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Who Should Use this Manual

Use this manual if you are responsible for designing, programming, or troubleshooting control systems that use Allen-Bradley small logic controllers.

You should have a basic understanding of SLC 500™ products. If you do not, contact your local Allen-Bradley representative for the proper training before using this product.

We recommend reviewing the *APS Quick Start for New Users* before using the software.

Purpose of this Manual

This manual is a programming guide for the Advanced Programming Software (APS). It describes the procedures you use to program APS. This manual:

- gives you an overview of such topics as addressing, ladder logic, creating and editing processor files, available processor modes, online editing, and transferring program files.
- explains the procedures you use to program APS
- complements the online help available at the terminal

Contents of this Manual

Chapter	Title	Contents
	Preface	Describes the purpose, background, and scope of this manual. Also specifies the audience for whom this manual is intended.
1	Installing the Software	Describes the requirements for installing and running APS.
2	Navigating Through the Software	Discusses online help, guides you through the APS menu displays, and explains the keys you use.
3	Configuring Your System	Describes how to select color options, the printer configuration, system startup state, and user-preferred directories.
4	Ladder Logic Program Basics	Explains ladder programming. Includes examples of simple rungs and 4-rung programs.

Chapter	Title	Contents
5	Creating and Configuring Processor Files	Steps you through creating and then configuring processor files.
6	Creating and Editing Ladder Program Files	Shows you how to create and edit a program file.
7	Documenting Ladder Programs	Describes how to enter text in ladder program files which explains the events related to a particular rung or program.
8	Protection	Describes the available types of protection for each processor.
9	Saving and Compiling a Processor File	Describes the procedures used to save and compile a processor file.
10	Creating and Printing Reports	Describes the procedure for creating and printing reports.
11	Configuring Your Programming Device for Online Communications	Describes how to configure the terminal and software for online communication.
12	Using WHO	Describes the DH-485 and DH+ functions.
13	Configuring Your Processor for Online Communications	Describes how to configure the SLC 500 processor for online communication.
14	Restoring and Saving Processor Files	Describes how to upload and download program files.
15	Changing Processor Modes	Describes the different operating modes a processor can be placed in while using APS.
16	Monitoring Controller Operation	Describes how to monitor controller operation.
17	Online Editing	Describes what online editing is and how to use it.
18	The Multi-Point Function	Describes the multi-point function and how to use it.
19	The Force Function	Describes the force function and how to use it.
20	Using Memory Modules (EEPROMs and UVPROMs)	Describes the procedures used to transfer a program to/from an EEPROM. Also describes UVPROMs.
21	Transferring Program Files	Describes how to transfer program files between programming devices connected on a DH-485 network.
Appendix A	APS Error Messages	Describes possible APS error messages and their corrective actions.


Related Documentation

The following documents contain additional information concerning RSI and Allen-Bradley SLC products. To obtain a copy, contact your local sales office or distributor.

For	Read this Document
An introduction to APS for first-time users, containing basic concepts but focusing on simple tasks and exercises, and allowing the reader to begin programming in the shortest time possible	APS Quick Start for New Users
A training and quick reference guide to APS	SLC 500 Software Programmer's Quick Reference Guide, Publication Number ABT-1747-TSG001—available on PASSPORT at a list price of \$50.00
A guide of common procedures used in APS	SLC 500 Software Common Procedures Guide, Publication Number ABT-1747-TSJ50—available on PASSPORT at a list price of \$50.00
A reference manual that contains status file data and instruction set information for the SLC 500 processors and MicroLogix 1000 controllers.	Instruction Set Reference Manual
A procedural and reference manual for technical personnel who use the APS import/export utility to convert APS files to ASCII and conversely ASCII to APS files	APS Import/Export User Manual
An overview of the SLC 500 family of products	SLC 500 System Overview, Publication Number 1747-2.30
A description on how to install and use your <i>Fixed</i> SLC 500 programmable controller	Installation and Operation Manual for Fixed Hardware Style Programmable Controllers, Catalog Number 1747-NM001
A description on how to install and use your <i>Modular</i> SLC 500 programmable controller	Installation and Operation Manual for Modular Hardware Style Programmable Controllers, Publication Number 1747-6.2
A description on how to install and use your MicroLogix 1000 controllers. This manual also contains status file data and instruction set information for the micro controllers.	MicroLogix 1000 Controllers User Manual, Publication Number 1761-6.3.
A complete listing of current documentation, including ordering instructions. Also indicates whether the documents are available on CD-ROM or in multi-languages.	Allen-Bradley Publication Index, Publication Number SD499
A glossary of industrial automation terms and abbreviations	Allen-Bradley Industrial Automation Glossary, Publication Number AG-7.1

Common Techniques Used in this Manual

The following conventions are used throughout this manual:

- Bulleted lists provide information, not procedural steps.
- Numbered lists provide sequential steps or hierarchical information.
- Text in `this font` indicates words or phrases you should type.
- *Italic* type is used for emphasis.
- Key names match the names shown and appear in bold, capital letters within brackets (for example, [**ENTER**]). A function key icon matches the name of the function key you should press, such as  .

The following table summarizes the conventions used to distinguish the differences between the SLC 5/03 processor and SLC 5/04 processor keyswitch positions, the processor modes, and the actual display on the APS status line.

When Referring to the Keyswitch Position	When Referring to the Processor Mode	When Referring to the Status Line
RUN position	Run mode	RUN
REMOte position	Run mode	REM RUN
	Program mode	REM PROG
	Test — Single Step mode	REM SRG
	Test — Single Scan mode	REM SSN
	Test — Continuous Scan mode	REM CSN
PROGram position	Program mode	PROG

1 *Installing the Software*

Use the information in this chapter for information on:

- personal computer requirements
- platform restrictions
- procedures for installing APS
- configuring the windows drivers
- running APS
- SupportPlus Remote Software Support
- transferring registration information
- the documentation database utility

Personal Computer Requirements

The Advanced Programming Software (APS) can be used with an Allen-Bradley T47, T53, T60, or T70 terminal, 386/SX, NEC VERSA™ E and M Series Notebooks, or GATEWAY 2000™ models 386DX/25, 386DX/33, 486DX/33, 486DX2/50, and 486DX2/66 personal computers. Your computer must have:

- 640 Kbytes of RAM (A minimum of 2 Mbytes of extended memory is required; 3 Mbytes are required for programming a 1747-L543 processor.)
- 10 Mbytes fixed-disk drive (APS requires 7.5 Mbytes of free disk space.)
- MS DOS version 3.3 or higher (INTERCHANGE™ requires MS DOS version 5.0 or higher.)
- *For operation using Microsoft® Windows™*: Windows version 3.1 or Windows for Workgroups version 3.11.

Note

APS 6.0 is not supported on the following operating systems:

- *Windows 95^①*
- *Microsoft Windows NT™ 351*
- *IBM OS/2*
- *IBM OS/2 WARP*

^① Rockwell Software does not recommend the use of APS 6.0 in the Windows 95 operating system. APS 6.0 was not designed for specific Windows 95 compatibility, nor has a complete set of tests within this operating system been completed at the time of the APS 6.0 release. However, if you still want to attempt to operate in the Windows 95 operating system, there is some background information provided for you in the APS ReadMe file.

The amount of free conventional RAM that APS requires depends on what communication drivers you want to load:

If you want to load:	You need:
only the standalone communications drivers	300K bytes
Microsoft Windows drivers (INTERCHANGE software)	369K bytes

Platform Restrictions

If Using a 386/DX33 or Higher Platform

These platforms operate with no restrictions.

If Using a Platform Lower Than 386/DX33

Some restrictions may apply when operating at these platforms depending on the communication driver you use and its associated baud rate.

When operating at 19200 with an Allen-Bradley T47 or T60, a 386SX, or a similar computer, the use of EMM386 may slightly degrade network communications, and may degrade the reliability of APS communications to a network node. For enhanced communications performance on these computers, we recommend you remove EMM386 from the CONFIG.SYS file.

For restrictions on other drivers, see the table that follows.

		Communication Driver					
		KF3/KE and DF1 Half-Duplex				Windows 485 (PIC Only)	
Platform	Baud Rate	19200	9600	4800	2400	19200	9600
	386/DX25		▲	●	●	●	▲
386/SX16		■	▲	●	●	■	■

- Communication between the driver and APS is supported with or without an expanded memory manager.
- ▲ Communication between the driver and APS is only supported without an expanded memory manager.
- Communication between the driver and APS is not supported.

Note

Using a platform lower than a 386/SX16 is not supported online or offline.

Using Extended Memory

APS requires a minimum of 3 Mbytes of extended memory (XMS). To use extended (XMS) memory, add the following command to your CONFIG.SYS file:

Type: **DEVICE=HIMEM.SYS**

If the file HIMEM.SYS is not located in your root directory (C:\), you must specify the directory path to the file so DOS can locate the file (for example, DEVICE = C:\DOS\HIMEM.SYS).

If you use HIMEM.SYS, we strongly recommend that you increase the number of available XMS handles (NUMHANDLES) to 128. To do this add the following line to your CONFIG.SYS file.

DEVICE=C:\DOS\HIMEM.SYS /NUMHANDLES=128

After you enter this command and save the modified CONFIG.SYS file, restart your computer for the changes to take effect.

For more information about installing the extended memory manager, refer to the ReadMe file included with this software. This file is located in the directory in which the APS executable resides.

Note

Be sure to add the following line to your AUTOEXEC.BAT:
C:\DOS\SHARE.EXE .

Using Expanded Memory

Use of expanded memory decreases APS performance; therefore, it is not recommended. If you still choose to use expanded memory, follow the EMS 4.0 and VCPI specifications so that APS can use the expanded memory successfully (for example, DEVICE = C:\DOS\EMM386.EXE).

Determine if you can use expanded memory by referring to the chart on page 1–3. If you use a memory manager that is not 100% compatible, your computer may lock up when you attempt to run APS. Contact your local computer software vendor to determine what requirements your memory manager meets.

Note

If an EMS handler (such as EMM386) is installed, it must follow the EMS 4.0 and VCPI specifications. If it does not, contact the manufacturer and obtain the latest release. If you are using an EMS handler (or you want to use other switches than those specified here) refer to the README file included with this software. An exception is the IBM PC-DOS 4.01, which has an EMS manager that is not VCPI compatible.

If you are using one of the following EMS memory managers, make certain you use the switch shown in the example below (or an equivalent):

```
DEVICE=<path>EMM386 FRAME=NONE  
DEVICE=<path>386MAX NOFRAME  
DEVICE=<path>386MAX EMS=0
```

If you are using a QEMM memory manager, make certain you use the switch shown in the example below (or an equivalent):

```
DEVICE=<path>QEMM386.SYS FRAME=NONE  
DEVICE=<path>QDPMI.SYS
```

Using APS with DOS 5.0

Recommended CONFIG.SYS for 386/486 PCs with 4 meg. RAM running DOS 5.0 (uses a combination of extended and expanded memory):

Note

If running in a Windows environment:

- load *SHARE.EXE* and *INTERCHANGE* drivers prior to loading MS Windows.
- set the **FILES** parameter to 46 or higher

```
DEVICE=C:\DOS\HIMEM.SYS /NUMHANDLES=128
DOS=HIGH,UMB
```

```
DEVICEHIGH=C:\DOS\ANSI.SYS
FILES=40
BUFFERS=40
DEVICE=C:\DOS\SMARTDRV.SYS
```

Note

The executable **EMM386.EXE** does not automatically exclude the memory used by PC expansion cards. You must exclude the memory used by all of the PC expansion cards by adding an exclusion option to the memory manager invoke line.

For example, the memory manager invoke line would appear as follows when using a 1784-KT Communication Interface module set up to use address range D400 to DFFF:

```
DEVICE=C:\DOS\EMM386.EXE 1024 x=D400-DFFF FRAME=NONE
```

See the user manual provided with each expansion card for more information.

Example CONFIG.SYS file for *expanded* memory only:

```
FILES=40
BUFFERS=40
DEVICE=C:\DOS\HIMEM.SYS /NUMHANDLES=128
DEVICE=C:\DOS\EMM386.EXE FRAME=NONE
```

Example CONFIG.SYS file for *extended* (XMS) memory only:

```
FILES=40
BUFFERS=40
DEVICE=C:\DOS\HIMEM.SYS /NUMHANDLES=128
```

Using APS with DOS 6.0

When a power loss or system reboot occurs when using DOS 6.0, data on your hard drive may become corrupt when the “write cache” option is enabled by SMARTDRV. We recommend disabling the “write cache” option. Use the following configuration to disable the “write cache” option:

SMARTDRV

If you are using DOS 6.0 with DoubleSpace, add the following line to your AUTOEXEC .BAT file.

SMARTDRV H

Note

The above example assumes you are using a standard computer configuration consisting of Drives A, B, and C. Drive H is the host drive used by DoubleSpace.

If your computer is configured differently, refer to your DOS 6.0 user manual for information regarding the DoubleSpace host drive selection.

Using DOS 6.0 with DoubleSpace

If you are using a 386/486 PC with 4 meg. RAM running DOS 6.0 with DoubleSpace (uses a combination of extended and expanded memory), we recommend using the following CONFIG .SYS:

```
DEVICE=C:\DOS\HIMEM.SYS /NUMHANDLES=128
DOS=HIGH,UMB
DEVICE=C:\DOS\EMM386.EXE FRAME=NONE
DEVICEHIGH=C:\DOS\ANSI.SYS
FILES=40
BUFFERS=40
DEVICEHIGH=C:\DOS\DBLSPACE.SYS /MOVE
```

Note

*If running in a Windows environment, set the **FILES** parameter to 46 or higher*

Example CONFIG .SYS file for *extended* (XMS) memory only:

```
DEVICE=C:\DOS\HIMEM.SYS /NUMHANDLES=128
DEVICE=C:\DOS\DBLSPACE.SYS /MOVE
FILES=40
BUFFERS=40
```

Using DOS 6.0 without DoubleSpace

If you are using a 386/486 PC with 4 meg. RAM running DOS 6.0 without DoubleSpace, we recommend using the following AUTOEXEC .BAT and CONFIG .SYS files:

Note

If running in a Windows environment,

- *load SHARE . EXE prior to loading windows.*
- *set the **FILES** parameter to 46 or higher*

Example AUTOEXEC .BAT file for DOS 6.0

```
C:\DOS\SMARTDRV.EXE C
PATH=C:\;C:\DOS
goto %config%

:STANDARD
goto end

:APS
C:\DOS\SHARE.EXE
CD C:\ABIC\BIN
CALL ABICRUN
CD C:\IPDS\ATTACH\SLC500
CALL APS
goto end

:end
```

Example CONFIG .SYS file for DOS 6.0 without DoubleSpace

```
[menu]
menuitem=standard
menuitem=APS

[Common]
DEVICE=C:\DOS\HIMEM.SYS /NUMHANDLES=128
DOS=HIGH,UMB

[Standard]
DEVICE=C:\DOS\EMM386.EXE 1024 FRAME=NONE
DEVICEhigh=C:\ANSI.SYS
FILES=40
BUFFERS=40
```

```
[APS]
DEVICEhigh=C:\DOS\ANSI.SYS
FILES=40
BUFFERS=40
```

Installing the Software or Software Updates

Before you actually install the software, complete the prepaid postage **Software Updates** registration card and return it to Rockwell Software Incorporated. This is very important, since it confirms your registration.

Inside the software envelope you will find the APS software, Catalog Number 9323-PA2E, on 3.5 inch high-density disks. If you require 5.25 inch or 3.5 inch low-density disks and are a registered user, contact the media exchange service at 1-800-289-2279. Have your software serial number available when you call.

We assume that you have installed DOS in your computer. If you have not, do this now, following the instructions supplied with your computer.

Checking Available Memory

To determine if your computer has enough memory for the software, at the DOS prompt type: **CHKDSK**, then press [**ENTER**]. The screen displays the memory configuration of your computer. Check the last line of the display **XXXXXX** bytes free. See page 1-2 for memory requirements.

Updating the System Files

To update your system files, follow the instructions supplied with your computer. You must re-boot the system to initialize any changes you make.

AUTOEXEC.BAT File

Make sure your AUTOEXEC.BAT file contains this statement:

```
C:\DOS\SHARE.EXE
```


CONFIG.SYS File

Your CONFIG.SYS file must contain the following statements:

FILES=40 (If running in a windows environment, set **FILES** \geq 46.)

BUFFERS=40

Note

These are minimum values. If your CONFIG.SYS file contains FILES and BUFFERS statements with greater values, there is no need to change the file. Be aware that these statements may conflict with the CONFIG.SYS requirements for other software packages you have installed on your programming terminal.

Locating the Software's Serial Number

During the installation process you are asked for the serial number of your software. The serial number you enter is used to personalize the software.

The serial number is not found on the disks. It can be found in several places though. These are:

- the software registration card
- the registration change card
- the outside of the shipping carton

Note

If you enter the serial number incorrectly or enter the wrong serial number and accept the entry, you will be unable to correct this situation later. Therefore, verify your serial number carefully, before committing your work.

Installing the Software

To install the software, do the following:

1. Insert the diskette labeled Disk 1 into the appropriate disk drive (either drive A or drive B). For this example, we are using drive A.
2. Exit to DOS.
3. Type: **A:INSTALL**, then press [**ENTER**].
4. During the installation process, instructions appear on the screen to prompt you through the procedure. Follow the instructions and type in the information requested.

Note

You must use the default directories provided during initial installation if you intend to run APS in a Windows environment with INTERCHANGE and/or access the DH+ WHO function.

The APS executable is named AP.EXE which is called by APS .BAT. The installation procedure also loads the INTERCHANGE software executables, IT executables, and the DH+ WHO executable. These executables are required to run APS under Windows and to access the DH+ WHO function.

Configuring the Windows Drivers (INTERCHANGE)

APS 6.0 and above uses part of the INTERCHANGE software product, Catalog Number 5850-WKTS. This software supports the use of Data Highway Plus (DH+) and DH-485 protocols, in addition to DH+ WHO functionality. You can load the complete INTERCHANGE software through the internal INTERCHANGE executables shipped with the APS software. For more information on the INTERCHANGE software product contact your local Allen-Bradley representative.

INTERCHANGE software is an Application-Programming Interface (API) that provides a host computer (MS-DOS operating system with or without Windows) with a library of functions and executable commands. INTERCHANGE software lets multiple applications (such as APS and 6200 Programming Software) share a single common interface module to communicate with various devices on DH+ and/or DH-485 networks.

The type of computer you use dictates which KT DH+ communication interface module (referred to as card) you need:

Type of Computer	Communication Interface Card
IBM compatible	1784-KT or 1784-KTX
IBM compatible PCMCIA	1784-PCMK
IBM PS/2 microchannel	1784-KT2
T47 portable terminals	1784-KL

If this is the first time the Windows drivers (INTERCHANGE software) are configured, you need to configure the INTERCHANGE drivers. You can do this from either a Windows or DOS environment. Explanations of both methods follow.

Configuring the Drivers From a Windows Environment

To configure the INTERCHANGE drivers from Windows, click on the DeviceConfig icon found in the INTERCHANGE program group. Follow the instructions provided.

Configuring the Drivers From a DOS Environment

To configure the INTERCHANGE drivers from a DOS environment, verify that the following statements are included in your AUTOEXEC .BAT file:

```
SET ABIC_CONFIG=C:(INTERCHANGE directory)
PATH=%PATH% ; C:(INTERCHANGE directory);
```

Note

If this was a new installation, the default INTERCHANGE directory is **\RSI\IC\BIN**. If you installed INTERCHANGE over a previous version, the default directory is **\ABIC\BIN**.

Activating the INTERCHANGE Drivers

You must activate the INTERCHANGE drivers from a DOS environment. To do this, edit the CFG_KT .INI file contained in the directory containing your INTERCHANGE components. If a Windows driver has already been configured, we recommend verifying the settings to meet your requirements. Additionally, verify that the following statement is included in your AUTOEXEC .BAT file:

```
CALL (INTERCHANGE directory)\ABICRUN .BAT
```

Note

If this was a new installation, the default INTERCHANGE directory is **\RSI\IC\BIN**. If you installed INTERCHANGE over a previous version, the default directory is **\ABIC\BIN**.

To edit the file, do the following:

1. At the DOS prompt type:
edit C:(INTERCHANGE directory)\CFG_KT.INI

Note

If this was a new installation, the default INTERCHANGE directory is `\RSI\IC\BIN`. If you installed INTERCHANGE over a previous version, the default directory is `\ABIC\BIN`.

2. A description of INTERCHANGE is provided along with the driver initialization templates. To activate an interface card, edit and uncomment an option(s) by removing the semicolon at the beginning of the line. The following examples show an unedited and edited initialization file for the 1784-KT interface card. A listing of the available files begins on page 1–14.

Unedited initialization file for the 1784-KT:

```
; [DTL_KT.1]
; DEVICE=KT
; MEMORY=D400
; IRQ=5
; STATION=77
; NAME=KT 1
; TERMINATION=ON
```

Edited initialization file that configures the 1784-KT for port 4:

```
[DTL_KT.1]
DEVICE=KT
MEMORY=D400
IRQ=5
STATION=77
NAME=KT 4
TERMINATION=ON
```

Note

See the interface card documentation to determine the correct memory address and IRQ address.

3. Once you have edited the required interface cards, save the file and exit.

Available Initialization Files

```
; [DTL_KT.1]
;DEVICE=KT2
;MEMORY=D400
;IRQ=9
;STATION=77
;NAME=DTL_KT 1
;TERMINATION=ON

; [DTL_KT.1]
;DEVICE=KL
;MEMORY=E000
;IRQ=2
;STATION=77
;NAME=DTL_KT 3
;TERMINATION=ON

; [DTL_KT.1]
;DEVICE=PCMK
;MEMORY=D000
;IRQ=5
;STATION=77
;NAME=DTL_KT 4

; [DTL_KT.1]
;DEVICE=KTX
;PROTOCOL=DHPLUS
;MEMORY=C800
;IRQ=5
;STATION=22
;NAME=DTL_KT 6

; [DTL_KT.7] 485
;DEVICE=KTX
;PROTOCOL=DH485
;MEMORY=C800
;BAUD=19200
;IRQ=5
;STATION=0 ;octal (0 to 37)
;MAXNADDR=037 ;octal (0 to 37)
;NAME=485 KTX
```

The communication port specified here must match the communication port defined during installation.

```
      ; [DTL_DF1.8]
      ; DEVICE=DF1
      ; BAUD=1200
      ; IRQ=4
      → ; COM_PORT=1
      ; NAME=DTL_KT 8
      ; ERROR=1
      ; PARITY=1
      ; DUPLEX=1
```

The communication port specified here must match the communication port defined during installation.

```
      ; [DTL_485.5]
      ; DEVICE=PIC
      ; BAUD=19200
      ; IRQ=4
      → ; COM_PORT=1
      ; STATION=0 ;octal (0 to 37) ←
      ; MAXNADDR=037 ;octal (0 to 37)
      ; NAME=485 PIC
```

If you use the DH-485 protocol, you must enter an octal value for the Station Number and Maximum Address field.

Running APS

You can run APS either from a DOS or a Windows environment.

Running APS in a DOS Environment

1. If necessary, change the drive specifier to the drive where the software is installed (typically C). To do this, type:


C: and press [**ENTER**].

2. If you are using the default directory, at the DOS prompt, type:


CD \IPDS\ATTACH\SLC500 and press [**ENTER**].

If you specified a different directory path, change to that directory and press [**ENTER**].

3. Use the table that follows to choose your next step:

To run APS:	First:	Then:
with INTERCHANGE and DH+ WHO		Type APS and press [ENTER]. The APS main menu appears.
with only DH+ WHO	Make certain the Windows drivers are stopped. <ul style="list-style-type: none"> • If your AUTOEXEC.BAT contains this command: \ABIC\BIN\ABICRUN, type: \ABIC\BIN\ABICSTOP . 	Type IT and press [ENTER]. The APS main menu appears.
alone (without INTERCHANGE and DH+ WHO)	<ul style="list-style-type: none"> • If your AUTOEXEC.BAT contains this command: \RSI\IC\BIN\ABICRUN, type: \RSI\IC\BIN\ABICSTOP . 	Type AP and press [ENTER]. The APS main menu appears.

Exiting the System: You can exit APS software and return to DOS by

accessing the APS main menu and pressing  .

F10

Running APS in a Windows Environment

1. If you plan to go online with the processor, the INTERCHANGE drivers must be configured and activated. See page 1–11 for more information.
2. At the DOS prompt type:

WIN
3. Click on the APS icon. The main APS menu appears.

SLC-500 ADVANCED PROGRAMMING SOFTWARE	RELEASE 6.00								
Rockwell Software Incorporated, Copyright 1989-1995									
9323 - PA2E									
All Rights Reserved									
This Software is licensed to:									
Your Name									
Your company name									
00000000									
<table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">Fri Nov 24, 1995</td> <td style="width: 33%;">Current Offline File: DEFAULT</td> <td style="width: 33%; text-align: right;">11:03:09 am</td> </tr> <tr> <td>TERM Address: 0</td> <td>Current Device: 1747-PIC (DH-485)</td> <td style="text-align: right;">PROC Address: 1</td> </tr> </table>		Fri Nov 24, 1995	Current Offline File: DEFAULT	11:03:09 am	TERM Address: 0	Current Device: 1747-PIC (DH-485)	PROC Address: 1		
Fri Nov 24, 1995	Current Offline File: DEFAULT	11:03:09 am							
TERM Address: 0	Current Device: 1747-PIC (DH-485)	PROC Address: 1							
Press a function key									
ONLINE	ONLINE CONFIG	OFFLINE PRG/DOC	OFFLINE CONFIG	WHO	SYSTEM CONFIGR	FILE OPTIONS	PRINT REPORTS	SYSTEM UTILS	EXIT SYSTEM
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

Exiting the System: You can exit APS software and return to Windows by accessing the APS menu and pressing

**EXIT
SYSTEM**
F10

Using the ReadMe File

The Advanced Programming Software contains a ReadMe file that covers information made available after the time of printing of the documentation. Review this file before using the software.

To view this file online, type: `README`

To print this file to printer port 1, type: `README LPT1 :`

SupportPlus Remote Software Support Disks

Remote Software Support consists of a help utility (ABHELP) and a HOST communications software package.

Remote Software Support must be installed separately. Use the `INSTALL` command with the Remote Software Support disk. For more information, see chapter 1 in the *SupportPlus Remote Software Support User Manual*, Publication SUPS-6.5.8.

Transferring the Software Ownership

If any of the information provided to Rockwell Software changes, such as name, company name, or mailing address, complete the postage prepaid **Change of Product Registration** card and return it to Rockwell Software.

To alter this information stored electronically in the APS package, do the following:

1. Insert the disk labeled Disk 1 into the appropriate disk drive (either drive A or B). For this example, we are using drive A.
2. Type: `A:INSTALL TRANSFER`, then press `[ENTER]`.

During the installation process, instructions appear on the screen to prompt you through the procedure. Follow the instructions and type in the information requested. You will not be prompted to re-enter the serial number. The serial number can be entered only once for each APS package.

Documentation Database Utility (UPDATEDB.EXE)

The documentation database utility, `UPDATEDB.EXE` automates the task of updating your databases from a previous version of APS to APS 6.0. It scans the specified drive for APS documentation databases and performs the update. *Only* documentation databases located on the drive where APS is installed are audited.

Using the Documentation Database Utility

1. We recommend backing up your databases. The APS “Copy to Disk” function may be used for this purpose. You may also use the DOS “Copy Command” to perform the backup. Note that each APS documentation database contains seven different files (.b0\$, .b1\$, .lx\$, .op\$, .ix\$, .pc\$, and .ac\$). Make sure you copy all seven files for each database.
2. Verify that you are still in the directory where `AP.EXE` is installed. If you are not, change to that directory.
3. Type: `UPDATEDB`, then press [**ENTER**]. The following menu is displayed.

```
What drive do you want to scan for APS database files (A-Z)? C
Do you want to create a log file? YES
Log file name: UPDATEDB.LOG
AUDIT or UPDATE databases? AUDIT
Start AUDIT? YES
```

```
Enter the letter of the drive you want to scan for APS databases.
```

To abort the program without corrupting your database files, press [**CTRL-C**] or [**CTRL-Break**].

4. Respond to the prompts as required, then press [**ENTER**] to start the update.

Note

We recommend specifying a log file. This ensures that you have a record of what `UPDATEDB.EXE` did. The log file contains the list of databases that require updating. It also helps Rockwell Software answer any questions you might have after running `UPDATEDB.EXE`.

5. Upon completion of the audit process, the program indicates what the audit found. If the install program determined an update is not required, no further action is necessary.
6. The UPDATEDB.LOG file is created in the same directory as your AP.EXE file. To view this file, change to the directory where AP.EXE is located and enter:

```
type updatedb.log|more
```

7. To print the UPDATEDB.LOG file, enter:

```
print updatedb.log
```

Using Other Documentation Databases

Converted documentation databases can still be loaded by any version of APS. However, you should be aware that comments attached to timer instructions with a 1.0 second timebase and TOD/FRD instructions that do not use the math register will not be displayed by versions of APS prior to release 4.0.

If you use a version of APS prior to 4.0 to change the documentation database and you document TON, TOF, RTO, TOD, and FRD instructions, you may need to go through the update process again.

Note

If a documentation database that needs updating is loaded by APS 6.0, a warning message will be displayed indicating that the database needs to be updated. The documentation database will be loaded and you may make changes to your ladder program, but you should not make any changes to the documentation database until you have run the UPDATEDB.EXE program. Error messages like “database read error” or “fatal internal error” may be displayed when using databases that have not been updated.

2 *Navigating Through the Software*

Use this chapter as a guide to accessing the software's functions. Specifically, you will find information on:

- using online help
- APS screen format
- the five basic APS displays
- keys you use

Using Online Help

The Advanced Programming Software, version 4.0 and above supports online help. You can access the help text by pressing [**ALT-H**].

If you press [**ALT-H**], and help is not currently available, the message: **HELP CURRENTLY UNAVAILABLE** is displayed. This message may appear when a process is active, such as uploading or downloading processor images or when creating or printing reports.

The help text is displayed in the following priorities:

- If currently in the ladder editor or monitor program function, the help text displayed is for the currently cursored (or edited) instruction.
- If currently in the system status file data table monitor function, the help text displayed is for the currently cursored address.
- If none of the above conditions exist, then the beginning of the help text file is displayed.

Use the [**Pg Up**], [**Pg Dn**], [arrow-up], [arrow-down], [Home], and [End] keys to scroll through the help text.

Once the help text is displayed, you can search the help file for specific topics by entering text at the command line. For example, you may want to enter an instruction mnemonic or a system status file address. See the example that follows.

Example

To initiate a search for the move instruction, do the following:

1. At the command line, type: **MOV** and press [**ENTER**].
2. APS searches the help file in the following manner:
 - a. First, APS searches for an exact match of the entered text.
 - b. If an exact match is not found, APS searches for a topic that begins with the entered text.
 - c. If a topic is not found, APS searches for a topic that contains the entered text.
 - d. Finally, if no text is found, the position of the help text file remains unchanged.
3. When APS finds a match, the help text is displayed. At this point you can either scroll through the text, or enter a different topic on the command line.

APS Screen Format

The APS screen is divided into three areas:

- Display area
- Message, prompt, data entry, and status lines
- Main APS functions

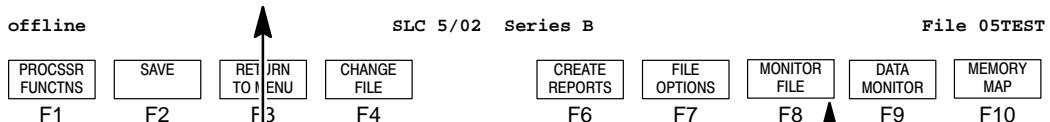
The following figure indicates what appears in these areas.

- **Display Area:** The five APS displays appear here – the APS menu, offline program directory (shown here), offline monitor file, online program directory, and online monitor file. Various option windows overlay these displays, depending on the function you are accessing. Also, the status data file and other data files, force tables, and the memory map appear in this area.

PROGRAM DIRECTORY FOR PROCESSOR: 05TEST

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	217
1			reserved	0
2			ladder	9
3			ladder	4

Press a key, enter file number or file name



- **Message, Prompt, Data Entry, and Status Lines**

Message: Error codes/descriptions and information concerning terminal or processor operation appear here.

Prompt: Indicates action you should take.

Data Entry: Information entered from the terminal keyboard appears on this line.

Status: Status information concerning the processor and program file appears on this line.

- **Main Functions:** APS functions appear here. They are accessed by terminal keys F1 to F10. You complete tasks by pressing the appropriate function keys. In most cases, pop-up option windows appear in the display area to facilitate task completion. The main functions are replaced with sub-functions related to options or data entry.

The Five Basic Menu Displays

This section describes the five basic APS menu displays.

Main Menu Display

The following display is the main menu. This menu appears when you first enter APS.

```

===== SLC-500 ADVANCED PROGRAMMING SOFTWARE ===== RELEASE 6.00 =====
Rockwell Software Incorporated, Copyright 1989-1995

          9323 - PA2E

          All Rights Reserved

This Software is licensed to:      Your Name
                                   Your company name
                                   00000000

-----
Fri Nov 24, 1995                    Current Offline File: DEFAULT                11:03:09 am
-----
TERM Address:  0                    Current Device: 1747-PIC (DH-485)                PROC Address:  1
-----
    
```

Press a function key

ONLINE	ONLINE CONFIG	OFFLINE PRG/DOC	OFFLINE CONFIG	WHO	SYSTEM CONFIGR	FILE OPTIONS	PRINT REPORTS	SYSTEM UTILS	EXIT SYSTEM
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

This function key:	Allows you to:
[F1] Online	go online with the processor.
[F2] Online Configuration	change the online configuration of the terminal (port, terminal address, processor address, and baud rate).
[F3] Offline Program/Document	access the offline programming functions.
[F4] Offline Configuration	change the processor file in the terminal workspace or create an archive processor file.
[F5] WHO	display node and network diagnostic windows, change the programmer online configuration, and the network configuration.
[F6] System Configuration	change the system configuration (highlight, color, printer configuration, and system startup display). Also allows you to specify the location of processor and documentation directories for retrieval.
[F7] File Options	copy to or from a floppy. Also allows you to rename, copy, and delete files.

Continued on next page

This function key:	Allows you to:
[F8] Print Reports	print reports.
[F9] System Utilities	use the Prom Translator, which converts archive files to hexadecimal format. Also allows you to transfer a processor file between two APS terminals or from an APS terminal to an HHT.
[F10] Exit System	exit the software.

Offline Program Directory Display

The following display appears when you press **OFFLINE PRG/DOC F3** from the previous menu.

PROGRAM DIRECTORY FOR PROCESSOR: 05TEST SINGLE STEP TEST: DISABLED

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	73
1			reserved	0
2		ladder	ladder	12
3			ladder	45

Press a key, enter file number or file name

offline SLC 5/03 File 05TEST

PROCSRR
FUNCTNS

SAVE

RETURN
TO MENU

CHANGE
FILE

CREATE
REPORTS

FILE
OPTIONS

MONITOR
FILE

DATA
MONITOR

MEMORY
MAP

F1
F2
F3
F4
F6
F7
F8
F9
F10

This function key:	Allows you to:
[F1] Processor Functions	change the processor and I/O configuration; add/delete/change a password or master password; change the processor file name; create/delete ladder program files; name ladder program files; and clear the processor file from the workspace.
[F2] Save	save the processor file to disk.
[F4] Change File	replace the processor file with another processor file. Also allows you to create an archive processor file.
[F6] Create Reports	create reports.
[F7] File Options	rename, copy, and delete archive files. Also allows you to copy a file to and from disk.

Offline Monitor File Display

The following display appears when you press **MONITOR FILE** from the previous menu.

F8

The screenshot displays a ladder logic rung with the following components:

- IN**: I:0.0, with a normally open contact and a zero (0) below it.
- TON** (Timer On Delay) block:
 - Timer: EIGHT_SEC
 - Time Base: 0.01
 - Preset: 800
 - Accum: 0
- OUT**: O:0.0, with a normally open contact and a zero (0) below it.
- The rung ends with **END**.

Below the ladder logic, the following text and function key menu are visible:

Press a function key
(file 2, rung 0)
offline no forces EDITS: NONE File 05TEST

CONFIG DISPLAY	EXIT	MULTI POINT	DOCUMNT	SEARCH	GENERAL UTILITY	DATA MONITOR	FORCE	EDIT
F2	F3	F4	F5	F6	F7	F8	F9	F10

This function key:	Allows you to:
[F2] Configure Display	configure the ladder file display (display/suppress comments and symbols).
[F4] Multi-Point	access the multi-point list menu. (Available only for the SLC 5/03 OS302 and SLC 5/04 OS401 processors and the MicroLogix 1000 controllers.)
[F5] Document	document ladder files (add/delete/edit comments and symbols).
[F6] Search	search, search and replace instructions/addresses.
[F7] General Utility	monitor/edit the status data file. Also allows you to clear minor and major faults and clear the workspace memory.
[F8] Data Monitor	monitor data file information and change the radix. You can also edit data and move to the Force Monitor function.
[F9] Force	force I/O from the force table. You can also access the Data Monitor display and monitor forced I/O.
[F10] Edit	edit rungs and instructions, cut/copy/paste (advanced editing), test edits, and use the quick edit feature.

Online Program Directory Display

The following display appears when you enter the online mode by pressing

ONLINE

at the main menu.

F1

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	73
1			reserved	0
2		ladder	ladder	12
3			ladder	45

Press a key, enter file number or file name

REM RUN

L532 Series C Rev 2

PROC Addr 2

PROCSSR FUNCTNS	SAVE RESTORE	RETURN TO MENU	CHANGE LNK ADR	WHO ACTIVE	CREATE REPORTS	FILE OPTIONS	MONITOR FILE	DATA MONITOR	MEMORY MAP
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

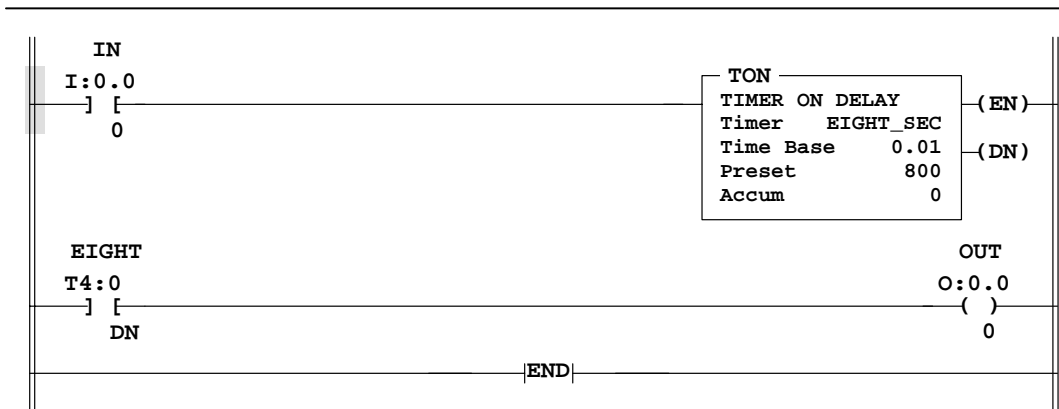
The following function keys allow you complete tasks applying to the processor file in the addressed processor.

This function key:	Allows you to:
[F1] Processor Functions	change the processor mode. Copy a processor file stored in an EEPROM to the processor memory.
[F2] Save/Restore	save a processor file to disk or restore an archive file to the processor memory.
[F4] Change Link Address	communicate with a different node address on the DH-485 network.
[F5] WHO Active	monitor the WHO Active window, change the network configuration, monitor node and network diagnostic windows.
[F6] Create Reports	specify the type of report you want to create.
[F7] File Options	rename, copy, and delete archive files. You can also copy a file to/from a floppy.

Online Monitor File Display

The following display appears when you are online and you press **MONITOR FILE** from the previous menu.

**MONITOR
FILE
F8**



Press a function key
(file 2, rung 0)

REM RUN

no forces

EDITS: NONE

PROC Addr 2

CHANGE MODE	CONFIG DISPLAY	EXIT	MULTI POINT	DOCUMNT	SEARCH	GENERAL UTILITY	DATA MONITOR	FORCE	EDIT
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

This function key:	Allows you to:
[F1] Change Mode	change processor mode.
[F2] Configure Display	configure the ladder file display.
[F4] Multi-Point	access the multi-point list menu. (Available only for the SLC 5/03 OS302 and SLC 5/04 OS401 processors and the MicroLogix 1000 controllers.)
[F5] Document	add rung and instruction comments to your ladder program.
[F6] Search	search for instructions and addresses.
[F7] General Utility	monitor and edit the status file; clear minor and major faults; clear the processor memory; and copy the processor file to/from EEPROM and processor memory.
[F8] Data Monitor	monitor data files, edit data, and change the radix.
[F9] Force	force I/O from the force table and then monitor the forced I/O.
[F10] Edit	edit the ladder program using the quick edit feature.

Keys You Use

Within APS you can use certain keys to access screen displays and then move the cursor in those displays.

Hot Key Functions

Hot key functions provide short cuts to display frequently used screens and information.

This key combination or function key:	Allows you to:		
<p>[Alt-M] alternate of</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px auto;">MEMORY MAP</div> <p>F1</p>	<p>access the Memory Map display. Functional at these displays:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><u>Offline</u> monitor file edit</td> <td style="width: 50%; border: none;"><u>Online</u> monitor file</td> </tr> </table>	<u>Offline</u> monitor file edit	<u>Online</u> monitor file
<u>Offline</u> monitor file edit	<u>Online</u> monitor file		
<p>[Alt-D] alternate of</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px auto;">DATA MONITOR</div> <p>F8</p>	<p>access the Data Monitor display. Functional at these displays:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><u>Offline</u> monitor file edit</td> <td style="width: 50%; border: none;"><u>Online</u> monitor file</td> </tr> </table>	<u>Offline</u> monitor file edit	<u>Online</u> monitor file
<u>Offline</u> monitor file edit	<u>Online</u> monitor file		
<p>[Alt-E] alternate of</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px auto;">CONFIG DISPLAY</div> <p>F2</p>	<p>access the Configure Display menu choices. Functional at these displays:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><u>Offline</u> monitor file edit force</td> <td style="width: 50%; border: none;"><u>Online</u> monitor file force</td> </tr> </table>	<u>Offline</u> monitor file edit force	<u>Online</u> monitor file force
<u>Offline</u> monitor file edit force	<u>Online</u> monitor file force		
<p>[Alt-S] alternate of</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px auto;">SEARCH</div> <p>F6</p>	<p>access the Search menu choices. Functional at these displays:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><u>Offline</u> monitor file edit force</td> <td style="width: 50%; border: none;"><u>Online</u> monitor file force</td> </tr> </table>	<u>Offline</u> monitor file edit force	<u>Online</u> monitor file force
<u>Offline</u> monitor file edit force	<u>Online</u> monitor file force		
<p>[Alt-T] alternate of</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px auto;">DOCUMNT</div> <p>F5</p>	<p>access the Document menu choices. Functional at these displays:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"><u>Offline</u> monitor file edit force</td> <td style="width: 50%; border: none;"><u>Online</u> monitor file</td> </tr> </table>	<u>Offline</u> monitor file edit force	<u>Online</u> monitor file
<u>Offline</u> monitor file edit force	<u>Online</u> monitor file		

This key combination or function key:	Allows you to:
<p>[Alt-C] alternate of</p> <div style="border: 1px solid black; padding: 2px; display: inline-block;">CHANGE MODE</div> <p>F1</p>	<p>Accesses Change Mode menu choices. Functional Online, at these displays:</p> <ul style="list-style-type: none"> <li>online (program directory) <li>monitor file <li>force, monitor inputs, monitor outputs <li>configure display <li>data monitor <li>general utility, memory map, proc status
<p>[Alt-U]</p>	<p>Aborts changes, exits the function, and moves you to the previous display. [ESC] exits the function and moves you to the previous display, but does not abort changes.</p>
<p>[Alt-H]</p>	<p>Accesses the online help text. This is available at any display.</p>
<p>[Alt-Shift-H]</p>	<p>Disconnects the DF1 communication connection from the modem.</p>

Control Key Functions












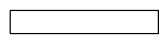

Control (CTRL) keys let you enter and edit the information you type on the data/command line or in the data entry window on a screen. These keys perform the same task on every screen in the software.

This key combination:	Allows you to:
[CTRL-A]	toggle the insert mode between enable and disable.
[CTRL-B]	move the cursor to the beginning of the line.
[CTRL-D]	move the cursor one position to the left.
[CTRL-E]	move the cursor to the end of the line.
[CTRL-F]	move the cursor one position to the right.
[CTRL-H]	move the cursor back one space (backspace).
[CTRL-J]	delete the text from the cursor's current position to the end of the line.
[CTRL-M]	add a carriage return.
[CTRL-R]	recall the previous command you entered.
[CTRL-U]	delete the text from the start of the line to the cursor's current position.
[CTRL-X]	delete the entire line of text.

CTRL Key Functions Only Available When Using Multiple Line Comment Editors

This key combination:	Allows you to:
[CTRL-J]	delete the previous word.
[CTRL-N]	move the cursor to the next word.
[CTRL-P]	move the cursor to the previous word.

Additional Short Cut Keys

This key:	Allows you to:
 Enter/Return Key	enter data you've typed. It also functions as a Return key, to end the current line and begin another when typing multi-line comments.
	move to the previous display.
   	move left, right, up, and down in a ladder program, in a directory, or in a data table.
	move the cursor to the left power rail of rung 0 in a ladder program or to the data at the upper left in a data file page, or to the top line of a directory.
	move the cursor to the last instruction of a ladder program or to the data at the lower right in a data file page, or to the bottom line of a directory.
	move the cursor to the previous page in a directory or to the previous page in a multi-page data file.
	move the cursor to the next page of a directory or to the next page in a multi-page data file.
	move the cursor to the left in a line of typed characters, deleting the characters as it moves.
	move the cursor to the right in a line of typed characters, deleting the characters as it moves.
	delete typed characters on which the cursor is located.

3 *Configuring Your System*

This chapter shows you how to:

- select and save highlight options for ladder displays
- select and save color options
- select and save the printer configuration
- select and save the system startup display
- define and save user-preferred directory paths
- monitor M0 and M1 files (SLC 5/03 and SLC 5/04 processors)

Configuration Options

The following pages show the factory default settings. If your system has been previously configured, the displays may vary.

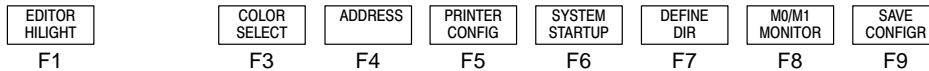
From the main menu, press **SYSTEM CONFIGR** to view the System Configuration display.
F6

```

SYSTEM CONFIGURATION
-----
F1 Editor Highlighting Style:          REVERSE
F3 Color Selection:                   MONOCHROME
F4 Address
F5 Printer Configuration
F6 System Startup State:              MAIN MENU
F7 Define Directory Paths
F8 Monitor M0/M1 Addresses:          DISABLED
F9 Save Configuration

ESC exits/Alt-U aborts changes
    
```

Press a function key



Editor Highlighting Style

Function key [F1], Editor Highlight toggles the editor highlighting style between REVERSE and INTENSIFY. These two options are for monochrome and LCD monitors only. They do not affect the color display monitors.

Reverse (Default Option – Preferred Option When Using an LCD Monitor)

- Cursor is shown as a flashing area (the instruction, rung location, or power rail location alternately appears/disappears).
- True instructions are shown as reversed screen areas.
- A true instruction at the cursor location is shown as a reversed screen area (true) and flashing (cursor).
- Enabled forces are shown as On or Off in a reversed screen area.

Intensify

- Cursor is shown as a reversed screen area (located on an instruction, rung, or power rail).
- True instructions are shown intensified (heavier line weight).
- A true instruction at the cursor location is shown diminished (true) in a reversed screen area (cursor).
- Enabled forces are shown as an intensified “On” or “Off.”

Note

If you are using a T47 terminal or another terminal having an LCD display, the preferred option is REVERSE. With the INTENSIFY option, true instructions and enabled forces are not easy to distinguish because they are diminished rather than intensified.

Color Selection

Function key [F3], Color Select toggles the Color Selection between MONOCHROME and COLOR.

Monochrome (Default Option)

The display varies according to the type of monochrome or LCD monitor used. If you are using a T45 or T47 terminal or another terminal having an LCD display, you should use the MONOCHROME option. With the color option certain parts of the display are not easy to distinguish.

Color

The following table describes the colors for the various APS functions and displays. The functions and displays are described in chapter 2.

Monitor Display	Foreground Color	Background Color	Cursor
Main Menu	White	Blue	NA
Program Directories	White	Blue	Black
Function Keys	White	Blue	N/A
Function Key Displays	Black	Aqua	Gray
Who Listen	Red	Gray	NA
Who Active	Red	Gray	Black
Message Line	Yellow	Black	NA
Prompt Line	Green	Black	NA
Data Entry Line	White	Black	White Flashing
Run Mode	Green	Black	NA
Test Mode	Blue	Black	NA
Program Mode	White	Black	NA
Fault Codes	Magenta	Black	NA
Status Line	White	Black	NA
Ladder Logic Instructions	White	Black	Red
Data Monitor	White	Black	Red
True Instructions	Green	Black	Red
Enabled Forces	Magenta "On" or "Off"	Black	Red
Rung Comments	Aqua	Black	NA
Address Comments	Yellow	Black	NA
Instruction Comments	Yellow	Black	NA
Instruction Symbols	Magenta	Black	NA

NA = Not Applicable

Selectable Address Display

You have the option to select the method used to reference the physical addressing of bit (data) files. Bit files include outputs (O), inputs (I), and binary (B). For each file type, you can select between two address displays:

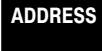

- Word/Bit
- Sequential

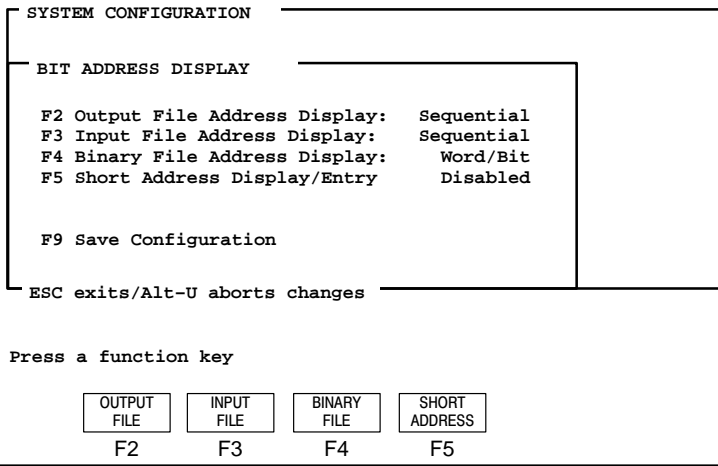
The following table shows the differences between the two types of displays:

Bit File Type	Word/Bit	Sequential Bit
Input	I1:2.0/10 I1:1.3/0	I1:2/10 I1:1/48
Output	O0:0.1/1	O0:0/17
Binary	B3:5/10 B10:0/15	B3/90 B10/15

In addition you have the option of selecting short addressing for address display and entry. Short addressing omits the file number and colon from the address. For example, N13 is the short address of N7:13. See the *Instruction Set Reference Manual* for more information.

Once you select the method(s) of display, it is applied to the database editor, create reports function, and to the ladder display.

1. From the System Configuration display, press . The function keys  toggle between Word/Bit and Sequential address display types. See the following figure.



2. Select the address display for each file type. When you are finished, press **SAVE CONFIG** (F9). The message **NEW CONFIGURATION SAVED TO FILE** is displayed.

Note

To enable short addressing, you must set [F4] Binary File to Sequential.

3. Press [**ESC**] and return to the System Configuration display.

Configuring Your Printer

This option allows you to designate the type and required configuration for your printer.

1. Begin at the System Configuration display and press **PRINTER CONFIG** **F5**. The following print options appear:

```
PRINTER CONFIGURATION

F1 Printer Type   PARALLEL
F2 Port          LPT1

F9 Save Configuration
F10 Printer Control

ESC exits/Alt-U aborts changes
```

Press a function key

PRINTER
TYPE
F1

PORT
NUMBER
F2

SAVE
CONFIG
F9

PRINTER
CONTROL
F10

2. Select the printer type:
 - The default configuration is PARALLEL port, so if you have a parallel printer you do not need to change the printer type. Descriptions of the function keys available follow. Use the keys to select the appropriate print settings.

Function Keys	Description
[F1] Printer Type	Toggles between Serial and Parallel printer types. The default is a Parallel printer type.
[F2] Port Number	Toggles between LPT1 and LPT2.
[F9] Save Configuration	Saves your changes to file.
[F10] Printer Control	Allows you to enter an initialization and termination string. See page 3-9 for more information. The following options are available: [F1] Initial String – Allows you to enter a control string of data for your current print request. [F2] Termination String – Allows you to enter a control string of data to reset the printer to its previous setup mode.

3. If you want to change to SERIAL port, press **PRINTER TYPE** **F1** to access its printer configuration screen. Descriptions of the function keys available for the SERIAL printer type follow.

Function Keys	Description
[F1] Printer Type	Toggles between Serial and Parallel printer types. The default is a Parallel printer type.
[F2] Port Number	Toggles between COM1 and COM2.
[F3] Baud Rate	Toggles between 300, 600, 1200, 2400, 4800, and 9600 baud. The default is 9600 baud.
[F4] Bits/Char	Toggles between 7 and 8. The default is 8.
[F5] Stop Bits	Toggles between 1 and 2. The default is 2.
[F6] Select Parity	Toggles between Even, Odd, and None. The default is None.
[F7] Select Duplex	Toggles between Half and Full. The default is Half-duplex.
[F9] Save Configuration	Saves your changes to file.
[F10] Printer Control	Allows you to enter an initialization and termination string. See page 3-9 for more information. The following options are available: [F1] Initial String – Allows you to enter a control string of data for your current print request. [F2] Termination String – Allows you to enter a control string of data to reset the printer to its previous setup mode.

4. Use the function keys to select the appropriate print settings.

5. Save the control string by pressing **SAVE TO FILE** **F9**. Once you have entered both strings, press **SAVE CONFIG** **F9**, then [ENTER] or [ESC].

Printer Control String Option

This option allows you to change the printer configuration for the current print request. You can change the printer to condensed mode, the typeface, and the characteristic of the typeface, such as bold or italic. Before using this option, we recommend referring to the printer's user manual for the correct printer control sequences.

We recommend using the initial string and termination string together. This ensures that the printer is reset to its previous setup mode for the next print request. Enter the initial control string data first. It should not exceed 1 line of 160 printable characters.

Control String Entry Priorities:

1. Enter the printable characters (hexadecimal values 20–7E).
2. Enter the control character (hexadecimal values 00–1F) by preceding it with the control character, “^”. For example, hexadecimal value 12 (form feed) can be entered as ^L.
3. Enter any character (hexadecimal values 00–FF) by preceding it with a backslash, “\”. For example, <escape> can be entered as \027.
4. Enter any character (hexadecimal values 00–FF) by preceding it with an “x” before the one or two hexadecimal digit string. For example, a vertical tab can be entered as \x0B.
5. A “\” character followed by any non-numeric character is interpreted as that character. For example, “\A” is interpreted as an “A”.

Configuring Your System Startup State

This function allows you to select the display that appears at system startup.

1. At the main menu display press **SYSTEM CONFIGR** . The following display appears:

F6

```

SYSTEM CONFIGURATION
-----
F1 Editor Highlighting Style:          REVERSE
F3 Color Selection:                   COLOR
F4 Bit Address Display:
F5 Printer Configuration
F6 System Startup State:              MAIN MENU
F7 Define Directory Paths
F8 Monitor M0/M1 Addresses:          DISABLED

F9 Save Configuration

ESC exits/Alt-U aborts changes
    
```

Press a function key

EDITOR HILIGHT	COLOR SELECT	BIT DISPLAY	PRINTER CONFIG	SYSTEM STARTUP	DEFINE DIR	M0/M1 MONITOR	SAVE CONFIGR
F1	F3	F4	F5	F6	F7	F8	F9

Function key [F6], System Startup scrolls through the following selections:

- Main Menu
- WHO Menu
- Online Menu
- Offline Menu
- Offline Config Menu
- Multi-point Menu (Available for SLC 5/03 OS302 and SLC 5/04 OS401 processors only.)

2. Save the new configuration for future sessions by pressing **SAVE CONFIGR** . The

F9

message: **NEW CONFIGURATION SAVED TO FILE** is displayed.

Defining Your Directory Paths

- At the System Configuration display press **DEFINE DIR** . The user directory window appears.

```

USER DIRECTORIES
-----
F2 Temporary Files:                C:\IPDS\TEMP
F4 Processor Memory, Comments and Symbols:  C:\IPDS\ARCH\SLC500
F5 Documentation Reports:          C:\IPDS\LIS\SLC500
F6 Exported Files:                C:\IPDS\TEXT\SLC500
F7 User Configuration:            C:\IPDS\ATTACH\SLC500

F9 Save Configuration
F10 Set Directories to Default

ESC exits/Alt-U aborts changes
    
```

Press a function key



- Using the available function keys, create new directory names according to your needs. The following keys are also active at these displays:

Key	Description
Edit keys	Left and right arrows, backspace, and [CTRL-J] (deletes to end of line).
Ins	Toggles between insert and overstrike mode.
[ENTER] or [ESC]	Closes the window and saves any changes made.
[ALT-U]	Closes the window and cancels any changes made.

- Function key **TEMP DIR** brings up the following window, displaying the default directory name for temporary files.

```

TEMPORARY FILES [Overstrike]
-----
C:\IPDS\TEMP

ESC exits/Alt-U aborts changes
    
```

Function key **PROCESS DIR** brings up the following window, displaying the default
F4
directory name for processor memory, comments, and symbols.

```
PROCESSOR MEMORY, COMMENTS, AND SYMBOLS [Overstrike]
C:\IPDS\ARCH\SLC500
ESC exits/Alt-U aborts changes
```

Function key **DOCUMENT DIR** brings up the following window, displaying the default
F5
directory name for documentation reports.

```
DOCUMENTATION REPORTS [Overstrike]
C:\IPDS\LIS\SLC500
ESC exits/Alt-U aborts changes
```

Function key **EXPORT DIR** brings up the following window, displaying the default
F6
directory name for export files.

```
EXPORTED FILES [Overstrike]
C:\IPDS\TEXT\SLC500
ESC exits/Alt-U aborts changes
```

Function key **CONFIG DIR** brings up the following window, displaying the default
F7
directory name for user configuration.

```
USER CONFIGURATION [Overstrike]
C:\IPDS\ATTACH\SLC500
ESC exits/Alt-U aborts changes
```

If the directory does not exist you are prompted to either continue and create a directory or abort the procedure.

The error message **ERROR CREATING DIRECTORY** appears if the name of a directory is not supported by DOS. The maximum length of a path name is 65 characters.

After you have entered a new directory name, **SAVE CONFIG** saves the

F9

configuration for future sessions. Press [**ENTER**] or [**ESC**] to return to the System Configuration display.

Use function key **DEFAULT DIRS** if you selected a custom directory and wish to change

F10

it back to the default directory.

Determining Your Monitoring Requirements (SLC 5/03 and SLC 5/04 Processors)

The M0/M1 Monitoring option is available for SLC 5/03 and SLC 5/04 processors. These files reside in specialty I/O modules only. There is no image for these files in the processor memory. The application of these files depends on the function of the particular specialty I/O module. For some modules, the M0 file is regarded as a module output file and the M1 file is regarded as a module input file. Refer to the screen display on page 3–10.

Function key **M0/M1 MONITOR** toggles between Enable and Disabled. The default is

F8

Disabled. If monitoring of M0 and M1 files is enabled and you are currently online with a SLC 5/03 or SLC 5/04 processor, monitoring is enabled in these areas:

- Data Table Monitor
- Ladder Monitor
- Ladder Listing Report
- Data Table Report

Note

Additionally, when this option is enabled, scan time can be increased significantly. This is determined by the number of M0/M1 addresses that can be displayed on a single APS monitor screen.

Saving Your Configuration

Once you have your system configured, you must save the changes. Use one of the following methods to save your system configuration.

- Press **SAVE CONFIGR** **F9**, then [**ENTER**] or [**ESC**] to save the configuration for this and future sessions.
- Press [**ENTER**] or [**ESC**] to enforce your selection for this session *only*.

Pressing [**ALT-U**] aborts any change you make and returns you to the APS main menu.

File Extensions Used by APS and APSIE

These file extensions are preceded by an 8-character archive filename specified by the user when creating the processor file. The archive filename must follow the rules and restrictions pertaining to DOS filenames.

File Type	APS					APSIE	Default Directory
	V1.00 V1.01 V1.02 V1.04	V2.00 V2.01	V3.00	V3.20	V4.0 V5.0 V6.0		
APS User Preference File	.P10	.P20	.P30	.P32	.P40 .P50 .P60	.PIE	\ipds\attach\slc500
APS Cross Reference Report	.XRF	.XRF	.XRF	.XRF	.XRF	—	\ipds\lis\slc500
APS Data Table Report	—	.DTR	.DTR	.DTR	.DTR	—	\ipds\lis\slc500
APS UVPRM Translator Files	—	.HEX	.HEX	.HEX	.HEX	—	\ipds\arch\slc500
APS Processor Configuration Report	—	.PCR	.PCR	.PCR	.PCR	—	\ipds\lis\slc500
APS Error View File	—	.ERR	.ERR	.ERR	.ERR	—	\ipds\lis\slc500
APS Ladder File Names	—	.NAM	.NAM	.NAM	.NAM	—	\ipds\arch\slc500
APS User Directory Configuration	—	—	.CFG	.CFG	.CFG	—	\ipds\attach\slc500
APS Overlay Files	.OVL	.OVL	—	—	—	—	\ipds\attach\slc500

File Type	APS					APSIE	Default Directory
	V1.00 V1.01 V1.02 V1.04	V2.00 V2.01	V3.00	V3.20	V4.0 V5.0 V6.0		
APS Rung Comment, Instruction Comment, Address Comment, and Symbol Files. <i>Note: Do not change or delete these files.</i>			.AC\$.B0\$.B1\$.IX\$.LX\$.OP\$.PC\$			—	\\ipds\arch\slc500
APS Cross Reference Files <i>Note: Do not change or delete these files.</i>			.XD\$.XO\$.B2\$			—	\\ipds\arch\slc500
APS Program Listing Report			.LIS			—	\\ipds\lis\slc500
APS Message and Prompt File	—	.DT0	.DT0	.DT0	.DT0	.DT0	\\ipds\attach\slc500
APS Function Key Menu Text	—	—	.DT1	.DT1	.DT1	—	\\ipds\attach\slc500
APS Windows Text	—	—	—	—	.DT3		\\ipds\attach\slc500
APS Help Files (APSHelp.XXX for Version 4.0 and APHELP.xxx for Versions 5.0 and 6.0)	—	—	—	—	.DAT .OFF		\\ipds\attach\slc500
APS Archive File and Data Tables			.ACH			—	\\ipds\arch\slc500
APS/APSIE Executable and Link Layer Files			.EXE			.EXE	\\ipds\attach\slc500
APSIE Processor Memory Text File			—			.SLC	\\ipds\text\slc500
APSIE Documentation Text			—			.TXT	\\ipds\text\slc500
APSIE User Directory Configuration			—			.CFG	\\ipds\attach\slc500
APSIE Summary Log File			—			.LOG	\\ipds\arch\slc500

4 *Ladder Logic Program Basics*

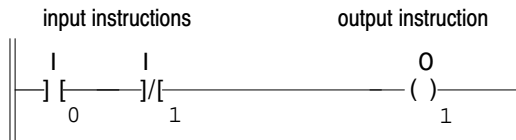
This chapter discusses the basic operation of ladder logic programs. Topics include:

- understanding ladder logic programs
- types of ladder logic connections
- application example – 4-rung ladder logic program

For a more detailed introduction to ladder logic programming, refer to the *APS Quick Start for New Users*. This guide is intended for the first time user.

Understanding Ladder Logic Programs

Ladder logic is a graphical programming language based on electrical relay diagrams. Instead of having electrical rung continuity, ladder logic is looking for logical rung continuity. A ladder logic diagram identifies each of the elements in an electromechanical circuit and represents them graphically. This allows you to see how your control circuit operates before you actually start the physical operation of your system.



The ladder logic program you enter into the controller's memory contains bit (relay logic) instructions representing external input and output devices. It also contains other instructions, as described in the *Instruction Set Reference Manual*.

As your program is scanned during controller operation, the changing on/off state of the external inputs is applied to your program, energizing and de-energizing external outputs according to the ladder logic you have programmed.

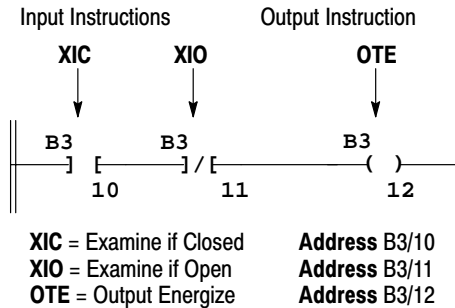
To illustrate how ladder logic programming works, we chose to use bit (relay logic) instructions, since they are probably the easiest to understand. The three instructions discussed in this section are:

—] [—	Examine if Closed (XIC) Analogous to the normally open relay contact. For this instruction, we ask the processor to "Examine if (the contact is) Closed."
—] / [—	Examine if Open (XIO) Analogous to the normally closed relay contact. For this instruction, we ask the processor to "Examine if (the contact is) Open."
—(+)	Output Energize (OTE) Analogous to the relay coil. The processor makes this instruction true (analogous to energizing a coil) when there is a path of true XIC and XIO instructions in the rung.

Keep in mind that operation of these instructions is similar but not equivalent to that of relay contacts and coils. In fact, a knowledge of relay control techniques is not a prerequisite for programming with ladder logic.

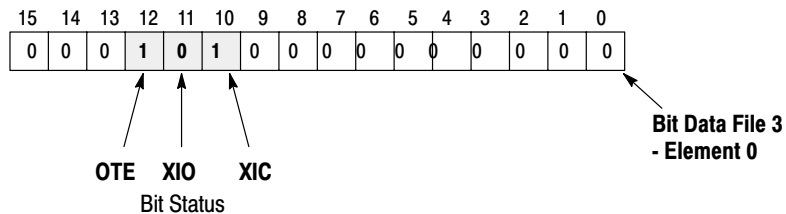
Example 1-Rung Ladder Logic Program

A ladder logic program consists of individual rungs, each containing at least one output instruction and one or more input instructions. The ladder rung that follows has two input instructions and an output instruction. An output instruction always appears at the right, next to the right power rail. Input instructions always appear to the left of the output instruction.



A simple rung, using relay logic instructions

Note that each instruction in the diagram above has an address. This address identifies a location in the processor's data files, where the on/off state of the bit is stored. Addresses of the above instructions indicate Bit data file 3 (B3), bits 10, 11, and 12:



In the preceding diagram, we indicated that bit 10 is logic 1 (On), bit 11 is logic 0 (Off), and bit 12 is logic 1 (On). These logic states indicate whether an instruction is true or false, as pointed out in the following table.

If the data table bit is	The status of the instruction is		
	XIC Examine if Closed —] [—	XIO Examine if Open —] / [—	OTE Output Energize —()—
Logic 0	False	True	False
Logic 1	True	False	True

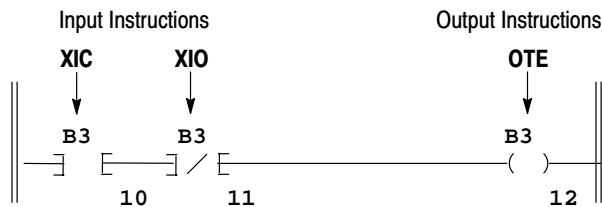
From the above table, we see that status bits 10, 11, and 12 indicate that the XIC instruction, XIO instruction, and OTE instruction of our rung are all true. The true/false state of instructions is the basis of controller operation, as indicated in the following sections.

Logical Continuity

During controller operation, the processor determines the on/off state of the bits in the data files, evaluates the rung logic, and changes the state of the outputs according to the logical continuity of rungs. More specifically, input instructions set up the conditions under which the processor will make an output instruction true or false. These conditions are:

- When the processor finds a continuous path of true input instructions in a rung, the OTE output instruction will become (or remain) true. We then say that “rung conditions are true.”
- When the processor does *not* find a continuous path of true input instructions in a rung, the OTE output instruction will become (or remain) false. We then say that “rung conditions are false.”

The figure below shows the on/off state of output B3/12 as determined by the changing states of the inputs in the rung.



Time	Inputs		Output	Bit Status		
	XIC	XIO	OPE	XIC	XIO	OPE
t_1 (initial)	False	True	False	0	0	0
t_2	True	True	Goes True	1	0	1
t_3	True	False	Goes False	1	1	0
t_4	False	False	Remains False	0	1	0

Types of Ladder Logic Connections

In a ladder logic diagram each of the input devices are represented in series or parallel logic combinations across the rung of the ladder. The last element on the rung is the output that receives the action as a result of the conditional state of the inputs on the rung.

Series Logic

In the previous section on logical continuity, you have seen examples of series (AND) logic. This means that when all input conditions in the path are true, energize the output.



In the above example, if A *and* B are true, energize C.

Parallel Logic

Another form of logical continuity is parallel (OR) logic. This means that when one or another path of logic is true, energize the output.

Example — Parallel Inputs



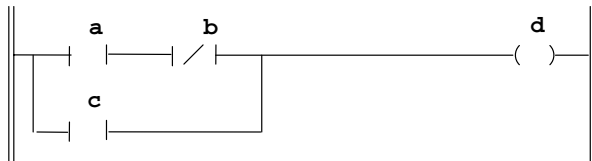
In the above example, if A *or* B is true, energize C.

