled Password:** The controller program is not protected. The user may change or delete the password. Any authorized user may enable the password.
- **Enabled Password:** The controller program is protected according to the protection level assigned to the password (see below). If a protected operation is attempted from any communications port, the operation is denied and an error response is given. Only an authorized user may change, delete, or disable the password.

Three levels of access are available when a password has been entered and enabled in the controller:

- **No Access:** The controller program cannot be read or modified.
- **Read-only Access:** The controller program can be read but it cannot be modified.
- **Full Access:** The controller program is not protected.

## Online Password Operational Modes

There are nine online operational modes for password. The following paragraphs describe online password operational modes and online disk password operations.

The following numbered paragraphs detail the corresponding mode-number information found in Online Password Operations Table.

---

**NOTE** If converting files from TISOFT to 505 SoftShop, check to make sure that the selected program on disk has TISOFT 5.0 or greater format.

---

**Mode 1:** If the controller and the selected program on disk do not have a password, you will not be prompted for a password. (Save and Open functions will be allowed.)

No password will be written to the selected program on disk or to the controller.

**Mode 2:** If the selected program on disk has a password and you enter a password for the selected program on disk at the online prompt, you will be able to use (Save and Open) functions.

**Mode 3:** If the selected program on disk has a password and you do not enter a password for the selected program on disk at the online prompt, you will not be allowed to use the (Save) function. You will, however, be able to use the (Open) function, but only if the controller supports password. You will also have full access to the controller and the selected program on disk.

**Mode 4:** If the controller has a password and you enter a password for the controller at the online prompt, you will be able to use the (Save) and the (Load) functions. Save writes the controller password to the selected program on disk. Open retains the controller password. You will also have full access to the controller and the selected program on disk.

**Mode 5:** If the controller has a password and you do not enter a password for the controller at the online prompt, you will not be able to use the (Save) and the (Open) functions. Depending on the controller password access level, you will be allowed partial to full access to the controller. You will also have full access to the selected program on disk.

**Mode 6:** If both the controller and the selected program on disk have passwords and you enter a password for both at the online prompt, you will be able to use the (Save) and the (Open) functions. The passwords for both the selected program on disk and for the controller are retained. You will also have full access to the selected program on disk and to the controller.

**Mode 7:** If both the controller and the selected program on disk have passwords and you enter a password only for the selected program on disk at the online prompt, you will not be able to use the (Save) and (Open) functions. You will have partial to full access to the controller depending on the controller access level. You will also have full access to the selected program on disk.

**Mode 8:** If both the controller and the selected program on disk have passwords and you enter a password for the controller at the online prompt, you will not be allowed to use the (Save) function. You will, however, be able to use the (Open) function. Open will write the selected program on disk password to the controller and enable the password in the controller. You will also have full access to the controller. Some reads and no writes will be allowed to the selected program on disk.

**Mode 9:** If both the controller and the selected program on disk have passwords, and you do not enter a password for either the controller or the selected program on disk at the online prompt, you will not be able to use either the (Save) or the (Open) functions. You will, however, have partial to full access to the controller depending on the controller access level. Some reads and no writes will be allowed to the selected program on disk.

All online password operational modes are summarized in the following table.

Online Password Operations Table

Mode No.	Controller Password	Offline Password	User Password	Save Allowed to Disk?	Open Allowed to PLC?	Comments
1	No	No	Not asked for.	Yes. No password.	Yes. No password.	Selected program on disk must have 5.0 format or greater. There is no password for selected program on disk or in the controller.
2	No	Yes	User gives password for selected program on disk.	Yes. Selected program on disk password is retained.	Yes. Disk password is written to controller, if controller supports password.	Full access to controller and selected program on disk is allowed.
3	No	Yes	User does not give password for program on disk.	No. Selected program on disk is password protected.	Only if controller supports password.	Full access to controller is allowed. Some reads and no writes are allowed to selected program on disk.
4	Yes	No	User gives controller password.	Yes. Controller password is written to disk.	Yes. Controller password is retained.	Full access to controller and to selected program on disk is allowed.
5	Yes	No	User does not give a password.	No. Controller is password protected.	No. Controller is password protected.	Partial to full access to controller is allowed depending on access level. Full access is allowed to selected program on disk.
6	Yes	Yes	User gives disk and controller password.	Yes. Selected program on disk password is retained.	Yes. Controller password is retained.	Full access to selected program on disk and to controller is allowed.
7	Yes	Yes	User gives disk password.	No. Controller is password protected.	No. Controller is password protected.	Partial to full access to controller is allowed depending on access level. Full access is allowed to selected program on disk.
8	Yes	Yes	User gives controller password.	No. Selected program on disk is password protected.	Yes. Selected program on disk password is written to controller and enabled.	Full access to controller is allowed. Some reads and no writes are allowed to selected program on disk.
9	Yes	Yes	User gives no password.	No.	No.	Partial to full access to controller is allowed depending on access level. Some reads and no writes are allowed to selected program on disk.

To invoke Password from Online or Offline:

1. Click on Password from the PLC Utilities menu (Alt+U, W).
2. The Password dialog box is displayed in the format shown in Figure 6.12e.

Figure 6.12e

### Offline Password Selection and Access Level

The buttons in Figure 6.12e are defined below:

- **Close**-Allows you to return to the ladder display screen.
- **Enter Password**-Allows you to enter or change the password for the selected program on disk. SoftShop prompts you for the new password twice. If the new passwords are not the same, the password is not changed. To delete a password (or to make the selected program on disk unprotected), enter a null password or press clear and enter a new password.
- **No Access**-Allows you to set the protection level of the controller for no access. This option is written to the controller when you perform an (Open) function. No Access does not work without a password.
- **Read Only**-Allows you to set the protection level of the controller for read-only access. This option is written to the controller when you perform an (Open) function. Read Only does not work without a password.
- **Full Access**-Allows you to set the protection level of the controller for full read/write access. This option is written to the controller when you perform an (Open) function. Full Access does not work without a password.

### Online Password Selection and Access Level

The buttons in Figure 6.13 are defined below:

- **Close**-Allows you to return to the ladder display screen.
- **Enter Password**-Allows you to enter or change the password for the selected program in the controller. SoftShop prompts you for the new password twice. If the new passwords are not the same, the password is not changed. To delete a password (or to make the selected program on disk unprotected), enter a null password or press clear and enter a new password.
- **No Access**-Allows you to set the protection level of the controller for no access. This option is written to the controller. No Access does not work without a password.
- **Read Only**-Allows you to set the protection level of the controller for read-only access. This option is written to the controller. Read Only does not work without a password.
- **Full Access**-Allows you to set the protection level of the controller for full read/write access. This option is written to the controller. Full Access does not work without a password.
- **Enable Password**-Allows you to enable password protection for the controller.

- **Disable Password**-Allows you to disable password protection for the controller. If you have not already entered a password for the controller, 505 SoftShop prompts you for the current password. If the password you provide is not correct, 505 SoftShop does not disable the password protection. This function does not work unless you provide a password.

Figure 6.13

## Powering Up/Restart the Controller

### Power Up Restart

Use **Power Up Restart** to clear all unforced X, Y and non-retentive C elements on power up or restart of the controller. Retentive control relays are not cleared. The WX and WY elements are not affected.

# Caution

If you execute Power Up Restart with the controller battery switch set to Off, all programs residing in the controller will be cleared. Be certain to check battery switch position before using Power Up Restart.

To execute **Power Up Restart**:

1. Click **Power Up Restart** from the PLC Operations dialog box.
2. When you receive the message, **Execute a PLC power up restart?** Select either YES or NO.
3. For 575 controllers, you are also prompted with **Coordinate Reset With Other Applications:** and **Coordinate Reset With Entire System:** For each of these prompts, press NO or YES as required for your process.

## Partial Restart

Use a Partial Restart to clear all discrete elements except retentive C and forced elements. The word elements and presets are not reset.

To execute a **Partial Power Up Restart**:

1. Click **Partial Restart** from the PLC Operations dialog box.
2. When you receive the message, **Execute a Partial restart?** Select either YES or NO.
3. For 575 controllers, you are also prompted with **Coordinate Reset With Other Applications:** and **Coordinate Reset With Entire SYSTEM:** For each of these prompts, press NO or YES as required for your process.

## Complete Restart

Use Complete Restart to clear all discrete elements and word elements, including retentive C elements. Complete Restart also clears controller fatal errors. Forced discrete elements and forced word elements are not reset.

To execute Complete Restart:

1. Click **Complete Restart** from the PLC Operations dialog box.
2. When you receive the message, **Execute a Complete restart?** Select either YES or NO.

For 575 controllers, you are also prompted with **Coordinate Reset With Other Applications:** and **Coordinate Reset With Entire System:** For each of these prompts, press NO or YES as required for your process.

# Clearing Memory

This option allows you to clear all or parts of logic memory, data, tags, and documentation in the current program.

You can use clear memory in either online or offline mode. When programming offline, you clear the entire active program or parts. When programming online, you clear the PLC memory. However, you cannot clear memory online while the processor is in Run mode. You must first stop the processor before clearing the memory online.

The following is a list of parts of memory that can be cleared:

- Ladder
- V Data
- K Data
- Word I/O Data
- TCC/TCP Data
- DSP/DSC Data
- PID Loops
- Analog Alarms
- Special Functions Programs
- Special Functions Subroutines
- U-Memory

To access the Clear Memory option:

1. If you want to save the changes you've made to your logic and documentation, save them before going to Step 2. Use the Save Program or Save Program As options in the File menu.
2. Click Clear Memory from the PLC Utilities menu (Alt+U, L, A). A warning message appears stating all program logic, data values, tags, and documentation will be deleted.
3. Click Yes to clear all memory. If changes to the program were not saved, another warning message appears stating that changes to your program were not saved; do you wish to continue with the clear memory procedure. Click Yes to clear the memory.

## Selecting (575) Application

When you configure a 575 controller offline, you must first select the application:

1. Select PLC Configuration from the PLC Utilities menu. The PLC Configuration dialog box appears (Figure 5.2).
2. Select the **ReqApp** button under the Processor Information window on the PLC Configuration dialog box. The Required Application dialog box appears (Figure 6.15).

You can change the Application ID only during offline configuration. (Configuring the controller online displays the current application.)

Figure 6.15

The following fields display information about applications. Only the IDs listed in the REQUIRED or OPTIONAL fields are valid for use as G-memory parameters in your RLL program.

- APPLICATION ID displays the ID of the current application.
- REQUIRED APPLICATIONS displays a listing of the application IDs needed for the current application to complete a process.
- OPTIONAL APPLICATIONS displays a listing of the application IDs that are not required, but may be present.
- CPU MODE LOCKED TO displays a listing of the application IDs that must transition to RUN mode at the same time.

Connecting online displays the current application ID configuration.

After modifying the configuration, click OK to enter the new configuration relationships.

# 7 - Documentation

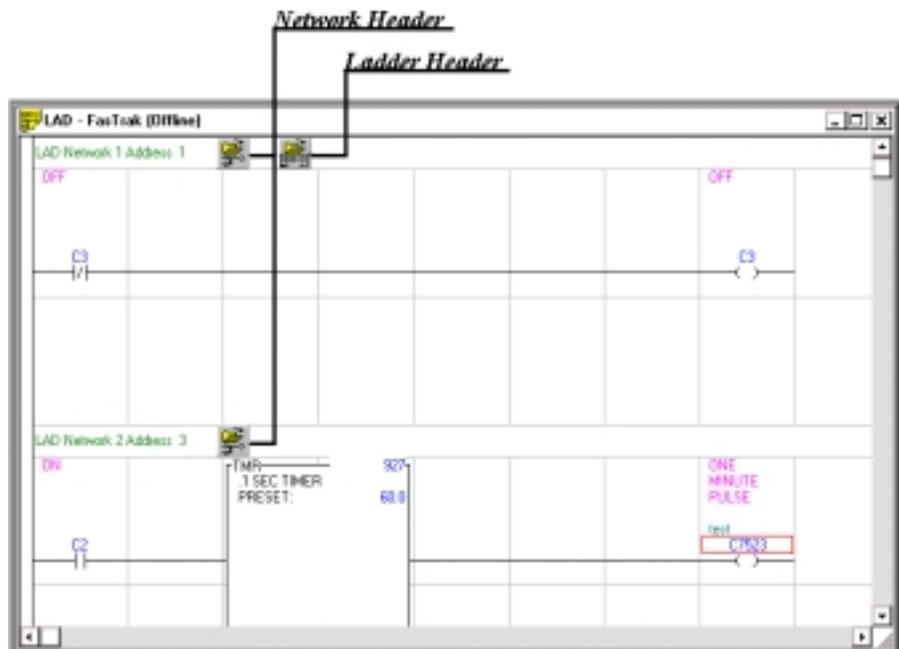
## Using the Ladder, Network, and SF Header Editor

### Ladder Header

505 SoftShop provides a simple way to document ladder while you are creating or editing your program. The maximum number of characters you can enter for each header is 16K.

Double-click the Ladder Header icon in the active logic program window (see Figure 7.1). The Ladder Header dialog box is displayed (see Figure 7.2). Type in your header. Select OK when you're finished.

Figure 7.1



To see ladder headers in the active logic program, select **Program Setup** from the **Options** menu. Click **Ladder Headers** in the Logic Editor box and click **OK**.

Figure 7.2

## Network Header

505 SoftShop provides a simple way to document networks while you are creating or editing your logic program. The maximum number of characters you can enter for each header is 16K. The network header is tied to the corresponding network output. If a XCALL, PGSTS OR PGTSZ are the outputs, the header is tied to the first occurrence of an X, Y or C address.

Double-click the Network Header Input icon in the active logic program window (see Figure 7.1). The Network Header Input dialog box is displayed (see Figure 7.3). The drop down box paging preference in the top left-hand corner of the header input box. Controls the page print out of the particular network header and ladder that is selected. If Page None is selected there will be no page break between the current network and last network printed. Page Odd prints the current selected network on the next odd page. Page Before prints the current selected network on the next blank page. Type in your header. Select OK when you're finished.

To see network headers in the active logic program, select Program Setup from the Options menu. Select the Logic tab. Then General from the drop down box and check Show All Headers.

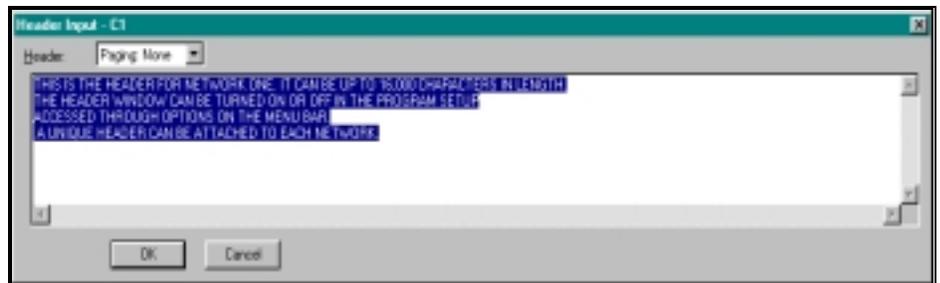


Figure 7.3

## SF Header

505 SoftShop provides a simple way to document SF while you are creating or editing your SF program. The maximum number of characters you can enter for each header is 16K.

Double-click the SF Header Input icon in the active logic program window. The Network Header Input dialog box is displayed (see Figure 7.5). Type in your header. Select OK when you're finished.

Figure 7.4

Figure 7.5

To see SF headers in the active logic program, select Program Setup from the Options menu. Click All Headers in the Logic Editor box and click OK.

## Using the Documentation Window

In both online and offline programming, you can view and edit tags, descriptions, and comments in your program using the Documentation Window.

The Documentation Window allows you to view, create, edit, and delete tags, descriptions, and comments for the active logic program. The maximum number of characters for each item is defined below:

Descriptions	96
Tags	32
Comments	2048

To open the Documentation Window, click  on the toolbar or select Documentation Window from the View menu (Figure 7.6).

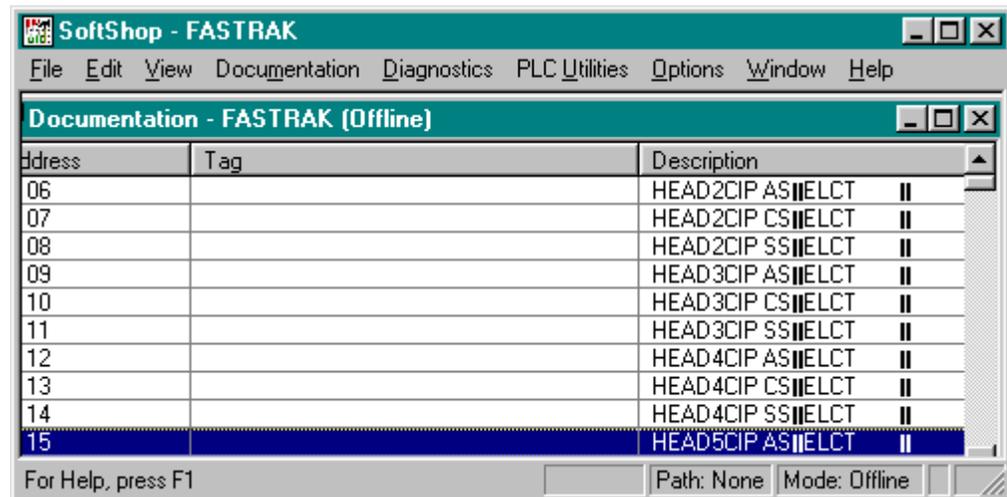


Figure 7.6

The window is displayed with all of the addresses, tags, and descriptions in the current program. The first column indicates the method of sorting.

---

**NOTE** Only one (1) documentation window can be displayed per program.

---

The window also can be sized and moved to another location within the viewing area using the standard window features.

### Customizing the Display

The Documentation Window can be customized to display Tags, Descriptions, or both Tags and Descriptions. Setting options in the Program Setup can customize these. The Program Setup also allows you to select the sorting method: by address, tags, or descriptions.

To change the display, select Options, Program Setup (Alt-O, P). In the Documentation Window section, click Tag to include tags and/or click

Descriptions to include address descriptions. You must include either Tags or Descriptions in your window. In the Sort Order group, select Address, Tag, or Description to change the sort method. The sort order also modifies the Documentation Window by displaying the sort order method as the first column.

For example, if the Sort Order is defined as Tag, then the first column in the Documentation Window is the Tag column. The address column is always included in the display. See *Program Setup* in Chapter 4 for more information.

## Editing and Creating New Documentation

You can create a new address tag, description, and comment by using one of the following methods:

1. From the Documentation menu, select New Doc (Alt-D, N).
2. From the Pop-up menu in the Documentation Window, select New Doc.
3. Select an address in the Documentation Window press the Enter key, Ctrl-L or double click on the address.

---

**NOTE** You can also edit documentation in the Data Window by pressing Ctrl L on the description or tag columns.

---

The Edit Documentation window is displayed. You can enter a new tag, description, and comment (see Figure 7.7) Select OK when you're finished.

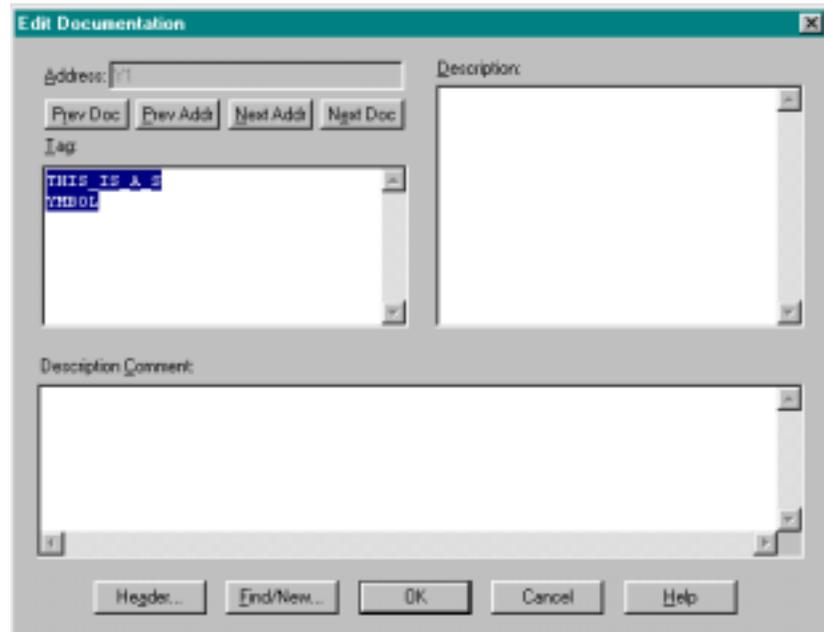


Figure 7.7

The Tag and Description fields are sized according to the Documentation Window Column Width variable in the Program Setup. The font selected in your program setup will also be used for the tag and description fields. This will show the documentation, as it actually will be displayed in your ladder program.

---

**NOTE** If the font and size selected in the program setup is too large to be represented in the window, a standard font will be used. When this situation occurs, the warning message is displayed. The tag and description will NOT be shown in its actual size in this case.

---

To edit an existing tag or description, you can use any of the following methods:

1. From the Documentation menu, select Modify Doc (Alt-D, M).
2. From the Pop-up menu in the Documentation Window, select Modify Doc.
3. Press the Enter key, Ctrl-L or double click on the actual address, tag, or description in the Documentation Window (Figure 7.6).

---

**NOTE** If you double-click in the description column to edit existing documentation, the cursor will be placed in the description column in the Edit Documentation window (Figure 7.7). Similarly, if you double-click in the tag column, the cursor will be placed in the tag column in the Edit Documentation Window.

---

The Edit Documentation window is displayed. You can change the tag, description, and comment (Figure 7.7). Select OK when you're finished.

## Cut, Copy, Paste and Deleting Documentation

Probably the most frequently used editing features are the three interrelated commands: Cut, Copy, and Paste. Use these commands to quickly copy documentation to either another location in the same program or another program. The list below describes Cut, Copy, Paste and Deleting Documentation differences.

Cut	Removes the selection from the program and places it on the clipboard.
Copy	Copies the selection and places it on the clipboard.
Paste	Inserts clipboard contents into the documentation window at the start and end address.
Delete	Removes selected contents from the documentation window.

The clipboard referred to in the list above is the standard Windows clipboard. Refer to your *Windows User's Guide* for more information.

To select the information you want to cut or copy, click, hold and drag the pointer over the desired area. Selected items will be highlighted with a different color than your normal workspace color.

Each of the three editing commands, described in detail in the following paragraphs, can be accessed several ways.

