
PLC WorkShop™ for

Siemens S5™

Performance Series

Version 5.12

By FasTrak SoftWorks, Inc.



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PLC WorkShop for Siemens S5 - Performance Series

Introduction

How to get Customer Support

How to Update the License Key

Overview of PLC WorkShop Siemens S5 - Performance Series

How to get Customer Support

FasTrak SoftWorks, 262-238-8088
Inc.

Technical Support 262-238-8088

Fax 262-238-8080

Web <http://www.fast-soft.com>

eMail support@fast-soft.com

Mail Attention: Technical Service

FasTrak SoftWorks, Inc.

PO Box 240065

Milwaukee, WI 53224

How to Update the License Key

This FasTrak product is protected by a security key or site license.

If your installation has a site license, you do not need a key. For site license information, contact your FasTrak software distributor or sales representative.

The security key connects to either a 25-pin parallel (printer) port or to a USB (Universal Serial Bus) port. The key is activated for updates for the term of the Maintenance Agreement. Existing software will run on an expired key indefinitely, but updates released after the expiration date will not.

When you renew your Maintenance Agreement, contact FasTrak SoftWorks by telephone or email for a Key Update Code.

To obtain the Key Update Code by email:

1. Connect your hardware key to your computer (parallel or USB port).
2. Run your FasTrak software. From the Help menu, select Update Key to bring up the Security Key Update window.
3. Copy the contents of the Key License field. Paste it into an email message. Note that the key license may be longer than the displayed part of the field. Repeat for each key, and write the key number found on the label on your key (4 digits and a letter) near the key license number.
4. Send the message to support@fast-soft.com
5. FasTrak SoftWorks will reply with a new Key Update Code.
6. Copy the Key Update Code from my email into the Key Update Code field, and click OK. Your key is now reprogrammed.

To obtain the Key Update Code by telephone:

1. Connect your hardware key to your computer (parallel or USB port).
2. Call FasTrak SoftWorks at the number listed on the Customer Support page. Ask for a key update.
3. Run your FasTrak software. From the Help menu, select Update Key to bring up the Security Key Update window.
4. Read the contents of the Key License field to the representative. Note that the key license may be longer than the displayed part of the field.
5. Type the Key Update Code that the representative reads to you into the Key Update Code field, and click OK. Your key is now reprogrammed.

Overview of PLC WorkShop for Siemens S5 - Performance Series

PLC WorkShop is a programmable logic controller (PLC) programming software system. PLC WorkShop offers features such as:

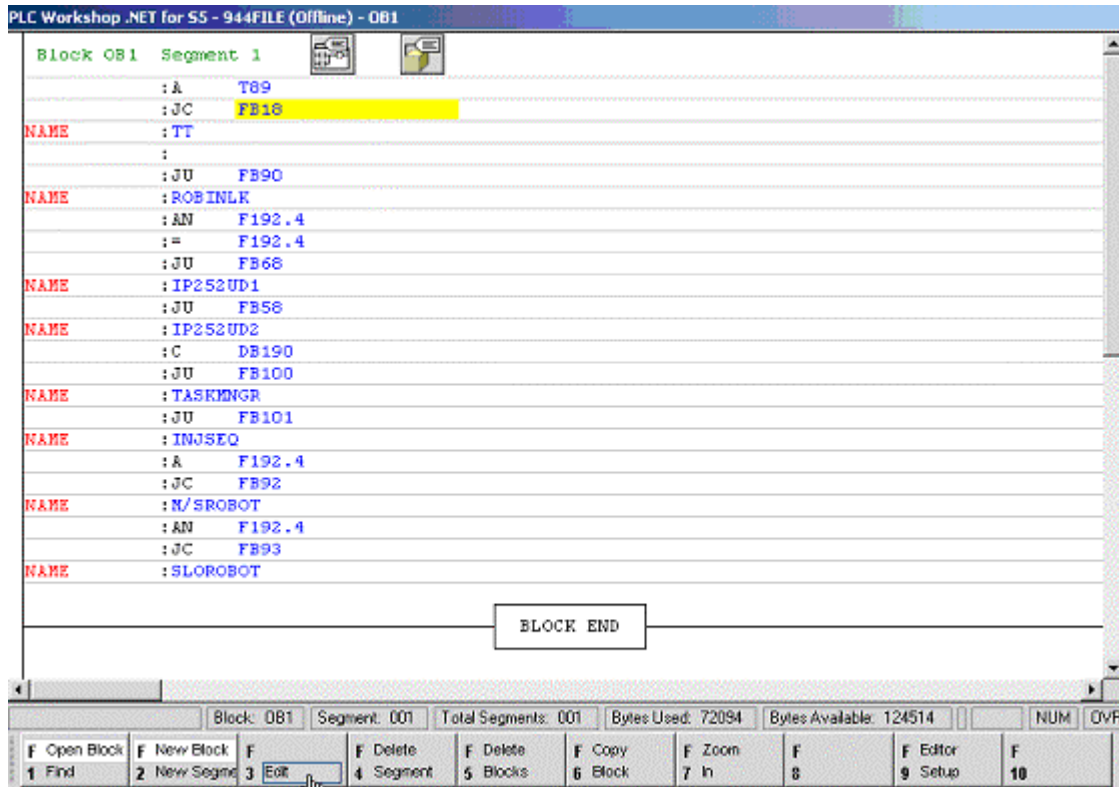
- · Symbolic Programming
- · Cut, Copy, & Paste
- · Instruction Toolbar and Mnemonics
- · Multiple windows view and edit
- · Flexible program setup
- · Write, read, and force addresses from the Data Window
- · Multiple documentation options
- · Generous Online Help

Using WorkShop

Softkey mode

What is Softkey mode?

Softkey mode provides a classic style interface for users familiar with PLC WorkShop for DOS software products. In Softkey mode, PLC WorkShop is controlled primarily through function keys rather than menus. The menu based mode is called the Pro mode.



In Softkey mode, function keys have different uses depending on the context.

The available function keys are shown at the bottom of the screen. Pressing **Esc** moves "up" to the next higher context.

Going from Pro Mode to Softkey Mode

To go to Softkey mode, select the Options/Switch to Softkey Mode menu option.

Going from Softkey Mode to Pro Mode

To go from Softkey mode back to the Pro mode, press Esc until the first set of function keys is shown, then press F5-Pro Mode.

File Operations

Fast PLC Connection

The Fast PLC Connection operation allows you to go into online editing with a single click.

To use the Fast PLC Connection:

1. Click the Fast PLC Connection icon or select the File-Fast PLC Connection menu item.

The system attempts to connect to a PLC using the *communication parameters* set in Fast PLC Setup.

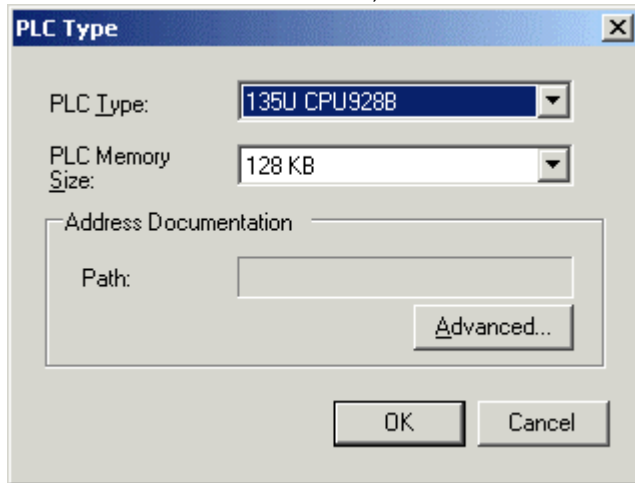
Note: The communication parameters for Fast PLC Connect are separate from those used by the Open operation. Changes to one will not affect the other.

Fast PLC Connection does not open a documentation file. No existing documentation will be available. However, you can enter new documentation or input documentation from an existing PLC program file.

New Program

To create a new PLC program offline:

1. Select File/New from the menu, click the toolbar button, or press Ctrl-N

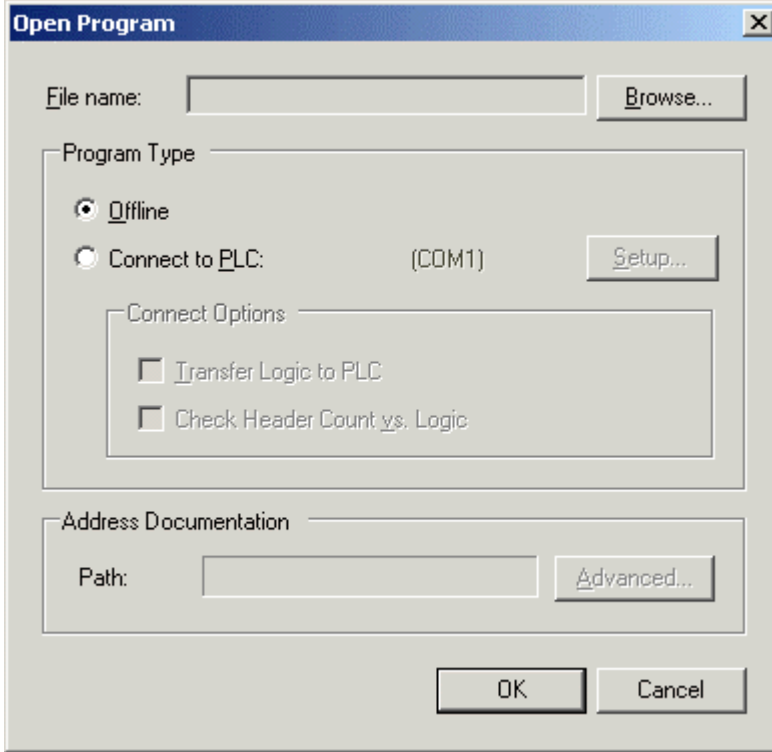


2. Select the PLC Type and memory size corresponding to the PLC where the program will be used.
3. If the documentation is not to be shared with other applications or programs, click OK.
4. To share documentation with other applications or programs, click the Advanced button to bring up the Shared Documentation Database wizard.

Open Program 

To open an existing program, either online or offline:

Select **File/Open** from the menu, click the toolbar button, or press **Ctrl-O**.



- **File name:** Browse for the PLC file to open. PLC WorkShop for Siemens S5 - Performance Series can open the following file types, but can only save PLC programs in .SF5 format.

• *.FS5	• WorkShop for Siemens S5 - Performance Series
• *.FTK	• 16 bit WorkShop for S5
• *.WGS	• GS Wings
• *.PGR	• FasTrak S5 for DOS
• *.S5D	• Step 5

- **Program Type:** Select **Online** or **Connect to PLC**.
If you select **Offline**, the file selected above is required.
If you select **Connect to PLC**, WorkShop will connect to a PLC using the communication option displayed. The documentation will be read from the file selected above, if any.
Opening connected to the PLC without selecting a file is equivalent to using the Fast PLC Connection function, except that the Open communication settings are used rather than the Fast PLC Connection communication settings.
- **Setup:** Click Setup to access the *Communications Setup* dialog. Note that the options set from here are separate from those used in the *Fast PLC Connection*.
- **Connect Options - Transfer Logic to PLC:** Before opening the program online, WorkShop transfers the ladder logic and data to the PLC.

- **Connect Options - Check Header Count vs Logic:** Before opening the program online, WorkShop counts the number of headers in the online program and compares that count to the number of headers in the offline program, in order to keep the network documentation on the correct networks.
- **Address Documentation:** To share documentation with other applications or programs, click the **Advanced** button to bring up the *Shared Documentation Database* wizard.

Save Program

To save the current program:

Select **File/Save** from the menu, click the toolbar button, or press **Ctrl-S**.

If the program has a name it will be saved under that name, overwriting any previous version of the program. The old version will be saved as a backup under the name x_BAK001.FSS, where x is the name of the program. The old x_BAK001.FSS will be renamed to x_BAK002.FSS, and so on, up to the number of backups specified in *Application Setup*.

If the program file does not have a name (it is new or was opened online without opening an offline file) a standard **Save As** dialog will appear for you to select the file name and location.

To save the current program under a new name:

Select File/Save As from the menu. A standard **Save As** dialog will appear for you to select the file name and location.

PLC WorkShop can open several file types, but can only save PLC programs in .SF5 format.

Close Program

To close a PLC program, select the **File/Close Program** submenu, and select the particular program to be closed.

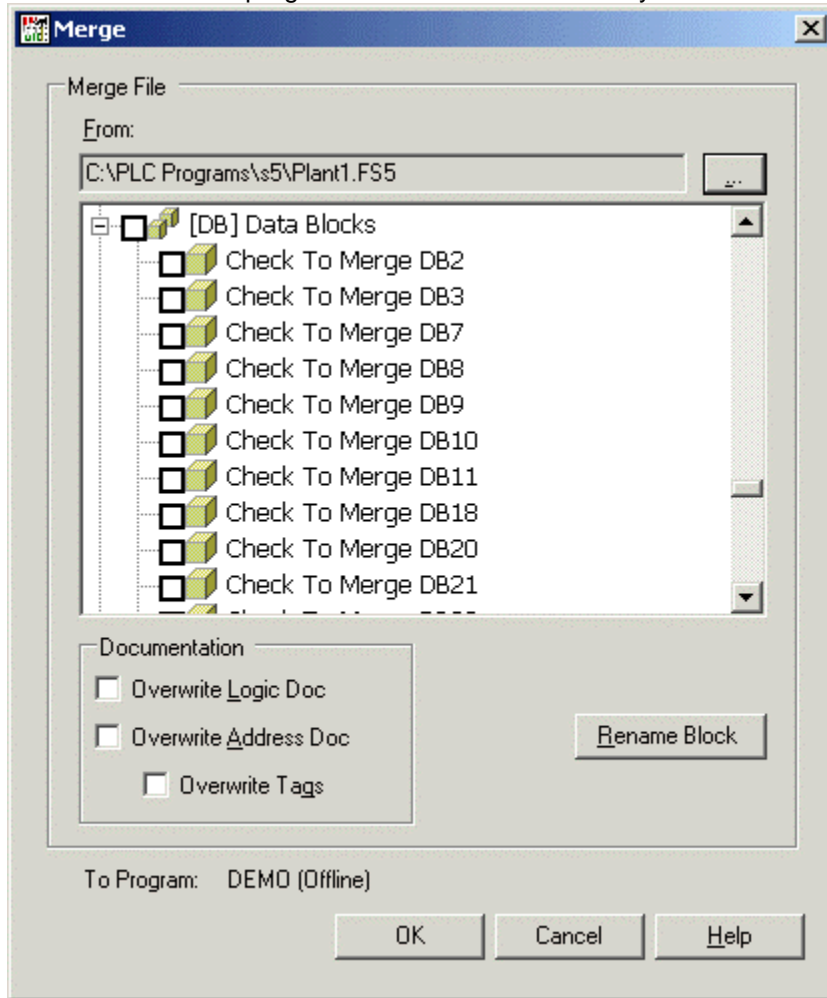
If there are changes that have not been entered, a warning dialog will appear, giving you the opportunity to cancel the close.

If there are edits that have not been saved, a warning dialog will appear, giving you the options of closing and losing the changes, saving the changes, or cancelling the close.

Merge File

Use the Merge feature bring blocks from one program into another.

1. With the program that you want the blocks added to (the target program) open and in the foreground, select **File/Merge...**
2. Browse for the PLC program that contains the blocks you want.



3. Check the box next to each desired block. If your target program already has a block by that name and that block should be kept, click **Rename Block** and enter a new block name.

Documentation: These boxes control which documentation is kept when there is a conflict between the documentation in the blocks being merged and the target program. If a box is checked, documentation for that item will be imported with the blocks regardless of any existing documentation in the target program. If the box is not checked, any existing documentation in the target program will be preserved.

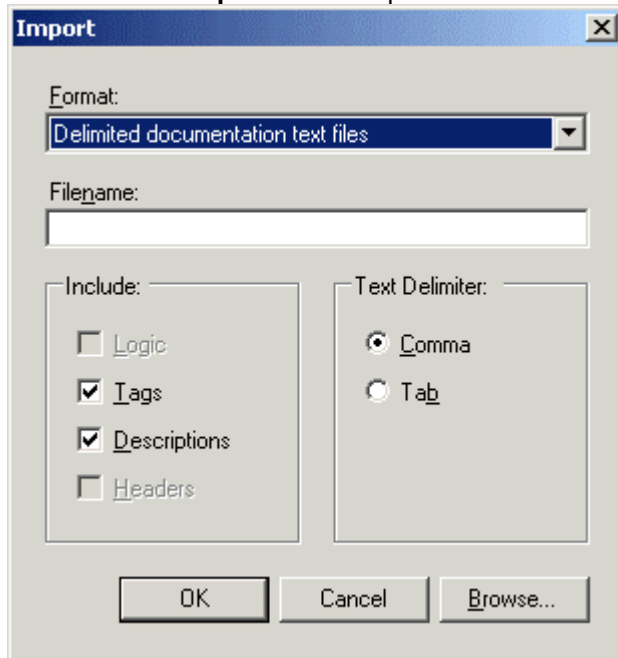
4. Click **OK**.

Import Documentation

The Import Documentation feature allows you to use documentation exported from other software or to edit documentation in either a text editor or a spreadsheet application such as Microsoft Excel.

To import documentation from a text file:

1. Select the **File/Import...** menu option.



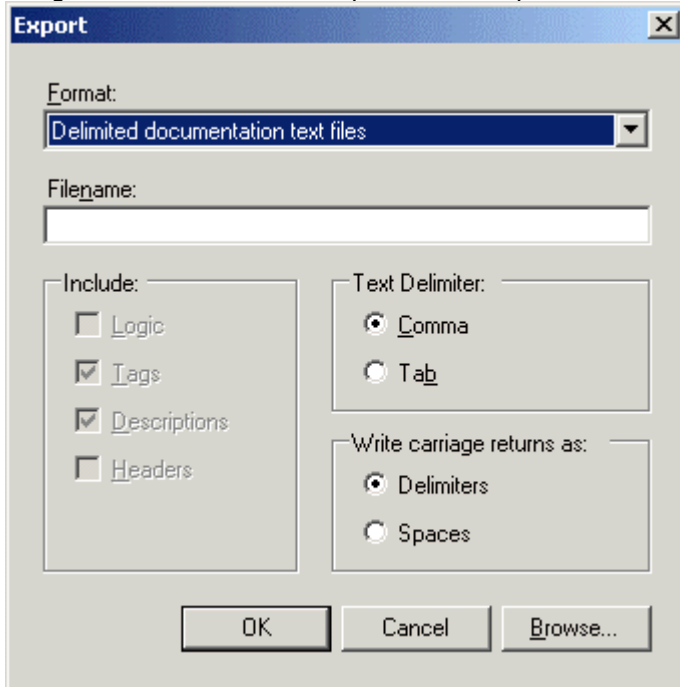
2. Browse for the file to import.
3. To skip fields, un-check their corresponding boxes in the **Include** area.
4. Select the delimiter used in the text file. By default, the text files that Microsoft Excel creates are tab delimited.
5. Click OK.

Export Documentation

The Export Documentation feature allows you to create a text file containing the PLC program documentation, either to be imported into another program, or to edit using a text editor or spreadsheet program such as Microsoft Excel.

To export the documentation to a text file:

1. With the PLC program from which the documentation will be exported open and in the foreground, select the File/Export... menu option.



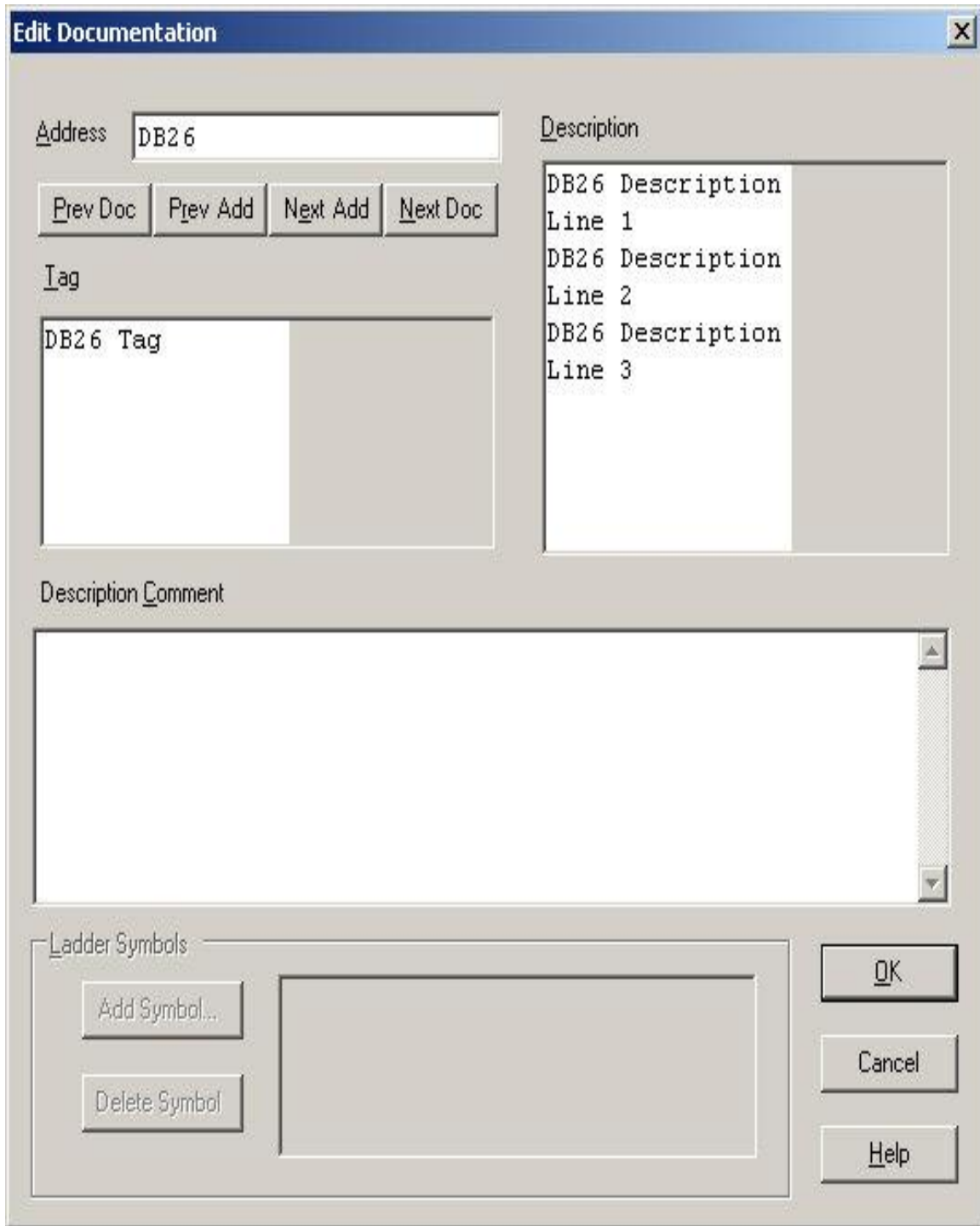
2. Select the format. There are two options:
 - **Delimited documentation text file:** Use this format to edit the documentation in a spreadsheet or text editor.
 - **STEP5 Logic and Documentation files:** Use this format to transfer the program to STEP5.
3. Set the Text Delimiter to determine how the fields will be separated in the text file. Microsoft Excel uses the tab delimiter by default, but can also use comma delimiter.
4. Each record in the documentation database is represented as a single line in the text file. Set the Write carriage returns as: to determine how to represent multi-line descriptions and description comments.
5. Browse to set the file name and location.
6. Click OK.

Text file format

The following is the text format that is used when documentation is exported to a text file, and expected when documentation is imported from a text file:

- each record is stored in a line
- fields are separated by commas
- Fields are:
 - Address
 - Tag
 - **Description lines**, each line is a comma-separated field

For example:



appears in the text file as

```
DB26,DB26 Tag,DB26 Description Line 1,DB26 Description Line 2,DB26
Description Line 3
```

Transfer to Online

The Transfer to Online feature is a convenient way to move from offline editing to online editing.

When you transfer to online, WorkShop writes the current PLC program to the PLC, and then opens it for online editing. The communication parameters are the ones set via the **Communications Setup** menu option, not the ones set via Fast PLC Setup.

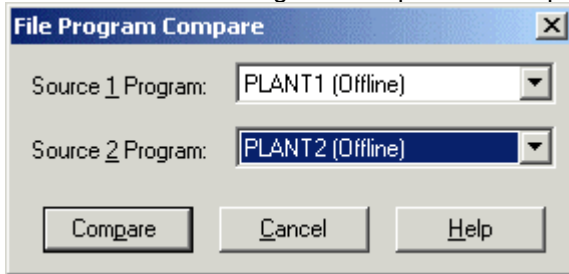
To Transfer to Online, select the **File/Transfer -> Online** menu option or press **Ctrl-T**.

File Program Compare

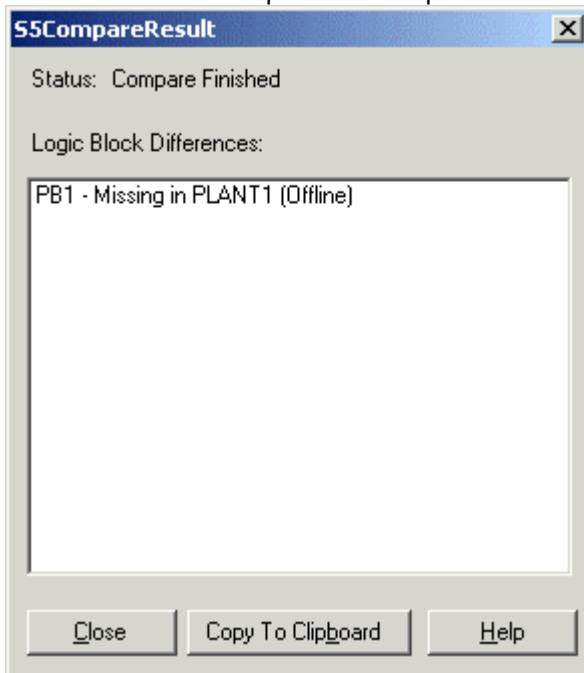
The File Program Compare provides a convenient way to compare two PLC programs.

To compare two PLC program files:

1. Open both files.
2. Select the File/File Program Compare menu option



3. Select the files to compare. The drop-down lists show files currently open. Click **Compare**.

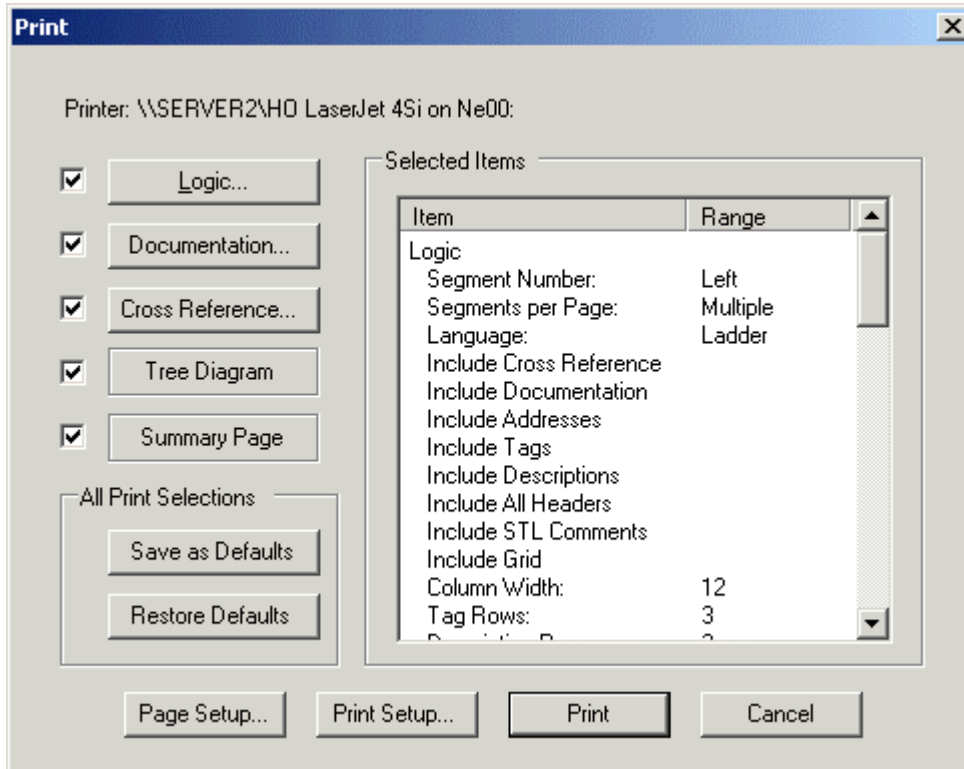


4. The window shows differences between the programs. You can copy the contents to the clipboard to be pasted into another application such as a text editor by clicking the **Copy to Clipboard** button.

Print 

To print information about your PLC program:

Select **File/Print** from the menu, click the toolbar button, or press **Ctrl-P**.



For each category of reports to be printed, check the box. To configure a report, click that report's button.

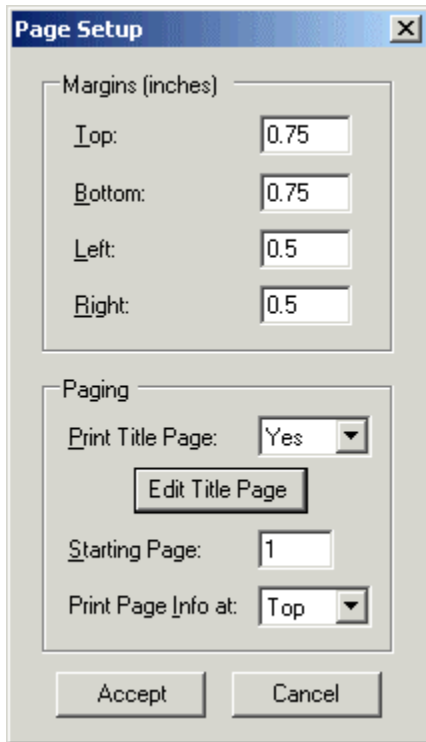
To configure the page layout, click the **Page Setup** button.

To access the printer options, click Print Setup. The dialog presented depends on your printer drivers.

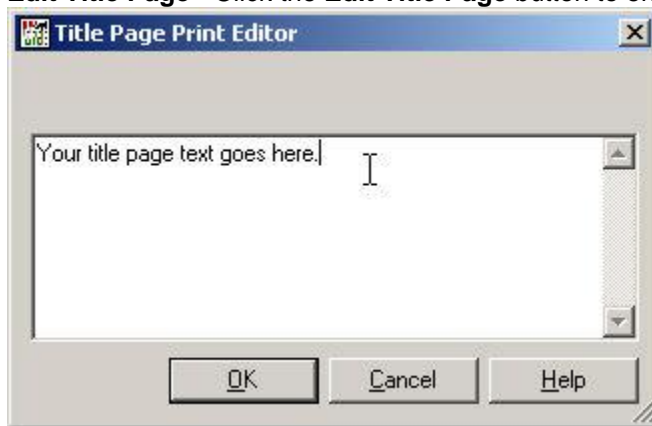
To save the current settings, click the **Save as Defaults** button. To restore the saved settings, click the **Restore Defaults** button.

Page Setup

Use the **Page Setup** dialog to set up margins, title page, and page numbering.



- **Margins** - Set the margins around the main part of page. The page info is printed outside the margins.
- **Print Title Page** - The title page is an optional first page containing any text you specify.
- **Edit Title Page** - Click the **Edit Title Page** button to enter the text to appear on the title page.



- **Starting Page** - Enter the page number of the first page of the report.
- **Print Page Info at** - Select where the page information line (program name, date and time, page number) will appear on each page.

To access the Page Setup dialog

1. Bring up one of the print dialogs, by selecting one of the following menu options:
File/Print
File/Print Preview
2. Click the Page Setup button.

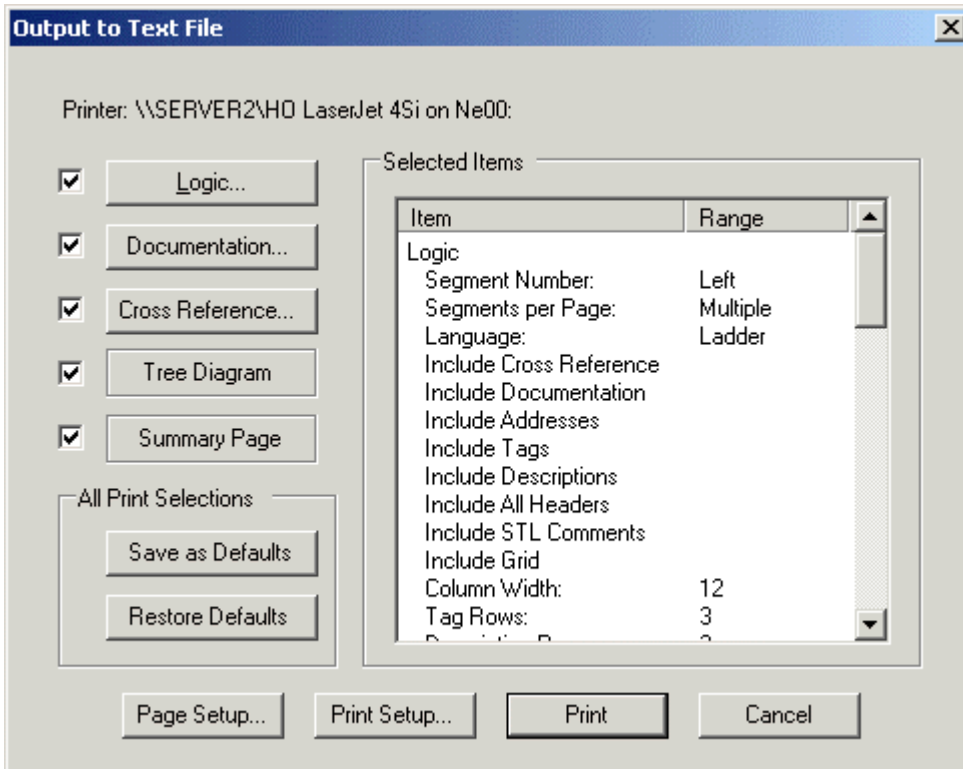
Output to Text File

The **Output to Text File** feature generates a text version of the same type of reports that the Print feature generates.

The resulting files can be sent to a printer in text mode (many printers are much faster in text mode, some older printers only operate in text mode) or edited with a text editor. The text file can provide a convenient way to send an excerpt of your ladder logic to a colleague.

To print information about your PLC program to a text file:

Select the **File/Output to Text File** menu option. The Output to Text File feature is almost identical to the Print feature, except for the Print Configuration options.



For each category of reports to be printed, check the box. To configure a report, click that report's button.

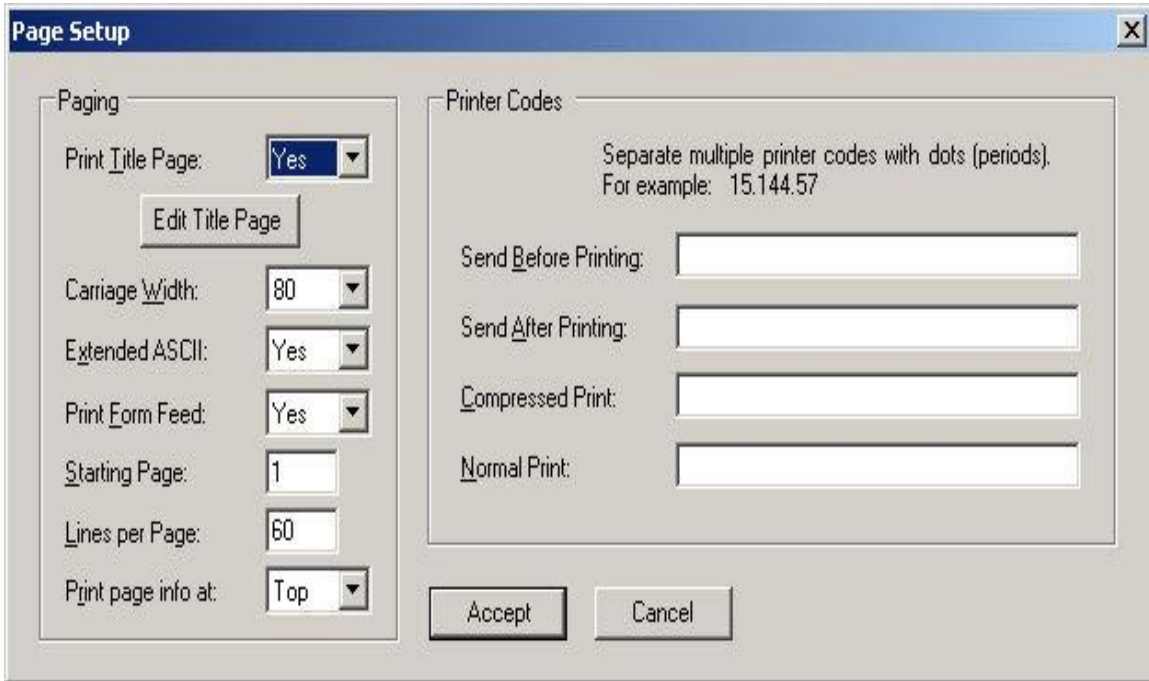
To configure the page layout, click the **Page Setup** button.

To access the printer options, click Print Setup. The dialog presented depends on your printer drivers.

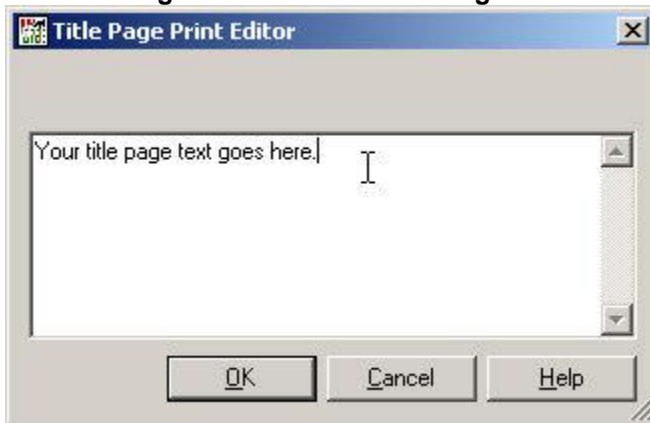
To save the current settings, click the **Save as Defaults** button. To restore the saved settings, click the **Restore Defaults** button.

Print Page Setup for Output to Text File

Use this **Page Setup** dialog to set up margins, title page, page numbering, and printer codes.



- **Margins** - Set the margins around the main part of page. The page info is printed outside the margins.
- **Print Title Page** - The title page is an optional first page containing any text you specify.
- **Edit Title Page** - Click the **Edit Title Page** button to enter the text to appear on the title page.



- **Starting Page** - Enter the page number of the first page of the report.
- **Lines per Page** - Enter the number of lines of text that will fit on a page when sent to the printer, including **Page Info** line. This varies with printer and font, but most often 60 is appropriate. If the value is too low, there will be blank space at the end of each page. If it is too high, the last part of each page will be forced onto the next page, most of which will be blank.
- **Print Page Info at** - Select where the page information line (program name, date and time, page number) will appear on each page.
- **Printer Codes** - Enter the appropriate codes for your printer. These vary by printer model.

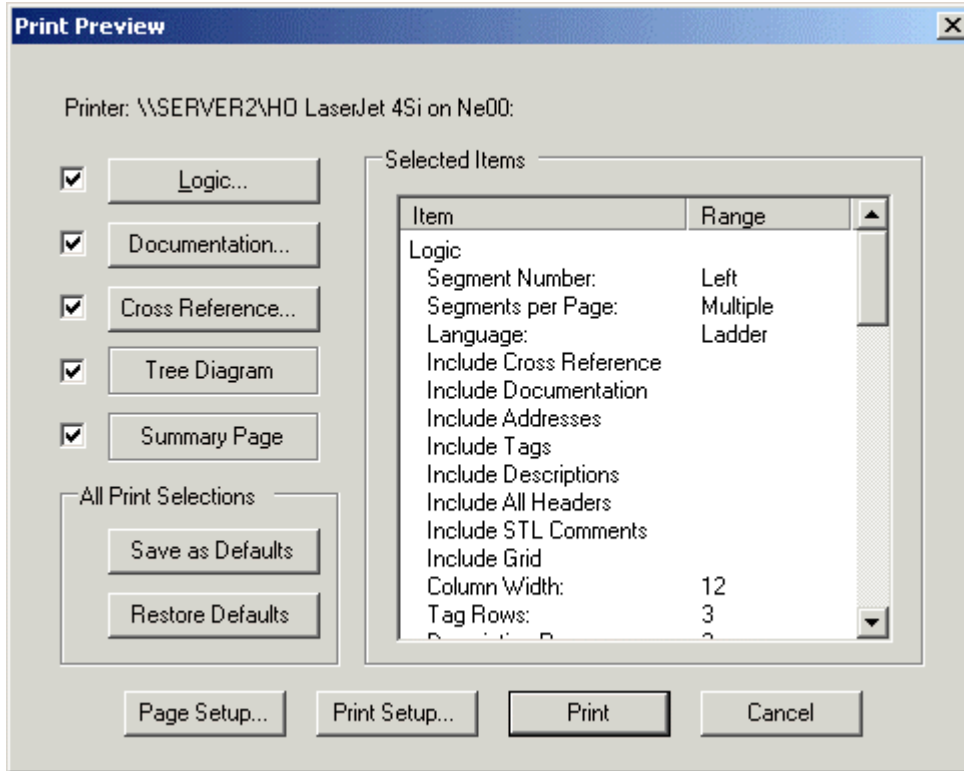
To access this Page Setup dialog

1. Bring up the output to text dialog, by selecting the File/Output to text file menu option.
2. Click the Page Setup button.

Print Preview 

To see what reports of information about your PLC program will look like:

Select **File/Print Preview** from the menu or click the toolbar button. The Print Preview button does not appear on the default configuration of the toolbar, but can be added.