Use branching to form parallel logic in your user program. Branches can be established at both input and output portions of a rung. The upper limit on the number of levels which can be programmed in a branch structure is 75. The maximum number of simple instructions per rung is 128. (The maximum number decreases if the rung contains instructions with many parameters, or if complex addressing is used.)

Input Branching

Use an input branch in your application program to allow more than one combination of input conditions to form parallel branches (OR-logic conditions). If at least one of these parallel branches forms a true logic path, the rung logic is enabled. If none of the parallel branches forms a true logic path, rung logic is not enabled and the output instruction logic will not be true. Output is not energized.

Example — Parallel Input Branching



In the above example, either A *and* B, *or* C provides a true logical path.

Output Branching

You can program parallel outputs on a rung to allow a true logic path to control multiple outputs. When there is a true logic path, all parallel outputs become true.

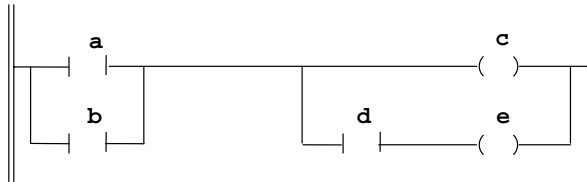
Example — Parallel Output Branching



In the above example, either A *or* B provides a true logical path to all three output instructions.

Additional input logic instructions (conditions) can be programmed in the output branches to further condition control of the outputs. When there is a true logic path, including extra input conditions on an output branch, that branch becomes true.

Example — Parallel Output Branching with Conditions



In the above example, either A *and* D *or* B *and* D provide a true logic path to E.

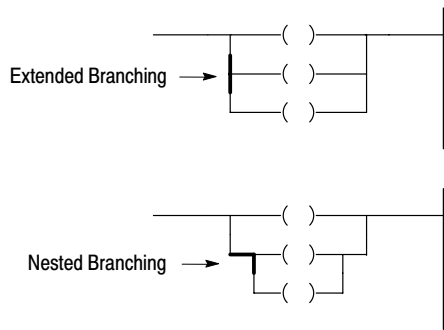
Branching Combinations and Limitations

Use branching to avoid redundant instructions, speed-up processor evaluation, and provide more efficient programming.

APS allows branching combinations to be programmed in the fixed, SLC 5/01, SLC 5/02, SLC 5/03, and SLC 5/04 processors, and the MicroLogix 1000 controllers. (Note that the Hand-Held Terminal (HHT) does not allow nested input and output branches to be programmed in a fixed or SLC 5/01 processor.)

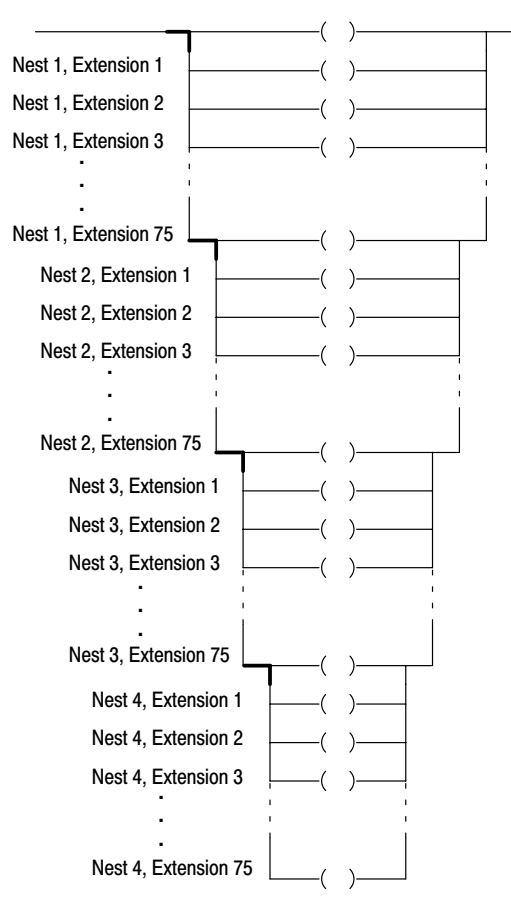
Extended Branching Versus Nested Branching

Using extended branches rather than nested branches is more efficient and speeds up processor evaluation. Both of the examples shown below accomplish the same result; however, the extended branching example is evaluated approximately 1 μ s faster than the nested branching example.



Branching Limitations

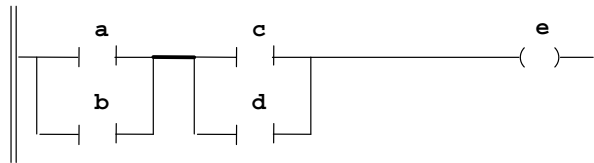
You are limited to four nested branches per rung; however, each nested branch can have up to 75 extended branches, as shown below.



Connecting Blocks

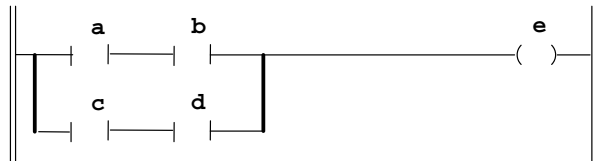
Blocks of input and output instructions can be connected in series and parallel as well.

Example – Series Block Connection



In the above example, two blocks of information are connected in series. Either A or B, and C or D provides a true logical path.

Example – Parallel Block Connection



In the above example, two blocks of information are connected in parallel. Either A and B, or C and D provides a true logical path.

Application Example – 4-Rung Ladder Logic Program

The following 4-rung ladder logic program uses the same 3 bit locations as our simple 1-rung diagram. It also uses an external input bit address and an external output bit address. Note that individual bits are addressed repeatedly. For example, B3/11 is addressed with an XIC instruction in rungs 1 and 4, and it is addressed with both an XIC and an OTE instruction in rung 2.

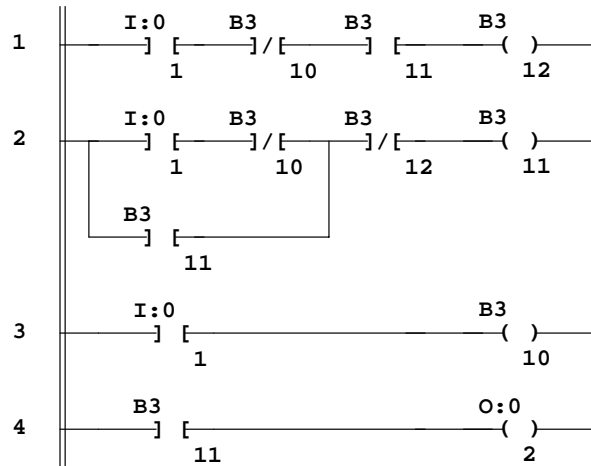
During normal controller operation, the processor checks the state of the input data file bits, then executes the program instructions individually, rung by rung, from the beginning to the end of the program; as it does, it updates the data file bits and energizes the appropriate output data file bits accordingly.

When the XIC instruction I:0/1 goes true (because an external momentary push button closes):

- Rung 1 is evaluated as false, because XIC instruction B3/11 is false at this time.
- Rung 2 is evaluated as true. XIC B3/11 in the branch of this rung goes true to maintain continuity in the rung.
- Rung 3 is evaluated as true.
- Rung 4 is evaluated as true because XIC B3/11 has gone true. The external device represented by OTE O:0/2 is energized.

Use the following program to achieve the maintained contact action of an On-Off toggle switch using a momentary contact push button. Press for On. Press again for Off.

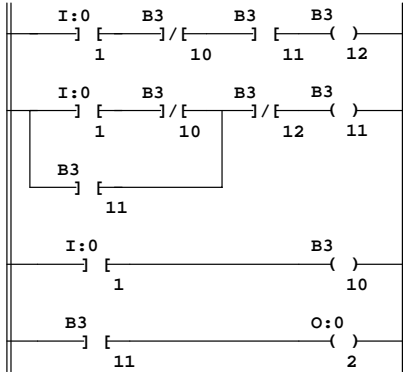
The first time you press the push button (represented by address I:0/1), instruction B3/11 is latched, energizing output O:0/2. The second time you press the push button, instruction B3/12 unlatches instruction B3/11, de-energizing output O:0/2. Instruction B3/10 prevents interaction between instructions B3/12 and B3/11.



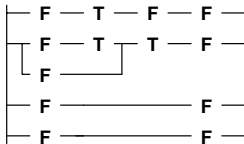
Rung	Status Bit				
	I:0/1	B3/10	B3/11	B3/12	O:0/2
1	—] [—	—] / [—	—] [—	— () —	—
2	—] [—	—] / [—	— () —	—] [—	—] / [—
3	—] [—	— () —	—	—	—
4	—	—	—] [—	—	— () —

Previously, we indicated that the processor executes instructions individually, rung by rung, from the beginning to the end of the program. This is called a program scan and is repeated many times a second. The figure on the next page indicates in greater detail what happens during individual scans when an external input device (represented by I:0/1) is operated.

When the state of a bit changes during the program scan, the effects this may have in earlier rungs of the program are not accounted for until the next scan. To point this out, we have shown successive scans (1000 and 1001, 2000 and 2001, etc.).



The diagram above is the same one that appears on the preceding page. This diagram is also represented below, with each instruction replaced with a T or F, indicating the initial True/False status of the instruction.



The table at the right indicates how the instructions are executed when XIC instruction I:0/1 changes state. (I:0/1 represents an external momentary contact push button.)

XIC I:0/1	Instruction Execution T = true at time of execution F = false at time of execution	
Goes True	Scan 1000	Scan 1001
Goes False	Scan 2000	Scan 2001
Goes True	Scan 3000	Scan 3001
Goes False	Scan 4000	Scan 4001

5 *Creating and Configuring Processor Files*

This chapter discusses the related functions for creating and editing a processor file. Those functions include:

- processor functions
- deleting a processor file from the workspace
- archive file operations

Processor Functions

This section shows you how to create an example processor file. The example file is compatible with a modular controller consisting of:

- Chassis 1746-A4 (chassis 1)
- Processor 1747-L532 (slot 0)
- Input Modules 1746-IA4 and 1746-IA8 (slots 1 and 2)
- Output Module 1746-OA8 (slot 3)

The processor file name chosen for this example is EXAMPLE.

Creating Processor Files

1. Begin at the main menu and press **OFFLINE CONFIG** , then **CREATE FILE** .
F4 F6
2. At the prompt, type: **EXAMPLE**. EXAMPLE appears on the data/command entry line. (File names can be a maximum of 8 characters in length.)

If you press [**ESC**] at this time, the error message: **FILENAME MUST BE SPECIFIED** is displayed. If you press [**ALT-U**], the previous display appears.

PROCESSOR	INPUTS	OUTPUTS
BUL. 1761	MicroLogix 1000	
1747-L511	5/01 CPU - 1K	USER MEMORY
1747-L514	5/01 CPU - 4K	USER MEMORY
1747-L524	5/02 CPU - 4K	USER MEMORY
1747-L532	5/03 CPU -12K	USER MEMORY
1747-L541	5/04 CPU -12K	USER MEMORY

```

CREATE PROCESSOR FILE
NAME:      EXAMPLE
F2 Processor: Bul. 1761  MicroLogix 1000
ESC exits/Alt-U aborts changes
    
```

Press a Function Key or Enter File Name

SELECT PROC

F2

CONFIG I/O

F5

ADJUST FILTERS

F6

SAVE & EXIT

F8

3. Press [**ENTER**]. This places the processor file name in the lower window.
4. The Create Processor File window lists the default processor, Bul. 1761. For our example we are using the 1747-L532 processor. Cursor down to highlight it. (If you are using a different processor, use the cursor keys to locate the appropriate processor in the upper option window.) Press **SELECT PROC** .
F2

If you select either an SLC 5/03 or SLC 5/04 processor, a display like the following appears:

```

PROCESSOR  INPUTS  OUTPUTS
-----
OPERATING SYSTEM
1747-OS300 SERIES A
1747-OS301 SERIES A
1747-OS302 SERIES A
-----

CREATE PROCESSOR FILE
NAME:      EXAMPLE
F2 Processor: 1747-L532   5/03 CPU -12K USER MEMORY

ESC exits/Alt-U aborts changes
    
```

Press a Function key, ENTER to Select Processor, ESC to exit, or Alt-U to abort

```

PAGE UP   PAGE DOWN
  F1      F2
    
```

Check the label on your processor to verify which operating system you are using. Highlight the correct operating system and press [**ENTER**]. Note that the status line does not reflect the current operating system.

Note

*If you are using a MicroLogix 1000 controller, press **SAVE & EXIT** and then move on to step 10 on page 5-7.*
F8

5. Press **CONFIGR I/O** . The following display appears:

F5

```

I/O CONFIGURATION FOR:EXAMPLE
RACK 1 = 1746-A4 4-SLOT Backplane
RACK 2 = NOT INSTALLED
RACK 3 = NOT INSTALLED

SLOT    CATALOG #    CARD DESCRIPTION
*0      1747-L532    5/03 CPU -12K USER MEMORY
*1
*2
*3
4
5
6
7
8
ESC exits
    
```

Press a function key

READ CONFIG	ONLINE CONFIG	MODIFY RACKS	MODIFY SLOT	DELETE SLOT	UNDEL SLOT	EXIT	SPIO CONFIG
F1	F2	F4	F5	F6	F7	F8	F9

The display title is **I/O CONFIGURATION FOR:EXAMPLE**. The chassis selection is Rack 1 = 1746-A4, 4-slot. Racks 2 and 3 are not installed.

Slot 0 lists the processor, 1747-L532. Slots 1, 2, and 3 must be specified. (An asterisk indicates the slot is available.)

SLC 5/03 and SLC 5/04 Processors – Reading I/O Configuration

The read I/O configuration function allows the programming device to read the actual processor I/O configuration. Use function keys [F1], Read Configuration and [F2], Online Configuration to perform this function.

When you press [F1], Read Configuration, APS attempts to attach to the processor node specified in the current online configuration. If the attempt to attach to the processor node fails, the message: **MESSAGE TIMEOUT-LOSS OF COMMUNICATIONS** is displayed.

If the current processor type is not an SLC 5/03 or SLC 5/04, as specified in the online configuration, the message: **SELECTED PROCESSOR DOES NOT SUPPORT THIS FEATURE, CHECK ONLINE CONFIGURATION** is displayed. To check the online configuration, press [F2], Online Configuration. If necessary, change the processor node address and press [F9], Save To File.

Note that the currently selected processor type in the I/O configuration does not have to be set to an SLC 5/03 or SLC 5/04 processor for the read I/O configuration function to be performed. Only the current processor type as specified by the processor node address in the current online configuration must be an SLC 5/03 or SLC 5/04 processor.

The status line is updated and the updated processor I/O configuration is displayed on the screen when the following events occur:

- the current communication driver is successfully activated
- the online configuration specifies an SLC 5/03 or SLC 5/04 processor
- APS successfully attaches to the processor

If the read of the auto configuration from the processor is successful, the information is stored in the I/O configuration for the current archive file.

If the attempt to read the auto configuration file from the processor, specified by the current online configuration, fails the message: **ERROR ACCESSING PROCESSOR I/O CONFIGURATION FILE** is displayed.

G Files: If one or more slots are detected as having a G File associated with it when a read configuration is performed, the message: **G FILES NEED TO BE INITIALIZED** is displayed. To initialize these files, you must first set the G file size and then modify the G file. Refer to page 5–8 for the screen display that allows you to access the G file information.

6. Press **MODIFY SLOT** . This brings up the I/O module selection for slot 1.
F5

```

I/O MODULE SELECTION FOR SLOT: 1
-----
CATALOG          CARD DESCRIPTION
1746-I*8         8 - Any 8 point Discrete Input Module
1746-I*16        16 - Any 16 point Discrete Input Module
1746-I*32        32 - Any 32 point Discrete Input Module
1746-O*8         8 - Any 8 point Discrete Output Module
1746-O*16        16 - Any 16 point Discrete Output Module
1746-O*32        32 - Any 32 point Discrete Output Module
1746-IA4         4 - Input 100/120 VAC
1746-IA8         8 - Input 100/120 VAC
1746-IA16        16 - Input 100/120 VAC
-----
ESC exits
    
```

Press ENTER to select I/O Module
Enter Module ID Code

SELECT
MODULE

F2

SLC 5/02, SLC 5/03, and SLC 5/04 processors – You have the option of configuring generic I/O modules having 8, 16, or 32 discrete I/O. For example, if you select 1746-I*8, any 8-point discrete input module may be used.

7. Select a module for the indicated slot number by positioning the cursor on the desired module and pressing either **SELECT MODULE** or [ENTER]. The cursor is **F2** already correctly positioned in this case. The I/O configuration display reappears.

8. Repeat the procedure until you have configured all of the required I/O.

9. Once you have configured all of your I/O press **EXIT** or [ESC], then **F8**

SAVE & EXIT . The following display appears:
F8

C:\IPDS\ARCH\SLC500		
Name	Size	Date
CONVEYOR	8847	08-18-95
DRILL1	9392	09-12-95
EXAMPLE	929	10-07-95
MIXER	10221	10-15-94
ONOFF	9334	08-04-95
PAINTGUN	9261	07-19-94
RPMCALC	8704	04-27-94
SEQUENCE	8684	10-03-95
STOP_GO	8586	09-28-94
TOGGLE	8695	07-19-94

NEW ARCHIVE FILE CREATED
Press a Function Key or Enter File Name

OFFLINE
PRG/DOC
F1

CREATE
FILE
F6

DEFINE
DIR
F7

SAVE
TO FILE
F9

The message line indicates **NEW ARCHIVE FILE CREATED**. The name **EXAMPLE**, along with the size and date appear in the right-hand window. This file is now in the terminal workspace.

10. If you wish to change the processor type or I/O configuration, press **OFFLINE PRG/DOC**.

F1

The program directory of the offline processor file is displayed.

```

PROGRAM DIRECTORY FOR PROCESSOR: EXAMPLE
-----
FILE      PROTECTED      NAME      TYPE      SIZE (words)
0          No              system   *
1          No              reserved *
2          No              ladder   *
    
```

Press a key, enter file number or file name

```

offline                               SLC 5/03                               File EXAMPLE
-----
PROCSSR  SAVE  RETURN TO MENU  CHANGE  CREATE  FILE  MONITOR  DATA  MEMORY
FUNCTNS  F1   F2          F3          F4      REPORTS  OPTIONS  FILE    MONITOR  MAP
-----
    
```

The status line indicates that you are offline, the configured processor is an SLC 5/03, and the processor file is EXAMPLE.

11. Press **PROCSSR FUNCTNS** to modify a processor file. The following display appears:

F1

Press a key, enter file number or file name

```

offline                               SLC 5/03                               File EXAMPLE
-----
CHANGE  CHANGE  CHANGE  CHANGE  CLEAR  CREATE  DELETE  MONITOR  DATA  FILE
PROCSSR PASSWORD PR. NAME FL. NAME MEMORY FILE    FILE    MONITOR  PROTECT
F1      F2      F3      F4      F5      F6      F7      F8      F9      F10
-----
    
```

You can now change the processor type or I/O configuration.

If you select an incompatible configuration, the message **I/O CONFIGURATION DOES NOT MATCH PROGRAM** appears. After you make a compatible selection, return to the processor functions menu.

Configuring Specialty I/O Modules

When you use a specialty I/O module, you must indicate the type of module to APS. The configuration menu provides a list of available modules from which to select. Each module is pre-configured, so after selecting the module from the list you have the option of viewing its configuration by pressing [F9], SPIO Configuration. Alteration of the fields is not recommended since these fields are pre-configured. However, if you select a module not listed, you may be required to alter some of the fields. Refer to your specialty I/O module user manual for more information regarding the required parameters.

To configure a specialty I/O module not listed, do the following:

1. At the I/O Configuration menu (refer to page 5-4), press **MODIFY SLOT** **F5**. Using the [down arrow] key or the [**END**] key, go to the end of the menu and select OTHER from the list.
2. Refer to your specialty I/O module user manual and enter the module's ID code at the prompt. For example, type: **12705**. This is the ID code for the 1746-HSCE module. Press [**ENTER**].
3. Press **SPIO CONFIG** **F9**. A screen similar to the following is displayed:

```

I/O CONFIGURATION FOR:EXAMPLE
RACK 1 = 1746-A4 4-SLOT Backplane
RACK 2 =
RACK 3 =
SLOT 0
*1
*2
*3
4
5
6
7
8
SPECIAL CONFIG FOR SLOT: 1
Module's ID Code: 12705
Maximum Input Words: 0
Maximum Output Words: 0
Scanned Input Words: 0
Scanned Output Words: 0
M0 Length: 0
M1 Length: 0
'G' File Size: 0
ISR Number: 0
ESC exits
ESC exits
    
```

Press a function key

ISR
NUMBER
F1

MODIFY
G FILE
F3

ADVNC'D
SETUP
F5

G FILE
SIZE
F7

Function Key	Description
[F1] ISR Number	Allows you to enter the Interrupt Subroutine Number (3 to 255).
[F3] Modify G File	Allows you to edit the G file.
[F5] Advanced Setup	Allows you to tell the system the number of input/output words and lets you designate the number of words you want to scan. The scanned input/output values must be less than or equal to the maximum in order to maximize your I/O scan. For example, a 1746-NI4 Analog Module has 4 input channels. If you set the scanned input words to 2, the I/O scan will only scan the first 2 input words; thus optimizing your I/O scan. The same method can be used for any other module that has more than 1 input and/or output word associated with it.
[F7] G File Size	Allows you to designate the number of words in the configuration file. You must specify this before modifying the G file. The valid range is 1 to 256. See page 5-5 for more information.

- If your user manual specifies recommended parameters, enter those now using the above function keys.

Effects of Processor Type Changes

Almost any program written for an SLC 500 fixed controller, SLC 5/01, or SLC 5/02 processor may be used in an SLC 5/03 or SLC 5/04 processor. However, some programs may contain instructions (for example, MSG, REF, SVC, and HSC) that must be altered or removed before the program will run in the SLC 5/03 or SLC 5/04 processor. APS creates an “error/warning” file that provides you with information you can then use to correct any problems. An explanation of the conversion error file begins on page 5-11.

Note

The SLC 5/03 OS301 and OS302 processors are the same size, but the OS302 has 1284 bytes less memory available for the user program due to the addition of the multi-point function. Therefore, if you have a program for the OS301 processor that is near maximum capacity, saving it as an OS302 program will result in an error.

In addition, you can convert an SLC 500™ program to a MicroLogix 1000™ program. However, you first need to understand the effect processor type changes have on your programs.



Before changing processor types, copy and rename the ladder program file you intend to convert.

Converting an SLC 500 Program to a MicroLogix 1000 Program

The following will occur when you attempt to convert an SLC 500 program to a micro program:

- SLC 500 program files are either expanded automatically or must be deleted manually to meet the MicroLogix 1000 controller's fixed program file structure.

For example, if the SLC 500 program has program files 0–3, program files 4–15 will be automatically added when the program is converted to a MicroLogix 1000 controller. All program files that are added will be empty ladder files. All existing program files will not be modified by the conversion.

If the largest program file number in the SLC 500 program is greater than 15, all program files are maintained when converting the program to a MicroLogix 1000 controller. However, you must delete all program file numbers larger than 15 before the program can be saved. Rungs in program files greater than 15 can be cut and pasted to valid micro files before the “extra” program files are deleted.

- Invalid instructions in the program will be flagged as errors. These instructions must be removed before the program can be saved.
- Invalid addressing and/or invalid addresses in the program will be flagged as errors. This addressing and/or addresses must be modified or removed before the program can be saved.
- All forces are removed.
- SLC 500 data files are either expanded or deleted automatically to meet the MicroLogix 1000 controller's fixed data file structure.

For example, if data file N9 is present in the SLC 500 program, it will be deleted when converting the program to a MicroLogix 1000. In addition, if data file N7 has 200 elements (N7:0 to N7:199), all elements greater than N7:104 will be deleted when converting the program to a MicroLogix 1000.

On the other hand, if data file N7 has 50 elements in the SLC 500 program (N7:0 to N7:49), elements N7:50 to N7:104 will be added when converting to a MicroLogix 1000. All added elements will be zero.

All data in the SLC 500 program files that are within the MicroLogix 1000 controller's fixed structure will remain unchanged when converting to a MicroLogix 1000, except for the following status file elements:

Status File Bit	will be set to
S:0/8	0
S:1/5	1
S:2/4	0
S:5/8	0

Viewing the Conversion Error File

When you create a program for a specified processor and later change the processor, APS checks for advanced programming instructions, structures, addresses, and addressing modes not permitted in some processors. An "error/warning" file is created if any of the above items are detected. You must correct all of the errors before you can successfully save the file.

For example, this file is created if an SLC 5/03 processor configuration is selected for a program and you later modify the processor type to be a fixed controller or an SLC 5/01 processor.

Example

The following example uses a program file configured for an SLC 5/02 processor that contains a Message (MSG) instruction.

1. Create an error file by pressing **PROCCSR** **FUNCTNS** **F1**, then **CHANGE** **PROCCSR** **F1** and select an SLC 5/03 processor. Press **SELECT** **PROC** **F2**.

PROCESSOR	INPUTS	OUTPUTS
BUL. 1761	Micrologix 1000	
1747-L511	5/01 CPU - 1K	USER MEMORY
1747-L514	5/01 CPU - 4K	USER MEMORY
1747-L524	5/02 CPU - 4K	USER MEMORY
1747-L532	5/03 CPU -12K	USER MEMORY
1747-L541	5/04 CPU -12K	USER MEMORY

CREATE PROCESSOR FILE

NAME:
 F2 Processor: 1747-L532 5/03 CPU -12K USER MEMORY

ESC exits/Alt-U aborts changes

Press a Function Key, ENTER to Select Processor, ESC to exit, or ALT-U to abort

<div style="border: 1px solid black; padding: 2px; display: inline-block;">SELECT PROC</div> F2	<div style="border: 1px solid black; padding: 2px; display: inline-block;">CONFIGR I/O</div> F5	<div style="border: 1px solid black; padding: 2px; display: inline-block;">ADJUST FILTERS</div> F6	<div style="border: 1px solid black; padding: 2px; display: inline-block;">SAVE & EXIT</div> F8
--	--	---	--

- Press **SAVE & EXIT** (F8). The error file is displayed automatically and the function keys are not active.

To examine the error file, press [**ESC**] then **VIEW ERRORS** (F9).

The following screen is displayed:

PROCESSOR CONFIGURATION ERRORS			
Filename.ACH	Date	Time	
ERROR File	2 Rung	1	MSG is not allowed
ERROR File	2 Rung	6	Invalid OSR location
ERROR File	2 Rung	13	LIM is not allowed
ERROR File	2 Rung	15	TON can not use 1.0 sec time base

Press<ESC> to exit

offline

- Use the arrow keys to scroll through the list of errors. If you choose to print the file, make sure your printer is correctly configured and then press **PRINT ERRORS** (F10).

For more information about protecting your files, refer to chapter 8.

Deleting a Processor File from the Workspace

Deleting a file from the workspace physically removes it from the memory of the terminal, but the file resides in the processor's memory and on the terminal hard disk.

- At the main menu press **OFFLINE PRG/DOC** (F3), then **PROCSSR FUNCTNS** (F1). The following menu

appears:

```

PROGRAM DIRECTORY FOR PROCESSOR: EXAMPLE
FILE    PROTECTED    NAME            TYPE            SIZE (words)
0                               system          *
1                               reserved        *
2       No            ladder          *
    
```

Press a key, enter file number or file name

offline SLC 5/03 File EXAMPLE

CHANGE PROCSSR	CHANGE PASSWRD	CHANGE PR. NAME	CHANGE FL. NAME	CLEAR MEMORY	CREATE FILE	DELETE FILE	MONITOR FILE	DATA MONITOR	FILE PROTECT
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

- Press **CLEAR MEMORY** (F5), then **YES** (F8) to clear the file in the workspace, or

NO (F10) to abort the operation.

- Press either **RETURN TO MENU** (F3) or **CHANGE FILE** (F4).

Archive File Operations

You can perform the following archive file operations:

- copy, rename, and delete files within the archive
- copy archive files to a disk
- copy files from a disk to the archive
- convert image files to the archive (SLC 5/03 and SLC 5/04 processors only)
- convert archive files to image files (SLC 5/03 and SLC 5/04 processors only)

You can access the archive file operations from the main menu by pressing any one of the following sequences of function keys:

- Either **FILE
OPTIONS** , or
F7
- **OFFLINE
PRG/DOC** , then **FILE
OPTIONS** , or
F3 F7
- **ONLINE** , then **FILE
OPTIONS** .
F1 F7

Note

The Image to Archive and Archive to Image options are not available from the online and offline directories.

Also, you cannot perform any file operations on the current APS file from the online and offline directories.

The following function keys operate the same for Rename, Copy, Delete, Copy To Disk, and Copy From Disk.

Function Key	Description												
[F1] Processor Memory	The operation is performed on the processor file, but not the comments, symbols and documentation reports associated with it. Includes all program files and data files (the part of the processor file that can be downloaded to a processor, memory module, or HHT). Files with the extension <i>.ach</i> are affected.												
[F3] Comments and Symbols	The operation is performed on the comments and symbols associated with the file, but not the processor file itself. These reside on hard disk only. Files with the following extensions are affected: <table style="margin-left: 20px;"> <tr> <td>.ac\$</td> <td>.b0\$</td> <td>.b1\$</td> </tr> <tr> <td>.b2\$</td> <td>.ix\$</td> <td>.lx\$</td> </tr> <tr> <td>.nam</td> <td>.op\$</td> <td>.pc\$</td> </tr> <tr> <td>.xd\$</td> <td>.xo\$</td> <td></td> </tr> </table>	.ac\$.b0\$.b1\$.b2\$.ix\$.lx\$.nam	.op\$.pc\$.xd\$.xo\$	
.ac\$.b0\$.b1\$											
.b2\$.ix\$.lx\$											
.nam	.op\$.pc\$											
.xd\$.xo\$												
[F4] Documentation Reports	The operation is performed on the documentation reports associated with the file, but not the processor file itself. These reside on hard disk only. Files with the following extensions are affected: <table style="margin-left: 20px;"> <tr> <td>.dtr</td> <td>.lis</td> </tr> <tr> <td>.pcr</td> <td>.xrf</td> </tr> </table>	.dtr	.lis	.pcr	.xrf								
.dtr	.lis												
.pcr	.xrf												
[F5] All of the Above	All files associated with a processor file are affected. (i.e., processor file, comments and symbols, and documentation reports.)												

These components are discussed in detail later in the chapter.

Copying Archive Files

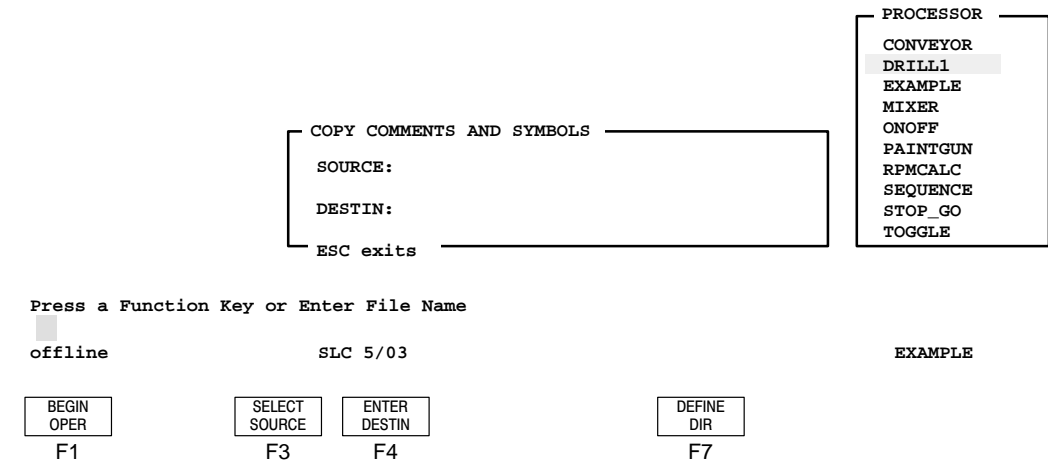
To illustrate the Copy function, suppose you have created symbols in processor file DRILL1 and you want to make a copy of them, for use in other processor files.

- From the offline program display, select **FILE OPTIONS** (F7), then **COPY** (F4), then

**COMMNTS
SYMBOLS**

F3

. This brings you to the following display:



The window at the right is the directory of Comments and Symbols stored on disk. The cursor is on DRILL1. The window at the left indicates the Source and Destination of the Comments and Symbols to be copied.

2. Press **SELECT SOURCE** (F3). This enters DRILL1 as the source.
3. Press **ENTER DESTIN** (F4). Type: DRILL2 and press [ENTER].
4. Press **BEGIN OPER** (F1). The file DRILL2 is copied into the directory.

Renaming Archive Files

The *procedures* for copying and renaming are the same. In the last example, if [F3], Rename was selected, the comments and symbols would have been deleted from the processor file DRILL1 and placed in a separate file name DRILL2.

Deleting Archive Files

- At the main menu press **FILE OPTIONS** . The following display appears:

F7

```

File Operations
F1 Image to Archive
F2 Archive to Image
F3 Rename
F4 Copy
F5 Delete

F7 Copy to Disk
F8 Copy from Disk

ESC exits
  
```

Press a function key

IMAGE TO ARCH	ARCH TO IMAGE	RENAME	COPY	DELETE	COPY TO DISK	COPY FR DISK
F1	F2	F3	F4	F5	F7	F8

- Press **DELETE** . The following display appears:

F5

```

DELETE
F1 Processor Memory File
F3 Comments and Symbols
F4 Documentation Reports
F5 All of the Above

ESC exits
  
```

Press a function key

PROCSSR MEMORY	COMMNTS SYMBOLS	DOCU REPORTS	ALL
F1	F3	F4	F5

You may choose to retain the comments and symbols and documentation reports. They can be accessed later under function keys [F3] and [F4] at this menu level when you are in the delete, rename, or copy function. They will have the name of the deleted processor file.

Example

1. Suppose the option of **ALL** is selected. The following display appears:

F5

C:\IPDS\ARCH\SLC500		
Name	Size	Date
CONVEYOR	8847	08-18-95
DRILL1	9392	09-12-95
DRILL2	9392	10-07-95
EXAMPLE	929	10-07-95
MIXER	10221	10-15-94
ONOFF	9334	08-04-95
PAINTGUN	9261	07-19-94
RPMCALC	8704	04-27-94
SEQUENCE	8684	10-03-95
STOP_GO	8586	09-28-94
TOGGLE	8695	07-19-94

DELETE ALL REPORTS AND FILES

NAME: CONVEYOR

ESC exits

Press a Function Key or Enter File Name

offline SLC 5/03

BEGIN OPER	SELECT NAME	DEFINE DIR
F1	F3	F7

2. The archive file directory is at the right in the display area. Press **SELECT NAME**.

F3

The file name CONVEYOR appears in the left-hand window.

3. Press **BEGIN OPER** to start the file deletion process. The verify menu choices

F1

appear.

4. Press **YES** to delete file CONVEYOR from the directory. The display

F8

returns to the previous menu, allowing you to delete other files.

Copying Archive Files To Disk

The Copy To Disk option allows you to copy archive files to a user-specified path or floppy disk.

- From the File Options menu press **COPY TO DISK** (F7), then **ALL** (F5). The following menu appears:

COPY ALL RPTS AND FILES TO DISK

F3 FILE:

F4 DESTIN DIR: A:\

ESC exits

C: \IPDS \ARCH \SLC500

Name	Size	Date
DRILL1	9392	09-12-95
DRILL2	9392	10-07-95
EXAMPLE	929	10-07-95
MIXER	10221	10-15-94
ONOFF	9334	08-04-95
PAINTGUN	9261	07-19-94
RPMCALC	8704	04-27-94
SEQUENCE	8684	10-03-95
STOP_GO	8586	09-28-94
TOGGLE	8695	07-19-94

ESC exits/Alt-U aborts changes

Press a function key or enter file name. (Source dir may be changed via F7)

BEGIN
OPER
F1

SELECT
NAME
F3

ENTER
DST DIR
F4

DEFINE
DIR
F7

Function Key	Description
[F1] Begin Operation	Starts the copy operation and places the file in the destination directory.
[F3] Select File	Selects the highlighted file from the directory window and places a copy in the file field.
[F4] Enter Destination Directory	Changes the destination directory.
[F7] Define User Directories	Displays the user directory window. See chapter 3 for more information.

- The archived files are shown in the right window. Select the file you want to copy to disk by cursoring to the correct file and pressing **SELECT FILE** (F3).

- Press **ENTER DST DIR** and enter the destination directory if it is not A:\.
F4

Note

A destination directory must be specified before attempting to begin the operation. It cannot be the same as the source directory. If either of these is incorrect, the following error messages are displayed:

DIRECTORY CAN NOT BE THE SAME AS A SOURCE DIRECTORY
or
DESTINATION DIRECTORY MUST BE SPECIFIED

Changing the destination directory also changes the source directory used during the copy from disk operation. The default selection for the destination directory is A:\.

- Press **BEGIN OPER** to start the file copying process.
F1

Copying Files From Disk

This option allows you to copy an archive file from a user-specified path or floppy disk.

- From the File Options menu press **COPY FR DISK**, then **ALL**. The following menu appears:
F8 F5

```

COPY ALL RPTS AND FILES FROM DISK
F3 FILE:
F4 SOURCE DIR: A:\
ESC exits
    
```

A:\		
Name	Size	Date
FILE01	9325	07-17-92
FILE02	8695	07-10-92
FILE03	8684	06-30-93
FILE04	9392	06-13-92
FILE05	8847	05-12-93
FILE06	8586	05-15-92

ESC exits/Alt-U aborts changes

Press a function key. (Destination directory may be changed via F7)

BEGIN
OPER
F1

SELECT
FILE
F3

ENTER
SRC DIR
F4

DEFINE
DIR
F7

Function Key	Description
[F1] Begin Operation	Starts the copy operation and places the file in the archive file directory.
[F3] Select File	Selects the highlighted file from the directory window and places a copy in the file field.
[F4] Enter Source Directory	Changes the source directory.
[F7] Define User Directories	Displays the user directory window. See chapter 3 for more information.

Changing the source directory also changes the destination directory used during the Copy To Disk operation. The default for the source directory is a:\.

- To change the source directory press **ENTER SRC DIR** . The following menu appears:

F4

```

Source Directory _____ [Overstrike]
a:\
ESC exits/Alt-U aborts changes _____
    
```

Press a function key or enter directory path

SAVE
CONFIG

F9

- Type the new directory path and press [**ENTER**] .
- Save the new directory by pressing **SAVE CONFIG** .
F9
- Return to the main menu by pressing [**ENTER**] or [**ESC**] , or press [**ALT-U**] to abort your changes.

Image to Archive Operation (SLC 5/03 and SLC 5/04 Processors Only)

The Image to Archive option allows you to convert image files to the archive file directory.

- From the File Options menu press **IMAGE TO ARCH** . The following menu appears:

F1

IMPORT PROCESSOR IMAGES

SOURCE:

DESTIN:

ESC exits

C:\IPDS\TEXT\SLC500

Name	Size	Date
DRILL1	9392	09-12-95
DRILL2	9392	10-07-95
EXAMPLE	929	10-07-95
MIXER	10221	10-15-94
ONOFF	9334	08-04-95
PAINTGUN	9261	07-19-94
RPMCALC	8704	04-27-94
SEQUENCE	8684	10-03-95
STOP_GO	8586	09-28-94
TOGGLE	8695	07-19-94

ESC exits/Alt-U aborts changes

Press a function key

BEGIN
OPER
F1

SELECT
SOURCE
F3

ENTER
DESTIN
F4

DEFINE
DIR
F7

Function Key	Description
[F1] Begin Operation	Converts the selected processor image to the archive file.
[F3] Select Source	Selects the highlighted file from the directory window and places a copy in the file field.
[F4] Enter Destination	Prompts you to enter the destination file name.
[F7] Define User Directories	Displays the user directory window. See chapter 3 for more information.

- The external processor image files are shown in the right window. Select the image file you want to convert by cursoring to the correct file and pressing

**SELECT
SOURCE** .

F3

3. Press **ENTER DESTIN** and enter the destination file name. If the [Enter] key is
F4
 pressed without typing in a name, the source name is used as the destination name.

4. Press **BEGIN OPER** to start the file conversion process.
F1

Archive to Image Operation (SLC 5/03 and SLC 5/04 Processors Only)

The Archive to Image option allows you to convert archive files to processor image files.

1. From the File Options menu press **ARCH TO IMAGE**. The following menu appears:
F2

```

ARCHIVE TO IMAGE
-----
F7 Update External Processor Image Tag:
ALLEN-BRADLEY IMAGE FILE
F8 External Format Processor Image File
F9 Save User Preferences
ESC exits
    
```

Press a function key

IMAGE TAG	PROC IMAGE	SAVE PREFS
F7	F8	F9

Function Key	Description
[F7] Image Tag	Updates the external processor image tag. Up to 80 characters can be entered.
[F8] Processor Image	Allows you to access the convert processor image functions.
[F9] Save Preferences	Saves the current preferences, including the Processor Image Tag, to the user preference file.

2. Access the Processor Image functions by pressing **PROC IMAGE**. The following
F8
 menu appears:

EXPORT PROCESSOR IMAGES

SOURCE:

DESTIN:

ESC exits

C:\IPDS\ARCH\SLC500

Name	Size	Date
DRILL1	9392	09-12-95
DRILL2	9392	10-07-95
EXAMPLE	929	10-07-95
MIXER	10221	10-15-94
ONOFF	9334	08-04-95
PAINTGUN	9261	07-19-94
RPMCALC	8704	04-27-94
SEQUENCE	8684	10-03-95
STOP_GO	8586	09-28-94
TOGGLE	8695	07-19-94

ESC exits/Alt-U aborts changes

Press a function key or Enter File Name

BEGIN
OPER
F1

SELECT
SOURCE
F3

ENTER
DESTIN
F4

DEFINE
DIR
F7

Function Key	Description
[F1] Begin Operation	Converts the selected source archive file to an external processor image.
[F3] Select Source	Selects the highlighted file from the directory window and places a copy in the file field.
[F4] Enter Destination	Prompts you to enter the destination file name.
[F7] Define User Directories	Displays the user directory window. See chapter 3 for more information.

3. The archived files are shown in the right window. Select the file you want to convert by cursoring to the correct file and pressing **SELECT FILE** .

F3

4. Press **ENTER DESTIN** and enter the destination file name. If the [Enter] key is

F4

 pressed without typing in a name, the source name is used as the destination name.

5. Press **BEGIN OPER** to start the file conversion process.

F1

6 *Creating and Editing Ladder Program Files*

This chapter discusses how to create and edit program files. Considerations for creating a program file include:

- naming the file, and creating and naming subroutine files
- creating and deleting data files
- editing program files – inserting and modifying rungs, instructions, and branches and searching for instructions.
- radices used in APS

This chapter also discusses the Advanced Editing function that allows you to cut, copy, and paste rungs in a ladder program.

Certain status file elements are required for program operation. Refer to the *Instruction Set Reference Manual* for more information.

Creating Ladder Program Files

Once you have created a processor file (refer to chapter 5) and placed it in the appropriate directory, you can name the program file and create subroutine files as needed.

Program Files for the MicroLogix 1000 Controllers

The program files for the micro controllers are allocated as shown in the table below.

File Number	Purpose
0,1	System use
2	Main ladder
3	User Fault interrupt
4	HSC interrupt or User subroutine
5	STI interrupt or User subroutine
6-15	User subroutines

You can use files 4 and 5 for user subroutines; however, if your MicroLogix 1000 program contains a HSC interrupt and/or an STI, the controller uses files 4 and 5, respectively, to service the interrupt.

Note

If you enter a user subroutine into file 4 or 5 and later use the HSC or STI interrupt in your program, these files will be executed when the interrupt occurs. If you think you may need one of these routines in your program, we recommend that you start your user subroutines at file 6.

Creating a Subroutine Program File (SLC 500 Processors Only)

You create subroutine program files for specific applications. For example, if your application requires you to change the status file default values for Fault Routines, Selectable Timed Interrupt Setpoint, or I/O Interrupts a subroutine is required. Valid file numbers range from 3 to 255.

Note

An SLC 5/04 processor is capable of supporting up to 60K words of ladder program; however, the maximum size of any program file is 12K words. Therefore you must structure your ladder program into more than one file. One way to do this is have a main file (file 2) and at least one subroutine file (3–255).

1. Begin at the main menu and press **OFFLINE PRG/DOC** (F3), then **PROCSRR FUNCTNS** (F1), then **CREATE FILE** (F6).
2. The prompt **Enter the file number to create** appears. Type: **3** and press [**ENTER**].

```
PROGRAM DIRECTORY FOR PROCESSOR: EXAMPLE
```

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	*
1			reserved	*
2		Main	ladder	*
3			ladder	x

Press a key, enter file number or file name

offline SLC 5/03 File EXAMPLE

CHANGE PROCSRR	CHANGE PASSWRD	CHANGE PR. NAME	CHANGE FL. NAME	CLEAR MEMORY	CREATE FILE	DELETE FILE	MONITOR FILE	DATA MONITOR	FILE PROTECT
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

Ladder file 3 is entered. If you had entered a higher number, 5 for example, files 3, 4, and 5 would be listed; file 5 would be entered as “ladder”, and files 3 and 4 would be entered as “undefined”.

Deleting a Program File (SLC 500 Processors Only)

Locate the cursor on the file and press **DELETE FILE** (F7), then **YES** (F8) to verify the file deletion.

In the previous example, you cannot delete file 0 or 1. If you attempt to delete file 2, all of the rungs in the file will be deleted, but the file will remain in the program directory.

Editing Ladder Program Files

This section explains the editing functions that can be performed on a rung:

- Append/Insert/Modify
- Delete/Undelete

Rung Operations

1. At the main menu press **OFFLINE PRG/DOC** (F3), then **MONITOR FILE** (F8). The following menu appears:

|END|

Press a function key
(file 2, rung 0)
offline no forces EDITS: NONE File EXAMPLE

CONFIG DISPLAY	EXIT	MULTI POINT	DOCUMNT	SEARCH	GENERAL UTILITY	DATA MONITOR	FORCE	EDIT
F2	F3	F4	F5	F6	F7	F8	F9	F10

Note

From the monitor file display, you can quickly access another file number and/or rung within the program file by typing one of the following formats at the command line:

- *file#,rung#*
- *file#:rung#*
- *file#;rung#*

The display area shows the end rung. No other rungs exist. The data entry line indicates the file number (2) and the cursored rung number (0). When you are monitoring or editing a ladder program no forces, forces DISABLED, or forces ENABLED appear on the status line.

2. To insert a rung press **EDIT** . The following rung functions appear:

F10

Press a key for desired editing function
(file 2, rung 0)
offline no forces EDITS: NONE FILE EXAMPLE

SAVE/GO ONLINE	ONLINE CONFIG	APPEND RUNG	INSERT RUNG	MODIFY RUNG	DELETE RUNG	UNDEL RUNG	ADVANC'D EDITING	TEST EDITS	CANCEL EDITS
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

Function key [F10] only appears if you are using an SLC 5/03 or SLC 5/04 processor.

3. Press **INSERT RUNG** and the following menu appears:

F4

|END|

Type a mnemonic or press a key for desired editing function
(file 2, rung 0)
offline no forces RUNG INSERT File EXAMPLE

BRANCH	APPEND INSTR	INSERT INSTR	MODIFY INSTR	DELETE INSTR	UNDEL INSTR	ACCEPT RUNG
F1	F3	F4	F5	F6	F7	F10

An empty rung appears. The power rails of the rung are broken lines, indicating that the rung is not yet accepted. The cursor is on the left power rail of the rung. The data entry line indicates this to be rung 0. (The end rung is now rung 1.) The status line indicates RUNG INSERT, the current function.

- Press **INSERT INSTR** (F4), then **BIT** (F1). The following bit instructions appear:

Type a mnemonic or press a key for desired instruction
 (file 2, rung 0
 offline no forces INSTR INSERT File EXAMPLE

XIC -] [-	XIO -]/ [-	OTE -()-	OTL -(L)-	OTU -(U)-	OSR	OTHERS
F1	F2	F3	F4	F5	F6	F10

- Select **XIC -] [-** (F1), Input Energize. The prompt line asks for the operand. Type address: **B3/10** and press **[ENTER]**. The following display appears:

```

I      I
I      B3
I      ] [-
I      10
I
||-----|END|-----||
  
```

Type a mnemonic or press a key for desired instruction class
 (file 2, rung 0
 offline no forces INSTR INSERT File EXAMPLE

BIT	TIMER/ COUNTER	I/O MESSAGE	COMPARE	MATH	MOVE/ LOGICAL	FILE	SHIFT/ SEQCNCER	CONTROL	SPECIAL
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

The address appears with the instruction in the display area. At this point, another instruction can be added using the same procedure.

- After you have added all of the rung operations your application requires press **[ESC]** to leave the Insert function.

- Press **ACCEPT RUNG** (F10) to accept the rung. The power rails are now solid lines.

Using the Command Line Instruction Entry Feature

You can enter an instruction mnemonic and any parameters visible from the ladder display from the command line. This feature allows you to enter one instruction and its address at a time. For example: **XIC B3/1**.

While entering the parameters, if you omit a parameter by typing two consecutive commas, the parameters typed are entered into the instruction and you are prompted for the remaining parameters.

When using command line instruction entry to modify an *existing instruction*, APS assumes that you want to modify the instruction that the cursor is on. If you have just started a new rung, use command line entry to program *new instructions*.

Instructions that Must be Entered Using Command Line Entry

There are several new instructions that are only available through command line entry. They are: SIN, COS, TAN, ASN, ACS, ATN, LN, LOG, ABS, DEG, RAD, and XPY.

Instructions that Cannot be Entered Using Command Line Entry

Because of the uniqueness of some instructions and their operands, the following instructions' operands cannot be entered using the command line entry:

- Message (MSG) — SLC 5/03 and SLC 5/04 instruction only
- Service Communications (SVC) — SLC 5/03 and SLC 5/04 instruction only
- Refresh (REF) — SLC 5/03 and SLC 5/04 instruction only

Exception — When entering the PID instruction, only the first three instruction operands may be entered. You cannot enter the control block parameters from the command line.

Branch Operations

Branches allow you to form parallel logic in your user program. Branches can be established at both input and output portions of a rung. For more information on branching, refer to chapter 4 of this manual.

- From the monitor file display, press **EDIT** (F10), then **MODIFY RUNG** (F5). The following display appears:

```

I  B3      B3                                B3      I
I  ] [    ]/[                                ( )  I
I  10     11                                12     I
||
R  B3      B3                                B3      R
R  ] [    ]/[                                ( )  R
R  10     11                                12     R
||
||-----|END|-----||

```

Type a mnemonic or press a key for desired editing function
(file 2, rung 0 offline) no forces RUNG MODIFY File EXAMPLE

BRANCH	APPEND INSTR	INSERT INSTR	MODIFY INSTR	DELETE INSTR	UNDEL INSTR	ACCEPT RUNG
F1	F3	F4	F5	F6	F7	F10

- Move the cursor to the XIO instruction (B3/11) and press **BRANCH** (F1). The following menu functions appear:

```

Press a key for desired branch editing function
(file 2, rung 0 offline)      no forces      RUNG MODIFY      File EXAMPLE

```

EXTEND UP	EXTEND DOWN	APPEND BRANCH	INSERT BRANCH	DELETE BRANCH	UNDEL BRANCH
F1	F2	F3	F4	F6	F7

Function Key	Description
[F1] Extend Up	Adds a parallel (extended) branch above the cursored branch.
[F2] Extend Down	Adds a parallel (extended) branch below the cursored branch.
[F3] Append Branch	Places the starting point of a nested branch to the right of the cursored instruction or at the cursor.
[F4] Insert Branch	Places the starting point of the nested branch to the left of the cursored instruction or at the cursor.
[F5] Delete Branch	Removes a branch from a rung and places the instructions of the branch in a buffer.
[F6] Undelete Branch	Places a specified branch on the rung along with the instructions of the buffered branch. A deleted branch can be undeleted repeatedly because the branch instruction remains in the buffer until another branch is deleted.

3. Press **APPEND BRANCH** . Targets (A), (B), and (C), appear on the rung. Press [F2],
F3

Target B. This action places a branch around the XIO instruction.

You may continue to add more branches to the rung or place instructions in the branch you just created.

Deleting an Instruction or Branch

When you are editing a ladder program, you may want to delete an instruction, move it, or copy it to one or more locations. The same is true for rungs and the instructions in branches. If you choose to delete an instruction, the following message appears: **CAUTION: REMOVING DATA REFERENCES LEAVES DATA/FORCES IN THEIR LAST STATE.**

The caution informs you that data/forces associated with the instruction is in its last state and will remain so after you delete the instruction. This can cause incorrect program operation if this data is associated with other instructions.

Deleting and Undeleting Rungs

When deleting and undeleting rungs, the same caution message is displayed on the message line. Use the [F6], Delete Rung or [F7], Undelete Rung function keys.

Moving Between Files (Changing Files)

There are two ways to change program files:

Method 1 —

To enter a program into a different program file, press [F3], Exit, move the cursor to the file you want to move and press **MONITOR FILE** . Using this method assumes that a **F8** file and rung number have already been created. You do not have to enter the rung number.

Method 2 — A program must exist

1. Locate the cursor on the file you wish to monitor and press **MONITOR FILE** .
F8
2. At the prompt, type the file number separated by a comma and then the rung number. For example: **3,0**.

The Search Function

The search function allows you to quickly locate instructions and addresses in ladder program files. The search and replace function also allows you to quickly locate instructions and addresses; however, this function also allows you to automatically replace the instruction or address with a different one. This function is discussed later in this section.

Searching for Instructions and Addresses

This section shows you how to search for:

- instruction (type + operand)
- instruction type
- operand (address or symbol)
- edit zones (SLC 5/03 and SLC 5/04 processors)

The Search function is accessible offline and online from the Monitor File display. You can also access the search function from the Monitor File, Edit, or Force displays by pressing [**ALT-S**].

Each time the search object is found, the new cursor location becomes the search start point. If the search object appears at least once in the ladder program, no message appears. When you press [F5], Start Search the cursor moves to the next occurrence.

Note

You cannot search for an indirect address; however, you can search for components within the indirect address. For example if you are searching for N7:0, the indirect address F8:[N7:0] will be found as a match. Refer to the Instruction Set Reference Manual for more information about indirect addressing.

For indexed addresses, the # sign is ignored when performing a search and replace for instructions or addresses. For example:

If the address is:	and you search for:	and replace with:	the result is:
#N7:1	N7:1	#N7:4	#N7:4
N7:1	N7:1	#N7:4	N7:4
#N7:4	#N7:4	N7:5	#N7:5
N7:4	#N7:4	N7:5	N7:5

1. At the offline Program display press **MONITOR FILE** (F8), then **SEARCH** (F6) or [**ALT-S**].

The following function keys are available:

Function Key	Description
[F1] Search Type	Toggles between Search Instruction/Address, Search & Replace Instruction/Address, and Edit Zone (SLC 5/03 and SLC 5/04 only). The replacement of I/O addresses is not checked against the I/O configuration until you compile and save the program. This allows you to upgrade a fixed processor to a chassis program and vice versa.
[F2] Search For	Prompts you to enter the search string. If you are using an SLC 5/03 or SLC 5/04 processor and Edit Zone is the search type, you have the option of searching for an inserted/replaced/deleted rung.
[F3] Replace With	Appears only when you select the Search & Replace Instruction/Address mode. This is only valid during offline programming. Note that the replace pattern must be in the same format as the search pattern.
[F5] Start Search	Starts the search operation. When Search & Replace mode is in effect, the following additional options are available: [F1] Replace — Replaces the string with the string specified on the Replace With Field. [F2] Skip — Does not change the found string, but finds the next matching search string. [F3] Quit — Does not change the found string and discontinues searching. [F4] All — Finds all remaining strings and replaces each occurrence with the specified string on the Replace With Field.
[F7] Toggle Scope	Toggles between File and Global. If File is selected, only the current file is searched. If Global is selected, all of the program files (2 - 255) in the current program are searched.
[F8] Toggle Direct	Toggles between Up and Down. Up specifies to search upward in the file from the current rung. Down specifies to search downward in the file from the current rung.
[F9] Toggle Wrap	Toggles between On and Off for file wrap. On specifies that when the end of the file is reached, the search continues from the other end of the file. Off specifies that when the end of the file is reached, the search stops.
[F10] Save Configuration	Saves the search configuration options to disk.

2. Press **SEARCH FOR** . Enter the instruction type by doing one of the following:
F2

- a. Type in the search string. Enter the instruction type first, followed by a comma, and then the address. Do not add spaces to the search string. For example, **xic,b3/0**.
- b. Press one of the available function keys, described below.

Function Key	Description
[F5] Current Instruction	Inserts the mnemonic of the instruction the cursor is currently positioned on in the search/replace field. If an address is already present in the field, a comma is appended to the instruction mnemonic prior to the mnemonic being inserted in the search/replace field.
[F6] Current Operand	Inserts the logical address of the first parameter of the instruction the cursor is currently positioned on in the search/replace field. If an instruction mnemonic is already preset in the field, a comma is appended to the instruction mnemonic prior to the mnemonic being inserted in the search/replace field.
[F7] Previous String	Replaces the contents of the search/replace field with the previous search pattern. If no previous search pattern is present in the buffer, the current contents of the search/replace field is left unchanged.
[F8] Instruction List	Brings up the instruction menus and allows you to select the instructions to “search for” or “replace with.”

3. Press **START SEARCH** . If no match is found, the cursor position does not change and
F5
the message **SEARCH PATTERN NOT FOUND** is displayed.

Search and Replace

Note

You cannot search for an indirect address; however, you can search and replace components within the indirect address. For example, if you are replacing N7:0 with R6:2.POS, the indirect address F8:[N7:0] becomes F8:[R6:2.POS].

For indexed addresses, the # sign is ignored when performing a search and replace for instructions or addresses. For example:

If the address is:	and you search for:	and replace with:	the result is:
#N7:1	N7:1	#N7:4	#N7:4
N7:1	N7:1	#N7:4	N7:4
#N7:4	#N7:4	N7:5	#N7:5
N7:4	#N7:4	N7:5	N7:5

To search for and replace an instruction or address, begin at the search screen.

1. Press **SEARCH TYPE** (F1), until Search & Replace Instr/Addr appears in the search type field.
2. Press **SEARCH FOR** (F2). Enter the instruction type by doing one of the following:
 - type in the search string and press [**ENTER**]
 - press the appropriate function key
3. Press **REPLACE WITH** (F3). Select the replace string and press [**ENTER**].
4. Press **START SEARCH** (F4). The system moves the cursor to the first occurrence of the search object and prompts you to either Replace, Skip, Quit, or All. If no match is found, the cursor position does not change and the following message is displayed: **SEARCH PATTERN NOT FOUND**
If replacements are made, the following message is displayed: **REPLACEMENTS HAVE BEEN MADE.**

Additional Search Messages

- SEARCH PATTERN NOT FOUND

Indicates that there are no more occurrences of the search object between the current start point and the end rung.

- CURSORED INSTRUCTION IS THE ONLY OCCURRENCE OF SEARCH OBJECT

Indicates that the search object only appeared once in the ladder program.

Advanced Editing Functions

The Advanced Editing function allows you to mark a range of rungs to be either cut or copied. The cut or copied section can then be pasted anywhere in the processor program. This function is available with all of the SLC 500 processors.

1. Begin at the main menu and press **OFFLINE PRG/DOC** (F3), then **MONITOR FILE** (F8), then **EDIT** (F10). The following menu choices appear:

```

Press a key for desired editing function
(file 2, rung 0)
offline                no forces                EDITS: NONE                File EXAMPLE
    
```

SAVE/GO ONLINE	ONLINE CONFIG	APPEND RUNG	INSERT RUNG	MODIFY RUNG	DELETE RUNG	UNDEL RUNG	ADVANCED EDITING	TEST EDITS	CANCEL EDITS
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

Function key [F10] only appears if you are using an SLC 5/03 or SLC 5/04 processor.

2. Press **ADVANCED EDITING**. The following menu choices appear:

F8

Press a key for desired editing function
(file 2, rung 0)
offline

no forces

EDITS: NONE

File EXAMPLE

SELECT	CUT	COPY	PASTE
F1	F2	F3	F4

Function Key	Description
[F1] Select	Marks the first rung in the block of rungs to be cut or copied.
[F2] Cut	Marks the last rung in the block of rungs to be cut and performs the cut. The cut block of rungs is stored in a temporary buffer. The cut function is inclusive of the marked block of rungs.
[F3] Copy	Marks the last rung within the block to be copied and performs the copy. The copied block of rungs is stored in a temporary buffer. The copy function is inclusive of the marked block of rungs.
[F4] Paste	Inserts the stored rungs in the buffer above the current rung.

Cut or Copy

To cut or copy a rung(s), begin at the Advanced Editing menu and do the following:

1. Move the cursor to the beginning or end of the block of rungs to be cut or copied using the arrow keys and press **SELECT**. If you select an Inserted rung which is connected to a Replaced rung, both rungs are selected.
F1
2. After you have selected the rung(s), press either **CUT** or **COPY**.
F2 F3

The editor places the specified rungs in the temporary buffer. The contents of the buffer is maintained until you perform another cut or copy function, or until you exit the software package.

Paste

To paste a rung(s) stored in the temporary buffer, do the following:

1. Move the cursor to the place in the ladder program where the rungs are to be inserted.
2. Press **PASTE** **F4** . The rungs are placed in the program file above the current rung.

The only limitation on the number of rungs you may cut or copy to the temporary buffer is the amount of free disk space in your system. If insufficient disk space exists, the system will display **DISK FULL** and the cut or copy operation will not be performed.

APS also allows you to paste between archive files. When pasting from one processor to another, the system checks the paste buffer to insure that it does not contain illegal instructions or addressing modes. If it does, the operation does not occur and the following error message is displayed:

INSTRUCTION(S) IN PASTE BUFFER ARE INCOMPATIBLE WITH CURRENT PROCESSOR.

Recovering Your Work

If a power failure occurs or your system locks up, APS attempts to save your work in progress in the form of filename. \$\$\$ backup file. After correcting the problem:

1. Begin at the Main menu and press **FILE
OPTIONS** .
F7
2. Press **COPY** , then **ALL** .
F4 F5
3. Select the filename. \$\$\$ file and press **SELECT
SOURCE** .
F3
4. Press **ENTER
DESTIN** . Enter the name of a file you want the contents of
filename. \$\$\$ copied to. Press [**ENTER**] , then **BEGIN
OPER** .
F1

Creating and Deleting Data Files (SLC 500 Processors Only)

When you assign an address to an instruction in your ladder program, you are allocating memory space to a data file. As more and more addresses are assigned, the various data files increase in size, according to the needs of your program.

Memory space is allocated in element blocks, beginning with element 0. For example, suppose the first address you assign in your program is B3/19. This allocates two elements to your program: B3:0, which consists of bits B3/0 through B3/15; and B3:1, which consists of bits B3/16 through B3/31. Since B3/16 is the first bit of element B3:1, all 16 bits of that element are created; therefore, the highest bit address now available to you is B3/31.

Timers are 3-word elements. If the first timer element you assign in your program is T4:99, you allocate timers T4:0 through T4:99. By assigning timer T4:100, you allocate 100 elements using 300 words of memory. So whether you use timers T4:0 through T4:98 later in the program, they are permanently allocated in memory.

Obviously, you can keep the size of your data files to a minimum by assigning addresses beginning at element 0 of each data file, and trying to avoid creating blocks of addresses that are allocated but unused.

Note

Refer to the *Instruction Set Reference Manual* for detailed information about addressing and the processor memory layout.

Using Indirect Addresses

Memory space is allocated for components within indirect addresses. For example, the address N11:[N22:33]/[N44:55] allocates the following space in the data table:

- N11:0/0
- N22:33/0
- N44:55/0

Using Indexed Addresses

Data tables are not expanded automatically to accommodate indexed addresses. You must create this data using the memory map function (described in the next section).

Creating Data Files

The memory map function of the programming device allows you to create data files by entering addresses directly, rather than assigning addresses to instructions in your program. You can create data files to store recipes and lookup tables if needed.

1. Begin at the main menu and press **OFFLINE PRG/DOC** (F3), then **MEMORY MAP** (F1). The following menu appears:

DATA TABLE MAP

FILE	TYPE	LAST ADDRESS	ELEMENTS	WORDS	FILE PROTECTION
0	O output	O:3	1	1	
1	I input	I:2	2	2	
2	S status	S:82	83	83	
3	B binary or bit	B3/15	1	1	
4	T timer		0	0	
5	C counter		0	0	
6	R control		0	0	
7	N integer		0	0	
8	F floating		0	0	

PROCESSOR MEMORY LAYOUT

87 data words of memory used in 9 data table files
 82 instruction words of memory used in 3 program files
 938 instruction words of unused memory available

Press a key or enter file number

offline no forces EDITS: NONE File EXAMPLE

CREATE
DT FILE

DELETE
DT FILE

DATA
PROTECT

F6 F7 F10

File 8 only applies to SLC 5/03 OS301, OS302 and SLC 5/04 OS400, OS401 processors.

Note

File 2, Status file, has different address limitations based on the type of processor you are using. Refer to the Instruction Set Reference Manual for detailed information about the processor memory layout.

When using an SLC 5/03 OS301, OS302 or SLC 5/04 OS400, OS401 processor, you can create data files for ASCII, string, and floating point addresses.

Data is created by entering the highest numbered element you want to be included. For example, entering element N7 : 12 (default integer file 7) creates element N7 : 12 and all lower numbered elements down to N7 : 0, if they have not already been created.

2. Press **CREATE DT FILE** . The prompt line displays Enter Address to create.
F6

Data is created by entering the highest numbered element you want to be included. For example, entering element N7:12 (default integer file 7) creates element N7:12 and all lower numbered elements down to N7:0, if they have not already been created.

3. Type the element address: **N7:12** and press [**ENTER**].

If you accept the file, the Data Table Map is updated as shown below.

DATA TABLE MAP

FILE	TYPE	LAST ADDRESS	ELEMENTS	WORDS	FILE PROTECTION
0	O output	O:3	1	1	
1	I input	I:2	2	2	
2	S status	S:82	83	83	
3	B binary or bit	B3/15	1	1	
4	T timer		0	0	
5	C counter		0	0	
6	R control		0	0	
7	N integer	N7:12	13	13	
8	F floating		0	0	

PROCESSOR MEMORY LAYOUT

100 data words of memory used in 9 data table files
 * instruction words of memory used in 3 program files
 * instruction words of unused memory available

Press a key or enter file number

offline no forces EDITS: NONE File EXAMPLE

CREATE
DT FILE

DELETE
DT FILE

DATA
PROTECT

F6 F7 F10

The Data Table Map indicates that the integer (N) file 7 size is 13 elements (equivalent to 13 words) and the last address is N7:12. Note the change in the processor memory layout. The number of data words has increased from 87 to 100. Also, the “instruction words of memory” figures are replaced with asterisks (*).

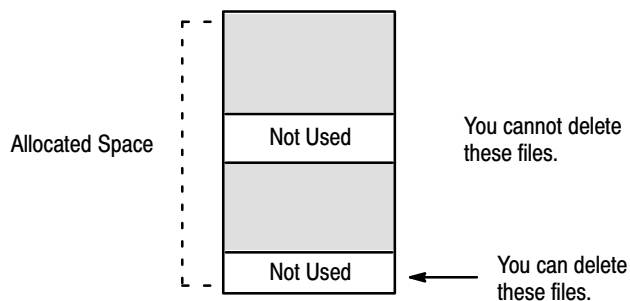
Refer to chapter 8 for more information on protecting files.

Note *These figures are updated only after the processor file is saved to disk again.*

Deleting Data Files

There are two ways to delete the contents of data files:

- **Clear memory-** to delete your entire processor file, including all files except the system program file (0) and the status data file (2).
- **Use the memory map function-** to delete data in individual files or portions of files. For example, you can delete blocks of addresses that have been allocated but are not being used.



You can delete binary, timer, counter, control, and integer elements. You cannot delete an element if it is used in your program. Neither can you delete an unused element if a higher numbered element in the file is used in your program. For example, if you are using element B3:5, you cannot delete B3:0 through B3:4, even if you aren't using them in your program. If you try to delete them, the error message **DATA TABLE FILE ADDRESS USED IN PROGRAM** is displayed.

Note

Make certain that you do not inadvertently delete data originally reserved for indexed addressing. Unexpected operation will result.

Radices Used in APS

Almost all calculations are performed on signed integer values. Most operands used to perform these calculations are sized at 16 bits. A signed 16 bit integer spans the range of $-32,768$ to $32,767$. These 16 bit values can be displayed or entered in several radices. The radices that can be *displayed* using the APS programming software are:

- Integer
- Binary
- ASCII
- Hexadecimal
- Floating Point

When entering values into an APS instruction or data table element, you can specify the radix of your entry using the “&” special operator. The radices that can be used to *enter* data into an APS instruction or data table element are:

- Integer (&N)
- Binary (&B)
- ASCII (&A)
- Hexadecimal (&H)
- BCD (&D)
- Octal (&O)

The data type you select when programming an APS instruction determines the display radix. For example, if a 16-bit value contains the value 48 decimal:

- an N: type element is displayed as 48
- a B: type element is displayed as 0000000000110000
- a Hexadecimal radix is displayed as 0030
- an ASCII radix is displayed as 0

You may enter or display a value in several radices, however, the processor will always operate on the data in the format described for the particular instruction. Using the above example, an ADD instruction would always add 48 decimal, regardless of the radix used to enter or display this value. Likewise, the Mask parameter of a MVM instruction would use the value 0030.

Example

You are prompted to enter the second parameter of an EQU instruction and you wish to enter a constant. Constants are displayed in the Integer radix. Using the value 48, this value can be entered using any one of the following methods:

- &H0030 (&H specifies the hexadecimal radix)
- &B0000000000110000 (&B specifies the binary radix)
- &O60 (&O specifies the octal radix)
- &A0 (&A specifies the ASCII radix)
- &D0048 (&D specifies the BCD radix)
- &N48 (&N specifies the Integer radix)

In this case, &N is not required because the Integer is the default radix for constants. You would enter 48.