## Cut

To use the cut feature, select the information you want to cut by:

1. Clicking  on the toolbar or select Cut from the Edit menu and the Cut Range dialog box appears. Enter the start and ending address to cut, in the dialog box from and to location. If tags are to be cut with the address, the Include Tags check box must be selected.

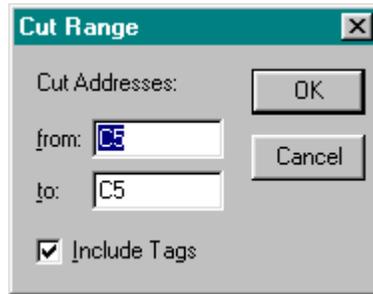


Figure 7.7a

2. Select OK and the selected range of addresses are cut out of the Documentation Window and placed into the clipboard.

## Copy

To use the copy features:

1. Click  on the toolbar or select Copy from the Edit menu and the Copy Range dialog box appears. Enter the start and ending address to copy into the Copy Range dialog box, from and to locations. If tags are to be copied with the address the Include Tags check box must be selected.

Figure 7.7b

2. Select OK and the selected range of address are copied from the Documentation Window and placed into the clipboard.

## Paste

To access the paste feature:

1. Click  on the toolbar or select Paste from the Edit menu and the Paste Range dialog box appears. Enter the start address to paste to, in the Paste Range dialog box at location.

Figure 7.7c

2. Select OK and the addresses in the clipboard are pasted into the Documentation Window starting with the at address.

## Delete

To delete an existing address tag, description, and comment:

1. From the Edit menu, select Delete (Alt-E, D) and the delete dialog box appears.

Figure 7.7d

2. Enter the start and ending addresses to be deleted into the Delete Range dialog box from and to locations.
3. Select OK and the selected range of addresses are deleted from the Documentation Window.

## Searching for an Address, Tag, or Description

You can find the documentation associated with a specific address, tag, or description by using the Find option. To find an item, select one of the following:

1. From the Edit menu, select Find (Alt-E, F).
2. From the Pop-up menu, select Find.
3. Click  on the toolbar.

After you select Find, the window in Figure 7.8 is displayed.

Figure 7.8

Enter the address, tag, or description you wish to find in the *Find What* field. In the *Search* field, select whether you are searching for an address, tags, or description. Find will try to locate the closest match to the entered search information. If you want to find the exact match, click Exact Match. Press OK, and the search item will be located and displayed in the Documentation Window.

## Pop-Up Menus

The menu items available with the right mouse button are displayed in Figure 7.9

<b><u>M</u>odify Doc...</b>	
<b><u>N</u>ew Doc...</b>	
<b><u>C</u>ut</b>	<b>Ctrl+X</b>
<b><u>C</u>opy</b>	<b>Ctrl+C</b>
<b><u>P</u>aste</b>	<b>Ctrl+V</b>
<b><u>D</u>elete...</b>	
<b><u>F</u>ind</b>	<b>Ctrl+F</b>

Figure 7.9

# Documenting in Ladder

In addition to editing and creating new documentation in the Documentation Window, you can also edit and create new documentation in the logic program as you enter and edit your logic. The Documentation Window can also be used to help you program your logic.

In the logic editor, these features are available:

- Assign Tags.
- Assign Addresses.
- Edit and Create Documentation in Ladder.
- Look up tags and use them in ladder.

These items are discussed in the following sections.

## Assign Tags

The Assign Tags option allows you to assign tags, descriptions, and comments to an undocumented address that you are currently using in your ladder program. For example, if you enter an address in an ADD instruction and that address does not have a tag or description, the Edit Documentation window in Figure 7.7 will automatically appear when you move off the address. Enter a tag, description, and comment, and press OK to save the documentation. This allows you to document undocumented addresses as you program without leaving the ladder editor.

To use this feature, select Options, Program Setup (Alt-O, P). Then select the Logic tab dialog. Select Ladder from the Options for drop down window. Then check the Assign Tag in the selection check box.

## Assign Addresses

The Assign Addresses option allows you to assign addresses, descriptions, and comments to tags as you use them in your ladder program. For example, if you enter the tag NEW\_TAG (and NEW\_TAG doesn't exist), the Edit Documentation window in Figure 7.7 will automatically appear with the tag filled in. You can enter the address, description, comment, and press OK to save the documentation. This allows you to assign addresses to tags as you program without leaving the ladder editor.

To access the Assign Address feature, select Options, Program Setup (Alt-O, P). Then select the Logic tab dialog. Select Ladder from the Options for drop down window. Then check the Assign Address in the selection check box.

## Editing Documentation in Ladder Editor

You can automatically assign documentation and edit existing documentation by pressing Ctrl L on an address in your ladder program. For example, if you would like to change the documentation for the address 00001 that is used on a contact, move the cursor to that location and press Ctrl L. The Edit Documentation window in Figure 7.7 automatically appears. Enter the tag, description, and comment, and press OK to save the documentation.

## Tag Table/Paste to Logic

You can use the Tag Table in the logic editor and Paste to Logic in the Documentation Window to help you program with tags. These two options work in conjunction, enabling you to look up documentation and copying it into your current location in your ladder instruction.

For example, if you would like to enter a tag as a parameter in your ladder instruction but you can't recall its name or address, use the following steps:

1. Enter a partial string (or nothing).
2. Select Tag Table from the View Menu or select Tag Table from the Pop-up menu. The Documentation Window will automatically open or will be displayed in the foreground with the closest matching tag at the current cursor location.
3. Locate the address/tag in the Documentation Window you wish to use.
4. Select Paste to Logic from the Edit menu or Paste to Logic from the Pop-up menu and the address/tag will be pasted back into the current location in your ladder program.

## Shared Documentation

Address Documentation can be used in two ways:

The first is the traditional style. Where a temporary DATABASE file is not shared and all edits are buffered until the file is saved. If the file is not saved then any edits are lost. Upon saving the temporary DATABASE file is copied to the same destination as the logic file.

A shared file works differently. This file can be shared (Opened more than once.) by different programs. Edits are not buffered but are immediately saved. Upon saving a program the Address Documentation DATABASE file does not get saved, thus Save As does not affect the file at all. A refresh time can be entered that causes the database to reread the file to acquire any new or changed documentation. Also, a shared database can reference a database created for another purpose as long as the fields are map-able to our defaults. A shared file can be created at user direction, but once created is the responsibility of the user to delete.

To modify a shared documentation file select Shared Documentation setup from the Options menu.

## Edit Title Page (Print Only)

This option allows you to display descriptive information at the beginning of your printouts.

To access the Edit Title Page option:

- Select Title Page Print Editor from the View menu.
- The following dialog window is displayed (Figure 7.10):

Figure 7.10

- Enter the text and press OK when you are done.

# 8 - Analog Alarms

## Overview

The analog alarm functions allow you to monitor an analog input signal by setting standard alarm on a process variable (PV) and a target setpoint (SP). Analog alarms are referenced by a user-assigned number from (1-512) depending on the processor type. All analog alarm parameters are stored in Special Memory (S-Memory) when you program the analog alarm. The size of S-Memory is user configurable.

### Analog Alarm Editor

The Analog Alarm Editor gives you the ability to display, access, and/or modify analog alarms.

To access the Analog Alarm Editor:

1. Click Alarm from the View menu (Alt+V, A).
2. The Analog Alarm Directory dialog box appears (see Figure 8.1).
3. The dialog box shows the Loop Mode, Alarm number (1-512) depending on the processor type, Alarm Title, and Enable/Disable state.

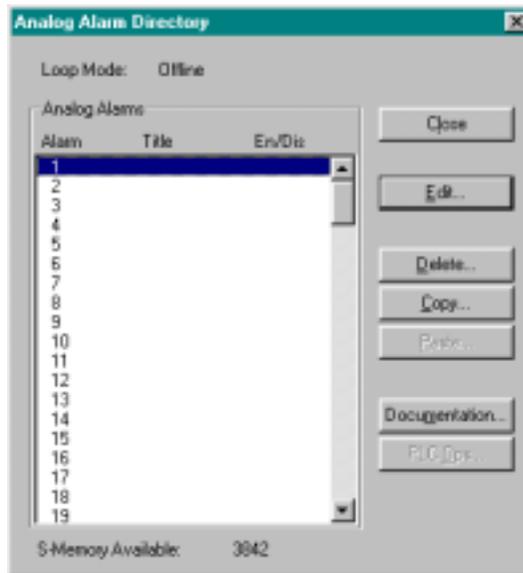


Figure 8.1

4. Select the Analog Alarm number that you want to enter or edit by using the left mouse button or the Arrow keys on the keyboard.
5. To edit the selected alarm number, double-click on the alarm number or click on the dialog box Edit button, or use the keyboard to Tab to the Edit button and press Enter. The following dialog box appears (Figure 8.2).

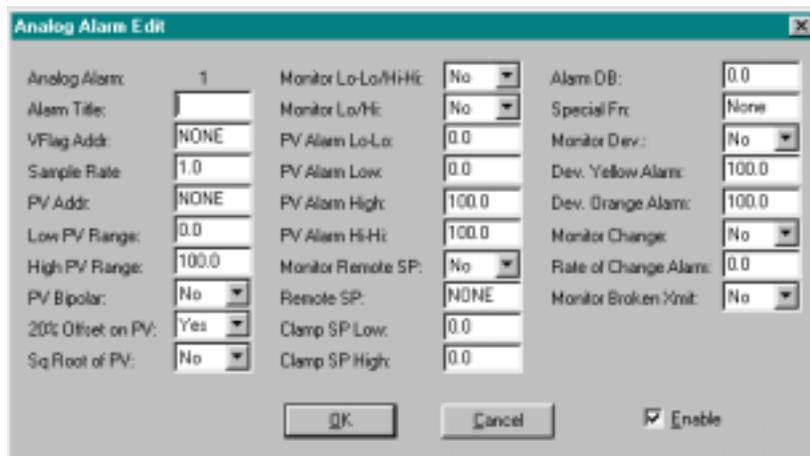


Figure 8.2

To delete Analog Alarm

1. To delete an Analog Alarm, Click Alarm from the View menu (Alt+V,A). The Analog Alarm Directory dialog box appears (see Figure 6.10). The dialog box shows the Loop Mode, Alarm number (1-512) depending on the processor type, Alarm Title, and Enable/Disable state.
2. Select the Analog Alarm number that you want to delete by using the left mouse button or the Arrow keys on the keyboard. Click on the dialog box Delete button or use the keyboard to

Tab to the Delete button and press Enter. The following dialog box appears (Figure 8.3).

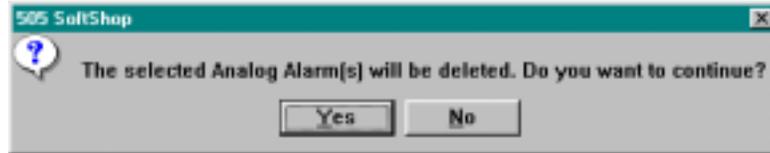


Figure 8.3

3. Select Yes to delete the analog alarm, or No to return to the previous dialog box.

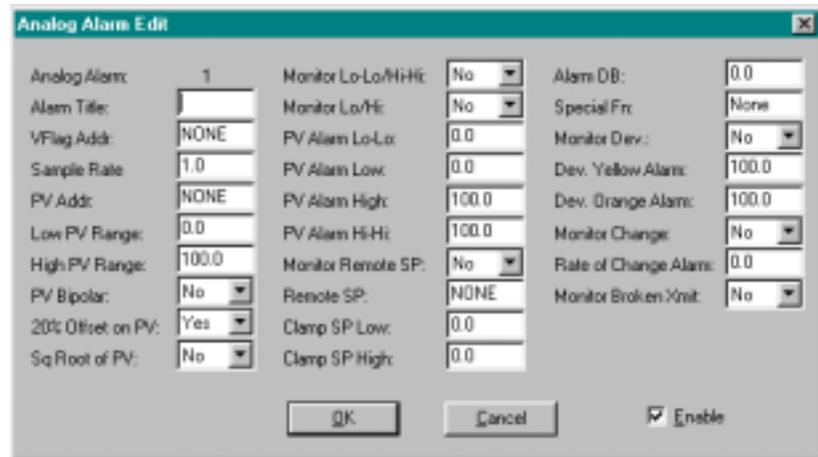
## Copy and Paste Alarms

To Copy and Paste an Alarm:

1. Click Alarm from the View menu (Alt+V, A).
2. The Analog Alarm Directory dialog box appears (see Figure 8.1). The dialog box shows the Loop Mode, Alarm number (1-512) depending on the processor type, Alarm Title, and Enable/Disable state.
3. Select the Alarm number that you want to Copy by using the left mouse button or the Arrow keys on the keyboard. The drag and left mouse button or Shift + arrow key can be used to select multiple Alarm numbers. Click on the dialog box Copy button to place the selected Alarm number in the clipboard.
4. Move the cursor to the desired location and click on the dialog box Paste button to paste the clipboard contents into the new location.

# Analog Parameters

Figure 8.4 shows a template of the Analog Alarm Edit window.



The screenshot shows the 'Analog Alarm Edit' dialog box with the following parameters:

Analog Alarm:	1	Monitor Lo-Low/HiHi:	No	Alarm DB:	0.0
Alarm Title:		Monitor Lo/Hi:	No	Special Fnc:	None
VFlag Addr:	NONE	PV Alarm Lo-Low:	0.0	Monitor Dev.:	No
Sample Rate:	1.0	PV Alarm Low:	0.0	Dev. Yellow Alarm:	100.0
PV Addr:	NONE	PV Alarm High:	100.0	Dev. Orange Alarm:	100.0
Low PV Range:	0.0	PV Alarm Hi-Hi:	100.0	Monitor Change:	No
High PV Range:	100.0	Monitor Remote SP:	No	Rate of Change Alarm:	0.0
PV Bipolar:	No	Remote SP:	NONE	Monitor Broken Xmit:	No
20% Offset on PV:	Yes	Clamp SP Low:	0.0		
Sq Root of PV:	No	Clamp SP High:	0.0		

Buttons: OK, Cancel,  Enable

Figure 8.4

## Alarm Title

An eight-character title can be entered for each specific Analog Alarm number. The title is optional and can be left blank.

## V-Flag Address

Enter an address: C, Y, V, or WY in the ALARM VFLAG ADDRESS field. If you select **NONE**, no data is written from the V-Flags in the analog alarm.

The V-Flags contains the operational data for an analog alarm. The V-Flags comprises the individual bits making up the 16-bit word. The bits are defined in Table 8.1.

Table 8.1 Analog Alarm V-Flags 1

Bit	Analog Alarm Function
1	1=Enable alarm.
2	1=Disable alarm.
3	1=Process Variable is in high-high alarm.
4	1=Process Variable is in high alarm.
5	1=Process Variable is in low alarm.
6	1=Process Variable is in low low alarm.
7	1=Process Variable is in yellow deviation alarm.
8	1=Process Variable is in orange deviation alarm.
9	1=Process Variable is in rate of change alarm.
10	1=Broken transmitter alarm.
11	1=Analog alarm is overrunning.
12	1=Alarm is enabled.*
13-16	1=Unused.
* If a word is selected for the analog alarm V-Flags, bit 12 is written. If a C or Y is selected, bit 12 is not used.	

---

*NOTE: If you program an analog alarm and do not disable it, the controller begins to monitor the programmed variable as soon as you place the controller in Run mode.*

---

## Sample Rate

Enter a time in seconds in the SAMPLE RATE field.

The sample rate determines how often deviation alarm bits and associated math are evaluated. Sample rates are programmable in 0.1-second increments, with alarms checked at least once every two seconds. The sample rate can be any floating point number between 0.1 and  $1.6772 \times 10^6$  seconds.

## Process Variable Address

Enter an address: V, WX, or WY in the PROCESS VARIABLE ADDRESS field.

A process variable must be specified for each analog alarm. The process variable can be taken from the following:

- A word input or output module - The programming table uses a WX or WY address.
- A location in V-Memory - The programming table uses an address in V-Memory.

If you select NONE, the analog alarm does not read an address to obtain the Process Variable.

## **Low Process Variable Range**

Enter the low value of the process variable in the Process Variable Range Field.

You must specify the engineering values that correspond to the lower range of the input span.

## **High Process Variable Range**

Enter the high value of the process variable in the Process Variable Range Field.

You must specify the engineering values that correspond to the upper range of the input span.

## **Process Variable Bipolar**

Select YES or NO to specify analog inputs as bipolar or not. Bipolar inputs span have spans of -5 to 5 volts, or -10 to 10 volts.

## **20% Offset**

Select No for no offset and Yes for 20% offset. A span of 0 to 5.0 volts (0 to 20 milliamps) is referred to as a span of 0 to 100%. A span of 1 to 5.0 volts (4 to 20 milliamps) is referred to as a span of 20% to 100% (20% offset on the process variable).

## **Square Root of Process Variable**

Select Yes if the input for the process variable is from a device (such as an orifice meter) that requires a square root calculation to determine the correct value to use.

## **Monitor Low-Low/High-High**

Select Yes to have the controller monitor the Low-Low/High-High Alarm; otherwise, select No. The Low-Low/High-High can be entered as values requiring critical action.

## **Monitor Low/High**

Select Yes to have the controller monitor the Low/High Alarm; otherwise, select No. The Low/High Alarm can be entered as values requiring remedial action.

## **Process Variable Alarm Low-Low**

Enter a real number in engineering units; must be less than or equal to low alarm value, and greater than or equal to low range of Process Variable.

## **Process Variable Alarm Low**

Enter a real number in engineering units; must be less than or equal to high alarm value of Process Variable.

## **Process Variable Alarm High**

Enter a real number in engineering units; must be less than or equal to high-high alarm value of Process Variable.

## **Process Variable Alarm High-High**

Enter real number in engineering units; must be greater than or equal to high alarm value, and less than or equal to high range of Process Variable.

## **Monitor Remote Setpoint**

To have the controller monitor the remote setpoint, select Yes in the Monitor Remote Setpoint field. If you select No, the analog alarm uses the current value in the analog alarm variable.

## **Remote Setpoint**

Select NONE if there is no remote setpoint. Otherwise, enter an address: V, K, WX, or WY, or a value in the remote setpoint field.

## **Clamp Setpoint Low/High**

Enter values for the setpoint limits in the CLAMP SETPOINT LIMITS field. If there are no limits, enter zeroes in the High and Low fields.

## **Alarm Deadband**

Enter a value in engineering units for the alarm deadband in the ALARM DEADBAND field. When you specify an alarm deadband, the controller can provide hysteresis on all alarms except the rate of change alarm to prevent them from chattering when the process variable is near one of the alarm limits.

## **Special Function**

Enter a SF program number in the SF field. Select NONE if no SF program is to be called for execution.

## **Monitor Deviation**

To have the controller monitor the deviation alarm limits select Yes in the Monitor Deviation field; otherwise, select No.

## **Deviation Yellow Alarm**

Enter values in engineering units for the setpoint deviation limits. The deviation alarm bands are always centered around the target or setpoint; i.e., the deviation alarm test is actually on the control error. This value indicates the maximum allowable error (SP-PV) that sets the yellow alarm deviation alarm. The yellow deviation limit must be within the span of the process variable, and it must be less than or equal to the orange deviation alarm.

## **Deviation Orange Alarm**

Enter values in engineering units for the setpoint deviation limits. The deviation alarm bands are always centered around the target or setpoint; i.e., the deviation alarm test is actually on the control error. This value indicates the maximum allowable error (SP-PV) that sets the orange alarm deviation alarm. The orange deviation limit must be within the span of the process variable, and it must be greater than or equal to the yellow deviation alarm.

## **Monitor Rate of Change**

To have the controller monitor the rate of change, select Yes in the Monitor Deviation field; otherwise, select No.

## **Rate of Change Alarm**

Enter a value in engineering units for the rate of change alarm.

## **Monitor Broken Transmitter Alarm**

To have the controller monitor the Broken Transmitter Alarm, select Yes in the Monitor Broken Transmitter Alarm field; otherwise, select No.

If you program the controller to monitor for the broken transmitter condition, an alarm occurs if the raw process variable is outside the valid range designated for the Process Variable. Valid ranges are:

- Bipolar: -32000 to 32000
- 0% offset: 0 to 32000
- 20% offset: 6400 to 32000

# 9 - PID Loops

## Overview

Process and batch control capability is provided using the controller's proportional-integral-derivative (PID) loop functions, illustrated in Figure 9.1. When you program a loop, you can set the same eight alarm types used by analog alarms and described in Chapter 8.

- High-high alarm point on the process variable (PV).
- High alarm point on the PV.
- Low alarm point on the PV.
- Low-low alarm point on the PV.
- Yellow deviation alarm point referenced to the setpoint (SP).
- Orange deviation alarm point referenced to the SP.
- Rate of change alarm, for a PV changing too rapidly.
- Broken transmitter, for a PV outside the designated valid range.

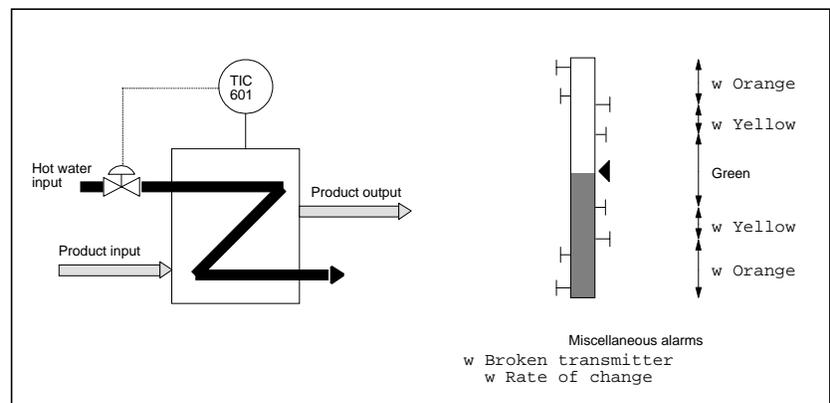


Figure 9.1 Example of Loop Control

The high-high, high, low, and low-low alarms are fixed absolute alarms and may correspond to warnings and shutdown limits for the process equipment itself. The yellow and orange deviation alarms move up and down with the setpoint, and may refer to specification tolerances around the setpoint.

A PV alarm deadband is provided to minimize cycles in and out of alarm (chattering) that generate large numbers of messages when the PV hovers near one of the alarm limits.

An option is also available to call a Special Function Program to initiate a special function calculation. The SF program call can be scheduled on the PV, the SP, or the output.

## Programming PID Loop

The PID Loop Editor gives you the ability to display, access, and/or modify PID Loops.