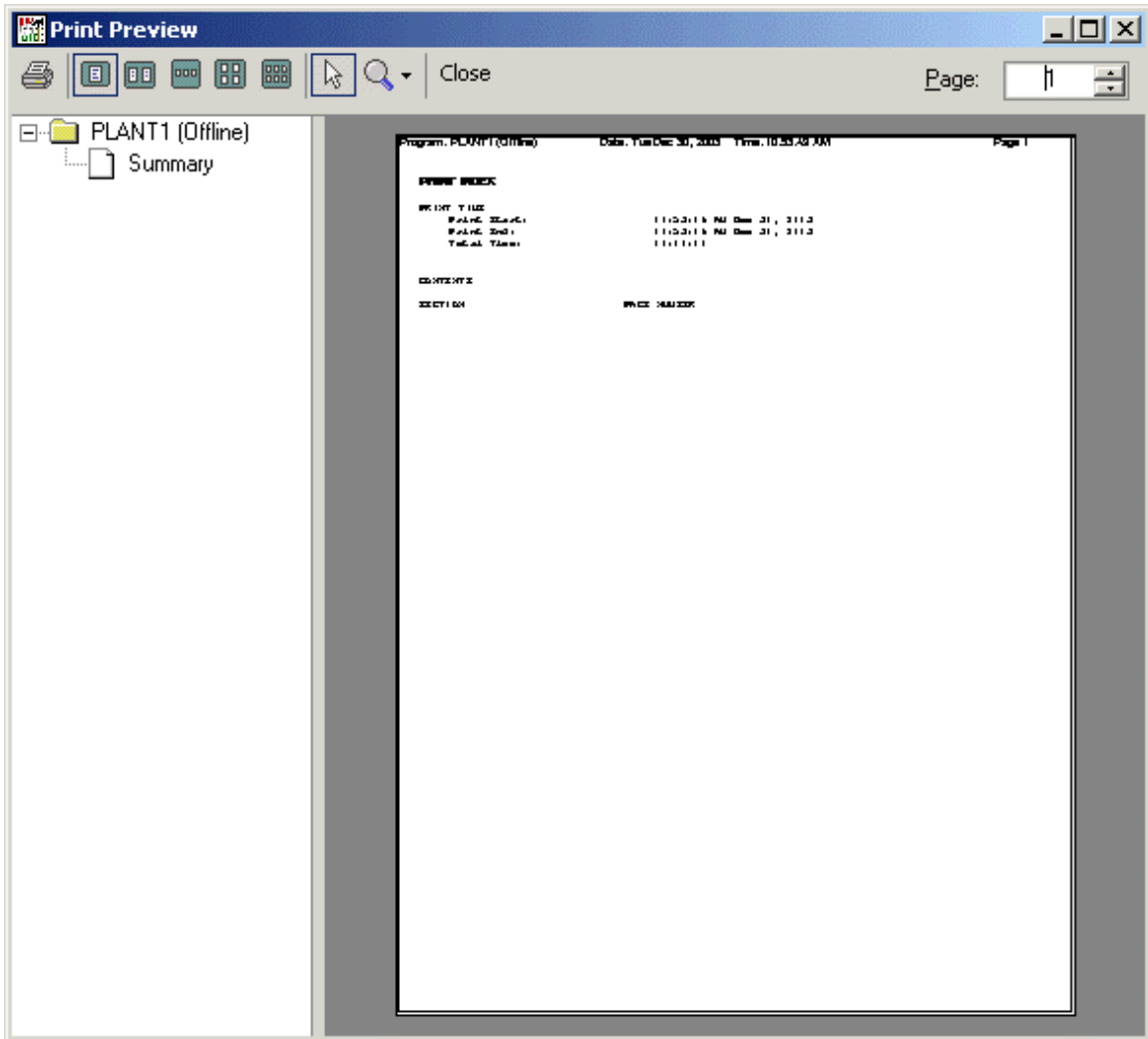
For each category of reports to be printed, check the box. To configure a report, click that report's button.

To configure the page layout, click the **Page Setup** button.

To access the printer options, click Print Setup. The dialog presented depends on your printer drivers.

To save the current settings, click the **Save as Defaults** button. To restore the saved settings, click the **Restore Defaults** button.

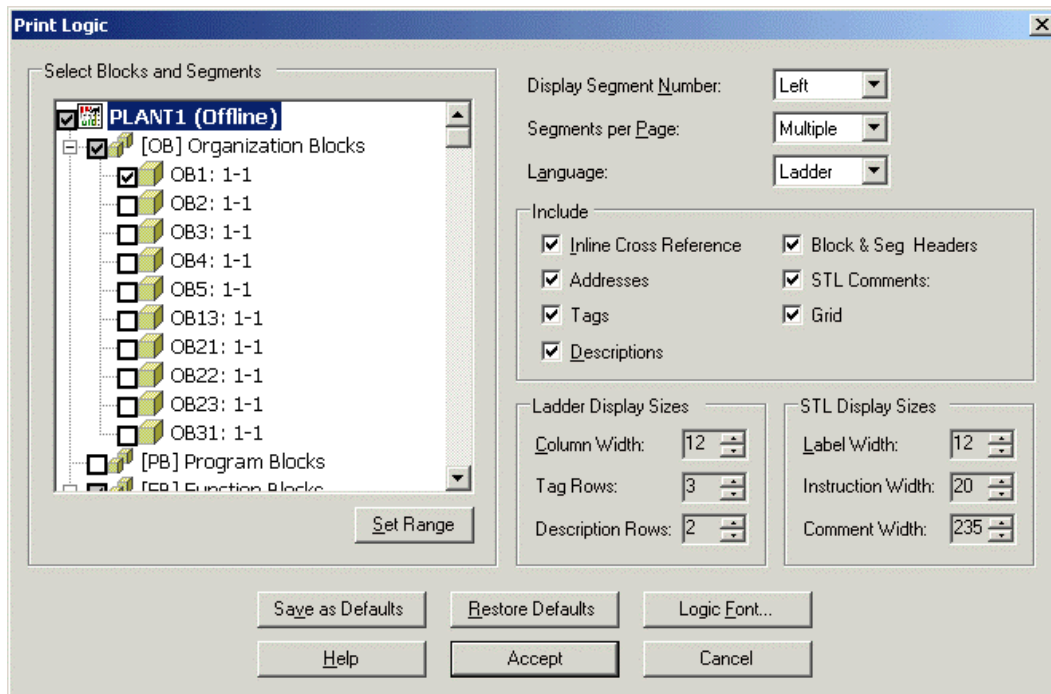
When you click **Print**, WorkShop displays a graphic representation of the report.

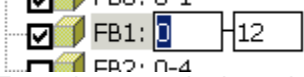


Print Logic

To print a report of the logic of the PLC program :

1. Bring up the *Print* dialog. The documentation report can also be *previewed* or *printed to a text file*.
2. Check the **Logic** box.
3. To set the configuration options, click the **Logic** button.



- **Select Blocks and Segments:** Check the boxes for the blocks and segments to include in the report. To select a range of segments within a block:
 1. check the block and click the **Set Range** button.
 2. Enter the range in the pair of text boxes that appears.
- **Display Segment Number:** Select the position of the segment number on the report. Choices are Left, Right, or Disabled.
- **Segments per page:** Select Single or Multiple.
- **Language:** Select Ladder or STL..
- **Include:** Check the boxes for the items to include in the logic report. The Inline Cross Reference, while convenient, can add a significant number of pages to the report, since the cross reference is repeated for each occurrence of the address. For a shorter report, consider printing the *cross reference report* separately.

- **Ladder Display Sizes, STL Display Sizes:** Use these settings to control the size of rungs/STL lines in the report. These settings are currently not changeable.
 - **Defaults:** To save the current settings, click the **Save as Defaults** button. To restore the saved settings, click the **Restore Defaults** button.
 - **Doc Font:** To select the font, style, and size of text to appear in the report, click the **Doc Font** button.
4. When the options are set, click the **Accept** button.
 5. Click **Print**.

Print Documentation

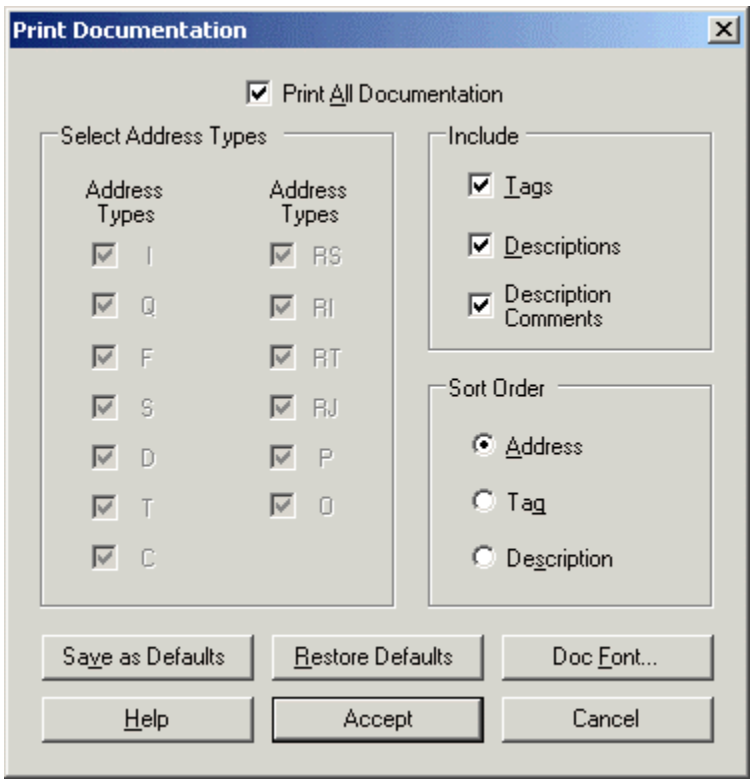
Documentation may also appear in other reports. These settings do not affect how documentation appears anywhere other than in this report.

This report shows the contents of the documentation database, and does not refer to the PLC program. As a result, documentation may be reported that refers to addresses that do not exist or that are not used.

To print a report of the contents of the documentation database :

1. Bring up the *Print* dialog. The documentation report can also be *previewed* or *printed to a text file*.
2. Check the **Documentation** box.

To set the configuration options, click the **Documentation** button.



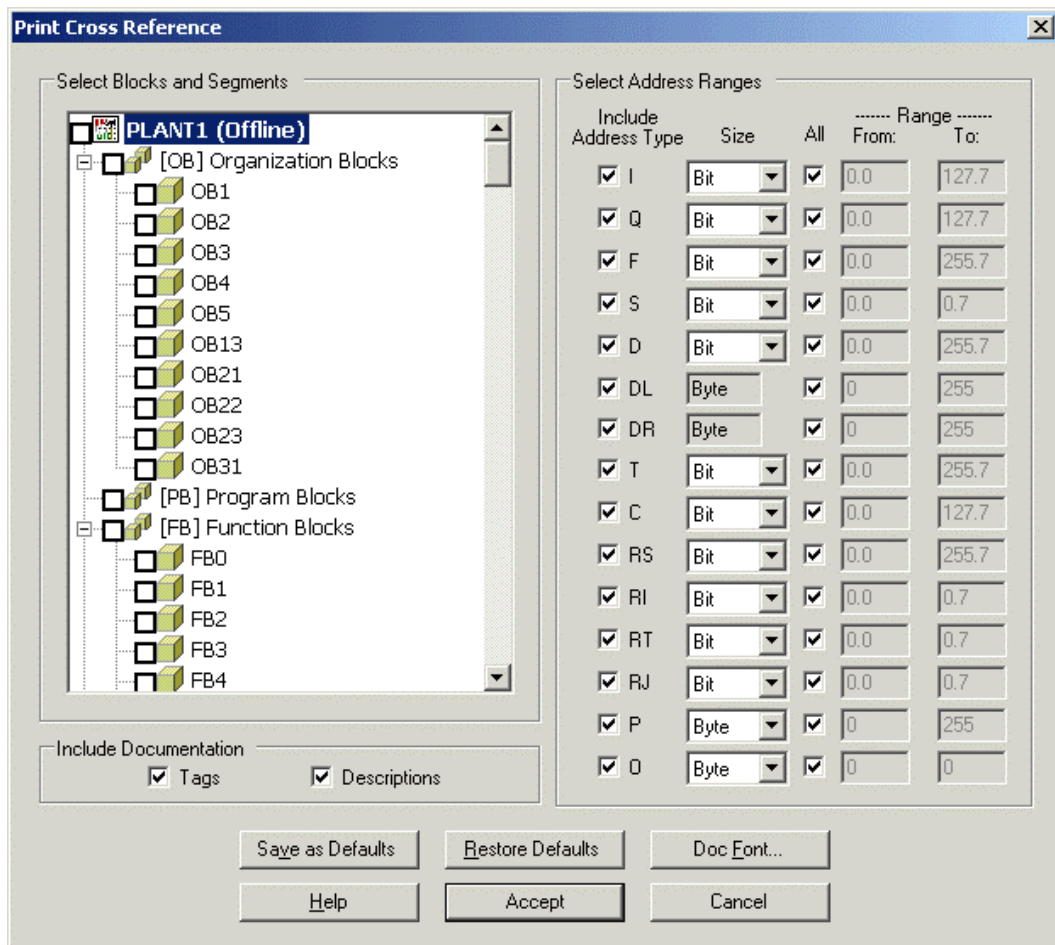
- **Print All Documentation:** check this box to include the documentation for all addresses.
 - **Select Address Types:** Check the boxes for the address types to appear in the report.
 - **Include:** Check the boxes for the documentation elements (Tags, Descriptions, and Description Comments) to include in the report.
 - **Sort Order:** Select the order (Address, Tag, or Description) in which the addresses will appear in the report.
 - **Defaults:** To save the current settings, click the **Save as Defaults** button. To restore the saved settings, click the **Restore Defaults** button.
 - **Doc Font:** To select the font, style, and size of text to appear in the report, click the **Doc Font** button.
 1. When the options are set, click the **Accept** button.
3. Click **Print**.

Print Cross Reference

Cross reference information may also appear on the *logic report*. The information here refers to the separate cross reference report only.

To print a cross reference report, showing where, and in what way, each address is used:

1. Bring up the *Print* dialog. The cross reference report can also be *previewed* or *printed to a text file*.
2. Check the **Cross Reference** box.
3. To set the configuration options, click the **Cross Reference** button.



- **Select Blocks and Segments:** check the boxes for the parts of the program to be included in the cross reference report. Uses of an address outside the selected blocks and segments will not appear in the report. If no boxes are checked, the entire program will be included.
- **Select Address Ranges:** Check the boxes for the address types to appear in the report. For address types that can be interpreted as either bits or words, select the **Size**. To include all the addresses of a type, leave the **All** box checked. To include only a selected range, clear the **All** box and enter the **From** and **To** addresses.

- **Defaults:** To save the current settings, click the **Save as Defaults** button. To restore the saved settings, click the **Restore Defaults** button.
 - **Doc Font:** To select the font, style, and size of text to appear in the report, click the **Doc Font** button.
 - **Include Documentation:** To include address documentation in the report, check the **Tags** and/or **Descriptions** buttons.
4. When the options are set, click the **Accept** button.
 5. Click **Print**.

Print Tree Diagram

To print the tree diagram for a PLC program:

1. Bring up the *Print* dialog. The Tree Diagram can also be *previewed* or *printed to a text file*.
2. Check the Tree Diagram box. There are no configuration options.
3. Click Print.

Print Summary Page

The summary page lists the reports printed in the batch, and records the time and date of the printing.

To include the summary page in a batch of reports:

1. Bring up the *Print* dialog. The Tree Diagram can also be *previewed* or *printed to a text file*.
2. Check the **Summary Page** box. There are no configuration options.
3. Click Print.

Recent Files

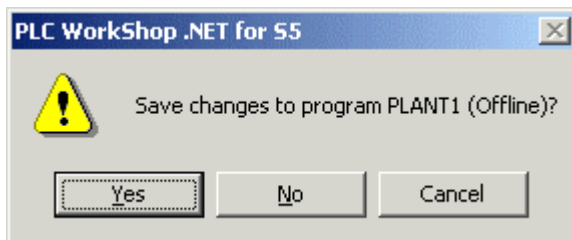
To re-open a recently used PLC program file, select the file name from the **File/Recent Files** submenu.

The number of files in the recent files list is set in the *Application Setup* dialog.

Exit PLC WorkShop

To exit from PLC WorkShop, select the File/Exit menu option or press Alt-F4.

A prompt will appear for each PLC program with unsaved edits.

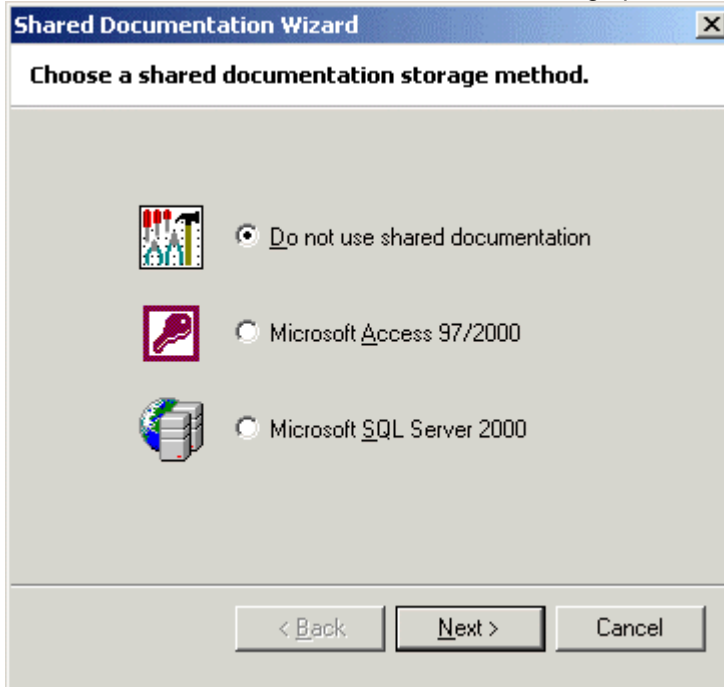


Shared Documentation Database

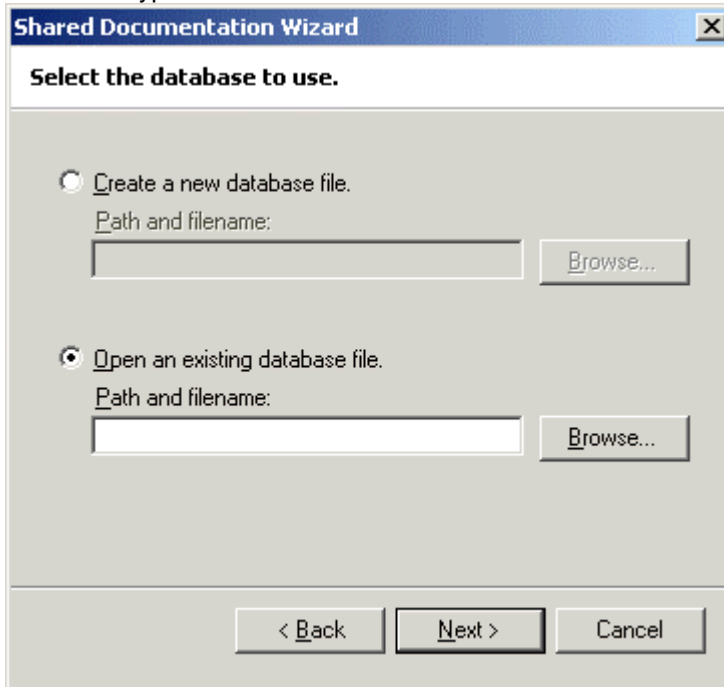
Address documentation can be shared between applications by using an external database.

To share the address documentation with other applications:

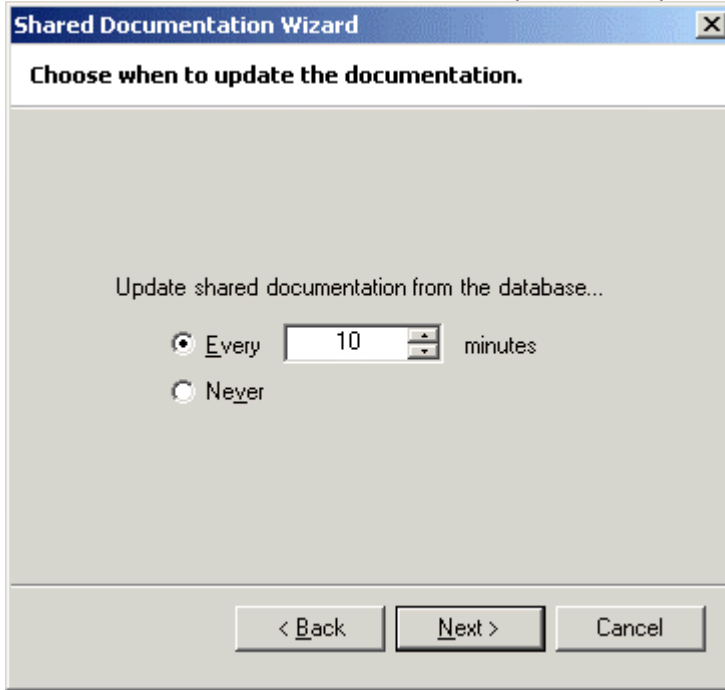
1. From either the **New Program** dialog or the **Open Program** dialog, click the **Advanced** button in the Address Documentation area to bring up the Shared Documentation Wizard.



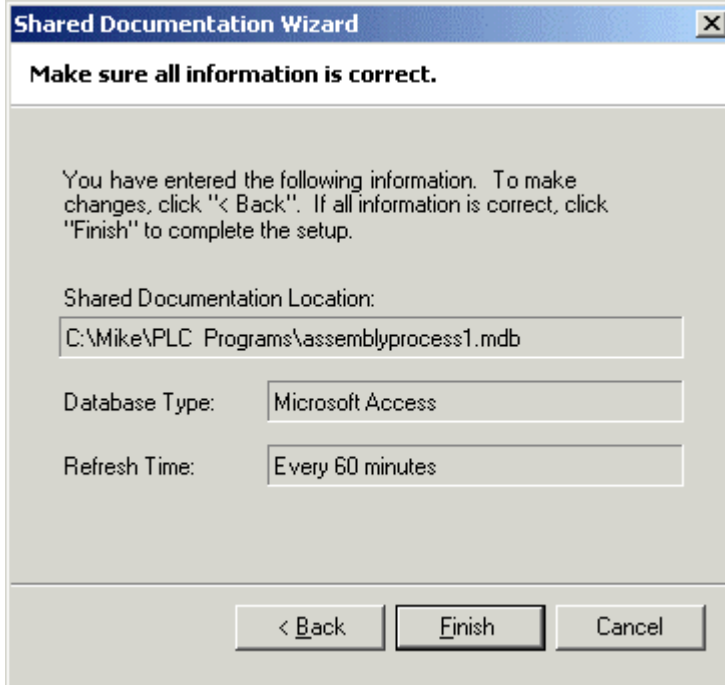
2. Select the type of database and click **Next**.



3. If there is already a shared documentation database, select the **Open an existing database file** option and browse for the database. To create a new shared database, select the **Create a new database file** option and browse to set the path and file name, and a new database will be created in the file format selected in the previous step. Click **Next**.



4. In this step, you determine how often the database will be checked for changes that have been made in other applications. If the database is shared on a network and others may be changing it while you are using WorkShop, you may wish to select a short interval. If you are sure no other users will update the documentation while you are using WorkShop, you may prefer a long interval. Set the interval in minutes, or select **Never**. Click **Next**.

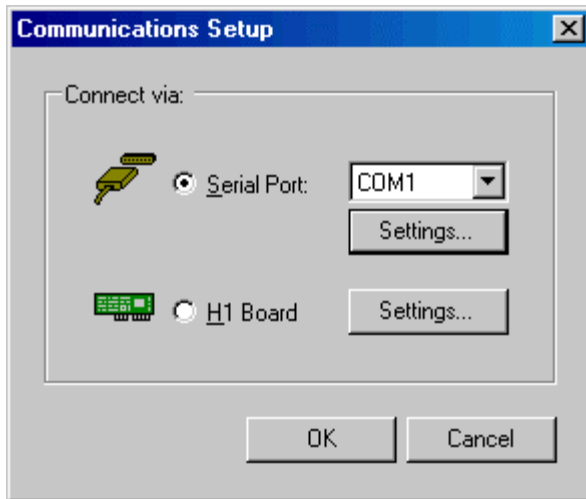


5. Confirm that all the information is correct. Click **Finish**.

Communications Setup

Communications Setup Dialog

Use the **Communications Setup** or **Fast PLC Connection Setup** dialog to set the parameters for communication between the computer and the PLC. The **Communications Setup** dialog controls the settings used when you connect to the PLC using the **Open** operation, the **Fast PLC Connection Setup** dialog controls the settings used when you connect using the **Fast PLC Connection** operation. The controls on each are identical.



- **Serial Port** - Select this option button to communicate via your computer's serial port. Use the drop-down list to select which serial port to use.
- **Settings** -Click the **Settings** button directly below the serial port drop-down list to access the **Serial Port Settings dialog**.
- **H1 Board** - Select this option button to communicate via an H1 communications board.
- **Settings** -Click the **Settings** button to access the **H1 Board Settings dialog**.

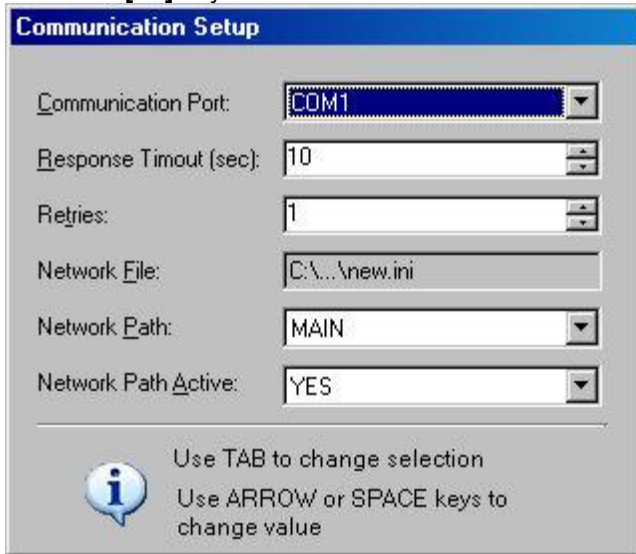
To access the Communications Setup dialog:

There are two ways to access the Communications Setup dialog. Both control the settings used when you connect to the PLC using the **Open** operation.

1. Select the File/Communications Setup menu option.
2. From the *Open Program* dialog, select the **Connect to PLC** option button and click the **Setup** button.

To Configure Communications in SoftKey mode:

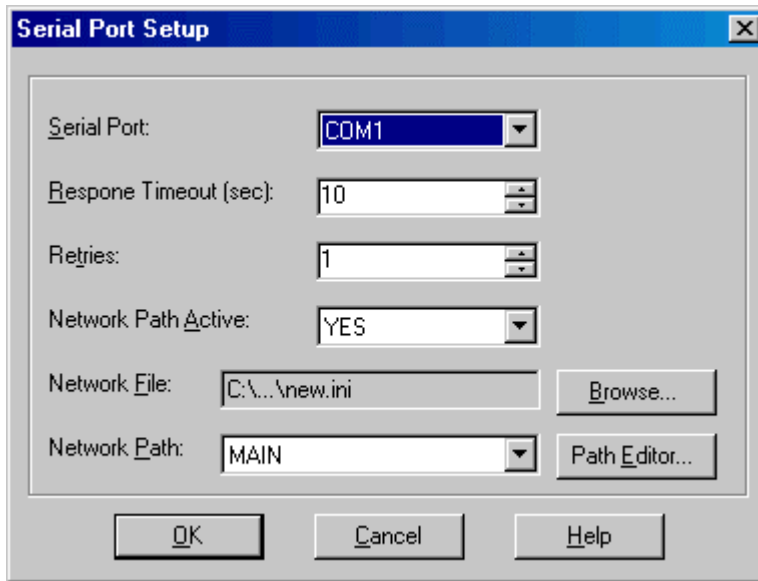
1. Press the [F8] key.



- **Communications Port** - Select the port from the drop-down list. The options are **COM1** through **COM4** and **H1 Board**.
- **Response Timeout (sec)** - Enter the number of seconds that WorkShop is to wait for a response from the PLC.
- **Retries** - Select the number of times to try again when there has been no response within the number of seconds specified in the **Response Timeout**.
- **Network File** - The network file contains network path configurations. Press [F2] to select the network file. To create a new network file, use the Path Editor.
- **Network Path** - Select the network path from the drop-down list. To create or edit a path, access the **Path Editor** by pressing [F3]. The Path Editor is part of a stand-alone application called **FTH1Config for S5**.
- **Network Path Active** - For a direct serial connection, select **NO**. To use an H1 path, select **YES** and select the network file and path as described below.

Serial Port Setup dialog

Use the Serial Port Settings dialog to configure the serial port used to communicate between the computer and the PLC.



- **Serial Port** - Use the drop-down list to select which serial port to use.
- **Response Timeout (sec)** - Enter the number of seconds that WorkShop is to wait for a response from the PLC.
- **Retries** - Select the number of times to try again when there has been no response within the number of seconds specified in the **Response Timeout**.
- **Network Path Active** - For a direct serial connection, select **NO**. To use an H1 path, select **YES** and select the network file and path as described below.
- **Network File** - The network file contains network path configurations. Use the **Browse** button to select the network file. To create a new network file, use the Path Editor.
- **Network Path** - Select the network path from the drop-down list. To create or edit a path, access the **Path Editor** by clicking the **Path Editor** button. The Path Editor is part of a stand-alone application called **FTH1Config for S5**.

H1 Board

PLC WorkShop supports CP1413 and CP1613 H1 communications modules.

Software Requirements for H1 boards

- PLC WorkShop for Siemens S5 -Performance Series, **version 5.04** or higher
- **Simatic Net CD 5/2000** or greater. Note that drivers for the CP1413 are not available for some Windows versions.
- If the 6GK1143 (CP1430TF) modules are not already configured, you may need **SINEC NCM COMs** to set the MAC addresses.

Installation

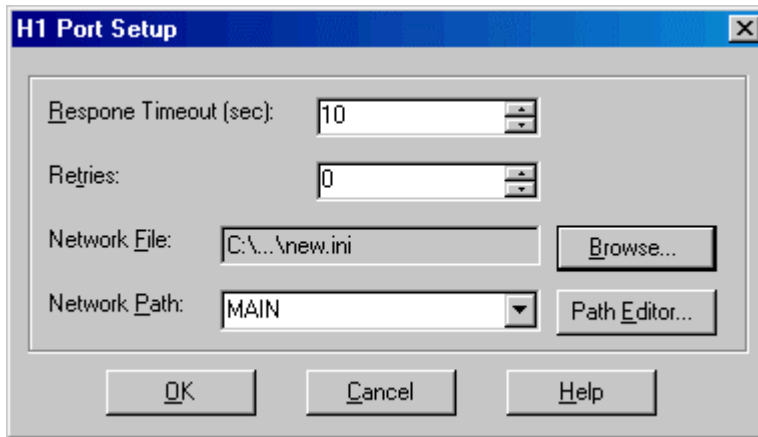
1. Install the **S7-1413/1613 for Windows** libraries that include the **S7_SR.DLL**, from the Simatic Net CD.
2. Install the **CP1413** or **CP1613** following the manufacturers recommendations.
3. If necessary, use the **SINEC NCM COMs** software to set the MAC address on the 6GK1143.
4. Synchronize the PLC and the CP1430 as described in the manufacturer's manual.
5. Install PLC WorkShop for Siemens S5 -Performance Series, **version 5.04** or higher.

Configuration

Use the **FTH1Config for S5** program to configure H1 communication paths. **FTH1Config for S5** can be accessed via the **Path Editor** buttons on the **Serial Port Setup** and **H1 Port Setup** dialogs, or as separate program. See *Path Editor* for details.

H1 Port Setup dialog

Use the H1 Port Setup dialog to configure the serial port used to communicate between the computer and the PLC.



- **Response Timeout (sec)** - Enter the number of seconds that WorkShop is to wait for a response from the PLC.
- **Retries** - Select the number of times to try again when there has been no response within the number of seconds specified in the **Response Timeout**.
- **Network File** - The network file contains network path configurations. Use the **Browse** button to select the network file. To create a new network file, use the Path Editor.
- **Network Path** - Select the network path from the drop-down list. To create or edit a path, access the **Path Editor** by clicking the **Path Editor** button. The Path Editor is part of a stand-alone application called **FTH1Config for S5**.

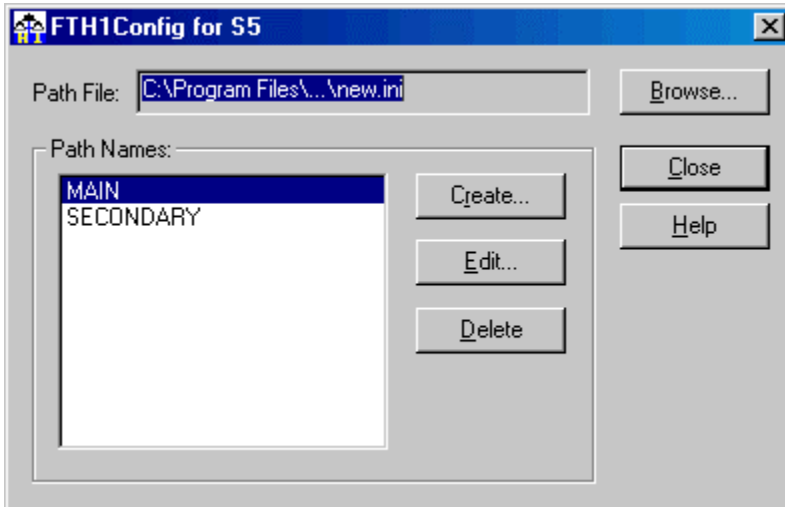
Path Editor: FTH1Config for S5

FTH1Config is a stand-alone program for configuring H1 communications paths.

FTH1Config can be opened from the Windows Start menu (**Start/Program Files/FasTrak SoftWorks/FTH1Config** by default) or by clicking the **Path Editor** button on the **Serial Port Setup** dialog or the **H1 Port Setup** dialog.

Main Dialog

When you open FTH1Config, the main dialog appears:

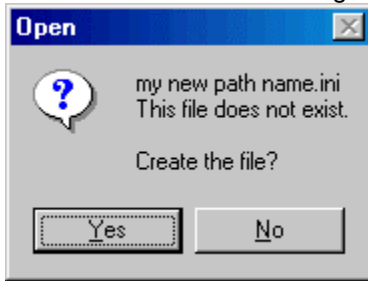


- **Path File** - The file containing the path information. Use the **Browse** button to select or create a path file.
This file is in the same format as that used by Siemens Step5 software, so path information from Step5 projects can be used.
If FTH1Config was opened by clicking a **Path Editor** button, the path file is set to that of the dialog where the button was located. However, selecting another file here does not change the file in that dialog.
- **Path Names** - The list shows path names from the path file selected above. If FTH1Config was opened by clicking a **Path Editor** button, the path is set to that of the dialog where the button was located. Selecting another path in this list does not change the path selection in that dialog.
- **Create** - Click this button to create a new path. The **Path Editor** described below opens, with the **Path Name** field empty.
- **Edit** - Click this button to create a new path. The **Path Editor** described below opens, with the **Path Name** field in a non-editable state.
- **Delete** - Click this button to delete the highlighted path.

To create a new path file:

1. Click the **Browse** button.
2. Select the location for the file.
3. Type the new file name.

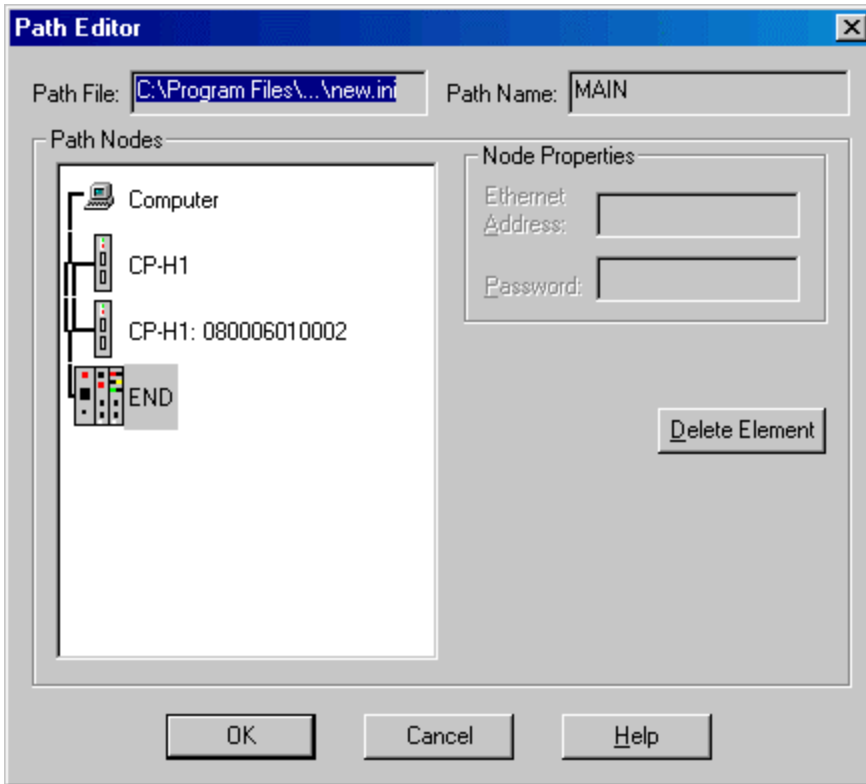
4. Click the **OK** button. A dialog appears:



5. Click the **Yes** button to create the new path file.

Path Editor

Click the **Create** button or the **Edit** button on the FTH1Config main dialog to open the Path Editor.



- **Path File** - The file containing the path information that is being edited. This field is display-only.
- **Path Name** - The name of the path being edited. If editing an existing path, this field is display-only.
- **Path Nodes** - A graphic display of the devices used in the path. One node may be highlighted. The highlighted node is described in the **Node Properties** fields, but the position of the highlight has no effect on the insertion or deletion of nodes: those operations always apply to the end of the path.
- **Node Properties** - When there are configurable properties for the highlighted node, edit them in these fields.
 - **Ethernet Address** - The ethernet address for a CP1430. This field is available only when the current node is a CP1430 not directly connected to the serial port of the PC.

- **Password** - The password for a CP1430. This field is available only when the current node is a CP1430 not directly connected to the serial port of the PC.
- **Address** - The COR/MUX address. If the current node is not a COR/MUX, this field is not available.
- **Delete Element** - Click this button to delete the element at the end of the path - the last element shown in the **Path Nodes** display.
- Node append buttons - Click one of these buttons to add a node to the end of the path. The buttons displayed vary depending on the current nodes - nodes that cannot be added to the current path are not shown.
 - **Computer - AS511** - Click this node button for paths where a serial port on the computer is used. No node properties are configurable.
 - **H1-CP** - Click this node button for paths where a CP1413 and CP1613 H1 communications module is used. No node properties are configurable.
 - **COR/MUX** - Click this node button to represent a COR/MUX device in the path. Enter the COR/MUX **Address** in the **Node Properties**.
 - **CP-H1** - Click this node button to represent a CP1430 in the path. If this CP1430 is not connected directly to the PC serial port, set the **Ethernet Address** and the **Password** (if any) in the **Node Properties**. If this CP1430 is directly connected to the PC serial port, the Node Properties will not be available.
 - **END** - Click this node button to represent the end of the path. No node properties are configurable.

Editing

Undo Redo

To undo an edit, select the **Edit/Undo** menu option, click the toolbar button, or press **Ctrl-z**.

Repeating the Undo command reverses more edits.

To reverse an Undo command, select the **Edit/Redo** menu option, click the toolbar button, or press **Ctrl-y**.

Cut , Copy

To cut, select the **Edit/Cut** menu item, click the toolbar button, or press **Ctrl-x**.

To copy, select the **Edit/Copy** menu item, click the toolbar button, or press **Ctrl-c**.

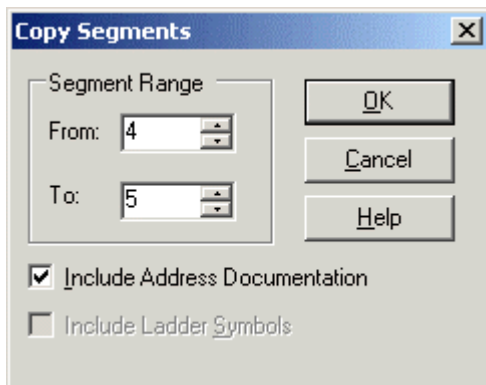
To paste, select the **Edit/Paste** menu item, click the toolbar button, or press **Ctrl-v**.

You can cut, copy and paste either complete segments, or partial segments.

If a selection within a segment is active when you cut or copy, the selected logic is cut or copied to the buffer. This is a partial segment selection, even if the selection happens to include all the logic in the segment. In the case of a cut, the segment is placed in edit mode and turns yellow.

Paste with Rewire is not available for partial segment selections. Select complete segments by dragging the mouse in the space to the left of the logic, or by dragging the mouse from one segment to another.

If no logic is selected, or if complete segments are selected, a dialog appears.



Set the **Segment Range** to be cut or copied.

Check the **Include Address Documentation** box to copy documentation along with the logic.

Paste , Paste Special, Paste with Rewire

To Paste, select the **Edit/Paste** menu item, click the toolbar button, or press **Ctrl-v**.

To Paste Special, select the **Edit/Paste Special** menu item.

To Paste with Rewire, select the **Edit/Paste with Rewire** menu item.

Paste

When you paste a partial segment, the logic in the clipboard replaces the logic under the insertion point, and to the right.

When you paste complete segments, the segments on the clipboard are inserted above the segment where the insertion point is located.

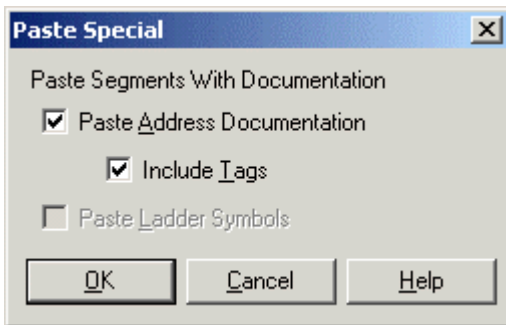
Paste Special

When you paste special, you have the option of pasting the documentation along with the logic.

The Paste Special option is not available when the address documentation is not included with the logic on the clipboard. See *Cut, Copy* for details.

To Paste Special:

Select the **Edit/Paste Special** menu option.



Check the boxes for the documentation to paste with the logic. A tag that already exists in the target program (the program where the logic is being pasted) will not be included even if the box is checked.