7 Documenting Ladder Programs

Before or after you enter the rungs of logic in your ladder program, you have the option of documenting the rungs, addresses, instruction, or symbols (online and offline). This allows someone else who may be maintaining the program to understand it. You can also use symbols instead of addresses for ease of programming your ladder logic.

This chapter explains how to document your ladder program using:

- rung comments
- instruction comments
- address comments
- symbols

This chapter also discusses how to edit your comments and symbols using the database editor and how to determine the display format used when monitoring the program.

Note

Before continuing in this chapter, refer to 7-25 and review how to configure your display to show the comments in your ladder program.

Comment Types and Symbols

This section discusses the types of comments and/or symbols you can add to your ladder program and their unique characteristics.

Rung Comments

A rung comment explains the purpose of an individual rung or group of rungs. The rung comment can consist of up to 6 lines, with up to 80 ASCII characters in each line. A rung comment is internally associated with the output instruction of the rung.

Rung comments are associated with the top-most or first output instruction and address on the rung; they are not tied to the rung number. Therefore, if you use the same output instruction and address on more than one rung, each of those rungs has the same rung comment. If you want a unique rung comment for rungs with the same instruction and operand pair, an OTE instruction with a unique bit address on each rung must be programmed. If the rung contains output branches, the comment is associated with the output instruction in the top line of the branch.

A rung comment need not be unique. If the instruction has more than one address, the comment is tied to the control or destination address for that instruction.

Instruction Comments

The instruction comment can consist of up to 5 lines, with up to 10 ASCII characters in each line.

These are associated with the instruction type and its address. All instructions with the same combination of instruction type and address will automatically have the same instruction comment.

If the input instruction has more than one address, the instruction comment is associated with the instruction type and source A or the test value address. If the output instruction has more than one address, the instruction comment is associated with the instruction type and the control or destination address.

An instruction comment need not be unique. The same comment can be applied to instructions having different address/instruction type combinations.

Address Comments

Address comments help to identify the type of mechanism (pilot light or push button) associated with the address. The address comment can consist of up to 5 lines, with up to 10 ASCII characters in each line. All instructions having the same address will automatically have the same address comment.

An address comment need not be unique. The same comment can be applied to instructions having different addresses. Address comments are internally associated with the instruction address.

Symbols

You create these identifying “labels” to serve as substitutes for addresses. Once an address/symbol definition exists, you can enter the *address or symbol* when you are prompted for an address while programming.

All instructions having the same address automatically have the same symbol. A symbol is unique. The same symbol cannot be applied to different addresses.

An instruction can have a symbol in addition to a rung, instruction, or address comment.

A symbol can consist of up to 10 characters. Letters are displayed as all caps. Spaces are underlines (___). Note that you cannot begin a symbol with a numeral (0 to 9).

Note

Do not use delimiters “/”, “,” “=,” “;”. Constants cannot have symbols associated with them.

Documenting Your Ladder Program

You have the option of documenting your program before or after it is entered. If you have a complex program, it is recommended to enter comments after you have entered the ladder program.

Adding Comments and Symbols

Rung, instruction, and address comments and symbols help explain your ladder program to someone else who has to read, modify, or maintain the program.

Deleting Comments and Symbols

Deleting a comment, line, or word places it in the corresponding buffer. If you choose to insert the deleted item in this or another comment, select the appropriate undelete function with the cursor at the desired location. You can undelete as often as you like. Contents of a comment, line, or word buffer remain until you either delete another comment, line, word, or exit the document function.

Ladder Documentation Conventions

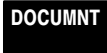
When entering, modifying, or deleting comments, keep the following rules in mind:

- Rung comments can only be added after the rung contains an output instruction. The comments are attached to the first output instruction in the rung.
- If both an instruction comment and address comment exist for an instruction, the instruction comment is displayed.
- You can also use the database editor to add, modify, or delete comments, addresses, and symbols.

The following key stroke combinations provide editing and navigational capabilities when entering comments and symbols.

This key combination:	Performs this function:
[CTRL-B] or [CTRL-left arrow]	Moves the cursor to the beginning of the line. If the cursor is already at the beginning of the line, cursor moves to the beginning of the previous line.
[CTRL-E] or [CTRL-right arrow]	Moves the cursor to the end of the line. If the cursor is already at the end of the line, cursor moves to the end of the next line.
[CTRL-N]	Moves the cursor to the first character in the next word.
[CTRL-P]	Moves the cursor to the first character in the previous word.
[Home]	Moves the cursor to the beginning of the comment.
[END]	Moves the cursor to the end of the comment.
[CTRL-D]	Same as the left arrow key.
[CTRL-F]	Same as the right arrow key.
[CTRL-H]	Deletes the character to the left of the cursor.
[CTRL-U]	Deletes all characters to the left of the cursor in the current line.
[CTRL-J]	Deletes the previous word.
[CTRL-X]	Deletes the whole line, regardless of the position of the cursor in the line.
[CTRL-A] or [INS]	Toggles between insert and overstrike mode.
[CTRL-I]	Same as the tab key.
[CTRL-M]	Same as the return [ENTER] key.

The following section describes how to add comments and symbols to your ladder program. Access the Document menu choices from either the Monitor file, Edit, or

Force displays by pressing [ALT-T]. You can also press  from the

F5

Monitor file display.

Adding Rung Comments

The following figure shows the offline Monitor file display of processor file EXAMPLE. The cursor is on rung 0.

Press a function key
(file 2, rung 0)
offline no forces File EXAMPLE

CONFIG DISPLAY	EXIT	DOCUMNT	SEARCH	GENERAL UTILITY	DATA MONITOR	FORCE	EDIT
F2	F3	F5	F6	F7	F8	F9	F10

- To add a rung comment to rung 0, press **DOCUMNT** **F5**. The document menu functions appear.

Press a key for desired document function
(file 2, rung 0)
offline no forces EDITS: NONE File EXAMPLE

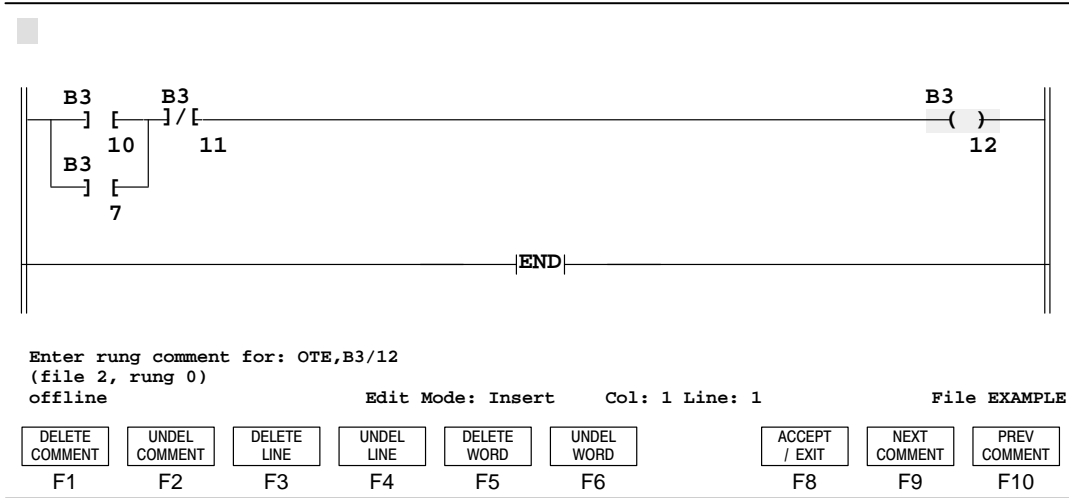
RUNG COMMENT	INSTRUC COMMENT	ADDRESS COMMENT	EDIT DBASE	MODIFY SYMBOL	REMOVE SYMBOL	SAVE DOCUMNT
F1	F2	F3	F5	F6	F7	F10

- The cursor is located on the rung for which you want to add a comment. Press

RUNG COMMENT

. The following display appears:

F1



Enter rung comment for: OTE,B3/12
(file 2, rung 0)
offline

Edit Mode: Insert Col: 1 Line: 1 File EXAMPLE

DELETE COMMENT (F1) UNDEL COMMENT (F2) DELETE LINE (F3) UNDEL LINE (F4) DELETE WORD (F5) UNDEL WORD (F6) ACCEPT / EXIT (F8) NEXT COMMENT (F9) PREV COMMENT (F10)

Note that the ladder cursor has moved to the output instruction, which will be associated with the rung comment. An area above the rung is reserved for the comment. The rung comment cursor appears there.

Function Key	Description
[F1] Delete Comment [F2] Undelete Comment	Deletes and undeletes comments, lines of comments, and individual words.
[F3] Delete Line [F4] Undelete Line	Deletes and undeletes line comments.
[F5] Delete Word [F6] Undelete Word	Deletes and undeletes word comments.
[F8] Accept/Exit	Allows you to accept the rung comment and exit to the Document menu functions.
[F9] Next Comment	Saves the current comment and moves the cursor to the next rung, instruction, or address that you can comment.
[F10] Previous Comment	Saves the current comment and moves the cursor to the output instruction in the previous rung, instruction, or address that you can comment.

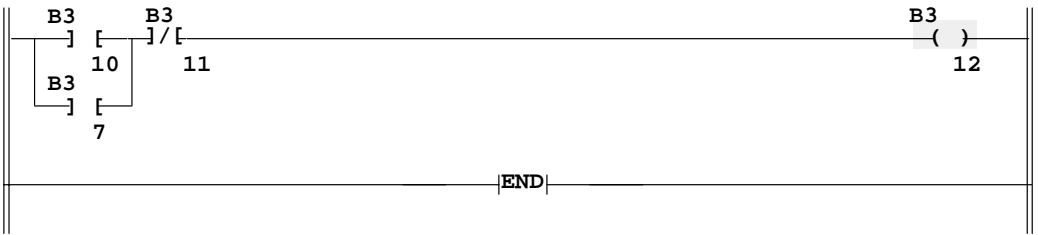
The prompt line indicates Enter rung comment for: OTE, B3/12. The status line indicates Edit Mode: Insert. You can change the mode to Overstrike by pressing [CTRL-A] or [INS]. Also, Col: 1 Line: 1 is indicated on the status line. This is the position of the cursor in the comment field.

3. Type: **Rung comment**.
4. Press [ENTER] and type: **line 2**.

```

Rung comment
line 2 █

```



```

Enter rung comment for: OTE,B3/12
(file 2, rung 0)
offline
Edit Mode: Insert Col: 1 Line: 2 File EXAMPLE

```

DELETE COMMENT	UNDEL COMMENT	DELETE LINE	UNDEL LINE	DELETE WORD	UNDEL WORD	ACCEPT / EXIT	NEXT COMMENT	PREV COMMENT
F1	F2	F3	F4	F5	F6	F8	F9	F10

5. A second line is started. The status line indicates the cursor position is at column 7, line 2. Accept the comment by pressing either **ACCEPT / EXIT** , or

ACCEPT / EXIT , or **ACCEPT / EXIT** ,
NEXT COMMENT , or **PREV COMMENT** .
F8
F9 F10

Adding Address Comments

Adding an address comment is similar to adding an instruction comment.

- To add an address comment to rung 0 press **DOCUMNT** . The following document menu functions appear:

F5

```

Press a key for desired document function
(file 2, rung 0)
offline                no forces                EDTIS: NONE                File EXAMPLE

```

RUNG COMMENT	INSTRUC COMMENT	ADDRESS COMMENT	EDIT DBASE	MODIFY SYMBOL	REMOVE SYMBOL	SAVE DOCUMNT
F1	F2	F3	F5	F6	F7	F10

- Locate the cursor on the address you want to add a comment and press

**ADDRESS
COMMENT** .

F3

- A typical display is shown below. The window in the display area applies to the address of the cursored instruction.

```

Bit File

```

```

Enter address comment for: B3/11
(file 2, rung 0)
offline                Edit Mode: Insert        Col: 1 Line: 1                File EXAMPLE

```

DELETE COMMENT	UNDEL COMMENT	DELETE LINE	UNDEL LINE	DELETE WORD	UNDEL WORD	ACCEPT / EXIT	NEXT COMMENT	PREV COMMENT
F1	F2	F3	F4	F5	F6	F8	F9	F10

Function Key	Description
[F1] Delete Comment [F2] Undelete Comment	Deletes and undeletes comments, lines of comments, and individual words.
[F3] Delete Line [F4] Undelete Line	Deletes and undeletes line comments.
[F5] Delete Word [F6] Undelete Word	Deletes and undeletes word comments.
[F8] Accept/Exit	Allows you to accept the rung comment and exit to the Document menu functions.
[F9] Next Comment	Saves the current comment and moves the cursor to the next rung, instruction, or address that you can comment.
[F10] Previous Comment	Saves the current comment and moves the cursor to the output instruction in the previous rung, instruction, or address that you can comment.

An address comment appears in the same position as an instruction comment. If the instruction already has an instruction comment, an address comment can be assigned but it will not appear. When adding multiple address comments, vertical bars appear to the left of the comments in order to separate them.

4. Type: **Address** and press either **ACCEPT / EXIT** , or **NEXT COMMENT** , or **PREV COMMENT** .
F8 F9 F10

Adding Instruction Comments

Adding an instruction comment is similar to adding a rung comment with the cursor on the instruction.

- To add an instruction comment to rung 0 press **DOCUMNT** **F5**. The following document functions appear:

```

Press a key for desired document function
(file 2, rung 0)
offline                no forces                File EXAMPLE
    
```

RUNG COMMENT	INSTRUC COMMENT	ADDRESS COMMENT	EDIT DBASE	MODIFY SYMBOL	REMOVE SYMBOL	SAVE DOCUMNT
F1	F2	F3	F5	F6	F7	F10

- Locate the cursor on the instruction you want to add a comment to and press **INSTRUC COMMENT** **F2**. The following display appears:

```

Enter instruction comment for: XIC,B3/10
(file 2, rung 0)
offline                Edit Mode: Insert                Col: 1 Line: 1                File EXAMPLE
    
```

DELETE COMMENT	UNDEL COMMENT	DELETE LINE	UNDEL LINE	DELETE WORD	UNDEL WORD	ACCEPT / EXIT	NEXT COMMENT	PREV COMMENT
F1	F2	F3	F4	F5	F6	F8	F9	F10

The window in the display area applies to the cursored instruction. The comment Bit File has been entered, but not yet accepted.

Function Key	Description
[F1] Delete Comment [F2] Undelete Comment	Deletes and undeletes comments, lines of comments, and individual words.
[F3] Delete Line [F4] Undelete Line	Deletes and undeletes line comments.
[F5] Delete Word [F6] Undelete Word	Deletes and undeletes word comments.
[F8] Accept/Exit	Allows you to accept the rung comment and exit to the Document menu functions.
[F9] Next Comment	Saves the current comment and moves the cursor to the next rung, instruction, or address that you can comment.
[F10] Previous Comment	Saves the current comment and moves the cursor to the output instruction in the previous rung, instruction, or address that you can comment.

3. Press either **ACCEPT / EXIT** (F8), or **NEXT COMMENT** (F9), or **PREV COMMENT** (F10).

Adding Symbols

A symbol can consist of up to 10 characters. Characters can be the letters A to Z, numbers 0 to 9, and spaces. Letters are displayed as all caps. Spaces are underlines (_). Note that you cannot begin a symbol with a numeral (0 to 9).

The following shows the offline Monitor file display of processor file EXAMPLE2. Assume the display is presently configured to display symbols. The Configure Display option is discussed on page 7–25.

1. To add a symbol to rung 0, press **DOCUMNT** (F5). The document functions appear.

```

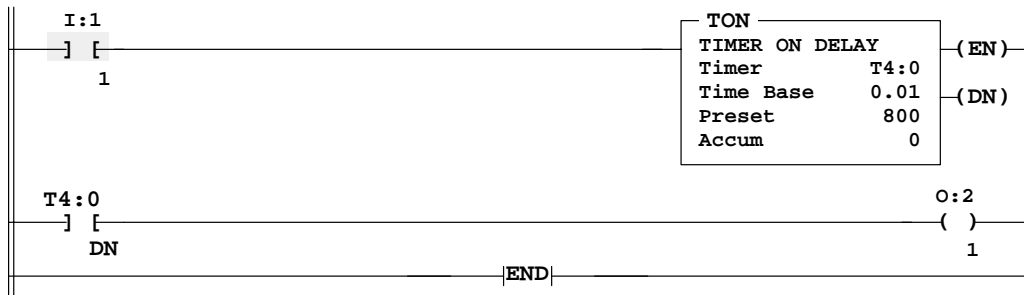
Press a key for desired document function
(file 2, rung 0)
offline                no forces                File EXAMPLE2
    
```

RUNG COMMENT	INSTRUC COMMENT	ADDRESS COMMENT	EDIT DBASE	MODIFY SYMBOL	REMOVE SYMBOL	SAVE DOCUMNT
F1	F2	F3	F5	F6	F7	F10

2. Using the arrow keys, move the cursor to instruction I:1/1 and press

MODIFY SYMBOL

F6



Enter symbol
Relate I:1/1 to offline no forces

File EXAMPLE2

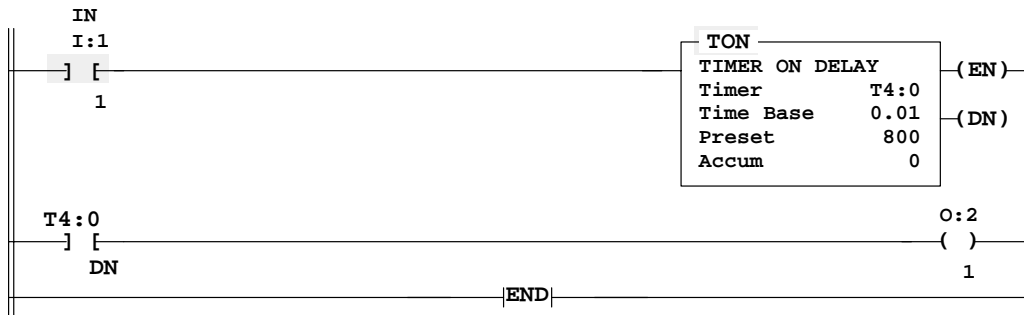
NEXT INSTR F9 PREV INSTR F10

3. Note the prompt line and data/command entry line. Type: **IN** and press

NEXT INSTR

. The following display appears.

F9



Enter symbol
Relate T4:0 to offline no forces

File EXAMPLE2

NEXT INSTR F9 PREV INSTR F10

- The symbol **IN** appears above the instruction. Note that symbols are always displayed in capital letters. You are now prompted for a symbol relating to

T4:0. Type: **eight sec** and press **NEXT INSTR**.

F9

The screenshot shows a ladder logic diagram with two rungs. The first rung has a normally open contact labeled 'I:1' and a coil labeled 'TON'. The second rung has a normally open contact labeled 'DN' and a coil labeled 'O:2'. A configuration window for the TON instruction is open, showing the following settings:

TON	
TIMER ON DELAY	
Timer	EIGHT_SEC
Time Base	0.01
Preset	800
Accum	0

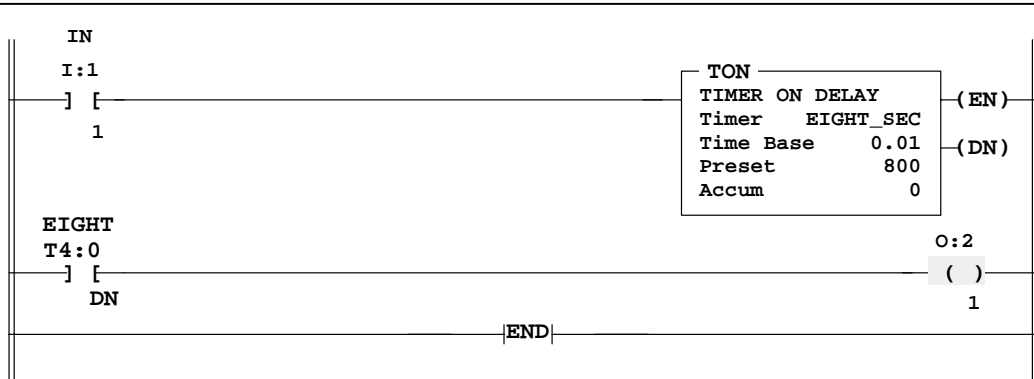
Below the diagram, the text 'EIGHT_SEC/DN' is displayed. At the bottom of the screen, there is a status bar with the following text:

Enter symbol
 Relate T4:0/DN to offline no forces File EXAMPLE2

At the bottom right, there are two buttons: 'NEXT INSTR' (F9) and 'PREV INSTR' (F10).

- EIGHT_SEC** appears within the TON instruction and also above the XIC instruction associated with the timer instruction. Note that the Done bit in rung 1 was automatically assigned the symbol **EIGHT_SEC/DN**. If you choose, you can assign a different symbol for the Done bit. For example, type: **eight** and press **NEXT INSTR**. The following display appears.

F9



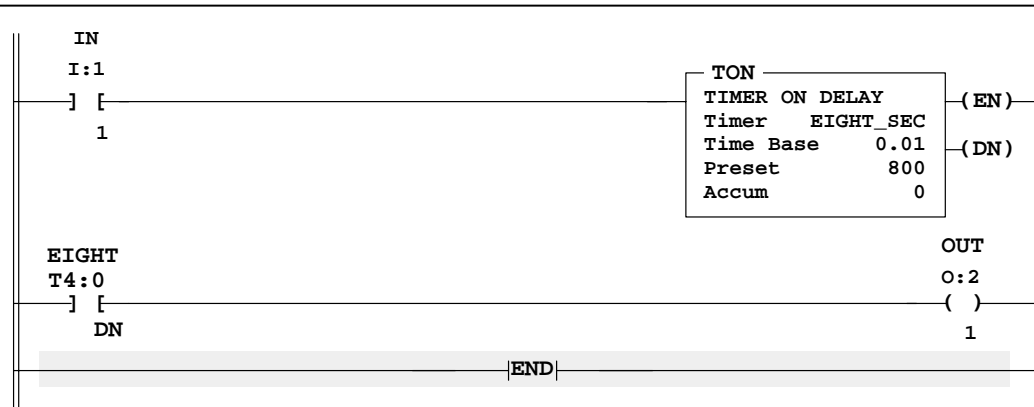
Enter symbol
Relate O:2/1 to offline no forces

File EXAMPLE2

NEXT INSTR F9
PREV INSTR F10

6. The Done bit symbol is now EIGHT. Type: **out** for the output instruction symbol, and press **NEXT INSTR**.

F9



AT BOTTOM OF PROGRAM
Press a key for desired document function
(file 2, rung 2)
offline no forces

File EXAMPLE2

RUNG COMMENT F1
INSTRUC COMMENT F2
ADDRESS COMMENT F3
EDIT DBASE F5
MODIFY SYMBOL F6
REMOVE SYMBOL F7
SAVE DOCUMNT F10

Note

Function key **SAVE DOCUMENT** saves your changes. However, the display and menu **F10** selections do not change. This function does not save changes made to the ladder program. You must press [F2], Save at the Offline Program menu display to save the ladder program.

Using the Database Editor

The database editor provides access to all comments and symbols for a processor memory file. The database stores program documentation separately from the program logic. The database editor allows you to modify, delete, or insert addresses, symbols, and comments into the documentation database.

The database editor display contains four windows, each for different types of database information. These types are:

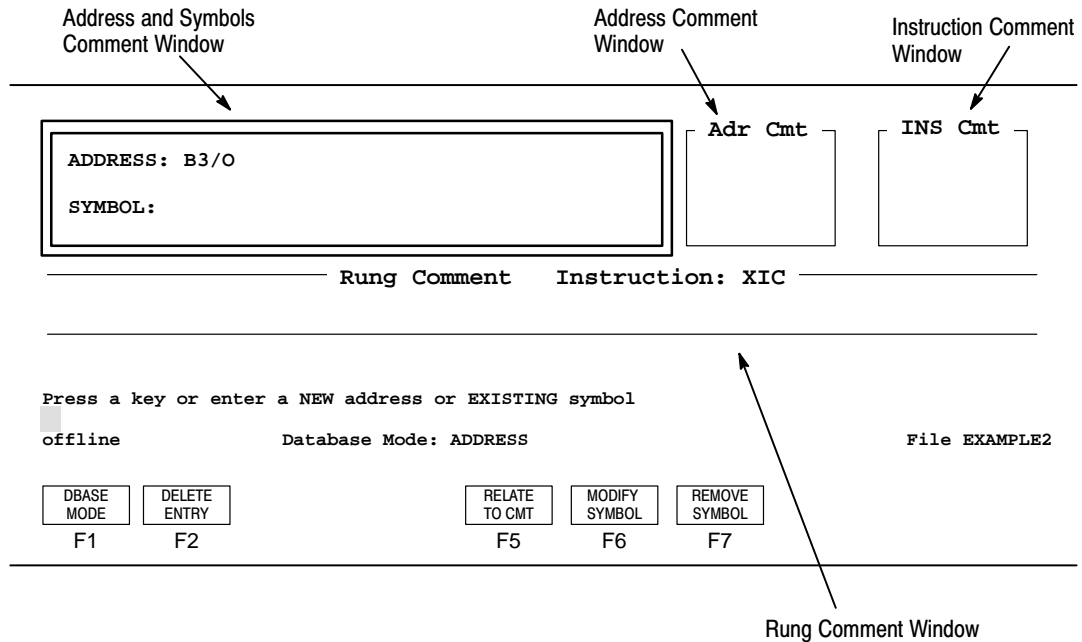
- address and symbols (default)
- address comments
- instruction comments
- rung comments

There are two ways of editing the database:

- Enter the database editor mode and use function keys [F1], [F2], or [F3]. These keys work the same as the previous section describes; however, when you are editing your comments, you can edit any type of comment without restrictions. Refer to the previous sections of this chapter for more information.
- To enter addresses and symbols before entering the ladder program use function key [F5], Edit DBase.

Display Conventions

There are four windows that you can access in a display. The active window is shown with an intensified double line border. Inactive windows are shown with a single line border.



Accessing the Database Editor

Enter the database editor using the following key sequence:

Begin at the main menu and press **OFFLINE PRG/DOC** (F3), then **MONITOR FILE** (F8), then **DOCUMNT** (F5), and then **EDIT DBASE** (F5). The following pages show the available editing windows.

Use the following navigational keys in the displays:

Function Key	Description
[left arrow]	Activates the previous window.
[right arrow]	Activates the next window.
[up arrow]	Displays the next address, wrapping to the top of the database if required.
[down arrow]	Displays the previous address, wrapping to the bottom of the database if required.
[Home]	Places the cursor at the first address in the database for the current database mode.
[End]	Places the cursor at the last address in the database for the current database mode.
[ESC]	Returns you to the previous display.

Address/Symbol Window

At this window you can select a different address or symbol:

<div style="border: 2px solid black; padding: 5px;"> <p>ADDRESS: B3/O</p> <p>SYMBOL:</p> </div>	<div style="border: 1px solid black; width: 100%; height: 60px; margin: 0 auto;"></div> <p style="text-align: center; margin: 0;">Adr Cmt</p>	<div style="border: 1px solid black; width: 100%; height: 60px; margin: 0 auto;"></div> <p style="text-align: center; margin: 0;">INS Cmt</p>
<hr/> <p style="margin: 0;">Rung Comment Instruction: INS</p> <hr/>		

Press a key or enter a NEW address or EXISTING symbol

offline Database Mode: ADDRESS File EXAMPLE2

DBASE MODE	DELETE ENTRY	RELATE TO CMT	MODIFY SYMBOL	REMOVE SYMBOL
F1	F2	F5	F6	F7

Function Key	Description
[F1] DBase Mode	Toggles between address, symbol, and data table database modes.
[F2] Delete Entry	Deletes the current address (and associated symbol and comments).
[F5] Relate To Comment	Changes the address related to the current set of symbol, address, instruction, and rung comments.
[F6] Modify Symbol	Allows you to enter a new symbol value on the command line. Pressing this key displays the following function keys.
[F5] Specify Address	Allows you to go to another address. The address may or may not be in the documentation database.
[F9] Next Address	Allows you to go to the next address in the documentation database.
[F10] Previous Address	Allows you to go to the previous address in the documentation database.
[F7] Remove Symbol	Removes the symbol assigned to the current address.

Address Comment Window

At this window you can change the current address comment and then modify or delete the address:

ADDRESS: B3/O SYMBOL:	Adr Cmt	INS Cmt
_____ Rung Comment Instruction: INS _____		

Press a key or enter a NEW address or EXISTING symbol

offline Database Mode: ADDRESS File EXAMPLE2

DBASE MODE	DELETE ENTRY	MODIFY COMMENT
F1	F2	F5

Function Key	Description
[F1] DBase Mode	Toggles between address, symbol, or data table database modes.
[F2] Delete Entry	Deletes the current address (and associated symbol and comments).
[F5] Modify Comment	Modifies the address comment.
[F1] Delete Comment [F2] Undelete Comment	Deletes and undeletes comments, lines of comments, and individual words.
[F3] Delete Line [F4] Undelete Line	Deletes and undeletes line comments.
[F5] Delete Word [F6] Undelete Word	Deletes and undeletes word comments.
[F8] Accept/Exit	Allows you to accept the address comment and exit to the Document menu function.

Instruction Comment Window

At this window you can choose a specific instruction or class of instructions to modify or delete:

ADDRESS: B3/O SYMBOL:	Adr Cmt	INS Cmt
_____ Rung Comment Instruction: INS _____		

Press a key or enter a NEW address or EXISTING symbol

offline

Database Mode: ADDRESS

File EXAMPLE2

DBASE MODE	DELETE ENTRY	MODIFY COMMENT	SELECT INSTRUC	NEXT INSTRUC
F1	F2	F5	F6	F7

Function Key	Description
[F1] DBase Mode	Toggles between address, symbol, or data table database modes.
[F2] Delete Entry	Deletes the current address (and associated symbol and comments).
[F5] Modify Comment	Modifies the instruction comment.
[F1] Delete Comment [F2] Undelete Comment	Deletes and undelete comments, lines of comments, and individual words.
[F3] Delete Line [F4] Undelete Line	Deletes and undeletes line comments.
[F5] Delete Word [F6] Undelete Word	Deletes and undeletes word comments.
[F8] Accept/Exit	Allows you to accept the instruction comment and exit to the Document menu functions.
[F6] Select Instruction	Allows you to select an instruction type to go with the address for the instruction comment. Use the function keys or enter the type of instruction.
[F7] Next Instruction	Goes to the next instruction type for the current address.

Rung Comment Window

At this window you can select a rung comment to edit:

ADDRESS: B3/O SYMBOL:	ADR CMT	INS CMT
------------------------------	---------	---------

Rung Comment Instruction: INS

Press a key enter a NEW address or EXISTING symbol

offline Database Mode: ADDRESS File EXAMPLE2

DBASE MODE	DELETE ENTRY	MODIFY COMMENT	SELECT INSTRUC	NEXT INSTRUC
F1	F2	F5	F6	F7

Function Key	Description
[F1] DBase Mode	Toggles between address, symbol, and data table database modes.
[F2] Delete Entry	Deletes the current address (and associated symbol and comments).
[F5] Modify Comment	Modifies the rung comment.
[F1] Delete Comment [F2] Undelete Comment	Deletes and undeletes comments, lines of comments, and individual words.
[F3] Delete Line [F4] Undelete Line	Deletes and undeletes line comments.
[F5] Delete Word [F6] Undelete Word	Deletes and undeletes word comments.
[F8] Accept/Exit	Allows you to accept the rung comment and exit to the Document menu functions.
[F6] Select Instruction	Allows you to select an instruction type to go with the address for the rung comment. Use the function keys or enter the type of instruction.
[F7] Next Instruction	Goes to the next instruction type for the current address.

Example – Selecting an Address

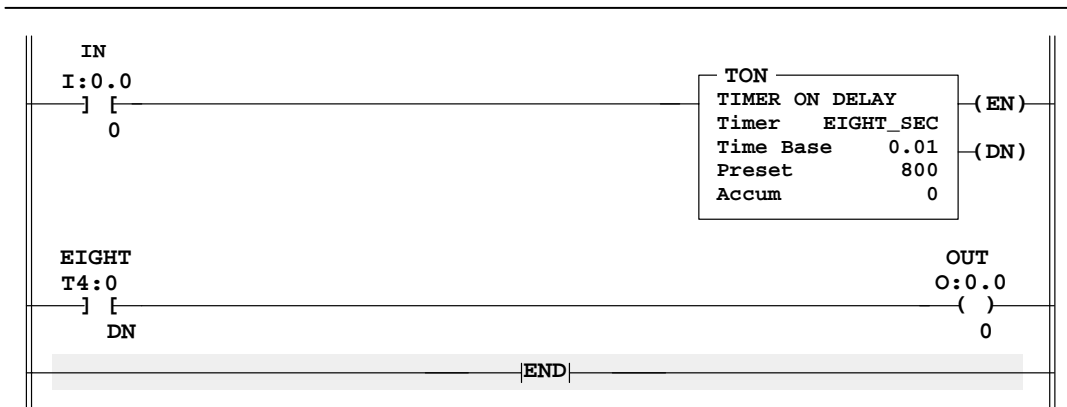
To select an address using the database editor, do the following:

1. Begin at the main menu and press **OFFLINE PRG/DOC** (F3), then **MONITOR FILE** (F8), then

DOCUMNT (F5).

The following display appears:

F5



AT BOTTOM OF PROGRAM

Press a key for desired document function
(file 2, rung 2)
offline

no forces

File EXAMPLE2

RUNG COMMENT	INSTRUC COMMENT	ADDRESS COMMENT	EDIT DBASE	MODIFY SYMBOL	REMOVE SYMBOL	SAVE DOCUMNT
F1	F2	F3	F5	F6	F7	F10

2. Press **EDIT DBASE** **F5** and type: **I:1/1**. Press **[ENTER]** and the following display appears:

<div style="border: 3px double black; padding: 5px;"> <p>ADDRESS: I:1/1</p> <p>SYMBOL:</p> </div>	<div style="border: 1px solid black; height: 60px; width: 100%;"></div> <p style="text-align: center; margin-top: -5px;">Adr Cmt</p>	<div style="border: 1px solid black; height: 60px; width: 100%;"></div> <p style="text-align: center; margin-top: -5px;">INS Cmt</p>
<hr style="border: 0; border-top: 1px solid black; margin: 0;"/> <p style="margin: 0;">Rung Comment Instruction: INS</p> <hr style="border: 0; border-top: 1px solid black; margin: 0;"/>		

Press a key or enter a NEW address or EXISTING symbol

offline Database Mode: ADDRESS File EXAMPLE2

DBASE MODE	DELETE ENTRY	RELATE TO CMT	MODIFY SYMBOL	REMOVE SYMBOL
F1	F2	F5	F6	F7

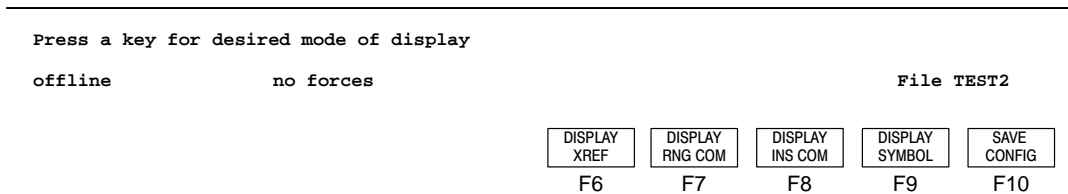
3. Using the **[right arrow]** or **[left arrow]**, move the cursor to the window you want to modify. In this case move the cursor to the address window. The system highlights the active window with an intensified double line border.
4. Do one of the following to select an address:
 - Use the **[up arrow]** or **[down arrow]** and scroll through the addresses in the database.
 - Type the address, such as **B3/18** and press **[ENTER]**.

Any comments that exist for the address, instruction, or rung are displayed.
5. Use the displayed function keys to make changes to the comments.

Viewing Your Documented Program

Once you have entered the comments for your ladder program you have the option of displaying or suppressing (hiding) those comments in your ladder program (shown in step 2). You can also choose to display or suppress output cross references. (See page 7–26.)

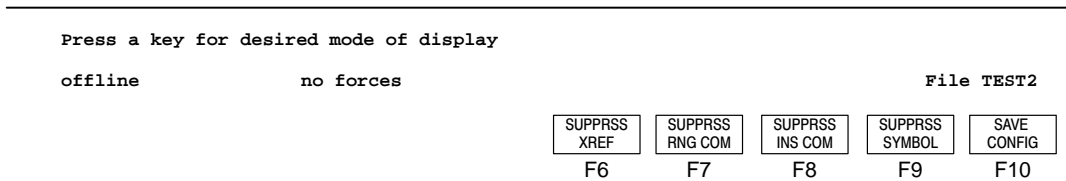
1. Press **MONITOR FILE** (F8) and then **CONFIG DISPLAY** (F2). The following menu functions appear:



2. Note the prompt line display. If any comments and symbols exist for the file being monitored, they will be displayed in the ladder program. Pressing **DISPLAY XREF** (F6), **DISPLAY RUNG COM** (F7), **DISPLAY INS COM** (F8), or **DISPLAY SYMBOL** (F9) changes the text to indicate SUPPRESS instead of DISPLAY.

Note

When DISPLAY is shown on the function key, SUPPRESS is in effect. When SUPPRESS is shown on the function key, DISPLAY is in effect.



3. Save whatever selections are currently in effect by pressing **SAVE CONFIG** (F10). The message line indicates **NEW CONFIGURATION SAVED TO FILE**. The selections will be in effect the next time you monitor a ladder program, and they will be in effect when you power up for your next APS session.
4. Press [ENTER] or [ESC] to return to the Monitor file display.

Output Cross Reference Displays

Pressing **DISPLAY XREF** **F6** enables the display of output cross references. A cross reference can be displayed for the following instructions: ASR, EQU, GEQ, GRT, LEQ, LES, LIM, MEQ, NEQ, OSR, XIC, and XIO.

The cross reference appears below the input instruction. It shows the file and rung number corresponding to the first instance that the specified address is assigned to an output instruction in the ladder program. An example of an XIC instruction with cross reference enabled is shown below:

```

O:2
——] [—
      15
(100:1)
    
```

For input instructions with several operands, the cross references for each operand appear in the same order as the operands are displayed. As an example, an EQU instruction with cross references is shown below:

```

EQU
EQUAL
Source A      N7:0
              23
Source B      N7:1
              3
N7:0 - (100:3)
N7:1 - (3:0)
    
```

The cross reference display is updated whenever a change is made to a rung.

8 Protection

There are several file protection options for your applications. File protection is designed to protect against unauthorized access and modification to both user data (data files) and user programs (online edits).

Depending on the type of processor, 11 types of processor file protection are available.

Types of Protection	Fixed, SLC 5/01	SLC 5/02	SLC 5/03	SLC 5/04	MicroLogix 1000	Page
Password	•	•	•	•	•	8-2
Future Access (OEM Lock)	•	•	•	•	•	8-5
Program Owner	•	•	•	•	NA	8-6
Program Files	NA	NA	•	•	NA	8-8
Data Table Files	•	•	•	•	NA	8-10
Memory Module Data File Overwrite	NA	NA	•	•	NA	8-16
Memory Module Program Compare	NA	NA	•	•	NA	8-17
Memory Module Write Protection	NA	NA	•	•	NA	8-17
Force	NA	NA	•	•	NA	8-20
Keyswitch	NA	NA	•	•	NA	8-20
Communication Channel	NA	NA	•	•	NA	8-21

NA = Not Available

Password

Password protection is designed to protect against unauthorized access to a processor file and from changes being made to the ladder program. Each ladder program may contain two passwords; the *Password* and the *Master Password*. The master password overrides the password. This function is available offline and online from the Processor Functions menu. You can only use numbers.

You can use passwords in the following combinations:

Only Password Designated	You must enter the password to gain access to the processor file.
Password and Master Password Designated	You must enter either the password or the master password to gain access to the processor file.

Generally, if you are using a number of processors, each processor is given a different password, and a master password is applied to all of the processors. You can use the master password to change or remove any password.

Note

There is no password override to defeat the protection. Contact your Rockwell Software representative if you are not able to locate your password.

Entering Passwords

Ordinarily, you would not enter a password until your ladder program is completed, tested, and ready to be applied. This avoids having to type in the password each time you edit the program, download, edit again, and so on.

Example

The following is the offline Program Directory display for processor file SEQUENCE. Suppose you want to designate a password for this file.

1. At the main menu press **OFFLINE PRG/DOC** (F3), then **PROCSSR FUNCTNS** (F1). The following display appears:


```
PROGRAM DIRECTORY FOR PROCESSOR: 05TEST
```

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	73
1			reserved	0
2			ladder	10

Press a key, enter file number or file name

offline

SLC 5/03

File SEQUENCE

CHANGE PROCSSR	CHANGE PASSWRD	CHANGE PR. NAME	CHANGE FL. NAME	CLEAR MEMORY	CREATE FILE	DELETE FILE	MONITOR FILE	DATA MONITOR	FILE PROTECT
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

- Press **CHANGE PASSWRD**, then **ENTER MODIFY**. The prompt line indicates **Enter New Password (10 char max)**.
- Password characters are restricted to numbers 0 through 9. Type: **9 9 9 9**. Note that asterisks appear on the data/command entry line instead of the numbers.

```
Enter New Password ( 10 char max)
* * * * *
offline
```

SLC 5/03

File SEQUENCE

ENTER MODIFY	REMOVE	ENT/MOD MASTER	REMOVE MASTER
F2	F4	F5	F6

- Press [**ENTER**]. Verify the password by re-entering the number **9 9 9 9** and pressing [**ENTER**]. The password is now accepted.

Entering Master Passwords

If a master password is required, press **ENT/MOD MASTER**. The entry procedure is the same as for a password.

F5


Removing Passwords


To remove a password or master password, do one of the following:

Removing Passwords	Removing Master Passwords
1. Press [F4], Remove.	1. Press [F6], Remove Master.
2. Enter existing password and press [ENTER].	2. Enter the existing master password and press [ENTER].
3. Save to disk.	3. Save to disk.

Saving to Disk

By designating a password, the processor file is changed. To save the changes to disk, do the following:

Offline: At the program directory display, select . If you neglect to do this, APS gives you another opportunity to save when you return to the main menu.

Online: At the program directory display, select . Then select


F2

Invalid Entry

When you respond to the password prompt with an incorrect password, the message `PASSWORD INVALID` appears on the message line. After three unsuccessful attempts, the message: **ILLEGAL PROGRAM ACCESS ATTEMPTED** appears. You are restricted to online and offline functions as follows:

Online: Available online functions include returning to the main menu, changing processors, and monitoring network activity.

Offline: Available offline functions include delete, copy, or rename the archive file, and print reports.

Future Access (OEM Lock)

This option allows you to protect proprietary program data and algorithms. This type of protection can be applied using any of the SLC 500 processors or MicroLogix 1000 controllers. The protection takes effect only after the program is downloaded to a controller. The protection does not allow online access to the processor program unless a matching copy of the online processor program is resident on the hard disk, in the Hand-Held Terminal (HHT), or in the memory module of a Hand-Held Programmer (HHP).

Allow: Online access to the processor file and data table is unrestricted. This is the default.

Disallow: Online access to the processor program is not permitted. You cannot:

- monitor the program or create reports
- enter or change the password
- save the online processor file to disk
- transfer the file from the processor memory to a memory module (*SLC 500 processors only*)

However, you can:

- edit or view user data
- clear the processor memory
- create the processor configuration and data table reports (*SLC 500 processors only*)
- transfer the contents of a memory module into the processor memory (*SLC 500 processors only*)
- restore (download) a different program to the controller

Note

If you lose or delete the offline copy of the program, you cannot access the program in the controller. You must clear the controller memory and re-enter the program.

This feature is not recommended for use when the HHT is your only source of program backup.

There is no “back door” access to get around this feature. If you intend to use this feature, back up your program.

Program Owner Protection

Note: This function only applies to the DH-485 driver's WHO Active. This function is not supported in the DH+ driver's WHO Active.

Assigning program ownership is done using the DH-485 WHO function via the commands Set Owner and Clear Owner. The Set and Clear Owner commands permit a terminal to "own" one or more processor files on the network. Ownership means that as long as the owner is active on the network, other terminals cannot access the online functions of the owned processor files.

When the owner becomes inactive (exits the network), another terminal can clear the ownership of the inactive node and gain access to an owned processor file. However, to do so, you must clear the ownership of the terminal. An owner can clear ownership at any time.



Program ownership is lost when a processor cycles power or when communication errors occur.

1. Begin at the main menu and press **WHO** (F5), then **WHO ACTIVE** (F5). The following menu shows the active stations of a network having terminals at nodes 0 and 1.

```

WHO ACTIVE - Active Station Identification
-----
 0 TERM          (31)    12
 1 APS           (31)    13
 2 500-20        (31)    14
 3 5/03          (31)    15
 4 500-40        (31)    16
 5 5/02          (31)    17
 6                (31)    18
 7                (31)    19
 8                (31)    20
 9                (31)    21
10                (31)    22
11                (31)    23
-----
ESC exits
    
```

Press a key for desired network function

ONLINE	STATION DIAGS	SET OWNER	CLEAR OWNER	MAX ADDRESS	NODE ADDRESS	NODE BAUD
F1	F2	F3	F4	F7	F8	F9

2. To claim ownership of nodes 4 and 5, move the cursor to node 4 and press **SET OWNER** **F3** . Move the cursor to node 5 and press **SET OWNER** **F3** . The display changes as follows:

```

WHO ACTIVE - Active Station Identification
-----
 0 TERM          (31)      12                24
 1 APS           (31)      13                25
 2 500-20        (31)      14                26
 3 5/03          (31)      15                27
 4 500-40        (31/0)    16                28
 5 5/02          (31/0)    17                29
 6               (31)      18                30
 7               (31)      19                31
 8
 9
10 5/03          (31/10)   22
11
ESC exits

```

Press a key for desired network function

ONLINE	STATION DIAGS	SET OWNER	CLEAR OWNER	MAX ADDRESS	NODE ADDRESS	NODE BAUD
F1	F2	F3	F4	F7	F8	F9

To indicate ownership by a programmer, the node address of the owner is included in the parentheses with the maximum node address. In this case, to indicate ownership by terminal 0, “31” changed to “31/0” for nodes 4 and 5.

As long as terminal 0 is running APS, the APS terminal at node 1 cannot monitor the processor file or access the processor functions at nodes 4 and 5. The message **PROGRAM OWNER ACTIVE** tells you why you are denied access.

If terminal 0 exits APS or is disconnected from the network, terminal 1 can use the Clear Owner function to clear terminal 0’s ownership of a node. Terminal 1 then has access to the node and can claim ownership.

3. To clear ownership, place the cursor on the desired node and press **CLEAR OWNER** **F4** .

To succeed you must either be the current owner or the current owner cannot be active.

Program File Protection (SLC 5/03 and SLC 5/04 Processors)

Program file protection is designed to protect your application from having online edits performed on a program file. The SLC 5/03 and SLC 5/04 processors provide you with the capability to protect program files on a per file basis. Since the fixed, SLC 5/01, and SLC 5/02 processors do not support online editing, their protection status is set to all program files protected.

Program file protection can only be changed during offline programming. Program file protection is set by selecting the form of protection and then entering a file list on which to apply the protection. Files can be listed by:

- separating single file numbers and ranges of files with a delimiter, a comma or semi-colon. For example 2, 4, 6.
- specifying ranges of files by separating the beginning and ending file numbers with a hyphen. For example 2-7.
- intermixing ranges and individual files. For example 2, 5, 7-10, 250.

Once you have entered the file list, if any errors are detected the cursor is placed at the position of the error.

The default protection is no program files protected. Additionally, program file protection cannot be set in a program containing edit zones from an online editing session. If you press [F10], File Protect for a program containing edit zones, the message: **PROGRAM CONTAINS EDITS - CANNOT MODIFY PROGRAM FILE PROTECTION** is displayed. For protection to be asserted, you must either accept or cancel the edit.

To set file protection, do the following:

1. Begin at the main menu and press **OFFLINE PRG/DOC** (F3), then **PROCSSR FUNCTS** (F1), then

FILE PROTECT

F10

. The following display appears:

```
PROGRAM DIRECTORY FOR PROCESSOR: EXAMPLE
```

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	*
1			reserved	*
2	Yes		ladder	*
3			undefined	*
4			ladder	*

Press a key to select protection

offline

SLC 5/03

File EXAMPLE

PROTECT
FILE

F1

REMOVE
PROTECT

F4

Note that only SLC 5/03 or SLC 5/04 processor files can be protected. If the processor type is not a SLC 5/03 or SLC 5/04, when you press **FILE PROTECT** the **F10** message: **PROGRAM FILES CANNOT BE PROTECTED FOR THIS PROCESSOR TYPE** is displayed.

- To set protection, press **PROTECT FILE** and enter the file(s) you want protected. To remove file protection press **REMOVE PROTECT**. File protection is indicated in the display as either Yes or No.

```
PROGRAM DIRECTORY FOR PROCESSOR: EXAMPLE
```

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	*
1			reserved	*
2	Yes		ladder	*
3	No		undefined	*
4	Yes		ladder	*

Enter list of files to apply protection

offline

SLC 5/03

File EXAMPLE

PROTECT
FILE

F1

REMOVE
PROTECT

F4

3. After selecting protect file, you can specify individual program files and/or ranges of program files on which to apply the file protection. Refer to the previous page for the different ways files can be listed. After successful validation, program file protection is applied to the list of specified files.

If program file protection is changed, the user program must be saved before you leave the program directory screen in order for the new program file protection to be applied.

If you create additional program files, program file protection is set to No if the current processor type is a SLC 5/03 or SLC 5/04. If the current processor type is not a SLC 5/03 or SLC 5/04, protection is set to Yes.

When changing processor types from a SLC 5/03 or SLC 5/04 to a SLC 5/02 or below processor, all of the program files will have file protection set to Yes. When changing processor types from a fixed, SLC 5/01, or SLC 5/02 to a SLC 5/03 or SLC 5/04, all program files will have protection set to No.

Data Table File Protection

Data table file protection is available with any of the SLC 500 processors. It can only be changed during offline programming.

Forms of Protection

Depending on the SLC 500 processor, two forms of data table file protection are available:

- Static - Changes to protected data values are only allowed by the ladder program during program execution. Data values cannot be altered by communication channels, but the values can be changed by the user program or from the multi-point list. (This includes online edits.)
- Constant - The file is protected from all changes. Data values cannot be altered by communication channels, your ladder program, or multi-point lists. For example, constantly protected data table files can be used for recipe storage or look-up tables. The Input, Output, and Status files cannot be constantly protected.

Fixed and SLC 5/01 Processor

The output file is always statically protected. You cannot alter the output data file while in the REM Run mode using the communication channels. However, all other data table files are unprotected.

SLC 5/02 Processor

You can choose to statically protect your data table files at the time you save your program. When you press [F2], Save from the Program Directory display, the following screen appears:

```

File Name:                EXAMPLE
F1 Single Step Test      DISABLE
F3 Index Across Files:   DISALLOW
F4 File Protection       OUTPUTS
F6 Future Access:        ALLOW
ESC exits

```

FILE ALREADY EXISTS
Overwrite File?

offline	SLC 5/02	File EXAMPLE
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
SINGLE STEP	INDEX CHECKS	FUTURE ACCESS
F1	F3	F6
	<input type="checkbox"/>	<input type="checkbox"/>
	FILE PROTECT	YES
	F4	F8
		<input type="checkbox"/>
		NO
		F10

Apply protection to your data table file by pressing **FILE PROTECT**.

F4

This key [F4], toggles between:

- Output - only the output file is statically protected (default).
- All - all files are statically protected.
- None - no files are protected.

For more information on saving your file(s), see chapter 9.

SLC 5/03 and SLC 5/04 Processors

Data table file protection is only available on a per file basis when using a SLC 5/03 and SLC 5/04 processor. You can choose between static or constant protection for each data file. You cannot write to a protected status file while in the run or test modes. However, you are allowed to clear a processor fault, write a zero to bit S:1/13 (Major Error Bit Halted) or words S:5 (minor error bits) and S:6 (Fault Code) while in the fault mode.

This protection is selectable prior to saving your offline program. The default file protection for the Output file is statically protected; all other data files are unprotected. You can list SLC 5/03 and SLC 5/04 processor files by:

- separating single file numbers and ranges of files with a delimiter, a comma or semi-colon. For example 2, 4, 6.
- specifying ranges of files by separating the beginning and ending file numbers with a hyphen. For example 2-7.
- intermixing ranges and individual files. For example 2, 5, 7-10, 250.

Once you have entered the file list, if any errors are detected the cursor is placed at the position of the error.

1. Begin at the main menu and press **OFFLINE PRG/DOC** (F3), then **MEMORY MAP** (F10), then

DATA PROTECT
F10

. The following display appears:

SLC 5/03 and SLC 5/04
processors only

DATA TABLE MAP					
FILE	TYPE	LAST ADDRESS	ELEMENTS	WORDS	FILE PROTECTION
0	O output	O:2	1	1	
1	I input	I:3	2	2	STATIC MEM-MOD
2	S status	S:82	83	83	STATIC MEM-MOD
3	B binary or bit	B3/15	1	1	MEM-MOD
4	T timer	T4:10	11	33	
5	C counter	C5:10	11	33	CONSTANT
6	R control	R6:10	11	33	STATIC
7	N integer	N7:255	256	256	
8	F floating	F8:0	1	2	

File 8 only applies to
SLC 5/03 OS301,
OS302 and SLC 5/04
OS400, OS401
processors.

PROCESSOR MEMORY LAYOUT

444 data words of memory used in 9 data table files
266 instruction words of memory used in 3 program files
11924 instruction words of unused memory available

Press a key to select protection

offline

SLC 5/03

File EXAMPLE

STATIC PROTECT	CONST PROTECT	REMOVE PROTECT
F1	F2	F3

MEM-MOD PROTECT	MEM-MOD UNPRCT
F9	F10

If the processor type is not a SLC 5/03 or SLC 5/04, when you press [F10], Data Protect the message: **DATA FILES CANNOT BE PROTECTED FOR THIS PROCESSOR TYPE** appears.

Function Key	Description
[F1] Static Protect	Selects static data file protection.
[F2] Constant Protect	Selects constant data file protection.
[F3] Remove Protect	Removes static or constant data table file protection.
[F9] Memory-Module Protect	Selects memory module data table file protection.
[F10] Memory-Module Unprotect	Removes memory module data table file protection.

Use the [Pg Dn] or the [Pg Up] keys if you have more than one page of data files.

2. Select the form of protection by pressing either **STATIC PROTECT** , **CONST PROTECT** , or

F1

F2

**REMOVE
PROTECT**

. For this example static protection is applied to address R6:10.

F3

Depending on the form of protection, one of the following prompts is displayed:

- Enter list of files to apply static protection
- Enter list of files to apply constant protection
- Enter list of files to remove static and/or constant protection

If you attempt to change the protection of an already protected file, APS detects this request. In this example, R6:10 is already statically protected. The following display appears if protection is detected:

DATA TABLE MAP					
FILE	TYPE	LAST ADDRESS	ELEMENTS WORDS		FILE PROTECTION
0	O output	O:2	1	1	
1	I input	I:3	2	2	STATIC MEM-MOD
2	S status	S:82	83	83	STATIC MEM-MOD
3	B binary or bit	B3/15	1	1	MEM-MOD
4	T timer	T4:10	11	33	
5	C counter	C5:10	11	33	CONSTANT
6	R control	R6:10	11	33	STATIC
7	N integer	N7:255	256	256	
8	F floating	F8:0	1	2	

File 8 only applies to SLC 5/03 OS301, OS302 and SLC 5/04 OS400, OS401 processors.

PROCESSOR MEMORY LAYOUT

391 data words of memory used in 9 data table files
 266 instruction words of memory used in 3 program files
 3732 instruction words of unused memory available

File(s) already STATIC Protected. DO you wish to alter protection?

offline

SLC 5/03

File EXAMPLE

YES

NO

F8

F10

The above prompts only appear if you attempt to change the form of protection for one or more data table files. If you press **YES** **F8**,

all of the files in the list will have their protection changed. If you press **NO** **F10**, the entire request is cancelled and protection is not changed.

If the file is Constant protected and you want to change it to Static protection, the prompt: **File(s) already CONSTANT protected. Do you wish to alter protection?** is displayed.

If the file is Static protected and you want to change it to Constant protection, the prompt: **File(s) already STATIC protected. Do you wish to alter protection?** is displayed.

If you attempt to apply Constant protection to Input, Output, and/or Status files, your request will be acknowledged and the message: **INPUT, OUTPUT, AND STATUS FILES CANNOT BE CONSTANT PROTECTED** is displayed.

If data table file protection is changed for any individual data file, the user program must be saved before you leave the program directory screen in order for the new data table file protection to be applied.

If you create additional data table files and you are using a SLC 5/03 or SLC 5/04 processor, protection is set to the default protection value (unprotected).

When changing processor types from an SLC 5/03 or SLC 5/04 to a fixed, SLC 5/01, or SLC 5/02 processor, all of the data table files will have their protection set to their default values.

If you attempt to modify the contents of a Static or Constant protected data table file using a communications port, the request is denied and the message: **DATA VALUE CANNOT BE MODIFIED DUE TO FILE PROTECTION** is displayed.

Memory Module Data File Overwrite (SLC 5/03 and SLC 5/04 Processors)

Use the memory module data file overwrite protection with the memory module autoloading bits to retain values such as counter accumulators and sequencer positions through a power cycle. Refer to the *Instruction Set Reference Manual* for more information about the autoloading bits. This type of protection allows you to autoloading your memory module and preserve retentive data.

The memory module data file overwrite protection only occurs when the program in the processor matches the program in the memory module. If the programs do not match, all memory module data files are transferred to the processor and bit S:36/10 "Memory Module Data File Overwrite Protection Lost" becomes set. Use minor error bit S:36/10 to determine the validity of retentive data following the memory module transfer.

The data table (memory map) screen allows you to view the type of protection applied to data table files.

At the Program Directory display, press **MEMORY MAP** (F10), then **DATA PROTECT** (F10). The following display appears:

DATA TABLE MAP					
FILE	TYPE	LAST ADDRESS	ELEMENTS	WORDS	FILE PROTECTION
0	O output	O:2	1	1	
1	I input	I:3	2	2	STATIC MEM-MOD
2	S status	S:82	83	83	STATIC MEM-MOD
3	B binary or bit	B3:15	1	1	MEM-MOD
4	T timer	T4:10	11	33	
5	C counter	C5:10	11	33	CONSTANT
6	R control	R6:10	11	33	STATIC
7	N integer	N7:255	256	256	
8	F floating	F8:0	1	2	

File 8 only applies to SLC 5/03 OS301, OS302 and SLC 5/04 OS400, OS401 processors.

PROCESSOR MEMORY LAYOUT
 391 data words of memory used in 9 data table files
 266 instruction words of memory used in 3 program files
 3732 instruction words of unused memory available

Press a key to select protection

offline

SLC 5/03

File EXAMPLE

STATIC PROTECT

CONST PROTECT

REMOVE PROTECT

MEM-MOD PROTECT

MEM-MOD UNPRCT

F1

F2

F3

F9

F10

Depending on the form of protection, one of the following prompts is displayed:

- Enter list of files to apply memory module overwrite protection
- Enter list of files to remove memory module overwrite protection

Memory Module Program Compare Protection (SLC 5/03 and SLC 5/04 Processors)

If bit S:2/9 is set inside a valid program that is contained in a memory module, you cannot modify the NVRAM (processor) user program file. This includes online editing, program downloading, and clear memory commands. Use this feature to prevent a programming device from altering the NVRAM program from the program contained in the memory module. If a memory module is installed with this bit set, and a different NVRAM user program is contained in NVRAM, the processor does not enter the RUN or REM Run mode. You must transfer the memory module program to NVRAM in order to enter the RUN or REM Run mode. To enable this feature, set bit S:2/9 in NVRAM using the data monitor function, then transfer the program to the memory module.

Memory Module Write Protection (SLC 5/03 and SLC 5/04 Processors)

Memory module write protection (when selected) allows you to permanently program the memory module. This option is similar to UVPRAM functionality. Once a memory module is programmed with write protection, you can no longer write to it using an SLC 5/03 or SLC 5/04 processor.

To enable memory module protection select [F8], Write Protect when transferring your user program to the memory module. Select [F10], Allow Reuse when transferring your user program to the memory module to allow future re-programming. This option is similar to EEPROM functionality.

1. Access the Transfer function from the main menu by pressing **ONLINE** , then

F1

**PROCSSR
FUNCTNS**

F1

**XFER
MEM MOD**

F7

Monitor File display for processor file TOGGLE.

PROGRAM DIRECTORY FOR PROCESSOR: TOGGLE

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	76
1			reserved	0
2	Yes		ladder	6

Press a key for desired transfer function

REM RUN

L532 Series C Rev.2

PROC Addr 1

PROC TO
MEM MOD

F1

MEM MOD
TO PROC

F2

2. Press **PROC TO MEM MOD** . The following display appears:

F1

PROGRAM DIRECTORY FOR PROCESSOR: TOGGLE

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	76
1			reserved	0
2	Yes		ladder	6

Select F8 to write-protect (permanently burn) your memory module.

REM RUN

L532 Series C Rev.2

PROC Addr 1

WRITE
PROTECT

F8

ALLOW
REUSE

F10

3. If you want to write protect your memory module permanently, press

**WRITE
PROTECT**

. The prompt line changes to the following:

F8

```
PROGRAM DIRECTORY FOR PROCESSOR: TOGGLE
```

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	76
1			reserved	0
2	Yes		ladder	6

WARNING, SELECTING YES DISABLES FUTURE REPROGRAMMING OF MEMORY MODULE
Press F8 to write-protect memory module.

REM RUN

L532 Series C Rev.2

PROC Addr 1

YES

NO

F8

F10

4. Confirm the transfer by pressing **YES** . While the transfer takes place the

F8

prompt **...WORKING...** is displayed. If the transfer is successful the program directory for the processor is displayed.

Press **NO** to cancel the transfer and return to the previous display.

F10

5. If you want to reuse the memory module, press **ALLOW REUSE** and confirm your

F10

choice by pressing **YES** . Press [ESC] or **NO** to cancel the

F8

F10

transfer.

If you choose to write protect a memory module and then later decide to erase the protected data, you must use a commercially available PROM burner. The SLC 5/03 and SLC 5/04 processor memory modules use “Flash EEPROM” technology. A memory module is erased when its contents consist of all zeros or all ones.

Force Protection

Applying force file protection applies to SLC 5/03 and SLC 5/04 processor files. Force file protection must be selected before you save your offline program. When force protection exists, you cannot enable forces in the Input or Output data table files. If you attempt to enable forces when force protection is active, the message: **FORCE STATE CANNOT BE MODIFIED DUE TO FORCE FILE PROTECTION** is displayed.

Keyswitch Protection (SLC 5/03 and SLC 5/04 Processors)

The SLC 5/03 and SLC 5/04 processors have a 3-position keyswitch on the front panel of the module. The keyswitch allows you to select one of three modes of operation:

- RUN
- PROGram
- REMOTE program/test/run

RUN Position

When the keyswitch is in the RUN position, and the processor is in the Run mode, you can only change the mode by changing the keyswitch position. You cannot use a programming device to remove the processor from the Run mode. When the SLC 5/03 or SLC 5/04 processor keyswitch is in the RUN position, online editing and processor mode changes via channels 0 and 1 are *not* permitted. When the processor is faulted, you can attempt recovery by toggling the keyswitch position from RUN to PROGram and back to RUN.

PROGram Position

When the keyswitch is in the PROG position you cannot use APS to take the processor out of the specified mode. You must change the keyswitch position to change the processor's mode.

REMote Position

While you are in the REM position, you can change the mode using a programming device. Online editing is allowed while in the REM Run, REM Program, and REM test mode.

Communication Channel Protection (SLC 5/03 and SLC 5/04 Processors)

Use this type of protection to designate one channel as programming and the other as monitoring. Either channel may be protected, but not both. When a channel is protected, the following functions are not available from the affected channel:

- change mode
- force
- open/close a file
- set program owner
- clear memory
- downloading
- writing user data or user program
- channel configuration

Channel protection is selectable using the channel configuration menus. Both channels should have their protection cleared prior to enabling channel protection.



Do not apply protection to the channel you are currently communicating through unless you: 1) never intend to alter the program again, or 2) can establish communications using the other channel.

Channel protection is permanent.

9 *Saving and Compiling a Processor File*

This chapter discusses the various options related to saving and compiling a file. Those options include:

- Single Step Test
- Future Access
- Index Checks
- File Protection

Also discussed is the procedure used to evaluate the processor memory layout after you save the program.

Saving a Processor File

In the Program Directory display below, processor file EXAMPLE is in the workspace. The asterisks in the SIZE column indicate that values are not determined because the file has not been saved or compiled. Access the Program

Directory display by pressing **OFFLINE PRG/DOC** .
F3

PROGRAM DIRECTORY FOR PROCESSOR: EXAMPLE

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	*
1			reserved	*
2			ladder	*

Press a key, enter file number or file name

offline SLC 5/03 File EXAMPLE

PROCSSR FUNCTNS	SAVE	RETURN TO MENU	CHANGE FILE	CREATE REPORTS	FILE OPTIONS	MONITOR FILE	DATA MONITOR	MEMORY MAP
F1	F2	F3	F4	F6	F7	F8	F9	F10

1. Save the edit by pressing **SAVE** . The display that appears depends on the
F2
 type of processor you are using. If you have a SLC 5/03 or SLC 5/04 processor, the following display appears:

File Name: EXAMPLE

F3 Index Across Files: DISALLOW

F5 Force Protection: DISABLE

F6 Future Access: ALLOW

ESC exits

FILE ALREADY EXISTS
 Overwrite File?

offline SLC 5/03 File EXAMPLE

INDEX CHECKS	FORCE PROTECT	FUTURE ACCESS	YES	NO
F3	F5	F6	F8	F10

The following figure shows the displays for all other available processors.

Fixed or SLC 5/01 Processor

```
File Name:           EXAMPLE

F6 Future Access:   ALLOW

ESC exits _____
```

SLC 5/02 Processor

```
File Name:           EXAMPLE

F1 Single Step Test  DISABLE
F3 Index Across Files: DISALLOW
F4 File Protection   OUTPUTS
F6 Future Access:    ALLOW

ESC exits _____
```

MicroLogix 1000 Controller

```
File Name:           EXAMPLE

F6 Future Access:    ALLOW
File Protection:     NONE
F7 Adjustable Filters

ESC exits _____
```

Function Key	Description
[F1] Single Step Test – SLC 5/02 processor (For SLC 5/03 and SLC 5/04 processors this feature is always enabled.)	Toggles between Enable and Disable. This option allows you to execute your program one rung at a time or a section at a time. Use this function for debugging purposes. See page 9-4 for more information.
[F3] Index Checks – SLC 5/02, SLC 5/03, SLC 5/04 processors	Toggles between Allow and Disallow. This option allows you to use indexed addressing to address data table elements outside of the base address data file. See page 9-4 for more information.
[F4] File Protect – SLC 5/02 processor (For SLC 5/03 and SLC 5/04 File Protection see chapter 8.)	Toggles between Outputs, None, and All. This option allows you to protect your data table files from external modification by devices on the DH-485 network. See page 9-5 for more information.
[F5] Force Protect – SLC 5/03 and SLC 5/04 processors	Toggles between Enable and Disable. This option allows you to prevent I/O forces from being enabled. This protection takes effect only after the processor file is downloaded to a controller. See page 9-5 for more information.
[F6] Future Access – Fixed, SLC 5/01, SLC 5/02, SLC 5/03, and SLC 5/04 processors, and MicroLogix 1000 controllers	Toggles between Allow and Disallow. This option allows you to protect proprietary program algorithms. The protection takes effect only after the processor file is downloaded to a controller. See page 9-5 for more information.
[F7] Adjustable Filters – MicroLogix 1000 controllers	Allows you to select input filter response times at the time your program is developed. See page 9-6 for more information.

2. Determine the amount of program file protection your application requires. Refer to “Available Protection Options,” below, for more information. If another program resides on the hard disk with the same name, the prompt **Overwrite File?** is displayed.

3. After you have made your selections, press **YES** . The first menu on page **F8** 9–2 is displayed, with the SIZE column displaying the number of words in the file.

If errors are encountered while compiling the program, you are given the option to save your changes. However, even though you saved your changes, the program is compiled incorrectly and cannot be downloaded to a controller.

Available Protection Options

[F1] Single Step Test (SLC 5/02 Processors)

This option allows you to execute your program one rung at a time or a section at a time. Use this function for debugging purposes.

Enable: When selected, the size of your program increases by 0.375 instruction words per rung. Because of this you may not be able to upload the program to a Hand-Held Terminal (HHT). You will have to disable and resave the program to reduce the program size. Refer to chapter 14 for more information.

Disable: Single Step Test is not available. This is the default selection.

[F3] Index Checks (SLC 5/02, SLC 5/03, and SLC 5/04 Processors)

This option allows you to use indexed addressing to address data table elements outside of the base address data file. Refer to the *Instruction Set Reference Manual* for more information.

Allow: The processor will not verify if the indexed address, the sum of the base address, and the offset value is in the same data file as the base address. The processor does check to ensure that the indexed address is contained within the data table address space.

Disallow: The processor performs run-time checks on indexed addresses to ensure that the indexed address is contained within the same data file as the base address. This is the default selection.

SLC 5/03 OS301, OS302 and SLC 5/04 OS400, OS401 processor specific –
When an indexed string data file is specified, indexed addressing is not allowed to cross a string element boundary, regardless of your index checking selection. A run-time error will occur if you use an offset value that results in crossing a string element boundary.