To access the PID Loop Editor:

1. Click PID Loop from the View menu (Alt+V,P).
2. The PID Loop Directory dialog box appears (Figure 9.1a).
3. The dialog box shows the Loop Mode, Loop number (1-512 ) depending on the processor type, Loop Title, and Enable/Disable state.

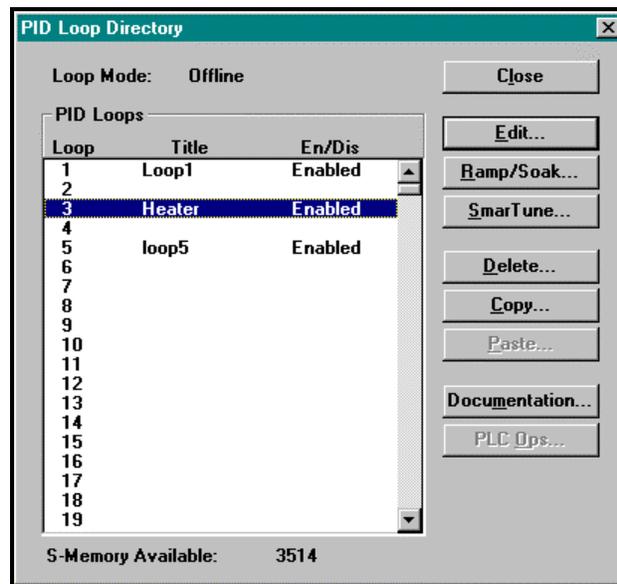


Figure 9.1a

4. Select the PID Loop number that you want to enter or edit by using the left mouse button or the Arrow keys on the keyboard.
5. To edit the selected PID Loop number, double-click on the Loop number or click on the dialog box Edit button, or use the keyboard to Tab to the Edit button and press Enter or (Alt + E). The following dialog box appears (see Figure 9.2).

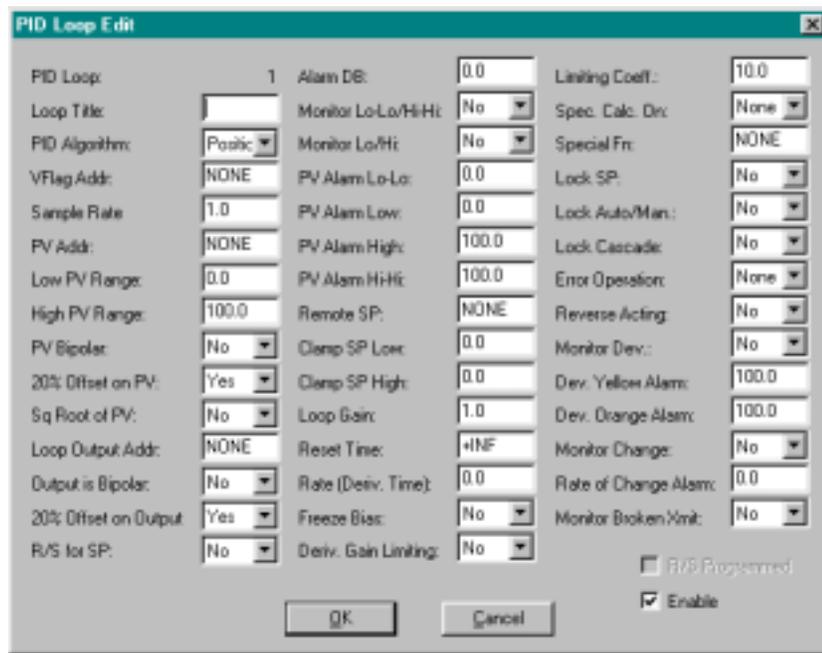


Figure 9.2

## PID Title

An eight character title can be entered for each specific PID Loop number. The title is optional and can be left blank.

## PID Algorithm

Select **POS** for the position algorithm or **VEL** for the velocity algorithm in the PID Algorithm field. For the position algorithm, the position of the device being controlled is computed based on the error. The velocity form of the PID algorithm computes the change in the device position based on the error.

## V-Flag Address

Enter an address: C,Y,V, or WY in the LOOP VFLAG ADDRESS field. If you select **NONE**, no data is written from the V-Flags in the PID Loop. You can still control the loop mode by using a SF program to change the control flag bits in the Loop V Flag.

The V-Flags contains the operational data for a PID Loop. The V-Flags corresponds to individual bits making up the 16-bit word. The bits are defined in Table 9.1.

Table 9.1 PID Loop V-Flags 1

Bit	PID Loop Function
1	1=Go to manual mode
2	1=Go to auto mode
3	1=Go to cascade mode
4 & 5	4 5 0 0 Loop is in manual mode

Bit	PID Loop Function
	1 0 Loop is in auto mode 0 1 Loop is in cascade mode
6	1=Error is positive 1=Error is negative
7	1=Process Variable is in high high Alarm
8	1=Process Variable is in high Alarm
9	1=Process Variable is in low Alarm
10	1=Process Variable is in low low Alarm
11	1=Process Variable is in yellow deviation alarm
12	1=Process Variable is in orange deviation alarm
13	1=Process Variable is in rate of change Alarm
14	1=Broken transmitter alarm
15	1=PID Loop is overrunning
16	1=Unused

## Sample Rate

Enter a time in seconds in the SAMPLE RATE field.

The sample rate determines how often deviation Alarm bits and associated math are evaluated. Sample rates are programmable in 0.1 second increments, with Alarms checked at least once every two seconds. The sample rate can be any floating point number between 0.1 and  $1.6772 \times 10^6$  seconds.

## Process Variable Address

Enter an address: V, WX, WY, or select **NONE** in the PROCESS VARIABLE ADDRESS field.

A process variable must be specified for each PID Loop. The process variable can be taken from the following:

- A word input or output module - The programming table uses a WX or WY address.
- A location in V-Memory - Uses an address in V-Memory in the programming table. When a special calculation is performed on a process variable, the result is stored in V-Memory where the Loop accesses it.

If you select **NONE**, the PID Loop does not read an address to obtain the Process Variable.

## Low Process Variable Range

Enter the low value of the process variable in the Process Variable Range Field.

You must specify the engineering values that correspond to the lower range of the input span.

## High Process Variable Range

Enter the high value of the process variable in the Process Variable Range Field.

You must specify the engineering values that correspond to the upper range of the input span.

### **Process Variable Bipolar**

Select YES or NO to specify analog inputs as bipolar or not. Bipolar inputs span have spans of -5 to 5 volts, or -10 to 10 volts.

### **20% Offset of Process Variable**

Select No for no offset, and Yes for 20% offset. A span of 0 to 5.0 volts (0 to 20 milliamps ) is referred to as a span of 0 to 100%. A span of 1 to 5.0 volts (4 to 20 milliamps) is referred to as a span of 20% to 100% (20% offset on the process variable).

### **Square Root of Process Variable**

Select Yes if the input for the process variable is from a device (such as an orifice meter) that requires a square root calculation to determine the correct value to use.

### **Loop Output Address**

Enter an address: V, or WY, in the Loop Output Address field. Select **NONE** when you do not want the loop to write the output to an address.

Use the LOOP OUTPUT ADDRESS field to specify the address into which the loop writes the value of the output. You can select **NONE** in situations such as cascaded loops in which the outer loop does not require an output address.

### **Output is Bipolar**

Select YES or NO in the OUTPUT IS BIPOLAR field. If you Select Yes, the output range is -32000 to +32000.

### **20% Offset on Output**

Select YES or NO in the 20% OFFSET ON OUTPUT field.

If you Select No for both fields (no 20% Offset and output is not bipolar), then the output range is 0 to +32000.

### **Ramp/Soak for SP**

Select **YES** or **NO** in the RAMP/SOAK FOR SP field to indicate whether a ramp/soak program for the loop is to be executed.

### **Alarm Deadband**

Enter a value in engineering units for the Alarm deadband in the ALARM DEADBAND field. When you specify an Alarm deadband, the controller can provide hysteresis on all Alarms except the rate of change Alarm to prevent them from chattering when the process variable is near one of the Alarm limits. The loop does not exit the alarm condition until the process variable has come inside the alarm limit minus the deadband.

### **Monitor Low-Low/High-High**

Select Yes to have the controller monitor the Low-Low/High-High Loop; otherwise, select No. The Low-Low/High-High can be entered as values requiring critical action.

## Monitor Low/High

Select Yes to have the controller monitor the Low/High Alarm; otherwise, select No. The Low/High Loop can be entered as values requiring remedial action.

## Process Variable Alarm Low-Low

Enter a real number in engineering units; must be less than or equal to low Alarm value, and greater than or equal to low range of Process Variable.

## Process Variable Alarm Low

Enter a real number in engineering units; must be less than or equal to high Alarm value of Process Variable.

## Process Variable Alarm High

Enter a real number in engineering units; must be less than or equal to high-high Alarm value of Process Variable.

## Process Variable Alarm High-High

Enter real number in engineering units; must be greater than or equal to high Alarm value, and less than or equal to high range of Process Variable.

## Remote Setpoint

Select **NONE** if there is no remote setpoint. Otherwise, enter an address: V, K, WX, WY, or LMN in the REMOTE SETPOINT field.

## Clamp Setpoint Low/High

Enter values for the setpoint limits in the CLAMP SETPOINT LIMITS field. If there are no limits, enter zeroes in the High and Low fields.

## Loop Gain

Enter the value for the tuning constant LOOP GAIN in this field. See Note 1 below.

## Reset Time

Enter the value for the tuning constant Reset Time (INTEGRAL TIME) in this field. See Note 1 below.

## Rate Derivative Time

Enter the value for the tuning constant RATE DERIVATIVE TIME in this field. See Note 1 below.

---

**NOTE** It is not always necessary to have full three-mode PID control of a loop. Parts of the PID equation can be eliminated by choosing appropriate values for the gain ( $K_c$ ), reset ( $T_i$ ), and rate ( $T_d$ ), thus yielding a P, PI, PD, I, and even an ID or a D loop. To eliminate **integral** action, set ( $T_i$ ) to infinity. To eliminate **derivative** action, set ( $T_d$ ) to zero. To eliminate **proportional** action, set ( $K_c$ ) to zero.

---

## Freeze Bias

Select YES or NO in the Freeze Bias field.

Select No to have the bias adjusted when the output goes out of range.

Select Yes to have the bias frozen when the output goes out of range.

## Derivative Gain Limiting

Select Yes or No in the Derivative Gain Limiting field to have derivative gain limiting done. If you specify No, then derivative gain limiting is not done, even if a value is entered in the Limiting Coefficient field.

## Limiting Coefficient

Enter a value of the Derivative Gain Limiting Coefficient in this field.

Typically, Derivative Gain Limiting Coefficient should be in the range of 10 to 20.

In the standard PID algorithm, the algorithm responds excessively to the process noise if the coefficient of the derivative term (rate time/sample time) is significantly above the 10 to 20 range. This causes disturbances that lead to erratic behavior of the process.

To solve this problem, the controller allows you the option of selecting a derivative gain limiting coefficient. Using this coefficient enables the process variable to be filtered with a time constant that is proportional to the derivative time. The PID equations with the derivative gain limiting coefficient follow.

## Special Calculation On

Enter a **PROCESS VARIABLE**, **SETPOINT**, or **OUTPUT** in the Special Calculation On field. Select **NONE** if no SF program is to be called for execution.

## Special Function

Enter a SF program number in the SF field. Select **NONE** if no SF program is to be called for execution.

## Lock Setpoint

Select YES or NO in this field to lock or not lock the SETPOINT.

## Lock Auto/Manual

Select YES or NO in this field to lock or not lock the AUTO/MANUAL.

## Lock Cascade

Select YES or NO in this field to lock or not lock the CASCADE.

## Error Operation

Select **SQUARED** or **DEADBAND** in the Error Operation field. The Error Squared and the Deadband options are mutually exclusive. Select **NONE** if there is to be no calculation on the error value.

In calculating the control equation, the controller uses an error value equal to or less than 1.0 (% of PROCESS VARIABLE span over 100). Therefore, selecting error squared gives a lower gain for a higher error.

The control, equation with error squared is based on signed error squared, instead of the error alone.

To implement a high gain for large errors, and no gain for small errors, incorporate an error deadband. When error deadband is selected, the controller does not take any action on the output if the process variable is within the yellow deviation limits.

**Squared error calculation:**

$$e_n = (SP - PV_n) \times \text{abs}(SP - PV_n)$$

**Deadband error calculation:**

$$e_n = 0 \text{ if } \text{abs}(SP - PV_n) < YDEV$$

$$e_n = (SP - PV_n) - YDEV \text{ if } (SP - PV_n) > YDEV$$

$$e_n = (SP - PV_n) + YDEV \text{ if } (SP - PV_n) < -YDEV$$

**No error calculation:**

$$e_n = (SP - PV_n)$$

## Reverse Acting

Select **YES** for reverse-acting loop in the REVERSE ACTING field.  
Select **NO** for a direct-acting loop.

A reverse acting loop is defined to have a negative gain; i.e., a positive change in error (SP - PROCESS VARIABLE ) results in a negative change in the output from the controller. The value of the output signal decreases as the value of the error increases.

A direct acting loop is defined to have a positive gain; i.e., a positive change in error (SP - PROCESS VARIABLE ) results in a positive change in the output from the controller. The value of the output signal increases as the value of the error increases.

## Monitor Deviation

To have the controller monitor the deviation Loop limits, select Yes in the Monitor Deviation field; otherwise, select No.

## Deviation Yellow Alarm

Enter values in engineering units for the setpoint deviation limits. The deviation Alarm bands are always centered around the target or setpoint; i.e., the deviation Alarm test is actually on the control error. This value indicates the maximum allowable error (SP-PROCESS VARIABLE ) that sets the yellow Alarm deviation Alarm. The yellow deviation limit must be within the span of the process variable, and it must be less than or equal to the orange deviation Alarm.

## Deviation Orange Alarm

Enter values in engineering units for the setpoint deviation limits. The deviation Alarm bands are always centered around the target or setpoint; i.e., the deviation Alarm test is actually on the control error. This value indicates the maximum allowable error (SP-PROCESS VARIABLE ) that sets the orange Alarm deviation Alarm. The orange deviation limit must be within the span of the process variable, and it must be greater than or equal to the yellow deviation Loop.

## Monitor Rate of Change

To have the controller monitor the rate of change, select Yes in the Monitor Deviation field; otherwise, select No.

## Rate of Change Loop

Enter a value in engineering units for the rate of change Alarm in the Rate of Change Alarm field.

## Monitor Broken Transmitter Alarm

To have the controller monitor the Broken Transmitter Alarm, select Yes in the Monitor Broken Transmitter Alarm field; otherwise, select No.

If you program the controller to monitor for the broken transmitter condition, an Alarm occurs if the raw process variable is outside the valid range designated for the Process Variable. Valid ranges are:

- Bipolar: -32000 to 32000
- 0% offset: 0 to 32000
- 20% offset: 6400 to 32000

## R/S Programmed

The RAMP/SOAK PROGRAMMED field is a read-only field and contains an **X** (YES) or blank (NO) to indicate the creation of a ramp/soak program for the loop.

To create a ramp/soak profile for a loop, exit the PID Loop Edit window and select the Ramp/Soak button on the PID Loop Directory dialog box.

## Delete PID Loop

1. To Delete a PID Loop, Click on PID Loop... from the View menu or (Alt+V, P). The PID Loop Directory dialog box appears (Figure 9.1a). The dialog box shows the Loop Mode, Loop number (1-64), Loop Title, and Enable/Disable state.
2. Select the PID Loop number that you want to delete by using the left mouse button or the Arrow keys on the keyboard. Click on the dialog box Delete button or use the keyboard to Tab to the Delete button and press Enter or (Alt+D). The following dialog box appears (Figure 9.3).

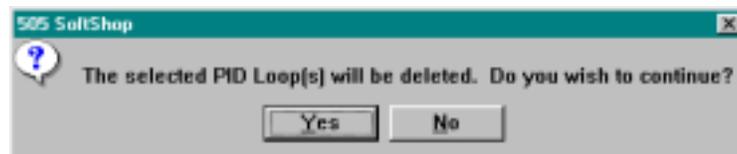


Figure 9.3

3. Select Yes to delete the PID Loop, and No to return to the previous dialog box.

# Ramp/Soak

The ramp/soak feature allows you to define a variation for the process variable by specifying the time characteristics of the loop setpoint (Figure 9.4). The capability of varying the loop setpoint can be useful in a number of processes such as heat treating and batch cooking.

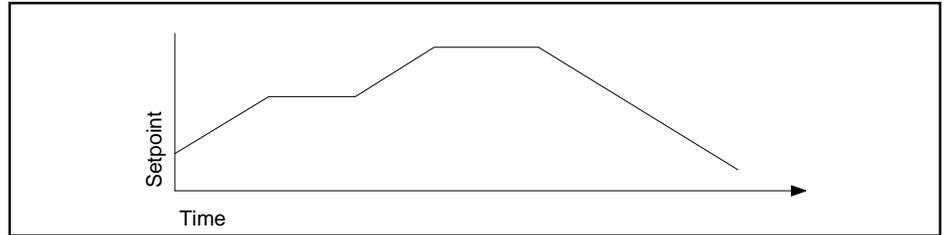


Figure 9.4 Example Ramp/Soak Cycle

You can use simple ramp operations to improve some process startup procedures. For example, the controllers do a bumpless transfer from manual to automatic mode. This transfer holds the process at the initial state when the mode change occurs. A two-step ramp/soak profile can then move the setpoint to a predefined value following the mode change, with minimal disturbance to the process.

Defining Ramp/Soak Steps:

Ramp/Soak is programmed as a set of time periods, or steps. A step can be one of three types: a ramp, a soak, or an end.

- The ramp step changes the loop setpoint linearly from its current value to a new value, at a specified rate of change.
- The soak step holds the setpoint constant for a specified period of time. You can guarantee a soak period by entering a deadband value. This form of soaking ensures that the process variable is within a specified deadband around the setpoint for a specified period of time.
- The end step terminates a ramp/soak profile. When the program reaches an end step, the loop remains in automatic mode and holds the setpoint constant.

You can program a status bit for each step of the ramp/soak. This bit is set to 1 when the loop is executing this step. It is reset when the loop leaves the step. This allows for easy tracking in the RLL program.

## Controlling the Ramp/Soak Operation

Ramp/Soak operation can be controlled by two methods: allowing the profile to be executed automatically, or by writing values to the variables that control ramp/soak.

**Automatic** - Whenever the loop changes from manual to automatic mode, the loop begins to execute the ramp/soak profile at the initial step (Step 1). The loop continues to execute the profile until an end step is encountered in the profile. At this point, the loop remains in automatic mode, and the setpoint is held at the last value in the profile.

**Using Ramp/Soak Number** - Each loop ramp/soak profile has a corresponding 16-bit variable, LRSN that contains the current step. You can monitor LRSN with a SF program and also write a step number to it with a SF program. The ramp/soak profile changes to the step that is

currently contained in LRSN. Note that the step number is zero-based. LRSN contains 0 when the profile is on step #1, 1 when the profile is on step #2, etc.

**Using the Ramp/Soak Flags** - Each loop ramp/soak profile has a corresponding 16-bit variable, LRSF, that contains operational and status information for the profile.

When you program a ramp/soak profile, you may optionally specify a RAMP/SOAK FLAG ADDRESS. When you enter an address into this field, the controller writes the ramp/soak data from LRSF to this address. You can use TISOFT or APT, or design your RLL program to write to the first three bits at the specified address. The controller reads these bits and then writes their status over the corresponding bits in LRSF. This enables you to change the ramp/soak operation by setting/clearing the three bits as needed. The controller ignores changes that you make in bits 4-16.

You can also monitor LRSF with a SF program and write changes to bits 1-3 with a SF program.

---

*NOTE: The step number is zero-based. LRSN contains 0 when the profile is on step #1, 1 when the profile is on step #2, etc.*

---

## Editor

The Ramp/Soak Editor allows you to Edit or Delete an existing programmed step or Insert a new one.

To access the Ramp/Soak Editor:

1. Click PID Loop from the View menu (Alt+V,P). The PID Loop Directory dialog box appears (Figure 9.1a). The dialog box shows the Loop Mode, Loop number (1-64), Loop Title, and Enable/Disable state.
2. Select the PID Loop number that you want to enter or edit Ramp/Soak by using the left mouse button or the Arrow keys on the keyboard.
3. To edit, delete, or insert the selected PID Loop number Ramp/Soak, click on the dialog box Ramp/Soak button or use the keyboard to Tab to the Ramp/Soak button and press Enter or (Alt + R). The following dialog box appears (Figure 9.4a).

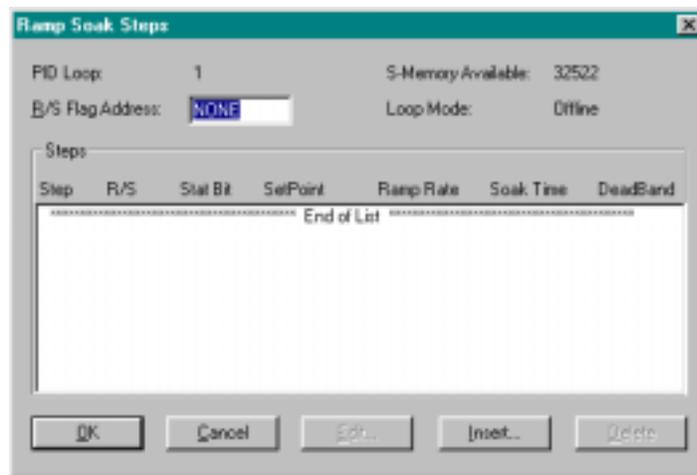


Figure 9.4a

The first field in the table contains the ramp/soak flag address. An entry in this field causes ramp/soak data to be written from the ramp/soak variable (LRSF) to another address, as described above. The address can be either a bit (Y or C) that allocates 5 contiguous bits, or a word (WY or V) that allocates one word for ramp/soak data. The format of the bits in a ramp/soak flag address correspond to the individual bits making up the 16-bit word LRSF. Bits are defined in Table 9.2.

Table 9.2

BIT	LOOP/FUNCTION
1	1= Restart at the first step. To restart, toggle bit off, on, then off again. The restart occurs on the trailing edge of a square wave.
2	1= Hold at current step. To hold, set bit on.
3	1= Jog to next step. To jog, set bit on. Jog occurs on the rising edge of a square wave.
4	1= Finish. Indicates ramp/soak is completed.
5	1= Wait. This bit is set during a soak period when the process variable is not within a specified deviation from the SP. The loop holds the soak timer when bit 5 is set.
6	1= Hold in progress at current step.
7-8	Unused ( always returns 0 ).
9-16	1= Contains step number loop is currently executing. Step number is zero-based. Step number contains 0 when ramp/soak is on step #1, 1 when the ramp/soak is on step #2 etc.