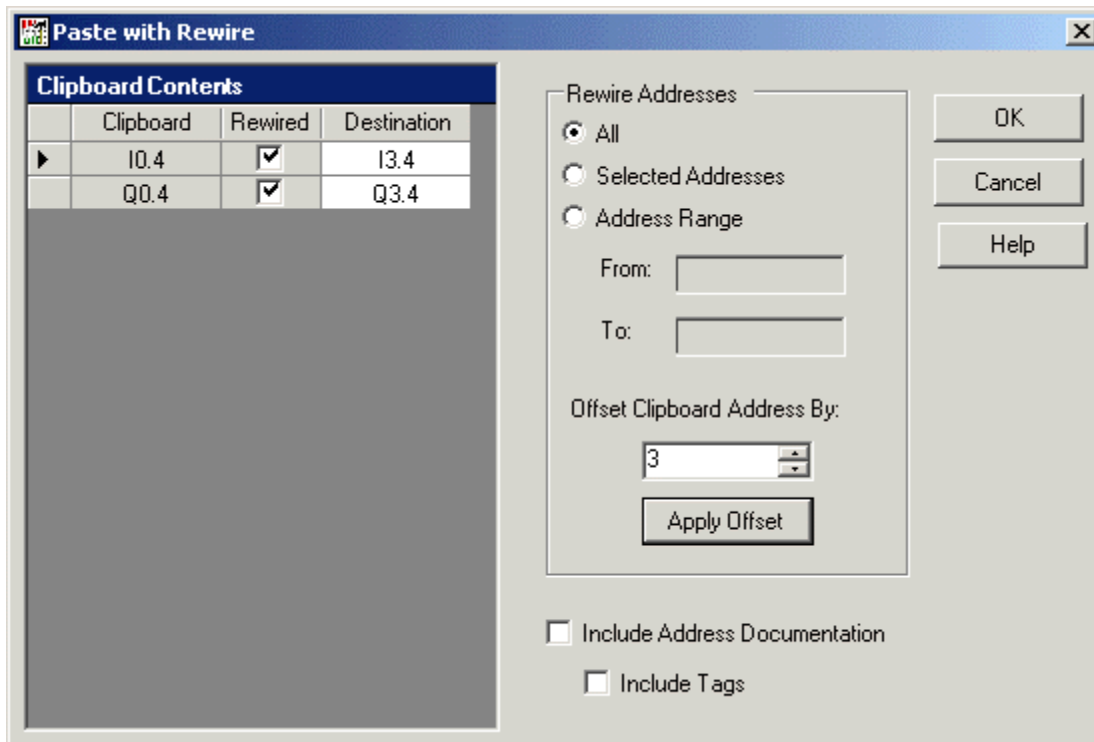
Paste with Rewire

The Paste with Rewire feature allows you to replace addresses in the logic on the clipboard.

Paste with Rewire is only available when complete segments are on the clipboard. Partial segment selections cannot be rewired, even if the selection happens to include all the logic from the segment. See *Cut, Copy* for details.

To Paste with Rewire:

Select the Edit/Paste with Rewire menu option.



- Clipboard Contents
 - Clipboard: This column shows the addresses as they appear in the logic on the clipboard.
 - Rewired: This column indicates whether the address will be replaced.
 - Destination: This column contains the replacement address.
- Rewire Addresses:
 - Select the addresses to be rewired.
 - To change all the selected addresses by the same offset, enter the offset in the **Offset Clipboard Addresses By** field and click **Apply Offset**.
- Include Address Documentation / Include Tags: Check the desired boxes to copy the address documentation to the new addresses.

Modify Address Documentation

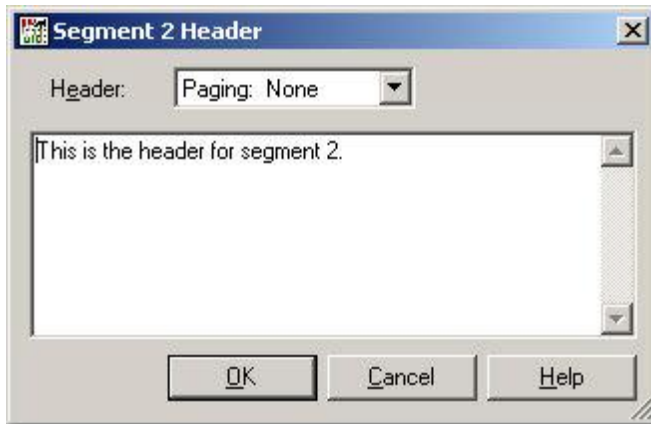
To modify the documentation for the current address, select the **Edit/Modify Address Documentation** menu option or press **Ctrl-L**. WorkShop displays the *Edit Documentation* dialog with the current address loaded.

New Address Documentation

To create new documentation, select the **Edit/New Address Documentation** menu option. WorkShop displays the *Edit Documentation* dialog.

Header Input Dialog

Use the Header Input Dialog to document segments and blocks.



- **Paging** - This feature is not currently available.
- **Header** - Enter up to 16k of text.

To access the Header Input Dialog:

Either

click the segment header or block header icon,



or, if there is already header text present, double-click on the text.

Clear

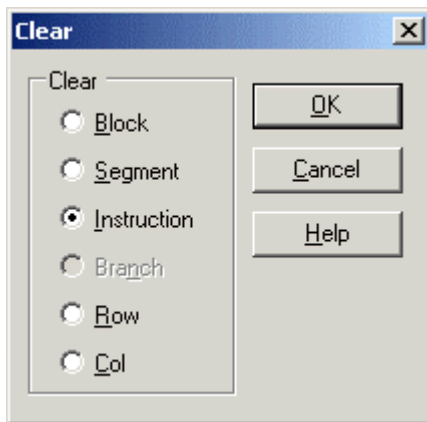
Clearing removes content without moving the surrounding content, leaving a blank area. Deleting removes both the content and the space it occupied, and moves other content.

To clear logic or data, select the **Edit/Clear** menu option or press the **Del** key. Pressing the **Del** key clears the default item: an instruction in ladder logic, a line in STL or data.

Selecting the **Edit/Clear** menu option displays a dialog appropriate to the context.

Clearing Ladder Logic

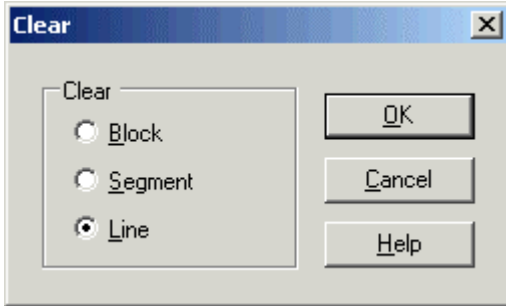
When clearing ladder logic, the following dialog appears:



- **Block** - Clears the entire containing block. WorkShop displays a warning before deleting the block. The result is an empty block.
- **Segment** - Clears the entire segment/network. The result is a blank segment in edit mode.
- **Instruction** - Clears the instruction at the cursor location. If the cursor is on a branch, the instruction to the left is cleared. The segment is placed in edit mode.
- **Branch** - Clears the branch at the cursor location. This selection is available only when the cursor is on a vertical branch. The segment is placed in edit mode.
- **Row** - Clears all the instructions and branches at the same height as the cursor. A branch is considered to be on the row at the top of the branch. The segment is placed in edit mode.
- **Col** - Clears all the instructions and branches in the segment that are in the same column as the cursor. A branch is considered to be on the column to the left of the branch. The segment is placed in edit mode.

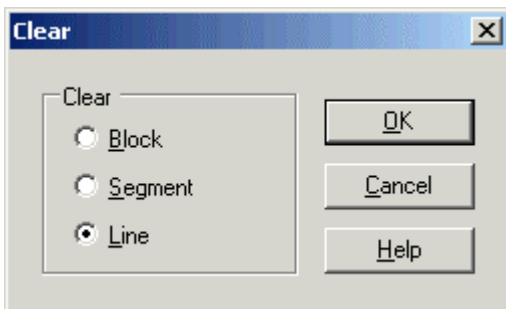
Clearing STL

When clearing STL, whether in a block being viewed as STL or in a block being viewed as ladder, the following dialog appears.



- **Block** - Clears the entire containing block. WorkShop displays a warning before deleting the block. The result is an empty block.
- **Segment** - Clears the entire segment. The result is a blank segment in edit mode.
- **Line** - Clears the line at the cursor location.

Clearing Data

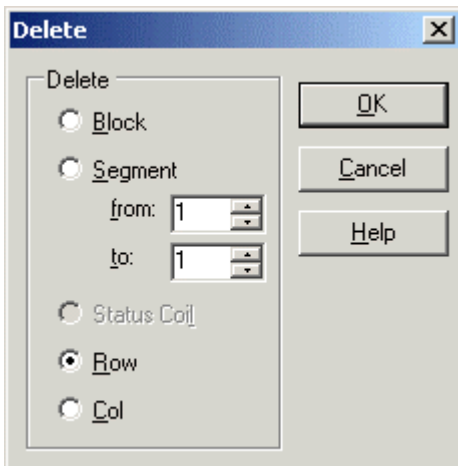


Clear Data

Delete 

Deleting removes both the content and the space it occupied, and moves other content.

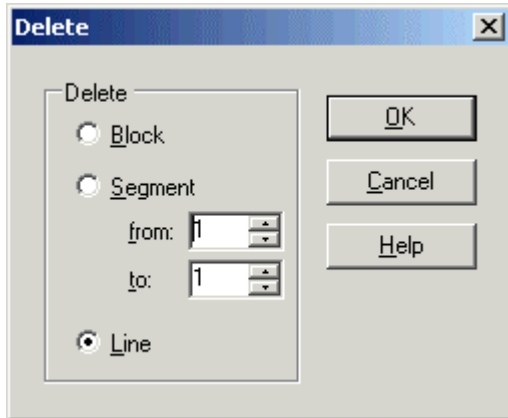
To delete logic or data, select the **Edit/Delete** menu option, click the toolbar button (the delete button does not appear on the default toolbars, but it can be added) or press **Shift-Del**. Depending on the context, a dialog may appear for you to select what is to be deleted.



Delete STL

Deleting removes both the content and the space it occupied, and moves other content.

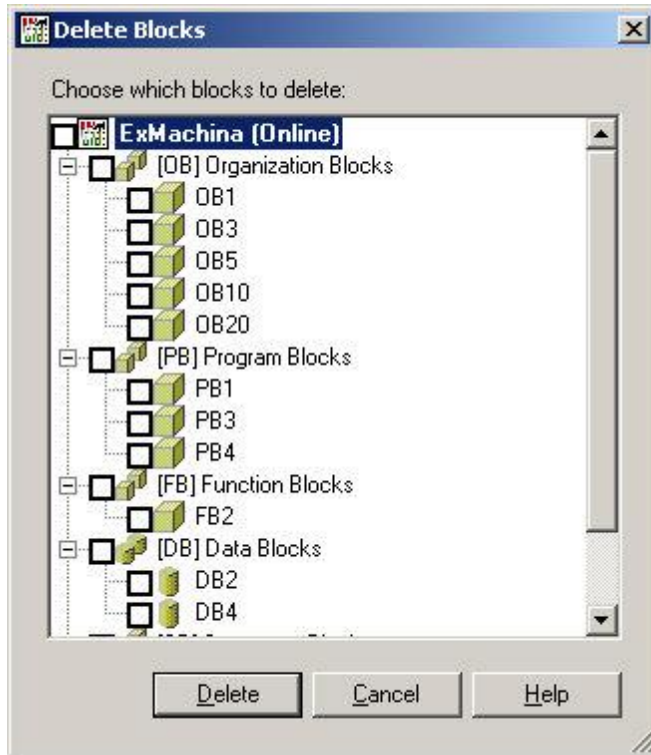
To delete STL code, select the **Edit/Delete** menu option, click the toolbar button (the delete button does not appear on the default toolbars, but it can be added) or press **Shift-Del**. Depending on the context, a dialog may appear for you to select what is to be deleted.



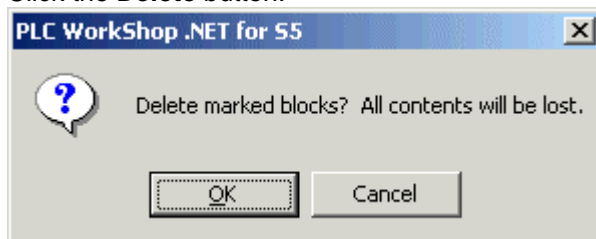
Delete Blocks

To delete blocks:

1. Select the Block/Delete Blocks menu item or click the toolbar icon.



2. Select the blocks to delete by checking the boxes.
3. Click the **Delete** button.



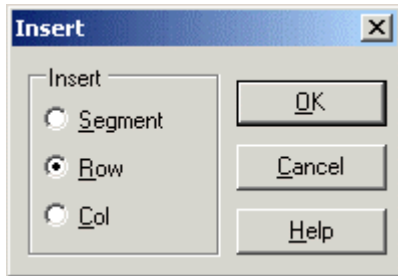
4. Click the OK button if you are certain about the deletion.

Insert

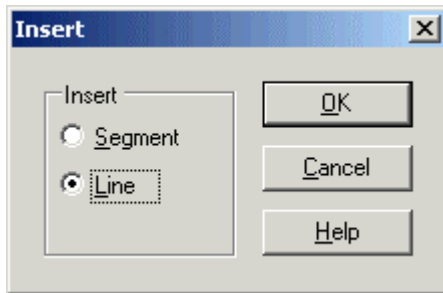
Inserting moves logic or data to make space for new logic or data. The new space is above or to the left of the insertion point.

To insert logic or data, select the **File/Insert** menu option or press the **F3** key. Depending on the context, a dialog may appear for you to select what is to be inserted.

Insert Ladder

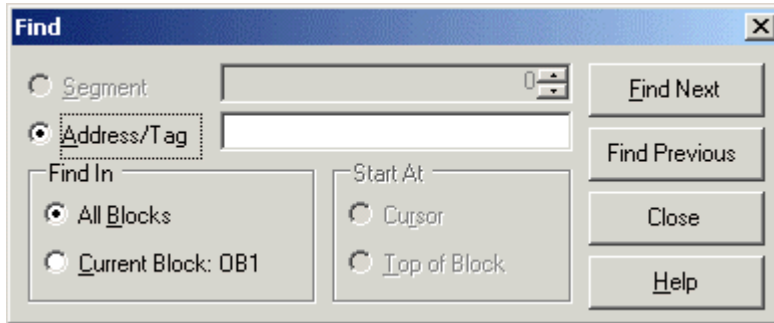


Insert STL



Find

To find an address or tag, or to go to a particular segment, select the **Edit/Find** menu item or press **Ctrl-F**. WorkShop displays the **Find** dialog.



To find an address or tag:

1. Select the **Address/Tag** option button.
2. Enter the address or tag in the text field.
3. Select the appropriate option button to search all the blocks or only the current block.
4. If you are searching only the current block, select whether the search will start at the top of the block or at the cursor.
5. Click **Find Next** and/or **Find Previous** until you locate the desired instance.
6. Click **Close**.

To go to a segment in the current block:

1. Select the **Current Block** option button.
2. Select the **Segment** option button.
3. Enter the segment number in the text field.
4. Click **Find Next**.

Find Next/Previous

To repeat the last search, select the **Edit/Find Next** (or **Ctrl-G**) or **Edit/Find Previous** menu option depending on the desired search direction.

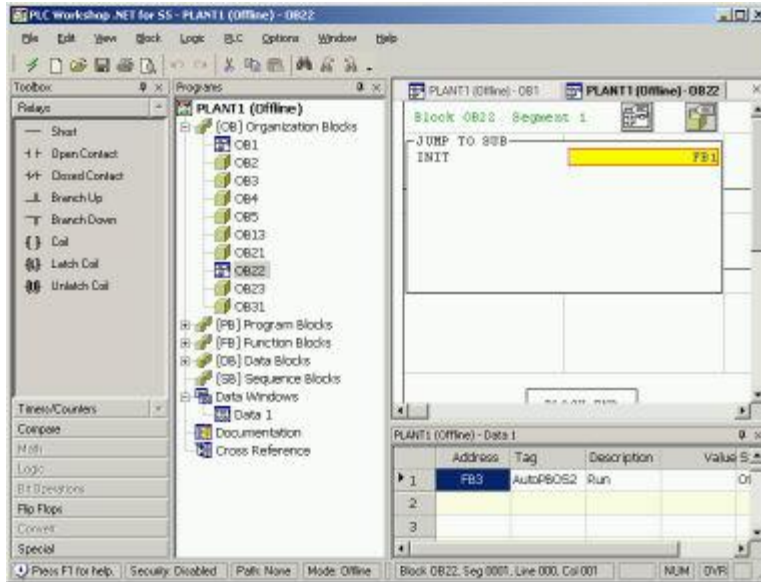
Select All

To select the entire contents of a block, select the **Edit/Select All** menu option or press **Ctrl-A**.

Viewing

Screen Overview

The WorkShop screen will usually look something like this:

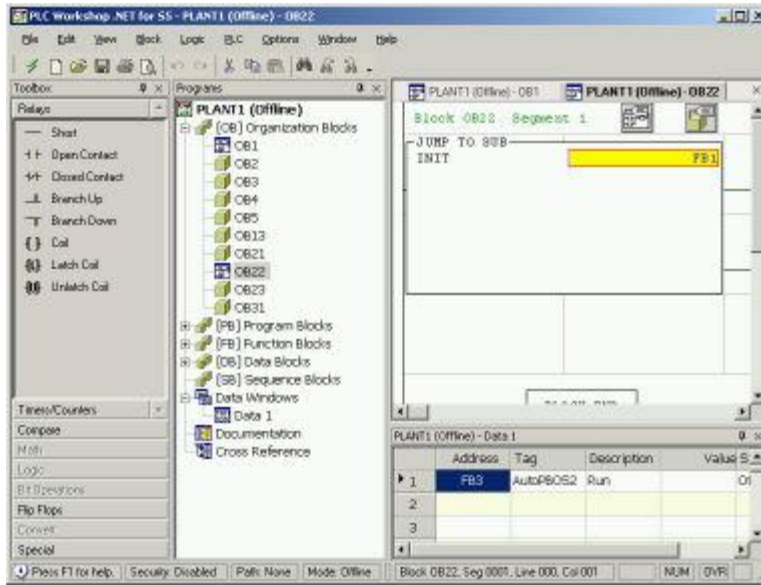


Each of the components shown is optional. Some may be subdivided or moved.

For details on any part of the display, click on the picture above.

Screen Overview

The WorkShop screen will usually look something like this:



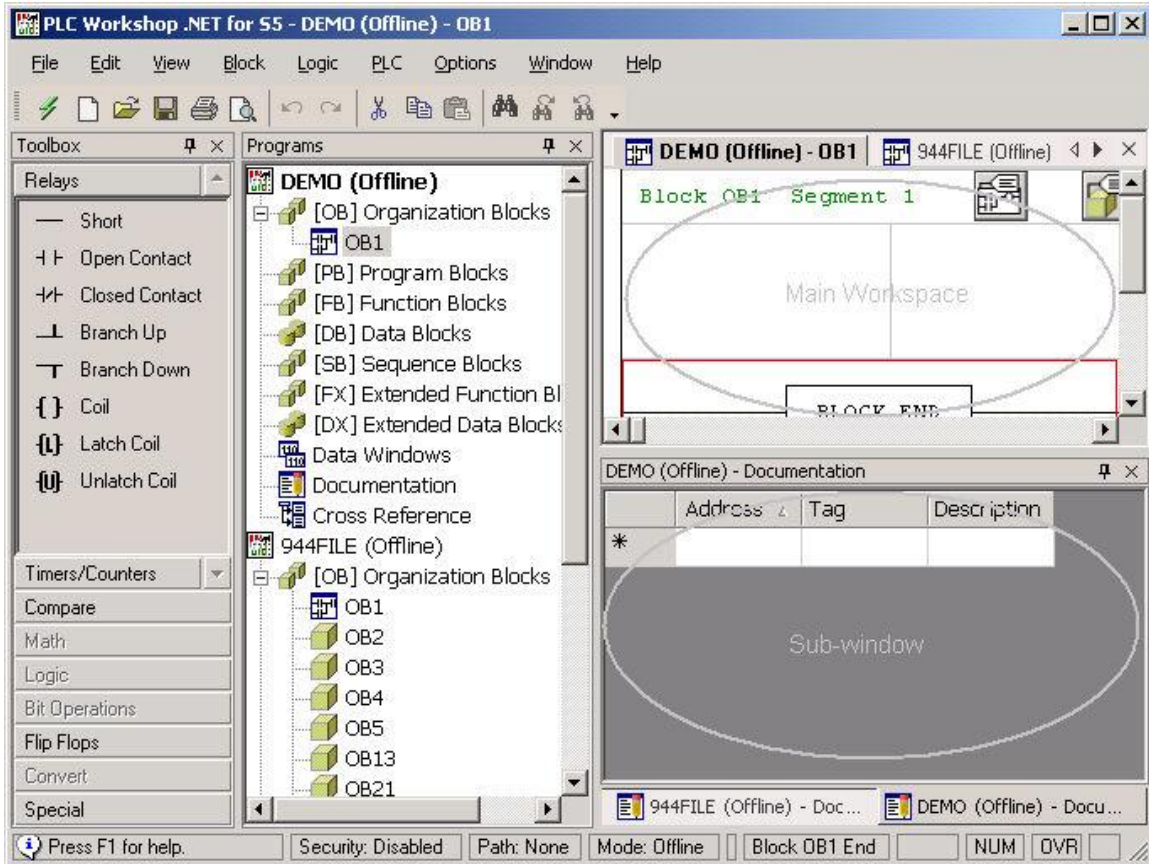
Each of the components shown is optional. Some may be subdivided or moved.

For details on any part of the display, click on the picture above.

Workspace

WorkShop's editors are shown on the workspace - the main area of the WorkShop window.

The workspace can contain multiple tabs, each containing a logic block or data block editor.




Sub-Windows

The workspace can also contain sub-windows, each containing one or more tabs containing lists or editors. The sub-windows can be docked to an edge of the workspace, resized, or detached from the workspace. A sub-window can also be set to Auto-Hide. A tab in a sub-window can be moved to the main work area.

To resize a sub-window:

1. move the mouse cursor to an edge of the sub-window. When the mouse cursor is in the right

spot, it changes: .

2. Click and drag to the desired size.

To move a sub-window to another docking point or detach it, click and drag the sub-window's title bar.

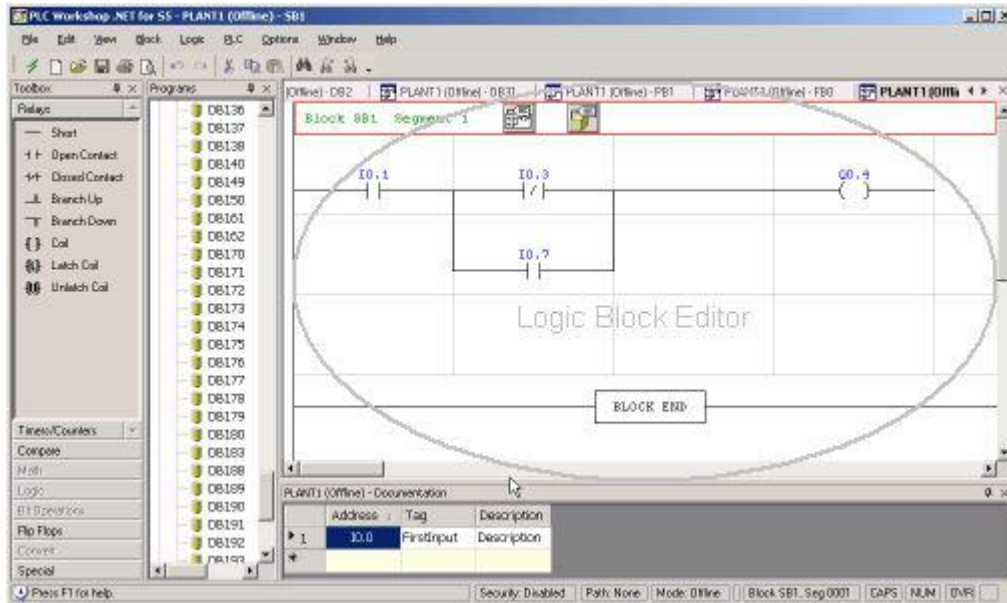
To re-attach a detached sub-window, double click the sub-window's title bar.

To set a sub-window to auto-hide, right-click the sub-window's title bar and check the **Auto Hide** menu option.

To move a tab from a sub-window to the main workspace, right-click the sub-window's title bar and un-check the **Dockable** menu option. This menu option is not available when the sub-window is in auto-hide mode.

Logic Block Editor

A logic block editor is displayed as a tab in the main *workspace*. There can be multiple block editors open. Logic may be edited in ladder form as shown below or in statement list form.

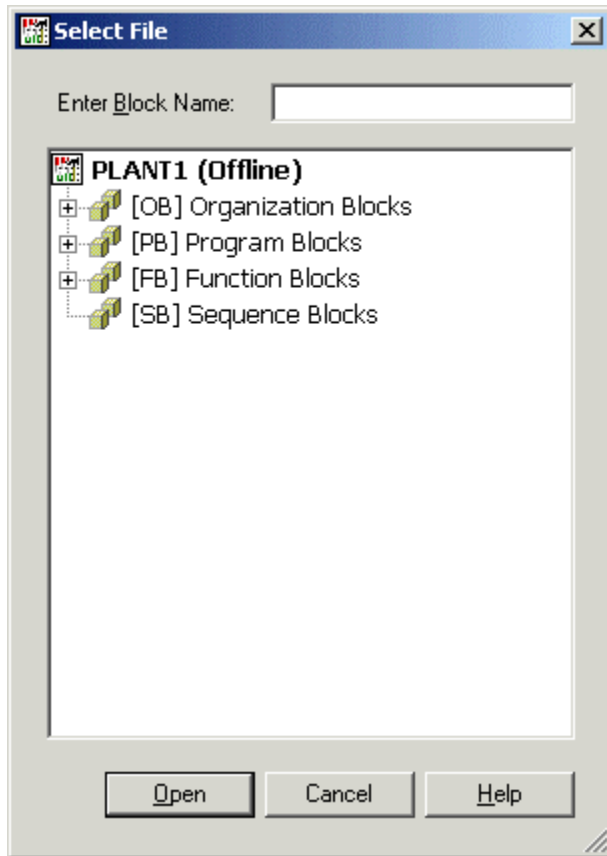


The display options for the logic block editor are set in the *Logic tab* on the *Program Setup* dialog

To open a block in a logic block editor, either:

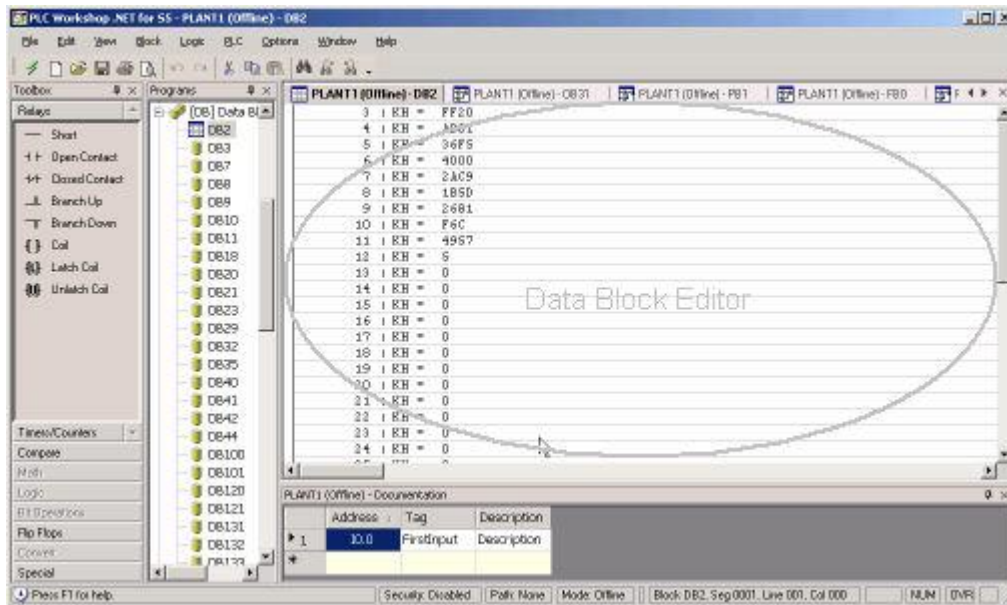
- double-click the logic block in the program tree, or

- bring up the Select File dialog by selecting the **View/Logic Block Editor** menu option or clicking the toolbar button, then either double-click the block or type the block name in the **Enter Block Name** field.



Data Block Editor

A data block editor is displayed as a tab in the main *workspace*. There can be multiple block editors open.

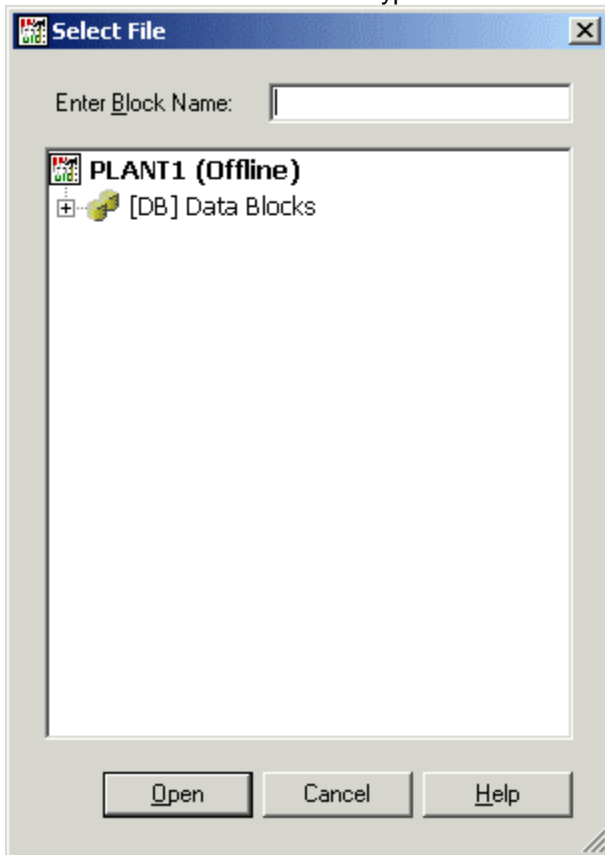


The display options for the data block editor are set in the *Data tab* on the *Program Setup* dialog

To open a block in a data block editor, either:

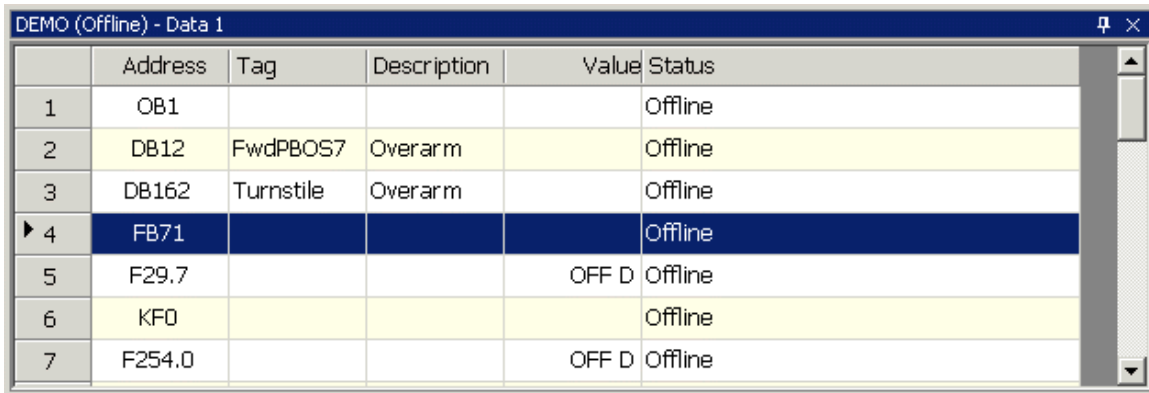
- double-click the logic block in the program tree, or

- bring up the Select File dialog by selecting the **View/Data Block Editor** menu option, then either double-click the block or type the block name in the **Enter Block Name** field.



Data Window 

A data window provides way to view and edit the values in a set of PLC memory addresses.



The screenshot shows a window titled "DEMO (Offline) - Data 1" containing a table with the following data:

	Address	Tag	Description	Value	Status
1	OB1				Offline
2	DB12	FwdPBOS7	Overarm		Offline
3	DB162	Turnstile	Overarm		Offline
4	FB71				Offline
5	F29.7			OFF D	Offline
6	KF0				Offline
7	F254.0			OFF D	Offline

To bring up a data window, either:

- double-click the data window in the program tree, or
- bring up the Select File dialog by selecting the **View/Data Window** menu option or clicking the toolbar button, then either double-click the data window or type the name in the **Enter Block Name** field.

To add an address to the data window, either:

- Type the address in a cell in the **Address** column, or
- open the drop-down list in a cell in the **Tag** column and select the tag for the address to be added.

To add a series of addresses to the data window:

1. Select the **Data/Fill** menu option to bring up the Data View Fill dialog.

The screenshot shows the 'Data View Fill' dialog box. It contains 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: [Drop-down menu]

Buttons on the right: OK, Cancel, Apply, Help.

2. Enter the first address in the **Start Address** field.
3. Enter the line on which that address should appear in the **Start Row** field.
4. Select End Address to specify the end of the series, or select Count to specify the number of addresses in the series. Enter the appropriate information in the field next to the selected option button.
5. Set the **Increment** between addresses in the series. The default, 1, creates a series of consecutive addresses.
6. Select the display **Format** for the data from the drop-down list.

To edit the documentation for an address in the data window, use the *Modify Address Documentation* feature.

View Documentation

Address documentation is listed in a spreadsheet-style display.

	Address	Tag	Description
45	FB22	Conv	Entry Peeler Dn SOL
46	FB23	ConvA	Payoff Expand LightOS2
47	FB24	ConvB&C	Recoil Hi-gear L/s Recoil Lo-Gear L/s Slitter in Place L/S Holddown
48	FB25	ConvB&C&	Arm L/S
49	FB26	ConvB&CFw	Recoil
50	FB27	ConvB&CR	Collanse PPOS2 Payoff Tension High

To display the documentation list, select the **View/Documentation** menu option.

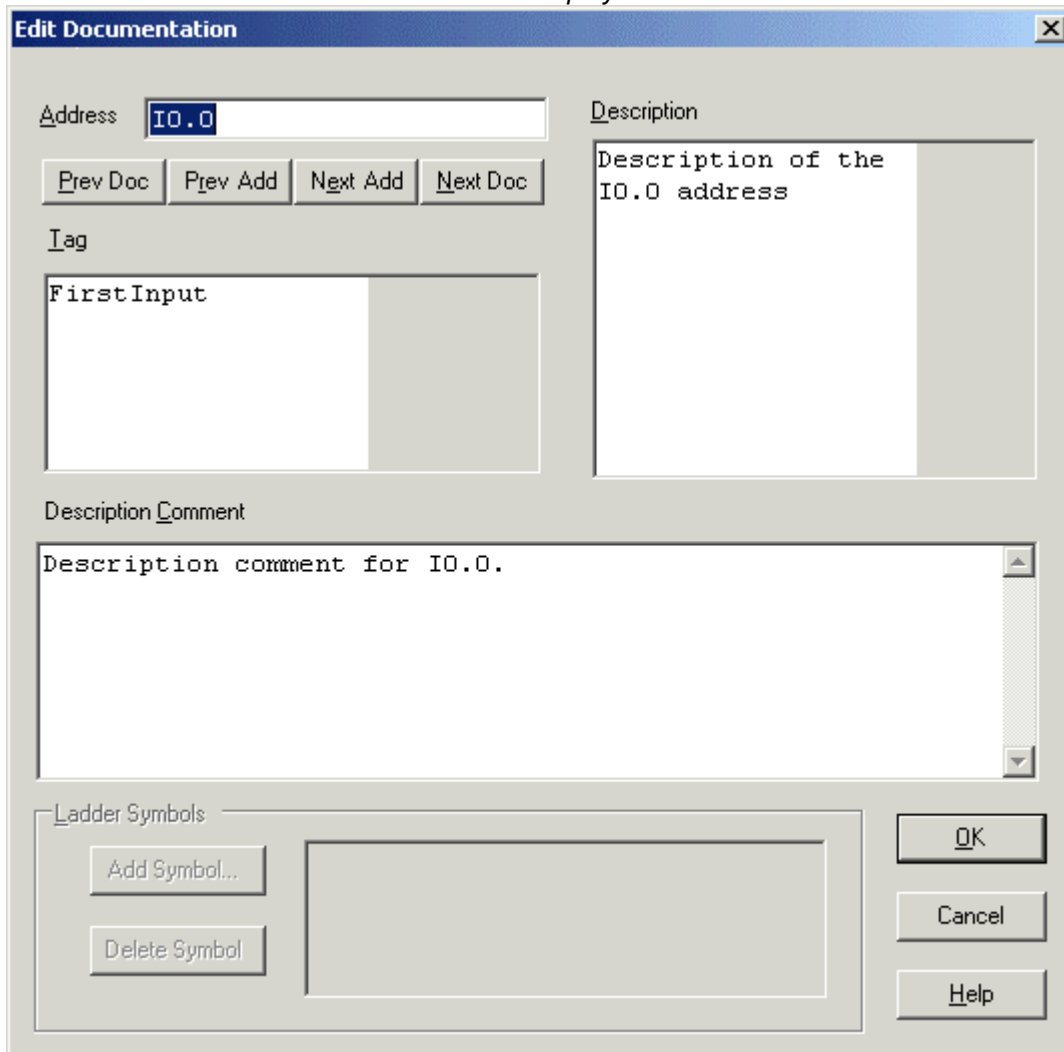
The display is not directly editable. Double-click on a line to *edit the documentation*.

Documentation Editor

Use the documentation editor to edit documentation about PLC memory addresses.

There are several ways to bring up the documentation editor:

- Select the **Edit/Modify Address Documentation** menu option, or press **Ctrl-L**, while the cursor is on the address to be modified.
- Select the Edit/New Address Documentation menu option.
- Double-click a line in the *documentation display*.



- **Address:** Enter the address to be documented. When this field does not contain a valid address, all the other fields are disabled.
- **Tag:** Enter the tag for the displayed address. Tags must be unique.
- **Description:** Enter the description of the address.
- **Description Comment:** Enter comments about the address.
- **Prev Doc, Next Doc:** Edit documentation for the previous or next documented address.
- **Prev Add, Next Add:** Edit documentation for the previous or next address, whether it is currently documented or not.

Assign Tag

When the **Assign Tag** option is selected and you enter an address that does not already have a tag in ladder logic or STL, WorkShop displays the **Assign Tag** dialog. This is identical to the **Edit Documentation** dialog except that the address is a non-editable field containing the address to which the tag will be assigned, and the navigation buttons are disabled.

Assign Address

When the **Assign Address** option is selected and you enter a tag that is not already assigned to an address in ladder logic or STL, WorkShop displays the **Assign Address** dialog. This is identical to the **Edit Documentation** dialog except that the Tag field is already filled in and the navigation buttons are disabled.

Find in Documentation

Use the **Find in Documentation** dialog to locate text in the address documentation.



- **Find what** - Enter the text to be found.
- **Match case** - Check this box to search for the exact case. For example, if you search for 'Coil' and box is checked, WorkShop will only find 'Coil', not 'coil' or 'COIL'.
- **Match whole word** - Check this box to find the text only as a whole word. For example, if you search for 'Coil' and this box is checked, WorkShop will find 'Coil' but not 'Coils'.
- **Search Direction** - Select whether to search **Forward** towards the end of the program or **Reverse** towards the start of the program.
- **Find in** - Check to boxes for the areas in which to search. For example, if you search for 'Coil' and only the Tag box is checked, WorkShop will find only documentation where the tag contains 'Coil', not documentation where 'Coil' appears only in the description.
- **Find Next** - Click this button to find the next (or previous, if the **Search Direction** is **Reverse**) instance of the text. The Find in Documentation dialog does not close automatically when you click this button, so you can click it repeatedly to find more instances.

To access the Find in Documentation dialog:

1. Select a documentation window.

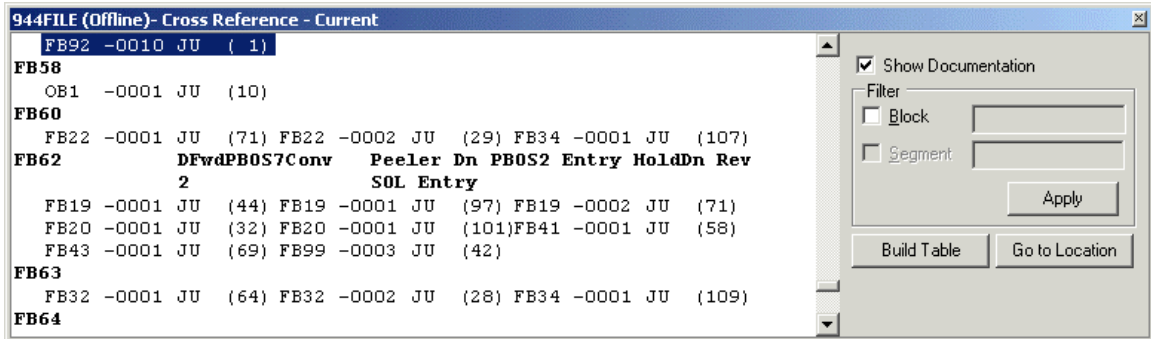
	Address	Tag	Description
11	FW20	TIME OUT PRESET	
12	FW100	Timer 1 Flag Area	
13	I0.0	START PROCESS 1 LPB 1	
14	I0.1	STOP PROCESS 1 LPB 2	

2. Select the **Edit/Find** menu option, press **Ctrl-F**, or click the binoculars icon in the toolbar.

View Cross Reference 

The cross reference lists PLC addresses and the contexts (location and instruction) where they are used.

You can go to any of the locations where an address is in use, by selecting the segment reference in the cross reference display and clicking the **Go to Location** button.



To display the cross reference, select the **View/Cross Reference** menu option, click the toolbar button, or double-click the cross reference icon in the *program tree* display.

You can go to any of the locations where an address is in use, by selecting the segment reference in the cross reference display and clicking the **Go to Location** button.

To rebuild the cross reference table, click **Build Table**.

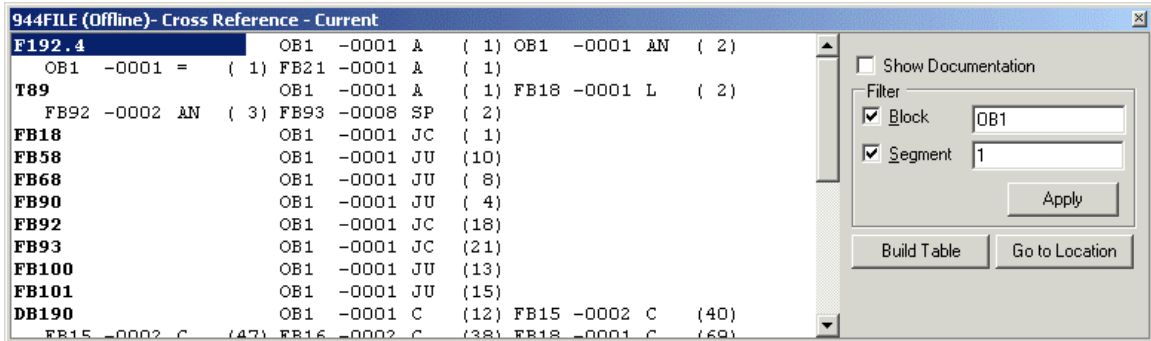
To include address documentation in the display, check the Show Documentation box.