[F4] File Protection (SLC 5/02 Processor)

This function key toggles between Outputs, None, and All. This option allows you to protect your data table files from external modification by devices on the DH-485 network.

Outputs: Only the output file (O:0) is protected from external data modification. This is the default selection.

None: External devices may change any data address within the data file, including the output file (O:0).

All: The entire data table is protected from external data modification.

[F5] Force Protection (SLC 5/03 and SLC 5/04 Processors)

This function key toggles between Enable and Disable. This option prevents a user from enabling forces in the program. However, you can add, delete, or disable forces. You must enable this option before downloading a program.

Enable: Forcing is not allowed and the processor indicates that it did not perform the requested action.

Disable: Allows forcing to occur. This is the default state.

[F6] Future Access (All Processors)

This option allows you to protect proprietary program data and algorithms. The protection takes effect only after the processor file is downloaded to a controller. The protection does not allow online access to the processor unless a matching copy of the online processor program is resident on the hard disk or in the Hand-Held Terminal (HHT).

Allow: Online access to the processor file and data table is unrestricted. This is the default.

Disallow: Online access to the processor program is not permitted. You cannot:

- monitor the program or create reports
- enter or change the password
- save the online processor file to disk
- transfer the file from the processor memory to a memory module (*SLC 500 processors only*)

However, you can:

- edit or view user data
- clear the processor memory
- create the processor configuration and data table reports (*SLC 500 processors only*)
- transfer the contents of a memory module into the processor memory (*SLC 500 processors only*)
- restore (download) a different program to the controller

Note

If you lose or delete the offline copy of the program, you cannot access the program in the controller. You must clear the controller memory and re-enter the program.

This feature is not recommended for use when the HHT is your only source of program backup.

There is no “back door” access to get around this feature. If you intend to use this feature, back up your program.

[F7] Adjustable Filters (MicroLogix 1000 Controllers)

This option allows you to select input filter response times for the 1761–L16BWA and 1761–L32BWA micro controllers.

Note

The input filter response times can only be adjusted at the time your program is developed.

The input filter response time is the time from when the external input voltage reaches an on or off state to when the micro controller recognizes that change of state. The higher you set the response time, the longer it takes for the input state change to reach the micro controller. However, setting higher response times also provides better filtering of high frequency noise.

You can apply a unique input filter setting to each of the three input groups.

Function Key	Adjusts Inputs
[F1]	0 and 1
[F2]	2 and 3
[F3]	4 to x ^①

^① For 16 I/O point controllers, x=9.
For 32 I/O point controllers, x=19.

Note

The input filter response times for the 1761–L16AWA and 1761–L32AWA micro controllers are fixed at 8ms. Selecting any other input filter response time for these controllers will not change the response time of the inputs. However, your response times given by your software will not show the actual times. Also, the Input Filter Modified Bit (S5/13) will be set when the controller is in run or test mode.

For the minimum and maximum response times associated with each input filter setting, see the *MicroLogix 1000 with Programming Software User Manual*, or the *MicroLogix 1000 with Hand-Held Programmer User Manual*.

Alternate Method of Saving a File

If you press **RETURN TO MENU** and you have not saved your program, you will be given the opportunity to do so. The same prompts and function keys apply to this method of saving a file.

F3

Evaluating How Processor Memory is Stored

Once you have successfully saved and compiled your processor file, you may view how that file is stored in memory.

The short-cut [**ALT-M**] allows you to access the Data Table Map and Processor Memory Layout more quickly from the Program Directory display.

Data Table Map

This function lists the data files created by the I/O configuration and ladder program. It also lists the default bit, timer, counter, control, integer, and floating point files, 3 through 8. Additional files (9-255) can be created if needed using [F6], Create Data File. Refer to chapter 6 regarding how to create data files.

DATA TABLE MAP					
FILE	TYPE	LAST ADDRESS	ELEMENTS	WORDS	FILE PROTECTION
0	O output	O:2	1	1	
1	I input	I:3	2	2	STATIC
2	S status	S:82	83	83	
3	B binary or bit	B3/15	1	1	
4	T timer	T4:10	11	33	
5	C counter	C5:10	11	33	
6	R control	R6:10	11	33	
7	N integer	N7:255	256	256	
8	F floating	F8:0	1	2	

File 8 only applies to SLC 5/03 OS301, OS302 and SLC 5/04 OS400, OS401 processors.

PROCESSOR MEMORY LAYOUT

444 data words of memory used in 9 data table files
 266 instruction words of memory used in 3 program files
 11924 instruction words of unused memory available

Press a key or enter file number

offline SLC 5/03 File EXAMPLE

CREATE
DT FILE

DELETE
DT FILE

DATA
PROTECT

F6 F7 F10

Output (**O**) and input (**I**) size is determined by the I/O configuration.

The number of words in the status (**S**) file vary depending on the type of the processor:

- fixed and SLC 5/01 processor – 16 words
- SLC 5/02 processor and MicroLogix 1000 controller – 33 words
- SLC 5/03 processor – 83 words
- SLC 5/04 OS400 processor – 97 words
- SLC 5/04 OS401 processor – 164 words

The data table map displays these data types according to the amount of each type you have defined:

- binary (**B**)
- timer (**T**)
- counter (**C**)
- control (**R**)
- integer (**N**)
- floating (**F**)
- ASCII (**A**)
- string (**ST**)

Note

The data file size is fixed for MicroLogix 1000 controllers.

When using a SLC 5/02 processor or a MicroLogix 1000 controller, if the program has been changed but not saved, asterisks appear in the “File Protection” column.

Processor Memory Layout

This function tells you where the user memory has been used and how much memory remains.

- For the data table file portion of memory, it lists the number of data words used and the number of data files the words are used in.
- For the program file portion of memory, it lists the number of instructions used and the number of program files the instructions are used in.
- The display tells you *approximately* how much of the user memory capacity remains.

In the example on page 9–8, Processor Memory Layout indicates that 444 data words were used in data files and 266 instruction words were used in program files. The memory layout indicates that 11924 instruction words remain in memory.

10 *Creating and Printing Reports*

The Create Reports function allows you to generate reports listing specific information about your application. You can use the default settings or you can modify these settings to meet your requirements. This chapter shows you how to:

- Create reports using the default settings
- Change the default settings
- Add a title to a report
- Print reports

Note

A new report must be created after a program edit is performed. If you do not create a new report, the contents of the printout will not match the processor file in the processor memory or on the hard disk.

This function is accessible both offline and online. Offline, the function applies to the processor file in the terminal workspace. Online, the function also applies to the processor file in the terminal workspace, but data values come from the online processor.

Use the Create Reports function to store the reports you generate on your hard disk. Use the Print Reports function to send your reports to the printer. (This function is only accessible while offline.)

Types of Reports

You can create and print the following reports:

- Program Listing — includes:
 - the main program file and all subroutine files
 - a single file
 - a range of files
 - a range of rungs within a single file
 - a range of rungs between two or more files

You can also embed a Cross Reference report within the Program Listing report.

- Cross Reference — provides an alphabetical list of addresses and their rungs, in either address or symbol order.
- Processor Configuration — details the configuration of the processor and associated hardware in the system.
- Data Tables — details the contents of the offline or online data files.
- Instruction List (*MicroLogix 1000 controllers only*) — converts the contents of a ladder program to an Instruction List format.

Each of these is discussed in detail in this chapter.

Conventions Used to Select Reports

Function keys allow you to select the types of reports you wish to create or print.

Function Key	Description
[F2] Select All	Selects all of the reports. Asterisks appear before all the reports.
[F3] Toggle Report	Alternately selects and resets the cursored report.
[F4] Reset Reports	Resets all of the reports. There should be no asterisks before the reports.

Note

Once you have selected a report, an asterisk is placed in front of your selection.

The following examples show the different uses of the function keys.

```
DOCUMENTATION
* Program Listing
* Cross Reference
* Processor Config
* Data Tables
ESC exits
```

All Selected [F2]

```
DOCUMENTATION
* Program Listing
Cross Reference
Processor Config
Data Tables
ESC exits
```

Toggle Reprt [F3]

```
DOCUMENTATION
Program Listing
Cross Reference
Processor Config
Data Tables
ESC exits
```

Reset [F4]

Note

If creating a report for a MicroLogix 1000 controller, "Instruction List" will also appear as a report option.

Creating Reports

This section explains how to create the different types of reports for files that are in the terminal workspace. You have the option of using the default settings that are displayed, or you can change the default settings to match your requirements. The file `DRILL1` is used here as an example.

Program Listing Report

The program listing report is similar to the ladder program you view on the terminal screen. It can include:

- the main program file and all subroutine files
- a single file
- a range of files
- a range of rungs within a single file

The report shows:

- instruction addresses and symbols (you can omit symbols)
- address/instruction comments (you can omit these)
- rung comments (you can omit these)
- cross reference data for the addresses in each rung (you can show data for all addresses, output addresses only, or no addresses)
- output reference data for the input addresses in each rung (you can enable or disable this option)

1. Begin at the main menu and press **OFFLINE PRG/DOC** (F3), then **CREATE REPORTS** (F6). The following display appears:

PROGRAM LISTING OPTIONS

Starting File:Rung 2
Ending File:Rung 3

Power Rail YES
Address Comments YES
Address Display SYMBOL
Rung Comments YES
Ladder Cross Reference ALL
Output Cross Reference NO

Save to File

ESC exits/Alt-U aborts changes

DOCUMENTATION

Program Listing
Cross Reference
Processor Config
Data Tables

ESC exits

Press a function key or press ENTER to perform operation

offline
SLC 5/03
File DRILL1

SELECT
ALL
F2

TOGGLE
REPORT
F3

RESET
REPORTS
F4

REPORT
OPTIONS
F5

GENERAL
OPTIONS
F6

TITLE
F8

Two windows are shown in the display area. The window at the right indicates the types of reports. The cursor is on the Program Listing report.

The window at the left indicates the program listing options for the selected report. Use the arrow keys to select the type of report. The window at the left changes according to the type of report you choose.

At this display, you can create one or all of the reports using the default settings or you can modify the settings. The default options are shown. If subroutine program files have been created (in this case, file 3 has been created), the default options will include them in the Ending File entry.

2. Change the program listing options by pressing **REPORT OPTIONS** . The following

F5

display appears:

```

PROGRAM LISTING OPTIONS
F1 [ Starting File:Rung          2
    Ending File:Rung          3

F2 Power Rail                YES
F3 Address Comments          YES
F4 Address Display           SYMBOL
F5 Rung Comments             YES
F6 Ladder Cross Reference    ALL
F7 Output Cross Reference    NO

F9 Save to File

ESC exits/Alt-U aborts changes
    
```

```

DOCUMENTATION
Program Listing
Cross Reference
Processor Config
Data Tables

ESC exits
    
```

Press a function key or press ENTER to perform operation

offline

SLC 5/03

File DRILL1

RUNG RANGE	POWER RAIL	ADDRESS COMMENT	ADDRESS DISPLAY	RUNG COMMENT	CROSS REFRNCE	OUTPUT XREF	SAVE TO FILE
F1	F2	F3	F4	F5	F6	F7	F9

3. Change the program listing options by pressing the corresponding function key.

Function Key	Description
[F1] Rung Range	Allows you to specify a range of rungs to print. The following additional options are available:
	[F2] Select All – Selects the Starting File through the Ending File. This includes all rungs in the specified files.
	[F3] Single File – Selects the entire contents of a single file.
	[F4] Select Range – A range of files and/or rungs within a single file or multiple files can be selected by entering the delimiter '.' after the ladder file number. If a rung number is not entered next to the file number, the entire file will be selected. A valid range entry might be: <ul style="list-style-type: none"> • 4:6 to 2:4 • 2:10 to 3:5
[F2] Power Rail	Toggles between Yes and No, indicating whether the printout will show the right-hand power rail or not. Selecting No saves time in the printing process.
[F3] Address Comment	Toggles between Yes and No. Yes indicates that address/instruction comments will be shown. No indicates that comments will not be shown.
[F4] Address Display	Toggles between Symbol and Address. Symbol indicates that existing symbols and addresses will be shown. Address indicates that only addresses will be shown.
[F5] Rung Comment	Toggles between Yes and No, indicating whether rung comments will be shown.
[F6] Ladder Cross Reference	Cross reference data for a particular address includes the instruction type, symbol, address comment, file number, and rung number of all instructions having that address. Toggles between All, None, and Outputs Only.
	All – Cross reference information for all addresses in a rung appear directly after the rung.
	None – No cross reference information appears.
	Outputs Only – Only cross reference information for addresses in output instructions appear.
[F7] Output Cross Reference	Cross reference data for a particular input address, indicating the file and rung number of the first output instruction in the ladder program having that address. Toggles between Yes and No. Yes indicates that output cross references will be shown. No indicates that references will not be shown.
[F9] Save to File	Stores your selected options for future reference. Initial starting and ending numbers always conform to the files existing in the selected processor file.

4. After making all of your changes, you *must* press **SAVE TO FILE** for the changes to become the new default settings. To enable your current report options press **F9** [**ENTER**].
5. The message **NEW CONFIGURATION SAVED TO FILE** appears on the message line. When you subsequently press [**ENTER**] or [**ESC**], all option changes you've made are in effect.

You can make changes during the current APS session if you need to, but the next time you power up APS, the options are automatically reverted to those last saved. To abort your changes press [**ALT-U**].

Note

New option settings only apply to reports created after the changes are made. Previously created reports are printed with the options that were in affect at the time they were created.

6. To initiate the report generation process, press [**ENTER**]. After the report is generated, a display similar to the following appears. In this display, every type of report has been created.

```
ROCKWELL SOFTWARE INCORPORATED
          9323 SERIES SOFTWARE
          SLC-500 DOCUMENTATION SOFTWARE
```

```
Archive File: DRILL1.ACH      Report:    PROCESSOR CONFIG
Output File:  DRILL1.XRF     Config:    Config:
Phase:       COMPLETED      Status:    Successful Completion
```

```
** REGENERATE CROSS REFERENCE DATA BASE **
** GENERATE LISTING **
** LISTING COMPLETE **
** GENERATE CROSS REFERENCE REPORT **
** CROSS REFERENCE REPORT COMPLETE **
** DOCUMENTATION COMPLETE **
```

PRESS A KEY TO CONTINUE

offline

SLC 5/03

File DRILL1

Cross Reference Report

The cross reference option displays the list of addresses used in the ladder program. The list is alphabetical, in either address order or symbol order. You can limit the list to a single address or range of addresses, or a particular symbol or range of symbols. The report shows the:

- Instruction mnemonics (optional)
- Address/instruction comment (optional)
- File number
- Rung number

Move the cursor in the right-hand window to Cross Reference and press [F3], Toggle Report. The following display appears:

CROSS REFERENCE OPTIONS

Starting File:Rung B
Ending File:Rung T

Sort Order ADDRESS
Address Comments YES
Instruction Mnemonics YES

Save to File

ESC exits/Alt-U aborts changes

DOCUMENTATION

Program Listing
Cross Reference
Processor Config
Data Tables

ESC exits

Press a function key or press ENTER to perform operation

offline
SLC 5/03
File DRILL1

SELECT ALL	TOGGLE REPORT	RESET REPORTS	REPORT OPTIONS	GENERAL OPTIONS	TITLE
F2	F3	F4	F5	F6	F8

The default settings are shown in the window at the left. Change the default settings by pressing **REPORT OPTIONS** . Note that only the function keys changed.

F5

Press a function key

offline
SLC 5/03
File DRILL1

FILE RANGE	SORT ORDER	ADDRESS COMMENT	INSTRUC MNONICS	SAVE TO FILE
F1	F2	F3	F4	F9

[F1], File Range and [F2], Sort Order

These function keys select the starting and ending points and the sort order. The [F2], Sort Order key toggles between ADDRESS and SYMBOL. Note that the [F1] options automatically change when you change the sort order.

CROSS REFERENCE OPTIONS	
F1	Starting Type B Ending Type T
F2	Sort Order ADDRESS
F3	Address Comments YES
F4	Instruction Mnemonics YES
F9	Save to File
ESC exits/Alt-U aborts changes	

CROSS REFERENCE OPTIONS	
F1	Starting Symbol A Ending Symbol ZZZZZZZZZ
F2	Sort Order SYMBOL
F3	Address Comments YES
F4	Instruction Mnemonics YES
F9	Save to File
ESC exits/Alt-U aborts changes	

In the display at the left, [F2] indicates that the Sort Order is ADDRESS and [F1] indicates that the starting type is B (Bit File) and the ending type is T (Timer File).

In alphabetical order, the types are B (bit), C (counter), I (input), M (module), N (integer), O (output), R (control), S (status), and T (timer).

In the display at the right, [F2] indicates that the sort order is Symbol and [F1] indicates that the starting symbol is A and the ending symbol is ZZZZZZZZZZ. The symbols you have created are listed alphabetically.

Function Key	Description
[F1] File Range	Allows you to change the data file range. The following additional options are available: [F2] Select All - If Address is in effect, the starting and ending types will include all data file types in the existing program file. If Symbol is in effect, the starting and ending symbols will be A and ZZZZZZZZZZ. [F3] Select One - Any valid address starting letter or any valid symbol (ten characters max) can be entered. [F4] Select Range - A range of valid file type letters or symbols can be created.
[F2] Sort Order	Toggles between Address and Symbol.
[F3] Address Comment	Toggles between Yes and No. Yes indicates that address/instruction comments will be created. No indicates that address/instruction comments will not be created.
[F4] Instruction Mnemonics	Toggles between Yes and No, indicating whether the cross reference report will include mnemonics.
[F9] Save to File	Stores your selected options for future reference. Initial starting and ending numbers always conform to the files existing in the selected processor file.

Processor Configuration Report

This option details the hardware configuration of the processor and associated hardware in the system. There are no report parameters available. The report shows the:

- type of chassis (fixed or modular)
- slot number
- type of I/O module

This option is accessible from the Program Directory display by pressing

**CREATE
REPORTS**

, then cursoring to the Processor Configuration report. Select the type of

F6

report to print using [F2], Select All or [F3], Toggle Report then press [**ENTER**].

The following display appears:

ROCKWELL SOFTWARE INCORPORATED

9323 SERIES SOFTWARE

SLC-500 DOCUMENTATION SOFTWARE

Archive File:	DRILL1.ACH	Report:	PROCESSOR CONFIG
Output File:	DRILL1.XRF	Config:	
Phase:	COMPLETED	Status:	Successful Completion

```

** REGENERATE PROCESSOR CONFIGURATION REPORT **
** PROCESSOR CONFIGURATION REPORT COMPLETE **
** DOCUMENT COMPLETE **

```

PRESS A KEY TO CONTINUE

offline

SLC 5/03

File DRILL1

Data Table Report

This report details the status of the offline data files. It is useful for validating data that has been entered into the program file and for troubleshooting. The report shows the data files, including:

- Input and Output files
- Status files
- Bits
- Timers
- Counters

1. Begin at the Program Directory display and press **CREATE REPORTS** **F6**. Cursor down to the Data Tables report. The following display appears:

DATA TABLE OPTIONS

```

Starting File:Rung      0
Ending File:Rung      8

Input File Radix      HEX
Output File Radix     HEX
Integer File Radix    DEC
Binary File Radix     BINARY
ASCII File Radix      ASCII

M0 File Radix         HEX
M1 File Radix         HEX

Save to File

ESC exits/Alt-U aborts changes
                
```

DOCUMENTATION

```

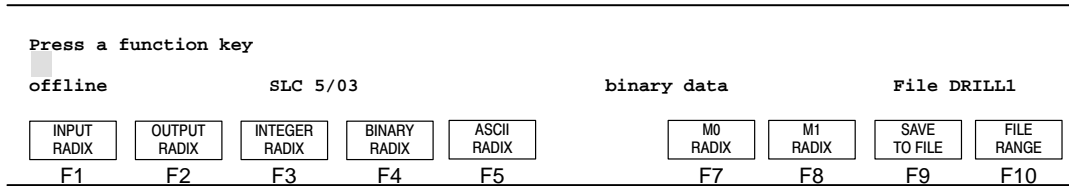
Program Listing
Cross Reference
Processor Config
Data Tables
ESC exits
                
```

Press a function key or press ENTER to perform operation

offline
SLC 5/03
File DRILL1

SELECT ALL	TOGGLE REPORT	RESET REPORTS	REPORT OPTIONS	GENERAL OPTIONS	TITLE
F2	F3	F4	F5	F6	F8

2. To change any of the radix options, press **REPORT OPTIONS** . The display remains the same, but the menu choices change.



Function Key	Description
[F1] Input Radix	Toggles between decimal, HEX, ASCII and binary input. The default is HEX.
[F2] Output Radix	Toggles between decimal, HEX, ASCII, and binary output. The default is HEX.
[F3] Integer Radix	Toggles between ASCII, decimal, HEX, and binary. The default is decimal.
[F4] Binary Radix	Toggles between ASCII, decimal, HEX, and binary. The default is BINARY.
[F5] ASCII Radix	Toggles between ASCII, decimal, HEX, and binary. The default is ASCII.
[F7] M0 Radix	Toggles between ASCII, decimal, HEX, and binary. The default is HEX.
[F8] M1 Radix	Toggles between ASCII, decimal, HEX, and binary. The default is HEX.
[F9] Save to File	Stores your selected options for future sessions.
[F10] File Range	Allows you to change the data file range.
[F2] Select All	Selects all program data files.
[F3] Single File	Enter any single data file number.
[F4] Select Range	Enters a range of valid file numbers.

3. Once you have made your changes, press **SAVE TO FILE** . To generate a new report, press [**ENTER**].

What is “Radix”?


Radix refers to the way numeric based information is displayed on the status line (in the previous display “binary data” is indicated). You can change the radix for output, input, bit, ASCII, string, and integer data files. Choices are:

- Binary — default radix for output, input, and bit files
- Decimal — default radix for integer files
- Hex — default radix for M0 and M1 files
- ASCII — default radix for ASCII files
- Floating Point — default radix for floating point files

Instruction List Report (MicroLogix 1000 Controllers Only)

This option converts the contents of a ladder program to an Instruction List format. The report shows:

- Instruction Function Code
- Graphic Symbol and Mnemonic
- Parameters and values
- Forces

1. Begin at the Program Directory display and press . Cursor down to **F6** the Instruction List report.

2. Move the cursor in the right-hand window to Instruction List, press **TOGGLE REPORT** ,

F3

then press **REPORT OPTIONS** . The following display appears:

F5

```

PROGRAM LISTING OPTIONS
-----
F1 Starting File:Rung          2
   Ending File:Rung          3
F3 Address Comments          YES
F4 Address Display           SYMBOL
F5 Rung Comments             YES

F9 Save to File

ESC exits/Alt-U aborts changes
    
```

```

DOCUMENTATION
-----
Program Listing
Cross Reference
Processor Config
Data Tables
* Instruction List
ESC exits
    
```

Press a function key

offline

1761-Micro

File BOTTLINE

RUNG
RANGE

ADDRESS
COMMENT

ADDRESS
DISPLAY

RUNG
COMMENT

SAVE TO
FILE

F1

F3

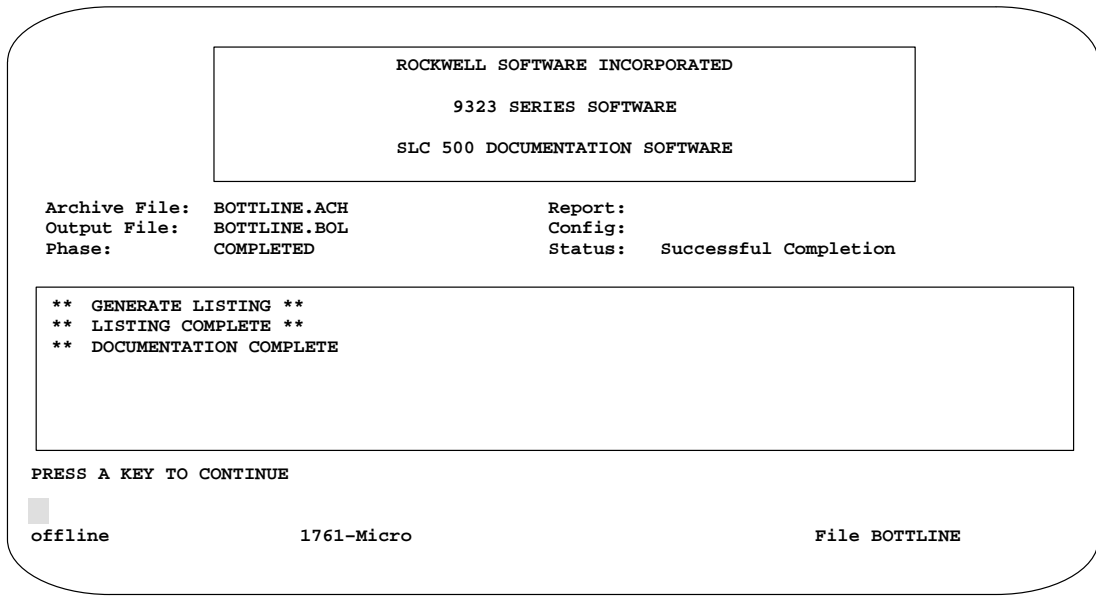
F4

F5

F9

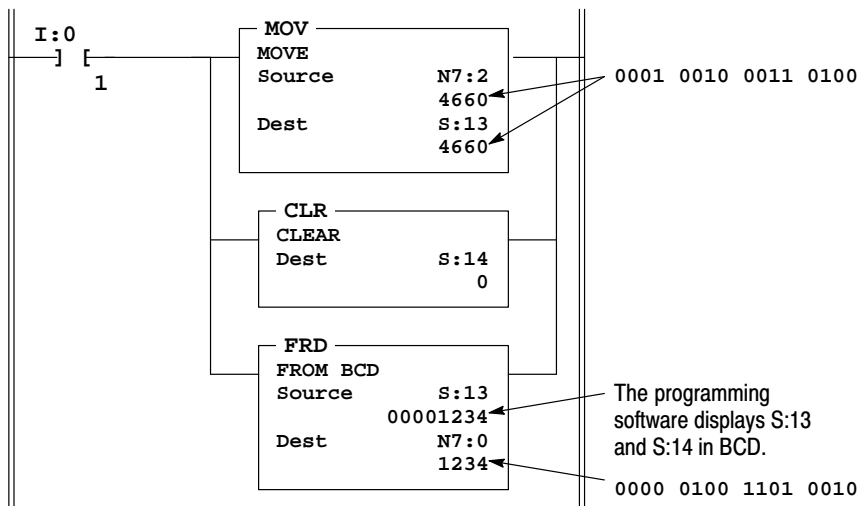
3. Change the program listing options by pressing the corresponding function key(s). See page 10-7 for an explanation of the function keys.
4. After making all of your changes, you *must* press **SAVE TO FILE** for the changes to become the new default settings. To enable your current report options, press **F9** [**ENTER**] .

5. To initiate the report generation process, press [**ENTER**]. After the report is generated, a display similar to the following appears. In this display, every type of report has been created.



The following example shows a ladder rung as it is displayed using APS and then the Instruction List report of the ladder rung.

Example Ladder Rung



Example Instruction List Report

FUN CODE	GRAPHIC SYMBOL	MNEMONIC	PARAMETER		VALUE	FORCES
			NAME	ADDRESS		
20	-] [-	LD		I/1	0	
106		MOV	SRC N2		4660	
			DEST S13		4660	
85		CLR	DEST S14		0000H	
101		FRD	SRC S13		00001234H	
			DEST N0		1234	

Adding Titles to Printed Reports

You have the option of adding a title to your reports before printing them. The title appears on the cover page of each report and also on every page of all of the reports. This option provides a way to identify which workstation generated the report.

1. At the Create Reports display, press **TITLE**. The following display appears.

F8

```

PROGRAM DIRECTORY FOR PROCESSOR: DRILL1
FILE          NAME          TYPE          SIZE (words)
0             system        system        74
1             reserved      reserved      0
2             ladder        ladder        48
3             ladder        ladder        26
    
```

LISTING TITLE _____ INSERT _____

ESC exits/Alt-U aborts changes _____

Press a function key, or enter string (50 character maximum)

```

offline          SLC 5/03          File DRILL1
    
```

SAVE TO FILE

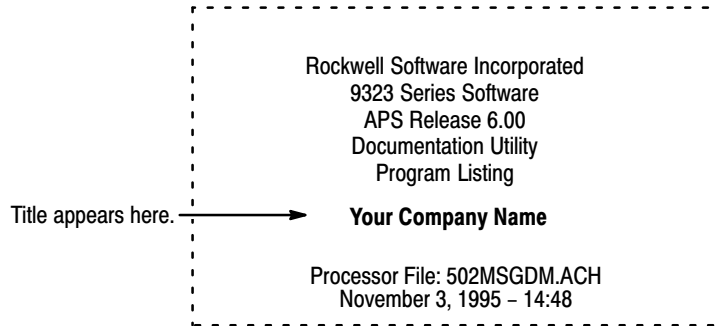
F9

2. Enter a name up to 50 characters. All ASCII characters are valid.
3. Save the title for use on all future listings by pressing **SAVE TO FILE**. If you want

F9

to use the title for this session only, press [**ENTER**] or [**ESC**]. Select the type of report you want to generate by pressing [F2], Select All or by cursoring to the report and pressing [F3], Toggle Report. You can also abort any changes at this time by pressing [**ALT-U**].

A cover page appears first when printing reports. In the example below, note where the title appears:



Configuring the Report Page Layout

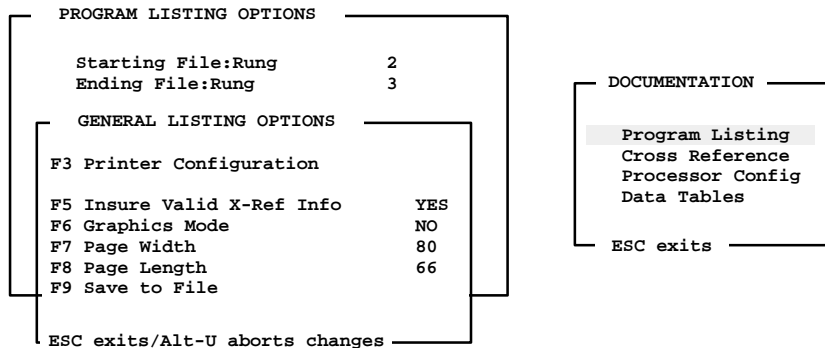
The General Options display allows you to determine how a report appears on a page. If you need to alter the default settings, at the main menu press **OFFLINE PRG/DOC**,

F3

then **CREATE REPORTS**, and then **GENERAL OPTIONS**. The following display appears:

F6

F6



Press a function key

offline

SLC 5/03

File DRILL1

PRINTER
CONFIG

F3

VALID
X-REF

F5

GRAPHIC
MODE

F6

PAGE
WIDTH

F7

PAGE
LENGTH

F8

SAVE TO
FILE

F9

Function Key	Description
[F3] Printer Configuration	Allows you to change the printer configuration parameters.
[F5] Valid Cross-Reference	<p>Toggles between Yes and No. The default selection is Yes. When set to Yes, the report generation time may be significantly increased.</p> <p>Yes: The cross reference database is generated each time you create a cross reference document or a program listing that includes cross reference data. This provides cross reference information each time the document is created.</p> <p>No: The first time you create a cross reference document or a program listing that includes cross reference data, a cross reference database is generated for the processor file involved. The next time you create a cross reference document or program listing that includes cross reference data, the same, original database is used. Since the database was not regenerated, the cross reference data can be invalid if the processor file was edited since the original database generation.</p>
[F6] Graphic Mode	<p>Toggles between Yes and No.</p> <p>Selecting No results in printouts with lines (rungs, power rails, and instruction boxes) made up of individual characters.</p> <p style="text-align: center;">- - - - - +</p> <p>Selecting Yes results in printouts with solid lines. However, this option slows down the printer.</p> <p style="text-align: center;">_____┘</p>
[F7] Page Width	Changes the width to a value within the range of 80 to 250.
[F8] Page Length	Changes the length to a value within the range of 58 to 250.
[F9] Save to File	Stores your selected options for future sessions. The message <code>NEW CONFIGURATION SAVED TO FILE</code> appears. When you subsequently press <code>[ENTER]</code> or <code>[ESC]</code> , all of the changes you made will be in effect. To abort your changes press <code>[ALT-U]</code> . You can make additional changes, but the next time you power up APS, the options are automatically reverted to those last saved.

Printing Reports

If you have not yet designated the type and required configuration for your printer do so now by following the steps on page 3–7.

Follow these steps to print your reports.

1. Begin at the main menu and press **PRINT REPORTS** **F8**. The directory shows the processor files for reports that have been created.

```

PROCESSOR
DRILL1
EXAMPLE
TOGGLE
ESC exits
    
```

Press a Function Key

```

DEFINE
DIR
F7
    
```

2. Select a file by moving the cursor to the file name and pressing **[ENTER]**. The following display appears:

```

PRINT DRILL1
Report          Size      Date
-----
Program Listing 13698    11-09-95
Cross Reference  4650     11-09-95
Processor Config          11-09-95
Data Tables           11-09-95
ESC exits
    
```

Press a function key or press **ENTER** to perform operation

SELECT ALL	TOGGLE SELECT	CLEAR ALL	PRINTER CONFIG	SELECT PROCESS	PRINT FILES
F2	F3	F4	F5	F6	F7

The display area identifies the processor file, DRILL1 in this example, and indicates the reports, their sizes, and the dates they were created. The cursor is located on the Program Listing report.

3. If you want to select another processor file at this time, press **SELECT PROCESS**. This **F6** returns you to the previous display.
4. Use the function keys to select the types of reports you wish to print. Asterisks identify the selected reports.
5. After making a selection press either [**ENTER**] or **PRINT FILES** to initiate **F7** printing.
6. If the printer is not ready the message **PRINTER NOT READY** appears. Two options are available:
 - **YES** **F8** If the problem is external, such as forgetting a cable connection, correct the problem and press [**F8**].
 - **NO** **F10** If the problem is something else, such as an incorrect printer configuration, press [**F10**] to return to the previous display.

11 *Configuring Your Programming Device for Online Communication*

This chapter describes how to configure your terminal and software for online communication.

Configuration Options

You can configure your programming device to communicate:

- with a single processor, or a network of processors on a DH-485 or DH+ data link
- from a node on a DH+ data link, bridged to a DH-485, DF1 full-duplex, or DH+ data link
- over a DF1 full-duplex data link with or without a modem

You can also configure your programming device to communicate using INTERCHANGE drivers. The drivers allow the APS software to run in a DOS Microsoft window and also allows multiple applications to simultaneously access the same communication module or channel.

Having too many Windows applications opened at a time can impact the performance of your computer. For optimum performance, reduce the number of Windows opened at any one time or increase the performance of your personal computer.

For example, you can select an Interchange DH+ driver to allow APS and 6200 programming software to run simultaneously under Microsoft Windows using the same 1784-KT Communication Interface Module. The drivers are available for DH-485 and DH+ networks (excluding the 1785-KA5 Communications Adapter Module).

APS does not support the 1784-KTK1 card.

Using Non-INTERCHANGE Drivers

If INTERCHANGE is running for a device that you want to use a non-INTERCHANGE driver for, do the following:

1. Exit APS.
2. If necessary, change the drive specifier to the drive where the software is installed (typically C). To do this, type:

C: and press [**ENTER**].

3. If you are using the default directory, at the DOS prompt, type:

CD \IPDS\ATTACH\SLC500 and press [**ENTER**].

If you specified a different directory path, change to that directory and press [**ENTER**].

4. Make sure the Windows drivers are stopped:

If your AUTOEXEC.BAT contains this command: **\ABIC\BIN\ABICRUN**, type **ABIC\BIN\ABICSTOP**.

If your AUTOEXEC.BAT contains this command: **\RSI\IC\BIN\ABICRUN**, type **RSI\IC\BIN\ABICSTOP**.

5. Run APS without INTERCHANGE by typing: **IT** and press [**ENTER**].

Now you can configure the non-INTERCHANGE driver that you want, connect to the processor online, and enter the DH+ Who Active screen.

Available Interface Cards

The table that follows lists the interface cards you can use with your system.

Note

Refer to the documentation accompanying the interface cards for information on proper installation procedures.

Device	Catalog Number	Fixed, SLC 5/01	SLC 5/02	SLC 5/03	SLC 5/04	ML 1000	Page
1747-PIC (DH-485)	1747-PIC Interface Converter	•	•	•	• ^①	NA	11-6
1784-KR (DH-485)	1784-KR Communication Board	•	•	•	• ^①	NA	11-8
1784-KL (DH+ Bridged)	1784-KL Communication Interface Module	•	•	•	•	NA	11-10
1784-KT (DH+ Bridged)	1784-KT Communication Interface Module	•	•	•	•	NA	11-11
KF3/KE (Full-Duplex)	1770-KF3 or 1747-KE Gateway Device	•	•	•	•	NA	11-13
Full-Duplex	DF1 Full-Duplex Protocol	NA	NA	•	•	NA	11-19
Half-Duplex Slave	DF1 Half-Duplex Protocol	NA	NA	•	•	NA	11-23
Full-Duplex (Micro)	DF1 Full-Duplex Protocol	NA	NA	NA	NA	•	11-26
1784-KL (DH+ Direct)	1784-KL Communication Interface Modules	NA	NA	NA	•	NA	11-28
1784-KT (DH+ Direct)	1784-KT Communication Interface Modules	NA	NA	NA	•	NA	11-29
1784-KT2 (DH+ Direct)	1784-KT2 Communication Interface Module	NA	NA	NA	•	NA	11-29
1784-KT2 (DH+ Bridged)	1784-KT2 Communication Interface Module	•	•	•	•	NA	11-11
Interchange DH+ Direct	see footnote ^②	NA	NA	NA	•	NA	11-30
Interchange DH-485	see footnote ^③	•	•	•	• ^①	NA	11-32
Interchange DH+ Bridged	see footnote ^{②④}	•	•	•	•	NA	11-33

NA= Not Applicable.

^① An SLC 5/04 processor only can communicate using DH-485 protocol through Channel 0 via RS-232.

^② A 1784-PCMCK, -KTX, -KT, -KT2, or -KL interface card is required with this configuration and has to be configured in the `cfg_kt.ini` file. See chapter 1 in this manual for details on how to configure this file.

^③ A 1747-PIC, 1784-KTX interface card, or 1784-PCMCK card is required with this configuration and has to be configured in the `cfg_kt.ini` file. See chapter 1 in this manual for details on how to configure this file.

^④ Several types of bridging options are available. See page 11-33 for more information.

Online Configuration

The online communication parameters allow you to select the hardware communication interface module (referred to as interface card) as well as the communication channel and baud rate. The following section describes the available interface cards and their configurable parameters.

1. From the main menu press **ONLINE CONFIG** . The following display appears.
F2

```

Select Device
1747-PIC (DH-485)
1784-KR (DH-485)
1784-KL (DH+ Bridged)
1784-KT (DH+ Bridged)
KF3/KE (Full-Duplex)
Full-Duplex
Half-Duplex Slave
Full-Duplex (Micro)
1784-KL (DH+ Direct)
1784-KT (DH+ Direct)
1784-KT2 (DH+ Direct)
1784-KT2 (DH+ Bridged)
Interchange DH+
Interchange DH485
Interchange DH+ Bridged
ESC exits/Alt-U aborts changes

```

Press a function key

DRIVER
CONFIG

F2

SAVE TO
FILE

F9

2. Cursor to the required interface card and press either **[ENTER]**.

Note

The term “direct” indicates that the device is directly connected to a network. The term “bridged” indicates that there are at least two networks involved, requiring a bridge device such as the 1785-KA5 to connect the two networks together.

3. Accept the default settings or press **DRIVER CONFIG** to access the parameters related to the interface card.
F2

1747-PIC Interface Converter

The 1747-PIC Interface Converter is the default interface module and supports DH-485 communication. Note that the SLC 5/04 processor only supports DH-485 communication via channel 0 (RS-232). See the *SLC 500 Modular Hardware Style Installation and Operation Manual*, Publication 1747-6.2 for connection information.

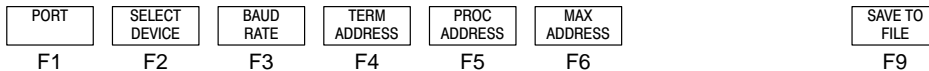
```

ONLINE CONFIGURATION
-----
F1 Port                COM1
  Current Device      1747-PIC (DH-485)
F3 Baud Rate          19200
F4 Terminal Address   0
F5 PROC Address       1
F6 MAX Node Address   31

F9 Save to File

ESC exits/Alt-U aborts changes
    
```

Press a function key



Function Key	Description
[F1] Port	Toggles between COM1 and COM2. This field indicates where the processor is connected to your computer. The default is COM1.
[F2] Select Device	Toggles between the selected interface card and the interface card selection menu.
[F3] Baud Rate	Toggles between the communication rate of 1200, 2400, 9600, and 19200. The default is 19200.
[F4] Terminal Address	Allows you to select a terminal address from 0–31 decimal. The default is 0.
[F5] Processor Address	This is the default address of the processor the APS terminal attempts to go online with. The default is 1.
[F6] Maximum Node Address	This is the maximum node address on the DH-485 network. The default is 31.
[F9] Save to File	Allows you to save the established parameters to a user configuration file that APS accesses to automatically set-up these parameters the next time you use the software.


Note *When using the serial port with APS, COM1 must use IRQ 4 and COM2 must use IRQ 3.*

Once you select the 1747-PIC Interface Converter the following addresses must be set:

Terminal Node Addresses


The DH-485 network requires you to set unique node addresses for the terminal and each processor or other devices on the network. This section describes how to set the node address for the APS terminal and the default APS processor. The default APS processor address is the node the APS terminal attempts to establish communication with when you go online.

Setting APS Terminal Node Address: The default node address for an APS terminal is 0. To change the terminal address, do the following:

1. Press  .
F4
2. Type any number between 0 and 31.
3. Press [**ENTER**] .

Note *The terminal address cannot equal the processor address.*

Setting Default APS Processor Addresses: The address of the processor APS will try to communicate with when you attempt to go online from the main menu. To change the processor address, do the following:

1. Press  .
F5
2. Type any number between 1 and 31.
3. Press [**ENTER**] .

Setting APS maximum node addresses: The highest numbered node that the APS terminal will expect to see on the network. To set the APS maximum node address, do the following:

1. Press **MAX ADDRESS** .
F6
2. Type any number between 0 and 31.
3. Press [**ENTER**]

The maximum node address will change. At the main menu notice that the bottom line in the display area indicates the terminal address, device, and processor address.

1784-KR Interface Card

The 1784-KR interface card does not require you to use a PC communication channel. When using an SLC 5/04 processor with a 1784-KR Interface card you need to use a 1747-PIC interface converter. Note that the SLC 5/04 processor only supports DH-485 communication via channel 0 (RS-232). See the *SLC 500 Modular Hardware Style Installation and Operation Manual*, Publication 1747-6.2 for connection information.

Note

Before going online with APS, make sure that your system is configured for the 1784-KR Interface Card. If it is not, we recommend either placing the DOS Set command in your autoexec.bat file or at the DOS command line prompt, type:

```
<set AB_OAKLAND=mX,bY,iZ>
```

Where:

X = memory address; C000-E800

Y = I/O address; 2A8H-360H

Z = interrupt level; IRQ 2, 3, 4, or 5

These values must match those set via the DIP switches on the module. This command is not case sensitive, but placing extra spaces in the line causes problems.

When going online with APS, do not select the start up command option IT (where APS runs with only DH+ WHO). The command AB_OAKLAND does not function. See chapter 1 for more information on starting APS.

Note

If you use the serial port with APS, COM1 must use IRQ 4 and COM2 must use IRQ 3.

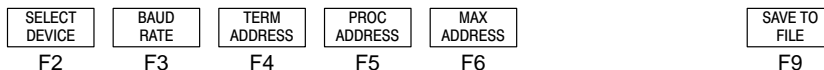
```

ONLINE CONFIGURATION
-----
Current Device          1784-KR (DH-485)
F3 Baud Rate           19200
F4 Terminal Address    0
F5 PROC Address        1
F6 MAX Node Address    31

F9 Save to File

ESC exits/Alt-U aborts changes
    
```

Press a function key



Note

If you remove the 1784-KR card, the variable `AB_OAKLAND` must also be removed. Failure to remove this variable may cause the software to lock up.

To remove the variable, at the DOS prompt:

Type: `AB_OAKLAND=[ENTER]`.

Do not place spaces on either side of the equal sign. This produces a different variable.

Function Key	Description
[F2] Select Device	Toggles between the selected interface card and the interface card selection menu.
[F3] Baud Rate	Toggles between the communication rate of 1200, 2400, 9600, and 19200. The default is 19200.
[F4] Terminal Address	Allows you to select a terminal address from 0–31 decimal. The default is 0.
[F5] Processor Address	This is the default address of the processor the APS terminal will attempt to go online with. The default is 1.
[F6] Maximum Node Address	This is the maximum node address of the KR on the DH-485 network. The default is 31.
[F9] Save to File	Allows you to save the established parameters to a user configuration file that APS accesses to automatically set up these parameters the next time you use the software.

For more information regarding the 1784-KR Interface Card, refer to Publication 1784-2.23.

1784-KL (DH+ Bridged) Interface Card

The 1784-KL (DH+ Bridged) interface card requires one of the following devices to establish communication with an SLC processor:

- 1785-KA5 DH+/DH-485 gateway module to bridge the DH+ and DH-485 data links (required for all SLC 500 processors)
- 1747-PIC Interface Converter when using an SLC 5/04 processor configured for DH-485 communication via channel 0 (RS-232)

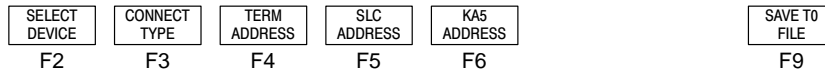
```

ONLINE CONFIGURATION
-----
Current Device          1784-KL (DH+ Bridged)
F3 Connection          DIRECT
F4 Terminal DH+ Address 0 (octal)
F5 SLC Node Address    1 (decimal)
F6 KA5 DH+ Address     1 (octal)

F9 Save to File

ESC exits/Alt-U aborts changes
    
```

Press a function key



Function Key	Description
[F2] Select Device	Toggles between the selected interface card and the interface card selection menu.
[F3] Connect Type	Toggles between Direct and Multi-Drop. Direct means that the terminal has a termination resistor (last device on the DH+ link). Multi-Drop means that the terminal does not have a termination resistor. The default is Direct.
[F4] Terminal Address	Allows you to select a terminal address on DH+ as a node number from 0–77 octal. The default is 0.
[F5] SLC Address	This is the default address of the processor the APS terminal attempts to go online with. Valid range is 0–31 decimal. The default is 1.
[F6] KA5 Address	Allows you to select a KA5 address on DH+ as a node number from 0–77 octal. The default is 1.
[F9] Save to File	Allows you to save the established parameters to a user configuration file that APS accesses to automatically set up these parameters the next time you use the software.

1784-KT (DH+ Bridged) and 1784-KT2 (DH+ Bridged) Interface Cards

The 1784-KT (DH+ Bridged) or the 1784-KT2 (DH+ Bridged) interface cards require a 1785-KA5 DH+/DH-485 gateway module to bridge the DH+ and DH-485 data links when communicating from a terminal located on a DH+ data link.

```

ONLINE CONFIGURATION
-----
Current Device          1784-KT (DH+ Bridged)
F3 Connection          DIRECT
F4 Terminal DH+ Address 0 (octal)
F5 SLC Node Address    1 (decimal)
F6 KA5 DH+ Address     1 (octal)
F7 IRQ                 3
F8 Board Address       000011
F9 Save to File

ESC exits/Alt-U aborts changes
  
```

Press a function key

SELECT DEVICE	CONNECT TYPE	TERM ADDRESS	SLC ADDRESS	KA5 ADDRESS	IRQ	BOARD ADDRESS	SAVE TO FILE
F2	F3	F4	F5	F6	F7	F8	F9

Function Key	Description
[F2] Select Device	Toggles between the selected interface card and the interface card selection menu.
[F3] Connect Type	Toggles between Direct and Multi-Drop. Direct means that the terminal has a termination resistor (last device on the DH+ link). Multi-Drop means that the terminal does not have a termination resistor. The default is Direct.
[F4] Terminal Address ^①	Allows you to select a terminal address on DH+ as a node number from 0–77 octal. The default is 0.
[F5] SLC Address	Allows you to select a processor address on DH-485 as a node number from 1–31 decimal. The default is 1.
[F6] KA5 Address ^①	Allows you to select a KA5 address on DH+ as a node number from 0–77 octal. The default is 1.
[F7] IRQ	Allows you to select the IRQ on the board (3, 4, 5, and 7.) The software default is 3. This selection must match the setting of the jumpers on your KT(2) card (hardware default is 0). See the KT(2) card user manual for details..

Function Key	Description
[F8] Board Address ^①	Allows you to select the board address for the 1784-KT(2) card. Valid values are A000 to D800 in increments of 400 with the exception of B000 and BC00 (all values in hexadecimal). The default is A000.
[F9] Save to File	Allows you to save the established parameters to a user configuration file that APS accesses to automatically set up these parameters the next time you use the software.

^① Refer to either the 1784-KT or 1784-KT2 user manuals for more information about these parameters.

Note

*If initialized for a 1784-KT interface card, APS displays the message **Illegal Data or Parameter Value** during power up if any of the following are true:*

- *an invalid board address is programmed*
- *memory allocation contention exists*
- *the KT module does not exist*
- *an invalid or previously assigned interrupt (IRQ) is selected*

1770-KF3 or 1747-KE (Full-Duplex) Device Configuration

The 1770-KF3 or 1747-KE device establishes DF1 full-duplex communication with or without a modem between the APS terminal and a device. Refer to the user manuals for cabling guidelines used to establish communication for a modem or a direct connection.

```

ONLINE CONFIGURATION

F1 Port                               COM1
   Current Device                       KF3/KE (Full-Duplex)

F4 KF3/KE Address                       0
F5 PROC Address                         1
F6 MAX Node Address                     31
F7 KF3/KE/Modem/Full-Duplex Configuration

F9 Save to File

ESC exits/Alt-U aborts changes

```

Press a function key

PORT	SELECT DEVICE	KF3/KE ADDRESS	PROC ADDRESS	MAX ADDRESS	DEVICE CONFIG	SAVE TO FILE
F1	F2	F4	F5	F6	F7	F9

Function Key	Description
[F1] Port	Toggles between COM1 and COM2. This field determines where the KF3/KE is connected to your computer.
[F2] Select Device	Toggles between the selected interface card and the interface card selection menu.
[F4] KF3/KE Address	This is the node address of the KF3/KE on the DH-485 network.
[F5] Processor Address	This is the address of the processor the APS terminal attempts to go online with through the KF3/KE. The default is 1.
[F6] Maximum Address	This is the maximum node address of the KF3/KE on the DH-485 network. Valid range is 0–31 decimal. The default is 31.
[F7] Device Configuration	Allows you to select the configuration parameters for the specified device.
[F9] Save to File	Allows you to save the established parameters to a user configuration file that APS accesses to automatically set up these parameters the next time you use the software.

- To configure the 1770-KF3 or 1747-KE, begin by pressing **DEVICE CONFIG** **F7**. The Device/Modem/Full-Duplex configuration menu appears.

```

KF3/KE/Modem/Full Duplex Configuration
-----
F1 Baud Rate (PC to KF3/KE)      1200
F2 Parity                        NONE
F3 Error Check                   CRC
F4 Use Modem (Flow Control)     YES

F5 Dial Phone Number            YES
F6 Modem Init String            AT L1 &M &C1 &D2 &S1 &W DT
F7 Phone Number
F8 Auto Disconnect              0 (minutes)

F9 Save to File
F10 Full Duplex Configuration

ESC exits/Alt-U aborts changes
    
```

Press a function key

BAUD RATE	PARITY	ERROR CHECK	USE MODEM	DIAL PHONE #	MODEM INIT	PHONE NUMBER	AUTO DISCNCT	SAVE TO FILE	FULL DUPLEX
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

Function Key	Description
[F1] Baud Rate (PC to KF3/KE)	Toggles between 300, 1200, 2400, 4800, 9600, and 19200. The default is 1200. This selection is only for communication between your personal computer and the 1770-KF3 or 1747-KE device.
[F2] Parity	Toggles between None and Even. The default selection is None.
[F3] Error Check	Toggles between Cyclic Redundancy Check (CRC) and Block Check Character (BCC) error checking procedures. The default selection is CRC.
[F4] Use Modem	Toggles between Yes and No. This field indicates if a modem is being used. If a modem is used the KF3/KE must have flow control enabled for handshaking. If No is selected, flow control is disabled and function keys [F5], [F6], and [F8] are inactive. If you use a modem, you must enter at least one telephone number to establish communication. The default selection is Yes.
[F5] Dial Phone Number ^①	Toggles between Yes, No, Yes-And Always Send Init String, and No-But Always Send Init String. If set to Yes or Yes-And Always Send Init String, the telephone number is dialed. If set to No or No-But Always Send Init String, a direct connection is made. The default selection is Yes.

Function Key	Description
[F6] Modem Initialize	Allows you to configure the modem using Hayes commands before the telephone number is dialed. See page 11–16 for more information.
[F7] Phone Number	Displays the telephone directory where a new number may be selected or entered. The telephone number is sent immediately following the initialization. See page 11–17 for more information.
[F8] Auto Disconnect ^②	Allows you to go offline and return without causing the modem to re-dial. If set to zero, the carrier will be dropped as soon as you go offline. The default is zero. The valid range is 0–60 minutes. See page 11–18 for more information.
[F9] Save to File	Allows you to save the established parameters to a user configuration file that APS will use to automatically set up these parameters the next time you use the software.
[F10] Full Duplex Configuration	Displays the full-duplex configuration sub-menu for modifying system performance parameters.

^① Function is only available when [F4] Use Modem is set to Yes.

^② Function is only available when [F5] Dial Phone Number is set to Yes or Yes–And Always Send Init String.

2. Use this table to help you decide your next steps:

If you intend to use full-duplex:	Do this:
without a modem	<ol style="list-style-type: none"> 1. Configure the first three fields. 2. Select to use no modem by pressing [F4] Use Mode. Doing this makes function keys [F5], [F6], [F7], and [F8] unavailable for configuration, since they are a part of modem support. 3. Configure the full-duplex timers and retries by pressing [F10] Full Duplex Configuration.
with a modem	<p>Configure all of the parameters [F1]–[F10].</p> <p>The first three function keys are specific to the 1770-KF3 or 1747-KE interface cards. The parameters must identically match those set on the cards. The remaining function keys apply to configuring your system. See the sections that follow for more information about the functions [F5]–[F8].</p>

[F6] Modem Initialize String

You should verify in your modem user manual that all of the commands in the modem initialize string are supported. All unsupported commands should be deleted from the initialize string, or your modem may not function properly.

Pay particular attention to commands beginning with “&”. If your modem does not support these AT commands, there will be either a dip switch or a set of jumper switches on the modem that will have to be checked to make certain that the hardware handshaking is configured properly.

Default Initialize String – AT L1 &M &C1 &D2 &S1 &W DT where:

- AT Gets the modem’s attention.
- L1 Sets speaker volume low (2 = medium, 3 = high).
- &M Sets communication mode to asynchronous.
- &C1 DCD set by modem when remote carrier is detected.
- &D2 Switches to command mode when DTR goes off. Also hangs up.
- &S1 Causes DSR to operate in accordance with EIA RS-232C specification.
- &W Writes new settings to non-volatile RAM and causes preceding commands to take effect.
- DT Specifies tone dialing.

Other commonly used commands:

- M0 Shuts off modem speaker.
- DP Specifies pulse dialing.

[F7] Phone Number

When you press **PHONE NUMBER**, the telephone directory will appear.

F7

	Name	Phone Number
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		

ESC exits/Alt-U aborts changes

Press a function key

ENTER NAME F1	ENTER PHONE # F2	SELECT PHONE # F3	DELETE LINE F5	UNDEL LINE F6	SAVE TO FILE F9
------------------	---------------------	----------------------	-------------------	------------------	--------------------

This lets you view all of the available phone numbers entered into the system. The cursor is placed on the currently selected phone number. If no phone number is selected, the cursor is placed on the first row with an empty phone number.

Function Key	Description
[F1] Enter Name	Allows you to enter a description of the phone number. A maximum of 30 characters may be entered.
[F2] Enter Phone Number	Allows you to enter the phone number. A maximum of 60 characters may be entered. However, only up to 37 characters will be displayed. If a number greater than 37 is entered, three dots appear to the right of the number. If a phone number already exists, it is displayed on the command line.
[F3] Select Phone Number	Closes the Telephone Directory window and places the cursored phone number in the KF3/KE/Modem/Full Duplex configuration window.
[F5] Delete Line	Deletes the current name and phone number and places them in a temporary buffer.
[F6] Undelete Line	Places the current name and phone number in the temporary buffer on the cursored row, overwriting any data on that row.
[F9] Save to File	Allows you to save the established parameters to a user configuration file that APS accesses to automatically set up these parameters the next time you use the software.

[F8] Auto Disconnect

At any point while offline, [**ALT-SHIFT-H**] is a hot key that overrides the auto disconnect. This causes the carrier to be dropped immediately. You can also abort the dial-up sequence by pressing the [**ESC**] key.

[F10] Full Duplex Configuration

Pressing  displays the following:

```
Full Duplex Configuration
-----
F1 ACK Timeout                18
F2 NAK retries                 3
F3 ENQ Retries                 3

F5 Command Reply Timeout      [x55ms] 198

F9 Save to File

ESC exits/Alt-U aborts changes
-----
```

Press a function key

ACK
TIMEOUT

F1

NAK
RETRIES

F2

ENQ
RETRIES

F3

REPLY
TIMEOUT

F5

SAVE TO
FILE

F9

We recommend using the default settings unless otherwise instructed. Refer to your 1770-KF3 or 1747-KE user manual for more information.

Function Key	Description
[F1] ACK Timeout	Contains a user-specified value to count down the amount of time the sender will wait per command attempt for an acknowledgement before sending a ENQ command to the KF3/KE. Valid multipliers are 2–65,535. The default selection is 18.
[F2] NAK Retries	Indicates the number of times the sender is not willing to be acknowledged by the receiver before some sort of error recovery takes place. Valid entries are 0–255. The default selection is 3.
[F3] ENQ Retries	Indicates the number of times the sender will request re-transmission of a response from the receiver. Valid entries are 0–255. The default selection is 3.
[F5] Command Reply Timeout	Contains a user-specified value multiplied by 55 ms to count down the amount of time the sender will wait for a reply after the command has been acknowledged. Valid multipliers are 18–25,000. The default selection is 198.
[F9] Save to File	Allows you to save the established parameters to a user configuration file that APS accesses to automatically set up these parameters the next time you use the software.

DF1 Full-Duplex Device Configuration (SLC 5/03 and SLC 5/04 Processors)

The SLC 5/03 and SLC 5/04 processors support DF1 full-duplex protocol via the RS-232 connection (channel 0 for both processors) to a host computer. Refer to the *Instruction Set Reference Manual* for more information on full-duplex protocol.

Note

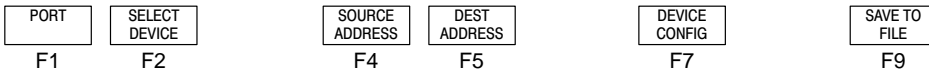
The SLC 5/04 OS401 processor also supports bridging from DH+ to DF1 full-duplex and from DF1 full-duplex to DH+. For more information, see the section Interchange DH+ Bridged, beginning on page 11–33.

Use a 1747-CP3 cable or a modem to connect the RS-232 channel. Refer to the *SLC 500 Modular Hardware Style Installation and Operation Manual*, Publication 1747-6.2 for more information on cabling.

```

ONLINE CONFIGURATION
F1 Port COM1
  Current Device Full-Duplex
F4 Source Address 0
F5 Destination Address 1
F7 Device/Modem/Full-Duplex Configuration
F9 Save to File
ESC exits/Alt-U aborts changes
    
```

Press a function key



- To configure the DF1 parameters begin by pressing **DEVICE CONFIG** . The following display appears:

```

Device/Modem/Full Duplex Configuration
F1 Baud Rate (PC to SLC) 1200
F2 Parity NONE
F3 Error Check CRC
F4 Use Modem (Flow Control) NO
F5 Dial Phone Number N/A
F6 Modem Init String N/A
F7 Phone Number N/A
F8 Auto Disconnect N/A (minutes)
F9 Save to File
F10 Full Duplex Configuration
ESC exits/Alt-U aborts changes
    
```

Press a function key



Function Key	Description
[F1] Baud Rate (PC to SLC)	Toggles between 110, 300, 600, 1200, 2400, 4800, 9600, and 19200. The default is 1200.
[F2] Parity	Toggles between None and Even. The default selection is None.
[F3] Error Check	Toggles between Cyclic Redundancy Check (CRC) and Block Check Character (BCC) error checking procedures. The default selection is CRC.
[F4] Use Modem	Toggles between Yes and No. This field indicates if a modem is being used. If a modem is used you must have flow control enabled for handshaking. If No is selected, flow control is disabled and function keys [F5], [F6], and [F8] are inactive. If you use a modem, you must enter at least one telephone number to establish communication. The default selection is No.
[F5] Dial Phone Number ^①	Toggles between Yes, No, Yes-And Always Send Init String, and No-But Always Send Init String. If set to Yes or Yes-And Always Send Init String, the telephone number is dialed. If set to No or No-But Always Send Init String, a direct connection is made. The default selection is Yes.
[F6] Modem Initialize ^①	Allows you to configure the modem using Hayes commands before the telephone number is dialed.
[F7] Phone Number	Displays the telephone number that the modem will dial. Pressing this key displays the telephone directory where a new number may be selected or entered. The telephone number is sent immediately following the initialization.
[F8] Auto Disconnect ^①	Allows you to go offline and return without causing the modem to re-dial. If set to zero, the carrier will be dropped as soon as you go offline. The default is zero. The valid range is 0-60 minutes.
[F9] Save to File	Allows you to save the established parameters to a user configuration file that APS will use to automatically set-up these parameters the next time you use the software.
[F10] Full Duplex Configuration	Displays the full duplex configuration sub-menu for modifying system performance parameters.

^① Function is only available when [F4] Use Modem is set to Yes.

2. Press **FULL DUPLEX** . The following menu is displayed:
F10

```

FULL Duplex Configuration
-----
F1 ACK Timeout                      50
F2 NAK Retries                      3
F3 ENQ Retries                      3

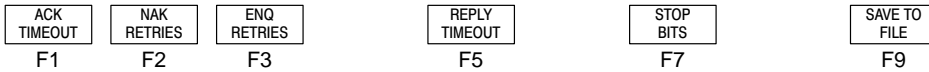
F5 Command Reply Timeout            [x55ms] 198

F7 Stop Bits                        1

F9 Save to File

ESC exits/Alt-U aborts changes
-----
    
```

Press a function key



Function Key	Description
[F1] ACK Timeout	Contains a user-specified value to count down the amount of time the sender will wait per transmission attempt for an acknowledgement before sending an enquiry. Valid multipliers are 2-65,535. The default selection is 50.
[F2] No Acknowledgement Retries	Indicates the number of times the sender is not willing to be acknowledged by the receiver before some sort of error recovery takes place. Valid entries are 0-255. The default selection is 3.
[F3] Enquiry Retries	Indicates the number of times the sender will request re-transmission of a response from the receiver. Valid entries are 0-255. The default selection is 3.
[F5] Command Reply Timeout	Contains a user-specified value multiplied by 55 ms to count down the amount of time the sender will wait for a reply after the command has been acknowledged. Valid multipliers are 18-25,000. The default selection is 198.
[F7] Stop Bits	Toggles between 1 and 2. The default selection is 1.
[F9] Save to File	Saves the full-duplex parameters to the user file.

DF1 Half-Duplex Slave Device Configuration

The SLC 5/03 and SLC 5/04 processors support half-duplex protocol via RS-232 (channel 0 for both processors). In contrast to DF1 full-duplex, DF1 half-duplex communication takes place in only one direction at a time. Refer to the *Instruction Set Reference Manual* for more information on Half-Duplex DF1 Slave protocol.

Note

It is not possible for APS and an SLC 5/03 or SLC 5/04 processor to communicate using DF1 half-duplex protocol unless one of the processors or another device is configured to be a DF1 half-duplex master.

```

ONLINE CONFIGURATION
-----
F1 Port                               COM1
  Current Device                       Half-Duplex Slave

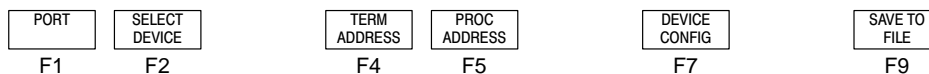
F4 Terminal Address                    0
F5 PROC Address                        1

F7 Device/Modem/Half-Duplex Configuration

F9 Save to File

ESC exits/Alt-U aborts changes
  
```

Press a function key



Function Key	Description
[F1] Port	Toggles between COM1 and COM2. This field indicates where the processor is connected to your computer. The default is COM1.
[F2] Select Device	Toggles between the selected interface card and the interface card selection menu.
[F4] Terminal Address	Allows selection of a terminal address as a node number. Valid range is 0–254 decimal. The default is 0.
[F5] Processor Address	Allows selection of a processor address as a node number. Valid range is 1–254 decimal. The default selection is 1.
[F7] Device Configuration	Allows you to select the configuration parameters for the specified device.

1. Press **DEVICE CONFIG** . The following display appears:
F7

```
Device/Modem/Half Duplex Slave Configuration

F1 Baud Rate (PC to Master)      1200
F2 Parity                        NONE
F3 Error Check                   CRC
F4 Use Modem (Flow Control)      NO

F5 Dial Phone Number             N/A
F6 Modem Init String             N/A
F7 Phone Number                  N/A
F8 Auto Disconnect               N/A (minutes)

F9 Save to File
F10 Half Duplex Slave Configuration

ESC exits/Alt-U aborts changes
```

Press a function key



Select the different options by pressing the corresponding function key. Notice that [F4] Use Modem has additional parameters associated with it. They are:

- Yes With Continuous Carriers
- Yes W/O Continuous Carrier
- No

The default is No.

2. Press **HALF DUPLEX** . The following display appears:
F10

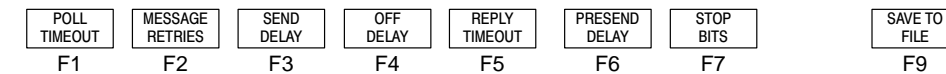
```

Half Duplex Configuration
-----
F1 Master Poll Timeout      (x20 ms)   50
F2 Message Retries         3
F3 RTS Send Delay          (x20 ms)   0
F4 RTS Off Delay           (x20 ms)   0
F5 Command Reply Timeout   (X55 ms)  198
F6 Pre-send Time Delay [x1 ms]
F7 Stop Bits               1

F9 Save to File

ESC exits/Alt-U aborts changes
    
```

Press a function key



Function Key	Description
[F1] Poll Timeout	Allows you to select the master poll timeout value in increments of 20 ms. The valid range is 0–65,635. The default is 50.
[F2] Message Retries	Allows you to select the message retries value. The valid range is 0–255. The default is 3.
[F3] RTS Send Delay	Allows you to select the RTS send delay value in increments of 20 ms. The valid range is 0–65,535. The default is 0.
[F4] Off Delay	Allows you to select the RTS off delay value in increments of 20 ms. The valid range is 0–65,535. The default is 0.
[F5] Reply Timeout	Allows you to select the reply timeout value in increments of 55 ms. The valid range is 18–25,000. The default is 198.
[F6] Pre-send Time Delay	Allows you to select a pre-send time delay in increments of 1 ms. The valid range is 0–65,535. The default is 0.
[F7] Stop Bits	Toggles between 1 and 2. The default is 1.
[F9] Save to File	Saves the half-duplex slave parameters to the user file.

DF1 Full-Duplex Device Configuration (MicroLogix 1000 Controllers)

The MicroLogix 1000 controllers support full-duplex DF1 protocol via the RS-232 connection to a host computer. You use a 1761-CBL-PM02 cable or a modem to connect the RS-232 channel.

For more cabling information, refer to the *MicroLogix 1000 Programmable Controllers User Manual*, Publication 1761-6.3.

ONLINE CONFIGURATION

```

F1 Port                COM1
  Current Device       Full-Duplex (Micro)

F7 Device/Modem/Full-Duplex (Micro) Config.

F9 Save to File

ESC exits/Alt-U aborts changes
    
```

Press a function key

PORT
F1

SELECT
DEVICE
F2

DEVICE
CONFIG
F7

SAVE TO
FILE
F9

- To configure the DF1 parameters begin by pressing DEVICE CONFIG. The following display appears:

Device/Modem/Full Duplex Configuration

```

F1 Baud Rate (PC to SLC)      9600
F2 Parity                     NONE
F3 Error Check                CRC
F4 Use Modem (Flow Control)   NO

F5 Dial Phone Number          N/A
F6 Modem Init String          N/A
F7 Phone Number               N/A
F8 Auto Disconnect            N/A (minutes)

F9 Save to File
F10 Full Duplex (Micro) Configuration

ESC exits/Alt-U aborts changes
    
```

Press a function key

BAUD
RATE
F1

USE
MODEM
F4

PHONE
NUMBER
F7

SAVE
TO FILE
F9

FULL
DUPLEX
F10

Function Key	Description
[F1] Baud Rate (PC to SLC)	Toggles between 300, 600, 1200, 2400, 9600, and 19200. The default is 9600.
[F4] Use Modem	Toggles between Yes and No. This field indicates if a modem is being used. If No is selected, flow control is disabled and function keys [F5], [F6], and [F8] are inactive. If you use a modem, you must enter at least one telephone number to establish communication. The default selection is No.
[F5] Dial Phone Number ^①	Toggles between Yes, No, Yes-And Always Send Init String, and No-But Always Send Init String. If set to Yes or Yes-And Always Send Init String, the telephone number is dialed. If set to No or No-But Always Send Init String, a direct connection is made. The default selection is Yes.
[F6] Modem Initialize ^①	Allows you to configure the modem using Hayes commands before the telephone number is dialed.
[F7] Phone Number	Displays the telephone number that the modem will dial. Pressing this key displays the telephone directory where a new number may be selected or entered. The telephone number is sent immediately following the initialization.
[F8] Auto Disconnect ^①	Allows you to go offline and return without causing the modem to re-dial. If set to zero, the carrier will be dropped as soon as you go offline. The default is zero. The valid range is 0-60 minutes.
[F9] Save to File	Allows you to save the established parameters to a user configuration file that APS will use to automatically set-up these parameters the next time you use the software.
[F10] Full Duplex Configuration	Displays the full duplex configuration sub-menu containing system performance parameters.

