SST-PFB-SLC
User's Guide

Version 2.04

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This document applies to the SST-PFB-SLC ProfiBus Scanner.

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Contents

1

Introduction

Revision Notes and Exceptions

As of Publication Date	Exception Note

This chapter describes:

- the purpose of this manual
- related documentation
- style conventions used in this manual
- warranty and technical support information

1.1 Purpose of this manual

This manual explains how to install and use the SST-PFB-SLC scanner. It describes the procedures you use to install, configure, and operate the SST-PFB-SLC scanner.

1.2 Related Documentation

For...	Read this Document...	A-B Document Number
An overview of SLC products	SLC 500 System Overview	1747-2.30
A description of how to install and use the SLC 500 PLC	Installation and Operation Manual for Modular Hardware Style Programmable Controllers	1747-6.2
A procedural manual for technical personnel who use APS	Allen-Bradley Advanced Programming Software (APS) User Manual	1747-6.4
A reference manual for APS	Allen-Bradley Advanced Programming Software (APS) Reference Manual	1747-6.11
An introduction to APS for first time users	Getting Started Guide for APS	1747-6.3
A training and quick reference guide to APS	SLC 500 Software Programmer's Quick Reference Guide	ABT-1747-T SG001
An index of Allen-Bradley publications	Allen-Bradley Publication index	SD499

For information on ProfiBus, refer to one of the following:

- ProfiBus standard DIN 19 245 parts 1 and 3. Part 1 describes the low level protocol and electrical characteristics. Part 3 describes the DP protocol.
- European standard EN 50170
- ET 200 Distributed I/O System Manual, 6ES5 998-3ES22
- IEEE 518 Guide for the Installation of Electrical Equipment to Minimize Electrical Noise Input to Controllers

1.3 Conventions used in this manual

The following conventions are used throughout the manual:

- Listed items, where order is of no significance, are preceded by bullets.
- Listed items, to be performed in the order in which they appear, are preceded by a number.
- References to commands, or dialog boxes are *italicized.*
- User entry text is in `Courier 9 pt` font
- Buttons that the user may press are in SMALL CAPS.

1.3.1 Special Notation

The following special notations are used throughout the manual:

Warning messages alert the reader to situations where personal injury may result. Warnings are accompanied by the symbol shown, and precede the topic to which they refer.

Caution messages alert the reader to situations where equipment damage may result. Cautions are accompanied by the symbol shown, and precede the topic to which they refer.

A note provides additional information, emphasizes a point, or gives a tip for easier operation. Notes are accompanied by the symbol shown, and follow the text to which they refer.

1.4 Warranty

ST guarantees that all new products are free of defects in material and workmanship when applied in the manner for which they were intended and according to SST's published information on proper installation. The Warranty period for the SST-PFB-SLC is 1 year from the date of shipment.

SST will repair or replace, at our option, all products returned freight prepaid, which prove upon examination to be within the Warranty definitions and time period.

The Warranty does not cover costs of installation, removal or damage to user property or any contingent expenses or consequential damages. Maximum liability of SST is the cost of the product(s).

Product Returns

If it should be necessary to return or exchange items, please contact SST for a Return Authorization number.

SST

50 Northland Road

Waterloo, Ontario, N2V 1N3

Voice: (519) 725-5136

Fax: (519) 725-1515

1.5 Technical Support

1.5.1 Before you call for help

Before calling for technical support, ensure that you have the following information readily available:

- SLC module name and serial number
- module revision and series, firmware revision, other modules installed
- operating system type and version
- details of the problem - application module type and version, target network, circumstances that caused the problem

1.5.2 Getting help

For questions or problems that the manual does not address, contact Profibus Technical Support by mail, fax or email, or by phone during regular business hours (Eastern Standard Time).

Profibus Technical Support
SST
50 Northland Road
Waterloo, Ontario
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CANADA

Voice: (519) 725-5136
Fax: (519) 725-1515

Email: techsupport@sstech.on.ca
Web site: www.sstech.on.ca

Documentation and software updates are available on our Web site.

2

Overview

This chapter describes the following:

- system overview
- how the scanner interacts with the SLC processor
- how the scanner interacts with ProfiBus DP I/O modules

2.1 System Overview

The SST-PFB-SLC is the ProfiBus scanner for the SLC 500. It enables communication between a SLC processor (SLC 5/03 or later) and DP remote I/O devices on a ProfiBus network. It acts as a ProfiBus DP remote I/O scanner to scan up to 96 slaves. The scanner supports up to 244 bytes of input data and 244 bytes of output data per slave.