1. Enter an address: **C,Y,V**, or **WY** in the RAMP/SOAK FLAG ADDRESS field. If you select NONE, no data is written from the Loop Ramp/Soak Flags. See the following table for Loop Functions Bits.
2. To edit the selected Ramp/Soak step number, click on the dialog box EDIT button or use the keyboard to Tab to the EDIT button and press Enter or (Alt + E). The following dialog box appears (Figure 9.5).

Figure 9.5

3. Select Ramp, Soak, or End from the Mode field:
  - The **RAMP** step changes the loop setpoint (you can enter the setpoint in the **Setpoint** field) linearly from its current value to a new value at a specified rate of change (you can enter the rate of change in the **Ramp Rate** field). You can program a status bit (C or Y) for each step of the ramp/soak. This bit is set to 1 when the loop is executing this step. It is reset when the loop leaves the step.
  - The **SOAK** step holds the setpoint constant for a specified period of time (you can enter a soak time in the **Soak Time** field). You can guarantee a soak period by entering a deadband value (you can enter a deadband in the **Deadband** field). This form of soaking ensures that the PV is within a specified deadband around the setpoint for a specified period of time.
  - The **END** step terminates a ramp/soak profile. When the program reaches an end step, the loop remains in automatic mode and holds the setpoint constant.

## SmarTune Automatic Loop Tuning

SmarTune is an automatic PID loop tuning process that is built into the new SIMATIC 555 CPUs with Release 5.0 or greater firmware.

SmarTune temporarily puts a loop into manual mode. It makes a selectable change to a loop's output ( $M_n$ ) to cause a process variable (PV) movement toward the center of the PV span. Resultant PV changes are sampled. After sampling criteria is met, sampled values are used to calculate theoretical optimum gain ( $K_c$ ), reset ( $T_i$ ), and rate ( $T_d$ ). Theoretical optimums are converted to pragmatic optimums by a heuristic and assigned. The loop is switched to its previous mode and its previous set point (SP) is re-assigned.

Only one SmarTune session is in progress at a time. Other requests are automatically queued. A SmarTune queue can hold all possible entries. Each entry is processed in the order requested. A session may be aborted at any time, whether in progress or queued.

A SmarTune configuration consists of 33 parameters for each loop, which are either value parameters or variable parameters. These parameters allow you to automate loop tuning as desired. For example, you can choose whether or not to automatically load the new tuning parameters directly into the referenced loop.

---

**NOTE:** SmarTune can only be used for position or temperature loops. It is not applicable to velocity loops.

---

To access the SmarTune Loop Editor:

1. Click PID Loop from the View menu (Alt+V,P).
2. The PID Loop Directory dialog box appears (Figure 9.1a).
3. The dialog box shows the Loop Mode, Loop number (1-512 ) depending on the processor type, Loop Title, and Enable/Disable state.
4. Select the PID Loop number that you want to SmarTune by using the left mouse button or the Arrow keys on the keyboard. To program or edit SmarTune for the selected PID Loop number, click on the dialog box SmarTune button, or use the keyboard to Tab to the SmarTune button and press Enter or (Alt + E). The following dialog box appears (see Figure 9.6).

**PID SmarTune - Loop 1** [X]

<b>Security</b> PIN: <input type="text"/> <input checked="" type="checkbox"/> Not Used PIN Variable: <input type="text"/> <input checked="" type="checkbox"/> Not Used	<b>Feature Selection</b> Automatic Download: YES Calculate Derivative: NO [OK] [Cancel] [Delete]
<b>Activation and Status</b> Start Variable: <input type="text"/> Abort Variable: <input type="text"/> <input checked="" type="checkbox"/> Not Used Ack Variable: <input type="text"/> <input checked="" type="checkbox"/> Not Used Status Variable: <input type="text"/> <input checked="" type="checkbox"/> Not Used	<b>Sampling Parameters</b> Max Time: 30.0 minutes Wait Time: 0.5 minutes Noise Band: 0.5 Engineering Units Step Change: 7.0 Engineering Units Output Step Multiplier: 1.0
<b>PV Safety Limits</b> High Stop: 80.0 Engineering Units Low Stop: 20.0 Engineering Units	<b>Safe Output</b> Use Prev Output <input type="button" value="v"/>
<b>Calculated Value Limits</b> Largest Gain: 8000000.0 %/ % Smallest Gain: 0.0000008 %/ % Largest Reset: 8000000.0 minutes Smallest Reset: 0.0000008 minutes Largest Rate: 8000000.0 minutes Smallest Rate: 0.0000008 minutes	<b>Session Logging Variables</b> Previous Mode: <input type="text"/> <input checked="" type="checkbox"/> Not Used Previous SP: <input type="text"/> <input checked="" type="checkbox"/> Not Used Previous Output: <input type="text"/> <input checked="" type="checkbox"/> Not Used Previous Gain: <input type="text"/> <input checked="" type="checkbox"/> Not Used Previous Reset: <input type="text"/> <input checked="" type="checkbox"/> Not Used Previous Rate: <input type="text"/> <input checked="" type="checkbox"/> Not Used
<b>Session Results Variables</b> Calculated Gain: <input type="text"/> <input checked="" type="checkbox"/> Not Used Calculated Reset: <input type="text"/> <input checked="" type="checkbox"/> Not Used Calculated Rate: <input type="text"/> <input checked="" type="checkbox"/> Not Used	<b>SmarTune Performance</b> Activation Time Slice: <input type="text"/> ms <input checked="" type="checkbox"/> Not Used Calculated Time Slice: <input type="text"/> ms <input checked="" type="checkbox"/> Not Used SmarTune Restart: <input type="text"/> <input checked="" type="checkbox"/> Not Used

Figure 9.6

Now enter each appropriate variable for the autotune process. The following section describes, in general terms, each variable and the PID autotune process for a temperature control loop.

# Caution

SmarTune should not be used if a process might experience harmful effects as a result of arbitrary  $M_n$  assignment. During a tuning session,  $M_n$  values are assigned in such a way as to determine the frequency response of a process. The tuning process may result in process product that does not meet required standards. This product may need to be purged before and/or after a tuning session. Ensure that your process is designed to handle the results of loop tuning.

The PID algorithm consists of three components: the Proportional, the Integral (Reset), and the Derivative (Rate). Each component impacts the output to address the varied characteristics of the process variable. The PID expression is:

$$Output = P\_Gain * Error + I\_Gain * \int_0^t Error (dt) + D\_Gain * Error (d / dt)$$

where,

Error = Setpoint - Process Variable

P\_Gain = Proportional Gain

I\_Gain = Integral Gain

D\_Gain = Derivative Gain

### The Proportional Component

Temperature control with PID has two regions of operation, the proportional band, and the saturated region. The proportional band is the region above and below the setpoint where the controller output is less than 100%. The heat or cooling output is time proportioned as determined by the PID output. The proportional gain value determines the proportional band.

A typical proportional band might be around  $\pm 30^\circ\text{F}$  for a given machinery temperature control, as shown in Figure 9-7. For example, with a setpoint of  $300^\circ\text{F}$ , a proportional band of  $\pm 30^\circ\text{F}$  would equate to the region between  $270^\circ\text{F}$  and  $330^\circ\text{F}$ , where the controller would be in the proportional band. Outside of this region, on either side, is the saturated region where the controller output would be 100%, which equates to 100% heating or cooling.

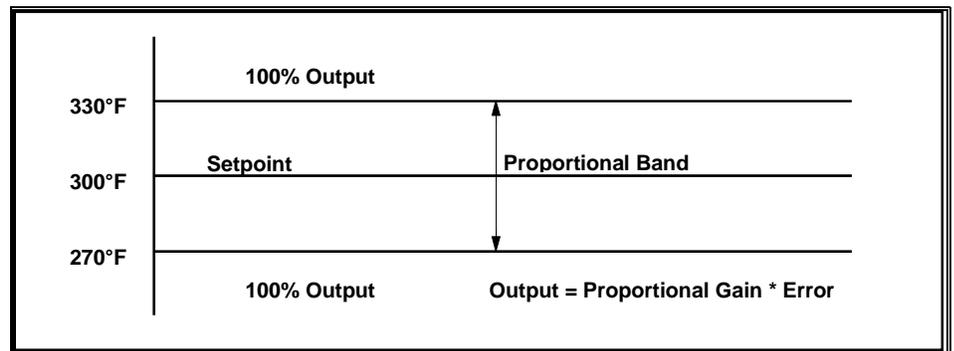


Figure 9-7 Proportional Band

A temperature controller using only the proportional component of the PID expression may experience a steady state error, as shown in Figure 9-8. This error is induced by thermal loading on a temperature zone. As the thermal loading on a temperature zone increases, the magnitude of the steady state error is increased.

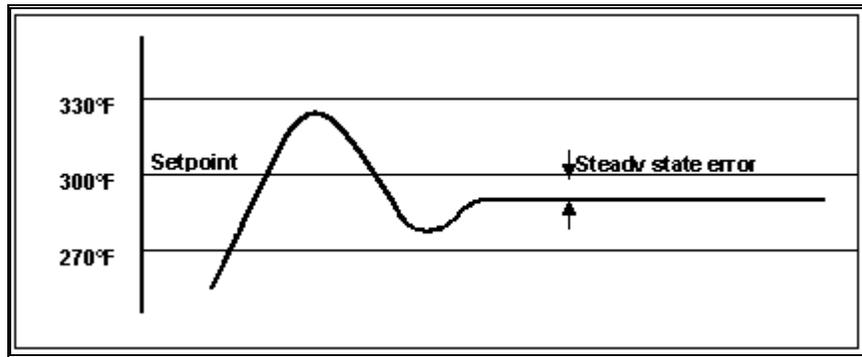


Figure 9-8 Steady State Error

Thermal loading is induced by energy losses to the surroundings, conduction through the machine, as well as the process. A proportional-only controller can resolve this error only to a limited degree.

### The Integral Component

The integral term of the PID expression provides a means to eliminate the error in the proportional band. This term is defined as the *Error* integrated over time. Thus, in the case of the steady state error, the output would be increased (or decreased depending on the sign of the *Error*) over time. The amount of the integral adjustment is determined by the magnitude of the *Error*, and the Integral gain. Excessive Integral gain would cause an oscillation about the setpoint. Likewise, minimal Integral gain would not reduce the *Error* in a timely manner and be ineffective.

### The Derivative Component

The Derivative term of the PID expression provides a mathematical means for limiting the rate of change of the process variable. As the rate of change becomes larger, the derivative term reduces the output, resulting in the reduction of the rate of change of the process variable. The Derivative gain defines the magnitude of the output reduction as a function of the rate of change of the process variable. Excessive Derivative gain would result in an undesirable output oscillation as the controller continues to eliminate the error.

When the PID gains are set appropriately, the resulting process variable curve would take on the “ideal curve” appearance, as shown in Figure 9-9.



Figure 9-9 Ideal Process Variable Curve

Many factors affect the process variable curve. These factors may take the process beyond where the controller can create the ideal curve. It is the function of the PID SmarTune utility to determine the optimum PID gain values to achieve a response as close to the ideal curve as possible.

Essentially, the SmarTune utility creates a disturbance by initiating a step increase of the PID output. Process variable samples are collected as this increase in output precipitates a change in the process variable. When the sample period is complete, the data collection is analyzed for time lag, gradient, overshoot, steady state error, and oscillation. Using a frequency analysis method, the optimum PID gain values are determined. You can choose to accept the newly calculated gain values, or keep the present PID gain settings.

The SmarTune variable parameters are listed and described in this section. Start Variable is the only variable that must be specified. It names a discrete variable used to activate a SmarTune session. The others may be null.

Variable parameters provide the coupling between a PLC program and SmarTune. If only Start Variable is specified, no program coupling is needed; a session begins when Start Variable becomes true and ends with a loop changing back to its previous mode and SP. Since coupling is done with variables, any program type may be used to monitor and control SmarTune (relay ladder logic, SFPGM, or SFSUB).

Table 9-3 lists the variable parameters used by SmarTune. The following paragraphs describe the parameters.

Table 9-3 Variable Parameters

<b>Name</b>	<b>Type</b>	<b>Allowable Variable Types</b>
Start Variable	discrete	X Y C WX WY V
Abort Variable	discrete	X Y C WX WY V
Ack Variable	discrete	Y C WY V
SmarTune Restart	discrete	X Y C WX WY V
Status Variable	word	WY V
PIN Variable	word	WX WY V
Previous Mode	Word	V
Previous SP	Real	V
Previous Output	Word	V
Previous Gain	Real	V
Previous Reset	Real	V
Previous Rate	Real	V
Calculated Gain	Real	V
Calculated Reset	Real	V
Calculated Rate	Real	V

### **Start Variable, Abort Variable, Ack Variable**

These three discrete variables allow easy activation/deactivation via an RLL program, as shown in Figure 9-10.

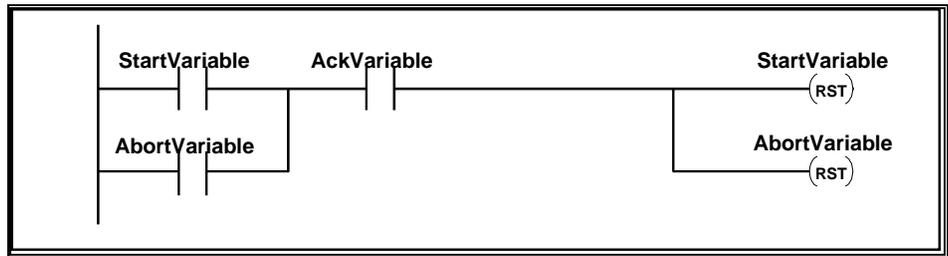


Figure 9-10 Example of Activation/Deactivation of Auto Tuning Process

These variables could just as easily be manipulated with IF, IMATH or MATH statements in an SFPGM or SFSUB. Allowed discrete variables include bits in a V-memory word.

- When Start Variable transitions from a false to a true, a SmarTune session is activated.
- When Abort Variable is true, a SmarTune session is deactivated.
- If both are true, a session is deactivated, and Start Variable must transition before a session will be activated.
- If a SmarTune session is already queued or in progress, Start Variable transitions are ignored.

Ack Variable acknowledges that SmarTune has detected that Start Variable or Abort Variable is true. It is used to synchronize Start Variable and Abort Variable program logic with SmarTune. If not used, Start Variable and Abort Variable should remain true for a relatively large amount of time. What constitutes a large amount of time depends on program size and time slice assignments. See the discussion for Activation Time Slice for further guidance.

#### SmarTune Restart

If this discrete variable is true, then SmarTune is restarted completely. SmarTune will act as if a run-program-run transition occurred. If SmarTune Restart is specified in more than one configuration, all are tested for true and acted upon.

### Status Variable

This word variable reports on the current state of a session. Three bits are used in the word to allow easy use by an RLL program. Bit 2 is set when a SmarTune session is completed, with or without errors or warnings. If bit 3 is also set then an error was detected. Similarly, if bit 4 is set, then a warning condition occurred. If only bit 2 is set, then a SmarTune session completed with no errors or warnings. See Table 9-4 for a complete listing. Note that entries with X's represent ranges of values.

### PIN Variable

PIN Variable and PIN are provided to force a two-step procedure to be followed before a loop is tuned. To use this feature, PIN Variable and PIN must both be set. If PIN Variable is a null or PIN is zero, then SmarTune activation is a one-step procedure dependent only on Start Variable. If both are specified, then PIN Variable must equal PIN or a SmarTune session will not be started or queued.

### Previous Mode

If Previous Mode is used, SmarTune sets it to a value, which will switch a loop to its pre-session mode when written to a loop's LVF. This was

conceived for use when Automatic Download has been configured as false, but may be used for other purposes. If Automatic Download is false, a loop is left in manual mode with its output set to Safe Output when a tuning session has completed. When Automatic Download is true, a loop is switched back to its previous mode and is assigned its previous SP on completion.

### Previous SP, Previous Output, Previous Gain, Previous Reset, Previous Rate

You can use these five parameters to record the prior SP, Mn, Kc, Ti, and Td of a loop before a SmarTune session starts. See Previous Mode for a short discussion on why they would be configured.

### Calculated Gain, Calculated Reset, Calculated Rate

You can use these three variables to record the tuning values calculated by SmarTune. See Previous Mode for a short discussion on why they would be configured.

Table 9-4 lists the loop tuning errors written to the Status Variable word.

Table 9-4 Status Code Bit Values

<table border="1" style="margin: auto;"> <tr> <td>r</td><td>c</td><td>e</td><td>w</td><td>f</td><td>g</td><td>h</td><td>i</td><td>j</td><td>k</td><td>l</td><td>m</td><td>n</td><td>o</td><td>p</td><td>q</td> </tr> </table>	r	c	e	w	f	g	h	i	j	k	l	m	n	o	p	q
r	c	e	w	f	g	h	i	j	k	l	m	n	o	p	q	
<ul style="list-style-type: none"> <li>r – reserved (always 0)</li> <li>c – complete (operation is complete)</li> <li>e – error (error condition detected)</li> <li>w – warning (warning condition detected)</li> <li>f-&gt;q meanings dependent on c-e-w bits</li> <li>x – irrelevant for this condition</li> </ul>																

rcew fghi jklm nopq	Description
0000 xxxx xxxx xxxx	SmarTune in progress or not active
0000 0000 0000 0000	Not active
0000 0000 0000 1000	Waiting in SmarTune queue
0000 0000 0001 0000	Waiting for Loop to enter manual mode
0000 0000 0001 1000	Wait 1 (PV value stabilize)
0000 0000 0010 0000	Wait 2 (PV value stabilize)
0000 0000 0010 1000	Wait 3 (PV value stabilize)
0000 0000 0011 0000	Calculating Tuning Parameters
0100 0000 0000 0000	SmarTune complete with no errors or warnings
0101 xxxx xxxx xxxx	SmarTune complete with warning(s)
0101 xxxx xxxx xx01	Data questionable, tuning may not be reliable
0101 xxxx xxxx xx10	Data questionable, tuning is not reliable
0101 xxxx xxx0 01xx	Sample interval too large for optimal

<b>rcew fghi jklm nopq</b>	<b>Description</b>
	tuning
0101 xxxx xxx0 10xx	Small PV changes; Step too small?
0101 xxxx xxx0 11xx	PV near span low; Range marginal?
0101 xxxx xxx1 00xx	PV near span high; Range marginal?
0101 xxxx xxx1 01xx	Small output change; Step too small?
0101 xxxx xxx1 10xx	Output near span low; Range marginal?
0101 xxxx xxx1 11xx	Output near span high; Range marginal?
0101 xxxx xx1x xxxx	PV changes before output; Noisy signal?
0101 xxxx x1xx xxxx	PV changes inconsistent with output; Noisy signal?
0101 xxxx 1xxx xxxx	Gain clamped to high/low limit
0101 xxx1 xxxx xxxx	Reset clamped to high/low limit
0101 xx1x xxxx xxxx	Rate clamped to high/low limit
0110 xxxx xxxx xxxx	SmarTune complete with error(s)
0110 0000 0000 0000	Unanticipated error

Table 9-4 Status Code Bit Values (continued)

<b>rcew fghi jklm nopq</b>	<b>Description</b>
0110 xxxx xxxx 0001	PIN mismatch
0110 xxxx xxxx 0010	Loop would not go to Manual Mode
0110 xxxx xxxx 0011	Loop not completely under SmarTune control
0110 xxxx xxxx 0100	SmarTune timeout (Maximum time exceeded)
0110 xxxx xxxx 0101	Not enough free memory
0110 xxxx xxxx 0110	Out of required system resources
0110 xxxx xxxx 0111	PV greater than high stop
0110 xxxx xxxx 1000	PV lower than low stop
0110 xxxx xxxx 1001	PV change too small
0110 xxxx xxxx 1010	Operation aborted
0110 xxxx xx01 xxxx	Sample interval (LTS) range error (allowed range: 0.1 ms to 2 hours)
0110 xxxx xx10 xxxx	PV (LPV) or output (LMN) range error (range < 0.00001)
0110 xxxx xx11 xxxx	Sample size too small (probably would never happen) size < 33 (increase STEP or decrease NOISE)
0110 xxx0 01xx xxxx	PV/output inconsistent 1; Noisy PV/output signal?

<b>rcew fghi jklm nopq</b>	<b>Description</b>
0110 xxx0 10xx xxxx	PV/output inconsistent 2; Noisy PV/output signal?
0110 xxx0 11xx xxxx	PV/output inconsistent 3; Noisy PV/output signal?
0110 xxx1 00xx xxxx	PV/output inconsistent 4; Noisy PV/output signal?
0110 xxx1 01xx xxxx	PV/output inconsistent 5; Noisy PV/output signal?

Table 9-5 lists the value parameters used by SmarTune, with the default values and the ranges possible for each.

Table 9-5 Value Parameters

<b>Name</b>	<b>Default Value</b>	<b>Range</b>
Max Time	30.0 minutes	0 to 71582 minutes (maximum is about 49 days)
Noise Band	0.005 of PV range	PV range (engineering units)
Step Change	0.07 of PV range	PV range (engineering units)
Wait Time	0.5 minutes	same as Max Time
PIN	0 (PIN not required)	0 to 32767
Automatic Download	TRUE	TRUE/FALSE
Calculate Derivative	FALSE	TRUE/FALSE
Safe Output	use Previous Output	Previous Output, 0 to 32000
High Stop	0.8 of PV range	PV range (engineering units)
Low Stop	0.2 of PV range	PV range (engineering units)
Largest Gain	8000000.0 %/%	real
Smallest Gain	0.0000008 %/%	real
Largest Reset	8000000.0 minutes	real
Smallest Reset	0.0000008 minutes	real
Largest Rate	8000000.0 minutes	real
Smallest Rate	0.0000008 minutes	real
Activation Time Slice	0	0: not configured here, 1 to 255 ms
Calculation Time Slice	0	0: not configured here, 1 to 255 ms

Table 9-5 Value Parameters

## Max Time

Max Time is a time in minutes. When a SmarTune session is started, a timer is set to this value. If that timer expires before the session has completed, the session is aborted with an error (see Table 9-4).

## Noise Band

When electrical signals are converted to values, they vary randomly by insignificant amounts. An insignificant amount is application dependent. Noise Band gives a value in engineering units denoting the boundary between a significant and an insignificant change. If a PV value differs from a prior value by a Noise Band or greater amount, then a PV change has occurred. Otherwise the PV is considered unchanged. An incorrect Noise Band setting could cause some errors and warnings in Table 9-2. A correct setting may be calculated from hardware specifications, or determined by experiment and observation, or both.