To limit the cross reference to a particular block or segment, check the **Block** box and enter the block name, and the **Segment** box and number if applicable, in the **Filter** area, then click **Apply**.

Segment Cross Reference

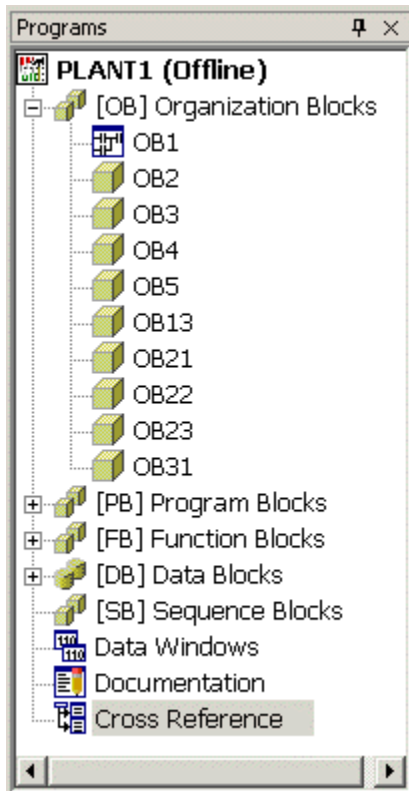
The segment cross reference displays the cross reference information for the addresses in the current logic segment.

The segment cross reference is equivalent to the general *cross reference* with the filter set to the current block and segment.



To display the segment cross reference, select the **View/Segment Cross Reference** menu option.

Program Tree



The program tree provides an overview of the structure of the PLC program.

Double-clicking an item in the tree opens that item. If the item is a container (indicated by a +/- box) the container opens by expanding the tree. For other items, an editor or list opens. For blocks that can contain logic (Organization Blocks, Program Blocks, Function Blocks, and Sequence Blocks) a *Logic Block Editor* opens in the *workspace*. For Data Blocks, a *Data Block Editor* opens in a sub-window.

Toolbars

Like many Windows programs, WorkShop provides toolbars for quick access to program functions.



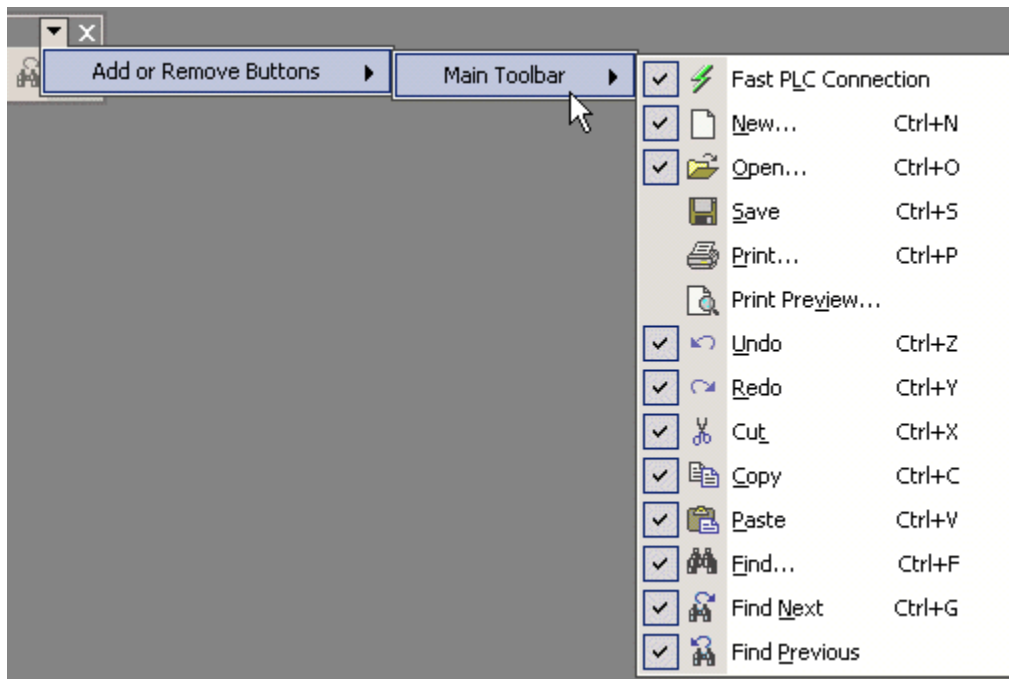
The toolbars are configurable. Options include:

- selecting which toolbars are visible
- adding or removing buttons
- moving toolbars to another part of the screen.

Move a toolbar by clicking and dragging the handle at the left edge of the toolbar.

Toggle a toolbar on or off by selecting the toolbar from the **View/Toolbars** submenu.

Toggle a button on or off a toolbar by selecting the item from the menu that appears when you click the triangle at the right edge of the toolbar, as shown below.



To configure several toolbars or buttons at once, use the *Customize* dialog by selecting the **View/Toolbars/Customize** menu option.

Status Bar

To toggle display of the status bar, select the **View/Status Bar** menu option.

The status bar shows the status of several features of the system.



- **Security** - Displays the status of the *security system*, enabled or disabled.
- **Path** - Displays the *communications path*.
- **Online** - Displays the *RUN/STOP status* of the PLC.
- **Cursor location** - Displays the block, segment, line, and column at which the cursor is located.
- **CAPS** - If the Caps Lock is active, the word CAPS is shown.
- **NUM** - If the Num Lock is active, the word NUM is shown.
- **OVR** - If the Caps Lock is active, the word CAPS is shown.
- **Heartbeat** - When online, the heart symbol alternates between red and white to indicate that communication with the PLC is occurring.

Cut , **Copy** 

To cut, select the **Edit/Cut** menu item, click the toolbar button, or press **Ctrl-x**.

To copy, select the **Edit/Copy** menu item, click the toolbar button, or press **Ctrl-c**.

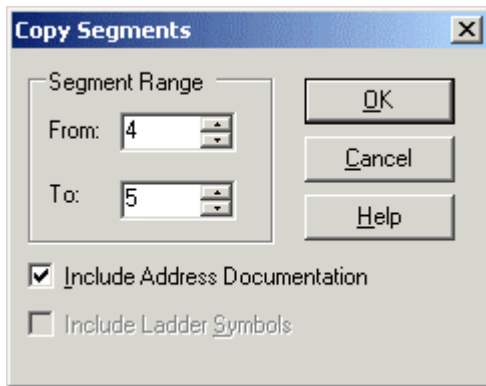
To paste, select the **Edit/Paste** menu item, click the toolbar button, or press **Ctrl-v**.

You can cut, copy and paste either complete segments, or partial segments.

If a selection within a segment is active when you cut or copy, the selected logic is cut or copied to the buffer. This is a partial segment selection, even if the selection happens to include all the logic in the segment. In the case of a cut, the segment is placed in edit mode and turns yellow.

Paste with Rewire is not available for partial segment selections. Select complete segments by dragging the mouse in the space to the left of the logic, or by dragging the mouse from one segment to another.

If no logic is selected, or if complete segments are selected, a dialog appears.



Set the **Segment Range** to be cut or copied.

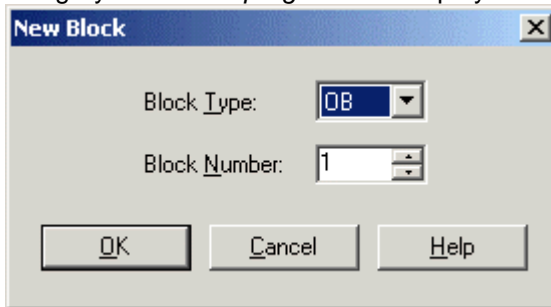
Check the **Include Address Documentation** box to copy documentation along with the logic.

Block Operations

New Block

To create a new block:

1. Select the **Block/New Block** menu option, click the toolbar icon, or right-click on a block category icon in the *program tree* display. The New Block dialog appears.

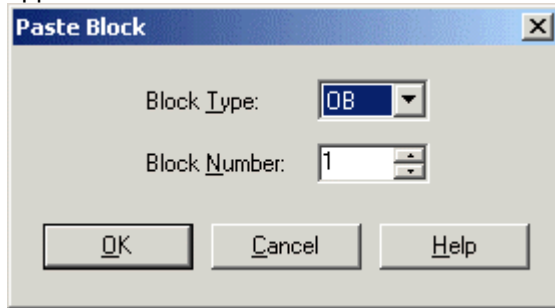


2. Select the Block Type and Block Number.
3. Click **OK**.

Copy/Paste block

To copy and paste blocks:

1. Select the **Block/Copy Block** menu item or click the toolbar icon to copy the block in the current block editor, or right-click on the block to be copied in the *program tree* display.
2. Select the **Block/Paste Block** menu item or click the toolbar icon. The Paste Block dialog appears.



3. Select the Block Type and Block Number.
4. Click **OK**.

Zoom Into Block

Open and display the contents of the block referred to by the instruction under the *Zoom Cursor*. In other words, go into the selected block.

To Zoom Into a Block:

1. Place the zoom cursor on the block reference, by using the Zoom Next and Zoom Previous operations.
2. Either click the **Zoom Into** icon on the toolbar or select the **Blocks/Zoom Into** menu option.

Zoom Out of Block

"Back out" of a **Zoom Into Block**. Display the location where the *Zoom Cursor* was when a Zoom Into Block operation occurred. Repeated Zoom Out of Block operations reverse Zoom Into Block operations in reverse order - the first Zoom Out of Block reverses the last Zoom Into Block.

To Zoom Out of a Block:

1. Either click the **Zoom Out of Block** icon on the toolbar or select the **Blocks/Zoom Out of** menu option.

Zoom Next/Previous 

Move the *Zoom Cursor* to the next or previous zoomable location.

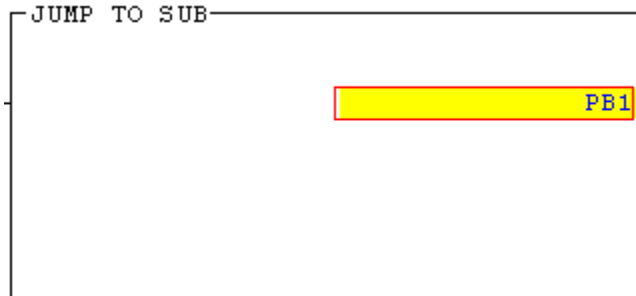
To zoom the next or previous zoomable location:

Click the appropriate toolbox icon, or select the **Block/Zoom Next** or **Block/Zoom Previous** menu option.

Zoom Cursor

The Zoom Cursor controls the location of **Zoom Into Block** operations.

Move the Zoom Cursor by using the **Zoom Next** and **Zoom Previous** operations.



The Zoom Cursor is a highlight on a zoomable block reference. The color of the highlight can be changed using the **Colors tab** on the **Program Setup** dialog.

Logic

Validate and Enter

When you edit a line of STL or data, or a segment of ladder, the affected area goes into an edit mode, which is highlighted by a different background color. The Validate and Enter operation checks the syntax of the parts of the program that are in edit mode, and if they are valid, enters them in the program and clears the highlight.

The edit mode background is yellow by default, but configurable on the **Colors tab** of the Program Setup dialog.

To Validate and Enter **edits**:

Select the **Logic/Validate and Enter** menu option, click the toolbar icon, or press the **F8** key.

New Segment

To insert a new segment of ladder or STL, select the **Logic/New Segment** menu option or click the toolbar icon.

You can also insert a segment by using the **Insert** operation.

New Row

To insert a new row in the current segment of ladder, STL, or data, select the Ladder/New Row menu option or click the toolbox icon.

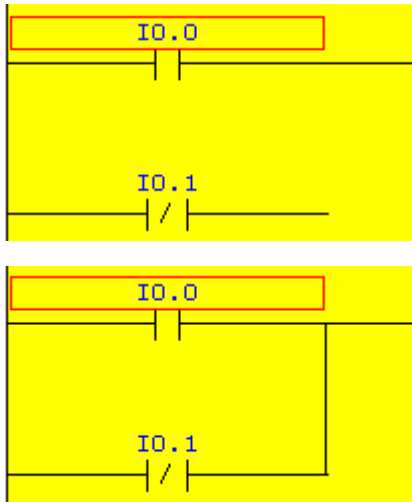
You can also add a row by using the **Insert** operation.

Toggle Branch

To insert or remove a branch in ladder logic, select the Logic/Toggle Branch menu item or press F9.

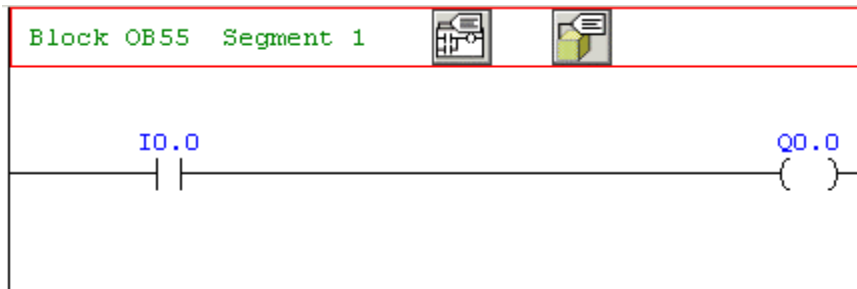
You can also insert or remove a branch using the **Branch Up** or the **Branch Down** relay from the **toolbox**.

A branch is added to or removed from the right and down from the cursor location.

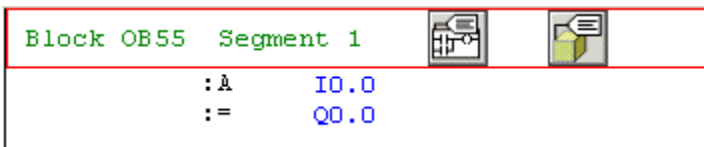


Switch to Statement List STL

To switch from viewing logic as ladder when possible to viewing it as STL in all cases, either select the **Logic/Switch to STL** menu option or click the toolbar icon.

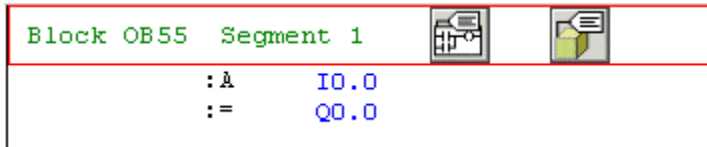


becomes

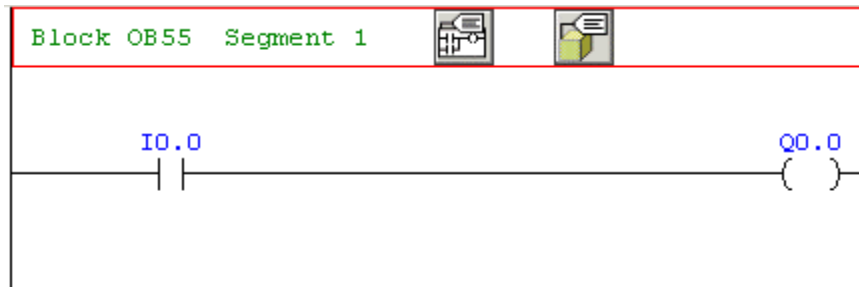


Switch to Ladder LAD

To switch from viewing logic as STL in all cases to viewing it as ladder where possible, either select the **Logic/Switch to Ladder** menu option or click the toolbar icon.



becomes

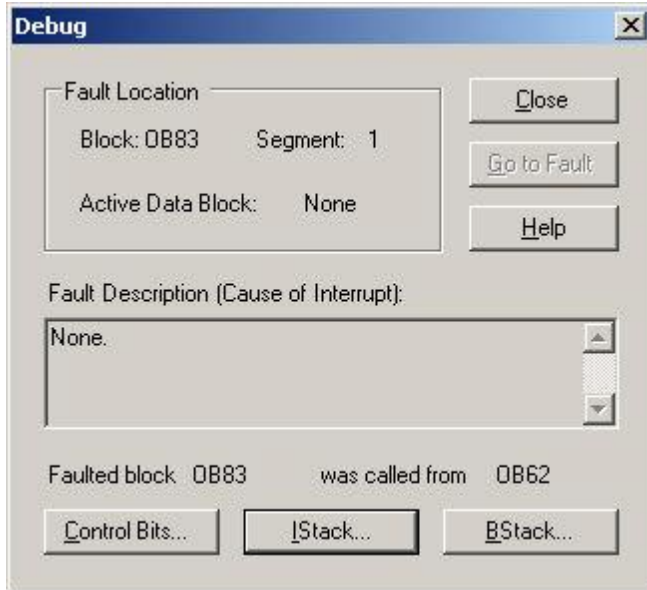


Note that ladder logic is a view of certain sequences of STL code, and not all STL code can be represented as ladder logic. When in Ladder mode, WorkShop displays the code that can be displayed as ladder as ladder and the rest as STL.

Diagnostics

Debug

Use the **Debug** dialog to get detailed information about the program and PLC status.



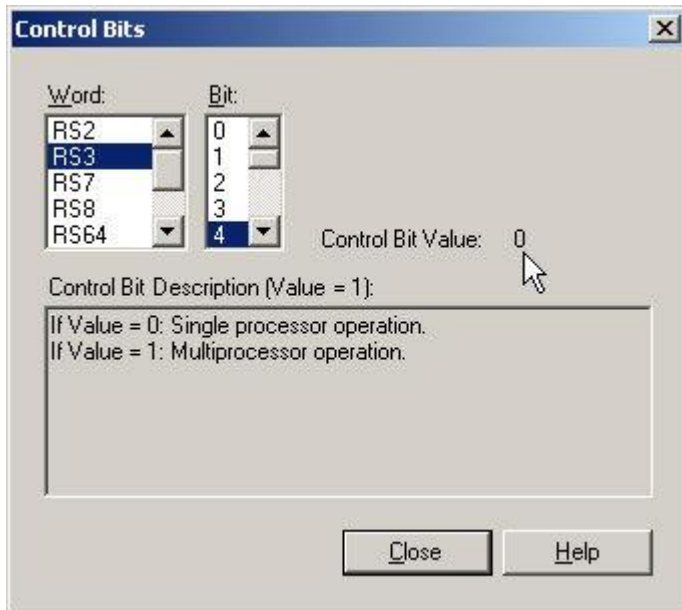
- **Fault Location** - Indicates the block and segment where the fault occurred, and the data block that was active.
- **Fault Description** - Provides a brief description of the fault.
- **Control Bits** - Click this button for information on the status of the processors control bits. This information is available whether the PLC is running or stopped due to a fault.
- **IStack** - Click this button for program status information stored on the PLC. This information is only available if the processor is stopped due to a fault.
- **BStack** - Provides block and address information about the current block stack. This information is only available if the processor is stopped due to a fault.

To access the Debug dialog:

Select the **Diagnostics/Debug** menu item, or click the Debug button on the **PLC Status** dialog.

Control Bits

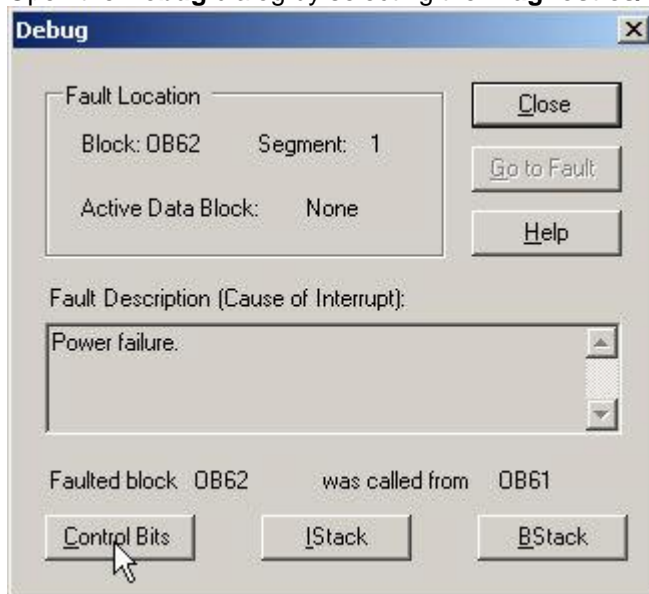
The Control Bits dialog shows the current state of any control bit, and a description of the meaning of the bit.



- **Control Bit Value:** The current value of the bit.

To access the Control Bits dialog:

1. Open the **Debug** dialog by selecting the **Diagnostics/Debug** menu option.



2. Click the **Control Bits** button.

Block Stack

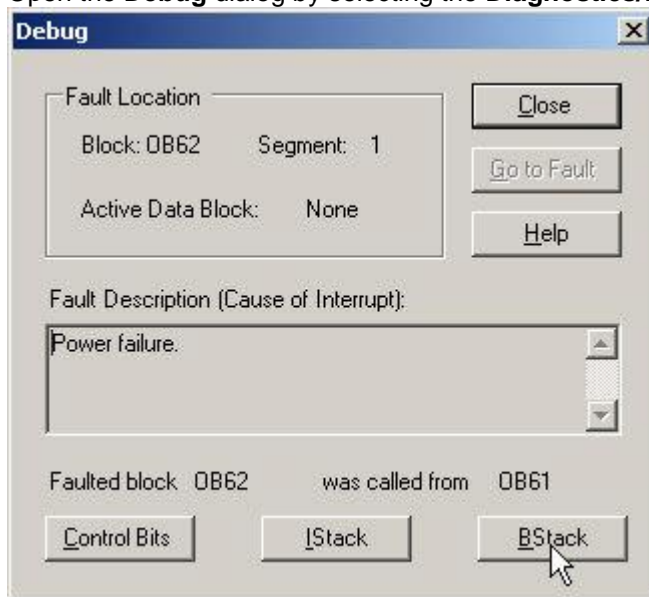
The Block Stack dialog shows the stack of called blocks, for debug purposes. This information is only available if the processor is stopped due to a fault.



To access the Block Stack dialog:

This information is only available if the processor is stopped due to a fault.

1. Open the **Debug** dialog by selecting the **Diagnostics/Debug** menu option.



2. Click the **BStack** button.

Interrupt Stack

The **IStack** dialog shows information about the state of the interrupt processing at the time of the current fault. This information is only available if the processor is stopped due to a fault.

IStack
✕

Fault Location

Block: OB62 Segment: 1

Active Data Block: None

Fault Depth

1 of 1

Levels

Close

Go to Fault

Next Fault

Prev Fault

Help

Fault Description (Cause of Interrupt):

Power failure.

Faulted block: OB62 was called from: OB61

Last Instruction Executed

Block: OB62 Segment: 1

Instruction: ADD DH

Next Instruction Executed

Block: OB62 Segment: 1

Instruction: MAS

Accumulated Values

A1: 000E 08F1 A2: 0000 FFFF A3: ED71 9DFF A4: ED71 9DFF

Nested Brackets Open at Fault

Nest Level:	1	2	3	4	5	6
Bracket Type:						
O before (:						
RLO before (:						

Result Bits..

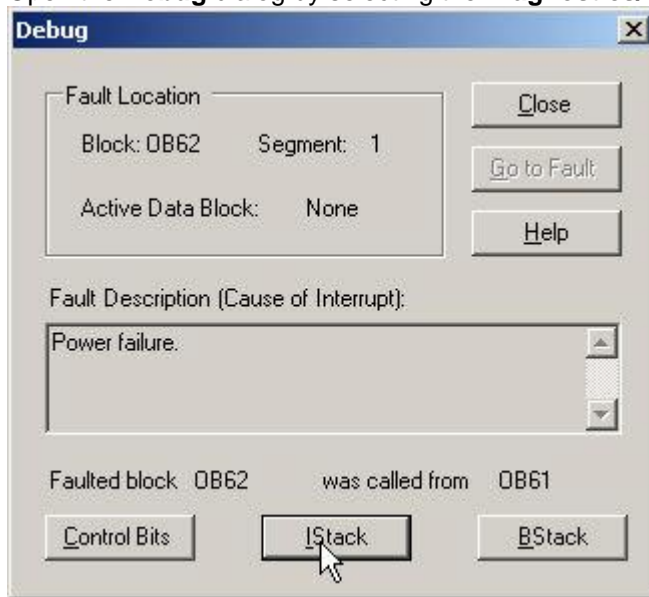
Error Bits...

Inhibit Bits...

To access the IStack dialog:

This information is only available if the processor is stopped due to a fault.

1. Open the **Debug** dialog by selecting the **Diagnostics/Debug** menu option.

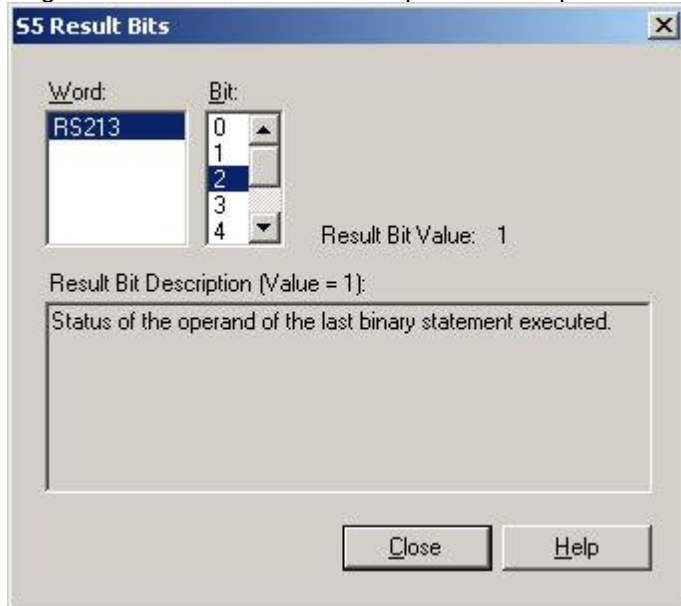


2. Click the **IStack** button.

Result Bits

Use the Result Bits dialog to display information about the status of the user program when the fault occurred. This information is only available if the processor is stopped due to a fault.

Registers used for result bits are processor dependant.

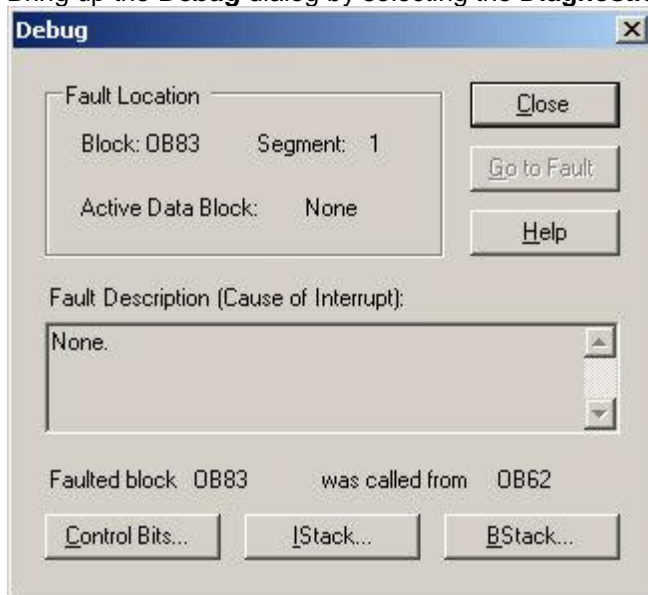


Use the **Word** and **Bit** selectors to select the bit in question. The description of the selected bit appears in the text box, the state of the bit (0 or 1) appear to the right.

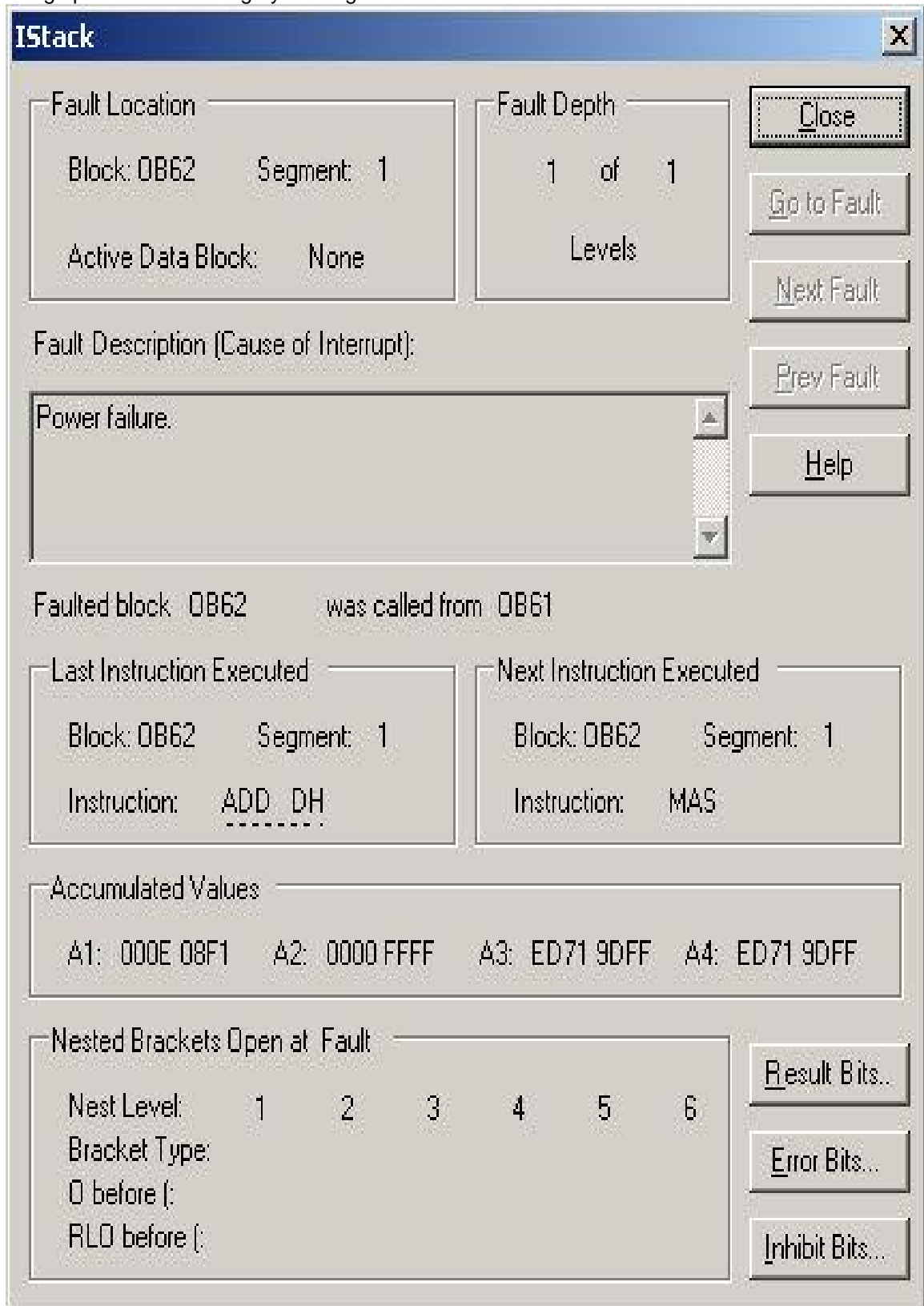
To access the Result Bits dialog:

This information is only available if the processor is stopped due to a fault.

1. Bring up the **Debug** dialog by selecting the **Diagnostics/Debug** menu item.



- Bring up the **IStack** dialog by clicking the **IStack** button.

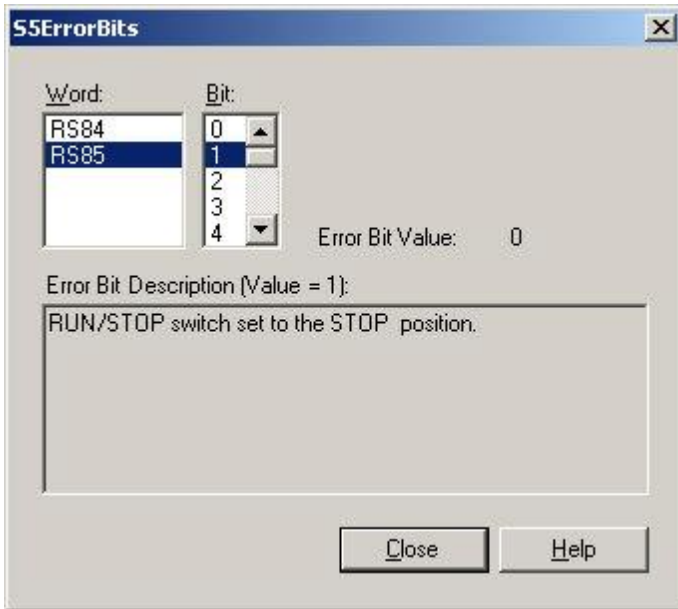


- Click the **Result Bits** button.

Error Bits

Use the Error Bits dialog to display information about all the errors that occurred up to the point that the processor was stopped.

Error Bits are only available with some types of processors. Registers used for error bits are processor dependant.

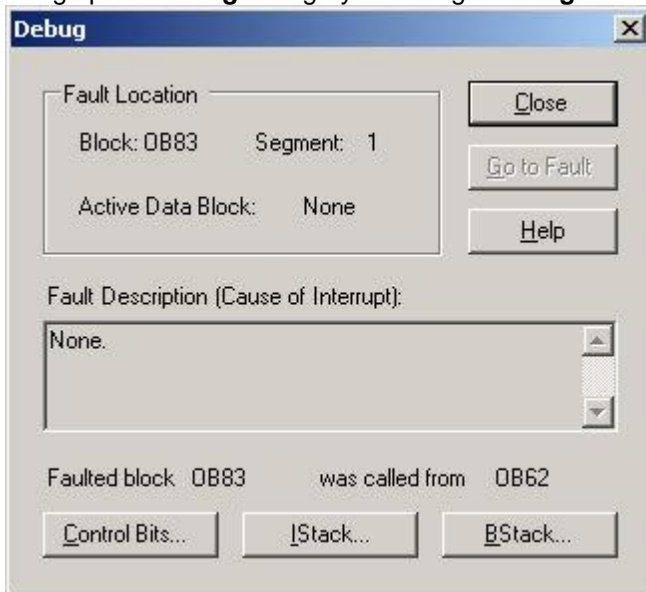


Use the **Word** and **Bit** selectors to select the bit in question. The description of the selected bit appears in the text box, the state of the bit (0 or 1) appear to the right.

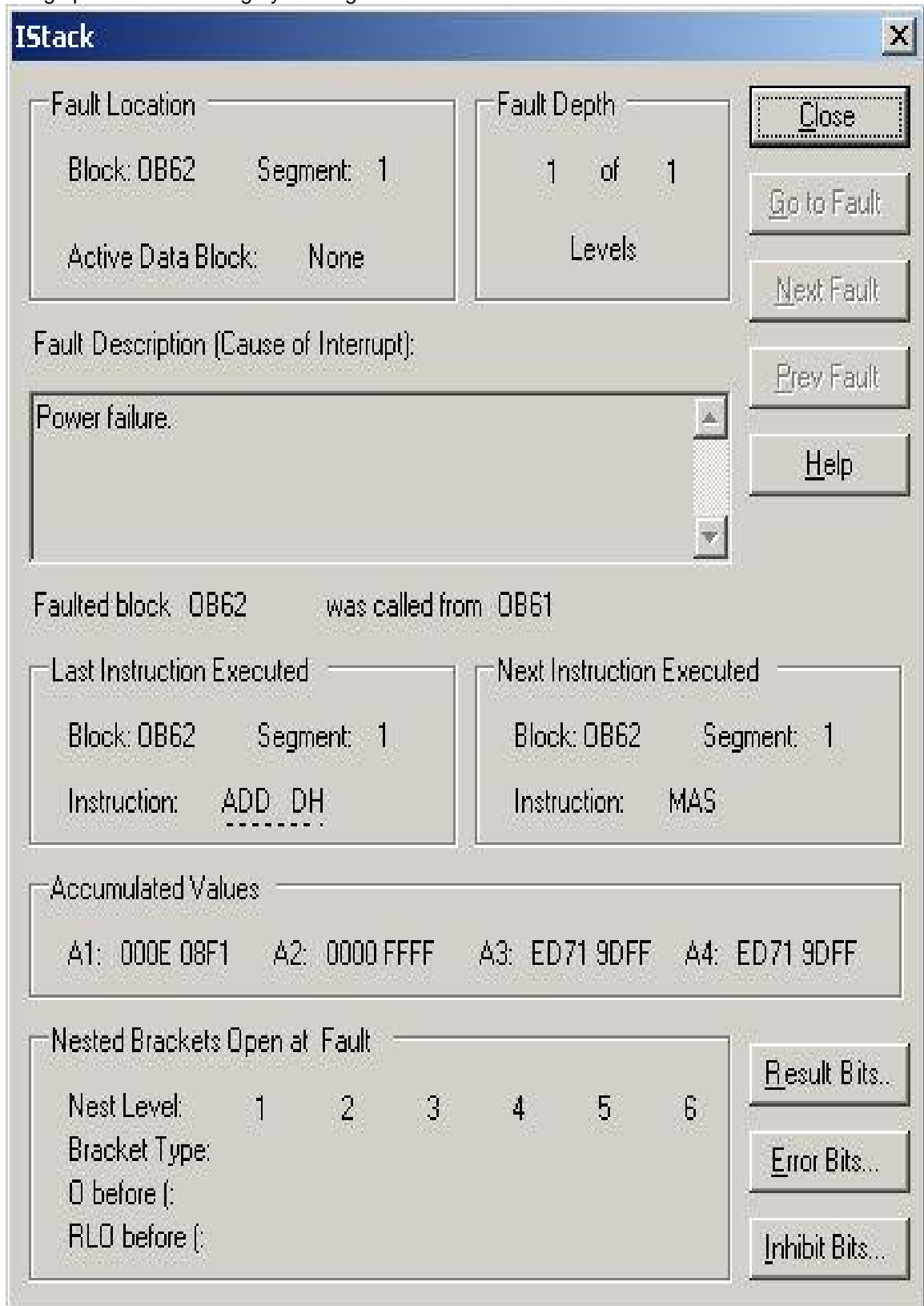
To access the Error Bits dialog:

This information is only available if the processor is stopped due to a fault.

1. Bring up the **Debug** dialog by selecting the **Diagnostics/Debug** menu item.



- Bring up the **IStack** dialog by clicking the **IStack** button.



- Click the **Error Bits** button.

Inhibit Bits

Inhibit bits are a way of permitting or preventing the system from stopping in the event described by a particular bit.

Inhibit bits are only available with some types of processor. If you are using such a processor, use the **Inhibit Bits** dialog to display information about the bits.

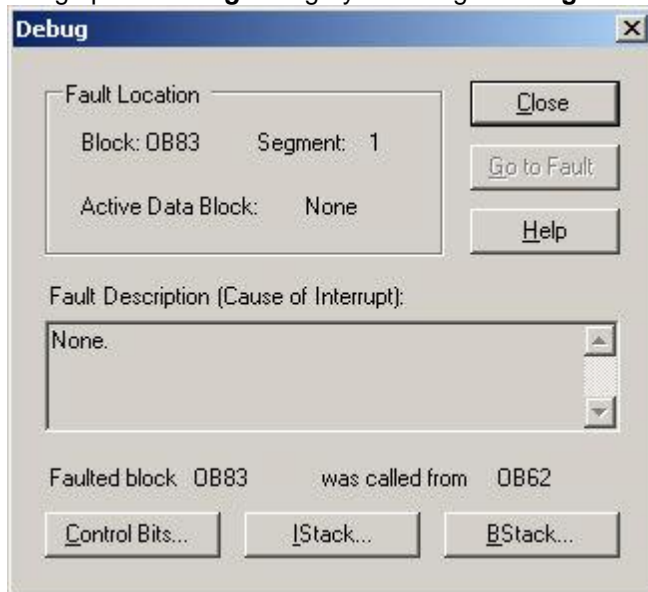


Use the **Word** and **Bit** selectors to select the bit in question. The description of the selected bit appears in the text box, the state of the bit (0 or 1) appear to the right.

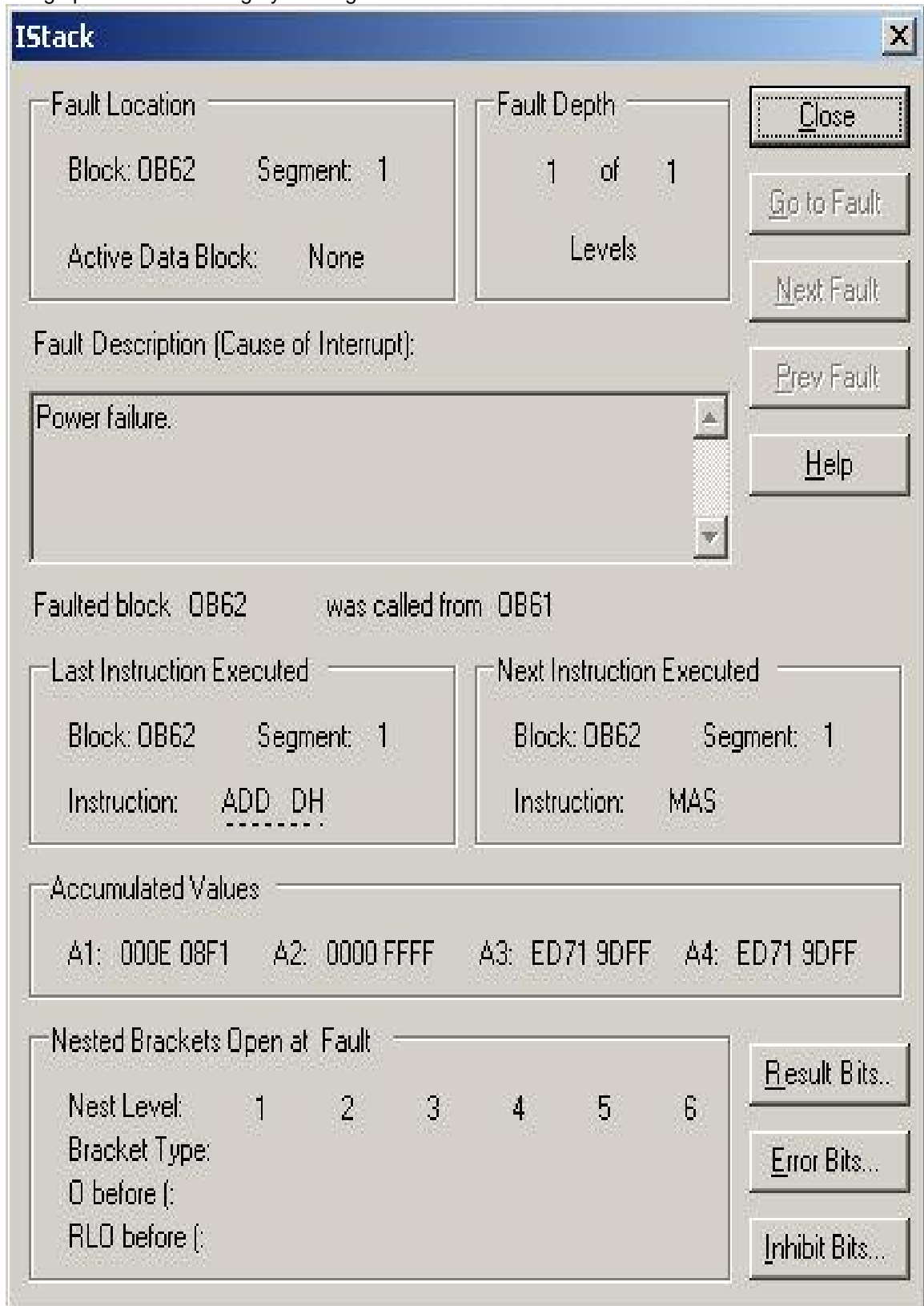
To access the Inhibit Bits dialog:

This information is only available if the processor is stopped due to a fault.