If you use the SST ProfiBus Configuration Tool to configure the scanner, you can have up to 1000 words of input data and 1000 words of output data.

If you use Siemens COM PROFIBUS to configure the scanner, it supports up to 160 words of input data and 160 words of output data in total.

The scanner can reside in any slot in the local SLC chassis except slot 0 (reserved for the SLC processor). You can have multiple scanners in the same rack.

The scanner supports all standard ProfiBus baud rates (9600, 19200, 93.75k, 187.5k, 500k, 750k, 1.5M, 3M, 6M, 12M)

You configure the I/O on the DP network using either the SST ProfiBus Configuration Tool or Siemens COM PROFIBUS configuration software. The SST configuration tool exports the configuration to a **.bss* file (binary), while COM PROFIBUS exports the configuration to a **.2bf* file (binary). You upload the configuration to the scanner via the serial port on the scanner, using an Xmodem transfer from any serial communications software.

The scanner stores this configuration in flash memory on the scanner so you don't need to upload the configuration every time you start the SLC.

The input and output data for the slaves is mapped into SLC I, O, M0 and M1 files. The mapping depends on the addresses you assign in the configuration you create with either configuration tool.

The scanner does not require setting up a G file in the SLC. All the configuration is done with the SST configuration tool or COM PROFIBUS.

The scanner maintains the following status information about the network and the I/O modules on the network:

- slave status for each slave
- network diagnostic counters
- DP master diagnostic counters
- FDL diagnostic counters

The SLC processor scan and the scanner I/O scan are independent (asynchronous) of each other.

The SLC processor reads the scanner input data during its input scan and writes the output data during its output scan. The scanner continues reading input data from the slaves and writing output data to the slaves independent of what the SLC is doing.

The scanner module can also act as a DP slave to another DP master on the same network. It supports up to 122 words of input data and 122 words of output data as a slave. Up to 32 words of data can be configured to be in the input and output files. With the SST ProfiBus Configuration Tool, up to 1000 words of data can be configured in the M0 and M1 files. With COM PROFIBUS, up to 122 words of data can be configured in the M0 and M1 files.

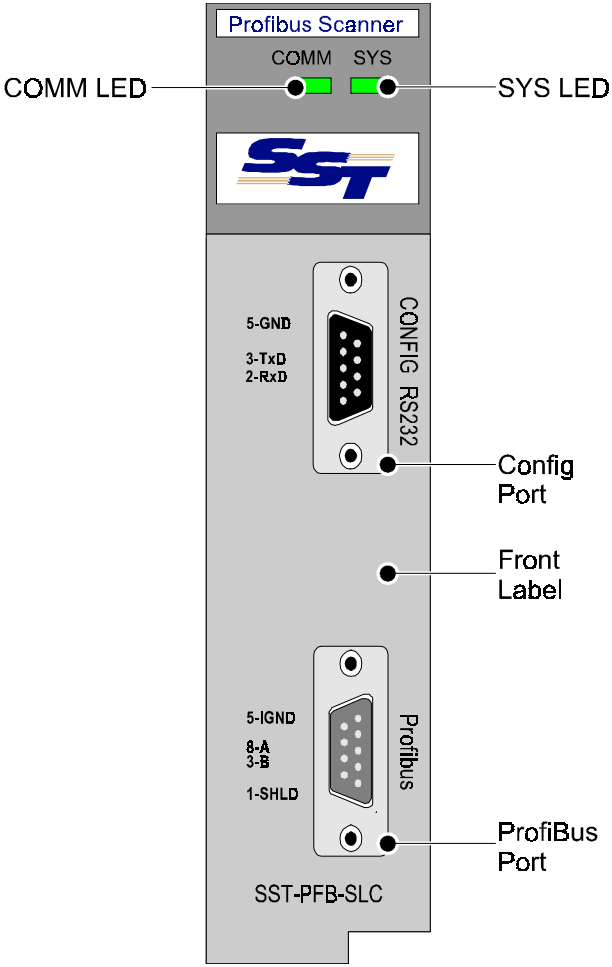
The scanner supports up to four FDL SAPs and up to four FDL message blocks.