^① Function is only available when [F4] Use Modem is set to Yes.

1784-KL (DH+ Direct) Interface Card

Use the 1784-KL (DH+ Direct) interface card to connect a T47 directly to an SLC 5/04 processor on a DH+ link for programming.

```

ONLINE CONFIGURATION
-----
Current Device          1784-KL (DH+ Direct)
F3 Connection          DIRECT
F4 Terminal DH+ Address 0 (octal)
F5 SLC Node Address    1 (octal)

F9 Save to File

ESC exits/Alt-U aborts changes
    
```

Press a function key



Function Key	Description
[F2] Select Device	Toggles between the selected interface card and the interface card selection menu.
[F3] Connect Type	Toggles between Direct and Multi-Drop. Direct means that the terminal has a termination resistor (last device on the DH+ link). Multi-Drop means that the terminal does not have a termination resistor. The default is Direct.
[F4] Terminal Address	Allows selection of a terminal address as a node number. Valid range is 0–77 octal. The default is 0.
[F5] SLC Address	Allows selection of a processor address as a node number. Valid range is 0–77 octal. The default is 1.
[F9] Save to File	Saves the selected parameters to the user file.

1784-KT (DH+ Direct) and 1784-KT2 (DH+ Direct) Interface Cards

Use either the 1784-KT (DH+ Direct) or 1784-KT2 (DH+ Direct) interface cards to connect an IBM compatible or IBM PS/2 microchannel computer directly to an SLC 5/04 processor on a DH+ link for programming. These interface cards share the same configurable parameters.

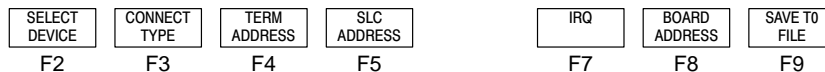
```

ONLINE CONFIGURATION
-----
Current Device          1784-KT (DH+ Direct)
F3 Connection           DIRECT
F4 Terminal DH+ Address 0 (octal)
F5 SLC Node Address     1 (octal)

F7 IRQ                  3
F8 Board Address        000011
F9 Save to File

ESC exits/Alt-U aborts changes
    
```

Press a function key



Function Key	Description
[F2] Select Device	Toggles between the selected interface card and the interface card selection menu.
[F3] Connect Type	Toggles between Direct and Multi-Drop. Direct means that the terminal has a termination resistor (last device on the DH+ link). Multi-Drop means that the terminal does not have a termination resistor. The default is Direct.
[F4] Terminal Address	Allows selection of a terminal address as a node number. Valid range is 0–77 octal. The default is 0.
[F5] SLC Address	Allows selection of a processor address as a node number. Valid range is 0–77 octal. The default is 1.
[F7] IRQ	<p>1784-KT Allows you to select the IRQ on the board (3, 4, 5, and 7.) The default is 3. See the 1784-KT card user manual for details.</p> <p>1784-KT2 Allows you to select the IRQ on the board (9, 10, 11, and 12.) The default is 9. See the 1784-KT2 card user manual for details.</p>

Function Key	Description
[F8] Board Address	1784-KT Allows you to enter the 1784-KTs board dip switch setting in a binary format. Valid range is 000000–111111. The default is 000011.
	1784-KT2 Allows you to select the four digit hexadecimal number that represents the board segment address. Valid values are C000, C400, C800, CC00, D000, D400, D800, and DC00. The default is C800.
[F9] Save to File	Saves the selected parameters to the user file.

Interchange DH+ Direct

The Interchange DH+ configuration is only available when using an SLC 5/04 processor with an interface card. The Current Device field displays the interface card installed in your personal computer.

The following interface cards are available for configuration via the initialization file (cfg_kt.ini):

- 1784-KT
- 1784-KL
- 1784-KT2
- 1784-KTX
- 1784-PCMK with a 1785-PCM4 cable

Note

You must edit the initialization file (cfg_kt.ini) found in the INTERCHANGE directory in order to use the Interchange DH+ option. To do this, use the INTERCHANGE Device Configuration utility that was loaded during the APS installation procedure. Refer to chapter 1 in this manual for configuration information.

If the INTERCHANGE driver is not loaded or the INTERCHANGE port selected is not configured for use, all entries in the online configuration screen will display asterisks (), except SLC node addresses and the current INTERCHANGE port.*

Refer to the *Instruction Set Reference Manual* for more information on the Data Highway Plus communication protocol.

Example Configuration

The following 1784-KT parameters are read from the `cfg_kt.ini` file.

```

ONLINE CONFIGURATION

Current Device          1784-KT (DH+ Direct)

Connection             DIRECT
Terminal Name          MYKT
Terminal Address       0 (octal)
Baud Rate              57600
F5 SLC Node Address   3 (octal)
IRQ                    3
Board/Memory Address  110011

F8 Curr. Interchange Port  1
F9 Save to File

ESC exits/Alt-U aborts changes
    
```

Press a function key

SELECT
DEVICE

F2

PROC
ADDRESS

F5

NEXT
PORT

F8

SAVE TO
FILE

F9

Function Key	Description
[F2] Select Device	Toggles between the selected device driver and the device driver selection menu.
[F5] Processor Address	Allows you to select a processor address as a node number. Valid range is 0–77 octal. The default is 1.
[F8] Next Port	Allows you to select the port number where the interface card is installed. Valid range is 1–8. The default is 1.
[F9] Save to File	Saves the selected parameters to a user file.

Interchange DH-485

The Interchange DH-485 option is available when using any of the SLC 500 processors with a 1747-PIC Interface Converter, the 1784-KTX interface card, or with the 1784-PCM4 card and a 1784-PCM4 cable.

Note

You must edit the initialization file (cfg_kt.ini) found in the INTERCHANGE directory in order to use the Interchange DH-485 option. To do this, use the INTERCHANGE Device Configuration utility that was loaded during the APS installation procedure. Refer to chapter 1 in this manual for configuration information.

If the the INTERCHANGE driver is not loaded or the INTERCHANGE port selected is not configured for use, all entries in the online configuration screen will display asterisks (), except SLC node addresses and the current INTERCHANGE port.*

For cabling information, see the *SLC 500 Modular Hardware Style Installation and Operation Manual*, Publication 1747-6.2.

ONLINE CONFIGURATION

```

Comm. Port          COM1
Current Device      DH-485
Baud Rate           57600
Terminal Address    0
F5 PROC Address     1
MAX Node Address    31
F8 Curr. Interchange Port 1

F9 Save to File

ESC exits/Alt-U aborts changes
    
```

Press a function key

SELECT
DEVICE
F2

PROC
ADDRESS
F5

NEXT
PORT
F8

SAVE TO
FILE
F9

Function Key	Description
[F2] Select Device	Toggles between the selected device driver and the device driver selection menu.
[F5] Processor Address	Allows you to select a processor address as a node number. Valid range is 0–77 octal. The default is 1.
[F8] Next Port	Allows you to select the port number where the interface card is installed. Valid range is 1–8. The default is 1.
[F9] Save to File	Saves the selected parameters to a user file.

Interchange DH+ Bridged

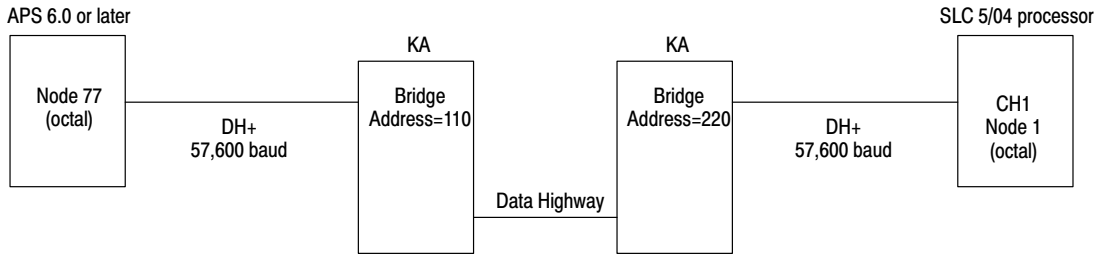
The following bridge types are supported:

- DH+ to DH+ via two 1785 KA
- DH+ to DH-485 via 1785 KA5 gateway
- PI routing
- DH+ to DH-485 via an SLC 5/04 OS401 processor with passthru enabled (S:34/0=0)
- DH+ to DF1-Full-Duplex via an SLC 5/04 OS401 processor with passthru enabled (S:34/5=1)
- DF1-Full-Duplex to DH+ via an SLC 5/04 OS401 processor with passthru enabled (S:34/5=1)

Refer to the *Instruction Set Reference Manual* for more information on the Data Highway Plus™ communication protocol.

The example configurations that follow are provided to show the parameters associated with each of the bridge types.

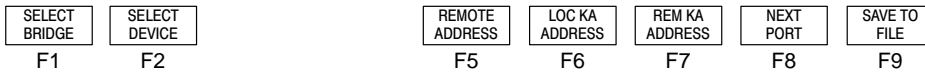
Example Configuration: DH+ to DH+ via Two 1785-KA



```

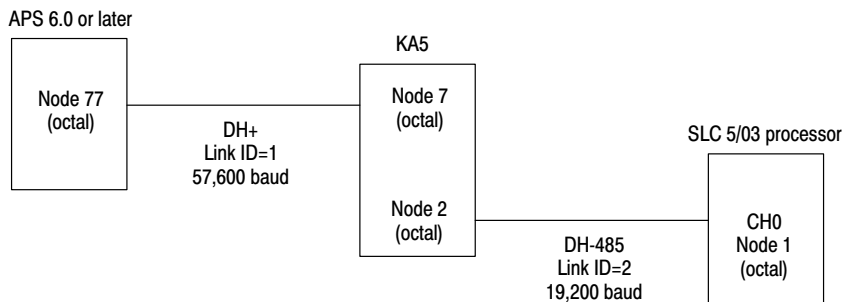
ONLINE CONFIGURATION
-----
Current Device          1784-KT (DH+ Bridged)
F1 Bridge Type         DH+ to DH+ via two 1785 KA
Terminal Name
Terminal Address       77 (octal)
Baud Rate              57600
F5 SLC Node Address    1 (octal)
F6 Local Bridge Address 110 (octal)
F7 Remote Bridge Address 220 (octal)
IRQ                    5
Board/Memory Address   001011
F8 Curr. Interchange Port 1
F9 Save to File
ESC exits/Alt-U aborts changes
  
```

Press a function key



Function Key	Description
[F1] Select Bridge Type	Allows you to select the desired bridge type: DH+ to DH+ via two 1785-KA, DH+ to DH485 via 1785 KA5 Gateway, PI routing, or DH+ to Channel 0 via 5/04 passthru.
[F2] Select Device	Toggles between the selected device driver and the device driver selection menu.
[F5] SLC Node Address	Allows you to select a processor address as a node number. Valid range is 0–77 octal. The default is 1.
[F6] Local Bridge Address	Allows you to enter the local KA bridge address on the DH+ network. Valid range is 0–376 octal. The default is 110. Note You must limit the range to 0–299 octal if your APS node address is 77 octal. An address greater than 299 octal will cause APS to send broadcast commands on the DH link.
[F7] Remote Bridge Address	Allows you to enter the remote KA bridge address on the DH+ network. Valid range is 0–376 octal. The default is 220.
[F8] Next Port	Allows you to select the port number where the interface card is installed. Valid range is 1–8. The default is 1.
[F9] Save to File	Saves the selected parameters to a user file.

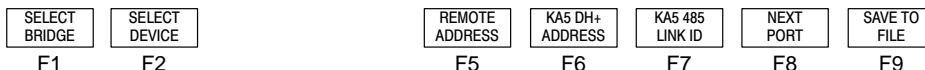
Example Configuration: DH+ to DH-485 via 1785-KA5 Gateway



```

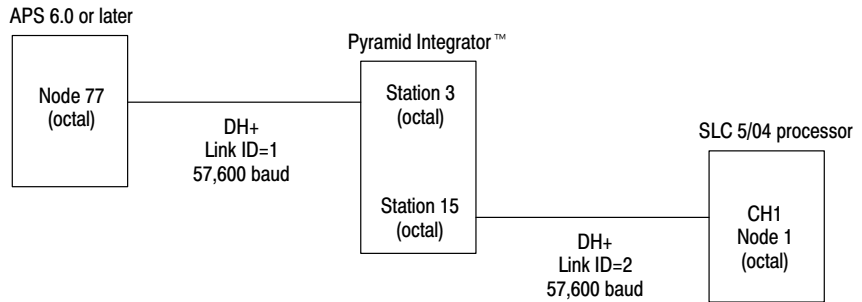
ONLINE CONFIGURATION
Current Device          1784-KT (DH+ Bridged)
F1 Bridge Type         DH+ to DH485 via 1785 KA5 Gateway
Terminal Name
Terminal Address       77 (octal)
Baud Rate              57600
F5 Remote SLC Node Addr. 1 (decimal)
F6 KA5 DH+ Address     7 (octal)
F7 KA5 DH485 Link ID   2 (decimal)
IRQ                    5
Board/Memory Address   001011
F8 Curr. Interchange Port 1
F9 Save to File
ESC exits/Alt-U aborts changes
    
```

Press a function key



Function Key	Description
[F1] Select Bridge Type	Allows you to select the desired bridge type: DH+ to DH+ via two 1785-KA, DH+ to DH485 via 1785 KA5 Gateway, PI routing, or DH+ to Channel 0 via 5/04 passthru.
[F2] Select Device	Toggles between the selected device driver and the device driver selection menu.
[F5] Remote SLC Node Address	Allows you to enter the SLC address. Valid range is 1–31 decimal. The default is 1.
[F6] KA5 DH+ Address	Allows you to enter the KA5 DH+ address. Valid range is 0–77 octal. The default is 7.
[F7] KA5 DH-485 Link ID	Allows you to enter the KA5 DH+ link ID. Valid range is 0–15 decimal. The default is 2.
[F8] Next Port	Allows you to select the port number where the interface card is installed. Valid range is 1–8. The default is 1.
[F9] Save to File	Saves the selected parameters to a user file.

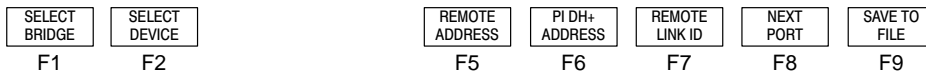
Example Configuration: PI Routing



```

ONLINE CONFIGURATION
-----
Current Device          1784-KT (DH+ Bridged)
F1 Bridge Type         PI Routing
Terminal Name
Terminal Address       77 (octal)
Baud Rate              57600
F5 Remote Node Addr.   1 (octal)
F6 PI DH+ Address      3 (octal)
F7 PI Remote Link ID   2 (decimal)
IRQ                    5
Board/Memory Address   001011
F8 Curr. Interchange Port 1
F9 Save to File
-----
ESC exits/Alt-U aborts changes
  
```

Press a function key

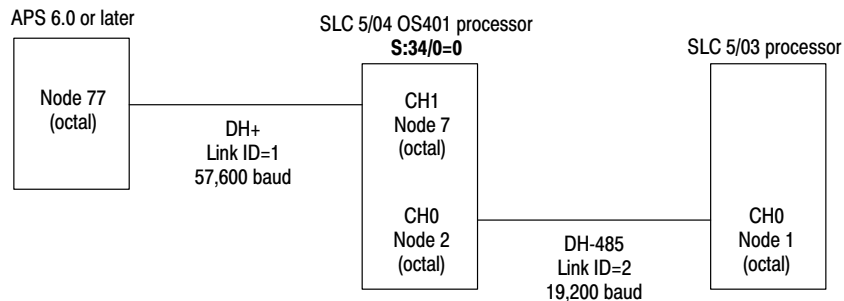


Function Key	Description
[F1] Select Bridge Type	Allows you to select the desired bridge type: DH+ to DH+ via two 1785-KA, DH+ to DH485 via 1785 KA5 Gateway, PI routing, or DH+ to Channel 0 via 5/04 passthru.
[F2] Select Device	Toggles between the selected device driver and the device driver selection menu.
[F5] Remote Node Address	Allows you to enter the processor address. Valid range is 0–77 octal. The default is 1.
[F6] PI DH+ Address	Allows you to enter the PI DH+ address. Valid range is 0–77 octal. The default is 7.
[F7] Remote Link ID	Allows you to enter the Remote link ID. Valid range is 1–65,535 decimal. The default is 2.
[F8] Next Port	Allows you to select the port number where the interface card is installed. Valid range is 1–8. The default is 1.
[F9] Save to File	Saves the selected parameters to a user file.

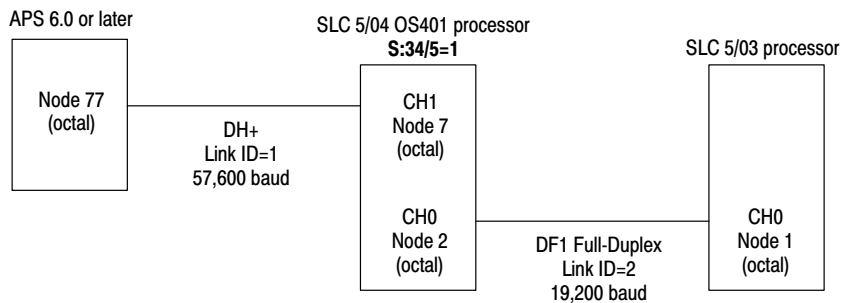
Example Configuration: DH+ to Channel 0 via 5/04 Passthru

Bridging is allowed via an SLC 5/04 OS401 processor when the passthru bit is enabled. Examples of DH+ to DH-485 bridging and DH+ to DF1 full-duplex bridging are shown below.

DH+ to DH-485



DH+ to DF1 Full-Duplex



```

ONLINE CONFIGURATION
Current Device          1784-KT (DH+ Bridged)
F1 Bridge Type         DH+ to Channel 0 via 5/04 Passthru
Terminal Name
Terminal Address       77 (octal)
Baud Rate              57600
F5 Remote SLC Node Addr. 1 (decimal)
F6 SLC 5/04 DH+ Address 7 (octal)
F7 5/04 Channel 0 Link ID 2 (decimal)
IRQ                    5
Board/Memory Address   001011
F8 Curr. Interchange Port 1
F9 Save to File
ESC exits/Alt-U aborts changes
    
```

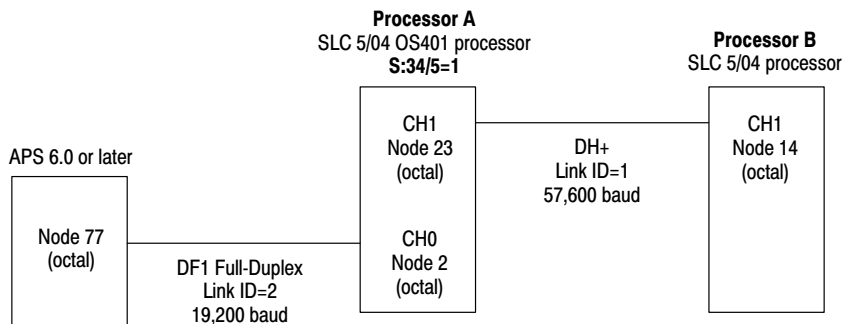
Press a function key

SELECT BRIDGE	SELECT DEVICE	REMOTE ADDRESS	SLC DH+ ADDRESS	SLC 485 ADDRESS	NEXT PORT	SAVE TO FILE
F1	F2	F5	F6	F7	F8	F9

Function Key	Description
[F1] Select Bridge Type	Allows you to select the desired bridge type: DH+ to DH+ via two 1785-KA, DH+ to DH485 via 1785 KA5 Gateway, PI routing, or DH+ to Channel 0 via 5/04 passthru.
[F2] Select Device	Toggles between the selected device driver and the device driver selection menu.
[F5] Remote SLC Node Address	Allows you to select a processor address as a node number. If the remote network is DH-485, the valid range is 0-31 decimal. If the remote network is DH+, the valid range is 0-63 decimal. The default is 1.
[F6] SLC 5/04 DH+ Address	Allows you to select a processor address as a node number. Valid range is 0-77 octal. The default is 1.
[F7] 5/04 Channel 0 Link ID	Allows you to select a processor address as a node number. Valid range is 0-65,535 decimal. The default is 1.
[F8] Next Port	Allows you to select the port number where the interface card is installed. Valid range is 1-8. The default is 1.
[F9] Save to File	Saves the selected parameters to a user file.

Example Configuration: DF1 Full-Duplex to DH+ via 5/04 Passthru

DF1 to DH+ bridging is allowed via an SLC 5/04 OS401 processor when the passthru bit is enabled. An example is shown below.



To program the SLC 5/04 OS401 processors on DH+, use the *DF1 full-duplex driver*. As shown in the screens that follow, enter the destination address 19 decimal for processor A, and enter the destination address 12 decimal for processor B.

Screen for Processor A

```

ONLINE CONFIGURATION
F1 Port COM1
  Current Device Full-Duplex
F4 Source Address 0
F5 Destination Address 19
F7 Device/Modem/Full-Duplex Configuration
F9 Save to File
ESC exits/Alt-U aborts changes
  
```

Press a function key



Screen for Processor B

```
  ONLINE CONFIGURATION
  F1 Port                      COM1
    Current Device             Full-Duplex

  F4 Source Address            0
  F5 Destination Address       12

  F7 Device/Modem/Full-Duplex Configuration

  F9 Save to File

  ESC exits/Alt-U aborts changes
```

Press a function key

PORT
F1

SELECT
DEVICE
F2

SOURCE
ADDRESS
F4

DEST
ADDRESS
F5

DEVICE
CONFIG
F7

SAVE TO
FILE
F9

For more information on configuring the parameters necessary for DF1 full-duplex, see page 11–19.

12 *Using WHO*

The WHO function lets you view active devices on the DH-485 and DH+ networks. WHO has two modes of operation:

- Who Listen lets you view active nodes on the DH-485 or DH+ network without placing your terminal on the network.

Note

DH+ Bridged users - When you use the Who function with a 1784-KT or 1784-KL module, access to the DH+ link is not possible using the Who function. However, you can see the Active Node Table from the DH-485 side of the 1785-KA5 gateway module.

- Who Active identifies the nodes currently being used and allows you to monitor and modify parameters associated with the nodes.

WHO is not supported when your system is configured for DF1 protocol (DF1 Full-Duplex and DF1 Half-Duplex Master/Slave).

Note

The WHO function is not available for the MicroLogix 1000 controllers.

Using DH-485 WHO

When configured for a DH-485 network, you can use WHO with any of the SLC 500 processors. When using an SLC 5/03 processor, the current online configuration must be for a DH-485 device in order for Who Active and Who Listen to be available. When using an SLC 5/04 processor, the current online configuration must be for a DH-485 device or your system must be configured for Interchange DH-485.

DH-485 WHO Listen

The Who Listen function shows you active nodes without placing your terminal on the network. You cannot change a node's status from this display.

“Listening” is done at the baud rate selected in the online configuration function. Asterisks appear next to active nodes. If no asterisks appear in the table, it may be because:

- either you are listening at a baud rate different from that of the network devices, or
- there are no initiators present on the network.

At the main menu display, press  , then  . The following display appears.

WHO LISTEN - Active Node Table		
0		24
1	*	25
2	*	26
3	*	27
4		28
5		29
6		30
7		31
8		20
9		21
10		22
11		23

ESC exits

Press a function key


F2

Function Key	Description
[F1] Online	Allows you to go online and communicate with the device at the node address the cursor is highlighting.
[F2] Station Diagnostics	Allows you to monitor the diagnostics of the network and the highlighted cursored node.
[F3] Set Owner	Allows your APS terminal to establish ownership of a processor on the network. While your terminal is active on the network, other programmers cannot access the processor.
[F4] Clear Ownership	Allows your APS terminal to clear the ownership it has established with a processor, thus allowing other programmers to access the processor.
[F7] Maximum Address	Allows you to set the maximum node address of any active processor on the network. The valid range is 1-31. The default selection is 1.
[F8] Node Address	Allows you to set or change the node address of any active processor on the network. You must cycle power to the processor for your changes to take effect.
[F9] Node Baud	Allows you to set or change the communication rate of any active processor on the network. You must cycle power to the processor for your changes to take effect.

Setting the Processor Node Address

1. Begin at the main menu and press **WHO** , then **WHO ACTIVE** . The following display appears:

F5

F5


display appears:

```

WHO ACTIVE - Active Station Identification
-----
0  TERM          (31)      12          24
1
2
3  500-20        (31)      15          27
4
5
6
7
8
9
10
11
ESC exits
    
```

Press a key for desired network function

ONLINE	STATION DIAGS	SET OWNER	CLEAR OWNER	MAX ADDRESS	NODE ADDRESS	NODE BAUD
F1	F2	F3	F4	F7	F8	F9

2. Cursor to the processor node address you wish to change and press  .
F8
3. Type any number between 1 and 31.
4. Press [**ENTER**] and cycle power to the processor.

Assign other node addresses in the same manner until all of your processors have a unique node address.

Note

*You cannot change the node address of the terminal at this display. If you try, the message **CURRENT DEVICE IS NOT A PROCESSOR** appears.*

Consequences of Changing a Processor Node Address

Remember that *the processor node address resides in the status data file (word S:15) of a processor file*. This means that when you overwrite the contents of processor memory by using the Restore or Memory Transfer function, the node address may change as follows:

Restore - When you restore a processor file, then cycle processor power, the node address of the restored processor file will take effect, overwriting the previous node address.

Memory Transfer - When you transfer a processor file from a memory module to the processor, then cycle processor power, the node address of the transferred file takes effect, overwriting the previous node address.

Note

If the processor node address is unknown, immediately after you restore (download) a processor file or transfer a processor file from a memory module to the processor, select [F8] Node Address from the Who Active table and re-enter the current node address. Failure to do this can result in a duplicate or incorrect node address after you cycle power to the processor.

Setting the Processor Maximum Node Address

If a processor is the highest numbered node, access the Who Active display to set the maximum node address. For the most efficient network operation, we recommend setting the maximum node address of the highest numbered node equal to the highest node address (total number of devices) used on the network.

Note

If you set the maximum node address of the highest node you are using to its own address, a higher numbered node is prohibited from being added to the network.

1. Begin at the main menu and press **WHO** (F5), then **WHO ACTIVE** (F5). The following display appears:

```

WHO ACTIVE - Active Station Identification
-----
0  TERM          (31)    12                24
1  500-20        (31)    13                25
2  500-30        (31)    14                26
3  500-40        (31)    15                27
4                               16                28
5                               17                29
6                               18                30
7                               19                31
8                               20
9                               21
10                              22
11                              23
-----
ESC exits
    
```

Press a key for desired network function

ONLINE	STATION DIAGS	SET OWNER	CLEAR OWNER	MAX ADDRESS	NODE ADDRESS	NODE BAUD
F1	F2	F3	F4	F7	F8	F9

2. Cursor to the highest numbered node.
3. Press **MAX ADDRESS** (F7) and enter the number of the node you are on.
4. Press [**ENTER**]. If the message: **MAXIMUM NODE ADDRESS VIOLATION DETECTED** appears, this informs you that APS has detected an active node on the network with a node address higher than the APS maximum node address.

Note

When you cycle power to an SLC 5/01 Series A processor, the maximum node address returns to the default selection of 31.

*You cannot change the maximum node address of the terminal at this display. If you attempt to change the address, the message **CURRENT DEVICE IS NOT A PROCESSOR** appears.*

Setting and Clearing Ownership

The Set and Clear Owner function allows a terminal to “own” one or more processor files on the network. Ownership means that as long as the owner is active on the network, other terminals can not access the online functions of the owned processor files. Note that only a programmer can own another node.

When the owner becomes inactive (exits the network), another terminal can clear the ownership of the inactive node and gain access to an owned processor file. However, to do so, the user of that terminal must first select the Clear Owner function. An owner can clear ownership at any time.

You can set ownership from the Who Active display. The following figure is the Who Active offline display, showing the active stations of a network having terminals at nodes 0 and 1.

WHO ACTIVE - Active Station Identification			
0	TERM	(31)	12
1	APS	(31)	13
2	500-20	(31)	14
3	500-20	(31)	15
4	500-40	(31)	16
5	5/02	(5)	17
6			18
7			19
8			20
9			21
10			22
11			23
			24
			25
			26
			27
			28
			29
			30
			31

ESC exits

Press a key for desired network function

ONLINE	STATION DIAGS	SET OWNER	CLEAR OWNER	MAX ADDRESS	NODE ADDRESS	NODE BAUD
F1	F2	F3	F4	F7	F8	F9

1. Cursor to node 4 and press **SET OWNER** .
F3

2. Cursor to node 5 and press **SET OWNER** F3 . The display changes to the following:

```

WHO ACTIVE - Active Station Identification
-----
 0 TERM      (31)    12          24
 1 APS       (31)    13          25
 2 500-20    (31)    14          26
 3 500-20    (31)    15          27
 4 500-40    (31/0)  16          28
 5 5/02      (5/0)    17          29
 6           ( )     18          30
 7           ( )     19          31
 8
 9
10
11
-----
ESC exits
    
```

Press a key for desired network function

ONLINE	STATION DIAGS	SET OWNER	CLEAR OWNER	MAX ADDRESS	NODE ADDRESS	NODE BAUD
F1	F2	F3	F4	F7	F8	F9



If you have chosen the 1784-KT or 1784-KL as your communication device, the set/clear owner function applies to the 1785-KA5 gateway *only*. If you set owner, and then exit APS, no other DH-485 device is able to gain access until either:

- the 1785-KA5 gateway power cycles, or
- another node on DH+ clears owner.

This is because the 1785-KA5 is the owner of the processor, not your terminal.

To indicate ownership by a programmer, the node address of the owner is included in the parentheses with the maximum node address. In this case, to indicate ownership by terminal 0, “(31)” has changed to “(31/0)” for node 4 and node 5 has changed to (5/0).

As long as terminal 0 is running APS, the APS terminal at node 1 can not monitor the processor file or access the processor functions at nodes 4 and 5. The message **PROGRAM OWNER ACTIVE** tells the user why he is denied access.

If terminal 0 exits APS or is disconnected from the network, terminal 1 can use the Clear Owner function to clear terminal 0's ownership of a node. Terminal 1 then has access to the node and can claim ownership.

- To clear ownership, cursor to the desired node and press **CLEAR OWNER** . To
F4
succeed you must either be the current owner or the current owner cannot be active.

Station Diagnostics

The Station Diagnostics function allows you to monitor network activity and to display individual node diagnostics. Access this function by pressing **STATION DIAGS** at
F2
the Who Active display. The following display appears:

WHO ACTIVE - Active Station Status			
Network Diagnostics:		Node Diagnostics	
Total Nodes	3	Node	0
Max. Node Address	31	Device Type	5/02
Messages Transmitted	21	Firmware Revision	1
Messages Received	21	Firmware Series	C
Retries	0	Mode	
Retry Limit Exceeded	0	Major Fault	0000H
Bad Messages Received	0	Program Name	
Nak No Memory Sent	0	Forces	
Nak No Memory Rcvd	0		
ESC exits			

Press a key for desired network function

**CLEAR
COUNTER**
F2

Note that the only option available at this display is to clear counters. This function resets all of the network diagnostics fields to zero. The counters wrap if they are not cleared.

The counters listed under network diagnostics have the following ranges:

Network Diagnostics	Valid Ranges
Total Nodes	0-31
Max. Node Address	0-31
Messages Transmitted	0-65535
Messages Received	0-65535
Retries	0-255
Retry Limit Exceeded	0-255
Bad Messages Received	0-255
Nak No Memory Sent	0-255
Nak No Memory Rcvd	0-255

Node diagnostics are for the censored node shown in the Who Active display.

Note

The firmware revision and firmware series fields refer to the processor's series and revision fields in the status file for the SLC 5/03 and SLC 5/04 processors. The operating system (OS) series and revision fields are found only in the status file (S:58 and S:59 respectively).

Establishing Processor Node Addresses on a Multi-Node Network

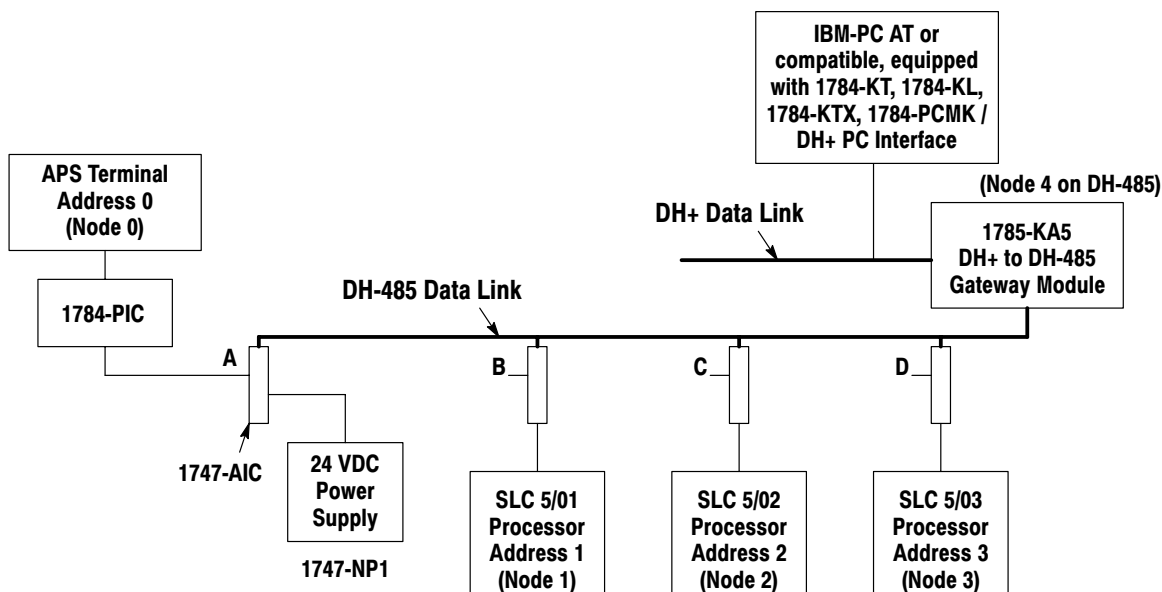
The default node address for a processor file is 1. This means that unless addresses have been changed previously, all processor nodes on the network initially have address 1. This makes it impossible to communicate with an individual processor. You must bring up the network one node at a time.

Refer to the typical DH-485 network on page 12–11. An APS terminal at node 0 (the default node) is connected to link coupler A. There are 3 processors on the network plus a gateway module to bridge to a DH+ network. The gateway module has been assigned to node 4 by means of DIP switch settings on the device.

Assuming that the default node address value of 1 has not been changed for any of the processors, set processor addresses as follows:

1. Apply power only to the processor connected to link coupler D. Restore (download) the appropriate processor file to the processor.
2. Assign node address 3 to the processor using the Who Active function or set the node address in the system status file before saving the program you wish to download. Address 3 takes effect when you cycle power to the processor.

3. Apply power to the processor connected to link coupler C. Restore (download) the appropriate processor file to the processor. Now, assign node address 2 to this processor file using the Who Active function. Address 2 takes effect when you cycle power to the processor.
4. Apply power to the processor connected to link coupler B. Restore (download) the appropriate processor file to the processor.
5. Assign the maximum node addresses. For this network, the maximum node address is set to 4.



Tip

You can protect the assigned node address and baud rate of a processor file against inadvertent changes by using ladder logic as described for Word S:15 (Node Address, Baud Rate) in the *Instruction Set Reference Manual*.

Important Recommendations When Using DH-485 Devices

The following summarizes the recommendations for a DH-485 network.

- Use node 0 and the lowest node numbers for APS terminals.
- Number the processor nodes consecutively, beginning at the lowest possible number.
- Set the maximum node address as low as possible. The highest numbered node should have its maximum node address set to its own address.
- Make certain that the baud rate settings of all nodes are the same. A terminal will only communicate with processors set at the terminal's baud rate.
- Set the baud rate of the terminal at the Online Configuration display. The baud rate for the processor nodes is set either at the Who Active display or in the status data file of a processor file. Baud rate changes for SLC 5/01 and SLC 5/02 processors take effect after cycling power to the processor. The default baud rate for devices on the network is 19200.
- A processor memory change using the restore or memory transfer function overwrites the existing node address and existing baud rate after you cycle processor power. If the processor node address is unknown, immediately after you make such a processor memory change on an active DH-485 network, select the Node Address function at the Who Active table; re-enter the node address number at which you are presently located. Failure to do this can result in a duplicate or incorrect node address after you cycle power to the processor.



If two processors on the DH-485 network are assigned the same node address, it is possible that the processor file in one of the processors will be lost and replaced with the default file.



If you press the DOS [Pause] key or [CTRL-Num Lock] while DH-485 network communication is taking place between APS and any SLC 500 processor, the network may fail.

Using DH+ WHO (SLC 5/04 Processors Only)

DH+ WHO allows you to monitor devices on the DH+ network, such as SLC 5/04 processors, PLC processors, bridge devices, and programming devices. When your system is configured for a DH+ direct network connection you can have up to 64 nodes. You must use one of the following configuration options to access DH+ WHO.

Configuration 1	Configuration 2
DH+ direct interface card (1784-KL, -KT, -KTX, or -KT2)	Interchange DH+ with cfg_kt.ini file configured
SLC 5/04 processor	Interchange loaded
	SLC 5/04 processor

Note

If you are running APS in standalone mode (that is, you started the software by typing AP at the DOS prompt), the INTERCHANGE drivers and DH+ WHO are not active. Therefore, the WHO function key will not appear as a menu option. To use DH+ WHO, you must exit the software and restart it with DH+ WHO active. See page 1–16 for more information.

If you did not install all APS components in the default directories, DH+ WHO will not function properly.

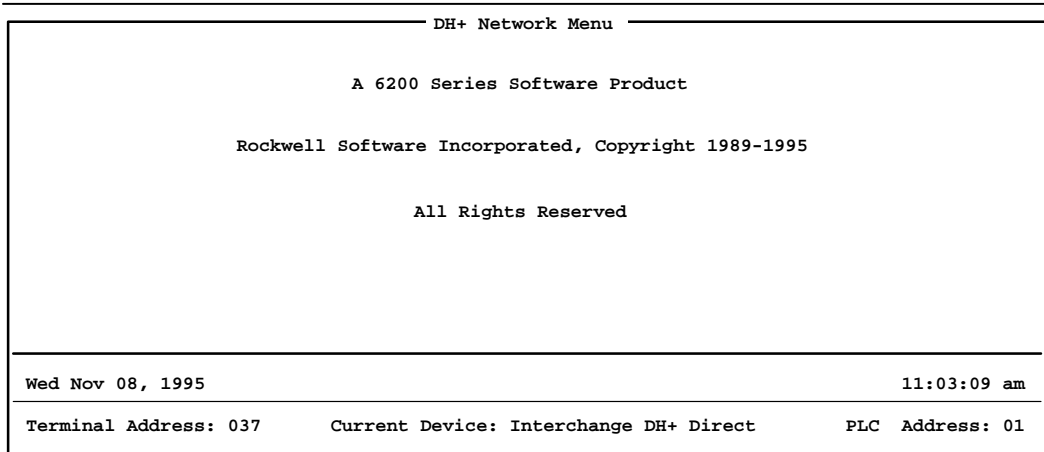
Accessing DH+ WHO

Access DH+ WHO one of two ways.

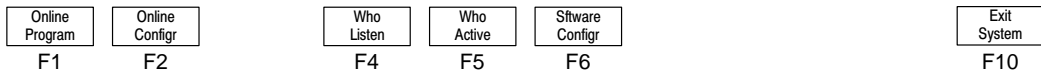
- either from the APS main menu by pressing [F5] WHO. The DH+ WHO main menu is displayed.

Note that [F5] WHO *only* appears on the APS main menu when configured for DH+ direct communication and when using an SLC 5/04 processor.

- or, press [F1] Online from the main menu of APS then [F5] WHO Active. The DH+ WHO Active menu is displayed.



Press a function key



When you press [F1] Online Program from either the DH+ WHO main menu or DH+ WHO Active display and your cursor is on an SLC 5/04 processor, APS is invoked and the APS Online screen is displayed. APS attempts to go online with the program file stored in the SLC 5/04 processor.

If the program file of the processor you selected cannot be found on the disk, the message: **NO MATCHING DISK FILE FOUND** is displayed. You can either upload the file and go online or you can download a different processor program from your terminal and go online.

DH+ WHO Listen

The DH+ WHO Listen display shows you active node addresses. You cannot change a node's status from this display.

Access the DH+ WHO Listen display by pressing [F4] WHO Listen. If your system is configured using a 1784-KT (DH+ direct) interface card, only the processor is indicated in the WHO Listen display. If your system is configured using Interchange DH+ with a 1784-KT interface card and the `cfg_kt.ini` file initialized, then the WHO Listen display appears as follows:

```

DH+ Network Menu
-----
A 6200 Series Software Product

Rockwell Software Incorporated, Copyright 1989-1995

All Rights Reserved

WHO LISTEN - Active Node Table
-----
0      10     20     30     40     50     60     70
01000000 00000000 00000000 00000000 00000000 00000000 00000000 00000001
  ↑                                     ↑
Processor location                       Terminal location

Press a function key

Online
Config
F2

```

An active node is represented by a one and a non-active node is represented by a zero. Note that the display is presented in octal.

DH+ WHO Active

The DH+ WHO Active display allows you to view other active devices on the network. DH+ WHO Active works the same as DH-485 WHO, except valid node addresses range from 0-77 octal.

Access the DH+ WHO Active display by pressing [F5] Who Active from the APS Online menu. The following display appears:

WHO ACTIVE - Active Station Identification

Node Address	00	20	40	60
	01	21	41	61
	02	22	42	62
	03	23	43	63
	04	24	44	64
	05	Name of Program File		45
	06	26	46	66
	07	27	47	67
	Device Type	30	50	70
	11	31	51	71
	12	32	52	72
	13	33	53	73
	14	34	54	74
	15	35	55	75
	16	36	56	76
	17	37	57	77
				TERM

ESC exits

Press a function key

Online Program	Station Diags
F1	F2

Note that the station diagnostics option is only available when using a PLC processor or when the cursor is on a terminal. If you try to access this function when the cursor is on an SLC 5/04 processor the error message: **FUNCTION NOT AVAILABLE** is displayed.

Note

The program name and program owner fields are only updated when you first enter the DH+ WHO function or when the DH+ node configuration changes. For example, these fields are updated when another node appears or disappears from the WHO screen.

13 *Configuring Your Processor for Online Communication*

Use the information in this chapter to configure the SLC 500 processors for online communication. Choose from several methods:

- DH-485

All SLC 500 processors have DH-485 capability.

Several bridge and gateway devices exist to interface the SLC 500 DH-485 channel to other devices, such as the 2760-RB (with the 2760 SFC3 Protocol Cartridge), 1770-KF3, 1747-KE, and the 1785-KA5 card. When using bridge or gateway devices, refer to the specific user documentation to configure your system.

- direct connect via RS-232

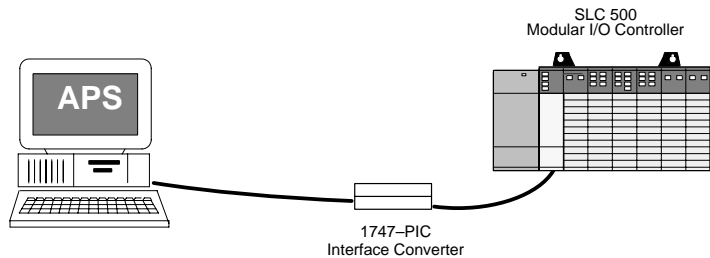
The SLC 5/03 and SLC 5/04 processors support RS-232 communication.

- DH+

The SLC 5/04 supports DH+ communication and connectivity to a DH+ link.

Configuring SLC 5/01 and SLC 5/02 Processors

APS versions 2.0 and later support DH-485 point-to-point communication. You can connect APS to the SLC 500 processors using a 1747-PIC Interface Converter, a 1770-KF3 module, or 1747-KE module. A 1747-AIC Link Coupler is required for DH-485 network communication.



The parameters that must be configured for online communication are explained below.

Note

The SLC 5/01 and SLC 5/02 processors store their node addresses and baud rates in word S:15. We recommend making these parameters part of your user program. This prevents unauthorized (or unintended) alteration of your program. Refer to the system status file in the Instruction Set Reference Manual for more information about word S:15.

Node Address

Each device on the DH-485 network must have a unique node address. The default node address for APS is 0, and the default for the processors is 1. To change a processor node address, write a value between 1 and 31 using the Who function. The change is applied immediately.

Baud Rate

Each DH-485 network device must have a common baud rate. The table below shows the available baud rates. You must cycle power to apply the new baud rate.

Processor	Baud Rate
Fixed and SLC 5/01	9600 or 19200
SLC 5/02	1200, 2400, 9600, or 19200

Configuring the SLC 5/03 and SLC 5/04 Processors for Online Communication

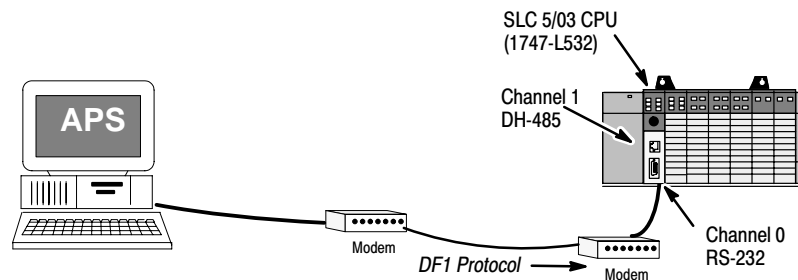
The SLC 5/03 and SLC 5/04 processors offer an extensive selection of communication options. (For more information on these options, see the *Instruction Set Reference Manual*.) APS provides channel configuration screens that allow you to set the communication parameters instead of using the status file. Pressing a function key immediately applies your communication parameters instead of cycling power to apply your communication parameters.

Using an SLC 5/03 or SLC 5/04 Processor with Channel 0 Configured (RS-232)

The APS version 5.0 and later supports RS-232 communication directly from channel 0 of the SLC 5/03 or SLC 5/04 processor. (The APS version 4.0 supports RS-232 communication only from an SLC 5/03 processor.) Connecting a modem to your DF1 COM channel allows you to connect your SLC 5/03 processor to a remote APS terminal. APS can dial out; however, the SLC 5/03 and SLC 5/04 processors do not have the capability to dial out. We recommend that your modem have the auto answer feature. For more information about RS-232 communication and modems, refer to the *Installation and Operation Manual for Modular Hardware Style Programmable Controllers*, Publication 1747-6.2.

You can also connect APS to the SLC 5/03 processor directly using a null-modem serial cable (Catalog Number 1747-CP3) from your personal computer's serial port to channel 0.

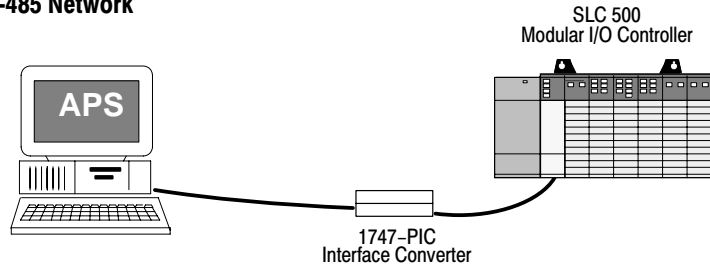
Full-Duplex (Point-to-Point)



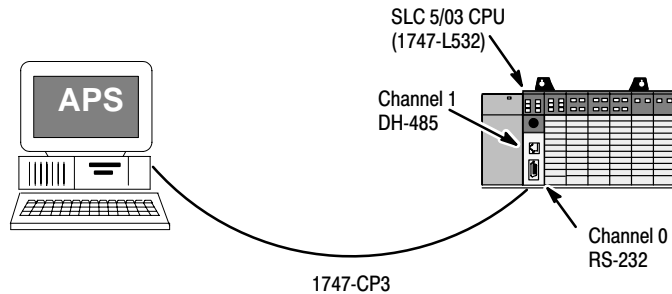
Using an SLC 5/03 Processor with Channel 1 Configured (DH-485)

The APS version 4.0 and later supports DH-485 point-to-point communication. You can connect APS to the SLC 500 processors using a 1747-PIC Interface Converter, a 1770-KF3 module, or 1747-KE module. A 1747-AIC Link Coupler is required for DH-485 network communication.

DH-485 Network



Full-Duplex (Point-to-Point)



Using an SLC 5/04 Processor with Channel 1 Configured (DH+)

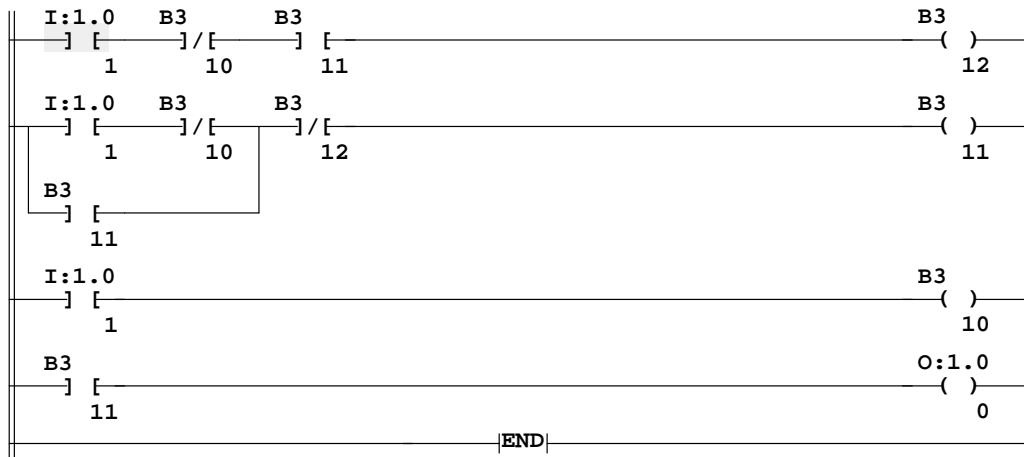
The APS version 5.0 and later supports DH+ communication. Depending on your system configuration, one of the following interface devices must be used to communicate over the DH+ network.

To Connect This Device	Use This Interface
IBM Compatible or IBM PS/2 Microchannel Computer	1784-KT or 1784-KT2 Communication Interface Module
1784-T47 Industrial Terminal	1784-KL Communication Interface Module
	1784-KTX Communication Interface Module
	1784-PCMK Communication Card

Understanding the Channel Configuration Option

The SLC 5/03 and SLC 5/04 processors support communication drivers which allow you to select and then monitor the status of a communication channel.

1. Access the General Utility display by pressing either **ONLINE** (F1) or **OFFLINE PRG/DOC** (F3), then **MONITOR FILE** (F8), and then **GENERAL UTILITY** (F7). The online display is shown below:



Press a key for desired status function
(file 2, rung 0)

REM PROG

no forces

EDITS: NONE

PROC Addr 1

MEMORY
MAP
F1

PROC
STATUS
F2

CHANNEL
CONFIG
F5

XFER
MEMMOD
F8

CLEAR
MEMORY
F10

2. Access the Channel Configuration display by pressing **CHANNEL CONFIG** . The

F5

following display shows the default parameters for an SLC 5/03 OS301, OS302 processor.

```

Channel Configuration
-----
CHANNEL 0 CONFIGURATION
  Current Communication Mode: SYSTEM
  System Mode Driver: DF1 FULL-DUPLEX
  User Mode Driver: GENERIC ASCII
  Write Protect: DISABLED
  Mode Changes: DISABLED
  Mode Attention Character: /lb
  System Mode Character: S
  User Mode Character: U
  Edit Resource/File Owner Timeout: 60 (seconds)
  Passthru Link ID: 1 (decimal)

CHANNEL 1 CONFIGURATION
  System Mode Driver: DH-485 MASTER
  Write Protect: DISABLED
  Edit Resource/File Owner Timeout: 60 (seconds)
  Passthru Link ID: 2 (decimal)
    
```

Press a key for desired function

REM PROG	no forces	EDITS: NONE	PROC Addr 1
<input type="button" value="ACCEPT EDITS"/>	<input type="button" value="UNDO EDITS"/>	<input type="button" value="CH0 SYS CONFIG"/>	<input type="button" value="CH0 USR CONFIG"/>
<input type="button" value="CH1 SYS CONFIG"/>	<input type="button" value="SELECT OPTION"/>		
F1	F2	F4	F5
		F7	F10

Available Function Keys	Description
[F1] Accept Edits	Accepts all changes made to the general channel configuration.
[F2] Undo Edits	Discards any changes made to the general channel configuration since the last time the Accept Edits key was pressed.
[F4] Channel 0 System Configuration	Accesses the channel 0 configuration screen for the selected system mode communication driver.
[F5] Channel 0 User Configuration	Accesses the channel 0 configuration screen for the selected user mode communication driver. This option only applies to SLC 5/03 OS301, OS302 and SLC 5/04 OS400, OS401 processors.
[F7] Channel 1 System Configuration	Accesses the channel 1 configuration screen for the selected system mode communication driver.
[F10] Select Option	Changes the value for the currently censored option.

3. Leave the channel configuration screen by either accepting the edit or undoing the edit.

Online Channel Configuration

When online, the channel configuration parameters are continually read from the processor and updated on the APS screen until you press [F10] *Select Option*. Once this key is pressed, ownership is applied to protect the channel configuration files from being changed by another node. At this point the channel configuration data is no longer read from the processor. When you accept or undo the edit, APS releases ownership and continues to read and display the channel configuration parameters from the processor.

Unlike offline modifications, online modifications to the channel configuration do not cause asterisks to appear in either the Program Directory screen or the Memory Map screen.

Accepting Edits

After you have made your changes to the configuration parameters and pressed [F1] *Accept Edits*, APS verifies that the changes are for the processor channel the programmer is currently communicating with.

- If they are not, reconfiguration occurs.
- If they are, and if the parameters are changed so a loss of communication may result, the prompts: **CHANNEL RECONFIGURATION MAY CAUSE LOSS OF COMMUNICATIONS**

PERFORM RECONFIGURATION? (Y/N) are displayed.



Do not apply protection to the channel you are currently communicating through unless you:

- **never intend to alter the program again, or**
- **can establish communication using the other channel.**

If you press *No*, the new configuration is discarded and the channel configuration is read from the processor again and re-displayed. If you press *Yes*, the reconfiguration proceeds.

If the processor is not in the program mode the message: **PROCESSOR IS NOT IN PROGRAM MODE; CHANNEL RECONFIGURATION NOT ALLOWED** is displayed. You will be prompted to change the processor mode to REM Program.

Offline Channel Configuration

Offline modifications to the channel configuration cause asterisks to appear on the Program Directory screen in the file size column and on the Memory Map screen in the program size field. The asterisks indicate that changes have been made, but need to be saved.

Accepting Edits

The channel configuration parameters currently on the screen are written to the channel configuration file in the APS database. However, this does not cause the parameters to be written to the processor image. After accepting those edits, you must save your new configuration to the processor image for the program file. If you press [F1] `Accept Edits` one or more times, but do not save the program, the changes made are discarded and the last version saved is loaded.

Undoing Edits

The channel configuration parameters from the APS database revert back to the previously saved configuration.

Possible Channel Configuration Errors

Up to four error codes may be displayed if the communication channels *cannot* be successfully reconfigured. If any of the following errors occur, you must correct the source of the error and retry channel reconfiguration.

- COMMUNICATION DRIVER NOT AVAILABLE IN PROCESSOR
- COMMUNICATION DRIVER IS NOT COMPATIBLE WITH CHANNEL
- BOTH CHANNEL SYSTEM DRIVERS CANNOT BE DISABLED
- BOTH CHANNEL SYSTEM DRIVERS CANNOT BE WRITE PROTECTED

If the above errors occur, channel protection remains unchanged and all other changes are accepted.

Undoing Edits

The channel configuration parameters revert back to what they were prior to the last time an `Accept Edits` was performed.

Changing the Channel Configuration

```

Channel Configuration
-----
CHANNEL 0 CONFIGURATION
  Current Communication Mode: SYSTEM
  System Mode Driver: DF1 FULL-DUPLEX
  User Mode Driver: SHUTDOWN
  Write Protect: DISABLED
  Mode Changes: DISABLED
  Mode Attention Character: /lb
  System Mode Character: S
  User Mode Character: U
  Edit Resource/File Owner Timeout: 60 (seconds)
  Passthru Link ID: 1 (decimal)

CHANNEL 1 CONFIGURATION
  System Mode Driver: DH-485 MASTER
  Write Protect: DISABLED
  Edit Resource/File Owner Timeout: 60 (seconds)
  Passthru Link ID: 2 (decimal)
    
```

Press a key for desired function

REM PROG no forces EDITS: NONE PROC Addr 1

ACCEPT EDITS	UNDO EDITS	CH0 SYS CONFIG	CH0 USR CONFIG	CH1 SYS CONFIG	SELECT OPTION
F1	F2	F4	F5	F7	F10

Use the following tables to configure the channels of your processor.

Parameter — Channel 1	Description		
	SLC 5/03 OS300	SLC 5/03 OS301, OS302	SLC 5/04 OS400, OS401
System Mode Driver	Toggles between DH-485 Master and Shutdown. The default is DH-485 Master.	Toggles between DH-485 Master and Shutdown. The default is DH-485 Master.	Toggles between DH+ and Shutdown. The default is DH+.
Write Protect	Toggles between Enabled and Disabled. The default is Disabled.	Toggles between Enabled and Disabled. The default is Disabled.	Toggles between Enabled and Disabled. If enabled, the channel ignores incoming write commands. The default is Disabled.
Edit Resource/File Owner Timeout	This is the communication timeout period (application layer). Valid range is 1-65535 seconds. The default is 60.	This is the communication timeout period (application layer). Valid range is 1-65535 seconds. The default is 60.	This is the communication timeout period (application layer). Valid range is 1-65535 seconds. The default is 60.
Passthru Link ID	Not Applicable	Valid range is 0-65534.	Valid range is 0-65534.

Parameter - Channel 0	Description	
	SLC 5/03 OS300	SLC 5/03 OS301, OS302 and SLC 5/04 OS400, OS401
Current Communication Mode	This field defaults to System and is non-selectable.	Toggles between System and User. The default is System.
System Mode Driver	Toggles between DF1 Half-Duplex Slave, DF1 Full-Duplex, DH-485, and Shutdown. The default is DF1 Full-Duplex.	Toggles between DF1 Half-Duplex Slave, DF1 Half-Duplex Master, DF1 Full-Duplex, DH-485 Master and Shutdown. The default is DF1 Full-Duplex.
User Mode Driver	Reserved	Toggles between Generic ASCII and shutdown. The default is Generic ASCII.
Write Protect	Toggles between Enabled and Disabled. The default is Disabled.	Toggles between Enabled and Disabled. If enabled, the channel ignores incoming write commands. The default is Disabled.
Mode Changes	Reserved	Toggles between Enabled and Disabled. The default is Disabled.
Mode Attention Character	Reserved	Allows you to enter any hexadecimal value or ASCII printable character. The default is \1b.
System Mode Character	Reserved	Allows you to enter any hexadecimal value or ASCII printable character. The default is S.
User Mode Character	Reserved	Allows you to enter any hexadecimal value or ASCII printable character. The default is U.
Edit Resource/File Owner Timeout	This is the communication timeout period (application layer). Valid range is 1-65535 seconds. The default is 60.	This is the communication timeout period (application layer). Valid range is 1-65535 seconds. The default is 60.
Passthru Link ID	Not Applicable	Valid range is 0-65534.

System Mode Driver Information for Channel 0

Each type of system mode driver has a channel configuration screen associated with it that allows you to select the configuration parameters. The following section describes the system modes available with channel 0 when using either an SLC 5/03 or SLC 5/04 processor. Use [F10] Select Option to change the configuration displays.

DH-485 Master Channel 0 Configuration

When the system mode driver for channel 0 or channel 1 is DH-485 Master, the following screen is displayed:

```

Channel 0 System Mode Configuration
-----
Communication Driver:          DH-485
Diagnostic File:              Reserved

Baud Rate:                   19200
Node Address:                 1
Max Node Address:            31

Token Hold Factor (1-4):     1
  
```

Press a key for desired status function

REM PROG

no forces

EDITS: NONE

PROC Addr 1

ACCEPT
EDITS

UNDO
EDITS

CHAN
STATUS

SELECT
OPTION

F1

F2

F9

F10

Separate channel configurations exist for channel 0 and channel 1 DH-485 Master configurations. You can configure channel 0 even if the current communication mode is set to User.

Parameter	Description
Diagnostic File	Reserved for future use.
Baud Rate	Toggles between the communication rate of 1200, 2400, 9600, and 19200. The default is 19200.
Node Address	This is the node address of the processor on the DH-485 network. The valid range is 1-31. The default is 1.
Max Node Address	This is the maximum node address of an active processor. The valid range is 1-31. The default is 31.
Token Hold Factor	Determines the number of transactions allowed to make each DH-485 token rotation. Increasing this value allows your processor to increase its DH-485 throughput. This also decreases throughput to others on the DH-485 link. The valid range is 1-4. The default is 1. SLC 5/01 and 5/02 processors are factory set to 1.

DF1 Half-Duplex Slave Channel 0 Configuration

When the system mode driver is DF1 Half-Duplex Slave for channel 0 the following screen is displayed:

```

Channel 0 System Mode Configuration
-----
Communication Driver:      DF1 HALF-DUPLEX SLAVE
Diagnostic File:          Reserved

Baud Rate:                1200          Parity:                NONE
Stop Bits:                1

Duplicate Detect:         ENABLED

Poll Timeout [x20 ms]:   50

Control Line:            NO HANDSHAKING

Station Address:         0
Error Detect:            CRC
RTS Off Delay [x20 ms]:  0
RTS Send Delay [x20 ms]: 0
Pre-send Time Delay [x1 ms]: 65535
Message Retries:        0
EOT Suppression:        NO
    
```

Press a key for desired status function

REM PROG

no forces

EDITS: NONE

PROC Addr 1

ACCEPT
EDITS

UNDO
EDITS

CHANNEL
STATUS

SELECT
OPTION

F1

F2

F9

F10

You can configure the DF1 Half-Duplex Slave driver even if the Current Communication Mode of channel 0 is set to User.

Parameter	Description
Diagnostic File	Reserved for future use.
Baud Rate	Toggles between the communication rate of 110, 300, 600, 1200, 2400, 4800, 9600, and 19200. The default is 1200.
Parity	Toggles between None and Even. The default is None.
Stop Bits	Toggles between 1, 1.5, and 2. The default is 1.
Station Address	The valid range is 0-254 decimal. The default is 1.
Duplicate Packet Detection	Toggles between Enabled and Disabled. The default is Enabled.
Error Detection	Toggles between CRC and BCC. The default is CRC.
RTS Off Delay	Allows you to select the RTS off delay value in increments of 20 ms. The valid range is 0-65535. The default is 0.
RTS Send Delay	Allows you to select the RTS send delay value in increments of 20 ms. The valid range is 0-65535. The default is 0.
Poll Timeout	Allows you to select the master poll timeout value in increments of 20 ms. The default is 50. The valid range is 0-65535.
Pre-send Time Delay	Allows you to select the RTS pre-transmit time delay in increments of 20 ms. The valid range is 0-65535.

Parameter	Description
Message Retries	Allows you to select the message retries value. The valid range is 0-255. The default is 3.
Control Line	Toggles between No Handshaking, Half-Duplex with continuous carrier, and Half-Duplex without continuous carrier. The default is No Handshaking.
EOT Suppression	Toggles between Yes and No. The default is No.

DF1 Half-Duplex Master Channel 0 Configuration

When the system mode driver is DF1 Half-Duplex Master for channel 0, the following screen is displayed:

```

----- Channel 0 System Mode Configuration -----
Communication Driver:      DF1 HALF-DUPLEX MASTER
Diagnostic File:          Reserved

Baud Rate:                19200          Parity:                NONE
Stop Bits:                1              Station Address:      254
Duplicate Detect:          DISABLED       Error Detect:          CRC
ACK Timeout [x20 ms]:    65535          RTS Off Delay [x20 ms]: 65535
Message Retries:          255            RTS Send Delay [x20 ms]: 65535
                                           Pre-send Time Delay [x1 ms]: 65535

Control Line:             HALF-DUPLEX WITHOUT CONTINUOUS CARRIER
Polling Mode:             MESSAGE BASED (DO NOT ALLOW SLAVE TO INITIATE MESSAGES)
Priority Polling Range - Low:100          Normal Polling Range - Low: 100
Priority Polling Range - High:100         Normal Polling Range - High: 100
Reply Message Wait Time [x20ms]: 65535   Normal Poll Group Size: 255

Press a key for desired status function

REM PROG          no forces          EDITS: NONE          PROC Addr 1
ACCEPT           UNDO
EDITS            EDITS
F1              F2
CHANNEL         SELECT
STATUS          OPTION
F9              F10
    
```

Parameter	Description
Diagnostic File	Reserved for future use.
Baud Rate	Toggles between the communication rate of 110, 300, 600, 1200, 2400, 4800, 9600, and 19200.
Parity	Toggles between None and Even. The default is None.
Stop Bits	Toggles between 1, 1.5, and 2. The default is 1.
Station Address	The valid range is 0–254 decimal. The default is 1.
Duplicate Packet Detection	Toggles between Enabled and Disabled. The default is Enabled.
Error Detection	Toggles between CRC and BCC. The default is CRC.
ACK Timeout	Allows you to select the ACK timeout value in increments of 20 ms. The valid range is 0–65535.
RTS Off Delay	Allows you to select the RTS off delay value in increments of 20 ms. The valid range is 0–65535. The default is 0.
Message Retries	Allows you to select the message retries value. The valid range is 0–255. The default is 3.
RTS Send Delay	Allows you to select the RTS send delay value in increments of 20 ms. The valid range is 0–65535. The default is 0.
Pre-send Time Delay	Allows you to select the RTS pre-transmit time delay in increments of 20 ms. The valid range is 0–65535.
Control Line	Toggles between No Handshaking, Full-Duplex Modem, and Half-Duplex Without Continuous Carrier.
Polling Mode	Toggles between Message Based (Do Not Allow Slave to Initiate Messages), Message Based (Allow Slave to Initiate Messages), Standard (Single Message Transfer Per Node Scan), and Standard (Multiple Message Transfer Per Node Scan).
Priority Polling – Low	Allows you to select the Priority Polling Range Low Address. The valid range is 0–255.
Normal Polling – Low	Allows you to select the Normal Polling Range Low Address. The valid range is 0–255.
Priority Polling – High	Allows you to select the Priority Polling Range High Address. The valid range is 0–254.
Normal Polling – High	Allows you to select the Normal Polling Range High Address. The valid range is 0–254.
Reply Message Wait Time	Allows you to select the Reply Message Wait Time setting in increments of 20 ms. The valid range is 0–65535.
Normal Poll Group Size	Allows you to select the Normal Poll Group Size. The valid range is 0–255.

DF1 Full-Duplex Channel 0 Configuration

When the system mode driver is a DF1 Full-Duplex for channel 0 the following screen is displayed:

```

Channel 0 System Mode Configuration
-----
Communication Driver:      DF1 FULL-DUPLEX
Diagnostic File:          Reserved

Baud Rate:                1200          Parity:                NONE
Stop Bits:                1              Error Detect:           CRC
Duplicate Detect:         ENABLED

ACK Timeout [20 ms]:     2              NAK Retries:           3
Source ID:                9              ENQ Retries:           3

Control Line:            NO HANDSHAKING  Embedded Responses:    ENABLED
  
```

Press a key for desired function

REM PROG

no forces

EDITS: NONE

PROC Addr 1

ACCEPT
EDITS

UNDO
EDITS

CHAN
STATUS

SELECT
OPTION

F1

F2

F9

F10

You can configure the DF1 Full-Duplex driver even if the Current Communication Mode of channel 0 is set to User.

Parameter	Description
Diagnostic File	Reserved for future use.
Baud Rate	Toggles between the communication rate of 110, 300, 600, 1200, 2400, 4800, 9600, and 19200. The default is 1200.
Parity	Toggle between None and Even. The default is None.
Stop Bits	Toggles between 1, 1.5, and 2. The default is 1.
Duplicate Packet Detection	Toggles between Disabled and Enabled. The default is Enabled.
Error Detection	Toggles between CRC and BCC. The default is CRC.
ACK Timeout	Valid range is 2-65535 (in 20 ms increment) The default is 50.
NAK Retries	Valid range is 0-255. The default is 3.
ENQ Retries	Valid range is 0-255. The default is 3.
Control Line	Toggles between No Handshaking and Full-Duplex modem. The default is No Handshaking.
Embedded Responses	Toggles between Enabled and Auto-Detect. The default is Enabled.
Source ID	Specify the address of the sender in this field. Valid range is 0-254. The default is 9.