## Step Change

SmarTune works best with a PV change of about 7%. Changing Mn proportional to the ratio between Step Change and PV span accomplish this change. Step Change is specified in engineering units of the PV. If a PV span is 0 to 60 degrees and Step Change is 5 degrees, then Mn would be changed by about 2667 ( $5/60 * 32000$ ). Due to round-off error, the actual value might be slightly different. This example is based on a Mn span of 0 to 32000. If a 20% offset on output is selected for a loop, a Mn change of about 2133 (Mn span of 25600) would be accomplished. See Table 9-2 for possible warnings and errors associated with Step Change.

## Wait Time

The SmarTune sample algorithm looks for a PV to change by Step Change or to quit changing. Wait Time is required to determine when a PV has quit changing. If a PV value does not change by a Noise Band amount within a Wait Time period, then it has stopped changing.

## PIN

PIN and PIN Variable are provided to force a two-step procedure to be followed before a loop is tuned. To use this feature, PIN and PIN Variable must both be set. If PIN is a zero or PIN Variable is a null, then SmarTune activation is a one-step procedure dependent only on Start Variable. If both are specified, PIN Variable must equal PIN or a SmarTune session will not be started or queued.+

## Automatic Download

If Automatic Download is true, a loop tuning session is accomplished with minimum additional support. After tuning values are calculated, three actions are taken:

- Calculated Kc, Ti, and Td are written to a loop.
- The loop is changed to its prior mode.
- The loop's SP is assigned its prior value.

## Calculate Derivative

If Calculate Derivative is false, only Kc and Ti are calculated, and Td is set to zero. If Calculate Derivative is true, Kc, Ti, and Td are calculated.

## Safe Output

Safe Output is a Mn value that will not cause any harm to a process. The default is to use the loop Mn value just prior to a tuning session start.

## High Stop

If a PV goes above High Stop, Mn is set to Safe Output and an error is declared (see Table 9-4).

## Low Stop

If a PV goes below Low Stop, Mn is set to Safe Output and an error is declared (see Table 9-4).

## Largest Gain, Largest Reset, Largest Rate

If a calculated value is larger than a configured value, then it is reduced to a configured value and a warning is declared (see Table 9-4).

## Smallest Gain, Smallest Reset, Smallest Rate

If a calculated value is smaller than a configured value, then it is increased to a configured value and a warning is declared (see Table 9-4).

## Activation Time Slice, Calculation Time Slice

These two values set how much impact SmarTune will have on PLC scan time. If zero in all configurations, a default will be used (2 milliseconds). Otherwise, in each category, the largest value specified will be used.

Activation Time Slice controls how responsive SmarTune is to tuning session requests. Increase this value if SmarTune is taking an excessive amount of time to start a tuning session. Remember that as this value is increased, PLC scan time will increase.

Calculation Time Slice determines how much real time it will take to calculate tuning parameters. It is possible a calculation might take 20 seconds or more of PLC time. If a PLC has a scan time of 10 milliseconds and Calculation Time Slice is 2 milliseconds, then a 20-second calculation would take about 120 seconds in real time:  $(10\text{ms} + 2\text{ms}) / 2\text{ms} * 20\text{s} = 120\text{s}$ . The above formula is an algebraic simplification of:  $X\text{s} / (2\text{ms} / 12\text{ms}) = 20\text{s}$  where X is real time in seconds. This value should be increased if a SmarTune session takes an excessive amount of time with a status of calculating (see Table 9-4 and Status Variable). Remember that as this value is increased, PLC scan time will increase while a SmarTune session is calculating.

# PID Documentation

505 SoftShop provides a simple way to document PID Loops while you are creating or editing loops. The maximum number of characters you can enter for each header is 16K.

1. To Document a PID Loop, Click on PID Loop... from the View menu or (Alt+V, P). The PID Loop Directory dialog box appears (Figure 9.1a). The dialog box shows the Loop Mode, Loop number (1-64), Loop Title, and Enable/Disable state.
2. Select the PID Loop number that you want to document by using the left mouse button or the Arrow keys on the keyboard. Click on the dialog box Document button or use the keyboard to Tab to the document button and press Enter or (Alt+O). The following dialog box appears (Figure 9.11).

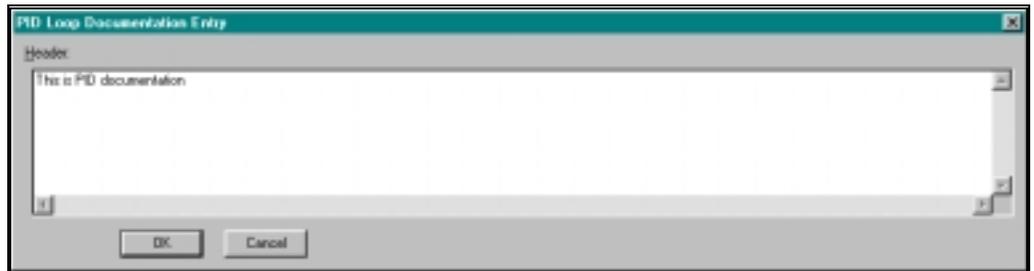


Figure 9.11

# 10 - FTLogger/FTTrend

## FTLogger Overview

FTLogger collects data from multiple PLC devices to selected database files. Addresses are entered in a spreadsheet format with up to 1,000 addresses per log window. Data is logged based on a specific time frame or used defined trigger. **See pages 182 to 201.**

## FTTrend Overview

FTTrend displays real-time data collected from multiple PLC devices or historical data collected from the FTLogger. This information is displayed in a graph with up to 256 points per graph. You can view different devices on the same graph and control how often the information is gathered and displayed. **See Pages 202 to 216.**

# FTLogger

## FTLogger Overview

FTLogger collects data from multiple PLC devices to selected database files. Addresses are entered in a spreadsheet format with up to 1,000 addresses per log window. Data is logged based on a specific time frame deadband or event.

## Creating a Log Window

To create a new Log Window, perform the following steps:

1. Launch FTLogger
2. Click  on the Toolbar or select New Program from the File menu.

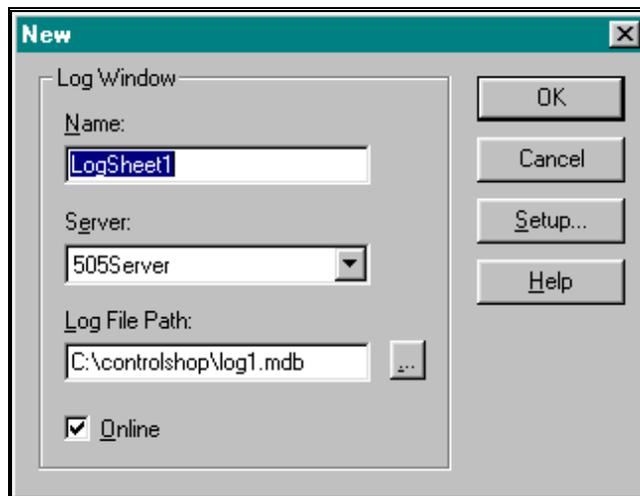


Figure 1

3. Enter a unique name, up to 128 characters, for the new Logger Window spreadsheet in the Name field.

4. Select the appropriate communications server (see appendix ? for listing of sever device associations).
5. The default path appears in the Log File Path field. Enter a path if different from the default.
6. Click the radio button Online to select the device port.  
Result: Communication is established as soon as the addresses are inserted in the log window.

Until addresses are entered into the log window, the server is not actually online. By remaining online there is a significant speed increase because the port remains open and the addresses logged remain in the server.

7. Click the **Setup** button.  
Result: The Log Window Setup screen appears (Figure 3).

---

**Note** Selecting **OK** (on the New dialog box) without configuring the Log Window Setup will set values to the factory defaults.

---

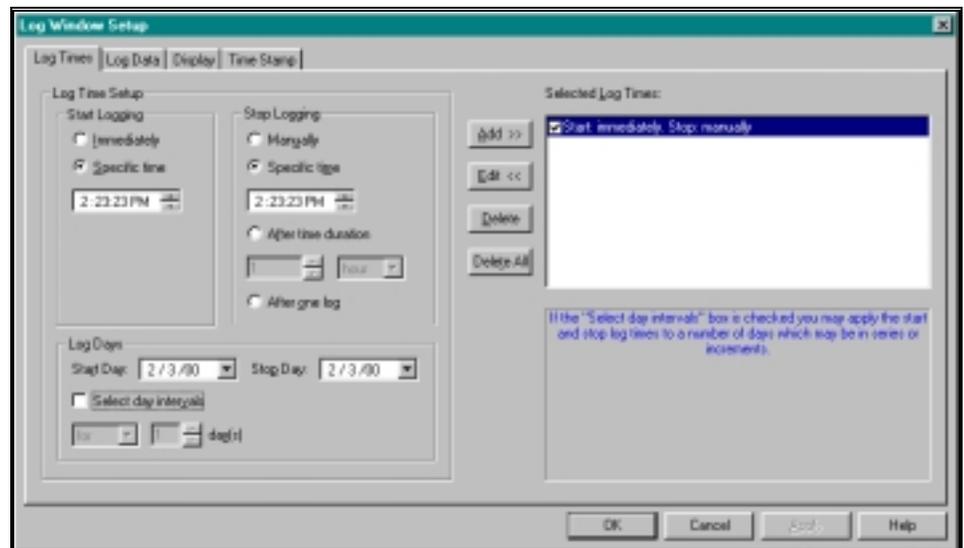


Figure 3

## Log Times

Log Times allows you to set when the log window starts and stops logging data within the window.

- **Start Logging**
  - Immediately - Data is logged to the .mdb logfile as soon as data is entered into the log window provided that the log window is online and active.
  - Specific time - Data is read from the server and logged after the time indicated just below the radio button.
- **Stop Logging**
  - Manually - Data is logged to the .mdb logfile as long as the log window is open. Deselecting the Online menu or selecting offline overrides this action and suspends logging.

Specific time - Logging terminates after the time indicated just below the radio button.

After time duration - Logging occurs for the duration of the time selected starting from the time indicated under the Start Logging group box.

After one log - Logging is terminated after the first and only log. Closing the log window prior to the selected stop logging time overrides the time and terminates all logging from the closed window. A message appears warning you of the consequences of shutting down this window.

- Log Days

Start Day - Select which days to apply the start times.

Stop Day - Select which days to apply the stop times.

Select day intervals - Select start and stop log times that can be applied a number of times to a number of days. Options are For (for consecutive days) or Every (for incremental days).

- Selected Log Times

Enable and disable each log time by clicking the check box next to the log description. The FTLogger defaults to logging data immediately after addresses are entered into the log window and continues until the log window is closed.

Add>> - When a log time is configured, click Add >> to save the log time and display it in text form in the Selected Log Times list box. 256 log times may be added. Two examples of log times in text format are listed below:

*Start logging at 1:30 PM on 10/25/1999. Stop logging after 5 minutes.*

*Every 2 days - start logging at 1:30PM. Stop logging at 2:30PM.*

Edit>> - Highlight text and click Edit>> to edit the log time. The text is removed and updated in the static text box with settings that correspond to the text.

## Log Data

The Log Data screen allows you to configure how the server reads the data and updates the cache that determines how data is logged (Figure 4).

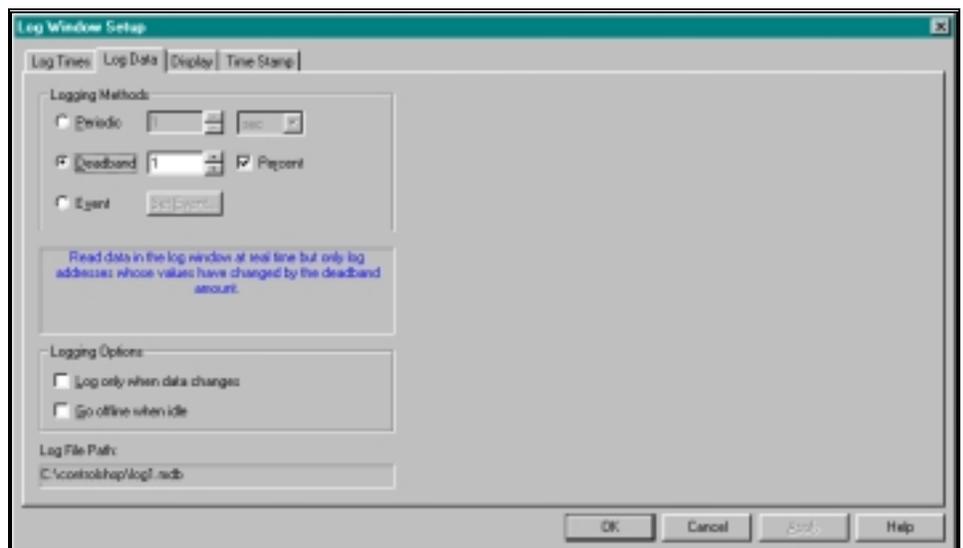


Figure 4

- Logging Methods  
Periodic - Updates the cache in time intervals specified in edit box. The format is msec, sec, min, and hour. Minimum value is 0 (updates as quickly as possible) and maximum value is 24 hours.  
Deadband - Data variation value or a percentage of a data variation. Compares each data value from the addresses in the log window with the deadband value. If a particular value fluctuates by the deadband amount (+ or -), the server updates the cache for that data item. Deadband then compares to the updated value for that particular item.  
Event - Updates only if the event created in Set Event is true and selected. The Set Event screen appears (Figure 5).

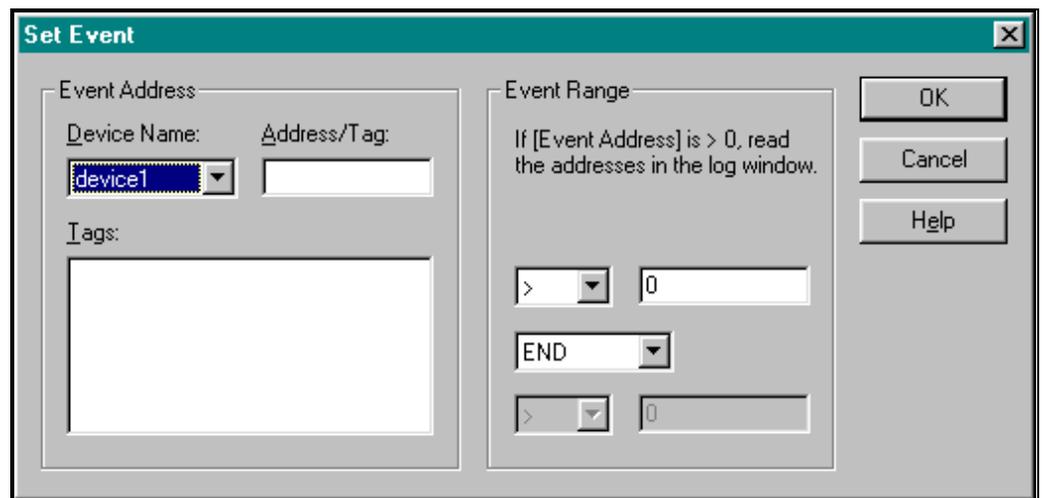


Figure 5

- Event Address  
Device Name - Displays the device name.  
Address/Tag - Displays the event address.  
Tags - Displays addresses and tags. Click an item and the corresponding address/tag appears in the Address/Tag edit box.
- Event Range  
Represents an expression involving the event address. The addresses in a log window are updated as long as the expression is true.  
The text at the top of the edit box describes the complete expression with the event address.  
The first combo box and adjacent edit box contain the low trigger range. The combo box contains the following options: <, >, <=, >=, =, and !=.  
The last combo box and adjacent edit contain high trigger range. The combo box contains the following options: <, >, <=, >=, =, and !=.  
The middle combo box represents the trigger relationship. This combo box contains the following strings:

- END
- AND
- AND NOT
- OR
- OR NOT

When END is selected, only the low trigger range is used in the expression.

- Logging method description box  
Describes the log method that is currently checked. This text changes whenever you select a different log method.
- Logging Options  
Update only when data changes - Log addresses on an individual basis only if the address value (including format) or status has changed.

**NOTE** When this box is not checked the addresses are logged every time they are read from the server.

- Go offline when idle - Allows the devices in the corresponding log window to be offline when no log times are active. When offline with a device, the port is only closed when no other log windows or clients are using the ports for their own data.

## Display

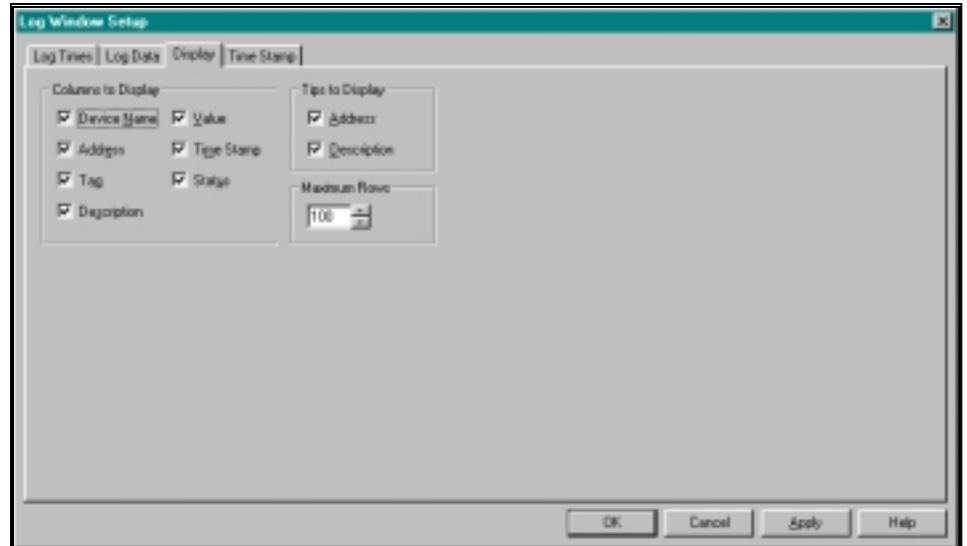


Figure 6

- Columns to Display  
Turns on and off columns in the log window (see Log Window Appearance ). All the columns are checked by default except for Value, Time Stamp, and Status.
- Tips to Display

Scroll through the Tag combo box in a log window to display the corresponding address and description (if it exists) of the highlighted tag. The address and description are referred to as doc tips and can be turned on and off with these boxes. All tips are checked by default.

## Time Stamp

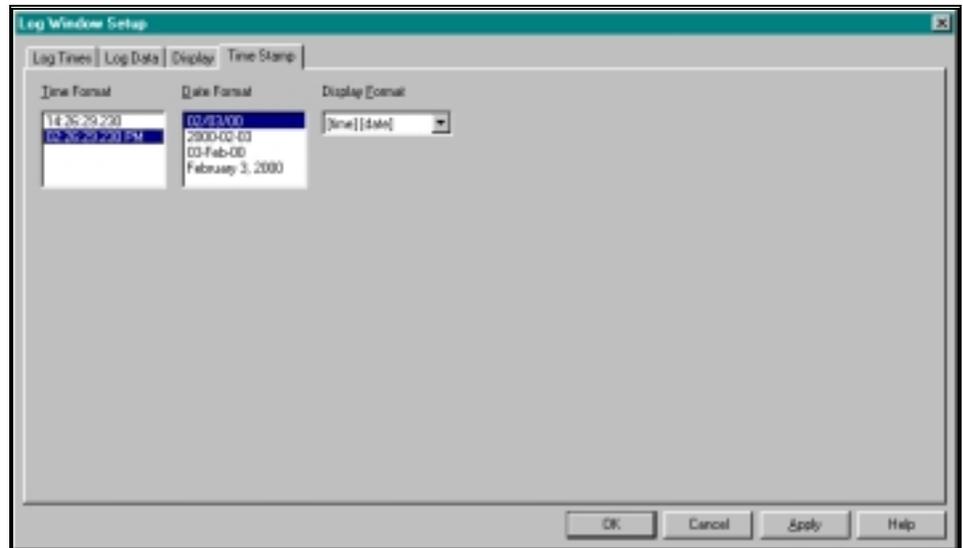


Figure 7

- Time Format  
Displays the current time (time at which the page was activated) in a standard format or military format. The default is standard format.
- Date Format  
Displays the current date (date at which the page was activated) in four different formats.  
The default is format 1 (**[month]/[day]/[year]** - each represented by 2 digits).  
**[month]/[day]/[year]** - each represented by 2 digits.  
**[year]-[month]-[day]** - The year is displayed in 4 digits while the month and day are displayed in 2 digits.  
**[day]-[month]-[year]** - The day and year are displayed in 2 digits while the month is displayed as a 3-character abbreviation.  
**[month] [day], [year]** - The month is completely spelled out, the day is displayed in minimal digits and the year is displayed as 4 digits.

## Configuring FTLogger Devices

To configure a device (items to which FTLOGGER will communicate with), select Device Source from the Data menu. Only devices from running servers can be configured. Opening a log window starts the server and it will continue to run throughout the duration of the

application. The Device Source Configuration screen is disabled if no servers are running (Figure 8).

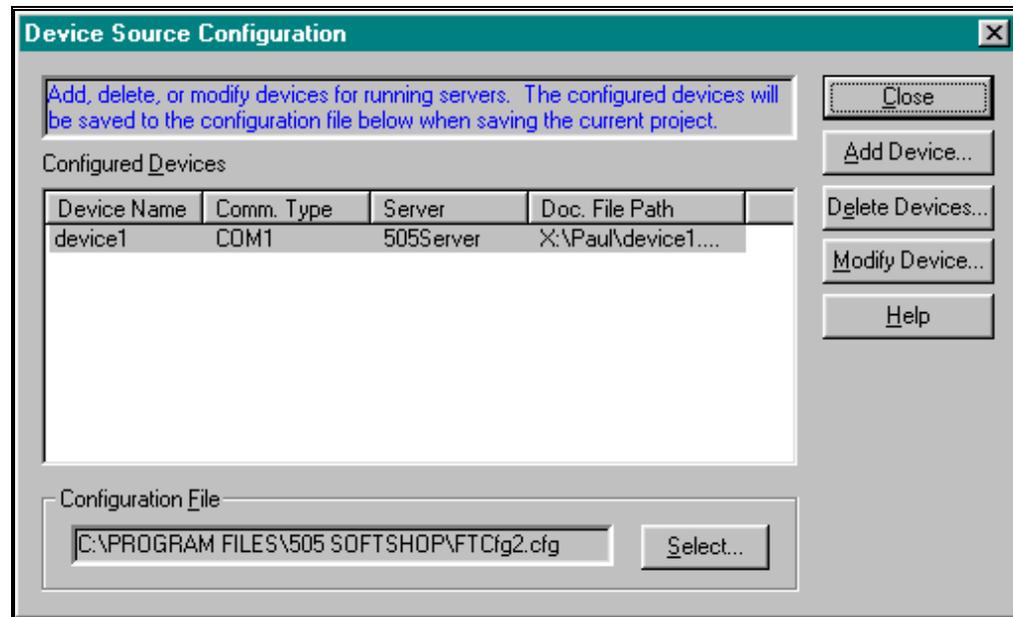


Figure 8

Two different messages are available in the static message box.