1. Bring up the **Debug** dialog by selecting the **Diagnostics/Debug** menu item.



- Bring up the **IStack** dialog by clicking the **IStack** button.

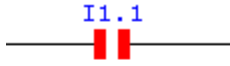


- Click the **Inhibit Bits** button.

Logic Status

The Logic Status feature shows the current status of a contact or coil by highlighting it if it is on.

In the case of a Normally Closed Contact, a zero value opens the contact, so the contact will be highlighted if the value is zero.



In the illustration, I1.1 is on, F0.0 is off.

The width of the highlight is configurable by setting the **Status Thickness** on the **Program Status** dialog under the **Logic tab options for Ladder**. The color is configurable using the **Colors tab** on the **Program Status** dialog.

To enable or disable Logic Status:

Select the **Diagnostics/Logic Status** menu option.

PLC

PLC Operations

Use the **PLC Operations** dialog to perform basic PLC operations.



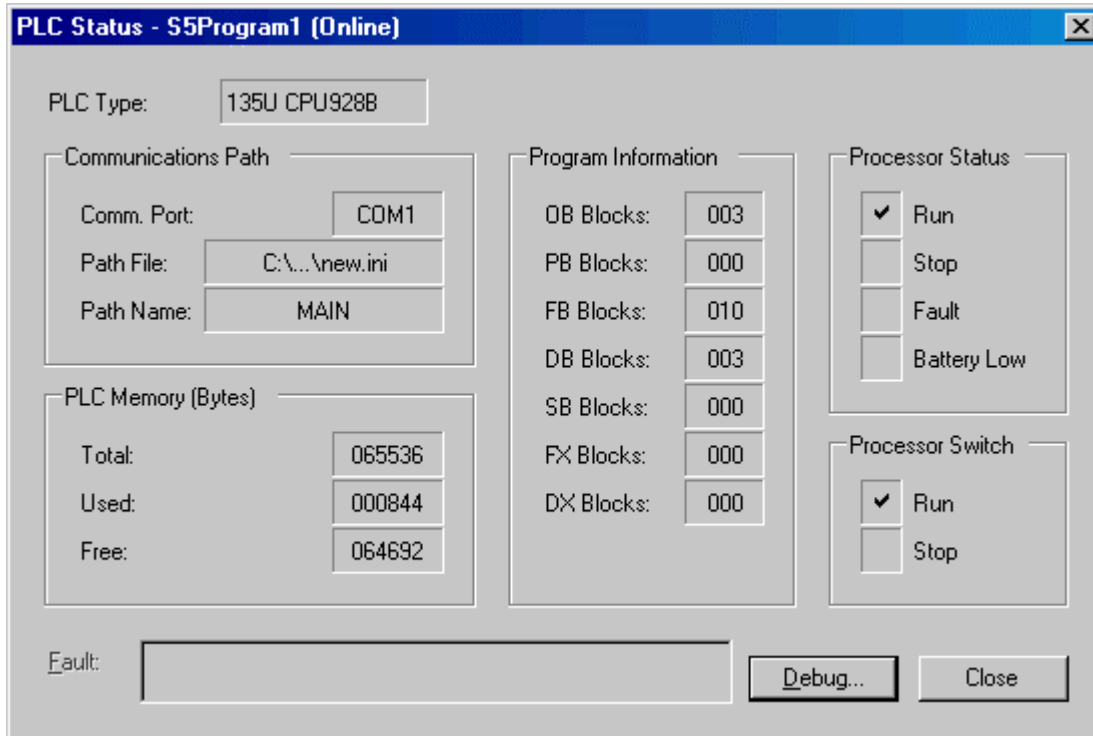
- **Warm Start** - Start the PLC if it was stopped without a fault. The warm start retains register data and the PLC resumes processing at the point of interruption..
- **Cold Start** - Start the PLC if it was stopped by a fault. The cold start clears register data before starting the PLC.
- **Stop** - Stop the PLC.
- **Compress** - Eliminate gaps in PLC memory allocation to free memory for programs and data.

To access the PLC Operations dialog:

Select the **PLC/Operations** menu item.

PLC Status

Use the PLC Status dialog to find information on the status of the PLC process.



- **Communications Path** - The path to the PLC. The **Comm. Port** field displays the selected port. The **Path File** is the file containing path configurations. The **Path Name** identifies a path within the path file. To examine or configure this information, use the **Path Editor**.
- **PLC Memory** - Displays the **Total**, **Used**, and **Free** memory in the PLC, in bytes.
- **Program Information** - Displays the number of blocks of each type.
- **Processor Status** - Displays the current state of the PLC.
- **Processor Switch** - Displays the state of the run/stop switch on the front of the PLC.
- **Debug** - Click this button to access the **Debug** dialog.

To access the PLC Status dialog:

Select the **PLC/Status** menu item.

Setting up WorkShop

Installing WorkShop

Installation

Installing PLC WorkShop for Siemens S5 - Performance Series

Installing the FasTrak-Key

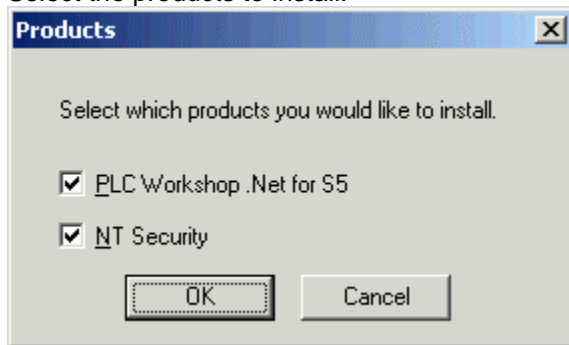
Connect the Communications Cable

Installing PLC WorkShop for S5 - Performance Series

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

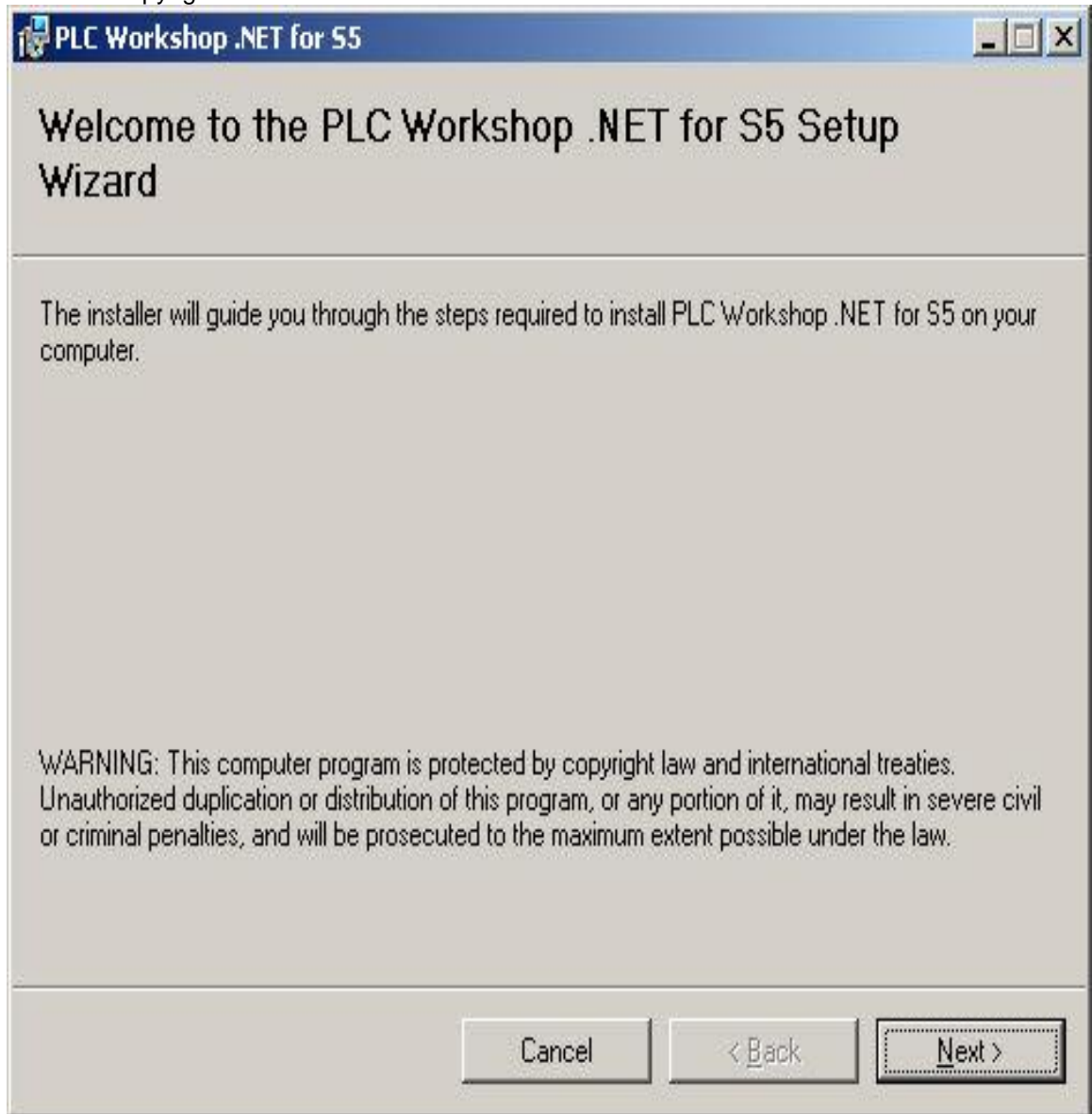
To install PLC WorkShop, turn your computer on and start Windows. You may need to provide a user name and password to log in to a computer network. If you are unsure, contact your company's System Administrator or IT representative. Follow these steps to install the software:

1. Insert the **PLC WorkShop for Siemens S5 - Performance Series** CD 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. Select the products to install.

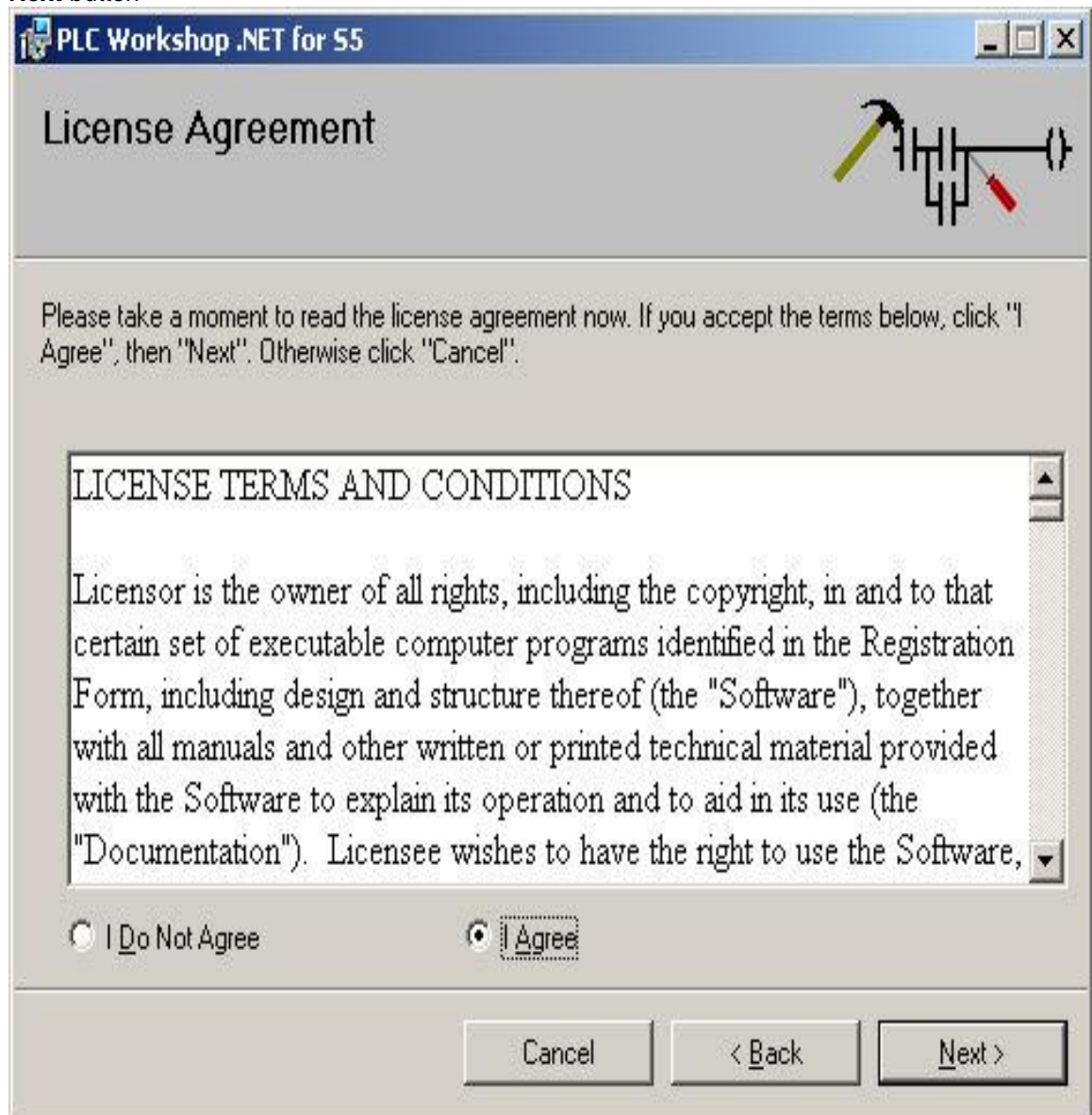


PLC Workshop for Siemens S5 is the main part of the product.
NT Security is an optional security system.

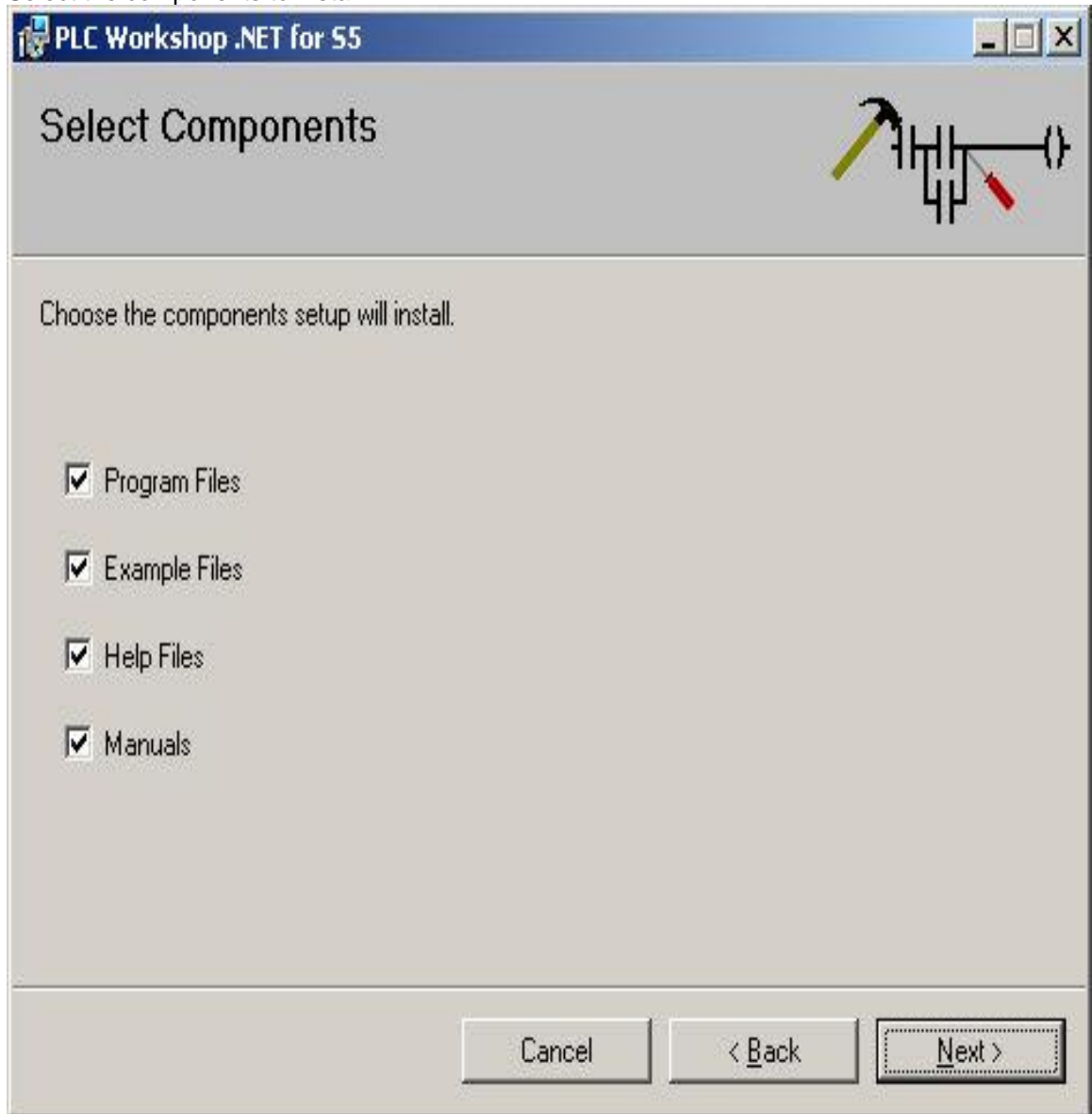
4. Read the copyright information and click the **Next** button.



5. Read the license agreement. If you agree, select the I Agree option button and click the **Next** button

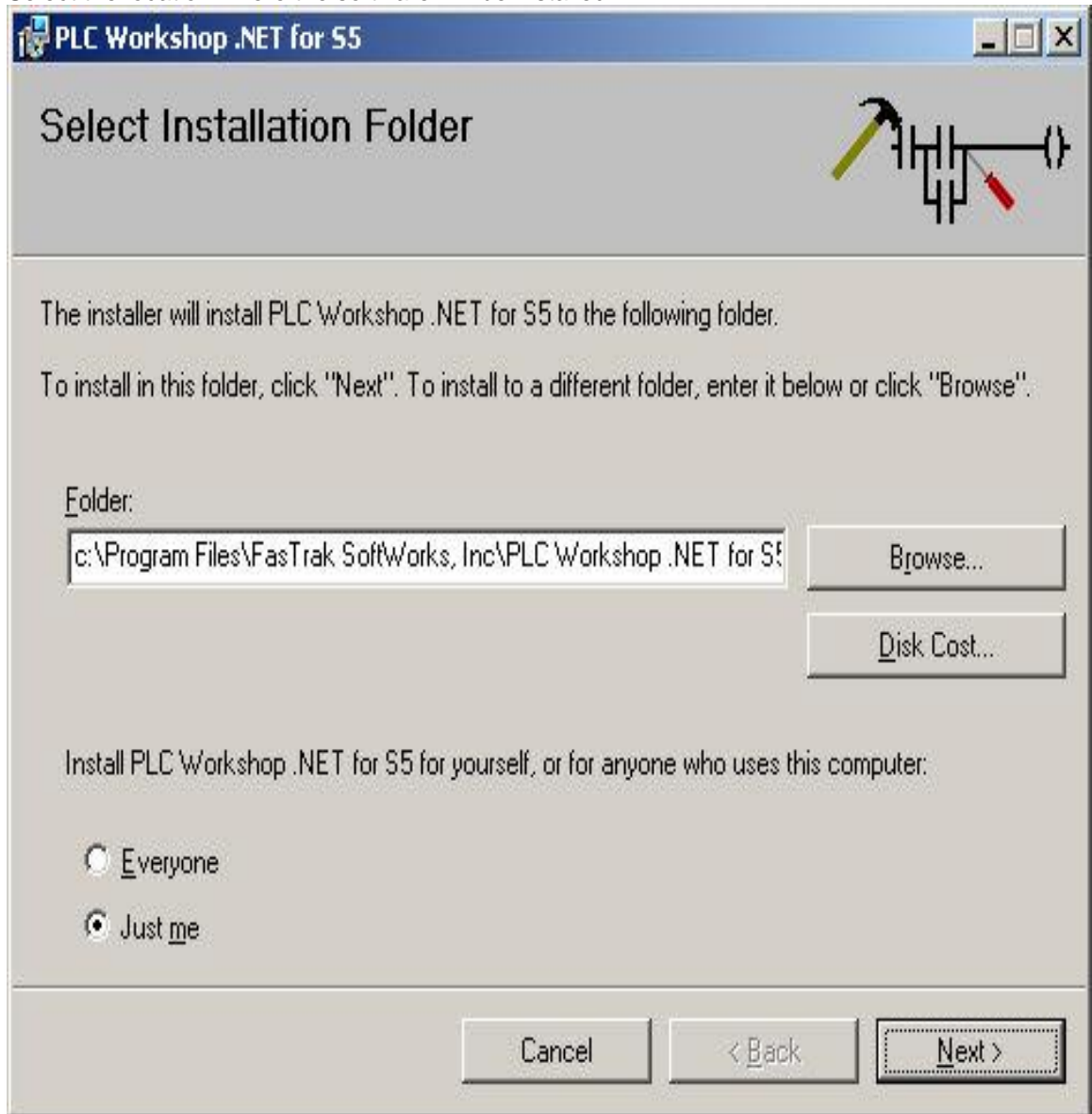


6. Select the components to install.



Check **Program Files** and **Help Files** to install WorkShop.
Check the **Example Files** box to install an example of an S5 program.
Check the **Manuals** box to install the PLC WorkShop manual in Adobe Acrobat (PDF) format.
Click the **Next** button.

7. Select the location where the software will be installed.

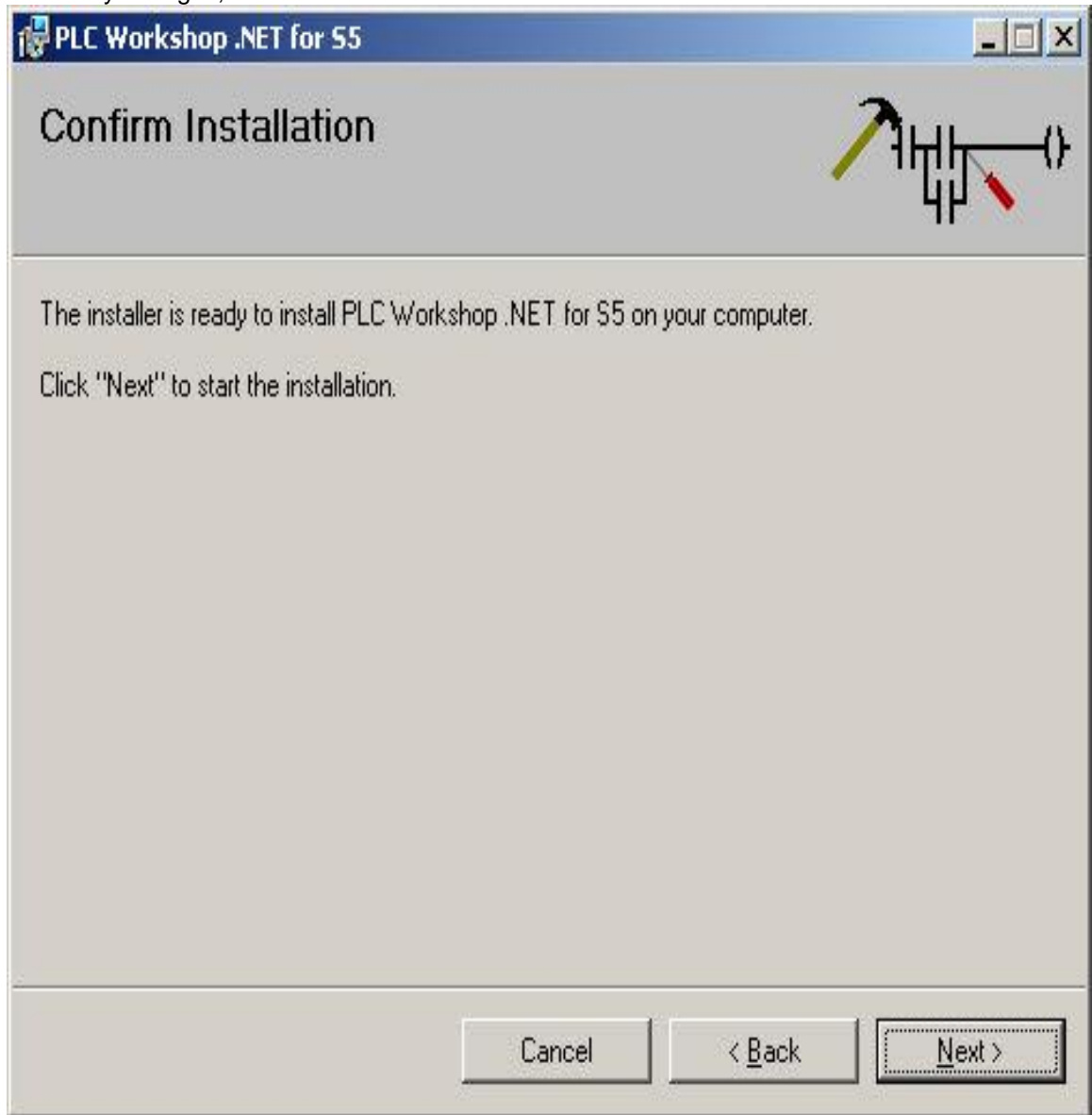


Click the **Browse** button to select another **Folder**.

To locate a drive with enough disk space, click the **Disk Cost** button.

To install WorkShop for any user on the computer, select the **Everyone** option button. To install WorkShop so it can only be used by the currently logged in user, select the **Just me** option button.

8. To confirm that all the options you have selected are correct, click the **Next** button. To make any changes, click the **Back** button.



Installing the FasTrak-Key

What is the FasTrak-Key?

Connecting the FasTrak-Key

What is the FasTrak-Key?

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

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

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

Connecting the FasTrak-Key

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

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

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

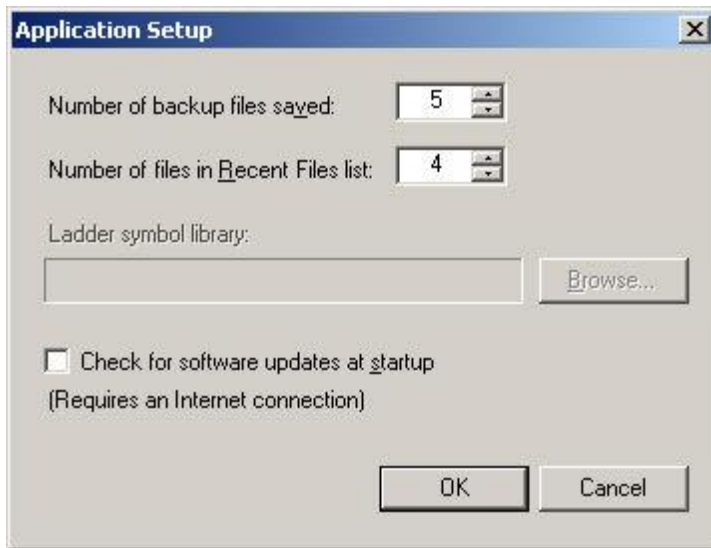
Connect the Communications Cable

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.

Application Setup

Use the Application Setup dialog to set several WorkShop options.



- **Number of backup files to be saved** - When you save the program you are working on, WorkShop creates a backup of the previous version under the name x_BAK001.FSS, where x is the name of the program. The old x_BAK001.FSS will be renamed to x_BAK002.FSS, and so on, up to the number of backups specified here.
- **Number of files in Recent Files list** - Set the number of files to appear in the *Recent Files* list.
- **Ladder symbol library** - Use the **Browse** button to select a file containing alternative symbols to be used in displaying ladder logic. Use the **Application Setup** dialog to turn this feature on or off. This feature is not yet available.
- **Check for software updates at startup** - If this box is checked and there is an active Internet connection when you start WorkShop, WorkShop will check the FasTrak web site (www.fast-soft.com) for new versions of WorkShop, and inform you if any are available.

To access the Application Setup dialog:

Select the **Options/Application Setup** menu option.

Program Setup

Program Setup

The **Program Setup** dialog allows you to configure many features of the WorkShop display.

The dialog is divided into tabs:

- **Logic** - Configuration options for the display of logic and data blocks.
- **Data** - Configuration options for the **Data Window**. These options do not affect the display of data within logic or data blocks.
- **Documentation** - Configuration options for the **Documentation Window**.
- **Update Times** - Configure how often data is updated for the Data Window and for **Logic Status**.
- **Colors** - Configure the colors for many parts of the display.

The **Save Defaults** button allows you to save your usual configuration. Then, if you change some options for a special situation, you can use the **Use Defaults** button to restore the defaults you saved. The defaults apply to the entire dialog, not just the tab being displayed.

To access the Program Setup dialog:

Select the **Options/Program Setup** menu option.

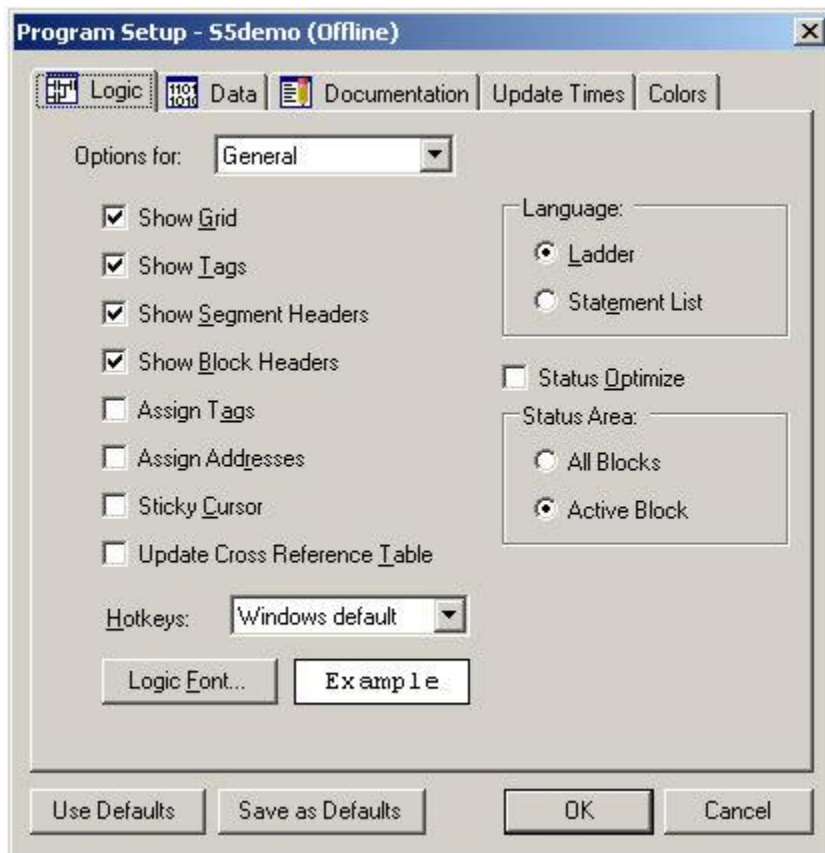
Program Setup: Logic

This tab provides configuration options for the logic and data block editors.

There are three sets of options, selected by the **Options for:** drop-down list:

- **General** - configure the logic and data block editors in general
- **Ladder** - configure the ladder options
- **Statement List** - configure the STL options





General Options



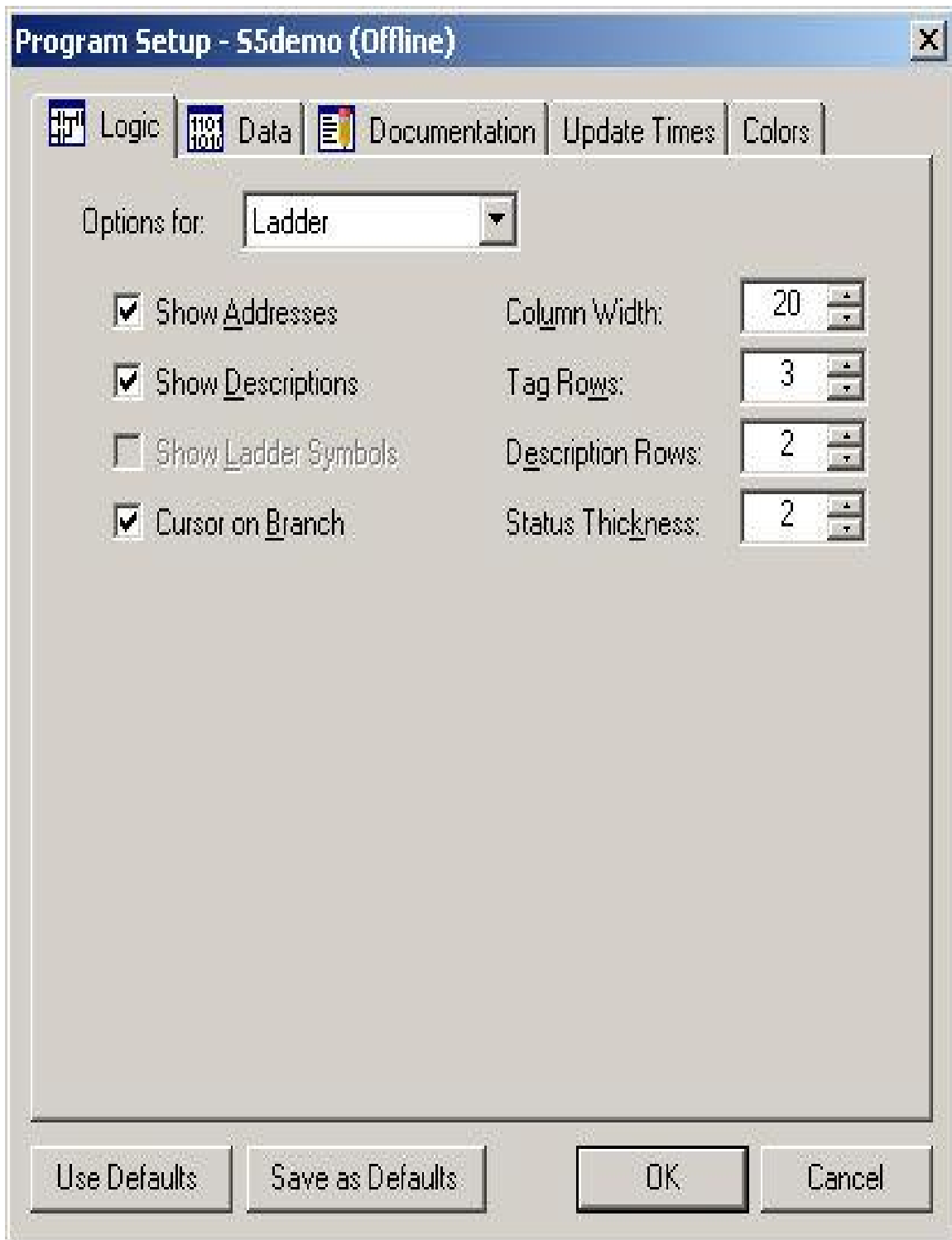
- **Show Grid** - See illustration below.
- **Show Tags** - See illustration below.
- **Show Segment Headers** - See illustration below.
- **Show Block Headers** - See illustration below.
- **Assign Tags** - When this box is checked, if the user enters an address in ladder logic, and that address does not already have a tag, the **Assign Tag** dialog is displayed for the user to enter a tag and any other address documentation.
- **Assign Addresses** - When this box is checked, if the user enters a tag in ladder logic, and that tag does not already assigned to an address, the **Assign Address** dialog is displayed for the user to enter the address.
- **Sticky Cursor** - When this box is not checked, the instruction-dropping cursors that are activated by clicking instructions in the **Toolbox** drop an instruction once and then the cursor reverts to a normal selection cursor. When this box is checked, the instruction-dropping cursors are "sticky" - they continue dropping the instruction until another cursor is selected.

- **Update Cross Reference Table** - If this box is checked, when logic is entered the cross reference table is immediately updated.
- **Language Ladder, Statement List** - To display logic as ladder when possible (not all logic can be displayed as ladder) select the **Ladder** option button. To display logic as STL , select the **Statement List** option button.
- **Status Optimize** - Check this box to optimize the *Logic Status* display.
- **Status Area: All Blocks, Active Block** - To monitor the logic status for the entire program, select the **All Blocks** option button. To monitor the logic status for only the active block, select the **Active Block** option button.
- **Logic Font** - Select the font used in the logic and data block display.

THIS IS AN EXAMPLE OF A BLOCK HEADER. IT IS SPECIFIC TO EACH BLOCK AND CAN BE UP TO 16K CHARACTERS. THE SAME HEADER IS SEEN BOTH IN THE LADDER MODE AND THE STATEMENT LIST MODE.

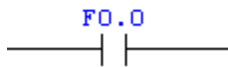
Block OB1 Segment 1  							
This is the header for segment one of OB1. It can be up 16k characters. This Segment header window can be turned on or off in the Program Setup accessed through Utilities. A header can be attached to each segment. The header will be displayed for every segment.							
This is a Symbol. F28.0 	This is a Description. Symbols can be up to 30 char F28.1	Address F28.1	Grid				
Column width							
Block OB1 Segment 2 							
This is the header for segment 2.							
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">TIMER</td> <td style="width: 50%; text-align: center;">WORD</td> </tr> <tr> <td style="text-align: center;">CLEAR</td> <td></td> </tr> </table>				TIMER	WORD	CLEAR	
TIMER	WORD						
CLEAR							

Ladder options

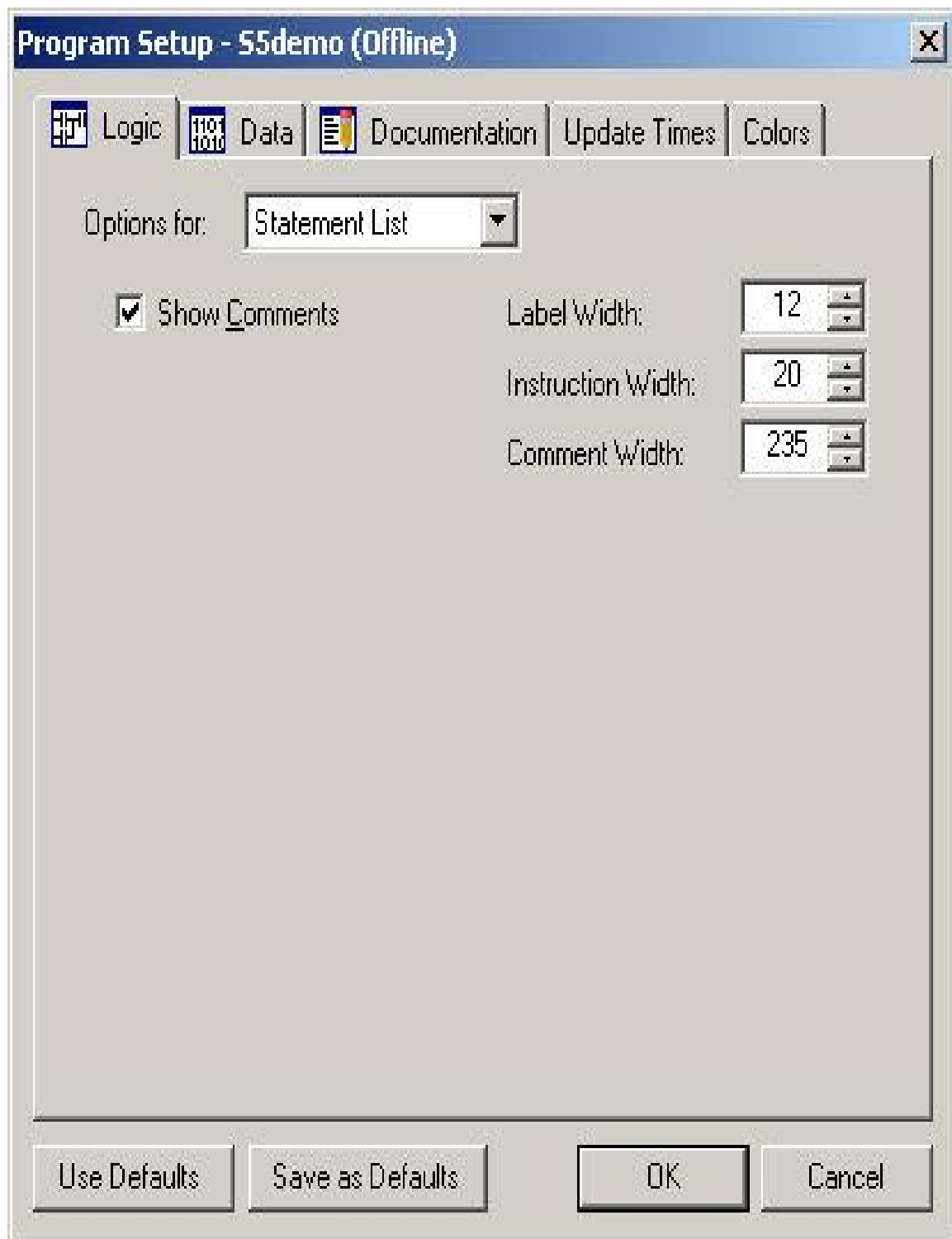


- **Show Addresses** - See illustration above.
- **Show Descriptions** - See illustration above.
- **Show Ladder Symbols** - Show alternate ladder symbols from the *Symbol Library*. This feature is not currently available.