Generic ASCII Channel 0 Configuration

When the user mode driver is Generic ASCII for channel 0 the following screen is displayed:

```

Channel 0 User Mode Configuration
-----
Communication Driver:      GENERIC ASCII
Diagnostic File:          Reserved

Baud Rate:                1200          Parity:                NONE
Stop Bits:                1             Data Bits:              7
Delete mode:              IGNORE        RTS off delay [20 ms]:  0
Echo:                     DISABLED     RTS send delay [20 ms]: 0

Control Line:            NO HANDSHAKING  XON/XOFF                DISABLED

Termination 1:           \d             Append 1:                \d
Termination 2:           \ff           Append 2:                \a
    
```

Press a key for desired function

REM PROG

no forces

EDITS: NONE

PROC Addr 1

ACCEPT
EDITS

UNDO
EDITS

CHAN
STATUS

SELECT
OPTION

F1

F2

F9

F10

Parameter	Description
Diagnostic File	Reserved for future use.
Baud Rate	Toggles between the communication rate of 110, 300, 600, 1200, 2400, 4800, 9600, and 19200. The default is 1200.
Parity	Toggles between None, Odd, and Even. The default is None.
Stop Bits	Toggles between 1, 1.5, and 2. The default is 1.
Data Bits	Toggles between 7 and 8. The default is 8.
Delete Mode	Toggles between Ignore, CRT, and printer. The default is Ignore. This parameter is dependent on the Echo parameter being Enabled.
Echo	Toggles between Disabled and Enabled. The default is Disabled.
RTS Off Delay	Allows you to select the RTS off delay value in increments of 20 ms. Valid range is 0-65535 (in 20 ms increment). The default is 0.
RTS Send Delay	Allows you to select the RTS send delay value in increments of 20 ms. Valid range is 0-65535 (in 20 ms increment). The default is 0.
Control Line	Toggles between No Handshaking, Half-Duplex With Continuous Carrier, Half-Duplex Without Continuous Carrier, and Full-Duplex Modem. The default is No Handshaking.
XON/XOFF	Toggles between Disabled and Enabled. The default is Disabled.
Termination 1 Termination 2	Specify FF for no termination character.
Append 1 Append 2	Specify FF for no append character.

System Mode Driver Information for Channel 1

The following section describes the system modes available for channel 1 when using either an SLC 5/03 or SLC 5/04 processor.

```

Channel Configuration
-----
CHANNEL 0 CONFIGURATION
  Current Communication Mode: SYSTEM
  System Mode Driver: DF1 FULL-DUPLEX
  User Mode Driver: SHUTDOWN
  Write Protect: DISABLED
  Mode Changes: DISABLED
  Mode Attention Character: /lb
  System Mode Character: S
  User Mode Character: U
  Edit Resource/File Owner Timeout: 60 (seconds)
  Passthru Link ID: 1 (decimal)

CHANNEL 1 CONFIGURATION
  System Mode Driver: DH+
  Write Protect: DISABLED
  Edit Resource/File Owner Timeout: 60 (seconds)
  Passthru Link ID: 2 (decimal)
  
```

Press a key for desired function

REM PROG	no forces	EDITS: NONE	PROC Addr 1
ACCEPT EDITS	UNDO EDITS	CH0 SYS CONFIG	CH0 USR CONFIG
CH1 SYS CONFIG	SELECT OPTION		
F1	F2	F4	F5
		F7	F10

Refer to the table on 13-9 for channel 1 configuration parameters.

DH+ Channel 1 Configuration (SLC 5/04 processors only)

When the system mode driver is DH+ for channel 1 pressing [F7] CH1 System Configuration displays the following:

Channel 1 System Mode Configuration

Communication Driver:	DH+	
Diagnostic File:	Reserved	
Baud Rate:	57600	
Node Address:	1 (octal)	
Global Status Word Transmit Enable	0	← Global Status Word parameters are available only for SLC 5/04 OS401 processors.
Global Status Word Receive Enable	0	
Global Status Transmit Word	S:99	
Global Status Receive File	S:100-S:163	

Press a key for desired function

REM PROG

no forces

EDITS: NONE

PROC Addr 1

ACCEPT
EDITS

UNDO
EDITS

CHAN
STATUS

SELECT
OPTION

F1

F2

F9

F10

Parameter	Description
Baud Rate	Toggles between the communication rate of 57.6K, 115.2K, and 230.4K. The default is 57.6K. A programming terminal only can communicate on a DH+ link configured for 57.6 Kbaud. Make sure all devices on your DH+ link are configured for the same communication rate.
Node Address	Valid range is 0-77 octal. The default is 1.
Global Status Word Transmit Enable ^①	Toggles between 0 and 1. The default is 0.
Global Status Word Receive Enable ^①	Toggles between 0 and 1. The default is 0.

^① This parameter is only available for SLC 5/04 OS401 processors.

Changing the Communication Mode of Channel 0

You can switch the communication mode of channel 0 as needed from user mode to system mode and vice versa. For example, if you are using channel 0 in user mode to control an ASCII device, like a printer or an Allen-Bradley Dataliner™ message display device, and you want to use channel 0 to connect online to the processor, do the following:

- Using the Channel Configuration screen, ensure that Mode Changes is enabled.

Channel Configuration

```

CHANNEL 0 CONFIGURATION
  Current Communication Mode: SYSTEM
  System Mode Driver: DF1 FULL-DUPLEX
  User Mode Driver: GENERIC ASCII
  Write Protect: DISABLED
  Mode Changes: ENABLED
  Mode Attention Character: /1b
  System Mode Character: S
  User Mode Character: U
  Edit Resource/File Owner Timeout: 60 (seconds)
  Passthru Link ID: 1 (decimal)

CHANNEL 1 CONFIGURATION
  System Mode Driver: DH-485 MASTER
  Write Protect: DISABLED
  Edit Resource/File Owner Timeout: 60 (seconds)
  Passthru Link ID: 2 (decimal)
    
```

If disabled, press SELECT OPTION
F10

Press a key for desired function

REM PROG	no forces	EDITS: NONE	PROC Addr 1
<div style="display: inline-block; border: 1px solid black; padding: 2px; margin: 2px;">ACCEPT EDITS</div> <div style="display: inline-block; border: 1px solid black; padding: 2px; margin: 2px;">UNDO EDITS</div>	<div style="display: inline-block; border: 1px solid black; padding: 2px; margin: 2px;">CH0 SYS CONFIG</div> <div style="display: inline-block; border: 1px solid black; padding: 2px; margin: 2px;">CH0 USR CONFIG</div>	<div style="display: inline-block; border: 1px solid black; padding: 2px; margin: 2px;">CH1 SYS CONFIG</div>	<div style="display: inline-block; border: 1px solid black; padding: 2px; margin: 2px;">SELECT OPTION</div>
F1	F2	F4	F5
		F7	F10

- Note the System Mode, User Mode, and Mode Attention characters. You send these characters to the processor to tell it to switch modes. The defaults are:

Parameter	Default value
Mode Attention Character	/1b
System Mode Character	S
User Mode Character	U

- Accept any edits.

4. Go to the main menu and press **ONLINE CONFIG** . Select Full-Duplex.
F2

```

Select Device
1747-PIC (DH-485)
1784-KR (DH-485)
1784-KL (DH+ Bridged)
1784-KT (DH+ Bridged)
KF3/KE (Full-Duplex)
Full-Duplex
Half-Duplex Slave
Full-Duplex (Micro)
1784-KL (DH+ Direct)
1784-KT (DH+ Direct)
1784-KT2 (DH+ Direct)
1784-KT2 (DH+ Bridged)
Interchange DH+ Direct
Interchange DH485
Interchange DH+ Bridged
ESC exits/Alt-U aborts changes
    
```

Press a function key, ENTER to select device, ESC or Alt-U to abort

DRIVER CONFIG
F2

SAVE TO FILE
F9

5. Press **DRIVER CONFIG** . You see:
F2

```

ONLINE CONFIGURATION
F1 Port COM1
Current Device Full-Duplex
F4 Source Address 7
F5 Destination Address 8
F7 Device/Modem/Full-Duplex Configuration
F9 Save to File
ESC exits/Alt-U aborts changes
    
```

Press a function key

PORT
F1

SELECT DEVICE
F2

SOURCE ADDRESS
F4

DEST ADDRESS
F5

DEVICE CONFIG
F7

SAVE TO FILE
F9

6. Press **DEVICE CONFIG** . You see:
F7

```

Device/Modem/Full Duplex Configuration
-----
F1 Baud Rate (PC to SLC)          1200
F2 Parity                          NONE
F3 Error Check                     CRC
F4 Use Modem (Flow Control)       YES

F5 Dial Phone Number              NO - BUT ALWAYS SEND INIT STRING
F6 Modem Init String              \1bs
F7 Phone Number
F8 Auto Disconnect                0 (minutes)

F9 Save to File
F10 Full Duplex Configuration

ESC exits/Alt-U aborts changes
    
```

Press a function key

BAUD RATE	PARITY	ERROR CHECK	USE MODEM	DIAL PHONE #	MODEM INIT	PHONE NUMBER	AUTO DISCNCT	SAVE TO FILE	FULL DUPLEX
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

7. Set the fields as follows:

Field	Value
F4 Use Modem	YES
F5 Dial Phone Number	No - But Always Send Init String
F6 Modem Init String	Delete any modem initialization that may be present. Replace it with: <i>your mode attention character</i> <i>your system mode character</i> The default is \1bs. This is the command that tells the processor to switch modes.

8. Return to the Main Menu by pressing [Enter] [Enter].
9. Go online by pressing **ONLINE** .
F1

You may or may not go online, depending if hardware handshaking was enabled.

If you:	Then:
went online	this procedure is finished
did not go online	<ol style="list-style-type: none">1. Repeat steps 4-6.2. Set F4 Use Modem to NO.3. Repeat steps 8-9 on page 13-21.

To switch the channel back to user mode, follow the steps above, but for the modem initialization string (step 7), enter *<your mode attention character><your user mode character>*. The default is `\1bU`.

Considerations When Communicating as a DF1 Slave on a Multi-drop Link

When communication is between either APS and an SLC 5/03 processor or between two SLC 5/03 processors via a slave-to-slave connection on a larger multi-drop link, the devices depend on a DF1 Master to give each of them polling permission to transmit in a timely manner. As the number of slaves increase on the link (up to 255), the time between polls for APS or the SLC 5/03 processor also increases. Additionally, the amount of time between polls to any one APS and/or SLC 5/03 processor also increases. This increase in time may become larger if you are using low baud rates.

As these time periods grow, the following values may need to be changed to avoid loss of communication:

- APS – poll timeout and reply timeout values
- SLC 5/03 processor – poll timeout and edit resource/file owner timeout values

To change the poll timeout and reply timeout values for APS, do the following:

1. At the main menu press [F2] Online Configuration, then [F2] Select Device until “Half-Duplex Slave” is displayed.
2. Press [F7] Device Configuration and then [F10] Half Duplex.
3. Change the poll timeout and reply timeout values using the appropriate function keys.
4. Press [F9] Save to File, then [ESC], [ESC], [ESC] and return to the main menu.

To change the SLC 5/03 processor poll timeout value, do the following:

1. At the Program Directory display, press [F8] Monitor File, then [F7] General Utility, then [F5] Channel Configuration.
2. Cursor to the System Mode Driver parameter and press [F10] Select Option until “DF1 Half-Duplex Slave” is displayed.
3. Press [F4] CH0 System Configuration. Cursor to the poll timeout parameter and press [F10] Select Option. Enter the new value and press [ENTER].

You can also change the edit resource/file owner timeout value at this time.

4. Press [F1] Accept Edits, then [ESC], [ESC], [ESC] and return to the Program Directory display.

If you are using MSG instructions between SLC 5/03 processors, the MSG timeout value shown in the control block may also need to be changed for reliable slave-to-slave communication on the multi-drop network.

14 *Restoring and Saving Processor Files*

This chapter shows you how to:

- go online (initiate communication with a processor)
- change the link address
- restore a file from the disk to a processor
- save an online processor file to disk

Communicating with a Processor

Before attempting to go online with a processor, you must have already configured your processor, established a network, and created a valid program.

Going Online

Once you have established a network and configured the necessary parameters, you are ready to go online. You can go online from the main menu two ways:

- Either pressing **ONLINE** **F1** from the main menu display, or
- by pressing **WHO** **F5**, then **WHO ACTIVE** **F5**. If you use the Who function you must select a processor with the arrow keys and then press **ONLINE** **F1**.

Note

If you have a SLC 5/04 processor configured for DH+ communication and you press [F5], WHO from the main APS menu, the DH+ WHO main menu is displayed. Pressing [F1], Online Program from the DH+ WHO main menu places your processor online and the APS online display appears.

If you are finished with communications using the current processor, and you want to communicate with another processor on the same network, use the change link address option. This method avoids going back to the main menu and having to re-establish communications.

Changing the Link Address

This option lets you change to another node address to monitor another processor file.

1. When you are online at the program directory display, press **CHG LINK ADDRESS** .
F4
2. To attach to node address 2, at the prompt line type: **2** and press [**ENTER**]. If the processor program is found on your disk and the processor is not password protected, the following display appears:

```
PROGRAM DIRECTORY FOR PROCESSOR: STOP_GO
```

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	74
1			reserved	0
2			ladder	48

Press a key, enter file number or file name

REM RUN L532 Series C Rev.2 PROC Addr 2

CHANGE PROCSSR	CHANGE PASSWRD	CHANGE PR. NAME	CHANGE FL. NAME	CLEAR MEMORY	CREATE FILE	DELETE FILE	MONITOR FILE
F1	F2	F3	F4	F5	F6	F7	F8

The above display is for processor file STOP_GO. Notice that the status line indicates that the APS terminal is communicating with PROC Addr 2. If you specify a node address that does not exist or is inactive, the message: **ILLEGAL DATA OR PARAMETER VALUE** is displayed.

3. If you are communicating with a processor and the processor loses power, the message: **MESSAGE TIMEOUTS - LOSS OF COMMUNICATIONS** appears.

At this point you can abort by pressing **YES** , or press **NO** to
F8 F10
continue and re-establish communications.

2. To restore the file EXAMPLE press **SAVE RESTORE** F2 . The following display appears:

Press a function key

REM PROG L532 Series C Rev.2 PROC Addr 1

SAVE PROGRAM	RESTORE PROGRAM
F2	F4

3. The word PROGRAM has the same meaning as Processor File. Press **RESTORE PROGRAM** F4 and the following display appears:

C:\IPDS\ARCH\SLC500*.ACH		
Name	Size	Date
EXAMPLE	829	10-07-95
SEQUENCE	8684	10-03-95
TOGGLE	8695	07-19-94

Press a Function Key or Enter File Name

REM PROG L532 Series C Rev.2 PROC Addr 1

BEGIN RESTORE	DEFINE DIR
F1	F7

4. Move the cursor in the right-hand window to EXAMPLE and press **SELECT FILE** F3 and [ENTER] . Or type in the file name and press [ENTER] .

5. Once you have selected the file, press **BEGIN RESTORE** . The existing online processor file SEQUENCE will be overwritten by file EXAMPLE. While EXAMPLE is being downloaded, the restore utility is displayed.

```

ROCKWELL SOFTWARE, INC.

9323 SERIES SOFTWARE

SLC-500 PROGRAM RESTORE UTILITY
    
```

```

File Name : C:\IPDS\ARCH\SLC500\EXAMPLE .ach
Processor Number: 1

A total of 4 data, 4 program, and 2 force table(s) created.
Downloaded 20 Words in 4 Data Files, 78 Words in 4 Program Files,
           2 Words in 2 Force Tables.
There are 0 undefined data and 0 undefined program file(s).
    
```

Press any key to continue

REM PROG

L532 Series C Rev.2

PROC Addr 1

The contents of the downloaded file is summarized in the display area. After you have reviewed the summary display, press any key to continue. When you do so, the program directory of processor file EXAMPLE appears:

```

PROGRAM DIRECTORY FOR PROCESSOR: EXAMPLE
    
```

FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	74
1			reserved	0
2			ladder	48

Press a key, enter file number or file name

REM PROG

L532 Series C Rev.2

PROC Addr 2

PROCSSR FUNCTNS	SAVE RESTORE	RETURN TO MENU	CHANGE LINK ADR	WHO ACTIVE	CREATE REPORTS	FILE OPTIONS	MONITOR FILE	DATA MONITOR	MEMORY MAP
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

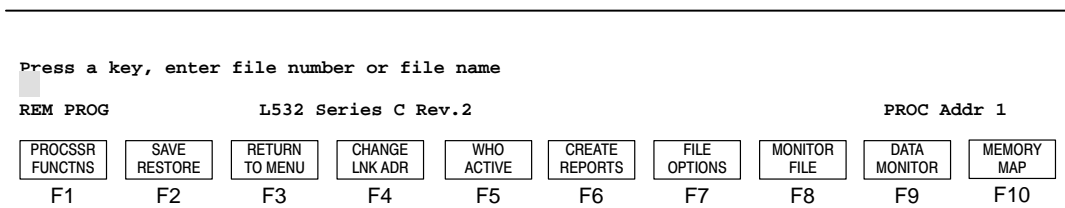
From this point, you can place the processor in REM Run mode, monitor operation, and perform other functions.

Saving a File

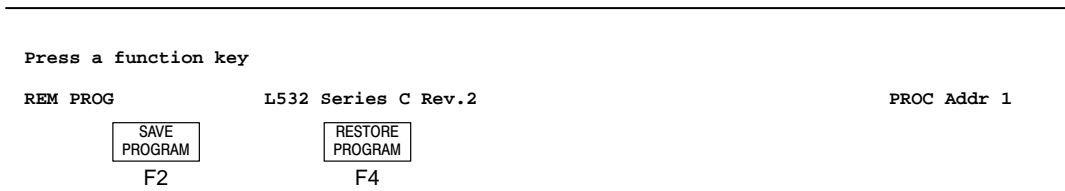
Use the Save function when:

- An online data change or a password change has been made to the file and you want the change to be a permanent part of the file.
- The file in the processor is from some other source (a memory module, an HHT, or another APS terminal) and you want to place a copy of the file on disk.

The Save function is accessed from the same menu level used to restore a processor file.



1. Assume that an online data change or password change has been made to a file already on disk, and you want to save the change. Press **SAVE RESTORE** . The following menu functions appear:



2. Press **SAVE PROGRAM** . The following display appears:


```
SAVE PROCESSOR PROGRAM TO DISK

File Name: EXAMPLE
```

FILE ALREADY EXISTS
Overwrite File?

REM PROG L532 Series C Rev.2

PROC Addr 1

YES

NO

F8

F10

If the file already exists on the hard disk the message line will indicate **FILE ALREADY EXISTS**. At this point you have the option to overwrite the file.

- To overwrite the file press **YES** . While uploading, the Program Save Utility display appears:

```
ROCKWELL SOFTWARE INCORPORATED

9323 SERIES SOFTWARE

SLC-500 PROGRAM SAVE UTILITY
```

```
File Name: C:\IPDS\ARCH\SLC500\EXAMPLE .ach
Processor Number: 1

There are    4 data files(s), 4 program files(s), 2 force table(s).
Uploaded    20 Words in 4 Data Files, 78 Words in 4 Program Files,
            2 Words in 2 Force Tables.
There are    0 undefined data and 0 undefined program file(s).
```

Press Any Key to Continue

REM PROG

L532 Series C Rev.2

PROC Addr 1

- After you press any key, the program directory display for file EXAMPLE reappears. If you wish to return to the main menu, press **RETURN TO MENU** .

F3

15 *Changing Processor Modes*

This chapter describes how to change the processor modes. It details information on:

- available modes of operation
- changing remote modes
 - single step test
 - single scan
 - continuous scan

Available Modes of Operation

The following section describes the available modes of operation for the SLC 500 processors and MicroLogix 1000 controllers.

SLC 5/01 and SLC 5/02 Processors and MicroLogix 1000 Controllers

Remote mode indicates that the processor can be changed via the communication channels. Since these processors do not have a keyswitch, all modes are considered to be remote. The following table summarizes the status of the processors while in the remote mode.

Status Line	Processor Mode
REM PROG	Program
REM RUN	Run
REM SRG (SLC 5/02 processor only) REM SSN REM CSN	Test - Single Step Test - Single Scan Test - Continuous Scan
FAULT xxxx	Faulted
REM SUSP	Run or Test

SLC 5/03 and SLC 5/04 Processors

The SLC 5/03 and SLC 5/04 processors have a 3-position keyswitch on the front panel of the module. The keyswitch allows you to select one of three modes of operation:

- RUN
- PROGram
- REMOTE program/test/run



The response time of changing the keyswitch from RUN to either REMote or PROGram can be up to 2.5 seconds (depending on the size of your user program). Do not use the keyswitch in place of a hard-wired master control relay or an emergency stop switch.

The following table details the different modes available to the SLC 5/03 and SLC 5/04 processors:

Keyswitch Position	Processor Mode	Status Line
RUN	Run	RUN
REMOTE	Run Program Test - Single Step Test - Single Scan Test - Continuous Scan	REM RUN REM PROG REM SRG REM SSN REM CSN
RUN	Run or Suspend	SUSP
REMOTE	Run, Test, or Suspend	REM SUSP
not applicable	Faulted	FAULT xxxx
PROG	Program	PROG



If you are online with an SLC 5/03 or SLC 5/04 processor and the keyswitch position is in RUN and you press the clear major fault function key, the processor enters the Run mode once you clear the fault.

You cannot restore a file from disk to the processor until the processor is placed in either the PROGRAM, REMote Program, or Fault mode. (The keyswitch is not in the RUN position.)

REMote Program Mode (All Processors)

The REMote Program mode facilitates the transfer of processor files through the restore function. In this mode the processor does not scan or execute the ladder program, and all outputs are de-energized. When the processor is in this mode it functions as if the keyswitch were in the PROGRAM position.

The remote program mode allows you to:

- Monitor the ladder program in the processor (without rung state indication).
- Set up I/O forces.
- Save a processor file to disk.
- Use the search function.
- Monitor and edit data files.
- Transfer processor files to and from a memory module. (*Does not apply to MicroLogix 1000 controllers.*)
- Perform SLC 5/03 and SLC 5/04 online edits.

REMOte Test Mode (All Processors)

The REM Test mode allows you to:

- Monitor the current ladder program as it is being executed.
- Save a processor file to disk.
- Use the search function.
- Force inputs and set up outputs.
- Monitor and edit data files.
- Run your program with output points disabled.
- Perform SLC 5/03 and SLC 5/04 online edits.

While you are in the REM Test mode, the processor scans or executes the ladder program, monitors input devices, and updates the output data files without energizing output circuits or devices. You can perform the following ladder program tests.

- **Single Step Test (SRG)** — This test mode applies to SLC 5/02, SLC 5/03 and SLC 5/04 processors. Use this test to verify proper ladder operation and for troubleshooting purposes. Single Step Test initiates the processor to scan and execute a single rung or group of rungs. Refer to the *Instruction Set Reference Manual* for additional information on this feature.
- **Single Scan (SSN)** — In this test mode, the processor executes a single operating cycle that reads the inputs, executes the ladder program, and updates all data without energizing output circuits.
- **Continuous Scan (CSN)** — This test mode is the same as the REMote Run mode, except output circuits are not energized. This allows you to troubleshoot or test your ladder program without energizing external output devices.

REMote Run Mode (All Processors)

The REMote Run mode allows you to:

- Monitor the ladder program, rung state, and data as it is being executed.
- Save a processor file to disk.
- Use the search function.
- Force inputs and set up outputs.
- Monitor and edit data files.
- Perform SLC 5/03 and SLC 5/04 online edits.
- Change a mode using a programmer.

While you are in the REM Run mode, the processor scans or executes the ladder program, monitors input devices, energizes output devices, and acts on enabled I/O forces.

When the processor is in this mode it functions as if the keyswitch were in the RUN position. Online program editing is allowed in this mode.

RUN Mode (SLC 5/03 and SLC 5/04 Processors)

When the keyswitch is in the RUN position, you can only change the mode by changing the keyswitch position. You cannot use a programming device to remove the processor from the Run mode. When the 5/03 keyswitch is in the RUN position, online editing and processor mode changes via Channels 0 and 1 are not permitted.

PROGRAM Mode (SLC 5/03 and SLC 5/04 Processors)

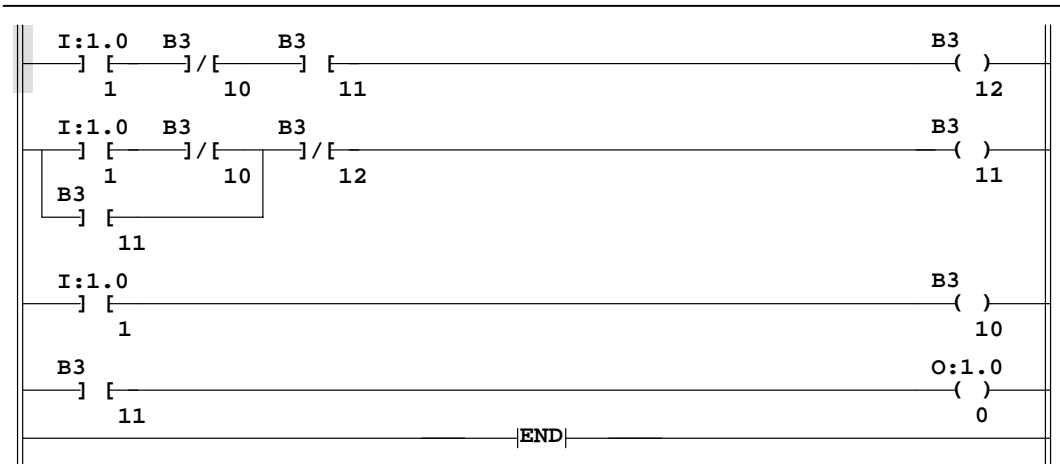
When the keyswitch is in either the RUN or PROG mode, you cannot use APS to take the processor out of the specified mode. You must change the keyswitch position to change the processor's mode.

When the SLC 5/03 and SLC 5/04 processor's keyswitch is in the REMote position, the processor remains in the mode it is currently in. With the keyswitch in this position you can change between REMote Program, REMote Test, and REMote Run using your programming device. Refer to status file S:2/4 and 2/18 in the *Instruction Set Reference Manual*. You can also toggle the mode from REMote-PROG-REMote or REMote-RUN-REMote using the keyswitch.

- The selection is accepted and the processor is placed in the REMote Run mode.

To monitor the program file, press **MONITOR FILE**. The ladder program appears:

F8



Press a function key
(file 2, rung 0)

REM RUN no forces PROC Addr 1

CHANGE MODE	CONFIG DISPLAY	EXIT	DOCUMNT	SEARCH	GENERAL UTILITY	DATA MONITOR	FORCE	OFFLINE EDIT
F1	F2	F3	F5	F6	F7	F8	F9	F10

The data entry line indicates that this is program file 2 and the cursor is on rung 0. The status line indicates that no forced I/O instructions exist.

Additionally, XIO instruction B3/10 (rungs 0 and 1), XIO instruction B3/12 (rung 1) and the END instruction are true.

XIC instruction I:0.0/1 in the ladder program represents an external input circuit. When the circuit closes, XIC instruction I:0.0/1 goes true. The ladder program will indicate this and the resulting changes in the logical status of other instructions.

In the above display all instructions are true except XIO instruction B3/10 (rungs 0 and 1) and OTE instruction B3/12 (rung 0).

Single Step Test

This mode is used with SLC 5/02, SLC 5/03, and SLC 5/04 processors. To use the Single Step Test mode with an SLC 5/02 processor, you must first save and compile your program offline with the Single Step option enabled. Refer to chapter 9 for saving files. Note that your program size and scan time increases when you use an SLC 5/02 processor. Refer to the *Instruction Set Reference Manual* for more information on estimating your scan time.

The Single Step Test mode is always available when using an SLC 5/03 or SLC 5/04 processor. Use the single step test mode to test a single rung or a group of rungs. When you enter this mode, “SRG” appears on the status line.

When in the Single Step Test mode, the power rail character B replaces an edit zone marker when execution reaches the break point or end rung while testing a group of rungs. The edit zone marker is redrawn once the rung is executed. For rungs with an I and R edit zone pair, the currently active rung will have its edit zone marker replaced with the Single Step Test rail character.

Note

The following four characteristics are associated with the Single Step Test mode (SRG) when using SLC 5/03 and SLC 5/04 processors:

- *You must modify your program to step through a fault routine. We recommend adding a test rung containing the Jump to Subroutine (JSR) instruction to the fault routine. Once you have done this, you will be able to step through the fault routine.*
- *The Selectable Timed Interrupt (STI) may appear to run 18% slower than background timers. This will cause the program timing to be skewed between the STI and other timers in your program.*
- *When stepping through user interrupts, the user watchdog timer is replaced by an internal software timer that will expire within approximately five seconds.*
- *A STI, DII, or I/O Event Interrupt cannot occur during an I/O scan or while servicing a communication packet. Interrupt subroutine execution will only occur between rungs while your program is being executed.*

To test a **single** rung at a time, do the following:

1. Press **SINGLE STEP** **F2**, then **EXECUTE STEP** **F8**. The processor executes an initialization scan. The blinking power rail indicates the next rung to be scanned (Rung 2:0).
2. Press **EXECUTE STEP** **F8** again. The processor then executes file 2, rung 0. The power rails on the next rung to be scanned now blink (Rung 2:1).
3. Repeat step 2 to proceed through your program one rung at a time.

To test a **group** of rungs, do the following:

1. Press **SINGLE STEP** **F2**, then **SET END RNG** **F1**. Enter the ending file and rung number the processor is to scan. For example: 2:10 (file 2, rung 10).
2. Press [**ENTER**]. The processor executes an initialization scan and then executes from the blinking rung to the specified ending rung. The power rails on the specified end rung now blink indicating that it is the next rung to be scanned.
3. Press [**ENTER**] and scan from the blinking rung through the end of the program and back to the blinking rung, or enter a new ending file and rung number and press [**ENTER**]. The processor scans from the existing rung with blinking power rails to the newly specified end rung.
4. Repeat step 3 to continue scanning groups of rungs.

To resume processor execution from rung 0 (or start over), exit the Single Step Test mode and enter the Program mode or any other mode. Then re-enter the Single Step Test mode.

Single Scan

When you enter this mode, “REM SSN” appears on the status line. To use the Single Scan mode, do the following:

1. Press **SINGLE SCAN** (F4), then **YES** (F8) to confirm your selection. The processor executes an initialization scan.
2. Press **SINGLE SCAN** (F4), then **YES** (F8) again. The processor scans the program once.
3. Repeat step 2 to execute subsequent scans.

Continuous Scan

When you enter this mode “REM CSN” appears on the status line. To use the Continuous Scan mode, do the following:

- Press **CONTINU SCAN** (F6), then **YES** (F8) to confirm your selection. The processor executes an initialization scan and continues scanning.

16 *Monitoring Controller Operation*

This chapter shows you how to use program files and data table files to monitor the operation of your controller.

The quick edit function is also discussed. This function allows you to change from monitoring a ladder rung online to editing the rung offline and vice versa. This chapter also shows you how to recover from a fault if one occurs while monitoring a file.

Monitoring Program Files

Program files contain controller information, the main ladder program, and any subroutine programs.

Once you have entered and saved your ladder program, you must download (restore) it to the processor. Downloading the ladder program ensures that the processor file matches the program file. To monitor your ladder program file:

1. Begin at the main menu and do one of the following options. (*Option b does not apply to MicroLogix 1000 controllers.*)

- a. Press **ONLINE**
F1 and go to step 4 on the next page.

- b. Press **WHO**
F5, then **WHO ACTIVE**
F5; select a processor to monitor and press **ONLINE**
F1.


Note

If you have an SLC 5/04 configured for DH+ communication and you press [F5], WHO from the main APS menu, the DH+ WHO main menu is displayed. Pressing [F1], Online Program from the DH+ WHO main menu places your processor online and the APS online display appears.

2. If the program file of the processor you selected cannot be found on the disk, the message: **NO MATCHING DISK FILE FOUND** is displayed. If you still want to monitor the file, press **YES**
F8 and the file is saved (uploaded). If you press **NO**
F10, you can restore (download) a different processor program from your terminal and monitor it.

If the processor is password protected, you are prompted to enter your existing password or the master password. You must enter a valid password at this time to continue.

If you enter a valid password, the Program Directory menu is displayed; you can monitor any program file listed. If you are unsuccessful after three attempts, the message **ILLEGAL PROGRAM ACCESS ATTEMPTED** is displayed and you are prompted to:

- either return to the main menu, or
 - select a different processor by pressing [F4], Change Link Address.
3. Make sure that the processor is in RUN or REM Run mode.
 4. Cursor to the program file you want to monitor (default is program file 2), then press  .
F8

Note

From the monitor file display, you can quickly access another file number and/or rung within the program file by typing either format at the command line:

- *file # : rung # (3:1)*
- *file # ; rung # (3;1)*

Monitoring your ladder program allows you to watch how the timers, counters, and accumulated values increase. Additionally, you can watch how the bits turn on and off as your program runs.

Note

Since the fixed, SLC 5/01, and SLC 5/02 processors, and MicroLogix 1000 controllers do not support online editing, their protection status is set to all program files protected. The SLC 5/03 and SLC 5/04 processors allow you to protect program files on a per file basis. However, you cannot perform online edits if your file is protected.

Performing a Quick Edit

The quick edit feature allows you to change from monitoring a ladder program online to editing the program offline, and vice versa. Use this feature with any of the SLC 500 processors or MicroLogix 1000 controllers.

2. Enter the type of program you want to edit by pressing either **OFFLINE PROCSSR** or **F1** **OFFLINE DISK** **F3**. If you are using an SLC 5/02 processor and the file already exists, the message: **OVERWRITE FILE** is displayed. Press **YES** **F8** if you want to overwrite the file and continue, or press **NO** **F10** and choose a different program to edit.

If you are using an SLC 5/03 or SLC 5/04 processor, you can press **ONLINE EDIT** **F7** and access the editing functions. If the operating system in your processor is capable of performing more advanced editing operations than your program indicates you can accept the advanced functions and your program will be updated.

Choose the processor program if you want to retain the current processor data. When you upload the ladder logic, all of the current data is captured.

Choose the disk program if you want to begin from a “default” base, such as with timers and counters. This option allows you to edit the data on the hard disk.

If you choose **DISK PROGRAM** and the disk file contains a password, the system prompts you to enter a password. If the processor password does not match the disk file password or the master password, the message: **WARNING, PROCESSOR PASSWORD(S) DO NOT MATCH DISK FILE PASSWORD(S)** is displayed.

This message warns you that if the disk file is restored to a processor, the processor takes on the disk file password.

- The status line identifies the current mode; REM Run, REM Test (SSN, CSN, or SRG), or REM Program. If you are in the REM Run or any of the REM Test modes, when you enter the type of program you want to edit, the message: **WARNING: PROCESSOR NOT IN PROGRAM MODE, DATA TABLE VALUES MAY BE CHANGING** is displayed.

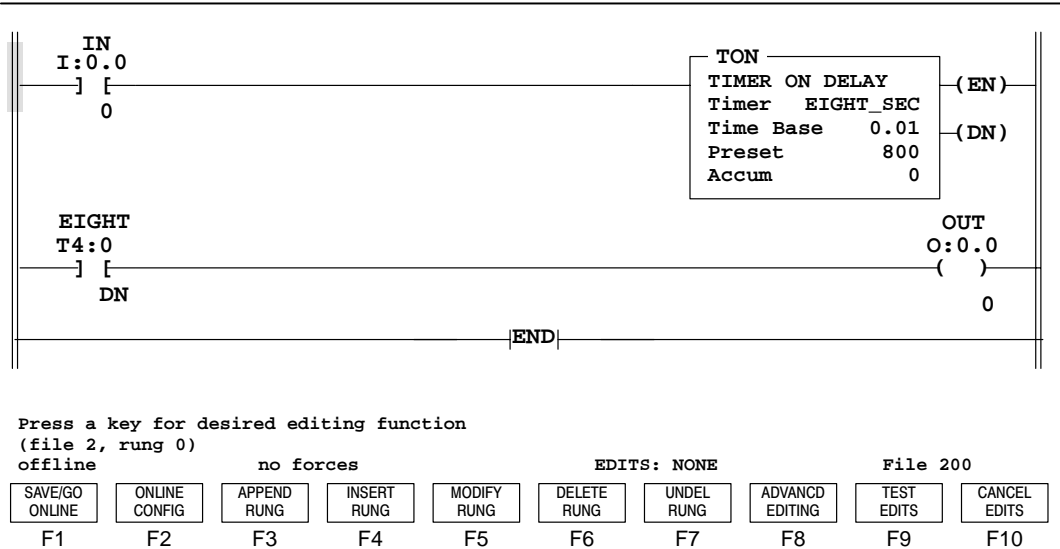
You are asked whether you want to proceed with the upload or not.

Note

If you proceed with the upload, the processor remains in the REM Run state after the upload.

Press **PROCEED** to proceed, or **NO** to cancel the edit.
F8 F10

- The message: **READING PROCESSOR PROGRAM; ...Working...** is displayed. After the program has been read, the edit display appears:



- Edit the ladder program. When done, accept the changes and press **SAVE/GO ONLINE**.
F1

SLC 5/03 and SLC 5/04 Processors — If edits are not assembled or canceled and the ladder program is saved, rungs marked with edit zones have the edit zones saved into the ladder program.

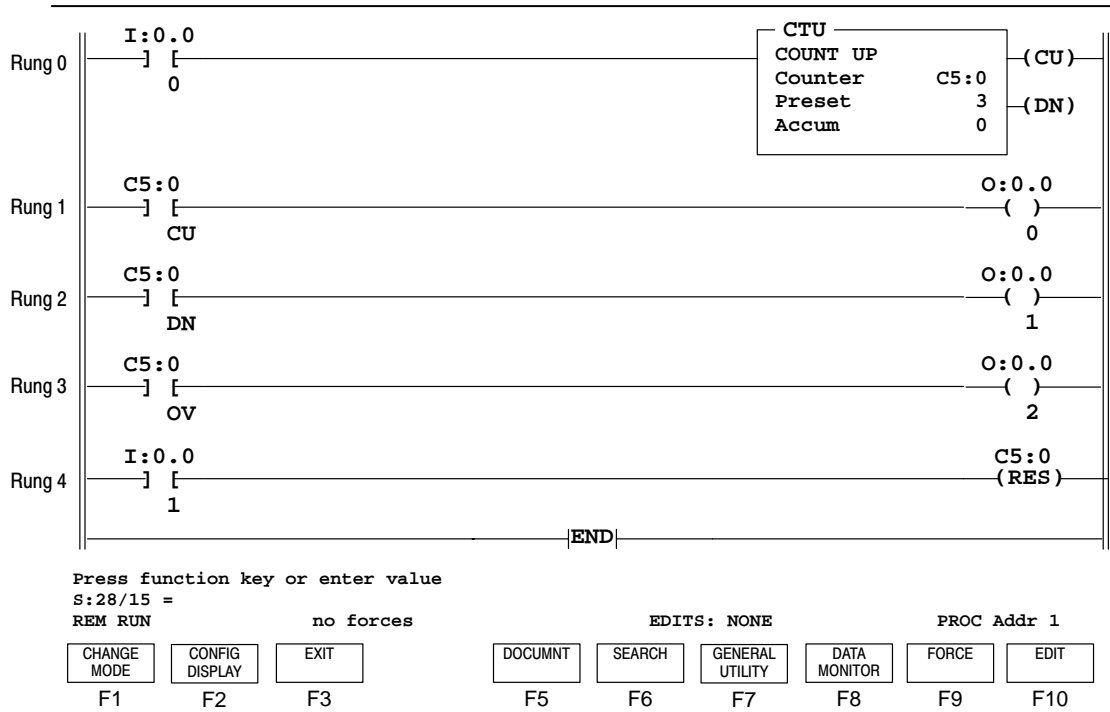
Monitoring an Application

A ladder program using an up counter is used as an example in this section. Using this example, you will see how to:

- monitor a program file
- view the data table file
- change the radices

Monitoring a Program File

1. Select the file using the arrow keys and then press **MONITOR FILE** (F8). The count up bit (CU or 15), done bit (DN or 13), and overflow bit (OV or 12) energize external outputs 0, 1, and 2 respectively. External input 0 enables the counter; external input 1 resets the counter.



2. Monitor the ladder program online while the processor is in either REM Run or REM CSN (Test Continuous Scan) mode and observe the following:
 - XIC instruction C5:0/CU (count up) and rung 1 will be true whenever rung 0 is true; and false whenever rung 0 is false.
 - Each time I:0.0/0 makes a false to true transition, the accumulator value (Accum) increments. The value is shown in the CTU instruction box of the ladder program.
 - When the accumulator value equals the preset value of 3, XIC instruction C5:0/DN (done bit) goes true, making rung 2 true. The instruction remains true as long as the accumulator value is greater than or equal to the preset value.

While monitoring the counter data file, observe how the status bits CU, DN, and OV change state and also how the accumulator value ACC increments.

Monitoring a Data Table File

This section describes the data table files that you can monitor. These files contain information used in your ladder program. Data table files include:

- Data File 0 — Output (O:)
- Data File 1 — Input (I:)
- Data File 2 — Status (S:)
- Data File 3 — Binary or Bit (B3:)
- Data File 4 — Timer (T4:)
- Data File 5 — Counter (C5:)
- Data File 6 — Control (R6:)
- Data File 7 — Integer (N7:)
- Data File 8 — Floating Point (F8:) (SLC 5/03 OS301, OS302 and SLC 5/04 OS400, OS401 processors)
- Data Files 9-255 — User created files. They can be bit, timer, counter, control, and integer files. For SLC 5/03 OS301, OS302 and SLC 5/04 OS400, OS401 processors floating point, string, and ASCII files are also supported.

Refer to the example displays of each file type starting on page 16–16.

When *offline*, use data table files 3-255 to set up sequencers, math routines, “recipes,” and look-up tables. When *online*, use data table files to reset timers and counters, and sequencers to test and/or troubleshoot.

Note *Data changes made Offline only affect the disk file unless the program is restored to the processor. Data changes made Online only affect the processor file unless the program is saved or uploaded while online to update the disk file.*

Accessing Data Table Files

There are several ways to access the Data Monitor function.

Option 1

At the Main menu press **ONLINE** (F1), then **MONITOR FILE** (F8), then **DATA MONITOR** (F8). Enter the address you want to monitor and press [ENTER].

Option 2

At the Main menu press **ONLINE** (F1), then either **DATA MONITOR** (F9) or [ALT-D]. Enter the address you want to monitor.

Option 3

Press **ONLINE** (F1) and then cursor to an instruction. Press **DATA MONITOR** (F9) or [ALT-D]. The data file corresponding to the instruction address is displayed.

Note *Data table file protection is available with any of the SLC 500 processors. However, the form of protection can only be changed during offline programming.*

- *Fixed and SLC 5/01 processors — output files are always statically protected and all other files are unprotected.*
- *SLC 5/02 processors — at the time you save your program you can statically protect output files, all files, or no files.*
- *SLC 5/03 and SLC 5/04 processors — you can choose between static or constant protection for data table files on a per file basis.*

Example

1. Access the data monitor by pressing **DATA MONITOR** . Enter the address of a counter **F8** file and press [**ENTER**]. In the following display, the accumulator value is 16 and the DN bit is set. Reset the counter by making rung 4 true momentarily. The ACC value and DN bit are reset to zero.

address	CU	CD	DN	OV	UN	UA	PRE	ACC
C5:0	0	0	1	0	0	0	3	16

Press a key or enter value

C5:0/CU =

REM CSN	no forces	formatted	decimal addr	PROC ADDR 1
---------	-----------	-----------	--------------	-------------

2. While you are online, change the preset and accumulator values at the counter data file display. Move the cursor to the preset, PRE, and enter 32,767 (maximum value). Move the cursor to the accumulator, ACC, and enter 32766. The display appears as follows:

address	CU	CD	DN	OV	UN	UA	PRE	ACC
C5:0	0	0	0	0	0	0	32767	32766

3. Increment the counter by turning on I:O.0/0. The accumulator value equals the preset value, the done bit DN is set, and rung 2 is true. Increment the counter again. The counter is in an overflow condition, setting the overflow bit OV. Rung 3 in the ladder program is now true.

address	CU	CD	DN	OV	UN	UA	PRE	ACC
C5:0	0	0	1	1	0	0	32767	-32768

The accumulator is on the 32,768th count, shown in the display as -32768. As the count continues to increment, the accumulator shows negative numbers of decreasing absolute value.

Changing the Radix

Radix refers to the way numeric based information is displayed on the status line. You can only change the radix for output, input, bit, and integer data files. Choices are:

- Binary
- Decimal – default radix for Global Status file
- Hex/BCD
- ASCII

1. From the Program Directory display, press **DATA MONITOR** or [ALT-D]. Enter the **F9** address you want to monitor and press [ENTER]. If you are currently on an address and you press either **DATA MONITOR** or [ALT-D], the system goes directly **F9** to monitoring the specified file. In the following example the display of an integer file is changed from decimal to binary, then from binary to hexadecimal, and then from hexadecimal to ASCII. The following display is in decimal.

address	0	1	2	3	4	5	6	7	8	9
N7:0	0	2	3	0	0	0	0	0	0	0
N7:10	0	0	0	0	0	0	0	0	0	0
N7:20	0	0	0	1098	0	0	0	0	0	0
N7:30	0	0	0	0	0	0	0	57	0	0
N7:40	0	0	0	0	0	0	0	0	0	0
N7:50	0	0	0	0	0	0	0	0	0	0
N7:60	0	0	0	0	0	0	0	0	0	0
N7:70	0	0	0	0	0	0	0	0	0	0
N7:80	0	0	0	0	0	0	0	0	0	0
N7:90	0	0	0	0	0	0	0	0	0	0
N7:100	2043									

Press a key or enter value
 N7:23 =

REM PROG	no forces	decimal data	decimal addr	PROC Addr 1
----------	-----------	--------------	--------------	-------------

<input type="button" value="CHANGE RADIX"/>	<input type="button" value="SPECIFY ADDRESS"/>	<input type="button" value="NEXT FILE"/>	<input type="button" value="PREV FILE"/>
F1	F5	F7	F8

Notice that the status line identifies the type of display. In this case the display is for decimal data.

Function Key	Description
[F1] Change Radix	Allows you to change the format display of data. Choices are: Binary, Decimal, HEX/BCD, or ASCII.
[F5] Specify Address	Moves the cursor to any address within the data file or to any other data file by first pressing [F5], entering the address, and pressing [ENTER].
[F7] Next File	Accesses the next data file.
[F8] Previous File	Accesses the previous data file.

2. Change the radix by pressing **CHANGE RADIX** . The following function keys are displayed:

Press a key or enter value
(file 2, rung 0)

REM PROG no forces decimal data decimal addr PROC Addr 1

BINARY	DECIMAL DATA	HEX/BCD DATA	ASCII DATA
F1	F3	F4	F5

3. Press **BINARY** . The display changes to the following:

address	15	data	0	address	15	data	0		
N7:0	0000	0000	0000	0000	N7:16	0000	0000	0000	0000
N7:1	0000	0000	0000	0010	N7:17	0000	0000	0000	0000
N7:2	0000	0000	0000	0011	N7:18	0000	0000	0000	0000
N7:3	0000	0000	0000	0000	N7:19	0000	0000	0000	0000
N7:4	0000	0000	0000	0000	N7:20	0000	0000	0000	0000
N7:5	0000	0000	0000	0000	N7:21	0000	0000	0000	0000
N7:6	0000	0000	0000	0000	N7:22	0000	0000	0000	0000
N7:7	0000	0000	0000	0000	N7:23	0000	0100	0100	1010
N7:8	0000	0000	0000	0000	N7:24	0000	0000	0000	0000
N7:9	0000	0000	0000	0000	N7:25	0000	0000	0000	0000
N7:10	0000	0000	0000	0000	N7:26	0000	0000	0000	0000
N7:11	0000	0000	0000	0000	N7:27	0000	0000	0000	0000
N7:12	0000	0000	0000	0000	N7:28	0000	0000	0000	0000
N7:13	0000	0000	0000	0000	N7:29	0000	0000	0000	0000
N7:14	0000	0000	0000	0000	N7:30	0000	0000	0000	0000
N7:15	0000	0000	0000	0000	N7:31	0000	0000	0000	0000

Press a key or enter value
N7:0 =

REM PROG no forces binary data decimal addr PROC Addr 1

CHANGE RADIX	SPECIFY ADDRESS	NEXT FILE	PREV FILE
F1	F5	F7	F8

4. Notice that the status line now displays binary data. Now press **CHANGE RADIX** and

F1

then **HEX/BCD DATA**. The display changes to the following:

F4

address	0	1	2	3	4	5	6	7	8	9
N7:0	0000	0001	0002	0004	0008	0010	0020	0040	0080	0000
N7:10	0000									

Press a key or enter value
 N7:0 =
 REM PROG no forces HEX/BCD data decimal addr PROC Addr 1

CHANGE RADIX	SPECIFY ADDRESS	NEXT FILE	PREV FILE
F1	F5	F7	F8

5. Notice that the status line now displays hex/bcd data. Press **CHANGE RADIX** and then

F1

ASCII DATA

. The display changes to the following:

F5

address	0	1	2	3	4	5	6	7	8	9
N7:0	\00\00	\00\01	\00\02	\00\04	\00\08	\00\10	\00\20	\00\40	\00\80	\00\00
N7:10	\00\00									

Press a key or enter value
 N7:0 =
 REM PROG no forces ASCII data decimal addr PROC Addr 1

CHANGE RADIX	SPECIFY ADDRESS	NEXT FILE	PREV FILE
F1	F5	F7	F8

Fault Recovery Procedure

To remove a fault condition and return to the RUN or REMote Run mode, do the following:

1. Press **ONLINE** (F1), then **DATA MONITOR** (F9). Press the letter **S** and then press [**ENTER**].

The first screen of the status file contains the fault code and fault description.

```

ARITHMETIC FLAGS      S:0          Z:0          V:0          C:0
1 → PROCESSOR STATUS  00000000 00000000  SUSPEND CODE      0
   PROCESSOR STATUS  00000000 00000001  SUSPEND FILE      0
2 → PROCESSOR STATUS  00000000 00000000
   MINOR FAULT       00000000 00000000  WATCHDOG [x10 ms] 10
3 → FAULT CODE        0000          0000  LAST SCAN [x10 ms] 0
   FAULT DESCRIPTION: 0000          0000  FREE RUNNING CLOCK 00000000 00000000
4 → MATH REGISTER     0000 0000


ACTIVE NODE LIST      I/O SLOT ENABLES
0          10          20          30          0          10          20          30
11000000 00000000 00000000 00000000  11111111 11111111 11111111 11111111

PROCESSOR BAUD RATE (Channel 1) 19200  PROCESSOR ADDRESS: 1

Press function key or enter value, press Alt-H for help.
S:0/0 = 
offline      no forces      formatted      decimal addr      File 09TEST

PAGE UP      PAGE DOWN      SPECIFY ADDRESS      NEXT FILE      PREV FILE      CLR MIN FAULT      CLR MAJ FAULT
F1          F2          F5          F7          F8          F9          F10
    
```

- 1 Word S:1. Bit S:1/13 in this word is the major fault bit. Cleared by pressing [F10] Clear Major Fault.
- 2 Word S:5. Minor fault bits. Cleared by pressing [F9] Clear Minor Fault or [F10] Clear Major Fault.
- 3 Word S:6. Fault code. Cleared by pressing [F10] Clear Major Fault.
- 4 Fault description. A textual description of the fault code. Cleared by pressing [F10] Clear Major Fault.

2. Remove the fault by pressing . This clears words S:1/13, S:5, and F10 S:6. Refer to the *Instruction Set Reference Manual* for more information on possible faults and their cause.
3. Once the fault code is cleared, the code 0000 is displayed.



SLC 5/03 and SLC 5/04 processors - clearing these bits with the keyswitch in the RUN position causes the processor to immediately enter the RUN mode.

4. Re-enter the REMote Run or RUN mode. When you return to the RUN mode all forces and latches are in effect.



If you are online with an SLC 5/03 and/or SLC 5/04 processor and the keyswitch position is in RUN and you press the clear major fault function key, the processor enters the RUN mode once you clear the fault.

Data Table File Displays

The following section provides a sample screen for each type of data table status file display. The displays for timer, counter, control, floating point, and status data files are pre-formatted, which means the option of changing radix is not available.

Note

The memory space for the MicroLogix 1000 controllers is already allocated. Therefore, their status file displays show the full range of elements.

Input Data Files (I:) and Output Data Files (O:)

The input and output data files display the elements that correspond to the specified controller I/O configuration. In the display below, a fixed controller having 12 inputs is shown.

```

address 15      data 0      address 15      data 0
I:0.0          0000 0000 0000

Press a key or enter value
I:0.0/0 :
REM PROG      no forces          binary data      decimal addr      PROC Addr 1

CHANGE RADIX          SPECIFY ADDRESS          FORCE MONITOR          NEXT FILE          PREV FILE
F1                    F5                    F6                    F7                    F8
    
```

Bit Data File (B3:)

The display below shows the bit data file. In the display below, two elements are shown; B3:0 and B3:1 with all bits reset to zero.

```

address 15      data 0      address 15      data 0
B3:0          0000 0000 0000 0000
B3:1          0000 0000 0000 0000

Press a function key
B3/0 :
REM PROG      no forces          binary data      decimal addr      PROC Addr 1

CHANGE RADIX          SPECIFY ADDRESS          NEXT FILE          PREV FILE
F1                    F5                    F7                    F8
    
```

Integer Data File (N7:)

The display below shows the integer data file. There are 101 elements in the file. The cursor is on N7:23, which has a value of 1098.

address	0	1	2	3	4	5	6	7	8	9
N7:0	0	2	3	0	0	0	0	0	0	0
N7:10	0	0	0	0	0	0	0	0	0	0
N7:20	0	0	0	1098	0	0	0	0	0	0
N7:30	0	0	0	0	0	0	0	57	0	0
N7:40	0	0	0	0	0	0	0	0	0	0
N7:50	0	0	0	0	0	0	0	0	0	0
N7:60	0	0	0	0	0	0	0	0	0	0
N7:70	0	0	0	0	0	0	0	0	0	0
N7:80	0	0	0	0	0	0	0	0	0	0
N7:90	0	0	0	0	0	0	0	0	0	0
N7:100	2043									

Press a function key
N7:23 :

REM PROG	no forces	decimal data	decimal addr	PROC Addr 1
<input type="button" value="CHANGE RADIX"/>		<input type="button" value="SPECIFY ADDRESS"/>	<input type="button" value="NEXT FILE"/>	<input type="button" value="PREV FILE"/>
F1		F5	F7	F8

Timer Data File (T4:)

The display below shows the timer data file. The cursor in the display area is on the enable bit (EN) of timer T4:0, address T4:0/EN. There are four timers in the file.

address	EN	TT	DN	BASE	PRE	ACC
T4:0	0	0	0	01 sec	0	0
T4:1	0	0	0	01 sec.	0	0
T4:2	0	0	0	01 sec.	0	0
T4:3	0	0	0	01 sec.	0	0

Press a function key
T4:0/EN =

REM PROG	no forces	formatted	decimal addr	PROC Addr 1
		<input type="button" value="SPECIFY ADDRESS"/>	<input type="button" value="NEXT FILE"/>	<input type="button" value="PREV FILE"/>
		F5	F7	F8

Counter Data File (C5:)

The display below shows the counter data file. The cursor is on the Count Up Enable bit (CU) of counter C5:0, address C5:0/CU. There are three counters in the file.

address	CU	CD	DN	OV	UN	UA	PRE	ACC
C5:0	0	0	0	0	0	0	3601	1602
C5:1	0	0	0	0	0	0	24	15
C5:2	0	0	0	0	0	0	0	0

Press a function key
 C5:0/CU =

REM PROG	no forces	formatted	decimal addr	PROC Addr 1
----------	-----------	-----------	--------------	-------------

<input type="button" value="SPECIFY ADDRESS"/>	<input type="button" value="NEXT FILE"/>	<input type="button" value="PREV FILE"/>
F5	F7	F8

Control Data File (R6:)

The display below shows the control data file. The cursor in the display area is on the enable bit of control element R6:0, address R6:0/EN. In the control element there are eight control bits. The fixed controller and SLC 5/01 processor have six control elements. The SLC 5/02, SLC 5/03, and SLC 5/04 processors have eight control elements.

address	EN	EU	DN	EM	ER	UL	IN	FD	LEN	POS
R6:0	0	0	0	0	0	0	0	0	0	0
R6:1	0	0	0	0	0	0	0	0	0	0
R6:2	0	0	0	0	0	0	0	0	0	0
R6:3	0	0	0	0	0	0	0	0	0	0
R6:4	0	0	0	0	0	0	0	0	0	0

Press a function key
 R6:0/EN =

REM PROG	no forces	formatted	decimal addr	PROC Addr 1
----------	-----------	-----------	--------------	-------------

<input type="button" value="SPECIFY ADDRESS"/>	<input type="button" value="NEXT FILE"/>	<input type="button" value="PREV FILE"/>
F5	F7	F8

Note

The IN bit is the Running bit (RN) for ASCII instructions.

Floating Point Data File (F8:)

The display below shows the floating point data file. The cursor in the display area is on F8:0.

address	0	1	2	3	4
F8:0	0.000000	0.000000	0.000000	0.000000	0.000000
F8:5	0.000000	0.000000	0.000000	0.000000	0.000000
F8:10	0.000000	0.000000	0.000000	0.000000	0.000000
F8:15	0.000000	0.000000	0.000000	0.000000	0.000000
F8:20	0.000000	0.000000	0.000000	0.000000	0.000000
F8:25	0.000000	0.000000	0.000000	0.000000	0.000000
F8:30	0.000000	0.000000	0.000000	0.000000	0.000000
F8:35	0.000000	0.000000	0.000000	0.000000	0.000000
F8:40	0.000000	0.000000	0.000000	0.000000	0.000000

Press a function key or enter a value

F8:0 =

REM PROG no forces float decimal addr PROC Addr 1

SPECIFY ADDRESS	NEXT FILE	PREV FILE
F5	F7	F8

ASCII Data File

The display below shows the ASCII data file.

address	0	1	2	3	4	5	6	7	8	9
A15:0	\00\00	\00\01	\00\02	\00\04	\00\08	\00\10	\00\20	\00\40	\00\80	\00\00
A15:10	\00\00	\00\00	\00\00	\00\00	\00\08	\00\00	\00\00	\00\00	\00\00	\00\00
A15:20	\00\00	\00\00	\00\00	\00\00	\00\08	\00\00	\00\00	\00\00	\00\00	\00\00
A15:30	\00\00	\00\00	\00\00	\00\00	\00\08	\00\00	\00\00	\00\00	\00\00	\00\00
A15:40	\00\00	\00\00	\00\00	\00\00	\00\08	\00\00	\00\00	\00\00	\00\00	\00\00

Press a key or enter value

A15:10

REM PROG no forces ASCII decimal addr PROC Addr 1

CHANGE RADIX	SPECIFY ADDRESS	NEXT FILE	PREV FILE
F1	F5	F7	F8

Module Files (M0/M1) Data File

The display below shows the M0/M1 data file.

address	data	address	data	address	data	address	data
M0:1.0	0000	M0:1.16	0000	M0:1.32	0000	M0:1.48	0000
M0:1.1	0000	M0:1.17	0000	M0:1.33	0000	M0:1.49	0000
M0:1.2	0000	M0:1.18	0000	M0:1.34	0000	M0:1.50	0000
M0:1.3	0000	M0:1.19	0000	M0:1.35	0000	M0:1.51	0000
M0:1.4	0000	M0:1.20	0000	M0:1.36	0000	M0:1.52	0000
....
....

Press a function key or enter a value

R6:0/EN =

REM RUN no forces formatted decimal addr PROC Addr 1

<input type="button" value="CHANGE RADIX"/>	<input type="button" value="SPECIFY ADDRESS"/>	<input type="button" value="NEXT FILE"/>	<input type="button" value="PREV FILE"/>
F1	F5	F7	F8

String Data File

The display below shows the string data file.

address	LEN	STRING TEXT
ST10:0	9	HELLO MOM
ST10:1	0	
ST10:2	0	
ST10:3	0	

Press a function key or enter a value

ST10:0: =

REM RUN no forces formatted decimal addr PROC Addr 1

<input type="button" value="CHANGE RADIX"/>	<input type="button" value="EDIT STRING"/>	<input type="button" value="SPECIFY ADDRESS"/>	<input type="button" value="NEXT FILE"/>	<input type="button" value="PREV FILE"/>
F1	F3	F5	F7	F8

Status Data File (S2:)

The displays below show the status data files for the fixed, SLC 5/01, SLC 5/02, SLC 5/03, and SLC 5/04 processors, and MicroLogix 1000 controllers.

The number of words in the status file vary depending on the type of the processor:

- fixed and SLC 5/01 processor – 16 words
- SLC 5/02 processor and MicroLogix 1000 controller – 33 words
- SLC 5/03 processor – 83 words
- SLC 5/04 OS400 processor – 97 words
- SLC 5/04 OS401 processor – 164 words

Status File for Fixed, SLC 5/01, and SLC 5/02 Processors (Display 1)

```

ARITHMETIC FLAGS   S:0           Z:0           V:0  C:0

PROCESSOR STATUS   00000000 00000000   SUSPEND CODE      0
PROCESSOR STATUS   00000000 00000001   SUSPEND FILE      0
PROCESSOR STATUS   00000000 00000000

MINOR FAULT        00000000 00000000   WATCHDOG [x10 ms] 10
FAULT CODE          0000           LAST SCAN [x10 ms] 0
FAULT DESCRIPTION:  FREE RUNNING CLOCK 00000000 00000000

MATH REGISTER      0000 0000

ACTIVE NODE LIST   I/O SLOT ENABLES
0          10          20          30          0          10          20          30
00000000 00000000 00000000 00000000 11111111 11111111 11111111 11111111

PROCESSOR BAUD RATE      19200   PROCESSOR ADDRESS      1

```

Press function key or enter value, press Alt-H for help.

S:0/0 =

offline no forces

formatted decimal addr

File EXAMPLE

PAGE
UP

PAGE
DOWN

SPECIFY
ADDRESS

NEXT
FILE

PREV
FILE

CLR MIN
FAULT

CLR MAJ
FAULT

F1

F2

F5

F7

F8

F9

F10

Status File for SLC 5/03 Processors (Display 1)

```

ARITHMETIC FLAGS  S:0          Z:0          V:0          C:0

PROCESSOR STATUS  00000000 00000000    SUSPEND CODE      0
PROCESSOR STATUS  00000000 00000001    SUSPEND FILE      0
PROCESSOR STATUS  00000000 00000000

MINOR FAULT      00000000 00000000    WATCHDOG          [x10 ms] 10
FAULT CODE       0000          0000    LAST SCAN         [x10 ms] 0
FAULT DESCRIPTION:  FREE RUNNING CLOCK 00000000 11110010

MATH REGISTER          0000 0000

ACTIVE NODE LIST (CHANNEL 1)  I/O SLOT ENABLES
0          10          20          30          0          10          20          30
11000000 00000000 00000000 00000000    11111111 11111111 11111111 11111111

PROCESSOR BAUD RATE (CHANNEL 1) 19200    PROCESSOR ADDRESS (CHANNEL 1) 1
    
```

Press a key or enter value, press Alt-H for help.

S:0/0 =

offline no forces

formatted

decimal addr

File EXAMPLE

PAGE
UP

PAGE
DOWN

SPECIFY
ADDRESS

NEXT
FILE

PREV
FILE

CLR MIN
FAULT

CLR MAJ
FAULT

F1

F2

F5

F7

F8

F9

F10

Status File for SLC 5/04 OS400 Processors (Display 1)

```

ARITHMETIC FLAGS  S:0          Z:0          V:0          C:0

PROCESSOR STATUS  00000000 00000000    SUSPEND CODE      0
PROCESSOR STATUS  00000000 00000001    SUSPEND FILE      0
PROCESSOR STATUS  00000000 00000000

MINOR FAULT      00000000 00000000    WATCHDOG          [x10 ms] 10
FAULT CODE       0000          0000    LAST SCAN         [x10 ms] 0
FAULT DESCRIPTION:  FREE RUNNING CLOCK 00000000 00000000

MATH REGISTER          0000 0000

I/O SLOT ENABLES
0          10          20          30          11111111 11111111 11111111 11111111
    
```

Press function key or enter value, press Alt-H for help.

S:0/0 =

offline no forces

formatted

decimal addr

File 09TEST

PAGE
UP

PAGE
DOWN

SPECIFY
ADDRESS

NEXT
FILE

PREV
FILE

CLR MIN
FAULT

CLR MAJ
FAULT

F1

F2

F5

F7

F8

F9

F10

Status File for SLC 5/04 OS401 Processors (Display 1)

```

ARITHMETIC FLAGS      S:0          Z:0          V:0  C:0

PROCESSOR STATUS      00000000 00000000  SUSPEND CODE          0
PROCESSOR STATUS      00000000 00000001  SUSPEND FILE          0
PROCESSOR STATUS      00000000 00000000
WATCHDOG              [x10 ms]          10
LAST SCAN             [x10 ms]          0
MINOR FAULT           00000000 00000000  FREE RUNNING CLOCK    00000000 00000000
FAULT CODE            0000
FAULT DESCRIPTION:

MATH REGISTER          0000 0000

GLOBAL STATUS TRANSMIT WORD      0  I/O SLOT ENABLES
GLOBAL STATUS WORD TRANSMIT ENABLE 0  0          10          20          30
GLOBAL STATUS WORD RECEIVE ENABLE 0  11111111 11111111 11111111 11111111

PROCESSOR BAUD RATE (CHANNEL 1)  57600  PROCESSOR ADDRESS  01 octal (01 dec)

Press function key or enter value, press Alt-H for help.
S:0/0 = 
offline      no forces          formatted      decimal addr      File EXAMPLE

PAGE UP      PAGE DOWN      GLOBAL STATUS  SPECIFY ADDRESS      NEXT FILE      PREV FILE      CLR MIN FAULT      CLR MAJ FAULT
F1           F2           F4           F5           F7           F8           F9           F10

```

Status File for MicroLogix 1000 Controllers (Display 1)

```

ARITHMETIC FLAGS      S:0          Z:0          V:0  C:0

PROCESSOR STATUS      00000001 00000000  SUSPEND CODE          0
PROCESSOR STATUS      00000000 00000001
PROCESSOR STATUS      00000000 00000010  WATCHDOG              [x10 ms]  10
LAST SCAN             [x10 ms]  0
MINOR FAULT           00000000 00000000  MAXIMUM SCAN          [x10 ms]  0
FAULT CODE            0000  FREE RUNNING CLOCK    00000000 00000000
FAULT DESCRIPTION:

MATH REGISTER          0000 0000  SELECTABLE TIMED INTERRUPT
SETPOINT              [x10 ms]  0
INDEX REGISTER VALUE  0  ENABLED              1
EXECUTING              0
PROCESSOR BAUD RATE   9600  PENDING              0

Press function key or enter value, press Alt-H for help.
S:0/0 = 
offline      no forces          formatted      decimal addr      File EXAMPLE

SPECIFY ADDRESS      NEXT FILE      PREV FILE      CLR MIN FAULT      CLR MAJ FAULT
F5           F7           F8           F9           F10

```

Status File for SLC 5/02 Processors (Display 2)

```

I/O SLOT INTERRUPT ENABLES
LAST SCAN [x10 ms]:      0      0      10      20      30
                        00000000 00000000 00000000 00000000
AVERAGE SCAN [x10 ms]:  0
MAXIMUM SCAN [x10 ms]:  1      I/O SLOT INTERRUPT PENDING
                        0      10      20      30
INDEX REGISTER VALUE:   4      00000000 00000000 00000000 00000000
INDEX ACROSS FILES:     NO

FAULT ROUTINE SUBROUTINE FILE: 0      I/O INTERRUPT FILE EXEC:      0

SELECTABLE TIMED INTERRUPT      SINGLE STEP TEST      FILE RUNG
SUBROUTINE FILE:                 0      START STEP ON:        2      3
SETPOINT [x10 ms]:              0      END STEP BEFORE:      0      0
ENABLED:                         1      FAULT/POWER DOWN:    2      3
EXECUTING:                       0      COMPILED FOR SINGLE STEP: NO
PENDING:                         0
1 ms TIMEBASE                    0      STI LOST:              0
    
```

Press a key or enter value, press Alt-H for help.

s:28/15 =

offline no forces formatted decimal addr File EXAMPLE

PAGE
UP

PAGE
DOWN

SPECIFY
ADDRESS

NEXT
FILE

PREV
FILE

F1

F2

F5

F7

F8

Status File for SLC 5/03 and SLC 5/04 Processors (Display 2)

```

I/O SLOT INTERRUPT ENABLES
LAST SCAN (x01 ms)      0      I/O SLOT INTERRUPT ENABLES
LAST SCAN [x10 ms]:    0      0      10      20      30
1 ms TIMEBASE (SCAN Times) 0      00000000 00000000 00000000 00000000
AVERAGE SCAN [x10 ms]: 0
MAXIMUM SCAN [x10 ms]:  1

INDEX REGISTER VALUE:   4      I/O SLOT INTERRUPT PENDING
INDEX ACROSS FILES:     NO      0      10      20      30
                        00000000 00000000 00000000 00000000

FAULT ROUTINE SUBROUTINE FILE: 0      I/O INTERRUPT FILE EXEC:      0

SELECTABLE TIMED INTERRUPT      SINGLE STEP TEST      FILE RUNG
SUBROUTINE FILE:                 0      START STEP ON:        2      3
SETPOINT [x10 ms]:              0      END STEP BEFORE:      0      0
ENABLED:                         1      FAULT/POWER DOWN:    2      3
EXECUTING:                       0      COMPILED FOR SINGLE STEP: YES
PENDING:                         0
1 ms TIMEBASE                    0      STI LOST:              1
    
```

Press a key or enter value, press Alt-H for help.

s:28/15 =

offline no forces formatted decimal addr File EXAMPLE

PAGE
UP

PAGE
DOWN

GLOBAL
STATUS

SPECIFY
ADDRESS

NEXT
FILE

PREV
FILE

F1

F2

F4 ^①

F5

F7

F8

^① This function key is only available for SLC 5/04 OS401 processors.