- *Add, delete, or modify for running servers. The configured devices will be saved to the configuration file below when saving the current project.* This message appears when devices are attached to the server and a log window is opened.
- *One or more devices must be configured for <server name> before any addresses/tags can be entered into the active log window.* This message appears when no devices are attached to the server and a new log window is opened.
- **Configured Devices**  
Lists the configured devices for all the servers. If a new configuration file is selected, no devices are available.
- **Configuration File**  
Change the configuration file at any time by clicking on the Select button to bring up the Select Configuration File (Figure 9). All the configured devices are saved here when selecting Save or Save As from the File menu.

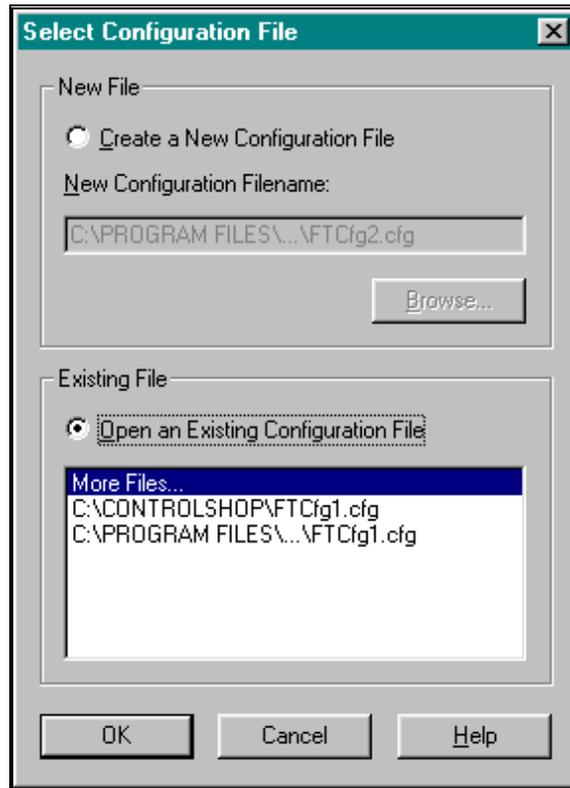


Figure 9

The Select Configuration File screen allows you to create a new configuration file or open an existing file

- **New File**  
 Create a New Configuration File - Opens a new file.  
 New Configuration Filename - The path for the configuration file defaults to the same path as the executable. Modify the new file or path by clicking the Browse button. The Select a New Configuration File screen appears (Figure 10).  
 Enter a file name or select a name using the drop down arrow in the Look in field.

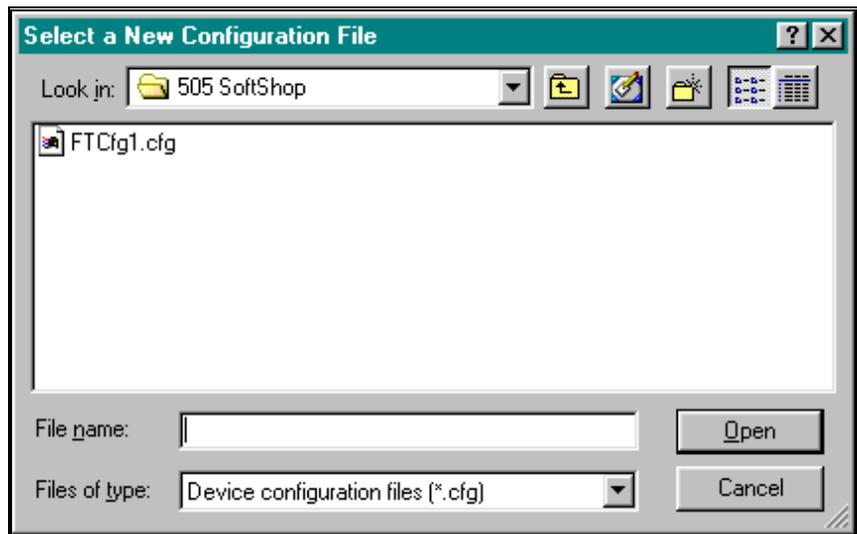


Figure 10

- Existing File  
Open an Existing Configuration File - Opens an existing file.  
More Files - Contains the Most Recently Used (MRU) configuration files read from the registry similar to the MRU list of .LGR files from the File menu.  
The database file must include at least four fields (address, tag, descrip, and comment) in order. If these fields are not found, a documentation-mapping dialog appears to map user fields to FasTrak fields described above. A tag is synonymous with a Workshop symbol and a description is synonymous with a Workshop label. Every device configured must have a corresponding documentation file.

## Adding Devices

1. To add a device, click Add Device from the Device Source Configuration screen.  
Result: The Add Device screen appears (Figure 11).

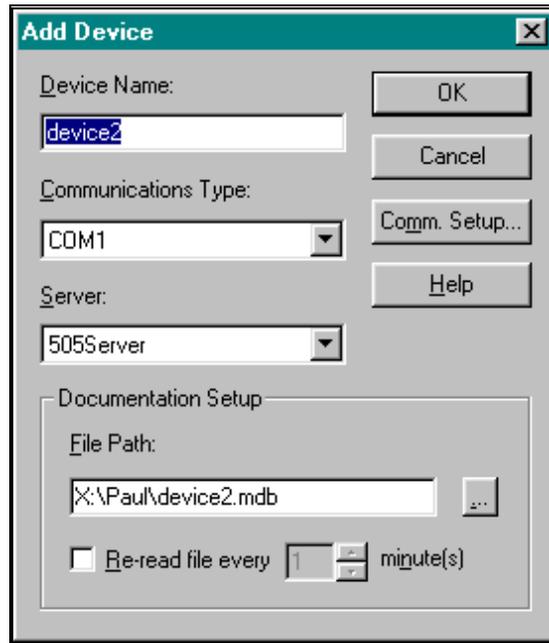


Figure 11

2. Enter information in the Device Name, Communications Type, and Server fields.  
Notes: The first running server (alphabetically) appears in the Server field.  
Modification of the device name automatically updates the doc filename so that they mirror one another.  
The Re-read file every <> minutes field is not available at this time.
3. Click the Comm. Setup... button to initialize vendor specific device settings as shown for Siemens 505 (Figure 12).

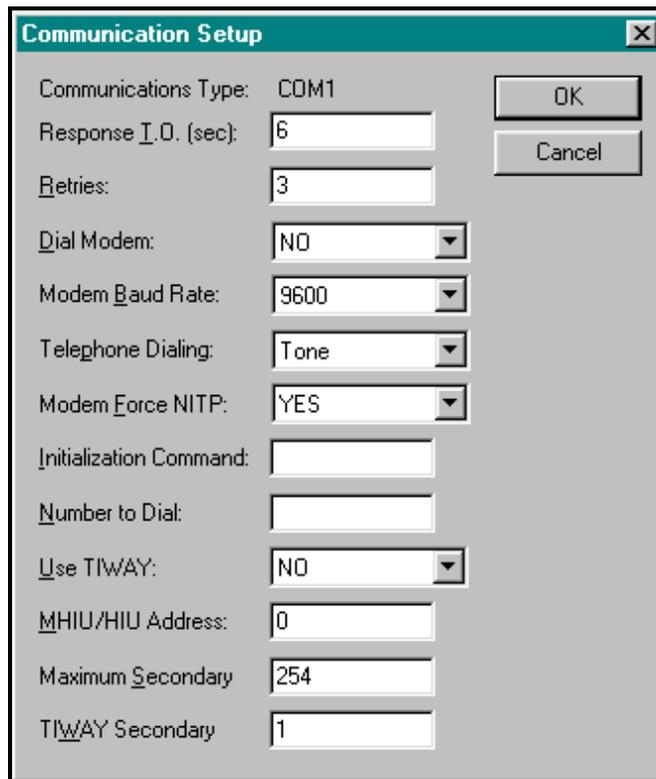


Figure 12

4. Click OK to send the configuration to the server.  
Result: A connection is made to the doc database file for reading and writing.

If the database you are connecting to does not match specifications such as a mismatch between table name or field names, the Documentation Database Mapping screen appears to map specific fields so that the software knows where various types of documentation reside (Figure 13).

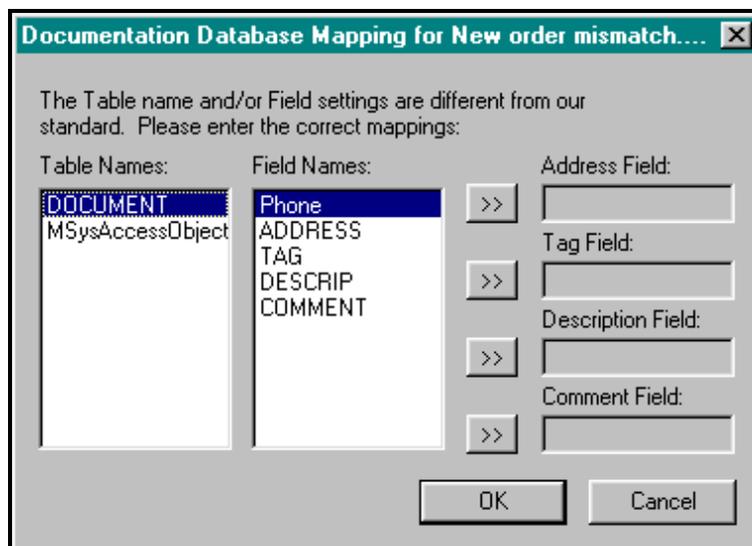


Figure 13

For the mapping to be successful, the fields names must map to the table names. The fields that are mapped must be of type “Text” for address, tag, and description and “Memo” for the comment field. The lengths of the fields must be less than or equal to FasTrak’s lengths for all fields except the comment field. The maximum character length is:

- Address = 64
- Tag = 32
- Description = 96

Failure to provide a valid mapping prevents the device from being added.

## Modifying Devices

1. To modify a device, click Modify Device from the Device Source Configuration screen.

Result: The Modify Device screen appears (Figure 14).

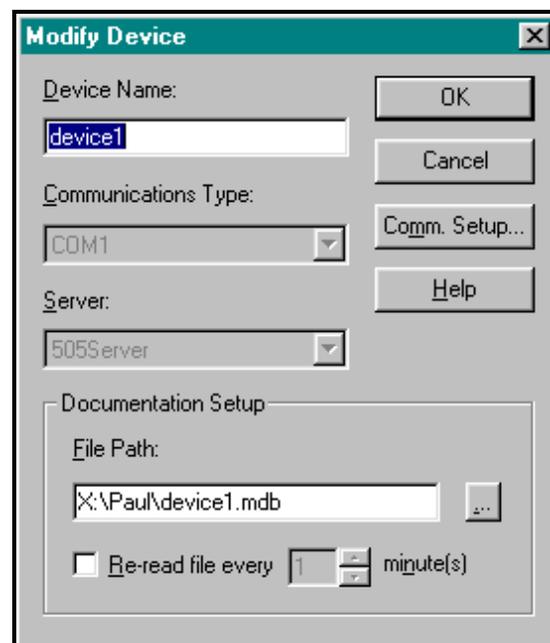


Figure 14

2. Enter information in the Device Name and Documentation Setup fields. If the device is offline, you can change the Communications Type field.
3. Click OK to send the configuration to the server.

## Deleting Devices

1. To delete a device, click Delete Device from the Device Source Configuration screen.

Result: The Delete Devices screen appears (Figure 15).



Figure 15

2. Select a server from which you wish to delete a device.
3. Select a name in the Device Names field to delete devices.
4. Click Select All and OK to delete all the devices for a selected server.

## Documentation

Once a device is configured you can specify a database file to hold and sort all documentation. Multiple users can simultaneously modify documentation for the same device so regular updates can be scheduled to get the latest documentation within the database. One documentation file is available for each device.

Documentation can be imported from comma or tab separated text files into an existing documentation database file by selecting **File** → **Import Documentation** from the menu. The Import Documentation window appears (Figure 15b).

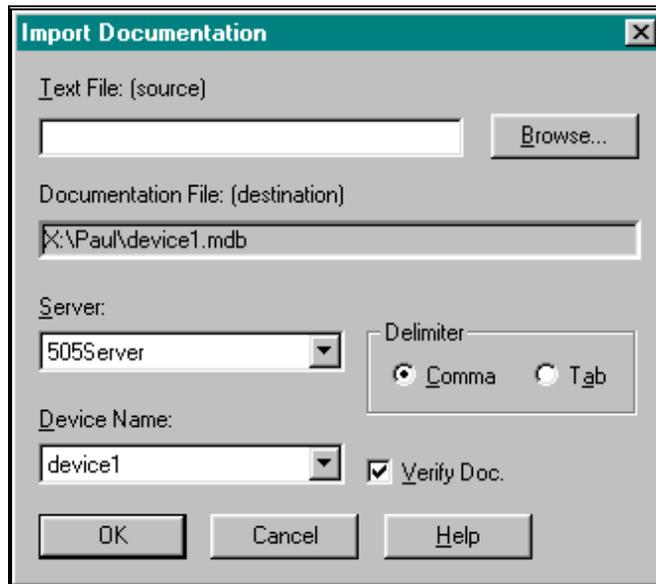


Figure 15b

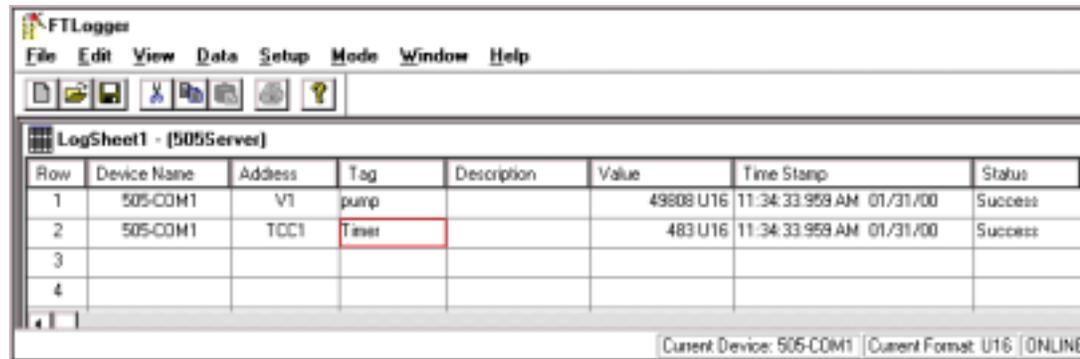
Documentation is merged into an existing database file attached to a single device. Note, when the radio button Verify Doc. is checked, tags,

addresses, and the general file format are verified. This action causes the import process to be slightly slower. To start the import process, click the **OK** button.

Documentation can also be exported by selecting **File** → **Import Documentation** from the menu.

## Using the Log Sheet

The Log Sheet displays information about the devices such as address, tag, description, value, timestamp, and status. You can change the way the data is presented and determine your status - online or offline.



The screenshot shows the FTLogger application window titled "LogSheet1 - (505Server)". The window has a menu bar with "File", "Edit", "View", "Data", "Setup", "Mode", "Window", and "Help". Below the menu bar is a toolbar with several icons. The main area contains a table with the following data:

Row	Device Name	Address	Tag	Description	Value	Time Stamp	Status
1	505-COM1	V1	pump		49808 U16	11:34:33.959 AM 01/31/00	Success
2	505-COM1	TCC1	Timer		483 U16	11:34:33.959 AM 01/31/00	Success
3							
4							

At the bottom right of the window, there is a status bar that reads "Current Device: 505-COM1 | Current Format: U16 | ONLINE".

Figure 16

### Column Layout

Each log window is a spreadsheet with columns that can be sized in different methods.

- Click and hold the left mouse button when between the columns. Move the cursor to the right or left to increase or decrease the column.
- Double-click between the columns. This action adjusts the left column to display the largest string within this column. When no strings are displayed in the column, no adjustment is made.

### Row

Each row represents a single address from a single device that is configured in the server from which the log window is connected. Currently, rows are not sizeable.

### Device Name

The device name changes the current device on the status bar. Click in this column to start an auto-search for all the device names for the log window server. Select the device name when it appears.

### Address

The address corresponds to the device in the Device Name column of the same row. If a device name is not listed, the address applies to the current device listed on the status bar. Press any key or click in this column to

enter text in the address field. Entering an address creates an update of all other columns. You can enter a range of addresses by using the fill format equations below.

Address\+-[count][\increment][\format]

Address1-Address2[\increment][\format]

## Tag

A tag is a very short description of an address and can be used in place of an address. Devices must exist if you want to edit this field. Tags are stored in database files containing addresses and their corresponding descriptions.

Press any key or click in this column to start an auto-search for all the tags for the device indicated on the status bar (if an empty row) or entered in the Device Name column. A tag can be assigned to an address by first entering the address in the Address column. Then click in the column and type a unique tag. Press Enter or the Tab key or click outside the column to enter the tag into the database and associate the new tag to the address listed in the same row. Delete a tag by clicking in the column, removing all the text, and entering information by one of the methods described. Editing a tag creates an update of all other columns.

## Description

An address and/or tag must be present to edit this field. Descriptions are stored in database files containing addresses and their corresponding tags. Press a key or click in this column to display a vertically scrolling multi-line edit box containing the current description if one exists. Approximately six rows can be viewed at one time. The edit box accepts carriage returns. Press the Tab key or click outside the column to enter the description into the database. Delete a description by clicking in the column, removing all the text, and entering the information by one of the methods described. Editing a description creates an update of all other columns.

## Value

Data Value with format indicator. This column enables you to view data values. This field is not editable. When the log window is switched to “offline” mode or “online-pause” mode this field will display the last value read from the server. Addresses or tags that are entered while the log window is offline or online-paused will all display a 0 value.

## Time Stamp

Time that data value was read and put into the server cache. This column cannot be directly edited.

## Status

Status of the data read from the device. Any errors reading addresses will be displayed here. Since many addresses are read in one packet, a status error is usually displayed in multiple rows. For example, assume we configured 200 “V” addresses in a 505 PLC and we were displaying them all in FTLogger. If a packet can consist of 256 addresses and we enter V201, a status error will be displayed on all 201 rows because the

entire packet would have failed by including 1 erroneous address. Unlike SoftShop, ControlShop does not implement the type of error checking that would prevent a user from entering an invalid address so it is up to the PLC/device to report these types of errors. When offline, all the status rows will display the string “Offline”. This field is not displayed by default.

## (DATA) Menu Functionality

### Format

Selecting a format will display and log the value that the cursor is on (as well as any highlighted values) in that format.

### Size

Allows you to select a 16-bit or 32-bit format size.

### Next/Previous

Based on the vender address, get the next device register address.

Based on the vender address, get the Previous device register address.

### Fill

This will fill the log window with addresses that are set up in the dialog below.

The image shows a 'Fill' dialog box with the following fields and controls:

- Source:**
  - Start Address: [Text Box]
  - Start Row: [Spin Box, value: 1]
- Destination:**
  - End Address [Text Box]
  - Count [Spin Box, value: 1]
- Attributes:**
  - Increment: [Spin Box, value: 1]
  - Format: [Dropdown Menu, value: U16]
  - Device Name: [Dropdown Menu, value: device1]
- Buttons:** OK, Cancel, Apply, Help

Figure 17

“Start Address” will hold the first address in a range of addresses. “Start Row” will hold the starting address location in the current log window.

Destination can be in the form of an end address or a count. For example, a start address of 400001 and an end address of 400003 will display 400001, 400002, and 400003 in the log window. Selecting a count of 3 instead of an end address will give the same results. However, if increment is set to 2 and end address is selected addresses 400001 and 400003 will be displayed while addresses 400001, 400003, and 400005 will be displayed if count is selected. The format will determine how to display the data values for the addresses selected.

Clicking on the “Apply” button will fill the log window with the addresses specified in the Fill dialog without closing the dialog. Pre-existing addresses in the log window that fall within the fill range will be overwritten if “OVR” is enabled in the status bar. After clicking on Apply, the following fields will be modified:

**Start Address** – This will now indicate the address at the new start row.

**Start Row** – This will now indicate the first empty row after the last address in the fill.

### Fill Example

Below is an example of how you might set up the fill dialog.

**Start Address** = 400001  
**Start Row** = 5  
**End Address** = 400003  
**Increment** = 1

After “Apply” is selected and the log window is modified, the Fill dialog will have the following values:

**Start Address**= 400004  
**Start Row** = 8  
**End Address**= 400006  
**Increment** = 1

## Editing Features

### Cut, Copy, and Paste

Cut, Copy, and Pastes can be performed on log window rows a variety of different ways. The menu items can be found under the main “Edit” menu along with hot keys. Alternative hotkeys shift-delete, ctrl-insert, and shift-insert are supported for Cut, Copy, and Paste respectively. Toolbar items are also provided for all three features. Log window rows can be cut from one log window and pasted into another provided that the log window’s servers match.

Cut, Copy, and Paste will observe highlighted rows similar to excel. Highlighting log window rows is also similar to excel with the exception of column highlighting.

## Select All

The “Select All” menu item under the main “Edit” menu can be used to unconditionally highlight all the rows in the active log window. Features such as delete, format, size, on, off, cut, copy, and paste can be performed on the entire log window.

## Log Status Window

The log status window shown below lists successful and failed logs as well as any miscellaneous errors that may occur while attempting to log data (dependant upon setup criteria) for all log windows that are currently logging data. A successful log entry in this window will read “At [date and time of log] data was successfully logged from [log window name] to [Access log filename]”. A failed log entry in this window will read “At [date and time of log] data failed to log. [error message describing reason of failure]”. Each message type can be displayed in a different

A floating menu brought on by a right mouse button click while the cursor is over this window can be utilized to allow a user to clear or hide the window.