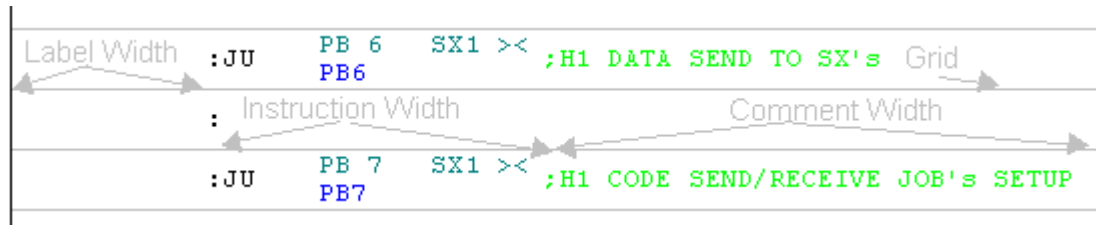
- **Cursor on Branch** - Branches in ladder logic are shown on the border between cells. When this box is checked, the cursor can be located on a branch. When it is not, the cursor can only be located inside a cell.
- **Column Width** - Set the width, in character, of columns in the ladder display. Narrower columns allow more logic to be displayed without horizontal scrolling, but may result in tags and descriptions not being displayed completely.
- **Tag Rows** - Set the number of rows to be reserved for tags. If there are not enough rows to display a tag, part of the tag will be displayed. The space is reserved in every place where there could be a tag, whether there is a tag or not.
- **Description Rows** - Set the number of rows to be reserved for descriptions. If there are not enough rows to display a description, part of the description will be displayed. The space is reserved in every place where there could be a description, whether there is a description or not.
- **Status Thickness** - Specify the width of the highlight for logic status, in pixels. In the illustration below, the width is 5. If the width is 1, the highlighted logic is the same width as the normal logic, but colored red.



Statement List

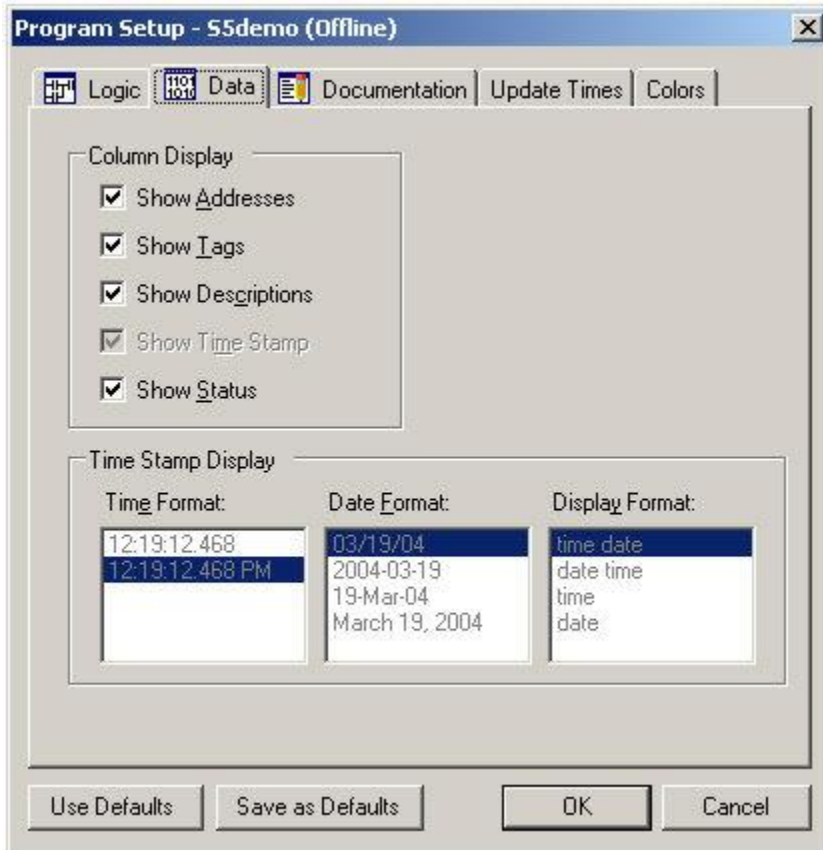


- **Show Comments** - Check this box to show address comments on the STL.
- **Label Width** - See illustration below. Enter the width in characters.
- **Instruction Width** - See illustration below. Enter the width in characters.
- **Comment Width** - See illustration below. Enter the width in characters.



Program Setup: Data

This tab provides configuration options for the **Data Window**. The options here do not affect the display of data in the logic and data block displays.

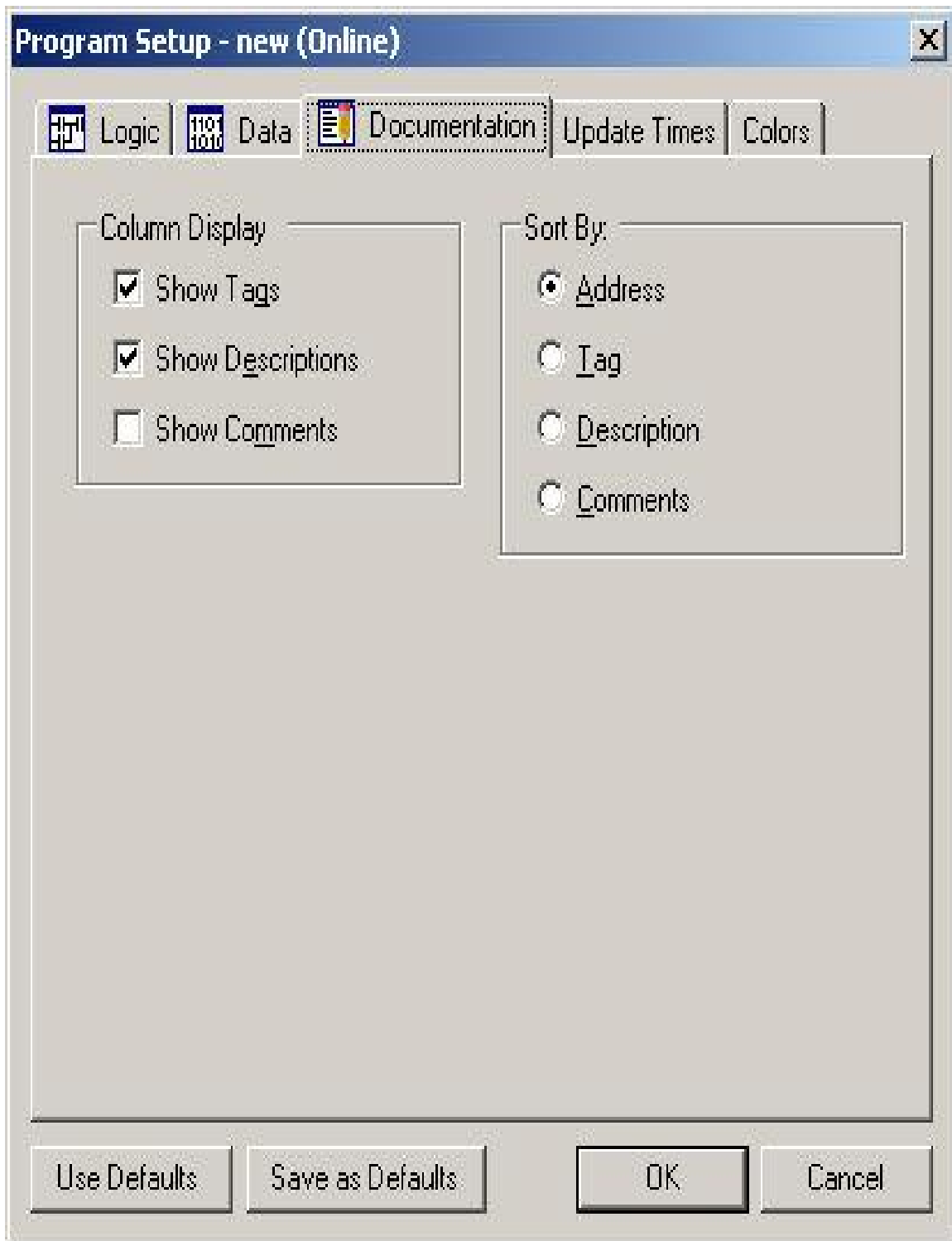


- **Show Address** - Check this box to display the address column.
- **Show Tags** - Check this box to display the tag column.
- **Show Time Stamp** - Display the time stamp, indicating when the data shown was read.. This option is not currently available - the time stamp is mandatory.
- **Show Status** - Check this box to display the status column, indicating whether the data has been successfully read.
- **Time Format** - Select the time format for the **Timestamp** column.
- **Date Format** - Select the date format for the **Timestamp** column.
- **Display Format** - Select the combination of time and date information to include in the **Timestamp** column.

	Address	Tag	Description	Value	Timestamp	Status
1	F10.1			ON D	11:19:48.277 AM	Success
2	DB2:DW2	Example Ta	Example Description	4F42 H	11:19:48.277 AM	Success
3	T2	Example Tag		000 OFF	11:19:48.277 AM	Success
4	F0.0			OFF D	11:19:48.277 AM	Success
5						
6						

Program Setup: Documentation

This tab provides configuration options for the **Documentation Window**. The options here do not affect the display of documentation in the logic and data block displays.



Column Display

These check boxed control which columns will be displayed

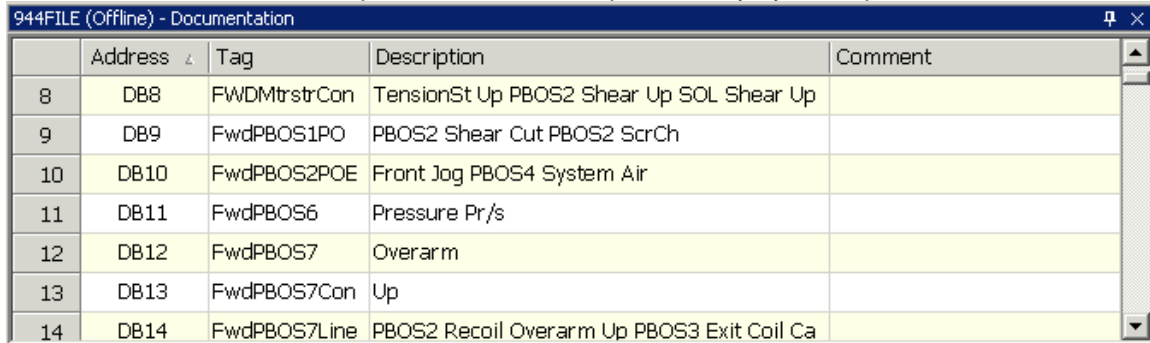
- Show Tags
- Show Descriptions
- Show Comments

Sort By

These option buttons control how the documentation list is sorted. In each case, the sort is in ascending order. It is possible, but likely to be confusing, to sort by a field that is not displayed.

You can also control the sort order by clicking on the column headers. Clicking on the column headers allows you to sort in ascending or descending order.

- **Address** - Select this option button to sort by address. This sort is logical, not alphabetic. In other words, DB1 is followed by DB2, not DB10.
- **Tag** - Select this option button to sort alphabetically by tag. This is an alphabetic sort, so X1 is followed by X10, not X2.
- **Description** - Select this option button to sort alphabetically by description.
- **Comments** - Select this option button to sort alphabetically by description comment.



	Address	Tag	Description	Comment
8	DB8	FwdMtrstrCon	TensionSt Up PBOS2 Shear Up SOL Shear Up	
9	DB9	FwdPBOS1PO	PBOS2 Shear Cut PBOS2 ScrCh	
10	DB10	FwdPBOS2POE	Front Jog PBOS4 System Air	
11	DB11	FwdPBOS6	Pressure Pr/s	
12	DB12	FwdPBOS7	Overarm	
13	DB13	FwdPBOS7Con	Up	
14	DB14	FwdPBOS7Line	PBOS2 Recoil Overarm Up PBOS3 Exit Coil Ca	

Program Setup: Update Times

This tab controls how often data will be read for display purposes.

The screenshot shows a dialog box titled "Program Setup - 944FILE (Offline)" with a close button (X) in the top right corner. The dialog has a tabbed interface with five tabs: "Logic", "Data", "Documentation", "Update Times" (which is selected and highlighted with a dotted border), and "Colors".

Inside the "Update Times" tab, there are two main sections:

- Online Data View Update:** This section contains a checkbox labeled "Real Time". To its right is a numeric spinner box set to "10" and a dropdown menu set to "msec".
- Online Logic Status Update:** This section also contains a checkbox labeled "Real Time". To its right is a numeric spinner box set to "10" and a dropdown menu set to "msec".

At the bottom of the dialog, there are four buttons: "Use Defaults", "Save as Defaults", "OK", and "Cancel".

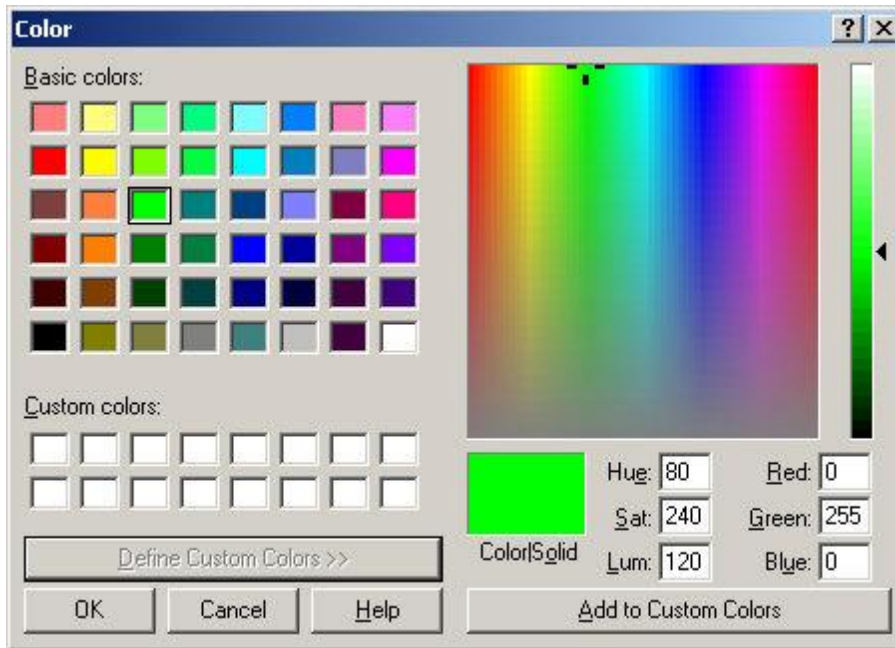
Real Time means that the data will be read as fast as possible. The number and unit fields set the highest update speed - actual update speeds may be lower due to system limitations.

Program Setup: Colors

This tab controls the colors of various display items.



To change the color of an item, either double-click the color box for that item, or select the item and click the **Change Color** button. Either way, WorkShop displays a standard color selection dialog.



Security

Security Type Selection

Use the **Security Type Selection** dialog to select and configure a security system to protect your system from unauthorized use of WorkShop functions.



- **Enable Password Security** - Check this box to enable a security system.
- **FasTrak Authentication** - Check this option button to use the *FasTrak authentication* system.
- **NT Authentication** - Check this option button to use the *NT Authentication* system.
- **Configure** - Click this button to configure the selected security system

To access the Security Type Selection **dialog:**

Select the **Options/Security/Administrator Options/Select** menu item.

FasTrak Authentication Security Configuration

The Authentication Security Dialog is accessible from the Security Type Selection screen (please see that section of the manual). The dialog is seen below.



Figure 14.2

In addition to controlling user access, this security mode also can record each attempt made by a user to the parts displayed above. To enable this, click on the "Enable Security Log" check box.

Note: If, when exiting this dialog with the check box checked but having not setup the security log, PLC WorkShop will warn the user that no log file had been configured and the check box selection will not be retained.

To learn more about setting up the FasTrak Authentication Log, please refer to this chapter or [click here](#).

NT Authentication Security Server

FasTrak NT Authentication Server- An Overview

The FasTrak NT Authentication Security uses Windows NT security. NT Security is a feature that is part of the Windows NT Operating System and is also found in Windows 2000 and XP. The server must therefore be installed on a machine running Microsoft Windows NT (3.1 or later), Windows 2000, or Windows XP. The following hardware requirements are recommended.

- 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.

Both the FasTrak Security Server (FTSecSvr.exe) and the FasTrak Security Configurator (FTSecCfg.exe) must be installed and configured prior to activating and utilizing these features.

The Security Server Application (FTSecSvr.EXE) handles all client requests to access secured FasTrak features. The server grants or denies access to a feature request depending on the configuration provided by FTSecCfg. When security is enabled for FasTrak applications, all secure features are inaccessible unless security is configured via FTSecCfg and the security server is running. All NT auditing including security and application audits are handled by the server. Security audits are configured in FTSecCfg and application audits are configured in the FasTrak applications that support security.

The following breakdown of steps will aid the user as they go through the installation, configuration, and use of these parts as found in this help manual. They are:

1. Installation- The procedure for installing both the Security Server and Configurator on local and remote machines (the Sever must be installed regardless of operating system and whether it is ran locally or remotely)
2. WorkGroups and Domains- Details to how both relate to NT Security
3. Configuring Users and Groups- Procedures for adding and setting up groups for the variety of supported Operating Systems
4. Configuring User's Rights and Audit Policy- Instructions for configuring specific user rights and audit policy on the machine to which the server will be running from
5. DCOM (Distributed Component Object Module) Configuration- Instructions for configuring DCOM on the available variety of Operating Systems and how to setup the Security Administrator
6. Security Configuration- Specific instructions for how to setup, configure and launch the Security Configurator. Also, instructions for configuring the users, groups and auditing features as well as the Event Viewer, used to view generated logs.

Installing the Security Server

If the FasTrak client applications are installed on a machine other than the one FTSecSvr is running on (remote security), users may want to install FTSecCfg on the client machine(s) as well as the server machine so that the server can be configured locally or from the client machine.

FasTrak security must be installed on a machine running Windows NT (3.1 or later), 2000 or XP. Two applications get installed to a user-selected directory on the local machine. These files are FTSecCfg.exe and FTSecSvr.exe. If running Windows XP, FTSecSvr.exe can only be installed on the Professional version, not on the Home version. Regardless of what Operating System the user has, they still must install the server (FTSecSvr.exe) locally on the client machine as well as on the remote machine. This is true even if the client machine is a non-NT type machine. By default, all "checkable" items get installed including FTSecSvr.exe (under NT Security\Server) and FTSecCfg.exe (under NT Security\Configurator). If installing to Win9x or Me, NT Security\Configurator is not listed and therefore FTSecCfg.exe does not get installed.

Installing to a Local Machine

If the user wishes to install the Security Server locally, this may be achieved by installing from off of CD or from a self-extracting executable file available from FasTrak's web site (<http://www.fast-soft.com>).

A CD installation requires only that all items for security be checked during the InstallShield process. If a client software application has been previously installed, and it supports NT Security, then re-inserting the installation CD or running the self-extracting executable and un-checking the client during the InstallShield process is all that is required.

Installing to a Remote Machine

Installation begins with the installation of the client (ie. PLC WorkShop) to a local, or client, machine. In this case, installing the Security Configurator is an option.

After this installation is complete, the user must install to the machine which will act as the remote server. Installation is identical to the above with the exception that the client need not be installed and therefore may be unchecked from InstallShield. It is recommended that both the Security Server (FTSecSrv) and Configurator (FTSecCfg) be installed.

If a client software application is already installed to the machine which the user wishes to run as the remote security server, installation of security is identical to installing to a local machine, in the above section.

Installation Dialogs

The following two dialogs are examples of what a user should expect to see during installation. Below is the dialog whereby the user selects to install the client application, security, or both.

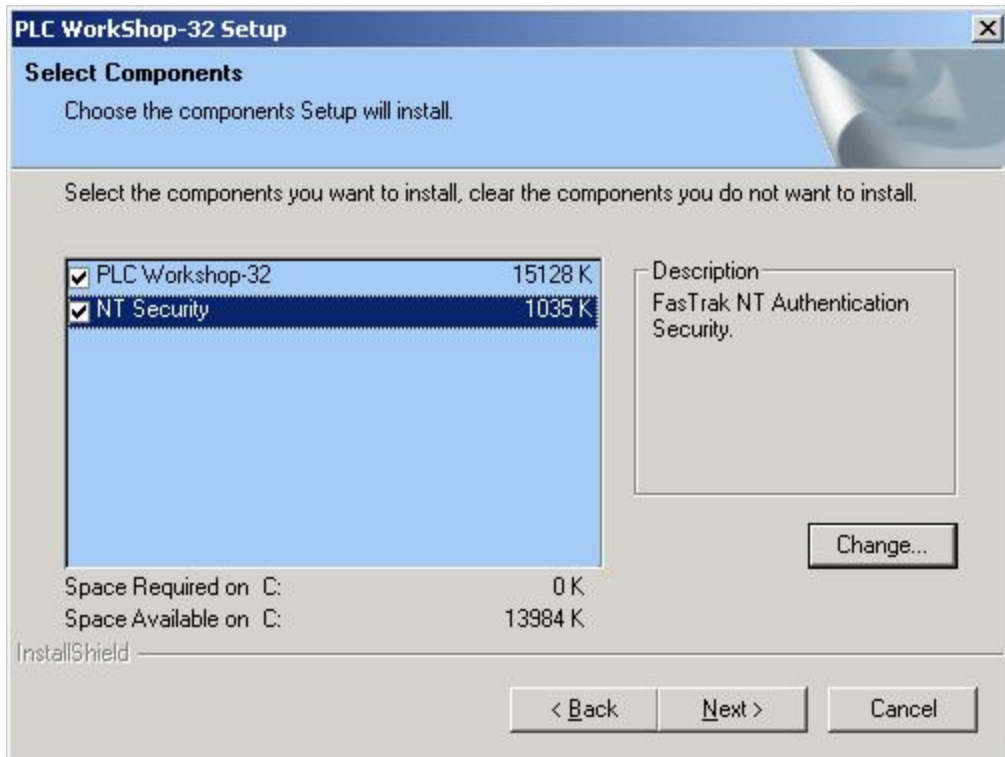


Figure 1.1a

To add or remove which component of security the user wishes, click on the "Change..." button from the dialog above while selecting "NT Security". The next dialog will then open.

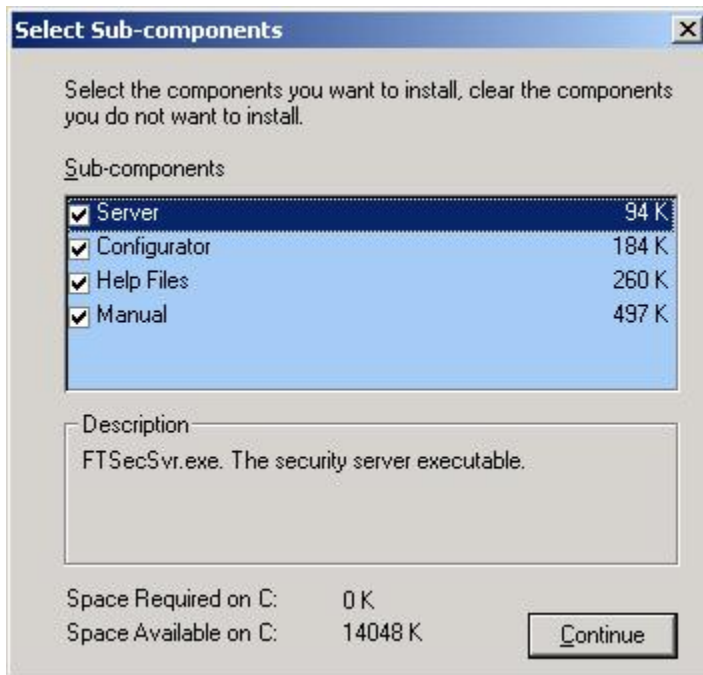


Figure 1.1b

These are the only two dialogs that will be needed during the installation process.

Workgroups and Domains

Workgroups

NT security works slightly different in workgroups than in domains. This difference is only a factor when using the security server remotely. When a computer is part of a Workgroup and a user enters their user name and password to log onto the operating system, the user name they logged in as, the rights they have, and groups they belong to are known only to the local computer.

When a local computer (running a client application such as PLCWorkMod) connects to a remote computer running the security server, it tries to log on to the remote computer with the same user name and password. If the exact user name and password cannot be found on the remote computer, the client (local computer) gets logged onto the remote computer as "Guest". For this reason, a guest user normally has minimal rights. This account is disabled by default. If a guest account is enabled, anyone can log on to the computer because a password is not required for this account. In general, when using workgroups, all users that need to get security clearance from FasTrak's security server must exist on the server machine. The rights a user has on the local machine may differ than the rights they have on a remote machine. Similarly, the groups a user belongs to on the local machine may differ than the groups they belong to on a remote machine.

Domains

When a computer is part of a Domain and a user logs onto any computer that's a member of the domain, the user name and password they supply is stored on the domain controller vs. the local machine. There is no "re-logging" when connecting to a remote machine on a domain. The rights a user has and the groups they belong to are the same amongst all the machines on the domain. This eliminates the need to declare users twice. Once on the local machine and once on the remote machine. When setting up a server on a domain, its important to choose the domain controller machine because this machine holds all the domain users and groups.

Adding Users and Groups to the Operating System

Configuring users and groups differ depending on the operating system you are on. Because NT Security is based on Users and Groups, the following must be done.

Adding Users for Windows 95, 98, and ME

In Windows 9x and Me, users may logon to the system to get their unique user profile, but they do not have any rights since the OS is unprotected and they do not belong to any groups. A user can be created simply by entering a unique user name and password when logging on to the OS. A user may skip the login procedure altogether, in which case they become the "Guest" user.

Adding Users for Windows NT

In Windows NT users and groups can be created by entering Administrative Tools from Control Panel and selecting User Manager. This is shown in the figure below.

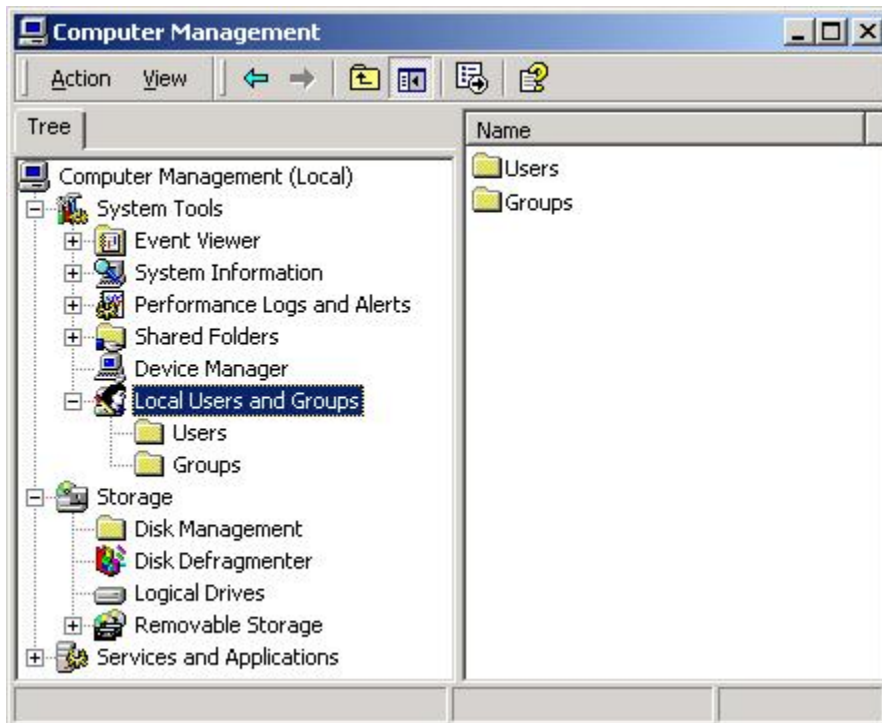


Figure 1.1c

Adding Users for Windows 2000 and XP

In Windows 2000 and XP users and groups can be created by entering Administrative Tools from Control Panel and selecting Computer Management. Within the Computer Management application, users and groups can be created by right clicking on the corresponding folders under the "Local Users and Groups" tree item. This is shown in the figure below.

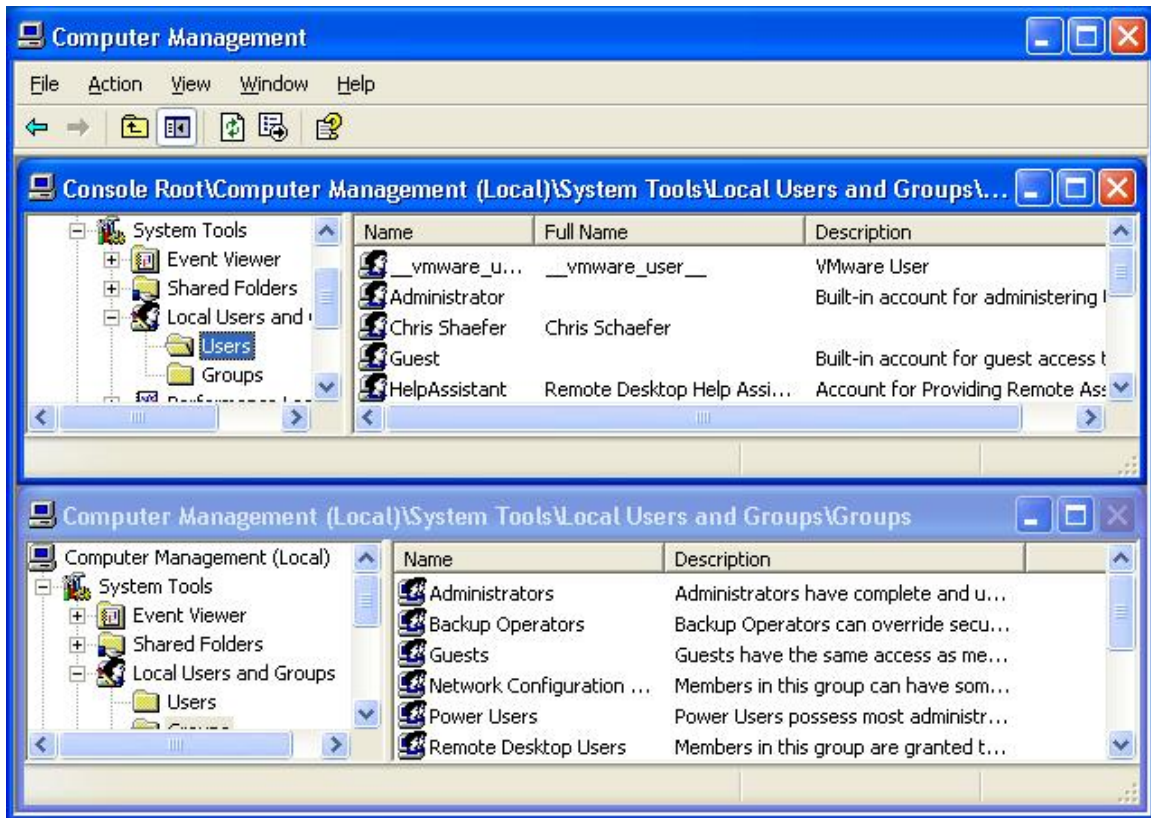


Figure 1.1d

Adding Users and Groups on a Domain Controller

If on a domain controller, select "Active Directory Users and Computers" from the Administrative Tools menu. From the tree control, right click on the "Users" folder to add users and/or groups.

Configuring User Rights and Audit Policy

Correctly configuring specific user rights and audit policy on the server machine is essential for proper security and for the server to operate correctly. The following user rights need to be configured:

- Access this computer from the network - Enter all users/groups that will need to access this computer from the network. These users will represent the server's clients that need to request security clearance.
- Deny access to this computer from the network - Make sure that any user/groups that are listed in the above right are not listed here.
- Generate security audits - A user with administrative rights should be added here. This should be the same user that the server is launched under. See DCOM in the *Centralized Security Server- Server Configuration* of this manual. This right should be configured even if security audits are not used. This Administrator will be referenced later in this manual, in the section dealing with DCOM.
- Manage auditing and security log - A user with administrative rights should be added here. This should be the same user that the server is launched under. See DCOM in the *Centralized Security Server- Server Configuration* portion of this manual. This right should be configured even if the logs are not used. Note: this is the same Administrator as mentioned in the above point.

Configuration location differs depending on the operating system your on. In Windows NT enter the User Manager and choose User Rights from the Policies menu. If interested in generating security audits, select the Audit option from the Policies drop-down menu in the User Manager. From this dialog, check the Success and Failure buttons next to "File and Object Access".

In Windows 2000 and XP, users rights can be modified under Administrative Tools under Local Security Policy. While on a domain controller, users rights may be modified under Administrative Tools which is under Domain Controller Security Policy. From either application, right click on the User Rights Assignment to list all user rights.

To enable security audits, click on Audit Policy from within Local Security Policy under Local Policies. Double click on the Audit Object Access policy and check both Success and Failure boxes. The computer's operating system must have the latest service pack installed as this fixes auditing problems with earlier releases.

The following table may assist a user in determining what rights must be given to a user on the machines involved in FasTrak's NT Authentication Security.

Remote Server Machine	Local Server Machine	Client Machine
-----------------------	----------------------	----------------

Access this computer from the network	Generate Security Audits	N/A
Generate Security Audits	Manage auditing and security log	
Manage auditing and security log		

Note: It is mandatory that you reboot the machine for the new user rights to take effect.

Configuring DCOM for NT Authentication Security

The machine that the user wishes to run FTSecSvr (FasTrak Security Server) on must be configured for proper server/client communication. Below are the needed steps for configuring the server.

Configuring DCOM on Windows 9x, 2000, and NT

DCOM enables FasTrak clients, such as PLC WorkShop to communicate with remote security servers. The dialog window, shown below, is launched by running **dcomcnfg.exe** from a DOS prompt or by clicking on the Windows Start button followed by clicking Run. Changes made in DCOM are applied immediately and there is no need to reboot the PC.

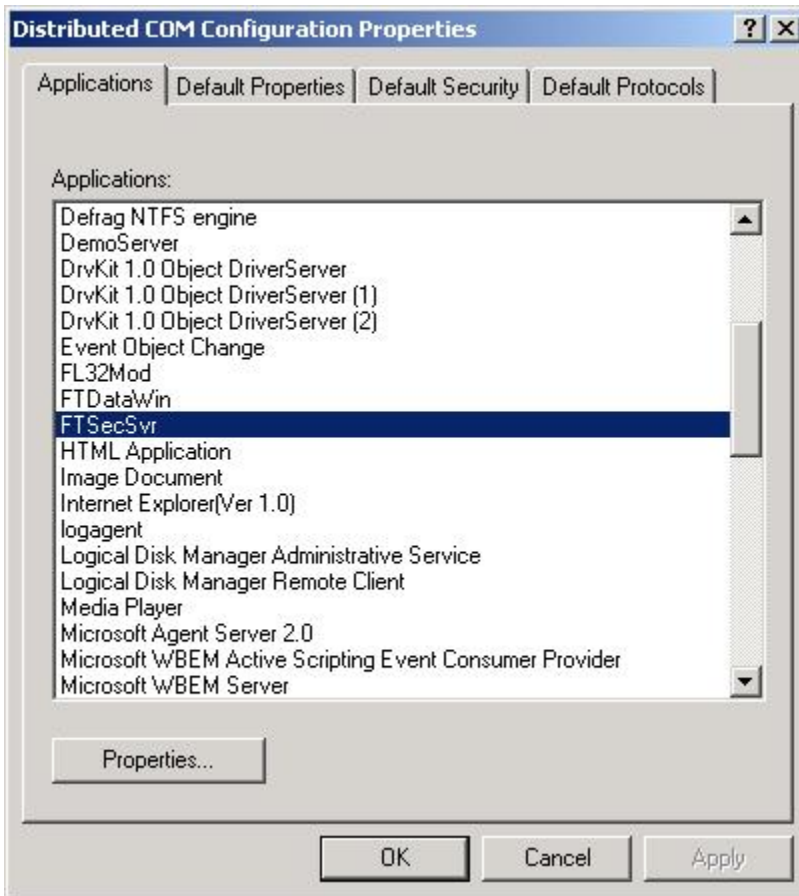


Figure 1.1e

Instructions for Configuration

1. In the Applications list box, scroll down and select FTSecSvr. If this item is missing, it was not properly installed; refer to earlier sections in this manual.
2. Select the Properties button. (See Figure 1.1e)
3. The Properties dialog window opens. Click the Security tab. (Figure 1.1f)

4. Under Security, choose the Administrator (from section "Configuring User Rights and Audit Policy) who will have access permission. The following affects both the areas of Access and Launch. For Custom security for Launch and Access Permissions, follow these steps.
 - a. While in the Properties dialog, with the Security tab being active, click on Edit.
 - b. Click Add and choose the Administrator.
5. Choose the Identity tab and click the "this user" radio button. (See Figure 1.1k below)
6. Browse and select the Administrator. Click OK to return to the main dialog.
7. Finally, click the Default Properties tab and choose "connect" for Default Authentication and "impersonate" for Default Impersonation. (See Figure 1.1l below)
8. If the server is on a remote machine, then for the client, step 7 from above needs only be repeated.

Configuring DCOM for Windows XP

Configuring DCOM under Windows XP begins with launching the application, **dcomcnfg.exe**, from a DOS prompt or the Run dialog, just as in the previous instructions. The following dialog launches.

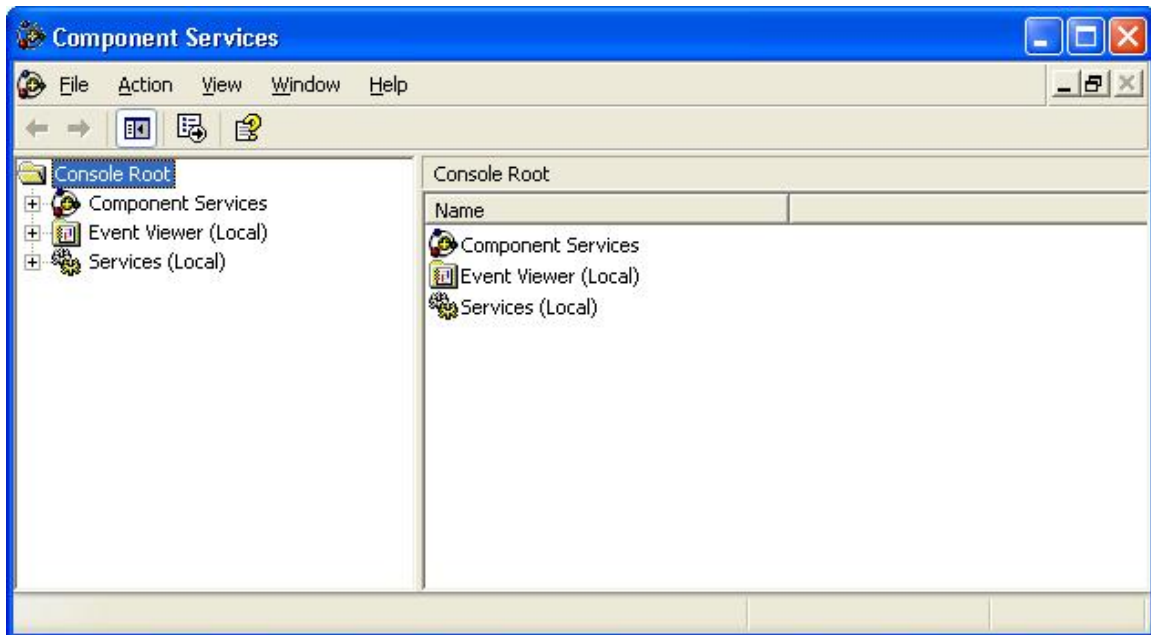


Figure 1.1f

Using the tree structure in the left-most pane, expand the selection of Component services to Computer and then to My Computer, as shown in the dialog window below.

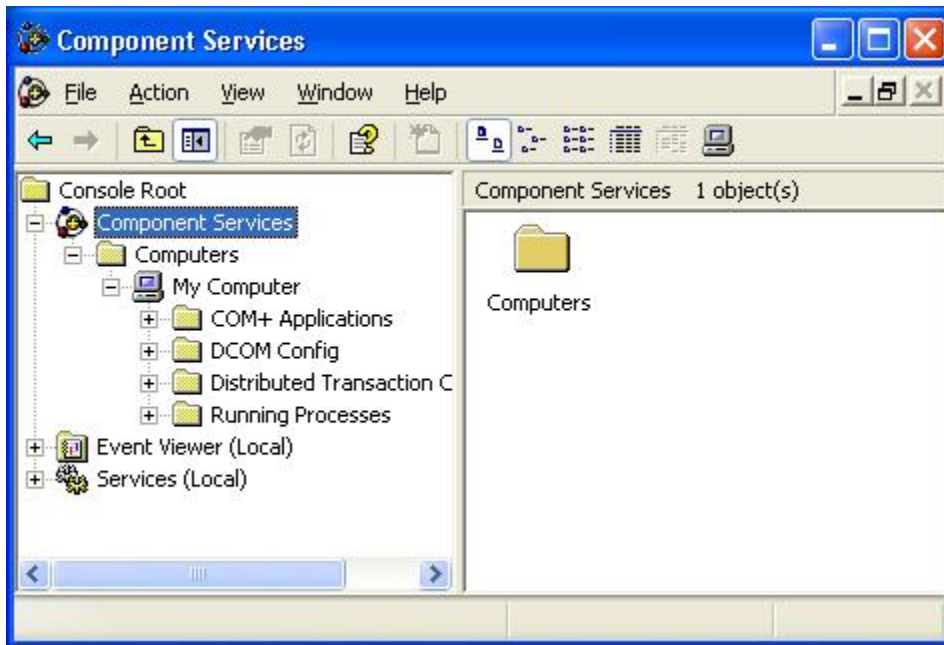


Figure 1.1g

Right-click on My Computer and Select "Properties." In the Default Properties tab, select the default authentication and impersonation levels. This dialog resembles the dcomcnfg interface of Windows NT and 2000, from earlier above.

To set the security and identity properties for FTSecSvr, select DCOM Config under My Computer in the above dialog. The available registered COM applications will be displayed. Scroll and select FTSecSvr.

Open its properties by right-clicking on it. The dialog is shown below.