Caution

this equipment is neither designed for, nor intended for use in installations where it is subject to hazardous voltages and hazardous currents.

2.2 Hardware Features

The scanner's features are shown here. LED information is in section 4.3.



Feature	Description
status LEDs	display the communication and system status
front label	identifies the scanner
9-pin ProfiBus connector	for connection to the ProfiBus network
self locking tabs	secure the scanner in the chassis slot
side label (nameplate)	provides module information
configuration port	for uploading I/O configuration data

2.2.1 LEDs

There are two LEDs on the scanner, the SYS LED and the COMM LED.

The SYS LED indicates overall status of scanner operations.

The COMM LED indicates communication status.

Refer to section 4.3, *Status LEDs*, in this manual for more detailed information.

2.2.2 9-pin ProfiBus connector

The 9-pin ProfiBus connector connects the scanner to the ProfiBus network.

2.2.3 Configuration port

Use the configuration port to upload I/O configurations exported from the SST ProfiBus Configuration Tool or Siemens COM PROFIBUS to the scanner.

3

Quick Start

This chapter describes the following:

- what tools and equipment you need
- preliminary considerations
- how to address, configure and program the module
- how to wire and install the module
- system power-up procedures

Note

The procedures in this chapter are written with the assumption that the user has a basic understanding of process control, and is able to interpret the ladder logic instructions that control the applications.

This Quick Start guide does not include detailed information in the procedures, although other chapters are referenced, where more information is available.

3.1 Equipment and tools

Have the following tools and equipment ready:

- SLC programming equipment
- SST ProfiBus Configuration Tool, or Siemens COM PROFIBUS software
- communication software
- null modem cable
- ProfiBus cable to connect the scanner to the ProfiBus network.

Note

Prior to performing the procedures outlined in this section, ensure that the latest version of the software has been downloaded to the module. The firmware is available on our website:

www.sstech.on.ca

3.2 Package Contents

Unpack the module. Make sure that the contents include:

- ProfiBus scanner
- this manual
- serial null modem cable for uploading I/O configurations
- CD with files for DOS installation
- CD with files for Windows 95/NT installation

3.3 Power Requirements

Review the power requirements of your system to see that your chassis supports placement of the scanner module.

Note

The scanner consumes 700 mA @ 5VDC.

For modular systems, calculate the total load on the system power supply using the procedure described in the:

SLC 500 Modular Style Installation & Operation Manual, Allen-Bradley Publication 1747-6.2

or:

SLC 500 Family System Overview, Publication 1747-2.30.

3.4 Procedures

The setup of the SST-PFB-SLC ProfiBus Scanner is divided into two parts:

- Setting up the scanner.
- Getting the scanner running.

3.4.1 Setting up the Scanner

Warning

Ensure that system power is off, before working on or around this equipment.

1. Insert the scanner module into your 1746 chassis.
2. Connect the scanner to the ProfiBus devices, using appropriate cabling and termination. Refer to section 4.2, *Wiring*, in this manual for more detailed information.
3. Set up your system I/O configuration for the particular slot in which you installed the scanner.

   Set the module type to Other and enter the scanner module ID (`13635`) at the prompt. Refer to section 5.1, *Configuring the Scanner*, in this manual for more detailed information.
4. Set the M0 and M1 file sizes to 4200.

Note

If you do not set the M0 and M1 file sizes, the programming device will not let you access the M files in the SLC control program. Refer to section 5.1, *Configuring the Scanner*, in this manual for more detailed information.

If you are using fewer than 32 input words or 32 output words, you can reduce the size of "scanned inputs" or "scanned outputs".

5. Write the rest of the control program that will use the scanned data.
6. Apply power to the SLC. Put the SLC in program mode and transfer the program to the SLC. See your programming software manuals for details.

3.4.2 Getting the Scanner Running

1. Install the SST ProfiBus Configuration Tool.

   Run the *setup.exe* file from the Windows 32 distribution disk.

1. Create your I/O configuration.

   Refer to section 5.2, *Creating an I/O Configuration in the SST ProfiBus Configuration Tool*, in this manual for more detailed information.

2. Create a new file.
3. Select the master station number.
4. Configure the bus parameters and set the network baud rate.
5. Configure the slave parameters for each slave, set the slave station number, the slave module type and assign I/O addresses to the slave.