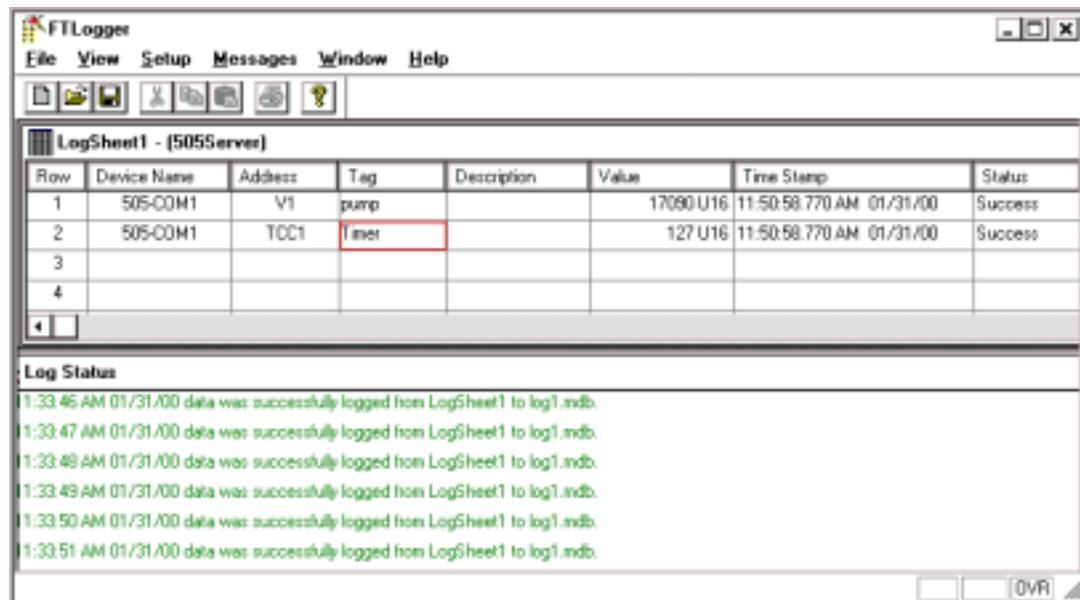


Figure 18

## Log Status Window Creation

This window will be created upon startup but can be hidden. To access this window you must select the “Log Status” menu under the main menu “View”. A check mark next to “Log Status” will indicate that we are currently viewing this window. Clicking again on this menu will remove the check mark and hide the window. If this window is full, entries will be removed from the top down as new ones are appended to the bottom.

## Log Status Setup Dialog

The log status setup dialog can be accessed by clicking on the “Log Status” menu under the main menu “Setup”. This dialog is shown below.

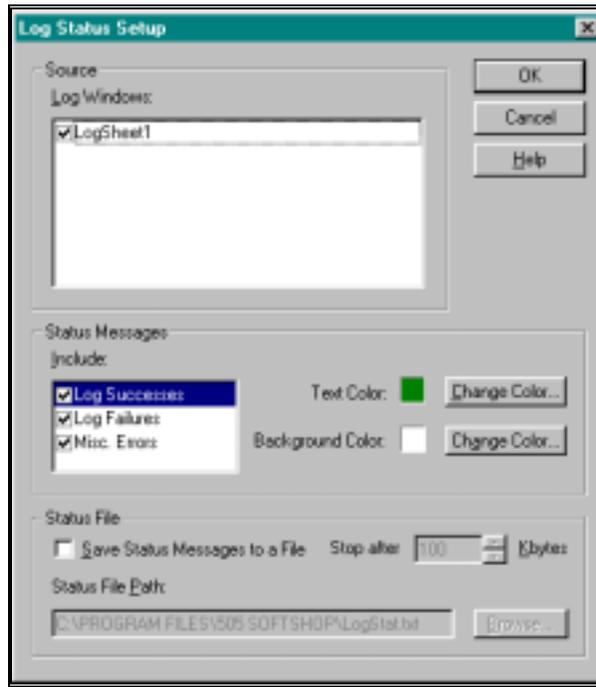


Figure 19

This dialog allows you to select which log windows we will be receiving status messages from (Source group box) as well as which status messages we wish to receive (Include group box). These messages can also be written to a file by checking the “Save Status Messages to a File” box in the “Status File” group box and including a path and filename. You can click on the “Browse” button to bring up a common file search dialog as shown above. If you’ve selected an existing file and click on “OK” the software will ask you if you would like to append the new messages to this file or clear the file and begin from scratch. Writing status messages to a file allows more flexibility in two ways. First, a file can hold more entries than a window. Secondly, status messages from one log session can be appended to messages from a previous session.

## Error Response Dialog

The Error Response dialog is accessed by clicking on the “Error Response...” menu under the main menu “Setup”. This dialog allows you to configure how the logger should react to a variety of error situations. This dialog is displayed below.

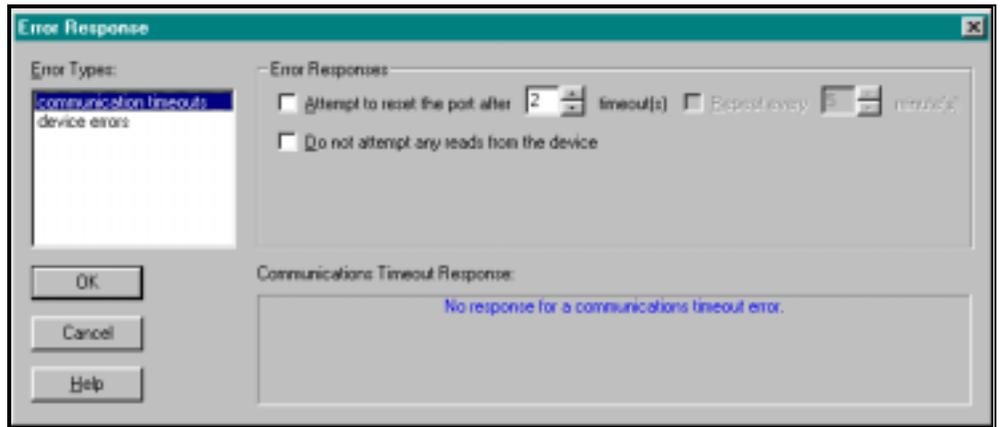


Figure 20

The “Error Types” list box holds all the error situations in which a response can be preprogrammed. Error situations include communication timeouts and device errors. The “Error Responses” group box lists all the possible responses for the item that is currently highlighted in the “Error Types” list box. If no items are checked in the group box, no action will be taken when the corresponding error situation arises. The text in bottom right corner gives a more detailed description of the error response for the error type that is highlighted.

# FTTrend

## Overview

FTTrend displays real-time data collected from multiple PLC devices or historical data collected from the FTLogger. This information is displayed in a graph with up to 256 points per graph. You can view different devices on the same graph and control how often the information is gathered and displayed.

## Creating a Trend Window

To create a new Trend Window:

- First launch FTTrander
- Click  on the Toolbar or select New Program from the File menu.

Result: A default trend widow appears (figure 1)

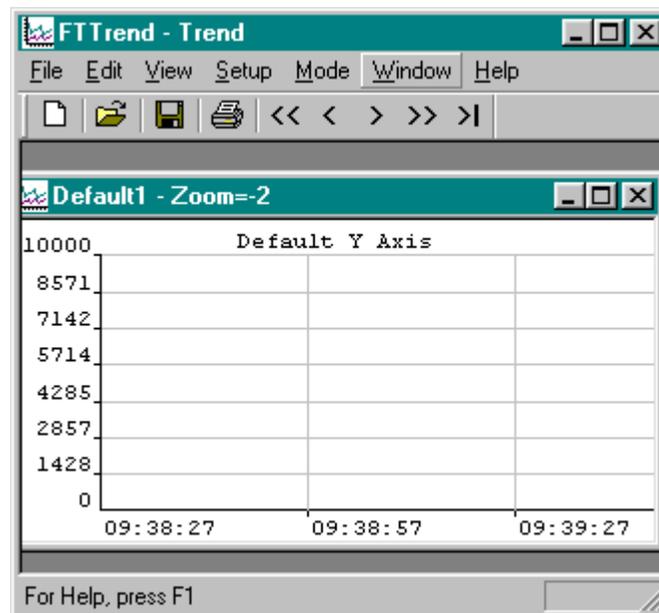


Figure 1

# Configuring FTTrend Devices

Before any addresses can be inserted into a trend window, devices must be configured so that the servers know where to read the addresses. Selecting "Device Source..." from the Setup menu list does this. Only devices from "running" servers can be configured. Opening up a trend window starts a server for the selected server. Once a window is opened and the server starts running, it will continue to run throughout the duration of the application. The menu "Device Source..." will be disabled if no servers are running. When this menu item is selected or when a trend window is created with no devices attached to the server, the dialog below will be displayed. If the dialog was prompted by a new trend window, the text in the box at the top will read "One or more devices must be configured for [server name] before any addresses/tags can be entered into the active trend window".

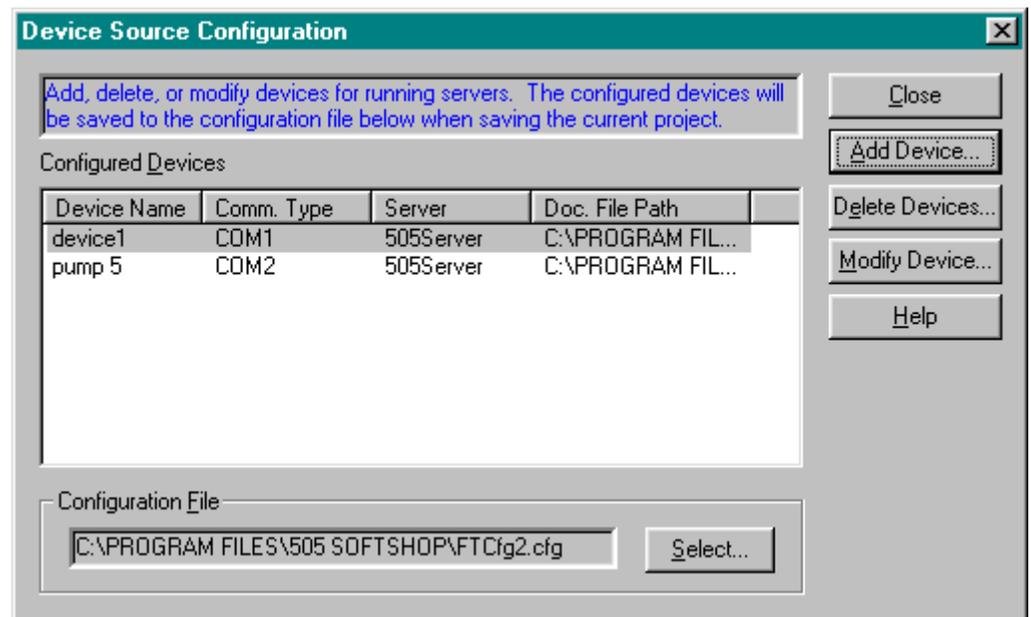


Figure 2

All the configured devices for all the servers will be listed here sorted by device name. The name of the recently selected configuration file will be displayed in the static box on the bottom. If a new configuration file is selected this window will show nothing under "Configured Devices". You can change the configuration file at any time by clicking on the "Select" button to bring up the "Select Configuration File" dialog shown below. All the configured devices will get saved here when you attempt a Save or Save As from the File menu.

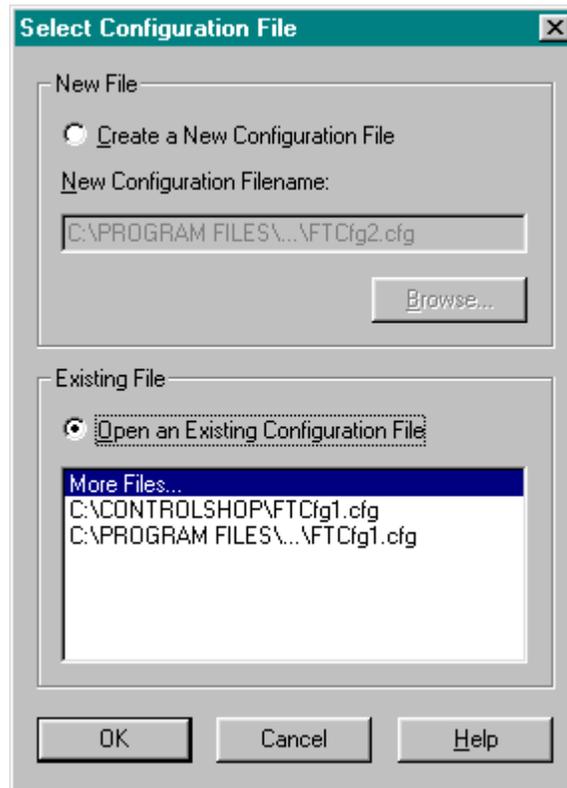


Figure 3

Within the “Select Configuration File” dialog, you can create a new configuration file or open up an existing one. If no configuration files exist, the “New File” radio button will be checked and the edit box within this group will hold a default configuration path and file. The path for the configuration file will default to the same path as the executable. You can modify the new file and/or path by editing this manually or select a new path and/or file by clicking on the “Browse” button to bring up common file dialog displayed below.

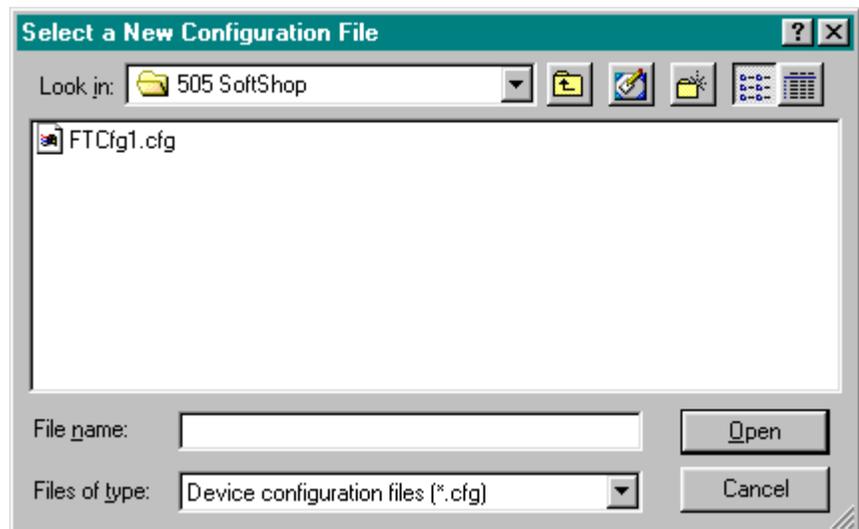


Figure 4

The list box within the “Existing File” group box will hold the most recently used (MRU) configuration files read from the registry similar to the MRU list of .LGR files under the “File” menu

The database file must include at least 4 fields (ADDRESS, TAG, Description, and COMMENT) in order. If these fields are not found, a documentation-mapping dialog will be displayed to map user fields to FasTrak fields described above. A tag is synonymous with a Workshop symbol and a description is synonymous with a Workshop label. Every device configured must have a corresponding doc file.

## Adding Devices

To add a device select the “Add Device” button and the dialog below will be displayed.

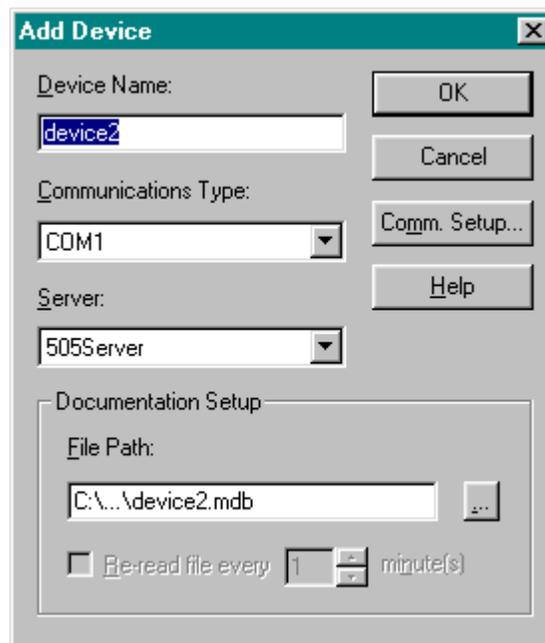


Figure 5

The first running server (alphabetically) will be displayed in the “Server” combo box along with any other running servers. Modification of the device name will automatically update the doc filename so that they mirror one another. You can select a different doc path and/or file by manually editing this string or by selecting a new or existing doc file by clicking on the “...” button to bring up a common file select dialog. Since database files can be shared with other applications a “Re-read” check box is included along with a time increment. When this is checked, the database will be re-read and the tags and descriptions will be modified in the trend windows to reflect any changes in the database. This can create a short wait time depending on how many tags are in the database.

Select the “Comm. Setup...” button to initialize vendor specific device settings as shown below for Siemens 505.

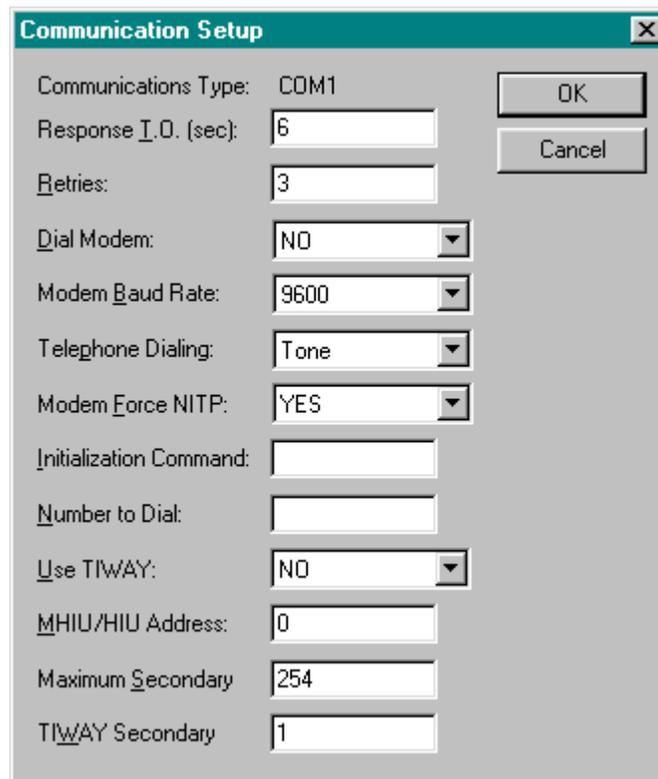


Figure 6

When “OK” is selected from the “Add Device” dialog, the configuration is sent to the server and a connection is made to the doc database file for reading and writing.

If the database you are connecting to does not match specifications (i.e. there is a mismatch between table name or field names) then a dialog will be displayed to map specific fields so that the software knows where various types of documentation reside. This dialog is shown below.

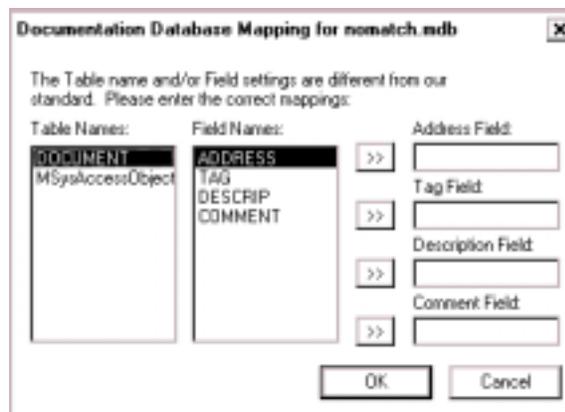


Figure 7

For the mapping to be successful, you must map to all four fields from one of the tables listed in the “Table Names” list box. The fields that are mapped must be of type “Text” for address, tag, and description and “Memo” for the comment field. The lengths of the fields must be less

than or equal to FasTrak's lengths for all fields except the comment field. The max character length for "Address" is 64. The max character length for "Tag" is 32. The max character length for "Description" is 96. Failure to provide a valid mapping will prevent the device from being added.

## Modifying Devices

To modify a device that is already configured select the "Modify Device" button from the "Device Source Configuration" dialog and the dialog below will be displayed.

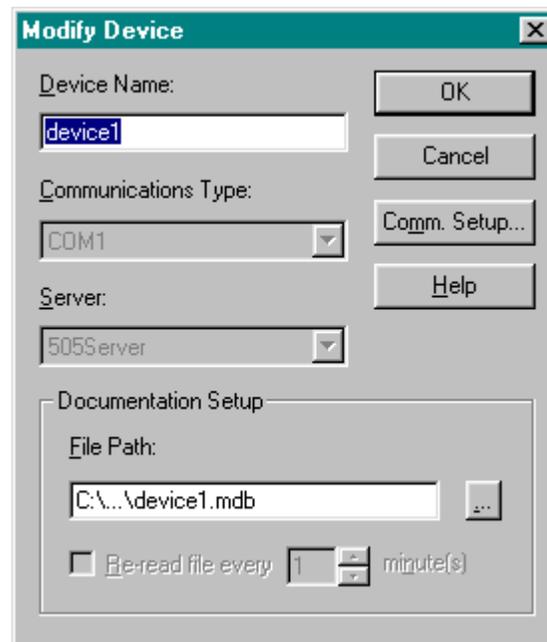


Figure 8

In this dialog only the device name and documentation setup info can be modified. If no trend windows are online with this device then the communication settings can also be modified. If the device is online then the communication settings can be viewed but cannot be modified by selecting the "Comm. Setup" button. Unlike the "Add Device" dialog, when we modify the device name here, the doc filename does not change.

## Deleting devices

To delete devices select the "Delete Devices" button in the "Device Source" setup dialog to bring up the dialog below.

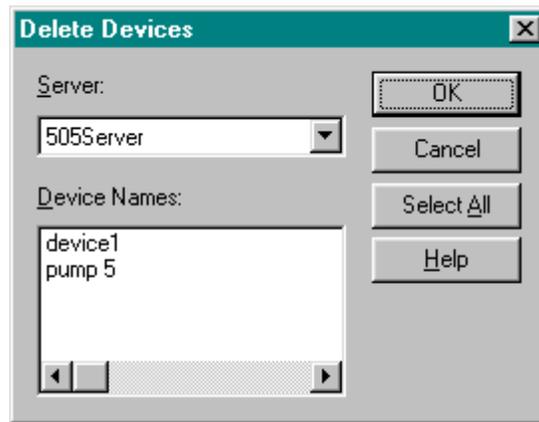


Figure 9

Clicking on “Select All” followed by “OK” will delete all the devices for a selected server. You can also click in the “Device Names” list box to manually select which devices to delete.