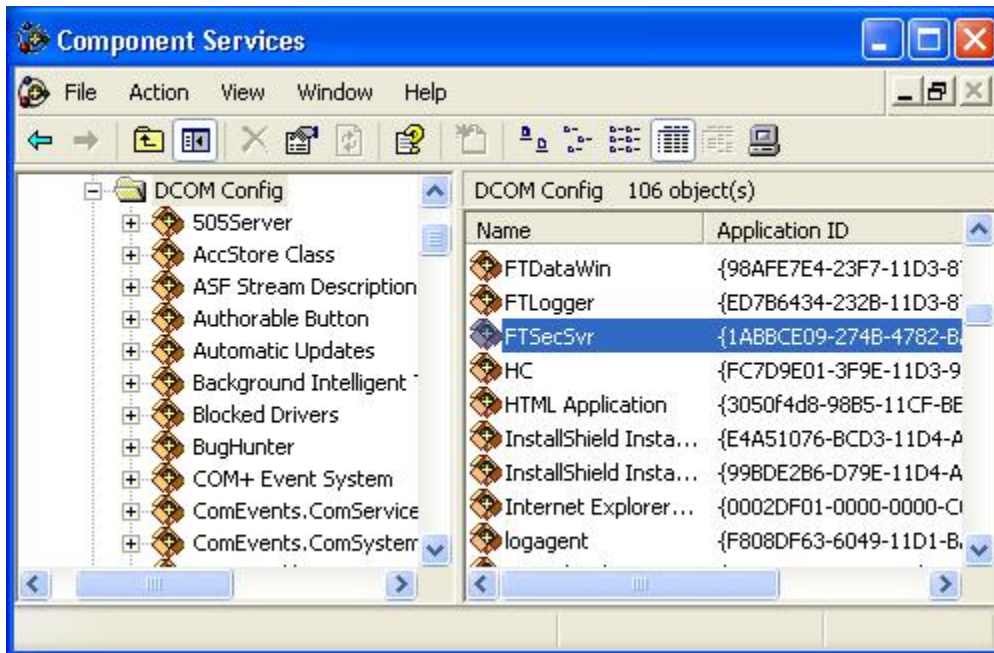


Figure 1.1h

The dialog that opens is identical to the one earlier in this chapter.

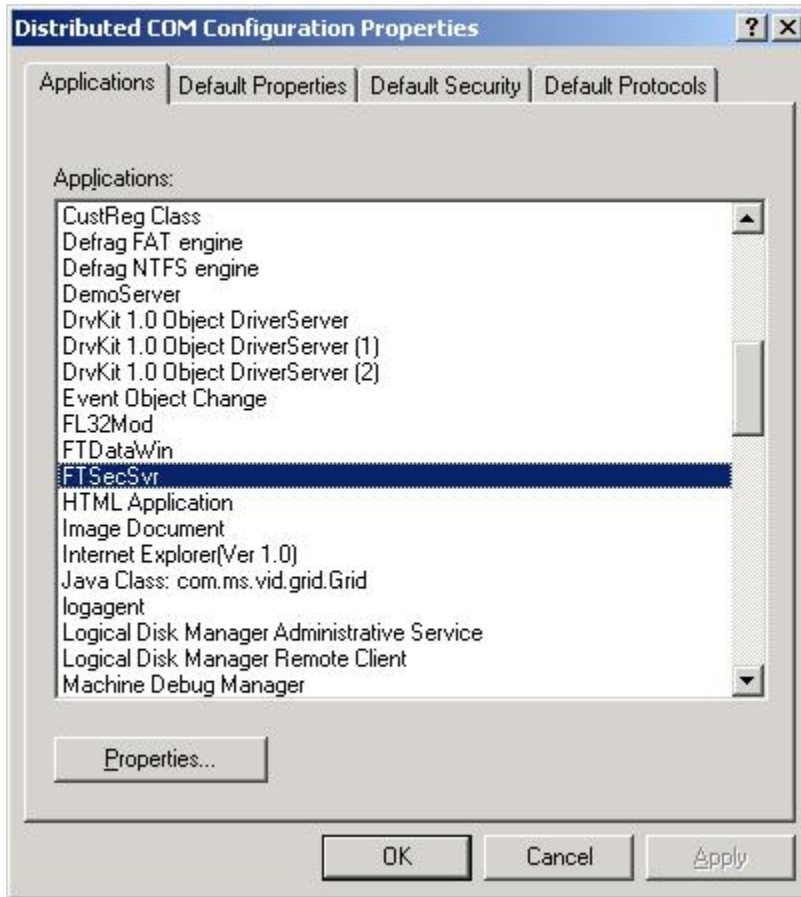


Figure 1.1i

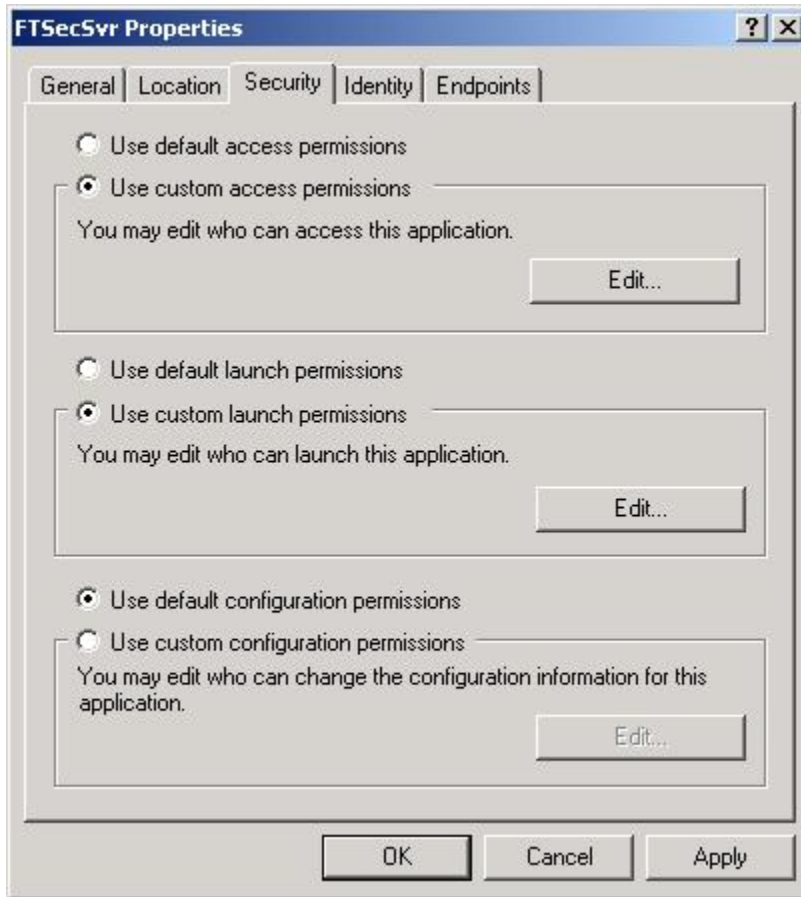


Figure 1.1j

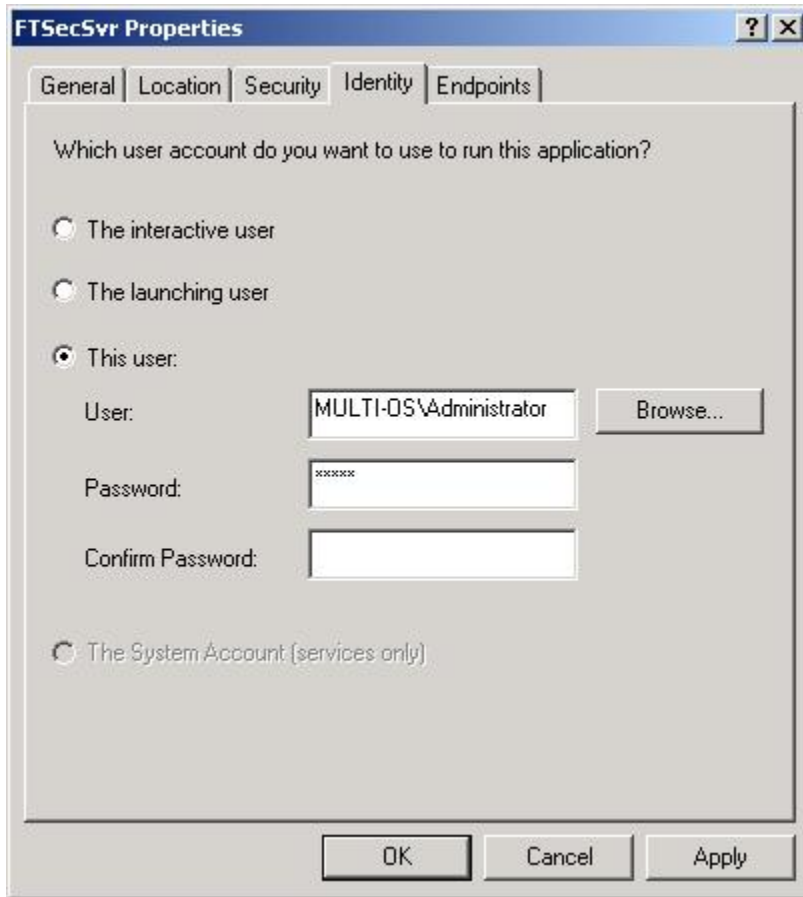


Figure 1.1k

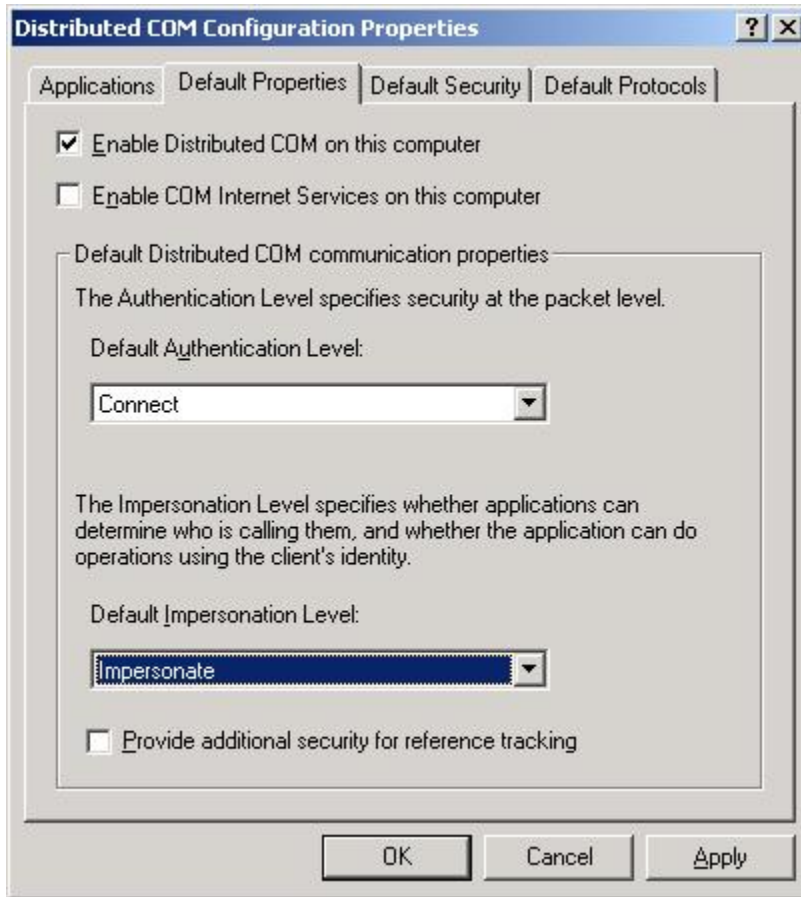


Figure 1.11

Security Configurator

Security Configurator

The Security Configuration Application (FTSecCfg.EXE) allows users with administrator rights to configure their centralized server based security. This .EXE will reside on the same machine and directory as the server. Users will also be able to install FTSecCfg on client machines running Windows NT (3.1 or later)/2000/XP so that they can configure their security server remotely. The following features are supported.

- a. Ability to configure which users and or groups have access to various FasTrak features. This includes users and groups from the machine running the server. Separate secure features will exist for individual FasTrak applications including programming packages as well as Controlshop applications.
- b. Security Auditing can be configured for each specific feature on an individual or group basis. Audit information will be logged to the "Event Viewer" in the "Security Log" section.
- c. A link to the Event Viewer will be provided allowing quick access to the Security Log. The event viewer can also be accessed under "Administrative Tools" in Control Panel.

Launching the Security Configurator

The Configuration Application may be launched from either the Start menu in Windows or from within the FasTrak client should it be installed.

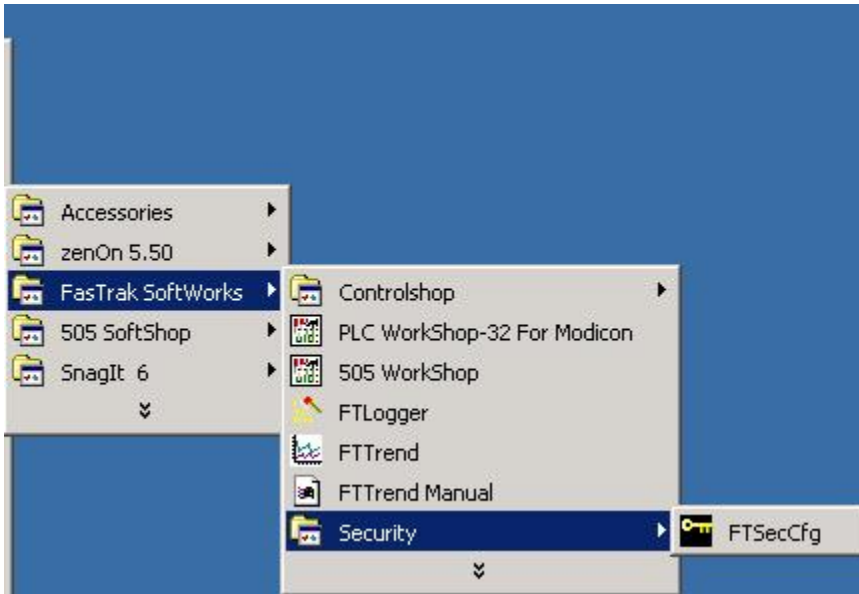


Figure 1.2a

The Security Configurator application will launch and (if the user is not in the client), at the same time, the Security Server Location dialog may open. Both are shown below.

When launched from the Start menu, the Security Server Location dialog will prompt the user to select the machine that the server will run on.



Figure 1.2b

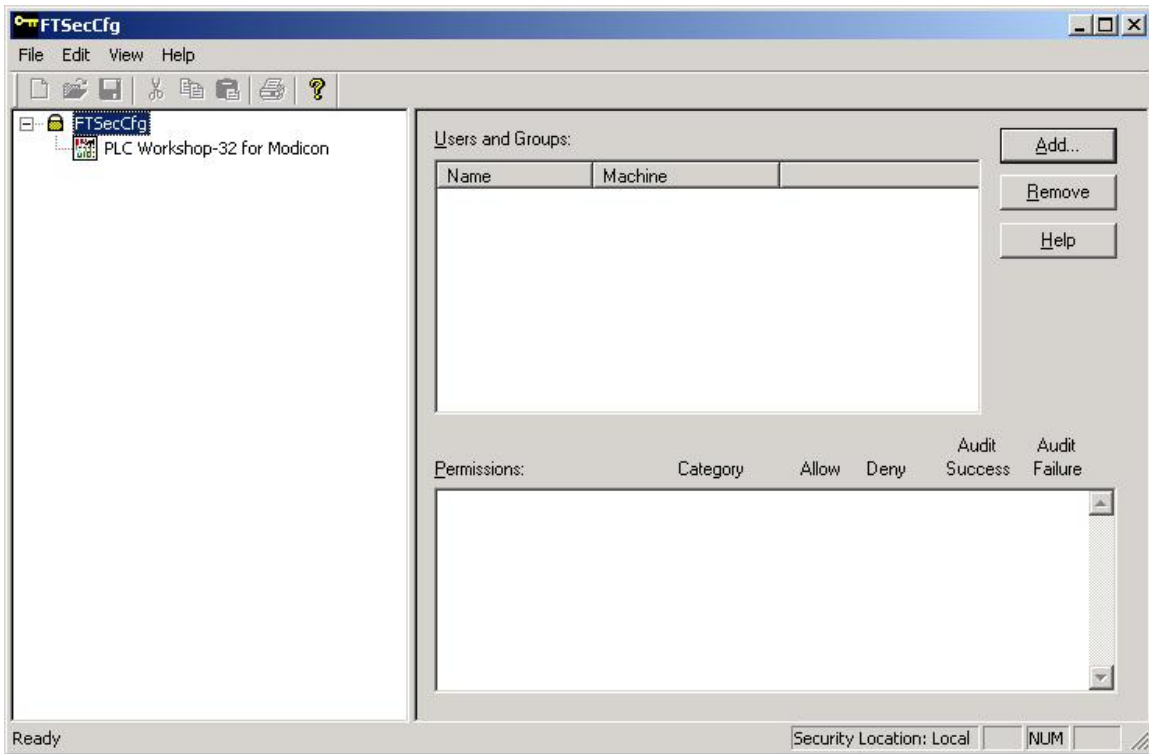


Figure 1.2c

Configuring Users, Groups, and Security Audit

After having configured security and chosen a server location, individuals Users, Groups of Users, and permissions may be set from within the FTSecCfg utility. The dialog below will be referenced in this manual with regards to these features.

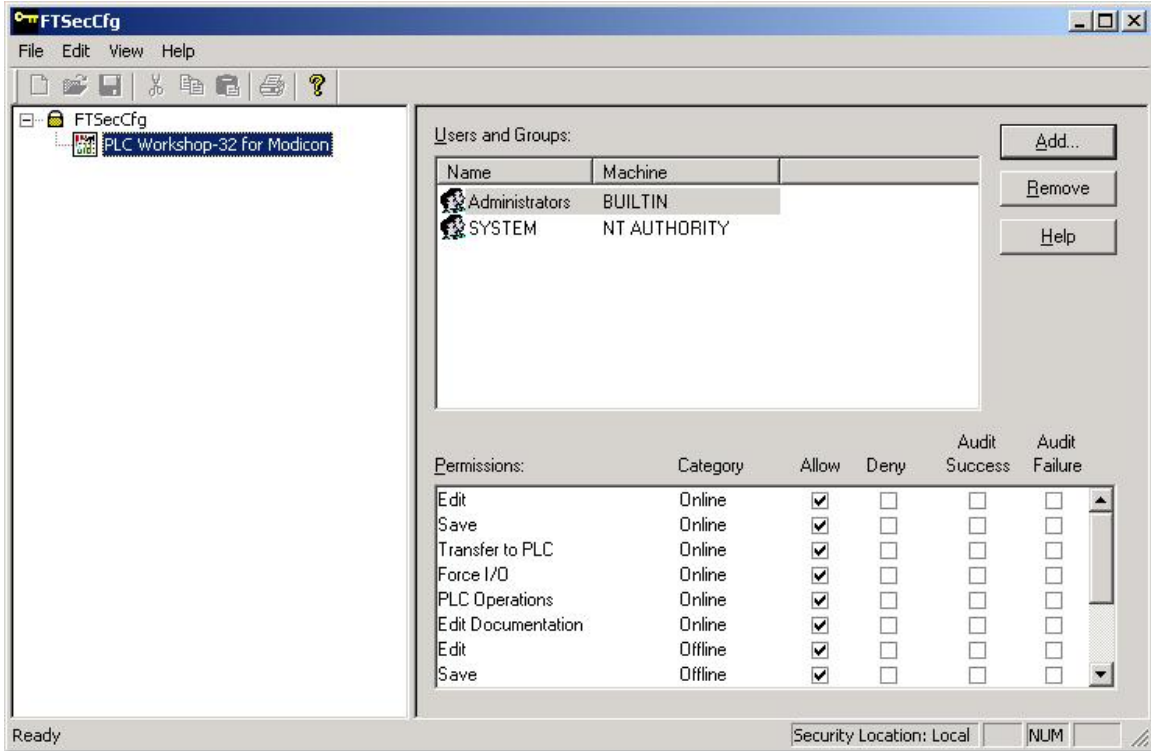


Figure 1.2d

The selected server machine appears in the status bar in the lower right portion of the application window.

In the tree control on the left-most pane, pick "PLC Workshop-32 for Modicon". In the "Users and Groups" list box, two names (System and either the administrators group or the current user) will exist by default with access to all features.

Adding and Removing Users and Groups

To Add or Remove individual Users or Groups, use the buttons on the far right of this dialog.

Add additional users and/or groups by selecting the "Add..." button. Remove users or groups by highlighting the name and selecting the "Remove" button.

Users and groups that are not displayed in the list box are automatically denied access to all features.

The list box is sorted with groups listed first followed by users. A group is identified with the two person icon to the left while the user is identified with the one person icon. A combination of around 16 users and groups can be configured for an application.

Setting Permissions

The lower list box in the right pane reflects the access rights and audits for individual permissions based on the highlighted name in the "Users and Groups" list box. When the "Allow" box is checked the user or group will be given access by the server when requested from the client (PLCWorkMod for example). When the "Deny" box is checked the user or group will be denied access by the server when requested from the client.

In cases where a user has conflicting rights on a permission, the denied permission will always take precedence and the user will not be able to access the feature. one such example would be a user is allowed access to a specific permission but a group they belong to is denied access to the same permission. If neither box is checked, the user will not be granted access to the feature unless one of the groups they belong to has access to the feature

Security Audits

Security audits for individual features can be performed on user and groups by selecting the "Audit Success" and/or "Audit Failure" boxes. These audits will appear in the security log on the server machine and can be accessed using Microsoft's Event Viewer. See the topic entitled "Event Viewer" or click [here](#) for more details on the Event Viewer. A "Success" audit will appear in the security log when a user is given access to a secure feature and the "Audit Success" box is checked for that feature. A "Failure" audit will appear in the security log when a user is denied access to a secure feature and the "Audit Failure" box is checked for that feature.

All security changes in FTSecCfg are accumulated and do not get committed to the server until confirmation upon exit of FTSecCfg.

Event Viewer

The Event viewer is a Windows application for displaying application, security, and system logs. FasTrak uses and writes to this log to hold audits. It is launched from within the Security Configurator. To launch the Event Viewer, click on View, Event Viewer as shown in the figure below. The Event Viewer is also accessible from the Administrative Tools of Window's Control Panel.

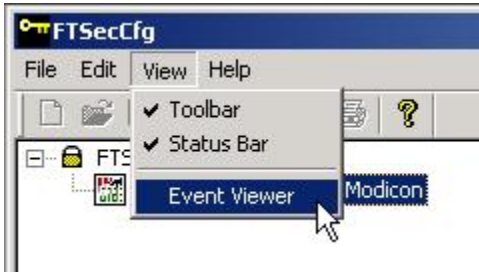


Figure 1.2e

The following window opens. Double-clicking an entry in the right-most pane above will display more information for the item.

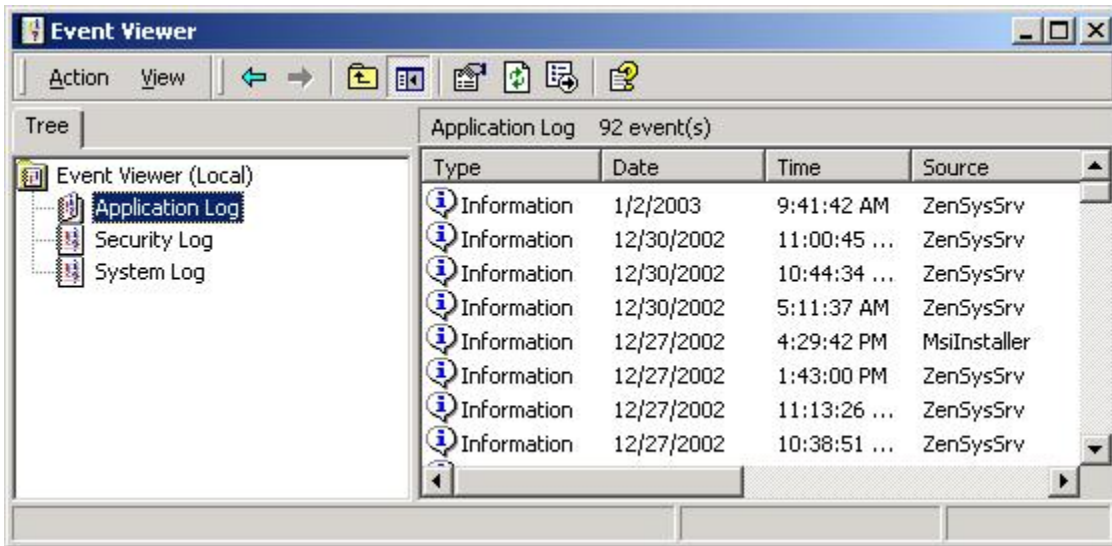


Figure 1.2f

From this application, the user may view the Security log. If running the Security Configurator from a different machine than the security server (FTSecSvr), then the security server's machine name must be specified in the event viewer to view the security log entries referring to FasTrak security. This can be accomplished by highlighting the "Event Viewer" in the tree control and then picking the "Action" menu. This is in the figure below.

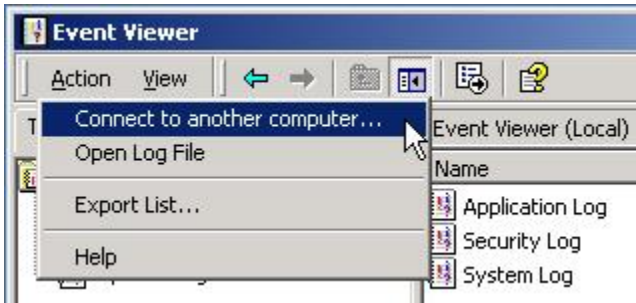


Figure 1.2g

Selecting "Connect to another computer..." launches the following window.

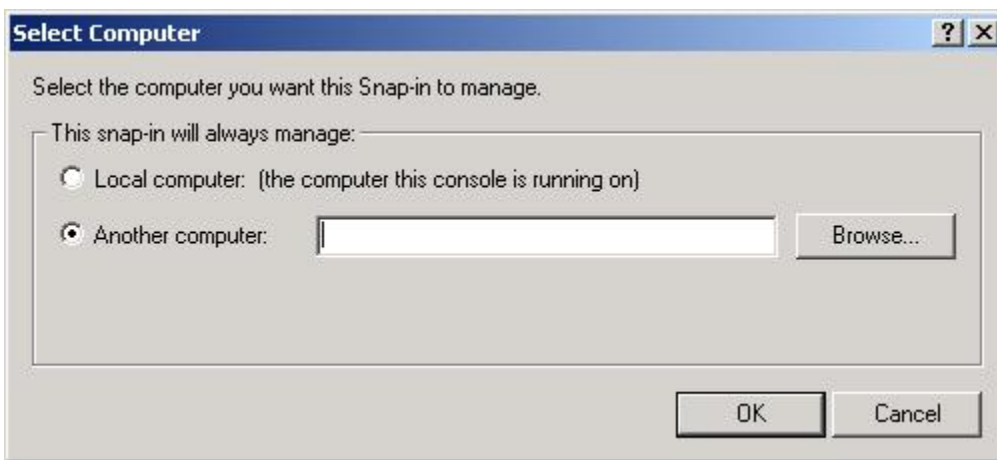


Figure 1.2h

Use the Browse button for searching for and selecting another computer. Once chosen, click OK to accept the selection.

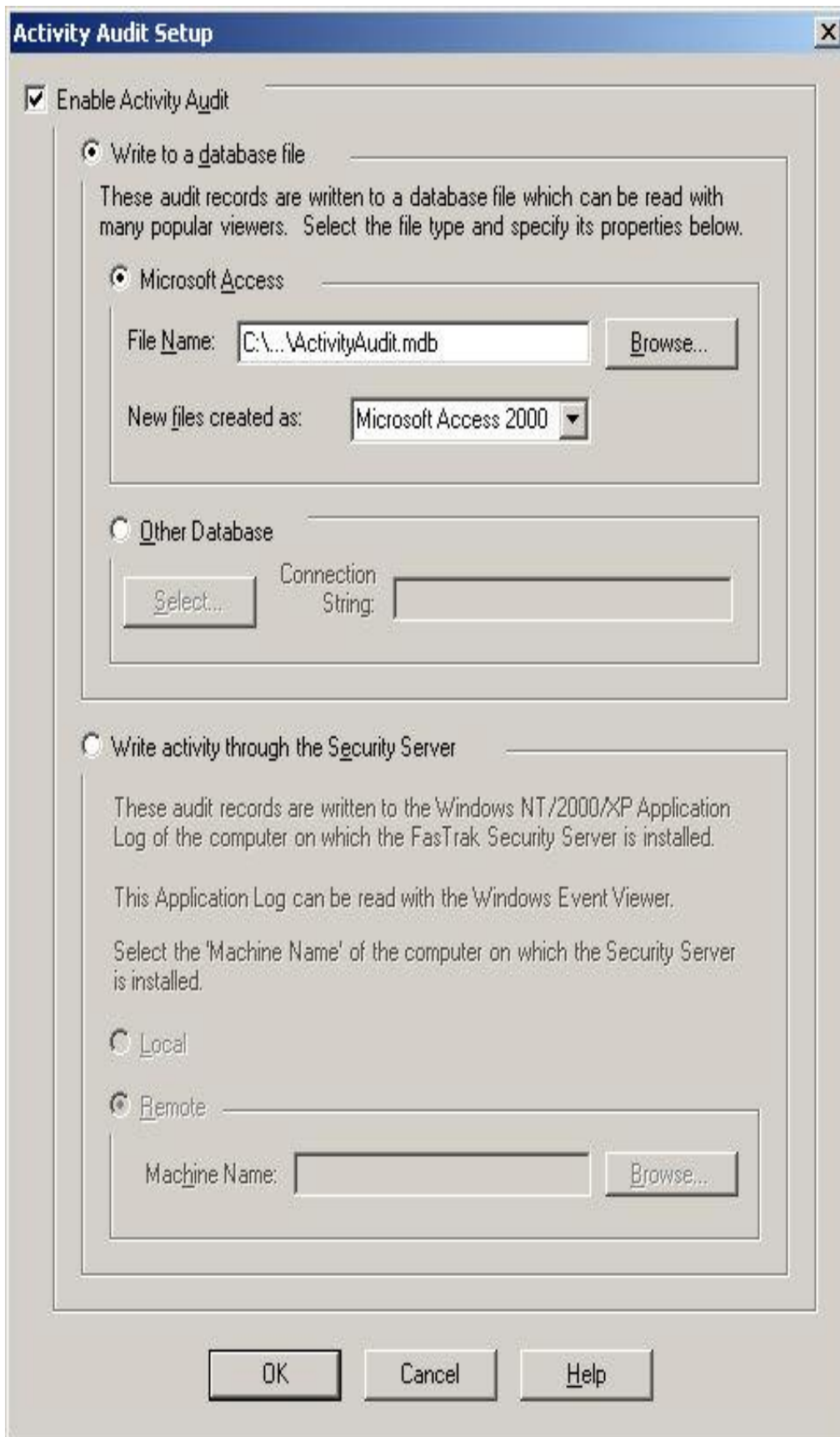
Audit

Activity Audit Setup

The **Activity Audit** feature records events and user actions for future review. The records are stored in a database or in the Windows NT/2000/XP Application Log through the *Security Server*.

See also: **Security Audit**, which records access to password-protected areas of WorkShop.

To bring up the **Activity Audit Setup** dialog, select the **Options/Activity Audit Setup** menu option.



- **Enable Activity Audit** - check this box to activate the activity audit feature.
- **Write to a database file** - select this option to store activity information in a database. The other option is to store the information in the Windows Application Log using the **Write activity through the Security Server** option.
- **Microsoft Access** - Select this option to use a **Microsoft Access** database. The other option is to use **Other Database** as described below.
- **File Name** - Select the Access database by typing the path or by using the **Browse** button. To create a new database, enter a filename that does not currently exist.
- **New files created as:** - Select the format for the new Microsoft Access database created if the File Name selected above does not already exist.
- **Other Database** - Select this option to use another type of database. Click Select to bring up the **Data Link Properties** dialog. The other option is to **Write to a database file**, as described above.
- **Write activity through the Security Server** - Select this option to store the activity information in the Windows NT/2000/XP Application Log through the Security Server. The other option is to store the information in a database using the **Write to a database file** option as described above.
- **Local** - Select this option to store information in the Application Log on this computer. This option is only available under Windows NT, Windows 2000, or Windows XP.
- **Remote** - Select this option to store information in the Application Log of a Security Server on your network.
- **Machine Name** - Select the remote computer that hosts the Security Server. This computer must be running the FasTrak Security Server software under Windows NT, Windows 2000, or Windows XP.

Security Audit Log Setup

The security audit feature records access to password-protected parts of WorkShop. The records are stored in a database or in the Windows NT/2000/XP Application Log through the Security Server. The security audit feature is available only when using FasTrak security. When using *NT Authentication*, access is recorded by the Security Server.

The FasTrak Authentication Security Audit contains records that document each time users access password-protected portions of WorkShop.

This Security Audit is a database file whose records can be read with many popular viewers.

Select the file type and specify its properties below.

Microsoft Access

File Name:

New files created as:

Other Database

Connection String:

- **Microsoft Access** - Select this option button to store the security audit information in a Microsoft Access database
- **File Name** - Select the Access database by typing the path or by using the **Browse** button. To create a new database, enter a filename that does not currently exist.
- **New files created as:** - Select the format for the new Microsoft Access database created if the file selected above does not already exist.
- **Other Database** - Select this option to use another type of database. Click Select to bring up the **Data Link Properties** dialog.

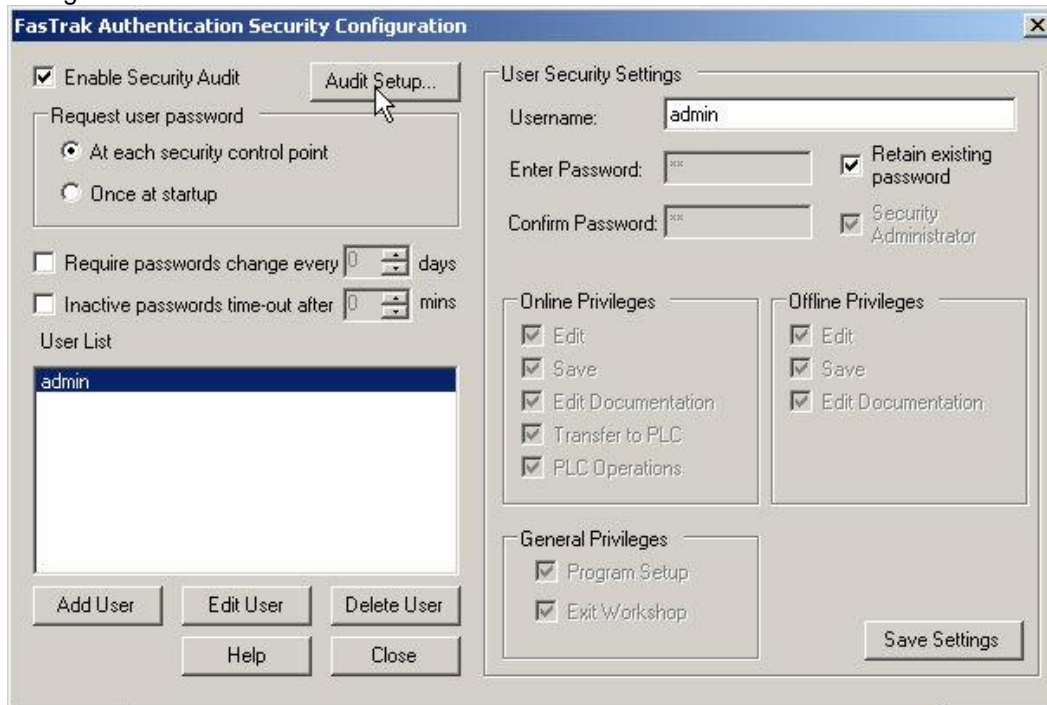
To bring up the Security Audit Setup dialog:

1. Open the **Security Type Selection** dialog by selecting the **Security/Administrator Options/Select** menu item.



2. Check the **Enable Password Security** box.
3. Select the **FasTrak Authentication** option button.

- Click the **Configure** button to bring up the **FasTrak Authentication Security Configuration** dialog..



- Check the Enable Security Audit box.
- Click the **Audit Setup** button.

Programming the PLC

Editing Commands

PLC WorkShop provides a number of time saving editing commands to help you with your programming tasks. Use these commands to quickly copy logic and documentation to either another location in the same program or another program.

Cut	Removes the selected logic or data from the program and places it on the clipboard.
Copy	Places a copy of the selected logic or data on the clipboard.
Paste	Inserts the clipboard contents – not including documentation - into the program at the cursor location.
Paste Special	Inserts the clipboard contents, with the option of including documentation, 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.
Insert	Inserts space for new logic or data above or to the left of the insertion point, moving the existing logic or data as needed.
Clear	Removes selected content without moving the surrounding content, leaving a blank area.
Delete	Removes both the content and the space it occupied, and moves other content as needed.

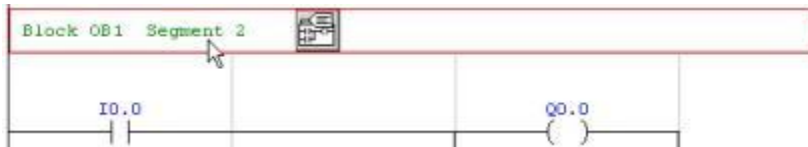
Selecting by Segment or by Parts

Program logic or data may be selected (for copying, cutting, deleting, or clearing) either by whole segments or by individual parts. In order to **Paste with Rewire**, the contents of the clipboard must have been selected by segment.

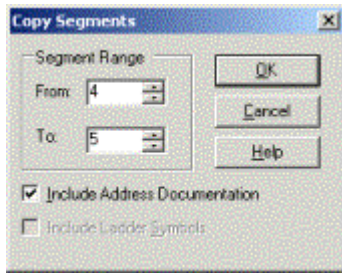
NOTE: Selecting by parts is not the same as selecting by segments, even if you have selected all the parts of a segment.

By Segment

To select by segment, click the segment header, as shown.



When the selection is by segments and you cut or copy, PLC WorkShop displays a dialog to give you easier control over the selection:



This makes selecting large areas much easier – simply select any segment in the block, and use the dialog to specify the range.

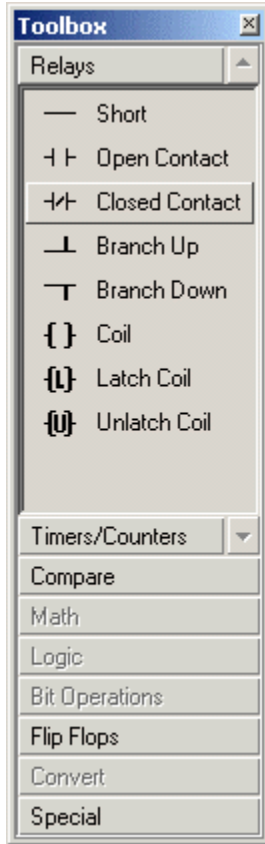
By Parts

To select by parts, click and drag directly on the desired parts.

If you drag the mouse from one segment to another, the selection changes from by parts to by segment.

Toolbox

The toolbox provides a convenient way to select ladder elements to place in logic. Clicking on an instruction turns the mouse cursor into an instruction-dropping cursor. When you click an instruction-dropping cursor on the ladder logic editor, that instruction is dropped into the ladder logic.

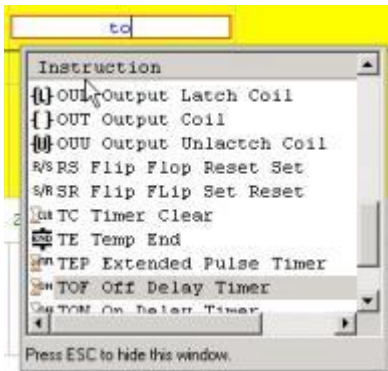


To turn the toolbox display on or off, select the **View/Toolbox** menu item.

To access the items in a category, click that category. In the illustration, the Relays category has been clicked.

Typing instructions

You can enter instructions by simply placing the cursor at the desired location and typing. PLC WorkShop presents an auto-completion window.



Edit Mode and Validate and Enter

When you begin editing a segment, the segment is placed in Edit mode.

Edit mode is indicated by a change in background color. In Online mode, a segment in Edit mode is in a special buffer outside the actual program, and the original segment remains in place unchanged. When you have completed the edits, **Validate and Enter** the changes by selecting the **Logic/Validate and Enter** menu item, pressing **F8**, or clicking the check mark (✓) button on the toolbar. The system validates the changed segments, and if the segments are valid, enters them in the actual program. If necessary, PLC WorkShop displays a dialog so you can stop the PLC. In either online or off line mode, the segments return to the normal display.

<p>WARNING: The validation only examines the edited segment. It is possible for changes in one segment to affect another, causing unexpected results.</p>
--

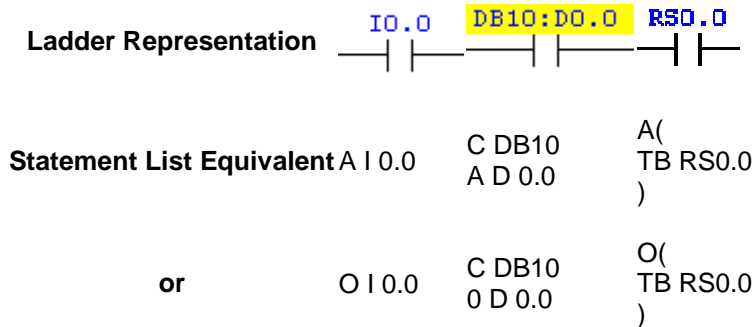
PLC Instructions

Ladder Instructions

Contacts: CONTACT NO BIT

Normally Open Contact

A normally open contact passes power (is closed) when the referenced signal status is ON (1). When the referenced signal status is OFF (0), the contact is open and does not pass power.



The following example illustrates a segment with a normally open contact. When contact F8.2 is energized (its value is 1), it passes power to coil Q4.0.



The following are valid data references for contacts:

Data Area	Bit	Byte	Word	Double Word
I (Input)	I			
Q (Output)	Q			
F (Flag)	F			
S (Extended Flag)	S			
T (Timer)	T			
C (Counter)	C			
DB (Data Block)	D			
DX (Extended Data Block)	D			
P (Peripheral Data)				
O (Extended Peripheral Data)				
RS (System Data)	RS			

RT (Extended System Data) RT

RI (Interface Data) RI

RJ (Extended Interface Data) RJ

Flip-flops: RS FLIPFLOP BIT

RS Flip-flop

When the S input is on, the output goes on and stays on until the R input goes on. When the R input goes on, the output goes off and stays off until the S input goes on. The S and R inputs should never both be on at the same time.