Status File for SLC 5/03 and SLC 5/04 Processors (Display 3)

```
EXT PROCESSOR STATUS 0000000 00000000 REAL TIME CLOCK DATE: 11-17-1995
EXT MINOR FAULT 0000000 00000000 TIME: 2:15.34
```

DISCRETE INPUT INTERRUPT

```
SUBROUTINE FILE: 3 MASK: 00000001
INPUT SLOT: 1 COMPARE VALUE: 00000001
ENABLED 1 PRESET: 1
EXECUTING: 0 RETURN MASK: 00000000
PENDING: 0 ACCUMULATOR: 0
OVERFLOW: 0 LAST SCAN [ms]: 0
LOST: 0 MAX. SCAN [ms]: 0
```

```
PROCESSOR OPERATING SYSTEM USER PROGRAM
CATALOG #: 0 CATALOG #: 0 FUNCTIONAL TYPE: 0
SERIES: 0 SERIES: 0 FUNCTIONAL INDEX: 0
REVISION: 0 F.R.N.: 0
USER RAM SIZE: 0
FLASH EEPROM SIZE: 0
```

Press a key or enter value, press Alt-H for help.

S:37 =

offline no forces formatted decimal addr File EXAMPLE

PAGE UP	PAGE DOWN	GLOBAL STATUS	SPECIFY ADDRESS	NEXT FILE	PREV FILE
F1	F2	F4 ^①	F5	F7	F8

^① This function key is only available for SLC 5/04 OS401 processors.

Status File for SLC 5/03 Processors (Display 4)

```
EXT PROCESSOR STATUS: 00000000 00000000
```

CHANNEL 0 ACTIVE NODE TABLE

	0	10	20	30		
0-31	00000000	00000000	00000000	00000000		
32-63	00000000	00000000	00000000	00000000		
64-95	00000000	00000000	00000000	00000000	10 μ s DII TIMER:	0
96-127	00000000	00000000	00000000	00000000	10 μ s STI TIMER:	0
128-159	00000000	00000000	00000000	00000000	10 μ s I/O TIMER:	0
160-191	00000000	00000000	00000000	00000000		
192-223	00000000	00000000	00000000	00000000		
224-255	00000000	00000000	00000000	00000000		

Press a key or enter value, press Alt-H for help.

S:34/0 =

offline no forces formatted decimal addr File EXAMPLE

PAGE UP	PAGE DOWN	SPECIFY ADDRESS	NEXT FILE	PREV FILE
F1	F2	F5	F7	F8

Status File for SLC 5/04 Processors (Display 4)

EXT PROCESSOR STATUS: 00000000 00000000

CHANNEL 0 ACTIVE NODE TABLE

	0	10	20	30		
0-31	00000000	00000000	00000000	00000000		
32-63	00000000	00000000	00000000	00000000		
64-95	00000000	00000000	00000000	00000000	10 μ s DII TIMER:	0
96-127	00000000	00000000	00000000	00000000	10 μ s STI TIMER:	0
128-159	00000000	00000000	00000000	00000000	10 μ s I/O TIMER:	0
160-191	00000000	00000000	00000000	00000000		
192-223	00000000	00000000	00000000	00000000		
224-255	00000000	00000000	00000000	00000000		

CHANNEL 1 ACTIVE NODE TABLE (octal)

	0	10	20	30
0-37	00000000	00000000	00000000	00000000
40-77	00000000	00000000	00000000	00000000

Press a key or enter value, press Alt-H for help.

S:34/0 =

offline no forces formatted decimal addr File EXAMPLE

PAGE UP	PAGE DOWN	GLOBAL STATUS	SPECIFY ADDRESS	NEXT FILE	PREV FILE
F1	F2	F4 ^①	F5	F7	F8

^① This function key is only available for SLC 5/04 OS401 processors.

Global Status File Display (SLC 5/04 OS401 Processors Only)

You can access the Global Status File display from any of the SLC 5/04 OS401 processor's status file displays by pressing **GLOBAL STATUS**. The following screen

F4

appears:

GLOBAL STATUS RECEIVE FILE

00		20		40		60
01	2458	21		41		61
02	7864	22		42		62
03	17653	23		43		63
04		24		44		64
05	612	25		45		65
06		26		46		66
07	1234	27		47		67
10	713	30		50		70
11		31		51		71
12		32		52		72
13		33		53		73
14		34		54		74
15		35		55		75
16		36		56		76
17		37		57		77

TRANSMIT WORD: 2458 TRANSMIT ENABLE: 1 RECEIVE ENABLE: 1

Press a key or enter value, press Alt-H for help.

S:99 =

offline no forces decimal data decimal addr File EXAMPLE

BINARY
DATA

F1

DECIMAL
DATA

F3

HEX/BCD
DATA

F4

ASCII
DATA

F5

SAVE
CONFGR

F9

EXIT

F10

Global Status Receive File: The octal numbers 00–77 represent DH+ node addresses. They are mapped to memory locations in the SLC 5/04 processor where:

- 00 is mapped to S:100
- 01 is mapped to S:101
-
-
-
- 77 is mapped to S:163

This series of status file addresses is where the SLC 5/04 processor collects and stores Global Status information from other processors. If another node on the DH+ network is transmitting Global Status information, that information appears on the screen next to the device's node address. (For example, if node 07 is transmitting a Global Status Word of 1000 (decimal), the number 1000 appears next to the node address of 07.) You can cursor to any of the node addresses on the screen to see the corresponding status file address on the status line.

Transmit Word: This data is mapped to memory location S:99 in the SLC 5/04 processor. The screen displays the data that the SLC 5/04 processor transmits as its Global Status Word. You can cursor to this location and change the data that the processor sends out.

Transmit Enable: This data is mapped to memory location S:34/3 in the SLC 5/04 processor. A 1 in this location allows the SLC 5/04 processor to send out the information in S:99 on the DH+ link as its Global Status Word. A 0 disables transmitting. You can cursor to this entry and turn on/off Global Status Word transmission.

Receive Enable: This data is mapped to memory location S:34/4 in the SLC 5/04 processor. A 1 in this location allows the SLC 5/04 processor to collect Global Status Words from other devices on the DH+ link and stores them in memory locations S:100–S:163. A 0 disables collection. You can cursor to this entry and turn on/off Global Status Word collection.

The keys available at the Global Status File display perform the following functions:

Function Key	Description
[F1] Binary Data	These keys allow you to change the radix display. Decimal Data is the default radix for the Global Status File.
[F3] Decimal Data	
[F4] Hex/BCD Data	
[F5] ASCII Data	
[F9] Save Configuration	Saves the current radix as the new default radix.
[F10] Exit	Returns you to the previous status file screen.

17 *Online Editing*

The online editing function lets you monitor and correct your ladder program when your programming terminal is connected to an SLC 5/03 or SLC 5/04 processor. The following table provides a listing of what this chapter covers:

If you want to	Refer to page
Understand the concept of online editing and terms used	17-2
Understand the types of online editing	17-5
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The quick edit function provides offline editing capabilities. Refer to chapter 16 for information about this function.

Overview of Online Editing

Online editing of ladder programs is available when using SLC 5/03 or SLC 5/04 processors. Use this function to make minor changes to a pre-existing ladder program. Online editing functions consist of inserting, replacing, and deleting rungs in an existing ladder program while online with the processor. You can also document your program while performing an online edit. Refer to chapter 7 for more information on documenting ladder programs.

Only one programming device can perform an online edit of a user program at a time. When an online editing session begins, all other programming devices are removed from the Program Monitor display.



Before initiating an online editing session, we recommend that you fully understand the possible results of the edit to the system under control. Physical injury or equipment damage may result.

The following table summarizes the differences between offline and online editing.

Offline	Online
No restrictions exist. Full editing capabilities are allowed.	Data table file resizing is not permitted.
	Program file creation and deletion are not permitted.
	Alteration of file protection is not permitted.
	Alteration of static and constant data file values is not permitted.
	Indexing across file boundary selections is not permitted.
	Force protection selection is not permitted.
	I/O configuration is not permitted.

Note

It is important to keep in mind that some ladder instructions, when programmed online, cause data table values to change. These instructions are those that require timer, counter, and control addresses to be specified. This is discussed later in the chapter.



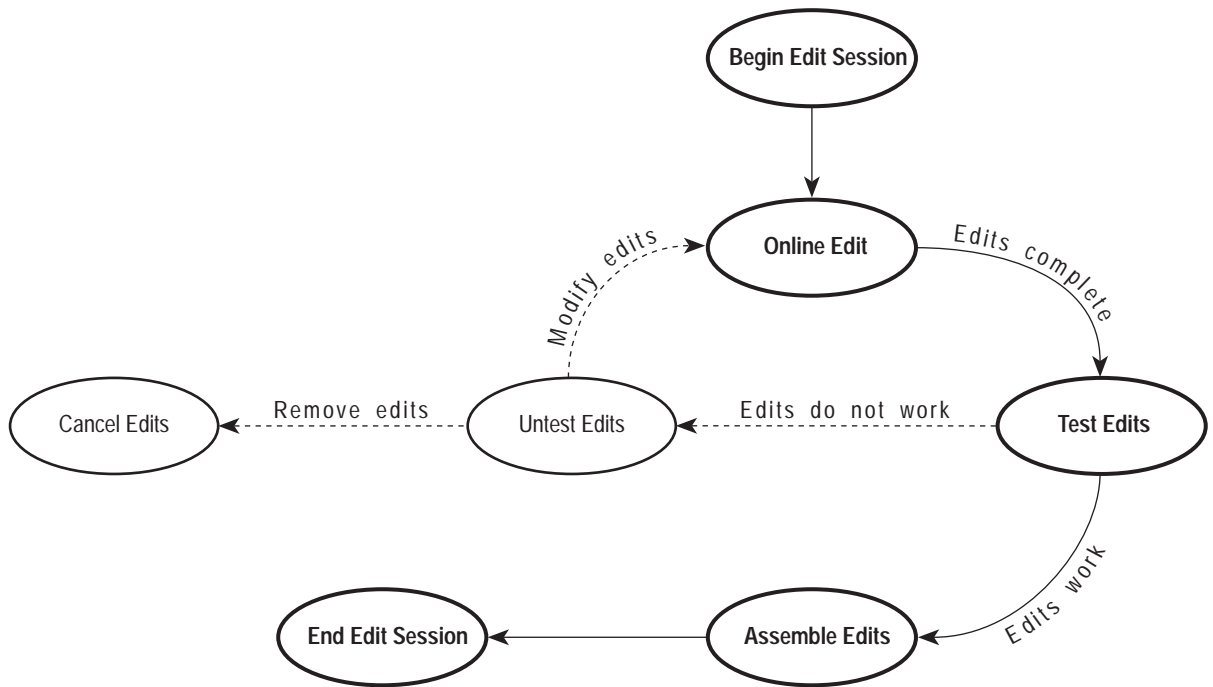
If you use DII or STI interrupts and your application requires an interrupt latency less than 0.50 ms, the online editing feature is not recommended. Online editing increases the interrupt latency response time beyond 0.50 ms. To ensure interrupts are responded to within 0.50 ms, place the keyswitch in the RUN position. This prevents the use of the online editing feature.

Online Editing Terms

The following terms are used throughout this chapter:

- **Assemble Edits** — Deletes any rungs marked with Delete or Replace edit zone markers during an online editing session. Inserted or modified rungs remain. All edit zone markers are removed when this function is complete.
- **Cancel Edits** — Deletes any inserted or modified rungs added during an online editing session. Rungs marked with Delete and Replace edit zone markers remain. All edit zone markers are removed when this function is complete.
- **Test Edits** — Allows you to verify that the changes you entered are not going to cause improper machine operation before you make the changes a permanent part of your ladder program.
- **Untest Edits** — Allows you to disable testing.
- **Edit Zone markers** — Appear on the power rail of the ladder program display. They indicate the type of edit taking place on the rung.
- **Accept Rung** — Incorporates the edits of a single rung into the ladder program.
- **online edit session** — begins when the edit function key is pressed while online. Any other programming device that was monitoring the user program is removed from the program monitor display.
- **modify rung** — when an existing rung is modified two edit zones are created. The original rung is indicated by replace zone markers on the power rail. A copy of the original rung is made so you can insert, delete, or modify instructions. This rung is indicated by insert zone markers on the power rail. Thus, an IR pair is created when you modify a rung.
- **runtime online editing** — the user program is executing when an edit takes place. Any rungs that are inserted, modified, or deleted remain in the ladder program and are indicated by edit zone markers on the power rail. Edit zone markers remain after an action is completed.
- **program online editing** — the user program is not executing when an edit session begins. Any action that inserts, deletes, or modifies a rung takes place immediately.

The following figure shows the process involved when performing an online edit.



Types of Online Editing

The type of online editing is dependent on the SLC 5/03 or SLC 5/04 processor's keyswitch position and the processor's mode. There are two types of online editing:

- Program Online Editing — when the processor is in either PROG mode or REM Program mode
- Runtime Online Editing — when the processor is in either REM Test or REM Run mode

The following table summarizes the SLC 5/03 and SLC 5/04 processor keyswitch positions and modes that enable online editing.

Keyswitch Position	SLC 5/03 and SLC 5/04 Processor Mode	Editing Mode
RUN	Run	Not Available
PROGram	Program	Program Online Editing
REMote	REMote Program	Program Online Editing
REMote	REMote Test	Runtime Online Editing
REMote	REMote Run	Runtime Online Editing

Note

*Online editing is not available when the keyswitch is in the RUN position. If you attempt to perform an online edit with the keyswitch in the RUN position, the message: **ONLINE EDITING NOT AVAILABLE, INVALID KEYSWITCH POSITION** is displayed.*



Use the online editing function while in the RUN mode to make minor changes to the ladder program. We recommend developing your program offline since ladder rung logic changes take effect immediately after testing your edits. Improper machine operation may occur, causing personnel injury or equipment damage.

Edit Functions in Runtime Online Editing

During a runtime online editing session, the processor *is executing* ladder logic. The edit zone markers tell the processor that changes exist, but the changes are not executed until you test the edits.

Deleted and replaced (modified) rungs are not removed from the program and inserted rungs are not executed until you assemble the edits.

Edit Functions in Program Online Editing

During a program online editing session, the processor *is not executing* ladder logic. This mode is like the offline editing mode. Note that if a runtime online editing session was performed prior to entering the offline editing mode, edit marked rungs (I, IR, and D) *appear* in the program.

If you perform a program online edit, once you accept or delete the rung, the edits take effect immediately and the power rail is displayed as a solid line. If you edit a rung with edit zone markers, the markers are removed when the rung is accepted.

Online Editing Screen Display

Online editing functions consist of inserting, replacing, and deleting rungs in an existing ladder program. The editing display for SLC 5/03 and SLC 5/04 processors is different from the SLC 5/01 and SLC 5/02 processors:

- The status line provides diagnostic information sent by the processor.
- New edit zone markers (Replace and Delete) indicate the type of rung changes.

Edit Zone Markers

While programming online edits, edit zone markers appear on the power rails, indicating the type of ladder program edit. Edit zone markers include:

- I — indicates the rung is to be *inserted*
- R — indicates the rung is to be *replaced*
- D — indicates the rung is to be *deleted*

Once you assemble or cancel the edits, the edit zone markers are removed and the power rails change back to a solid line. Edit markers are also removed from rungs that are modified and then accepted while performing a program online edit.

When using the modify rung function, modified rungs are marked with R edit zone markers on the power rail of the existing version and I edit zone markers are placed on the power rail of the new version of the rung. Since IR pairs are connected, you cannot insert, append, or undelete between rungs. An R marked rung is always preceded by an I marked rung.

Since IR pairs are connected, when you try to select just the I or the R rung during a cut, copy, or paste operation, both rungs are selected.

Status Line Display

If your program contains online editing modifications, APS indicates this on the status line of the Program Monitor display. Diagnostic information sent by the processor appears next to the keyswitch/processor mode. Possible diagnostic information includes:

- **EDITS: NONE** — indicates that there are no online edits in the processor
- **EDITS: TESTING** — indicates that edit marked rungs exist and they are being tested (executed)
- **EDITS: DISABLED** — indicates that edit marked rungs exist, but they are not being executed or tested

The following screen shows the edit zone markers. During a program online editing session, modification of rungs containing edit zones cause these zones to be removed.

Note

If at least one edit marked zone appears in your program, either “testing” or “disabled” appears on the status line.

Example Display with Edit Zone Markers

```

|| N7:10 N7:10 ||
| ] [ ( ) |
| 0 1 |
| N7:10 N7:10 |
| ] [ ( ) |
| 0 1 |
| I N7:10 N7:10 I |
| I ] [ ( ) I |
| I 0 1 I |
| R N7:10 N7:40 R |
| R ] [ ( ) R |
| R 0 5 R |
| D N7:10 N7:10 D |
| D ] [ ( ) D |
| D 0 1 D |
|| |
|| |END| ||

```

Edit Zone
Markers

Press a key for desired editing function
(file 2, rung 0)

REM PROG no forces EDITS: DISABLED RUNG INSERT File 04TEST

F1 F3 F4 F5 F6 F7 F8 F9 F10

Current Action
↓

Function Key	Description
[F1] Change Mode	Allows you to change the processor mode.
[F3] Append Rung	Inserts a blank rung following the cursored rung.
[F4] Insert Rung	Inserts a blank rung before the cursored rung.
[F5] Modify Rung	Allows you to modify a cursored rung.
[F6] Delete Rung	Deletes the cursored rung.
[F7] Undelete Rung	Undeletes the last rung deleted.
[F8] Advanced Editing	Allows access to the cut/copy/paste functions.
[F9] Test Edits	Verifies the changes made during online editing.
[F10] Cancel Edits	Discards modifications made during online editing.

Effects of Online Editing On Your System

The following section covers the effects of online editing on your system. Keep these items in mind while using the online editing function.

System Impacts

- The scan time and interrupt latency can be extended up to 10 ms when accepting a rung, assembling or canceling edits. Use the following formula to calculate the number of scans impacted:

$$10 + \frac{\text{\# of rungs}}{50} + \text{\# of ladder files (2-255)} = \text{Number of scans impacted by an online edit}$$

- Memory Limitations - Online editing can be performed until the program area in the processor is exhausted.
- The program execution time will be increased up to 117 μ s per edit rung. The increased execution time occurs regardless of the current editing state. For example, an IR pair will impact the execution time of the program by 234 μ s.
- If only one MCR instruction exists in your program, the END instruction acts as the second unconditional MCR instruction and all of the rungs following the first MCR instruction execute via the current MCR instruction state.

Communication Break

If a communication break or other critical errors occur while the processor is receiving online edit changes from APS, the default user program will be loaded into the processor. However, APS retains your online editing changes in an archive file (\$\$\$\$.ACH). This file contains the latest program file contained in APS and the current data table values.

To restore the \$\$\$\$.ACH file:

1. Go to the offline edit mode and verify that the \$\$\$\$.ACH file is correct.
2. Rename the archive file to your original processor filename.
 - a. From the main menu, press [F7], File Options then [F3], Rename.
 - b. Press [F1], Processor Memory File.

The previous steps ensure that only the archive file is renamed. Documentation and symbol files will be untouched. Refer to chapter 5 in this manual for more information on renaming files.

3. Save the program file.

Data Table File Size

Online editing cannot change the *size* of existing data tables nor can new ones be created. However, some ladder instructions, when programmed cause data table *values* to change. These instructions are those that require timer, counter, and control addresses to be specified.

APS sends new data table values associated with an instruction insertion or modification to the processor when the rung is accepted. For example, if a Timer On-Delay (TON) instruction is inserted, the preset and accumulator values are sent to the processor when the rung is accepted.

Once you accept the rung the data table values are applied and the message: **DATA TABLE VALUES HAVE BEEN PERMANENTLY MODIFIED** is displayed. Note that only unprotected data table values changed in the processor.

If the data table file being modified is constantly protected, APS displays the message: **CANNOT MODIFY PROTECTED DATA FILE DURING ONLINE EDITING**.

Refer to chapter 8 for more information about data table file protection.

Note

Data values associated with the “original version” of your program may be overwritten with the Runtime Online Edits. This is because “new” data values are applied to the program when you accept the rung, not when you test edits. Also, the original version of your program will operate using the new data.

If you perform an online edit that changes statically protected data file values, you will be prompted to either accept the edit *without* the data file changes or to abort the edit.

Offline Editing of a Program Containing Edit Zones

Although edit marked rungs cannot be created while offline, you can edit a program containing runtime online edits in the offline program mode. Note that these rungs are treated as normal rungs when editing offline.

During an offline edit session, a rung marked with an I or D edit zone marker can be modified. When the modified rung is accepted, the edit zone marker is removed. For IR pairs, only the rung marked with the I edit zone can be modified. When the rung is accepted, the I edit zone marker is removed and the rung marked with the R edit zone marker is removed from the ladder program.

Pre-existing edit zones can be assembled during offline program editing. When edits are assembled, rungs marked with an R or a D edit zone marker are removed from the ladder program and I edit zone markers are changed to regular rungs

Pre-existing edit zones can be canceled during offline program editing. When edits are canceled, rungs marked with I edit zones are removed from the ladder program. Rungs marked with R and D edit zone markers are changed to regular rungs.

Online Editing Functions

You can test your ladder program modifications made during an online editing session before assembling them into the ladder program. When you test your edits, the processor scans the edited program; rungs marked with insert edit zone markers are executed and all rungs marked with replace or delete edit zone markers are skipped.

Function Key [F9]

This key toggles between Test Edits and Untest Edits. The following section describes its operation.

[F9] Test Edits

Testing edits allows you to verify that the changes you entered are not going to cause improper machine operation before you make the changes permanent. If no edits exist, the message: **NO EDITS IN PROCESSOR** is displayed. From the

Edit menu, press **TEST EDITS** . If edits exist, the message: **CAUTION: REMOVING F9 OUTPUT REFERENCES LEAVES THE OUTPUTS IN THEIR LAST STATE** is displayed.

If you proceed, the edits field on the status line changes from **DISABLED** to **TESTING**. For a Program Online Editing session, a compile is performed on all unmarked rungs and rungs marked with insert edit zone markers.

For a Runtime Online Editing session, the processor enables the testing of the edits by executing rungs not marked with any edit zone and all rungs marked with insert zones. Rungs marked with delete or replace zones are not executed.

[F9] Untest Edits

If during a test edits session you find that improper machine operation is occurring, you can untest your edits and make modifications. To disable testing, press

UNTEST EDITS . If no edits exist, the message: **NO EDITS IN PROCESSOR** is displayed.

Online Editing cannot be performed while the edited rungs are executing. For example, if you are testing edits and you want to make further changes, you must either perform an untest edits or assemble edits.

If you proceed, the edits field on the status line changes from TESTING to DISABLED. For a Runtime Online Editing session, the processor executes rungs not marked with edit zones and all rungs marked with delete or replace zones. Any rungs marked with insert zones are not executed.

Note

Untesting edits does not restore the data table values that were altered when you accepted the rung.


Function Key [F10]

This key toggles between Assemble Edits and Cancel Edits. The following section describes its operation.

[F10] Assemble Edits

If you find that your changes are accomplishing proper machine operation, you can make those changes a permanent part of your program by using the Assemble Edits function. You can only assemble edits while edits are being tested. Assembling edits places the online editing changes into the program and removes the edit zone markers.

- All rungs marked with insert edit zones are assembled into the ladder program and the edit zone markers are removed.
- All rungs marked with replace or delete edit zones are deleted from the ladder program.

Press . If you proceed, the edits field on the status line changes from

F10

TESTING to NONE. Edits are assembled into the program and the message: **CAUTION: VERIFY STATE OF OUTPUTS WITH DATA MONITOR** is displayed.

When performing this function your scan time and interrupt latency can increase by 10 ms per scan.

[F10] Cancel Edits

If you want to discard your modifications made during online editing, press

**CANCEL
EDITS**

. This prevents them from being assembled into your ladder program.

F10

Canceling edits can only be done if edits are not currently being tested.

- Canceling edits removes the online editing changes from the program and removes the edit zones.
- When edits are canceled, all replace and delete edit zone markers are removed and all rungs marked with insert edit zone markers are deleted from the ladder program.

Note

Canceling edits does not restore data table values that were altered during an online editing session.

When performing this function your scan time and interrupt latency can increase by 10 ms per scan.

Accepting a Rung

Edits are sent to the processor when you accept a rung. Once you accept the rung, the data values are applied and the message: **DATA TABLE VALUES HAVE BEEN PERMANENTLY MODIFIED** is displayed.



On accepting a rung, the scan time and interrupt latency may increase up to 10 ms per scan. Note that although data table values have changed permanently, the rung changes are not permanent. You must test and then assemble your edits to make your edits permanent.

Note

Be careful of the types of ladder programs you choose to edit online. Programs that have future access (OEM Lock) set to “disallow” must be saved to disk prior to exiting APS. Failure to do this will prohibit you from accessing the program in the future.

Runtime and Program Online Editing Effects

This section describes the effects of runtime and program online editing of rungs to a user program. The following terms are used:

Normal Rung — No edit zone markers appear on the rung; power rail is solid.

Insert Rung — An insert edit zone marker appears on the power rail and indicates that it was inserted during a runtime online editing session.

Delete Rung — A delete edit zone marker appears on the power rail and indicates that it was deleted during a runtime online editing session.

Insert Rung of IR Pair — This is a copy of a rung that can be modified. An I edit zone marker appears on the power rail and is attached to the following replace marked rung.

Replace Rung — This is the original copy of the rung before rung modification and a replace edit zone marker appears on the power rail.

Assemble Edits — Deletes any rungs marked with delete or replace edit zone markers during a runtime online editing session. Inserted or modified rungs remain. All edit zone markers are removed when this function is complete.

Cancel Edits — Deletes any Inserted or modified rungs added during a runtime online edit session. Rungs marked with delete edit zone markers remain. All edit zone markers are removed when this function is complete.

The following tables show the effect of editing during a runtime online editing session. The effect of each type of edit varies depending on the type of rung the cursor is on.

Runtime Online Editing Effects

Action	Effect of Edit Zone Marker
Insert Rung	I zone marker remains. If edit = none, status line says disabled
Delete Rung	Normal rung - Rung is marked for deletion, it continues to execute, and a D appears on the power rail.
	Insert rung - The rung is physically removed from the user program. It was not executing.
	Delete rung - Illegal, cannot delete an executing rung.
	Insert rung of I/R pair - Inserted rung is removed from the user program and R zone marker is removed (rung remains).
	Replace rung - Illegal, cannot delete an executing rung.
Modify Rung	Normal rung - The original rung is marked with an R edit zone marker and a copy is created above it and marked with an I edit zone marker. You can only modify the I rung.
	Insert rung - Modify the rung. An IR pair is not created.
	Delete rung - Illegal, cannot modify an executing rung.
	Insert rung of I/R pair - Modify the I rung. The R rung is unchanged and continues to execute.
	Replace rung - Illegal, cannot modify an executing rung.
Undelete Rung	If a rung exists in the delete buffer, it is placed into the user program marked with an I edit zone marker.
Assemble Edits	I zone marked rungs remain and continue executing. I zone marker is changed to a normal rung. R and D zone marked rungs are removed from the user program.
Cancel Edits	Rungs originally marked with R and D edit zone markers change to a normal rung and continue to execute. Rungs marked with I edit zones are removed from the user program.

Program Online Editing Effects

Action	Effect of Edit Zone Marker
Insert Rung	I zone appears while entering rung instructions. It is removed when you accept the rung.
Delete Rung	Normal rung - Rung is removed.
	Inserted rung - Rung is removed.
	Delete rung - Rung is deleted.
	Replace rung - Illegal, cannot delete because an IR pair exists.
	Insert rung of IR pair - Inserted rung is deleted. The R edit zone marker is removed and the rung is displayed as a normal rung.
Modify Rung	Normal rung - The original rung is marked with an R edit zone marker and a copy is created above it and marked with an I edit zone marker. You can only modify the I rung.
	Insert rung - Modify the rung. An IR pair is not created.
	Delete rung - Illegal, cannot modify an executing rung.
	Insert rung of IR pair - Modify the I rung. The R rung is unchanged and continues to execute.
	Replace rung - Illegal, cannot modify a replaced rung.
Undelete Rung	Inserts the previously deleted rung from the buffer as a normal rung.
Assemble Edits	Remove R and D rungs. I rungs remain, but the I edit marked rungs change to normal rungs.
Cancel Edits	I zones are deleted and R and D zones remain, but the R and D edit zone markers change to normal rungs.

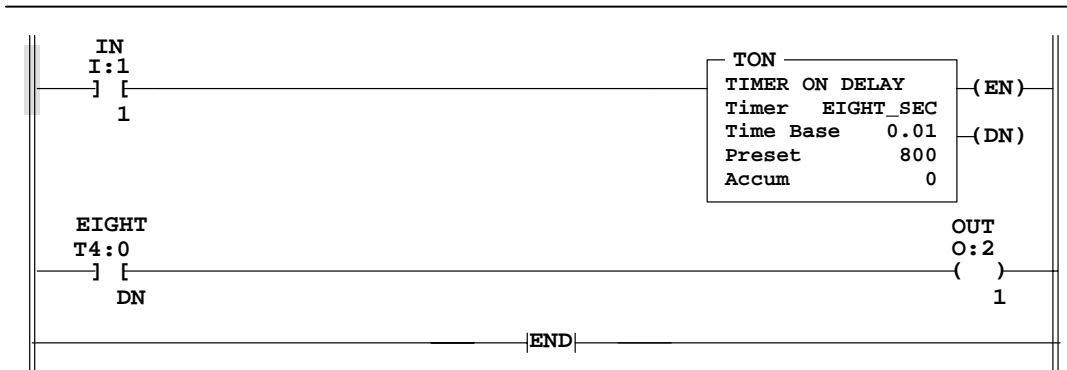
Performing an Online Edit

Before performing an online edit, we recommend that you save your program. To access all of the online editing features while in either Runtime or Program Online Editing:



When editing a rung that contains an MCR instruction, both the MCR start and MCR end rungs must be edited (whether it be test/assemble/cancel) at the same time. We recommend that you fully understand the possible results of the edit to the system under control. Physical injury or equipment damage may result.

1. Begin at the Program Directory display and press **MONITOR FILE** (F8), then **EDIT** (F10), then **ONLINE EDIT** (F7). The following display appears:



Press a key for desired editing function
(file 2, rung 0)

REM RUN no forces

EDITS: NONEFile 200

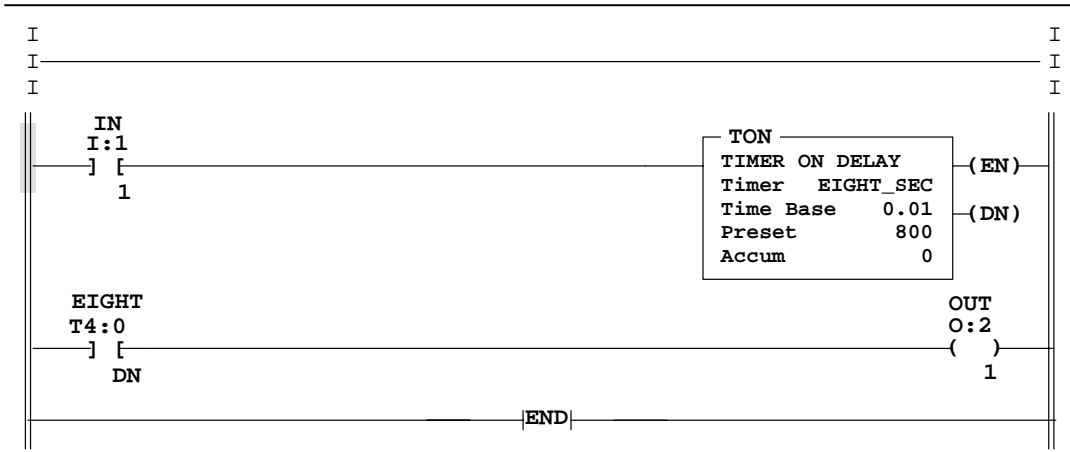
CHANGE MODE	APPEND RUNG	INSERT RUNG	MODIFY RUNG	DELETE RUNG	UNDEL RUNG	ADVANCED EDITING	TEST EDITS	CANCEL EDITS
F1	F3	F4	F5	F6	F7	F8	F9	F10

2. Select the desired editing function for a particular rung. In this example,

INSERT RUNG

is selected. The following display appears:

F4



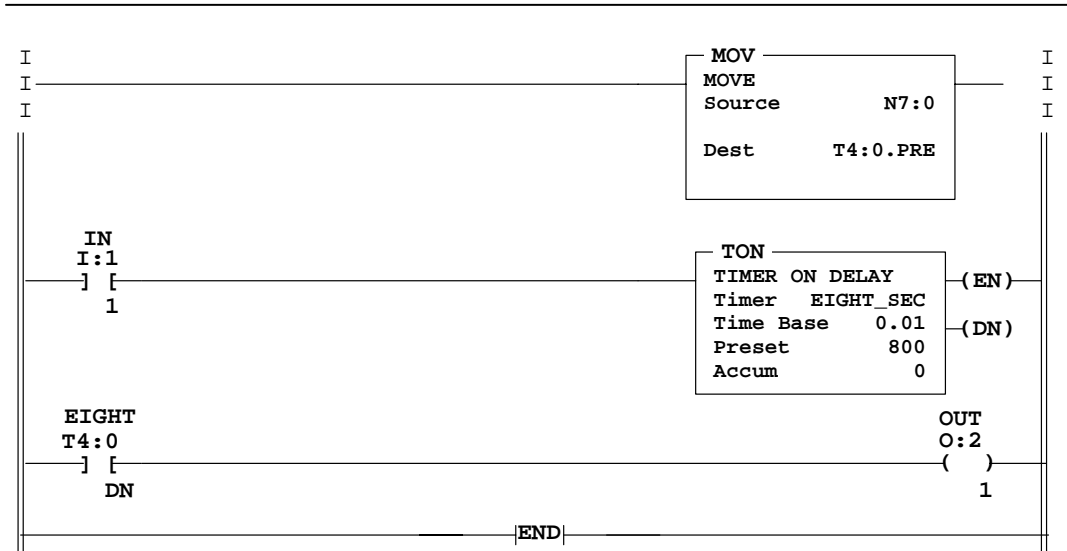
Type a mnemonic or press a key for desired editing function
(file 2, rung 0)

REM RUN no forces RUNG INSERT File 200

BRANCH	APPEND INSTR	INSERT INSTR	MODIFY INSTR	DELETE INSTR	UNDEL INSTR	ACCEPT RUNG
F1	F3	F4	F5	F6	F7	F10

3. Insert a MOVE instruction by pressing **INSERT INSTR** (F4), then **MOVE/ LOGICAL** (F6), and then

MOV (F1). Enter the source address and then the destination. The following display appears:



Type a mnemonic or press a key for desired editing function
(file 2, rung 0)

REM RUN no forces

INSTR INSERT

File 200

BRANCH	APPEND INSTR	INSERT RUNG	MODIFY INSTR	DELETE INSTR	UNDEL INSTR	ACCEPT RUNG
F1	F3	F4	F5	F6	F7	F10

- 6. Press **ACCEPT RUNG** .
F10

Note

You can use all of the shortcut keys while performing an online edit, except [ALT-T].

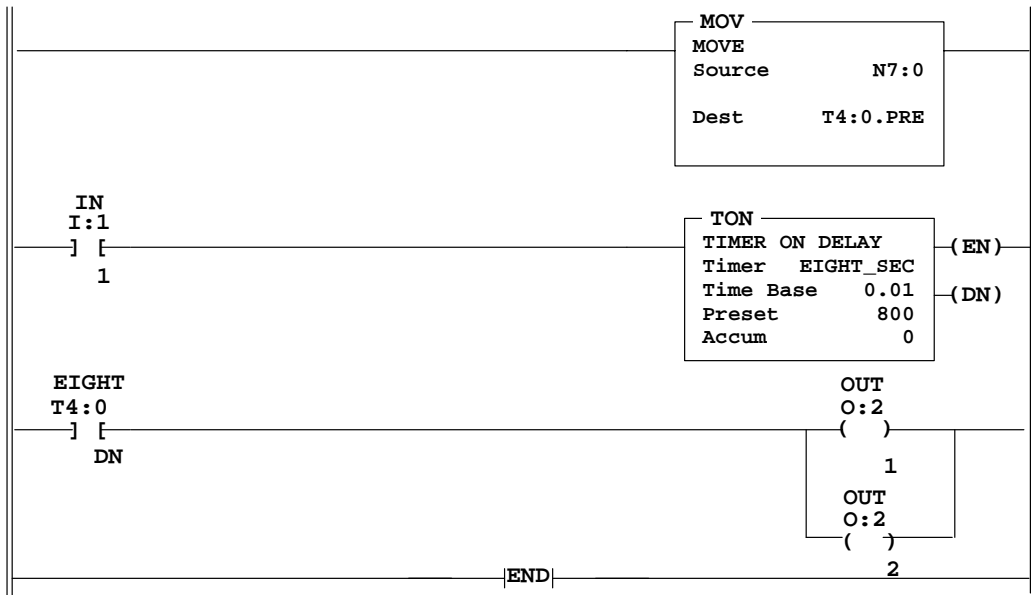
- 7. At this point you can either test or cancel edits, or save your edits. To save your edits press [ESC], then **EXIT** , and then **SAVE RESTORE** . If you want to test your edits, press **TEST EDITS** .
F3 F2
F9

Note that only the function keys change to the following:

```
Press a key for desired editing function
(file 2, rung 0)
REM RUN      no forces          EDITS: TESTING          File 200
```

CHANGE MODE	UNTEST EDITS	ASSEMBLE EDITS
F1	F9	F10

You may now fully incorporate your changes by pressing **ASSEMBLE EDITS** . Notice F10 that the I marked rungs return to a normal power rail state and the R marked rung is completely removed.



Press a key for desired editing function
(file 2, rung 0)
REM RUN no forces

EDITS: NONEfile 200

CHANGE MODE	APPEND RUNG	INSERT RUNG	MODIFY RUNG	DELETE RUNG	UNDEL RUNG	ADVANCED EDITING	TEST EDITS	CANCEL EDITS
F1	F3	F4	F5	F6	F7	F8	F9	F10

Note

After you have made your edits, the processor program is different from the program saved on disk. We recommend saving your changes before and after the online edit session.

See appendix A for APS error messages that may occur during online editing.

18 *The Multi-Point Function*

This chapter provides the following information:

- multi-point function overview
- the multi-point list menu
- the edit fields menu
- the multi-point force menu

Note

For use with the SLC 5/03 OS302 and SLC 5/04 OS401 processors and MicroLogix 1000 controllers only.

Multi-Point Function Overview

The multi-point function provides an ergonomic user interface with the most important bits in your application, by allowing you to monitor up to 32 non-contiguous bits of data at a time (16 bits for MicroLogix 1000 controllers). Since the multi-point list is stored with the program, you can create a unique list for each program. The multi-point list remains with the program, allowing a programming device to access the list without having an offline copy of the user program.

The Online Multi-Point List

The online multi-point list is maintained as part of the controller's program. Therefore, it is cleared whenever the controller's memory is cleared.

The Offline Multi-Point List

An optional offline multi-point list can also be maintained as part of the program's archive file. *This offline multi-point list is not part of the processor image.* However, this list can be copied to the online multi-point list if you want to add it to the processor image.

Navigational Keys Available in the Multi-Point List

The following keys are useful when you are using the multi-point function. These keys are active online or offline.

Key	Description
[↑]	Moves the cursor up one entry.
[↓]	Moves the cursor down one entry.
[Pg Up]	Moves the cursor up a page in the multi-point list.
[Pg Dn]	Moves the cursor down a page in the multi-point list.
[Home]	Moves the cursor to the top of the multi-point list.
[End]	Moves the cursor to the end of the multi-point list.

The Multi-Point List Menu

You can access the multi-point list when online or offline from the monitor file

display by pressing **MULTI POINT**. The following screen appears:

F4

```

MULTIPOINT
-----
POINT  ADDRESS          STATE  DESCRIPTION
-----
0      I:2.0/15           1      Gate OPEN
1      N7:0/12            0      P/N is even
2P     O:3.0/0            1      Motor STARTED
3P     I:1.0/3            1      LSl Actuated
4      B3/3               0      target file=15
5P     B3/4               1      barcode data OK
6      O:3.0/2            1      Diverter RIGHT
7      I:2.0/0            0
8      I:2.0/1            1      Overtravel RIGHT
9      I:2.0/2            0
10P    I:2.0/3            1      Overtravel DOWN
11     B3/10              0      Machine Idle
12     B3/11              0      Normal Storage
13     O:3.0/12           0      Laser OFF
-----
ESC exits
-----
Press a function key

REM PROG          no forces          EDITS: NONE          PROC Addr 1
-----
EDIT  DISPLAY  TOGGLE  VIEW  COPY TO  FORCE  EXIT
FIELDS SYMBOLS STATE OFFLINE OFFLINE F7
F1      F2      F3      F5      F6      F7      F10

```

Point: The number of the entry in the multi-point list. If the entry is protected (read-only), the letter P appears to the right of the entry number. See page 18–4 for more information on protection.

Address: Displays the address within the data table that is being monitored.

State: Shows the current state of the monitored bit (i.e., 0, 1, 0FON, 1FON, 0FOF, 1FOF, FON, FOF).

Description: Displays a description of up to 16 characters. Separate descriptions can be entered for the ON and OFF states. The SLC 5/03 and SLC 5/04 processors store these descriptions in the controller's memory.

The keys available at the multi-point list menu perform the following functions:

Function Key	Description
[F1] Edit Fields	Accesses the multi-point edit fields menu. See page 18–5.
[F2] Display Symbols/Address	Toggles between Display Symbols and Display Address.
[F3] Toggle State	<p><i>If online:</i> Toggles the state in the online data table of the bit that is addressed by the current entry.</p> <p><i>If offline:</i> Toggles the state in the offline data table of the bit that is addressed by the current entry.</p> <p>This does not effect any force applied to the bit.</p>
[F4] Protect	<p>(Available only from the offline multi-point list.)</p> <p>Toggles an entry between read/write and read-only. If read-only is selected the letter P appears after the point number.</p> <p>Once a bit is protected, and the offline multi-point list contents are copied to the online multi-point list, the following is true when viewing the online multi-point list. You <i>cannot</i>:</p> <ul style="list-style-type: none"> • toggle the state of the bit • edit the address • edit the on or off descriptions • install or remove forces • delete the entry <p>Note <i>Forces can still be enabled and disabled, since these functions apply to all forces, both inputs and outputs, and can include forces not shown on the multi-point list screen.</i></p>
[F5] View Offline/Online	<p>(Available only when <i>online</i>.)</p> <p>It toggles between the offline multi-point list and the online multi-point list.</p>
[F6] Copy to Offline/Online	<p>(Available only when <i>online</i>.)</p> <p>If viewing the online multi-point list, pressing this key copies the contents of the online multi-point list to the offline multi-point list. The online list remains displayed.</p> <p>If viewing the offline multi-point list, pressing this key copies the contents of the offline multi-point list to the online multi-point list. The offline list remains displayed.</p>
[F7] Force	Allows you to access the multi-point force menu. See page 18–6.
[F10] Exit	Returns you to the previous menu. Offline multi-point lists are saved when you save the program.

The Edit Fields Menu

From the multi-point list menu, you can access the edit fields menu by pressing

**EDIT
FIELDS**

. The following function keys are available:

F1

Press a function key

REM PROG	no forces	EDITS: NONE		PROC Addr 1			
EDIT ADDRESS	DEFINE SYMBOL	TOGGLE STATE	EDIT ON DESC	EDIT OFF DSC	FORCE	DELETE ENTRY	EXIT
F1	F2	F3	F4	F5	F7	F8	F10

These keys perform the following functions:

Function Key	Description
[F1] Edit Address	Allows you to update the address in the highlighted field (unless the entry is protected). The address must be a direct bit address that currently exists in the program. It may be entered either as a logical address or as a symbol, provided the symbol has already been defined in the documentation database.
[F2] Define Symbol	Allows you to define or edit the symbol for the highlighted address.
[F3] Toggle State	Toggles the state in the data table of the bit that is addressed by the current entry. This does not effect any force applied to the bit.
[F4] Edit ON Description	Allows you to enter an ON description for the current entry (up to 16 characters in length). This description is displayed when the bit's state is either 1, 1FON, or FON.
[F5] Edit OFF Description	Allows you to enter an OFF description for the current entry (up to 16 characters in length). This description is displayed when the bit's state is either 0, 0FOF, or FOF.
[F7] Force	Allows you to access the multi-point force menu. See page 18-6.
[F8] Delete Entry	Removes the highlighted entry from the multi-point list (unless the entry is protected).
[F10] Exit	Exits the edit fields menu and returns you to the multi-point list menu.

The Multi-Point Force Menu

Allows you to update forces for input and output bit entries in the multi-point list.

Note

When online, updates made to the forces are immediately applied to the processor.



To avoid possible personal injury and damage to equipment, investigate the effects on machine operation before forcing external input data file bits or external output circuits.

Note

For MicroLogix 1000 controllers, forces are always enabled, but must be forced on or off to be active. For all other processors, forces are always disabled until enabled.

From the multi-point list menu, you can access the multi-point force menu by pressing **FORCE** . The following function keys are available:

F7



The functions [F7] Enable Forces and [F8] Disable Forces apply to all forces in the processor. This can include forces not shown in the multi-point list; therefore, be sure to investigate the effects on machine operation before enabling or disabling forces.

Function Key	Description
[F1] Force ON	Enters a 1 in the input or output force table for the highlighted bit address. This forces that bit address ON (FON).
[F2] Force OFF	Enters a 0 in the input or output force table for the highlighted bit address. This forces that bit address OFF (FOF).
[F3] Remove Force	Affects the highlighted bit address. It removes the installed force from the force table and the data file, if applicable. Other forces are unaffected.
[F7] Enable Forces	<i>(Does not apply to MicroLogix 1000 controllers.)</i> Enables <i>all</i> forces, both inputs and outputs, and <i>can include forces not shown on the multi-point list screen</i> . You must confirm this selection. Note, the processor must be in the Run or Test mode to see the effects of the forced input table.
[F8] Disable Forces	<i>(Does not apply to MicroLogix 1000 controllers.)</i> Disables <i>all</i> forces, both inputs and outputs, and <i>can include forces not shown on the multi-point list screen</i> . You must confirm this selection. Note, the processor must be in the Run or Test mode to see the effects of the forced input table.
[F10] Exit	Exits the multi-point force menu and returns you to the multi-point list menu.

For more information on forcing, see chapter 19.

19 *The Force Function*

This chapter shows you how to:

- force an external input data file bit ON and OFF
- force an external output circuit ON and OFF
- use the input and output force monitor displays

A guide to forcing input data file bits and output circuits is also provided.

Force Function Overview

The Force function allows you to override the actual status of external input circuits by forcing external input data file bits ON or OFF. You can also override the processor logic and status of output data file bits by forcing output circuits ON or OFF.

Note

MicroLogix 1000 controllers only: Forces are always enabled but must be installed to be active.

You can install and then enable or disable forces while:

- monitoring your file offline
- in any processor mode while monitoring your file online



To avoid possible personal injury and damage to equipment, investigate the effects on machine operation before forcing external input data file bits or external output circuits.



MicroLogix 1000 controllers only: Forces override any output control from either the high-speed counter or from the output image. Forces may also be applied to and recognized by the high-speed counter inputs. (e.g., A forced count input off and on increments the high-speed accumulator.)

Navigational Keys When Using the Force Function

The following keys are useful when you are at the Force function menu. These keys are active when the processor is either online or offline, except where noted.

Key	Description
[Pg Up]	Moves the cursor to the left power rail of rung 0 in a ladder program.
[Pg Dn]	Moves the cursor to the end instruction of a ladder program.
[ALT-S]	Accesses the Search menu choices.
[ALT-E]	Accesses the Configure Display menu choices.
[ALT-T]	Accesses the Document menu choices (Offline only).
[ALT-C]	Accesses the Change Mode menu choices.

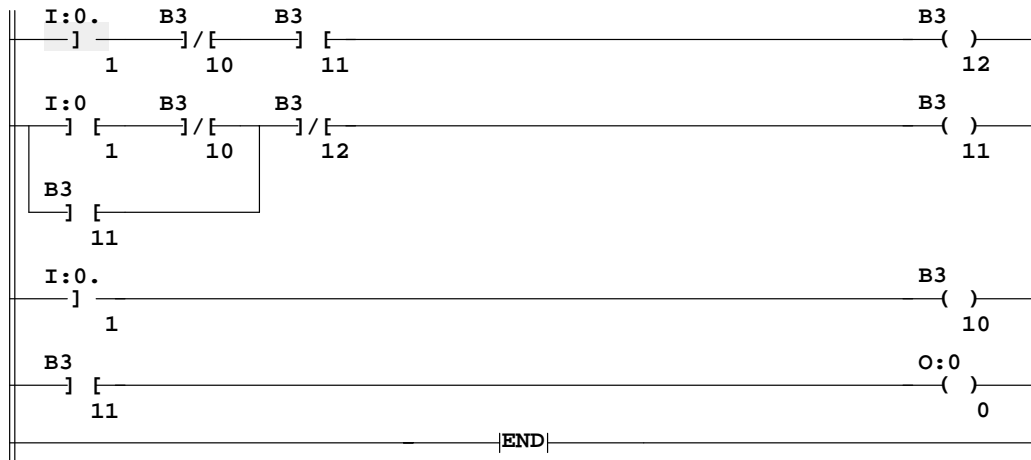
Applying Force File Protection (SLC 5/03 and SLC 5/04 Processors)

Applying force file protection applies to SLC 5/03 and SLC 5/04 processor files. Force file protection must be selected before performing a Test Edits or Program Save when using SLC 5/03 and SLC 5/04 processors. If you attempt to enable forces of an already force protected file, the message: **FORCE STATE CANNOT BE MODIFIED DUE TO FORCE FILE PROTECTION** is displayed.

Forcing External Input Data File Bits

Installing forces on input data file bits only affects the input force table. However, when forces are enabled the input data file and the program logic are also affected. The effects on the program logic of installed and enabled forces can be seen in both the REM Run and any of the REM Test modes.

The following is the online Monitor File display for a processor file. The status line indicates that the processor is in the REM Run mode and no forces exist. The cursor is located on instruction I:0/1 in rung 0.



Press a function key
(file 2, rung 0)
REM RUN no forces

PROC Addr 1

CHANGE MODE	CONFIG DISPLAY	EXIT	DOCUMNT	SEARCH	GENERAL UTILITY	DATA MONITOR	FORCE	EDIT
F1	F2	F3	F5	F6	F7	F8	F9	F10

1. Access the Force menu functions, by pressing **FORCE** . The following function keys appear:

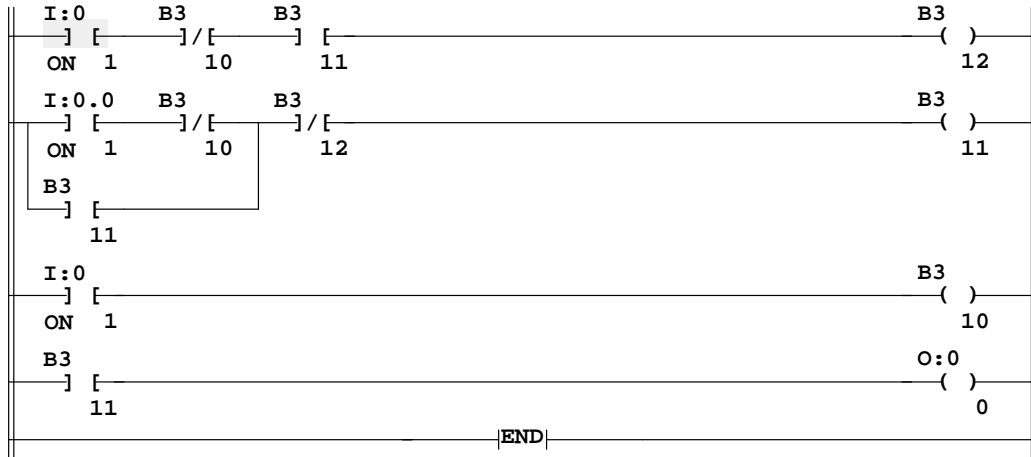
F9

Press a key for desired forcing function
(file 2, rung 0)
REM RUN no forces



2. To install a force ON for the cursoried external input file address press **ON** . (Press F1 OFF to install a force OFF.) The following display appears:

F2



Press a key for desired forcing function
(file 2, rung 0)
REM RUN forces DISABLED



ON appears with instruction I:0/1 in rungs 0, 1, and 2. The status line indicates forces DISABLED. The controller's Forced I/O LED is flashing.

MicroLogix 1000 controllers only: Since forces are always enabled, skip step 3.

- Enable the forces by pressing **ENABLE** . Confirm your selection by pressing **F7** .
YES .
F8 .

This simulates the closing of the external input circuit is simulated. However, the actual open/closed status of the external input circuit no longer affects the program logic.

For the previous display, the following is now true:

- The status line indicates `forces ENABLED`.
- The display indicates that `I:0/1` is true (intensified).
- The word `ON` associated with instruction `I:0/1` is intensified, indicating that forces are enabled.
- Other instructions in the ladder program have gone true or false based on the forced external input data file bit and logical continuity rules.
- The controller's Forced I/O LED is on continuously.

Monitor Input Force Display

To install and monitor input data file forces, press **MONITOR INPUTS** .
F9

```

address  15      data  0      address  15      data  0
I:0      .... ..1.

```

Press a key or enter force value

```

I:0/0 =  forces ENABLED      binary data      decimal addr      PROC Addr 1
REM RUN

```

OFF	ON	REMOVE	REMOVE ALL	SPECIFY ADDRESS	DATA MONITOR	ENABLE	DISABLE
F1	F2	F3	F4	F5	F6	F7	F8

A period indicates that no force is installed. A 0 indicates that a force OFF is installed. A 1 indicates that a force ON is installed. The status line indicates whether the installed forces are enabled or disabled.

Note that menu functions OFF, ON, REMOVE, REMOVE ALL, ENABLE, and DISABLE are available in this display. These allow you to:

- move the cursor to any bit and enable a force ON or OFF (a 1 or 0 appears)
- remove individual forces (the 0 or 1 changes to a period)
- remove all forces (periods appear for all bits)
- enable or disable the force function (*does not apply to MicroLogix 1000 controllers.*)

Use [F5] Specify Address to move the cursor to an address in either the input or output force displays.

Data Monitor

The input data file can be accessed from the previous input force display. Press

**DATA
MONITOR**

. The following display appears:

```

F6
-----
address  15      data   0  address  15      data   0
I:0      0000 0000 0010
-----

Press a key or enter value
I:0/0 = 
REM RUN  forces ENABLED      binary data      decimal addr      PROC Addr 1

[CHANGE RADIX]              [SPECIFY ADDRESS]  [FORCE MONITOR]  [NEXT FILE]  [PREV FILE]
  F1                          F5                  F6                F7            F8
-----
  
```

The display area shows input word I:0. Bit I:0/1, the address of the instruction you forced, is set (1). The input data file reflects installed *and* enabled input forces.

You can return to the monitor input force display by pressing

**FORCE
MONITOR**

F6

Guide to Forcing External Input Data File Bits

The following occurs in the Run or Test mode:

- The ladder program is scanned and ladder logic is applied.
- True instructions are intensified in the display.
- Forcing of input data file bits and resultant data changes appear in the data file displays.

The table below shows the available function keys and describes how each of them functions.

Function Key	Description
[F1] OFF	Enters a 0 in the input force table for the highlighted external input bit address. This installs a force.
[F2] ON	Enters a 1 in the input force table for the highlighted external input bit address. This installs a force.
[F3] Remove	Affects the highlighted external input bit address. It removes the installed force from the force table and the data file, if applicable. Other forces are unaffected.
[F4] Remove All	Affects all forced external input bit addresses and external output circuits. It removes the installed forces from the external bit addresses and output circuits. You must confirm this selection.
[F7] Enable	<i>(Does not apply to MicroLogix 1000 controllers.)</i> Enables all forces, both inputs and outputs. You must confirm this selection. Note, the processor must be in the Run or Test mode to see the effects of the forced input table.
[F8] Disable	<i>(Does not apply to MicroLogix 1000 controllers.)</i> Disables all forces, both inputs and outputs. You must confirm this selection. Note, the processor must be in the Run or Test mode to see the effects of the forced input table.

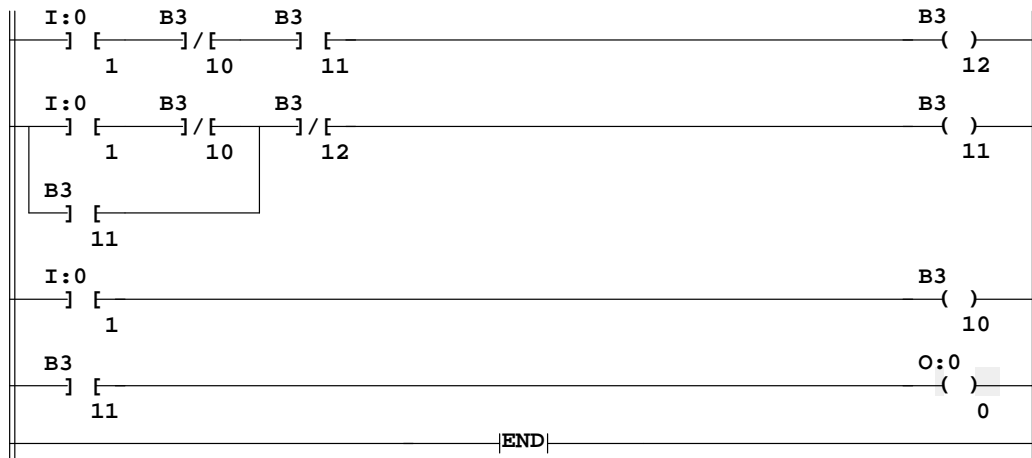
The table below shows an example of an installed, enabled force while in Run or Test mode.

Force On		
Run or Test Mode	Data file bit = 0	Data file bit = 1
Initial conditions: Data file bit = 0 Input circuit is Off. No forces.	I : 0 _____] [_____ 1 false	I : 0 _____] [_____ 1 true
Force is On, [F2] key. A 1 is placed in the input force table. Forces are always enabled. Data file bit remains 1. Input circuit is still effective.	I : 0 _____] [_____ 1 ON false	I : 0 _____] [_____ 1 ON true

Forcing an External Output Circuit

A forced external output circuit is independent of the internal logic of the ladder program and the output data file. Installing forces on output circuits affects *only* the output force table. Installed, enabled forces do not affect the output data file or the program logic. However, they do affect the output circuit. The effects of installed and enabled forces can only be seen in the Run mode. The Test mode does not energize output circuits.

The following figure is an example online Monitor File display for processor file. The status line indicates that the processor is in the Run mode and no forces exist. The cursor is located on instruction O:0/0 in rung 3.



Press a function key
(file 2, rung 3)

REM RUN no forces

PROC Addr 1

CHANGE MODE	CONFIG DISPLAY	EXIT
F1	F2	F3

SEARCH	GENERAL UTILITY	DATA MONITOR	FORCE
F6	F7	F8	F9

The procedure for forcing external output circuits is the same as forcing external input data file bits. For your reference the procedure follows. Refer to pages 19–3 and 19–4 for menu displays.

Monitor Output Force Display

To install and monitor output data file forces, press

**MONITOR
OUTPUTS**

F10

```

address 15      data 0      address 15      data 0
O:0      .... ...1

```

Press a key or enter force value
O:0/0 =

REM RUN forces ENABLED binary data decimal addr PROC Addr 1

OFF	ON	REMOVE	REMOVE ALL	SPECIFY ADDRESS	DATA MONITOR	ENABLE	DISABLE
F1	F2	F3	F4	F5	F6	F7	F8

The output force table shows that O:0/0 is forced ON.

Data Monitor

The output data file can be accessed from the previous output force display. Press

**DATA
MONITOR**

. The following display appears:

F6

```

address 15      data 0      address 15      data 0
O:0      0000 0000

```

Press a key or enter value
O:0/0 =

REM RUN forces ENABLED binary data decimal addr PROC Addr 1

CHANGE RADIX	SPECIFY ADDRESS	FORCE MONITOR	NEXT FILE	PREV FILE
F1	F5	F6	F7	F8

The output data file indicates that O:0/0 is false. The data file bit is unaffected by the forced output.

You can return to the monitor input force display by pressing

**FORCE
MONITOR**

F6

Guide to Forcing External Output Circuits

The following occurs in the Run mode:

- The ladder program is scanned and ladder logic is applied.
- True instructions are intensified in the display.
- Controller output LEDs go on and/or are held on for enabled forced on external output circuits.

The table below shows the available function keys and describes how each of them functions.

Function Key	Description
[F1] OFF	Enters a 0 in the output force table for the highlighted instruction. This installs a force. If the force is enabled and the processor is in the Run mode, the force is applied and the output circuit remains forced until the force is removed. The data file bit is unaffected.
[F2] ON	Enters a 1 in the output force table for the highlighted instruction. This installs a force. If the force is enabled and the processor is in the Run mode, the force is applied and the output circuit remains forced until the force is removed. The data file bit is unaffected.
[F3] Remove	Affects the highlighted external output circuit. It removes the installed force from the force table. Other forces are unaffected.
[F4] Remove All	Affects all forced external input bit addresses and external output circuits. It removes the installed forces from the external bit addresses and output circuits. You must confirm this selection.
[F7] Enable	<i>(Does not apply to MicroLogix 1000 controllers.)</i> Enables all forces, both inputs and outputs. You must confirm this selection. Note, the processor must be in the Run mode to see the effects of the forced output circuits.
[F8] Disable	<i>(Does not apply to MicroLogix 1000 controllers.)</i> Disables all forces, both inputs and outputs. You must confirm this selection. Note, the processor must be in the Run mode to see the effects of the forced output circuits.

The table below shows an example of installed, enabled force while in Run mode.

Force On		
Run Mode	Data file bit = 0	Data file bit = 1
Initial conditions: No forces. Output circuit follows output data file bit state.	$\begin{array}{c} \text{O: 0} \\ \text{---()---} \\ \text{0} \\ \text{false} \end{array}$	$\begin{array}{c} \text{O: 0} \\ \text{---()---} \\ \text{0} \\ \text{true} \end{array}$
Force is On, [F2] key. A 1 is placed in the output force table. Output circuit and LED go on and/or are held on. Data file bit status is unaffected.	$\begin{array}{c} \text{O: 0} \\ \text{---()---} \\ \text{ON 0} \\ \text{false} \end{array}$	$\begin{array}{c} \text{O: 0} \\ \text{---()---} \\ \text{ON 0} \\ \text{true} \end{array}$

20 *Using Memory Modules (EEPROMs and UVPROMs)*

This chapter explains:

- transferring processor files
- using the PROM translator function

Using a Memory Module

Memory modules provide a non-volatile memory back-up in a convenient modular form. The modules plug into a socket on the controller. For a selection of automatic download functions (S:1/10 through S:1/12), refer to the *Instruction Set Reference Manual*.

Note

Processor program and memory module sizes must be compatible. For more information on available memory modules, see the SLC 500 Modular Hardware Style Installation and Operation Manual, publication 1747-6.2.



Controllers must be configured alike to exchange programs. Otherwise, system errors occur.

Accessing the Transfer Function

The transfer function is accessed online under Processor functions. It is also accessible from the General Utility display, provided that a processor file resides in the processor memory.

Transferring Files

Processor File to Memory Module

Install your EEPROM. To transfer processor file TOGGLE to an EEPROM, do the following:

1. Power up the controller. Go online and Restore the file to the processor memory (if it is not already there).
2. Make certain the processor is in REM Program mode.



Damage to the PROMs or CPU faults will occur if the EEPROM or UV PROM is installed incorrectly. Refer to the controller's hardware and operation user's manual.

3. To access the Transfer function press **ONLINE**, then **PROCSSR**, and then

F1

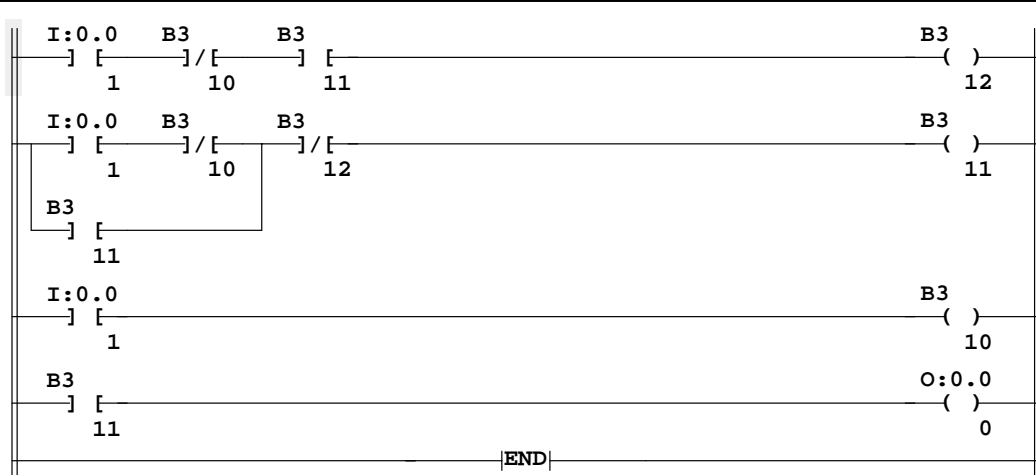
F1

**MONITOR
FILE**

. In the following figure, you are online at the monitor file display

F8

for processor file TOGGLE.



Press a function key
(file 2, rung 0)
REM PROG no forces

EDITS: NONE

PROC Addr 1

CHANGE MODE	CONFIG DISPLAY	EXIT	DOCUMNT	SEARCH	GENERAL UTILITY	DATA MONITOR	FORCE	EDIT
F1	F2	F3	F5	F6	F7	F8	F9	F10

4. Press **GENERAL UTILITY**. The following menu choices appear:

F7

Press a key for desired status function
(file 2, rung 0)
REM PROG no forces

PROC Addr 1

MEMORY MAP	PROC STATUS	CHANNEL CONFIG	XFER MEM MOD	CLEAR MEMORY
F1	F2	F5	F8	F10

5. Press **XFER
MEM MOD** . The following menu choices appear:

F8

Press a key for desired transfer direction
(file 2, rung 0)

REM PROG no forces

PROC Addr 1

PROC TO MEM MOD	MEM MOD TO PROC
--------------------	--------------------

F1

F2

6. The prompt line indicates **Press a key for desired transfer direction**. Press **PROC TO
MEM MOD** and confirm the transfer by pressing

F1

YES

. If a memory module is not present in the processor, the message:

F8

NO MEMORY MODULE IN PROCESSOR is displayed.

A copy of processor file TOGGLE now resides in the EEPROM. The former contents of the EEPROM are overwritten. Any Comments, Symbols, or Documentation Reports associated with TOGGLE have not been transferred to the EEPROM. They reside on the terminal's hard disk with the archive copy of TOGGLE.

Memory Module to Processor

Suppose an EEPROM containing processor file DRILL1 is installed in the controller and you want to transfer this file to the processor memory.

1. Begin at the main menu and press **ONLINE** . The following display appears:

F1

Using the PROM Translator Function

The PROM Translator function converts an archive processor file to hexadecimal format:

- fixed, SLC 5/01, and SLC 5/02 — Intel Intellec™ 8/MDS
- SLC 5/03 and SLC 5/04 — Intel Intellec 8/MCS-86

Once converted, the hex-formatted processor file can be downloaded to a PROM programmer for copying to a UVPROM using the software provided with your PROM programmer.

Note

You must provide a PROM programmer and the PROM. The utility does not program the PROM. It only converts the processor archive file into a form compatible with various PROM programmers.

To convert processor file EXAMPLE to a hexadecimal format.

1. Begin at the main menu and press **SYSTEM UTILS** **F9**. The following display appears:

```

===== SLC-500 ADVANCED PROGRAMMING SOFTWARE ===== RELEASE 6.00 =====
Rockwell Software Incorporated, Copyright 1989-1995
          9323 - PA2E
          All Rights Reserved

This Software is licensed to:   Your Name
                               Your company name
                               00000000
=====
Fri Nov 24, 1995                Current Offline File: DEFAULT                11:03:09 am
=====
TERM Address: 0                  Current Device: 1747-PIC (DH-485)                PROC Address: 1
=====

```

Press a function key

PROM TRNSLTR	PROGRAM TRANSFR
F1	F2

2. Press **PROM TRNSLTR**. The following display appears:

F1

```

\IPDS\ARCH\SLC500

```

Name	Size	Date
* DRILL1	9325	09-12-95
EXAMPLE	929	10-07-95
EXAMPLE2	9254	10-17-95
EXAMPLE3	8345	10-17-95
EXAMPLE4	8715	10-17-95
EXAMPLE5	9395	10-17-95
EXAMPLE6	8225	10-17-95
EXAMPLE7	8831	10-17-95
SEQUENCE	8684	10-03-95
TOGGLE	8695	07-19-94 ↓

* - Newer .HEX file exists

ESC exits

Press a Function Key or Enter File Name

CONVERT
TO HEX
F1

DEFINE
DIR
F7

The names, sizes, and dates of the archive files currently stored on disk are shown. An asterisk indicates that a hexadecimal version of the file already exists. However, the hexadecimal version may or may not match the current version of the archive file.

If you press **DEFINE DIR**, the User Directory is displayed. Refer to chapter 2 for more information on the User Directory display.

3. Select EXAMPLE by either typing: **EXAMPLE** on the data entry line or by moving the cursor to EXAMPLE.

4. Once you select the file, press **CONVERT TO HEX** . The menu functions allow you to
F1
select the size of the PROM.

- SLC 5/01 and SLC 5/02 processors
 - 8K bytes corresponds to Allen-Bradley modules specifying 1K instruction words (1747- M1, M3)
 - 32K bytes corresponds to Allen-Bradley modules specifying 4K instruction words (1747-M2, M4)
- SLC 5/03 processors
 - OS300 – 64K bytes or 128K bytes
 - OS301 – 64K bytes or 128K bytes
 - OS302 – 64K bytes, 128K bytes, or 256K bytes
- SLC 5/04 processors
 - OS400 – 128K bytes
 - OS401 – 128K bytes or 256K bytes

When you create hexadecimal files for the SLC 5/03 and SLC 5/04 processor, you have the option of setting the memory module protect byte. After you select the number of bytes, the message: **Set Memory Module Protection** is displayed.