## Trend Window Graph Setup

To setup the graph settings:

1. Select Graph from the Setup menu.  
Result: The Graph Settings tab dialog box appears (Figure 10).

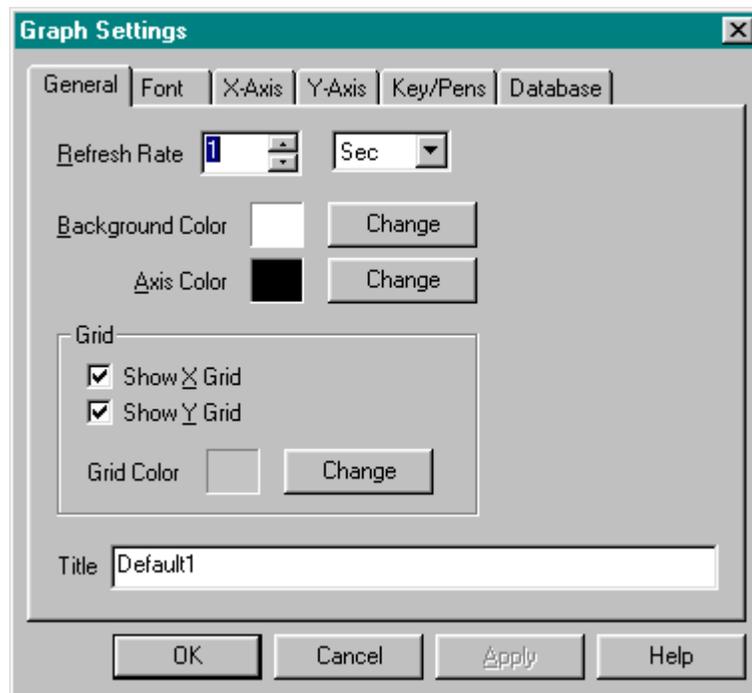


Figure 10

There are six pages belonging to this property sheet.

## General Tab

The General Tab settings are the settings for both the Y and X-axis:

- Refresh Rate is the time between screen updates.
- Background Color- sets the color of the graph background.
- Axis Color- sets the X and Y-axis color.
- Grid – turns on and off the X and Y reference lines.
- Grid Color- sets the color of the X and Y reference lines
- Title is the name of the graph. Any name up to 64 characters can be used.

## Font Tab

Font Tab changes character fonts of the graph. To change the font of text or numbers

1. Select the Change button on the Font tab.
2. On the Font dialog, click a font name in the Font box. The Font color and background can also be changed here.

## X-Axis Tab

X-Axis Tab is where settings for the X-axis are set (figure 11).

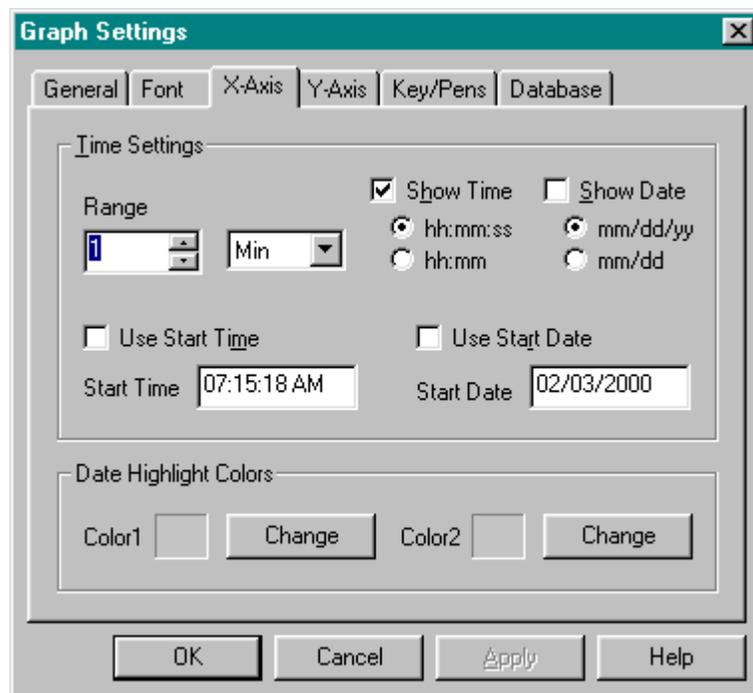


Figure 11

“Time Settings” group box sets the time range and format for the x-axis. “Range” sets the X-axis time intervals. The intervals can be set from 1 second up to 365 days. If “Show Time” check box is selected the current time in a standard format Hours: Minutes: Seconds or Hours: Minutes is displayed. If “Show Date Format” check box is selected the current date (in two possible formats) is displayed.

[Month]/[day]/[year] - each represented by 2 digits.

[month] / [day] - each represented by 2 digits. The default format is ([month]/[day]/[year] - each represented by 2 digits).

If neither is checked then nothing is display along the X-axis.

“Use Start Times ” or “Use Start Date ” allow you to set a time range to view logged data. If Use Start Time or Use Start Date is not checked then data will be read from the server or database and plotted immediately provided that the trend window is online and active. If Use Start Time or Use Start Date is checked then data will be read from the server or database and plotted after the time indicated in the selection box.

“Date Highlight Colors ” changes the color for the date display on the x-axis. For clarity sack, days are alternated up and down on the x-axis. The first day is positioned up, the second day down and to the right, third day up and to the right etc. Color1 represents the up day and Color2 the down day.

### Y-Axis Tab

Y-axis Tab is where settings for the Y-axis are set (figure 12).

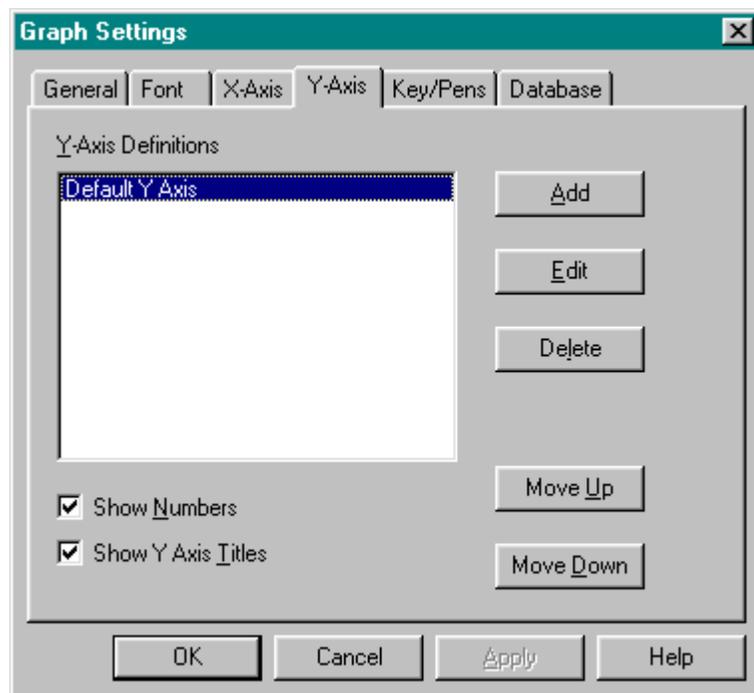


Figure 12

There can be up to 16 different y-axis per trend graph. To add additional y-axis charts select the Add button and enter an y-axis title, the high and low ranges of the data to chart (figure 13). The high value must be greater than the low value. If Auto Number is checked FTTrender will automatically scale the y-axis. If it is not selected, then a number count must be entered to scale the axis.

A limit marker can also be added to the graph. The limit marker gives a visual reference to a selected data point across the y-axis. The limit marker must be greater than or equal to the low Data Range and less than or equal to the high Data Range. It also must have a tag description associated with it. It's line thickness and color can be changed as well.

If there are multiple y-axis plotted there order of appearance from top to bottom can be changed by using the Move Up and Move Down button on

the Y-axis Tab dialog box. The y-axis scale values and titles can be turned on and off by selecting/deselecting Show Number and Show Y-Axis Titles check boxes.

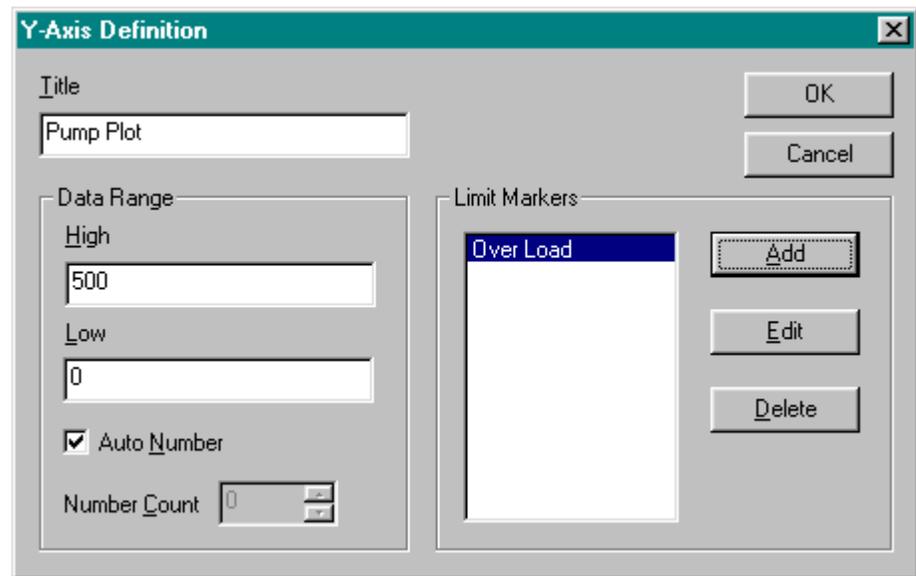


Figure 13

### ***Key/Pens Display***

There are five Key display options (display at the bottom of FTTrender window) available in FTTrender and four Pen (pen point that plots the data value (figure 14):

- Show Value, the value of the data point being read.
- Show Address, the current address being read.
- Show Device Name, the name of the device which communication is established.
- Show Tag; if FTTrend is linked with a database with tags (documentation) then the address tag can be displayed.
- Show Description, if FTTrend is linked with a database with description (documentation) then the address description can be displayed.

In order for the above Keys to be displayed the Show Key check box must be selected. The key displays font's can be changed by selecting change font on the Graph Settings dialog Key/Pen tab. Display column widths can also be changed by entering a number in the Key Columns selection box.

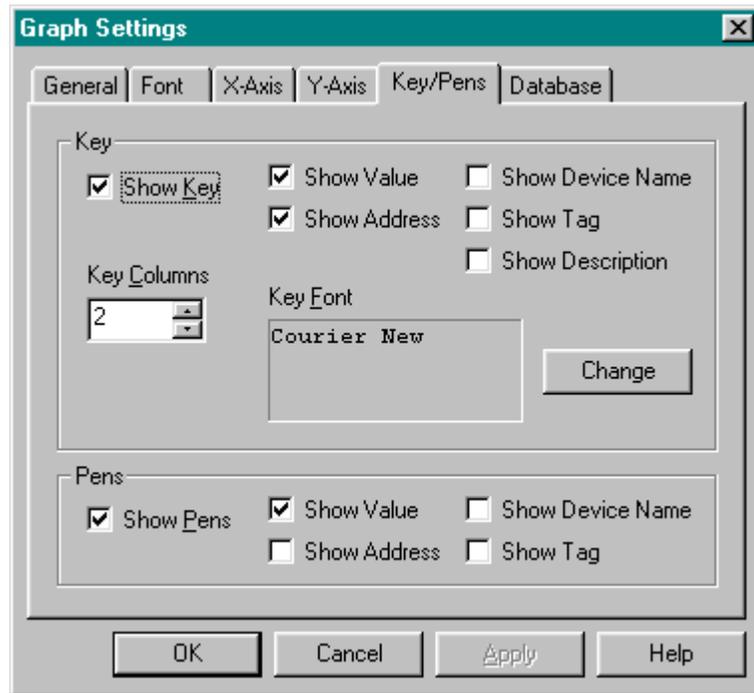


Figure 14

### Database Tab

FTTrend can display real time data as well as data stored in a database. When FTTrend is in the real data mode it's data is also stored in a database. This provides the ability to not only see the most current data plotted but past data as well.

The settings under Graph Settings Database tab (Figure 15) is where the database options are selected.

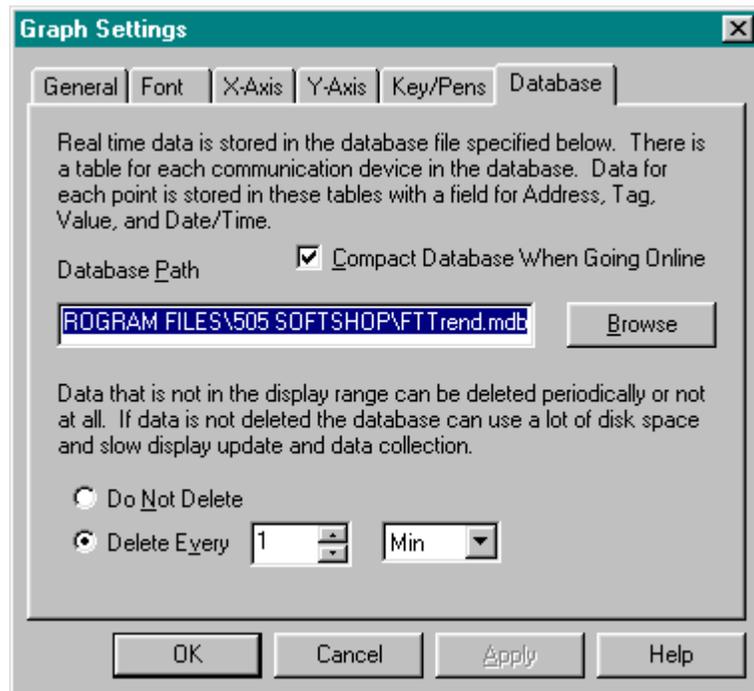


Figure 15

Compact Database When Going Online check box, when checked, helps to limit the amount of disk space used by FTTrend. When data is stored in a database some of the fields are not completely full. By compacting the trended data removes the spaces between these fields.

The data base filename and location are user defined. A new path and filename can entered in the Database Path selection box. The Browse button is used to help in the location of file folders and pre-established files.

Deleting data that will not be reviewed can control the amount of data stored in the database. This is accomplished by selecting a time frame of data to keep and deleting the unwanted portion. To delete the unwanted data select Delete Every radio button. Then enter the time frame to delete the past data.

## Defining a Data Point to Trend

To create a data point to trend:

Select Data from under the Setup Menu

Result: Graph Data dialog box appears (figure 16)

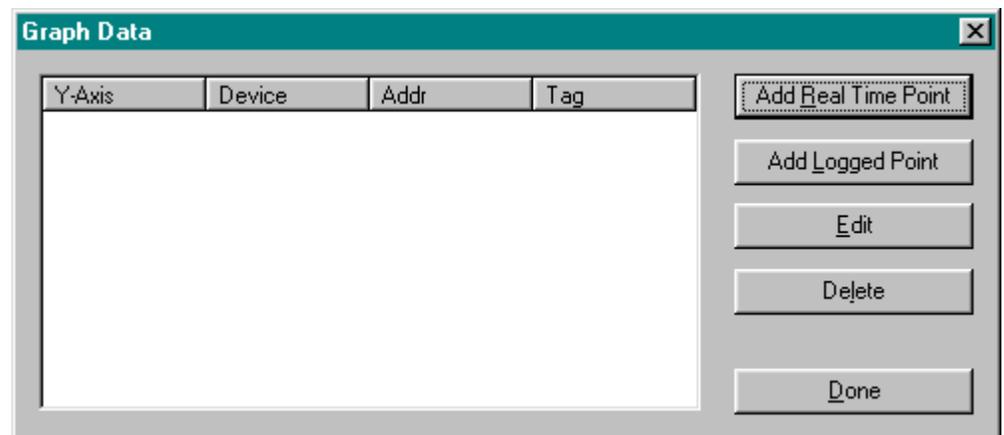


Figure 16

Real time data and logged data can both be plotted together or separately.

### Real Time Data point Setup

To add a real time point to plot, select the Add Real Time Point button.

Result: Data Point – Real Time dialog box appears (Figure 17)

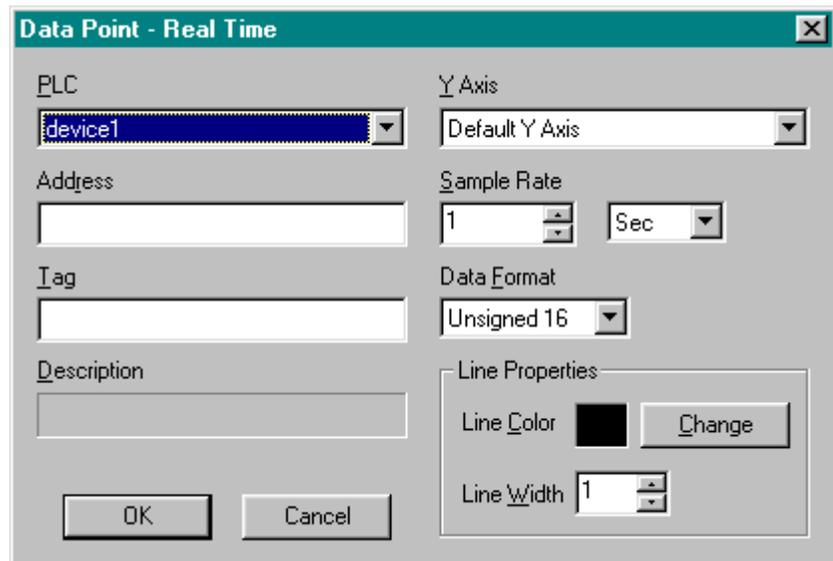


Figure 17

Choose a pre-setup device name from the drop down PLC selection box. This is the device from which data is to be retrieved from. Then enter an address (under Address box) or tag (under Tag box) to plot. Entering an item in the “Tags” list box will display the corresponding address in the “Address” edit box. If a description is associated with the address or tag it will be displayed in the Description box.

The data point must now be associated with an Y-Axis chart *see Y-Axis Tab for chart setup*. Select one of the pre-setup names Under the Y-Axis drop down box. Next enter the sample rate. Sample Rate is how often data is to be read from the device.

---

NOTE Reading large amounts of data may not retrieve data in the desired sample rate.

---

The data format (unsigned 16, signed 16, unsigned 32, signed 32 and floating point) and Line Properties (color and line width/thickness) are also selected here.

## Logged Data point Setup

To add a logged point to plot, select the Add Logged Point button from the Graph Data dialog box (Figure 16).

Result: Data Point – Logged dialog box appears (Figure 18)

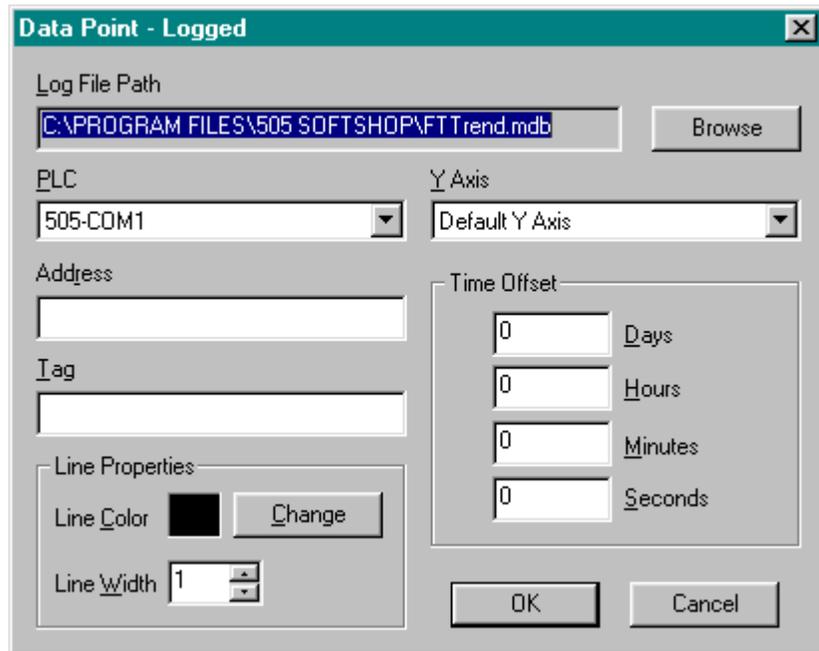


Figure 18

A previously logged database file must be entered under the Log File Path.

Choose a pre-setup device name from the drop down PLC selection box. This is the device from which data is to be retrieved from. Then enter an address (under Address box) or tag (under Tag box) to plot. Entering an item in the “Tags” list box will display the corresponding address in the “Address” edit box.

The data point must now be associated with an Y-Axis chart *see Y-Axis Tab for chart setup*. Select one of the pre-setup names Under the Y-Axis drop down box. Next enter the sample rate. Sample Rate is how often data is to be read from the device.

Time Offset allows you to offset the timed data in the database to lineup with the real time.

Example: If real time data starts logging at 1 p.m. and logged data started at 11:00 a.m. to synchronize the time enter 2 in the Hours selection box.

## Online/Offline

After a device name and y-axis point has been setup the FTTrend can begin plotting points.

To start real time trending:

Select Online from the Mode menu

Result: Graph will begin plotting.

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**NOTE** When plotting logged data the graph will automatically start after the Graph Data dialog box has been configured.

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Selecting Offline under the Mode menu stops real time trending.

# Viewing Charts

To view different time periods on a graph select one of the following options under the View Menu:

- Prev Page (<<), goes one complete time interval page into the past.
- Prev Time (<), goes one time interval in to the past.
- Next Time (>), goes one time interval into the future (cannot go past current real time).
- Next Page (>>), goes one time interval page into the future (cannot go past current real time).
- Graph End (>|), goes to the beginning real time data trending or end of time period for logged data.
- Zoom In, each time Zoom In is selected it cuts displayed time in half starting from the middle time period. Effectively showing more detail but not as much plotted graph.
- Zoom Out, each time Zoom Out is selected it doubles the displayed time starting from the middle time period. Effectively showing less detail but more graph.
- Reset Zoom, returns zoom to factory setting.
- Toolbar items are also provided for all three features

# Cut, Copy, Paste and Undo

Cut, Copy, Paste and Undo can be performed on trend text selection boxes only. The menu items can be found under the main “Edit” menu along with hot keys. Alternative hotkeys shift-delete, ctrl-insert, and shift-insert are supported for Cut, Copy, and Paste respectively.

Cut, Copy, and Paste will observe highlighted text.

# Print

To print a graph, it must be the active graph displayed on the screen. After displaying the graph, select Print from the File menu and press OK.