Contacts: CONTACT NC BIT

Normally Closed Contact

A normally closed contact passes power (is closed) when the referenced signal status is OFF (0). When the referenced signal status is ON (1), the contact is open and does not pass power.

Ladder Representation I0.0 DB10:DO.0

Statement List Equivalent AN I 0.0 C DB10 A(
AN D 0.0 TBN RS0.0
)

or ON I 0.0 C DB10 O(
ON D 0.0 TBN RS0.0
)

The following example illustrates a segment with a normally closed contact. If contact F8.0 is energized (its value is 1), it is open and does not pass power to coil Q1.0.



The following are valid data references for contacts:

Data Area	Bit Byte Word Double Word
I (Input)	I
Q (Output)	Q
F (Flag)	F
S (Extended Flag)	S
T (Timer)	T
C (Counter)	C
DB (Data Block)	D
DX (Extended Data Block)	D
P (Peripheral Data)	
O (Extended Peripheral Data)	
RS (System Data)	RS
RT (Extended System Data)	RT
RI (Interface Data)	RI

RJ (Extended Interface Data) RJ

Flip-flops: SR FLIPFLOP BIT

SR Flip-flop

When the S input is on, the output goes on and stays on until the R input goes on. When the R input goes on, the output goes off and stays off until the S input goes on. The S and R inputs should never both be on at the same time.

Compare: COMPARE =

Equal To Comparator

The result of an equal-to comparison is true if the first value (A) is equal to the second value (B) and false otherwise.

Ladder Representation



RLO-Independant Statement List Equivalent

```
L FW12
L IW11
><F
```

RLO-Dependant Statement List Equivalent

```
A (
JC =M1
JU =M2
M1 : L FW12
L IW11
><F
M2 : )
```

The RLO-dependent use of this instruction is restricted to function blocks.

A comparator takes a binary value specified as value A and compares it to value B according to a specified operation. If the comparison conditions are met, the RLO is true. Values used in comparisons must be of the same data length (words, double words, etc.).

Comparators used in blocks other than function blocks must be implemented as RLO-Independent instructions (must be connected directly to the power rail).

The following are valid data references for comparators:

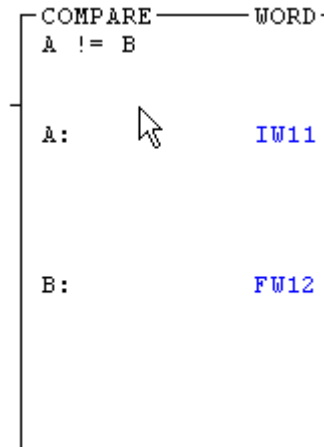
Data Area	Bit	Byte	Word	Double Word
I (Input)	IB	IW	ID	
Q (Output)	QB	QW	QD	
F (Flag)	FY	FW	FD	
S (Extended Flag)				
T (Timer)			T	
C (Counter)			C	
DB (Data Block)	DL,DR	DW	DD	
DX (Extended Data Block)	DL,DR	DW	DD	
P (Peripheral Data)				
O (Extended Peripheral Data)				
RS (System Data)			RS	
RT (Extended System Data)			RT	
RI (Interface Data)			RI	
RJ (Extended Interface Data)			RJ	
Constants:	KM, KH, KF, KG, KT, KC			

Compare: COMPARE NOT =

Not Equal To Comparator

The result of a not-equal-to comparison is true if the first value (A) is not equal to the second value (B) and false otherwise.

Ladder Representation



RLO- Dependant Statement List Equivalent

```
L FW12
L IW11
><F
```

RLO- Dependant Statement List Equivalent

```
A(
JC =M1
JU =M2
M1: L FW12
L IW11
><F
M2: )
```

The RLO-dependent use of this instruction is restricted to function blocks.

A comparator takes a binary value specified as value A and compares it to value B according to a specified operation. If the comparison conditions are met, the RLO is true. Values used in comparisons must be of the same data length (words, double words, etc.).

Comparators used in blocks other than function blocks must be implemented as RLO-Independent instructions (must be connected directly to the power rail).

The following are valid data references for comparators:

Data Area	Bit	Byte	Word	Double Word
I (Input)	IB	IW	ID	
Q (Output)	QB	QW	QD	
F (Flag)	FY	FW	FD	
S (Extended Flag)				
T (Timer)			T	
C (Counter)			C	
DB (Data Block)	DL,DR	DW	DD	
DX (Extended Data Block)	DL,DR	DW	DD	
P (Peripheral Data)				
O (Extended Peripheral Data)				
RS (System Data)			RS	
RT (Extended System Data)			RT	
RI (Interface Data)			RI	
RJ (Extended Interface Data)			RJ	
Constants:	KM, KH, KF, KG, KT, KC			

Compare: COMPARE <

Less Than Comparator

The result of a 'Less than' comparison is true if the first value (A) is less than the second value (B) and false otherwise.

Ladder Representation

		L	FW12
RLO-Independent Statement List Equivalent		L	IW11
		<F	
		A(
		JC	=M1
		JU	=M2
RLO- Dependant Statement List Equivalent	M1 :	L	FW12
		L	IW11
		<F	
	M2 :)	

The RLO-dependent use of this instruction is restricted to function blocks.

A comparator takes a binary value specified as value A and compares it to value B according to a specified operation. If the comparison conditions are met, the RLO is true. Values used in comparisons must be of the same data length (words, double words, etc.).

Comparators used in blocks other than function blocks must be implemented as RLO-Independent instructions (must be connected directly to the power rail).

The following are valid data references for comparators:

Data Area	Bit	Byte	Word	Double Word
I (Input)	IB	IW	ID	
Q (Output)	QB	QW	QD	
F (Flag)	FY	FW	FD	
S (Extended Flag)				

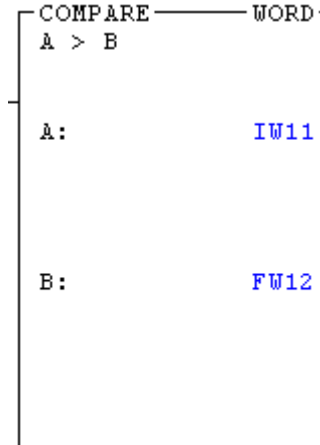
T (Timer)	T
C (Counter)	C
DB (Data Block)	DL,DR DW DD
DX (Extended Data Block)	DL,DR DW DD
P (Peripheral Data)	
O (Extended Peripheral Data)	
RS (System Data)	RS
RT (Extended System Data)	RT
RI (Interface Data)	RI
RJ (Extended Interface Data)	RJ
Constants:	KM, KH, KF, KG, KT, KC

Compare: COMPARE >

Greater Than Comparator

The result of a 'greater than' comparison is true if the first value (A) is greater than the second value (B) and false otherwise.

Ladder Representation



RLO-Independent Statement List Equivalent

```

    L FW12
    L IW11
    >F
  
```

RLO-Dependant Statement List Equivalent

```

    A(
    JC  =M1
    JU  =M2
    M1: L  FW12
        L  IW11
        >F
    M2: )
  
```

The RLO-dependent use of this instruction is restricted to function blocks.

A comparator takes a binary value specified as value A and compares it to value B according to a specified operation. If the comparison conditions are met, the RLO is true. Values used in comparisons must be of the same data length (words, double words, etc.).

Comparators used in blocks other than function blocks must be implemented as RLO-Independent instructions (must be connected directly to the power rail).

The following are valid data references for comparators:

Data Area	Bit	Byte	Word	Double Word
I (Input)	IB	IW	ID	
Q (Output)	QB	QW	QD	
F (Flag)	FY	FW	FD	
S (Extended Flag)				
T (Timer)			T	
C (Counter)			C	
DB (Data Block)	DL,DR	DW	DD	
DX (Extended Data Block)	DL,DR	DW	DD	
P (Peripheral Data)				
O (Extended Peripheral Data)				
RS (System Data)			RS	
RT (Extended System Data)			RT	
RI (Interface Data)			RI	
RJ (Extended Interface Data)			RJ	
Constants:	KM, KH, KF, KG, KT, KC			

Compare: COMPARE <=

Less Than or Equal To Comparator

The result of a 'Less than or Equal to' comparison is true if the first value (A) is less than or equal to the second value (B) and false otherwise.

Ladder Representation

		L	FW12
RLO-Independent Statement List Equivalent		L	IW11
		<=F	
		A(
		JC	=M1
		JU	=M2
RLO- Dependant Statement List Equivalent	M1 :	L	FW12
		L	IW11
		<=F	
	M2 :)	

The RLO-dependent use of this instruction is restricted to function blocks.

A comparator takes a binary value specified as value A and compares it to value B according to a specified operation. If the comparison conditions are met, the RLO is true. Values used in comparisons must be of the same data length (words, double words, etc.).

Comparators used in blocks other than function blocks must be implemented as RLO-Independent instructions (must be connected directly to the power rail).

The following are valid data references for comparators:

Data Area	Bit	Byte	Word	Double Word
I (Input)	IB	IW	ID	
Q (Output)	QB	QW	QD	
F (Flag)	FY	FW	FD	
S (Extended Flag)				

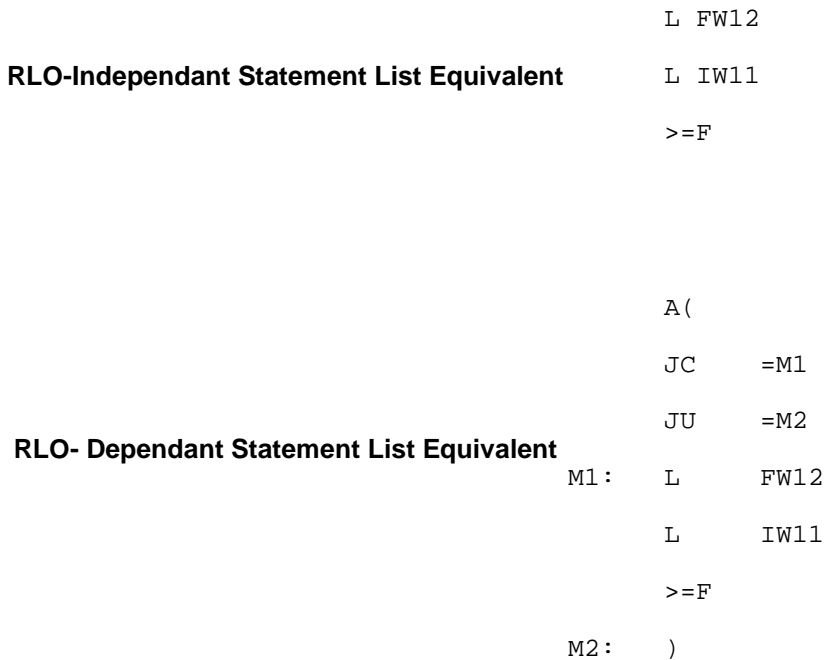
T (Timer)	T
C (Counter)	C
DB (Data Block)	DL,DR DW DD
DX (Extended Data Block)	DL,DR DW DD
P (Peripheral Data)	
O (Extended Peripheral Data)	
RS (System Data)	RS
RT (Extended System Data)	RT
RI (Interface Data)	RI
RJ (Extended Interface Data)	RJ
Constants:	KM, KH, KF, KG, KT, KC

Compare: COMPARE >=

Greater Than or Equal To Comparator

The result of a 'Greater than or Equal to' comparison is true if the first value (A) is greater than or equal to the second value (B) and false otherwise.

Ladder Representation



The RLO-dependent use of this instruction is restricted to function blocks.

A comparator takes a binary value specified as value A and compares it to value B according to a specified operation. If the comparison conditions are met, the RLO is true. Values used in comparisons must be of the same data length (words, double words, etc.).

Comparators used in blocks other than function blocks must be implemented as RLO-Independent instructions (must be connected directly to the power rail).

The following are valid data references for comparators:

Data Area	Bit	Byte	Word	Double Word
I (Input)	IB	IW	ID	
Q (Output)	QB	QW	QD	
F (Flag)	FY	FW	FD	
S (Extended Flag)				

T (Timer)	T
C (Counter)	C
DB (Data Block)	DL,DR DW DD
DX (Extended Data Block)	DL,DR DW DD
P (Peripheral Data)	
O (Extended Peripheral Data)	
RS (System Data)	RS
RT (Extended System Data)	RT
RI (Interface Data)	RI
RJ (Extended Interface Data)	RJ
Constants:	KM, KH, KF, KG, KT, KC

Coils: COIL LEVEL BIT**Level Coil**

A level coil directly reflects the current RLO. If the result of preceding instruction logic is 1, the level coil has a value of 1.

Special: TEMP END BIT**Temporary End**

The temporary end instruction terminates execution of the block in which it is used in one of the following ways:

Conditionally If the instruction is implemented as an RLO-dependent instruction, execution is terminated only if the RLO prior to the temporary end is 1.

Unconditionally If the instruction is implemented as an RLO-independent instruction (is attached to the power rail), execution is terminated unconditionally.

Coils: COIL LATCH BIT**Latch Coil**

Like a level coil a latch coil reflects the RLO. However, once a latch coil is set (its value is 1), it remains set, regardless of the RLO, until it is explicitly reset using an unlatch coil defined for the same address.

Coils: COIL UNLATCH BIT**Unlatch Coil**

Once a latch coil is set (its value is 1), it remains set, regardless of the RLO. The unlatch coil is programmed as a parallel instruction to conditionally reset the bit so that the latch coil once again responds to the RLO.

One Shots: ONS RISING BIT**False to True**

Sets the current RLO to true only when the state of the preceding RLO changes from false in one scan to true in the next.

A false-to-true instruction is true at startup or if the specified bit is reset by another instruction.

The A-AN open is used to establish the RLO needed to drive the instruction.

The RLO-dependent use of this instruction is restricted to function blocks.

One Shots: ONS FALLING BIT

True to False

Sets the current RLO to true only when the state of the preceding RLO changes from true in one scan to false in the next. This instruction is not available as an RLO-Independent instruction (cannot be connected directly to the power rail).

The RLO-dependent use of this instruction is restricted to function blocks.

Logic: BRLOGIC AND

AND

The AND instruction performs a logical AND for two values and assigns the result. This instruction is available in function blocks only.

: MOVE

Move instructions load and transfer data from one location to another.

Immediate Input: IMMED IO IN

Immediate Input

Directly updates an input address in the I/O module by bypassing the input process image (PII) table. This instruction is available in function blocks only.

Logic: BRLOGIC OR

OR

The OR instruction performs a logical OR for two values and assigns the result. This instruction is available in function blocks only.

Counters: COUNTER SET

Counter Set

The counter-set instruction assigns an initial value to a specified counter.

Logic: BRLOGIC XOR

Exclusive OR

The XOR (exclusive OR) instruction performs a logical XOR for two values and assigns the result. This instruction is available in function blocks only.

Conversions: ONES COMP

One's Complement

Performs a one's complement on the specified value. This instruction is available in function blocks only.

NOTE: When viewing the instruction status online, values are displayed within the instruction in hexadecimal format regardless of the type of conversion carried out by the instruction.

Counters: COUNTER CLEAR

Counter Clear

The counter-clear instruction stops execution of the specified counter and sets the counter value to 0 (zero).

Logic: BRLOGIC AND NOT

AND-NOT

The AND NOT instruction performs a logical AND NOT for two values and assigns the result. This instruction is available in function blocks only.

The following truth table illustrates the logic of an AND NOT instruction:

Value A	Value B	Result R
0	0	1
0	1	1
1	0	1
1	1	0

Logic: BRLOGIC OR NOT

The OR NOT instruction performs a logical OR NOT for two values and assigns the result.

This instruction is available in function blocks only.

The following truth table illustrates the logic of an OR NOT instruction:

Value A	Value B	Result R
0	0	1
0	1	0
1	0	0
1	1	0

Timers: TIMER CLEAR

Timer Clear

The timer-clear instruction stops timer execution and sets the current timer value to its preset value.

Conversions: FLOAT FIX DOUBLE

Floating Point to Fixed Point

Converts a floating point value to a fixed point value. This instruction is available in function blocks only.

NOTE: When viewing the instruction status online, values are displayed within the instruction in hexadecimal format regardless of the type of conversion carried out by the instruction.

Conversions: FIX FLOAT DOUBLE

Fixed-Point to Floating-Point

Converts a fixed point value to a floating point value. This instruction is available in function blocks only.

NOTE: When viewing the instruction status online, values are displayed within the instruction in hexadecimal format regardless of the type of conversion carried out by the instruction.

Jump: JUMP TO SUB OPS BIT

Jump

The jump instruction allow you to conditionally transfer program control to a particular block or subroutine. You can jump to any of the following types of blocks:

- OB Organization Block
- PB Program Block
- SB Sequence Block
- FB Function Block
- FX Extended Function Block

NOTE: Function blocks allow from 0 (zero) to 40 parameters. The ladder-programming jump instruction displays up to five parameters. If the function block you want to reference contains more than five parameters, you must program the segment containing the block jump in statement list.

Jump: JUMP TO SUB FB BIT

Jump

The jump instruction allow you to conditionally transfer program control to a particular block or subroutine. You can jump to any of the following types of blocks:

OB Organization Block
PB Program Block
SB Sequence Block
FB Function Block
FX Extended Function Block

NOTE: Function blocks allow from 0 (zero) to 40 parameters. The ladder-programming jump instruction displays up to five parameters. If the function block you want to reference contains more than five parameters, you must program the segment containing the block jump in statement list.

Timers: TIMER ON DELAY

ON Delay Timer

When the input RLO to an on-delay timer changes from 0 to 1, the timer is initiated.

When the timer ends, the timer output (TQ) coil is set to 1.

The timer runs only while its input logic is true. If the value of the input logic changes to 0 before the timer runs out, the timer is reset and the timer output (TQ) coil remains 0.

Counters: COUNTER UP

Up Counter

Increments the value in the specified counter by one.

Math: BRMATH PLUS

Addition

The addition operation combines two values, A and B, to produce their sum, R. This instruction is available in function blocks only.

Bit Operations: BIT OP SHIFT LEFT

Shift Left Instruction

The shift left instruction shifts each bit in a given register a specified number of places to the left. This instruction is available in function blocks only.

Conversions: BCD BIN

Binary to Binary Coded Digit

Converts a binary value to a binary coded digit (BCD). This instruction is available in function blocks only.

NOTE: When viewing the instruction status online, values are displayed within the instruction in hexadecimal format regardless of the type of conversion carried out by the instruction.

Timers: TIMER OFF DELAY

OFF Delay Timer

When the input RLO to an off-delay timer changes from 1 to 0, the timer is initiated.

When the timer ends, the timer output (TQ) coil is set to 0.

The timer runs only while its input logic is false. If the value of the input logic changes to 1 before the timer runs out, the timer is reset and the timer output (TQ) coil remains 1.

Counters: COUNTER DOWN

Down Counter

Decrements the value in the specified counter by one.

Math: BRMATH MINUS

Subtraction

The subtraction operation combines two values, A and B, to produce the difference between them, R. This instruction is available in function blocks only.

Bit Operations: BIT OP SHIFT RIGHT

Bit Shift Right

The shift right unsigned instruction shifts each bit in a given register a specified number of places to the left.

This instruction is available in function blocks only.

Conversions: BIN BCD

Binary Coded Digit to Binary

Converts a binary-coded-digit (BCD) value to a binary value. This instruction is available in function blocks only.

NOTE: When viewing the instruction status online, values are displayed within the instruction in hexadecimal format regardless of the type of conversion carried out by the instruction.

Math: BRMATH MULT**Multiplication**

The multiplication operation combines two values, A and B, to produce their product, R. This instruction is available in function blocks only.

Bit Operations: BIT OP SHIFT RIGHT SIGNED**Bit Shift Right - Signed**

The shift right (signed) instruction shifts each bit in the register a specified number of places to the right with the exception of the last bit (the sign bit).

This instruction is available in function blocks only.

Timers: TIMER STORED ON DELAY**Stored ON Delay Timer**

When the input RLO to a stored on delay timer changes from 0 to 1, the timer is initiated.

The timer continues running regardless of changes in the input logic. When the timer completes, the timer output (TQ) coil is set to 1.

Once the timer ends, the timer must be explicitly cleared before the timer output (TQ) coil changes from 1 to 0.

Math: BRMATH DIV**Division**

The division operation combines two values, A and B, to produce their quotient, R. This instruction is available in function blocks only.

Conversions: TWOS COMP**Two's Complement**

Performs a two's complement on the specified value. This instruction is available in function blocks only.

NOTE: When viewing the instruction status online, values are displayed within the instruction in hexadecimal format regardless of the type of conversion carried out by the instruction.

Timers: TIMER PULSE**Pulse Timer**

When the input RLO to a pulse timer changes from 0 to 1, the timer is initiated and the timer output (TQ) coil is set to 1.

The timer runs only while its input logic is true. When the timer completes or if the input logic changes to 0, the timer output (TQ) coil is reset to 0.

Timers: TIMER EXT PULSE

Extended Pulse Timer

When the input RLO to an extended-pulse timer changes from 0 to 1, the timer is initiated and the timer output (TQ) coil is set to 1.

The timer continues running regardless of changes in the input logic. When the timer completes, the timer output (TQ) coil is reset to 0.

Bit Operations: BIT OP ROT LEFT DOUBLE

Bit Rotate Left Double

The rotate left instruction moves each bit a specified number of places to the left. Displaced bits are wrapped around and replace the vacated bits.

This instruction is available in function blocks only.

Bit Operations: BIT OP ROT RIGHT DOUBLE

Bit Rotate Right Double

The rotate right instruction moves each bit a specified number of places to the right. Displaced bits are wrapped around and replace the vacated bits.

This instruction is available in function blocks only.

Statement List Instructions

AND: A

AND

A I Scan Input for 1

A Q Scan Output for 1

A F Scan Flag for 1

A S Scan Extended Flag for 1

A D Scan Data Bit for 1

A T Scan Timer for 1

A C Scan Counter contents for 1

AND: AN

AND NOT

AN I Scan Input for 0

AN Q Scan Output for 0

AN F Scan Flag for 0

AN S Scan Extended Flag for 0

AN D Scan Data Bit for 0

AN T Scan Timer for 0

AN C Scan Counter contents for 0

OR: O

O I Scan Input for 1

O Q Scan Output for 1

O F Scan Flag for 1

O S Scan Extended Flag for 1

O D Scan Data Bit for 1

O T Scan Timer for 1

O C Scan Counter contents for 1

OR: ON

OR NOT

ON I Scan Input for 0

ON Q Scan Output for 0

ON F Scan Flag for 0

ON S Scan Extended Flag for 0

ON D Scan Data Bit for 0

ON T Scan Timer for 0

ON C Scan Counter contents for 0

AND: A (

AND left parenthesis. Logical AND combining several expressions enclosed in parenthesis.

OR: O(

OR left parenthesis. Logical OR combining several expressions enclosed in parenthesis.

Close Paren:)

Close a grouping of expressions opened by an A(or O(instruction.

Set: S

S I Set Input

S Q Set Output

S F Set Flag

S Set Extended Flag

S D Set Data Bit

Reset: R

R I Reset Input

R Q Reset Output

R F Reset Flag

R S Reset Extended Flag

R D Reset Data Bit

Equals: =

Equals

= I Assign Input

= Q Assign Output

= F Assign Flag

= S Assign Extended Flag

= D Assign Data Bit

Load: L

The Load instruction loads a value into Accumulator 1.

L IB Load Input Byte

L IW Load Input Word

L ID Load Input Double Word

L QB Load Output Byte

L QW Load Output Word

L QD Load Output Double Word

L FY Load Flag Byte

L FW Load Flag Word

L FD Load Flag Double Word

L SY Load Extended Flag Byte

L SW Load Extended Flag Word

L SD Load Extended Flag Double Word

L DL Load Left Byte of Data Word

L DR Load Right Byte of Data Word

L DW Load Data Word

L DD Load Data Double Word

L T Load Time

L C Load Count

L PY Load Peripheral Byte

L OY Load Extended Peripheral Byte

L PW Load Peripheral Word

L OW Load Extended Peripheral Word

L R Load System Word

L DH Load Double Word in Hexadecimal Code

L KB Load 1-Byte Constant

L KS Load 2 ASCII Character Constant

L KM Load Binary Constant

L KH Load Hexadecimal Constant

L KF Load Fixed-Point Constant

L KG Load Floating-Point Constant

L KY Load 2-Byte Constant

L KT Load Time Constant

L KC Load Count Constant

LD T Load Time (BCD)

LD C Load Count (BCD)

Load: LC

Load times or counts (in BCD) into Accumulator 1.

Transfer: T

Transfer data from Accumulator 1 to the specified location.

T IB Transfer to Input Byte

T IW Transfer to Input Word

T ID Transfer to Input Double Word

T QB Transfer to Output Byte

T QW Transfer to Output Word

T QD Transfer to Output Double Word

T FY Transfer to Flag Byte

T FW Transfer to Flag Word

T FD Transfer to Flag Double Word

T SY Transfer to Extended Flag Byte

T SW Transfer to Extended Flag Word

T SD Transfer to Extended Flag Double Word

T DR Transfer to Right Byte of Data Word

T DL Transfer to Left Byte of Data Word

T DW Transfer to Data Word

T DD Transfer to Data Double Word

T PY Transfer to Peripheral Byte

T OY Transfer to Extended Peripheral Byte

T PW Transfer to Peripheral Word

T OW Transfer to Extended Peripheral Word

Timers: SP T

Start Timer as Pulse

Timers: SE T

Start Timer as Extended Pulse

Timers: SD T

Start Timer as ON Delay

Timers: SS T

Start Timer as Latched ON Delay

Timers: SF T

Start Timer as OFF Delay

Counters: CU

CU C Count Up

Counters: CD

CD C Count Down

Arithmetic: + F

Addition of Fixed-Point Numbers

Arithmetic: - F

Subtraction of Fixed-Point Numbers

Arithmetic: x F

Multiplication of Fixed-Point Numbers

Arithmetic: : F

Division of Fixed-Point Numbers

Arithmetic: + G

Addition of Floating-Point Numbers

Arithmetic: - G

Subtraction of Floating-Point Numbers

Arithmetic: x G

Multiplication of Floating-Point Numbers

Arithmetic: : G

Division of Floating-Point Numbers

Compare: != F

Compare two Fixed-Point Numbers for Equality

Compare: >< F

Compare two Fixed-Point Numbers for Inequality

Compare: > F

Compare two Fixed-Point Numbers for Greater Than

Compare: >= F

Compare two Fixed-Point Numbers for Greater Than or Equal to

Compare: < F

Compare two Fixed-Point Numbers for Less Than

Compare: <= F

Compare two Fixed-Point Numbers for Less Than or Equal to

Compare: != G

Compare two Floating-Point Numbers for Equality

Compare: >< G

Compare two Floating-Point Numbers for Inequality

Compare: > G

Compare two Floating-Point Numbers for Greater Than

Compare: >= G

Compare two Floating-Point Numbers for Greater Than or Equal to

Compare: < G

Compare two Floating-Point Numbers for Less Than

Compare: <= G

Compare two Floating-Point Numbers for Less Than or Equal to

Compare: != D

Compare two Fixed-Point Double Words for Equality

Compare: >< D

Compare two Fixed-Point Double Words for Inequality

Compare: > D

Compare two Fixed-Point Double Words for Greater Than

Compare: >= D

Compare two Fixed-Point Double Words for Greater Than or Equal to

Compare: < D

Compare two Fixed-Point Double Words for Less Than

Compare: <= D

Compare two Fixed-Point Double Words for Less Than or Equal to

Jump: JU

Unconditional Jump

Jump: JU FB

Jump Unconditionally to a Function Block

Jump: DOU FX

Jump Unconditionally to an Extended Function Block

Jump: JC

Conditional Jump

Jump: JC FB

Jump Conditionally to a Function Block

Jump: DOC FX

Jump Conditionally to an Extended Function Block

Block: C DB

Call a Data Block

Block: CX DX

Call an Extended Data Block

Block: G DB

Generate Data Blocks

Block: GX DX

Generate Extended Data Blocks

Block: BE

Block End

Block: BEC

Block End Conditional

Block: BEU

Block End Unconditional

Block: NOP 0

No Operation (All Bits Reset)

Block: NOP 1

No Operation (All Bits Set)

Block: STP

Stop

Block: BLD

Display Construction

Binary: A = Formal Operand

Scan Formal Operand for 1

Binary: AN = Formal Operand

Scan Formal Operand for 0

Binary: O = Formal Operand

Scan Formal Operand for 1

Binary: ON = Formal Operand

Scan Formal Operand for 0

Digital: AW

Digital AND of Word in ACCU 1 and ACCU 2

Digital: OW

Digital OR of Word in ACCU 1 and ACCU 2

Digital: XOW

Digital XOR of Word in ACCU 1 and ACCU 2

Bit Test : TB

TB T Test Bit for 1 in a Timer Word

TB C Test Bit for 1 in a Counter Word

TB D Test Bit for 1 in a Data Word

TB RS Test Bit for 1 in System Data Area

Bit Test : TBN

TBN T Test Bit for 0 in a Timer Word

TBN C Test Bit for 0 in a Counter Word

TBN D Test Bit for 0 in a Data Word

TBN RS Test Bit for 0 in System Data Area

Setting operations: S = Formal Operand

Binary setting of a formal operand

Setting operations: RB = Formal Operand

Binary resetting of a formal operand

Setting operations: RD = Formal Operand

Digital resetting of a formal operand for timers and counters

Setting operations: = = Formal Operand

Assignment of the RLO to a formal parameter

Set: SU

SU T Set Bit value in Timer Unconditionally

SU C Set Bit in Counter Unconditionally

SU D Set Bit in Data Word Unconditionally

SU S Set Bit in Extended Flag Area Unconditionally

Reset: RU

RU T Reset Bit value in Timer Unconditionally

RU C Reset Bit in Counter Unconditionally

RU D Reset Bit in Data Word Unconditionally

RU S Reset Extended Flag Bit Unconditionally

Timer and Counter Operations: SP = Formal Operand

Start Pulse Timer Specified as Formal Operand

Timer and Counter Operations: SD = Formal Operand

Start ON Delay Timer Specified as Formal Operand

Timer and Counter Operations: SEC = Formal Operand

Start Extended Pulse Timer Specified as Formal Operand or Set Counter specified as Formal Operand

Timer and Counter Operations: SSU = Formal Operand

Start Latched ON Delay Timer Specified as Formal Operand or Set Counter specified as Formal Operand

Timer and Counter Operations: SFD = Formal Operand

Start OFF Delay Timer Specified as Formal Operand or Decrement Counter specified as Formal Operand

Timer and Counter Operations: FR = Formal Operand

Enable Formal Operand for Cold Restart

Timer and Counter Operations: FR

Enable Timer or Counter for Cold Restart

The operation is executed only at the leading edge of the RLO (a 0 (zero) to 1 transition). The timer or counter restarts only if the RLO is 1 at the time of the start operation.

Load: L = Formal Operand

Load Formal Operand into ACCU 1

Load: LD = Formal Operand

Load Formal Operand in BCD into ACCU 1

Load: LW = Formal Operand

Load Formal Operand in Binary into ACCU 1

Load: LWD = Formal Operand

Load Floating-Point Formal Operand into ACCU 1

Transfer: T = Formal Operand

Transfer contents of ACCU 1 to Formal Operand

Conversion: CFW

One's Complement of ACCU 1 bits 0-15

Conversion: CSW

Two's Complement of ACCU 1 bits 0-15

Conversion: CSD

Two's Complement of ACCU 1 bits 0-31

Conversion: DEF

Converts a 16 bit fixed-point from BCD to binary

Conversion: DUF

Converts a 16 bit fixed-point from binary to BCD

Conversion: DED

Converts a 32 bit fixed-point from BCD to binary

Conversion: DUD

Converts a 32 bit fixed-point from binary to BCD

Conversion: FDG

Converts a 32 bit fixed-point into a floating-point

Conversion: GFD

Converts a floating-point into a 32 bit fixed-point

Shift: SLW n

Shift ACCU 1 (low word) to left n places

Shift: SRW n

Shift ACCU 1 (low word) to right n places

Shift: SLD n

Shift ACCU 1 (double word) to left n places

Shift: SSW n

Shift ACCU 1 (low word and sign) to right n places

Shift: SSD n

Shift ACCU 1 (double word and sign) to right n places

Rotate: RLD n

Rotate ACCU 1 (32 bits) to the left

Rotate: RRD n

Rotate ACCU 1 (32 bits) to the right

Jump: JU = Statement Label

Unconditional Jump

Jump: JC = Statement Label

Conditional Jump (if RLO=1)

Jump: JZ = Statement Label

Conditional Jump (if CC1=0 and CC0=0)

Jump: JN = Statement Label

Conditional Jump (if CC1=CC0, or if CC1=1 and CC0=1)

Jump: JP = Statement Label

Conditional Jump (if CC1=1 and CC0=0)

Jump: JM = Statement Label

Conditional Jump (if CC1=0 and CC0=1)

Jump: JO = Statement Label

Conditional Jump (if OV bit set)

Jump: JOS = Statement Label

Conditional Jump (if OS bit set)

Other operations (supplementary operations): IA

Disable interrupt:

After processing IA, the process interrupts are no longer serviced.

Other operations (supplementary operations): RA

Enable interrupt:

Cancels the effect of AI.

Other operations (supplementary operations): IAE

Disable addressing error:

Bit 4 in interrupt bit reset word (UALW) is reset.

Other operations (supplementary operations): RAE

Enable addressing error:

Bit 4 is set again.

Other operations (supplementary operations): BAS

Disable command output:

After BAS has been executed, the PIO is no longer affected.

Other operations (supplementary operations): BAF

Enable command output:

Cancels the effect of BAS.

Other: D

Decrement ACCU1

Other: I

Increment ACCU1

Other operations (supplementary operations): ENT

Enter data in the arithmetic memory.

Other: SED n

Set semaphore with n (multi-processor mode)

Other: SEE n

Enable semaphore with n (multi-processor mode)

Other: DO = Formal Operand

Process Formal Operand

DO: DO

DO DW Process Data Word

DO FW Process Flag Word

DO RS Execute an operation whose code is stored in the system data

Load: LIR

Load the contents of a memory word addressed by ACCU 1 into specified register

Transfer: TIR

Transfer contents of the specified register into memory word addressed by ACCU 1

Load: LDI

Load contents of registers N, addressed by ACCU 1, and N+1 into specified register

Transfer: TDI

Transfer contents of specified register into N, addressed by ACCU 1, and N+1

Transfer: TNW

Block Transfer 0 to 255 Words

System Operations: TXB

Block transfer from 8-bit memory to 16-bit memory. The address n byte is transferred to the HIGH byte, the address n+1 byte is transferred to the LOW byte of the destination data (SIMATIC data filing method).

System Operations: TXW

Block transfer from 16-bit memory to 8-bit memory. The HIGH byte of the source data (word) is transferred to the address n byte, the LOW byte of the source data is transferred to the address n+1 byte (SIMATIC data filing method).

Load: MBR

Load a 20-bit constant into the BR-register

Load: ABR

Add specified offset to contents of the BR-register

Load: LRW

Add specified offset to contents of the BR-register and load into register addressed by ACCU 1

Load: LRD

Add specified offset to contents of the BR-register and load into N register, addressed by ACCU 1, and N+1

Transfer: TRW

Add specified offset to contents of the BR-register and transfer contents of ACCU 1 into the specified address

Transfer: TRD

Add specified offset to contents of the BR-register and transfer contents of ACCU 1 into the specified address (N) and N+1

Transfer: MAS

Transfer contents of ACCU 1 into the step address counter (SAC)

ransfer: MAB

Transfer contents of ACCU 1 into the base address register (BR)

Transfer: MSA

Transfer contents of the step address counter (SAC) into ACCU 1

Transfer: MSB

Transfer contents of step address counter (SAC) into the base address register (BR)

Transfer: MBA

Transfer contents of base address register (BR) into ACCU 1

Transfer: MBS

Transfer contents of base address register (BR) into the step address counter (SAC)

Jump: JUR

-32768 to 32767 Relative Jump

Arithmetic: ADD

BN Add Byte Constant to ACCU 1

ADD KF Add Fixed-Point Constant to ACCU 1

ADD DF Add Hexadecimal Double Word Constant to ACCU 1

+D Add the Double Word Fixed-Points in ACCUy1 and ACCUy2

-D Subtract the Double Word Fixed-Points in ACCUy1 and ACCUy2

Arithmetic: + D

Add the Double Word Fixed-Points in ACCU 1 and ACCU 2

Arithmetic: - D

Subtract the Double Word Fixed-Points in ACCU 1 and ACCU 2

Other: DI

Execute an operation whose code is stored in a formal operand. The number of the formal operand must be stored in ACCU1.

Other: TAK

Swap the Contents of ACCU 1 and ACCU 2

Other: STS

Stop

System Operations: STW

Stop for interrupt processing.

System Operations: UBE

Interrupt block end

System Operations: SIM

Set interrupt mask

System Operations: LIM

Read interrupt mask

Transfer: TNB

Block Transfer 0 to 255 Bytes

Other operations (supplementary operations): IAI

Disable user interrupts:

After processing IAI, the user interrupts are no longer serviced.

Other operations (supplementary operations): RAI

Enable user interrupts:

Cancels the effect of IAE.

Special: ASM

Assembly language program.

Call an assembly language program.

Assembly language programming is outside the scope of PLC WorkShop.

Operands: KB

Constant Byte

Value range: 0-255: KC

Constant Count

Value range: 0-999

: KF

Constant fixed-point number

Value range: -32768 - +32767: KG

Constant floating point number

Value range $\pm 0.1701412 \times 10^{39}$ to $\pm 0.1469368 \times 10^{-38}$: KH

Constant hexadecimal value

Value range 0-FFFF: KM

Constant 2-byte bit pattern

Arbitrary bit pattern: KS

Constant ASCII characters

Two characters: KT

Constant Time

Value range: 0.0 - 999.3: KY

Constant 2 bytes

Load: LY

LY Gx n

Adds the specified offset (n=-32768 to +32767) to the BR register to produce an address in byte-organized global-memory. It then loads the data in the address into accu1.

- GB Loads a byte into the lower half of the low word in accu1.
- GW Loads a word into the low word in accu1.
- GD Loads a double word into accu1.

LY Cx n

Adds the specified offset (n=-32768 to +32767) to the BR register to produce an address in a byte-organized page. It then loads the data in the address into accu1. The page number (0-255) must first be indicated by the ACR instruction.

- CB Loads a byte into the lower half of the low word in accu1.
- CW Loads a word into the low word in accu1.
- CD Loads a double word into accu1.

Load: LW

LW Gx n

Adds the specified offset (n=-32768 to +32767) to the BR register to produce an address in word-organized global-memory. It then loads the data in the address into accu1.

- GW Loads a word into the low word in accu1.
- GD Loads a double word into accu1.

LW Cx n

Adds the specified offset (n=-32768 to +32767) to the BR register to produce an address in a word-organized page. It then loads the data in the address into accu1. The page number (0-255) must first be indicated by the ACR instruction.

- CW Loads a word into the low word in accu1.
- CD Loads a double word into accu1.

Transfer: TY**TY Gx n**

Adds the specified offset ($n=-32768$ to $+32767$) to the BR register to produce an address in byte-organized global-memory. It then transfers the data in accu1 into the address.

GB Loads a byte into the lower half of the low word in accu1.
 GW Loads a word into the low word in accu1.
 GD Loads a double word into accu1.

TY Cx n

Adds the specified offset ($n=-32768$ to $+32767$) to the BR register to produce an address in a byte-organized page. It then transfers the data in accu1 to the address. The page number (0-255) must first be indicated by the ACR instruction.

CB Loads a byte into the lower half of the low word in accu1.
 CW Loads a word into the low word in accu1.
 CD Loads a double word into accu1.

Transfer: TW**TW Gx n**

Adds the specified offset ($n=-32768$ to $+32767$) to the BR register to produce an address in word-organized global-memory. It then transfers the data in accu1 into the address.

GW Loads a word into the low word in accu1.
 GD Loads a double word into accu1.

W Cx n

Adds the specified offset ($n=-32768$ to $+32767$) to the BR register to produce an address in a word-organized page. It then transfers the data in accu1 to the address. The page number (0-255) must first be indicated by the ACR instruction.

CW Loads a word into the low word in accu1.
 CD Loads a double word into accu1.

Load: ACR

Calls the page whose number is indicated in the low word of ACCU1 (0-255)

System Operations: TSC

Add the specified constant to the contents of the BR register and test/set the Busy location addressed on the page opened.

This operation is allowed only in function blocks.

System Operations: TSG

Add the specified constant to the contents of the BR register and test/set the Busy location addressed.

This operation is allowed only in function blocks.

Special: FB DECL

Function Block Declaration

In addition to the header information included in other blocks, a function block header contains the following elements:

Block Name

In addition to a block number, each function block is given a name. The function block name can be from 1 to 8 alphanumeric characters long and helps identify the purpose of the block.

Parameter Declarations

Parameter declarations are a list of variables or formal operands to be used in the block. Instead of referring to a specific value in the program, the value is passed into the function block through a parameter. Within the function block, this value is referenced by its parameter name.

Each parameter in the list is declared or defined using the DECL instruction. It is assigned a parameter type, and, if applicable, a corresponding data type or data format:

```
DECL: Name Parameter-type  
or  DECL: Name Parameter-type,Data-type  
or  DECL: Name Parameter-type,Data-format
```

Parameter Names

The parameter name can be from 1 to 4 characters long and must begin with an alphabetic character.

Parameter Type

Each parameter is assigned one of the following parameter types:

- I = Input
- Q = Output
- D = Data
- B = Block
- T = Timer
- C = Counter

The parameter name and type are separated from each other by a space.

Data Type

If you assign the Input (I) or Output (Q) parameter types, you must also specify which one of the following types of data can be passed to the function:

- BI = Bit
- BY = Byte
- W = Word
- D = Double Word

The data type is separated from the parameter type by a space or a comma. If you use a space, a comma is added when the segment is entered.

Data Format

If you assign the Data (D) parameter type, you must also specify which one of the following data formats are recognized by the function block:

- KM = Binary
- KH = Hexadecimal
- KY = 2 Bytes
- KS = ASCII Text
- KF = Fixed Point
- KG = Floating Point
- KT = Timer Value
- KC = Counter Value

The data format is separated from the data type by a space or a comma. If you use a space, a comma is added when the segment is entered.

The parameter list can contain from 0 to 40 entries. If no entries are made in the parameter list, the function block behaves as a program block except that it has the ability to use the supplementary set of instructions available in function blocks.

Function blocks can be programmed and displayed in ladder or statement list. However, because ladder instructions do not support formal operands, you must program any segments in which you want to use parameters and formal operands in statement list. The total number of function blocks available depends on the PLC being used.

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