5. If you want to apply protection (permanently burn your memory module), press **WRITE PROTECT** . Otherwise, press **ALLOW REUSE** . Then confirm your selection by
F8 F10
pressing **YES** . Refer to chapter 8 for more information on protecting
F8
your program files.

6. For this example 8k bytes is used. Press **8K BYTES**. The message line displays **F1**
...Working... momentarily while the conversion is processing. If the conversion is successful, the message: **CONVERSION SUCCESSFUL – 8922 BYTES CONVERTED** is displayed. Press any key to return to the previous menu.

Notice that an asterisk appears before file `EXAMPLE`. This indicates the file has been successfully converted to hexadecimal.

When you exit the APS software, the hexadecimal file can be exported or copied to your PROM programmer using DOS commands or your UVPROM programmer software.

If you subsequently edit and save file `EXAMPLE` and want to convert the edited file to hexadecimal, you will have to overwrite the previous version of the hex file. When you attempt to overwrite the file, the message: **Overwrite existing .HEX file?** is displayed.

7. If you wish to overwrite the existing file, press **YES**. If you do not wish to overwrite the existing file, press **NO**.
F8
F10

8. At this point you can either attempt another conversion or go back to the system utility menu by pressing [**ESC**]. If you press [**ESC**] again, the main menu appears.

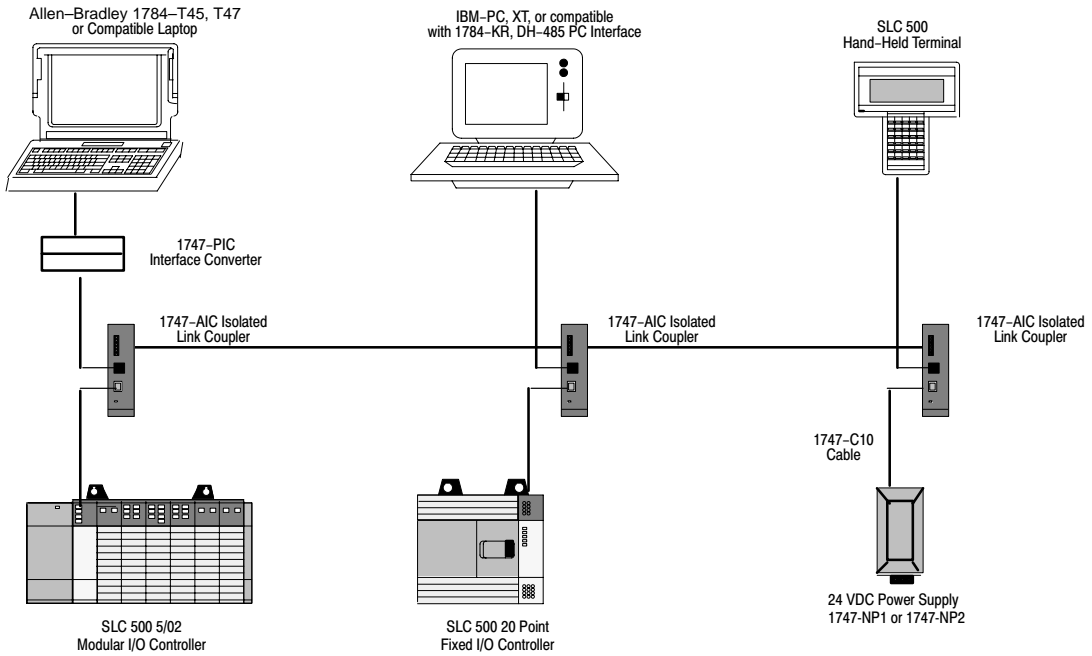
21 *Transferring Program Files*

This chapter shows you how to transfer program files between programming terminals connected on a DH-485 network using the program transfer function. You can transfer programs from one APS terminal to another or between an APS terminal and a Hand-Held Terminal (HHT).

Program Transfer Overview

For the examples in this section, the DH-485 network is configured as follows:

Node Address	Network Device
0	APS Terminal
1	SLC 500-20 Processor
2	SLC 5/02 Processor
3	IBM-AT APS Terminal
4	Hand-Held Terminal



Note

Program transfers are not supported if the current online configuration is for a direct DH+ connection or if the communication driver is an INTERCHANGE driver.

Transferring Programs Between Programming Terminals

Sending a Program — APS to APS

You can transfer a user program from the hard disk of the sending APS terminal to the workspace of the receiving APS terminal using the send program function.

In the following example, node 0 is the sending APS terminal and node 3 is the receiving APS terminal.

1. Begin at the main menu on node 0, the sending APS terminal. Press

**SYSTEM
UTILITIES**

F9

2. Press

**PROGRAM
TRANSFER**

F2

The Who Listen display appears. The display shows you the active nodes on the DH-485 network, indicated by asterisks next to the active node addresses.

At this point, node 0, your sending APS terminal is not active on the network.

WHO LISTEN - Active Node Table		
0		24
1 *	13	25
2 *	14	26
3 *	15	27
4 *	16	28
5	17	29
6	18	30
7	19	31
8	20	
9	21	
10	22	
11	23	
ESC exits		

Press a function key

Term. Addr: 0

Emulation: SLC 5/01

RECEIVE
PROGRAM

F2

SEND
PROGRAM

F4

EMULATE
5/01

F6

EMULATE
5/02

F7

EMULATE
5/03

F8

EMULATE
5/04

F9

3. Press **SEND PROGRAM** . The following display appears with the cursor on program **F4** file DRILL1. In this example, program file EXAMPLE is sent to the APS terminal, node 3.

\IPDS\ARCH\SLC500			
	Name	Size	Date
*	DRILL1	9325	09-12-95
	EXAMPLE	929	10-07-95
	EXAMPLE2	9254	10-17-95
	EXAMPLE3	8345	10-17-95
	EXAMPLE4	8715	10-17-95
	EXAMPLE5	9395	10-17-95
	EXAMPLE6	8225	10-17-95
	EXAMPLE7	8831	10-17-95
	SEQUENCE	8684	10-03-95 ↓
	TRANSFER	8695	07-19-94

Press a Function Key Or Enter File Name

Term. Addr: 0

Emulation: SLC 5/01

BEGIN
SEND

F1

DEFINE
DIR

F7

4. Move the cursor in the right-hand box to EXAMPLE, then press

**BEGIN
SEND**

F1

The **Waiting to Send** display appears:

```
ROCKWELL SOFTWARE INCORPORATED
          9323 SERIES SOFTWARE
SLC-500 PROGRAM TRANSFER UTILITY
```

Waiting to Send Program...

```
File Name : EXAMPLE .ACH
```

```
A total of  4 data, 4 program, and 2 force table(s)
           20 Words in 4 Data Files, 78 Words in 4 Program Files,
           2 Words in 2 Force Tables.
There are  0 undefined data and 0 undefined program file(s).
```

Press Control-C to abort

Term. Addr: 0

Emulation: 5/02

Notice that the processor emulation parameter automatically changes to display the currently configured processor type. In this case, an SLC 5/02 processor is used. Leave this menu displayed while you set up node 3 APS terminal to receive the program file, or press [**CTRL-C**] to abort the procedure.

5. To receive the program file, start at the main menu on node 3, the receiving APS terminal, and press **WHO** **F5**, then **WHO ACTIVE** **F5**.

The Who Active screen appears with a list of the active nodes on the network. The node 0 APS XFER indicates that node 0 is waiting to transfer a program file.

```

WHO ACTIVE - Active Station Identification
-----
 0 APS XFER      (5)  12      24
 1 500-20       (5)  13      25
 2 5/02         (5)  14      26
 3 TERM         (5)  15      27
 4 HHT          (5)  16      28
 5              (5)  17      29
 6              (5)  18      30
 7              (5)  19      31
 8              (5)  20
 9              (5)  21
10              (5)  22
11              (5)  23
-----
ESC exits
    
```

Press a key for desired network function

ONLINE	STATION DIAGS	SET OWNER	CLEAR OWNER	MAX ADDRESS	NODE ADDRESS	NODE BAUD
F1	F2	F3	F4	F7	F8	F9

6. Since the cursor is already on node 0, press **ONLINE** **F1**. If necessary, position the cursor on the appropriate station, then press **ONLINE** **F1**.

7. The screen displays a series of status messages while the program file is being transferred. When the transfer is complete the system prompts you to confirm reading the program. Press **YES**. The screen displays the program directory menu for EXAMPLE.

PROGRAM DIRECTORY FOR PROCESSOR: EXAMPLE				
FILE	PROTECTED	NAME	TYPE	SIZE (words)
0			system	74
1			reserved	0
2			ladder	8714

Press a key, enter file number or file name

REM PROG

L532 Series C Rev.2

PROC Addr 1

PROCSSR FUNCTNS	SAVE RESTORE	RETURN TO MENU	CHANGE LNK ADR	CREATE REPORTS	FILE OPTIONS	MONITOR FILE	DATA MONITOR	MEMORY MAP
F1	F2	F3	F4	F6	F7	F8	F9	F10

8. Save EXAMPLE to disk on this APS terminal by pressing **SAVE RESTORE** and then **F2**. Confirm your selection by pressing **YES**. Node 0, the sending APS terminal, downloads program file EXAMPLE to node 3, the receiving APS terminal.

Note

*Do not exit the Transfer Completed display at node 0 yet. Exiting at this point causes a **Message Timeout-Loss of Communications** critical error in the receiving APS terminal.*

Press any key to return to the program directory menu and press **RETURN TO MENU**.

This completes the receiving procedure at node 3. Return to node 0, the sending APS terminal.

At node 0, the sending APS terminal, the screen displays **TRANSFER COMPLETE**.

Note

*Do not exit this screen before this point. Exiting prematurely will cause a **Message Timeout-Loss of Communications** critical error in the receiving APS terminal.*

```
ROCKWELL SOFTWARE INCORPORATED
      9323 SERIES SOFTWARE
SLC-500 PROGRAM TRANSFER UTILITY
```

Waiting to Send Program...

```
File Name : EXAMPLE .ACH
```

```
A total of  4 data, 4 program, and 2 force table(s)
           20 Words in 4 Data Files, 78 Words in 4 Program Files,
           2 Words in 2 Force Tables.
There are   0 undefined data and 0 undefined program file(s).
```

Press <ESC> to exit

Term. Addr: 0

Emulation: 5/02

Press [**ESC**] [**ESC**] [**ESC**] to return to the main menu.

This completes the sending a program file procedure. See the next section for instructions on how to receive a program file from another APS terminal.

Receiving a Program — APS to APS

Using the receive function, you can transfer a user program from the workspace of an APS terminal to the hard disk of your APS terminal.

In the following example, node 0 is the sending APS terminal, node 3 is the receiving APS terminal.

1. Begin at the main menu on node 3, the receiving APS terminal. Press

**SYSTEM
UTILITIES** .
F9

2. Press **PROGRAM
TRANSFER** . The Who Listen display appears. The display shows you the active nodes on the DH-485 network, indicated by asterisks next to the active node addresses.

At this point, node 3, your receiving APS terminal is not active on the network.

WHO LISTEN - Active Node Table

0 *	12	24
1 *	13	25
2 *	14	26
3	15	27
4 *	16	28
5	17	29
6	18	30
7	19	31
8	20	
9	21	
10	22	
11	23	

ESC exits

Press a function key

Term. Addr: 0

Emulation: SLC 5/01

RECEIVE
PROGRAM

F2

SEND
PROGRAM

F4

EMULATE
5/01

F6

EMULATE
5/02

F7

EMULATE
5/03

F8

EMULATE
5/04

F9

For this example, you are transferring program file TRANSFER that is written for an SLC 5/02 processor.

Note

You must configure the receiving APS terminal to emulate the type of processor that the program is written for. The default emulation is for the SLC 5/01 processor.

3. Press **EMULATE 5/02** . The status line displays an SLC 5/02 processor. Press

F7

RECEIVE PROGRAM

F2

- . The **Waiting to Receive Program** screen appears.
-

```
ROCKWELL SOFTWARE INCORPORATED
      9323 SERIES SOFTWARE
SLC-500 PROGRAM TRANSFER UTILITY
```

Waiting to Receive Program...

```
File Name : DEFAULT .ACH
```

Press Control-C to about

Term. Addr: 0

Emulation: 5/02

Leave this menu displayed while you set up node 0 APS terminal to send the program file, or press [**CRTL-C**] to abort the procedure.

4. To send program file TRANSFER, start at the main menu on node 0, the sending APS terminal, and press **WHO** , then **WHO ACTIVE** .

F5

F5

The Who Active screen appears with a list of the active nodes on the network. Notice node 3 APS XFER. This indicates that node 3 is waiting to transfer a program file.

```

WHO ACTIVE - Active Station Identification
-----
 0 TERM          (5)   12                24
 1 500-20        (5)   13                25
 2 5/02          (5)   14                26
 3 APS XFER      (5)   15                27
 4 HHT           (5)   16                28
 5                17                29
 6                18                30
 7                19                31
 8
 9
10
11
-----
ESC exits
    
```

Press a key for desired network function

ONLINE	STATION DIAGS	SET OWNER	CLEAR OWNER	MAX ADDRESS	NODE ADDRESS	NODE BAUD
F1	F2	F3	F4	F7	F8	F9

5. Position the cursor on node 3 and press **ONLINE** .
- F1

```

PROGRAM DIRECTORY FOR PROCESSOR: EXAMPLE
-----
FILE    PROTECTED    NAME            TYPE            SIZE (words)
 0                               system          *
-----

```

PROCESSOR MEMORY CORRUPTED

Press a key, enter file number or file name

REM PROG

SLC 5/01 Series A FRN 1

PROC Addr 1

PROCSSR FUNCTNS	RESTORE	RETURN TO MENU	CHANGE LNK ADR
F1	F2	F3	F4

6. Press **RESTORE** . The following display appears with the cursor on the first file.

\IPDS\ARCH\SLC500		
Name	Size	Date
* DRILL1	9325	09-12-95
EXAMPLE	929	10-07-95
EXAMPLE2	9254	10-17-95
EXAMPLE3	8345	10-17-95
EXAMPLE4	8715	10-17-95
EXAMPLE5	9395	10-17-95
EXAMPLE6	8225	10-17-95
EXAMPLE7	8831	10-17-95
SEQUENCE	8684	10-03-95 ↓
TRANSFER	8695	07-19-94

Press a Function Key Or Enter File Name

Term. Addr: 0

Emulation: SLC 5/01

BEGIN
RESTORE

F1

DEFINE
DIR

F7

7. You can either type: **TRANSFER**, then press [**ENTER**] or move the cursor in the right-hand window to **TRANSFER**, then press **BEGIN RESTORE** .
- F1

Sending a Program — APS to HHT

You can transfer a user program from the hard disk of the sending APS terminal to the Hand-Held Terminal using the send program function.

In the following example, node 0 is the sending APS terminal, node 4 is the receiving terminal.

1. Begin at the main menu on node 0, the sending APS terminal. Press

**SYSTEM
UTILITIES**
F9

2. Press **PROGRAM
TRANSFER**. The Who Listen display appears. The display shows you the active nodes on the DH-485 network, indicated by asterisks next to the active node addresses.

WHO LISTEN - Active Node Table		
0 *	12	24
1 *	13	25
2 *	14	26
3	15	27
4 *	16	28
5	17	29
6	18	30
7	19	31
8	20	
9	21	
10	22	
11	23	
ESC exits		

Press a function key

Term. Addr: 0

Emulation: SLC 5/01

RECEIVE
PROGRAM
F2

SEND
PROGRAM
F4

EMULATE
5/01
F6

EMULATE
5/02
F7

EMULATE
5/03
F8

EMULATE
5/04
F9

3. Press **SEND PROGRAM** . The following display appears with the cursor on program file DRILL1. In this example you will send program file EXAMPLE to the HHT terminal, node 4.

TRANSFER FILE

F3 File Name:

ESC exits/Alt-U aborts changes

Press a Function Key Or Enter File Name

Term. Addr: 0

BEGIN
SEND
F1

DEFINE
DIR
F7

\IPDS\ARCH\SLC500

	Name	Size	Date
*	DRILL1	9325	09-12-95
	EXAMPLE	929	10-07-95
	EXAMPLE2	9254	10-17-95
	EXAMPLE3	8345	10-17-95
	EXAMPLE4	8715	10-17-95
	EXAMPLE5	9395	10-17-95
	EXAMPLE6	8225	10-17-95
	EXAMPLE7	8831	10-17-95
	SEQUENCE	8684	10-03-95 ↓
	TRANSFER	8695	07-19-94

4. Move the cursor in the right-hand window to EXAMPLE, then press

**BEGIN
SEND**
F1

The **Waiting to Send** display appears.

```
ROCKWELL SOFTWARE INCORPORATED
      9323 SERIES SOFTWARE
SLC-500 PROGRAM TRANSFER UTILITY
```

Waiting to Send Program...

```
File Name : EXAMPLE .ACH
```

```
A total of  4 data, 4 program, and 2 force table(s)
           20 Words in 4 Data Files, 78 Words in 4 Program Files,
           2 Words in 2 Force Tables.
There are   0 undefined data and 0 undefined program file(s).
```

Press Control-C to abort

Term. Addr: 0

Emulation: 5/02

Leave this menu displayed while you set up the HHT terminal (node 4) to receive the program file, or press [CTRL-C] to abort the procedure.

To receive the program file, begin at the main menu on the HHT.
The following display appears:

```
SLC 500 PROGRAMMING SOFTWARE Rel. 2.03

      1747 - PTA1E
Rockwell Software, Inc. Copyright 1990
All Rights Reserved

PRESS A FUNCTION KEY          OFL
SELFTEST  TERM  PROGMAINT     UTILITY

      F1          F2          F3          F4          F5
```

5. Press **UTILITY** . The following display appears:

F8

File Name:		Prog Name:	
File Name	Type	Size(Instr)	
0	System	211	
1	Reserved	0	
2	Ladder	15	
ONLINE	WHO	PASSWRD	CLR_MEM
F1	F2	F3	F4 F5

6. Access the Who menu by pressing [F2]. This display shows you the active nodes on the DH-485 network.

Node Addr.	Device	Max Addr./Owner
0	APS XFER	(31)
1	500-20	(31)
2	5/02	(31)
3	APS	(31)
4	TERMINAL	(31)
Node Addr: 1	Baud Rate: 19200	OFL
DIAGNSTC	ATTACH	NODE_CFG OWNER
F1	F2	F3 F4 F5

7. Notice node 0 APS Xfer. This indicates that node 4 is waiting to receive the program file. At this point, press **ATTACH** . The message **Going Online** will be displayed momentarily at the HHT.

F3

8. When the HHT is online, the following menu is displayed. If a file already exists, the system will display **Overwrite existing program?**. If the HHT memory is empty the prompt **UPLOAD FROM PROCESSOR** will appear.

In either case, press **YES** to continue and upload the file to the APS

F2

terminal or press **NO** to abort the procedure.

F4

File Name:	Prog Name:			
File Name	Type	Size(Instr)		
0	System	211		
1	Reserved	0		
2	Ladder	15		
OFFLINE UPLOAD DWNLOAD MODE CLR_PRC>				
F1	F2	F3	F4	F5

The APS terminal will display a series of status messages while the program file is being transferred. When the transfer is complete a display similar to the following appears:

```
ROCKWELL SOFTWARE INCORPORATED
9323 SERIES SOFTWARE
SLC-500 PROGRAM TRANSFER UTILITY
```

```
File Name : EXAMPLE .ACH

A total of 4 data, 4 program, and 2 force table(s)
           20 Words in 4 Data Files, 78 Words in 4 Program Files,
           2 Words in 2 Force Tables.
There are 0 undefined data and 0 undefined program file(s).
```

```
PROGRAM TRANSFER COMPLETED
Press <ESC> to exit
```

```
Term. Addr: 0
```

```
Emulation: 5/01
```

9. At this point you have completed the sending program procedure. At the APS terminal and HHT press **[ESC] [ESC] [ESC]** to return to the main menu.

Receiving a Program — HHT to APS

You can transfer a user program from the HHT to the APS terminal using the receive program function. In the following example, node 0 is the receiving APS terminal, node 4 is the sending terminal.

1. Begin at the main menu on node 0, the receiving APS terminal. Press

**SYSTEM
UTILITIES** .
F9

2. Press **PROGRAM
TRANSFER** . The Who Listen display appears. The display shows you the active nodes on the DH-485 network, indicated by asterisks next to the active node addresses.

3. The default emulation is for an SLC 5/01 processor. If the program in the HHT is for an SLC 5/02 processor, the APS terminal must be configured for an SLC

5/02 processor. Press **EMULATE
5/02** .
F7

WHO LISTEN - Active Node Table			
0 *	12		24
1 *	13		25
2 *	14		26
3	15		27
4 *	16		28
5	17		29
6	18		30
7	19		31
8	20		
9	21		
10	22		
11	23		
ESC exits			

Press a function key

Term. Addr: 0

Emulation: SLC 5/01

RECEIVE
PROGRAM
F2

SEND
PROGRAM
F4

EMULATE
5/01
F6

EMULATE
5/02
F7

EMULATE
5/03
F8

EMULATE
5/04
F9

4. The status line will indicate an SLC 5/02 processor. The APS terminal is now ready to receive the program from the HHT. Press **RECEIVE PROGRAM** . The following display appears at the APS terminal:

```
ROCKWELL SOFTWARE INCORPORATED
9323 SERIES SOFTWARE
SLC-500 PROGRAM TRANSFER UTILITY
```

Waiting to Send Program...

```
File Name : EXAMPLE
```

Press Control-C to abort

Term. Addr: 0

Emulation: 5/02

5. Leave the previous menu displayed on the APS terminal while you set up the HHT terminal. At this time you can press [**CRTL-C**] to abort the procedure.
6. To send the program file EXAMPLE, begin at the main menu on the HHT. Press **UTILITY** . The following display appears:

F5

```
File Name:          Prog Name:
File Name          Type      Size(Instr)
0                  System    211
1                  Reserved  0
2                  Ladder   15
```

```
ONLINE   WHO   PASSWRD          CLR_MEM
```

```
F1       F2       F3       F4       F5
```


7. Access the Who menu by pressing **WHO** . The following display appears

F2

which lists the active nodes on the network. Notice the node 0, APS Xfer. This indicates that node 0 is waiting to transfer the program file.

Node Addr.	Device	Max Addr./Owner
***0	APS XFER	(31) ***
1	500-20	(31)
2	5/02	(31)
3	APS	(31)
4	TERMINAL	(31)
Node Addr: 1 Baud Rate: 19200 OFL		
DIAGNSTC	ATTACH	NODE_CFG OWNER

F1
F2
F3
F4
F5

8. At this point, press **ATTACH** . The message **Going Online** is momentarily

F3

displayed on the HHT. Once the HHT is online the following menu appears:

Program Directory				
Programmer		Processor		
Prog:	EXAMPLE	Prog:	DEFAULT	
File:		File:		
Exec Files:	3	Exec Files:	0	
Data Files:	12	Data Files:	0	
PROCESSOR FILES CORRUPTED		PRG		
OFFLINE	UPLOAD	DWNLOAD	MODE	CLR_PRC

F1
F2
F3
F4
F5

9. To transfer the program file to the APS terminal, press **DOWNLOAD**. The
F3

message **Download to Processor?** will appear. Press either

YES

F2

to continue or

NO

F4

The message **Downloading File** appears on the HHT display as the file is transferred to the APS terminal. When the transfer is complete, the APS terminal displays the following menu:

```
ROCKWELL SOFTWARE INCORPORATED
      9323 SERIES SOFTWARE
SLC-500 PROGRAM TRANSFER UTILITY
```

```
File Name : EXAMPLE .ACH
```

```
A total of  4 data, 4 program, and 2 force table(s)
            20 Words in 4 Data Files, 78 Words in 4 Program Files,
            2 Words in 2 Force Tables.
There are   0 undefined data and 0 undefined program file(s).
```

```
PROGRAM TRANSFER COMPLETED
Press <ESC> to exit
```

```
Term. Addr: 0
```

```
Emulation: 5/01
```

10. This completes the program file transfer procedure. At the APS terminal press [**ESC**] [**ESC**] [**ESC**] to return to the main menu.

A *APS Error Messages*

This appendix contains APS error messages, which can occur during operation.

General Information

Often, APS errors are caused due to incorrect configuration of your personal computer. Verify that your system is configured as follows:

- CONFIG.SYS file should be set as: **FILES=40** (or **46** when running in Windows); **BUFFERS=40**.
- AUTOEXEC.BAT file should include: **C:\DOS\SHARE.EXE**
- Extended/expanded memory manager must be LIM 3.2 or higher.

APS runs with most Terminate and Stay Resident (TSR) programs. However, some TSR programs causes APS to operate erratically. Therefore, we recommend that *no* TSR programs execute while APS is running. If you choose to forego this recommendation and you experience difficulties, edit and mark out your TSRs one by one until you find the offensive TSR. This also applies to device drivers (other than extended/expanded memory managers).

Display Message	Description	Recommended Action
ADDRESS OUT OF RANGE	The specified device you are trying to communicate with is out of memory.	Check the device and your command; retry the function
ALL REQUIRED OPERANDS HAVE NOT BEEN ENTERED	While programming an instruction an operand(s) was left out.	Enter all operands and retry the function.
ATTEMPTING TO RESTORE FILE TO PROCESSOR, PROCESSOR MUST BE IN PROGRAM MODE	During a restore, or when attempting switching from offline editing to online monitoring, the offline program was not downloaded because the processor was not in program mode.	Place the processor in program mode and retry the function.
BAD REPLACE STRING	The text entered for a replace string does not have the correct syntax.	Check the syntax and correct if necessary. Retry the function.
BAD SEARCH STRING	The text entered for a search string does not have the correct syntax.	Check the syntax and correct if necessary. Retry the function.
BECAUSE IR PAIRS CANNOT BE SEPARATED, THE EXTRA RUNG HAS ALSO BEEN SELECTED	The last rung selected belongs to an IR pair.	None required.
BOTH SOURCE OPERANDS CANNOT BE CONSTANTS	Source A and Source B operands are both constants.	Change one of the operands to an address. Retry the function.
BRIDGE DEVICE NO LONGER RESPONDING	While online with DF1 Full Duplex through a KF3 (with or without a modem) a disconnection or hangup occurred.	Retry the function.

Display Message	Description	Recommended Action
BRIDGE DEVICE NOT ACTIVE	Inability to attach to a KF3 while going online with DF1 Full Duplex.	Retry the function.
BRIDGE DEVICE RESPONDED WITH ERRORS	There is an error in the received packet from the 1785-KA5 interface module.	Retry the function.
CANNOT EDIT THIS RUNG	An attempt was made to edit a replaced marked rung or modify a deleted marked rung.	Re-evaluate your edit attempt.
CANNOT INSERT A RUNG BETWEEN AN IR PAIR	An attempt was made to insert, append, or undelete a rung between an inserted marked rung followed by a replaced marked rung.	Move the cursor before or after the IR pair and try to insert, append, or undelete the next rung.
CANNOT MODIFY DATA TABLE SIZE DURING ONLINE EDITING	Modification of data table sizes or creation of new data tables cannot occur while in an online editing session.	Go offline to change the data table sizes and retry the function.
CANNOT MODIFY PARAMETER VIA 5/03 PROCESSOR'S CHANNEL 0	An attempt to change a node's owner, the max. address, node address, or baud rate of an SLC 5/03 while it was communicating with APS over channel 0 was made.	Not allowed.
CANNOT MODIFY PROTECTED DATA FILE DURING ONLINE EDITING	During an online editing session, an attempt was made to modify data tables that were constantly protected.	Not allowed. Go offline to either change the data file protection and retry the function, or edit the program offline.
CANNOT TRANSMIT - LOSS OF COMMUNICATIONS	Either the communication interface module has waited more than 10 seconds to gain access to the send mailbox or APS has attempted to send a packet before getting confirmation of the previous send.	Retry the function.
CAUTION: INDIRECT ADDRESSES MUST ALREADY EXIST AND BE PROPERLY REFERENCED	An indirect address was entered into the ladder program.	Ensure that the necessary data table addresses are allocated for indirect addressing.
CAUTION: REMOVING OUTPUT REFERENCES LEAVES THE OUTPUTS IN THEIR LAST STATE	Either 1) the Test Edits function key was pressed and edits do exist in the ladder program; or 2) an attempt to delete an instruction was made.	Be aware that changes may result to the output states when the new assembled edits become active or when a restore is performed via quick edits.
CAUTION: VERIFY STATE OF OUTPUTS WITH DATA MONITOR	You directed APS to assemble all existing online edits or a quick edit program.	Be aware that changes may result to the output states when the new assembled edits become active or when a restore is performed via quick edits.
CHANGE BINARY FILE TO SEQUENTIAL BEFORE ENABLING SHORT ADDRESSING	An attempt to enable short addressing failed because the Binary File selection is set to word/bit.	Change the Binary File selection to sequential and then retry.

Display Message	Description	Recommended Action
CHANNEL CONFIGURATION MAY CAUSE LOSS OF COMMUNICATIONS	Applies only if you are online. An incompatibility exists between the 5/03 and the current online configuration (APS).	Check your online configuration and retry the function.
CHANNEL CONFIGURATION NOT AVAILABLE FOR SELECTED PROCESSOR	A processor other than an SLC 5/03 or SLC 5/04 is selected.	Verify that an SLC 5/03 or SLC 5/04 processor is selected. Retry the function.
CHANNEL CONFIGURATION MODIFIED, ACCEPT OR UNDO CHANGES	The [ESC] or [ALT-U] key was pressed after a change was selected.	Informational message. No action necessary.
CHANNEL CONFIGURATION MAY CAUSE LOSS OF COMMUNICATIONS	Online only – An incompatibility between the SLC 5/03 or SLC 5/04 and the current online (APS) configuration exists.	Verify that the selected online configuration is compatible with an SLC 5/03. Retry the function.
COMMAND CANNOT BE EXECUTED	This message could mean 1) you are not the program owner; or 2) the file is in use by another device.	Determine why another node has explicit access.
COMMENT DATA LOST	The text storage capacity of a rung, address, or instruction comment has been exceeded.	Install a memory module, change mode, or install forces.
CONDITION CANNOT BE GENERATED	This message indicates either 1) no memory module exists; 2) the processor is in fault mode; or 3) no forces are installed.	Informational message. No action necessary.
CONFIRMATION TIMEOUT – LOSS OF COMMUNICATIONS	The communication interface module did not return the status of the message sent within 5 seconds.	Check the connection to the DH+ network and retry the function.
CONVERSION SUCCESSFUL-BYTES CONVERTED	An archive file was successfully converted into a hex file.	Send the hex file to a prom programmer.
CREATION OF XREF DB ENTRY FAILED	While attempting to create the cross reference database during create reports, a database call generated an error.	Contact your RSI representative.
CUT/COPY/PASTE FUNCTION NOT AVAILABLE DURING ONLINE EDITING	An attempt to perform a cut/copy/paste was made during a runtime online edit.	Change to the program online edit mode and try the cut/copy/paste function again.
DATA FILES CAN ONLY BE PROTECTED FOR 5/03 PROCESSOR TYPES	An attempt to modify program protection for a non 5/03 processor occurred.	Change the processor to an SLC 5/03 and retry the function.
DATA VALUE CANNOT BE MODIFIED DUE TO FILE PROTECTION	An attempt to alter an element within a protected data table was made from the multi-point list.	Informational message. No action necessary.

Display Message	Description	Recommended Action
DATABASE READ ERROR	A DOS file read error occurred or a program documentation file was altered.	Check your CONFIG.SYS file for proper set up. (FILES=30 and BUFFERS=30.) Verify that no TSR programs are interfering with APS. If changes are made, you must reboot the computer.
DATABASE WRITE ERROR	A DOS file write error occurred.	Check your CONFIG.SYS file for proper set up. (FILES=30 and BUFFERS=30). Verify that no TSR programs are interfering with APS. If changes are made, you must reboot the computer.
DECOMPILER BAD MATRIX DECOMPILER CRC ERROR	A decompiler error occurred. The message always begins with "DECOMPILER."	Contact your RSI representative.
DESTINATION DIRECTORY CANNOT BE THE SAME AS A SOURCE DIRECTORY	The copy to/from directories are the same.	Change one of the directories and retry the function.
DESTINATION DIRECTORY MUST BE SPECIFIED	During copy to, the destination directory was not specified.	Specify the destination directory and retry the function.
DISABLE SHORT ADDRESSING TO ALLOW SELECTION OF WORD/BIT FOR BINARY FILE	An attempt to change the Binary File selection to word/bit failed because short addressing is enabled.	Disable short addressing and then retry.
DOWNLOAD ABORTED	During quick edits, when trying to switch from offline editing to online monitoring, Ctrl-C was pressed during the download phase.	The offline ladder editor is displayed.
DUPLICATE NODE ADDRESS	Two or more devices on the network have the same address.	Change the Terminal Address in On-line Configuration. Retry this function.
ENQ RETRIES EXHAUSTED	DF1 Full Duplex is not getting a response from the KF3.	Check for electrical noise problem on network wiring and retry the function.
ERROR ACCESSING PROCESSOR I/O CONFIGURATION FILE	Attempt to read the I/O auto configuration file from the specified 5/03 processor failed.	Make sure the processor is in the program mode. Retry the function.
ERROR - ALLOCATING SPACE	To convert the processor image to a hex file, the software requests space from the system. Insufficient space generated an error.	At the DOS prompt verify that at least 580K of memory exists. Remove any TSRs that may be taking memory space. Retry the function.
ERROR - CLOSING ARCHIVE FILE	While attempting to close an archive file an error occurred.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
ERROR - CLOSING HEX FILE	While attempting to close a hex file an error occurred.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.

Display Message	Description	Recommended Action
ERROR – NOT ENOUGH MEMORY TO ACCEPT CURRENT RUNG	Transfer of an accepted rung to an SLC 5/03 failed because there is not enough program space for the selected rung size in the processor.	Reduce or optimize your user program or perform offline editing.
ERROR – OPENING ARCHIVE FILE	While attempting to open an archive file an error occurred.	Check your disk space by running “CHKDSK” from your DOS prompt. On successful completion retry the function.
ERROR – OPENING HEX FILE	While attempting to open a hex file an error occurred.	Check your disk space by running “CHKDSK” from your DOS prompt. On successful completion retry the function.
ERROR – READING HEADER OF ARCHIVE FILE	While reading the header in the archive file an error occurred.	Check your disk space by running “CHKDSK” from your DOS prompt. On successful completion retry the function.
ERROR – READING PROCESSOR IMAGE FILE STRUCTURE	While reading the processor image in the archive file an error occurred.	Check your disk space by running “CHKDSK” from your DOS prompt. On successful completion retry the function.
ERROR – READING PROCESSOR IMAGE FROM ARCHIVE FILE	While reading the processor image in the archive file an error occurred.	Check your disk space by running “CHKDSK” from your DOS prompt. On successful completion retry the function.
ERROR – READING PROCESSOR STATIC STRUCTURE	While reading the processor image in the archive file an error occurred.	Check your disk space by running “CHKDSK” from your DOS prompt. On successful completion retry the function.
ERROR – READING PROCESSOR IMAGE	While reading the processor image in the archive file an error occurred.	Check your disk space by running “CHKDSK” from your DOS prompt. On successful completion retry the function.
ERROR – RESERVED FILE NAME	An attempt to enter a reserved file name (PRN, LPT, CON, or AUX) was made.	Re-enter a different file name.
ERROR DELETING FILES	The routine called to delete files failed.	Check your disk space by running “CHKDSK” from your DOS prompt. On successful completion retry the function.
ERROR GETTING DIRECTORY LIST	An error occurred when the directory list of files was being retrieved by APS.	Check your disk space by running “CHKDSK” from your DOS prompt. On successful completion retry the function.
ERROR INITIALIZING COMMUNICATIONS DRIVER	The communication driver specified by the current online configuration could not be loaded or initialized.	Save your key strokes and program that created this error. Contact your RSI representative.
ERROR – SPECIFIED LADDER FILE DOES NOT EXIST	During create program listing, when specifying the file/rung range, the specified ladder file did not exist.	Specify a different file number or create a file and retry the function.
ERROR – SPECIFIED RUNG DOES NOT EXIST IN SPECIFIED FILE	During create program listing, the specified rung number did not exist.	Specify a different rung number or create a rung and retry the function.

Display Message	Description	Recommended Action
ERROR - TOO FEW DATA FILES IN THIS ARCHIVE FILE	An error occurred while accessing data files.	Contact your RSI representative.
ERROR - UNABLE TO CALCULATE PROM SIZE	The processor image is invalid.	Resave the file and retry the function.
ERROR - UNABLE TO FIND PROCESSOR IMAGE	While reading the processor image in the archive file an error occurred.	Check your disk space by running "CHKDSK" from your DOS prompt. Retry the function.
ERROR - WRITING DATA RECORD	The software is unable to write to the current hex file.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
ERROR - WRITING END OF FILE RECORD	The software is unable to write to the current hex file.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
ERROR - WRITING LRC RECORD	The software is unable to write to the current hex file.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
ERROR CLOSING REPORT LISTING FILE	During create reports an attempt to close a report listing failed.	Verify that the path (ipds\lis\slc500) exists and that the file is not write protected.
ERROR COPYING FILES	The routine called to copy files failed.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
ERROR CREATING NEW ARCHIVE FILE	An error occurred while saving the file contents to disk.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
ERROR MAPPING LADDER FILE RUNG	During create reports an error occurred while attempting to map rung or address/instruction comments to corresponding rungs, addresses, or instructions.	Contact your RSI representative.
ERROR OPENING COMMUNICATION PROTOCOL FILE	Either a disk read error occurred or the driver file does not exist in the specified directory.	Verify that the driver file exists and execute "CHKDSK" from the DOS prompt. Retry the function.
ERROR OPENING REPORT LISTING FILE	During create reports an attempt to close a report listing failed.	Verify that the DOS path contains (ipds\lis\slc500) and that the file is not write protected.
ERROR POSITIONING PROCESSOR FILE POINTER	During create reports an attempt to set a file pointer to a ladder executable file in the archive file failed.	Contact your RSI representative.

Display Message	Description	Recommended Action
ERROR READING ADDRESS/INSTRUCTION COMMENT FROM DATABASE	During create reports an error occurred while attempting to read an address/instruction comment from the comments database.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
ERROR READING COMMUNICATION PROTOCOL FILE	An error occurred while trying to start the comms. driver.	Verify that the driver file exists and execute "CHKDSK" from the DOS prompt. Retry the function.
ERROR READING LADDER FILE RUNG	During create reports an attempt to read a rung from the database failed.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
ERROR READING RUNG COMMENT FROM DATABASE	During create reports an error occurred while attempting to read a rung comment from the rung comments database.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
ERROR RENAMING FILES	The routine called to rename files failed.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
ERROR RENAMING REPORT LISTING FILE	During create reports an attempt to rename a report listing failed.	Verify that the DOS path contains (ipds\lis\slc500) and that the file is not write protected.
ERROR WRITING CONFIGURATION FILE	The configuration file was not successfully saved to the user preference file.	Check the configuration file and save the file.
ERROR WRITING TO REPORT LISTING FILE	During create reports an attempt to write to a report listing failed.	Verify that the DOS path (ipds\lis\slc500) exists and that the file is not write protected.
EXPRESSION CONTAINS TOO MANY CHARACTERS	A compute expression was entered that will exceed 255 characters when displayed.	Enter a shorter expression.
EXPRESSION NESTED TOO DEEP	A compute expression was entered that exceeds the space available for nesting expressions.	Enter a simpler expression.
EXT STS ERROR	Unrecognized or unknown error response from the processor.	Contact your RSI representative.
FATAL C-tree INTERNAL ERROR	An error related to program documentation or cross reference generation occurred.	Contact your RSI representative.
FATAL COMMUNICATION HARDWARE ERROR	An attempt is being made to use a non-available communication port.	Go to Online Configuration and change the Port selection. Retry the function.

Display Message	Description	Recommended Action
FATAL DISK ERROR	A failure occurred while trying to load the data base from disk or trying to save the data base to disk.	1) Retry the function, 2) restart APS from the DOS command prompt; then 3) verify your disk validity by running "CHKDSK." Contact your RSI representative if the above actions do not help.
FATAL ERROR - RUNG BRANCH CONTAINS MORE THAN 75 LEVELS	During create reports a rung was detected having more than 75 levels on a branch.	Change the rung to have no more than 75 levels. Retry the function.
FATAL ERROR CLOSING FILE	An unknown error occurred when APS tried to read from a file.	Either 1) retry the function; 2) restart the software; 3) reboot the PC; or 4) run "CHKDSK" from the DOS command prompt.
FATAL ERROR INITIALIZING DOCUMENTATION FILES	An error occurred during an initialization of the current data base after you requested to rename the current file.	1) Retry the function, 2) restart APS from the DOS command prompt; then 3) verify your disk validity by running "CHKDSK." Contact your RSI representative if the above actions do not help.
FATAL ERROR OPENING FILE	An unknown error occurred when APS tried to read from a file.	Either 1) retry the function; 2) restart the software; 3) reboot the PC; or 4) run "CHKDSK" from the DOS command prompt.
FATAL ERROR READING FROM FILE	An unknown error occurred when APS tried to read from a file.	Either 1) retry the function; 2) restart the software; 3) reboot the PC; or 4) run "CHKDSK" from the DOS command prompt.
FATAL ERROR SAVING DOCUMENTATION FILES	An error occurred during a save of the current data base after you requested to rename the current file.	1) Retry the function, 2) restart APS from the DOS command prompt; then 3) verify your disk validity by running "CHKDSK." Contact your RSI representative if the above actions do not help.
FATAL ERROR WRITING TO FILE	An unknown error occurred when APS tried to write to a file.	Either 1) retry the function; 2) restart the software; 3) reboot the PC; or 4) run "CHKDSK" from the DOS command prompt.
FATAL INTERNAL ERROR	Either 1) APS was not able to allocate memory from DOS while you were reviewing/editing comments or symbols; or 2) APS was initializing and could not allocate DOS memory for internal data storage.	Verify your disk validity by running "CHKDSK" from the DOS command prompt. We recommend 525K bytes available for APS 3.01, 550K bytes available for APS 4.0, 250K bytes available for APS 5.0, and 300K bytes available for APS 6.0.

Display Message	Description	Recommended Action
FATAL INTERNAL MANAGE FILES ERROR	A fatal error occurred in the MF function.	Either 1) retry the function; 2) restart the software; 3) reboot the PC; or 4) run "CHKDSK" from the DOS command prompt.
FATAL MEMORY ERROR	An error occurred while requesting space from the system.	Either 1) retry the function; 2) restart the software; 3) reboot the PC; or 4) run "CHKDSK" from the DOS command prompt.
FILE PROTECTION VIOLATION – ASSIGNED TO ANOTHER APS	While running under Windows, one APS attempted to monitor or perform an archive operation on the same file that a second APS has already claimed.	In the second APS session, free the archive file by selecting another archive file or returning to the main menu.
FILE, RUNG, ILLEGAL INSTRUCTION	During a program save or while testing edits, an unsupported instruction was detected.	Change or delete the instruction; verify that the selected processor supports the instruction; retry the function.
FILE, RUNG, ILLEGAL ADDRESS	During a program save or while testing edits, an unsupported address was detected.	Verify that the correct processor is selected to support your desired addressing structure. Make any necessary changes; retry the function.
FILE, RUNG, ILLEGAL PROGRAM STRUCTURE	During a program save or while testing edits, unsupported instructions or addresses were detected.	Verify that the correct processor is selected to support your ladder program; retry the function.
FILE, RUNG, ILLEGAL ADDRESSING MODE	During a program save or while testing edits, an unsupported address was detected.	Verify that the correct processor is selected to support your ladder program; retry the function.
FILE, RUNG, INSTRUCTION FILE OVERWRITE ERROR	For instruction types that contain file addresses and a corresponding length, adequate data table space must exist for the file address plus a number of addresses past that address. During a program save or test edits an instruction was detected that violates this rule.	Change the file address or length and retry the function.
FILE, RUNG, INSTRUCTION, I/O ADDRESS UNDEFINED	During a program save or test edits, an input or output address has been detected on a rung but the address is not configured for the given processor.	Change the address or I/O configuration and retry the function.
FILE, RUNG, INSTRUCTION, M0/M1 ADDRESS NOT CONFIGURED	During a program save or test edits, an M0/M1 address has been detected on a rung but the address is not configured for the given processor.	Change the address or I/O configuration and retry the function.

Display Message	Description	Recommended Action
FILE, RUNG, END MCR IS ONLY ALLOWABLE INSTRUCTION ON RUNG	Rungs containing 'end MCR' cannot contain any other instructions on that rung. During a program save or test edits a rung was detected that violates this rule.	Configure the address for the given processor and resave the program.
FILE, RUNG, INDEXED O, I, & S ADDRESSES CURRENTLY ILLEGAL	During program save or test edits, an indexed input, output, or status file address was detected where these files are not allowed.	Change any indexed O, I, S addresses.
FILE, RUNG, SYNTAX ERROR	During program save or test edits a rung was detected to contain invalid instruction codes or rung structure.	Contact your RSI representative.
FILENAME MUST BE SPECIFIED	A file name has not been specified.	Specify a file name.
FORCE STATE CANNOT BE MODIFIED DUE TO FILE FORCE PROTECTION	An attempt was made to force input/output files that are protected.	Go offline, deselect force protection, then restore the program.
FUNCTION DISALLOWED	This message could mean either 1) you are not the program owner; 2) the file is not open for read/write; or 3) the directory is currently open.	Retry the function.
I/O CONFIGURATION DOES NOT MATCH PROGRAM	The user program contains references to unconfigured I/O addresses.	Change the addresses or reconfigure the I/O.
I/O CONFIGURATION FILES CANNOT BE MODIFIED DURING ONLINE EDITING	I/O configuration files cannot be modified while in the online editing session.	Go offline and edit; then restore the program.
ILLEGAL DATA OR PARAMETER VALUE	The value input is not valid.	1) Check the file number, the file type, the count, and address being used; 2) use the WHO function to verify that the processor maximum node address is ≤ 31 .
ILLEGAL FILE TYPE	During configuration of report options for the cross reference report an illegal starting or ending file type was entered.	Enter a valid file type and retry the function.
ILLEGAL PROGRAM ACCESS ATTEMPTED	An invalid password was entered for a password protected file.	Enter a valid password for the specified file.
ILLEGAL SELECT-THE "I" RUNG ATTACHED TO THE SELECTED "R" RUNG CANNOT BE FOUND	During an attempt to perform a cut/copy/paste, the first rung selected was marked for replacement.	Contact your local Rockwell Software representative.
ILLEGAL SIZE	An Ext STS error occurred during communications indicating an illegally sized communication packet.	Verify that the bridge device is properly configured.

Display Message	Description	Recommended Action
ILLEGAL SYMBOL	During configuration of report options for the cross reference report an illegal starting or ending symbol was entered.	Enter a valid symbol and retry the function.
IMMEDIATE FLOATING POINT IS NOT SUPPORTED BY THIS PROCESSOR	A pre-SLC 5/03 Series B processor is configured.	Either change the processor to an SLC 5/03 Series B or SLC 5/04 processor, or change the ladder program to not include floating point values.
IMMEDIATE FLOATING POINT VALUE IS NOT ALLOWED	The instruction parameter does not support floating point values.	Either change the processor to an SLC 5/03 Series C or SLC 5/04 processor, or select a different instruction.
INCOMPATIBLE DEVICE	The version of the software is unable to communicate with the requested device.	Contact your RSI representative.
INCORRECT BOARD ADDRESS OR IRQ – DRIVER HAS SET CORRECT VALUES (This message only appears when one 1784-KT2 interface module is installed.)	When configuring the 1784-KT2 communication interface module, an incorrect board address or IRQ was entered.	No action required. The 1784-KT2 interface module sets the correct board address or IRQ value.
INCORRECT COMMUNICATION BOARD IRQ CONFIGURATION	The IRQ address for a 1784-KT2, 1784-KL, or 1784-KT interface module was entered incorrectly in the online configuration. This message also appears when more than one 1784-KT2 interface modules are installed.	Verify the correct IRQ address on the interface module and change the parameter in the online configuration set up. Retry the function.
INCORRECT COMMUNICATION BOARD ADDRESS CONFIGURATION	The board address for a 1784-KL or 1784-KT interface module was entered incorrectly in the online configuration. This message also appears when more than one 1784-KT2 interface module is installed.	Verify the correct board address on the interface module and change the parameter in the online configuration set up. Retry the function.
INPUT INVALID, PLEASE REENTER	Incorrect syntax entered.	Retry the function.
INPUT MIN. MUST BE LESS THAN INPUT MAX.	An attempt was made to enter a Scale with Parameters instruction having an input minimum constant operand greater than the input maximum constant operand.	Either make the input maximum value greater than the input minimum value, or change one of the operands to a non-constant value.
INPUT, OUTPUT, AND STATUS FILES CANNOT BE CONSTANT PROTECTED	An attempt to constant protect these types of files was made.	Apply only static protection to these types of files.
INSTRUCTION HAS NO OPERANDS	'Modify symbol' was selected, but the instruction does not have any operands.	Informational message. No action necessary.
INSTRUCTION HAS NO OPERANDS TO RELATE TO SYMBOL	The instruction has operands, but none of the operands support a symbol name.	Re-enter the user instruction address.

Display Message	Description	Recommended Action
INTEGRITY CHECK OF SERIAL NUMBER HAS FAILED, REINSTALL SOFTWARE PACKAGE	The runtime CRC does not match the install-time CRC. APS aborts because the serial number has been tampered with.	Reinstall the software.
INVALID ADDRESS FOR SELECTED PROCESSOR TYPE	A floating point, ASCII, or string address exists in the ladder program.	Either change the processor type to an SLC 5/03 Series B or SLC 5/04 or change the ladder program to not include these addresses.
INVALID BOARD ADDRESS	An illegal board address was entered.	Enter a valid board address and retry the function.
INVALID G-FILE SIZE	An attempt was made to set the G-File size greater than 256 words.	Set the G-File size to no more than 256 words.
INVALID ISR FILE NUMBER	An attempt was made to set an ISR number to the reserved or main ladder program files.	Verify the destination of the ISR number. Valid ISR numbers are 0, 4-255.
INVALID M0 FILE SIZE	An attempt was made to enter a numeric value that can be stored as the M0 file size.	Retry the function.
INVALID M1 FILE SIZE	An attempt was made to enter a numeric value that can be stored as the M1 file size.	Retry the function.
INVALID CHAR	An illegal character was entered in a file name.	Verify that entered characters are valid. Valid characters are: A-Z, a-z, 0-9, OR ' _ '. Retry the function.
INVALID COMMAND	A key was pressed that APS was not expecting.	Retry the function.
INVALID COMMUNICATION DRIVER FILE FORMAT	An error occurred while trying to start the communication driver.	Verify that the driver file exists and execute "CHKDSK" from the DOS prompt. Retry the function.
INVALID FILE NUMBER	During program save or test edits an error occurred while attempting to copy a data table from the database to the processor image.	Retry the function. If you still have problems contact your RSI representative.
INVALID FILE TYPE	The instruction does not permit the use of the entered file type or the file number is already defined as a different type of file.	Specify a valid file type and retry the function.
INVALID MODULE INPUT/OUTPUT SIZE	An attempt was made to set the input or output size greater than 32 words for a single module.	Set the input or output size to no more than 32 words for a single module.
INVALID OPERAND	Incorrect syntax was entered for the operand.	Enter a valid operand and retry the function.

Display Message	Description	Recommended Action
KF3 ADDRESS CANNOT EQUAL PROCESSOR ADDRESS	The 1770-KF3 and processor are at the same node address.	Change their node addresses to be unique.
LINK ERROR	Unrecognized or unknown problem with the communication driver.	Retry the function. If you still have problems contact your RSI representative.
LOSS OF MODEM CARRIER	While online with DF1 Full Duplex through a 1770-KF3 and a modem, a disconnection or hangup occurred.	Retry the function.
LOSS OF MODEM DSR STATUS	While online with DF1 Full Duplex through a 1770-KF3, the modem went inactive.	Check the connection and retry the function.
M0/M1 ADDRESS MONITORING ONLY SUPPORTED ONLINE	An attempt to monitor an M0/M1 file was made using a processor other than an SLC 5/03.	Change the processor to an SLC 5/03; go online with APS; retry M0/M1 address monitoring.
M0/M1 ADDRESS MONITORING CURRENTLY DISABLED	M0/M1 address monitoring is disabled in the APS configuration.	Enable M0/M1 address monitoring and retry the function.
M0/M1 ADDRESSES CANNOT BE MODIFIED	Unable to modify M0/M1 addresses from the M0/M1 data table monitor.	Informational message. You cannot modify M0 and M1 files from the data table monitor.
MAXIMUM COMMUNICATION DRIVER SIZE EXCEEDED	The link layer driver is too large to fit into the memory available.	Verify the size, date, and time for the link layer file. Also run "CHKDSK" from the DOS prompt.
MAXIMUM NODE ADDRESS VIOLATION DETECTED	The software detected a device at a node higher than the current maximum node address.	Change the Max. Node Address in the online Configuration screen.
MESSAGE TIMEOUTS - LOSS OF COMMUNICATIONS	Either 1) the specified device is currently busy; 2) the requested device is not at the specified address; 3) the requested device is not at the specified baud rate; 4) the PC may not be able to communicate through the requested port at the selected baud rate; or 5) electrical noise exists in the network wiring.	1) Verify all addresses and baud rates; 2) verify that the SLC has power and that it is sufficient to run the processor; 3) check the power supply jumper on the processor, verify positioning for the current input power; 4) use the Who function to determine network configuration; or 5) correct noise problem.
MODULE MUST BE SPECIFIED BEFORE SPECIAL CONFIG.	The Special I/O function key was pressed while the highlighted slot was empty.	Specify module and retry function.
MULTIPOINT ADDRESSES MUST ALREADY EXIST	An attempt to add an address to the multi-point list was made, but failed since the address does not currently exist in the program.	Specify the address in the program and then retry the function.

Display Message	Description	Recommended Action
MUST BE FIRST INSTRUCTION IN THE FILE	The required instruction must be the first instruction in the ladder file.	Change the location of the instruction to be the first instruction in the ladder file.
NAK RETRIES EXHAUSTED	DF1 Full Duplex data is not being received by the KF3.	Check for noise and retry the function.
NO ACCESS OR PRIVILEGE VIOLATION	The device is not in the program mode.	Change the mode to program mode and retry the function. If this message still appears, default the processor to its original settings.
NO EDITS IN PROCESSOR	The Test Edits function key was pressed and no edits exist in the ladder program.	Retry the function.
NO ENTRIES HAVE BEEN MADE INTO THE ADDRESS DATABASE	While documenting a program the function key 'next address' was pressed and no address comments exist.	Informational message. No action necessary.
NO ENTRIES HAVE BEEN MADE INTO THE SYMBOL DATABASE	While documenting a program the function key 'next symbol' was pressed and no symbols exist.	Informational message. No action necessary.
NO MEMORY LEFT	Either 1) there is no available hard disk space to perform the current operation; or 2) there is insufficient computer RAM memory.	1) Review all files on the hard drive and remove all unnecessary files; 2) remove any TSRs that may be taking memory space; 3) verify your disk validity by running "CHKDSK" from the DOS command prompt. We recommend 525K bytes available for APS 3.01, 550K bytes available for APS 4.0, 250K bytes available for APS 5.0, and 300K bytes available for APS 6.0.
NO PROGRAMMABLE MEMORY MODULE IN PROCESSOR	Either 1) there is no memory module in the processor; or 2) the memory module is write protected, or 3) the memory module that is installed is the wrong size for the processor.	Install a memory module in the processor.
NO ROOM IN BUFFER	Either 1) the software attempted to send out a message too large to transmit; or 2) another device is trying to send a message to the software.	Check the device for problems and retry the function. If this does not work contact your RSI representative.
NO SPACE FOR TAB INSERT HERE	The text storage for a rung, address, or instruction comment has been exceeded.	Informational message. No action necessary.
NO SYMBOL TO REMOVE	Invalid symbol name was entered.	Enter a valid symbol name.
NOT A DIRECT ADDRESS, PLEASE ENTER A DIRECT ADDRESS	An attempt to enter the Data Monitor was made, but the cursor was on an instruction with an indirect address.	Enter an address for a data table.

Display Message	Description	Recommended Action
NOT A LADDER FILE	An attempt to jump to a ladder file was made, but the file number specified is not a ladder file.	Verify the operation and specify a valid ladder file.
NOT ENOUGH MEMORY FOR COMMUNICATION DRIVER	The software package tried to load files that exceeded 128KBytes.	Retry the function and if necessary exit and restart the software. If the error continues validate the disk by running the "CHKDSK" from the DOS prompt.
ONLINE EDITING NOT AVAILABLE, INVALID KEYSWITCH POSITION	Online editing is not allowed when the SLC 5/03 or SLC 5/04 keyswitch is in the Run position.	Change the keyswitch to the Remote or Program position. Retry the function.
OPERAND MUST BE INDEXED	The operand for the current instruction is not indexed.	Index the operand and retry the function.
OPERATOR ABORTED DIALUP	While going online with DF1 Full Duplex through a 1770-KF3 and a modem the [ESC] key was pressed.	Retry the function.
OUT OF DATA TABLE MEMORY	During program save or test edits an error occurred while attempting to copy a data table from the database to the processor image.	The program is too large. Reduce the program memory requirements.
OUT OF MEMORY IN PROCESSOR IMAGE	Either 1) during program save or test edits all available memory in the processor image was used by the program; or 2) the program is too big for the processor.	The program is too large. Reduce the program memory requirements.
OUT OF MEMORY IN PROGRAMMING DEVICE	During program save or test edits all available memory in the programming device was used.	The program is too large. Reduce the program memory requirements.
PARSE ERROR	Entry on line was an invalid file or rung number.	Verify file or rung entry and retry the function.
PLINK Errors	These errors indicate software package problems.	Attempt to reinstall APS and call your RSI representative.
POINT IS PROTECTED, FUNCTION NOT AVAILABLE	An attempt to change the state of a protected bit was made, either from the online multi-point list, or from a force menu.	Informational message. No action necessary.
PROBLEMS ENCOUNTERED DURING ASSEMBLE/CANCEL EDITS	A problem exists with the database assemble/cancel edits function.	Contact your local RSI representative.
PROCESSOR DATA VALUES MAY HAVE CHANGED	During quick edits, when switching from offline to online monitoring, the offline data tables were downloaded.	Changes to the processor data tables may occur if the offline data tables do not match the online data tables. Verify for the correct data tables.

Display Message	Description	Recommended Action
PROCESSOR FAULTED	An attempt was made while online to change the processor mode to a state not available while the processor is faulted.	Correct the fault as specified, clear the fault, and retry the function.
PROCESSOR LOCKED AND SOURCE FILE NOT FOUND	The software is unable to find a matching file in the archive file directory. Lock bit (S:1/14) is set.	Place a copy of the program in the processor in the current archive file directory. Without a matching file, you can only restore, clear processor, or do a memory module transfer.
PROCESSOR MEMORY CORRUPTED	The processor's memory is currently invalid.	Clear the processor memory and retry the function.
PROCESSOR NOT IN PROGRAM MODE; CHANNEL RECONFIGURATION NOT ALLOWED	A mode other than Remote Program Mode is selected.	Change to Remote Program Mode and retry the function.
PROCESSOR OUT OF MEMORY, CHECK PROCESSOR MEMORY SIZE	While downloading, the processor indicated that an address was received outside of its memory address range.	Resave the file and retry the function.
PROGRAM LOAD ABORTED, CORRUPT LADDER FILE	An attempt to load a program was aborted.	Either 1) retry the function; 2) restart the software; 3) reboot the PC; or 4) run "CHKDSK" from the DOS command prompt.
PROGRAM OWNED BY ANOTHER PROGRAMMING DEVICE	A programming device cannot monitor a ladder program that another programming device currently has locked for an online editing session.	Determine why another node has explicit access.
PROGRAMMER IS OFFLINE, FUNCTION NOT AVAILABLE	An attempt to view or copy to an online multi-point list was made when an online processor does not exist.	Informational message. Retry the function at a later time.
PROCESSOR PROGRAM INCOMPATIBLE WITH PROGRAMMER	The user program in the processor is incompatible with this version of APS.	Install the correct version of APS and retry saving the program.
PROGRAM OWNER ACTIVATED BY ANOTHER PROGRAMMING DEVICE	A programming device, other than the one generating this message has initiated an online editing session.	Informational message. Retry the function at a later time.
PROGRAM OWNER ACTIVE	Another programming device owns the processor.	Find the programming device on the link and clear its ownership. Retry the function.
PROGRAM TRANSFER NOT SUPPORTED FOR CURRENT ONLINE CONFIGURATION	The current device does not support program transfers.	Select either a 1747-PIC (DH-485), 1784-KR (DH-485), or a KF3/KE (Full-Duplex).
PROGRAM WAS SAVED WITH ERROR - CANNOT TRANSFER FILE	Errors were saved with the program. You cannot download or transfer the program to a processor.	Correct the errors in the program and resave. Retry the function.

Display Message	Description	Recommended Action
PURGE OF EXISTING DATABASE FAILED	The deletion of the existing database failed.	Verify that the DOS path contains (ipds\lis\slc500) and that the file is not write protected.
RESOURCE IS NOT AVAILABLE	The device at the current node is unable to process the request because the program in the device was not compiled for single step debug.	Activate single step debug and resave the current image.
SAME ADDRESS FOUND, ONLY ADDRESS CURRENTLY IN DATABASE	While documenting a program function key "next address" was pressed and only one address comment exists.	Informational message. No action necessary.
SAME SYMBOL FOUND, ONLY SYMBOL CURRENTLY IN DATABASE	While documenting a program function key "next symbol" was pressed and only one symbol exists.	Informational message. No action necessary.
SAVE ABORTED, PROGRAM IS READ-ONLY	An attempt was made to save changes made to a read only program.	Informational message. No action necessary.
SCANNED I/O IS TOO LARGE	A scanned I/O value was entered which exceeded the actual Input or Output image size for the selected module.	Change to a valid size and retry the function.
SEARCH FOR OPERAND FAILED	During create reports an error occurred while attempting to search the cross reference database.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
SEARCH FOR XREF OCCURRENCE FAILED	During create reports an error occurred while attempting to search for an existing cross reference database entry.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
SEARCH OF DOCUMENTATION DB FAILED	During create reports an error occurred while attempting to search the cross reference database.	Check your disk space by running "CHKDSK" from your DOS prompt. On successful completion retry the function.
SELECTED DRIVER CONFLICTS WITH WINDOWS DRIVER	The serial port (COM1 or COM2) is already being used by the DH-485 INTERCHANGE driver.	Either exit APS (and Windows) and run ABICSTOP to shut down the INTERCHANGE/Windows driver, or select Windows DH-485 from the online configuration menu.
SELECTED PROCESSOR DOES NOT SUPPORT THIS FEATURE	I/O auto configuration is not available for the current processor.	Change the processor to an SLC 5/03 and retry the function.
SOFTWARE NOT INSTALLED PROPERLY	The personalization data entered during the installation process is missing.	Reinstall the software.
SOURCE DIRECTORY CANNOT BE THE SAME AS THE DESTINATION DIRECTORY	The copy to/from the paths are the same.	Change one of the paths and retry the function.
STARTING FILE TYPE MUST BE BEFORE ENDING FILE TYPE	During configuration of report options a starting file type that is alphabetically after the ending file type was entered.	Change the file types and retry the function.

Display Message	Description	Recommended Action
STARTING SYMBOL MUST BE BEFORE ENDING SYMBOL	During configuration of report options a starting symbol that is alphabetically after the ending symbol was entered.	Change the symbols and retry the function.
STATION NOT GETTING SOLICITED	Valid traffic is being detected on the network, but the software is unable to receive the traffic.	Go to online configuration and change the Terminal Address to a lower address.
STS LOCAL ERROR	Unrecognized or unknown error response from the processor.	Retry the function.
STS REMOTE ERROR	Unrecognized or unknown error response from the processor.	Retry the function.
TERMINAL ADDRESS CANNOT EQUAL KA5 ADDRESS	The 1785-KA5 and terminal are at the same node address.	Make their node addresses unique.
TEXT EDITOR EXIT FORCED; NO MORE ADDRESSES EXIST IN DATABASE	While documenting a program function key "next comment" was pressed.	Retry the function.
TEXT EDITOR EXIT FORCED; NO MORE SYMBOLS EXIST IN DATABASE	While documenting a program function key "next comment" was pressed.	Retry the function.
THIS FIELD CANNOT BE CHANGED WHEN AUTO IS SELECTED	An attempt to change a PID value in a field is being made while in AUTO mode.	Change the mode selection to MANUAL by pressing [F8], Data Monitor. This can be done offline or online.
TOO MANY INSTRUCTIONS ON A RUNG	During program save or test edits a rung has been detected which contains more than 128 instructions.	Change the rung to contain no more than 128 instructions.
UNABLE TO ACCESS USER CONFIG DIR USING DEFAULT DIRECTORY	The specified user configuration directory does not exist.	Use the default directory (ipds\attach\slc500).
UNABLE TO CONVERT ARCHIVE FILE - CORRUPTED PROCESSOR IMAGE	The processor image is invalid.	Resave the file and retry the function.
UNABLE TO CONVERT ARCHIVE FILE - DEVICE SIZE REQUESTED TOO SMALL	The software cannot translate the archive file since the processor image will not fit into the requested PROM.	Select an alternate prom size and retry the function.
UNABLE TO CONVERT ARCHIVE FILE - INVALID PROCESSOR IMAGE SAVED	The processor image is invalid.	Resave the file and retry the function.
UNABLE TO CONVERT ARCHIVE FILE - NO PROCESSOR IMAGE	The processor image is invalid.	Resave the file and retry the function.
UNABLE TO CREATE CROSS REFERENCE DATABASE	An attempt to update output cross references failed.	Run "CHKDSK" from the DOS command prompt, then retry the function.
UNABLE TO CREATE PROGRAM FILE DURING ONLINE EDITING	Program file creation is not allowed during an online editing session.	Go offline to create program files.

Display Message	Description	Recommended Action
UNABLE TO DELETE PROGRAM FILE DURING ONLINE EDITING	Program file deletion is not allowed during an online editing session.	Go offline to delete program files.
UNABLE TO SUCCESSFULLY READ ARCHIVE FILE	While reading the processor image in the archive file a failure occurred.	Verify your disk validity by running "CHKDSK" from the DOS command prompt. On successful completion retry the function.
UNMATCHED MCRS	During program save or test edits an unpaired MCR instruction was detected.	Verify that all MCRs occur in pairs. Retry the function.
USER PROGRAM INCOMPATIBLE WITH PROCESSOR OPERATING SYSTEM	The current user program is incompatible with the selected processor.	Change the processor and attempt to restore the user program again.
WARNING: EXPRESSION TOO LONG TO DISPLAY WITHOUT SYMBOLS	An expression was imported by the APS Import/Export utility, but it will exceed the maximum 255 character length if symbolic addressing is disabled.	Ensure symbolic addressing is enabled.
WARNING: INSTRUCTION PROVIDES NO FUNCTION; BOTH CHANNELS ARE DISABLED	For a SVC and REF using an SLC 5/03 both channels are programmed as disabled.	Informational message. No action necessary.
WARNING: PROGRAM IS READ-ONLY, NO CHANGES WILL BE SAVED	A read only program has been opened.	Informational message. No action necessary.
WARNING: PROCESSOR NOT IN PROGRAM MODE, DATA TABLE VALUES MAY BE CHANGING	An attempt is being made to upload a program while in the REM Run mode.	Informational message. No action necessary.
WHO NOT SUPPORTED FOR CURRENT ONLINE CONFIGURATION	Who Active and Who Listen are not supported by the current configuration.	Informational message. No action necessary.

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The instructions in this manual do not claim to cover all the details of variations in the equipment, procedure, or process described, not to provide directions for meeting every possible contingency during installation, operation, or maintenance.

Quick Reference Card

SLC 500™ Advanced Programming Software

9323-PA2E

Online Context Sensitive Help

Access the online help text by pressing [ALT-H]. Once the help text is displayed, you can search the help file by topic. Available topics are:

- instruction
- system status file

For example, to initiate a search for the MOV instruction, do the following:

1. Press [ALT-H].
2. At the command line, type: **MOV** and press [ENTER].
3. APS searches the help file.
4. When APS finds a match, the help text is displayed. At this point either scroll through the text, or enter a different topic on the command line.

Keyboard Shortcuts

Certain combinations of keystrokes access APS screen displays. Those keys are:

ALT-C	Accesses the Change Mode menu.
ALT-D	Accesses Data Monitor.
ALT-E	Accesses the Configure Display menu.
ALT-H	Accesses the Online Help.
ALT-M	Accesses the Memory Map.
ALT-S	Accesses the Search operation.
ALT-T	Accesses the Document operation.
ALT-U	Aborts any changes.
ALT-	
Shift-H	Disconnects DF1 communication from the modem.
CTRL-A	Toggles the insert mode between enable and disable.
CTRL-B	Moves cursor to beginning of the line.
CTRL-D	Moves cursor one position to the left.
CTRL-E	Moves cursor to the end of the line.
CTRL-F	Moves cursor one position to the right.
CTRL-H	Moves cursor back one space.
CTRL-J	Deletes text from the cursor's current position to the end of the line.
CTRL-M	Adds a Carriage Return.
CTRL-R	Recalls the previous command.
CTRL-U	Deletes text from the start of a line to the cursor's current position.
CTRL-X	Deletes an entire line of text.

Help (Alt-H) is available at all times. However, some of the above keys are not available in every display. See your user manual for more information.

Common APS Operations

Frequently used APS operations are available both online and offline. The following section steps you through some of the common operations. From the main menu:

