

SIEMENS

SIMATIC 505

TISOFT2 Release 6.3

User Manual

Order Number: PPX:TS505-8101-7
Text Assembly Number: 2590576-0007
Seventh Edition

 **DANGER**

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

DANGER is limited to the most extreme situations.

 **WARNING**

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

 **CAUTION**

CAUTION indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury, and/or damage to property.

CAUTION is also used for property-damage-only accidents.

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MANUAL PUBLICATION HISTORY

SIMATIC 505 TISOFT2 Release 6.3 User Manual

Order Manual Number: PPX:TS505-8101-7

Refer to this history in all correspondence and/or discussion about this manual.

Event	Date	Description
Original Issue	02/90	Original Issue (2590576-0001)
Second Edition	05/91	Second Edition (2590576-0002)
Update Package	04/92	Third Edition manual with visible revision bars (2590583-0001)
Third Edition	04/92	Third Edition (2590576-0003)
Fourth Edition	06/93	Fourth Edition (2590576-0004)
Fifth Edition	03/95	Fifth Edition (2590576-0005)
Sixth Edition	03/96	Sixth Edition (2590576-0006)
Seventh Edition	04/98	Seventh Edition (2590576-0007)

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Preface

TISOFT 6.3 Programming Package

Siemens Energy & Automation, Inc., is pleased to announce the release of TISOFT2™ Release 6.3 programming package for SIMATIC 505 controllers. The new features and enhancements of this release are summarized in this Preface.

NOTE: For up-to-the-minute information about the software release and installation guidelines, you may want to look at the README.TXT file, which is accessible from the installation diskettes, before you load the software. You can also access the readme file after installation.

Converting Programs from Earlier Releases

Programs created on releases prior to Release 5.0 of TISOFT software can be converted to use with this release. (Programs created with Release 5.0 or greater do not need to be converted to 6.3.) See Appendix C for details on converting user programs.

Terms in this Manual

The following terms are used in this manual as defined below.

- **Discrete:** Refers to relay ladder logic (RLL) programming; on/off conditions.
- **Batch:** Refers to loop, analog alarm, and/or special function programming.
- **PC:** Refers to personal computers.
- **PLC or controller:** Programmable Logic Controller, such as a SIMATIC™ 545 or 555 (used in TISOFT™ displays).

Controllers Supported

TISOFT2 Release 6.3 can be used with any Series 505™ or Series 500™ programmable logic controller. Controllers supported by TISOFT include the following:

- SIMATIC 520, 520C, 530, 530C, 530T
- SIMATIC 525, 535
- SIMATIC 560/565 (all models)
- SIMATIC 545 (including the 545–1103 or “Lite” controller, identified as “545L” onscreen)
- SIMATIC 555
- SIMATIC 575

New Features and Enhancements

New Features for Release 6.3	This new release of the TISOFT controller-programming software package incorporates several new features and enhancements described in the following pages.
Programming over PROFIBUS-FMS Network	TISOFT now allows you to program over a PROFIBUS network using Fieldbus Message Specification (FMS) network protocol communications. TISOFT can display multiple lists of network nodes you create to select the station you want to program. Each list consists of a network station address and a name that you choose to associate with each station address. (See Appendix J for details.)
PowerMath Support	TISOFT now supports PowerMath™ on SIMATIC 555 and 575 CPUs that are equipped with this feature. PowerMath provides new floating-point math functions and compiled Special Function execution.

Compiled SF execution translates the SF program or subroutine to the native instruction set of the CPU's microprocessor. The compiled code is then executed on the 68882 floating-point math coprocessor whenever the SF program or subroutine is scheduled for execution, making execution several times faster. PowerMath includes the following features:

- New IN-LINE attribute for SFPGM and SFSUB boxes. An SFPGM or SFSUB box instruction can be marked for in-line execution if the SF program or subroutine has been compiled. When power flow is on for an in-line SFPGM or SFSUB box, it executes immediately as part of the ladder scan. The result of the box's execution is available to the next element of the current rung.
- New memory type allocation: Compiled Special (CS) memory.
- Two instructions have been added to SF programs and SF subroutines: Integer IF (IIF) and Pet Scan Watchdog (PETWD).
- The math operators: logical AND, logical OR, comparisons, and absolute value (ABS), are now allowed in integer math.
- Support of unsigned 16-bit integer and "long" (32-bit) signed operands is allowed where expressions are allowed. An unsigned integer operand is identified with a "U" suffix, for example, V105U or 32768U, and has a range of 0 to 65,535. A long integer operand is identified with an "L" suffix, for example, K15L or -200L, and has a range of -2,147,483,648 to 2,147,483,647.

Refer to the *Release Notes for SIMATIC 575-2105 and 575-2106, Firmware Rel. 5.0 (2807266-0001)* for a full description of PowerMath.

Additional Features
and Enhancements
of TISOFT
Release 6.3

TISOFT provides the following additional features and enhancements:

- TISOFT now supports 115.2 and 57.6 K baud rates on the serial ports of SIMATIC 555 and 575 CPUs equipped with these baud rates.
- Math box instructions now show the relationship between parameters.
- A new AUX function, Memory Availability, displays the number of bytes configured, used, and available for L, CL, S, and CS memories.
- In Memory Configuration, TISOFT now provides a message to confirm changing from Run mode to Program mode (and back to Run mode) when writing a new configuration to the controller in Run mode.
- TISOFT now provides a confirmation message when writing a 505 I/O configuration online to the controller in Run mode.
- SF expression operators have changed to support word and long word operations: WAND is now "&", WOR is now "|", and WXOR is now "^".
- The SFSUB box parameter string length limit has increased from 20 to 40 characters.
- TCC/TCP synonyms in timer and counter boxes are now displayed.
- VMM, VMS, and G-Memory data types in LOOP, ALARM, SF programs and SF subroutines are now supported (575 only).
- A new Recover function (RECOVR-F8) in documentation recovers excess file space used by comments or synonyms by rebuilding the comment or synonym program files.

Features from
Releases after 6.0

The following features were added to releases of TISOFT after 6.0:

- Programming over an Ethernet network using the TCP/IP protocol and the PPX:505-CP2572 module is supported. (See Appendix I for details.)
- The startup screen now offers a function, HINTS-F2, that lists useful key combinations for TISOFT operations.
- TISOFT now allows you to interrupt communications (by pressing **ALT** + C) to minimize the long wait that you might experience during a normal communications timeout on the communication ports (such as when operating over modems).
- All Find operations can now be invoked with **CNTL** + F as well as from the FIND function key.
- Bit-of-word has been added to the Find operation in relay ladder logic.

New Features and Enhancements (continued)

- The SF DCP format has been changed to correspond to the format that is used elsewhere in ladders (from DxxxxSyy to DCPxxxx.yy).
- The load size of TISOFT has been reduced.
- The speed of Aux loads to the controller for L-memory, V-memory, and K-memory types has been increased when large amounts of space or variables are unused.
- When you change your password, TISOFT prompts you to supply the current password, even if you have already used the password to log on.
- Flexibility in choosing modules for a PROFIBUS-DP slave, such as a COROS operator panel, is enhanced. A secondary function key line has been added to the PROFIBUS-DP I/O configuration edit function.
- A load-only version of TISOFT is provided. The load-only version is just like the read-only version, except that the following Aux functions are allowed: Aux 10, 11, 12, 13, 20, 81, 86, 90, 98, and 99.
- The PROFIBUS-DP merge operation, which merges the COM PROFIBUS binary file with the selected program on disk when you are configuring PROFIBUS-DP I/O, is available online as well as offline.
- The H1 and TCP network error messages now contain an additional error code that provides more detailed error information.
- TISOFT now forces the H1TC and TCTCP drivers to reread the list of network names every time TISOFT goes online. This ensures that TISOFT always has the most up-to-date list. TISOFT no longer uses network names from the command line of the driver.

Functionality Not Supported by TISOFT

The following functions which are available in certain controller models are not supported by this release of TISOFT:

- Automatic tuning of loops.
- More than 64 loops.
- More than 128 analog alarms.

Safety Considerations

Overview

A programmable controller is a programmed system. When you create or modify the control program, you must be aware that your program affects control actions that manipulate physical devices. If the program contains errors, these errors can cause the controlled equipment to operate in unpredictable ways. This could cause harm to anyone who uses the equipment, damage to the controlled equipment, or both. You must ensure that the control program is correct before you introduce it to the operational environment of the controlled process. Read this section carefully before you create or modify the control program.

Failure of the Control System

The Series 500 and Series 505 controllers are highly reliable systems. However, you must be aware that these systems can fail. If a failure occurs, and if the control system is able to respond to the failure, the controller enters the Fatal Error mode. The Fatal Error mode sets all the discrete outputs to zero (off) and freezes all the word outputs at their values when the failure was detected. Your control system design must take the Fatal Error mode into consideration and ensure that the controller environment can react safely if a Fatal Error occurs.

WARNING

It is possible that the system could fail without being able to execute the Fatal Error actions. It is also possible for the system to continue to operate while producing incorrect results.

Operating and producing incorrect results could cause unpredictable controller behavior that could result in death or serious injury to personnel, and/or damage to equipment.

You must provide for manual overrides in those cases where operator safety could be jeopardized or where equipment damage is possible because of a failure. Refer to the Safety Guidelines section in the *SIMATIC 545/555/575 System Manual* or other hardware system manual.

NOTE: Some user program errors can also cause the controller to enter the Fatal Error mode. Examples include corruption of SF instruction control blocks retained in V-memory (all systems supporting SF programming).

Safety Considerations (continued)

Inconsistent Program Operation

You must ensure the correctness of your control program before you introduce it to the controlled process. An incorrect control program can cause the process to act incorrectly or inconsistently. Although any number of programming errors can cause control problems, one of the more subtle problems occurs with the incorrect assignment of instruction numbers for box instructions that have retained state information. The timer, counter, and drum instructions are examples of these instructions. The chapter about Controller Memory in the *SIMATIC 545/555/575 Programming Reference Manual* (PPX:505–8204–x) lists the various memory areas in the controller where retained state information is maintained; it also lists the restrictions that exist in assigning instruction numbers for the boxes that reference these areas. You must design your program to accommodate these requirements.

WARNING

Incorrect assignment of instruction numbers for retained state instructions could result in inconsistent controller action.

If this occurs, it could cause unpredictable controller action that could result in death or serious injury and/or damage to equipment.

You must ensure that instruction numbers are assigned uniquely for boxes with retained state information. Refer to the chapter about Controller Memory in the *SIMATIC 545/555/575 Programming Reference Manual*.

Editing an Active Process

Performing edits on an active process involves a number of considerations that are detailed in the section called “Doing Run-Time Program Edits” in the chapter of the *SIMATIC 545/555/575 Programming Reference Manual* that is about Programming Concepts. You must read and fully understand this information before you make any edits to the control program of an active process.

WARNING

Incorrect application of run-time edits could cause the controller to transition to the program mode, freezing both discrete and word outputs at their current status.

This could cause failure of the process that could result in death or serious injury and/or damage to equipment.

Avoid doing run-time edits if you can. If you cannot avoid doing a run-time edit, then ensure that you have read and fully understood the “Doing Run-Time Program Edits” section in the Programming Concepts chapter of the *SIMATIC 545/555/575 Programming Reference Manual*, and that your edits conform to the requirements of that section.

Additional Information

Software Compatibility	TISOFT is a DOS program and runs best in a DOS operating system. You may experience problems communicating with the controller when you are running TISOFT in a Windows® 95 environment. If this happens, restart your computer in MS-DOS mode for all on-line TISOFT operations.
Related Manuals	<p>Refer to the following manuals, as needed, for additional information:</p> <ul style="list-style-type: none">• <i>SIMATIC 545/555/575 System Manual</i> (PPX:505-8201-x) for hardware system information on current model controllers.• <i>SIMATIC 545/555/575 Programming Reference Manual</i> (PPX:505-8204-x) for programming information on current model controllers.• <i>SIMATIC TI505 Programming Reference User Manual</i> (PPX:505-8104-x) for programming information on earlier model controllers.• <i>SIMATIC S5 ET 200 Distributed I/O System Manual</i> (PPX:505-8206-x) for information on COM PROFIBUS.• <i>SIMATIC TI505 SINEC H1 Communication Processor User Manual</i> (PPX:505-8126-x) for information on operating and configuring the SINEC H1 CP module.• <i>SIMATIC 505 Ethernet TCP/IP Communication Processor (505-CP2572) User Manual</i> (PPX:505-8132-x) for information on setting up and operating the TCP/IP module.• <i>SIMATIC 505 PROFIBUS-FMS Communications Processor User Manual</i>, (PPX:505-8129-x) for information on operating and configuring the FMS CP module.
Technical Assistance	<p>For technical assistance, contact your Siemens Energy & Automation, Inc., distributor or sales office. If you need assistance in contacting your distributor or sales office in the United States, call 800-964-4114.</p> <p>For additional technical assistance, call the Siemens Technical Services Group in Johnson City, Tennessee at 423-461-2522, or contact them by e-mail at simatic.hotline@sea.siemens.com. For technical assistance outside the United States, call 49-911-895-7000.</p> <p>You can also find information about Siemens automation products at our website at http://www.aut.sea.siemens.com.</p>

Chapter 1

Installing TISOFT Release 6.3

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1.1 Programming Device Requirements

Hardware Requirements	TISOFT 6.3 runs on any IBM®-compatible PC, with MS-DOS 6.0 or higher and a 386 or higher. The PC must have a 3.5-inch floppy disk drive and an RS-232 serial communications port, and meet the system requirements specified in Table 1-1.
Memory Requirements	TISOFT requires 540K bytes of available conventional system memory in order to be executed. In addition, for off-line operation and on-line operations such as Block Put PC-to-Disk and Configure Memory Write-to-Disk, additional system memory is needed according to the amount of ladder memory configured. For each 4K bytes of ladder memory configured above 16K bytes, 4K bytes of system memory must be available.

NOTE: Your PC may require expanded memory configuration for certain applications. Refer to page 1-3 for information on expanded memory.

When TISOFT is used with H1, TCP/IP, or FMS networks, or with COM PROFIBUS, system memory requirements increase further. Some of these software programs require Windows 3.1 or Windows 95. See Table 1-1.

Table 1-1 Expanded System Requirements

Software Program	Windows	Total RAM	Conv. RAM	Disk Space
TISOFT software	Not needed	2 Mbytes	520 Kbytes	2.5 Mbytes
TISOFT program data	—	—	—	8 Mbytes
TISOFT H1, TCP, or FMS network driver	Not needed	—	25 Kbytes	—
COM PROFIBUS	3.1 or Win95	8 Mbytes	560 Kbytes	10 Mbytes
H1 Configurator for 505-CP1434TF module	3.1	—	40 Kbytes ¹	5 Mbytes
CP 1413 Configuration tools/driver	3.1	—	22 Kbytes	—
TCP Network Configuration s/w	DOS or 3.1 ¹	8 Mbytes	32 Kbytes ¹	5 Mbytes
TCP Module Configuration tool (IPSET)	Not needed	—	—	—
FMS CP 5412 (A2) Card configuration s/w	DOS or 3.1	1 Mbytes	64 Kbytes ¹	5 Mbytes
FMS CP COM5434 Configurator ²	Windows 95	8 Mbytes	—	3.5 Mbytes

¹Requirements may differ depending on the version you choose.
²The COM5434 Configurator software for the 505-CP5434-FMS module requires a 486 or greater processor.

Expanded Memory
in DOS

TISOFT requires the use of expanded memory when large programs are used off-line. Follow these steps to check your computer memory:

1. To determine if your PC has expanded memory, type **MEM** at the DOS prompt and press **Return**. If expanded memory (EMS) is not listed, your PC does not have it.
2. To obtain expanded memory, type one of the following groups of two-line commands in the C:\CONFIG.SYS file:

```
DEVICE=C:\WINDOWS\HIMEM.SYS  
DEVICE=C:\WINDOWS\EMM386.EXE ON
```

or

```
DEVICE=C:\DOS\HIMEM.SYS  
DEVICE=C:\DOS\EMM386.EXE ON
```

3. Reboot your PC and repeat the MEM command to confirm that expanded memory is now listed.

Expanded Memory
in Windows 95

TISOFT requires the use of expanded memory when large programs are used off-line. After installing TISOFT as described in section 1.4, use the following procedure to determine if your PC has expanded memory. (If necessary, refer to pages 1-8 and 1-9 for the procedures on creating a shortcut icon for TISOFT and accessing the Properties dialog.)

1. Select the TISOFT icon with a single click.
2. With the mouse cursor on the selected TISOFT icon, click the right mouse button to access the pop-up menu, and select "Properties" as shown in Figure 1-7. A TISOFT Properties dialog appears.
3. Click the "Memory" tab in the TISOFT Properties dialog.
4. Look at the "Expanded (EMS) memory" field. If it is grayed out, your PC does not have expanded memory.
5. To obtain expanded memory, exit to a DOS prompt and type the following two lines in the C:\CONFIG.SYS file:

```
DEVICE=C:\WINDOWS\HIMEM.SYS  
DEVICE=C:\WINDOWS\EMM386.EXE ON
```

6. Reboot your PC and repeat the procedure above (through step 4) to check the expanded memory field in the TISOFT Properties dialog.

1.2 Cable Requirements

Cable Pinouts for RS-232-C Ports

Connect your programming device to the controller with a double-shielded null modem RS-232-C cable. Figure 1-1, Figure 1-2, and Figure 1-3 show pinouts for the RS-232-C cables.

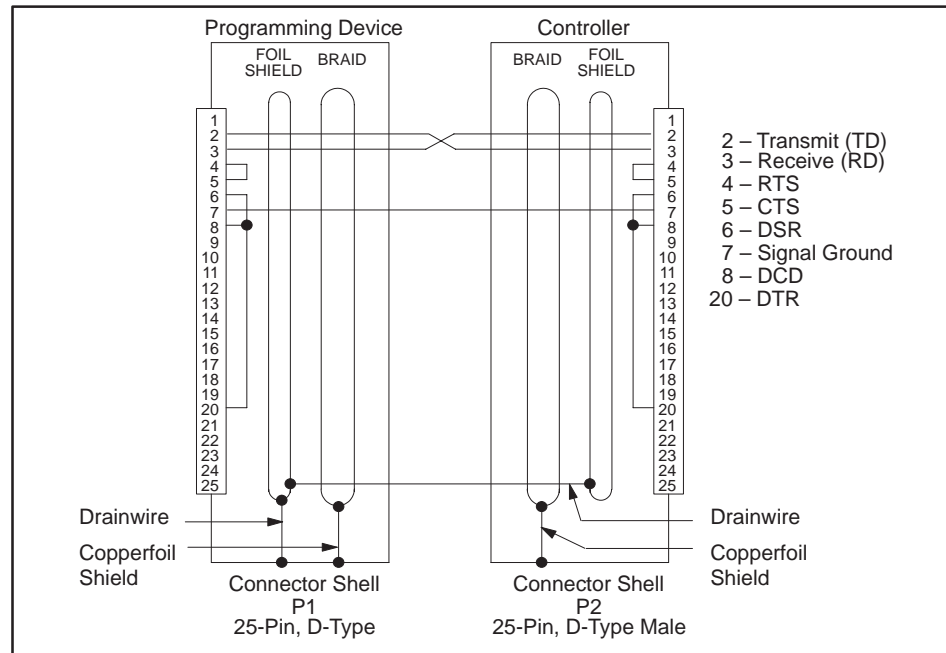


Figure 1-1 RS-232-C 25-Pin to 25-Pin Cable

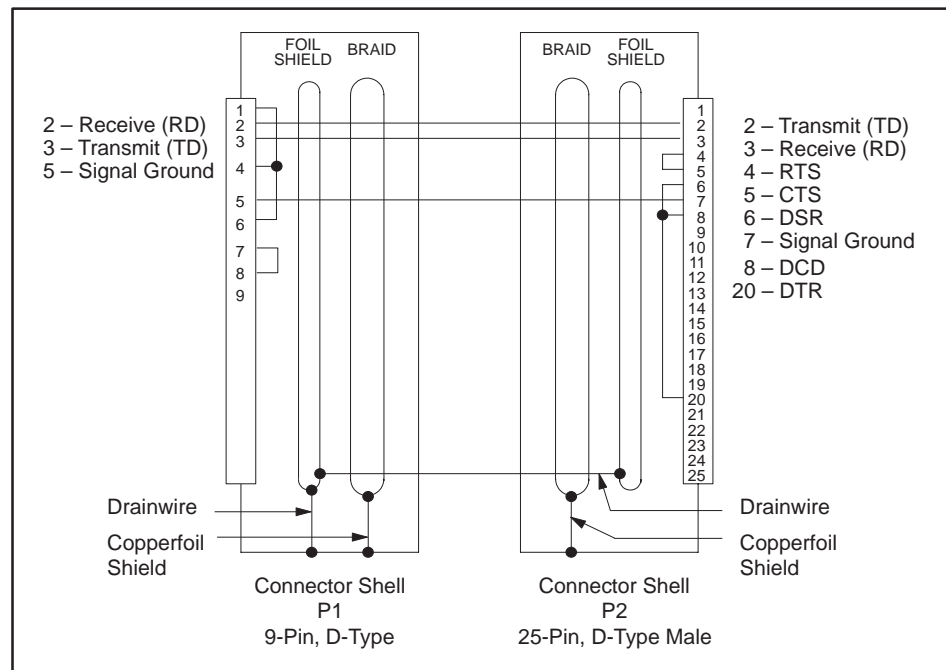


Figure 1-2 RS-232-C 9-Pin to 25-Pin Cable

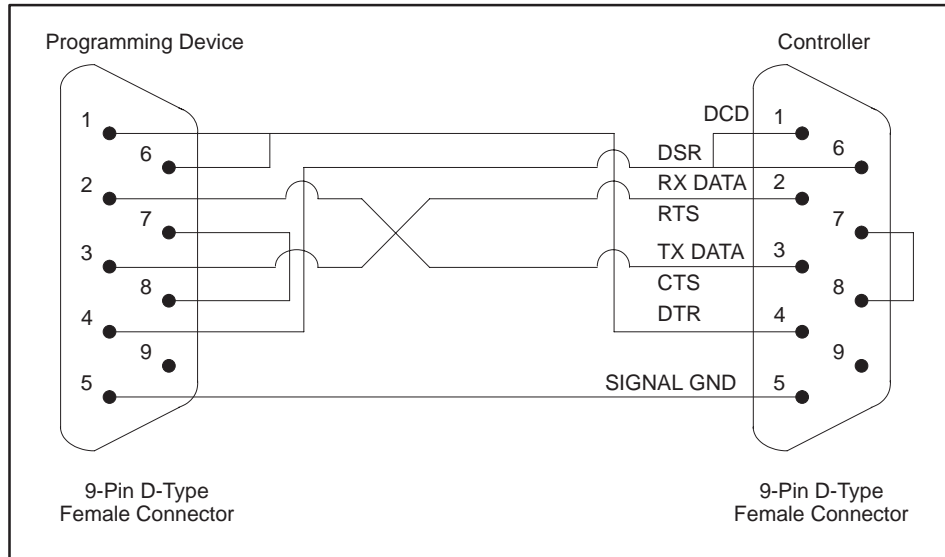


Figure 1-3 RS-232-C 9-Pin to 9-Pin Cable

Cable Pinouts for RS-422 Ports

If your controller has an RS-422 port, you can connect through the RS-422 port on your programming device. Use the pinout values shown in Figure 1-4 for the RS-422 cable.

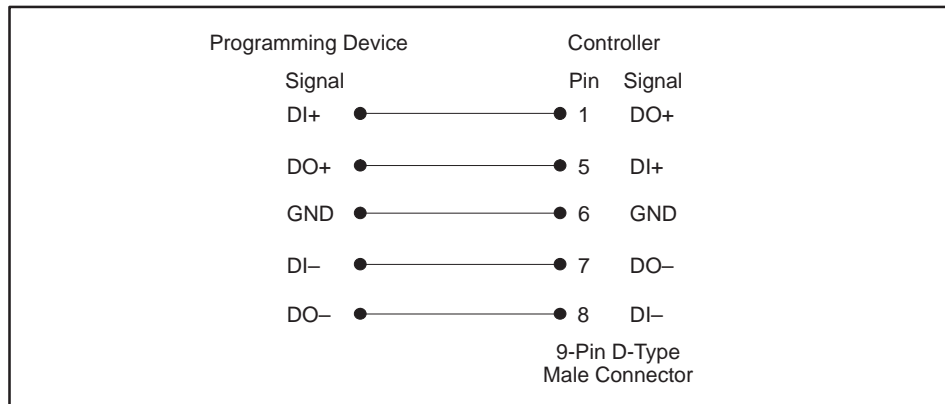


Figure 1-4 RS-422 Pin Values

1.3 Installing TISOFT in MS-DOS

Checking PC Memory Available

Your TISOFT kit contains two 3.5-inch TISOFT programming disks. Use the MS-DOS® MEM and CHKDSK commands to make sure you have 540K bytes of conventional system RAM available and 3.0 megabytes of hard-disk space available to load TISOFT. (Additional space is required for RLL program storage.)

Installing TISOFT Programming Software

After checking memory available, complete the steps listed below to load TISOFT onto the fixed disk.

NOTE: If you need 5.25-inch disks, use the MS-DOS COPY command to duplicate the 3.5-inch disks.

1. Insert the disk labeled #1 into the 3.5-inch drive.
2. Type in the drive letter followed by a colon (**A:** or **B:** or the letter for the drive you are using). Press **[Return]**.
3. At the prompt, type **\INSTALL** and press **[Return]**.
4. Follow the step-by-step instructions on-screen to complete the installation.

Installing TISOFT Upgrade Programming Software

If this is an upgrade kit of TISOFT, follow the steps listed below.

1. Set the DOS default directory to the directory where your current TISOFT executable resides. (For example, type: **CD C:\TI [Return]**.)
2. Insert disk #1 into the appropriate drive and type the drive letter followed by **INSTALL**. (For example, insert the 3.5-inch disk in drive A and type: **A:\INSTALL [Return]**.) Continue with the remaining disks as instructed on the screen.

The upgrade package will automatically install itself by overwriting the earlier release of TISOFT, while leaving your program files intact; when the upgrade is complete, the DOS prompt is re-displayed.

1.4 Installing TISOFT in Windows 95

Installing TISOFT Programming Software in Windows 95

For Windows 95, you can use the following procedure to install TISOFT, as shown in Figure 1-5.

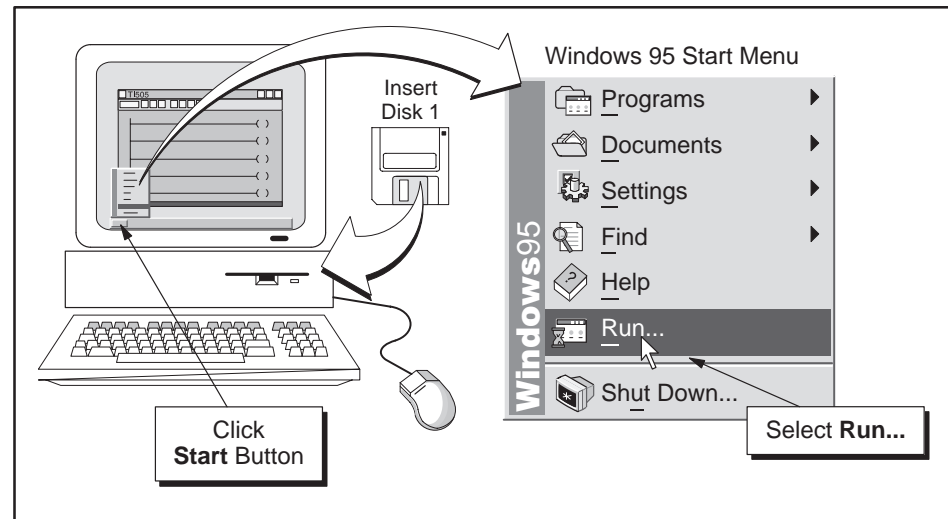


Figure 1-5 Installing TISOFT in Windows

1. Insert Disk 1 in your computer.
2. Click the **Start** button to open the Windows 95 menu.
3. Click on the **Run...** menu item.
4. In the Run dialog, type: **A: \INSTALL**
5. Click on "OK" or press **Return** to start the setup procedure.
6. Follow the on-screen prompts to complete the installation.

NOTE: TISOFT may encounter communication timeout problems with your programmable controller when running from the Windows 95 desktop, depending on the configuration of your particular computer and/or the programs or applications running at the same time as TISOFT.

For suggestions on minimizing problems when running TISOFT under Windows 95, see Appendix K. If you experience any such problems, restart your computer in MS-DOS mode (the Shut Down dialog from the Windows 95 Start menu provides this option), and start TISOFT as described in Section 1.5. Another way to run TISOFT in MS-DOS mode is described in Appendix K. Running TISOFT in MS-DOS mode optimizes communications and performance.

Installing TISOFT in Windows 95 (continued)

Creating a TISOFT Shortcut Icon on Your Desktop

You can add a TISOFT icon on your Windows 95 desktop that starts TISOFT in a DOS window simply by double-clicking the icon.

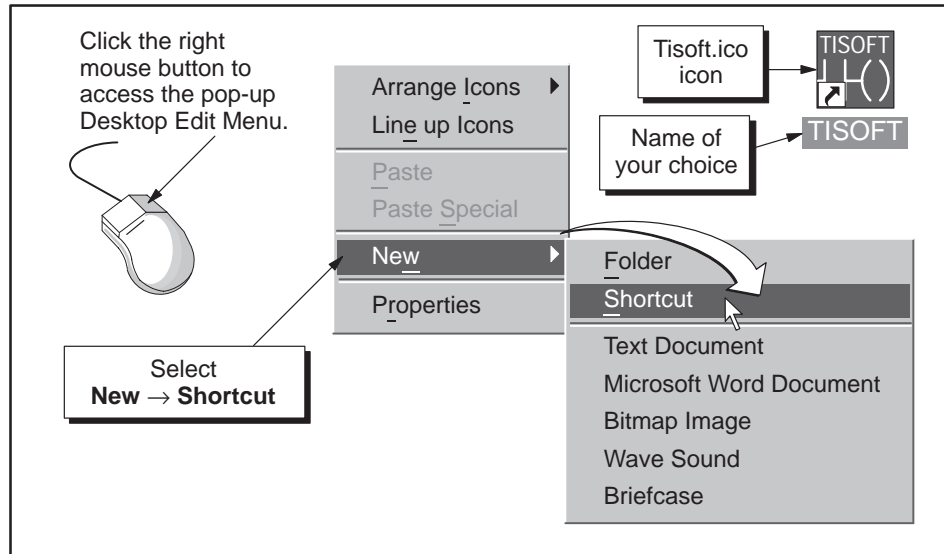


Figure 1-6 Creating a TISOFT Shortcut Icon for Your Windows Desktop

Follow these steps to add the shortcut icon:

1. With the mouse cursor anywhere within the desktop background, click the right mouse button to access the Windows desktop edit menu.
2. Select **New** → **Shortcut**, as shown in Figure 1-6. A Create Shortcut “wizard” dialog appears. This wizard guides you through the steps needed to create the shortcut icon.
3. In the “Command line” field, type `C:\TI\Tisoft.ico` if that is the directory location of your installed TISOFT, or click the “Browse...” button to locate the **Tisoft.ico** icon. (In the “Files of type” field, click the list arrow and select “All Files.”) Select the Tisoft.ico file and click on “Open.” (The file path appears in the Command line field.)
4. Click the “Next >” button, give the icon a name (for example, “TISOFT”), and click “Finish.”

If your programming cable is connected to port 2 on your PC, you can set TISOFT to communicate over port 2 by following these steps:

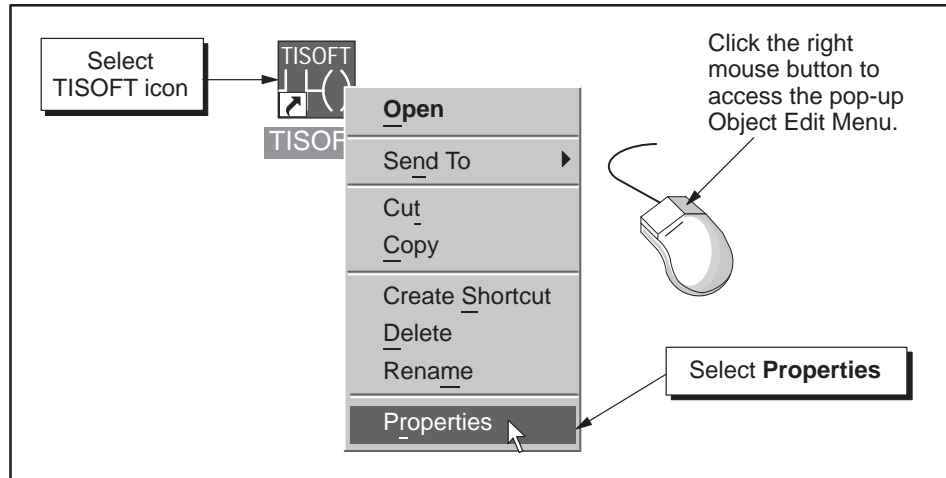


Figure 1-7 Accessing TISOFT Properties Dialog

1. Select the TISOFT icon with a single click.
2. With the mouse cursor on the selected TISOFT icon, click the right mouse button to access the pop-up menu, and select “Properties” as shown in Figure 1-7. A TISOFT Properties dialog appears.
3. Click the “Program” tab in the TISOFT Properties dialog.
4. In the “Cmd line” field, enter the port number in the path. For example, the command line might read:

```
C:\TI\TI505.BAT p2
```

5. Click on “OK.”

Now every time you double-click on the TISOFT shortcut icon, TISOFT establishes communications automatically over port 2.

6. For other settings in the TISOFT Properties dialog, refer to Section K.2 in Appendix K.

1.5 Starting TISOFT

Selecting TISOFT Operating Software Options

After TISOFT is installed, you are ready to select the TISOFT operating software you need. The listing below defines the command options available.

- *TI505* – selects main TISOFT operating software and proceeds to start-up screen.
- *TIXREF* – selects print cross-reference and proceeds to start-up screen.
- *TICON* – selects and runs the file conversion program. See Appendix C for details on this upgrade procedure.
- *TI505 CVU* – selects TISOFT online to TIWAY using the CVU Host Adapter Card. See Appendix E for information on setting up TIWAY communications.
- *TI505 H1* – selects TISOFT online over an H1 Ethernet network using the SINEC H1 Communication Processor (PPX:505-CP1434TF). See Appendix G for information on setting up H1 communications.
- *TI505 TCP* – selects TISOFT online over an Ethernet network using TCP/IP protocol and the PPX:505-CP2572 TCP/IP module. See Appendix I for information on setting up TCP/IP communications.
- *TI505 FMS* – selects TISOFT online over a PROFIBUS network using Fieldbus Message Specification (FMS) protocol and the CP5434-FMS module. See Appendix J for information on FMS communications.
- *RO505* – selects the read-only version of TISOFT.
- *LO505* – selects the load-only version of TISOFT (similar to the read-only version, but allows Aux 10, 11, 12, 13, 20, 81, 86, 90, 98, 99).

Using PC Port 1

To use COM1, type in the command for the TISOFT operating software you selected from the list above (e.g., *TI505*) and press **Return** to invoke TISOFT.

Using PC Port 2

To use COM2, type in the command for the TISOFT operating software you selected from the list above, followed by the port number (e.g., *TI505 P2*). Then press **Return** to invoke TISOFT.

Using PC TIWAY Adapter Card

To use a PC TIWAY Adapter Card (PPX:2587716-8011) with TISOFT, type in the command for the TISOFT operating software you selected from the list above, followed by *CVU* (e.g., *TI505 CVU*), and press **Return** to invoke TISOFT. (Refer to Appendix E.)

-
- Using H1 Network** To use H1 network with TISOFT, type in the name of the TISOFT operating software you selected from the list above, followed by *H1* (e.g., **T1505 H1**) and press **Return** to invoke TISOFT. (Refer to Appendix G.)
- Using TCP Communications** To use the TCP network with TISOFT, type in the name of the TISOFT operating software you selected from the list above, followed by *TCP* (e.g., **T1505 TCP**) and press **Return** to invoke TISOFT. (Refer to Appendix I.)
- Using FMS Communications** To use FMS communications over the PROFIBUS network with TISOFT, type in the name of the TISOFT operating software you selected from the list above, followed by *FMS* (e.g., **T1505 FMS**) and press **Return** to invoke TISOFT. (Refer to Appendix J.)
- Displaying the Start-up Screen** After you enter the TISOFT operating software selection you wish to use, the Start-up Screen is displayed as shown in Figure 1-8.
- From the Start-up Screen, you can choose on-line or off-line operation, color, and programs. You can also select **HINTS-F2** to display a list of useful key combinations for TISOFT operations. Refer to Chapter 2 for instructions on using these options.

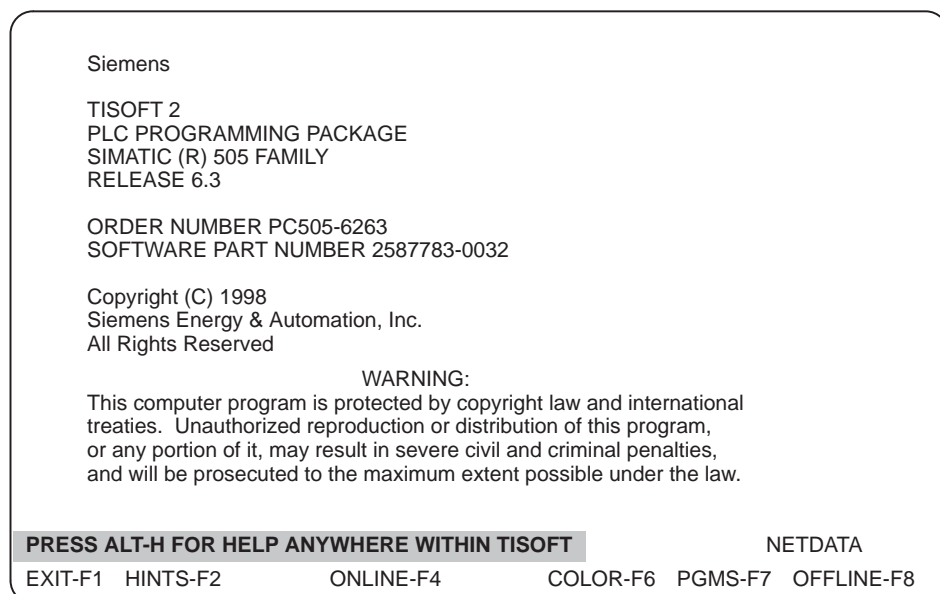


Figure 1-8 TISOFT Start-up Screen

Starting TISOFT in Windows

If you have created a TISOFT shortcut icon as described on page 1-8, you can start TISOFT by double-clicking on the icon. TISOFT appears in a window, as shown in Figure 1-9.

Figure 1-9 also shows some of the frequently used buttons. You can select full-screen display of TISOFT, which provides an easier-to-read display and a faster display update (for example, in status mode), by clicking the Full Screen button shown. To return to the Window view, press **ALT** + **Return**. This key sequence toggles between full-screen view and Window view.

The Properties button provides another way to access the TISOFT Properties dialog described on page 1-9.

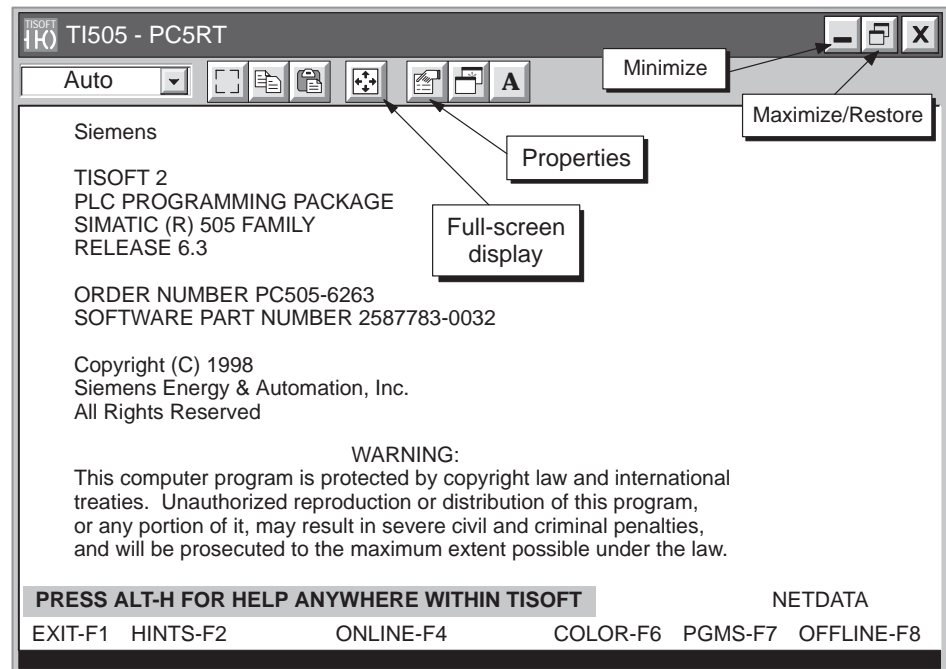


Figure 1-9 TISOFT Running in Windows

Setting up the TISOFT Environment

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2.1 Configuring Color Option

Configuring Colors You have the option of configuring the colors for your TISOFT screens. You can select colors for background and foreground of the displays, messages, cursor, and error messages. The range and shades of your colors depend upon the graphics adapter card and monitor you have. Colors discussed in this section are available with the CGA, EGA, and VGA display standards and a color monitor. If your color selections are different, check the documentation for your particular monitor and graphics adapter card.

Accessing Color Option To access the menu for configuring color on your TISOFT displays, press **COLOR-F6** at the Start-up Screen. You receive the color configuration menu as illustrated in Figure 2-1.

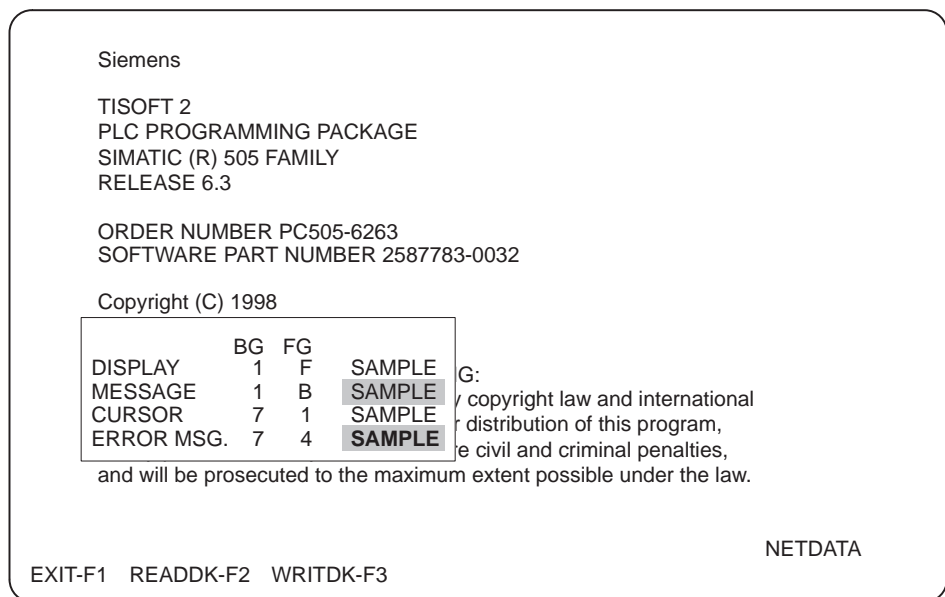


Figure 2-1 Color Configuration Menu

Selecting TISOFT
Colors

You can select foreground and background colors on your TISOFT displays from the following list. Enter the number or letter beside your color selection on the menu.

0 - Black	8 - Gray
1 - Blue	9 - Light Blue
2 - Green	A - Light Green
3 - Cyan	B - Light Cyan
4 - Red	C - Light Red
5 - Magenta	D - Light Magenta
6 - Brown	E - Yellow
7 - White	F - Bright White

The numbers 0 through 7 are valid for background colors; 0 through F are valid entries for foreground colors.

Assigning Color
Selections

The menu shows a sample of the color corresponding to each number that you type in. When the menu is displayed, the cursor is in the background (BG) field for display color. Complete the steps below to enter your color selection on the configuration menu.

1. Type in the number of the color that you want the display background.
2. Use the right arrow key to move the cursor to the foreground (FG) field.
3. Type in the color number or letter (0 through 9 and A through F).
4. Press **Return** or the arrow key to position the cursor in the next field.
5. Repeat steps 1 – 4 until you have completed the color selection.
6. Press **WRITDK-F3** to save the new color configuration to disk, or press **READDK-F2** to revert to the default colors or to previously saved color values.
7. Press **EXIT-F1** or **Esc** to return to the start-up screen and activate your color configuration.

NOTE: If you do not save your new color configuration with **WRITDK-F3**, the color values will return to the default settings when you exit and restart TISOFT. This allows you to experiment with color combinations and still be able to revert to the default color scheme.

2.2 Managing Program Files

The Program Management System (PGMS) feature in TISOFT enables you to store and use multiple programs and related functions, such as creating directories, deleting programs and related files, and formatting diskettes, within TISOFT. The PGMS function is available from the Start-up Screen, Block Put, and AUX functions.

TISOFT always shows the current program name on the status display line of the screen. The default program is the one used in the last session.

You may store your programs in a single directory; however, if you have more than one series of SIMATIC controllers or if you have numerous application programs, you may find it helpful to create a different subdirectory for each controller type or each large segment of your application.

Basic Features of the PGMS System

A TISOFT program is a group of files with the same name but with different extensions. A program or directory name can be up to eight characters long. Two screen configurations are available to work with programs: the Program Selection screen, shown in Figure 2-2, and the Directory Selection screen, shown in Figure 2-3.

Both screens have a PATH line showing the current directory where TISOFT looks for the selected program. Both screens also have a TISOFT PROGRAMS sub-window containing a list of all programs in the current directory.

The TISOFT Program Selection screen contains the **FILENAME** prompt where program names can be typed. The FLDTGL-F6 key toggles the field cursor between the TISOFT PROGRAMS sub-window and the **FILENAME** prompt. Inside the sub-window, the arrow keys, PageUp, PageDn, Home, and End keys are used to move the cursor. (See Figure 2-2.)

The TISOFT Directory Selection screen contains the **DIRECTORY PATH** prompt where directory names can be typed. The FLDTGL-F6 key toggles the field cursor between the **DIRECTORY** sub-window and the **DIRECTORY PATH** prompt. Inside the sub-window, the arrow keys, PageUp, PageDn, Home, and End keys are used to move the cursor. Letters followed by colons are drives. (See Figure 2-3.)

NOTE: If you select the field containing two dots (. .), pressing **Return** allows you to go back to the next higher directory level.

At the TISOFT Start-up Screen, press PGMS-F7 to display the Program Selection screen shown in Figure 2-2.

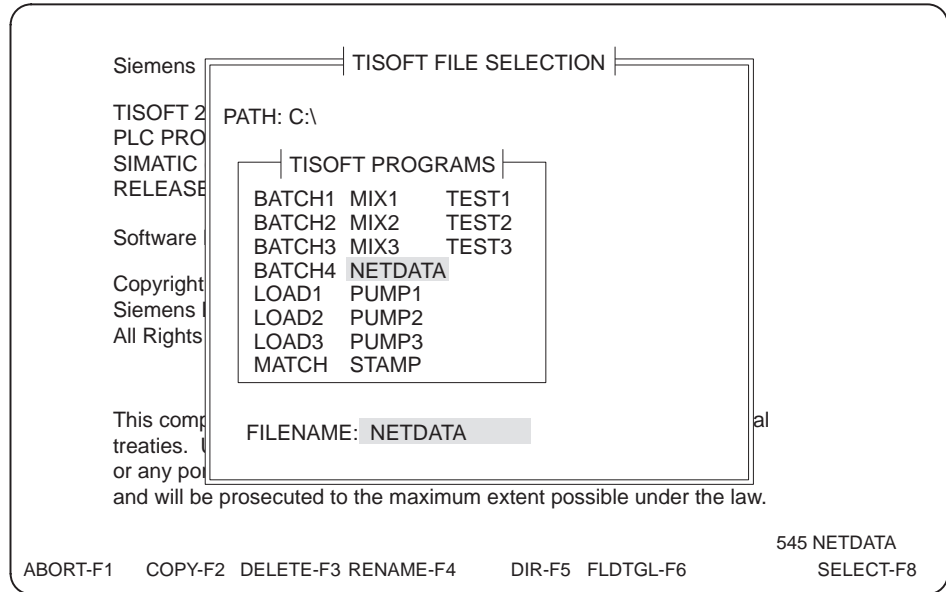


Figure 2-2 PGMS Program Selection Screen

Once the Program Selection screen is displayed, press DIR-F5 to access the Directory Selection screen shown in Figure 2-3.

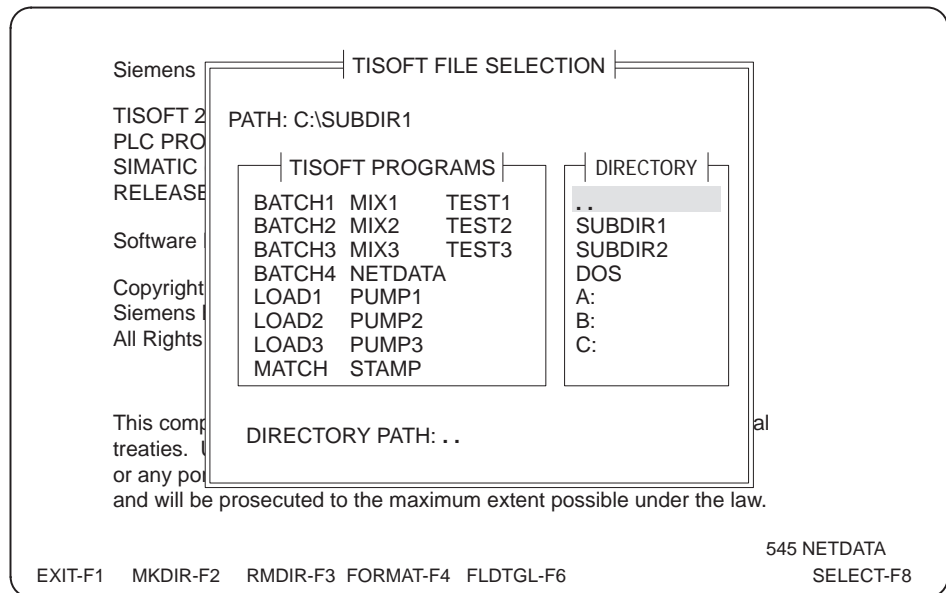


Figure 2-3 PGMS Directory Selection Screen

Managing Program Files (continued)

The PGMS subsystem of TISOFT allows you to execute a variety of DOS-related functions using screen menus and function keys without the need to exit TISOFT and return to DOS. The following sections describe the functions available in PGMS and how to use them.

Selecting a Drive

To select a drive, follow these steps.

1. Press **DIR-F5** from the Program Selection screen.
2. Move the field cursor with the up/down arrows to select the drive letter you want, or press **FLDTGL-F6** and type the drive letter and colon at the **DIRECTORY PATH** prompt.
3. Press **SELECT-F8** or **Return**. The drive and default directory appear in the **PATH:** line and the sub-windows are updated to reflect the new current drive and directory path.
4. Press **EXIT-F1** or **Esc** to get back to the Program Selection screen.

Creating a New Directory

To create a new directory, follow these steps.

1. Press **DIR-F5** from the Program Selection screen.
2. Press **FLDTGL-F6** to move the field cursor to the **DIRECTORY PATH** prompt.
3. Type the new directory name or path.
4. Press **MKDIR-F2**. The new directory appears in the **DIRECTORY** sub-window.
5. Repeat steps 2 to 4 as needed to create your directory structure.
6. Press **EXIT-F1** or **Esc** to get back to the Program Selection screen.

Removing a Directory

To remove a directory, follow these steps. (The directory must be empty to be deleted.)

1. Press **DIR-F5** from the Program Selection screen.
2. Move the field cursor in the **DIRECTORY** sub-window with the up/down arrows to select the directory you want to delete.
3. Press **RMDIR-F3**. The directory is removed from the **DIRECTORY** sub-window.
4. Press **EXIT-F1** or **Esc** to get back to the Program Selection screen.

Selecting a Directory

To select an existing directory, follow these steps.

1. Press **DIR-F5** from the Program Selection screen.
2. Move the field cursor in the **DIRECTORY** sub-window with the up/down arrows to select the directory you want.
3. Press **SELECT-F8** or **Return**. The new current directory appears in the **PATH** line and the sub-windows are updated to reflect the contents (if any) of the selected directory.
4. Press **EXIT-F1** or **Esc** to get back to the Program Selection screen.

Formatting a Floppy Disk

To format a floppy disk, follow these steps.

NOTE: Formatting totally erases any data on a disk.

1. Press **DIR-F5** from the Program Selection screen.
2. Select the appropriate drive in the **DIRECTORY** sub-window.
3. Press **FORMAT-F4** and follow the directions shown on the screen.
4. Press **EXIT-F1** or **Esc** to get back to the Program Selection screen.

Creating a New Program Name

To create a new program name to contain a new program, follow these steps.

1. Select the directory path where the new program is to reside. (See **Selecting a Directory**.)
2. Press **FLDTGL-F6** to move the field cursor to the **FILENAME** prompt.
3. Type the new program name.
4. Press **SELECT-F8** or **Return**. The program function is exited and the new program name appears on the lower right status line.
5. When you access **TISOFT** on-line or off-line to enter or edit a new program, it is saved under the new program name.

Managing Program Files (continued)

Selecting a Program

To select an existing program, follow these steps.

1. Select the directory path where the program resides. (Refer to Selecting a Directory.)
2. Move the field cursor in the TISOFT PROGRAMS sub-window to select the program you want, or type the name at the **FILENAME** prompt.
3. Press **SELECT-F8** or **[Return]**. The program function is dismissed and the selected program name appears on the lower right status line.

Deleting a Program

To delete an existing program, follow these steps.

NOTE: Chart, table and certain other files are not part of the program and are not copied, deleted, or renamed when the program is. See Appendix K for a list of program and non-program files.

1. Select the directory path where the program resides. (See Selecting a Directory.)
2. Move the field cursor in the TISOFT PROGRAMS sub-window to select the program you want to delete, or type the name at the **FILENAME** prompt.
3. Press **DELETE-F3**. The prompt **DELETE <filename>?** appears.
4. Press **YES-F2**. The program is removed from the TISOFT PROGRAMS sub-window. **NO-F1** aborts the operation.

Renaming a Program

To rename an existing program, follow these steps.

1. Select the directory path where the program resides. (See Selecting a Directory.)
2. Move the field cursor in the TISOFT PROGRAMS sub-window to select the program you want, or type the name at the **FILENAME** prompt.
3. Press **RENAME-F4**. The prompt **RENAME TO:** appears.
4. Type in the new program name and press **ENTER-F8** or **[Return]**. The renamed program appears in the TISOFT PROGRAMS sub-window.

Copying a Program

To copy an existing program, follow these steps.

1. Select the directory path where the program resides. (See *Selecting a Directory*.)
2. Move the field cursor in the TISOFT PROGRAMS sub-window to select the program you want, or type the name at the **FILENAME** prompt.
3. Press **COPY-F2**. The prompt **COPY TO:** appears.
4. Type in the new program name or new path and name and press **ENTER-F8** or **Return**. The new program appears in the TISOFT PROGRAMS sub-window if it is copied to the same directory.

Non-Program File Selection

When you save/load a chart or table or import/export, you also have access to the program management DOS-related functions, but not TISOFT programs. All program management function keys are available for use with chart and table files in the status/chart function or the import/export text file. Figure 2-4 shows the file management display in the Status function.

NOTE: The chart, table, import/export, and certain other files are not part of the program and are not copied, deleted, or renamed when the program is. See Appendix K for a list of program and non-program files.

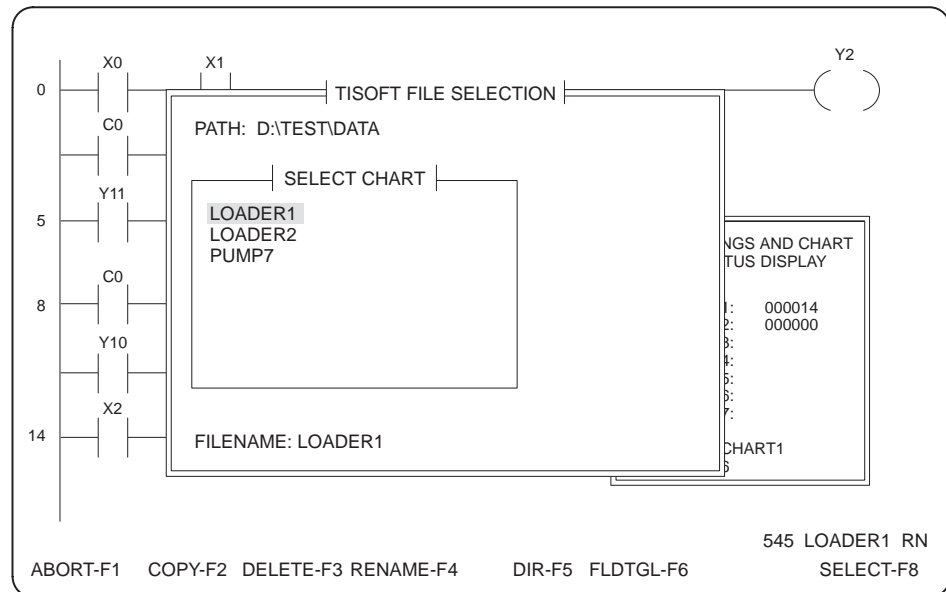


Figure 2-4 Selecting Status Charts

2.3 Backing up Program Files and Directories

Always back up your files and directories on floppy disks to prevent losing data if you have a problem with the hard drive. Use the DOS BACKUP and RESTORE functions to do this.

DOS BACKUP saves files from a source disk to a destination disk. When the destination disk is full, you receive a prompt to insert another floppy disk to store the remainder of the file.

DOS RESTORE transfers files previously stored on one disk to another disk; both directories must have exactly the same name or the files will not transfer.

Refer to your DOS documents for instructions on how to use BACKUP and RESTORE.

2.4 Selecting Off-Line Operation

To program off-line (using programming device only), press OFFLINE-F8. You then receive the off-line Ladder Display (Figure 2-5) with function keys for accessing TISOFT operations. You are now ready to use TISOFT.

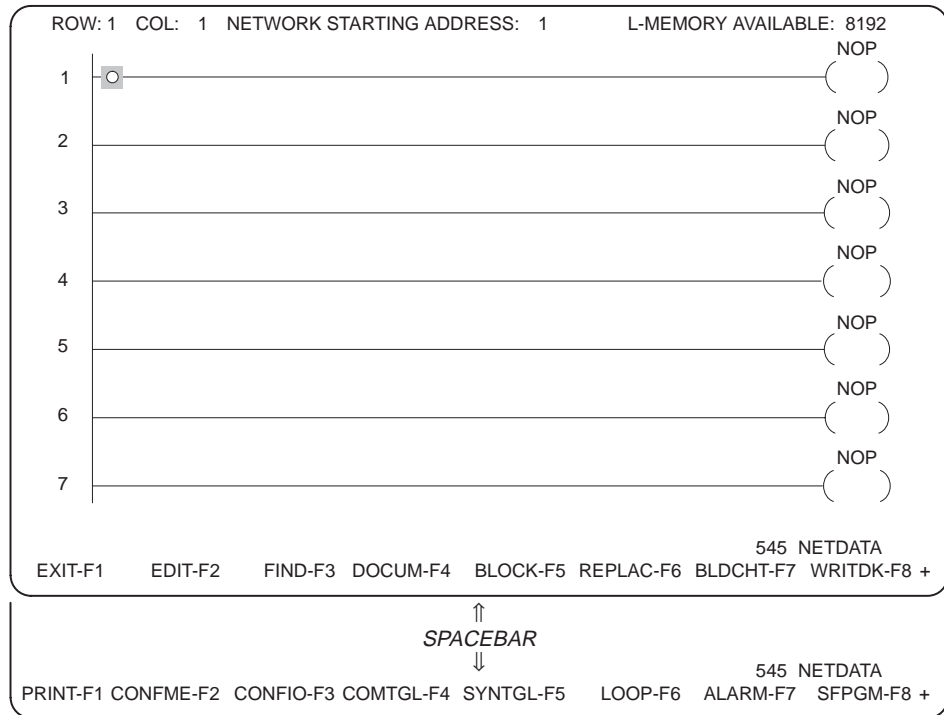


Figure 2-5 Off-Line Ladder Display

To return to the Start-up menu, press EXIT-F1 or .

NOTE: You can press from any function key line to exit to the next higher level or previous screen.

For information on the various TISOFT operations, see the section that describes the function you plan to perform.

2.5 Selecting On-Line Operation

To use TISOFT on-line (communicating with controller), press **ONLINE-F4**. This displays the on-line ladder screen, as shown in Figure 2-6.

NOTE: If your controller is a 575, refer to the next sections for information on selecting applications and configuring ports.

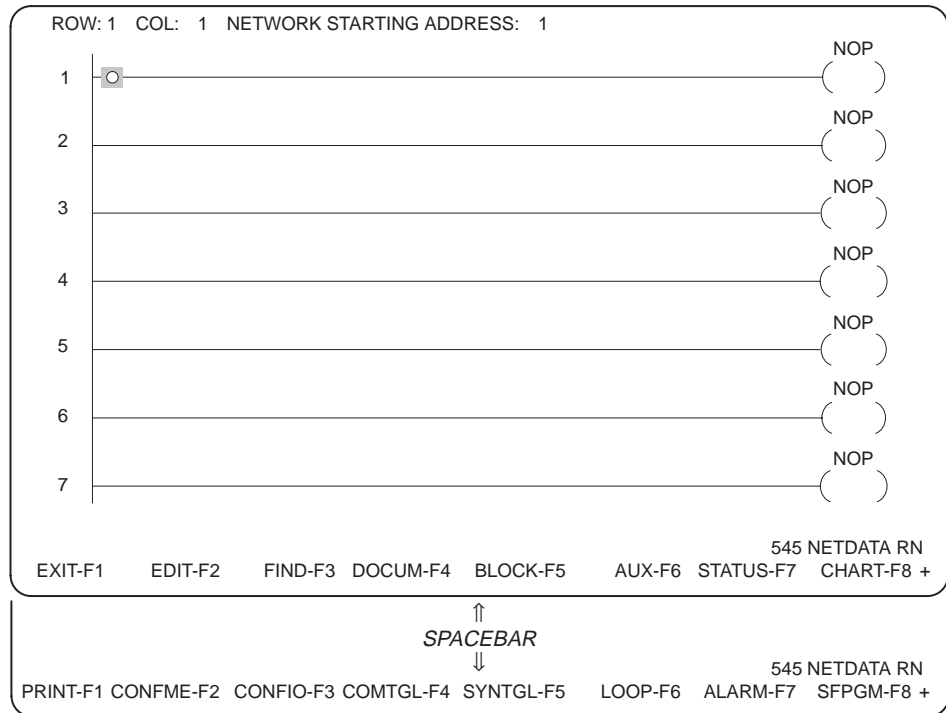


Figure 2-6 On-Line Ladder Display

From this display, you can access the Edit mode for Relay Ladder Logic programming by pressing **EDIT-F2**, or the Special Function programming menus by pressing the **SPACEBAR** followed by **SFPGM-F8**.

To return to the Start-up menu, press **EXIT-F1** or **Esc**.

NOTE: You can press **Esc** from any function key line to exit to the next higher level or previous screen.

Selecting On-Line Operation (continued)

Reading 575 Port Configuration

To read the 575 port configuration, follow these steps.

1. Select **PORTCF-F6** from the Application ID Table to access the Port Configuration chart shown in Figure 2-8.

PORT **1** CONFIGURATION
BOARD ADDRESS: 00

K BAUD: (0.3 1.2 2.4 4.8 9.6 19.2 38.4 57.6 115.2) 115.2
CHARACTER SIZE WITHOUT PARITY: (7 8) 7
PARITY: (NONE EVEN ODD MARK SPACE) ODD
NUMBER OF STOP BITS: (1 1.5 2) 1
FLOW CONTROL: (NONE DSR/DTR XON/XOFF BOTH) NONE

FROM PORT

EXIT-F1 READ-F2 WRITE-F4 NETDATA

Figure 2-8 Port Configuration Screen for 575 Controllers

2. Move the field cursor to the **PORT CONFIGURATION** line and type the port number to read.
3. Put the field cursor on the **BOARD ADDRESS** line and type the board address to read.
4. Press **READ-F2**. The port configuration for the selected port and address is read from the controller and displayed.
5. Press **EXIT-F1** to return to the Application ID Table screen (Figure 2-7).

Writing 575 Port Configuration

To write the 575 port configuration, follow these steps.

1. Select **PORTCF-F6** from the Application ID Table to access the Port Configuration chart shown in Figure 2-8.
2. Move the field cursor to the **PORT CONFIGURATION** line and type the number of the port that you want to be the destination of the port configuration data.
3. Put the field cursor on the **BOARD ADDRESS** line and type the address of the 575 board that is to be the destination of the port configuration data.
4. For each of the other fields, use the arrow keys to move the cursor to the parameter values and press **Return** to select the value you want.
5. Press **WRITE-F4** to write the port configuration to the controller.

NOTE: If the port you are changing is the port TISOFT is connected to, but the settings are not what TISOFT uses, when you press **WRITE-F4**, the following prompt appears to confirm your action:

TISOFT MAY NOT WORK WITH THIS PORT CONFIGURATION, CONTINUE?

If you press **YES-F2** to change the port configuration, TISOFT may or may not continue to communicate with the controller. Press **NO-F1** to abort the operation.

6. Press **EXIT-F1** to return to the Application ID Table screen (Figure 2-7).

Chapter 3

TISOFT Basics

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3.1 TISOFT Functionality

Programming and Utilities

TISOFT provides a programming and diagnostic interface with your controller. You use TISOFT for entering and editing your programs, as well as accessing programming utilities such as comment and block operations. Menus enable simple step-by-step entry of program data. For example, when you are entering a ladder program, pressing EDIT-F2 gives you access to the ladder programming functions. The menu chart in Figure 3-1 below illustrates the ease of access to editing functions.

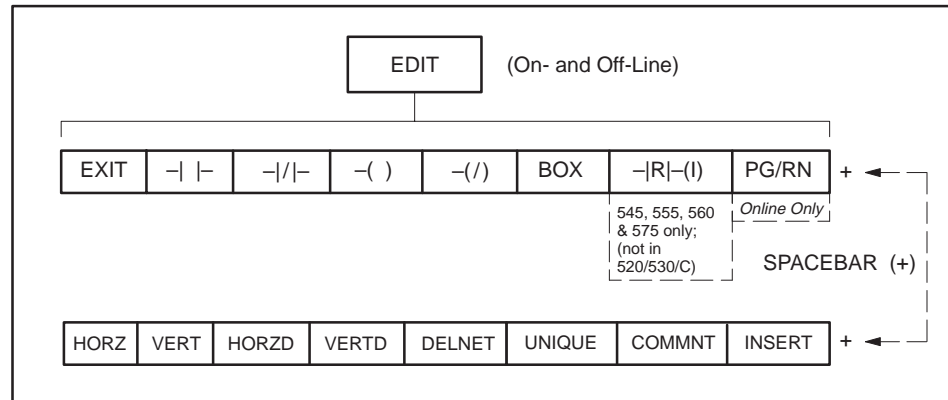


Figure 3-1 Accessing Program Functions

- When additional functions are available, the plus (+) sign appears in the lower right corner of the screen. To access the additional functions, press the spacebar. Press the spacebar again to return to the original group of functions.
- You can press `[Esc]` from any function key line to exit to the next higher level or previous screen.

Diagnostics, Memory and I/O Configuration

In addition to programming-related tasks, TISOFT provides access to controller functions such as diagnostics and configuration of I/O and memory.

3.2 TISOFT Menus

Reading TISOFT Displays

TISOFT menus are arranged for easy access to all functions. Ladder instructions are accessed by element type. Selecting a contact, coil, or box invokes menus or prompts for each element type. Loop, Analog Alarm, and Special Function programming are also accessed from the primary function menus available after selection of on- or off-line mode. For example, selecting CONFME-F2 from the primary menus invokes the Configure Memory functions as illustrated by Figure 3-2.

PLC TYPE: 575		MEMORY CONFIGURATION	
		USER MEMORY	SYSTEM MEMORY
LADDER (L)	..... 30	KBYTES	... 90 KBYTES
VARIABLE (V)	.....	32 KBYTES	... 32 KBYTES
CONSTANT (K)	.....	0 KBYTES	... 0 KBYTES
SPECIAL (S)	.....	32 KBYTES	... 32 KBYTES
COMPILED SF (CS)	...	0 KBYTES	... 0 KBYTES
USER SUB (U)	.....	0 KBYTES	... 0 KBYTES
GLOBAL (G)	.....	32 K	
TMR/CTR	.....	1 K	... 5 KBYTES
DRUMS	.....	64	... 3 KBYTES
SHIFT REG	.....	1 K	... 1 KBYTES
TABLE MOVE	.....	1 K	... 2 KBYTES
ONE SHOTS	.....	1 K	... 1 KBYTES
CONTROL RELAYS	.....	23 K	
I/O (X,Y,WX,WY)	.....	8 K	
TOTAL SYSTEM MEMORY			320 KBYTES
CONFIGURED SYSTEM MEMORY			166 KBYTES
REMAINING SYSTEM MEMORY			154 KBYTES
FROM RAM			
REQUESTED OPERATION IN PROGRESS			
EXIT-F1	READRM-F2	WRITRM-F3	545-F4 545L-F5 575-F6 555-F7 REQAPP-F8 +

Figure 3-2 Memory Configuration Menu

- The first line of the display gives the display title (for example, Auxiliary Functions; Memory Configuration), if any.
- The main body of the screen shows information about the function you select; it may be either a listing of options or a blank display for making entries.
- The source of the display (from RAM, from PLC) is given at the bottom left of the screen.
- TISOFT displays messages that help you detect syntax errors, illegal operations, and similar problems. See Appendix B for a listing of error messages and possible corrections.
- Status is shown on the lower right side of the screen. In off-line mode, there are two fields. The first field shows the controller model, and the second field shows the program name. In on-line mode, a third field is added that shows the operating mode of the controller.
- The last line on the screen is the function key menu.

3.3 Accessing TISOFT Functions

Using the Ladder Display Menus

You access all TISOFT primary functions, programming and utilities, from the ladder display. The plus (+) sign at the lower right of this, and other screens, indicates that you can access additional function keys by pressing the spacebar. Figure 3-3 illustrates the initial on-line ladder display. After you enter a program, your ladder display then shows a section of that program when you invoke the display. All references in this manual to “Ladder Display” refer to this screen. The numbers on the left side of the display are the ladder addresses being displayed.

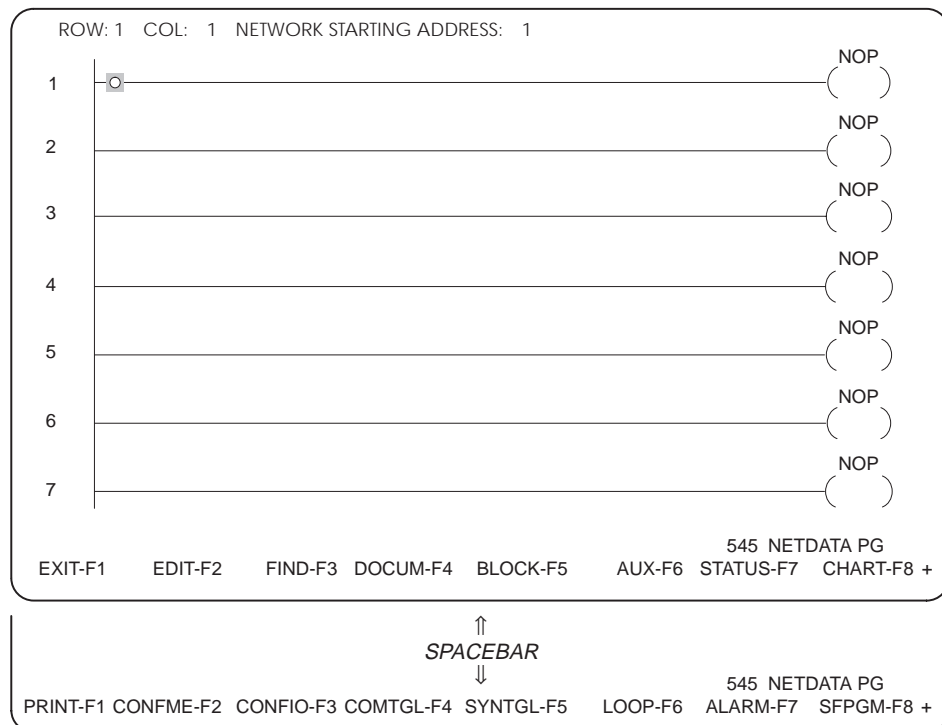


Figure 3-3 On-Line Ladder Display

Display Size

Your TISOFT ladder display is 12 columns wide and 7 rows long. (The actual ladder rung can be much longer.)

Element Size

Each element of a ladder program is displayed in a specific size. Contacts and coils are 1x1 (one column by one row). Box sizes vary according to box type. The box sizes are 1x1, 2x2, 2x3, 2x7, 3x3, 4x7 and 7x8.

3.4 TISOFT Functions

On-Line/Off-Line Defined

You can use TISOFT in either the on- or off-line mode. On-line mode allows communication with the controller; off-line mode communicates with the programming device only. Since there is no communication with the controller in off-line mode, you can only save programs or other inputs to a selected program on disk.

You can access the HELP system for information at virtually any point in TISOFT by pressing Alt H.

Certain functions are available either on- or off-line; some are available on-line only; and some, off-line only. Brief descriptions of the functions available in on- and off-line modes are given in the following paragraphs.

On-Line/Off-Line Functions

The following functions are available from both the on-line and off-line ladder display.

EXIT or returns to the start-up screen.

EDIT allows you to enter or edit ladder programs.

FIND or Ctrl F locates addresses, elements, or NOPs (ladder rungs that are not programmed).

BLOCK performs moves, copies, puts, or deletes of selected data segments (ladder memory only at main display).

PRINT enables you to set print parameters and select what to print, as well as initiate the print operation.

CONFME enables you to display and edit memory configuration.

CONFIO enables you to display and edit I/O configuration.

COMTGL toggles the display of comments (on or off).

SYNTGL toggles the display of synonyms (on or off).

DOCUM allows you to display and edit comments, synonyms, and program titles.

Ctrl L invokes the pop-up synonym editor.

Ctrl U accesses the Element Usage Table.

Ctrl V (Ctrl K) accesses the V/K memory editor for modifying the values and display format for V- and K-memory locations.

Ctrl O jumps (zooms) to the SF program or SF subroutine that the cursor is on in ladders.

TISOFT Functions (continued)

Alt H initiates help menu.

Alt R records keystrokes for reuse.

Alt S stops recording keystrokes.

Alt P plays recorded keystrokes.

Alt L initiates continuous replay of recorded keystrokes.

Alt W writes recorded keystroke macros to a file.

Alt O reads recorded keystroke macros from a file.

If S-memory is configured, you have the following additional functions available at the ladder display.

LOOP displays the loop directory for entry/edit of loops and ramp-soak steps.

ALARM displays the analog alarm directory for entry/edit of analog alarms.

SFPGM displays the SF program and SF subroutine directory for entry/edit of SFPGMs and SFSUBs.

Off-Line Only Functions

These functions are available only from the off-line ladder display menu.

P allows you to invoke the password function.

REPLAC enables you to search for and replace single and multiple elements in a program.

BLDCHT allows you to build and save status charts off-line.

WRITDK writes your program to disk under the selected program name. Most of your off-line programming is done in the programming device RAM until you save it by pressing WRITDK at the ladder display menu.

On-Line Only Functions

These functions are available only from the on-line ladder display menu.

AUX or A enables access to controller auxiliary functions.

STATUS or S allows you to monitor the status of elements in ladder rungs.

CHART allows you to monitor and initialize selected I/O values and variables in a table format. You can also access the BLDCHT function on-line through chart.

3.5 TISOFT Keys

Using Function Keys

TISOFT uses programming device function keys **F1** to **F8** to initiate operations from the various menus. When additional functions are available, the plus (+) sign appears in the lower right corner of the screen. To access the additional functions, press the spacebar. Press the spacebar again to return to the original group of functions.

Using Hard Keys

You have quick access to many frequently used operations through keys on the programming device keyboard. Table 3-1 provides a complete list of hard key equivalents. You can also press **HINTS-F2** from the start-up screen for a complete list of function and edit hard keys. The following list describes some of the commonly-used functions available with hard keys.

ESC returns to the previous level of menu operations.

Print Screen invokes the print operation to print the current display.

Ctrl L invokes the pop-up synonym editor to allow you to edit synonyms.

Shift [?] or [^] displays a list of valid entries for the current prompt.

Alt C allows you to interrupt communications after a timeout.

Alt H accesses the Help System menus.

Ctrl F invokes the Find operation.

Ctrl X invokes the on-screen cross-reference function.

Ctrl U invokes the element usage operation.

Ctrl V invokes the V-memory editor.

Ctrl K invokes the K-memory editor.

X, Y, C, V, K, W, and G keys access the contact and coil editors; the B key accesses box instructions.

NOTE: You must disengage the Num Lock and Scroll Lock keys to enable the hard keys on the numeric keypad.

Initiating TISOFT Functions with Hard Keys

Whenever a function appears on the menu, the hard key equivalent of the function is enabled. You can use the hard key to invoke the function rather than using a function key available on a TISOFT menu. Some operations are accessible through Ctrl and Alt keys only, such as element usage (Ctrl U).

Table 3-1 shows a listing of the function key alternatives and the CTRL/ALT functions.

TISOFT Keys (continued)

Table 3-1 TISOFT Keys

Function	Key	Comment
Abort	ESC	
AUX	A	Calls AUX screen
BOX	B	Creates a box or edits an existing box when the cursor is positioned on the box
Coils	Y	Valid if cursor is in an output column
	C	
	WY	
	V	
	G	
	W	
Contacts	X	Valid if cursor is in an input column
	Y	
	C	
	WX/WY	
	V	
	K	
	G	
W		
Contact/Coil Toggle	/	Open/closed contact/coil toggle
Cursor Position Display Toggle	Ctrl T	
Decrement Address	F10	Valid: CHGVAL (in Status)
Delete Character	DEL	Delete current element
	Backspace	Delete previous element
Enable/Disable	E	Enables or disables base
END	END	Moves to last column/row 1 of current rung
ENTER	ENTER	Edit: moves to next row, current rung, or appends new row to rung
		Display: moves to next row or rung
Equal to	=	Equal-to Relational Contact
EXIT	ESC	
FIND	Ctrl F	Calls Find function
Greater Than or Equal to	>	Greater-than-or-Equal-to Relational Contact
HELP System	Alt H	
Element List	? or \	List valid elements for current field
HOME	HOME	Moves to column 1, row 1 of current rung
HORZ	H	Draws horizontal line

Table 3-1 TISOFT Keys (continued)

Function	Key	Comment
HORZD	N	Deletes horizontal line
Immediate I/O	I	Immediate contact and coil
Increment Address	F9	Valid: CHGVAL (in Status)
Insert Character	INS	Insert Mode
INSERT	INS →	Inserts a column
	INS ↓	Inserts a row
K Memory Editor	Ctrl K	
L Memory Address	L	
Less Than	<	Less-than Relational Contact
Macro Functions	Alt R	Record macro
	Alt S	Stop macro
	Alt P	Play macro
	Alt L	Loop macro play until key-press
	Alt W	Write macro to file
	Alt O	Open macro file
NO	N	For a YES/NO response
Not Equal to	!	Not-Equal Relational Contact
Off-Line Password	P	Access password functions offline
Output	O	Create/edit output coil
Page Up	PgUp	
Page Down	PgDn	
Page Left	Ctrl ←	
Page Right	Ctrl →	
Pop-up Synonyms	Ctrl L	Edits synonym/descriptor
Print Screen	Ctrl PrtSc PrtSc	
Quick SF Edit	Ctrl O	Go to SF to show or edit
Quick Single Scan	Alt Q	Perform single scan
Single Scan	V	
Status	S	
Usage Table	Ctrl U	
V Memory Editor	Ctrl V	
VERT	J	Creates Down line
	U	Creates Up line
VERTD	M	Deletes vertical line
XREF	Ctrl X	Valid: Ladder display – XREF rung where cursor is located
YES	Y	For a YES/NO response

3.6 TISOFT HELP System

Accessing Help

You can access information about TISOFT at any location. Press Alt H to display the HELP menu. Figure 3-4 shows the function help display from the ladder display screen. As shown on the menu below, four types of help are available: Hot Key Help, Function Help, Element Help, and Message Help. To see another type of help, use the arrow keys to position the cursor on any of the Help types in the top line. You can also move the cursor down to any of the topics listed in the help window, and press **Return** for additional information on the selected topic.