Note

The I/O addresses determine where the slave data maps into the SLC data table. Siemens inputs P0 to P63 map into I0 to I31. Siemens outputs P0 to P63 map into O0 to O31.

6. Save the file, then export the configuration to a binary file (*.bss*).
7. Connect your communication software to the scanner using a null modem cable. While the SLC is in program mode, send an asterisk (`*`) to the scanner using your terminal software. You may need to send several "*"s as the scanner auto baud detects. See section 5.4 for details.

8. Issue the 'Rec2bssXmodem' command to the scanner serial port to upload the binary I/O configuration to the scanner.
9. Initiate an Xmodem file transfer in the communication software to upload the binary file.
10. Use the exit command to leave configuration mode when the file has been successfully transferred.

Note

After you type `Exit`, the message *Configuration HAS CHANGED. Do You Want to UPDATE FLASH (y/n)?* appears. Type `Y` to store the new configuration in flash.

11. Put the SLC in run mode.

The module is now scanning I/O.

4

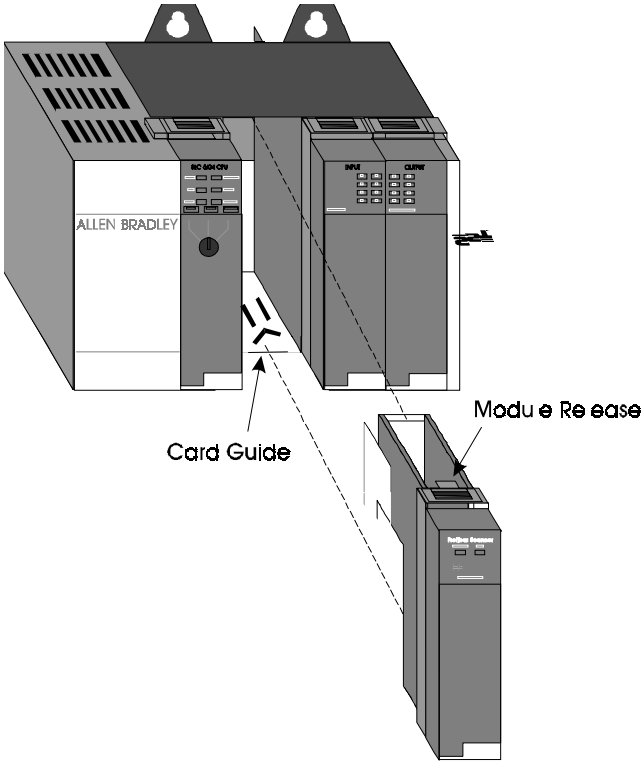
Installation and Wiring

This chapter contains the information necessary to:

- install the module
- insert the module in the SLC chassis
- connect the module to the network
- power up the module
- understand the module LEDs

4.1 Installing the Scanner Module

This illustration identifies the chassis and module components described in the procedures in this chapter.



Warning

Disconnect system power before attempting to install, remove, or wire the scanner.

Note

The scanner consumes 700 mA at 5 VDC.

4.1.1 Installation

1. Disconnect power.
2. Align the full-sized circuit board with the chassis card guides. The first slot (slot 0) of the first rack is reserved for the SLC 500 processor.
3. Slide the module into the chassis until the top and bottom latches catch.
4. Attach the ProfiBus cable. Turn on termination as required (Is this station at one of the two physical ends of the network?).
5. Route the cable down and away from the scanner.
6. Cover all unused slots with the card slot filler, Allen-Bradley catalog number 1746-N2.

4.1.2 Removal

1. Disconnect power.
2. Remove all cabling from the scanner.
3. Press the releases at the top and bottom of the module and slide the module out of the module slot.
4. Cover all unused slots with the card slot filler, Allen-Bradley catalog number 1746-N2.

4.2 Wiring

4.2.1 ProfiBus Wiring

The module contains a standard DB9 connector which can be connected to a Profibus bus terminal. The module has no termination but the bus terminal has built-in switchable termination.