When you invoke the HELP menu, **F1** is always available to define the keys used for cursor movement and paging within the Help system.

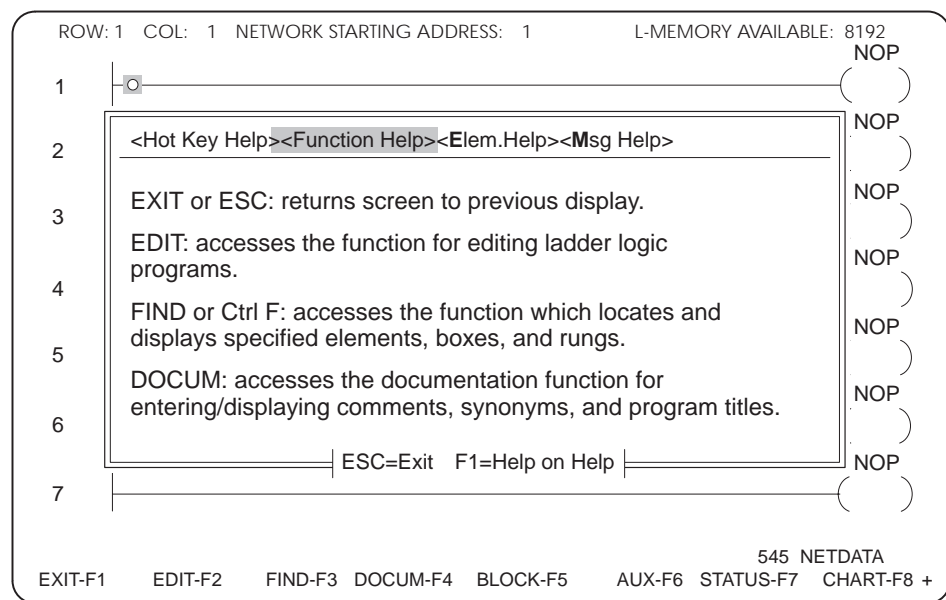


Figure 3-4 HELP Display

Hot Key Help

Hot Key help gives you a listing of keys that are active (both function and hard keys) on the current display and describes the operation performed by each of the keys.

Function Help

Function help gives a description of a particular operation. For example, if you ask for Function help when the Print function is displayed, details on all of the printing options are provided.

Element Help

Element help gives a description of all the elements used in TISOFT.

TISOFT HELP System (continued)

Message Help

Message help is available when an error or other message is displayed. Invoking message help gives you an explanation of the message with a suggested correction for the problem.

NOTE: You can also reference other manuals to obtain help in designing or changing your programs. For example, the user manuals for your controllers explain the functionality of the instructions and give guidelines for using a particular instruction. The system manuals for your controllers should be used to supplement the information provided in this manual.

Element List

As you enter or edit your program, you can access a List display at any point that has a prompt requesting an element entry. The List display lists the valid entries for that particular field. Figure 3-5 shows the List display available by pressing \square or Shift \square at the **FIND** selection prompt. Each of the entries shown on the display are valid entries for the current prompt. To access element help for an explanation of the function of a particular box, position the cursor on the box name, and press **HELP-F4**.

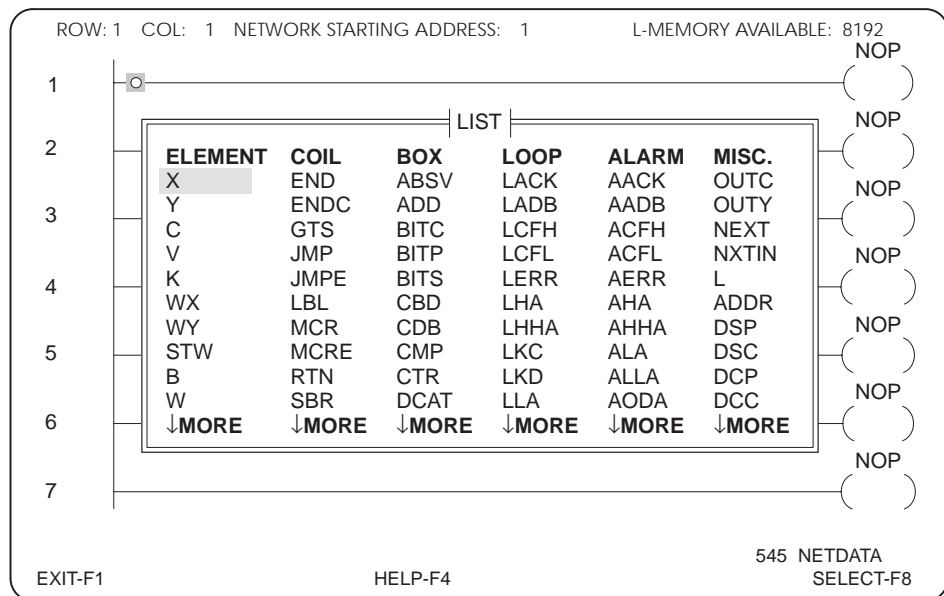


Figure 3-5 Element List Screen

Configuring Controller Memory

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	Configuration Procedure	4-6
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4.1 Reading Memory Configuration

Displaying Memory Configuration

You can display the memory configuration from either on-line or off-line. The source of the display is determined by whether you are performing the read on- or off-line. Off-line, you can read memory configuration only from programming device RAM. On-line, you can read the configuration from either your selected program on disk or the controller.

When you initially access the Memory Configuration menu, a read is performed that gives you the configuration from the source you are currently using.

Displaying Off-Line

To show the memory configuration in the programming device RAM, complete the following steps. The illustration below shows the function keys from the off-line configuration menu. (Refer also to Figure 4-1.)

1. Press OFFLINE-F8.
2. Press SPACEBAR.
3. Press CONFME-F2.
4. Press READRM-F2.

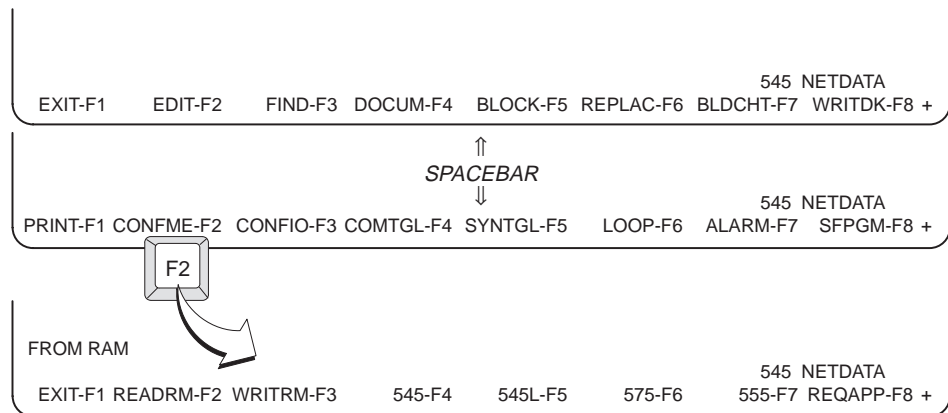


Figure 4-1 Accessing Memory Configuration Menu Off-Line

Displaying On-Line

To show the memory configuration from your program disk, complete the following steps. (Refer also to Figure 4-2.)

1. Press **ONLINE-F4**.
2. Press **SPACEBAR**.
3. Press **CONFME-F2**.
4. Press **READDK-F2**.

To see the memory configuration that is in the controller, complete the following steps. (Refer also to Figure 4-2.)

1. Press **ONLINE-F4**.
2. Press **SPACEBAR**.
3. Press **CONFME-F2**.
4. Press **READPC-F4**.

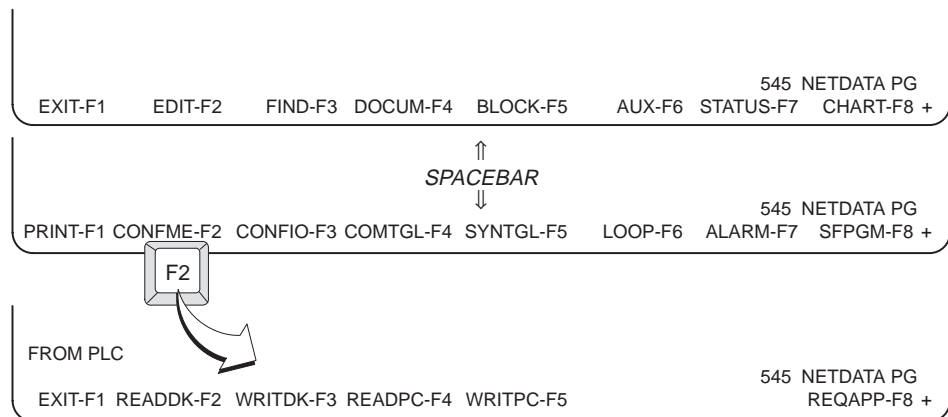


Figure 4-2 Accessing Memory Configuration Menu On-Line

4.2 Configuring Memory Off-Line

Accessing Configuration Menu

Access the off-line memory configuration menu from the TISOFT Start-up Screen by completing the steps listed below. If you are already off-line at the ladder display, begin with step 2. Figure 4-3 shows the off-line menu.

1. Press OFFLINE-F8.
2. Press SPACEBAR.
3. Press CONFME-F2.

PLC TYPE: 555		MEMORY CONFIGURATION	
		USER MEMORY	SYSTEM MEMORY
LADDER (L)	.....	32 KBYTES	... 96 KBYTES
VARIABLE (V)	.....	52 KBYTES	... 52 KBYTES
CONSTANT (K)	.....	0 KBYTES	... 0 KBYTES
SPECIAL (S)	.....	32 KBYTES	... 32 KBYTES
COMPILED SF (CS)	...	0 KBYTES	... 0 KBYTES
USER SUB (U)	.....	0 KBYTES	... 0 KBYTES
TMR/CTR	.....	1 K	... 5 KBYTES
DRUMS	.....	64	... 3 KBYTES
SHIFT REG	.....	1 K	... 1 KBYTES
TABLE MOVE	.....	1 K	... 2 KBYTES
ONE SHOTS	.....	1 K	... 1 KBYTES
CONTROL RELAYS	....	32 K	
I/O (X,Y,WX,WY)	.....	8 K	
TOTAL SYSTEM MEMORY			1856 KBYTES
CONFIGURED SYSTEM MEMORY			192 KBYTES
REMAINING SYSTEM MEMORY			1664 KBYTES
FROM RAM			
		555 NETDATA	
EXIT-F1	READRM-F2	WRITRM-F3	545-F4 545L-F5 575-F6 555-F7 REQAPP-F8 +

Figure 4-3 Off-Line Memory Configuration Menu

Configuration Menu Fields

You can make entries only to the **USER MEMORY** fields for specific memory types. The **SYSTEM MEMORY** column cannot be edited, except for Total System Memory. The numbers in this column give you the bytes of system memory used by each type of user memory you configure.

The **TOTAL SYSTEM MEMORY** field must match the total memory available with your controller model. Configured System Memory and Remaining System Memory numbers are supplied by TISOFT.

Selecting the
Controller

Since there are differences in memory types among controllers, your first step should be to select the controller model that you are configuring. To do this, press the function key that corresponds to your model number. When selecting a 565 controller, you must enter the S-memory configuration before the controller type changes from 560.

Configuration
Procedure

Use the arrow keys and/or **Return** to position the cursor in the fields to make entries.

Position the cursor in the **TOTAL SYSTEM MEMORY** field. Type in the number of Kbytes that correspond to your controller model. It is essential that you enter the correct memory size. When you attempt to load the configuration to your controller, you receive a controller error if the memory size is incorrect.

Type in the desired size for each memory type. For example, with the cursor in the Ladder memory field, use the numeric keys to change the existing number. Note that the entries you make for V, K, and L memory sizes are in kbytes, not words. Then use **Return** or arrow keys to move the cursor to the next memory type to be changed.

NOTE: If you enter a memory configuration smaller than that required for a program you have entered, the program is truncated to fit the smaller configuration.

Entering
Configuration

To write the configuration to RAM, press **WRITRM-F3**.

NOTE: Programmable controller type, internal C/control relay, and total system memory fields can be changed only when off-line.

4.3 Configuring Memory On-Line

Accessing Configuration Menu

Access the on-line memory configuration menu from the TISOFT Start-up Screen by completing the steps listed below. If you are already on-line at the ladder display, begin with step 2. Figure 4-4 shows the on-line menu.

1. Press ONLINE-F4.
2. Press SPACEBAR.
3. Press CONFME-F2.

PLC TYPE: 555		MEMORY CONFIGURATION	
		USER MEMORY	SYSTEM MEMORY
LADDER (L)	..... 32	KBYTES	... 96 KBYTES
VARIABLE (V)	..... 52	KBYTES	... 52 KBYTES
CONSTANT (K)	..... 0	KBYTES	... 0 KBYTES
SPECIAL (S)	..... 32	KBYTES	... 32 KBYTES
COMPILED SF (CS)	... 0	KBYTES	... 0 KBYTES
USER SUB (U)	..... 0	KBYTES	... 0 KBYTES
TMR/CTR	..... 1	K	... 5 KBYTES
DRUMS	..... 64		... 3 KBYTES
SHIFT REG	..... 1	K	... 1 KBYTES
TABLE MOVE	..... 1	K	... 2 KBYTES
ONE SHOTS	..... 1	K	... 1 KBYTES
CONTROL RELAYS	... 32	K	
I/O (X,Y,WX,WY)	..... 8	K	
TOTAL SYSTEM MEMORY		.....	1856 KBYTES
CONFIGURED SYSTEM MEMORY		.....	192 KBYTES
REMAINING SYSTEM MEMORY		.....	1664 KBYTES
FROM PLC			
EXIT-F1 READDK-F2 WRITDK-F3 READPC-F4 WRITPC-F5			555 NETDATA PG REQAPP-F8

Figure 4-4 On-Line Memory Configuration Menu

NOTE: You cannot change the controller type, internal C/control relay, or total system memory fields when doing an on-line configuration.

Configuration Procedure

Use the arrow keys and/or **Return** to position the cursor in the fields to make entries. Type in the desired number of bytes for each memory type. For example, with the cursor in the LADDER memory field, use the numeric keys to change the existing number. Then use **Return** or arrow keys to move the cursor to the next memory type to be changed.

! WARNING

If you enter a memory configuration smaller than that required for a program you have entered, the program is truncated to fit the smaller configuration. This can cause unexpected process operation to a controller in RUN mode.

Unexpected process operation can cause death or serious injury to personnel, and/or damage to equipment.

Use caution when writing a changed memory configuration to a controller in RUN mode.

Entering Configuration

To save the configuration to disk, press WRITDK-F3.

To write the configuration to the controller, press WRITPC-F5.

NOTE: You can change memory configuration in Program Mode only. If the controller is in Run mode, TISOFT prompts you to confirm changing to Program mode before writing the new memory configuration to the controller. After the operation, the controller goes back to Run mode.

Checking Memory Availability

You can determine how much memory is available by accessing AUX 28 under Diagnostics. The Memory Availability screen displays the memory information that your controller supports, as shown in Figure 4-5.

MEMORY AVAILABILITY				
	CONFIGURED (BYTES)	USED (BYTES)	AVAILABLE (BYTES)	AVAILABLE (WORDS)
LADDER (L)	32768	188	32580	16290
COMPILED L (CL)	(65536)			
SPECIAL (S)	32768	66	32702	

Note: Not all data is available from all controllers.

555 NETDATA PG

EXIT-F1

Figure 4-5 Memory Availability AUX Function Screen

4.4 Selecting Application (575)

When you configure a 575 controller off-line, you must first select the application. Press the spacebar, CONFME-F2, and then REQAPP-F8 as shown in Figure 4-6 to select the desired application. You can change the Application ID only during off-line configuration. (Configuring the controller on-line displays the current application.)

PLC TYPE: 575		MEMORY CONFIGURATION	
		USER MEMORY	SYSTEM MEMORY
LADDER	(L)	32 KBYTES	96 KBYTES
VARIABLE	(V)	52 KBYTES	52 KBYTES
CONSTANT	(K)	0 KBYTES	0 KBYTES
SPECIAL	(S)	32 KBYTES	32 KBYTES
COMPILED SF	(CS)	0 KBYTES	0 KBYTES
USER SUB	(U)	0 KBYTES	0 KBYTES
GLOBAL	(G)	32 K	
TMR/CTR	. . . .	1 K	5 KBYTES

APPLICATION ID:

REQUIRED APPLICATIONS: } Application ID field can be edited off-line only.

OPTIONAL APPLICATIONS: } These fields can be edited on- or off-line.

CPU MODE LOCKED TO: }

FROM RAM Off-line Menu 575 NETDATA

EXIT-F1 READRM-F2 WRITRM-F3

FROM PLC On-line Menu 575 NETDATA PG

EXIT-F1 READDK-F2 WRITDK-F3 READPC-F4 WRITPC-F5

Figure 4-6 575 Application Selection Screen

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

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

Pressing READRM-**F2** (off-line), or READDK-**F2** or READPC-**F4** (on-line), displays the current application ID configuration.

After modifying the configuration, press WRITRM-**F3** (off-line), or WRITDK-**F3** or WRITPC-**F5** (on-line), to save the new configuration relationships.

Chapter 5

Configuring Series 505 I/O

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5.1 Reading an I/O Configuration

This chapter describes I/O configuration for devices that use the Series 505 I/O channel.

For information about configuring devices that use the PROFIBUS-DP I/O channel, see Chapter 6.

Displaying the Configuration from RAM

In off-line mode, complete the following steps to display a base configuration from RAM:

1. Press SPACEBAR and then CONFIO-F3. The 505 Base Status screen appears. See Figure 5-1.

BASE	ENABLED	CONFIGURED
0	YES	NO
1	YES	NO
2	YES	NO
3	YES	NO
4	YES	NO
5	YES	NO
6	YES	NO
7	YES	NO
8	YES	NO
9	YES	NO
10	YES	NO
11	YES	NO
12	YES	NO
13	YES	NO
14	YES	NO
15	YES	NO

EXIT-F1 CONFIG-F2 FIND-F3 EN/DIS-F5 PRO-DP-F6 545 NETDATA

Figure 5-1 Off-Line 505 Base Status Screen

2. Type the channel number, if desired.
3. Use the arrow keys to highlight the desired base number on the screen.
4. Press CONFIG-F2. The Base I/O Configuration screen appears. See Figure 5-2.

An alternative procedure for displaying a base configuration is as follows:

1. Press SPACEBAR and then CONFIO-F3. The 505 Base Status screen appears. See Figure 5-1.
2. Press CONFIG-F2. The Base I/O Configuration screen appears. See Figure 5-2.
3. Use the arrow keys to highlight the CHANNEL field and type in the channel number.
4. Use the arrow keys to highlight the BASE field and type in the base number.
5. Press READRM-F3.

NOTE: You can change the base number either by using the PgUp/PgDn keys (if the last operation was a Read operation), or by typing a number in the BASE field and pressing READRM-F3. You can view bases by using PgUp/PgDn keys for the currently selected channel number only.

The configuration of the selected base is displayed with the source, FROM RAM, indicated on the prompt line of the display. (See Figure 5-2.)

505 I/O MODULE DEFINITION FOR CHANNEL ... 1										BASE ... 00	
BASE ENABLED	SLOT	I/O ADDRESS	NUMBER OF BIT AND WORD				I/O WX	I/O WY	SPECIAL FUNCTION		
			X	Y	WX	WY					
	01	0001	16	00	00	00	00	NO			
	02	0017	00	16	00	00	00	NO			
	03	0000	00	00	00	00	00	NO			
	04	0000	00	00	00	00	00	NO			
	05	0000	00	00	00	00	00	NO			
	06	0000	00	00	00	00	00	NO			
	07	0000	00	00	00	00	00	NO			
	08	0000	00	00	00	00	00	NO			
	09	0000	00	00	00	00	00	NO			
	10	0000	00	00	00	00	00	NO			
	11	0000	00	00	00	00	00	NO			
	12	0000	00	00	00	00	00	NO			
	13	0000	00	00	00	00	00	NO			
	14	0000	00	00	00	00	00	NO			
	15	0000	00	00	00	00	00	NO			
	16	0000	00	00	00	00	00	NO			

FROM RAM

545 NETDATA

EXIT-F1 SHOW-F2 READRM-F3 WRITRM-F4 EN/DIS-F6 DELCHN-F7 CLRBS-F8

Figure 5-2 Off-Line Base I/O Configuration Screen

Reading an I/O Configuration (continued)

Displaying the Configuration from Disk or Controller

In on-line mode, complete the following steps to display a base configuration from a disk or a controller.

1. Press **SPACEBAR** and then **CONFIO-F3**. The 505 Base Status screen appears. See Figure 5-3.

505 CHANNEL: 1 BASE STATUS			
BASE	ENABLED	CONFIGURED	ONLINE
0	YES	YES	YES
1	YES	NO	NO
2	YES	NO	NO
3	YES	NO	NO
4	YES	NO	NO
5	YES	NO	NO
6	YES	NO	NO
7	YES	NO	NO
8	YES	NO	NO
9	YES	NO	NO
10	YES	NO	NO
11	YES	NO	NO
12	YES	NO	NO
13	YES	NO	NO
14	YES	NO	NO
15	YES	NO	NO

EXIT-F1 CONFIG-F2 FIND-F3 EN/DIS-F5 PRO-DP-F6 545 NETDATA PG

Figure 5-3 On-Line 505 Base Status Screen

2. Type the channel number, if desired.
3. Use the arrow keys to highlight the desired base number on the screen.
4. Press **CONFIG-F2**. The Base I/O Configuration screen appears. See Figure 5-4.
5. The base I/O configuration from the programmable logic controller is automatically displayed. Press **READDK-F3** if you want to read the selected program on the disk.

An alternative procedure for displaying a base configuration is as follows:

1. Press **SPACEBAR** and then **CONFIO-F3**. The 505 Base Status screen appears. See Figure 5-3.
2. Press **CONFIG-F2**. The Base I/O Configuration screen appears. See Figure 5-4.

3. Use the arrow keys to highlight the **CHANNEL** field and type in the channel number.
4. Use the arrow keys to highlight the **BASE** field and type in the base number.
5. Press either **READDK-F3** or **READPC-F5**.

NOTE: You can change the base number either by using the PgUp/PgDn keys (if the last operation was a Read operation), or by typing a number in the **BASE** field and pressing **READDK-F3** or **READPC-F5**. You can view bases by using the PgUp/PgDn keys for the currently selected channel number only.

The configuration of the selected base is displayed with the source, **FROM DISK** or **FROM PLC**, indicated on the message line of the display. See Figure 5-4.

505 I/O MODULE DEFINITION FOR CHANNEL ... 1										BASE ... 00
BASE ENABLED	SLOT	I/O ADDRESS	NUMBER OF BIT AND WORD I/O				SPECIAL FUNCTION			
			X	Y	WX	WY				
	01	0001	16	00	00	00	NO			
	02	0017	00	16	00	00	NO			
	03	0033	00	00	04	04	YES			
	04	0000	00	00	00	00	NO			
	05	0000	00	00	00	00	NO			
	06	0000	00	00	00	00	NO			
	07	0000	00	00	00	00	NO			
	08	0000	00	00	00	00	NO			
	09	0000	00	00	00	00	NO			
	10	0000	00	00	00	00	NO			
	11	0000	00	00	00	00	NO			
	12	0000	00	00	00	00	NO			
	13	0000	00	00	00	00	NO			
	14	0000	00	00	00	00	NO			
	15	0000	00	00	00	00	NO			
	16	0000	00	00	00	00	NO			

FROM PLC

545 NETDATA PG

EXIT-F1 SHOW-F2 READDK-F3 WRITDK-F4 READPC-F5 WRITPC-F6 READBS-F7 CLRBS-F8 +

Figure 5-4 On-Line Base I/O Configuration Screen

Reading an I/O Configuration (continued)

Displaying the Configuration from a Base

You must be on-line to read a base configuration from the base. To read a base configuration, complete the following steps. See Figure 5-3.

1. Press the SPACEBAR and then CONFIO-F3. The 505 Base Status screen appears. See Figure 5-3.
2. Type the channel number, if desired.
3. Use the arrow keys to highlight the desired base on the screen.
4. Press CONFIG-F2. The Base I/O Configuration screen appears. See Figure 5-4.
5. Press READBS-F7.

NOTE: You can change the base number either by using the PgUp/PgDn keys (if the last operation was a Read operation), or by typing a number in the **BASE** field and pressing READBS-F7. You can view bases by using the PgUp/PgDn keys for the currently selected channel number only.

The configuration of the selected base is displayed with the source, **FROM BASE**, indicated on the prompt line of the display.

5.2 Configuring I/O

Controller Functionality in Configuration

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

I/O Configuration Guidelines

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

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

NOTE: 520, 520C, 530, 530C, and 525 are 8-slot programmable controllers.

Configuration Procedure

Use the following procedure to enter the desired configuration.

1. Press the SPACEBAR and then CONFIO-F3 to produce the 505 Base Status screen. See Figure 5-1 for off-line operation, or see Figure 5-3 for on-line operation.
2. Press CONFIG-F2. The Base I/O Configuration screen appears. See Figure 5-2 for off-line operation, or see Figure 5-4 for on-line operation.
3. Use the arrow keys to position the cursor at the CHANNEL field and type in the desired channel number.

Configuring I/O (continued)

4. Use the arrow keys to position the cursor at the **BASE** field and type in the desired base number.

NOTE: You can change the base number either by using the PgUp/PgDn keys (if the last operation was a Read operation), or by typing a number in the **BASE** field and pressing a read function READRM, READPC, READDK or READBS. You can view bases by using the PgUp/PgDn keys for the currently selected channel number.

5. Use the arrow or **Return** to select the I/O Address field of the slot to be configured.
6. Type in the beginning I/O Address.
7. Type in the number of I/O points (X, Y, WX, or WY) required for the type of module being configured.
8. If you are configuring a special function module, type in *Y(es)* in the **SPECIAL FUNCTION** column.
9. To enable or disable the current base, press EN/DIS-F6 (off-line), EN/DIS-F2 (on-line), or **E**. The following message appears:
CHANGE ENABLE/DISABLE STATUS? After responding NO-F1 or YES-F2, **ENABLED** or **DISABLED** displays in the upper left corner.

NOTE: Base 0 cannot be disabled. 520, 520C, 530, 530C, and 525 are 8-slot programmable controllers.

Saving the Configuration

Off-line: After completing entries for a base, press WRITRM-F4 to save the configuration to RAM. (The configuration is also saved on disk.)

On-line: After completing entries for a base, press WRITDK-F4 to write the configuration to disk. Press WRITPC-F6 to write the configuration to the controller.

WARNING

WRITPC takes effect immediately. If you are modifying an existing configuration, your process will be affected.

Unexpected process operation can cause death or serious injury to personnel, and/or damage to equipment.

Plan for the effect on your process before you execute WRITPC.

5.3 Changing I/O Configuration

Clearing a Base I/O Display

Complete the following steps to clear an I/O display (on- or off-line).

1. Start from the Base I/O Configuration screen. See Figure 5-2 or Figure 5-4.
2. Type in the desired channel number at the **CHANNEL** field at the top of the screen.
3. Type in the desired base number at the **BASE** field at the top of the screen.
4. Press **CLRBS-F8**.

Clearing a Base I/O Configuration On-Line

To clear the configuration from the controller or the selected program on disk, complete the following steps.

1. Start from the on-line Base I/O Configuration screen. See Figure 5-4.
2. Type in the desired channel number, in the field at the top of the screen.
3. Type in the desired base number at the **BASE** field at the top of the screen.
4. Press **CLRBS-F8**.
5. Press **WRITDK-F3** to clear the disk, or press **WRITPC-F5** to clear the controller.

Changing I/O Configuration (continued)

Clearing a Base I/O Configuration Off-Line

To clear an I/O configuration from the programming device RAM, complete the following steps.

1. Start from the off-line Base I/O Configuration screen. See Figure 5-2.
2. Type in the desired channel number at the **CHANNEL** field at the top of the screen.
3. Type in the desired base number at the **BASE** field at the top of the screen.
4. Press **CLRBS-F8**.
5. Press **WRITRM-F4** to clear RAM.

This change is also saved to disk (clear configuration from disk).

**Deleting a Channel
(560/565 Only)**

Be aware of the following considerations before you enter the channel number you wish to delete.

- You cannot delete the I/O configuration for Channels 1 and 2.
- Channels are paired on the RCC cards (for example, 1&2; 3&4, etc.). When one of a pair of channels is deleted, so is the other.
- All channels above the highest channel number entered are also deleted; for example, if you enter channel 5, channels 5, 6, 7, and 8 are deleted.

To delete an I/O channel configuration from RAM, complete the following steps from the off-line Base I/O Configuration screen.

1. Type in the desired channel number at the **CHANNEL** field at the top of the screen.
2. Press **DELCHN-F7**.
3. In response to the message stating the channel numbers to be deleted, press **YES-F2**.

5.4 Showing Individual I/O Configuration Points

Showing I/O Configuration Chart Display

With the SHOW function, you can display individual I/O points for a base configuration, either on- or off-line. You also have the option of displaying the synonyms for each point. Figure 5-5 illustrates the format of the display. To use the SHOW function, complete the following steps at the Base I/O Configuration screen. See Figure 5-2 for off-line mode and Figure 5-4 for on-line mode.

1. Enter the desired channel and base numbers at the top of the Base I/O Configuration screen, and press the appropriate read key.
2. Press SHOW-F2. The Show I/O Configuration screen appears. See Figure 5-5.

Use the PgUp/PgDn keys to scroll the display one screen at a time. Use the up/down arrow keys to scroll the display one row at a time.

505 I/O CONFIGURATION CHART FOR CHANNEL ... 1 BASE 00								
I/O POINTS								
SLOT 1	1	2	3	4	5	6	7	8
	X0233	X0234	X0235	X0236	X0237	X0238	X0239	X0240
SLOT 2	1	2	3	4	5	6	7	8
	X0161	X0162	X0163	X0164	X0165	X0166	X0167	X0168
SLOT 2	9	10	11	12	13	14	15	16
	X0169	X0170	X0171	X0172	X0173	X0174	X0175	X0176
SLOT 3	1	2	3	4	5	6	7	8
	Y0297	Y0298	Y0299	Y0300	Y0301	Y0302	Y0303	Y0304
SLOT 3	9	10	11	12	13	14	15	16
	Y0305	Y0306	Y0307	Y0308	Y0309	Y0310	Y0310	Y0311

FROM RAM

EXIT-F1 SYNTGL-F2

565 NETDATA

Figure 5-5 Show I/O Configuration Display

Displaying Synonyms

After pressing SHOW, you can choose to display the synonyms with the points in a base. Press SYNTGL-F2 to toggle the synonym display on and off. With synonyms on, you have 12 I/O points and their synonyms displayed.

5.5 Comparing Controller and Base Configuration

Using the Compare Function To check the physical configuration of a base with the configuration stored in the controller, use the compare function (available on-line only).

Entering the Compare From the on-line Base I/O Configuration screen, complete the following steps to initiate a comparison of a base configuration with that in the controller.

1. Enter the desired channel and base numbers at the top of the screen. See Figure 5-4.
2. Press SPACEBAR.
3. Press COMPAR-F1. The Base and Controller I/O Configuration Comparison screen appears.

When the compare finishes, you receive a display such as that shown in Figure 5-6. The display highlights any mismatches between the controller and the base and places asterisks beside the highlighted line.

I/O MODULE COMPARISON FOR CHANNEL ... 1 BASE 00											
SLOT	FROM PLC					FROM BASE					SF
	X	Y	WX	WY	SF	X	Y	WX	WY	SF	
** 01 ...	00	00	00	00	NO	00	08	00	00	NO	
** 02 ...	00	00	00	00	NO	00	08	00	00	YES	
03 ...	00	00	00	00	NO	00	00	00	00	NO	
** 04 ...	00	00	00	00	NO	00	00	07	01	YES	
05 ...	00	00	00	00	NO	00	00	00	00	NO	
06 ...	00	00	00	00	NO	00	00	00	00	NO	
07 ...	00	00	00	00	NO	00	00	00	00	NO	
08 ...	00	00	00	00	NO	00	00	00	00	NO	
09 ...	00	00	00	00	NO	00	00	00	00	NO	
10 ...	00	00	00	00	NO	00	00	00	00	NO	
11 ...	00	00	00	00	NO	00	00	00	00	NO	
12 ...	00	00	00	00	NO	00	00	00	00	NO	
13 ...	00	00	00	00	NO	00	00	00	00	NO	
14 ...	00	00	00	00	NO	00	00	00	00	NO	
15 ...	00	00	00	00	NO	00	00	00	00	NO	
16 ...	00	00	00	00	NO	00	00	00	00	NO	

COMPARISON NOT EQUAL – FAILED MODULE IN BASE 545 NETDATA RN
EXIT-F1

Figure 5-6 Base and Controller I/O Configuration Comparison

5.6 Finding I/O Point Locations

Finding an I/O Point

To find an I/O point, complete the following steps.

1. At the 505 Base Status screen press **FIND-F3**. See Figure 5-3.
2. The **FIND I/O POINT:** prompt shown in Figure 5-7 appears.
3. Type in the I/O point you wish to find and press **Return**.

505 CHANNEL: 1 BASE STATUS			
BASE	ENABLED	CONFIGURED	ONLINE
0	YES	YES	YES
1	YES	NO	NO
2	YES	NO	NO
3	YES	NO	NO
4	YES	NO	NO
5	YES	NO	NO
6	YES	NO	NO
7	YES	NO	NO
8	YES	NO	NO
9	YES	NO	NO
10	YES	NO	NO
11	YES	NO	NO
12	YES	NO	NO
13	YES	NO	NO
14	YES	NO	NO
15	YES	NO	NO

FIND I/O POINT: X0002 FOUND AT: CHAN: 1 BASE: 2 SLOT: 4 DONE
545 NETDATA PG
EXIT-F1 NEXT-F2

Figure 5-7 Find I/O Point Prompt

- If the I/O Point is not found, an **ELEMENT NOT FOUND** message displays.
- If only one (or the last) I/O Point is found, the location (CHAN, BASE, and SLOT) and a **DONE** message displays.
- If more than one I/O Point is found, the location (CHAN, BASE, and SLOT) and a **MORE** message displays. Press **NEXT-F2** to display the next location.
- TISOFT searches both Series 505 and PROFIBUS-DP I/O.

Configuring PROFIBUS-DP I/O

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6.1 Introduction

This chapter describes I/O configuration for devices that use the PROFIBUS-DP I/O channel.

For information about configuring devices that use the Series 505 I/O channel, see Chapter 5.

Getting Ready

You are ready to configure your I/O when you complete the following tasks.

- Install TISOFT according to the procedure described in Chapter 1 of this manual.
- Install the version of COM PROFIBUS that is shipped with TISOFT, following the procedure described in the *SIMATIC ET 200 Distributed I/O System Manual* (PPX:505-8206-x). (Windows must be installed on your PC.)
- Import type files for any slaves not currently supported by COM PROFIBUS. See the section on COM PROFIBUS in the *SIMATIC ET 200 Distributed I/O System Manual* (PPX:505-8206-x) for a description of how to import a type file into COM PROFIBUS.

Overview

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

The first utility, COM PROFIBUS, allows you to perform the following tasks.

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

Section 6.2 provides further information about what you need to do to configure your I/O in COM PROFIBUS.

The second utility, TISOFT, allows you to perform the following tasks.

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

The configuration tasks that you perform in TISOFT are described beginning with Section 6.3.

6.2 Configuring I/O Modules in COM PROFIBUS

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

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

Table 6-1 provides the information you need in order to configure your slave devices in COM PROFIBUS.

Table 6-1 Configuring Slaves in COM PROFIBUS

Task	Comment
Open a file in COM PROFIBUS.	You can modify an existing configuration file, if appropriate, or create a new file.
Select a master.	Required. Choose the 505-CP5434-DP.
Select a host.	Required. Choose the appropriate Series 505 CPU.
Modify bus parameters.	Optional. You can accept the default settings, unless you wish to modify one, such as baud rate.
Assign slave(s).	Required. Choose slave(s), such as the 505 PROFIBUS-DP RBC.
Parameterize slave(s).	Optional. (Note: if you are configuring a 505 PROFIBUS-DP RBC, PPX:505-6870, you may want to change the settings for I/O mismatch handling and RS-232 port communications; consult the <i>SIMATIC 505 PROFIBUS-DP RBC User Manual</i> for a description of the software parameters of the RBC.)
Configure slave(s).	Required. You can use either the "ID" or the "Order Number" list to select I/O module types and assign them to the appropriate slots in your slave device. The "Comment" field is optional. Do not fill in the "I. Addr." or "O. Addr." fields; you will assign starting I/O addresses to each module in TISOFT, and any data you assign to these fields in COM PROFIBUS is overwritten.
Save the file.	Optional. Allows you to add or delete slaves from your configuration later, without re-entering all data into COM PROFIBUS.
Export binary file to TISOFT.	Required. For convenience, you can select the disk drive and directory where your TISOFT program is stored, and assign the binary file the same name as the program where you intend to use the I/O. An extension (.2BF) is automatically assigned to the binary file; do not change this extension.
Exit COM PROFIBUS.	You are ready to perform configuration tasks in TISOFT; see Section 6.3.

6.3 Importing Configuration Data from COM PROFIBUS into TISOFT

Using Merge

The Merge function in TISOFT allows you to import configuration data from the binary file that you created with COM PROFIBUS (described in Section 6.2). The steps you take are the same regardless of whether you are importing data from an entirely new configuration, or merely importing selected items that have been modified from a previous configuration session in COM PROFIBUS. The Merge function performs a comparison between the current configuration information and the contents of the selected binary file exported from COM PROFIBUS. Only new information is written to TISOFT; pre-existing, unchanged configuration information (for example, I/O addresses) is not lost.

To execute Merge, you must be running TISOFT, and the binary file (with its .2BF extension) that you created with COM PROFIBUS must be in a known location. Follow the steps below to execute Merge.

1. If you are on-line, press OFFLINE-F8 to change to the off-line state.
2. Press the SPACEBAR (+) to get the secondary function key line, and then press CONFIO-F3 to get the base status screen. Figure 6-1 shows the function key line.

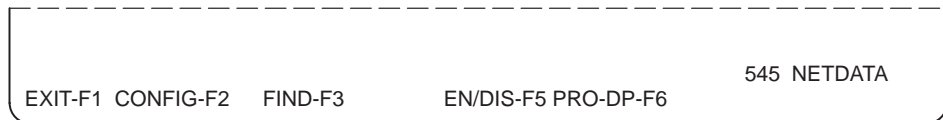


Figure 6-1 Off-Line 505 Base Status Function Key Line

3. If the status display is set to Series 505 I/O, press PRO-DP-F6 to toggle the display to PROFIBUS-DP I/O. See Figure 6-2.

NOTE: Once you select PROFIBUS-DP, all status and configuration screens display PROFIBUS-DP I/O information until the end of your TISOFT session, or until you use the 505IO-F6 toggle to return to Series 505 I/O configuration.

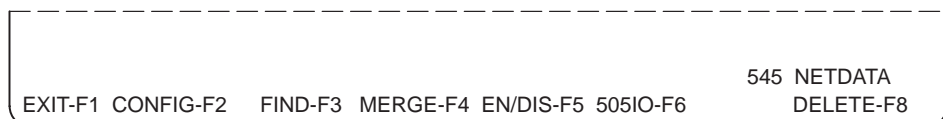


Figure 6-2 Off-Line PROFIBUS-DP Slave Status Function Key Line

4. Press **MERGE-F4** to execute the Merge function.
5. Press **YES-F2** in response to the prompt **MERGE COM PROFIBUS BINARY FILE INTO DISK PROGRAM?** The TISOFT File Selection screen appears as shown in Figure 6-3.

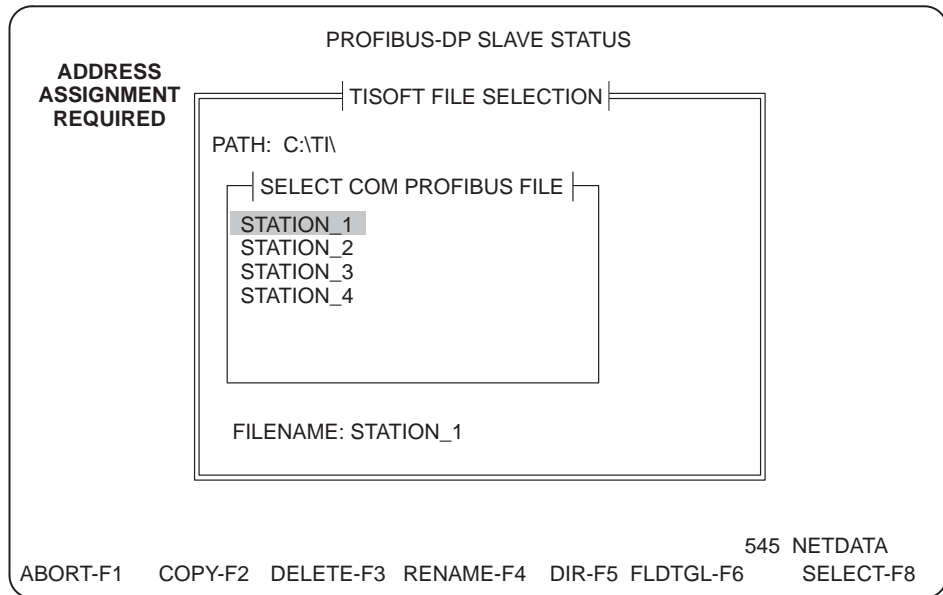


Figure 6-3 Selecting COM PROFIBUS File to Merge in TISOFT

6. Use the list to select the binary file from which you want to import configuration data. (If you type the filename at the prompt, do not type the .2BF extension; type only the filename.) Press **Return** or **SELECT-F8**.

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

You are now ready to configure starting I/O addresses for your PROFIBUS-DP slaves.

Assigning or Modifying I/O Addresses

There are three ways that you can assign or modify the starting module addresses of your PROFIBUS-DP slaves. You can edit on-line, edit off-line, or use the Update function. Section 6.4 describes Update, which is an automated procedure that loads bus parameters and prompts you to provide addresses for any modules requiring them. If you want to edit individual module addresses selectively, see Section 6.5.

To familiarize yourself with the options available from the on- and off-line status and configuration screens, and practice moving between them before you load your configuration, consult Section 6.6.

6.4 Loading a PROFIBUS-DP I/O Configuration to the Controller

I/O Configuration Guidelines

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

- For bit or bit-and-word modules (but not for word-only modules), the number for the I/O address must begin on an eight-point boundary. An eight-point boundary is $(n*8) + 1$, (for example, 1, 9, 17, etc.). Addresses not starting on an eight-point boundary are changed to do so when you write the values.
- TISOFT does not flag duplicate I/O points.

Using Update

The Update function automatically writes bus parameters and any previously-configured slaves to the controller, and prompts you on a case-by-case basis to supply addresses for unconfigured slave modules. In the case of a new configuration, this means that you are prompted to supply all addresses; if you have modified an existing configuration in COM PROFIBUS (to add or delete slaves) and merged the data into your TISOFT program, Update compares the data of the selected program on disk to the data in the controller, and modifies the controller data as necessary to match the additions or deletions indicated by the comparison.

WARNING

Update writes configuration data immediately to the controller. If your PROFIBUS-DP communications are in OPERATE mode, modifying your existing configuration can affect your ongoing process.

Unexpected process operation could cause serious injury or death to personnel, and/or damage to equipment.

Be prepared for the effect on your process, and take any necessary safeguards, if you choose to execute Update while your PROFIBUS-DP communications are in OPERATE mode.

Follow the steps below to load your I/O configuration to the controller.

1. If you are off-line, press ONLINE-F4 to change to the on-line state.
2. Press the spacebar (+) to get the secondary function key line, and then press CONFIO-F3 to get the status screen.
3. If the status display is set to Series 505 I/O, press PRO-DP-F6 to toggle the display to PROFIBUS-DP I/O. See Figure 6-4.

NOTE: Once you select PROFIBUS-DP, all status and configuration screens display PROFIBUS-DP I/O information until the end of your TISOFT session, or until you use the 505IO-F6 toggle to return to Series 505 I/O configuration.

```

EXIT-F1  CONFIG-F2  FIND-F3                EN/DIS-F5  PRO-DP-F6                545 NETDATA  PG

```

Figure 6-4 On-Line 505 Base Status Function Key Line

- If necessary, press OPR/ST-F7 to ensure that you are in STOP mode. Figure 6-5 shows the location of the OPR/ST toggle.

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

```

UPDATE IN PROGRESS                545 NETDATA  PG
EXIT-F1  CONFIG-F2  FIND-F3  MERGE-F4  EN/DIS-F5  505IO-F6  OPR/ST-F7  DELETE-F8

```

Figure 6-5 On-Line PROFIBUS-DP Slave Status Function Key Line

NOTE: In the slave status screen (Figure 6-5), the message **UPDATE IN PROGRESS** does not refer to the Update function; rather, the screen is being continuously refreshed to provide current status information.

- Press CONFIG-F2. The PROFIBUS-DP Slave Configuration screen appears. See Figure 6-6.

```

FROM PLC                STOP
                    545 NETDATA  PG
EXIT-F1  SHOW-F2  READDK-F3                READPC-F5                EDIT-F7  UPDATE-F8

```

Figure 6-6 On-Line PROFIBUS-DP Slave Configuration Function Key Line

Loading a PROFIBUS-DP I/O Configuration to the Controller (continued)

6. Press **UPDATE-F8** to execute the Update function.

If you are prompted to supply an I/O address, you have two choices. Type in a starting I/O address for the module in question and then press **CONT-F6** to write the address immediately to both the controller and the selected program on disk; or else press **ABORT-F1** to terminate the configuration session. See Figure 6-7.

Result: When you finish updating your I/O, you are automatically returned to the PROFIBUS-DP Slave Configuration screen.



Figure 6-7 PROFIBUS-DP Update Function Key Line

7. Press **EXIT-F1** to go back to the PROFIBUS-DP Slave Status screen.
8. If necessary, press **OPR/ST-F7** to toggle PROFIBUS-DP mode back to **OPERATE**.

Result: When you set the PROFIBUS-DP to the **OPERATE** mode, indicators on your slave devices should show that I/O is active.

You are now ready to exit the PROFIBUS-DP Slave Status screen and run your program.

6.5 Modifying an Existing I/O Configuration

I/O Configuration Guidelines

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

- For bit or bit-and-word modules (but not for word-only modules), the number for the I/O address must begin on an eight-point boundary. An eight-point boundary is $(n*8) + 1$, (for example, 1, 9, 17, etc.). Addresses not starting on an eight-point boundary are changed to do so when you write the values.
- TISOFT does not flag duplicate I/O points.

Adding or Deleting Slaves

To add or delete slaves or modules, you must return to COM PROFIBUS. Modify your configuration file as appropriate, and export it again. (See Section 6.2.) Follow the procedure outlined in Section 6.3 to import the new information by running Merge. Next, execute Update (Section 6.4), where you are prompted to supply any necessary new I/O addresses, and out-of-date addresses are automatically corrected.

Modifying an I/O Address or Enable/Disable Status

If you only wish to modify an I/O address or change a slave's enable/disable status, you can do so by using Edit. The Edit function can be accessed from either the on-line (Figure 6-8) or off-line (Figure 6-9) PROFIBUS-DP Slave Configuration screen.

```
FROM PLC                                     STOP  
                                           545 NETDATA PG  
EXIT-F1  SHOW-F2  READDK-F3          READPC-F5      EDIT-F7  UPDATE-F8
```

Figure 6-8 On-Line PROFIBUS-DP Slave Configuration Screen

```
FROM RAM  
                                           545 NETDATA  
EXIT-F1  SHOW-F2  READRM-F3          EDIT-F7
```

Figure 6-9 Off-Line PROFIBUS-DP Slave Configuration Screen

Modifying an Existing I/O Configuration (continued)

Using On-Line Edit

The on-line Edit screen gives you the option of reading from and writing to either the controller or the selected program on disk. See Figure 6-10.

PROFIBUS-DP I/O MODULE DEFINITION FOR SLAVE 15									
SLAVE	IDENT	MODULE	I/O ADDRESS	NUMBER OF BIT AND WORD I/O					
				X	Y	WX	WY		
15..	BCD0..	1	..... 0000	..... 0	32	0	0	..	ENABLED
		2	..... 0000	..... 0	16	0	0		
		3	..... 0000	..... 0	16	0	0		
		4	..... 0000	..... 32	0	0	0		
		5	..... 0000	..... 0	32	0	0		
		6	..... 0000	..... 0	0	8	0		
		7	..... 0000	..... 0	0	0	2		
		8	..... 0000	..... 0	0	0	4		

FROM PLC								OPERATE
								545 NETDATA PG
EXIT-F1	READDK-F3	WRITDK-F4	READPC-F5	WRITPC-F6	EN/DIS-F7			+

FROM PLC								OPERATE
								545 NETDATA PG
	X<->WX-F3	Y<->WY-F4	CMPACT-F5	UNIFY-F6				RESTOR-F8+

Figure 6-10 On-Line PROFIBUS-DP Slave Edit Screen

⚠ WARNING

The WRITPC function sends new I/O values immediately to the controller. If your PROFIBUS-DP communications are in OPERATE mode, modifying your existing I/O configuration can affect your ongoing process.

Unexpected process operation could cause serious injury or death to personnel, and/or damage to equipment.

Be prepared for the effect on your process, and take any necessary safeguards, if you choose to write an I/O address value to the controller while your PROFIBUS-DP communications are in OPERATE rather than STOP mode.

NOTE: If you need to change communications from OPERATE to STOP mode before you perform an edit, you can back out of the configuration screen (press EXIT-F1) and select the OPR/ST-F8 toggle at the status screen. Next, to return to the configuration screen, where the Edit function is available, press CONFIG-F2.

Using Off-Line Edit

When you access the off-line Edit screen, you can only read and write the configuration from the selected program on disk. See Figure 6-11.

PROFIBUS-DP I/O MODULE DEFINITION FOR SLAVE 15								
SLAVE	IDENT	MODULE	I/O ADDRESS	NUMBER OF BIT AND WORD I/O				
				X	Y	WX	WY	
15..	BCD0..	1	0000	0	32	0	0	ENABLED
		2	0000	0	16	0	0	
		3	0000	0	16	0	0	
		4	0000	32	0	0	0	
		5	0000	0	32	0	0	
		6	0000	0	0	8	0	
		7	0000	0	0	0	2	
		8	0000	0	0	0	4	

FROM RAM							OPERATE
EXIT-F1		READRM-F3	WRITRM-F4				545 NETDATA
							EN/DIS-F7 +

FROM RAM							OPERATE
							545 NETDATA
		X<->WX-F3	Y<->WY-F4	CMPACT-F5	UNIFY-F6		RESTOR-F8 +

Figure 6-11 Off-Line PROFIBUS-DP Slave Edit Screen

NOTE: After you change the enable/disable status or I/O address(es) of your slave(s), for the edit to take effect, you must issue a write command. You can write to the controller, to the selected program on disk, or to both, on-line. Off-line, you can write only to RAM.

Modifying an Existing I/O Configuration (continued)

Table 6-2 describes the operations performed by the function keys available in PROFIBUS-DP Slave Edit mode.

Table 6-2 PROFIBUS-DP Slave Edit Function Keys

Function	Description
READDK-F3	Reads a particular slave I/O configuration from the selected program on disk. On-line only.
READRM-F3	Reads a particular slave I/O configuration from the selected program in the programming device RAM. Off-line only.
WRITDK-F4	Writes the currently displayed slave I/O configuration to the selected program on disk. On-line only.
WRITRM-F4	Writes the currently displayed I/O configuration to the selected program in the programming device RAM. Off-line only.
READPC-F5	Reads a particular slave I/O configuration from the controller. On-line only.
WRITPC-F6	Writes the currently displayed I/O configuration to the controller. On-line only.
EN/DIS-F7	Toggles the display of enable or disable status of a slave.
X<->WX-F3	Toggles the image register type for the selected module between discrete and word inputs.
Y<->WY-F4	Toggles the image register type for the selected module between discrete and word outputs.
CMPACT-F5	Moves all discrete image register types to word image register types for every module of the selected slave. It also unifies all the modules into the first module. Only the first address is retained.
UNIFY-F6	Moves all modules for the selected slave into the first module. Only the first address is retained.
RESTOR-F8	Restores modules for the selected slave according to the COM PROFIBUS configuration, including the image register types. Zero addresses are assumed for all but the first address, which is kept.

6.6 Reading an I/O Configuration

Displaying a PROFIBUS-DP Slave Configuration from RAM

In off-line mode, complete the following steps to display a PROFIBUS-DP slave configuration from RAM:

1. Press SPACEBAR and then CONFIO-F3. The PROFIBUS-DP Slave Status screen appears. See Figure 6-12.

PROFIBUS-DP SLAVE STATUS			
ADDRESS ASSIGNMENT REQUIRED	SLAVE	ENABLED	ASSIGNED
	1	YES	NO
	2	YES	NO
	3	YES	NO
	4	YES	NO
	5	YES	NO
	6	YES	NO
	7	YES	NO
	8	YES	NO
	9	YES	NO
	10	YES	NO
	11	YES	NO
	12	YES	NO
	13	YES	NO
	14	YES	NO
	15	YES	NO

EXIT-F1 CONFIG-F2 FIND-F3 MERGE-F4 EN/DIS-F5 505IO-F6 545 NETDATA DELETE-F8

Figure 6-12 Off-Line PROFIBUS-DP Slave Status Screen

2. Use the arrow/page keys to highlight the desired slave number on the screen.
3. Press CONFIG-F2. The PROFIBUS-DP Slave Configuration screen appears. See Figure 6-13.

Reading an I/O Configuration (continued)

An alternative procedure for displaying a PROFIBUS-DP slave configuration is as follows:

1. Press SPACEBAR and then CONFIO-F3. The PROFIBUS-DP Slave Status screen appears. See Figure 6-12.
2. Press CONFIG-F2. The PROFIBUS-DP Slave Configuration screen appears. See Figure 6-13.
3. Use the arrow/page keys to set the **SLAVE** field, or type in the slave number.
4. Press READRM-F3.

The configuration of the selected slave is displayed at the top of the screen, with the source, **FROM RAM**, indicated on the prompt line of the display. (See Figure 6-13.)

PROFIBUS-DP I/O MODULE DEFINITION FOR SLAVE 003									
SLAVE	IDENT	MODULE	I/O ADDRESS	NUMBER OF BIT AND WORD I/O				I/O	
				X	Y	WX	WY		
3 ..	BCD0 ..	1	0000	0	32	0	0 ..	ENABLED	
		2	0000	0	16	0	0		
		3	0000	0	16	0	0		
		4	0000	32	0	0	0		
		5	0000	0	32	0	0		
		6	0000	0	0	8	0		
		7	0000	0	0	0	2		
		8	0000	0	0	0	4		
4 ..	BCD01 ...	1	0000	0	16	0	0 ..	DISABLED	
		2	0000	0	8	0	0		
		3	0000	0	0	16	0		
		4	0000	0	0	0	16		
		5	0000	32	0	0	0		
		6	0000	0	0	8	0		
		7	0000	0	0	0	2		
		8	0000	0	0	0	4		
FROM RAM								545 NETDATA	
EXIT-F1	SHOW-F2	READRM-F3					EDIT-F7		

Figure 6-13 Off-Line PROFIBUS-DP Slave Configuration Screen

Displaying a Configuration from Disk or Controller

In on-line mode, complete the following steps to display a PROFIBUS-DP slave configuration from a disk or a controller.

1. Press SPACEBAR and then CONFIO-F3. The PROFIBUS-DP Slave Status screen appears. See Figure 6-14.

ADDRESS ASSIGNMENT REQUIRED	PROFIBUS-DP SLAVE STATUS			
	SLAVE	ENABLED	ASSIGNED	ONLINE
	1	YES	YES	YES
	2	YES	NO	NO
	3	YES	NO	NO
	4	YES	NO	NO
	5	YES	NO	NO
	6	YES	NO	NO
	7	YES	NO	NO
	8	YES	NO	NO
	9	YES	NO	NO
	10	YES	NO	NO
	11	YES	NO	NO
	12	YES	NO	NO
	13	YES	NO	NO
	14	YES	NO	NO
	15	YES	NO	NO
	16	YES	NO	NO

UPDATE IN PROGRESS STOP
 EXIT-F1 CONFIG-F2 FIND-F3 MERGE-F4 EN/DIS-F5 505IO-F6 OPR/ST-F7 DELETE-F8 545 NETDATA PG

Figure 6-14 On-Line PROFIBUS-DP Slave Status Screen

NOTE: The on-line PROFIBUS-DP Slave Status screen (Figure 6-14) displays the message **UPDATE IN PROGRESS**. This has nothing to do with the **UPDATE-F7** function (accessed from the PROFIBUS-DP Slave Configuration screen); it means that the screen is being continuously refreshed to provide current slave status information.

2. Use the arrow/page keys to highlight the desired slave number on the screen.
3. Press **CONFIG-F2**. The PROFIBUS-DP Slave Configuration screen appears. See Figure 6-15.
4. The PROFIBUS-DP slave configuration from the programmable logic controller is automatically displayed. Press **READDK-F3** if you want to read the selected program on the disk.

Reading an I/O Configuration (continued)

An alternative procedure for displaying a PROFIBUS-DP slave configuration is as follows:

1. Press SPACEBAR and then CONFIO-F3. The PROFIBUS-DP Slave Status screen appears. See Figure 6-14.
2. Press CONFIG-F2. The PROFIBUS-DP Slave Configuration screen appears. See Figure 6-15.
3. Use the arrow/page keys to set the SLAVE field, or type in the slave number.
4. Press either READDK-F3 or READPC-F5.

The configuration of the selected slave is displayed at the top of the screen, with the source, FROM DISK or FROM PLC, indicated on the prompt line of the display. See Figure 6-15.

PROFIBUS-DP I/O MODULE DEFINITION FOR SLAVE 003								
SLAVE	IDENT	MODULE	I/O ADDRESS	NUMBER OF BIT AND WORD I/O				
				X	Y	WX	WY	
3..	BCD0..	1	..... 0000	..... 0	32	0	0	.. ENABLED
		2	..... 0000	..... 0	16	0	0	
		3	..... 0000	..... 0	16	0	0	
		4	..... 0000	..... 32	0	0	0	
		5	..... 0000	..... 0	32	0	0	
		6	..... 0000	..... 0	0	8	0	
		7	..... 0000	..... 0	0	0	2	
		8	..... 0000	..... 0	0	0	4	
4..	BCD0..	1	..... 0000	..... 0	16	0	0	.. DISABLED
		2	..... 0000	..... 0	8	0	0	
		3	..... 0000	..... 0	0	16	0	
		4	..... 0000	..... 0	0	0	16	
		5	..... 0000	..... 32	0	0	0	
		6	..... 0000	..... 0	0	8	0	
		7	..... 0000	..... 0	0	0	4	
		8	..... 0000	..... 0	0	0	8	
FROM PLC								
545 NETDATA PG								
EXIT-F1	SHOW-F2	READDK-F3	READPC-F5			EDIT-F7 UPDATE-F8		

Figure 6-15 On-Line PROFIBUS-DP Slave Configuration Screen

6.7 Showing Individual I/O Configuration Points

Showing I/O Configuration Chart Display

With the SHOW function, you can display individual I/O points for a slave configuration, either on- or off-line. You also have the option of displaying the synonyms for each point. Figure 6-16 illustrates the format of the display. To use the SHOW function, complete the following steps at the PROFIBUS-DP Slave Configuration screen. See Figure 6-13 for off-line mode and Figure 6-15 for on-line mode.

1. Enter the desired slave number at the top of the PROFIBUS-DP Slave Configuration screen, and press the appropriate read key.
2. Press SHOW-F2. The Show I/O Configuration screen appears. See Figure 6-16.

Use the PgUp/PgDn keys to scroll the display one screen at a time. Use the up/down arrow keys to scroll the display one row at a time.

PROFIBUS-DP I/O CONFIGURATION CHART FOR SLAVE 112								
I/O POINTS								
MODULE 1	1	2	3	4	5	6	7	8
	X0233	X0234	X0235	X0236	X0237	X0238	X0239	X0240
MODULE 2	1	2	3	4	5	6	7	8
	X0161	X0162	X0163	X0164	X0165	X0166	X0167	X0168
MODULE 2	9	10	11	12	13	14	15	16
	X0169	X0170	X0171	X0172	X0173	X0174	X0175	X0176
MODULE 3	1	2	3	4	5	6	7	8
	Y0297	Y0298	Y0299	Y0300	Y0301	Y0302	Y0303	Y0304
MODULE 3	9	10	11	12	13	14	15	16
	Y0305	Y0306	Y0307	Y0308	Y0309	Y0310	Y0310	Y0311

FROM RAM

EXIT-F1 SYNTGL-F2

555 NETDATA

Figure 6-16 Show I/O Configuration Display

Displaying Synonyms

After pressing SHOW, you can choose to display the synonyms with the points in a slave. Press SYNTGL-F2 to toggle the synonym display on and off. With synonyms on, you have up to 12 I/O points and their synonyms displayed.

6.8 Finding I/O Point Locations

Finding an I/O Point

To find an I/O point, complete the following steps:

1. At the PROFIBUS-DP Slave Status screen press **FIND-F3**. See Figure 6-14.
2. The **FIND I/O POINT:** prompt shown in Figure 6-17 appears.
3. Type in the I/O point you wish to find and press **Return**.

PROFIBUS-DP SLAVE STATUS			
SLAVE	ENABLED	ASSIGNED	ONLINE
1	YES	YES	YES
2	YES	NO	NO
3	YES	NO	NO
4	YES	NO	NO
5	YES	NO	NO
6	YES	NO	NO
7	YES	NO	NO
8	YES	NO	NO
9	YES	NO	NO
10	YES	NO	NO
11	YES	NO	NO
12	YES	NO	NO
13	YES	NO	NO
14	YES	NO	NO
15	YES	NO	NO
16	YES	NO	NO

FIND I/O POINT: X0002 FOUND AT: SLAVE: 3 MODULE: 1 DONE
545 NETDATA PG
EXIT-F1 NEXT-F2

Figure 6-17 Find I/O Point Prompt

- If the I/O Point is not found, an **ELEMENT NOT FOUND** message displays.
- If only one (or the last) I/O Point is found, the location (SLAVE and MODULE) and a **DONE** message displays.
- If more than one I/O Point is found, the location (SLAVE and MODULE) and a **MORE** message displays. Press **NEXT-F2** to display the next location.
- TISOFT searches both PROFIBUS-DP and Series 505 I/O.

Using TISOFT for Discrete Programming

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7.1 Ladder Programming

Ladder Program Elements

The term “element” designates a component used in your program: for example, a timer, a V-memory address, a contact or coil (X, Y, or C). Each element requires an “identifier,” which is the number that distinguishes one element of a particular type from another, such as TMR6, TMR8, etc. (Many box instructions, however, do not require an identifier.)

Entering your ladder programs with TISOFT is simplified by the design of the menu structure. Ladder programming is accomplished through three main elements: contacts, coils, and boxes. Most contact and coil types have a function key available; select the type by pressing the function key, and type in a numeric identifier. If you select a box, type in the box type at the prompt, or press **↵** or **SHIFT [?]** to select from the on-screen list (shown in Figure 7-1).

Using the Element List Screen

Although the entire TISOFT Help system is available to you in the edit mode, you may find the element List display particularly useful for element names. You can access a display listing the valid entries for a field at any point that has a prompt requesting an entry. For example, at the prompt for entering boxes, calling the List display gives a listing of all valid box types. Figure 7-1 shows the List displayed after selecting BOX in edit mode.

Invoke the List display by pressing **↵** or **SHIFT [?]**. Use arrow keys (or PgUp/PgDn, Home, End) to select a box instruction from the menu. The following function keys are available.

- **HELP-F4** – Accesses the Help System and gives you a definition for the element where the cursor is currently positioned.
- **SELECT-F8** or **Return** – Returns to the ladder display and writes at the prompt the element that was under the cursor before pressing **F8**.

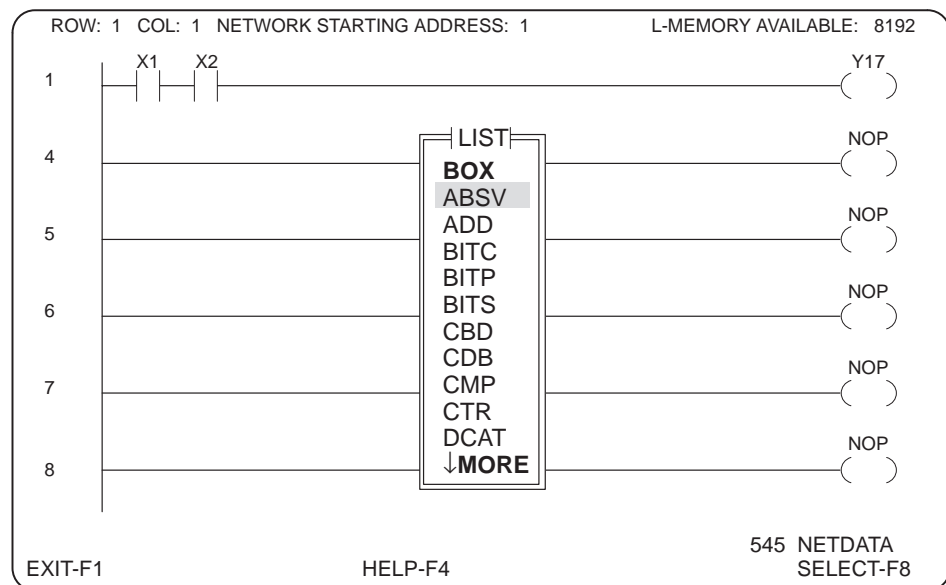


Figure 7-1 Element List Display

7.2 Accessing Program Entry Functions

Using TISOFT Menus TISOFT functions are accessible through the menu keys available after the selection of on- or off-line. Figure 7-2 shows the ladder display that appears off-line. The ladder display is the access point to the TISOFT functions. Whenever the plus (+) sign is visible at the end of a function key line, press the spacebar to display the remaining function keys.

Since you communicate with the controller in on-line mode, the menu keys for on-line include those functions that operate only with the controller. See Appendix A for a mapping of function key menus.

Entering/Editing Programs

To enter/edit a ladder program, first press EDIT-F2 to access the ladder programming functions.

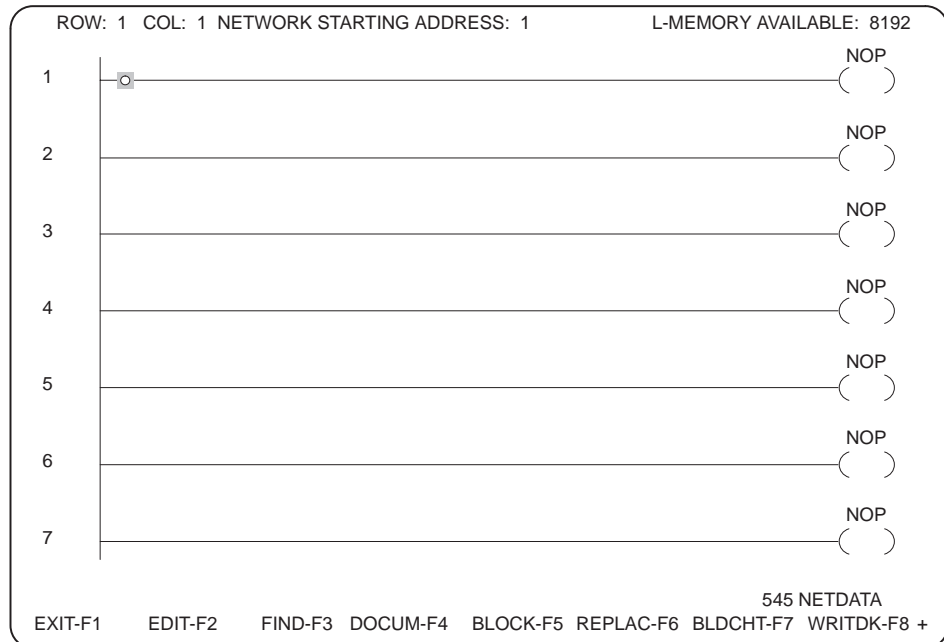



Figure 7-2 Off-Line Ladder Display


 WARNING
<p>TISOFT allows program entry and modification while the controller is in RUN mode. However, entries made to the program in RUN mode may immediately affect the execution of the program.</p> <p>Failure to follow appropriate safety precautions could result in death or serious injury to personnel, and/or damage to equipment.</p> <p>Only qualified personnel authorized to perform system level operations should enter or modify a program with the controller in RUN mode.</p>

Accessing Program Entry Functions (continued)

Run-time Edits

Some of the 545, 555, and 575 controllers have a RUN-TIME EDIT (ED) mode in addition to PROGRAM (PG) and RUN (RN) modes. RUN-TIME EDIT mode allows the editing of your RLL program while the process is running. Returning to RUN mode updates the program in the programmable controller to reflect the modifications made during RUN-TIME EDIT. See Figure 7-3 for a typical task flow.

Before returning to RUN mode from RUN-TIME EDIT, always press SYNTAX-F8 to check the syntax of the RLL program. Syntax check looks for invalid instructions that could cause the process to go to PROGRAM mode.

 WARNING
<p>TISOFT allows program entry and modification while the controller is in RUN mode. If your controller supports RUN-TIME EDIT mode and Syntax Check, always check the syntax of the modifications (using SYNTAX-F8) before returning to RUN mode. If your controller does not support Syntax Check, remember that all entries made to the program in RUN mode immediately affect the execution of the program.</p> <p>Failure to follow appropriate safety precautions could result in death or serious injury to personnel, and/or damage to equipment.</p> <p>Only qualified personnel authorized to perform system level operations should enter or modify a program with the controller in RUN mode.</p>

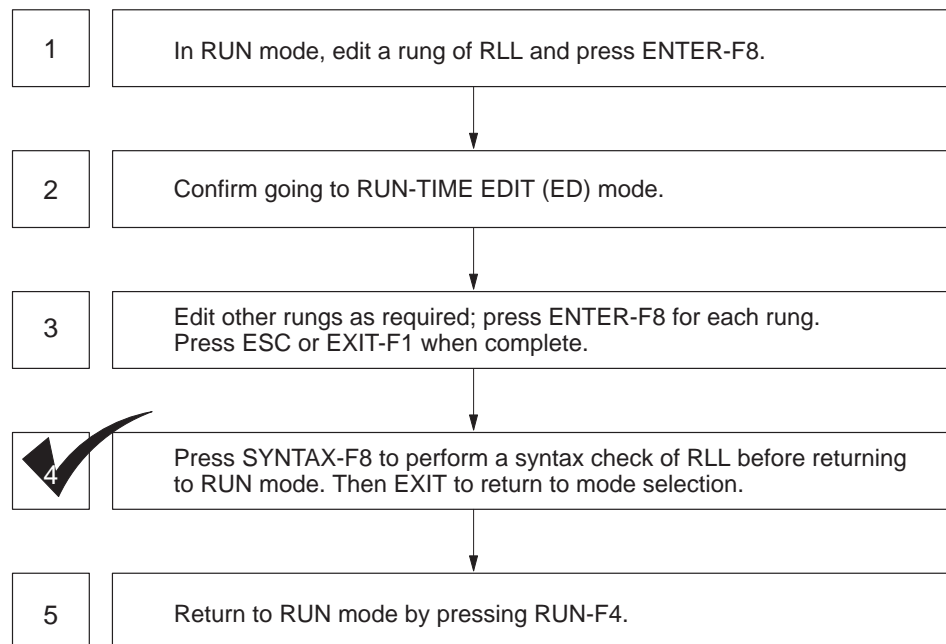


Figure 7-3 Task Flow for Run-time Edits

7.3 Displaying Networks

Displaying Networks

You can display networks with up to 32 contacts in series and 32 contacts in parallel, plus 32 output elements. Figure 7-5 shows a network that extends beyond the right edge of the screen. Absence of an output element in a display indicates that the network extends beyond the right edge of the screen. Absence of the network starting address indicates that the network extends beyond the left edge of the screen.

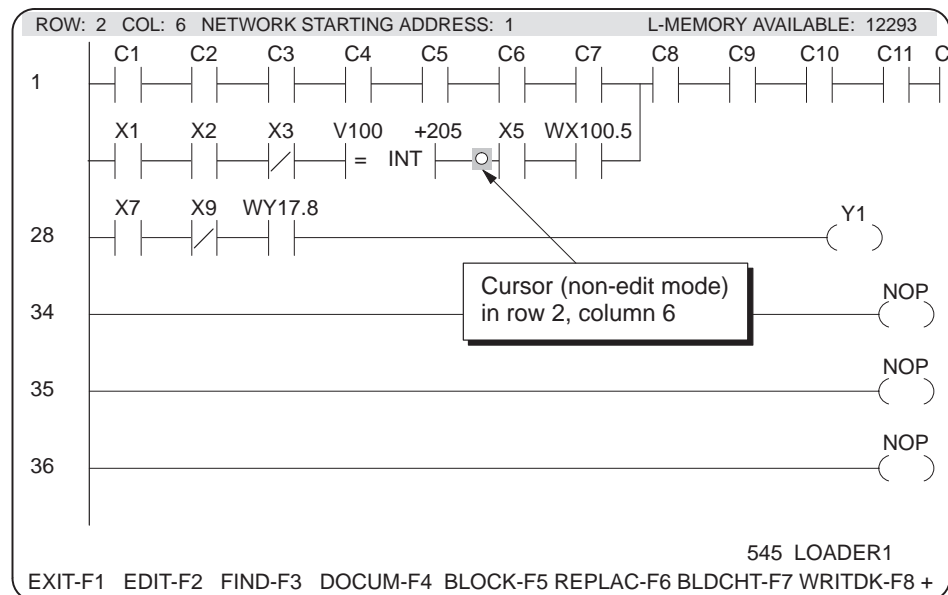


Figure 7-5 Program Display

Cursor Position

The top line of the ladder display tells you the location of the cursor by network block row, network block column, network address, and L-memory words available (off-line only). In Figure 7-5, the cursor is positioned in Row 2, Column 6, at Address 1. To toggle the cursor position display on/off, press Ctrl T.

Status Line Information

The fields on the status line at the bottom right of the display provide you with information as listed below.

- Controller type
- Selected program on disk name
- On-line, the third field shows PG, ED, or RN mode. The absence of PG, ED, or RN indicates offline.

In the display shown above, the status line shows that the controller is a 545 and the program name is LOADER1. Absence of PG, RN, or ED indicates that the programming device is offline.

The keys listed in Table 7-1 enable you to move through the program display. These keys are also available in other areas of TISOFT, such as block, ladder status, status edit, and replace, unless they were previously defined for another function.

Table 7-1 Cursor and Editing Keys

Key	Function
HOME	Moves cursor to the upper left contact in the current rung.
END	Moves the cursor to the first output coil in the rung.
Up/Down Arrows	Moves cursor up/down one row.
Right/Left Arrows	Moves cursor right/left one element.
PgUp, PgDn	Scrolls up/down one full screen in ladder display.
Ctrl Right Arrow	Scrolls the ladders left by the number of complete columns which are currently displayed on the screen. (Page Right)
Ctrl Left Arrow	Scrolls the ladders right by the number of complete columns which are currently displayed on the screen. (Page Left)
RETURN	If editing an element, RETURN enters the element; otherwise, RETURN moves to the left power rail of the next row. If editing a rung, RETURN on last row of rung appends a new row to the rung.
Ctrl T	Toggles the cursor position display on/off.

7.4 Entering/Editing Ladder Program Elements

Getting into Edit Mode

To enter or edit a ladder logic program, first press **EDIT-F2** to enter edit mode. Figure 7-6 shows the ladder screen in edit mode.

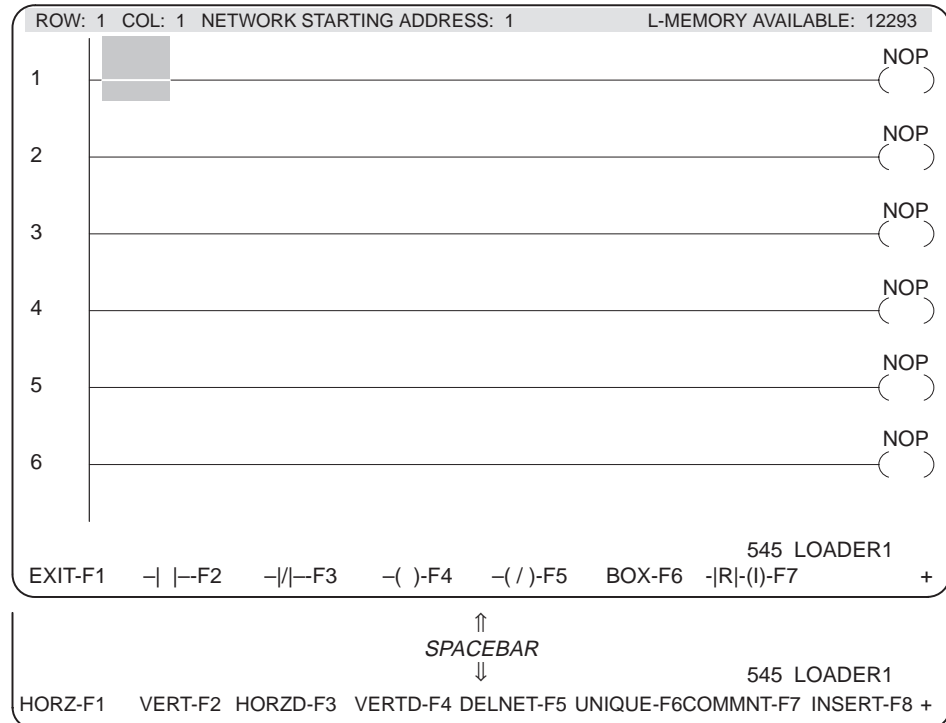


Figure 7-6 Edit Mode for Ladder Logic

The primary ladder editing function keys include the following:

- The first string of function keys provides the basic elements of a ladder program—contacts, coils, and box instructions.
- Additional function keys, accessed by pressing the **SPACEBAR**, provide the means to draw or delete horizontal or vertical connecting lines in your ladder program. Refer to Section 7.6 for details on using these function keys.
- You can use the **INSERT-F8** (or **INS** key) to insert networks or elements between existing networks or elements. Refer to Section 7.7 for details on using this function.

Entering Contacts

To enter or edit a contact, follow these steps:

1. Position the cursor where you want the contact to appear.
2. Press the `-| |`-F2 or `-|/|`-F3 contact function key to place the contact on the rung. After the contact appears, the cursor highlights the element identifier field, as shown in Figure 7-7.
3. Type in the element identifier. (For a list of valid element types, press `[^]` or Shift `[?]`.) You can also use the hard keys (for example X, Y, C) to enter a normally open contact directly.
4. Press `[Return]` to write the contact to the network. The editing cursor moves to the next available position.

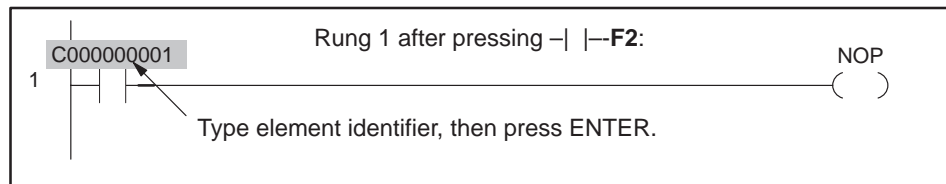


Figure 7-7 Entering Contacts

Entering Relational Contacts

To enter a relational contact, position the cursor where you want the contact to appear and follow these steps:

1. Press `-|R|-(|)`-F7. A different set of function keys appears, allowing you to select the type of relational contact you want.
2. Press the appropriate function key. The relational contact appears on the rung with two parameter fields, as shown in Figure 7-8.
3. Use the arrow keys to move the cursor to each field, including the INT field, which you can change to UINT (unsigned integer). You can also change the "relation" of the contact when INT or UINT is highlighted by typing one of the other sign keys (for example, `>`, `<`, `<>`, `>=`, or `<=`).
4. Enter the identifiers for each field and press `[Return]` to write the contact to the network. The editing cursor moves to the next available position.

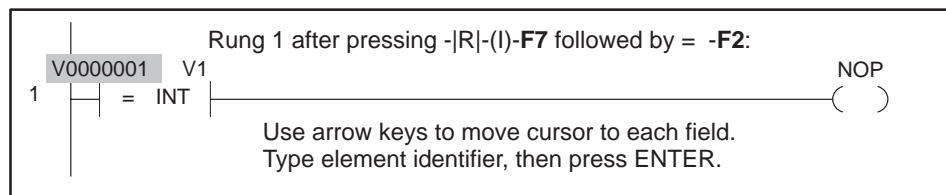


Figure 7-8 Entering Relational Contacts

Entering/Editing Ladder Program Elements (continued)

Entering Coils

To enter or edit a coil, position the cursor on the network. Use the coil function key or press the O hard key to position the cursor in the output column and make the entry. Type in the element identifier.

If you decide not to complete an entry, press **ABORT-F1**. Press **Return** to write the coil to the network. When a network is complete, press **ENTER-F8**.

Entering Boxes

To enter or edit a box, position the cursor in the column of the rung where the box is to be created. Press **BOX-F6**. Type in the mnemonic for the box, or press **↓** or **Shift ?** to show a listing of valid box types, then place the cursor on the box type you want and press **SELECT-F8** or **Return**. The selected box type appears in the prompt. Press **Return** again. When the box is displayed, type in the parameters. Use the arrow keys to move from field to field in the box.

If you decide not to complete an entry, press **ABORT-F1**. After completing the entry, press **Return** to write the box to the network. When a network is complete, press **ENTER-F8**.

Box Locations

Figure 7-9 shows locations for multiple-input and large boxes. As shown below, you can have no more than two contacts per input rung to the multiple-input and large boxes.

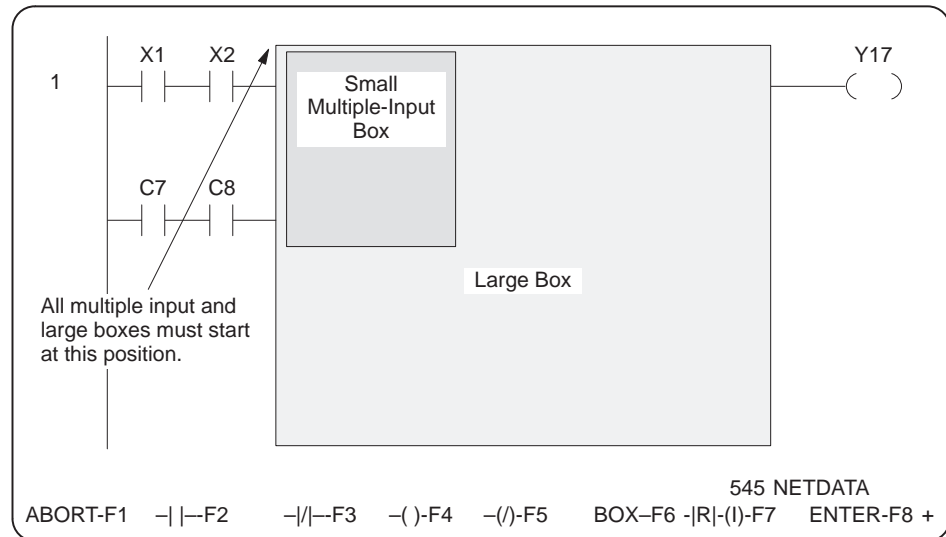


Figure 7-9 Multiple-Input and Large Box Locations

Correcting Entries

You can correct entries by using **Back Space** to delete previous characters, or you can keep typing until the field overflows and resets.

7.5 Entering/Editing Program Elements for Extended Rungs

To enter/edit an element (contact, coil, or box) that extends beyond column 12 of the display, you can either position the cursor in the output column and select an input contact or box, or use the insert mode. Complete the following steps to access the insert mode.

1. Press **EDIT-F2**.
2. Press the **INS** hard key, or press the **SPACEBAR**, then press **INSERT-F8**.

You receive the function key display shown in Figure 7-10.



Figure 7-10 Insert Function Keys

3. Press **INSMOD-F4**. The editing cursor changes as shown in Figure 7-11.

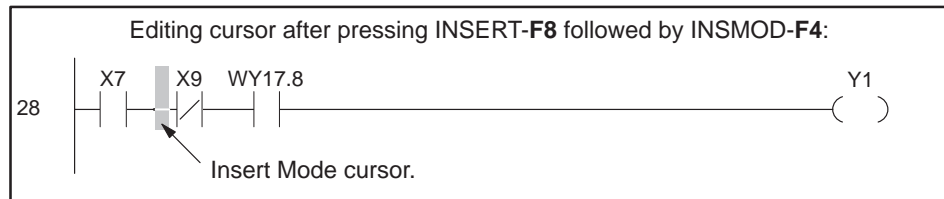


Figure 7-11 Insert Mode

When auto insert element mode is on, all ladder elements at and to the right of the block cursor position are shifted to the right when a new contact is created. It performs an **INSERT COLUMN** for each column required to display the new ladder element. You remain in the insert mode until you press **INSMOD-F4** again.

When a network is complete, press **ENTER-F8**.

If you attempt to enter a network that exceeds the maximum number of elements allowed (120 contact-sized nodes), you receive the following message: **ELEMENT TOO LARGE TO FIT INTO NETWORK**. To correct the entry, either delete some ladder elements, or break the logic into two networks.

7.6 Adding Connecting Lines for Ladders

Drawing Lines for Networks

Use **HORZ-F1** (or the H hard key) and **VERT-F2** (or the J hard key) to add the connecting lines when you are entering a complex network. You cannot draw a horizontal line in the last column of a row. With the vertical line key, you cannot draw a line from the first column, on the last row, or on the top of a box.

Drawing Horizontal Lines

Use **HORZ-F1** (or the H hard key) for drawing horizontal lines. Figure 7-12 shows positioning of the cursor before and after the line is drawn.

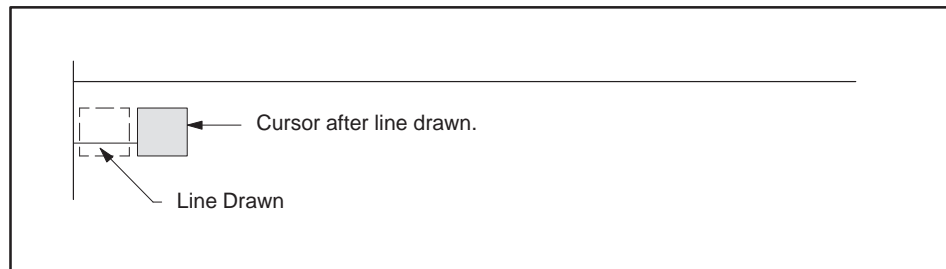


Figure 7-12 Creating Horizontal Lines

Drawing Vertical Lines

To draw a vertical line down to the left of the cursor, press **VERT-F2** (or the J hard key). To draw a vertical line up to the left of the cursor, press U. Figure 7-13 shows positioning of the cursor to draw the line down from the cursor.

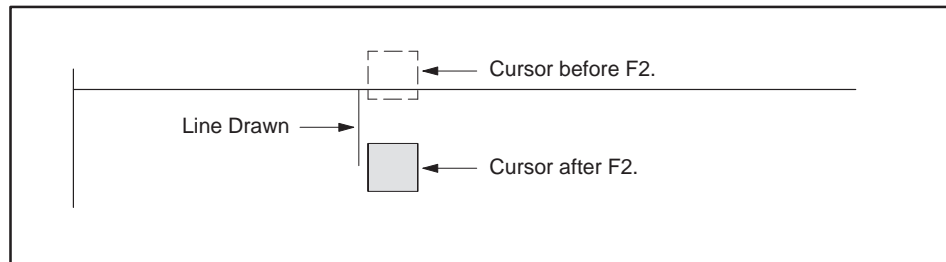


Figure 7-13 Creating Vertical Lines

7.7 Making Program Changes

Editing Programs Accessing edit functions to make changes to your program is as simple as first entering the program. You only add the step of finding the point in the program you wish to edit.

First, position the cursor at the point where you want changes. You may need to use the Find function to help locate the ladder address or element (see Section 7.11).

After locating the element(s) you wish to change, press **EDIT-F2**.

Saving Edits To save changes to your program disk (off-line), press **WRITDK-F8** at the ladder display menu. You also have the option of saving program changes when you exit from ladder edit mode.

Inserting Rungs You can either insert a single empty rung in your program or you can auto-insert to save time when adding several networks. Figure 7-14 illustrates the positioning of inserted networks.

To insert an empty rung in a display, press either the **INS** hardkey or **INSERT-F8**, then **RUNG-F5**, in the insert mode function keys.

To insert more than one empty rung, press either the **INS** hardkey or **INSERT-F8**, then **AUTORN-F6** in the insert mode function keys (Figure 7-10).

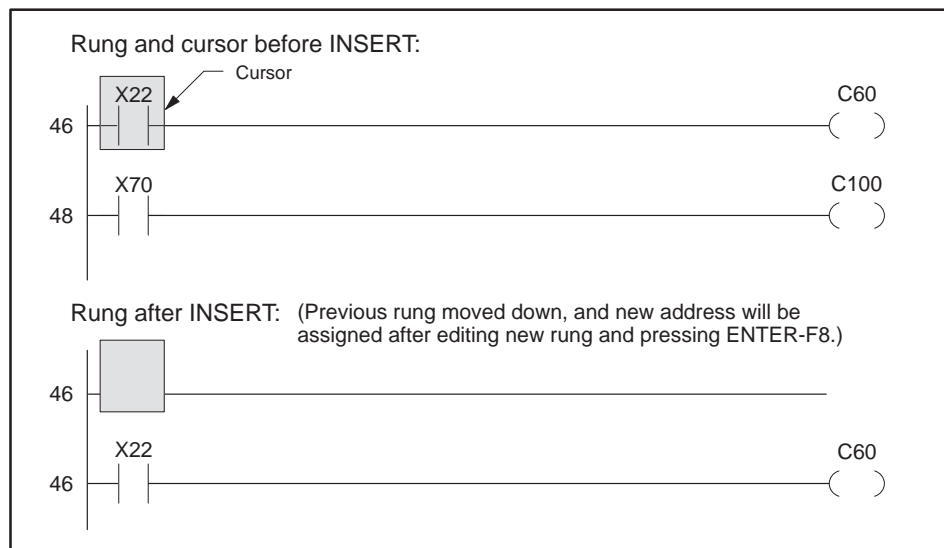


Figure 7-14 Inserting Networks

Deleting Rungs To delete an entire network, position the cursor on the network to be deleted, and press **DELNET-F5** in the edit mode function keys.

Making Program Changes (continued)

Inserting Elements

To insert elements in an existing network, press either the **INS** hardkey or **INSERT-F8**, then **ROW-F2** (H or down arrow) or **COL-F3** (J or right arrow). Figure 7-15 and Figure 7-16 show examples of how the inserts are made. To toggle between insert and edit modes for elements, press **INSMOD-F4**.

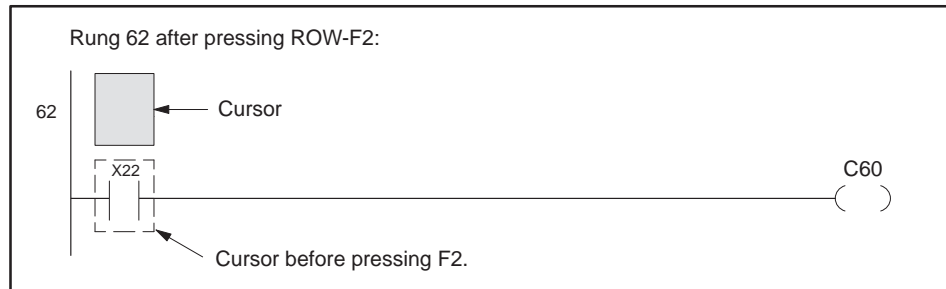


Figure 7-15 Inserting a Row

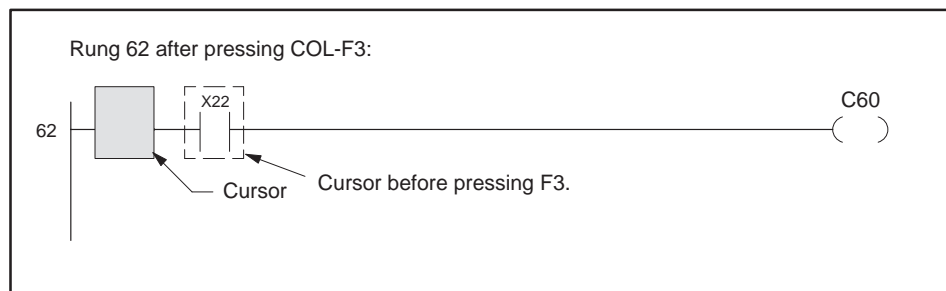


Figure 7-16 Inserting a Column

Deleting Lines and Elements

To delete lines and elements from your ladder program, use the HORZD-**F3**, N, DEL, or **Backspace** for horizontal lines, and VERTD-**F4** or M keys for vertical lines on the edit function key line. Figure 7-17 and Figure 7-18 illustrate horizontal and vertical line deletes.

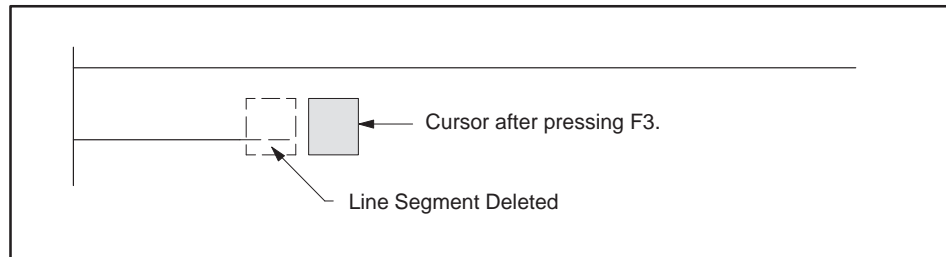


Figure 7-17 Deleting Horizontal Lines

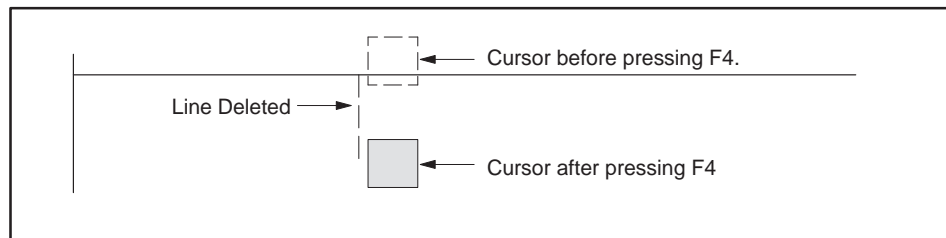


Figure 7-18 Deleting Vertical Lines

To delete elements from a network, position the cursor to the right of the element to delete, and press **Backspace**. You can also delete elements by placing the cursor on the element to delete and pressing HORZD-**F3** or the DEL hard key.

Using UNDEL to Restore a Deleted Element

If you make a deletion in error, press UNDEL-**F5**. The element is restored at the current position of the cursor. UNDEL-**F5** must be performed before making another entry. The element is restored at the current position of the cursor.

Using UNDEL to Duplicate Elements

After restoring a deleted element, you can duplicate it repeatedly with UNDEL-**F5** wherever you position the cursor until you make another entry.

7.8 Determining If an Element Is Unique

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

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

To access the Unique function, complete the steps below from the edit function with your cursor positioned on the element you wish to check.

1. Press SPACEBAR.
2. Press UNIQUE-F6.

After the check is complete, you receive one of the following messages about the element you selected.

- **ELEMENT NOT FOUND**
- **ELEMENT EXISTS ONLY AT CURRENT RUNG**
- **ELEMENT EXISTS AT RUNG NNNN**
(where NNNN gives the ladder address of another rung containing the element).

7.9 Showing Element Usage

Valid Element Types

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

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

Creating an Element Usage Listing

To create an element usage listing, press **Ctrl U**. Type in the desired starting address at the prompt, and press **Return**. Figure 7-19 shows an example table.

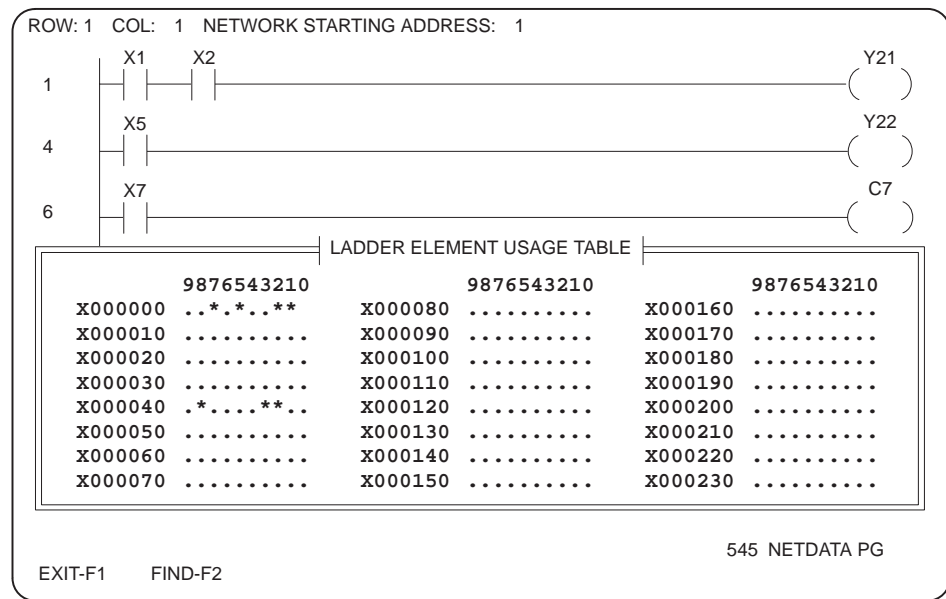


Figure 7-19 Ladder Element Usage Table

Reading the Listing

Elements are shown on the display in increments of 10 (C0, C10, C20, etc.). Usage of the points between is shown in the adjacent column from 0 through 9 (C1 under 1, C2 under 2 etc.). You receive a display showing use of the selected elements according to the following legend.

Blank	Point does not exist
Dot (.)	Point is not used in the program
Asterisk (*)	Point used in program
Dash (-)	Point not listed in program, but is used within a range
Right Bracket (])	Indicates beginning of a range
Left Bracket ([)	Indicates end of a range
I	Indicates point used as a beginning range and as an ending range at another location in the program

7.10 Creating Documentation at Program Entry

Accessing the Documentation Editors

Complete documentation of your programs—title, comments, synonyms, and descriptors—can be entered from the Documentation menus (DOCUM-F4 from the main ladder display). For your convenience, TISOFT also provides the option of adding or editing documentation for your program as you enter it.

To create or edit a synonym or descriptor for any elements in the rung, press Ctrl L. The element your cursor is currently on is the default element shown in the **SYNONYM** prompt field. Press **Return** to select the default element, or type in the appropriate element and identifier at the prompt and press **Return**. The pop-up synonym editor can be accessed throughout TISOFT.

To use the comment operation while entering programs, press SPACEBAR, then press **COMMNT-F7** to invoke the display for entering comments.

Documenting Your Program

For detailed instructions on complete documentation of your program with comments, synonyms, and descriptors, see Chapter 9 of this manual.

7.11 Finding Ladders and Elements

Find Functions

The Find operation enables you to locate any ladder address or element type (word or bit-of-word) in your ladder program.

NOTE: Depending on your program size and controller model, an on-line Find may take several minutes.

Using Find Operation

To use the Find operation to locate a particular ladder address or element, press **FIND-F3** or **Ctrl F** from the ladder display. You can use the function keys, or you can type in element types to find. At the prompt, enter the element type and identifier or address to find, as shown in Figure 7-20. Then press **Return**.

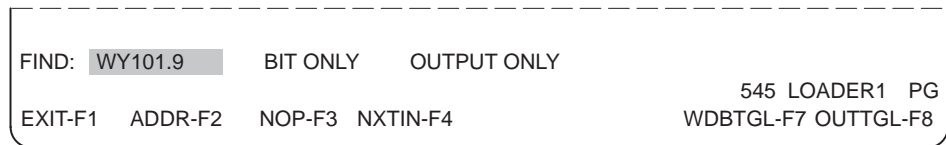


Figure 7-20 Find Function Keys

The following function keys are available for Find operations:

- **ADDR-F2** allows you to select the address for a rung of ladder logic as the element type you want to find.
- **NOP-F3** (no operation) finds the next occurrence of a non-programmed rung of ladder logic.
- **NXTIN-F4** (next instruction) finds the next occurrence of a programmed rung of ladder logic.
- **WDBTGL-F7** allows you to toggle between **BIT ONLY** (which restricts the word Find operation to bit-of-word only), **WORD ONLY** (which restricts the operation to word only), and an unrestricted search.
- **OUTTGL-F8** allows you to toggle between **OUTPUT ONLY** (which restricts the Find operation to outputs only), and an unrestricted search (which finds inputs as well as outputs).

Finding the Next Box

If you are unsure of a box number, type in the box type and a zero for the identifier. Then press **Return**. This finds the next occurrence of that box element type.

Finding Ladders and Elements (continued)

Determining Valid Entries

To determine valid entries for the Find operation, you can access a List display by pressing **[V]** or **SHIFT [?]** at the prompt line. The List display lists the valid entries for that particular field. Figure 7-21 shows the List display available at the FIND prompt.

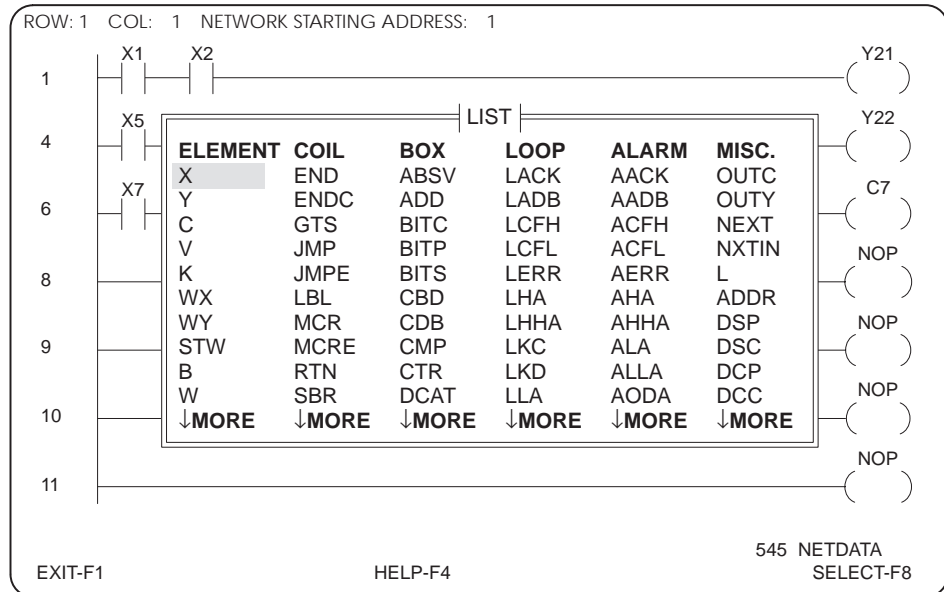


Figure 7-21 List Screen in Find Operation

Find Operation Examples

Table 7-2 shows examples of Find operations and the corresponding field settings.

Table 7-2 Find Examples

Sample FIND Operation	Type Field	Word/Bit Field	Output Field
Word and bit inputs and outputs	V2	—	—
Word elements only	V2	Word Only	—
Bit of word only	V2.7	—	—
All bits of a word	V2	Bit Only	—
All bits of a word used as an output	V2	Bit Only	Output Only
Timer 4 box	TMR4	—	—
All timer boxes (TMR and TMRF)	TMRS0	—	—
All boxes that use timer memory (TMR, TMRF, CTR, UDC, MCAF, DCAT)	TC0	—	—

7.12 Using the V/K Memory Editor

Reading/Altering V- and K-Memory Contents

With the V/K memory editor, you can display, read, and write V- or K-memory addresses in the format you select. To help in determining program function of the addresses, you can display the memory locations with synonyms listed as well.

To access the V/K memory editor, press Ctrl V or Ctrl K from any display in TISOFT.

The memory table you selected (V or K) is then displayed. Forty consecutive memory locations are listed in the table with the value given for each location. The format of the value is also shown. The default format for all locations is integer.

Displaying Memory Values

After accessing the V/K memory table, complete the steps below to display a specific memory location.

1. Press FIND-F2.
2. Type in the desired V or K address at the prompt.
3. Press .

The display is changed to show the V or K address you requested as the first entry in the table, along with 39 consecutive entries following the requested location.

Displaying Synonyms

First, locate the address by using the steps above. Then, complete the following steps to display synonyms with a particular location.

1. Using the or arrow keys, position the cursor on the desired address in the memory table.
2. Press SYNTGL-F5.

The address, synonym, and descriptor you requested are displayed, along with the next three locations.

Reading Values

Complete the following steps to read the current values on your display. Begin the steps at the V/K memory table.

1. Press READ-F7.

The current values of the locations on the screen are read and displayed. Any values you have modified on the screen, but have not written, are reset to their original value.

WARNING

TISOFT allows modification of V- and K-memory while the controller is in RUN mode. However, entries made to the program in RUN mode immediately affect the execution of the program, and could cause unexpected process operation.

Unexpected process operation could cause death or serious injury to personnel, and/or damage to equipment.

Only qualified personnel who are authorized to perform system level operations and are knowledgeable in safety application and limitations should enter or modify a program with the controller in RUN mode.

Changing Memory Values

To write a new value to a memory location, complete the following steps (beginning from the V/K memory table).

1. Press **FIND-F2**.
2. Type in the desired V or K address at the prompt.
3. Press **Return**.
4. Using the **Return** or arrow keys, position the cursor on the desired address in the new table display.
5. Type in the desired value for the location.

After completing inputs on the display, press **WRITE-F8** to save the changes you made to the values.

Saving a Numeric Display Format

Before making any numeric format changes that you want to save, verify with **FMTGL-F6** that **FMT: ON** is displayed on the lower right of the screen. The format must be on before format changes are made if they are to be saved.

Changing Numeric Format

To change the display format of a memory location, complete the steps as given below, starting at the V/K memory table display.

1. Press **FIND-F2**.
2. Type in the desired V or K address at the prompt.
3. Press **Return**.
4. Press **SPACEBAR**.
5. Press the function key corresponding to the desired format:
 HEX-F1 DOUBLE-F5
 BIN-F2 REAL-F6
 INT-F3 TMR.1S-F7
 +/-F4 TMR1MS-F8
6. Press **SPACEBAR**.

After completing inputs on the display, press **WRITE-F8** to save the changes you made to the formats. You do not have to write the changes after each entry on a display.

Entering Message Strings

To enter a message string in V- or K-memory, press **STRING-F4**. The fields shown in Figure 7-22 allow you to enter the starting address and number of words for the message. Forty (40) is the maximum number of words for each string. If you require the bytes be swapped for display or the data cleared, enter Y in those fields. Use the arrow keys to move from field to field. After completing the field entries, press **Return** or **ENTER-F8**.

Type in the message string at the prompt line. Press **ENTER-F8** to write the string to memory.

You can type in up to 80 characters (2 characters per word selected). To display the characters in ASCII, select ASCII format when building the chart for status displays. See Chapter 10 for details on building displays in ASCII format.

```
STARTING ADDRESS: V000000 NUMBER OF WORDS: 16 SWAP BYTES: NO CLEAR DATA: NO
545 LOADER1
ABORT-F1
ENTER-F8
```

Figure 7-22 String Entry Fields

7.13 Using Onscreen Cross-Reference

Accessing Onscreen Cross-Reference

You can access a cross-reference display at any network in your ladder program, either on- or off-line at the Ladder Display. Select the rung to cross-reference by positioning the cursor on the rung to be displayed. Then press Ctrl X. Figure 7-23 illustrates an on-screen cross-reference. Up to five rows can be displayed.

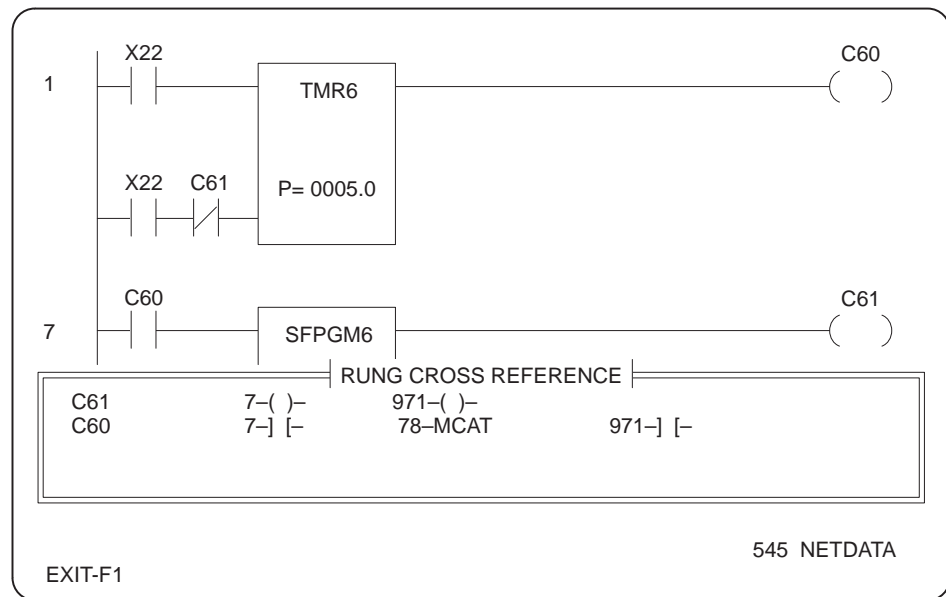


Figure 7-23 Cross-Reference Display

Cross-Reference Parameters

The cross-reference operates within the following parameters.

- Sorts display by element type and label.
- Displays a contact only once if used multiple times within a rung.
- Displays only elements that have cross-reference information.
- Shows references for outputs in the rung used in any element.
- Shows references for inputs in the rung used as outputs or box parameters.

Reading the Display

The elements cross-referenced are displayed in a pop-up window. Use the arrow keys to scroll through the listing. The listing displays only the first three usage addresses per element and a plus (+) if used more times.

7.14 Zoom

If your controller has S-memory, you can use zoom to display and/or edit SF programs or subroutines. To do this, place the cursor on the SFPGM or SFSUB box in ladders. Press Ctrl O. To return to the ladder display, press EXIT-F1.

7.15 Creating Keystroke Macros

You have the option of recording keystrokes for replaying or writing to a file for later use. Use the keys described in Table 7-3 to perform the record/play macro functions.

Press the Alt key and the letter key (R, S, P, L, O, or W) simultaneously.

Table 7-3 Keystroke Macros

Key Sequence	Action
Alt R	Records keystrokes until ALT S is pressed.
Alt S	Stops recording of the keystrokes.
Alt P	Plays the recorded keystrokes. Press any key to stop replay at end of current cycle. Press ESC to abort playback.
Alt L	Initiates continuous replay of recorded macros. Press any key to stop the replay. Press ESC to abort playback.
Alt W	Writes the recorded keystroke macros to the filename you specify.
Alt O	Reads a recorded keystroke macro from a file.

Using TISOFT for Batch Programming

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8.1 Accessing S-Memory Operations

Using TISOFT in S-Memory

The area of controller memory reserved for loops, analog alarms, and SF programs/subroutines is designated as S-memory. You must have S-memory configured before you can access the menus for loops, alarms, and SF programs/subroutines. (Chapter 4 provides details on configuring memory.)

Using TISOFT Menus

Display and edit loops, analog alarms, and special function programs or subroutines with the S-memory menu, which are grouped for access by type of operation. Each operation has a separate directory; e.g., loops, alarms, and special function programs/subroutines.

Figure 8-1 illustrates the key sequence to reach the S-memory directories.

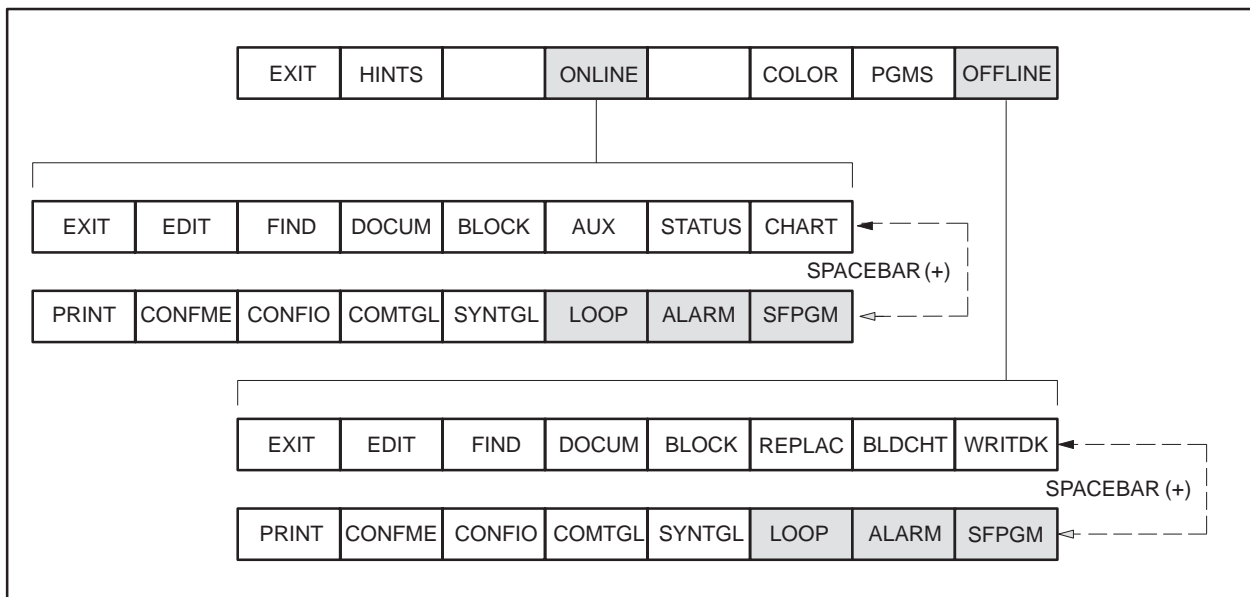


Figure 8-1 Menu Chart to S-Memory Functions

S-Memory Control Blocks

S-memory is accessed through control blocks (specific loop, alarm, or SF numbers) rather than memory addresses. For example, use Loop 1, 2, etc., or alarm 6, 7, etc., when you are making entries at S-memory prompts.

8.2 Using S-Memory Directories

Directory Information

Each S-memory directory displays the number and title of programmed entries, bytes of S-memory available, and whether the control block is enabled or disabled. The function key menus provide access to the S-memory programming and editing functions. Figure 8-2 shows a Loop Directory. Figure 8-3 shows an SF Program/Subroutine Directory.

PID LOOP DIRECTORY				S-MEMORY AVAILABLE: 384			
ENABLE/ DISABLE	LOOP	ENABLE/ DISABLE	LOOP	ENABLE/ DISABLE	LOOP	ENABLE/ DISABLE	LOOP
D	1		BOILER 3				
D	2		BOILER 6				
	3		BOILER 7				
	4		BOILER 8				
D	5		BOILER 9				

D indicates Disabled,
Blank indicates Enabled.

SELECT: LOOP0004

565 NETDATA
R/S-F6 ALARM-F7 SFPGM-F8

EXIT-F1 SHOW-F2 BLOCK-F3 EN/DIS-F4

Figure 8-2 Loop Directory

SPECIAL FUNCTION PROGRAM/SUBROUTINE DIRECTORY								S-MEMORY AVAILABLE: 32702			
C/ NC	EN/ DIS	PROGRAM	C/ NC	EN/ DIS	PROGRAM	C/ NC	EN/ DIS	SUBROUTINE	C/ NC	EN/ DIS	SUBROUTINE
	D	1			PALLET 5						
	D	2			PALLET 6						
C	D	3			PALLET 7						
		4			PALLET 8						
	D	5			PALLET 9						

C indicates Compiled,
Blank indicates Not Compiled.

Indicates Enable/Disable

Press SFSUB-F8 to move selection cursor to the SF Subroutine directory.

SELECT: SFPGM0001

575 NETDATA PG

EXIT-F1 SHOW-F2 BLOCK-F3 DIS/CP-F4 PG/RN-F5 LOOP-F6 ALARM-F7 SFSUB-F8

Figure 8-3 SF Program/Subroutine Directory Screen

Using S-Memory Directories (continued)

S-memory Available

Each directory lists S-memory available in bytes. When you make a change to S-memory, either by adding to or deleting from your program, S-memory available is updated.

S-memory available is also shown at the prompt line location (bottom left of the screen) of the Show screen and the Edit screen of a loop, alarm, or SF program/subroutine.

Common Function Keys

S-memory functions for loops, alarms, and special function programs are initiated with a set of keys common to each directory. For example, after invoking the directory for loops, analog alarms, or special function programs, the keys listed in Table 8-1 are common to each.

Table 8-1 S-Memory Function Keys

Function	Description
EXIT-F1	Returns to Ladder Display.
SHOW-F2	Displays selected control block.
BLOCK-F3	Invokes S-memory block operations.
EN/DIS-F4	Accesses the Enable/Disable functions in the selected control block for Loops and Alarms.
DIS/CP-F4	Accesses the Enable/Disable and Compile/NoCompile functions for SF Programs and SF Subroutines.
PG/RN-F5	Selects PLC operating mode (on-line only).
LOOP-F6	Selects PID Loop Directory.
R/S-F6	Selects Ramp/Soak Table.
ALARM-F7	Selects Analog Alarm Directory.
SFPGM-F8	Selects Special Function Program Directory.
SFSUB-F8	Selects Special Function Subroutine Directory.
PageUp/PageDown	Scrolls through directory screens when a directory contains more entries than can be displayed on a single screen.
<input type="text" value="Return"/>	Initiates find of selection entered at the prompt.
Arrow Keys	Move cursor on display.

Locating Directory
Entries

You have a choice of methods to use in selecting entries in an S-memory directory. You can select a particular loop, alarm, or SF program/subroutine in either of the following ways.

- Use the arrow keys to position the cursor on any entry in the directory; then press the function key for the operation you wish to perform on the selection. For example, position the cursor on Loop 6 and press **SHOW-F2** to display Loop 6.
- You can type in a LOOP, SFPGM, ALARM, or SFSUB type and identifier at the **SELECT** prompt in any S-memory directory. For instance, you can type in SFPGM2 at the **SELECT** prompt in the loop directory and press **SHOW-F2** to display Special Function Program 2 without going through the step of changing directories first.

NOTE: If an Alarm or SF program/subroutine directory screen contains more entries than it can display on a single screen view, press PgDn to view the remaining entries.

8.3 Displaying Loops

Invoking the Loop Directory

To invoke the Loop Directory, complete the steps below. If you are at the Ladder Display screen, begin with Step 2.

1. Select either **ONLINE-F4** or **OFFLINE-F8**.
2. When the Ladder Display screen appears, press **SPACEBAR**.
3. Press **LOOP-F6**.

Displaying the Loop Table

To display the Loop Table for a particular loop, complete the steps below from the Loop Directory. Figure 8-4 shows the format of the table and the functions available.

1. At the prompt, enter the loop number (1-64) you want to program, or move the cursor with the arrow keys to select the loop you want.
2. Press **SHOW-F2**.
3. As shown in Figure 8-4, only part of the Loop Table can be shown on one screen. Press **PgDn** to see the remainder of the table.

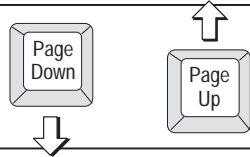
```

PID LOOP 64  TITLE:
POS/VEL PID ALGORITHM: POS
LOOP VFLAG ADDRESS: NONE
SAMPLE RATE (SECS): +1.00000
PROCESS VARIABLE ADDRESS: NONE
PV RANGE:  LOW= +0.00000
           HIGH= +100.000
PV IS BIPOLAR: NO
SQUARE ROOT OF PV: NO
20% OFFSET ON PV: YES
LOOP OUTPUT ADDRESS: NONE
OUTPUT IS BIPOLAR: NO
20% OFFSET ON OUTPUT: YES
RAMP/SOAK PROGRAMMED: NO
RAMP/SOAK FOR SP: NO

REMOTE SETPOINT: NONE
CLAMP SP LIMITS:  LOW:= +0.00000
                  HIGH= +0.00000
LOOP GAIN: +1.00000
RESET (INTEGRAL TIME): +INF
RATE (DERIVATIVE TIME): +0.00000
FREEZE BIAS: NO
DERIVATIVE GAIN LIMITING: NO
LIMITING COEFFICIENT: +10.0000
SPECIAL CALCULATION ON: NONE
SPECIAL FUNCTION: NONE
LOCK SETPOINT: NO
LOCK AUTO/MANUAL: NO
LOCK CASCADE: NO
ERROR OPERATION: NONE
REVERSE ACTING: NO

S-MEMORY AVAILABLE: 384
EXIT-F1  EDIT-F2
                    ENABLED
                    565 NETDATA
                    COMMNT-F7  EN/DIS-F8

```



```

ALARM DEADBAND: +0.00000
MONITOR LOW-LOW/HI-HI: NO
MONITOR LOW/HIGH: NO
PV ALARMS:  LOW-LOW = +0.00000
            LOW = +0.00000
            HIGH = +100.000
            HIGH-HIGH = +100.000
MONITOR DEVIATION: NO
DEVIATION ALARM:  YELLOW = +100.000
                  ORANGE = +100.000
MONITOR RATE OF CHANGE: NO
RATE OF CHANGE ALARM: +0.00000
MONITOR BROKEN XMITTER: NO

S-MEMORY AVAILABLE: 384
EXIT-F1  EDIT-F2
                    ENABLED
                    565 NETDATA
                    COMMNT-F7  EN/DIS-F8

```

Figure 8-4 Loop Table

8.4 Editing Loops

Showing Loops	<p>Display loops by completing the following steps from the Start-up Screen. If you are in an S-memory directory, begin at Step 4.</p> <ol style="list-style-type: none">1. Select either ONLINE-F4 or OFFLINE-F8.2. When the Ladder Display screen appears, press SPACEBAR.3. Press LOOP-F6.4. At the SELECT prompt, type in the loop number (1-64) to be displayed, or move the cursor to the loop to be displayed.5. Press SHOW-F2.
Invoking Edit Mode	<p>To edit a loop, use the Show function from the Loop Directory to display the Loop Table. Then press EDIT-F2.</p>
Making Entries to the Loop Table	<p>Use the arrow keys or Return to position the cursor in each of the fields in the Loop Table. Then complete the fields in the Loop Table by using the function keys or by typing in the element address or value required for each field. For example, if you want the RAMP/SOAK FOR SP field to read YES, either press YES-F2 or type in Y. Numeric entries, such as sample rate, must be typed in with the hard keys. (Remember there is more than one screen of loop data. Press PgDn to see the remainder of the table.)</p> <p>When you have completed entry of your loop data, press ENTER-F8 to save the Loop Table.</p> <p>All entries in the Loop Table are verified after you press Enter. If invalid entries are detected, the field cursor is placed on the invalid field and an error message is displayed. If no errors are detected, the loop is saved, and the display is returned to the Loop Directory.</p>

**Status of Control
Blocks during Edits**

When you show or edit a particular loop, the control block enabled/disabled status remains constant. However, when you press ENTER-F8, the control block is automatically disabled to enter your edit. The control block is restored to its original status, enabled or disabled, upon exit to the directory.

You can also enable the Loop control block by using the EN/DIS function key while in the Loop Directory or Loop display.

Deleting Loops

To delete a loop, use the Block functions from the Directory. While in the Loop Directory, access the Block functions by completing the following steps.

1. Press BLOCK-F3.
2. Press DELETE-F4.
3. When the prompt appears, enter the range of the loop(s) that you want deleted, and press Return.

For details on using Block functions, see Chapter 13 of this manual.

8.5 Entering Ramp/Soak Steps

Displaying Ramp/Soak Table

To enter ramp/soak steps, display the entry table by completing the steps below from the Start-up Screen. From the Loop Directory, begin at Step 4.

Figure 8-5 shows the Ramp/Soak Table. The table provides S-memory available and gives status, enabled or disabled, of the loop control block to which the ramp/soak steps are tied.

Your loop must already exist before you enter ramp/soak steps; otherwise, you cannot access the Ramp/Soak Table. Be sure that you have entered *YES* in the **RAMP/SOAK FOR SP** field of the loop programming table for which you are creating ramp/soak steps. If you do not, the Ramp/Soak Table will not be executed in the controller. TISOFT will give a message to remind you that the field is not set.

1. Select either **ONLINE-F4** or **OFFLINE-F8**.
2. When the Ladder Display screen appears, press **SPACEBAR**.
3. Press **LOOP-F6**.
4. Type in the desired loop number at the prompt or move the cursor to select the loop you want.
5. Press **R/S-F6**.

PID LOOP 4				S-MEMORY AVAILABLE: 384		
RAMP/SOAK FLAG ADDRESS: NONE						
STEP	R/S	STATUS BIT	SETPOINT (UNITS)	RAMP/RATE (UNITS/MIN)	SOAK TIME (MIN)	DEADBAND (UNITS)
---	--	---	---	---	---	---
						ENABLED
						565 NETDATA
						EN/DIS-F8
EXIT-F1 EDIT-F2		WRITE-F4				

Figure 8-5 Ramp/Soak Table

Entering
Ramp/Soak Flag
Address

To enter a flag address for a ramp/soak table, press **EDIT-F2**. Enter the memory type of the flag (access the pop-up list by pressing **▽** or **Shift ▽**), or type the memory type), then type in the identifier, and press **ENTER-F8**.

If you do not wish to program an R/S flag, type in **NONE** at the address field.

Making Entries to
Ramp/Soak Table

To program a Ramp/Soak Table, complete the following steps. Use the arrow keys or **Return** to move the cursor from field to field within a step. Use **DELLN-F6** or **INSLN-F7** to delete or insert lines.

1. Press **Return** to position the cursor for entry of the first step.
2. If a table already exists and you just need to modify it, press **EDIT-F2**.
3. In the **R/S** field, type in *R* for ramp, *S* for soak, or *E* for an end step. (Or, press the equivalent function key.)
4. The **STATUS BIT** field is optional. If you wish to designate a status bit for a step, type in a *Y* or *C* element type and identifier, or **NONE-F2**.
5. If you selected a ramp step, type in the desired values for **SETPOINT** and **RAMP RATE**.

If you selected a soak step, type in the desired values for **SOAK TIME** and **DEADBAND**.

6. Press **ENTER-F8**.
7. Press **Return** to enter the next step.
8. Repeat steps 3. through 7. until you have entered all ramp/soak steps.
9. To save the table, press **WRITE-F4** before exiting the display.

8.6 Displaying Analog Alarms

Invoking the Alarm Directory To display the Alarm Directory, press **ALARM-F7** from the Ladder Display.

Displaying the Alarm Table To display the Alarm Table, complete the following steps from the Analog Alarm Directory. Figure 8-6 shows the format of the table and the functions available.

1. At the **SELECT** prompt, enter the alarm number (1-128) you want to program, or move the cursor to select the alarm you want.
2. Press **SHOW-F2**.

```
ANALOG ALARM 128  TITLE:                MONITOR REMOTE SETPOINT: NO
                                           REMOTE SETPOINT: NONE
      ALARM VFLAG ADDRESS: NONE           CLAMP SP LIMITS:  LOW= +0.00000
      SAMPLE RATE (SECS): +1.00000      HIGH= +0.00000

PROCESS VARIABLE ADDRESS: NONE           SPECIAL FUNCTION: NO
      PV RANGE:  LOW= +0.00000
      HIGH= +100.000

      PV IS BIPOLAR: NO
      SQUARE ROOT OF PV: NO
      20% OFFSET ON PV: YES

      ALARM DEADBAND: +0.00000

MONITOR LOW-LOW/HI-HI: NO                MONITOR DEVIATION: NO
MONITOR LOW/HIGH: NO                     DEVIATION ALARM:  YELLOW= +100.000
PV ALARMS:  LOW-LOW= +0.00000            ORANGE= +100.000
      LOW= +0.00000
      HIGH= +100.000                     MONITOR RATE OF CHANGE: NO
      HIGH-HIGH= +100.000                RATE OF CHANGE ALARM: +0.00000

S-MEMORY AVAILABLE: 384                  MONITOR BROKEN XMITTER: NO
                                           ENABLED
                                           565 NETDATA
EXIT-F1  EDIT-F2                        COMMNT-F7 EN/DIS-F8
```

Figure 8-6 Analog Alarm Table

8.7 Editing Analog Alarms

Invoking the Edit Mode To edit an alarm, use the Show function from the Alarm Directory to display the Alarm Table. Then press EDIT-F2. Use the arrow and **Return** to position the cursor on the field you wish to change.

Making Entries to the Alarm Table Complete the fields in the Alarm Table by using the function keys available as you move the cursor onto each field, or you can type in the element address or value required for each field. Position the cursor in the fields with the arrow or **Return**. When you have completed entry of your alarm data, press ENTER-F8 to save the Alarm Table.

All entries in the alarm table are verified after you press ENTER. If invalid entries are detected, the field cursor is placed on the invalid field and an error message is displayed. If no errors are detected, the display is returned to the Alarm Directory.

Status of Control Blocks during Edits When you show or edit a particular alarm, the control block enabled/disabled status remains constant. However, when you press ENTER-F8, the control block is automatically disabled to enter your edit. The control block is restored to its original status, enabled or disabled, upon exit to the directory.

You can also enable the control block after edit by using the EN/DIS function key while in the Alarm Directory or the Alarm display.

Deleting Alarms To delete an alarm, use the Block functions from the Directory. While in the Alarm Directory, complete the following steps.

1. Press BLOCK-F3.
2. Press DELETE-F4.
3. When the prompt appears, enter the range of the alarms that you want deleted, and press **Return**.

For details on using the Block functions, see Chapter 13 of this manual.

8.8 Special Function Program/Subroutine Language

Special Function Language	<p>A Special Function (SF) program or subroutine is a sequence of SF statements. An SF program may be invoked from ladder programs (using the SFPGM box instruction), loops, or alarms. An SF subroutine may be invoked from ladder programs (using the SFSUB box instruction) or from an SF program (using the CALL SF instruction). Each SF program or SF subroutine is stored in S-memory as a control block.</p>
Special Function Statements	<p>Each SF statement in an SF program or subroutine is composed of the following elements:</p> <ul style="list-style-type: none">• A statement number (automatically assigned)• An SF instruction• A set of parameters
Special Function Instructions	<p>See the SF Instructions and Parameters section that follows for a listing of the Special Function instructions and parameters. In addition to decimal format, constants can also be displayed in either hexadecimal or binary format in math expressions.</p> <ul style="list-style-type: none">• To enter a hexadecimal constant, precede the hex value with 0H; e.g., 0H7FFE, 0H3F.• To enter a binary constant, precede the binary value with 0B; e.g., 0B1011100101110001, 0B01100111.
SF Programming Elements	<p>An element is an address that consists of a type (WY, for example), and an identifying number. Element types are used in the parameters for Special Function statements. The element type must be followed by an identifying number. For example, LERR is the element type for loop errors. The identifying number should refer to the particular loop that you wish to use. For example, LERR34 would be the type and identifier for loop errors for loop 34.</p>

Real and Integer Values

Most elements can be either real or integer. A real element is distinguished from an integer by placing a period (.) at the end of the element. For example, V110. designates a real element, while V110 designates an integer element. In PowerMath, the suffix L indicates a “long” integer (32 bits) and the suffix U indicates an unsigned 16-bit integer.

Using Expressions

The term “expression” is used in this manual to mean a logical grouping of tokens (smallest indivisible unit, such as an element address or an operator) that evaluates to an address or to a value. Enclosing an expression in parentheses indicates that the expression is to be evaluated to a value. Otherwise, the expression evaluates to an element address.

Check the Glossary if you are uncertain of the function of any of the expression operators, and use the help display in SF programming if you only need to see what expressions you can use and how they should look in a statement. The order of evaluation of the operators is left to right (except exponentiation, which is performed right to left) in the following precedence.

- Math Functions, as (ABS(X), etc.)
- Exponentiation (**), NOT, Negation (-)
- Multiplication (*), Division (/), MOD
- Addition (+), Subtraction (-)
- Shift Left (<<), Shift Right (>>)
- Relational Operators (=, <, <=, >, >=, <>)
- AND, & (word or double-word AND)
- OR, | (word or double-word OR), ^ (word or double-word XOR)
- Assignment (:=)

The operators listed above are available for integer/real math expressions; for example, MATH and IF statements, integer/real parameter fields.

In non-PowerMath controllers, IMATH statements and integer-only parameter fields do not support the Exponentiation, Relational, AND/OR operators, or functions. (Refer also to Table 8-2.)

In PowerMath controllers, IMATH statements, IIF statements, and integer-only parameter fields support all expression operators except exponentiation (**); PowerMath also supports the absolute value (ABS) function. (Refer also to Table 8-2.)

8.9 SF Instructions and Parameters

Program Headers The following list gives the parameters for the SF program header and SFSUB header.

Header	Field(s)	Parameters
SFPGM HEADER	TITLE CONTINUE ON ERROR ERROR STATUS ADDR PROGRAM TYPE CYCLE TIME (SEC)	(Opt.) 8 Alpha-numeric characters Y(es) or N(o) (Opt.) Y, C - Single discrete Element WY, V - 3-word Element range Normal, Priority, Cyclic, Restricted Real Constant (Cyclic programs only)
SFSUB HEADER	TITLE	(Opt.) 8 Alpha-numeric characters

SF Instructions The following list gives the parameters for the SF instructions.

Instruction	Field(s)	Parameters
*	Any free format text up to 1021 characters in length, with each line having 66 characters.	
BCDBIN	BCD INPUT BINARY RESULT	(Int) Element or Address Expression (Int) Output Element or Address Expression
BINBCD	BINARY INPUT BCD RESULT	(Int) Element or Address Expression (Int) Output Element or Address Expression
CALL	SFSUB P1 P2 P3 P4 P5	(Int) Constant (1 - max no. SFSUBS) (Int/Real) Constants, Discrete or Word Elements, Value or Address Expressions. May be blank
CDT	INPUT OUTPUT INPUT TABLE OUTPUT TABLE TABLE LENGTH	(Int/Real) Element or Address Expression (Int/Real) Output Element or Addr. Expression (Int/Real) Element or Address Expression (Int/Real) Element or Address Expression (Int) Constant (greater than zero), Element or Address Expression Input Table (and output table) + (table length - 1) must be within configured memory range.
ELSE	No parameters	
ENDIF	No parameters	
EXIT	ERRCODE	(Opt.) (Int) Constant, (range: 0 - 255)

Instruction	Field(s)	Parameters
FTSR-IN	INPUT REGISTER START REGISTER LENGTH STATUS BIT	(Int/Real) Element or Address Expression (Int/Real) Output Element or Addr. Expression (Int) Constant (greater than zero), Element, or Value or Address Expression. Reg Start + (Reg. Length - 1) + 4 words overhead must be within configured memory range. Y or C Element address (2 bits)
FTSR-OUT	REGISTER START OUTPUT REGISTER LENGTH STATUS BIT	(Int/Real) Output Element or Addr. Expression (Int/Real) Output Element or Addr. Expression (Int) Constant (greater than zero), Element, or Value or Address Expression Reg Start + (Reg.Length - 1) + 4 words overhead must be within configured memory range. Y or C Element address (2 bits)
GOTO	LABEL	(Int) Constant, (range: 0 - 65535)
IF	Free format math expression using integer or real Elements and Constants. May be up to 74 tokens (the smallest indivisible unit, such as an operator, or constant) in length. All Operators and Functions are valid. Assignment operator (:=) is optional.	
IIF	Free format math expression using integer Elements and Constants. May be up to 74 tokens (the smallest indivisible unit, such as an operator, or constant) in length. All Operators except exponentiation (**) are valid. Only ABS function is supported. Assignment operator (:=) is optional. (PowerMath only)	
IMATH	Free format math expression using only integer Elements and Constants. May be up to 74 tokens in length. Operators not supported: ** = < > < <= > >= AND OR MATH/IF Functions are not supported. In PowerMath, all Operators except exponentiation (**) are valid; only ABS function is supported. Assignment operator (:=) is required.	
LABEL	LABEL	(Int) Constant, (range: 0 - 65535)
LEAD/LAG	INPUT OUTPUT LEAD TIME (MIN) LAG TIME (MIN) GAIN (%/%) OLD INPUT	(Int/Real) Element or Address Expression (Int/Real) Output Element or Addr. Expression (Real) Constant (greater than zero), Element or Value or Address Expression (Real) Constant (greater than zero), Element or Value or Address Expression (Real) Constant (greater than zero), Element or Value or Address Expression (Int/Real)Output Element or Addr. Expression
MATH	Free format math expression using integer or real Elements and Constants. May be up to 74 tokens (the smallest indivisible unit, such as an operator, or constant) in length. All Operators and Functions are valid. Assignment operator (:=) is required.	

SF Instructions and Parameters (continued)

Instruction	Field(s)	Parameters
PACK Can have up to 20 pairs of NO. OF POINTS and DATA START ADDR parameters	TO/FROM TABLE TABLE ADDRESS	T or F (Int) Element or Addr. Expression. If TO table, cannot be READ ONLY. TABLE ADDR + (TOTAL NO. OF POINTS – 1) must be within configured memory range.
	NO. OF POINTS	(Int) Constant (greater than zero), Element, or Value or Address Expression. DATA START ADDR + (NO. OF POINTS – 1) must be within configured memory range.
	DATA START ADDR	(Int/Real) Constants, Discrete or word Elements and Value or Address Expressions. DATA START ADDR + (NO. OF POINTS – 1) must be within configured memory range. If FROM table, cannot be READ ONLY.
PACKAA	TO/FROM TABLE TABLE ADDRESS	T or F (Int) Element or Addr. Expression. If TO table, cannot be READ ONLY.
	ALARM NUMBER	(Int) Constant (range: 1 – max Alarm), Element, or Value or Address Expression
	PARAMETERS	(Int/Real) From 1 to 8 Alarm data types may be listed. No ID number. If FROM table, cannot be READ ONLY.
PACKLOOP	TO/FROM TABLE TABLE ADDRESS	T or F (Int) Element or Addr. Expression. If TO table, cannot be READ ONLY.
	LOOP NUMBER	(Int) Constant (range: 1 - max Loop), Element, or Value or Address Expression
	PARAMETERS	(Int/Real) From 1 to 8 Loop data types may be listed. No ID number. If FROM table, cannot be READ ONLY.
PACKRS	TO/FROM TABLE TABLE ADDRESS	T or F (Int) Element or Addr. Expression. If TO table, cannot be READ ONLY.
	LOOP NUMBER	(Int) Constant (range: 1 - max Loop), Element, or Value or Address Expression
	NUMBER OF STEPS	(Int) Constant (range: 1 - 256), Element, or Value or Address Expression TABLE ADDR + (No. of Steps * 6) – 1 must be within configured memory range.
	STARTING STEP	(Int) Constant (range: 1 - 256), Element, or Value or Address Expression
PETWD	No parameters	(PowerMath only)

Instruction	Field(s)	Parameters
PRINT	PORT MESSAGE	1 - ASCII message printer port 1 2 - ASCII message printer port 2 3 - both ASCII message printer ports Free format entry. Text enclosed in double quotes. Formfeed <FF> enclosed in double quotes. Element addresses and Expressions separated by a space (no embedded spaces in Expressions). To print date: Element (or Expression) :DATE To print time: Element (or Expression) :TIME To print text from memory: Element (or Expression) % nnn where nnn is number of characters. If nnn = 0, first word in memory contains number of characters.
RETURN	No parameters	
SCALE	BINARY INPUT SCALED RESULT LOW LIMIT HIGH LIMIT 20% OFFSET BIPOLAR	(Int) Element or Address Expression (Int/Real) Output Element or Addr. Expression (Real) Constant, LOW <= HIGH (Real) Constant, LOW <= HIGH Y(es) or N(o), NOT Yes if BIPOLAR Y(es) or N(o), NOT Yes if 20% OFFSET
SDT	INPUT TABLE OUTPUT TABLE PTR TABLE LENGTH RESTART BIT	(Int/Real) Element or Address Expression (Int/Real) Output Element or Addr. Expression (Int) Output Element or Address Expression (Int) Constant (greater than zero), Element, or Value or Address Expression INPUT TABLE + (TABLE LEN - 1) must be within configured memory range. Y or C Element address
SSR	REGISTER START STATUS BIT REGISTER LENGTH	(Int/Real) Output Element or Addr. Expression Y or C Element address (Int) Constant (greater than zero), Element, or Value or Address Expression REG. START + (REG. LENGTH - 1) must be within configured memory range.
UNSCALE	SCALED INPUT BINARY RESULT LOW LIMIT HIGH LIMIT 20% OFFSET BIPOLAR	(Int/Real) Element or Address Expression (Int) Output Element or Address Expression (Real) Constant, LOW <= HIGH (Real) Constant, LOW <= HIGH Y(es) or N(o), NOT Yes if BIPOLAR Y(es) or N(o), NOT Yes if 20% OFFSET

8.10 Displaying Special Function Programs/Subroutines

Invoking the SF Directory

To enter special function programs or subroutines, complete the following steps from the Start-up Screen to display the directory.

1. Select either **ONLINE-F4** or **OFFLINE-F8**.
2. When the Ladder Display screen appears, press **SPACEBAR**.
3. Press **SFPGM-F8**.

Displaying the SF Table

To display the Special Function Program or Subroutine table, complete the steps below from the SF directory. Figure 8-7 shows the SF Program table.

1. At the prompt, enter the program or subroutine number you want to program, or move the cursor to select the program.
2. Press **SHOW-F2**.

```
TITLE:                                     SF PROGRAM 1
      CONTINUE ON ERROR (Y,N): NO
      ERROR STATUS ADDR (Y,C,WY,V):
      PROGRAM TYPE (N,P,C,R): NORMAL
      CYCLE TIME (SEC): 0.0
-----
**** END ****

S-MEMORY AVAILABLE: 12288                                DISABLED
                                                           565 NETDATA
EXIT-F1 EDIT-F2      FIND-F4  DELST-F5  INSST-F6  COMMNT-F7  EN/DIS-F8
```

Figure 8-7 SF Program Table

Finding SF Statements

After you have displayed a program or subroutine with the Show function, use the Find operation to locate a particular statement or element within your program for display. Complete the following steps to find a specific statement or element.

1. Press **FIND-F4**.
2. Use one of the following function keys to select the type of Find to be performed.

Press **STMTNO-F2** to enter a statement number.

or

Press **INSTR-F3** to enter an SF instruction name.

or

Press **ELEMNT-F4** to enter an element address within an SF statement.

3. Enter the desired selection; e.g., statement number, instruction name, or element type and identifier at the prompt.
4. Press **Return**.

Finding Start/End of a Program

In addition to locating a particular statement or element within a program, you can use the Find operation to go to the beginning or end of a program.

- To find the SF header (beginning of program): Press **INSTR-F3**; type in *SF* at the **FIND INSTRUCTION** prompt and press **Return**.
- To find the beginning of a program: Press **STMTNO-F2**; type in *1* at the **FIND STATEMENT** prompt and press **Return**.
- To find the end of the program, press **INSTR-F3**; type in *END* at the prompt and press **Return**.

8.11 Editing SF Programs/Subroutines

- Invoking Edit Mode** To edit an SF program or subroutine, use the Show function from the SF Directory to display the SF Table. Then press EDIT-F2. Use the Page Up/Dn keys, the arrow keys, or FIND-F4 function key to locate the SF statement, instruction, or element to edit.
- Using the SF Entries LIST Screen** At many prompts requiring an element entry in SF programming, press SHIFT and [?] to access a display that lists SF instructions, element types, expression operators and functions, and the PRINT instruction options. Figure 8-8 shows the List display you receive.

SF INSTRUCTIONS:		MATH/IF FUNCTIONS:				ELEMENTS:		
		(INTEGER)				(REAL)	(INT/REAL)	
*	FTSR-OUT	ABS	FRAC	DCP	AACK	APVH	+*K	P
BINBCD	PRINT	ARCCOS	LN	DSC	ACF	APVL	+V	+T
BCDBIN	CALL	ARCSIN	LOG	DSP	ACFH	ARCA	*WX	LADB
SCALE	PACK	ARCTAN	ROUND	*STW	ACFL	ATS	WY	*LERR
UNSCALE	LEAD/LAG	CEIL	SIN	*TCC	AVF	LKC	AADB	LHA
MATH	RETURN	COS	SQRT	TCP	LACK	LKD	*AERR	LHHA
IMATH	PACKLOOP	EXP	TAN	C	LCF	LPVH	AHA	LLA
IF	PACKAA	FLOOR	TRUNC	*X	LCFH	LPVL	AHHA	LLLA
ELSE	PACKRS			Y	LCFL	LRCA	ALA	LMN
ENDIF	GOTO			SFEC	LVF	LTD	ALLA	LMX
SDT	LABEL	PRINT OPTIONS:		LRSF	LRSN	LTI	AODA	LODA
CDT	EXIT	%NNN	:TIME			LTS	APV	LPV
SSR	IIF	<FF>	:DATE				ASP	LSP
FTSR-IN	PETWD						ASPH	LSPH
							ASPL	LSPL
							AYDA	LYDA
							+VMS	+VMM
								+G
EXPRESSION OPERATORS:								
() (:) NOT * / MOD + - << >> & | ^ :=								
AND OR = <> < <= > >=								**
HEX CONSTANT: 0H7FFF		BINARY CONSTANT: 0B01011010						
EXIT-F1								

Figure 8-8 SF Programming Entries List

NOTE: You cannot use [V] to invoke the SF Programming Entries screen; you must use the SHIFT and [?] keys.

Status of Control
Blocks during Edits

When you show or edit a particular special function program or subroutine, the control block enabled/disabled status remains constant. However, when you press ENTER-F8, the control block is automatically disabled to enter your edit. The control block is restored to its original status, enabled or disabled, upon exit to the directory.

You can also enable the SF control block by using the DIS/CP function key while in the SF Directory or SF display.

PowerMath
Functional Support

TISOFT supports PowerMath on all controllers. However, only certain controllers support PowerMath. Table 8-2 lists the functional differences between PowerMath and non-PowerMath controllers.

Table 8-2 PowerMath vs. Non PowerMath Controllers

Non PowerMath Controllers	PowerMath Controllers
SF instructions IIF and PETWD are not supported.	All instructions are supported.
No function support in IMATH.	ABS function supported in IMATH and IIF.
Operators not allowed in IMATH: ** = <> < <= > >= AND OR	Operator not allowed in IMATH or IIF: **
32-bit long (L) and 16-bit unsigned (U) integer elements are not allowed.	32-bit long (L) and 16-bit unsigned (U) integer elements are allowed.
SF programs and SF subroutines cannot be compiled.	SF programs and SF subroutines can be compiled.
SFPGM and SFSUB boxes cannot be set for IN-LINE execution.	SFPGM and SFSUB boxes can be set for IN-LINE execution.

Editing SF Programs/Subroutines (continued)

Entering SF Header Complete the title and header information by using the arrow and Return keys to move the cursor through the fields. For a subroutine, you have a title field only. The length of the fields is the size of the highlighted cursor on the field.

If you do not make entries to the header fields, the following default values are assumed.

- Title: None
- Continue on Error: No
- Error Status Address: None
- Program Type: Normal
- Cycle Time: 0.0

Entering SF Statements

From the SF header title field, begin entry of statements by pressing the down arrow to position the cursor in the statement field. Type in the instruction name, and press **Return**. Use the alphanumeric keys to complete the parameter prompts for the SF instruction you requested. Move the cursor from prompt to prompt with **Return** or the arrow keys.

The following keys are available for editing:

- **Delete:** Press DEL to delete a single character. Use with the cursor at the end of a line to delete the RETURN and append the following line by filling the line at the cursor position.
- **Insert:** Press INS to invoke the insert mode. Add a return after the insert to split a line at any point and move the text after the RETURN to the following line. Toggle off the insert mode by pressing INS again.
- **DELST-F5:** Press F5 to delete the line on which your cursor is positioned.
- **INSST-F6:** Press F6 to insert a blank line.

Parameter entries are verified individually each time you move the cursor off a parameter. Verify each statement at completion by pressing **ENTER-F8**. If no errors are found, the statement is saved. If errors exist, you receive a message, and the cursor is positioned on the parameter containing the error.

To insert a new SF statement, position the cursor on the SF statement which is to follow the new one and press **INSST-F6** or the **INS** hard key.

To delete an SF statement, position the cursor on the statement, and press **DELST-F5** or the **DEL** hard key.

To change a parameter within a particular statement, use the **Return** key (or arrow keys) to position the cursor on the desired field. Then type in the new entry. Delete and insert characters or lines by selecting the appropriate function keys or hard keys.

To edit the SF instruction type of a particular statement, type in the desired instruction type over the existing one and delete any extra characters. At the prompt, **REPLACE STATEMENT?**, type in **Y** (or press **YES-F2**). The parameter fields for the new instructions are then displayed for editing.

The following sets of instructions are functionally related, and parameter values are automatically swapped and redisplayed when you change from one statement to the other.

BINBCD	↔	BCDBIN				
MATH	↔	IMATH	↔	IF	↔	IIF
SCALE	↔	UNSCALE				
FTSR-IN	↔	FTSR-OUT				

When you complete an edit of statement parameters, press **ENTER-F8** to save the statement.

Deleting SF Programs/ Subroutines

To delete an SF program or subroutine, use the Block function. When in an S-Memory Directory, complete the following steps.

1. Press **BLOCK-F3**.
2. Press **DELETE-F4**.
3. At the prompt, enter the range of the SF programs/subroutines that you want deleted, and press **Return**.

For details on using Block functions, see Chapter 13 of this manual.

8.12 Creating Documentation at Program Entry

Accessing the Documentation Editors	Complete documentation of your programs can be created from the Documentation menus (DOCUM-F4 at the main ladder display menu). For your convenience, TISOFT also provides the option of adding or editing documentation for your program while in the Show and Edit menus.
Invoking the Synonym Editor	To create or edit a synonym or descriptor in S-memory, press Ctrl L. (Synonyms are not displayed in S-memory.) The synonym editor can be accessed throughout TISOFT. See Chapter 9 for details on using the synonym editor.
Invoking Comment Screen	<p>To enter comments for your S-memory programs while in an S-memory directory, press the keys as listed below.</p> <ol style="list-style-type: none">1. Enter the desired Loop, Alarm, SF program or SF subroutine type and identifier; for example, LOOP001, SFSUB001, at the prompt in the directory.2. Press SHOW-F2.3. Press COMMNT-F7. Figure 8-9 shows the comment display for Show or Edit. <p>or</p> <ol style="list-style-type: none">1. After selecting SHOW-F2, press EDIT-F2.2. Then, press COMMNT-F7.

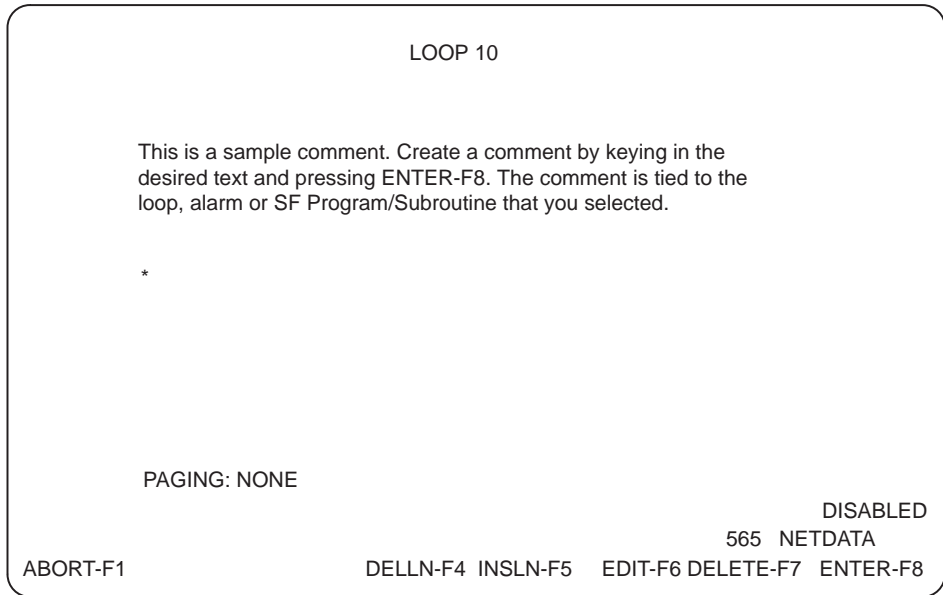


Figure 8-9 Comment Screen Fields

**Keying in
Comments**

When the comment display appears, the loop number, alarm number, etc., you selected for comment appears at the top of the screen. The cursor is positioned for you to begin typing in your comment.

Type in the comment and enter it by pressing **ENTER-F8**.

**Documenting Your
Program**

For detailed instructions on complete documentation of your program with comments, synonyms, and descriptors, see Chapter 9 of this manual.

8.13 Setting Controller Operating Mode

Changing Operating Mode

Use the PG/RN function to change controller operating mode while you are working in S-memory directories. To invoke the operation, press PG/RN-F5.

When you have S-memory configured, you receive a display with three fields, as shown in bold type below, to change operating mode. Use the arrow keys to position the cursor in the desired field. Function keys are available for each field to select the desired option.

LADDERS = **PROG** LOOPS = **PROG** LOOP MODE **LOCKED** TO FOLLOW LADDER MODE

Changing Ladder Mode

When you position the cursor on the **LADDERS** field, the following options are available. (With no S-memory configured, the **LADDERS** field is the only option for changing program mode and no cursor is displayed.)

- **PGMFRZ-F2** places the controller in PROGRAM FREEZE mode. All outputs are frozen in their current states. However, intelligent I/O modules still can update outputs.

When you elect to go to PROGRAM FREEZE mode, you receive the message, **GO TO PROGRAM MODE WITHOUT CLEARING OUTPUTS?**. Select either YES or NO.

- **PGMOFF-F3** places the controller in PROGRAM OFF mode. Discrete outputs are set to zero and all word outputs are frozen. However, intelligent I/O modules still can update outputs.

When you elect to go to PROGRAM OFF mode, you receive the message, **GO TO PROGRAM MODE?**. Select either YES or NO.

WARNING

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

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

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

- **RUN-F4** places the controller in RUN mode, beginning execution of the ladder program.

When you elect to go to RUN mode, you may receive the message, **PROFIBUS-DP IS STOPPED, CONTINUE TO PLC RUN MODE?**. Select either YES or NO.

-
- OPR/ST-F6 allows the changing of PROFIBUS-DP communications mode (OPERATE/STOP).
 - SYNTAX-F8 runs a syntax check on ladder memory (L-memory).

Changing Loop Mode

To select loop operating mode, position the cursor in the `LOOPS` field. You then have the following options available.

- PGM-F2 places the loop card in PROGRAM mode, and control blocks are neither running nor being queued for running. Your loop card cannot be in PROGRAM mode, however, while the discrete CPU is in RUN mode.
- HALT-F3 places the loop card in HOLD mode; enabled control blocks are being queued to run, but are not running. Upon returning to RUN mode, execution resumes where it was halted.
- RUN-F4 places the loop card in the RUN mode; enabled control blocks are being queued and are running.

When you elect to go to RUN mode, you may receive the message, `PROFIBUS-DP IS STOPPED, CONTINUE TO PLC RUN MODE?`. Select either YES or NO.

- OPR/ST-F6 allows the changing of PROFIBUS-DP communications mode (OPERATE/STOP).
- SYNTAX-F8 runs a syntax check on ladder memory (L-memory).

The loop mode can either follow that of the discrete CPU or be in RUN mode independent of the ladder program. To invoke this option, place the cursor in the `LOCKED` or `UNLOCKED` field. Your function keys are then as follows.

- UNLOCK-F2 frees the loop card for selection of RUN operating mode independent of the ladder CPU.
- LOCK-F3 locks the loop card to follow the operating mode selected for ladders.
- OPR/ST-F6 allows the changing of PROFIBUS-DP communications mode (OPERATE/STOP).
- SYNTAX-F8 runs a syntax check on ladder memory (L-memory).

8.14 Enabling/Disabling Control Blocks

Determining Status When a loop, alarm, or SF program/subroutine is disabled, a **D** is shown beside the number identifying the control block in the directory. The absence of a **D** indicates that the control block is enabled. When displaying or editing a loop, alarm, or SF program/subroutine, the status is shown at the right margin of the prompt line. The message then shows either enabled or disabled.

The default of a newly-created control block—loop, alarm, or special function program/subroutine—upon exit to the directory is enabled.

Enabling/Disabling Control Blocks You can enable or disable control blocks either from the directory or the table display. The Enable/Disable key operates the same from either location.

Modifying the Enable/Disable status in the Ramp/Soak table of a loop operates on the entire loop. To disable Ramp/Soak only, you must program *NO* for **RAMP/SOAK ON SP** in the Loop Table.

If a loop or alarm control block is disabled, setting the V-flags to manual/auto/cascade mode for a loop or to enable/disable for an alarm has no effect. The control block must be enabled for the V-flags to be active.

To enable or disable a control block from a directory, complete the following steps.

1. Select the control block by keying in the element and identifier and pressing **[Return]**; or using the arrow keys to position the cursor on the desired loop, alarm, etc., in the directory display.
2. Press **EN/DIS-F4** or **DIS/CP-F4**.
3. Then press **ENABLE-F2** if you want to enable the control block; or press **DISABL-F3** if you want to disable the control block.

To enable or disable a control block from a table display, complete the following steps.

1. Press **EN/DIS-F8** or **DIS/CP-F8**.
2. Then press **ENABLE-F2** if you want to enable the control block; or press **DISABL-F3** if you want to disable the control block.

8.15 Compiling SF Programs/Subroutines

Why Choose Compiled Mode for an SF Program or Subroutine?

When compiled mode is selected (if your controller model supports compiled mode), the SF program or subroutine is translated to the native instruction set of the CPU's microprocessor. The compiled code is then executed whenever the SF program or subroutine is scheduled for execution. The advantages of compiled execution include the following:

- Compiled mode provides a significant improvement in execution speed.
- A compiled SF program or subroutine can be executed in-line to the ladder logic program. This means that when the enable input to the SFPGM or SFSUB box instruction is on, the program or subroutine is executed immediately and its result is available for use in the next rung of the current ladder scan.

Selecting Compiled Mode

Press DIS/CP-F4 from the SF directory screen, or DIS/CP-F8 from the SF program display screen to access the enable/disable and compile/no compile functions, as shown in Figure 8-10. Then press COMPIL-F5 to set the selected SF program or subroutine to be compiled. (You can also change a compiled SF program or subroutine to interpreted mode by pressing NOCMPL-F6.)

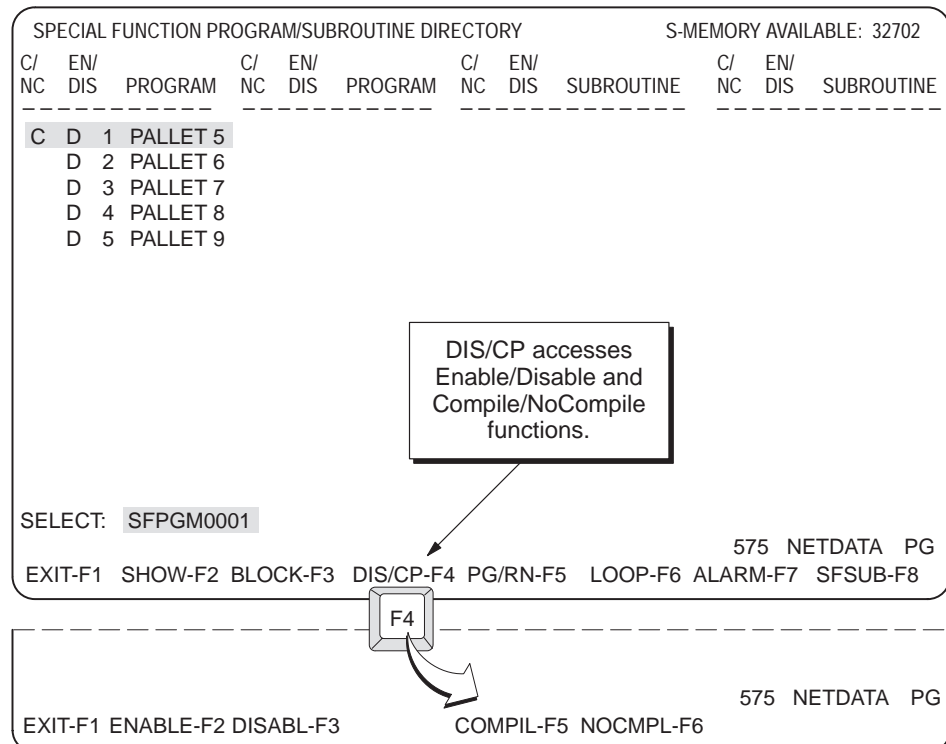


Figure 8-10 Accessing the Compile/No Compile Function Key Line

Compiling SF Programs/Subroutines (continued)

You must have Compiled Special (CS) memory configured in order to run compiled SF programs and subroutines. See Chapter 4 for information on configuring memory.

NOTE: You must disable the SF program or SF subroutine before you can select compile or no compile mode.

Determining Compiled Status

When an SF program or SF subroutine is compiled, a **C** is shown beside the number identifying the SF control block in the directory. The absence of a **C** indicates that the SF control block is interpreted (not compiled). When displaying or editing an SF program/subroutine, the status is shown at the right margin of the prompt line. The message then shows either **CP** for compiled or blank for interpreted (not compiled).

Chapter 9

Documenting Programs

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9.1 Documenting Your Ladder Program

Available Documentation

To help you in documenting your application program, TISOFT provides three methods for identifying elements in your programs. You can create comments, which are free-form entries of descriptive text up to 16 lines x 60 characters tied to selected elements. Further, you can add synonyms, which are 3-line x 11-character tags for selected elements. When more detail is required along with each synonym, you can add a 3-line x 48-character descriptor. (When you press SYNTGL-F5 to toggle synonym display on your ladder program, the descriptors are not shown.)

You can add comments, synonyms, and descriptors for the following elements in programs.

Y
C
END, ENDC
GTS, SBR
JMP, JMPE
MCR, MCRE
SKP, LBL
SSI

You can only add synonyms and descriptors for the following elements in programs.

X, IO
V (word and bit-of-word)
K (word and bit-of-word)
WX, WY, WIO (word and bit-of-word)
TCP, TCC, TCW (word and bit-of-word)

You can only add comments for the following elements in programs.

LOOP
ALARM
SFPGM
SFSUB

For identifying a particular program, you have the option of adding a title that is up to 16 lines x 60 characters. You can also add the date and version of the program.

Using External Editors

TISOFT provides editing capabilities for all available methods of documentation. However, if you use another package such as a word processor or a spreadsheet (e.g., Microsoft® Excel™), TISOFT allows you to export comment and synonym (including descriptor) documentation as files for editing. Refer to Section 9.8 for details on how to export and import documentation files.

**Accessing
Documentation
Functions**

From the TISOFT start-up screen, press the keys as listed below to invoke the Documentation Menu. If you are already at the Ladder Display, press DOCUM-F4. The function key menu shown in Figure 9-1 invokes all documentation operations.

1. Press either ONLINE-F4 or OFFLINE-F8.
2. Press DOCUM-F4.

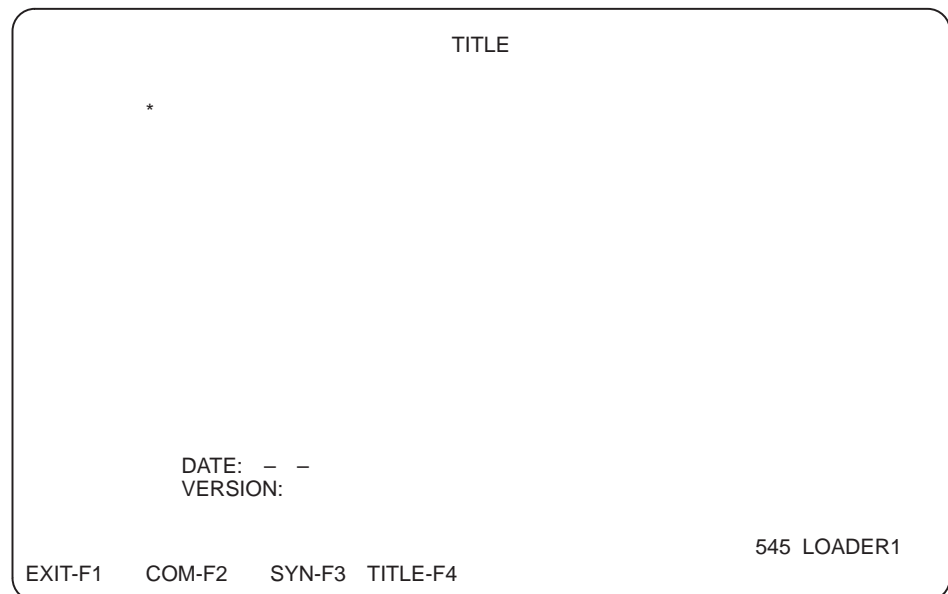


Figure 9-1 Documentation Menu

9.2 Preparing to Enter Comments

Selecting an Element

To create comments, after pressing **DOCUM-F4**, press **COM-F2** to display the prompt line shown in Figure 9-2. You can select the element in one of the following two ways.

- Use the comment field to enter an element.
- Or, use the pop-up list to select an element.

Details of the ways to select an element are shown in the next two sections.

Using the Comment Field to Select an Element

To select an element by using the **COMMENT:** field, use the following procedure:

1. Type in the element type at the **COMMENT:** field. For example, type in Y. See Figure 9-2.
2. Type in the identifier at the **COMMENT:** field. For example, type in 450.
3. Press **Return** to go to the Comment Editor Menu, Figure 9-4.

The screenshot shows a terminal-style interface for entering comments. At the top right, the word "TITLE" is displayed. Below it, the text "Your Document Title" is shown with an asterisk "*" underneath. In the center, there are two lines of text: "DATE: -- --" and "VERSION:". Below these, the "COMMENT:" field is visible, containing the text "Y000450" which is highlighted with a grey background. At the bottom of the screen, there are several function key prompts: "EXIT-F1", "IMPORT-F2", "EXPORT-F3", "SETUP-F5", "545 LOADER1", and "RECOVR-F8".

Figure 9-2 Comment Prompt Line

Using the Pop-up
List to Select an
Element

To select an element using the pop-up list, use the following procedure:

1. Press **[V]** or Shift **[?]** to display a full listing of elements that may be commented. See Figure 9-3.
2. Use the arrow keys to select the element from the list. For example, if you want a comment tied to Y, Highlight Y and press **[Return]**. The element type, Yxxx, is displayed in the **COMMENT :** field, and you are returned to the previous screen. See Figure 9-2.
3. Type in the identifier for the element; for example, type in 450 in the **COMMENT :** field.
4. Press **[Return]** to go to the Comment Editor Menu, Figure 9-4.

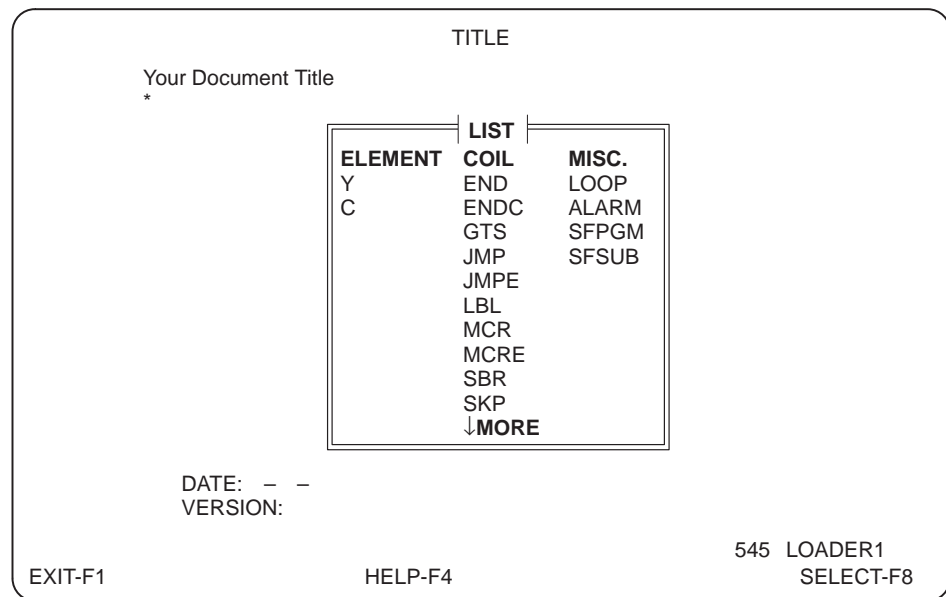


Figure 9-3 Comment Pop-up Element List

Preparing to Enter Comments (continued)

Comment Parameters

A comment for an element can be up to 16 lines in length, with 60 characters in each line.

Options for printing with the page break field are: begin a new page on the next odd page before the comment, begin a new page before the comment, or have no page break associated with the comment.

Invoking the Comment Editor Menu

After you select the element for comment, the Comment Editor Menu (Figure 9-4) is displayed with function keys for editing.

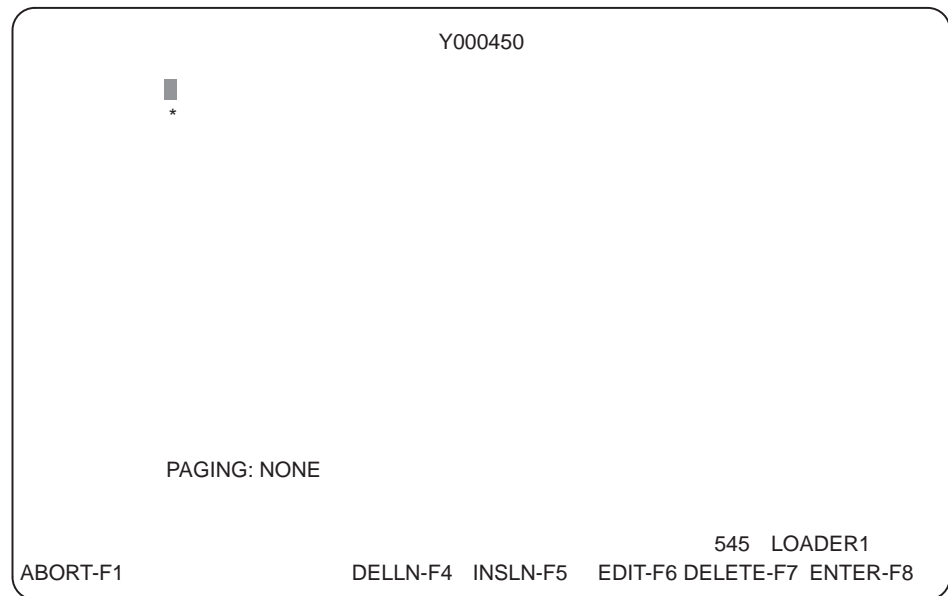


Figure 9-4 Comment Editor Menu

9.3 Entering Comments

Keying in Comments

When the Comment Editor Menu (see Figure 9-4) is displayed, the cursor is positioned at the starting point for a comment. Type in your comment for the selected element. The following keys are available for editing:

- **Delete:** Press DEL to delete a single character. Use with the cursor at the end of a line to delete the Return and append the following line by filling the line at the cursor position.
- **Insert:** Press INS to invoke the insert mode. Add a Return after the insert to split a line at any point and move the text after the Return to the following line. Toggle off the insert mode by pressing INS again.
- **Backspace:** Use Backspace to delete characters to the left of the cursor.
- **DELLN-F4:** Press F4 to delete the line where the cursor is positioned.
- **INSLN-F5:** Press F5 to insert a blank line above the line on which the cursor is positioned.
- **EDIT-F6 and COMPSE-F6:** Press F6 to toggle between edit and compose modes. Edit mode does not automatically insert a return at the end of a line. To enter text continuously and have the cursor positioned automatically at a new line, use compose mode.
- **DELETE-F7:** Press F7 to delete an entire comment and clear the display.

Adding Paging Instructions

After keying in your comment, use the down arrow key to position the cursor at the **PAGING** field.

- Press **ODD-F1** to have the comment and rung appear on separate pages when printed. (ODD causes the page to feed to the top of the next odd page before the comment has printed.)
- Press **BEFORE-F2** to have the comment and rung appear on separate pages when printed. (BEFORE causes the page to feed to the top of the next page before printing the comment.)
- Press **NONE-F3** to have the comment and rung print without pagebreaks.

Saving Comments

To save the comments, press **ENTER-F8** before exiting the Comment Editor Menu.

Entering Comments (continued)

Finding a Comment

After entering a comment, you may want to edit it later. When you do, follow the same procedure to find the comment as you used at entry.

1. Press **DOCUM-F4**.
2. Press **COM-F2**.
3. At the prompt, type in the element and identifier to be located, as C123, Y256, etc.
4. Press **Return**.

Changing a Comment

After you display the comment, the edit function keys are available. Use the arrow keys to position the cursor at the point you are changing. Then insert or delete text as desired.

Recovering and Rebuilding Comment Files

The Recover function (**RECOVR-F8**) recovers space used by comments by rebuilding the comment program files. It does this by writing all comments in the selected program on disk to a temporary text file. All of the comment files in the selected program are then deleted and rebuilt using the data in the temporary text file. The temporary text file is then deleted. This reduces the size of the comment files and may also fix some comment editing problems.

To execute the Recover function, follow these steps:

1. Press **RECOVR-F8** at the comment selection prompt (see Figure 9-5). The TISOFT File Selection screen appears. The default directory is the selected program on disk and the default file name is **TEMPFILE**.
2. Press **SELECT-F8** or **Return** to accept the default file and directory, or choose another drive, directory, or filename. TISOFT executes the Recover function as described above.

NOTE: If there is not enough space in the default drive and directory to temporarily store the comment data, choose another drive and/or directory.



Figure 9-5 Using the Recover Function

9.4 Preparing to Enter Synonyms and/or Descriptors

Selecting an Element

To create synonyms and/or descriptors, after pressing **DOCUM-F4**, press **SYN-F3** to display the prompt line shown in Figure 9-6. You can select the element in one of two ways, as follows.

- Use the synonym field to select an element.
- Or, use the pop-up list to select an element.

Details of the ways to select an element are shown in the next two sections.

NOTE: IO, X, and Y with the same identifier refer to the same point and synonym. WIO, WX and WY with the same identifier refer to the same word and synonym. TCW, TCP, and TCC with the same identifier refer to the same synonym. Word synonym elements can have bit-of-word synonyms.

Using the Synonym Field to Select an Element

To use the **SYNONYM:** field to select an element, use the following procedure:

1. Type in the element type at the **SYNONYM** field. For example, type in Y. See Figure 9-6.
2. Type in the identifier at the **SYNONYM** field. For example, type in 450.
3. Press **Return** to go to the Synonym Editor Menu, Figure 9-8.

```
TITLE
Your Document Title
*
DATE: --
VERSION:
SYNONYM: Y000000450
EXIT-F1  IMPORT-F2  EXPORT-F3          SETUP-F5          545 LOADER1
RECOVR-F8
```

Figure 9-6 Synonym Prompt Selection Screen

Preparing to Enter Synonyms and/or Descriptors (continued)

Using the Pop-up List to Select an Element

To select an element using the pop-up list, use the following procedure:

1. Press **[V]** or **Shift [?]** to display a full listing of elements that may be selected. See Figure 9-7.
2. Use the arrow keys to select the element from the list. For example, if you want a synonym tied to Y, highlight Y and press **[Return]**. You return to the previous screen and the element type, Yxxx, is displayed in the **SYNONYM:** field. See Figure 9-6.
3. Type in the identifier for the element; for example, type in 450 in the **SYNONYM:** field.
4. Press **[Return]** to go to the Synonym Editor Menu, Figure 9-8.

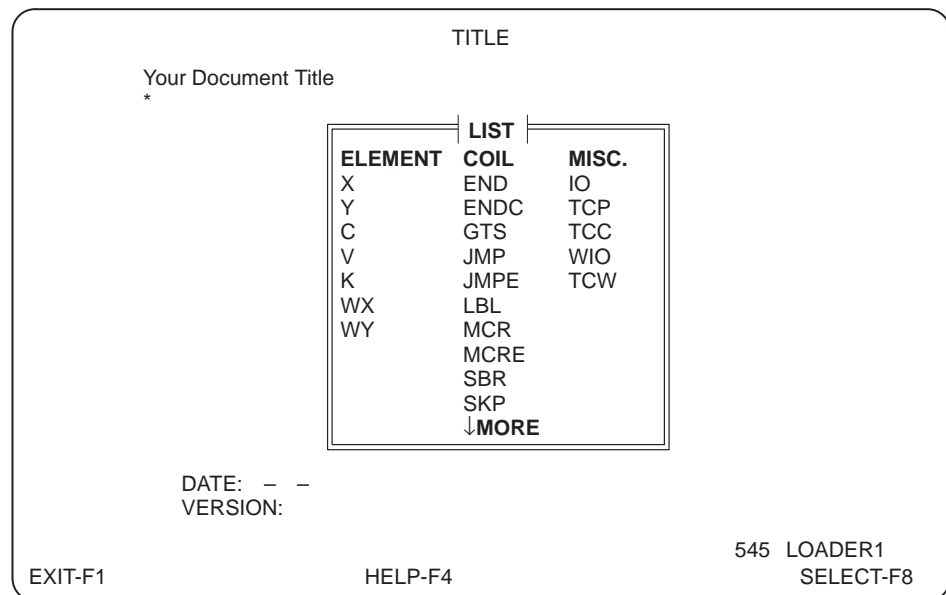


Figure 9-7 Synonym Pop-up Element List

Synonym Parameters

Synonyms can be up to 3 lines in length with up to 11 characters per line. Descriptors can be up to 3 lines long with up to 48 characters per line.

Invoking the
Synonym Editor
Menu

After you select the element for synonyms and descriptors, the Synonym Editor Menu, Figure 9-8, displays with function keys available for editing. The element you selected and up to four locations following it are displayed.

ELEMENT	SYNONYM	DESCRIPTOR
Y450		
Y451		
Y452		
Y453		
Y454		
EXIT-F1	DELLN-F4	INSLN-F5
	FIND-F6	DELETE-F7
	DESCR-F8	545 LOADER1

Figure 9-8 Synonym Editor Menu

Calling the Pop-up
Synonym Editor

You also have the option of entering synonyms and descriptors through the pop-up synonym editor, which is accessible at most locations in your program. This allows you the option of entering a synonym or descriptor at the point you are entering or editing your program.

Your synonyms and descriptors are saved when you exit the display.

To access the pop-up synonym editor, press Cntl L. Then, at the **SYNONYM** prompt, type in the element you want tied to a synonym or descriptor and press **Return**.

For example, after you press Cntl L, enter C25 at the prompt, and press **Return**, you see a display similar to that shown in Figure 9-9. To select a bit-of-word element for a synonym, type the word element followed by a period and the bit number (for example, V100.9).

You can also place the cursor on the element for which you want to create a synonym or descriptor and then press Cntl L. This way, the **SYNONYM** prompt will have your selected element displayed; then press **Return**.

9.5 Entering Synonyms and/or Descriptors

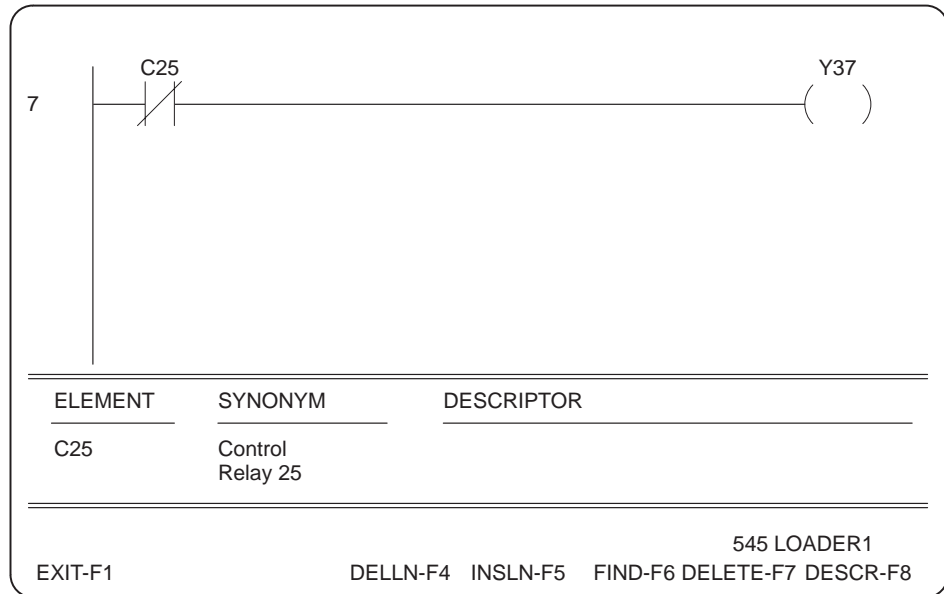


Figure 9-9 Pop-up Synonym Editor

Keying in Synonyms

At the initial display, the cursor is positioned for you to type in a synonym. Use the alphanumeric keyboard on your programming device to type in the synonyms and descriptors. The following keys are available for editing:

- **Delete:** Press DEL to delete a single character. Use with the cursor at the end of a line to delete the Return and append the following line by filling the line at the cursor position.
- **Insert:** Press INS to invoke the insert mode. Add a Return after the insert to split a line at any point and move the text after the Return to the following line. Toggle the insert mode off by pressing INS.
- **Backspace:** Use Backspace to delete characters to the left of the cursor.
- **DELLN-F4:** Press F4 to delete the line where the cursor is positioned.
- **INSLN-F5:** Press F5 to insert a blank line above the line on which the cursor is positioned.
- **FIND-F6:** Press F6 to locate another element you want displayed. Type in the element type and identifier, such as MCR6, and press **Return**.
- **DELETE-F7:** Press F7 to delete a synonym or descriptor and clear the display.
- **DESCR-F8 and SYN-F8:** Press F8 to toggle the cursor between the synonym and descriptor fields.

Finding a Synonym To find a synonym, complete the steps below to locate and display it.

1. Press **DOCUM-F4**.
2. Press **SYN-F3**.
3. At the prompt, type in the element and identifier to be located, such as C123, Y256, etc.
4. Press **[Return]**. You can then also use **FIND-F6** to find other synonyms.

Changing a Synonym After you display the synonym, the edit function keys are available. Use the arrow keys or **F8** to position the cursor at the point you are changing. Then insert or delete text as desired.

Recovering and Rebuilding Synonym Files The Recover function (**RECOVR-F8**) recovers space used by synonyms by rebuilding the synonym program files. It does this by writing all synonyms and descriptors in the selected program on disk to a temporary text file. All of the synonym files in the selected program are then deleted and rebuilt using the data in the temporary text file. The temporary text file is then deleted. This reduces the size of the synonym files and may also fix some synonym editing problems.

To execute the Recover function, follow these steps:

1. Press **RECOVR-F8** at the synonym selection prompt (see Figure 9-10). The TISOFT File Selection screen appears. The default directory is the selected program on disk and the default file name is **TEMPFILE**.
2. Press **SELECT-F8** or **[Return]** to accept the default file and directory, or choose another drive, directory, or filename. TISOFT executes the Recover function as described above.

NOTE: If there is not enough space in the default drive and directory to temporarily store the synonym data, choose another drive and/or directory.



Figure 9-10 Using the Recover Function

9.6 Titling Programs

Invoking the Title Editor

To enter a title, press **TITLE-F4** at the Documentation Menu shown in Figure 9-11. The Title Editor Menu, shown in Figure 9-12, is then available with function keys for editing and entering the title.

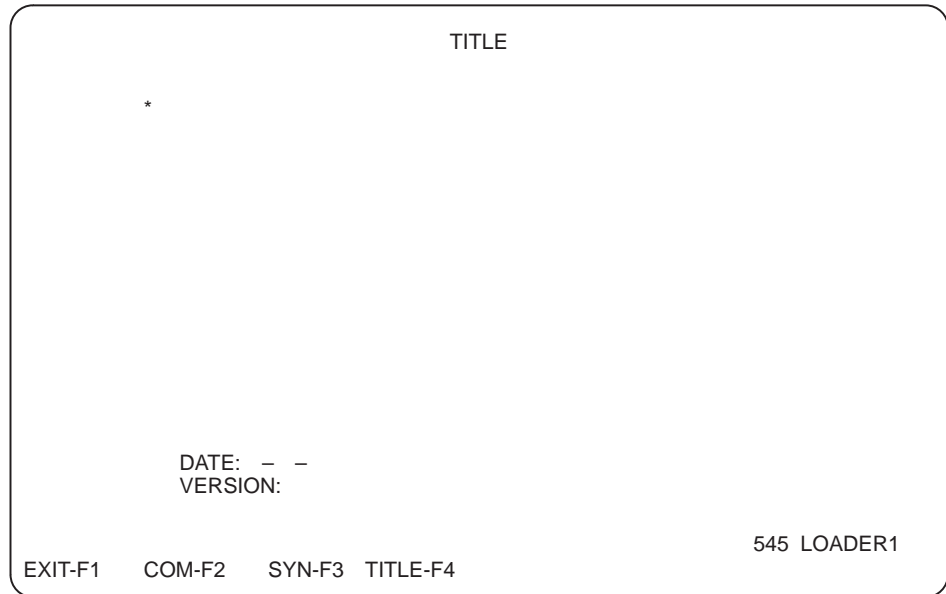


Figure 9-11 Documentation Menu

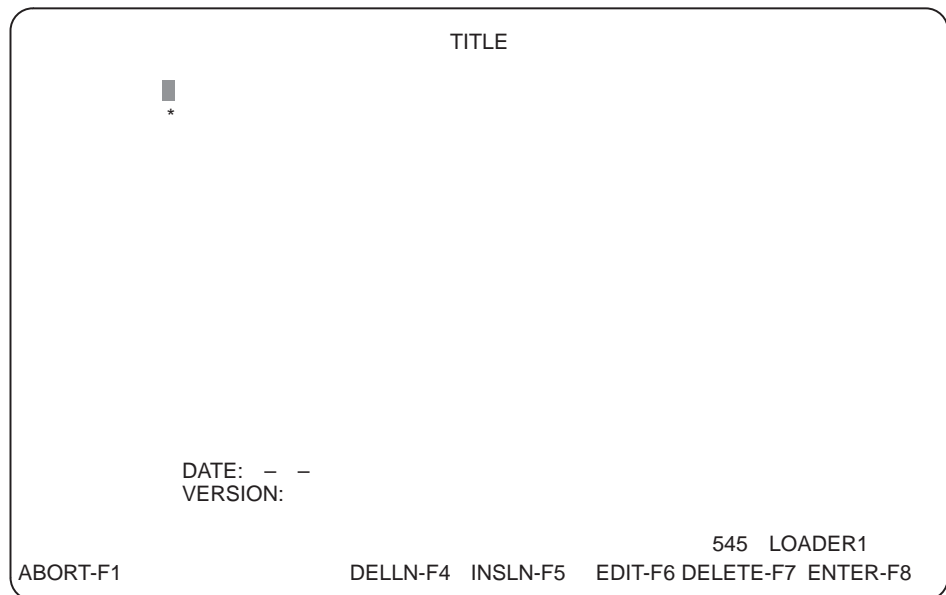


Figure 9-12 Title Editor Menu

Title Parameters	You can create a title of up to 60 characters x 16 lines. The DATE field accepts two numeric characters for each of month, day, and year. The VERSION field accepts any five characters, numeric or alphabetic.
Entering a Title	<p>Enter the title by keying in the desired text with the alphanumeric keys on your keyboard. You can use Backspace to delete characters to the left of the cursor. The following keys are available for editing:</p> <ul style="list-style-type: none">• Delete: Press DEL to delete a single character. Use with the cursor at the end of a line to delete the Return and append the following line by filling the line at the cursor position.• Insert: Press INS to invoke the insert mode. Add a Return after the insert to split a line at any point and move the text after the Return to the following line. Toggle the insert mode off by pressing INS.• Backspace: Use Backspace to delete characters to the left of the cursor.• DELLN-F4: Press F4 to delete the line where the cursor is positioned.• INSLN-F5: Press F5 to insert a blank line above the line on which the cursor is positioned.• EDIT-F6 and COMPSE-F6: Press F6 to toggle between edit and compose modes. Edit mode does not automatically insert a return at the end of a line. To enter text continuously and have the cursor positioned automatically at a new line, use compose mode.• DELETE-F7: Press F7 to delete an entire title and clear the display. Confirm by answering YES or NO to the prompt.
Adding Date and Version	After keying in your title, use the up/down arrow keys to position the cursor on the DATE field and/or VERSION field. The DATE field accepts three sets of two numeric characters. The VERSION field accepts any five characters, numeric or alphabetic.
Saving Titles	To save the title you have created, press ENTER-F8 before exiting the Title Display.

9.7 Entering Comments in S-Memory Programs

Accessing Comment Display

Comments for S-memory programs can be entered from the Documentation Menu, shown in Figure 9-11, as well as from the S-memory menus. To access the comment menu for S-memory, complete the following steps. The S-Memory Comment Editor Menu is then displayed as shown in Figure 9-13.

1. Press **DOCUM-F4**.
2. Press **COM-F2**.
3. Press **[^]** or **Shift [?]**.
4. Select an element for commenting; that is, **LOOP**, **ALARM**, **SFPGM**, or **SFSUB** from the pop-up list, and press the **SELECT-F8** or **[Return]**.
5. Key in an identifying number after the element type, such as **2**.
6. Press **[Return]**.

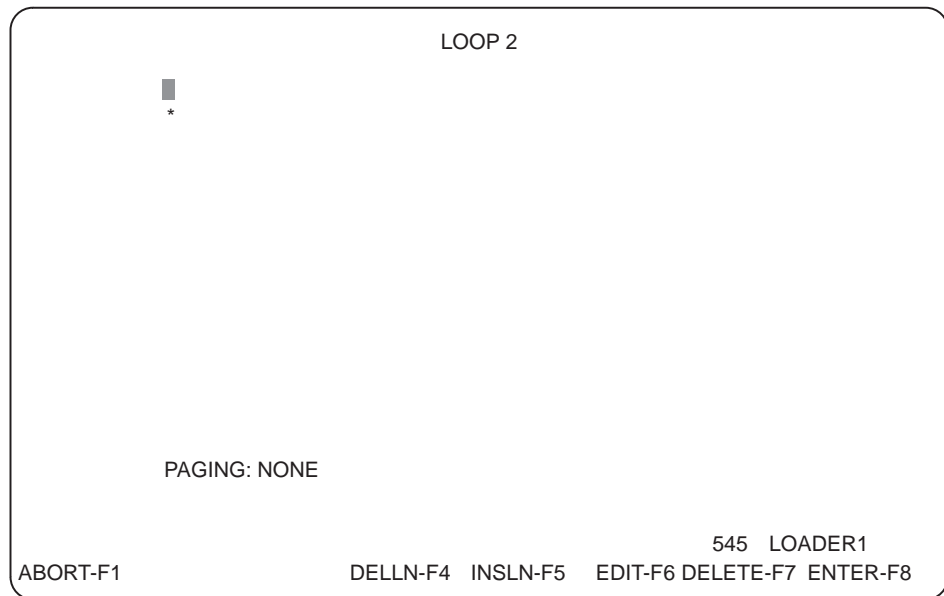


Figure 9-13 S-Memory Comment Editor Menu

Comment Parameters

A comment for an element can be up to 16 lines in length with 60 characters in each line.

The pagebreak field has no effect in S-memory programs.

Keying in
Comments

Enter the comments by keying in the desired text with the alphanumeric keys on your keyboard. You can use `Backspace` to delete characters to the left of the cursor. The following keys are available for editing:

- **Delete:** Press DEL to delete a single character. Use with the cursor at the end of a line to delete the Return and append the following line by filling the line at the cursor position.
- **Insert:** Press INS to invoke the insert mode. Add a Return after the insert to split a line at any point and move the text after the Return to the following line. Toggle the insert mode off by pressing INS.
- **Backspace:** Use Backspace to delete characters to the left of the cursor.
- **DELLN-F4:** Press F4 to delete the line where the cursor is positioned.
- **INSLN-F5:** Press F5 to insert a blank line above the line on which the cursor is positioned.
- **EDIT-F6 and COMPSE-F6:** Press F6 to toggle between edit and compose modes. Edit mode does not automatically insert a return at the end of a line. To enter text continuously and have the cursor positioned automatically at a new line, use compose mode.
- **DELETE-F7:** Press F7 to delete an entire comment and clear the display. Confirm by answering YES or NO to the prompt.

Saving Comments

To save the comments, press ENTER-F8 before exiting the comment menu.

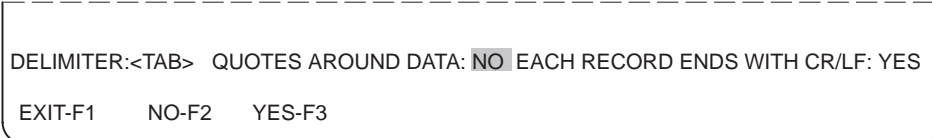
9.8 Importing and Exporting Synonyms and Comments

Importing and exporting of synonyms and comments is supported both online and offline. The importing and exporting of synonyms and comments depends on the file data structure parameters defined in the following set up procedure. The function keys and screens used to import and export synonyms and comments are very similar; minor differences are noted in the text below.

Setup Procedure

Before you actually import or export synonyms or comments, use the following procedure to set up the file data structure.

1. Press **DOCUM-F4**.
2. Press **COM-F2** or **SYN-F3**.
3. Press **SETUP-F5** to invoke the prompt line shown in Figure 9-14.



```
DELIMITER:<TAB> QUOTES AROUND DATA: NO EACH RECORD ENDS WITH CR/LF: YES
EXIT-F1 NO-F2 YES-F3
```

Figure 9-14 Set-up Prompt Line

The function keys shown in Figure 9-14 are summarized as follows:

- **EXIT-F1** or **[Esc]**: Press F1 or **[Esc]** to return to the synonym or comment function key line.
- **NO-F2**: Press F2 to select NO on the prompt line. **NO-F2** only displays when the cursor is in the **QUOTES AROUND DATA** or **EACH RECORD ENDS WITH CR/LF** field.
- **YES-F3**: Press F3 to select YES on the prompt line. **YES-F3** only displays when the cursor is in the **QUOTES AROUND DATA** or **EACH RECORD ENDS WITH CR/LF** field.

**Setting the Field
Delimiter**

The set-up function sets the type of field delimiter to a tab character or any printable character you choose except space, numeral, upper and lower case characters, period, or double quotes.

To change the delimiter character, position the cursor in the **DELIMITER** field with the arrow keys and type the character you want to use as the delimiter. Refer to Figure 9-14.

**Selecting Quotes
Around Data**

Setup also allows you to select whether to have quotes around the data. To select quotes around data, place the cursor in the **QUOTES AROUND DATA:** field and press **YES-F3** to select quotes or **NO-F2** to select no quotes. See Figure 9-14.

**Selecting the
End-of-Record
Character**

Setup also lets you decide whether to end records with a carriage return/line feed or not. To select the end-of-record characters, place the cursor in the **EACH RECORD ENDS WITH CR/LF:** field and press **NO-F2** or **YES-F3**. Refer to Figure 9-14.

Importing and Exporting Synonyms and Comments (continued)

Import/Export Procedure

Naming or selecting an import or export filename is done through the pop-up file selection window. The comment text file has the file extension .TXC; the synonym text file has the file extension .TXS. Refer to Section 2.2, Managing Program Files, for details of using the pop-up file selection window.

1. Press **DOCUM-F4**.
2. Press **COM-F2** to select comments or **SYN-F3** to select synonyms. The synonym prompt line shown in Figure 9-15 appears. The comment prompt line is similar to the synonym prompt line.
3. Ensure that the delimiters are set up. Refer to the following paragraphs in this section: Setup Procedure; Setting Field Delimiter; Selecting Quotes Around Data; and Selecting the End-of-Record Character.
4. Press **IMPORT-F2** or **EXPORT-F3**.
5. Select a filename. (Refer to Section 2.2, Managing Program Files.)



```
SYNONYM: Y000001
EXIT-F1  IMPORT-F2 EXPORT-F3      SETUP-F5      545 LOADER1
                                                RECOVR-F8
```

Figure 9-15 Synonym Prompt Line

The function keys in Figure 9-15 are summarized as follows:

- **EXIT-F1** or **Esc**: Press F1 or **Esc** to return to the main documentation screen.
- **IMPORT-F2**: Press F2 to import synonyms or comments from a text file.
- **EXPORT-F3**: Press F3 to export synonyms or comments to a text file.
- **SETUP-F5**: Press F5 to set parameters for import and export of synonyms and comments.
- **RECOVR-F8**: Press F8 to recover space used by synonyms or comments by rebuilding the synonym or comment files.

Comment Fields

Table 9-1 describes the fields used in the comment text file to identify and separate various parts of the data. If B (Before) or O (Odd) are not found in the paging field, then N (None) is the default. Refer to Section 9.3, Entering Comments, for more details on formatting comments.

The paging field and the type and ID field are automatically converted to upper case when they are imported.

Table 9-1 Comment Fields

Field	Maximum Size	Description
1	12	Comment type and ID.
2	1	Paging: 'N', 'B', or 'O'.
3-18	60	Comment text lines.

Synonym Fields

Table 9-2 describes the fields used in the synonym text file to identify and separate various parts of the data. Refer to Section 9.4, Preparing to Enter Synonyms and/or Descriptors, for more information about synonym fields.

The type and ID field is automatically converted to upper case when it is imported.

Table 9-2 Synonym Fields

Field	Maximum Size	Description
1	12	Synonym type and ID.
2-4	11	Synonym text lines.
5-7	48	Descriptor text lines.

Importing and Exporting Synonyms and Comments (continued)

Rules for Importing Synonyms and Comments

Importing synonyms or comments loads all the synonyms or comments of a text file into the currently selected program according to the following rules:

- Synonyms or comments not in the text file, but in the selected program, remain unchanged in the selected program.
- Synonyms or comments that are in both the text file and the selected program are overwritten in the selected program.
- Synonyms or comments in the text file, but not in the selected program, are added to the selected program.

NOTE: To exactly copy the synonyms and comments in the text file, you must delete all synonyms and comments in the selected program before running the import function.

Exporting Synonyms and Comments

Exporting synonyms or comments writes all the synonyms or comments in the currently selected program on disk to a text file. If the text file exists, a **FILE EXISTS, OVERWRITE?** prompt is displayed. Press **YES-F2** to overwrite the file or **NO-F1** to abort the operation.

Chapter 10

Using Status Functions

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10.1 Status Functions Available

After you have completed entry of your program and loaded it to your controller, TISOFT provides the functionality for debugging and monitoring. Whether you display your ladder program or build a chart of elements, status functions operate on either. You can access read, write, force, unforce, or find forced elements functions from either the ladder display or the chart display. In addition, you have the option of displaying ladders and charts on one display by using the SELECT feature.

You can monitor your program, either through a ladder display or a chart you have built, by using the status functions with the controller in the RUN mode.

You can build status charts to use on-line as your program executes. To give you flexibility in setting up charts, you can build them off-line, as well as on-line, and save them for reuse. You can include the following memory types in charts.

- Discrete I/O
- Analog Alarm Variables
- Loop Variables
- V- and K-Memory Addresses
- Status Words
- Timer, Drum, and Counter Current and Presets
- Word I/O

While in the ladder status display, you can observe the status of selected elements in your ladder program.

While in the status or chart mode, you can toggle controller operating mode between PROGRAM and RUN.

You can initiate a single scan of your program from either Status or Chart mode, but the controller must be in PROGRAM mode—not RUN mode—to execute this function.

If your controller supports more than one task, you can select which tasks to execute during the single scan.

Displaying Data in ASCII Format

Using the ASCII feature enables you to display the contents of V-, K-, WX-, WY-, and G-memory locations in ASCII characters. To create a display, complete the following steps from the Build Chart menu.

1. Type in the desired address, such as V100.
2. Press ASCII-F4.

You receive a prompt requesting the number of words to display in the sequence beginning with the address entered above (two ASCII characters displayed per word).

3. Type in the number of words (1 – 8).

If you want the bytes in the words to be swapped in the display, press SWAP-F2.

4. Press or ENTER-F8.

Changing Numeric Format

To complete a chart, type in a desired element location, as V100. If the format is acceptable—default is integer for word addresses and bit for discrete locations—then press an arrow key to position cursor for next entry. If you want to change the display format, complete the following steps before pressing the arrow key.

1. Press SPACEBAR to display format function keys.
2. Select format by pressing one of the function keys, F1–F8, that corresponds to desired display format.

If you select a format that is not allowed for a particular element type, an error message is displayed to tell you that the format is not allowed for that type. No key is required for bit format; it is selected automatically for discretes and cannot be altered.

Entering Elements in Sequence

When entering consecutive locations on a chart, rather than pressing arrow keys after an entry, you can use to move to the next field. TISOFT automatically enters the next location with the same format.

For example, if you enter V102 and press , V103 is displayed, and so on. If the location is in double or real format, the next location displayed is incremented by two. Elements with ASCII format are increased by the number of words selected. When you reach the end of the memory locations for a particular memory type, TISOFT duplicates the last element without incrementing.

10.4 Clearing and Saving Status Charts

Clearing a Chart Display

To clear either a single location on a display or an entire display, complete the following steps from the Status Chart Display.

Clearing a single location:

1. Using the arrow keys, position the cursor on the location to be cleared.
2. Press CLRLOC-F6.

Clearing a display:

1. Press CLRCHT-F5.
2. Press YES-F2.

Saving a Status Chart

You can save charts to recall for later use. This enables you to monitor and debug a variety of locations in your program without having to rebuild a chart each time. To save a status chart from the Build Chart Display, complete the steps below.

1. Press WRCHT-F8 to write the chart to disk.
2. Either use the arrow keys to select the filename from the window, or press FLDTGL-F6 and type in a name at the prompt where the current chart is to be stored.
3. Press SELECT-F8 or press .

Displaying Status Charts (continued)

Reading Chart Displays

Status is shown for the elements in your chart display in the format given below. The areas shaded in the examples are shown in reverse video on your display.

Controller Status	CHART Display
-------------------	---------------

ON :	X23 = ON
------	----------

OFF:	X23 = OFF
------	-----------

Forced ON:	X23 = ON
------------	----------

Forced OFF:	X23 = OFF
-------------	-----------

Value:	V23 = 126	(Status for words shows the value in the location.)
--------	-----------	---

Forced Value:	WY56 = 126	(Status for words shows the value in the location.)
---------------	------------	---

ASCII:	V125 = ABCD	(Forced Status is not shown for ASCII format.)
--------	-------------	--

10.6 Finding Ladders and Elements

Locating Ladder Addresses

Display the section of the program you need by completing the following steps.

1. Either press **STATUS-F7** from the Ladder Display or **STATUS-F8** from the Status Chart Display.
2. Press **FIND-F3** or **Ctrl F**. (See Figure 10-4.)
3. Press **ADDR-F2**.
4. At the prompt, enter the address of the ladder rung you want displayed.
5. Press **Return**.

Locating Elements

To use the Find function in locating elements, after pressing **FIND-F3**, enter the desired element type and identifier at the prompt.

For example, if you want to locate **WX20**, you can simply type in **WX20**.

Press **Return** to execute the Find operation.

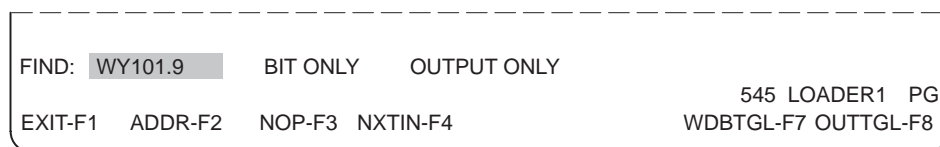


Figure 10-4 Find Function Keys

The following function keys are available for Find operations:

- **ADDR-F2** allows you to select the address for a rung of ladder logic as the element type you want to find.
- **NOP-F3** (no operation) finds the next occurrence of a non-programmed rung of ladder logic.
- **NXTIN-F4** (next instruction) finds the next occurrence of a programmed rung of ladder logic.
- **WDBTGL-F7** allows you to toggle between **BIT ONLY** (which restricts the word Find operation to bit-of-word only), **WORD ONLY** (which restricts the operation to word only), and an unrestricted search.
- **OUTTGL-F8** allows you to toggle between **OUTPUT ONLY** (which restricts the Find operation to outputs only), and an unrestricted search (which finds inputs as well as outputs).

10.7 Displaying Ladder Status

Invoking Ladder Status Functions

The Ladder Status display, shown in Figure 10-5, provides access to status and debug functions for ladders.

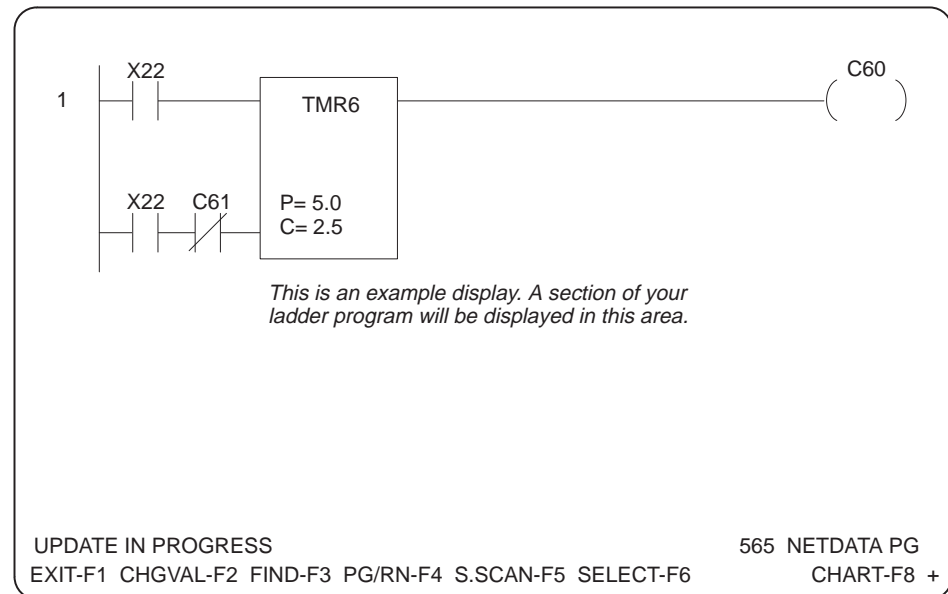


Figure 10-5 Ladder Status Display

Reading Ladder Displays

Status is shown for the elements in your ladder display as given in Figure 10-6. Bit-of-word elements are displayed in the same manner. The areas shaded in the examples are shown in reverse video on your display.

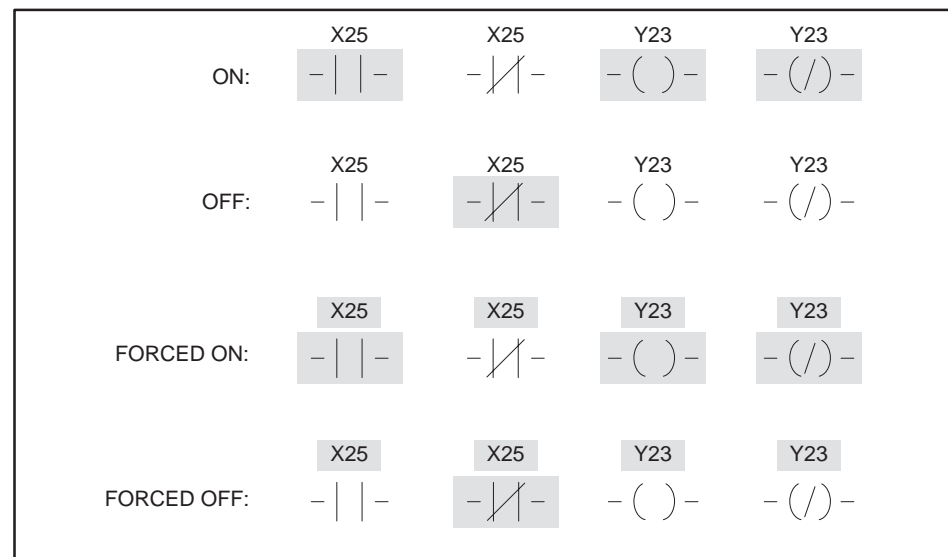


Figure 10-6 Element Status Displays

For box instructions, the information shown in Status Mode is updated for each type of box listed in Table 10-1.

Table 10-1 Status Information for Box Instructions

Box	Values	Description
TMR/CTR/UDC:	P = 123.4 C = 12.3	Preset value Current value
MCAT/DCAT:	C = 12.3 P = 34.5	Current value Preset value
DRUM:	Preset = 1	Preset step value Highlighted line is current step. Count/step in highlighted line is current count of current step.
EVENT DRUM:	Preset = 1 CNT/STP	Preset step value Drum counter preset values Highlighted line is current step. Count/step in highlighted line is current count of current step.
MASK DRUM:	Preset = 1 CNT/STP	Preset step value Drum Counter preset values Highlighted line is current step. Count/Step in highlighted line is current count of current step. Highlighted bits in drum are bits in the masks that are set to one.
IMC/SMC:		Highlighted line is the current pointer step value.
Relational Contacts: (<, >, =, <=, >=, <>)		Current values being compared: If Compare is TRUE, the contact is highlighted.

10.8 Displaying Synonyms and Comments in Ladder Status

Displaying Synonyms

TISOFT allows you to display synonyms for your ladder rungs while in the status operation. To enable the synonym display, complete the following steps from your ladder status display.

1. Press SPACEBAR.
2. Press SYNTGL-F2.

Displaying Comments

TISOFT allows you to display comments for your ladder rungs while in the status operation. To enable the comment display, complete the following steps from your ladder status display.

1. Press SPACEBAR.
2. Press COMTGL-F1.

10.10 Using the Edit Function

Accessing the Change Value Function

You have an element edit function available after you have selected either STATUS-F7 or CHART-F8 from the main ladder display. The edit functions are the same from either entry point, as illustrated in Figure 10-8 below. The CHGVAL function provides access to the read, write, force, unforce, and find force functions.

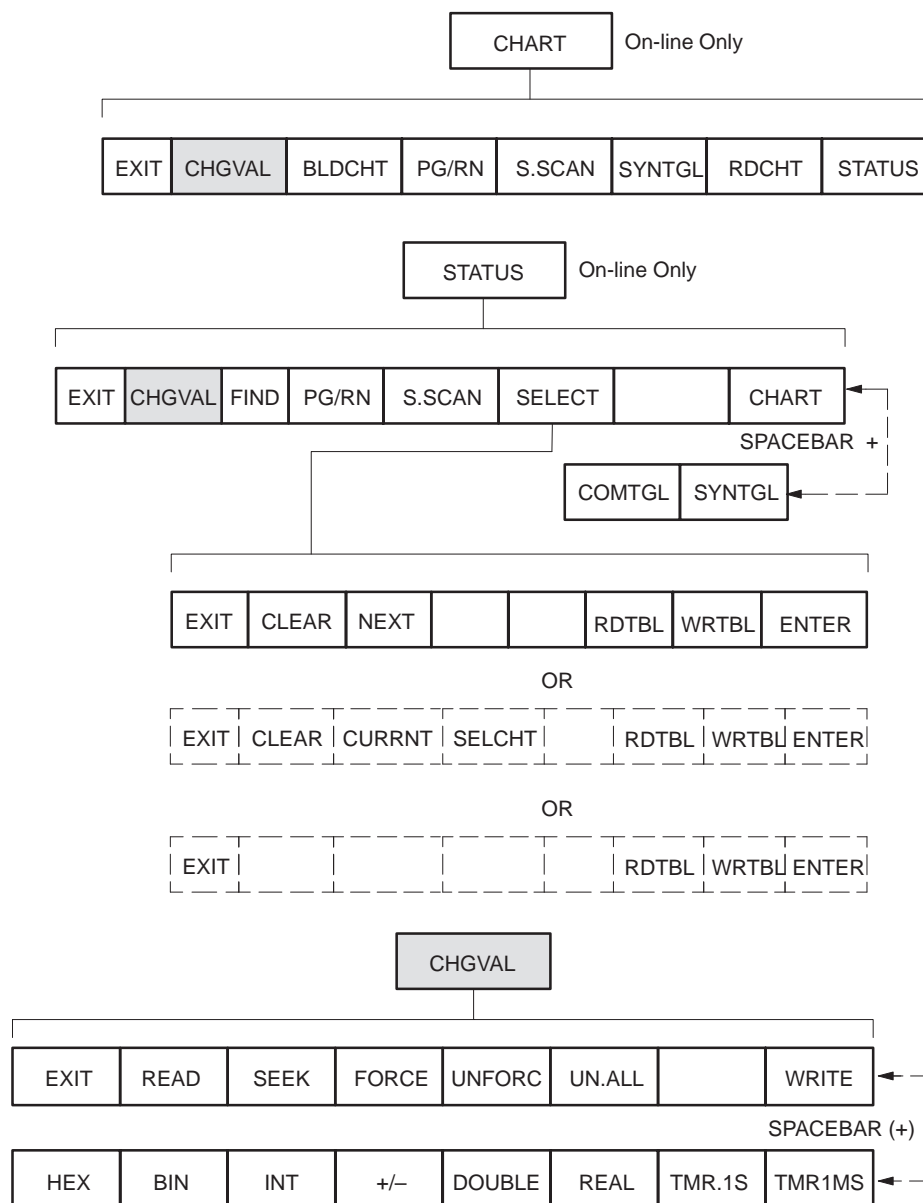


Figure 10-8 Status Editor Menu Charts

Using the Prompt Line

After you select the edit (CHGVAL) function, a prompt line appears for entry of the element type and identifier. The prompt line shows you the current format and forced state of the element type and identifier (unless you have made a change to the prompt line—in this case, you need to perform a read to obtain the correct status).

The forced status is indicated by the word **FORCED** to the right of the format. If the word **FORCED** is not displayed, the element is not forced.

Updates and Messages

While you are in the Change Value function, the main display continues to be updated. All information and error messages remain on the screen until you press a key. If no information or error messages are being displayed, the message, **UPDATE IN PROGRESS**, is displayed.

Checking Numeric Format

Numeric formats you have selected for particular types of elements affect the manner in which you use the edit functions. For example, both real and double formats require two consecutive words each for storage and display.

Since discrete elements (X, Y, & C) show only on and off status, there is no format selection for discrettes. These elements can be forced.

Word, loop and alarm elements show a value for status. Only WX and WY word elements can be forced.

**Incrementing/
Decrementing
Element Addresses**

F9 increments the element address; F10 decrements the address. Both keys perform a read with the address change provided the operation before using the F9 and F10 keys was a read. If any operation other than a read was performed before pressing F9 or F10, a read is not done.

Using Single Scan

You can use Alt Q to execute a single scan while you are in Change Value; refer to Section 10.9.

10.11 Reading/Changing Element Status


Reading Status


To read the status of an element complete the following steps.

1. Press CHGVAL-F2.
2. At the prompt, type in the element type and identifier to be read.
3. If the display format needs to be changed, press the SPACEBAR to select the desired format before going to the next step.
4. Press READ-F2.

Writing Values

You can write a value to almost all elements.

 WARNING
<p>In both PROGRAM mode and RUN mode, all changes made to the output image register are reflected in the output modules.</p> <p>Manually changing the state of an output (writing a value or forcing an element) could put the process in an uncontrolled state. Death or serious injury to personnel, and/or damage to equipment, could ensue.</p> <p>Use caution when using the Write and Force functions in your application.</p>

 WARNING
<p>A change made in chart or ladder status updates the program as entered. If made in RUN mode, this change is effective as soon as the controller reads it. Exercise caution when using the Write function in your application.</p> <p>Failure to follow appropriate safety precautions could result in death or serious injury to personnel, and/or damage to equipment.</p> <p>Use caution when writing values in RUN mode. To do so may seriously affect system level safety.</p>

From either the ladder or chart display, complete the following steps.

1. Press CHGVAL-F2.
2. At the prompt, type in the element type and identifier for changing value.
3. Use the right arrow key to position the cursor in the value field.
4. If the display format needs to be changed, press the SPACEBAR to select the desired format before going to the next step.
5. Type in the new value to be written.
6. Press WRITE-F8.

10.12 Forcing Elements

WARNING

A change made in chart or ladder status updates the program as entered. If made in RUN mode, this change is effective as soon as the controller reads it. Exercise caution when using the Force function in your application.

Failure to follow appropriate safety precautions could result in death or serious injury and/or damage to equipment.

Use caution when forcing values in RUN mode. To do so may seriously affect system level safety.

Forcing an Element To use the Force function from either the Status or Chart display, complete the following steps.

1. Press **CHGVAL-F2**.
2. At the prompt, type in the element type (either X, Y, C, WX, or WY), along with the identifier (for example, X250).
3. Use the right arrow key to position the cursor on the value field.
4. If you wish to select another numeric display format, press the **SPACEBAR** and then the function key for the desired format.
5. Type in the value to be forced for the selected element. For discretetes, you can use 1 or 0, ON or OFF, N or F, or T or F.
6. Press **FORCE-F4**.

Remember that, if the format is real or double, two consecutive memory locations will be forced.

Finding a Forced Element To find the next occurrence of a forced element for a specified type, complete the following steps from either the Status or Chart display.

1. Press **CHGVAL-F2**.
2. At the prompt, type in the element type (either X, Y, C, WX, or WY).
3. Type an identifier for the element type. This number sets the starting point for the search. The seek function will find the next occurrence of the forced element type after the number you select as the identifier.
4. If you wish to select another numeric display format, press the **SPACEBAR** and then the function key for the desired format.

If the element you are trying to find is in double or real format, both words must be forced, or the seek operation does not read the element as forced.

5. Press **SEEK-F3**.

10.13 Unforcing Elements

Unforcing an Element

To unforce an element from either status or chart, complete the following steps.

1. Press **CHGVAL-F2**.
2. At the prompt, type in the element type (either X, Y, C, WX, or WY), along with the identifier (for example, Y150).
3. If you wish to select another numeric display format, press the **SPACEBAR** and then the function key for the desired format.
4. Press **UNFORC-F5**.

Remember that, if the format is real or double, two consecutive memory locations will be unforced.

Unforcing All Elements

To unforce all elements in a program, complete the following steps from either status or chart.

1. Press **CHGVAL-F2**.
2. Press **UN.ALL-F6**. The prompt **UNFORCE ALL I/O?** is displayed. Press **YES-F2**.

10.14 Changing Controller Modes

Toggleing from Program to Run

You can change operating mode of the controller from either the chart or ladder status display. First, press PG/RN-F4.

When you have S-memory configured, you receive a display with three fields, as shown in bold type below, to change operating mode. Use the arrow keys to position the cursor in the desired field. Function keys are available for each field to select the desired option.

LADDERS = **PROG** LOOPS = **PROG** LOOP MODE **LOCKED** TO FOLLOW LADDER MODE

Changing Ladder Mode

When you position the cursor on the **LADDERS** field, the following options are available. (With no S-memory configured, the **LADDERS** field is the only option for changing program mode and no cursor is displayed.)

- **PGMFRZ-F2** places the controller in PROGRAM FREEZE mode. All outputs are frozen in their current states. However, intelligent I/O modules still can update outputs.

When you elect to go to PROGRAM FREEZE mode, you receive the message, **GO TO PROGRAM MODE WITHOUT CLEARING OUTPUTS?** Select YES or NO.

- **PGMOFF-F3** places the controller in PROGRAM OFF mode. Discrete outputs are set to zero and all word outputs are frozen. However, intelligent I/O modules still can update outputs.

When you elect to go to PROGRAM OFF mode, you receive the message, **GO TO PROGRAM MODE?.** Select either YES or NO.

WARNING

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

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

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

- **RUN-F4** places the controller in RUN mode, beginning execution of the ladder program.

When you elect to go to RUN mode, you may receive the message, **PROFIBUS-DP IS STOPPED, CONTINUE TO PLC RUN MODE?.** Select either YES or NO.

Changing Controller Modes (continued)

- OPR/ST-F6 allows the changing of PROFIBUS-DP communications mode (OPERATE/STOP).
- SYNTAX-F8 runs a syntax check on ladder memory (L-memory).

Changing Loop Mode

To select loop operating mode, position the cursor in the `LOOPS` field. You then have the following options available.

- PGM-F2 places the loop card in PROGRAM mode, and control blocks are neither running nor being queued for running.

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

- HALT-F3 places the loop card in HOLD mode; enabled control blocks are being queued to run, but are not running. Upon returning to RUN mode, execution resumes where it was halted.
- RUN-F4 places the loop card in the RUN mode; enabled control blocks are being queued and are running.

When you elect to go to RUN mode, you may receive the message, `PROFIBUS-DP IS STOPPED, CONTINUE TO PLC RUN MODE?`. Select either YES or NO.

- OPR/ST-F6 allows the changing of PROFIBUS-DP communications mode (OPERATE/STOP).
- SYNTAX-F8 runs a syntax check on ladder memory (L-memory).

The loop mode can either follow that of the discrete CPU or be in RUN mode independent of the ladder program. To invoke this option, place the cursor in the `LOCKED` or `UNLOCKED` field. Your function keys are then as follows.

- UNLOCK-F2 frees the loop card for selection of RUN operating mode independent of the ladder CPU.
- LOCK-F3 locks the loop card to follow the operating mode selected for ladders.
- OPR/ST-F6 allows the changing of PROFIBUS-DP communications mode (OPERATE/STOP).
- SYNTAX-F8 runs a syntax check on ladder memory (L-memory).

10.15 Displaying Both Ladders and Chart

Displaying Ladders with a Chart

You can specify a display of up to seven rungs and a chart of 1 to 13 lines by using the select function from the Ladder Status display. Enter your selections on a table invoked by pressing **SELECT-F6**.

To create a ladder and chart display, complete the following steps from the Ladder Status display.

1. Press **SELECT-F6**.

You receive a Selection Table, shown in Figure 10-9, for making entries to define the rungs and chart to be displayed. Use **CLEAR-F2** to delete entries from any of the Selection Table fields.

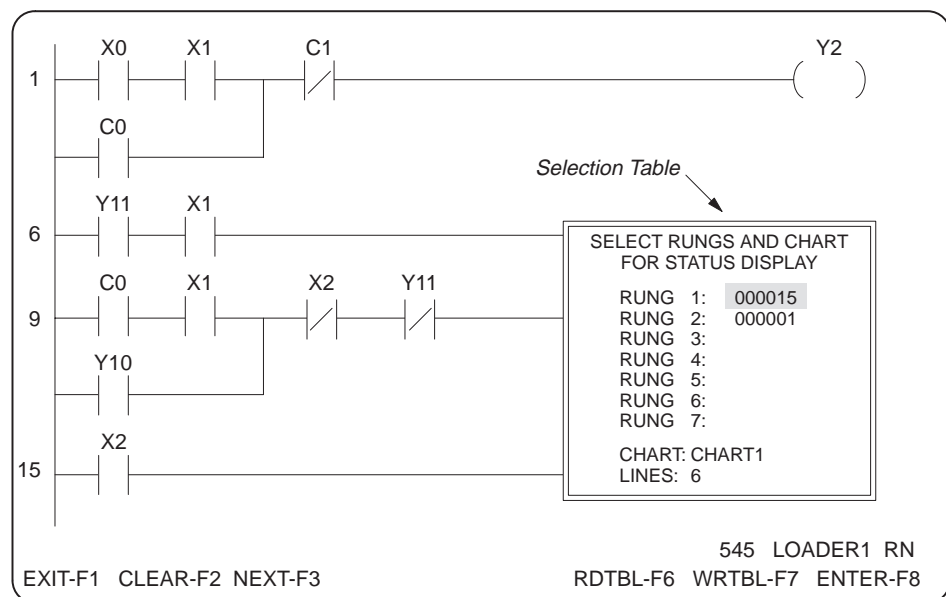


Figure 10-9 Making Entries for Ladder and Chart Display

2. Type in the ladder addresses of the rungs. Move the cursor from field to field with the arrow keys. If you want the rungs displayed sequentially, press **NEXT-F3** in each rung field after keying in the first address.

If you do not enter any addresses in the Selection Table, the screen displays sequential rungs, beginning with the cursor position.

3. With the cursor on the Chart field, press **SELCHT-F4** to enter the filename of the chart to be loaded. Or, to use the current chart already in RAM, press **CURRNT-F3**.
4. Type in the number of lines (1 to 13) to be displayed from the chart you selected. This number has no effect if there is no chart selected.
5. Press **ENTER-F8** to display your selection.

Displaying both Ladders and Chart (continued)

Use the up/down arrow keys to scroll through the selected networks. To return the ladders to a sequential display, press PgUp or PgDn. If you select a chart to be displayed with the ladders, the chart remains until you exit the select function by pressing EXIT-F1 or you exit the Status function.

Note in the sample entries to the Selection Table that the rungs you enter do not have to be sequential. You can select any seven rungs in your ladder program for displaying. You can also select rungs for display without displaying a chart.

Saving a Selection Table

To save a selection table, complete the steps below from the Select Display.

1. Press WRTBL-F7 to write the table to disk.

You now have access to the Program Management function keys. All program management functions are available for use with table files in Status/Chart.

2. Either use the arrow keys to select the filename from the window, or type in a name at the prompt where the current table is to be stored.
3. Press SELECT-F8 or press .

Loading a Selection Table

To load a selection table that you have previously saved, complete the following steps from the Select Display.

1. Press RDTBL-F6 to read a previously saved table from disk.

You now have access to the Program Management function keys. All program management functions are available for use with table files in Status/Chart.

2. Either use the arrow keys to select the filename from the window, or type in a name (of the table to be read) at the prompt.
3. Press SELECT-F8 if you selected the filename from the window or press if you keyed in the filename.

Executing Controller Auxiliary Functions

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11.1 Accessing Controller Auxiliary Functions

Controller Auxiliary Functions

Auxiliary Functions are available on-line only since they require communication with the controller. Your operations available through these functions include the following types.

- Powering up and restarting of the controller
- Clearing controller memory
- Saving programs from the controller
- Loading programs to the controller
- Changing controller operating mode
- Running controller diagnostics
- Checking RLL program syntax

Accessing Auxiliary Functions Menu

To display the auxiliary functions menu, press **AUX-F6** (or **A**) from the on-line ladder display. Since AUX functions are controller-based, the selections available on the AUX menu depend on the controller model you have. Figure 11-1 shows the auxiliary functions menu; as you highlight the function category, the individual auxiliary functions available are displayed.

To select a particular AUX function, either use the arrow keys to position the cursor on the AUX function, or type the number of the function, then press **Return**.

- **TITLE-F2** displays the current program title.
- **PGMS-F7** accesses the file management system to select the program name to be accessed and to copy, delete, or rename files and directories.

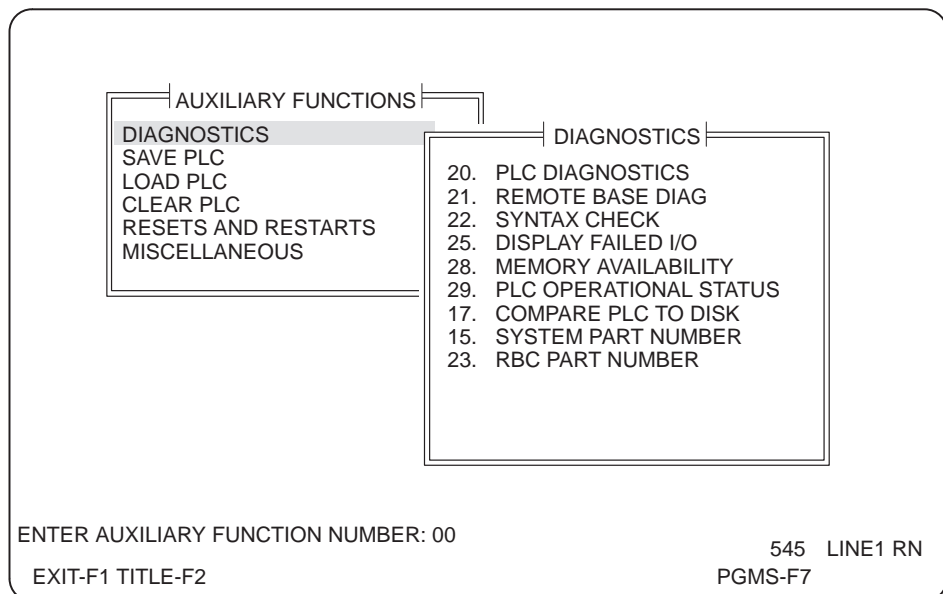


Figure 11-1 Auxiliary Functions Menu

To select an AUX function, either use the arrow keys to highlight an AUX function or enter the number of that AUX function, and press **Return**. Table 11-1 shows a list of auxiliary functions available for each category.

Accessing Controller Auxiliary Functions (continued)

Table 11-1 Auxiliary Functions

Category	AUX Functions	
Diagnostics	20. PLC Diagnostics 21. Remote Base Diagnostics 22. Syntax Check 25. Display Failed I/O 27. PLC Card Failure	28. Memory Availability 29. PLC Operational Status 17. Compare PLC to Disk 15. System Part Number 23. RBC Part Number
Save Controller	60. All 61. Ladder 62. Variable 63. Constant	64. Loops 65. Analog Alarms 66. SF Programs 67. SF Subroutines 42. Save U-memory
Load Controller	90. All without IR 91. Ladder 92. Variable 93. Constant 94. Loops	95. Analog Alarms 96. SF Programs 97. SF Subroutines 98. Forced IR 99. Word I/O 43. Load U-memory
Clear Controller	13. Clear All 31. Ladder 32. Variable 33. Constant 35. Word 36. TCC/TCP	37. DSP/DCP 74. Loops 75. Analog Alarms 76. SF Programs 77. SF Subroutines 41. Clear U-memory
Resets and Restarts	10. Power/up 11. Partial Restart	12. Complete Restart
Miscellaneous	14. Watchdog Timer 16. Task Codes per Scan 18. PLC Time of Day 19. Set PLC Scan Time 81. PLC Operational Modes 86. PROFIBUS-DP Mode	82. Hot Backup 83. Port Lockout 84. EEPROM Programming 85. Password Operations. 40. Convert S-records

NOTE: If no S-memory is configured, AUX 64–67, 74–77, and 94–97 are not displayed. If no U-memory is configured, AUX 40–43 are not displayed. If a hot back-up card is not present, AUX 82 is not displayed. If your controller model does not support EEPROM programming, AUX 84 is not displayed. If your controller does not support PROFIBUS-DP I/O, AUX 86 is not displayed.

The 520, 530, 520C, 530C, and 525 controllers do not display the following AUX functions: 14, 16, 18, 21, 22, 27, 33, 40–43, 63–67, 74–77, 82, 83, 86, 93–97.

11.2 Powering up/Restarting the Controller (AUX 10-12)

Powering up the Controller (AUX 10)

Use AUX 10 to clear all unforced X, Y, and non-retentive C elements on power-up or restart of the controller. Retentive control relays are not cleared. The WX and WY elements are not affected.

 CAUTION
--

If you execute AUX 10 with the controller battery switch set to Off, all programs residing in the controller will be cleared.
--

Be certain to check battery switch position before using AUX 10.

To execute AUX 10, use the numeric keys to enter 10 at the menu prompt, then press **Return**.

When you receive the message, **PLC POWER UP RESTART?**, confirm by pressing **YES-F2**.

For 575 controllers, you are also prompted with **COORDINATE RESET WITH OTHER APPLICATIONS:** and **COORDINATE RESET WITH ENTIRE SYSTEM:**. For each of these prompts, press **NO-F1** or **YES-F2** as required for your process.

Powering up/Restarting the Controller (AUX 10–12) (continued)

Performing a Partial Restart (AUX 11)

Use AUX 11 to clear all discrete elements except retentive C and forced elements. The word elements and presets are not reset.

To execute AUX 11, use the numeric keys to enter 11 at the menu prompt, then press **Return**.

When you receive the message, **PLC PARTIAL RESTART?**, confirm by pressing **YES-F2**.

For 575 controllers, you are also prompted with **COORDINATE RESET WITH OTHER APPLICATIONS:** and **COORDINATE RESET WITH ENTIRE SYSTEM:**. For each of these prompts, press **NO-F1** or **YES-F2** as required for your process.

Performing a Complete Restart (AUX 12)

Use AUX 12 to clear all discrete elements and word elements, including retentive C elements. AUX 12 also clears controller fatal errors. Forced discrete elements and forced word elements are not reset. To execute AUX 12, use the numeric keys to enter 12 at the menu prompt, then press **Return**.

When you receive the message, **PLC COMPLETE RESTART?**, confirm by pressing **YES-F2**.

For 575 controllers, you are also prompted with **COORDINATE RESET WITH OTHER APPLICATIONS:** and **COORDINATE RESET WITH ENTIRE SYSTEM:**. For each of these prompts, press **NO-F1** or **YES-F2** as required for your process.

11.3 Loading Program to Controller (AUX 43, 90–99)

Loading Memory Types (AUX 43, 90–99)

Use AUX 43 and AUX 90 through 99 to load specified memory types to your controller.

NOTE: Your controller will list only the numbers for the memory types in that particular model. Not all memory types are available in all models.

AUX 43 and AUX 91–99 require that the controller memory configuration be larger than, or equal to, the memory configuration on the disk.

AUX 90 loads ladder memory, V-memory, K-memory, U-memory, Series 505 I/O configurations for all bases, PROFIBUS-DP I/O configurations for all slaves, bus parameters for the PROFIBUS-DP I/O channel, memory configuration, scan time, and watchdog timer value. AUX 90 does not load forced word I/O or forced discrete I/O (X, Y, and C).

AUX 91 loads ladder memory only, AUX 92 loads V-memory only, and AUX 93 loads K-memory only.

AUX 98 loads forced word I/O and forced discrete I/O; AUX 99 loads forced and unforced word I/O.

AUX 43 loads U-memory.

AUX 94–97 loads S-memory types.

Executing Program Loads

To load programs to the controller with AUX 43, and AUX 90–99, use the numeric keys to enter the AUX number that corresponds to the type of load to be performed, then press **Return**.

After pressing **Return**, you receive the following display at the bottom of the AUX menu. If you want the current program to be loaded, press **YES-F2**.

```
LOAD <memory type you selected> TO PLC FROM <current pgm name>?
                                     545 LOADER1 PG
NO-F1   YES-F2                                     PGMS-F7
```

To change to another program, press **PGMS-F7** and select the new program name. Then press **YES-F2**.

11.4 Clearing Controller Memory (AUX 13, 31–37, 41, 74–77)

Clear PLC (AUX 13) Use AUX 13 to perform the following operations.

- Clear ladder and variable memory
- Set the scan time to variable
- Clear discrete elements X, Y, and C, including forced points
- Clear DCP, DSP, DSC, DCC, TCP, and TCC memories
- Perform a complete restart

To execute AUX 13, use the numeric keys to enter 13 at the AUX menu prompt, then press **Return**.

When you receive the message, **CLEAR PLC?**, confirm by pressing **YES-F2**.

Clearing Memory
Types (AUX 31–37,
41, 74–77)

Use AUX 31 through 37 to clear ladder, variable, word, constant, TCC/TCP, or DSP/DCP memory types. Use AUX 41 to clear U-memory, and AUX 74 through 77 to clear S-memory types.

To clear memory types, type in the number of the AUX function at the prompt on the AUX menu, then press **Return**. Confirm the operation by pressing **YES-F2**.

11.5 Saving Controller Memory Data to Disk (AUX 42, 60–67)

Saving Memory Types (AUX 42, 60–67)

Use AUX 42, and AUX 60–67 to save specified types of memory data from your controller to disk or directory.

NOTE: Your controller will list only the AUX numbers for the memory types in that particular model. Not all memory types are available in all models.

To save memory data, type in the number of the AUX function at the AUX menu prompt, then press **Return**.

AUX 42 and AUX 61-67 require that the selected program on disk memory configuration be the same as that of the controller. If the configurations do not match, the message, **PLC MEMORY CONFIGURATION DOES NOT MATCH**, is displayed, and the AUX function does not complete.

Use AUX 60 to save a program from controller to the selected program on disk. AUX 60 saves ladder memory, V-memory, K-memory, U-memory, Series 505 I/O configurations for all bases, PROFIBUS-DP I/O configurations for all slaves, bus parameters for the PROFIBUS-DP I/O channel, memory configuration, discrete elements, forced elements, scan time, and watchdog timer value. To execute AUX 60, use the numeric keys to enter 60 at the menu prompt, then press **Return**.

Executing Program Saves

After pressing **Return**, you receive the following display at the bottom of the AUX menu. If you want the controller memory saved to the current program on disk, press **YES-F2**.

```
SAVE <memory type you selected> FROM PLC TO <current pgm name>?
                                     545 LOADER1 PG
NO-F1   YES-F2                                     PGMS-F7
```

To change to another program, press **PGMS-F7** and enter the new program name. Then press **YES-F2**.

11.6 Setting Time Functions (AUX 14, 16, 18)

NOTE: Your controller will list only the AUX numbers for that particular model. Not all AUX functions are available in all models.

Setting Watchdog Timer (AUX 14)

Use AUX 14 to set the time-out on the controller watchdog timer. To invoke the function, type in 14 at the AUX menu prompt and press **Return**.

To read the time, press **READ-F2**.

To enter a new time-out, type in the desired value at the prompt. The minimum time-out supported by the controller is 500 ms. You can enter any number between that and 32767. Press **WRITE-F3** to enter the new value.

Setting Task Codes Processed per Scan (AUX 16)

Use AUX 16 to set the number of task codes processed per scan for SF modules on each channel. To invoke the function, type in 16 at the AUX menu prompt and press **Return**.

The window display appears as shown in Figure 11-2. (Only numbers for the channels you have configured are displayed; for example, if you have four channels, the numbering goes to 4.)

Type in the number of task codes for SF modules per scan; use the arrow keys to move from channel to channel. Press **WRITE-F3** to enter the new numbers.

To read current entries on the display, press **READ-F2**.

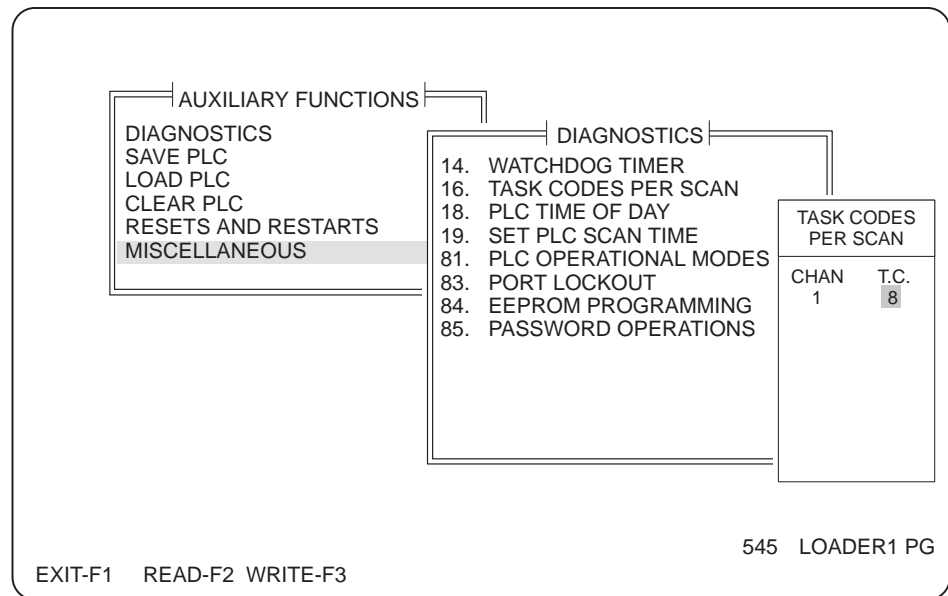


Figure 11-2 AUX 16 Programming Display

Setting Time Functions (AUX 14, 16, 18) (continued)

Reading/Setting Controller Time Display (AUX 18)

Use AUX 18 to read or set the date and time in the controller. To invoke the function, type in 18 at the AUX menu prompt and press **Return**.

This invokes the following display.

```
YEAR=98 MONTH=01 DAY=30 HOUR=14 MINUTE=29 SECOND=59 DAY OF WEEK=6
545 LOADER1 PG
EXIT-F1 READ-F2 WRITE-F3
```

To read the time, press **READ-F2**.

To enter a new time, complete the display by using the right arrow key to cursor from field to field and entering the desired number. The hour is expressed in 24-hour format, and the day of the week by 1 through 7. Press **WRITE-F3** to set the new time.

11.7 Performing Controller Diagnostics (AUX 15, 20, 23, 27, 28, 29)

Show Software Part Number (AUX 15)

Use AUX 15 to read the software part number and the release number of the cards installed in your controller. To invoke the function, type in 15 at the AUX menu prompt and press **Return**.

The part number and release for each card, along with the slot number and name of the card, displays as shown in Figure 11-3.

SYSTEM SOFTWARE PART NUMBERS			
PLC SLOT	PLC CARD NAME	PART NUMBER	RELEASE
-----	-----	-----	-----
1	575	2596626-0200	2.0
2	575	2596626-0200	2.0

EXIT-F1 READ-F2

565 NETDATA PG

Figure 11-3 System Software Part Number(s) Display

Run Controller Diagnostics (AUX 20)

Use AUX 20 to run diagnostics on your controller. To invoke the operation, type in 20 at the AUX menu prompt and press **Return**.

When you receive the message, **RUN PLC SELF-DIAGNOSTICS?**, confirm by pressing **YES-F2**. To abort the function, press **NO-F1** instead.

Performing Controller Diagnostics (AUX 15, 20, 23, 27, 28, 29) (continued)

Show RBC Software Part Number(s) (AUX 23)

Use AUX 23 to display the RBC software part number(s) and release number. To invoke the operation, type in 23 at the AUX menu prompt, and press **Return**.

The RBC software number(s) and release number are displayed in the format shown in Figure 11-4. The only editable field on this screen is the channel number. To exit the function, press **EXIT-F1**.

CHANNEL: 1 RBC SOFTWARE PART NUMBERS				
	ACTIVE		STANDBY	
BASE	PART NUMBER	RELEASE	PART NUMBER	RELEASE
0				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10	2591810-0201	2.0.1		
11				
12				
13				
14				
15				

EXIT-F1 READ-F2 555 NETDATA PG

Figure 11-4 RBC Software Part Number(s) Display

Show PLC Card
Failure Class
(AUX 27)

Use AUX 27 to specify the failure class of cards in your controller. To invoke the operation, type in 27 at the AUX menu prompt and press **Return**.

The PLC Card Failure Class displays as shown in Figure 11-5. To change the failure class of a card, use the arrow keys to position the cursor in the **FAILURE CLASS** field. Press **F2** to change the class to either fatal or non-fatal.

PLC CARD FAILURE CLASS		
PLC SLOT	PLC CARD	FAILURE CLASS
1	CPU	FATAL
2	LOOP	FATAL
3	GLOBAL MEMORY	FATAL
4	RCC	FATAL
5	RCC	FATAL

EXIT-F1 NONFATAL-F2

565 NETDATA PG

Figure 11-5 PLC Card Failure Class Display

Performing Controller Diagnostics (AUX 15, 20, 23, 27, 28, 29) (continued)

Checking Memory Availability (AUX 28)

Use AUX 28 to determine how much memory is configured, used, and available. The Memory Availability screen, shown in Figure 11-6, displays the number of bytes for L, CL, S, and CS (if supported) memory.

MEMORY AVAILABILITY				
	CONFIGURED (BYTES)	USED (BYTES)	AVAILABLE (BYTES)	AVAILABLE (WORDS)
LADDER (L)	32768	188	32580	16290
COMPILED L (CL)	(65536)	256	65280	
SPECIAL (S)	32768	66	32702	
COMPILED SF (CS) ..	2048	124	1924	

Note: Not all data is available from all controllers.

EXIT-F1 575 NETDATA PG

Figure 11-6 Memory Availability AUX Function Screen

Show PLC Operational Status (AUX 29)

Use AUX 29 to obtain the operational status from the controller. To invoke the operation, type in 29 at the AUX menu prompt and press **[Return]**. The operational status is then displayed in the format shown in Figure 11-7.

565 OPERATIONAL STATUS	
COMMUNICATIONS = P1 TBP	BAUD RATE = 19200
SCAN = 5 MSECS/VARIABLE	BATTERY = GOOD
KEY = UNLOCKED	DOWNLOAD = OFF
MODE = PROGRAM	PROGRAM IN RAM
SF/LOOP MODE = PROGRAM	
SF/LOOP FOLLOWS PLC TO PROGRAM MODE	
FATAL ERROR = NONE	
LOOP FATAL ERROR = NONE	
NON FATAL ERROR = NONE	
LOOP NON FATAL ERROR = NONE	

EXIT-F1 565 NETDATA PG

Figure 11-7 Operational Status Display

11.8 Comparing Controller Program to Disk (AUX 17)

Invoking the Verification Menu (AUX 17)

Use AUX 17 to compare the data on disk to that in the controller. To initiate the operation, type in 17 at the AUX menu prompt and press **Return**. You receive a display, Figure 11-8, for listing the types of memory to compare. The memory configuration on disk and the controller must match to access this function.

VERIFICATION FUNCTION			
VERIFY	MEMORY	STATUS	MISMATCHED LOCATIONS
NO	LADDER NETWORKS		
NO	FORCED WORD I/O		
NO	FORCED DISCRETE I/O		
NO	FORCED CONTROL RELAYS		
NO	SEQUENCER SCAN TIME		
NO	LOOPS		
NO	ANALOG ALARMS		
NO	SF PROGRAMS		
NO	SF SUBROUTINES		
NO	U-MEMORY		
NO	1 V-MEMORY	1	
NO	1 V-MEMORY	1	
NO	1 V-MEMORY	1	
NO	1 V-MEMORY	1	
NO	1 V-MEMORY	1	

SELECT PLC MEMORY TO BE COMPARED AGAINST DISK

555 NETDATA RN

ABORT-F1 SAVE-F2 LOAD-F3 START-F4 NO-F5 YES-F6

Figure 11-8 Verification Function Menu

Making Entries

Use the arrow keys to position the cursor in the desired field. Type in *Yes* (or use F6) in the **VERIFY** field to indicate that a memory type is to be checked. You also enter a memory range for the V- and K-memory locations. After entering *Yes* in the **VERIFY** field, use the right arrow key to position the cursor for entering beginning and ending memory addresses for verification. To select either V- or K-memory, press either **V-F5** or **K-F6**. TISOFT checks the range for V- and K-memory entries and corrects the highest entry to the memory configuration you have.

- If you want to save your menu entries to disk, press **SAVE-F2**.
- If you want to display a compare screen that you have saved to disk, press **LOAD-F3**.

Comparing Controller Program to Disk (AUX 17) (continued)

Initiating the Compare

When you have completed entries to the verification menu, press **START-F4** to begin the compare.

Reading the Compare Display

After the comparison is run, the **STATUS** field displays whether the comparison passed or failed for each location you selected. You receive a listing in the **MISMATCHED LOCATIONS** field of the ladder logic, V- or K-memory, and forced elements that do not compare. Up to three mismatched locations are displayed. If more than three mismatches exist, three dots appear after the three locations displayed.

Since there is only one memory location for the controller scan time, a passed or failed status is indicated by the message **PASSED** or **FAILED**. If failure is indicated in the **STATUS** field, the number 1 also is listed in the **MISMATCHED LOCATIONS** field.

11.9 Setting Controller Scan Time (AUX 19)

Changing Scan Time (AUX 19)

Use AUX 19 to set and read scan time for the controller. To invoke the AUX 19 menu, type in 19 at the AUX Functions menu prompt and press **Return**.

Complete the set of steps below for the controller model that you have.

For 520/C, 525, 530/C, 560/565 Controllers Only

To select a fixed scan time:

1. Press **FIXED-F3**.
2. Type in the desired time at the prompt.
3. Press **WRITE-F4** to enter the new scan time.

To select a variable scan time:

1. Press **VAR-F2**.
2. Press **WRITE-F4** to enter the new scan time.

For 545, 555, and 575 Controllers Only

Figure 11-9 shows the display for setting scan time on the 545 controller.

PLC SCAN TIME		VARIABLE
TOTAL SCAN TIME		
LOOP TIME SLICE	034 MS	
ANALOG ALARM TIME SLICE	006 MS	
CYCLIC SF PROGRAM TIME SLICE	004 MS	
PRIORITY SF PROGRAM TIME SLICE	004 MS	
NORMAL SF PROGRAM TIME SLICE	002 MS	
LADDER SF SUB TIME SLICE	001 MS	
NORMAL COMMUNICATION TIME SLICE	002 MS	
PRIORITY COMMUNICATION TIME SLICE ..	003 MS	
LADDER SF SUB ZERO (0) TIME SLICE	001 MS	
NETWORK COMMUNICATIONS TIME SLICE	000 MS	← (Present only if supported by controller)
REPORT BY EXCEPTION TIME SLICE	000 MS	←
PEAK TOTAL SCAN TIME	005 MS	READ ONLY
TOTAL SCAN TIME (LAST SCAN)	003 MS	READ ONLY
PEAK DISCRETE EXECUTION TIME	003 MS	READ ONLY
DISCRETE SCAN TIME (LAST SCAN)	002 MS	READ ONLY

545 NETDATA RN

EXIT-F1 VAR-F2 FIXED-F3 LIMIT-F4 READ-F5 WRITE-F6 RSTPKS-F7 TSCAN-F8

Figure 11-9 Scan Time Display for 545 Controller (AUX 19)

Setting Controller Scan Time (AUX 19) (continued)

To select a fixed scan time:

1. Press **FIXED-F3**.
2. Position the cursor on the total scan time field and type in the desired scan time.
3. Press **WRITE-F6** to enter the new scan time.

To select a variable scan time:

1. Press **VAR-F2**.
2. Press **WRITE-F6** to enter the new scan time.

To select a variable scan time with an upper limit:

1. Press **LIMIT-F4**.
2. Position the cursor on the total scan time field and type in the desired upper limit.
3. Press **WRITE-F6** to enter the new scan time.

To tune the time slices allocated for each of the operations:

1. Use the return or arrow keys to position the cursor on the time slice field and type in the desired upper limit.
2. After completing your changes, press **WRITE-F6** to enter the time slices.

To reset the display of peak times for the total scan and the discrete portion of the scan:

Press **RSTPKS-F7**.

To access AUX 16 to set the number of SF module task codes processed per scan:

Press **TSCAN-F8**.

You receive the pop-up display just as you do in accessing the operation from the Auxiliary Function menu. See the section on AUX 16 for more details.

Performing I/O Diagnostics (AUX 21, AUX 25) (continued)

Locating Dual Media Bases

To locate the next dual media base after the channel and base number entered at the prompt line, press NEXTDM-F2.

You receive a message either telling you no dual media was found or giving you the next base number with dual media.

Swapping RBC Roles

To change active and standby roles of RBCs on a particular base, complete the following steps from the diagnostics menu.

1. At the prompt, type in the channel and base number desired.
2. Press SWPRBC-F3.

Display Failed I/O (AUX 25)

Use AUX 25 to determine the status of the I/O modules in your system. To invoke the operation, type in 25 at the AUX menu prompt and press Return.

A listing of the modules is shown by channel, base, and slot number with any failures indicated.

11.11 Checking RLL Program Syntax (AUX 22)

Performing Syntax Check

Use AUX 22 to check your RLL program for errors that will prevent the controller from entering RUN mode (such as **UNKNOWN INSTRUCTION**, **LADDER ELEMENT OUT OF RANGE**, **NO CORRESPONDING PAIR**, or **OUT OF MEMORY**). This Syntax Check is also available from various function key menus. (Syntax Check is currently available only on 545, 555, and 575 controllers.)

To use AUX 22, enter 22 at the AUX menu prompt, or highlight Syntax Check, and press **Return**. Syntax Check reports progress and lists any errors found. (See Figure 11-11.) Up to 16 errors can be displayed on the Syntax Check screen; if more than 16 errors are detected, the prompt line announces **ADDITIONAL ERRORS DETECTED**. To display the additional errors press **MORE-F2**.

If no errors are detected, Syntax Check reports **PASSED** on the prompt line.

```

                                SYNTAX CHECK
                                -----
LABEL  ADDRESS  MESSAGE
-----
                                894  WARNING - INSTRUCTION WILL NOT BE EXECUTED

FAILED: PLC MAY NOT GO TO RUN MODE
EXIT-F1
                                545  LOADER1  RN
                                RESTRT-F8
```

Figure 11-11 Syntax Check Screen

Pressing **EXIT-F1** at any time during Syntax Check aborts the check and returns to the AUX function menu.

Pressing **RESTRT-F8** restarts the Syntax Check from the beginning.

11.12 Converting S-Record Format to Binary (AUX 40)

Converting Files to Binary

Use AUX 40 to convert your externally-created programming files to binary format for loading into U-memory.

Using AUX 40

Type in 40 at the AUX menu prompt. You receive the File Selection Display as shown in Figure 11-12.

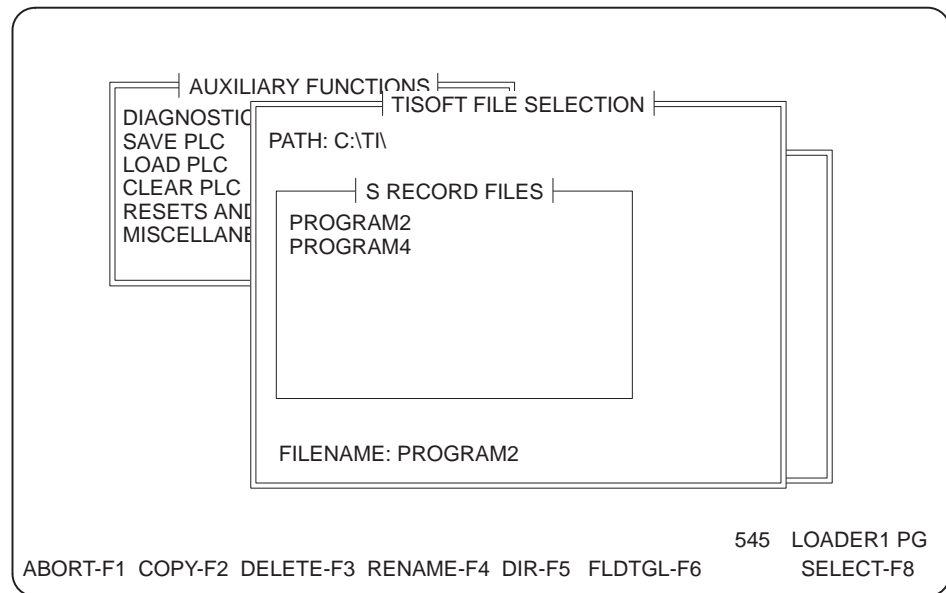


Figure 11-12 File Selection Display

Either type in or highlight with the cursor the S-record filename to be converted. Then, press **Return** or **SELECT-F8**. The display returns to the AUX menu and gives you a prompt, as shown in Figure 11-13.

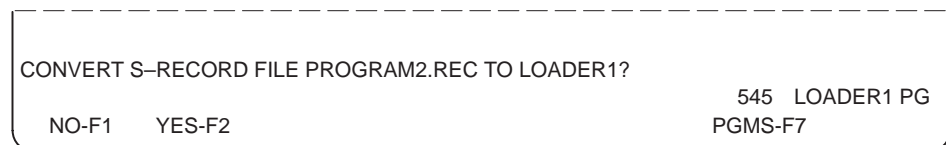


Figure 11-13 Convert S-Record Confirmation Prompt

To abort the conversion, press **NO-F1**; to complete the conversion, press **YES-F2**. In the example above, the file is **PROGRAM2.REC**, and the conversion is being saved to **LOADER1**, which is the current program. Your display contains the name of your **.REC** file and the name of your current program.

11.13 Setting Controller Operating Mode (AUX 81, 82)

Changing Operating Mode (AUX 81)

Use AUX 81 to make changes in controller operating mode. To invoke the operation, type in 81 at the menu prompt, then press **Return**.

When you have S-memory configured, you receive a display with three fields, as shown in bold type below, to change operating mode. Use the arrow keys to position the cursor in the desired field. Function keys are available for each field to select the desired option.

LADDERS = **PROG** LOOPS = **PROG** LOOP MODE **LOCKED** TO FOLLOW LADDER MODE

Changing Ladder Mode

When you position the cursor on the **LADDER** field, your options are then as follows. (With no S-memory configured, the **LADDER** field is the only option for changing program mode and no cursor is displayed.)

- **PGMFRZ-F2** places the controller in PROGRAM FREEZE mode. All outputs are frozen in their current states. However, intelligent I/O modules still can update outputs. When you press **F2**, you receive the message, **GO TO PROGRAM MODE WITHOUT CLEARING OUTPUTS?** Select YES or NO.
- **PGMOFF-F3** places the controller in PROGRAM OFF mode. Discrete outputs are set to zero and all word outputs are frozen. However, intelligent I/O modules still can update outputs. When you press **F3**, you receive the message, **GO TO PROGRAM MODE?** Select YES or NO.

WARNING

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

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

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

- **RUN-F4** places the controller in RUN mode, beginning execution of the ladder program. When you press **F4**, you may receive the message, **PROFIBUS-DP IS STOPPED, CONTINUE TO PLC RUN MODE?** Select either YES or NO.
- **OPR/ST-F6** allows the changing of PROFIBUS-DP communications mode (OPERATE/STOP).
- **SYNTAX-F8** runs a syntax check on ladder memory (L-memory).

Setting Controller Operating Mode (AUX 81, 82) (continued)

Changing Loop Mode

To select loop operating mode, position the cursor in the `LOOPS` field. You then have the following options available.

- **PGM-F2** places the loop card in `PROGRAM` mode, and control blocks are neither running nor being queued for running.

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

- **HALT-F3** places the loop card in `HOLD` mode; enabled control blocks are being queued to run, but are not running. Upon going to `RUN` mode, execution resumes where it was halted.
- **RUN-F4** places the loop card in the `RUN` mode; enabled control blocks are being queued and are running. When you press **F4**, you may receive the message, `PROFIBUS-DP IS STOPPED, CONTINUE TO PLC RUN MODE?`. Select either `YES` or `NO`.
- **OPR/ST-F6** allows the changing of `PROFIBUS-DP` communications mode (`OPERATE/STOP`).
- **SYNTAX-F8** runs a syntax check on ladder memory (L-memory).

The loop mode can either follow that of the discrete CPU or be in `RUN` mode independent of the ladder program. To invoke this option, place the cursor in the `LOCKED` or `UNLOCKED` field. Your function keys are then as follows.

- **UNLOCK-F2** frees the loop card for selection of `RUN` operating mode independent of the ladder CPU.
- **LOCK-F3** locks the loop card to follow the operating mode selected for ladders.
- **OPR/ST-F6** allows the changing of `PROFIBUS-DP` communications mode (`OPERATE/STOP`).
- **SYNTAX-F8** runs a syntax check on ladder memory (L-memory).

Selecting Hot
Backup Status
(AUX 82)

Use AUX 82 to select the status of a hot backup unit. To execute AUX 82, use the numeric keys to enter 82 at the prompt in the AUX Functions menu. Then press **Return**.

Press either **ONLINE-F2** or **SWITCH-F3** to select the status for your hot backup configuration.

- **ONLINE-F2** puts the standby unit in RUN mode.
- **OFFLINE-F2** puts the standby unit in PROGRAM mode.
- **SWITCH-F3** switches the roles of the active unit and standby unit.

11.14 Locking out Programming Ports (AUX 83)

Programming Port Lockout (AUX 83)

Use AUX 83 to prevent program changes from being made at different ports simultaneously. To execute AUX 83, use the numeric keys to enter 83 at the menu prompt, then press `Return`.

NOTE: Programming devices connected through the same Dual Communication Port (DCP) cannot lock each other out, nor can multiple hosts on the same TIWAY I™ Network Interface Module (NIM).

- If the controller is unlocked, you receive the following display:

```
PLC IS UNLOCKED          CURRENT: <PORT NAME>
EXIT-F1 UNLOCK-F2    LOCK-F3
```

- To lock the controller, press **LOCK-F3**. To confirm your request to lock the controller, press **YES-F2** at the **LOCK PLC?** prompt. Press **NO-F1** if you decide not to lock the controller.
- If the controller is locked, the display shows the Comm Port or the address of the RBC port that executed the lock and gives the current port or channel connection.

```
PLC IS LOCKED AT <PORT NAME> CURRENT: <PORT NAME>:
EXIT-F1 UNLOCK-F2    LOCK-F3
```

- To unlock the controller, press **UNLOCK-F2** from the port where the lockout was initiated.

Port Name can be one of the following:

```
COMM PORT:#
CHAN:# BASE:##
CHAN:# BASE:## SLOT:##
CPU:##
CPU:## CHAN:# BASE:##
CPU:## PORT:#
```

11.15 Programming EEPROMs (AUX 84)

AUX 84 Functions Use AUX 84 to perform the following tasks. Your controller must be in PROGRAM mode when using AUX 84.

- Copy the contents of RAM to EEPROM.
- Copy the contents of EEPROM to RAM.
- Erase the contents of EEPROM.
- Select EEPROM as the program source.
- Select RAM as the program source.

NOTE: Certain controller models support EPROMs as well as EEPROMs; other controllers have on-board flash EPROMs. Refer to the hardware system manual or the release notes for your particular controller for specific information on memory storage media.

Selecting RAM or EEPROM

From the AUX menu, complete the following steps to select either EEPROM or controller RAM as your program source.

1. Type in 84.
2. Press **Return**.
3. Press **SRCTGL-F2** to select either EEPROM or RAM.

Copying from RAM to EEPROM

From the AUX menu, complete the following steps to copy the controller RAM data to the EEPROM.

1. Type in 84.
2. Press **Return**.
3. If the prompt line reads **PROGRAM SOURCE: EEPROM**, press **SRCTGL-F2** to select RAM.
4. Press **COPY-F3**. You receive the message **COPY RAM TO EEPROM?**.
5. Press **YES-F2** to execute the copy, or **NO-F1** to abort.

Programming EEPROMs (AUX 84) (continued)

Copying from EEPROM to RAM

To copy an EEPROM to controller RAM, complete the following steps from the AUX menu.

1. Type in 84.
2. Press **Return**.
3. If the prompt line reads **PROGRAM SOURCE: RAM**, press **SRCTGL-F2** to select EEPROM.
4. Press **COPY-F3**. You receive the message **COPY EEPROM TO RAM?**.
5. Press **YES-F2** to execute the copy, or **NO-F1** to abort.

Erasing an EEPROM

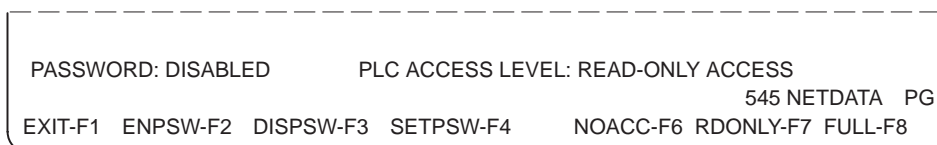
To erase an EEPROM, complete the following steps from the AUX menu.

1. Type in 84.
2. Press **Return**.
3. Press **ERASE-F4**. You receive the message **ERASE THE EEPROM?**.
4. Press **YES-F2** to erase the EEPROM, or **NO-F1** to abort.

11.16 Password Selection and Access Level (AUX 85)

Password Selection/Access Level (AUX 85)

Use AUX 85 to set or change the programmable controller password or set the level of access. To execute AUX 85, use the numeric keys to enter 85 at the prompt in the AUX Functions menu. Then press **Return**. Figure 11-14 shows the on-line password selection screen that is invoked with AUX 85. See Appendix H for a detailed discussion of password operation.



```
PASSWORD: DISABLED          PLC ACCESS LEVEL: READ-ONLY ACCESS
                               545 NETDATA PG
EXIT-F1  ENPSW-F2  DISPSW-F3  SETPSW-F4    NOACC-F6  RDONLY-F7  FULL-F8
```

Figure 11-14 On-Line Password Selection Screen

The keys in Figure 11-14 are defined below:

- **EXIT-F1** or **ESC**—Allows you to return to the main auxiliary (AUX) screen.
- **ENPSW-F2** or **E**—Allows you to enable password protection for the controller and the selected program on disk.
- **DISPSW-F3** or **D**—Allows you to disable password protection for the controller. If you have not already entered a password for the controller, TISOFT prompts you for the current password. If the password you provide is not correct, TISOFT does not disable the password protection. This function does not work if you cannot provide a password.
- **SETPSW-F4** or **S**—Allows you to set or change the password for the controller. TISOFT prompts you for the current password. If the current password is correct, TISOFT prompts you for the new password twice. If the new passwords are not the same or the current password is not correct, the password is not changed. To delete a password (or to make it not password-protected) enter a null password.
- **NOACC-F6** or **N**—Allows you to set the protection level of the controller for no access. This function does not work without a password.
- **RDONLY-F7** or **R**—Allows you to set the protection level of the controller for read-only access. This function does not work without a password.
- **FULL-F8** or **F**—Allows you set the protection level of the controller for full read/write access. This function does not work without a password.

11.17 Setting PROFIBUS-DP Communications Mode (AUX 86)

AUX 86 Functions Use AUX 86 to perform the following functions:

- Change from OPERATE to STOP mode.
- Change from SYNCHRONOUS to ASYNCHRONOUS mode.

To execute AUX 86, use the numeric keys to enter 86 at the prompt in the AUX Functions menu. Then press **[Return]**. Figure 11-15 shows the PROFIBUS-DP communications mode screen that is invoked with AUX 86.



```
PROFIBUS-DP MODE: OPERATE                ASYNCHRONOUS
EXIT-F1 OPER-F2 STOP-F3                SYNC-F5 ASYNC-F6
555 NETDATA PG
```

Figure 11-15 PROFIBUS-DP Communications Mode Screen

The keys in Figure 11-15 are defined below:

- **EXIT-F1**—Allows you to return to the main auxiliary (AUX) screen.
- **OPER-F2**—Puts PROFIBUS-DP communications in OPERATE mode (unless master is in FAULT state).
- **STOP-F3**—Puts PROFIBUS-DP communications in STOP mode (unless master is in FAULT state).
- **SYNC-F5**—Allows you to synchronize PROFIBUS-DP communications to RLL scan. This option can only be selected when PROFIBUS-DP mode is set to STOP mode.
- **ASYNC-F6**—Specifies that PROFIBUS-DP communications shall not be synchronized to RLL scan. This option can only be selected when PROFIBUS-DP mode is set to STOP mode.

Using Global Search and Replace

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12.1 Using Global Search and Replace for One Element

Search and Replace Functions

You can use Global Search and Replace to perform the following functions.

- Find and replace elements in ladders, loops, alarms, SF programs, and SF subroutines with designated elements and identifiers.
- Find and replace identifiers; for example, numbers, not types, for boxes in ladders.

Invoking Search and Replace Menu

To access the menu, press **REPLAC-F6** from the off-line ladder display. Figure 12-1 shows the Global Search and Replace menu and prompt.

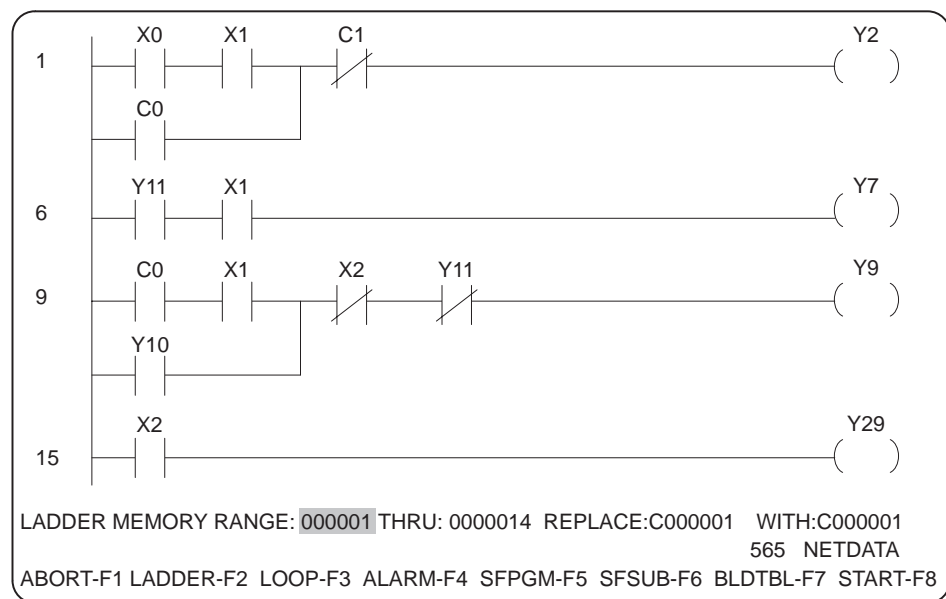


Figure 12-1 Search and Replace Menu

Completing the Prompt Fields

The first two fields, **LADDER MEMORY RANGE:** and **THRU:**, set the range for your search. The starting range number must be less than or equal to the ending range number. The **REPLACE:** field designates the element type and identifier you are replacing. The entry in the **WITH:** field designates the element type and identifier of the replacement element for the one designated in the replace field. The replacement continues for the range you indicated.

When you designate ladder memory type, the search defaults the first time to the beginning and ending numbers of the network that the cursor is on. For loops, alarms, and SF programs/subroutines, the search range is corrected to the maximum number for each type if the number you enter exceeds the maximum that can be programmed for each type.

No range-check is performed on the entry for the **REPLACE:** field. Range checking is performed, however, on the entries you make in the **WITH:** field.

Replacing an Element

To replace a single element within a designated search range, complete the following steps.

1. At the prompt, first select memory type. To do this, press the function key that corresponds to the desired memory type. Skip this step if your controller does not have S-memory.
2. Type in the beginning memory address for the search.
3. Use the right arrow key to position cursor in the field for **THRU:** to set the search range.
4. Type in the specific element type and identifier to replace in the **REPLACE:** field. (If needed, press or Shift for a list of valid element types.)
5. Type in the element that will replace the designated element in the **WITH:** field. (If needed, press or Shift for a list of valid element types.)
6. Press **START-F8**.

NOTE: If you receive an error message (for example: **ERROR REPLACING Y1 WITH X1 AT ADDRESS 5**) when you attempt to replace an element, and you do not know why, try replacing the element manually in the appropriate editor. A more specific syntax error message may explain why the operation is not allowed.

12.2 Using a Global Search and Replace Table

Invoking the Table Display

You can build a table of up to 32 entries to replace multiple elements in one operation. To access the Global Search and Replace Table (Figure 12-2), complete the following steps from the Search and Replace menu.

1. Enter memory type and memory range for the search operation at the prompt displayed on the Search and Replace menu.
2. Press **BLDTBL-F7**.

```
GLOBAL SEARCH AND REPLACE  LADDER MEMORY RANGE: 1  THRU: 14
REPLACE      THRU      WITH          REPLACE      THRU      WITH
██████████
COPY COMMENTS: NO          COPY SYNONYMS: NO
560 NETDATA
ABORT-F1  COMTGL-F2  SYNTGL-F3  CLRCHT-F4  READ-F5  CLRLOC-F6  START-F8
```

Figure 12-2 Global Search and Replace Table

Copying Comments and Synonyms

To have the comments and synonyms copied from the replaced elements to the new elements, use **COMTGL-F2** to change the fields for copying comments to read YES. Use **SYNTGL-F3** to change the fields for copying word, bit, and bit-of-word synonyms to read YES.

Clearing a Table

To clear a table, press **CLRCHT-F4**. Then press **YES-F2**. This clears all entries from the table.

Clearing a Location

To clear a location from the chart display, press **CLRLOC-F6**. This clears all three fields of the line where the cursor is positioned.

Completing the Table Fields

To replace a range of elements, type in the replace type and starting identifier in the **REPLACE** field. Then type in the ending identifier in the **THRU** field. This defines the range of the element to be replaced. Continue by keying in the new element type and starting identifier in the **WITH** field. The range of this element is defined by the range of the **REPLACE** and **THRU** fields. For example, replacing Y1 through 4 with C11 will result in Y1 being replaced by C11, Y2 replaced by C12, and so on (see Figure 12-3).

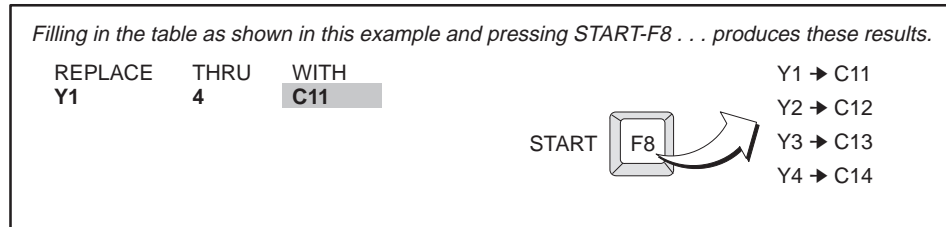


Figure 12-3 Example of Search and Replace Operation

You can make entries in the **REPLACE** and **WITH** fields to replace only a single element instead of a range of elements with an entry.

If you make an entry in the **REPLACE** column, you must also make an entry in the **WITH** column; otherwise, your table will not execute.

The **THRU** field does not display the ending entry for the search range if it is less than, or equal to, the identifier in the **REPLACE** field. Entries to the **THRU** field require the identifier only, not the element type. The element type is entered for the **REPLACE** and **WITH** fields.

No range-check is performed for the entries you make in either the **REPLACE** or **THRU** field. Range-checking is performed, however, on the entries you make in the **WITH** field.

Special Conditions

In SF Programs/Subroutines and SF Subroutine boxes, loop and alarm variables can be referenced; however, loop and alarm variables cannot be listed individually on the search and replace table. You can only replace a reference to one loop or alarm with another, not the individual variables. To make entries for a reference to loop or alarm, use the format **LVxx** or **AVxx**, where **xx** is the loop or alarm number. A specific loop or alarm variable, such as **ASPxx** or **LPVxx**, is not accepted as a valid entry.

On entries for DCP of drums, enter DCP, then drum number. Press , then enter the step number if you want to change from the default of step 1. The **THRU** field entry is a step number; the range for DCP is the steps of one drum only.

When replacing bit-of-word elements, only the main identifier is changed. The bit identifier is not changed. Bit-of-word elements cannot be entered into the table or at the prompt line.

12.3 Building a Table

Building a Table Your options for building a global search and replace table enable you to create the table from free-form entries or from a read display of elements of selected locations (which can also be edited).

Building a Table from a Read Display To build your search and replace table from a read of a specified range and memory type, complete the steps as listed below.

1. Enter memory type and range for the table at the prompt displayed on the Search and Replace menu.

The read is restricted to the range and memory type you set at the menu prompt.

2. Press **BLDTBL-F7**.
3. Press **READ-F5** to list elements for the range you selected.

The elements are displayed in the **REPLACE** column of the table. The Read function does not duplicate elements in the table listing; only one occurrence of an element within the selected range is listed. Null elements are not listed.

When all elements that will fit on one display are listed, you receive a table full message. At this point, you can begin editing of the listing by combining or deleting entries. Then do another Read. Repeat the edit steps and reads as needed.

4. Completing the table from this point is free-form entry. You can now edit the elements listed from the Read to fit your application.
5. Press **START-F8** to initiate the global search and replace.

**Building a
Free-Form Entry
Table**

To build your search and replace table from elements that you type in, complete the steps as listed below.

1. Enter memory type and range for the table at the prompt displayed on the Search and Replace menu.
2. The replacement is restricted to the range and memory type you set at the menu prompt.
3. Press **BLDTBL-F7**.
4. Type in the elements and ranges as needed for your application.

Use the arrow and return keys to move the cursor from column to column to make your entries.

5. Press **START-F8** to initiate the global search and replace.

Performing Block Data Functions

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13.1 Block Functions Defined

Types of Block Functions

Block functions enable you to copy, move, or put contents of specified memory addresses from one location to another, as well as allowing deletion of specified ranges of data. You have this feature available either at the ladder display or in the S-memory directories. Block operations can also be used with comments and synonyms. The list in Table 13-1 shows the types of memory for block functions accessed from either the Ladder Display or an S-Memory Directory.

Table 13-1 Memory Types Accessible by Block Functions

From Ladder Display	From S-Memory Directory
V	Loops
K	Analog Alarms
L	SF Programs
Title	SF Subroutines
Comments (includes S-memory comments)	
Synonyms	

NOTE: Block operations on synonym words are also performed on bit-of-words.

13.2 Block Functionality from Ladder Display

Block Copy	<p>In ladders, Block Copy inserts a copy of the source block of ladder rungs before the rung that starts at the selected destination address. The rungs starting at the destination address are moved to a higher address to make room for the new rung(s). When copying the source block to a lower address, after the copy, the source block parameters are adjusted to their new higher addresses. The destination address cannot be within the source block range.</p> <p>For V- or K-memory, Block Copy overwrites the data starting at the destination address with data in the source block V- or K-memory addresses. V- or K-memory formats are not copied.</p> <p>For synonyms and comments, Block Copy also overwrites data starting at the destination address with data from the source block.</p>
Block Move	<p>Block Move operates in the same manner as Block Copy, except that the selected source block is deleted after it is copied to the destination block.</p>
Block Delete	<p>Block Delete clears, deletes, or erases the selected memory block.</p> <p>In ladders, rungs after those deleted are moved up to fill the addresses in the deleted block. NOPs are added at the end of L-memory to replace the moved rungs.</p> <p>In V- or K-memory, data in the selected block are set to zero (0). The V- or K-memory formats are not cleared.</p> <p>For synonyms and comments, data in the selected block is erased (blanked).</p>
Block Put	<p>Off-line for all memory types, Block Put copies a source memory block from a selected source program to the destination memory block in the current program.</p> <p>On-line for Ladders, V-memory, and K-memory, Block Put copies a source memory block from a selected source program to the destination memory block in the controller. Conversely, using SRCTGL-F8 (source toggle), Block Put copies a source memory block from the controller to the destination memory block in a selected program.</p> <p>Block Put of synonyms and comments online copies a source memory block from a selected source program to the destination memory block in the current program.</p> <p>Block Put of a title copies the title from a source program to the current program overwriting the current title, if any. If the source program does not have a title, an error message, DISK FILE NOT FOUND, is displayed.</p>

13.3 Accessing Block Operations from Ladder Display

Accessing Ladder Display Block Functions

You can access block functions from the ladder display, either on- or off-line by pressing **BLOCK-F5**. Figure 13-1 shows menu options after pressing **BLOCK**.

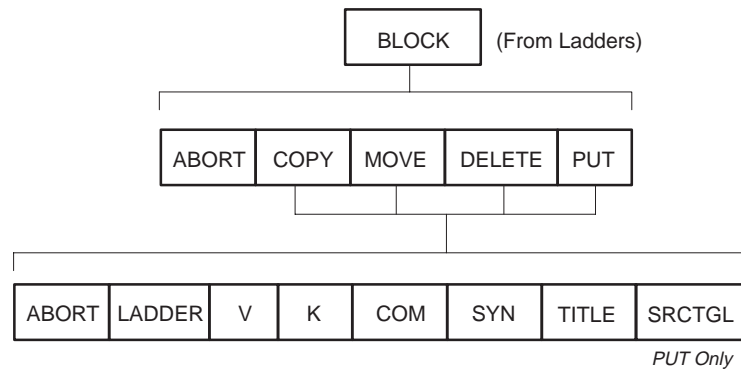


Figure 13-1 Menu Chart to Ladder Block Functions

Invoking a Block Operation

To invoke a block operation, enter the memory type, source starting and ending addresses, and destination starting address.

The source addresses set the memory range of the block and the destination address sets the starting point for the destination range of the block. For block deletes, the destination address is not needed. For ladder memory, the addresses are automatically adjusted to rung boundaries.

13.5 Block Functionality in S-Memory

Block Copy	<p>For loops, alarms, SF programs and SF subroutines, Block Copy overwrites the control blocks starting at the destination control block with data in the source block. The destination control block number cannot be within the source block range.</p> <p>For ramp/soak steps and SF instructions, Block Copy inserts a copy of the source block data before the step or instruction that starts at the selected destination address. The steps or instructions starting at the selected destination address are moved to a higher address to make room for the new steps or instructions. The destination address cannot be within the source block range.</p>
Block Move	<p>Block Move operates in the same manner as Block Copy except that the selected source block is deleted after it is copied to the destination address.</p>
Block Delete	<p>Block Delete clears or deletes the selected memory block.</p> <p>For loops, alarms, SF programs or SF subroutines, data in the selected control blocks are cleared.</p> <p>For ramp/soak steps and SF instructions, data after those deleted are moved up to fill the data in the deleted block.</p>
Block Put	<p>Off-line for all memory types, Block Put copies a source memory block from a selected source program to the destination memory block in the current program.</p> <p>On-line for all memory types, Block Put copies a source memory block from a selected source memory block to the destination memory block in the controller. Conversely, using SRCTGL-F8 (source toggle), Block Put copies a source memory block from the controller to the destination memory block in a selected program.</p>
S-Memory Comments	<p>Block functions for S-memory comments are available from the Ladder Display Block functions.</p>

13.6 Accessing Block Operations in S-Memory

Accessing S-Memory Block Operations

Access block operations in S-memory from either of the Directories: Loop, Analog Alarm, or Special Function Programming. Figure 13-2 shows the block functions available after you press BLOCK-F3.

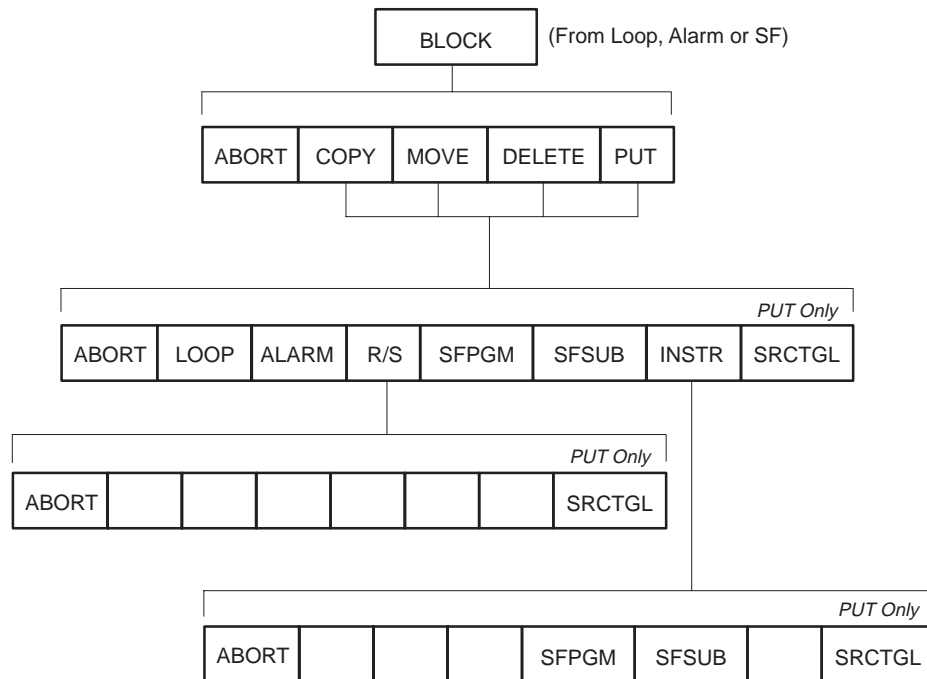


Figure 13-2 S-Memory Block Functions

Designating Blocks In S-Memory

When using block operations in S-memory, you designate a loop, alarm, or SF Program/Subroutine number, rather than a memory address. The prompts you receive request a number for the S-memory types. For example, you enter Loop1, Alarm1, or SFPGM1 instead of an address such as V356. Just as with memory addresses, however, the first entry sets a range. If you enter Loop 4 through Loop 8, for instance, each of the loops you specified will be acted on according to the block operation you are using.

13.7 Making Entries to Block Menus in S-Memory

Block Parameters

After you select the desired block function, a prompt, such as that shown below for the move operation, appears for entering identifiers to be acted on by the function. Use the arrow keys to move the cursor through the parameters. (The actual prompt line varies according to the memory type selected.)

MOVE LOOP: 0001 THRU: 0001 TO LOOP: 0001

 ↑ ↑ ↑ ↑ ↑

Block Type Memory Type Beginning Identifier Ending Identifier Destination Identifier

Entering Block Parameters

To perform a block operation—copy, move, delete, or put—complete the following steps from either of the S-memory directories.

1. Press **BLOCK-F3**.
2. Select **COPY-F2**, **MOVE-F3**, **DELETE-F4**, or **PUT-F5**. (If you select Put, continue with step 3; otherwise, go to step 4.)
3. For on-line PUT operations only, use **SRCTGL-F8** to switch the source and destination between controller-to-disk and disk-to-controller.
4. At the prompt, select **LOOP-F2**, **ALARM-F3**, **R/S-F4**, **SFPGM-F5**, **SFSUB-F6** or **INSTR-F7**. All fields accept only numeric entries or function keys.
5. At the memory type prompt, type in the beginning address of the block to be acted on. Use the right arrow key to move to **THRU:** field and type in the ending address of the source block.
6. Move the cursor to the destination field and type in the destination address.
7. Press **Return** to execute the block operation.

If the selected address fields encompass an invalid source block (that is, the starting address is greater than the ending address) or if the operation would cause S-memory overflow, you receive either the message **INVALID BLOCK PARAMETERS** or **S-MEMORY OVERFLOW**.

Chapter 14

Printing

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14.1 Print Functions Available

TISOFT offers you several printing options for printing program information. Each provides a different type of printout information.

- **Print current screen display:** Prints the information currently showing on the screen.
- **Print programs (or selected addresses):** Provides hard copies of ladder programs, including documentation, cross-reference, I/O, and variables.
- **Print element usage:** Shows a listing of elements and indicates if used in the program.
- **Print cross-reference: (separate TISOFT operating software)** Prints a cross-reference of program elements that gives a list of usage locations for each element in the program.
- **Print in-line cross-reference:** Prints a cross-reference listing of inputs and outputs with the rungs in which they appear.

14.2 Printing a Screen Display

To print the current display, press the PRINT SCREEN or CNTL-PRINT SCREEN key on the programming device keyboard. Figure 14-1 shows the functions available after pressing PRINT SCREEN.

- Press **SETUP-F3** to make changes to the print setup parameters.
- Press **EXECUTE-F2** to initiate the printout of the display.



Figure 14-1 Print Screen Function Key Menu

When you press **EXECUTE-F2**, the display on the screen is sent to your printer or a file, according to your print setup parameters. If you need to change the print setup, press **SETUP-F3** and make your changes before executing the printout.

14.3 Entering Print Selections

Accessing Print Menus

Access the Print Program Selection menu by pressing PRINT-F1, located at the ladder display (either on- or off-line). Figure 14-2 shows the mapping of the Print function keys.

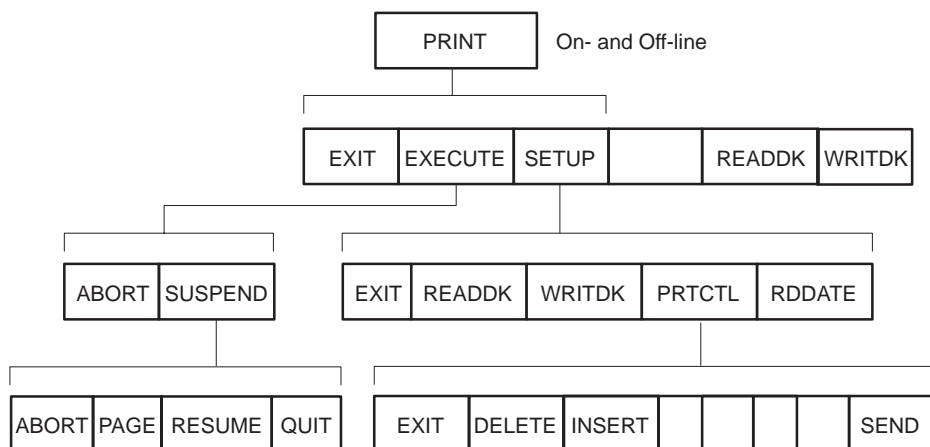


Figure 14-2 Print Menu Map

Invoking Print Selection Menu

The Print Selection Menu, shown in Figure 14-3, appears after you press PRINT-F1. Select the data types to print from this menu.

	Y/N	FROM	TO	SYN	DES	COM
TITLE:	N					
MEMORY CONFIGURATION:	N					
LADDERS: RANGE:	N	000001	016384	N	N	N
INLINE XREF (EXC CR):	N	00000	00000			
SKIP NOPS:	N					
ELEMENT USAGE TABLE:	N					
V-MEMORY:	N	000001	026624	N		
K-MEMORY:	N	000000	000000	N		
S-MEMORY: LOOPS:	N	01	64			N
ANALOG ALARMS:	N	001	128			N
SF PROGRAMS:	N	0001	1023			N
SF SUBROUTINES:	N	0001	1023			N
I/O CONFIGURATION:						
505 CHANNEL, BASE: ..	N	1 00	1 15	N		
PROFIBUS-DP SLAVE: ..	N	001	112	N		
SYNONYMS: I/O ELEMENTS:	N	0001	8192			
CONTROL RELAYS:	N	00001	32768			
SKP/LBL/GTS/SBR:	N	001	255			
JMP/MCR/END:	N					
565 NETDATA PG						
EXIT-F1		EXECUTE-F2		SETUP-F3		READDK-F5 WRITDK-F6

Figure 14-3 Print Selection Menu

**Print Selection
Options**

The options on the Print Selection menu provide you with program documentation as described below.

- **Title:** Prints the program title.
- **Memory Configuration:** Gives you a copy of the completed memory configuration menu showing types and sizes of memory configured.
- **Ladders:** Gives you a copy of the ladder program within the address range you specify. Synonyms, descriptors and comments are included if you indicate YES in the Syn, Des, and Com fields.
- **Inline XREF:** Lists the address of the first occurrence where an input is used as an output in each rung; performs a full cross-reference for each output. It also allows you to exclude a range of control relays in the cross reference.
- **Skip NOPS:** Allows you to not print NOPS within your ladder program.
- **Element Usage Table:** Prints all X, Y, WX, WY elements and indicates if used in the program.
- **V/K Memory:** Provides a listing of V- and K-memory address and contents in the range specified.
- **S-Memory:** Provides a copy of each programmed loop, analog alarm, and SF program/subroutine.
- **I/O Configuration:** Gives you a copy of the I/O configuration for each Series 505 base and/or PROFIBUS-DP slave, with synonyms (if selected). Unused bases and slaves are not printed.
- **Synonyms:** Prints the synonyms and descriptors within the range selected for each of the types listed on the menu.

**Entering Print
Selections**

Use the arrow keys to position your cursor from field to field to select the desired print options.

The **Y/N** field is one character long. Indicate the parameters for printing by typing in *Y* at the selected element type.

The **FROM** and **TO** fields vary in size with memory type, and size is indicated by length of the cursor when it is positioned on the field. Indicate memory locations to be printed by typing in the numbers for the range to be printed.

Indicate whether synonyms, descriptors, and comments are to be included in the printout by completing the **SYN**, **DES**, and **COM** fields. Enter a *Y* in each of the fields to be printed.

14.4 Completing the Print Setup Menu

Invoking the Print Setup Menu

The Print Setup Menu is available after choosing a print function. Press **SETUP-F3** to invoke the Print Setup menu (Figure 14-4).

Select the desired options from the menu by using the return and arrow keys to position the cursor in the correct column to make the selections. For the **PAGE HEADER**, **LINES PER PAGE**, **STARTING PAGE NUMBER**, and **FILENAME** fields, position the cursor in the correct field and type in the desired parameters.

```
PAGE HEADER: █
COLUMNS: (80 132) ..... 80
LINES PER PAGE: (50 TO 132) ..... 65
STARTING PAGE NUMBER: (1 TO 9999) ..... 1
DATE: ..... 00-00-00
USE EXTENDED ASCII CHARACTER SET: (YES NO) ..... YES
FORM FEED: (YES NO) ..... YES
PRINT LINE FEED ON CARRIAGE RETURN: (YES NO) ..... YES
PRINT OUTPUT: (PRINTER FILE) ..... PRINTER
FILE NAME: PRFILE.LIS

545  LOADER1

EXIT-F1  READDK-F2  WRITDK-F3  PRTCTL-F4  RDDATE-F5
```

Figure 14-4 Print Setup Menu

Completing the Menu

Use the function keys available on the Setup menu to make your selections. Each of the keys perform operations as indicated below.

- Press **EXIT-F1** to return to the main print display.
- Press **READDK-F2** to read the print set-up information from disk
- Press **WRITDK-F3** to write the print set-up information to disk.
- Press **PRTCTL-F4** to edit and send control characters to your printer. Entries must be in hexadecimal. See your printer manual to determine the sequence numbers to use.
- Press **RDDATE-F5** to read date from the PC system clock and display it in the date field of the Print Setup menu for inclusion in the printout.

14.5 Printing Extended Networks

When you print a network that is larger than a single display, the printout is formatted as shown in Figure 14-5. The columns of numbers above the elements designate the placement of synonyms in the printed copy. Each printed line of the network ends with a letter of the alphabet to show continuation of the rung; the next line of the network begins with that letter. The top row of the network is indicated by two > symbols, and additional rows contain only the letter of the alphabet. You can select a printout in this format for up to 132 columns.

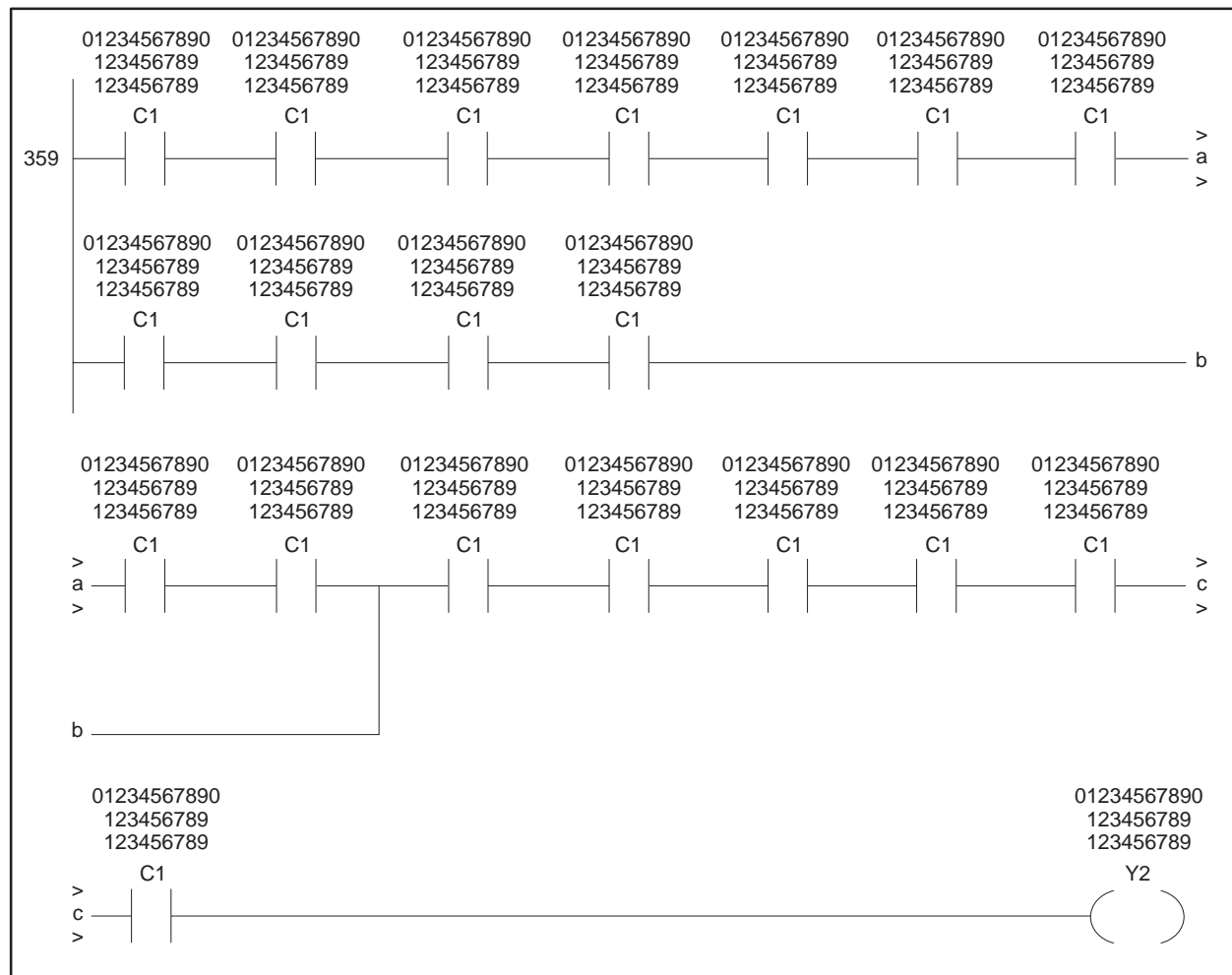


Figure 14-5 Extended Rung Printout

14.6 Using Print Cross-Reference Operation

Cross-Reference Options	Print Cross-Reference allows you to cross-reference the following elements: X, Y, C, WX, WY, V, K, Box Instructions, STW, DSP, DSC, DCP, DCC, TCP, TCC, SFEC, Loop and Alarm Variables.
Cross-Reference Contents	<p>Each element selected for cross-reference displays the following information in the printout.</p> <ul style="list-style-type: none"> • Program location where used, such as L-memory rung 120. • Special Function program addresses appear in the following format: PGxxxxIyyyy*, where xxxx is the Special Function program number, yyyy is the instruction number, and the asterisk (*) indicates that this number is the starting point of consecutive locations. If the instruction number appears as 0000, the memory address referenced is located in the header of the SF program. • L-memory type; for example, normally open contact, parameter in a BITP box, etc. • Synonym and descriptor, if selected.

Invoking Print Cross-Reference

The Print Cross-Reference operation is invoked from the DOS Operating System prompt, which is available just after installing TISOFT. If you have already selected another TISOFT operating software and want to return to select Print Cross Reference, press the **F1** Exit or Abort key until you have stepped back through all the menus. After you have exited the TISOFT operating software, type in TIXREF (or TIXREF P2). Then select On-line or Off-line. The menu shown in Figure 14-6 then appears for selecting the elements to cross-reference. You will not see the Loop, Alarm and SF selections if S-memory is not configured.

PRINT CROSS REFERENCE			
	<u>Y/N</u>	<u>FROM</u>	<u>TO</u>
TITLE:	N		
LADDER RANGE:	N	000001	0012000
LOOP RANGE:	N	01	64
ALARM RANGE:	N	001	128
SF PROGRAM RANGE:	N	0001	1023
SF SUBROUTINE RANGE:	N	0001	1023
I/O ELEMENTS:	N	0001	1023
CONTROL RELAYS:	N	00001	1023
EXCLUDE CR:	N	00000	00000
V MEMORY:	N	000001	005120
K MEMORY:	N	000000	000000
RLL BOXES:	N		
STATUS WORDS:	N		
DRUM/TIMER VARIABLES:	N		
SF ERROR CODES:	N		
LOOP/ALARM VARIABLES:	N		
WITH SYNONYMS:	N		

545 NETDATA PG

EXIT-F1 EXECUTE-F2 SETUP-F3 TITLE-F4 READDK-F5 WRITDK-F6

Figure 14-6 Print Cross-Reference Menu

Completing
Cross-Reference
Menu

To enter the desired options for cross-reference, use the arrow keys to position the cursor in the fields.

The **Y/N** field is one character long. Indicate the parameters for printing by typing in *Y* at the selected element type.

The **FROM** and **TO** fields vary in size with memory type, and size is indicated by length of the cursor when it is positioned on the field. Indicate memory locations to be printed by typing in the numbers for the range to be printed.

Setting up Print
Parameters

If you need to change the print parameters, press **SETUP-F3** to access the Print Setup Menu. (See Section 14.4.)

Make the desired changes and press **WRITDK-F3** if you want the changes saved to disk.

Executing the
Printout

After completion of the Cross-Reference Menu, press **EXECUTE-F2** to initiate the operation. You are given messages at the prompt line to indicate the status of the printout.

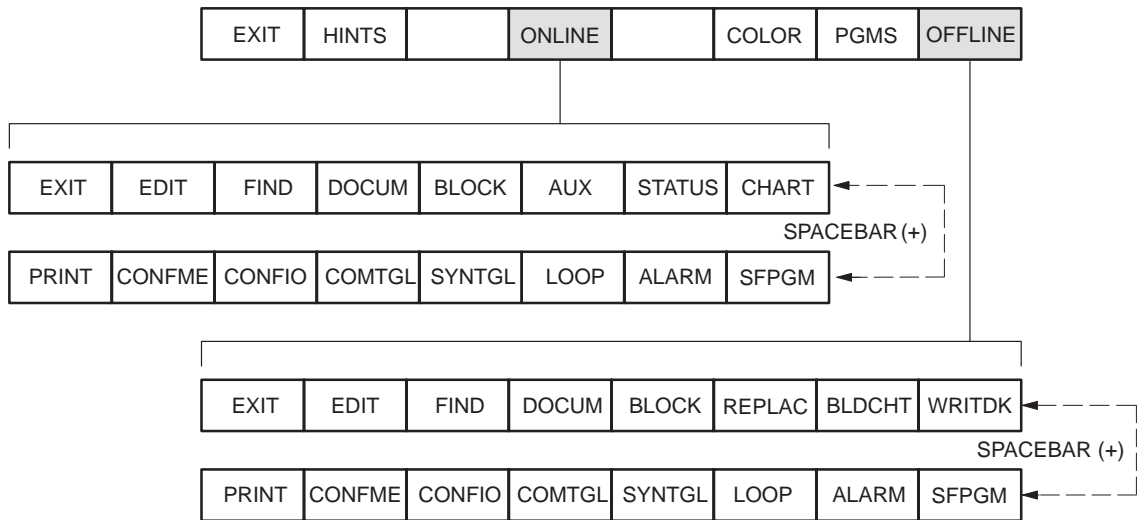
Appendix A

Menu Maps

The menu listings in this appendix show the primary functions as accessed from the Ladder Display (illustrated below). The listings are in alphabetical order.

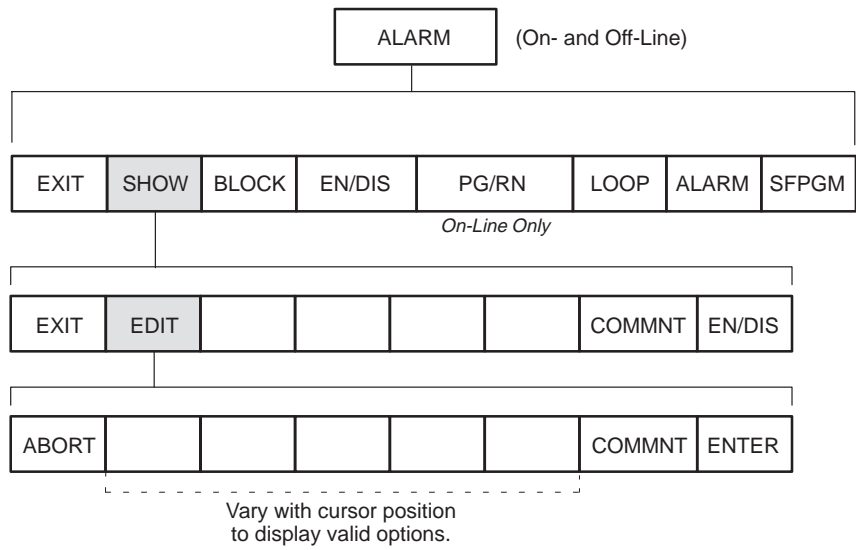
On-Line, Off-Line Ladder Displays

The first line of function keys shown below represents the Start-up Screen function keys.

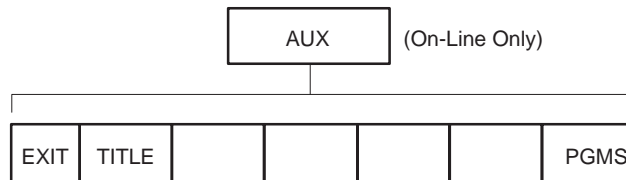


The last menu map in this appendix is the separate TISOFT operating software, Print Cross-Reference.

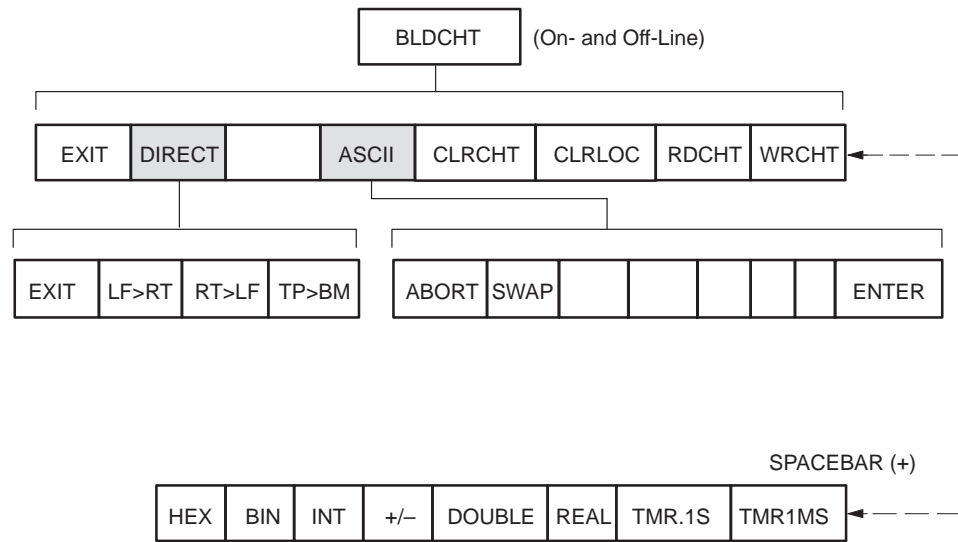
ALARM



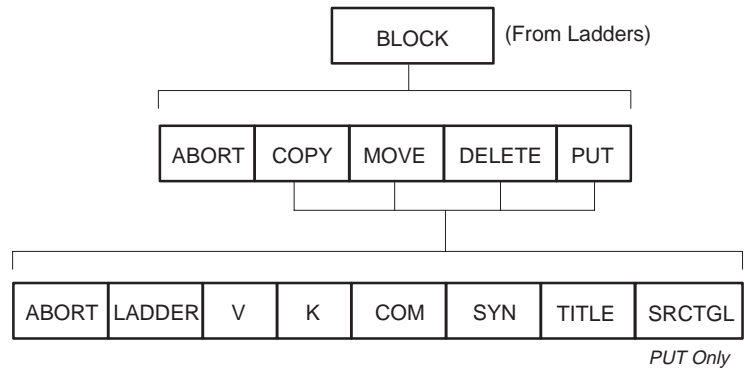
AUX



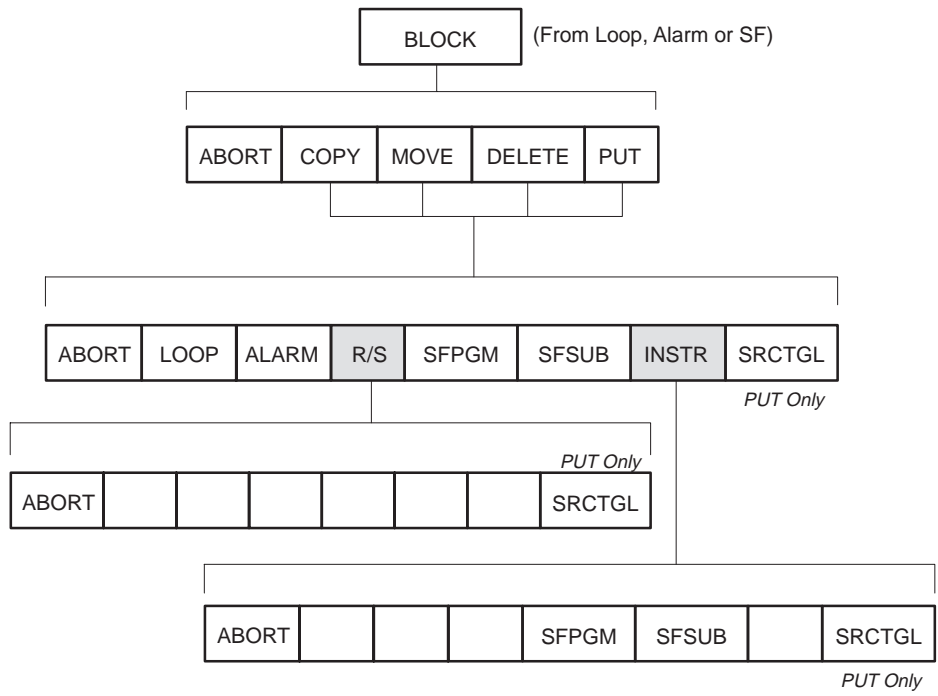
BLDCHT



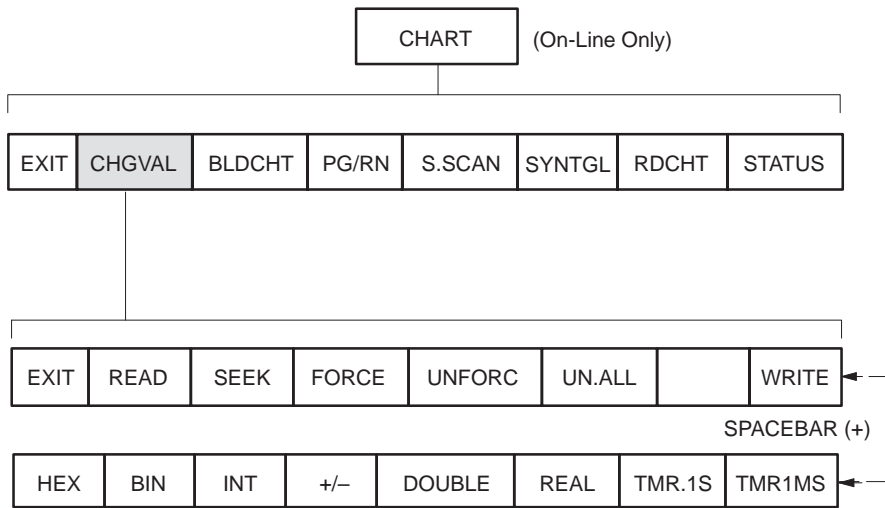
BLOCK
(From Ladders)



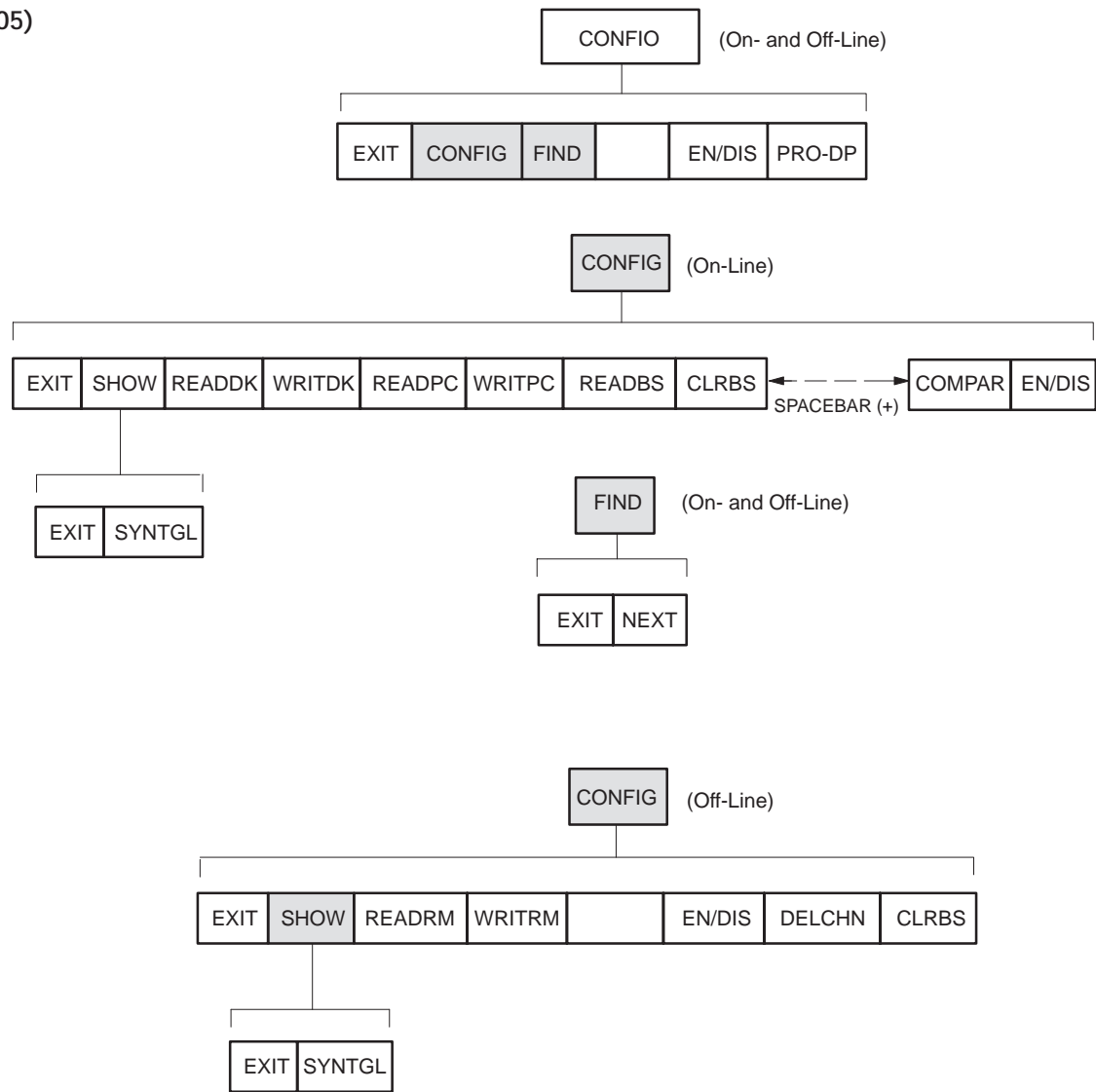
BLOCK (From Loop, Alarm, SF)



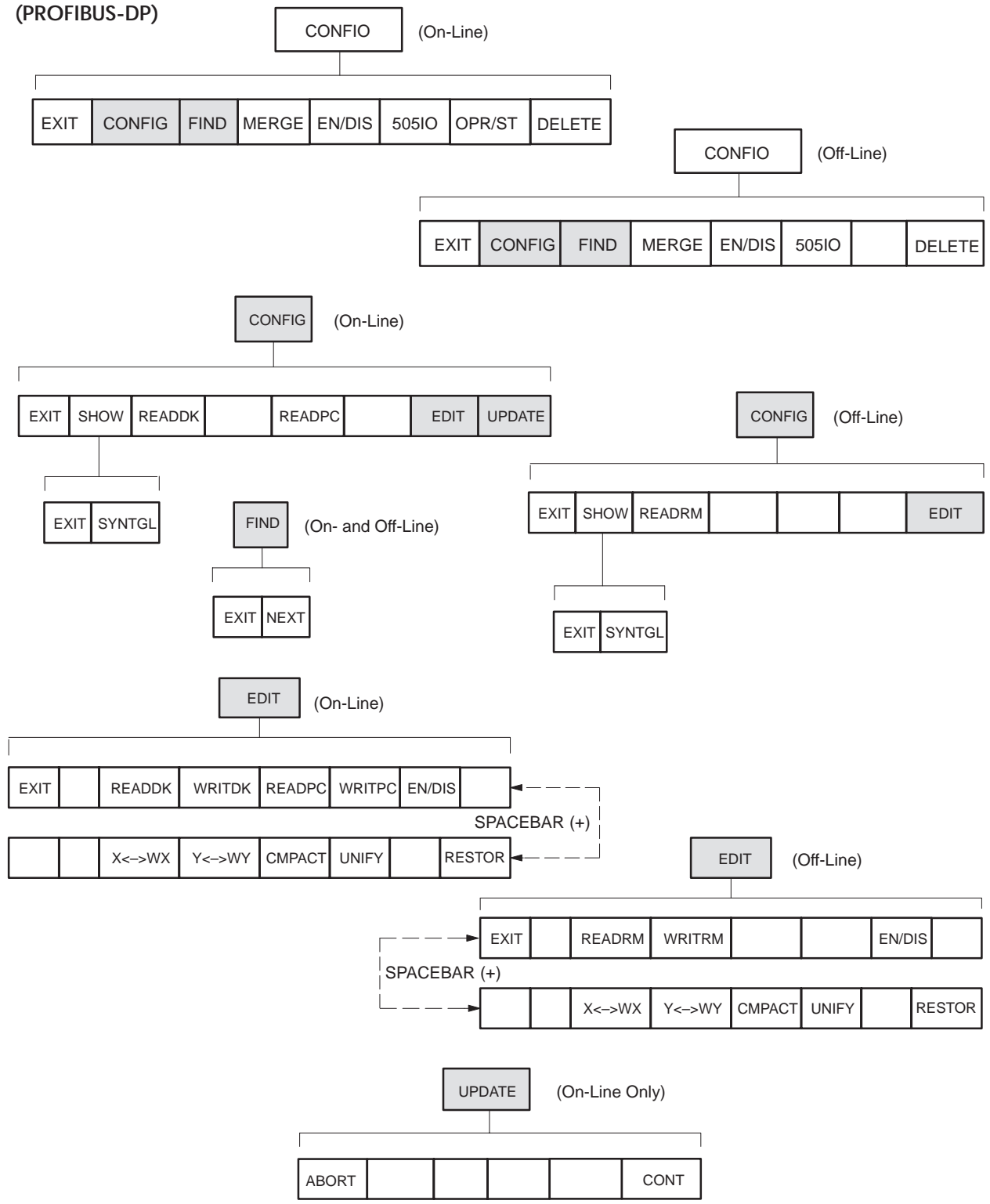
CHART



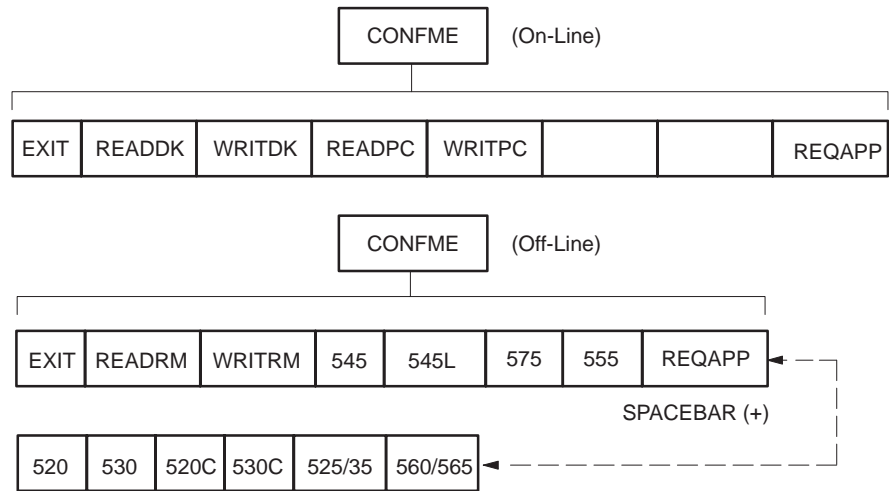
CONFIO
(Series 505)



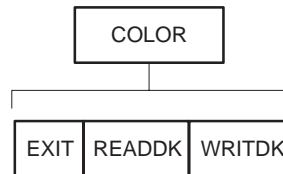
**CONFIO
(PROFIBUS-DP)**



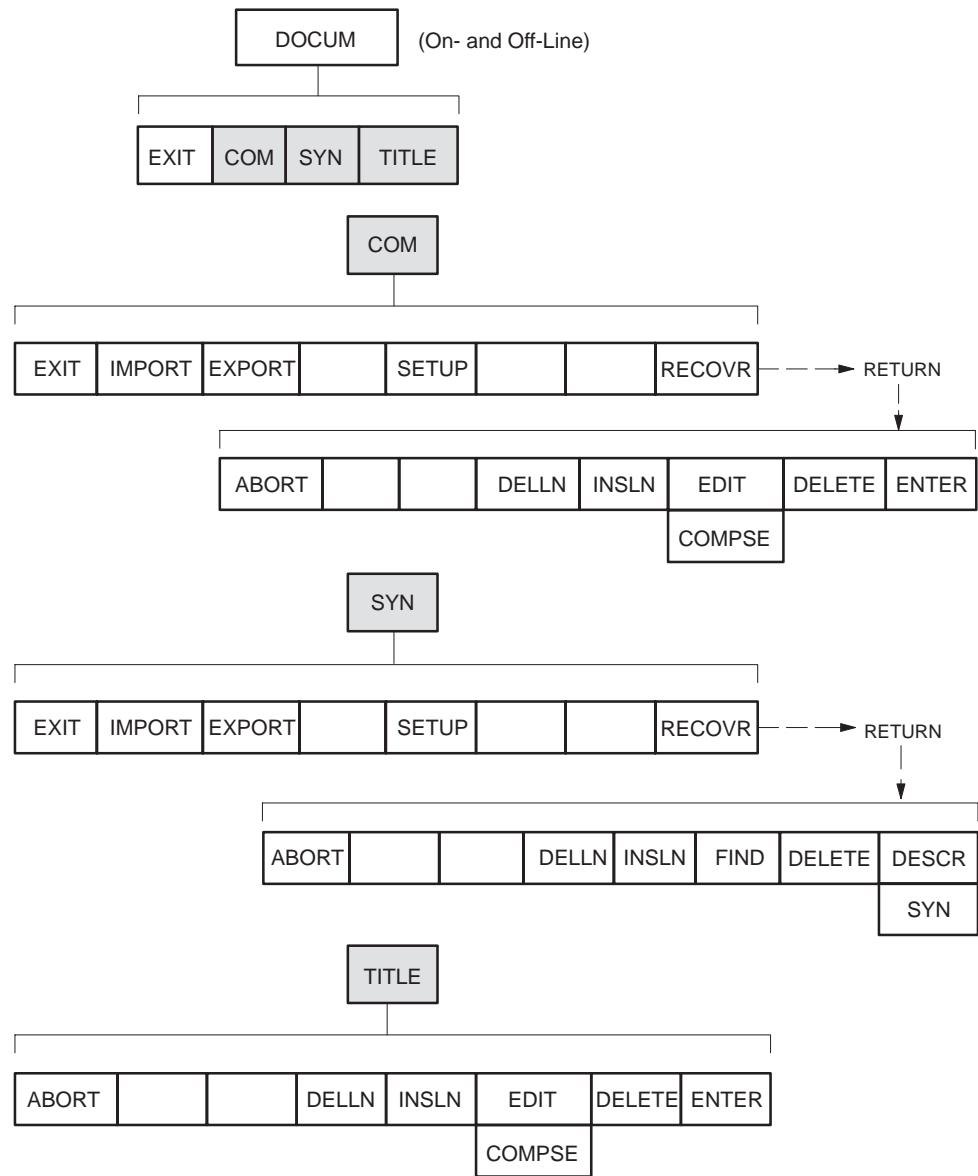
CONFME



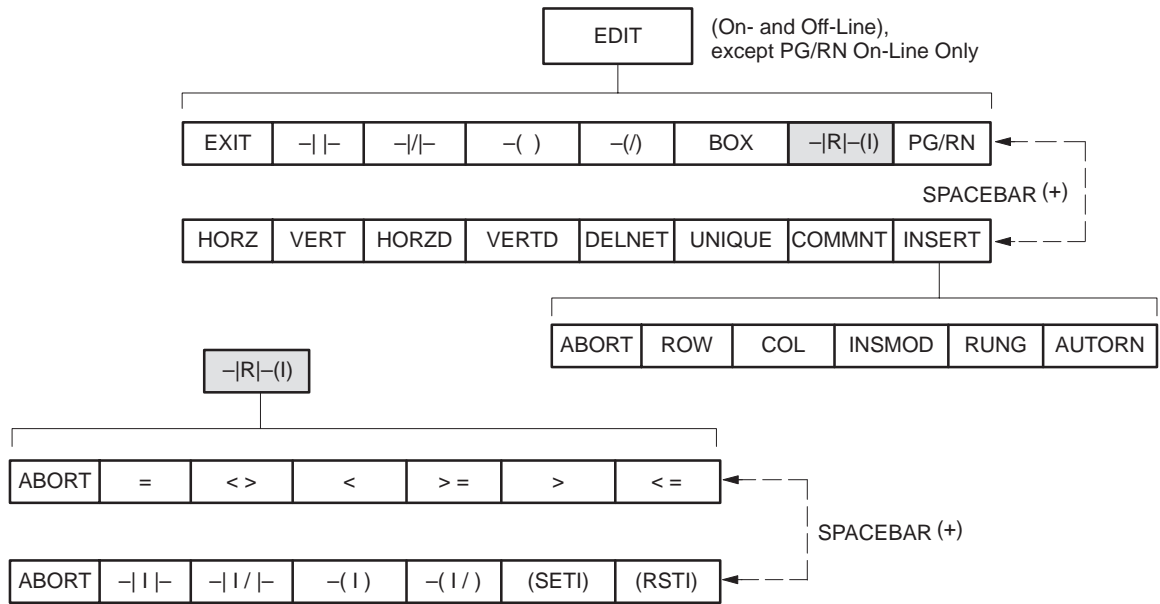
COLOR



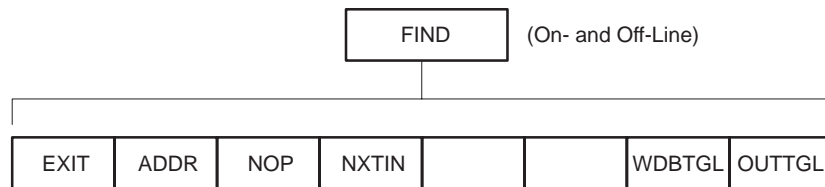
DOCUM



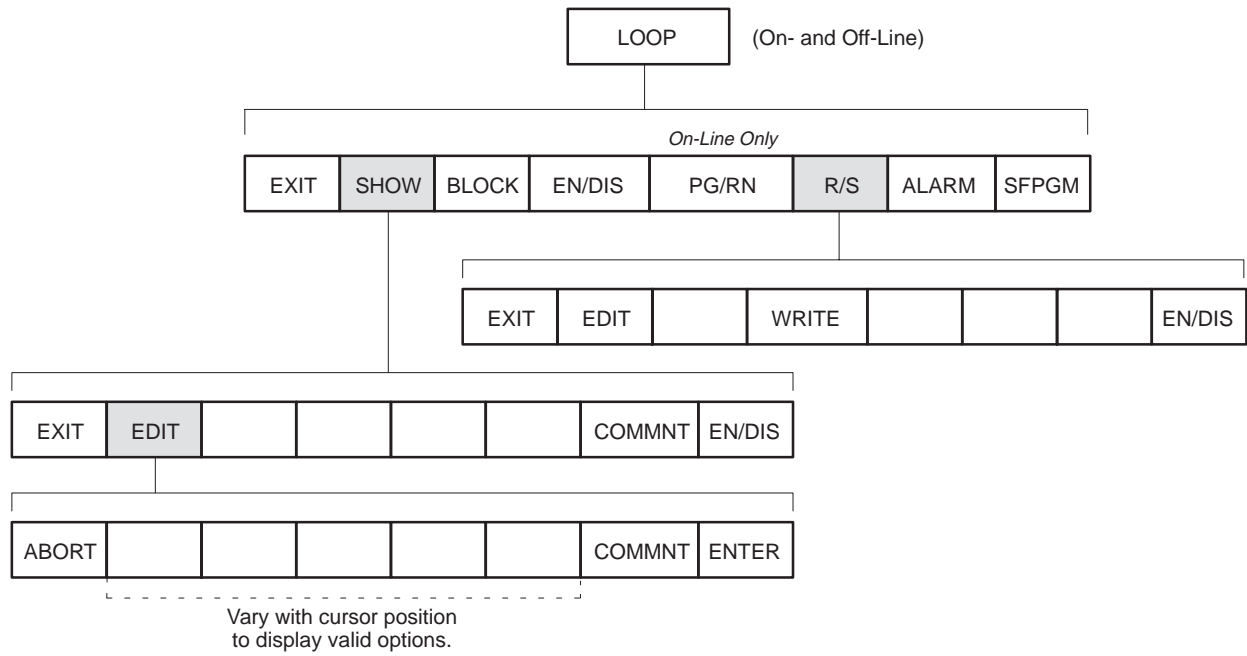
EDIT



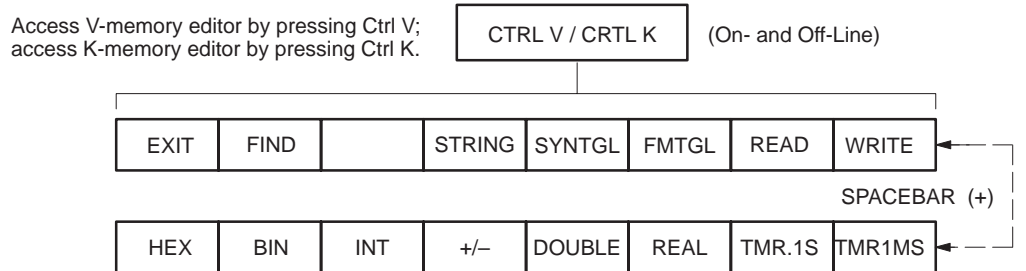
FIND



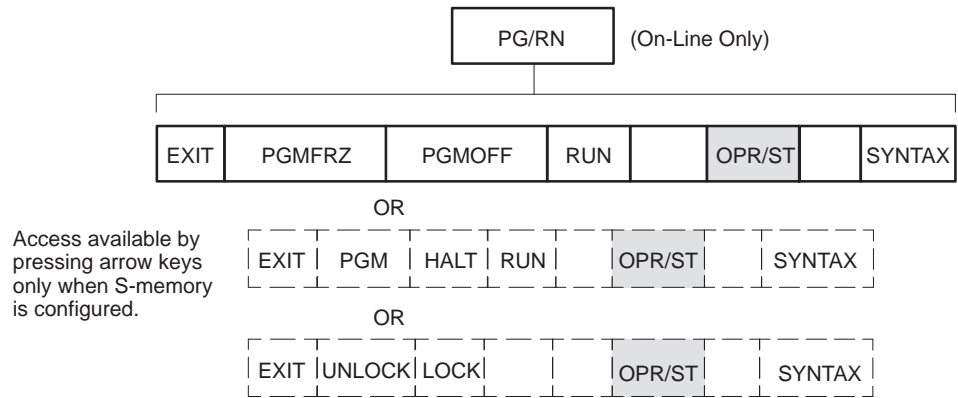
LOOP



Memory Editor

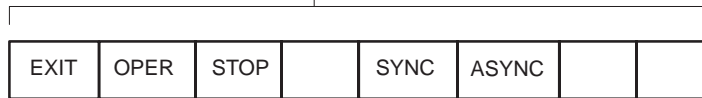


PG/RN

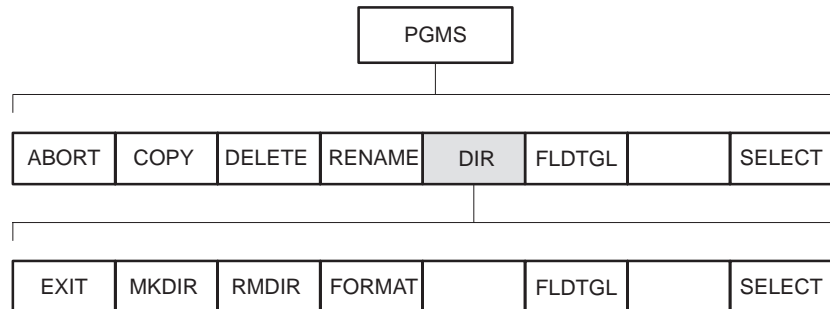


OPR/ST

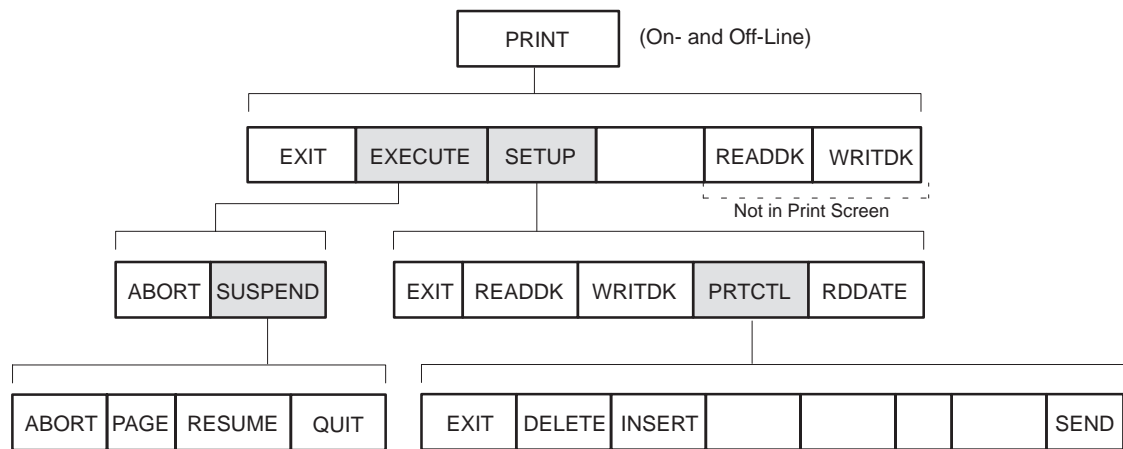
Operate/Stop and Synchronous/Asynchronous apply only to PROFIBUS-DP I/O communications.



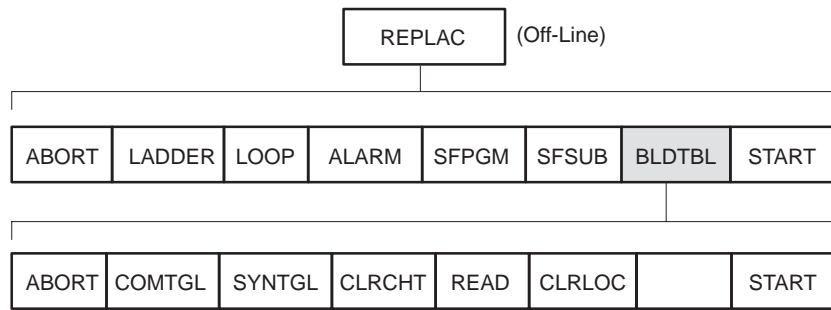
PGMS



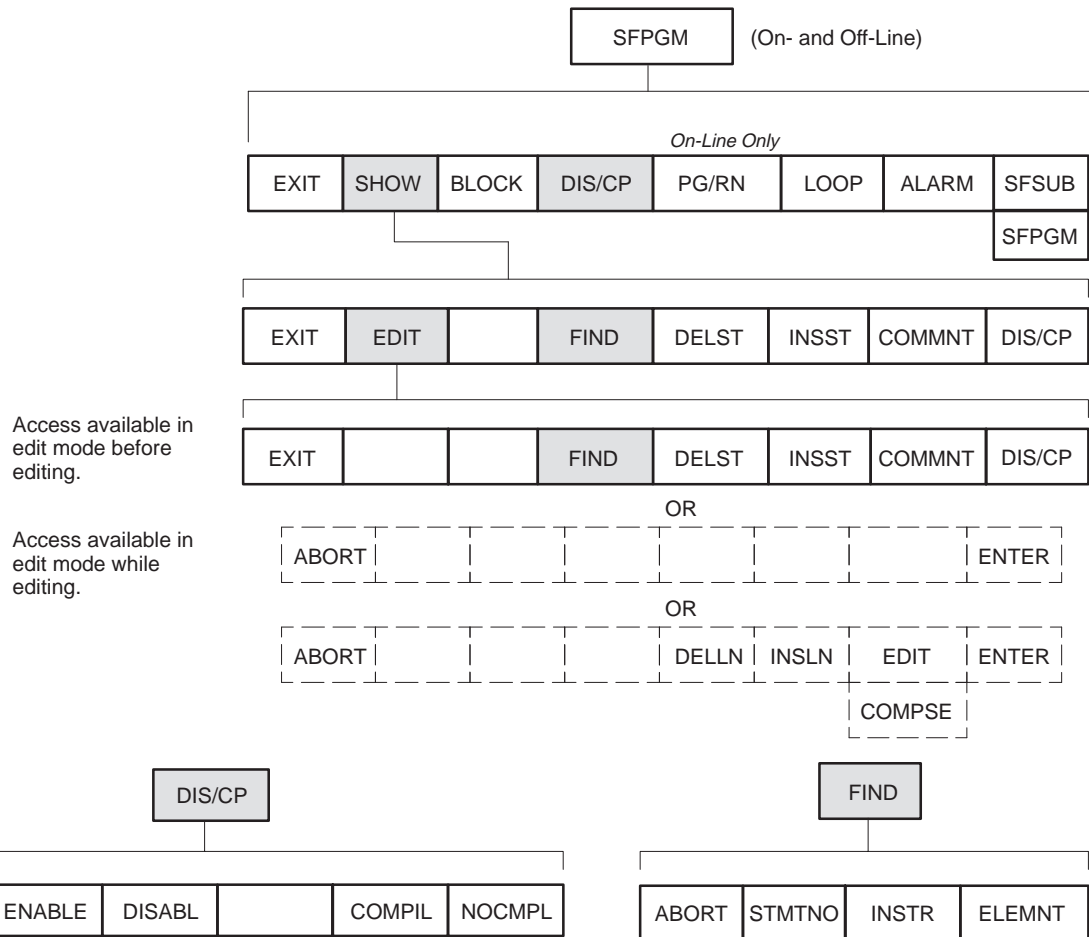
PRINT



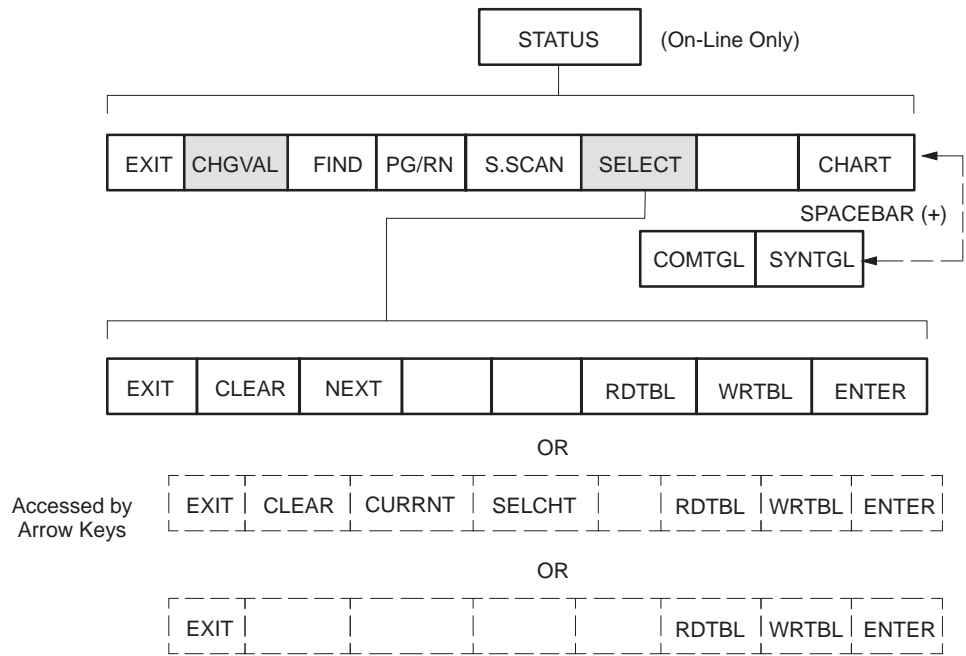
REPLACE



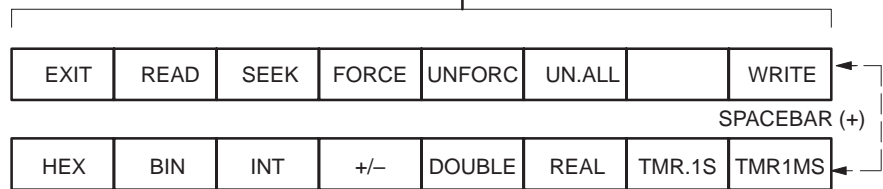
SF Program and SF Subroutine



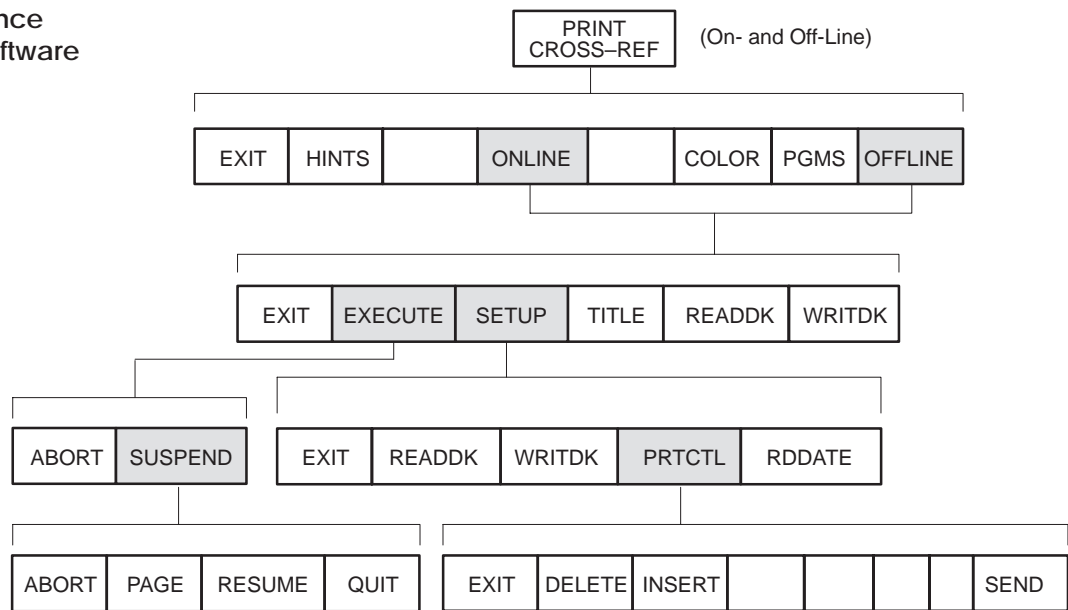
STATUS



CHGVAL (On-Line Only)



Print
 Cross-Reference
 Operating Software



Appendix B

TISOFT Messages

This appendix contains a listing of programming error messages that may be displayed on the TISOFT screen when you attempt various functions. The messages are a guide to help you in correcting error conditions.

The following symbols are used:

aaaannnn an element address (alphabetic and numeric characters)
xxxx decimal number value
hh hex number value
ladder address
“a” application list (575)

If an error occurs that you cannot resolve, please call your Siemens Energy & Automation distributor or sales office in the U.S. for assistance.

Alarm Variable Required	The PACKAA SF statement in an SFPGM or SFSUB requires at least one ANALOG ALARM data type variable; for example, APVH, after the PARAMETERS: prompt. ID numbers and other element types are not allowed.
Alarm xxx Not Programmed	The requested ANALOG ALARM control block has not been programmed and is not included in the ALARM DIRECTORY. An unprogrammed control block cannot be enabled or disabled. To create the ALARM, type in the desired ID number and press SHOW-F2.
All NOPS to End of Memory	This message is displayed when there are no more programmed ladder rungs from the starting address to the end of ladder memory.
Application Is Undefined or Unassigned	The selected application is not installed in the controller.
Arithmetic Error Detected	Invalid loop or alarm parameter; check loop and alarm parameters.
Arithmetic Overflow	Invalid parameter in a math statement; check parameters in math statements.
Attempt to Access a Real-only Variable as an Integer	Access the variable as a real value.
Attempt to Access an Integer-Only Variable as a Real	Access the variable as an integer value.
Attempt to Divide by Zero	Check the parameters in your IMATH statements.
Attempt to Execute Cyclic Statement in Non-Cyclic SFPGM	Lead/lag statement can only be invoked from a loop, analog alarm, or a cyclic SFPGM. Either remove the LEAD/LAG statement, or make the SFPGM cyclic by entering C after the program type prompt in the SFPGM header.

Attempt to Modify Control Block Control Information	An invalid attempt was made to change control information of a loop, alarm, SF program, or SF subroutine.
Attempt to Write a Read-Only Variable	An attempt was made to edit the value of a read-only variable via the CHGVAL operation under STATUS or CHART.
Attempted to Write to a Protected Variable	Cannot write to protected variables, such as TCC and TCP until you unlock the CPU keylock.
Attempted Write Operation Did Not Verify	Retry the operation.
Automatic Rung Insert—Off	Indicates that RUNG INSERT mode is inactive. This is the default. See also: Automatic Rung Insert—On.
Automatic Rung Insert—On	Indicates that RUNG INSERT mode is active. This mode is used to enter a series of rungs before existing ladder logic rungs. After pressing ENTER-F8 to enter a rung, a new blank rung is created. To toggle this mode on/off, press INSERT-F8, AUTORN-F6 in ladder edit.
Base Not Configured on Channel	An attempt was made to run Remote Base Diagnostics (AUX 21) on a Dual RBC, and the specified base is not configured. Configure the base and perform AUX 21 again.
Bit-of-Word Not Allowed	Bit-of-word is not allowed for this element to be entered.
Bit-of-Word Required	Bit-of-word is required for this element to be entered.
Bottom of Screen	When you use the down arrow to scroll through a status chart with synonyms, this message indicates that the bottom of the chart is on the screen.
Box Accesses Unconfigured CR Range	The box just created in RLL implicitly refers to a Control Relay which is out of range for the current configuration. Either reduce the length of the table of Control Relays in the box, or move the starting table address to a CR that can accommodate the length of the table, or increase your I/O configuration to accommodate the extra Control Relays.
Box Crosses Global/Local CR Boundary	The box just created in RLL contains a table of Control Relays which spans the boundary between Global and Internal Control Relays. The table must fit entirely within either the Global CR range (C1-C8192) or the Internal CR range (C8193-C56320)—not both.
Box Parameter Overflow at Address #####	This message is displayed when a box at the specified rung address contains more parameter data than expected for the particular box. Re-edit the box with the correct number of parameters.
Box Writes to Multiple Memory Values, Maximum Limit Exceeded	The box just created in RLL implicitly refers to a memory address which is out of range for the current configuration. Either reduce the length of the table in the box, or move the starting table address to a memory address that can accommodate the length of the table, or increase your configuration to accommodate the table range.
Cannot Copy File to Itself	Specify a destination filename which is different from the source filename.

Cannot Open File	This error should not occur except under extenuating circumstances. TISOFT attempted to open a program file and failed. The file may have been accidentally deleted, or a disk hardware failure may have occurred.
Cannot Put Program to Itself	The source and destination program filenames specified must be different.
Cannot Request Both 20% Offset and Bipolar	This message is displayed when the user attempts to enter a LOOP, an ANALOG ALARM, or a SCALE or UNSCALE SF statement in an SFPGM/SFSUB with both the 20% OFFSET and BIPOLAR fields set to YES. One or the other may be selected as YES, not both. Change one or both responses to NO.
Cannot Search for Element Online	The controller does not support the ability to find the requested element.
Channels 1 and 2 Cannot Be Deleted	The user has attempted to delete Channel 1 or 2 in the I/O Configuration. Channels 1 and 2 are permanent defaults and cannot be deleted. Additional channel configurations are optional.
Comment Cannot Be Tied to Element in Network	This message is displayed during edit of ladder logic when the Comment editor (COMMNT-F7) is invoked for an output type that does not have a comment associated with it, for example, NOP, RTN.
Communications Error	Data received from the controller has been corrupted or lost, perhaps due to a COMM PORT failure. If using TISTAR™, Model 20 or Model 70, exit TISOFT, check the cable connection between the DEU and the Operator Station, and reenter TISOFT.
Communications Error – Break Error	Data received from the controller has been corrupted or lost, perhaps due to a COMM PORT failure.
Communications Error – Overrun Error	Data received from the controller has been corrupted or lost, perhaps due to a COMM PORT failure.
Communications Error – Parity Error	Data received from the controller has been corrupted or lost, perhaps due to a COMM PORT failure.
Communications Error – Port Does Not Exist	The selected COMM PORT does not exist. Try a different port.
Communications Error Number – hh	The task code error shown is unknown by TISOFT.
Communications Terminated by User	You have terminated on-line communications by pressing Alt C. To restart communications, return to the start-up screen and press ONLINE-F4.
Communications Timeout	Communications between TISOFT and the controller have been interrupted. Make sure the cable is securely connected to the proper ports on the controller and the TISOFT host machine. Problem may also be the result of a COMM PORT failure. If using TISTAR, Model 20 or Model 70, exit TISOFT, check the cable connection between the DEU and the Operator Station, and reenter TISOFT.
Comparison Equal	Comparison of the I/O Configuration in the Base with the I/O Configuration in the controller has passed; configurations are the same.

Comparison Not Equal	Comparison of the I/O Configuration in the Base with the I/O Configuration in the controller has failed; configurations are not the same. Slots which failed are highlighted on the screen display.
Comparison Not Equal – Failed Module in Base	Comparison of the I/O Configuration in the Base with the I/O Configuration in the controller has failed; configurations are not the same. Slots which failed are highlighted on the screen display. In addition, a failed module has been detected in the base—which may have caused the comparison to fail.
Connection to Element Missing	This error occurs when you attempt to enter a ladder rung that is not valid. An example appears below.



Constant Value Required	This error occurs during edit of SF statements in an SF Program or SF Subroutine. The parameter indicated must be a constant value (for example, 10). Element addresses or text are not allowed.
Control Block Already Exists	An attempt was made to create a loop, alarm, SF Program or SF Subroutine that is already programmed. Select another number to identify the new block.
Control Block Does Not Exist	This message is displayed when the user attempts to enable or disable a LOOP, ALARM, SFPGM or SFSUB that has not yet been programmed.
Control Block Is Disabled	Enable the loop, alarm, SFPGM, or SFSUB control block.
Control Block Is Not Disabled	Disable the loop, alarm, SFPGM, or SFSUB control block.
Control Block Number out of Range	Check for an out-of-range reference to a loop, analog alarm, SF program or subroutine.
Control Block Size Error	A single SF program or subroutine cannot exceed 32767 bytes. To correct, divide the program or subroutine to fit the maximum.
Corrupted Data on Disk	Data in a TISOFT program file has been corrupted, leaving the file in an unrecoverable state. This error may result if an AUX SAVE or BLOCK PUT PLC-DK operation fails due to loss of communications. A power failure or popping the disk drive during writes to disk may also cause data corruption. To recover, retry the operation that failed. If all else fails, delete the <pgmname>.VP5 file from DOS and redo the operation. Note: deleting <pgmname>.VP5 will erase your ladder logic, memory and I/O configurations.
Current Value	During CHGVAL in STATUS or CHART, this message confirms that the value displayed on the screen is the current value in the controller at the time the data was read.
Cursor Not Positioned Properly	When you attempt to see if an element is unique using the UNIQUE operation in EDIT of ladder logic, the cursor must be positioned over a valid element (for example, over an existing contact, coil, or box). Move the cursor to the contact, coil, or box you wish to verify as unique.

Data File Not Found	Make sure the directory containing the TISOFT operating software files is in the path.
Data Not Inserted	Check that program memory size is not exceeded; if so, reconfigure to needed size. Verify also that you are attempting to write to RAM, not EPROM.
Data Not Written	Check that program memory size is not exceeded; if so, reconfigure to needed size. Verify also that you are attempting to write to RAM, not EPROM.
DEU Initialization Error	Check TISTAR (Model 20 or Model 70) cable connection.
DEU Not in Operate State	Enter TISTAR (Model 20 or Model 70) and change system to Operate State.
DEU Online Error	Start TISTAR (Model 20 or Model 70) software before running TISOFT.
DEU Security Error	Exit TISOFT and get appropriate TISTAR (Model 20 or Model 70) security privileges assigned. In TISTAR, reenter Programming Utilities using newly assigned security privilege.
DEU TIWAY Communication Error	Check TISTAR (Model 20 or Model 70) cable connections between DEU and NIM. Check NIM status. Check DEU error log file.
Diagnostics Failed upon Powerup	Perform Auxiliary Function 29 to determine cause of failure.
Directory Is Not Empty	This occurs when you try to delete a directory that still contains files. Delete the files in the directory first.
Directory Not Initialized	This message is displayed when you attempt to perform File Conversion to convert a program to Series 500/505 TISOFT Release 5.0 or greater. No TISOFT user program files are found in the current source directory/disk. Change to the directory/disk containing the program you wish to convert and invoke the File Conversion operation again.
Disk Access Error	This error occurs during a disk operation when either the source or destination directory becomes inaccessible while TISOFT internally switches directories. Perhaps the directory has been deleted or the disk drive has been popped open.
Disk File Not Found	An attempt to open a TISOFT program file has failed because the file does not exist. Perhaps the file has been accidentally deleted.
Disk File Not Open	An attempt to write to a file has failed because the file, which was previously opened successfully, has been unexpectedly closed.
Disk Full	This message occurs when you attempt to write data to the disk, and there is no more room on the disk to store data. User must make room on the disk either by deleting documentation or program data OFFLINE, or by exiting TISOFT and deleting non-TISOFT files.
Disk Is Write Protected	An attempt to write to a TISOFT program file has failed because the file or the disk is write protected. Remove the write protection mechanism and try the operation again.

Disk Not Initialized	This message is displayed when you attempt to perform File Conversion to convert a program to Series 500/505 TISOFT Release 5.0 or greater. No TISOFT user program files are found in the current source directory/disk. Change to the directory/disk containing the program you wish to convert and invoke the File Conversion operation again.
Disk Timeout Error	An attempt to access the disk has failed. Perhaps the disk drive has been popped open, or a disk hardware failure has occurred.
Duplicate "SBR" Reference	The specified subroutine (SBR) number has been declared more than once in the RLL program.
Element Address Corrected to Valid Boundary	The element address was adjusted to a legal value for the controller.
Element Cannot Be Displayed in This Format	This error occurs during BLDCHT or CHGVAL in STATUS or CHART. The element selected cannot be displayed in the requested format. For example, if the configured range for V-memory is V1-V2048, V2048 cannot be displayed as DOUBLE because it requires two word locations.
Element Exists at Rung Address #####	This message is displayed by the UNIQUE operation to indicate that the current element is not unique, and is also used in the rung at the specified address.
Element Exists Only at Current Rung	This message is displayed by the UNIQUE operation to indicate that the current element is unique, and does not appear anywhere else in the RLL program.
Element Forced	This message indicates that the requested element has been successfully forced to the specified value.
Element Must Be on an 8-Point Boundary	The box just created in RLL contains an element address which must be on an 8-point boundary; for example, C1, C9, C17, etc. Change the indicated element ID number to a valid 8-point boundary value.
Element Not Found	<p>During execution of the FIND or UNIQUE operations in RLL, this message indicates that the requested element address or box type does not exist anywhere in the ladder program.</p> <p>During execution of the FIND operation during SHOW/EDIT of an SF Program or Subroutine, this message indicates that the requested element address or SF instruction type does not exist in the current SF Program or Subroutine.</p>
Element out of Range	<p>When you specify ranges of elements to be replaced in the Global Search and Replace operation, this message indicates that the element(s) you are replacing WITH exceeds the memory configuration for that element, given the length of the range of elements you are REPLACING. With 2048 CRs configured, the following example would result in ELEMENT OUT OF RANGE:</p> <pre style="margin-left: 40px;"> REPLACE THRU WITH C1 C100 C2000 </pre>

Element Range Crosses Invalid Boundary

An invalid boundary crossing has occurred in the range of the element. For example, some 560/565 functions do not allow a control relay (C) range to cross the 8192/8193 boundary or the 24576/24577 boundary.

Element Too Large to Fit into Network

This message occurs if you attempt to create a rung that exceeds the maximum number of elements allowed per rung (120 contact-sized nodes). To correct the entry, either delete some ladder elements, or break the logic into two rungs. Elements require node sizes as listed below.

Contact = 1 node	2 x 3 box = 6 nodes	7 x 8 box = 56 nodes
Coil = 1 node	3 x 3 box = 9 nodes	4 x 7 box = 28 nodes
O/S Box = 1 node	2 x 7 box = 14 nodes	

Element Type Not Allowed – Press ‘?’ for Valid Type

The specified element type is an invalid type for the current field. Press the “\” or Shift “?” keys to display a screen listing valid element types for the current field.

Element Unforced

This message indicates that the requested element has been successfully unforced.

Element within Invalid Range

The specified Control Relay address exceeds the maximum Global CR range (determined by your current I/O Configuration), but is less than the minimum Internal (Local) CR range. Change the Control Relay address to a value within your Global CR range or within the Internal CR range (C8193 – C56320).

Empty Parameter Cannot Be before Another Parameter

This message is displayed when you edit parameter fields in either the SFSUB box in RLL (P1-P5), or the CALL (P1-P5), PACKLOOP (PARAMETERS:), or PACKAA (PARAMETERS:) SF statements in an SF Program or Subroutine. The parameter fields must be programmed in order. For example, this error message will be displayed if the P2 field is programmed while the P1 field has been left blank.

End of Memory

This message indicates that the end of the valid memory range has been reached, for example, when you page up or down in RLL or V/K memory editor.

Entry Required at This Field

This message indicates that the SF statement just entered has a parameter field that has been left blank. Type in a valid response for the field and enter the statement again.

Error Closing File

This error should not occur except under extenuating circumstances. TISOFT attempted to close a file on the disk and failed. The file may have been accidentally deleted, the disk drive may have been popped open, or a disk hardware failure may have occurred.

Error Compiling aaannn INSTxxx – Block Exceeds 32K

When compiling an SFPGM or SFSUB, a conditional block or the block bracketed by a LABEL – GOTO pair is larger than 32K when compiled.

Error Compiling aaannn INSTxxx – CS-Memory Overflow

When compiling an SFPGM or SFSUB, SF compiled code exceeded configured CS-memory.

Error Compiling aaannn INSTxxx – Duplicate Label	When compiling an SFPGM or SFSUB, a duplicate label definition was found.
Error Compiling aaannn INSTxxx – Expression Too Complex	When compiling an SFPGM or SFSUB, the expression was too complex.
Error Compiling aaannn INSTxxx – Invalid Control Blk Size	When compiling an SFPGM or SFSUB, the control block size was invalid in S-memory.
Error Compiling aaannn INSTxxx – Invalid Instruction	When compiling an SFPGM or SFSUB, the referenced statement was invalid in a compiled SF program or subroutine.
Error Compiling aaannn INSTxxx – Invalid Operation in EXP	When compiling an SFPGM or SFSUB, an expression contained an invalid operation.
Error Compiling aaannn INSTxxx – Invalid SFSUB Number	When compiling an SFPGM or SFSUB, a reference to an invalid SFSUB number was encountered.
Error Compiling aaannn INSTxxx – Invalid Variable Address	When compiling an SFPGM or SFSUB, an undefined or invalid variable address was encountered. Either the address is malformed, out of range, or specifies a variable that is invalid in the context of its use.
Error Compiling aaannn INSTxxx – Max IF Nesting Exceeded	When compiling an SFPGM or SFSUB, the maximum IF nesting was exceeded.
Error Compiling aaannn INSTxxx – Max Label Count Exceeded	When compiling an SFPGM or SFSUB, the maximum number of label definitions was exceeded.
Error Compiling aaannn INSTxxx – Syntax Error	When compiling an SFPGM or SFSUB, a syntax error was encountered, indicating that there is a problem with the content of S-memory.
Error Compiling aaannn LABEL xxx – Undefined Label	When compiling an SFPGM or SFSUB, an undefined label was encountered.
Error Creating File	This error should not occur except under extenuating circumstances. TISOFT attempted to create a file on the disk and failed. The disk drive may have been popped open, or a disk hardware failure may have occurred.
Error Deleting from Disk	TISOFT attempted to delete a file from the disk and failed. The file may be write-protected, or may have been accidentally deleted; the disk drive may have been popped open; or a disk hardware failure may have occurred.
Error Detected during Runtime Edit — Recommend Syntax Check	An error occurred while the controller was in RUN-TIME EDIT mode. To clear this error, take one of the following actions: <ul style="list-style-type: none"> • Perform a successful syntax check (AUX 22: Syntax Check or SYNTAX-F8 on the PG/RN menu) and then go to RUN mode. • Go to PGM mode.

**Error Reading
from Disk**

TISOFT attempted to read a program file and failed. This can occur if the system attempts to open too many files simultaneously. Make sure the command FILES=20 is in the CONFIG.SYS file. Or, you might need to increase the maximum number of open files allowed to FILES=25 or FILES=30.

If the problem persists, the file may have been accidentally deleted, the disk drive may have been popped open, data in the file may have been corrupted, or a disk hardware failure may have occurred.

**Error Replacing
aaaannnn with
aaaannnn at
Address #####**

This message indicates that an error occurred at the specified ladder rung address during execution of a Global Search and Replace. For whatever reason the new element makes the specified rung invalid. Perhaps the element causes a table in a box instruction to be out of range. Or an output field may have been replaced with a read-only element.

**Error Replacing
aaaannnn with
aaaannnn at Alarm xxx**

This message indicates that an error occurred in the specified ALARM during execution of a Global Search and Replace. For whatever reason, the new element makes the ALARM invalid. Perhaps the element is out of range for the particular field, or an output field may have been replaced with a read-only element.

**Error Replacing
aaaannnn with
aaaannnn at Loop xxx**

This message indicates that an error occurred in the specified LOOP table during execution of a Global Search and Replace. For whatever reason, the new element makes the LOOP invalid. Perhaps the element is out of range for the particular field, or an output field may have been replaced with a read-only element.

**Error Replacing
aaaannnn with
aaaannnn at
Loop xxx R/S xxx**

This message indicates that an error occurred in the specified RAMP/SOAK step for the given LOOP during execution of a Global Search and Replace. For whatever reason, the new element makes the R/S step invalid. Perhaps the element is out of range for the particular field, or an output field may have been replaced with a read-only element.

**Error Replacing
Element at
Address #####**

This message indicates that an error occurred in an SFSUB box at the specified ladder rung address during execution of a Global Search and Replace. For whatever reason, the new element makes the specified rung invalid. Perhaps the element is out of range for the particular field, or an output field may have been replaced with a read-only element.

**Error Replacing
Element at SFPGM
xxxx INST xxxxx**

This message indicates that an error occurred in the specified SF statement of the given SF Program during execution of a Global Search and Replace. For whatever reason, the new element makes the SF statement invalid. Perhaps the element is invalid or out of range for the particular field, or an output field may have been replaced with a read-only element.

**Error Replacing
Element at SFSUB
xxxx INST xxxxx**

This message indicates that an error occurred in the specified SF statement of the given SF Subroutine during execution of a Global Search and Replace. For whatever reason, the new element makes the SF statement invalid. Perhaps the element is invalid or out of range for the particular field, or an output field may have been replaced with a read-only element.

Error when Setting the Baud Rate

An invalid baud rate has been used with TISTAR (Model 20 or Model 70).

Error Writing to Disk

TISOFT attempted to write a program file and failed. This can occur if the system attempts to open too many files simultaneously. Ensure that the command FILES=20 is in your CONFIG.SYS file.

Extra Elements Not Allowed with an Unconditional Output

This error occurs when you attempt to enter a ladder rung that is not valid. See following example.



Fatal Error Detected

This message occurs ONLINE when the controller goes into a Fatal Error mode. Use AUX 29 to determine the cause of the error.

FIFO Is Incompatible with FTSR-IN or FTSR-OUT Statement

This is a run-time error caused by the FTSR-IN and the FTSR-OUT having different lengths.

FIFO Is Invalid

This is a run-time error caused by invoking the FTSR-OUT before the FTSR-IN with the result that the FIFO has not been set up.

File Already Exists

This message is displayed when the file name specified already exists. In FILE CONVERSION, specify a different program name to create. In the PRINT TO FILE option, you can choose either to replace the file, append to the end of the file, or to abort and select a different file name.

File or Directory Already Exists

Specify a new file or directory name.

Forcing Functions Cannot Be Used with This Element

The force, unforce, and seek operations under STATUS and CHART are available only for X, Y, C, WX, and WY element types.

FMS Network Error – xx, Code: xxx

The given error number has occurred on the FMS network. The code number gives a detailed description of the error.

“From” Boundary Exceeds “To” Boundary

The starting range specified in the PRINT ALL and PRINT CROSS-REFERENCE selections menu must be less than or equal to the ending range for the given option.

FTSR-In SF Statement Performed on Full Shift Register

Take data out of register (FTSR-OUT) before attempting to add more.

FTSR-Out SF Statement Performed on Empty Shift Register

Put data in register (FTSR-IN) before attempting to take out.

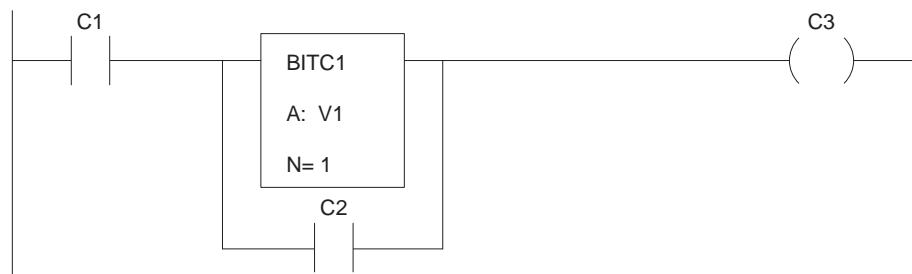
Function Not Available – Load-Only Version

The selected write function is not available because this mode of TISOFT is read-only except for the following Aux functions: 10, 11, 12, 13, 20, 81, 86, 90, 98, and 99.

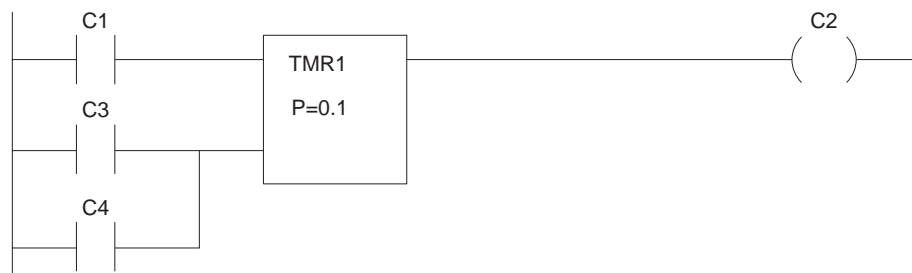
Function Not Available – Read-Only Version

The attempted function did not work because it is not allowed in read-only TISOFT.

Help File Not Found	The TISOFT help system file has not been found.
H1 Network Error – xx, Code: xxx	The given error code has occurred on the H1 network.
High-High Must Be Greater than or Equal to High	The value in the PV ALARMS HIGH-HIGH field of a LOOP/ALARM table must be larger than or equal to the value in the PV ALARMS HIGH field.
Host Adapter Error – hhhh	An error has occurred with the TIWAY network. Refer to the TIWAY user’s manual for the definition of the given error code.
I/O Configuration Error – Too Many Points	Check for duplicated points in I/O numbering.
Illegal Aux Function	The AUX function number requested is undefined for the current controller Configuration.
Illegal Connection around Box	This error occurs when you attempt to enter a ladder rung that is not valid. See following example. Box instructions may be ANDed, but may not be STRed or ORed.



Illegal Connection to Multiple Input Box	This error occurs when you attempt to enter a ladder rung that is not valid. Each input of a multiple input box cannot have ORed contacts or more than two ANDed contacts. See example.
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Illegal Connection to Multiple Input Box at Address #####	This error has occurred at the specified ladder rung address—not necessarily in the current rung. See above example for <i>Illegal Connection to Multiple Input Box</i> .
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Illegal Instruction at Address #####	The sequencer found an illegal instruction at the specified address during a PROGRAM-to-RUN transition. Edit and re-enter the logic at the given address.
Illegal Memory Configuration	The specified memory configuration exceeds the capacity of the total system memory. Either decrease the configuration for selected memory types, or increase the total system memory capacity to accommodate the larger configuration.
Illegal Network	This error should not occur except under extenuating circumstances. The network just entered contains an error that TISOFT does not recognize. Attempt to edit and re-enter the network with valid ladder logic.
Illegal Network – Too Many Elements in Parallel	This error occurs when you attempt to enter a ladder rung that contains more than 32 contact-sized elements in parallel.
Illegal Network – Too Many Elements in Series	This error occurs when you attempt to enter a ladder rung that contains more than 32 contact-sized elements in series.
Illegal Network – Too Many Elements in Series and Parallel	This error occurs when you attempt to enter a ladder rung that contains more than 32 contact-sized elements in series and/or in parallel.
Illegal Network – Too Many Elements in Series or Parallel	This error occurs when you attempt to enter a ladder rung that contains more than 32 contact-sized elements in series and/or in parallel.
Illegal Number of ASCII Characters Received	Maximum number of ASCII characters in a single task code is 72 for NITP protocol.
Illegal PLC Type on Disk	This message indicates that the user has attempted to use a non-Series 500/505 program during TISOFT operations. Make sure the selected Program Disk/Directory used for OFFLINE, AUX SAVE/LOAD, BLOCK PUT, FILE CONVERSION operations, etc., is a Series 500/505 Program.
Illegal Request in Current Operational Mode	An operation is not allowed when the controller is in RUN mode. Place the controller in PROGRAM mode, by means of either the PG/RN function key or AUX 81, and retry the operation.
Illegal Request when Running from EPROM	Your program is in EPROM or EEPROM and the requested operation cannot write to the EPROM.
Illegal Special Function Module	The specified I/O configuration for a slot(s) designated as a SPECIAL FUNCTION module is illegal.
Illegal Task Code Request	The current controller configuration does not recognize or support the specified Task Code.
Incorrect Amount of Data Sent with Request	Task code length field does not agree with number of characters sent.
Incorrect File Format	This message indicates that the user has attempted to use a pre-Series 500/505 Release 5.0 program during TISOFT operations. Use the File Conversion operating software (TICON) to create an converted version of the Program files. This message also indicates that the specified U-memory file contains an invalid S-record type. Modify the file and specify a valid S-record type.

Input Element Missing This error occurs when you attempt to enter a ladder rung that is not valid. An example appears below.



Instruction Number out of Range This message is displayed when you try to FIND an SF statement number in an SF Program/Subroutine that is beyond the end of the program. Use FIND INSTRUCTION: END to find the end of your program quickly.

Integer vs. Real Value Conflict This message is displayed during edit of SF statement parameters in an SF Program/Subroutine. Either the specified field requires an INTEGER response and the user has entered a REAL response, or else the specified field requires a REAL response and the user has entered an INTEGER response. Enter the correct INTEGER/REAL response.

Invalid Action During edit of a loop/alarm table, this message indicates that +INF (positive infinity) or -INF (negative infinity) are invalid values for the specified entry field. Enter a value between +INF and -INF.

During insertion of a row or a column in an RLL network, this message indicates that either the block cursor is incorrectly positioned, or there is insufficient room to perform the insert.

Invalid Block Parameters This error occurs when BLOCK operations involve invalid source beginning / ending and destination addresses for the controller.

Invalid Code Some code in an SF program—such as the scaled integer type code (0% offset, 20% offset, bipolar) in a SCALE or UNSCALE operation—is invalid.

Invalid Context This is an internal TISOFT error and should not occur under normal usage. The TISOFT help system files may have been corrupted.

Invalid Control Block Type The controller or TISOFT malfunctioned.

Invalid Data Received The data in the selected file contains invalid data or has an invalid data format. Make sure the data in the file is correct.

Invalid Data Sent With Command The controller or TISOFT malfunctioned.

Invalid Data Type Code Check MATH, IMATH, and IF-THEN statements.

Invalid Directory This error occurs if the specified directory path does not exist.

Invalid Drive This error occurs if the specified drive does not exist.

**Invalid Element Data After Element
aaaannnn** The import of synonyms or comments has encountered invalid information in the element record following the given element. Check the element type, range, case, data size, and delimiters.

Invalid Element Data at First Element The import of synonyms or comments has encountered invalid information in the first element record of the text file. Check the element type, range, case, data size, and delimiters.

Invalid Element Type – Press ‘?’ for Valid Types	<p>This message is displayed when the user specifies an element type that is illegal for the current field. Press the “\” or Shift “?” keys to display a screen listing valid element types for the current field.</p> <p>Also, during definition of ranges for the Global Search and Replace operation, this message indicates that the user has specified an illegal element type to replace another. For example, replacing an X address with a V address is not permitted.</p>
Invalid Expression	<p>This message indicates that the specified math expression in an SFSUB box parameter in RLL, or in an SF statement in an SF Program/Subroutine is syntactically incorrect. Perhaps an operand has been omitted.</p>
Invalid Instruction in Subroutine	<p>The instruction at the specified address is not permitted within a subroutine. Investigate moving the instruction to the main body of the program.</p>
Invalid Location	<p>The requested instruction cannot be displayed at the current block cursor position. A box may be too large; for example, a 3 row x 3 column CTR box will not fit on the last 2 rows of the rung. Also, multiple-input boxes must be positioned with the upper left corner of the box in the first row, third column from the left power rail.</p>
Invalid Message From DEU	<p>Shut down the system and reboot.</p>
Invalid Network Address	<p>This message is displayed during a BLOCK PUT operation which accesses the disk (that is, DK-RAM, DK-PLC, PLC-DK). A network address has been specified for a rung on the disk that exceeds the RLL memory configuration of the User Program. Specify an address within the configured range of RLL.</p>
Invalid Operation with the Local/Remote Mode	<p>Check the local/remote switch setting on the NIM.</p>
Invalid Operator in an Expression	<p>This message indicates that the specified math expression in an SFSUB box parameter in RLL, or in an SF statement in an SF Program/Subroutine contains an operator which is illegal or unrecognized by the expression type. For example, the exponential operator ** is invalid for Integer math expressions.</p>

Invalid Parameter	<p>During BLOCK operations on V/K memory, this message indicates that the specified V/K memory address exceeds the V/K memory configuration of the program.</p> <p>During BLOCK operations on RAMP/SOAK steps, this message indicates that the specified R/S step number exceeds the maximum number of R/S steps permitted.</p> <p>During definition of the search limits of a Global Search and Replace operation, this message indicates that the specified start address exceeds the specified end address.</p> <p>If you are editing parameters in an SFSUB box in RLL, or SF statements in an SF Program/Subroutine, this message indicates that the specified parameter is illegal for the current field. Real constants are displayed with at least one digit before and after the decimal point; for example, 1.0 or 0.1.</p> <p>If you are programming EEPROMs via AUX 84, this message indicates that the specified source is unrecognized—something other than RAM or EEPROM.</p> <p>Otherwise, this message generally indicates TISOFT has received an illegal value. Verify your inputs.</p>
Invalid Return Value	Invalid parameter passed in a return from a subroutine.
Invalid SF Program Type	During edit of a LOOP table, this message indicates that the SPECIAL CALCULATION option has been selected, but the SF Program number has not been specified. Enter a valid SF Program number in the SPECIAL FUNCTION field.
Invalid SF Statement Size Specified	A statement must be between 2 and 1023 bytes. Check that size of statement conforms to these parameters.
Invalid Variable Data Type for This Operation	An SF statement contains a data type that is not allowed.
Keylock or Password Protect Error	The selected TISOFT operation did not work because the password is enabled or the password operation is not allowed. The CPU keylock can also cause this message.
Ladder Element Required Parameter Missing	This message indicates that a required parameter for a ladder element is missing. Verify that all element parameters are supplied. In output boxes (PGTS, PGTSZ, XSUB) an empty parameter cannot be before another parameter.
Ladder Logic Address Out of Range	Instruction or rung exceeds program memory size. Increase L-memory allocation.
“LBL” Referenced But Not Defined	<p>The specified Label (LBL) is referenced in a Skip-to-Label (SKP) instruction, but does not exist in the program. The LBL must be defined in the same Task segment or Subroutine (SBR) as the SKP and must follow the SKP.</p> <p>Either create the corresponding Label (LBL) or delete the Skip-to-Label instruction referencing it.</p>

Loop Card in Run Mode	This message is displayed to alert the user who presses the EN/DIS key to enable or disable an S-memory Control Block while the Special Function CPU (LOOP) card is in RUN mode.
Loop Variable Required	The PACKLOOP SF statement in an SFPGM or SFSUB requires at least one LOOP data type variable (for example, LPVH.) after the PARAMETERS: prompt. ID numbers and other element types are not allowed.
Loop xxx Not Programmed	The requested LOOP control block has not been programmed and is not included in the LOOP DIRECTORY. An unprogrammed control block cannot be enabled or disabled. To create the LOOP, type in the desired ID number and press SHOW-F2.
Low Must Be Less than High	The specified value in a LOW range field of a Loop/Alarm Table must be less than the value in the HIGH range field. Also, in the SCALE or UNSCALE SF statement of an SF Program/Subroutine, the LOW LIMIT must be less than the HIGH LIMIT.
Low-Low Must Be Less than or Equal to Low	The value in the PV ALARMS LOW-LOW field of a Loop/Alarm Table must be smaller than or equal to the value in the PV ALARMS LOW field.
Maximum Number of Elements Exceeded	<p>During execution of the READ function in a Global Search and Replace operation, this message indicates that more elements were read than can actually be displayed. Select smaller blocks of search limits that will contain a maximum of 32 different element addresses.</p> <p>If you are editing large free format SF statements in an SF Program/Subroutine (MATH, IMATH, IF, PRINT, * (comment)), this message indicates that the maximum statement size has been exceeded. MATH, IMATH, IF expressions may contain a maximum of 74 tokens. A comment (*) may contain a maximum of 1021 characters assuming 66 characters per line. A PRINT statement may contain a maximum of 1017 text characters (in quotes); element addresses require 4-6 characters each.</p> <p>If you are entering RAMP/SOAK steps, this message indicates that the table already contains the maximum number of steps.</p>
Maximum Number of Points Exceeded	During I/O Configuration, this message indicates that the number of points specified for a given element type (X, Y, WX, WY) exceeds the maximum allowed (for example, 32).
Maximum SF Subroutine Nesting Level Exceeded	Check to see that subroutines are not nested beyond 4 levels.

Memory Size Exceeds Total Available Memory	<p>TISOFT requires 540K bytes of available system memory (conventional RAM memory in the computer) in order to be executed. In addition, for off-line operation and on-line operations such as Block Put Controller to Disk and Configure Memory Write to Disk, additional system memory is needed based on the amount of ladder memory configured. For each 4K bytes of ladder memory configured above 16K bytes, 4K bytes of system memory must be available.</p> <p>To accommodate larger L-memory configurations, increase available RAM by removing unnecessary device drivers, resident utility programs, etc. See Section 1.1 for more information about TISOFT's system memory requirements.</p>
Memory Size Is Larger than Maximum Defined Value	Check controller manual for allowed memory sizes.
Memory Size Is Less than Minimum Defined Value	Check controller manual for allowed memory sizes.
Memory Size Is Not Multiple of Allocation Size	Check controller manual for allowed memory sizes.
Missing Required Application "a"	The list of applications is required for operation. "a" represents a list of application IDs.
Mode-Lock Application Refusal by "a"	The requested mode change has been denied by this list of applications. "a" represents a list of application IDs.
Modified Values Entered	This message indicates that the requested write operation completed successfully—either writing the number of Task Codes per Scan to the PLC (AUX 16), or writing V/K memory values.
Module in Slot xx Is Already Configured by Application "a"	An application has tried to assign an I/O slot that is already assigned to another application. "a" represents a list of application IDs.
Multiple Outputs with Stand-alone Output Not Allowed	An element has been used in the output column which must be the <i>only</i> output in the rung. Remove the other outputs from the rung.
Network Contains Extra "STR" Element at Address #####	This message indicates that the rung at the specified address contains invalid Boolean stack logic. It contains an extra element with a STR attribute. Edit the rung and delete the extra STORE element.
Network Contains Invalid Large Box at #####	This message indicates that a large box (superbox) used in the specified rung address cannot be drawn at screen position (1,3) because the network is too complex. Edit and simplify the network.
Network Contains Invalid Multiple Input Box at #####	This message indicates that a multiple input box used in the specified rung address cannot be drawn at screen position (1,3) because the network is too complex. Edit and simplify the network.
Network Contains Invalid Output at Address #####	This message indicates that the rung at the specified address contains a midline output (coil or out box) followed by more input logic (contacts). Edit the rung and remove any midline output elements.

Network Contains No Coils at Address #####

This message indicates that the rung at the specified address contains no coils. Edit the rung and define one or more coils, or delete the rung. Also, contact or box data may be missing.

Network Contains No Cross Referencable Elements

This message is displayed during the On-Screen Cross Reference operation. It indicates that the current rung displayed on the screen contains no Y, C, WY, or V elements to be cross-referenced.

Network Driver Not Installed

The H1 TSR driver has not been installed. TISOFT cannot communicate over the H1 network until it is installed.

Network Missing "STR" Element at Address #####

This message indicates that the rung at the specified address contains invalid Boolean stack logic. It is missing an element with an STR attribute. Edit the rung and add the required STORE element.

Network Too Large to Fit into Program

This message is displayed when you attempt to display or enter a ladder rung that causes RLL to exceed the current L-memory configuration—Online or Offline. This message can also occur when you attempt to display or create a rung too large to fit the TISOFT buffer. Simplify the rung.

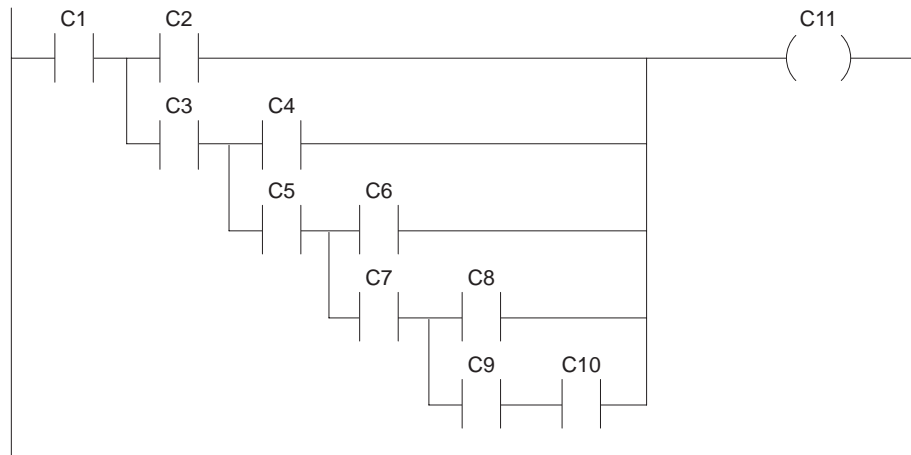
In addition, this message can occur Offline during a BLOCK COPY or PUT LADDER operation which causes RLL to exceed the current L-memory configuration. Online, the user must take care not to push networks off the end of RLL.

Network Was Not Deleted

The controller is keylock protected; therefore, the network cannot be deleted.

Network Will Cause Stack Overflow in PLC

This error occurs when you attempt to enter a ladder rung that is not valid. See the following example.



Note: Up to 16 levels for 555 only. All other controllers allow up to 8 levels.

No Failed I/O Found	This message is displayed during execution of AUX 25 to display failed I/O, and no failed I/O exist.
No Forced I/O of Type Found	This message is displayed during execution of the SEEK operation (under STATUS or CHART). It indicates that none of the addresses for the current I/O type has been forced.
No Help Available for the Current Topic	Information on the requested topic is not included in the TISOFT Help System. Refer to your user manual.
No K-Memory Configured	<p>This message indicates that a K-memory address has been referenced when no K-memory is configured. This may occur when you attempt any of the following operations:</p> <ul style="list-style-type: none"> • AUX functions on Constant memory: Clear (33), Save (63), Load (93), or Verify (17). • Editing K addresses in box parameters. • Block operations on K-memory ranges. • Invoking the K-memory editor. • Editing K addresses in any response field where K would normally be a valid parameter (for example Remote Setpoint field in a Loop or Alarm Table). <p>Use the CONFME function to configure K-memory for 545, 555, 560, 565, and 575 controllers.</p>
No Response from the PLC	This may be returned by an SF I/O module that has lost communication with the controller.
No Response from Special Function Module	SF module is not present, or communication with the controller has been lost.
No U-Memory Configured	Indicates that an operation involving U-memory has been tried, but there is no U-memory configured.
Non Ladder Logic Address out of Range	Multiple program operators have performed conflicting memory configurations.
Offset out of Range	Controller or TISOFT has malfunctioned.
Only One Constant Parameter Is Allowed	The box only allows one parameter to be a constant element type.
Operating System Error Detected	Use AUX 29 to determine the error.
Operation Complete	This message indicates that the selected operation has completed successfully.
Operation Failed	This message indicates a problem has occurred when you use AUX 84 EEPROM programming.

Out of Memory	The requested operation requires more RAM than is available. Free up some RAM within conventional (640K) base memory by unloading any device drivers or memory-resident programs.
PLC Does Not Recognize Hot Back Up	This message indicates that the current controller configuration does not support Hot Back Up (HBU).
PLC Does Not Support This Function	The controller does not support the function that TISOFT tried to execute.
PLC Is Busy – Cannot Complete Requested Operation	Retry operation later.
PLC Is Locked – Invalid Operation	Use AUX 83 from the port that performed the lock to unlock all ports.
PLC Memory Configuration Does Not Match	This message is displayed during an AUX partial Save operation (AUX 61–67) or during an AUX Verify operation (AUX 17) when the memory configuration on the disk is different from the memory configuration in the controller. Use the CONFME operation Online to copy the controller memory configuration to the disk: press READPC-F4, then WRITDK-F3.
PLC Memory Configuration Is Smaller than Disk	This message is displayed during an AUX Load operation (AUX 90–99) when the memory configuration in the controller is not large enough to accommodate the memory configuration on the disk. Make sure the controller memory configuration is at least as large as the disk memory configuration.
Parameter out of Range	If you are editing parameters in an SFSUB box in RLL, or SF statements in an SF Program/Subroutine, this message indicates that the specified parameter is out of the valid range for the current field. If specifying an element address (for example, V5121 or C2049), the address exceeds the current memory or I/O configuration for the element type. If specifying a constant value, the value is either less than the minimum, or greater than the maximum value expected.
Port Configuration Not Supported from This Connection	The port configuration operation is only allowed from the programmable logic controller local ports. Other connections, such as a remote base controller (RBC), will generate this message.
Press Alt H for Help Anywhere within TISOFT	While using TISOFT, if you need information on what hot keys are active, a description of a TISOFT feature, an explanation of how a particular controller instruction operates, or what an error message means, press Alt H for context-sensitive help.
Press Syntax to Verify Program Changes before Selecting Run	The controller is in RUN-TIME EDIT and may contain program changes that have not been activated. Perform a syntax check before going to RUN mode. If the program contains errors and you attempt to go to RUN mode without correcting those errors, the controller automatically goes to Program mode, and the process stops running.

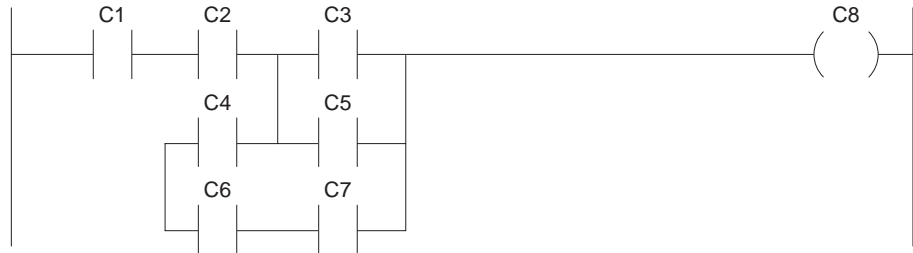
Printer out of Paper, Printing Suspended	Add paper to the printer and continue the print operation.
Printer Timeout, Printing Suspended	The printer has stopped working for some reason. Check the printer and the connections to it and continue the print operation.
Program Load in Progress or Invalidated	A load operation has been started but for some reason has not been completed. Reset the PLC and redo the last load operation.
Program Selected	A program on disk has been selected. The name of the program has been updated in the lower right corner of the screen.
RAM Segment Not Allocated	This is an internal TISOFT error and should not occur except under extenuating circumstances.
Ramp/Soak for SP Not Selected in Corresponding Loop	This message is displayed upon invoking the Ramp/Soak Table editor from the Loop Directory. It is intended to remind the user to make sure the current R/S table has been selected in the corresponding Loop table.
Ramp/Soak Step Type Mismatch	The current step type does not match the step type of the step being modified.
RBC Swapped at Selected Base	This message indicates that the request in AUX 21 to perform a Dual Media RBC role swap has been successfully completed.
Read-only Variable in Output Field	If you are editing parameters in an SFSUB box in RLL, or SF statements in an SF Program/Subroutine, this message indicates that the specified parameter is an Output field. Read-only element addresses (for example, X1, K1) are not permitted on the left side of the assignment operator in an expression, nor are they valid as the destination Table Address in a Pack operation.
Receive Error	Some type of receive error has occurred communicating with TISTAR (Model 20 or Model 70).
Rename across Drives Not Allowed	You cannot rename a file from one drive to another drive. Use the COPY operation.
Request Exceeds Available Memory	The instruction or rung exceeds program memory size. Increase L-memory allocation. This message can also mean that PROFIBUS-DP I/O configuration data has exceeded its memory size. Reduce the size of the PROFIBUS-DP configuration.
Requested Configuration Smaller than Active Program	An area of memory (for example, U-memory) being reduced (during controller Memory Configuration) contains data in the range being truncated. Before writing the reduced memory configuration to the controller, delete the data in the memory area to be reduced.
Requested Data Not Found	During execution of BLOCK operations on Ramp/Soak steps, this message is displayed when the range of steps specified in the source Ramp/Soak table exceeds the number of steps actually programmed. An attempt has been made to read past the end of the table. Specify the actual range of steps programmed. For read operations in general, this message simply indicates that part or all of the information requested does not exist.

Reset Current Transaction

Controller or TISOFT has malfunctioned.

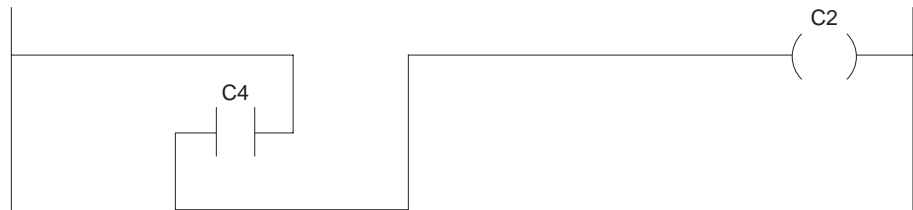
Reverse Power Flow

This error occurs when you attempt to enter a ladder rung that is not valid. An example appears below.



Reverse Power Flow or Connection to Element Missing

This error occurs when you attempt to enter a ladder rung that is not valid. An example appears below.



“RTN” Missing in Subroutine

A required Return (RTN) instruction has been omitted from the subroutine at the specified address.

“SBR” Referenced But Not Defined

A Go-to-Subroutine (GTS, PGTS, PGTSZ) instruction references an SBR that does not exist in the program. Either create the specified Subroutine (SBR) or delete the Go-to-Subroutine (GTS, PGTS, PGTSZ) instruction that references it.

Secondary Connection Failed

The DEU has failed to connect to the named TISTAR (Model 20 or Model 70) secondary.

Secondary Is Not Valid S-Memory Overflow

The named TISTAR (Model 20 or Model 70) secondary is the wrong type.

This message indicates that the total amount of S-memory used by LOOPS, Ramp/Soak tables, ALARMS, and SF Programs/Subroutines exceeds the amount of S-memory configured. This message can occur during any operation which increases the amount of S-memory used: creating a new LOOP or ALARM table, adding R/S steps, entering new SF statements in an SFPGM/SFSUB, or performing BLOCK COPY or PUT operations on S-memory. Either increase your S-memory configuration, or delete any unused LOOPS, ALARMS, R/S steps, or SF statements.

Selected Base Does Not Have a Dual RBC

This message is displayed when you try to use AUX 21 to perform a Dual Media RBC role swap, and there is no Dual RBC configured in the current Base.

SFPGM xxxx Not Programmed

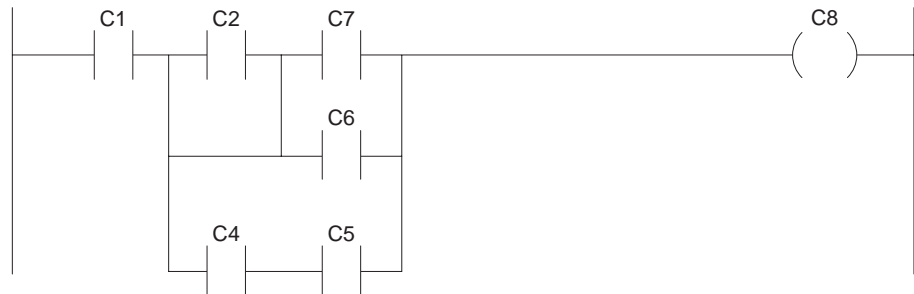
The requested SF Program control block has not been programmed and is not included in the SFPGM Directory. An unprogrammed control block cannot be enabled or disabled. To create the SF Program, type in the desired ID number and press SHOW-F2.

SFSUB xxxx Not Programmed

The requested SF Subroutine control block has not been programmed and is not included in the SFSUB Directory. An unprogrammed control block cannot be enabled or disabled. To create the SF Subroutine, type in the desired ID number and press SHOW-F2.

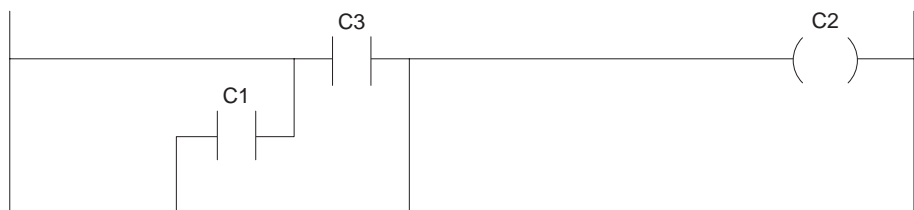
Short Circuit

This error occurs when you attempt to enter a ladder rung that is not valid. See the following example.



Short Circuit or Reverse Power Flow

This error occurs when you attempt to enter a ladder rung that is not valid. See the following example.



Short Circuit, Missing Connection, or Reverse Power Flow

See *Short Circuit or Reverse Power Flow*. Make sure all elements are connected.

Short Circuit, Unconnected Elements, or Reverse Power Flow	See <i>Short Circuit</i> or <i>Reverse Power Flow</i> . Make sure all elements are connected.
Slave Mismatch	The source slave does not match the destination slave.
Special Calculation Variable Not Specified	This message is displayed when you are entering a LOOP table where an SFPGM number has been specified in the Special Function field, but the SPECIAL CALCULATION parameter has not been specified. Either enter an option in the SPECIAL CALCULATION field, or set Special Function to NONE.
Stack Overflow Evaluating Math, If, IMath Expression	Simplify the expressions by dividing them into less complex elements that have intermediate solutions.
Step Not Found	This message is displayed during edit of Ramp/Soak table steps. It occurs when the user attempts to cursor left/right or to ENTER a step without first selecting the type of step (for example Ramp, Soak, or End). Press R to select a Ramp step. Press S to select a Soak step. Or press E to select an End step.
Task Code Buffer Overflow	Too much data was sent to the controller.
Task Code Request Buffer too Large	The controller has malfunctioned.
TCP/IP Network Error – xx, Code: xxx	The given error number has occurred on the TCP/IP network. The code number gives a detailed description of the error.
The Store and Forward Buffer Is Busy	The store and forward buffer is in use. Retry the operation.
Too Many Elements in Series or Parallel at Address #####	This message indicates that the network at the specified rung address contains too many elements in series or parallel. Re-edit the network to reduce the number of elements in series or parallel. Perhaps break into two simpler networks.
Too Many Immediate I/O References	The RLL program contains more Immediate I/O references than the controller can resolve. The controller allows Immediate I/O instructions—either Immediate contact/coil or IORW—to reference up to 32 8-point I/O ranges. Only one Immediate I/O module can be assigned to points within a given I/O range.
Top of Screen	If you are using the up arrow to scroll through a status chart with synonyms, this message indicates that the top of the chart is already on the screen.
U-Memory Data File Is Larger than PLC U-Memory Configuration	The amount of U-memory configured in the controller is too small to accommodate the .UMM data file. Increase the U-memory configuration.

Unable to Create Print File	This message occurs when you attempt to print to a file and, for some reason, the file cannot be created. Perhaps the disk is write protected or full; the disk drive may have been popped open; or a disk hardware failure may have occurred.
Unbalanced Parentheses	This message indicates that the specified math expression in an SFSUB box parameter in RLL, or in an SF statement in an SF Program/Subroutine contains an improper number of left and right parentheses. There must be one right parenthesis “) ” for each left one “ (”—and vice versa.
Unconfigured Base	This message indicates that a base on an unconfigured channel has been referenced during the I/O Configuration operation.
Unexpected “RTN”	An extraneous Return (RTN) instruction has been used in the RLL program.
Unexpected “SBR” Before “END”	The specified subroutine (SBR) is referenced in a Go-to-Subroutine (GTS, PGTS, PGTSZ) instruction, but the corresponding SBR itself does not exist in the program. Either create the corresponding subroutine (SBR), or delete the Go-to-Subroutine (GTS, PGTS, PGTSZ) instruction referencing it.
Unknown Instruction	When you are editing or finding SF statements in an SF Program/Subroutine, this message indicates that the specified SF instruction name is either invalid or not supported. Press the Shift “ ? ” keys to display a screen listing valid SF instruction names for the current field.
Unknown Secondary	The named TISTAR (Model 20 or Model 70) secondary is unknown. Verify that correct secondary name was entered or someone else may be connected to this secondary.
Unknown Standby Message Returned	This message is displayed during AUX 82 Hot Back Up operations when a message received from the standby unit is unrecognized.
Value Must Be Greater than Zero	This message is displayed when you edit a LOOP, ALARM, or Ramp/Soak step. The specified parameter must be a positive value. In a LOOP, the SAMPLE RATE, RESET TIME, and DERIVATIVE GAIN LIMITING COEFFICIENT values must be greater than zero. In an ALARM, the SAMPLE RATE must be greater than zero. The RAMP RATE of a Ramp step must be greater than zero. And the SOAK TIME and DEADBAND values of a Soak step must be greater than zero.
Value Must Be within SP Range	This message is displayed when you edit an ALARM. If the REMOTE SETPOINT field is a constant value, and if CLAMP SETPOINT LIMITS have been specified (enabled), then the REMOTE SETPOINT value must be greater than or equal to the CLAMP SETPOINT LOW and less than or equal to the CLAMP SETPOINT HIGH.

Value Written	When you use AUX 19 to set the controller Scan Time, this message indicates that the selected scan time has been written to the controller. When you edit values (CHGVAL) in STATUS or CHART, this message indicates that the selected value has been written to the controller.
Values Must Be within PV Range	This message is displayed when you edit a LOOP, ALARM, or Ramp/Soak step. The specified parameter must be greater than or equal to PV LOW and less than or equal to PV HIGH. In a LOOP or ALARM, the CLAMP SETPOINT LOW/HIGH limits (if non-zero), and the PV ALARM LOW-LOW/HIGH-HIGH limits must be within PV range. If the CLAMP SETPOINT limits are disabled (both zero), then the SETPOINT must be within PV range. In a RAMP step, the SETPOINT must be within PV range.
Values Must Be within PV Span	This message is displayed when you edit a LOOP, ALARM, or Ramp/Soak step. The specified parameter must be less than or equal to the PV span (PV HIGH - PV LOW). In a LOOP or ALARM, the ALARM DEADBAND and ORANGE DEVIATION ALARM must be within PV span. In a SOAK step, the DEADBAND must be within PV span.
Variable Address Required	This error occurs during edit of SF statements in an SF PROGRAM or SF SUBROUTINE. The parameter indicated must be an element address (for example, V100). Constant values or text are not allowed.
Warning — Instruction Will Not Be Executed	A non-NOP instruction has been detected in an area of memory which will never be executed. The instruction will be ignored during program execution. For example: the area of L-memory after the end of the main body of the RLL program and before the beginning of the first subroutine (SBR) is never executed.
Yellow Must Be Less than or Equal to Orange	This message is displayed when you edit a LOOP or ALARM. The value in the DEVIATION ALARM: YELLOW field must be less than or equal to the value in the ORANGE field.

Appendix C

Converting Program Files

Overview

To convert programs created with TISOFT releases prior to Release 5.0, use the file conversion software included with TISOFT Release 6.3. (Status charts are not converted and must be re-entered for releases earlier than 4.0.) The file conversion program can be used on the following TISOFT releases.

- 545/560/565 Release 3.1 and earlier
- 560T
- 520/530/525 Release 2.3 and earlier
- Series 505 Release 4.x

NOTE: When converting 560/565 Rel 2.3 and earlier files, check the following item if you have analog alarm tables in your program. If you have the setpoint field in the table programmed to S.P. value, the conversion will set the Remote Setpoint field in Release 6.3 to NONE and Monitor Remote Setpoint field to NO.

Conversion
Procedure for
Releases Earlier
than 4.0

Use the following procedure to convert user programs from TISOFT releases earlier than Release 4.0.

NOTE: After you have converted a program to Release 5.0 or later, it is no longer compatible with earlier releases.

1. Change to the Source Directory that contains the user program files to be converted to Release 6.3. Use the DOS Change Directory command; for example, `cd c:\USER2`.
2. Type in **TICON** to invoke the File Conversion software.
3. Press **Return**.

The TISOFT Start-up Screen is displayed.

4. At the prompt, **ENTER NEW PROGRAM NAME**, type in the new program name and the Destination Directory if you want the program in a different directory. To place the program in the current directory, enter only a program name. You must specify a unique program name.
5. Press **Return**.

The message **READING DOCUMENTATION/PROGRAM DATA** is displayed while the user program source files are being read.

The message **WRITING DOCUMENTATION/PROGRAM DATA** is displayed while the user program files are written to the destination directory.

When the conversion is complete with no errors, the following message is displayed: **FILE CONVERSION COMPLETE**.

Conversion
Procedure for
Release 4.x

Use the following procedure to convert user programs from TISOFT Release 4.x to Release 6.3.

NOTE: After you have converted a program to Release 5.0 or later, it is no longer compatible with earlier releases.

1. Change to the Source Directory that contains the user program files to be converted to Release 6.3. Use the DOS Change Directory command; for example, `cd c:\USER2`.
2. Type in **TICON** to invoke the File Conversion software.
3. Press **Return**.

The TISOFT Start-up Screen is displayed.

4. At the prompt, **ENTER NEW PROGRAM NAME**, type in the name of the program to be converted.
5. Press **Return**.

When the conversion is complete with no errors, the following message is displayed: **FILE CONVERSION COMPLETE**.

Appendix D

Using TISOFT with TISTAR/PCS

Users of SIMATIC TISTAR/PCS™ can access TISOFT both off-line and on-line, as described in this appendix.

Accessing TISOFT Off-Line

You can access TISOFT off-line only when TISTAR (Model 20 or Model 70) is not in the Operate State or when there is no communication between the DEU and the Operator Station. If you select on-line instead, you will be prompted for a secondary name to connect to.

At the Start-up Screen (Figure D-1), press OFFLINE-F8.

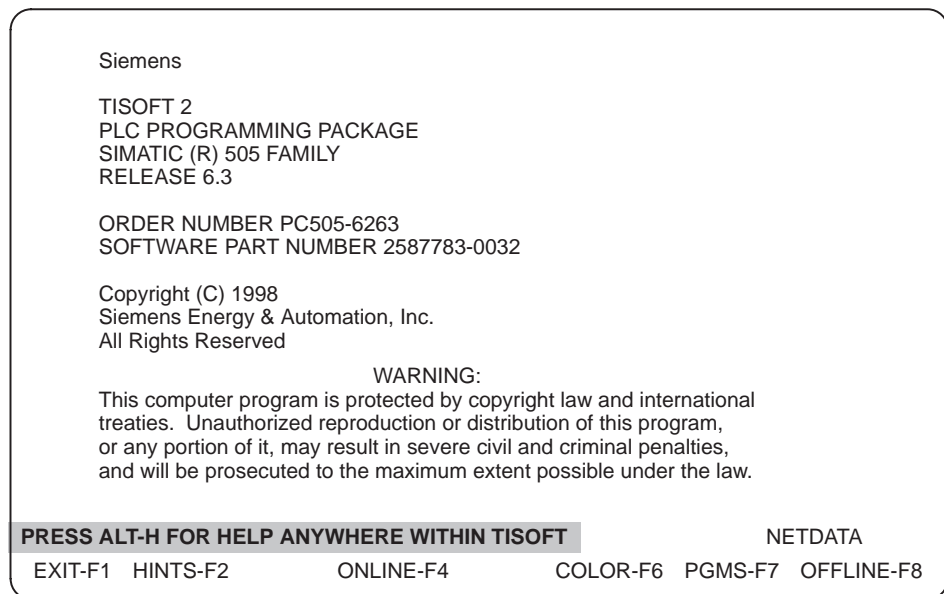
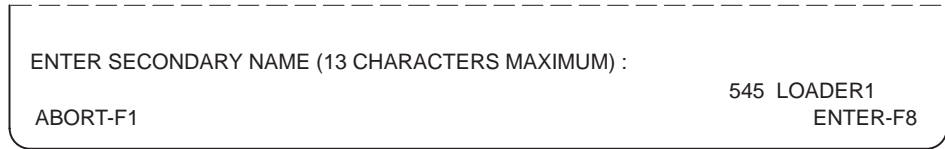


Figure D-1 TISOFT Start-up Screen

Accessing TISOFT
On-Line

When you select **ONLINE-F4** from the TISOFT Start-up Screen, the prompt for selecting a secondary appears, as shown in Figure D-2.



```
ENTER SECONDARY NAME (13 CHARACTERS MAXIMUM) :
545 LOADER1
ABORT-F1                                     ENTER-F8
```

Figure D-2 Secondary Selection Screen

To select a secondary, follow these steps.

1. Type in the appropriate name for the secondary that you configured in TISTAR/PCS.
2. Press **ENTER-F8**.

NOTE: The system does not prompt you for a baud rate. The baud rate is preconfigured at the factory.

If you receive any error messages while using TISOFT, refer to Appendix B.

Appendix E

Using TISOFT with TIWAY

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E.1 Communicating through TIWAY

There are three versions of the host adapter hardware: TIWAY I Host Adapter, UNILINK™ Host Adapter with Host Adapter PIM, and TIWAY Host Adapter Card (CVU card). TISOFT automatically determines the type of adapter installed and displays appropriate options.

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

Setting up the TIWAY I and UNILINK Host Adapters

To communicate with TISOFT, the TIWAY I Host Adapter or the UNILINK Host Adapter must conform to the following parameters.

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

NOTE: Using TISOFT to communicate over a TIWAY network has only been tested in MS-DOS mode. TISOFT may have problems running in Windows.

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

Setting up the TIWAY Host Adapter Card

To use the TIWAY Host Adapter Card to communicate with TISOFT, follow the steps below.

1. Before you begin, use a memory manager program to exclude the memory range for your TIWAY Host Adapter Card. (The default memory range for the TIWAY Host Adapter Card is C800–C900.)

For example, using the DOS memory manager, configure the TIWAY Host Adapter Card by adding the following line to your CONFIG.SYS file.

DEVICE=C:\DOS\EMM386.EXE X=C800–C900

2. To install the TIWAY Adapter Card Driver (CVUTA.DEV), add the following line to your CONFIG.SYS file:

DEVICE=C:\TICVUTA.DEV

3. If conditions permit you to safely interrupt your PC, reboot your PC.

NOTE: You must add Step 1 and Step 2 to your CONFIG.SYS file, in the order given above, before you can load any other TSRs.

TISOFT On-Line

To use the TIWAY Host Adapter Card to invoke TISOFT, follow these steps.

1. Key in the name of the operating software, followed by CVU.
(For example: **TI505 CVU**).
2. Press **Return**.

To use the other adapters to invoke TISOFT, follow these steps.

1. Key in the name of the operating software, followed by the port number. (For example: **TI505 P1** or **TI505 P2**).
2. Press **Return**.

After you select **ON-LINE-F4** with a TIWAY network, TISOFT establishes the means of communication. The type of TIWAY device you are using determines which menu is displayed on the screen. For example, Figure E-1 shows the display that appears if you are communicating through a TIWAY I Host Adapter.

E.2 Selecting Secondary with TIWAY I Host Adapter

If you are using a TIWAY I Host Adapter, type in the controller secondary address at the prompt (shown in Figure E-1). Your valid entries are from 1 to 254. The minimum value is 1, which is the default. Press ENTER-F8 to complete the configuration. The controller program displays within a few seconds.

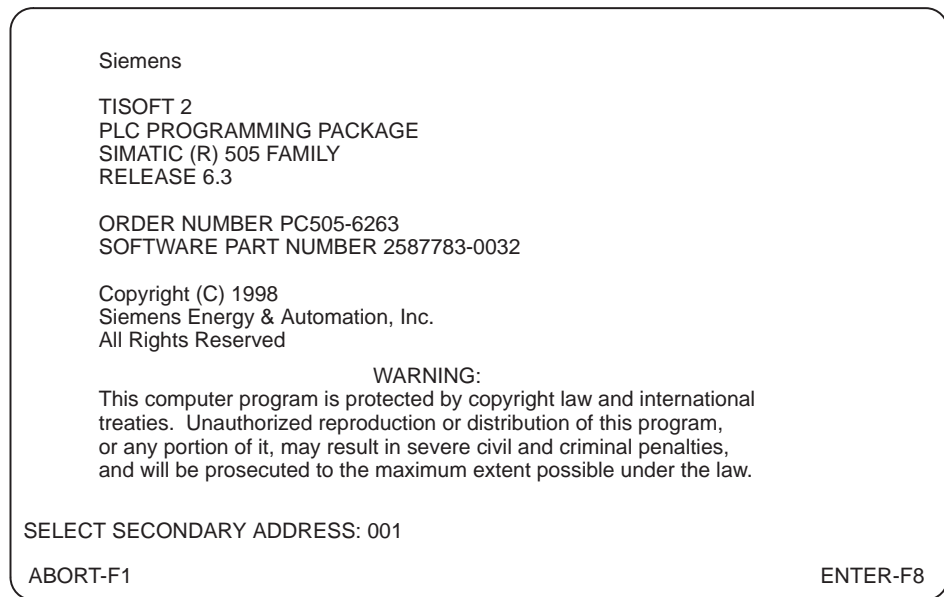


Figure E-1 TIWAY I Host Adapter Secondary Address Menu

E.3 Checking UNILINK Host Adapter Configuration

If your UNILINK Host Adapter has not been configured, you must select the configuration using the UNILINK Host Adapter Configuration Screen. (See Figure E-2.) The default parameters are MHIU/HIU address 0 and MAX SECONDARY ADDRESS: 254.

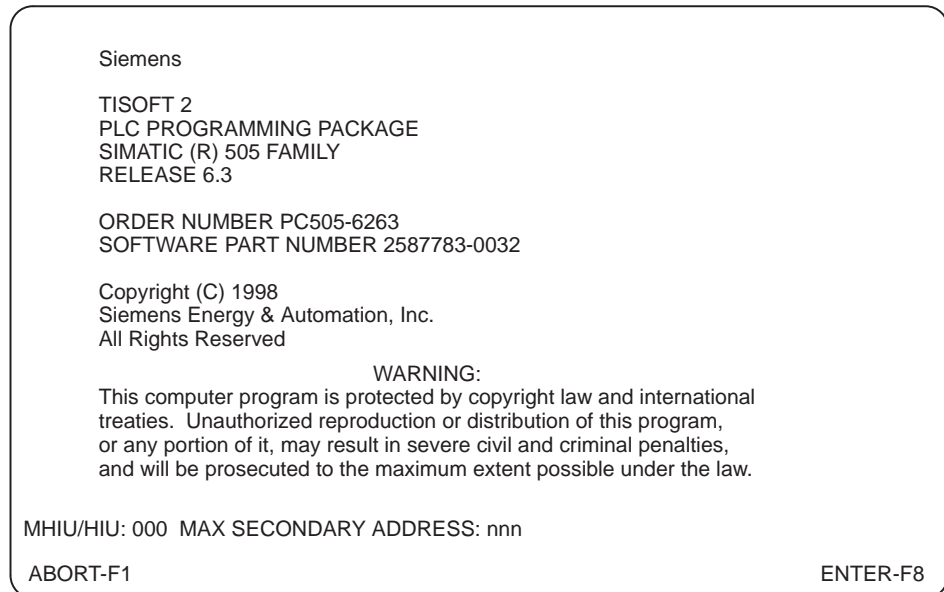


Figure E-2 UNILINK Host Adapter Configuration Screen

E.4 Select Secondary with UNILINK Host Adapter or TIWAY Host Adapter Card

When your programming device is connected through UNILINK Host Adapter or the TIWAY Host Adapter Card—not configured as a Network Manager—and you choose the on-line option, you will be prompted to enter the Secondary Address of the controller.

NOTE: If your UNILINK Host Adapter or TIWAY Host Adapter Card is not configured, you will be prompted first to select configuration parameters. (See Figure E-2.)

To change the UNILINK Host Adapter configuration, press **CONFIG-F2** for the UNILINK Host Adapter Configuration screen menu.

If the UNILINK Host Adapter is not configured as a Network Manager:

1. Type in the controller secondary address at the prompt as shown in Figure E-3. Your valid entries are from 1 to 254. Minimum value is 1, which is the default.
2. Press **ENTER-F8** to complete the configuration.

Siemens

TISOFT 2
PLC PROGRAMMING PACKAGE
SIMATIC (R) 505 FAMILY
RELEASE 6.3

ORDER NUMBER PC505-6263
SOFTWARE PART NUMBER 2587783-0032

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WARNING:

This computer program is protected by copyright law and international treaties. Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under the law.

SELECT SECONDARY ADDRESS: 001

ABORT-F1 CONFIG-F2 ENTER-F8

Figure E-3 UNILINK Host Adapter, Secondary Address Menu

E.5 Configuring UNILINK Host Adapter

If your UNILINK Host Adapter is not configured and you select the on-line option, complete the following steps to enter the desired configuration.

NOTE: Changing the MHIU/HIU parameter to a number other than 0 configures the UNILINK Host Adapter as a Host Interface Unit (HIU) mode rather than a Master Host Interface Unit (MHIU) mode. There can be only one MHIU on a network.

Use the left and right arrow keys to position the cursor in the entry fields.

1. To select HOST address, position the cursor on the **MHIU/HIU:** field and type in a number between 0 and 254. (0 configures the UNILINK Host Adapter as MHIU; 1-254 configures as HIU.)
2. To enter secondary address, position the cursor on the **MAX SECONDARY ADDRESS** field and type in a number between 1 and 254 (default is 254).
3. After completing the fields, press **ENTER-F8** to configure the UNILINK Host Adapter.

Appendix F

TISOFT with Modem

Setting up a Modem Link

When using modems to create a communication link between your TISOFT programming device and the controller, you need to observe the following guidelines.

- Use the MNP (or other) error correction system. Modems will not work reliably if error correction is not used. If your modem does not support error correction, it should not be used.
- Turn compression off. This is sometimes termed MNP4 error correction.
- For higher modem throughput, you may want to use the baud rate conversion feature. This will allow you to communicate at a higher baud rate than the actual data transmission over the telephone line. For example, both the PC and the controller can be set to 9600 baud while the modem is communicating over the phone line at 2400 baud.

Cable Pinouts

Depending on the port hardware on your computer and your controller, use the corresponding cable configuration as listed in Table F-1.

Table F-1 Cable Pinouts for Modem Communications

9-Pin Port to Modem			25-Pin Port to Modem		
Signal Name	PC or Controller 9-Pin	Modem 25-Pin	Signal Name	PC or Controller 25-Pin	Modem 25-Pin
CD	1	8	CD	8	8
RD	2	3	RD	3	3
TD	3	2	TD	2	2
DTR	4	20	DTR	20	20
SGND	5	7	SGND	7	7
DSR	6	6	DSR	6	6
RTS	7	4	RTS	4	4
CTS	8	5	CTS	5	5
RI	9	22	RI	22	22

Using TIDIAL

TIDIAL is an optional operating software that is supplied with TISOFT. TIDIAL allows you to set modem parameters, dial the modem, and go online with TISOFT. To invoke TIDIAL, follow the steps below.

1. Key in TIDIAL.
2. Press .

The screen displays detailed instructions on how to use TIDIAL.

NOTE: TIDIAL will not work when your computer is running Windows 95. To use TIDIAL, restart your computer in MS-DOS mode (the Shut Down dialog from the Windows 95 Start menu provides this option).

Setting Modem Parameters

The modem parameters must be set to exactly the same communication parameters that you will use. Use the following modem parameters: eight bits, no parity, one-stop bit, and the highest baud rate that your equipment will support.

- When you execute TIDIAL, it sends the following default setup string to the modem:

```
AT X1 E1 V1 Q0
```

- If these are not correct for your modem, then you can change them by using the SET command at the DOS prompt. For example,

```
SET M_CONFIG=AT&D0&E14&E3
```

If you want, you can also put this command in the AUTOEXEC.BAT file of your computer.

NOTE: It is strongly recommended that you use exactly the same type of modem at each end of the phone line.

TISOFT with H1 Communications

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G.1 Hardware and Software Requirements

The hardware and software requirements needed for TISOFT to communicate on an H1 network follow.

- SINEC Communications Interface Module (CP1413) for use in personal computers (part number: 6GK1 141-3AE01).
- Personal Computer with at least a 386 microprocessor. As well as the memory requirements and disk space required for direct connect TISOFT, as identified in Section 1.1, the personal computer must also have an additional 40K bytes of available memory and an additional 5 megabytes of free hard disk space.
- MS-DOS® 6.0 or later.
- DOS driver for SINEC communications module (CP1413).
- Planning tool for creating the local database (SINEC COML 1413-TF software).
- Knowledge of the H1 partner device that you want to communicate with (the Series 505 controller with 505-CP1434TF configurator software).
- Series 505 controller with base and power supply.
- 505 H1 Communication Module 505-CP1434TF, Rel. 2.0 or greater, with DOS or Windows configurator (Windows 95 is not supported).
- Windows 3.1 for running COML 1413-TF and Windows version of the 505-CP1434TF Configurator, or, you can use a text editor to modify COML 1413-TF parameters and the DOS version of the configurator.

NOTE: The CP1413 card is incompatible with a number of Compaq® computer models. Before you buy a personal computer, ensure that it is compatible with the CP1413 card.

Figure G-1 shows the hardware and software hierarchy.

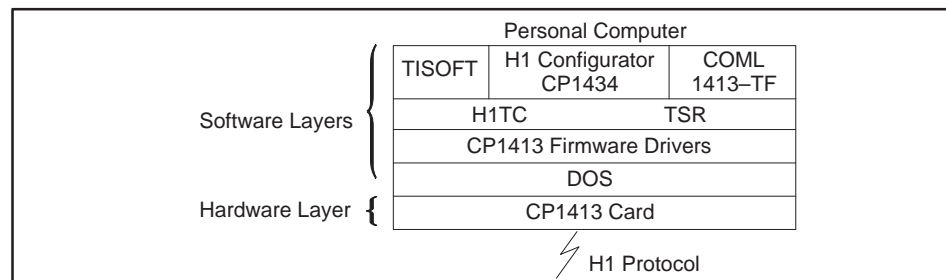


Figure G-1 Hierarchy Block Diagram

G.2 Steps for Installing and Configuring the CP1413 Module

These procedures are designed for initial setup. Once the parameters have been set, there is no need for you to change them, unless you add another node to the network. If you do not need to change the configuration, you can proceed directly to Step 17.

Figure G-2 shows an abbreviated list of the steps needed for installing and configuring your CP1413 module. It is provided to give you an overview of what you are about to do.

NOTE: Do not install your 505-CP1413 Module using the list in Figure G-2. Use the detailed steps that begin on the next page to guide you through the installation.

1. Select an I/O address that is available on your computer.
2. Set jumpers to chosen I/O address.
3. Install card in computer.
4. Select an available interrupt on your computer.
5. Select a DRAM address that is available on your computer.
6. Configure extended memory manager to exclude DRAM address (if applicable) of CP1413 (that is, either D000 or E000).
7. Select unique local ethernet address for CP1413 module.
8. Install software from diskette.
9. Test to ensure that the DRAM address doesn't conflict with the PC.
10. Preparing to Configure the H1 Network.
11. Configure 505-CP1434TF H1 module, using its configurator, for a single TISOFT station.
12. Configure 505-CP1434TF H1 module, using its configurator, for multiple TISOFT stations.
13. Reboot your PC.
14. Install H1 cabling.
15. Load CP1413 drivers.
16. Load H1 task code drivers.
17. Access H1 devices using TISOFT.
18. Display TISOFT start-up screen.
19. Select the H1 network node name.

Figure G-2 Overview List for Installing the CP1413 Module

Steps for Installing and Configuring the CP1413 Module (continued)

NOTE: If at any point your PC locks up, power down the system and go back to the previous steps and try other options for the settings.

Step 1: Select the I/O Address

Select an available I/O address for the CP1413. This number should be one of the following: 03E0, 0390, 03E8, or 0100. The I/O address chosen should be one that is not already being used on your computer.

Step 2: Set Jumpers

Set the jumpers on the CP1413 module as shown in the Hardware Installation section of the *SINEC TF-Net1413/MS-DOS, Windows* manual. Try a configuration register address of 0x03E0 first, if you are unsure what I/O addresses are available on your computer.

 **WARNING**

Before you install the H1 Communications Module (CP1413) into your personal computer, make sure your power supply is turned off to guard against sudden equipment startup or shock.

Control devices can fail in an unsafe condition, which could result in death or serious injury to personnel, and/or equipment damage.

Safety devices and techniques must be used in all industrial control systems to guard against sudden equipment startup.

Step 3: Install the CP1413 Card

Install the CP1413 card into your personal computer.

Step 4: Select an Interrupt

Select an available interrupt for the CP1413. This number should be one of the following: INT 5, INT 10, INT 12, or INT 15. Try INT 12 first. The interrupt number chosen should be one that is not already being used on your computer.

Step 5: Select a DRAM Address

Select an available DRAM address. This number should be either D0000 or E0000. Try DRAM address D0000 first, if you are unsure which DRAM address is available on your computer.

NOTE: Ensure that the DRAM address selection (D0000 or E0000) does not conflict with any other boards or software in your PC. Address E0000 often conflicts with shadowed BIOS and VGA ROMs, caches, and optional ROMs.

**Step 6: Configure
Extended Memory
Manager**

In order to run TISOFT with H1, you need to install a memory manager. TISOFT has been successfully configured with H1 using CEMM, QEMM®, DOS 5.x EMM386, or DOS 6.x MEMMAKER. When you edit your CONFIG.SYS to install the memory manager of your choice, you must include a memory exclusion command which identifies the region you have set aside for use by the CP1413 card; the memory manager cannot have access to the region of memory reserved for the CP1413.

Use an ASCII text editor to install the memory manager of your choice in your CONFIG.SYS. Figure G-3 shows the appropriate instruction for installing CEMM, QEMM, DOS 5.x EMM386, or DOS 6.x MEMMAKER, in that order. The memory exclusion command for each line is represented by the bolded text.

```
rem Compaq DOS 5.0
device=c:\dos\cemm.exe 384 noems romcompress x=d000-dfff

rem Quarterdeck expanded memory manager
device=c:\qemm\qemm386.sys ram frame=none exclude=d000-dfff

rem EMM386 from DOS 6.0
device=c:\dos\emm386.exe noems x=d000-dfff
```


Figure G-3 Three Memory Manager Setup Examples

NOTE: After you modify the CONFIG.SYS file to install the memory manager, power cycle the system to verify that it will boot up correctly.

Configure your extended memory manager, if applicable, to exclude the DRAM address range of the CP1413. For example, in your CONFIG.SYS file use DEVICE=EMM386.EXE X=D000-DFFF. Refer to your memory manager's manual for additional information.

**Step 7: Select
Unique Local
Ethernet Address**

Select a unique local Ethernet address, e.g., 080006010003, that is not already in use on your H1 network.

 WARNING
<p>Using the same Ethernet H1 network address more than once on the same H1 network can cause unpredictable controller behavior.</p> <p>Unpredictable controller behavior could cause death or serious injury to personnel, and/or damage to equipment.</p> <p>Ensure that you do not repeat an Ethernet H1 network address on the same H1 network.</p>

Steps for Installing and Configuring the CP1413 Module (continued)

Step 8: Install Software from Diskette

Install the CP1413 software from diskette by following the procedures in the Software Installation section of the *SINEC TF-Net1413/MS-DOS, Windows* manual. Only C:\SINEC\BIN, C:\SINEC\COM, and C:\SINEC\DATA subdirectories are required by TISOFT.

Once you have installed the card, run the INSTALL utility located on the first TF-1413 disk provided with your card. This batch program loads all software onto your hard drive and then invokes NETINST.EXE. The NETINST utility generates a series of prompts that must be answered so that the CP1413 card can be correctly configured. Use the answers you chose from the steps above to respond to the prompts. The following is a list of selections that work for many installations:

Description	Select:
Which software to use?	B: Full set
Enter the drive to install to	C ← (Your local hard drive letter)
Installation mode	Detailed mode
Number of installed boards	New installation
Which board to install	CP1413
Layer 2 communications	YES
Layer 4 communications	YES
Layer 7 communications	YES
Dual-port RAM address	0D0000H-64K ← (from Step 6)
Ethernet address	08.00.06.01.00.03 ← (from Step 7)
AT bus interrupt	INT 12 ← (from Step 4)
Configuration register	03E0H ← (from Step 1)
Local database	\sinec\data\startup.LDB
Select Quit	

The NETINST utility creates the directory \sinec on the selected hard drive. This directory holds the associated configuration files and the drivers needed to communicate over the H1 network.

You can change these settings later by running C:\SINEC\BIN\NETINST.EXE.

NOTE: You can obtain additional information about running these utilities by consulting the Software Installation section of the *SINEC TF-NET1413/MS-DOS, Windows Manual*.

If Configuration Fails. If the default configuration operates incorrectly, verify that the dual-port RAM address or the AT bus interrupt is correct for the host computer.

Dual-Port RAM (DPRAM) Address. This parameter specifies an area of high memory that will be used by the CP1413. It is possible that this area of memory is already in use by another piece of hardware in the system. Network cards and SCSI controllers often require an area of high memory; check them for conflict with the CP1413. If it is not possible to change the address of a conflicting card, then you will have to change the dual-port RAM address of the CP1413 to 0E0000H and power cycle your computer. Run C:\sinec\bin\netinst.exe to re-configure your system.

AT Bus Interrupt. The CP1413 card needs exclusive use of one hardware interrupt in order to function. This parameter specifies that address. Occasionally, another device, such as a mouse or a multi-media card, uses this interrupt. In most instances, changing the interrupt from 10 to 12 works.

Step 9: Ensure That the DRAM Address Does Not Conflict

Run C:\SINEC\BIN\DPRAMTES. This program requires two parameters. The first parameter is the I/O address. The second parameter is the DPRAM address. An example of both would be C:\SINEC\BIN\DPRAMTES 03E0 D0000. If it displays an error, the CP1413 will not work properly at the DRAM address you selected. For additional information, refer to the Dealing with Problems section of the *SINEC TF-Net1413/MS-DOS, Windows manual*.

After running DPRAMTES once, you need to follow the note below. DPRAMTES modifies the I/O address and DPRAM address and can only be run once before power cycling.

NOTE: The CP1413 requires a hardware reset whenever its hardware I/O or INT (IRQ) number addresses are changed. If the addressing is changed, you must turn off the power to your PC and wait a few minutes before reapplying power. Rebooting your PC using **CTRL ALT DEL** is not sufficient. The CP1413 card determines the address settings only when electrical power is applied.

Steps for Installing and Configuring the CP1413 Module (continued)

Step 10: Preparing to Configure the H1 Network

When the CP1413 card and all TF-NET software have been installed, you can proceed to configure the network. First-time H1 users will find two software tools helpful: the H1 Configurator, which is shipped with the CP1434TF modules, and the SINEC Configuration Management Local (COML), which is automatically installed when you run INSTALL to set up the CP1413. Both of these programs run under Windows.

Before TISOFT can communicate using the SINEC Communications Processor (CP1413TF), the associations on the CP1413 card and the CP1434TF module must be correctly configured. The H1 Configurator allows you to create a Technology Function (TF) Service for the CP1434TF module; you can then use COML to create a matching association for the CP1413 card.

NOTE: If you have not yet installed the H1 Configurator, you must do so before continuing. Consult the Installing the Software section in the *SIMATIC 505 SINEC H1 Communication Processor User Manual* for the proper procedure to follow.

In order for one node to communicate with another, each node must be configured to recognize the other one. When you create associations, you give each node an identifier (that is, Transport Service Access Point, or local TSAP) and you tell it the identifier (remote TSAP) of the other node.

Step 11: Use COML to Set up CP1413 Local Database (For a Single TISOFT Station)

Set up TSAP addresses for either a single TISOFT or multiple TISOFT stations. For a single TISOFT station, follow the directions in this step. For multiple TISOFT stations, follow directions given in Step 12.

Single-User TISOFT Installations. To use TISOFT from a single station over H1 (where TISTAR/PCS is not in use), only a minimum configuration is necessary. Figure G-4 shows an example of TSAP addressing guidelines for UnitA and UnitB. For peer-to-peer and TF Server applications, you may need additional items configured in the 505-CP1434TF (refer to the 505-CP1434TF documentation). For cases where multiple TISOFT stations are desired on the H1 network, you will need additional TSAPs configured. These are described later in this section.

Once a TISOFT PC makes a connection with a controller through the hidden connection, both the controller and that PC must be power cycled in order to release the connection so that another PC can be allowed to connect to the hidden TSAP of that same controller.

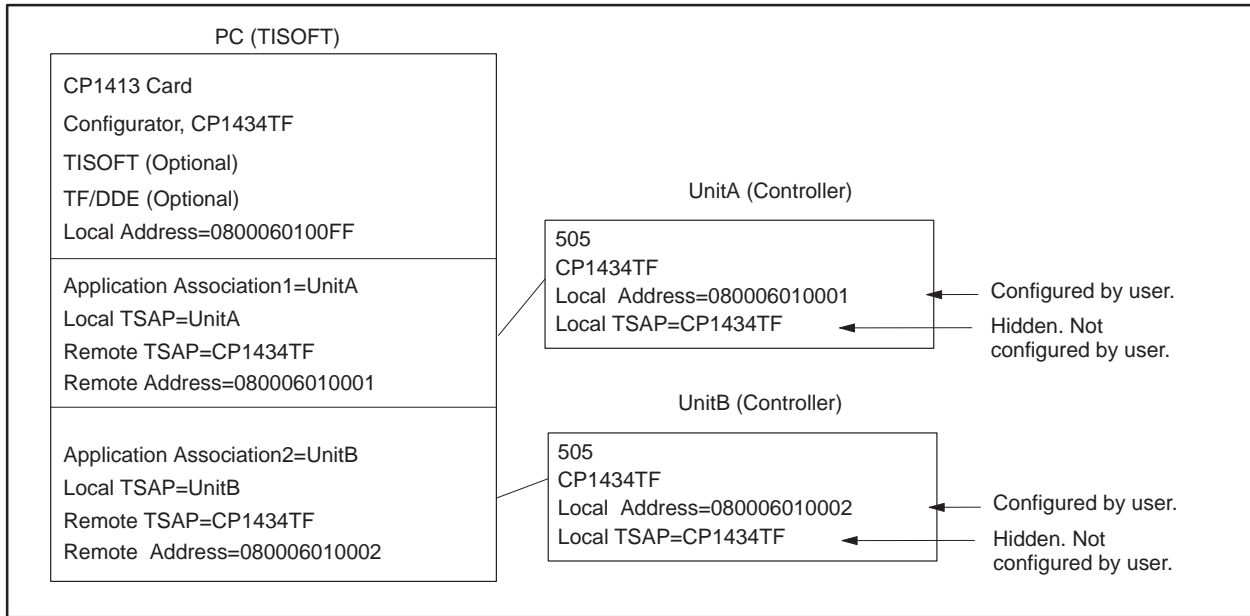


Figure G-4 Addressing TSAPs for a Single TISOFT Station

NOTE: An “application association” represents the connection between two applications using SINEC H1. TISOFT references the application association by using the local name of the application association (labeled application association name when set up in COML program).

WARNING

Using the same Ethernet H1 network address more than once on the same H1 network can cause unpredictable controller behavior.

Unpredictable controller behavior could cause death or serious injury to personnel, and/or damage to equipment.

Ensure that you do not repeat an Ethernet H1 network address on the same H1 network.

Select an Ethernet Address for Each Device on the H1 Network.

Perform the following steps to select an Ethernet address for each device.

1. Use the 505-CP1434TF H1 Configurator to create a configuration file for the first CP1434TF module, in File menu. Enter a unique local Ethernet address (e.g., 080006010001) that is not already in use on your H1 network. You do not need to enter a TF Service now. TF Services are not needed for TISOFT access. You can configure TF Services if you add another application that requires them. Refer to the TF User Interface section of the *SINEC H1 Communication Processor User Manual* for additional information.
2. Connect your PC serial port cable to the CP1434TF module using a programmable logic controller programming cable (Part Number 2601094–8001).
3. Select the menu command **Transfer** → **Download Configuration to CP...** to download the configuration file containing at least the Ethernet address to the CP1434TF.

NOTE: When the configurator downloads a configuration file to the CP1434TF module, a hidden application association is also transferred. This association has the name CP1434TF and TSAP CP1434TF. Its remote address and TSAP address are “unspecified”, allowing any host to connect to it. When several CP1434TF modules are on the same network, each module has this same association, but the local addresses will differ.

4. Repeat steps 1. and 2. for the second CP1434TF module, but this time type a different unused local Ethernet address, for example:

080006010002.

Creating a Matching Association with COML. The next association that you create is for the CP1413 card, allowing it to recognize and communicate with the CP1434TF module. Follow these steps to create an association for your CP1413 that matches the TF Service that you just filled out on the CP1434TF:

1. Invoke COML from Windows. This opens the SINEC COML 1413TF window.
2. From the drop-down File menu, select New to create a new configuration file to hold the association that you want to make.
3. Fill out the following fields in the SINEC COML 1413TF window.

Type a local station address that is not already in use on your H1 network: **0800060100FF**. This address needs to be the same address that you entered previously in C:\SINEC\BIN\NETINST.EXE.

Application	UnitA	UnitB
association name:	UnitA	UnitB
Remote Addr:	080006010001	080006010002
Local TSAP:	UnitA	UnitB
Remote TSAP:	CP1434TF	CP1434TF

For further information on how to use the COML 1413-TF software, refer to the *COML 1413-TF for Windows Configuration Guide*.

4. Save the file in text format in the directory C:\SINEC\DATA as a file name STARTUP.TXT. Generate a binary database file with the name STARTUP.LDB in the directory C:\SINEC\DATA. Exit the COML program.
5. Skip Step 12 and proceed to Step 13.

Steps for Installing and Configuring the CP1413 Module (continued)

Step 12: Use COML to Set up CP1413 Local Database (For Multiple TISOFT Stations)

Multiple-Station TISOFT Installations. To use TISOFT on multiple stations over H1, you must configure a set of TSAPs for each connection (see Figure G-5). This includes installations where TISTAR/PCS is in use because PCS expects to use the hidden TSAP connection in the CP1434TF. For the multi-user installation, you must use the H1 configurator to set up a new TSAP in the CP1434TF, such as “PC1,” for the first station, “PC2” for the second station, etc. The steps are the same as those outlined for the single-user installation, except that these “PC1,” “PC2,” etc., TSAPs must be substituted for the hidden “CP1434TF” TSAP in the procedure. Refer to your *SINEC H1 Communication Processor User Manual* for more information.

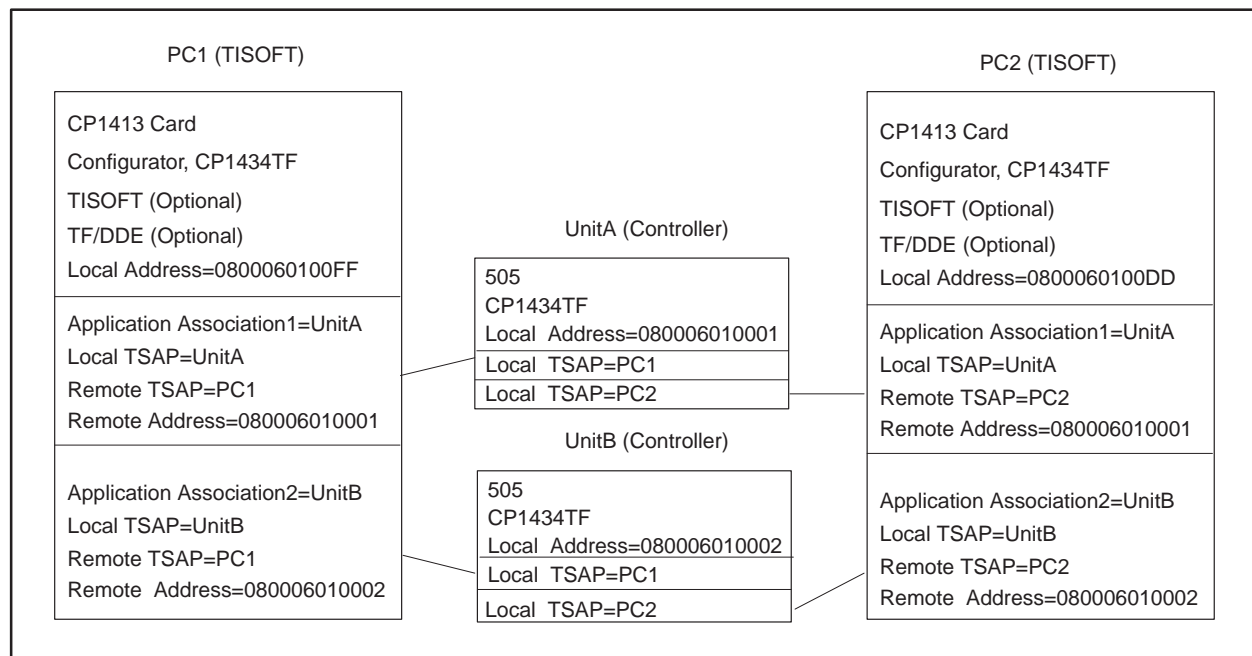


Figure G-5 Addressing TSAPs for Multiple TISOFT Stations

NOTE: An “application association” represents the connection between two applications using SINEC H1. TISOFT references the application association by using the local name of the application association (labeled application association name when set up in COML program).

Select an Ethernet Address for Each Device on the H1 Network. Perform the following steps to select an Ethernet address for each device:

 **WARNING**

Using the same Ethernet H1 network address more than once on the same H1 network can cause unpredictable controller behavior.

Unpredictable controller behavior could cause death or serious injury to personnel, and/or damage to equipment.

Ensure that you do not repeat an Ethernet H1 network address on the same H1 network.

1. Use the 505-CP1434TF H1 Configurator to create a configuration file for the first CP1434TF module, in File menu. Enter a unique local Ethernet address (for example, 080006010001) that is not already in use on your H1 network. Create a TF Service with the remote ethernet address set to the address of your CP1413 card. The remote TSAP name should be set to the same name as the local TSAP name on the CP1413. The local TSAP name should be set to the same name as the remote TSAP name on the CP1413. Additional TF Services are not needed for TISOFT access. You can configure additional TF Services if you add another application that requires them. Refer to the TF User Interface section of the *SINEC H1 Communication Processor User Manual* for additional information.
2. Connect your PC serial port cable to the CP1434TF module using a programmable logic controller programming cable (Part Number 2601094–8001). Use the configurator to “transfer” the configuration file containing at least the Ethernet address to the CP1434TF.

NOTE: When the configurator downloads a configuration file to the CP1434TF module, a hidden application association is also transferred. This association has the name CP1434TF and TSAP CP1434TF. Its remote address and TSAP address are “unspecified”, allowing any host to connect to it. When several CP1434TF modules are on the same network, each module has this same association, but the local addresses will differ.

3. Repeat steps 1. and 2. for the second CP1434TF module, but this time type a different unused local Ethernet address: 080006010002.

Steps for Installing and Configuring the CP1413 Module (continued)

Creating a Matching Association with COML. The next association that you create is for the CP1413 card, allowing it to recognize and communicate with the CP1434TF module. Follow these steps to create an association for your CP1413 that matches the TF Service that you just filled out on the CP1434TF:

1. Invoke COML from Windows. This opens the SINEC COML 1413TF window.
2. From the drop-down File menu, select New to create a new configuration file to hold the association that you want to make.
3. Fill out the following fields in the SINEC COML 1413TF window.

Type a local station address that is not already in use on your H1 network: **0800060100FF**. This address needs to be the same address you entered previously during CP1413 software installation (Step 8) or using the C:\SINEC\BIN\NETINST.EXE program.

Application association name:	UnitA	UnitB
Remote Addr:	080006010001	080006010002
Local TSAP:	UnitA	UnitB
Remote TSAP:	PC1	PC1

For further information on how to use the COML 1413-TF software, refer to the *COML 1413-TF for Windows Configuration Guide*.

4. Save the file in text format in the directory C:\SINEC\DATA as a file name STARTUP.TXT. Generate a binary database file with the name STARTUP.LDB in the directory C:\SINEC\DATA. Exit the COML program.

-
5. For each additional TISOFT station, install the CP1413 card and configure it as described in this appendix (starting with Step 1) on that particular computer. When configuring the local database for its CP1413, set its remote TSAP names, such as "PC2", "MainOffice", etc. Then create a TF-Service for each 505-CP1434TF configuration with the 505 configurator, and include the Ethernet address of the second TISOFT station, a remote TSAP name, e.g., "UnitA", and a local TSAP name, e.g., "PC2". For example:

Type a local station address that is not already in use on your H1 network: 0800060100FE. This address needs to be the same address you entered previously in C:\SINEC\BIN\NETINST.EXE.

Application		
association name:	UnitA	UnitB
Remote Addr:	080006010001	080006010002
Local TSAP:	UnitA	UnitB
Remote TSAP:	PC2	PC2

To automatically load the CP1413 drivers, initialize the CP1413 and allow TISOFT to use the CP1413. Type the following lines in your AUTOEXEC.BAT file:

```
cd c:\sinec\bin

tfnetdrv           (Loads the CP1413 driver)

scp_mon -c         (Loads the CP1413 firmware)

scp_mon -l         (Loads the CP1413 local database)

cd \TI             (Use cd \TI for TISOFT)

H1TC 0x82          (Loads the H1 Series 505 task code driver)

cd \               (Returns default directory to root)
```

The H1 Series 505 task code driver, H1TC, is a TSR that handles Series 505 requests for the CP1434TF Configurator and TISOFT. The task code driver uses one software address, usually 0x82 (0x80 and 0x81 are usually used by the CP1413 TFNETDRV driver and the TF/DDE driver). If 0x82 is already in use, pick an unused number above 0x82.

Steps for Installing and Configuring the CP1413 Module (continued)

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

Step 13: Reboot Your PC

If conditions permit safely interrupting your PC, you can reboot your PC at this time. After you reboot your PC, the AUTOEXEC.BAT changes and CONFIG.SYS changes that you just made will be used.

Step 14: Install H1 Cabling

Install H1 cabling. Three example installations are shown in Figure G-6 through Figure G-8. Figure G-6 shows a PC with a CP1413 module installed, and up to seven Series 505 systems. Each system is shown with a CP1434TF module cabled to the H1 network by a multi-port transceiver. If no external network exists, then the multi-port transceiver operates in loopback mode.

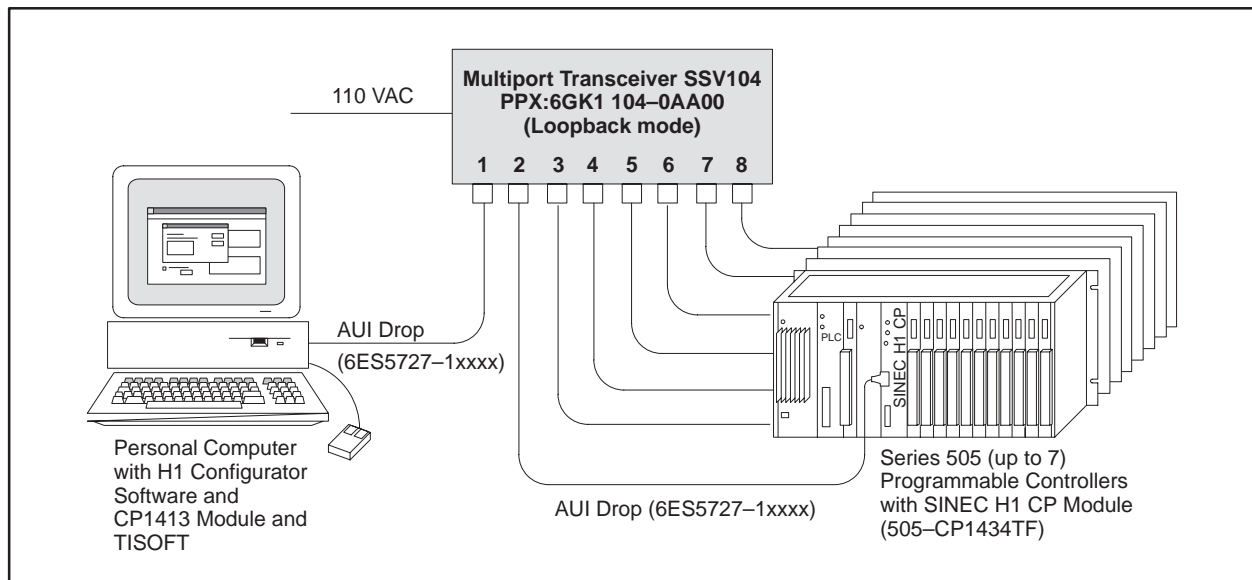


Figure G-6 Multi-Port Transceiver Cabling

Using a self-powered, multi-port, transceiver configuration gives you the option to lower the power requirement from the base. Refer to the *SIMATIC 505 SINEC H1 Communication Processor Manual*.

Figure G-7 and Figure G-8 are functionally the same. Both figures show a PC with a CP1413 module and a single Series 505 system. Figure G-7 illustrates the use of a separate single-port transceiver for each device. Figure G-8 shows both devices attached to a single two-port transceiver.

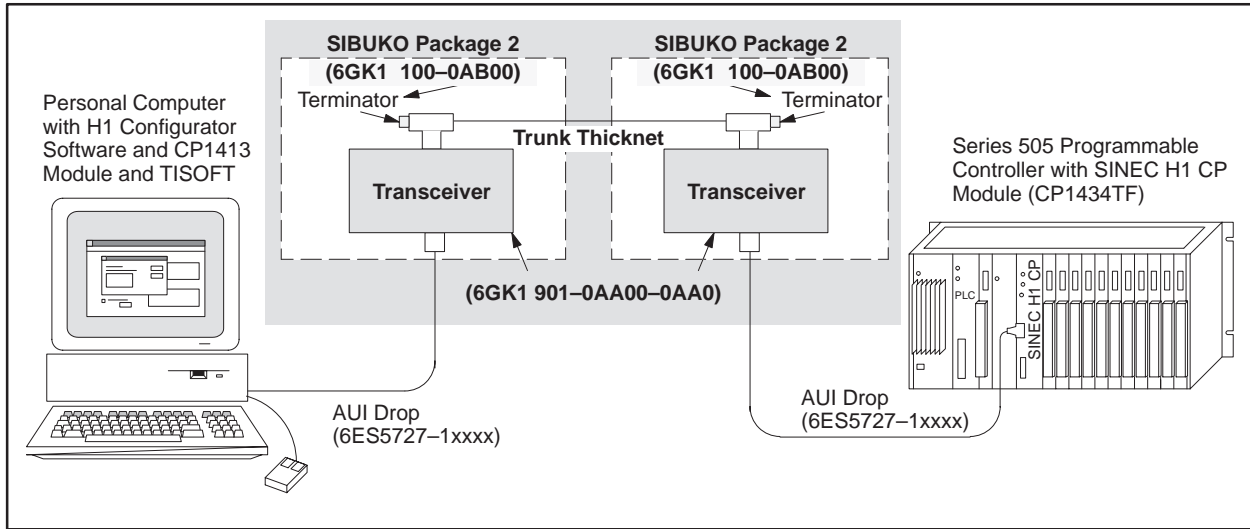


Figure G-7 Single-Port Transceiver Cabling

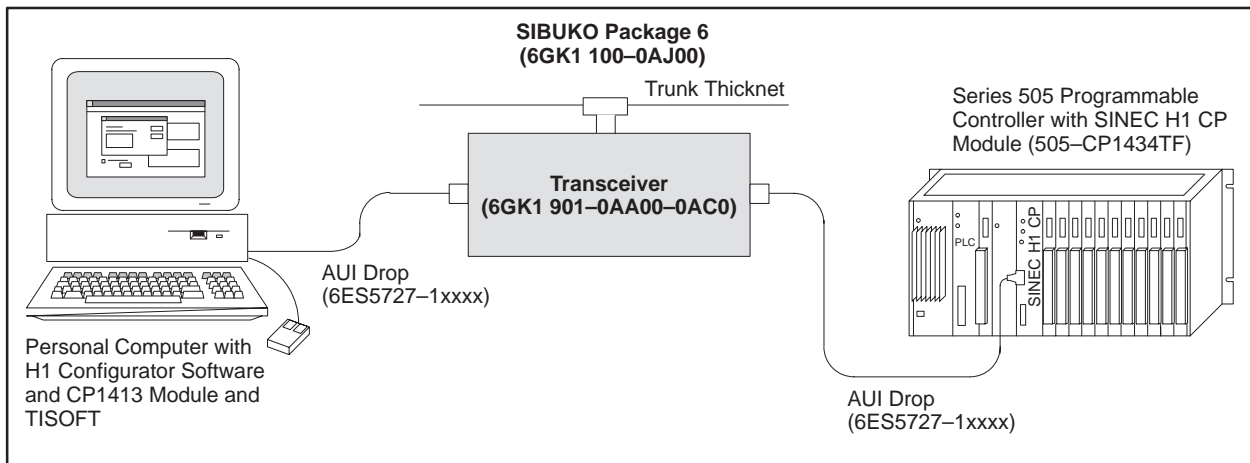


Figure G-8 Two-Port Transceiver Cabling

NOTE: The two-port transceiver must be terminated internally if the trunk cable is not installed. See the transceiver manual (6GK1 972-1AA00-0AA1) for instructions on terminating the transceiver.

Steps for Installing and Configuring the CP1413 Module (continued)

Step 15: Load CP1413 Drivers

Verify CP1413 Configuration. To confirm that you have successfully accomplished the configuration of your CP1413 card and the installation of your memory manager, you can generate a textual database and use it to test the system.

1. Display the \sinec\com directory. This directory contains the default database description H1.TXT, which was installed along with the TF-NET 1413 software. You can use the CVH1TF utility to create a sample local database (LDB) from the H1.TXT database description.

From the DOS command prompt, enter:

```
cvh1tf h1.txt \sinec\data\startup.ldb
```

2. Next, change to the \sinec\bin directory.

To start up the CP card, enter:

```
startcp.bat
```

If the system is correctly configured, the messages

```
CP ok
```

```
and
```

```
LDB downloaded
```

appear on the screen. If a problem is reported, or the system locks up, it is probably due to a conflict in either the dual-port address or the AT bus interrupt, which you can correct. Run c:\sinec\bin\netinst.exe and change the settings. The prompts you will see are given in Step 8. Then continue with the “if configuration fails” section in Step 8.

3. If the system did not lock up, and no errors were displayed on the screen, you can continue. From the DOS command line at the C:>SINEC\BIN prompt, enter:

```
scp_mon -s
```

This returns a box describing the status of the CP1413 card. Verify that the database is consistent and that all tasks are running.

NOTE: You can obtain additional information about starting the module and the driver, and using the SCP monitor, by consulting the Software Installation chapter (Sections 3.2 and 3.3) of the *SINEC TF-NET1413/MS-DOS, Windows Manual*.

Load Drivers. To automatically load the CP1413 drivers, initialize the CP1413 and allow TISOFT to use the CP1413.

NOTE: The commands are listed below, but do not enter them into your AUTOEXEC.BAT file until you have completed the configuration of your CP1413 card and all conflicts are resolved.

```
cd c:\sinec\bin

tfnetdrv          (Loads the CP1413 driver)

scp_mon -c        (Loads the CP1413 firmware)

scp_mon -l        (Loads the CP1413 local database)

cd \TI            (Use cd \TI for TISOFT)

H1TC 0x82         (Loads the H1 Series 505 task code driver)

cd \              (Returns default directory to root)
```

Steps for Installing and Configuring the CP1413 Module (continued)

Step 16: Load H1 Task Code Driver

If the H1 task code driver has not been installed, change to the directory on your computer where you placed TISOFT and type: `H1TC 0x82`.

The H1 Series 505 task code driver, H1TC, is a TSR that handles Series 505 requests for the CP1434TF Configurator and TISOFT. The task code driver uses one software interrupt number, usually 0x82 (0x80 and 0x81 are usually used by the TFNETDRV and the TF/DDE drivers). If 0x82 is already in use, pick an unused number above 0x82.

Step 17: Access H1 Devices Using TISOFT

After TISOFT is installed, you are ready to select the TISOFT operating software you need. The listing below defines the options you have available.

- *TI505* – selects main TISOFT operating software and proceeds to start-up screen.
- *TIXREF* – selects print cross-reference and proceeds to start-up screen.
- *LO505* – selects the load-only version of TISOFT.
- *RO505* – selects the read-only version of TISOFT.

To access the H1 network with TISOFT, type in the name of the TISOFT operating software you selected from the list above, followed by *H1* (for example, `TI505 H1`) and press `[Return]` or `[Enter]` to invoke TISOFT.

**Step 18: Display
TISOFT Start-up
Screen**

After you enter the TISOFT operating software selection you wish to use, the start-up screen is displayed as shown in Figure G-9. Your options for choosing on- or off-line operation, color, and programs are accessed from the start-up screen. Refer to Chapter 2 for instructions on using these options. To select an H1 network node name, you need to press **ONLINE-F4**.

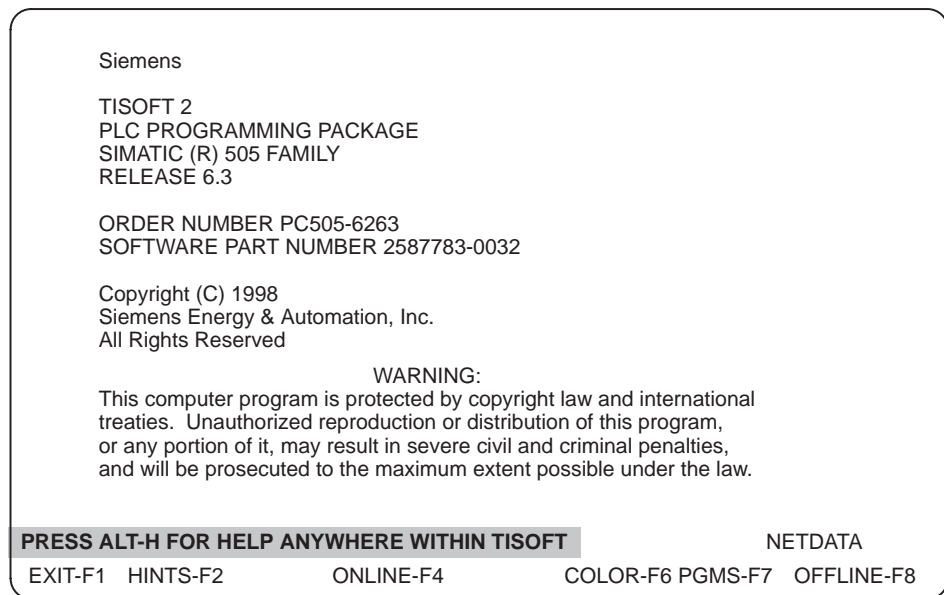


Figure G-9 TISOFT Start-up Screen

Steps for Installing and Configuring the CP1413 Module (continued)

Step 19: Select the H1 Network Node Names

The H1 Network Names screen appears as in Figure G-10. You can then select a node name. These are the node names you configured using the COML 1413-TF software prior to rebooting.

Using the arrow keys, select an H1 network node name and press ENTER-F8 or **Return** or **Enter**. TISOFT will go online.

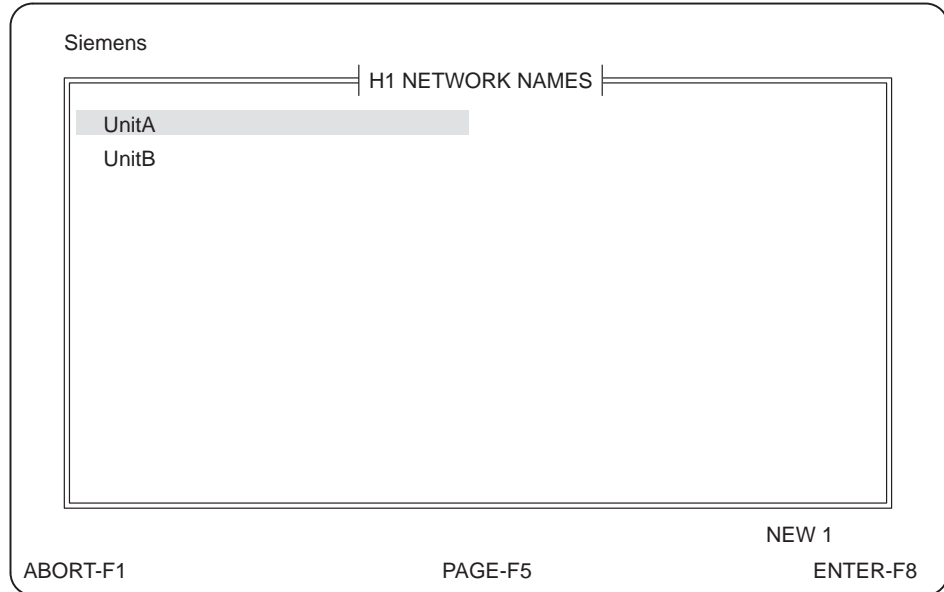


Figure G-10 H1 Network Names Screen

NOTE: The CP1413 driver does not run in protected mode. If you want to run more than one application (for example, H1 Configurator or TISOFT over H1) close one of the applications before running the other application.

G.3 Troubleshooting the H1 Network

Troubleshooting

Improperly matching up addresses and TSAPs between local and remote units leads to most of the communications problems in the H1 network. The most common situations are discussed below.

Address mismatch problems, for example:

- Addresses set up using the configurator and downloaded into the 505 CP1434TF module need to match both with the addresses set up for the CP1413 card using COML 1413-TF, and with the address given when the CP1413 NETINST.EXE program was executed.
- Ethernet address chosen must be unique; it cannot already exist on the H1 network.

Power problems, for example:

- Power may need to be connected to the H1 network transceiver.
- Power must be connected to Series 505 base.
- Power must be connected to personal computer.

Cabling problems, for example:

- Cable must be connected to CP1413 card.
- Cable must be connected to CP1434TF.
- H1 cable from CP1413 and from 505-CP1434 must be connected to an Ethernet transceiver.
- Ethernet “thicknet” cable must be connected between transceivers.
- Terminating Resistor must be connected to the transceiver on the two end nodes on the H1 network.
- Transceivers must be properly grounded.
- Cables must be wired properly.
- Cables must be placed far enough from adjacent electrical devices and wiring so that they do not pick up electrical noise.

For Expert Use
Only: Error Codes

Detailed information for the use of programmers is described in the CP1413 documentation (*SINEC TF User Interface*, order number 6GK1971-1AB00-0AA1), but that information will not help you to resolve the cause of the error; refer to the previous page for the most likely causes of the errors that can occur. Programmers can refer to Table G-1 for a description of the error codes.

Table G-1 H1 Network Errors

Error Code	Definition
1	App1Num larger than number of Application Reference Names defined at loading
2	GetApp1RelId failed due to SCP_send error
3	GetApp1RelId failed due to SCP_receive error
4	GetApp1RelId failed due to Request Block error
5	Initiate failed due to SCP_send error
6	Initiate failed due to SCP_receive error
7	Initiate failed due to Request Block error
8	Initiate failed due to AP Header error
9	Task code request exceeds PDU space
10	Task code request failed due to SCP_send error
11	Task code request failed due to SCP_receive error
12	Task code request failed due to Request Block error
13	Task code request failed due to AP Header error
14	Task code response exceeds RecvBufferSize
15	SetApp1RelList failed due to SCP_send error
16	SetApp1RelList failed due to SCP_receive error
17	SetApp1RelList failed due to SCP_Request Block error

Appendix H

Using Password

H.1	Overview	H-2
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H.1 Overview

The password feature provides protection for areas of memory that are part of the program. There are two passwords, one for the selected program on disk and one for the controller. They do not have to be the same.

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

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

Disabled and Enabled Passwords for the Selected Program on Disk

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

- **No Password:** The selected program on disk is not protected. Any user may enter an initial password.
- **Disabled Password:** The selected program on disk is not protected. Any user may change or delete the password.
- **Enabled Password:** The selected program on disk is protected. No write operations are allowed from online; you cannot go offline without the password.

Disabled and Enabled Passwords in the Controller

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

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

**Controller
Password Access
Levels**

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

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

**Password for TISOFT
Releases Earlier
than 5.0**

If a controller has a password, releases of TISOFT earlier than 5.0 cannot display ladders, loops, alarms, SF subroutines, or SF programs. If a controller does not have a password, releases earlier than 5.0 can be used with that programmable logic controller.

H.2 Password Selection and Access Level

Off-Line Password Selection and Access Level

When you are offline, you can press from the ladder display to invoke the screen options that are shown in Figure H-1. Then, you can either set or change the password, or you can set the controller access.

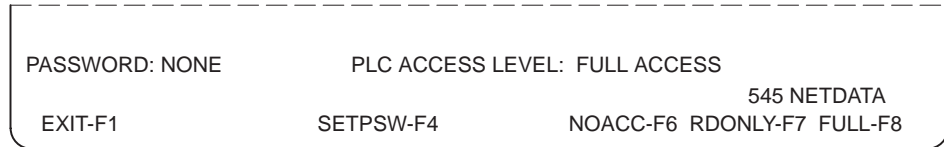


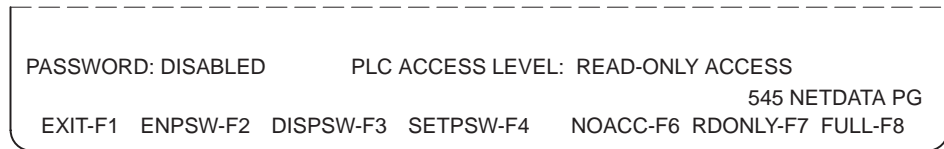
Figure H-1 Off-Line Password Selection Screen

The keys in Figure H-1 are defined below:

- **EXIT-F1** or **ESC**—Allows you to return to the ladder display screen.
- **SETPSW-F4** or **S**—Allows you to set or change the password for the selected program on disk. TISOFT prompts you for the new password twice. If the new passwords are not the same, the password is not changed. To delete a password (or to make the selected program on disk unprotected), enter a null password.
- **NOACC-F6** or **N**—Allows you to set the protection level of the controller for no access. This option is written to the controller when you perform an AUX 90 (Load All) function. **NOACC-F6** or **N** does not work without a password.
- **RDONLY-F7** or **R**—Allows you to set the protection level of the controller for read-only access. This option is written to the controller when you perform an AUX 90 (Load All) function. **RDONLY-F7** or **R** does not work without a password.
- **FULL-F8** or **F**—Allows you to set the protection level of the controller for full read/write access. This option is written to the controller when you perform an AUX 90 (Load All) function. **FULL-F8** or **F** does not work without a password.

On-Line Password Selection and Access Level

When you are online, you can use the AUX-F6 key and type in 85 at the prompt to set or change the password or to set the level of access. AUX 85 invokes the password selection screen shown in Figure H-2.



```
PASSWORD: DISABLED      PLC ACCESS LEVEL: READ-ONLY ACCESS
                                     545 NETDATA PG
EXIT-F1 ENPSW-F2 DISPSW-F3 SETPSW-F4 NOACC-F6 RDONLY-F7 FULL-F8
```

Figure H-2 On-Line Password Selection Screen

The keys in Figure H-2 are defined below:

- **EXIT-F1** or **ESC**—Allows you to return to the main auxiliary (AUX) screen.
- **ENPSW-F2** or **E**—Allows you to enable password protection for the controller and the selected program on disk.
- **DISPSW-F3** or **D**—Allows you to disable password protection for the controller. If you have not already entered a password for the controller, TISOFT prompts you for the current password. If the password you provide is not correct, TISOFT does not disable the password protection. This function does not work unless you provide a password.
- **SETPSW-F4** or **S**—Allows you to set or change the password for the controller. TISOFT prompts you for the current password. If the current password is correct, TISOFT prompts you for the new password twice. If the new passwords are not the same or the current password is not correct, the password is not changed. To delete a password (or to make the controller not password-protected), enter a null password.
- **NOACC-F6** or **N**—Allows you to set the protection level of the controller for no access. This function will not work without a password.
- **RDONLY-F7** or **R**—Allows you to set the protection level of the controller for read-only access. This function will not work without a password.
- **FULL-F8** or **F**—Allows you to set the protection level of the controller for full read/write access. This function will not work without a password.

H.3 On-Line Password Operations

There are nine on-line operational modes for password. The following paragraphs describe on-line password operational modes and on-line disk password operations.

On-Line Password Operational Modes

All on-line password operational modes are summarized in Table H-1. The following numbered paragraphs detail the corresponding mode-number information found in Table H-1.

- Mode 1. If the controller and the selected program on disk do not have a password, you will not be prompted for a password. AUX 60 (Save All) and AUX 90 (Load All) functions will be allowed. Check to make sure that the selected program on disk has TISOFT 5.0 or greater format. No password will be written to the selected program on disk or to the controller.
- Mode 2. If the selected program on disk has a password and you enter a password for the selected program on disk at the on-line prompt, you will be able to use the AUX 60 (Save All) and the Aux 90 (Load All) functions. If you choose to use Aux 90, the disk password is written to the controller if the controller supports password. If you decide to use Aux 60, the password of the selected program on disk is retained. You will also have full access to the controller and the selected program on disk.
- Mode 3. If the selected program on disk has a password and you do not enter a password for the selected program on disk at the on-line prompt, you will not be allowed to use the AUX 60 (Save All) function. You will, however, be able to use the AUX 90 (Load All) function, but only if the controller supports password. You will also have full access to the controller and the selected program on disk.
- Mode 4. If the controller has a password and you enter a password for the controller at the on-line prompt, you will be able to use the AUX 60 (Save All) and the AUX 90 (Load All) functions. AUX 60 writes the controller password to the selected program on disk. AUX 90 retains the controller password. You will also have full access to the controller and the selected program on disk.
- Mode 5. If the controller has a password and you do not enter a password for the controller at the on-line prompt, you will not be able to use the AUX 60 (Save All) and the AUX 90 (Load All) functions. Depending on the controller password access level, you will be allowed partial to full access to the controller. You will also have full access to the selected program on disk.

-
- Mode 6. If both the controller and the selected program on disk have passwords and you enter a password for both at the on-line prompt, you will be able to use the AUX 60 (Save All) and the AUX 90 (Load All) functions. The passwords for both the selected program on disk and for the controller are retained. You will also have full access to the selected program on disk and to the controller.
- Mode 7. If both the controller and the selected program on disk have passwords and you enter a password only for the selected program on disk at the on-line prompt, you will not be able to use the AUX 60 (Save All) and AUX 90 (Load All) functions. You will have partial to full access to the controller depending on the controller access level. You will also have full access to the selected program on disk.
- Mode 8. If both the controller and the selected program on disk have passwords and you enter a password for the controller at the on-line prompt, you will not be allowed to use the AUX 60 (Save All) function. You will, however, be able to use the AUX 90 (Load All) function. AUX 90 will write the selected program on disk password to the controller and enable the password in the controller. You will also have full access to the controller. Some reads and no writes will be allowed to the selected program on disk.
- Mode 9. If both the controller and the selected program on disk have passwords, and you do not enter a password for either the controller or the selected program on disk at the on-line prompt, you will not be able to use either the AUX 60 (Save All) or the AUX 90 (Load All) functions. You will, however, have partial to full access to the controller depending on the controller access level. Some reads and no writes will be allowed to the selected program on disk.

On-Line Password Operations (continued)

Table H-1 On-Line Password Operations

Mode No.	Controller Password	Disk Password	User Password	Aux 60 Save All Allowed to Disk?	Aux 90 Load All Allowed to PLC?	Comments
1	No	No	Not asked for.	Yes. No password.	Yes. No password.	Selected program on disk must have 5.0 format or greater. There is no password for selected program on disk or in the controller.
2	No	Yes	User gives password for selected program on disk.	Yes. Selected program on disk password is retained.	Yes. Disk password is written to controller, if controller supports password.	Full access to controller and selected program on disk is allowed.
3	No	Yes	User does not give password for program on disk.	No. Selected program on disk is password protected.	Only if controller supports password.	Full access to controller is allowed. Some reads and no writes are allowed to selected program on disk.
4	Yes	No	User gives controller password.	Yes. Controller password is written to disk.	Yes. Controller password is retained.	Full access to controller and to selected program on disk is allowed.
5	Yes	No	User does not give a password.	No. Controller is password protected.	No. Controller is password protected.	Partial to full access to controller is allowed depending on access level. Full access is allowed to selected program on disk.
6	Yes	Yes	User gives disk and controller password.	Yes. Selected program on disk password is retained.	Yes. Controller password is retained.	Full access to selected program on disk and to controller is allowed.
7	Yes	Yes	User gives disk password.	No. Controller is password protected.	No. Controller is password protected.	Partial to full access to controller is allowed depending on access level. Full access is allowed to selected program on disk.
8	Yes	Yes	User gives controller password.	No. Selected program on disk is password protected.	Yes. Selected program on disk password is written to controller and enabled.	Full access to controller is allowed. Some reads and no writes are allowed to selected program on disk.
9	Yes	Yes	User gives no password.	No.	No.	Partial to full access to controller is allowed depending on access level. Some reads and no writes are allowed to selected program on disk.

On-Line Disk Operations with Password

Table H-2 shows on-line disk operations that are allowed when the selected program on disk is password-protected. Table H-3 shows on-line disk operations that are not allowed when the selected program on disk is password-protected.

Table H-2 On-Line Disk Operations Allowed by Password Protection

Disk Operations That Are Allowed with a Password-Protected Selected Program on Disk
Change selected program on disk
Read current application ID from selected program on disk
Read print selection table
Read print setup table
Read title
Display synonyms in ladders, status, chart, I/O show and documentation
Display comments in ladders, status, S-memory and documentation
Synonym toggle
Comment toggle
Load all AUX 90 (if controller supports password)
AUX 17, compare controller to selected program on disk
Load AUX 17 screen

Table H-3 On-Line Disk Operations Not Allowed by Password Protection

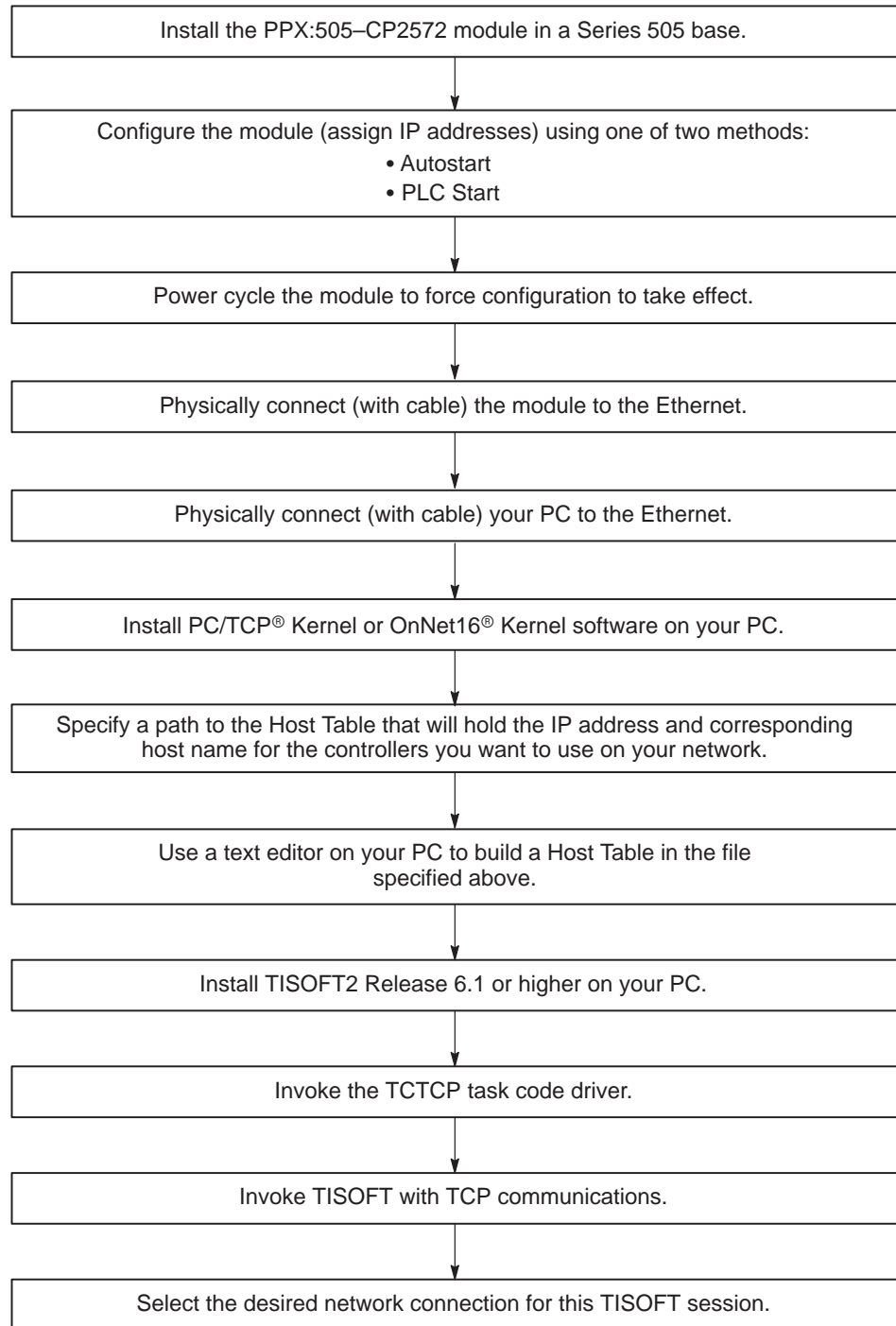
Disk Operations that Are Not Allowed with a Password-Protected Selected Program on Disk
Go off-line
Block Put in ladder and S-memory
Write print selection table
Write print setup table
Read and write memory configuration to/from selected program on disk
Read and write application ID list to/from selected program on disk in memory configuration
Read and write I/O configuration to/from selected program on disk
Edit synonyms, comments, and title
Import/export synonyms and comments
AUX save and load partials
Save AUX 17 screen
Change format in V/K memory

Appendix I

Using TISOFT with TCP/IP

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To establish TCP/IP communications, you must perform the following tasks:



These tasks are described in more detail on the pages that follow.

I.2 Setting Up the TCP/IP Module

Install the TCP/IP Module on a Series 505 Base

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

NOTE: The CP2572 is a Special Function (SF) module. If you have more than one SF module installed in a base, you should set the PLC Task Codes per Scan (AUX 16) to 8 to ensure maximum performance for data transfer between the CP2572 and the controller.

Assign an IP Address to the Module

There are two ways to configure the IP address for your PPX:505–CP2572 module. Each procedure has different advantages, as outlined in Table I-1.

Table I-1 Alternatives for Loading IP Address

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

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

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

The CP2572 module must be logged into the controller I/O configuration in order for it to run.

Setting Up the TCP/IP Module (continued)

Using the PLC Start Option

The *SIMATIC 505 Ethernet TCP/IP Communication Processor (505-CP2572) User Manual* describes how to build a Startup Network Command Block table, used with the PLC Start option, in the chapter on installation (Chapter 2). An easy way to construct this table is to press Ctrl V from the Ladder screen, and then press FIND-F2 to go to the desired location. (For instance, the Ladder Logic Example in the TCP/IP manual assumes that the command block is located in V-memory, starting at location V500.) From the desired location, you can simply key in the values from the Startup Network Command Block example table in the manual, supplying the correct IP address, IP router address, and subnet mask for your network.

For even more permanency, you can put the table into K-memory instead of V-memory. If you use the example ladder program from the TCP/IP manual, you can just add a MOVW box to move the values in K to V, as shown in Figure I-1. You can also trigger your logic from the first-scan flag bit in status word 201, instead of creating a lock with coil C1.

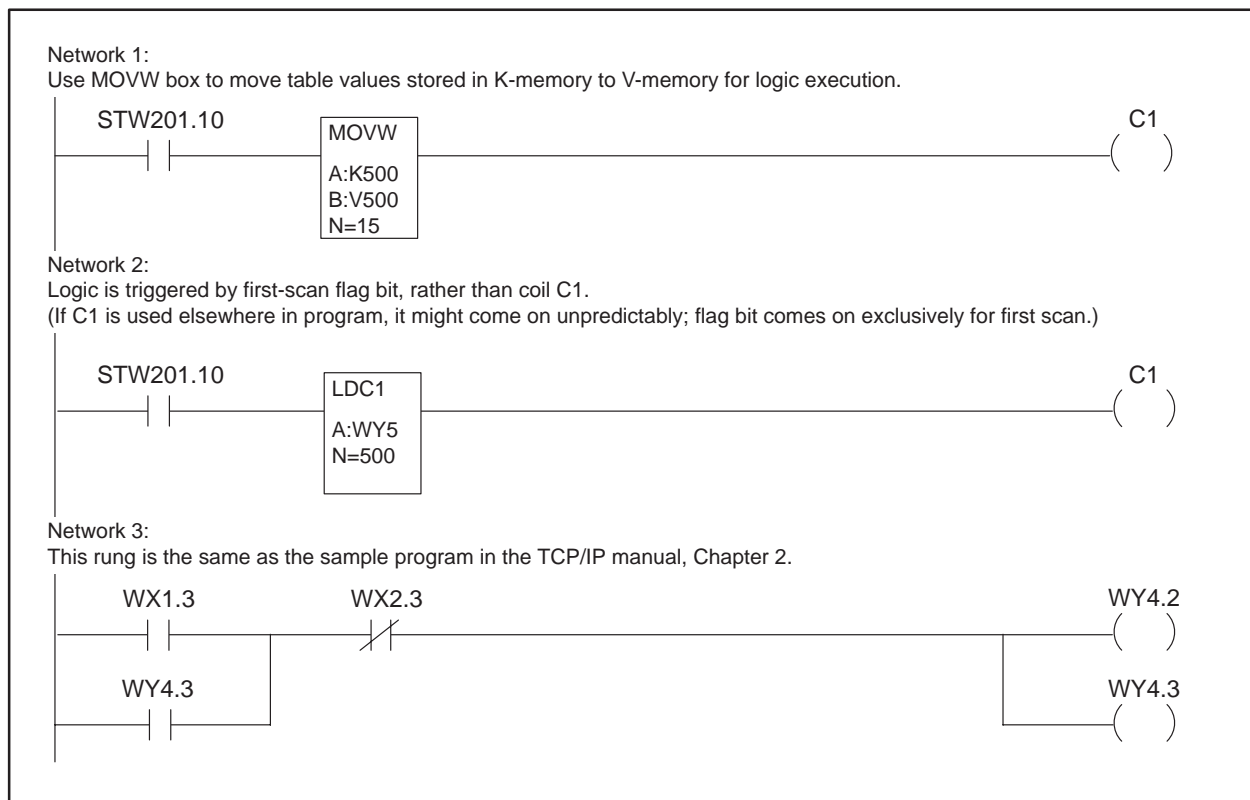


Figure I-1 Modified PLC Logic Example

Entering an IP Address in TISOFT

Two words of memory are required to store the IP address, which is in dotted decimal format. Because TISOFT cannot display dotted decimal (byte) format, you must enter the IP address in hexadecimal format. Convert each decimal value to hex, then enter two hex values per word.

Example:

For an IP address of 198.35.34.10, enter the first word (V506) as hex C623, where the high byte (C6) is the hex equivalent of decimal 198 and the low byte (23) is the hex equivalent of decimal 35. Similarly, enter the second word (V507) as hex 220A, as shown in Figure I-2:

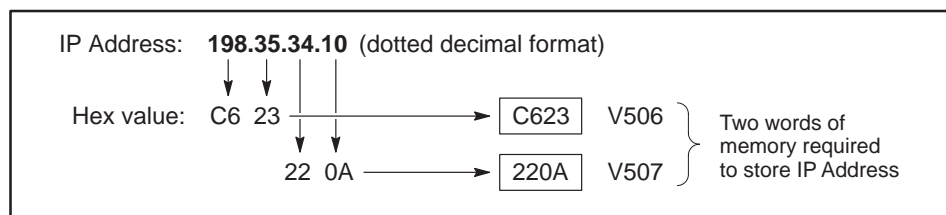


Figure I-2 Entering an IP Address in TISOFT

Using the Autostart Option

If you want to load the IP address into the CP2572 module EEPROM, then you must use the TCP Module Configuration tool (IPSET) that comes with the module. Refer to the included documentation for a description of how to use the IP address configuration tool.

Connect the Module to the Ethernet

The PPX:505-CP2572 module directly supports 10BaseT (UTP) and AUI cabling. If you have an existing network that uses a different cabling medium, but it is IEEE 802.3 compliant, you can purchase a transceiver to connect your TCP/IP module to your system. Consult the *SIMATIC 505 Ethernet TCP/IP Communication Processor (505-CP2572) User Manual* for information about how to connect cables to the 10bT or AUI port of your module. Consult the Siemens IK 10 catalog for information about how to purchase a Siemens transceiver if you need to use it with the AUI port.

I.3 Setting Up the PC with TCP/IP

Connect Your PC to the Ethernet

Your system administrator must determine what type of cable is best suited for your installation, because it affects your choice of Ethernet card for your PC. The FTP® Software packages (see below) support industry-standard Ethernet cards such as 3COM or NE2000 cards.

NOTE: The PPX:505–CP2572 module directly supports 10BaseT (UTP) and AUI cabling. If your existing network does not use UTP or AUI, but the cabling medium is IEEE 802.3 compliant, you can purchase a transceiver to connect your TCP/IP module to your system. If you have not yet installed your system, discuss with your system administrator whether you are able to use a 10BaseT (UTP) or AUI installation. Your Ethernet card purchase should be guided by the type of cabling medium that is best suited for your network.

Install PC/TCP Kernel or OnNet Kernel

In order for your PC to communicate with the PPX:505–CP2572 module, you must install a software package from FTP Software on your PC. Both DOS and Windows users can use the PC/TCP Kernel package from FTP Software. Another option for Windows users is the OnNet16 Kernel package, also manufactured by FTP Software, which uses a significantly smaller amount of conventional memory. To purchase these items, contact the vendor at the following address:

FTP Software, Inc.
100 Brickstone Square
Andover, MA 01810

Phone: 508–685–3300
Email: info@ftp.com
Website: <http://www.ftp.com>

NOTE: Do not purchase the OnNet 32 Kernel package for Windows 95 or Windows NT. The 32-bit version will not work with TISOFT.

Only the use of the PC/TCP Kernel software will be described here. Before you commence installation, talk to your system administrator and obtain all prerequisite information about your network (IP addresses, etc.). The PC/TCP Kernel software comes with an installation checklist that identifies all of the information you need—be sure to fill it out before you start the installation. Unless you have specialized configuration needs, you can follow the Express Install procedure. For installation instructions, consult the documentation that comes with your FTP software.

NOTE: The following pieces of information are always required, and must be entered accurately: the Internet (IP) address of your PC, the subnet mask, and the IP address of your routers, if you use any on the network.

Verify the
Installation
(Optional)

The FTP software documentation describes how system files may be modified when you install PC/TCP Kernel. Some of these modifications are performed automatically by the FTP software. To verify that the software has loaded correctly, you can reboot or power cycle your PC (to force the changes to take effect), and then type `ping` with a valid host name or IP address as the argument. If a valid response occurs, the software has been installed successfully. See your FTP software manual for more details.

Specify a Path to
the Host Table File

After you install PC/TCP Kernel on your PC, you need to specify the path to the file where you will store your host table. The host table is a file that you create to store IP addresses and logical names for the controllers that you want to use on your network. Your FTP software package comes with a configuration utility that prompts you for the host table path. To run the PC/TCP configuration utility, follow the procedure below.

1. At the DOS prompt, switch to the directory where your PC/TCP files are stored. For instance, if you created a directory called PCTCP to hold the software, you would type the following command:

```
cd pctcp
```

2. From the directory that holds your PC/TCP files, type the following command:

```
config
```

This invokes the PC/TCP Config utility.

3. At the prompt, Choose what you would like to configure from the list, choose PC/TCP Kernel. The prompt Host table: appears.
4. Type the full path to the host table file. (You can run the Config utility before you make the host table; all you are doing is identifying the location where you plan to store the file.) For instance, if you are going to store your host table in a file called HOST.TXT, located in subdirectory PCTCP on your C: drive, the path would be:

```
c:\pctcp\host.txt.
```

This is the only data you need to add to the configuration file; after you answer the Host table: prompt, you can save your configuration and exit the Config utility.

Setting Up the PC with TCP/IP (continued)

Build a Host Table File

In order for TISOFT to communicate to your system over the Ethernet network, you must build a host table that identifies an IP address and logical name for the controllers that you want to use on your network. The file name should correspond to the path that you specified when you ran the configuration utility for your FTP software. You can use any standard DOS text editor to construct the host table file. It should follow the format illustrated in Figure I-3.

```
#####  
#  
# a sample host table...  
#  
#####  
# ProNet – 3 host names  
128.127.126.1          blender1  
128.127.126.125      mixer2  
128.127.126.128      masher  
# end of file
```

Figure I-3 Sample Host Table File

The following rules apply when you construct a host table file:

- Lines beginning with the pound symbol (#) are comments.
- A maximum of 64 host names may be included in the host file.
- Host names (for example, blender1) are limited to 32 characters. Spaces are not allowed within host names.

I.4 Using TISOFT with TCP/IP

Starting TISOFT using TCP/IP Communications

To start TISOFT, you must perform the following tasks:

1. Install TISOFT as described in Chapter 1.
2. Invoke the TCTCP task code driver as described below.

To invoke the TCTCP task code driver from the command line, type **TCTCP** with the hex value of an unused interrupt (from 80 to FF) as the argument. Often, 0x80 and 0x81 are used by the CP1413 TFNETDRV driver and the TF/DDE driver. In consequence, 0x82 is usually a good choice. If 0x82 is in use, pick an unused value above 0x82.

Example: **TCTCP 0x82**

NOTE: The TCTCP task code driver is a TSR (terminate-and-stay-resident) program that resides in RAM and is lost every time you power cycle or reboot your machine. Therefore, the TCTCP task code driver must be invoked after every power cycle or reboot operation. You can invoke the driver at the DOS command line, or you can add the invocation to your AUTOEXEC.BAT file, so that the driver is invoked automatically.

3. Invoke TISOFT, using the TCP/IP communications protocol. Type the following command:

```
TI505 TCP
```

4. At the TISOFT startup screen, press **ONLINE-F4**.

TISOFT displays a list of connections that you specified in your host table file.

5. Select the controller connection that you want to use, and press **Return** or **ENTER-F8**.

Using TISOFT with TCP/IP (continued)

Troubleshooting

If the TCTCP task code driver encounters an error during TISOFT operation, you may see a prompt in the lower left hand corner that follows this syntax:

TCP/IP NETWORK ERROR - x , CODE: y

where x corresponds to an error number in Table I-2, and y corresponds to an internal error code value that provides more detailed diagnostics for factory assistance.

Table I-2 Error Numbers

Value	Meaning
1	HostNum index is larger than the number of hosts minus one that is currently recognized by the TSR program.
2	The FTP kernel was unable to match the indexed host name with an IP address.
3	The FTP kernel was unable to return a global descriptor.
4	The FTP kernel was unable to connect with the requested host.
5	The FTP kernel was unable to set the requested timeout value.
6	The FTP kernel experienced an error while trying to write a request to the host.
7	The FTP kernel experienced an error while trying to read a response from the host.
8	The FTP kernel was unable to globalize a local descriptor.
9	The FTP kernel experienced an error while trying to access the host table.
10	The CP2572 module returned an error due to a CAMP protocol error.
11	The number of host names returned in RecvBufferPtr is larger than RecvBufferSize.
12	There is no host on the command line, and the number of hosts in the host table exceeds the maximum hosts parameter.

The error numbers (x) most likely to appear are 4, 6, and 7, which indicate a problem in connecting to or communicating with the CP2572 module. If one of these errors occurs, shut down TISOFT and make sure that you can reliably ping the CP2572 module. You may have an incorrect IP address in the host table, or the FTP kernel may be configured with an incorrect router address.

When the error number (x) is 10, the error code value (y) contains either the CAMP error code, which is described in the appendix of the *SIMATIC 505 Ethernet TCP/IP Communication Processor (505-CP2572) User Manual*, or else one of the following special values:

- | | |
|-------|--|
| 65535 | Bad BCC checksum field in the received CAMP message. |
| 65534 | CAMP Message ID field of response does not match Message ID of last request. This comes into play if request message A times out and request message B is then sent, but delayed response A is then received as the response to message B. |
| 65533 | In case the CAMP error code at offset 23 in the response message is zero. |

Error number 12 occurs if the host table contains more than 64 entries. When the error number (x) is 1, 11, or 12, the error code value (y) is zero.

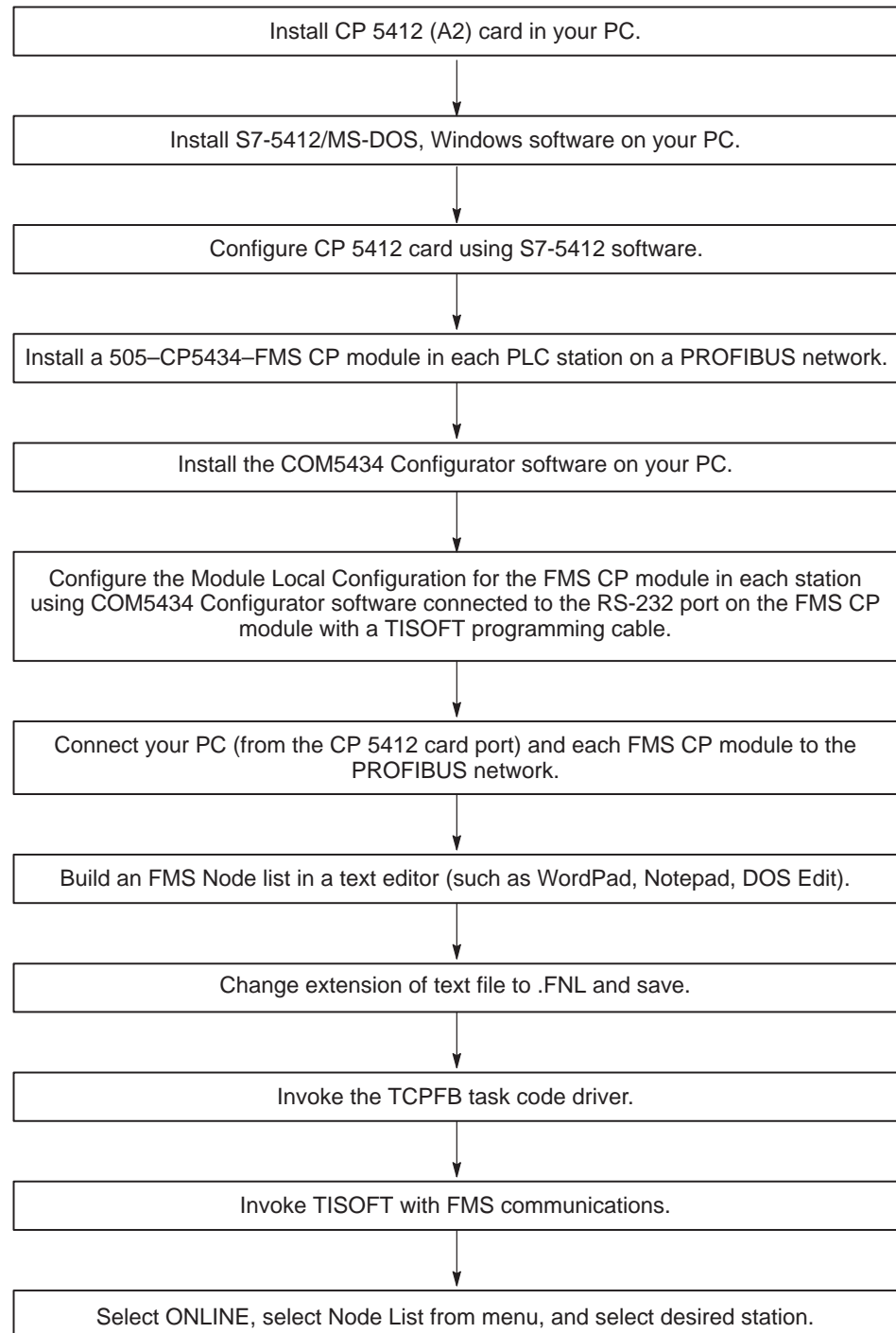
Appendix J

Using TISOFT with FMS

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J.1 FMS Communications Overview

To establish FMS communications, you must perform the following tasks. These tasks are described in more detail on the pages that follow.



J.2 Installing CP 5412 Hardware and Software on the PC

Installing the CP 5412 (A2) Card in your PC

In order for TISOFT to communicate over a PROFIBUS network using Fieldbus Message Specification (FMS) protocol, you must install the CP 5412 (A2) PC-AT card (order number 6GK1 541-2BA00) in your computer.

Set the DIP switch to select an I/O area that is not used by any other card. Refer to the documentation provided with the CP 5412 card for complete information on installing the card.

Installing the S7-5412/MS-DOS, Windows Software

After installing the CP 5412 (A2) card in the PC, you must install the S7-5412/MS-DOS, Windows software to configure the card for PROFIBUS network operation.

NOTE: Windows 95 and Windows NT versions of the S7-5412 software may not operate correctly with TISOFT.

Refer to the documentation provided with S7-5412/MS-DOS, Windows for information on installing the software.

After installing the software, use the diagnostic function with the menu command **Edit** → **Diagnosis** to check the hardware and software installation.

NOTE: The CP 5412 (A2) card must be assigned an interrupt that is not used by any other device on your computer. You can use the diagnostic function in the S7-5412/MS-DOS, Windows software to determine the available interrupts. The software cannot, however, detect the interrupt used by a SCSI driver.

Configuring the CP 5412 Card for Network Operation

Follow the guidelines provided by the S7-5412/MS-DOS, Windows documentation for configuring the CP 5412 card for PROFIBUS network operation.

NOTE: Make sure to select the bus parameters, the baud rate, and the highest station address (HSA) that match those of the network. Also be sure to select a unique network address for the CP 5412 device.

J.3 Installing the PROFIBUS-FMS Communications Processor and Software

Installing the FMS CP Module in a SIMATIC 505 Base

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

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

Installing the COM5434 Configurator Software

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

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

Configuring the FMS CP Module

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

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

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

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

Connecting to the PROFIBUS Network

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

J.4 Building an FMS Node List

What is a Node List?

Each node list file that you create consists of the station address of each device on a PROFIBUS network and a name that you want to associate with each station address, as shown in the example in Figure J-1.

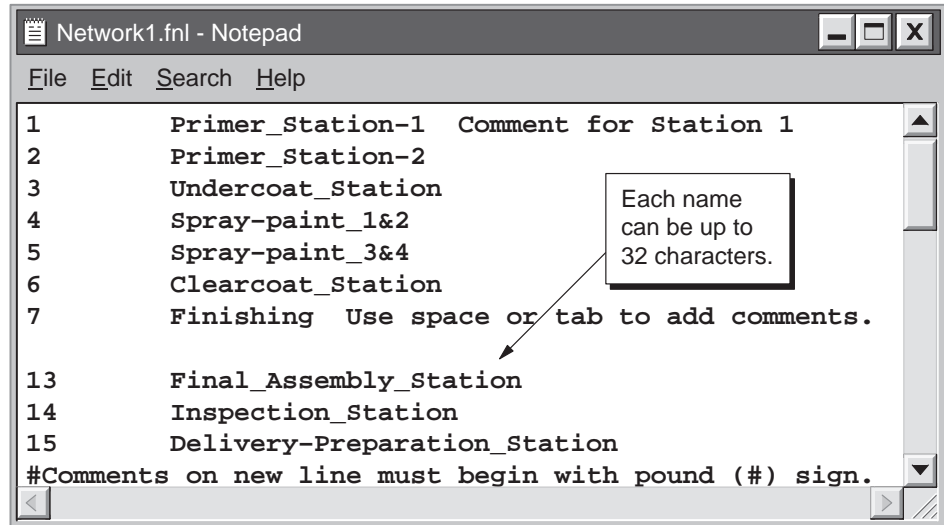


Figure J-1 FMS Network Names Node List Example

Using a Text Editor to Create the Node List

You can create a node list file for each network using an ASCII text editor, such as Notepad, WordPad, or DOS EDIT. Follow these guidelines:

- Use a space or tab between each station address and device name.
- Begin each station address/name on a new line.
- Do not use spaces within a name. For example, you may use Station1, Station-1, or Station_1, but not Station 1.
- Create a separate file for each network of PROFIBUS-FMS stations.

Change the Extension to .FNL

After creating your node list, save the file in the directory of your choice (for example, the same directory as your TISOFT program), and change the extension (usually .TXT) to .FNL (FMS node list).

NOTE: Windows may not automatically recognize the .FNL extension of a node list file that you want to edit. When you double-click the file from Windows Explorer or File Manager, a dialog then prompts you to select a program to open the file with, and you can choose an editor such as Notepad or WordPad. The dialog also allows you to set the text editor you choose as a default to open files with the .FNL extension in the future.

J.5 Establishing FMS Communications in TISOFT

Initializing the TCPFB Task Code Driver

To initialize the task code driver that enables communications over the PROFIBUS-FMS network, follow these steps:

1. Use any text editor to select and edit the AUTOEXEC.BAT file in the drive where TISOFT is installed.

If you use a Windows text editor such as Notepad, use the command **File** → **Open...** and browse to the appropriate drive. Select "All Files" in the "Files of type" field to enable the Open browser to display the AUTOEXEC.BAT file.

2. Add the TCPFB task code driver path with an unused interrupt (from 82 to FF) to the file. For example, type the following path:

```
C:\TI\TCPFB 0x82
```

If the interrupt is already in use, pick any unused value above 0x82.

3. Save the change to your AUTOEXEC.BAT file, and restart your computer to initialize the FMS task code driver.

Invoking TISOFT with FMS Communications

To invoke TISOFT using FMS communications, follow these steps:

1. Type the following command at the DOS prompt:

```
TI505 FMS
```

2. Press ONLINE-F4 to access the FMS node list.

Creating a TISOFT Shortcut Icon to Invoke FMS Communications

You can add another TISOFT icon on your Windows 95 desktop that starts TISOFT in a DOS window using FMS communications. Refer to Section 1.4 for the basic procedure of creating a shortcut icon. Give the new icon a unique name (for example, TISOFT-FMS). Then follow these steps:

1. Use a single click to select the newly created TISOFT icon, then click the right mouse button to access the pop-up menu, and select "Properties." A TISOFT Properties dialog appears.
2. Click the "Program" tab in the TISOFT Properties dialog.
3. In the "Cmd line" field, enter FMS in the path. For example, the command line might read `C:\TI\TI505.BAT fms`.
4. Click on "OK."

Now every time you double-click on the new TISOFT shortcut icon, TISOFT starts automatically in FMS communications mode.

Selecting an FMS Station from the Node List

After starting TISOFT online, the FMS node list appears, as shown in Figure J-2.

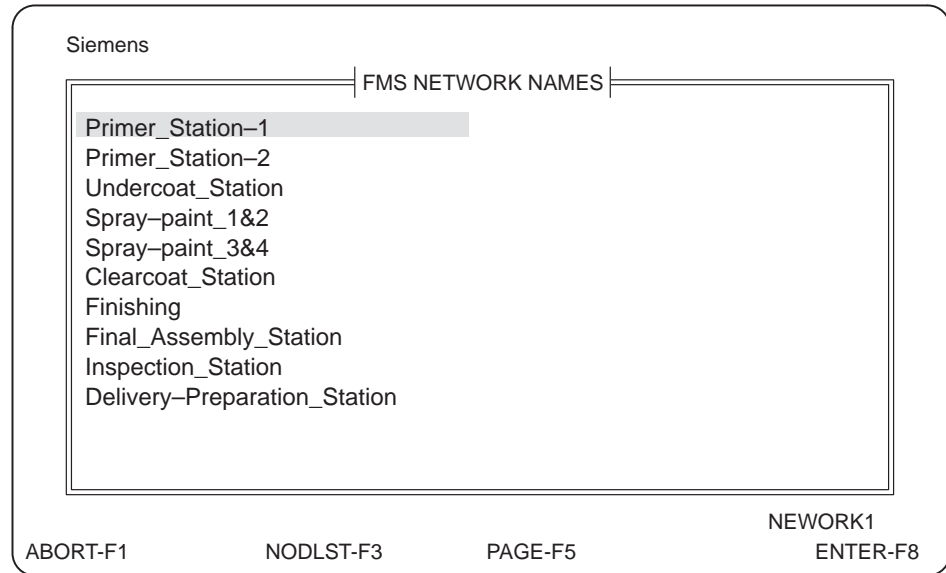


Figure J-2 FMS Network Names Screen

1. If you have created more than one node list file, press **NODLST-F3** to access the list of files, and select the one you want to access. Press **SELECT-F8** or **Return**.
2. From the list of station names displayed, select the station you want to communicate with and press **ENTER-F8** or **Return**.

TISOFT will go on-line to the selected station.

Troubleshooting

If the FMS task code driver encounters an error during TISOFT operation, you may see a prompt in the lower left hand corner that follows this syntax:

FMS NETWORK ERROR – x , CODE: y

where x corresponds to an error number in Table J-1, and y corresponds to an internal error code value that provides more detailed diagnostics for factory assistance.

Table J-1 FMS Network Error Codes

Error	Description
2	Unsupported opcode in internal request block.*
4	CP5412 (A2) has no configured address, or its database resources depleted.
6	Connection reference value is invalid.*
7	Parameter in internal request block is not correct.*
8	Receive buffer supplied by user is too small for task code response.
10	User data length exceeds the maximum permitted size.
11	Passive connection establishment error.*
12	Attempted to send expedited data*
14	505-CP5434-FMS aborted the connection establishment.
16	The addressed 505-CP5434-FMS not yet connected to the network.
18	Invalid conn_class in internal request block*
20	Duplicate await_close_req.*
22	505-CP5434-FMS aborted the connection establishment.
24	Improper connection negotiation by CP5412 (A2).
26	Invalid local or remote address or TSAP.
28	Not used in current revision.
29	Invalid protocol response received.
30	Not used in current revision.
32	Not used in current revision.
4660	Communication with CP5412 (A2) lost; attempting to re-establish.
*These errors should not occur, and may be an indication of a factory repair problem.	

TISOFT Program Files and Properties

K.1	TISOFT Program Files	K-2
K.2	Windows 95 Properties Setup for TISOFT	K-4

Table K-1 TISOFT Program Files (Alphabetically Listed)

File	Description
*.ALM	Alarm data
*.APP	575 applications
*.BKP	Bit-of-word synonym pointer for K-memory
*.BTP	Bit-of-word synonym pointer for TCP/TCC
*.BVP	Bit-of-word synonym pointer for V-memory
*.BWP	Bit-of-word synonym pointer for word I/O
*.CCP	Comment pointer for CR
*.CIP	Comment pointer for bit I/O
*.CJP	Comment pointer for JMP/MCR/SSI/END/SKP/LBL/GTS/LBL
*.CMT	Comment data
*.CSP	Comment pointer for S-memory
*.KMM	K-memory data
*.LOP	Loop data
*.PFB	PROFIBUS-DP data
*.PGM	SF program data
*.PRT	Printer setup and selection data
*.SCP	Synonym pointer for CR
*.SIP	Synonym pointer for bit I/O
*.SJP	Synonym pointer for JMP/MCR/SSI/END/SKP/LBL/GTS/LBL
*.SKP	Word synonym pointer for K-memory
*.STP	Word synonym pointer for TCP/TCC
*.SUB	SF subroutine data
*.SVP	Word synonym pointer for V-memory
*.SWP	Word synonym pointer for word I/O
*.SYN	Synonym data
*.TTL	Title data
*.UMM	U-memory data
*.VMM	V-memory data
*.VP5	General disk information, ladders, memory and I/O configuration, Aux 17, I/O value data, scan time

Table K-2 lists the same TISOFT files as Table K-1, grouped by function.

Table K-2 TISOFT Program Files (Listed by Function)

File	Description
Synonyms: *.BKP *.BTP *.BVP *.BWP *.SCP *.SIP *.SJP *.SKP *.STP *.SVP *.SWP *.SYN	Bit-of-word synonym pointer for K-memory Bit-of-word synonym pointer for TCP/TCC Bit-of-word synonym pointer for V-memory Bit-of-word synonym pointer for word I/O Synonym pointer for CR Synonym pointer for bit I/O Synonym pointer for JMP/MCR/SSI/END/SKP/LBL/GTS/LBL Word synonym pointer for K-memory Word synonym pointer for TCP/TCC Word synonym pointer for V-memory Word synonym pointer for word I/O Synonym data
Comments: *.CCP *.CIP *.CJP *.CMT *.CSP	Comment pointer for CR Comment pointer for bit I/O Comment pointer for JMP/MCR/SSI/END/SKP/LBL/GTS/LBL Comment data Comment pointer for S-memory
S-memory: *.ALM *.LOP *.PGM *.SUB	Alarm data Loop data SF program data SF subroutine data
General: *.APP *.KMM *.PFB *.PRT *.TTL *.UMM *.VMM *.VP5	575 applications K-memory data PROFIBUS-DP data Printer setup and selection data Title data U-memory data V-memory data General disk information, ladders, memory and I/O configuration, Aux 17, I/O value data, scan time

Table K-3 TISOFT Non-Program Files

File	Description
anyname.CH5	Status charts
anyname.FNL	PROFIBUS-FMS network node list
anyname.MAC	Keyboard macros
anyname.REC	External subroutine S-Record data
anyname.TB5	Status select tables
anyname.TXC	Import/export comment text data
anyname.TXP	Temporary data
anyname.TXS	Import/export synonym text data
anyname.2BF	PROFIBUS-DP binary export data

K.2 Windows 95 Properties Setup for TISOFT

The following list shows the Windows 95 properties for TISOFT that may work for you. Select the TISOFT shortcut icon, click the right mouse button, and select “Properties” as shown in Figure K-1. The list shows the settings for each tab in the dialog. Many of the settings listed are the defaults.

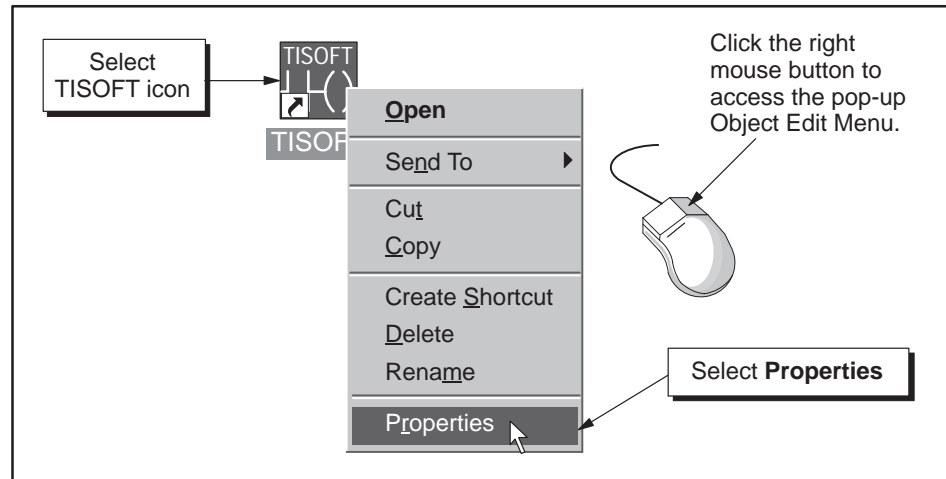


Figure K-1 Accessing TISOFT Properties Dialog

Program

TISOFT	(or other suitable name)
Cmd. line: C:\TI\TI505.BAT P1	(or wherever it is located)
Working: C:\TI	(or wherever it is located)
Batch file:	blank
Shortcut key:	“None”
Run:	“Normal window”
Close on exit	checked
Advanced... (button)	
Prevent MS-DOS-based programs from detecting windows	checked
Suggest MS-DOS mode as necessary	checked
MS-DOS mode	not checked (<i>see note below</i>)
Change Icon... (button)	
File name: C:\TI\TISOFT.ICO	(or wherever it is located)

NOTE: You may find that running TISOFT in MS-DOS mode provides better performance in PC-to-controller communications. Click on the “Advanced...” button, and check “MS-DOS mode.” The computer exits Windows and starts TISOFT in MS-DOS mode. You can also create an additional shortcut icon with the MS-DOS mode property set, so that you can easily choose which mode to run TISOFT in.

Font

Available types: "Both font types" (or as desired)
Font size: "Auto" (or as desired)

Memory

Conventional memory
Total: "Auto"
Initial environment: "Auto"
Protected: not checked
Expanded (EMS) memory
Total: "Auto"
Extended (XMS) memory
Total: "None" or "Auto"
Uses HMA: checked
MS-DOS protected-mode (DPMI) memory
Total: "Auto"

Screen

Usage
Full screen: not set
Window: set
Initial size: "Default"
Window
Display toolbar: checked
Restore settings on startup: checked
Performance
Fast ROM emulation: checked
Dynamic memory allocation: checked

Misc.

Foreground
Allow screen saver: checked
Background
Always suspend: not checked
Idle sensitivity: low to medium
Mouse
QuickEdit: not checked
Exclusive mode: not checked
Termination
Warn if still active: checked
Other
Fast pasting: not checked
Windows shortcut keys: all checked

Glossary of TISOFT Terms

5nn	Selects the controller model to be configured in the Memory Configuration function. These include the 545, 545L, 575, 555, 520, 530, 520C, 530C, 525, 535, 560/565 controllers.
505IO	<i>505 I/O</i> switches status screen from displaying PROFIBUS-DP to Series 505 I/O.
A	Accesses the AUX function; it is a hard key.
AACK	<i>Alarm Acknowledge Flags</i> , must be an integer.
AADB	<i>Alarm Deadband for Analog Alarm</i> , may be either integer or real.
ABORT	Discards any changes made and returns to the previous display.
ABS(X)	Returns absolute value of X in a math expression.
ABSV	Takes the absolute value of a number (RLL box instruction).
ACF	<i>Alarm C-Flags (32 bits)</i> , must be an integer.
ACFH	<i>Analog Alarm C-Flags, most significant word</i> , must be an integer.
ACFL	<i>Analog Alarm C-Flags, least significant word</i> , must be an integer.
ADD	<i>Adds</i> a signed integer (positive or negative) in memory location A to a signed integer in memory location B and stores the result in memory location C. The signed integers on which the addition is performed are not affected by the operation and retain their values in the original locations.
ADDR	<i>Address</i> references a rung of ladder logic; it also selects ladder logic.
AERR	<i>Analog Alarm Error</i> , may be integer or real.
AHA	<i>Analog Alarm High limit</i> , may be either integer or real.
AHHA	<i>Analog Alarm High-High limit</i> , may be either integer or real.
ALA	<i>Analog Alarm Low limit</i> , may be either integer or real.
ALARM	Provides access to analog alarm function, or selects alarm data to act on.
ALLA	<i>Analog Alarm Low-Low limit</i> , may be integer or real.
AND	Is the logical AND operator in Special Function MATH and IF statements.
AODA	<i>Orange Deviation for Analog Alarm</i> , may be integer or real.
APETn	Provides for each analog alarm a peak elapsed time that is the time from the alarm being scheduled until the process completes execution (n = 1–128).
APV	<i>Analog Alarm Process Variable</i> , may be either integer or real.
APVA	<i>Alarm Process Variable Address</i> .
APVH	<i>Alarm Process Variable High</i> , high limit for alarm process variable; must be real.
APVL	<i>Alarm Process Variable Low</i> , low limit for alarm process variable; must be real.
ARCA	<i>Rate of Change Alarm Limit for Analog Alarm</i> , must be real.
ARCCOS(X)	Returns inverse cosine of X in a math expression.
ARCSIN(X)	Returns inverse sine of X in a math expression.
ARCTAN(X)	Returns inverse tangent of X in a math expression.
ARSA	<i>Alarm Remote Setpoint Address</i> .

ASCII	Accesses the prompt to select memory locations to be displayed in ASCII format; available in BLDCHT function.
ASP	<i>Analog Alarm Setpoint</i> , may be either integer or real.
ASPH	<i>High Limit for Analog Alarm Setpoint</i> , may be either integer or real.
ASPL	<i>Low limit for Analog Alarm Setpoint</i> , may be either integer or real.
ASYNC	Sets the PROFIBUS-DP communication mode to asynchronous.
ATS	<i>Analog Alarm Sample Rate</i> , must be real.
AUX	<i>Auxiliary Functions</i> refers to on-line functions that interface with the controller.
AUTORN	<i>Automatic Rung Insert</i> automatically inserts rungs after entering until you abort the rung edit or press AUTORN again.
AVF	<i>Analog Alarm V-Flags</i> , must be an integer.
AVFA	<i>Analog Alarm V-Flags Address</i> .
AYDA	<i>Yellow Deviation for Analog Alarm</i> , may be integer or real.
B	Accesses the BOX function; it is a hard key. As an element type, B represents a bit parameter passed to a subroutine in RLL via the PGTS, PGTSZ, or XSUB box.
Backspace	Deletes the character to the left of the cursor position (a hard key).
BCD	<i>Binary Coded Decimal</i> is a number with four binary bits representing a decimal digit. See HEX.
BCDBIN	Converts a four-digit BCD value into a binary value.
BEFORE	Causes the printer to skip to the beginning of a page before printing a rung and the associated comment.
BIN	<i>Binary</i> displays up to 16 1s and 0s in any combination. This format takes one word (16 bits).
BINBCD	Converts a binary value into a four-digit BCD value.
BITC	<i>Bit Clear</i> clears a selected bit of a word to 0.
BITP	<i>Bit Pick</i> tests a selected bit of a specified memory word to determine its status. The bit is not affected by the BITP instruction, and retains its value in memory.
BITS	<i>Bit Set</i> sets a selected bit of a word to one.
BLDCHT	<i>Build Chart</i> allows building a status chart.
BLDTBL	<i>Build Table</i> accesses build table function in global search and replace.
BLOCK	Moves, copies, puts, or deletes a selected segment of data in either ladder or S-memory.
BOX	Allows access to preprogrammed modules in the controller.
C	Represents a control relay. Control relays may be either contacts, coils, or box parameters according to their functions in the program. C0 may be used in boxes to clear a parameter field.
CALL	Invokes the specified Special Function subroutine and passes up to five parameters to it for execution.
CBD	<i>Convert Binary to Decimal</i> converts binary inputs to equivalent binary-coded decimal values.

CDB	<i>Convert Decimal to BCD</i> converts binary-coded decimal to equivalent binary integer values.
CDT	<i>Correlated Data Table</i> locates an entry in an input table that is greater than or equal to a specified input value. The corresponding entry in the output table is then written to the output address.
CEIL(X)	Returns the smallest integer \geq to X.
CHART	Is an on-line function that allows monitoring and debugging program elements in a table form; toggles status from ladder to chart.
CHGVAL	In STATUS or CHART, accesses the edit function for displaying, forcing, and entering of elements.
CLEAR	<i>Clear</i> , used in status select, erases the entry at the cursor.
CLRBS	<i>Clear Base</i> , used in configure I/O, erases all the data on the screen.
CLRCHT	<i>Clear Chart</i> erases the entire status chart or replace table.
CLRLOC	<i>Clear Location</i> erases selected location in the status chart or replace table.
CMP	<i>Compare</i> compares a number in memory location A to a number in memory location B. The comparison is made for equal to, less than, or greater than. Values in the A and B memory locations are not affected.
COMPACT	<i>Compact</i> moves all discrete image register types to word image register types for every module of the selected slave, and unifies all modules into the first module.
Ctrl L	<i>Control L</i> invokes the pop-up Synonym Editor function.
COIL	Represents an output. Coils are designated by the letter Y, followed by a number; or by control relay coils designated by the letter C, followed by a number. Other coil types include JMP, JMPE, MCR, MCRE, END, ENDC, SKP, LBL, GTS, SBR, RTN, SSI, and B. Bit-of-word coils are also allowed.
COL	In ladder editor insert, this key inserts a blank column at the block cursor, shifting remaining columns to the right and extending horizontal connections. The right arrow does the same function.
COLOR	Accesses the menu to select background and foreground colors for TISOFT displays.
COM	<i>Comment</i> provides information for a rung in the program. Only one comment is allowed per rung, and it is tied to the first output element for the rung. A comment may be up to 16 lines long, with 60 characters on each line. <i>Comment</i> can also be used for loop, alarm, SFPGM, and SFSUB. <i>Comment</i> either accesses comment functions for documenting programs, or selects comment data.
COMMNT	See COM.
COMPAR	<i>Compare</i> compares the I/O configuration in the controller with the actual configuration of the I/O modules in a selected base. Any differences are shown in bright intensity in the chart, and two symbols (**) appear to the left of the slot affected.
COMPIL	Sets an SF program or subroutine to be compiled.
COMPSE	<i>Compose</i> is a mode in COM or TITLE; it inserts a new line after pressing <input type="button" value="Return"/> .

COMTGL – DELCHN

COMTGL	<i>Comment Toggle</i> toggles the display of comments on or off for displayed ladder rungs. In both on-line and off-line modes, the information is obtained from the currently selected program when comment display is on. In the Replace table, it toggles the copying of comments.
CONFIG	Selects the I/O module definition screen in I/O configuration.
CONFIO	<i>Configure Input/Output</i> configures or displays the inputs and outputs for the controller, base, RAM, or selected program on disk.
CONFME	<i>Configure Memory</i> allocates the memory areas of the selected program on disk or the controller. On-line, it displays the memory ranges of the controller or disk and writes memory ranges to the disk or controller. Off-line, CONFME displays and selects memory ranges in the programming device RAM and allows selection of a controller type.
CONT	<i>Continue</i> scrolls display of I/O in Aux Function 25. In the Update function, <i>Continue</i> writes the PROFIBUS-DP screen data to the controller and to the selected program on disk, and advances the Update prompt to the next unconfigured slave.
CONTOE	Selects <i>Continue-On-Error</i> in a SFSUB box.
CONTACT	Can be an input designated by the letter X; an output used as an input designated by the letter Y, or a control relay used as an input designated by the letter C. X, Y, or C can be passed as an argument parameter to an RLL subroutine designated by the letter B. Bit-of-word contacts are also allowed.
Control Relays	Are part of the controller internal memory, and do not exist as physical input or output devices. Control relay contacts or coils are represented by the letter C.
COPY	Duplicates a TISOFT program, selected block, comment, etc. to a specified location.
COS(X)	Returns the cosine of X in a math expression.
CTR	<i>Counter</i> counts recurring events up to a preset value (1–32767).
CTRS	<i>Counters</i> selects CTR and UDC counter types.
CURDSK	Reads and shows the application ID of the selected program on disk.
CURPRT	Reads and shows the application ID assigned to the currently connected CPU port.
CURRNT	Selects the current Status Chart to be displayed with ladders in status select.
DCAT	<i>Discrete Control Alarm Timer</i> provides feedback on status of discrete control valve.
DCC	<i>Drum Counter Current</i> is the current step count for a drum.
DCMP	<i>Date Compare</i> compares the current date with a stored date.
DCP	<i>Drum Counter Preset</i> is the starting value for the drum step count. This is a two part element: the first part is the drum number; the second is the step number. It is displayed in the format DCPxxxx.yy (for example, DCP1.1).
Del	Del (<i>Delete Character</i>) deletes the character at the cursor and moves characters on the right to fill the vacated space; it is a hard key.
DELCHN	<i>Delete Channel</i> deletes all channels configured in RAM from the selected channel through the last channel.

DELETE – ENABLE

DELETE	Deletes block, title, comment, synonym, printer control, number, program, PROFIBUS-DP configuration on disk (off-line) or in the controller (on-line), etc.
DELLN	<i>Delete Line</i> deletes the line on which the cursor is placed. The location of the cursor on the line is not important. The rest of the lines of text move up to fill the vacated line.
DELNET	<i>Delete Network</i> deletes the network on the screen from a ladder program.
DELST	<i>Delete Statement</i> deletes a Special Function statement from an SF program or subroutine.
DESCR	<i>Descriptor</i> positions cursor in descriptor field in synonym operation.
DIR	Accesses the sub-window and function keys for performing directory operations.
DIRECT	Enables selection of cursor movement direction in Build Chart.
DISABL	<i>Disables</i> a control block to be non-functional.
DISPSW	<i>Disables Password Protection</i> in the controller.
DIS/CP	<i>Disable/Compile</i> allows you to mark an SFPGM or SFSUB to be enabled or disabled, and compiled or non-compiled (interpreted).
DIV	<i>Divide</i> divides a dividend in two memory locations, A and A + 1, by a divisor in memory location B. The quotient and remainder are stored in two memory locations, C and C + 1. The dividend and divisor values are not affected and retain their values in memory after the division is complete.
DOCUM	<i>Document</i> allows you to display and edit titles, comments, and synonyms.
DOUBLE	Is a signed integer between +2147483647 and -2147483648. Entries outside this range default to either the upper or lower limit depending on the sign (+ or -). This format takes two words (32 bits); it is also called “long.”
DRM	Refers to drums and event drums.
DRUM	Is a box that simulates operation of an electromechanical drum.
DSC	<i>Drum Step Current</i> identifies the current step of the drum.
DSET	<i>Date Set</i> sets the date portion of the real-time clock to values contained in designated V-memory locations.
DSP	<i>Drum Step Preset</i> is the starting drum step number.
E	Toggles enable/disable of the current base when configuring I/O; it is a hard key.
EDIT	Allows you to change ladder logic in ladder display. In comment or title, does not insert a new line after pressing <input type="button" value="Return"/> . Allows the changing of S-memory data. Also, allows editing of a PROFIBUS-DP I/O configuration.
EDRUM	<i>Event Drum</i> simulates operation of an electromechanical drum. The event drum provides up to 15 output coils and 16 steps that are indexed by a timer alone, by an event contact alone, or a combination of the two. Each of the 15 output coils are available for use on each of the 16 steps.
ELEMNT	<i>Element</i> accesses variable types for Find operation in SFPGMs and SFSUBs.
ELSE	Used in conjunction with IF, IIF, ENDIF instructions to control conditional executions of SF statements. ELSE precedes the statements that are executed when the IF or IIF condition is false.
ENABLE	Sets a loop, alarm, SFPGM, or SFSUB control block to be functional.

END – G

END	Is a coil that unconditionally terminates the program memory scan, and is also an end of R/S marker. It is a hard key on a PC that moves the cursor to the top of the output column of the current rung in RLL, or moves the cursor to the end of the line or page.
ENDC	<i>End Conditional</i> is a coil that terminates the current memory scan and clears any active MCR and JMP instructions when the input to the ENDC is on.
ENDIF	Terminates an IF, IIF, or ELSE control structure.
EN/DIS	<i>Enable</i> and <i>Disable</i> permit selection between functioning or inoperative S-memory loop or alarm control blocks; also, can toggle selected base or slave enable/disable status in the controller.
ENPSW	<i>Enables Password Protection</i> in the controller and the selected program on disk.
ENTER	Is a hard or soft key that writes data or performs a particular function.
ERASE	Is used with AUX 84 to erase the contents of the controller EEPROM.
ESC	<i>Escape</i> performs an exit or abort on a personal computer; it is a hard key.
EXECUTE	Begins the print operation.
EXIT	Returns screen to previous display as a key function; also an SF instruction that terminates execution of the current SF program (even from within an SF subroutine) and reports error status.
EXPORT	Selects the export of synonyms or comments.
EXP(X)	Returns “e” raised to the X in a math expression.
FIND	Locates and displays various elements, boxes, statements, and rungs. In I/O configuration, it finds the location of a particular I/O point.
FIXED	Refers to a scan time that is a set length and does not vary.
FLDTGL	Moves cursor between sub-window menu and prompt fields in PGMS function.
FLOOR(X)	Returns the largest integer less than or equal to X in a math expression.
FMTGL	<i>Format Toggle</i> toggles between saving and not saving the format in the V-K memory editor. The mode is shown on the lower right of the screen.
FORCE	Sets an element to a specified value. The element remains the same value until UNFORC is selected. Only X, Y, C, WX, or WY can be forced.
FORMAT	Accesses the DOS disk formatting operation.
FRAC(X)	Returns portion of X to the right of the decimal point in a math expression.
FRS	<i>Forced Roll Swap</i> does a forced roll swap between Hot Backup Units.
FTSR-IN	<i>Fall Thru Shift Register-Input</i> adds an entry to an asynchronous shift register. The first of a pair of status bits is set when the register is full. The second bit is set when the register is empty. Used with the FTSR-OUT instruction.
FTSR-OUT	<i>Fall Thru Shift Register-Output</i> removes an entry from an asynchronous shift register. The first of a pair of status bits is set when the register is full. The second bit is set when the register is empty. Used with the FTSR-IN instruction.
FULL	In password it selects <i>Full</i> controller access when the password is enabled.
G	Global memory—memory used to interface between applications; available in 575 controllers only.

Global CR – Ins

Global CR	Is a type of CR that can be accessed by any part of the program. The range of global CRs is determined by the I/O configuration and the controller model.
GOTO	Causes program execution to continue starting at a specified LABEL.
GTS	<i>Go to Subroutine</i> is a coil that executes a ladder subroutine.
H	Accesses the horizontal line function; it is a hard key.
HALT	Suspends operation of the loop card in the controller.
Hard Key	Is a predefined key on the keyboard that performs a TISOFT function.
HEX	<i>Hexadecimal</i> is a number based on 16; the numbers 0–9 represent 0–9 and A–F represent 10–15. The format takes 1 word (16 Bits).
HINTS	<i>Hints</i> displays a list of useful key combinations for TISOFT operations.
HIU	<i>Host Interface Unit</i> configures UNILINK Host Adapter on TIWAY network.
HIUEHA	<i>Host Interface Unit Emulate Host Adapter</i> configures Unilink Host Adapter on TIWAY network.
Home	Moves the cursor to the beginning of the current rung in RLL, or moves the cursor to the beginning of the line or page; it is a hard key.
HORZ	<i>Horizontal</i> draws a horizontal line beginning at the position of the cursor. A line cannot be drawn over a box. It can, however, overwrite a contact.
HORZD	<i>Horizontal Delete</i> deletes the line, contact, coil, or box under the cursor in the ladder editor.
IF	Is used in conjunction with ELSE, ENDIF instructions to control conditional execution of SF statements. If the conditional expression is true (non-0), all SF statements between the IF and ELSE (or ENDIF if no ELSE) are executed. Otherwise the statements between the ELSE and ENDIF are executed.
IIF	Integer IF; same as IF for integer math in SF statements; allows you to code IF-THEN-ELSE blocks using an integer expression for the conditional. Integer expressions execute faster than equivalent floating-point expressions.
IMC	<i>Indexed Matrix Compare</i> compares the bit pattern of a user-specified step to the current state of up to 15 I/O points. Specify the step number (index the instruction) by loading a step number (1–16) into the location specified for PTR. The IMC compares a 15-bit mask pattern against the image register status of up to 15 discrete points.
IO	Is a bit input or output element with X or Y.
IORW	<i>Immediate I/O Read/Write</i> reads or writes immediately to a block of discrete I/O or to either a single point or blocks of word I/O.
IMATH	<i>Integer Math</i> is used to evaluate integer math expressions.
IMPORT	Selects the import of synonyms or comments.
INLTGL	<i>In-line Toggle</i> in SFPGM and SFSUB boxes sets the box instruction to execute in-line if the SF program or subroutine has been compiled. When power flow is on for an in-line SFPGM or SFSUB box instruction, the box executes immediately as part of the ladder scan. The result of the box's execution is available to the next element of the current rung.
Ins	In ladder edit, accesses a menu that allows rows, columns, elements, or rungs to be inserted; for text data, accesses character insert mode. It is a hard key.

INSERT – LLLA

INSERT	In ladder edit, accesses a menu that allows rows, columns, elements, or empty rungs to be inserted. In Print Setup, it inserts a print control sequence number.
INSLN	<i>Insert Line</i> inserts a line above the line or R/S step on which the cursor is placed.
INSMOD	<i>Insert Mode</i> automatically inserts elements until you exit the edit operation or press the INSMOD key again.
INSST	<i>Insert Statement</i> inserts a statement in an SF program or subroutine.
INSTR	<i>Instruction</i> selects SF instruction for find or block operations.
INT	<i>Integer</i> is an unsigned decimal number from 0 to 65535. Any entry above the 65535 range checks to 65535. Also, a relational contact parameter indicating a signed integer compare.
J	Draws a vertical line down from the bottom left edge of the cursor; a hard key.
JMP	<i>Jump</i> is a coil that freezes all outputs in its field of control. Each JMP instruction must be numbered (1–8). Numbers may be used more than once.
JMPE	<i>Jump End</i> is a coil that terminates a jump instruction.
K	Designates read-only memory locations in the controller.
L	Memory area designated for ladder programs. In SF programs or subroutines, L is a suffix that indicates a long (double) word or address (such as V23L, 427L).
LABEL	Specifies the destination of a GOTO statement where program execution resumes.
LACK	<i>Loop Alarm Acknowledge Flags</i> , must be an integer.
LADB	<i>Loop Alarm Deadband</i> , may be integer or real.
LADDER	Selects the ladder rung data in Replace or Block.
LBL	<i>Label</i> is a coil that ends a Skip function.
LCF	<i>Loop C-Flags</i> (32 bits)
LCFH	<i>Loop C-Flags High</i> , most significant word of loop C-flags, must be an integer.
LCFL	<i>Loop C-Flags Low</i> , least significant word of loop C-flag, must be an integer.
LDA	<i>Load Address</i> copies the address of a memory location into a memory location.
LDC	<i>Load Data Constant</i> is a box that loads the indicated data constant into a designated memory location.
LEAD/LAG	Performs signal processing on an analog variable. Available only when invoked from a Loop, Alarm, or Cyclic SF Program.
LERR	<i>Loop Error</i> , may be integer or real.
LHA	<i>Loop High Limit Alarm</i> , may be integer or real.
LHHA	<i>Loop High-High Limit Alarm</i> , may be integer or real.
LIMIT	Refers to a scan time that varies up to a set limit.
LKC	<i>Loop Gain</i> , must be real.
LKD	<i>Loop Derivative Gain-limiting Coefficient</i> , must be real.
LLA	<i>Loop Low Limit Alarm</i> , may be integer or real.
LLLA	<i>Loop Low-Low Limit Alarm</i> , may be integer or real.

LMN– MCR

LMN	<i>Loop Output</i> , may be integer or real.
LMNA	<i>Loop Output Address</i> .
LMX	<i>Loop Bias</i> , may be integer or real.
LN(X)	Returns natural logarithm of X in a math expression.
Local CR	Is a type of CR that resides on the 560 CPU board.
LOCK	Designates that loop card operating mode will follow discrete CPU mode; a box that allows you to coordinate access to resources
LODA	<i>Loop Orange Deviation Alarm</i> , may be integer or real.
LOG(X)	Returns the common logarithm of X in a math expression.
LOOP	Accesses loop directory for using loop functions or selects loop data to act on.
LPETn	provides for each loop a peak elapsed time that is the time from the loop being scheduled until the process completes execution (n = 1–64).
LPV	<i>Loop Process Variable</i> , may be integer or real.
LPVA	<i>Loop Process Variable Address</i> .
LPVH	<i>High Limit for Loop Process Variable</i> , must be real.
LPVL	<i>Low Limit for Loop Process Variable</i> , must be real.
LRCA	<i>Loop Rate-of-Change Alarm Limit</i> , must be real.
LRFA	<i>Loop Ramp/Soak Flag Address</i> .
LRSA	<i>Loop Remote Setpoint Address</i> .
LRSF	<i>Loop Ramp/Soak Flags</i> , must be an integer.
LRSN	<i>Loop Ramp/Soak Step Number</i> ; must be an integer.
LSP	<i>Loop Setpoint</i> , may be integer or real.
LSPH	<i>High Limit for Loop Setpoint Clamp</i> , may be integer or real.
LSPL	<i>Low Limit for Loop Setpoint Clamp</i> , may be integer or real.
LTD	<i>Loop Rate (derivative time)</i> , must be real.
LTl	<i>Loop Reset</i> , must be real.
LTS	<i>Loop Sample Rate</i> , must be real.
LVF	<i>Loop V-Flags</i> , must be an integer.
LVFA	<i>Loop V-Flag Address</i> .
LYDA	<i>Loop Yellow Deviation Alarm</i> , may be integer or real.
M	Performs the vertical delete function in ladders; it is a hard key.
MATH	Is an SF instruction that evaluates real (floating-point) math expressions.
MCAT	<i>Motor Control Alarm Timer</i> ; box instruction that operates with motor driven valves that drive in each direction.
MCR	<i>Master Control Relay</i> is a coil that turns off all coils within the zone of control between the MCR instruction and the MCRE instruction. Each MCR instruction must be numbered (1–8). Numbers may be used more than once.

MCRE	<i>Master Control Relay End</i> is a coil that terminates a master control relay function.
MDRMD	<i>Mask Drum Discrete</i> is a box that simulates operation of an electromechanical drum and allows specifying a mask for selection of discretes controlled.
MDRMW	<i>Mask Drum Word</i> is a box that simulates operation of an electromechanical drum and allows specifying a mask for selection of word outputs controlled.
MDRUM	Selects MDRMD and MDRMW drum types.
MERGE	Reads the COM PROFIBUS parameter configuration binary file and merges this information into the selected TISOFT program on disk.
MHIU	<i>Master Host Interface Unit</i> configures Unilink Host Adapter on TIWAY network.
MHIUEHA	<i>Master Host Interface Unit Emulate Host Adapter</i> configures Unilink Host Adapter on TIWAY network.
MIRFT	<i>Move Image Register from Table</i> allows moving of data from a table of consecutive word locations to the Image Register.
MIRTT	<i>Move Image Register to Table</i> allows moving of data from the Image Register to a table of consecutive word locations.
MIRW	<i>Move Image Register to Word</i> clears memory location A and shifts the number of bits specified from the discrete image register (X,Y, or C) to the word in memory location A in a single memory scan.
MKDIR	Enables creation of new directory in PGMS function.
MOD	Operator in SF MATH statements that performs modulo arithmetic: X MOD Y yields the remainder of X/Y.
MOVE	In Block, moves the selected block to another location, then deletes the source block. The Move Element box instruction copies data elements from a source address to a destination address.
MOVW	<i>Move Word</i> moves up to 256 words, beginning at the location designated in A, to the location specified as beginning at B, in a single memory scan.
MULT	<i>Multiply</i> multiplies a signed integer in memory location A by a signed integer in memory location B. The product is stored in two memory locations, C and C + 1. (C contains the most significant word and C + 1 contains the least significant.)
MWFT	<i>Move Word From Table</i> moves words from a table location in V-memory to another location in V-memory, as specified by a table address pointer. One word is moved in each memory scan. MWFT & MWTT instructions must have different numbers.
MWI	<i>Move Word with Indirect addressing</i> allows moving 1 to 256 words from one area of V-memory to another.
MWIR	<i>Move Word to Image Register</i> allows a specific number of bits to be shifted from a word memory location to specified discrete image register locations in a single memory scan.
MWTT	<i>Move Word to Table</i> moves words from a word source in V-memory to a table destination address specified by a pointer in V-memory. One word is moved during each memory scan.
N	Performs the horizontal delete line function; also a No response. It is a hard key.

NEXT – PC

NEXT	Finds and displays the next programmed ladder rung address in status select. In I/O configuration it finds the next location of an I/O point.
NO	A negative response to a prompt question.
NOACC	<i>No Access</i> in password selects no controller access.
NOCMPL	Sets an SF program or subroutine to not be compiled.
NODLST	<i>Node List</i> in FMS communications allows you to select a file that contains a list of network station names in order to select a station for on-line communications.
NONE	Selects no paging in comment; allows no element to be selected for a parameter in certain boxes in RLL and in S-memory.
NOP	<i>Null Operation</i> is an unprogrammed coil or rung.
NOT	Is the logical NOT operator in SF MATH and IF statements; NOT is also an RLL box to invert power flow.
NEXTDM	Locates the next Dual Media RBC after the channel and base number entered at the prompt.
NXTIN	<i>Next Instruction</i> is the next rung of programmed ladder logic.
ODD	Causes the printer to skip to the beginning of the next odd numbered page before printing a rung and its associated comment.
OFFLINE	A mode of the programming device; it is used when no communication with the controller is desired. In AUX 82, it puts the standby unit in PROGRAM mode.
ONLINE	A mode of the programming device; it is used when communication with the controller is desired. In AUX 82, it puts the standby unit in RUN mode.
OPER	Sets PROFIBUS-DP communications mode to OPERATE.
OPR/ST	At PROFIBUS-DP Slave Status screen, toggles between OPERATE and STOP communications mode. Elsewhere, allows you to select between ASYNCHRONOUS and SYNCHRONOUS as well as OPERATE and STOP communications mode for PROFIBUS-DP I/O.
OR	Is the logical OR operator in SF MATH and IF statements.
OS	<i>One Shot</i> is a box that looks like a contact; it provides an output for one controller scan.
OUTPUT	Allows the selection of special calculation on loop output.
OUTTGL	Toggles between OUTPUT ONLY or unrestricted search in the Find operation.
P	<i>Parameter</i> designator in special function subroutine; may be integer or real.
PACK	Is used to copy discrete and word data to/from a table.
PACKAA	<i>Pack Analog Alarm</i> copies alarm data to/from a specified table. Up to eight alarm data type parameters may be copied.
PACKLOOP	Copies loop data to/from a specified table. Up to eight loop data type parameters may be copied.
PACKRS	<i>Pack Ramp/Soak</i> copies ramp/soak data to/from a specified table.
PAGE	In print mode, it lets the printer continue to the end of the page and then stop. In H1, TCP, or FMS communications, Page allows you to select a list of names.
PC	<i>Personal Computer</i>

PETWD	<i>Pet Scan Watchdog</i> is an instruction in SF programs and SF subroutines that allows you to extend the scan watchdog while performing an in-line SFPGM or SFSUB of an RLL program.
PgDn	<i>Page Down</i> displays the next page; it is a hard key.
PG/RN	<i>Program/Run</i> allows the selection of discrete CPU mode, loop card mode, and interaction between the two.
PGM	<i>Program</i> initiates programming mode in the loop controller or SF module.
PGMFRZ	<i>Program Freeze</i> places the controller in Program mode with all outputs remaining in the state they were prior to initiating Freeze mode.
PGMOFF	<i>Program Off</i> places the controller in Program mode with discrete outputs set to zero and word outputs frozen.
PGMS	Accesses the function keys that enable performing program selection operations.
PGTS	<i>Parameterized Go to Subroutine</i> . This box instruction allows you to call a subroutine from RLL and pass parameters to the subroutine for execution.
PGTSZ	<i>Parameterized Go to Subroutine (Zero)</i> . This box instruction, like PGTS, allows you to call a subroutine from RLL and pass parameters to the subroutine for execution and also clears all discrettes indicated as outputs when the subroutine is not executed.
PgUp	<i>Page Up</i> displays the previous page; it is a hard key.
PLC	<i>Programmable Logic Controller</i> .
PORTCF	<i>Port Configuration</i> . For the 575 controller, accesses menu to configure port parameters.
PPETn	Provides for each SF program a peak elapsed time that is the time from the SF program being scheduled until the process completes execution (n= 1–1023).
PRINT	<i>(Function Key)</i> prints selected groups of program data; <i>(Hard Key)</i> prints the screen display; also an SF instruction that sends text and data through the ASCII message ports to a printer.
PRO–DP	<i>PROFIBUS-DP</i> switches status screen from displaying Series 505 to PROFIBUS-DP I/O.
PRTCTL	<i>Print Control</i> accesses function menu for entering control characters for printers.
PUT	Copies a selected block of data from a source program to a destination program. Source and destination options include controller, programming device RAM, and disk.
QUIT	Terminates the print operation and keeps the printer paper on a page boundary.
R/S	<i>Ramp/Soak</i> accesses ramp/soak programming function, or selects ramp/soak data to act on.
RAMP	Selects a ramp step.
RDCHT	<i>Read Chart</i> loads a status chart from the disk.
RDDATE	<i>Read Date</i> reads the date from the programming device and displays it on the print setup screen.
RDONLY	In password it selects <i>Read-Only</i> controller access when the password is enabled.
RDTBL	<i>Read Table</i> loads a saved Select Table to replace the current table.

READ – RUNDIA

READ	In Status CHGVAL, reads the value of the selected element. In V/K memory, it refreshes the screen display. In Replace edit, it reads elements for the last selected range. In AUX 14, it reads Watchdog timeout; in AUX 16, it reads Task Code values; in AUX 18 it reads time of day; in AUX 19, it reads controller scan time. In AUX 15 and AUX 23 it reads part numbers.
READBS	<i>Read Base</i> obtains the I/O module Definition Chart for the selected base from the base. Available on-line only.
READDK	<i>Read Disk</i> displays the memory configuration or the I/O Module Definition from the disk. In Print, it reads the setup or selection parameters from the disk.
READPC	<i>Read PLC</i> displays the memory configuration or the I/O Module Definition from the controller. Available on-line only.
READRM	<i>Read RAM</i> displays the memory configuration or the I/O Module Definition from the programming device RAM. Available off-line only.
REAL	A number format that uses decimal points and a floating point number. This format takes two words (32 bits).
RECOVR	<i>Recover</i> recovers excess file space used by comments or synonyms by rebuilding the comment or synonym program files.
RENAME	Enables renaming of program files.
REPLAC	<i>Replace</i> invokes global search and replace operation.
REQAPP	<i>Required Application</i> accesses a menu that allows viewing and defining applications (575 controller only).
RESTOR	Restores modules for the selected slave according to the COM PROFIBUS configuration, including the image register types
RESTRT	Restarts the Syntax Check operation.
RESUME	Restarts print operation that has been suspended.
RETURN	In an SF Subroutine, causes execution to return to the program that invoked it. In an SF Program, it stops the program.
RMDIR	Deletes the selected directory (if the directory is empty) in PGMS function.
ROUND(X)	Returns integer nearest X in a math expression.
ROW	In ladder editor insert, this key inserts a blank row at the block cursor, shifting remaining rows down and extending vertical connections. The down arrow does the same function.
RST	<i>Reset Coil</i> (used with Set Coil) to reset a specified bit; Set and Reset can flag transient conditions (such as alarms) or operate as a latched output.
RSTI	<i>Reset Coil Immediate</i> (used with Set Coil Immediate) to reset a specified bit of an immediate coil. (The bit is then immediately updated.) Set/Reset Immediate can flag transient conditions (such as alarms) or operate as a latched output.
RSTPKS	In AUX 19, this key resets all peak values.
RTN	<i>Return</i> is a coil that ends execution of a ladder subroutine.
RUN	Initiates run mode in controller or loop card.
RUNALL	Runs base diagnostics on all bases.
RUNDIA	Runs base diagnostics on the selected channel and base.

RUNG – SIN(X)

RUNG	Inserts an empty rung in your ladder program when in ladder editor insert mode.
S	Accesses the ladder status; it is a hard key.
SBR	<i>Subroutine</i> is a coil that defines a subroutine in ladder logic.
SCALE	Converts binary inputs into engineering units. (Available in SF programs and SF subroutines.)
SDT	<i>Sequential Data Table</i> writes the value at an indexed table location to the specified output address. The index is incremented to the next table entry each time the statement is executed. The restart bit is set when the index is at any point other than the beginning of the table. (Available in SF programs and SF subroutines.)
SEEK	Locates the next occurrence of a forced element type.
SELECT	Allows the selection of ladder rung and charts to be displayed in status; selects a program or file in multiple programs (PGMS).
SEND	Sends the print control sequence to the printer.
SET	<i>Set Coil</i> (used with Reset Coil) to set a specified bit; Set and Reset can flag transient conditions (such as alarms) or operate as a latched output.
SETI	<i>Set Coil Immediate</i> (used with Reset Coil Immediate) to set a specified bit of an immediate coil. (The bit is then immediately updated.) Set/Reset Immediate can flag transient conditions (such as alarms) or operate as a latched output.
SETPSW	Creates, changes, or clears the password in the controller or on the selected program on disk.
SETUP	Invokes print menu for setting up print parameters. Also selects a prompt for selecting import/export parameters.
SFEC	<i>Special Function Error Code</i> , an element used in SF programming; must be an integer.
SFPGM	<i>Special Function Program</i> provides access to the special function programming and subroutine functions, or it selects SFPGM data to act on; a box that calls an SF program.
SFPGM Header	<i>Special Function Program Header</i> is used to define program title, type, behavior of SF program when an error occurs.
SFSUB	<i>Special Function Subroutine</i> provides access to special function subroutine programming functions, or it selects SFSUB data to act on; a box that calls an SF subroutine.
SFSUB Header	<i>Special Function Subroutine Header</i> is used to define subroutine title.
SHOW	Displays selected program sections in S-memory. In I/O configuration, it displays the individual I/O points.
SHR	Accesses shift register types.
SHRB	<i>Bit Shift Register</i> creates a bit shift register in the Discrete Image Register.
SHRW	<i>Word Shift Register</i> shifts words from memory location A to the V-memory, beginning at location B. The number of words to be shifted to create the shift register is specified in N.
SIN(X)	Returns sine of X in a math expression.

SKP – SUSPEND

SKP	<i>Skip</i> skips execution of a section of ladder logic to the corresponding label; (see also LBL).
SMC	<i>Scan Matrix Compare</i> compares up to 16 user-defined bit patterns (steps) against the current states of up to 15 I/O points.
SOAK	Selects a soak step.
Soft Key	Is a function key labeled from F1 to F8, its action depends on the menu displayed on the screen.
Spacebar	Toggles between function key menus when a plus (+) appears to the right of the function key line; also inputs a space in text.
SPETn	Provides for each SF subroutine a peak elapsed time that is the time from the SF subroutine being scheduled until the process completes execution (n = 1–1023).
SQRT	<i>Square Root</i> takes the square root of a positive integer and stores the result in the B location of memory. The integer retains its original value.
SQRT(X)	Returns the square root of X in a math expression.
SRCTGL	<i>Source Toggle</i> toggles between sources in BLOCK operations and AUX 84 (EEPROM programming).
S.SCAN	<i>Single Scan</i> initiates a single scan of the ladder program or configures the task scan table.
SSI	<i>Scan Synchronization Inhibit</i> controls synchronization of active with standby unit in hot backup configuration.
SSR	<i>Sequential Shift Register</i> shifts data in a register one location each time the statement is executed. Vacated locations are set to 0. Data shifted out of the register is lost. The status bit is set when all locations in the register have been set to 0.
START	Starts the verify operation in AUX 17; in Replace, it starts the search and replace operation; in Single Scan (Status), it starts the single scan function.
STATUS	An on-line function that allows monitoring and debugging ladder programs.
STFE	<i>Search Table For Equal</i> locates the next occurrence of the word in a table that is equal to the source word.
STFN	<i>Search Table For Not Equal</i> locates the next occurrence of the word in a table that is not equal to the source word.
STMTNO	<i>Statement Number</i> is in Find in SF programs and SF subroutines; it allows the selection of statement numbers.
STOP	Sets PROFIBUS-DP communications mode to STOP.
STOPOE	Selects <i>Stop-On-Error</i> in a SFSUB box.
STRING	Accesses the menu to write characters to V- or K-memory locations.
STW	<i>Status Word</i> designates status word elements; must be an integer.
SUB	<i>Subtracts</i> a signed integer (positive or negative) in memory location B from a signed integer in memory location A and stores the result in memory location C. The signed integers on which the subtraction is performed are not affected by the operation and retain their values in the original locations.
SUSPEND	Halts the print operation.

SWAP	Reverses the order of the bytes in ASCII format.
SWITCH	Swaps the active and standby roles of CPU units in a hot backup system (AUX 82).
SWPRBC	Swaps the active and standby roles of dual media RBCs on the selected base.
SYN	<i>Synonym</i> creates or modifies synonyms, or selects synonym data.
SYNC	Sets PROFIBUS-DP communications mode to SYNCHRONOUS.
SYNTAX	Validates RLL instructions and displays errors found. Not all controllers support this function.
SYNTGL	<i>Synonym Toggle</i> toggles display of synonyms on or off for displayed ladder rungs or I/O points. In both on-line and off-line modes, the information is obtained from the currently selected program on the disk when synonym display is on. In the replace table, it toggles the copying of synonyms.
T	Designates temporary (cleared by controller) memory locations used in SF programming.
Tab	Moves from field to field in the synonym editor.
TAND	<i>Table to Table AND</i> ANDs the corresponding bits in two tables and places the results in a third specified table.
TAN(X)	Returns tangent of X in a math expression.
TASK	RLL Task box allows you to divide the RLL program into a normal task (synchronized with the I/O update) and a cyclic task (executed on a timed-interrupt basis, asynchronous to the I/O update).
TC	<i>Timer or Counter</i> selects timer, counter, and other related box types.
TCC	<i>Timer Counter Current</i> is the current value for a counter or timer.
TCMP	<i>Time Compare</i> compares the time of the real-time clock with the values contained in designated V-memory locations.
TCP	<i>Timer Counter Preset</i> is the starting value for a counter or timer.
TCPL	<i>Table Complement</i> inverts the status of each bit in a table and places results in a second table.
TCW	<i>Timer/Counter Word</i> element represents TCP and/or TCC elements.
TEXT	A box that stores up to five lines of 40 characters each in L-memory.
TITLE	Accesses the title function to program or display the title, date, and version of the program. In AUX, it displays the title; in Block, it selects title data.
TMR	<i>Timer</i> is a box instruction that times at a rate of 0.1 second.
TMRF	<i>Timer (Fast)</i> is a box instruction that times at the rate of 1 millisecond.
TMR1MS	<i>Timer 1-Millisecond</i> is a number format that shows 1-millisecond resolution. This format takes one word (16 bits).
TMR.1S	<i>Timer 0.1-Second</i> is a number format that shows 0.1 second resolution. This format takes one word (16 bits).
TMRS	<i>Timers</i> selects TMR and TMRF timer types.

TOR	<i>Table to Table OR</i> ORs the corresponding bits in two tables and places results in a third table.
TPETn	<i>Task Peak Elapsed Time</i> ; provides for each task a peak elapsed time defining the time from scheduling the task until the process completes execution (n = Task 1–16).
TRUNC(X)	Returns integer part of X in a math expression.
TSCAN	Accesses the Task Codes Per Scan function in AUX 19.
TSET	<i>Time Set</i> sets the time portion of the real-time clock to the values contained in designated V-memory locations.
TTOW	<i>Table to Word</i> duplicates a specified word in a table to another word location.
TXOR	<i>Table Exclusive OR</i> exclusively ORs the corresponding bits in a specified word and a word from a source table. The resultant word is placed in a destination table.
U	In the ladder editor, it is a hard key that draws a vertical line up from the top left edge of the cursor. In SF, U is a suffix that indicates a 16-bit unsigned word (such as V23U, 427U).
U-memory	Memory type used for storing external subroutines; in 545, 555, and 575 controllers only.
UDC	<i>Up Down Counter</i> counts the number of events that have occurred (up or down) between 0 and 32767.
UINT	A relational contact parameter indicating an unsigned integer compare.
UN.ALL	<i>Unforces All I/O</i> elements.
UNDEL	<i>Undelete</i> restores a deleted element at the current position of the cursor.
UNFORC	<i>Unforce</i> removes the forced condition from an element previously forced.
UNIFY	Moves all modules for the selected slave into the first module.
UNIQUE	Initiates a search for a like element of a specified type.
UNLCK	A box that unlocks a previously set lock.
UNLOCK	Allows the loop card operating mode to be set differently from the discrete CPU.
UNSCALE	Converts engineering units into binary.
UPDATE	Updates the controller with the PROFIBUS-DP I/O configuration from the selected program on disk.
V	Designates variable memory; in status and chart, it executes a single scan.
VAR	A scan time that takes as long as necessary and not any longer.
VERT	<i>Vertical</i> draws a vertical line to the left and below the cursor in the ladder editor.
VERTD	<i>Vertical Delete</i> deletes a vertical line in the ladder editor.
VMM	A24 VME address space (supervisor and non-supervisory); 575 controllers only.
VMS	A16 VME address space (non-supervisory); 575 controllers only.
W	Indicates a word parameter passed to a subroutine with PGTS and PGTSZ instructions.

WAND – WY

WAND	In ladders, a box instruction that logically ANDs a word in memory location A with a word in memory location B. The result is placed in memory location C. The words located in memory location A and B are not affected by the WAND instruction and retain their original values. [In SF, replaced by &]
WDBTGL	<i>Word/Bit-of-word Toggle</i> toggles between BIT ONLY (bit-of-word only), WORD ONLY, and unrestricted search in the Find operation.
WIO	A <i>Word Input or Output</i> element with WX or WY.
WOR	In ladders, a box instruction that logically ORs a word in memory location A with a word in memory location B. The result is placed in memory location C. The words located in memory locations A and B are not affected by the WOR instruction and retain their original values. [In SF, replaced by |]
WRCHT	<i>Write Chart</i> saves the displayed chart to a selected directory.
WRITDK	<i>Write Disk</i> sends the displayed memory configuration, or I/O Module Definition, to the current program; it then reads back what it sent and displays it on the screen. In print, it writes set up or selection parameters to disk. After editing, it saves off-line modifications made to the program in RAM to the currently selected program on disk.
WRITE	Saves the changes on the screen when in V/K memory editor. In R/S editor, it saves the modified table. In AUX 14, saves Watchdog timeout value; in AUX 16, saves Task Code values; in AUX 18, saves modified time of day; in AUX 19, saves controller scan time values.
WRITPC	<i>Write PLC</i> sends the displayed I/O Module Definition for the selected base or memory configuration to the controller. It then reads back what it sent and displays it on the screen. Available on-line only.
WRITRM	<i>Write RAM</i> sends the displayed memory configuration or I/O Module Definition to the programming device RAM. It then reads back what it sent and displays it on the screen. Available off-line only.
WROT	<i>Word Rotate</i> rotates a four-bit segment of a designated word.
WRTBL	<i>Write Table</i> saves the displayed <i>Select</i> table to the disk.
WTOT	<i>Word to Table</i> places a duplicate of a word in the destination table at the address specified.
WTTA	<i>Word to Table AND</i> compares each bit in a source word to corresponding bit of a designated word in a table and places results in a destination table.
WTTO	<i>Word to Table OR</i> ORs the corresponding bits of a word with a designated word in a source table.
WTTXO	<i>Word to Table Exclusive OR</i> exclusively ORs the corresponding bits in a specified word and a word from a source table. Results are placed in a destination table.
WX	Designates a word input that is connected to a physical input (16 bits).
WXOR	In ladders, a box instruction that exclusively ORs a word in a memory location with a word in a second location. Results are placed in a third memory location. [In SF, replaced by ^]
WY	Designates a word output that is connected to a physical output (16 bits).

X – YES

X	Represents a discrete (ON or OFF, open or closed) input device.
X<-->WX	Toggles the image register type for the selected module between discrete and word inputs.
XSUB	<i>External Subroutine</i> is a box instruction in RLL that invokes a user-defined subroutine in the 545, 555, and 575 controllers.
Y	Represents a discrete (ON or OFF, open or closed) output device; also a Yes response.
Y<-->WY	Toggles the image register type for the selected module between discrete and word outputs.
YES	A positive response to a prompt question.

Symbols

-| |-	Represents a normally open bit or bit-of-word input or monitored bit or bit-of-word output using its status as input.
-|/|-	<i>Contact (Closed)</i> is a normally closed input.
-|R|-(I)	<i>Relational Contact / Immediate Contacts and Coils.</i>
-()	<i>Output</i> is a normally open coil.
-(/)	Selects a normally closed coil.
+	Indicates that more function keys are accessible on a display by pressing the spacebar; also the addition/unary plus operator in SF IMATH, MATH, IF, and IIF statements. Also designates a positive constant in RLL, e.g., +32767.
+/-	Is a signed decimal integer with the range of +32767 to -32768. This format takes one word (16 bits).
-	Is a subtraction/unary minus operator in SF IMATH, MATH, IF, and IIF statements; also a minus sign for a signed number. Also designates a negative constant in RLL, e.g., -32768.
*	Is an SF statement used to insert comments for an SF program. Not executed when the SF program runs. * is also the multiplication operator in a math expression.
:=	Is the assignment operator in a math expression. (Assignment operator is not required in IF statements.)
=	Is equal to operator in a math expression or a relational contact.
<	Is less than operator in a math expression or a relational contact.
<=	Is less than or equal to operator in a math expression or a relational contact.
<>	Is not equal to operator in a math expression or a relational contact.
>	Is greater than operator in a math expression or a relational contact.
>=	Is greater than or equal to operator in a math expression or a relational contact.
>>	Is a shift right operator in a math expression.
<<	Is a shift left in operator in a math expression.
()	Is used to indicate offset indexing in a math expression; also used to override default precedence.
(: :)	Is used to indicate element indexing in a math expression.
/	Is the division operator in a math expression. (If an integer, any remainder is discarded.)
**	Is the exponentiation operator in a math expression.
@	Indirect address indicator, e.g., @V100 refers to the address stored within V100.
.	Specifies bit-of-word and DCP (Drum Step) elements in RLL. For example: WY23.16 specifies bit 16 of WY23, and DCP10.3 specifies step 3 of Drum 10. In SF, specifies a real address or real number (for example V23. or 2.74).
&	Operator in SF math expressions that performs logical, bit-by-bit AND of two words, 16 or 32 bits long. Replaces WAND in SF programs and subroutines.

-
- | Operator in SF math expressions that performs logical, bit-by-bit OR of two words, 16 or 32 bits long. Replaces WOR in SF programs and subroutines.
 - ^ Operator in SF math expressions that performs logical, bit-by-bit exclusive OR of two words, 16 or 32 bits long. Replaces WXOR in SF programs and subroutines.

Hard Key Listing

Table L TISOFT Keys

Function	Key	Comment
Abort	ESC	
AUX	A	Invokes AUX screen
BOX	B	Creates a box or edits an existing box when the cursor is positioned on the box
Coils	Y	Valid if cursor is in an output column
	C	
	WY	
	V	
	G	
	W	
Contacts	X	Valid if cursor is in an input column
	Y	
	C	
	WX/WY	
	V	
	K	
	G	
W		
Contact/Coil Toggle	/	Open/closed contact/coil toggle
Cursor Position Display	Ctrl T	Toggle cursor position display
Decrement Address	F10	Valid: CHGVAL (in Status)
Delete Character	DEL	Delete current element
	Backspace	Delete previous element
Enable/Disable	E	Enables or disables base
END	END	Moves to last column/row 1 of current rung
ENTER	ENTER	Edit: moves to next row, current rung, or appends new row to rung
		Display: moves to next row or rung
Equal to	=	Equal-to Relational Contact
EXIT	ESC	
FIND	Ctrl F	Invokes Find function
Greater Than or Equal to	>	Greater-than-or-Equal-to Relational Contact
HELP System	Alt H	Invokes help system
Element List	? or \	List valid elements for current field
HOME	HOME	Moves to column 1, row 1 of current rung
HORZ	H	Draws horizontal line

Table L TISOFT Keys (continued)

Function	Key	Comment
HORZD	N	Deletes horizontal line
Immediate I/O	I	Immediate contact and coil
Increment Address	F9	Valid: CHGVAL (in Status)
Insert Character	INS	Insert Mode
INSERT	INS →	Inserts a column
	INS ↓	Inserts a row
K-Memory Editor	Ctrl K	
L-Memory Address	L	
Less Than	<	Less-than Relational Contact
Macro Functions	Alt R	Record macro
	Alt S	Stop macro
	Alt P	Play macro
	Alt L	Loop macro play until key-press
	Alt W	Write macro to file
	Alt O	Open macro file
NO	N	For a YES/NO response
Not Equal to	!	Not-Equal Relational Contact
Off-Line Password	P	Access password functions offline
Output	O	Create/edit output coil
Page Up	PgUp	
Page Down	PgDn	
Page Left	Ctrl ←	
Page Right	Ctrl →	
Pop-Up Synonyms	Ctrl L	Edits synonym/descriptor
Print Screen	Ctrl PrtSc PrtSc	
Quick SF Edit	Ctrl O	Go to SF to show or edit
Quick Single Scan	Alt Q	Perform single scan
Single Scan	V	Invokes single scan function
Status	S	Invokes ladder status function
Usage Table	Ctrl U	
V-Memory Editor	Ctrl V	
VERT	J	Creates Down line
	U	Creates Up line
VERTD	M	Deletes vertical line
On-screen cross reference	Ctrl X	Valid: Ladder display – XREF rung where cursor is located
YES	Y	For a YES/NO response

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	Excellent	Good	Fair	Poor
Accuracy	_____	_____	_____	_____
Organization	_____	_____	_____	_____
Clarity	_____	_____	_____	_____
Completeness	_____	_____	_____	_____
Graphics	_____	_____	_____	_____
Examples	_____	_____	_____	_____
Overall design	_____	_____	_____	_____
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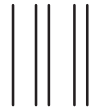
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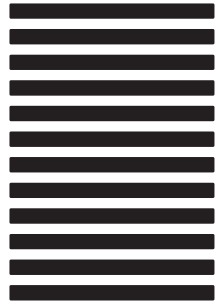
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