Pin #	Pin Description	DB9 Termination when using SST-PFB-SLC
1	chassis ground	
2	reserved	
3	data +	connect this pin to pin 8 (data -) with 220 ohm resistor
4	TX Enable	
5	Isolated ground	connect this pin to pin 8 (data -) with 390 ohm resistor
6	Isolated +5V	connect this pin to pin 3 (data +) with 390 ohm resistor
7	reserved	
8	data -	
9	reserved	

Selecting the proper line type

Use this table to determine which line type best suits your system requirements.

Baud Rate (bits/s)	Line A Distance (Max)	Line B Distance (Max)	Total Capacitance of all Drop Cables
v19.2k	1200 m**	1200 m**	*15nF
93.75k	1200 m**	1200 m**	*3nF
187.5k	1000 m**	600 m**	*1nF
500k	400 m**	200 m**	*0.6nF
1.5M	200 m**	NA	*0.2nF
3, 6 and 12M	100 m**	NA	*0.05nF

NA = Not Applicable
*If using a combination of both line types, divide the lengths shown by two.
**This is the sum of all bus segment and drop cable lengths.

The two physical ends of the network should be terminated. There should be two, and only two, terminators on a network.

The recommended cable is Beldon3079A. Examples include:

- Siemens 6XV1 830-OAH10 Two Core shielded
- Siemens 6XV1 830-OBH10 w/PE Sheath
- Siemens 6XV1 830-3AH10 for underground burial
- Siemens 6XV1 830-3BH10 trailing cable
- Bosch Comnet DP #913 548 Flexible ProfiBus cable
- Bosch Comnet DP #917 201 Trailing ProfiBus Cable
- Bosch Comnet DP #917 202 Massive ProfiBus Cable

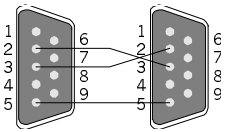
Allen Bradley blue hose which has an impedance of 78 ohms, is not recommended.

Caution

Do NOT Connect devices to the +5V line. It is there for termination purposes only.

4.2.2 Serial Port Wiring

Before scanning I/O, use the serial CONFIG port on the front of the scanner to upload an I/O configuration file to the scanner.



Note

Since pins 2 and 3 are wired the same as a PC 9-pin COM port, the serial cable for a standard PC COM port must have lines 2 and 3 swapped. The serial connection does not require any handshaking.

Connect to the serial port using any communication software such as Windows Terminal or Hyperterminal. The scanner serial port supports any baud rate from 9600 baud to 115 kbaud, with no parity, 8 data bits, 1 stop bit. The scanner automatically detects the baud rate you are using by adjusting the baud rate until it receives an "*".

4.3 Status LEDs

4.3.1 SYS LED

If you are using the scanner as a DP master and a DP slave, the SYS LED shows the status of both operations sequentially. The master status is flashed first, followed by the slave status. If you are using the scanner for FDL the sequence is DP Master DP slave FDL messages and FDL SAPs.

The following table provides a description of the LEDs:

DP Master.

Color	Indication
Red	one or more slaves is reporting a fault condition
Amber	the module is in program or test mode
Green	the module is scanning in Run mode.

DP Slave

Color	Indication
Red	the slave is not being scanned or is faulted
Amber	the slave is being scanned in program mode
Green	the slave is being scanned in run mode

FDL

Color	Indication
Red	a fault has occurred
Green	the system is functioning normally

At system start up, the SYS LED flashes green for two seconds.

4.3.2 COMM LED

The COMM LED indicates errors on the network. The following table provides a description of the status of the LEDs.

Color	Indication
Red	a network error has occurred. the LED flashes red at one second intervals.
Green	no network errors exist.

If you are using the scanner as a passive DP slave only, this LED will normally be off.

5

DP Master Configuration and Programming

This chapter describes:

- configuring the scanner in APS
- creating an I/O configuration in the SST ProfiBus Configuration Tool or Siemens COM PROFIBUS
- assigning I/O addresses to the slaves
- uploading the I/O configuration to the scanner
- running the scanner

5.1 Configuring the Scanner

5.1.1 APS

Note

When you are configuring the scanner, ensure that the SLC is in PROGRAM mode.

When you program your SLC system in APS, use the following steps to set up the scanner:

1. Create a new program or modify an existing program in offline mode.
2. Select the SLC processor, memory, and operating system.
3. Select Configure I/O.

   If you are online, select *Read Config* to read the configuration, and skip to step 9.
4. Select the slot in which the SST-PFB-SLC is located, then select *Modify slot*.
5. Select *Other* and enter the scanner ID (`13635`).
6. Select *SPIO Config* (press F9).

   You do not have to set the G file size.
7. Select *Advanced Setup*.
8. Set the M0 and M1 file sizes to 4200.
9. If you are using less than 32 input words or 32 output words, you can reduce the size of "scanned inputs" or "scanned outputs".
10. Exit configuration and save the configuration and the program.
11. Transfer the program to the SLC.

Note

You can configure a maximum of 8 SST-PFB-SLC modules using APS because of the 256 word I/O limit in the SLC and the fact that APS always assigns 32 words of input and 32 words of output to the SST-PFB-SLC.

5.1.2 PLC-500 Ladder Logistics

This procedure was tested with version 8.15 of PLC-500 Ladder Logistics. If you are using a previous version, contact SST for the proper procedures.

Note

When you are configuring the scanner, ensure that the SLC is in PROGRAM mode.

1. Create a new program offline.
2. Select the SLC processor, memory, and operating system.
3. Select the rack number for the scanner (rack 1) and the rack size.
4. Select the slot in which the SST-PFB-SLC is located, and press *F5 Select* to configure the scanner
5. Select *Other* and enter the scanner ID code (`13635`).
6. Select *spioCfg*.
7. Press *F1 M0 length* and set the M0 file size to 4200
8. Press *F2 M1 length* and set the M1 file size to 4200.
9. If you are using fewer than 32 input words or 32 output words, you can change the scanned input and output words.
10. You do not have to set the G file size or set an iSr number.
11. Press *Esc* to exit spioCfg.
12. Press *Esc* again to create the files.
13. Create the rest of your control program.
14. Exit the programming software and save the configuration and the program.
15. Transfer the program to the SLC.

Note

PLC-500 Ladder Logistics does not limit you to 8 SST-PFB-SLC modules in a rack.

5.1.3 RS Logix 500

This procedure was tested with version 2.10.12.0 of RS Logix 500.

Note

When you are configuring the scanner, ensure that the SLC is in PROGRAM mode.

1. Create a new program offline.
2. Select the SLC processor, memory, and operating system.
3. In the project tree, double click on *I/O Configuration*.
4. Set the rack size for rack 1.
5. Highlight the slot in which the SST-PFB-SLC is located
6. Double click on *Other* in the list of available modules and enter the scanner ID code (`13635`).
7. Highlight the scanner and click on the *Adv. Config* button.
8. Set the M0 length and M1 length to 4200.
9. If you are using fewer than 32 input words or 32 output words, you can change the scanned input and output words.
10. You do not have to set the G File Length or set an Interrupt Service Routine number.
11. Click *OK* to exit Advanced I/O Configuration.
12. Close the I/O Configuration dialog box.
13. Create the rest of your control program.
14. Save the file and download it to the SLC.

5.2 Creating an I/O Configuration in the SST ProfiBus Configuration Tool

The SST ProfiBus Configuration Tool consists of a main view (the network view) and two frames: the *Profibus Devices* frame and the *On-line Browse* frame. Both of these are floating frames; drag and drop them to move them anywhere inside the network view.

To configure the 5136-PFB-ISA card as a DP master:

1. Choose *Start/Programs/5136-PFB-32/Configuration Tools/SST Profibus Configuration* to run the SST ProfiBus Configuration Tool.
2. Choose *File/New* to create a new configuration.
3. If the *Profibus Devices* frame is closed, choose *View/Library* to open it. This frame appears by default on the upper left side of the window.
4. If the *On-line Browse* frame is closed, choose *View/On-line* to open it. This frame appears by default at the bottom of the window.
5. Find and select your SST ProfiBus master device in the *Profibus Devices* frame. To add this master device to the DP Network:

   • Drag and drop it into the network view.

   or:

   • Click on the *Add to Network* button on the main toolbar.

   A configuration dialog box appears for the selected device.
6. Specify the master station number on the *General* tab of the dialog box.
7. Click *OK*.

   The master device is added to the network view.

Note

Edit device properties at any time by right clicking on the device and choosing *Properties* or selecting the device from the network list and clicking on the *Properties* button on the main toolbar.

8. Find and select your slave device in the *Profibus Devices* frame. To add this slave device to the DP Network:

   • Drag and drop it into the network view under the master device.

   or:

   • Click on the *Add to Network* button on the main toolbar.

   If your slave device is not listed, click on the *Add Device* button on the *Profibus Devices* frame to add the GSD file for your device. The *Add PROFIBUS Devices* dialog box opens. Find the GSD file and click *Open*. You can now add the device to the network view as described above.

   A configuration dialog box appears for the selected slave.

9. Set the station address of the slave in the *General* tab.

10. If your device is a modular device, you have to insert the modules your slave device uses. Select the Modules tab of the dialog box. If your slave is not a modular device (compact device) then the modules are already configured.

11. Repeats steps 6-8 for each slave device on your network.

12. To set the parameters for your network, right click on the highest level of the network list (default PROFIBUS_DP) and choose Properties.

    The *Network* dialog box opens and you can set baud rate and other parameters.

13. Chose *File/Save As*. to save your configuration.

    The *Save As* dialog box opens. Specify a file name for your configuration and click *Save.*

14. Choose *Edit/Export Binary…* to export your configuration to a binary (.bss) file.

5.3 Creating an I/O Configuration in COM PROFIBUS.

Use Siemens COM PROFIBUS software to configure a master/slave system on the SST-PFB-SLC.

The COM PROFIBUS software does the following:

- COM PROFIBUS calculates all the details for each slave, for example, the configuration check data, the watchdog factors, etc.
- COM PROFIBUS calculates the details for the entire collection of slaves, for example, the target token rotation time
- COM PROFIBUS assigns appropriate values for all the network parameters and includes them in the binary file

To use the SST-PFB-SLC with COM PROFIBUS, install the update files for the SST-PFB-SLC in the appropriate COM PROFIBUS directories.

To install the files, run the batch file *updcomet.bat* on the distribution disk and tell it the directory where you are installing the files. For COM PROFIBUS, the directory name depends on the version you are running, and is *compbxx* where *xx* corresponds to the version number. For example, if the version is 3.0, the directory is called *compb30*. Type the following:

```
updcomet compb30
```

For the older COM ET 200 software, the main directory name is *comwinxx* where *xx* corresponds to the version number. For example, if the version is 2.1, the directory is called *comwin21*.

This procedure describes the steps to create a binary file to configure the SST-PFB-SLC as a DP master. In this procedure, the network being configured consists of only Profibus DP remote I/O devices. Refer to the COM PROFIBUS software documentation for more detailed information. each step.

1. Create a new file (*File/New*).
2. Select the master station number. This sets the station number of the scanner on the Profibus network.
3. For the master station type select SST-PFB-SLC Master. If the update files for the SST-PFB-SLC have not been installed, set the master station type to be IM 308-C and set the host type to S5-115U/ CPU 944A or S5-115U/CPU 944B.
4. Select *Configure/Bus parameters...*
    - Set the baud rate for the network.
    - If there is a repeater on the bus, check the Repeater on bus checkbox.
    - If there are FMS devices on the network, change the Bus profile to DP/FMS.
    - If the network has only Profibus DP devices, leave the bus profile as PROFIBUS-DP. COM PROFIBUS takes care of assigning appropriate default values for all the network parameters.
5. Click *OK*.
6. Select *Configure/slave parameters...* to create and configure each slave:
    - select the slave station number
    - select the slave device family
    - select the slave station type
    - select the slave module type

7. Click *Configure...* to assign the I/O addresses for the slave. These addresses determine where the slave data appears in the SLC.

   Refer to section 5.3.1, *Mapping the Addresses*, for detailed information on addressing.

8. Save the configuration file (*File/Save*) after all the slaves have been configured.

9. Export the configuration to a binary file (*File/Export/Binary File*). This generates a *.2bf* file.

Note

If there are multiple masters on the same network, include both masters in the COM PROFIBUS file. Select the master system to export and COM PROFIBUS will take care of increasing the target token rotation times, watchdog times, etc. to appropriate values.

5.3.1 Mapping the Addresses

The addresses assigned in the configuration tool determine where the I/O data for the module appears in the SLC memory.

Note

If you do not assign an address to a module, the data for that module will be unavailable.

Addresses in the P range appear in the I and O areas of the SLC.

Addresses P0 to P63 map to I0-31 for inputs and O0-31 for outputs.

Note

P addresses in the configuration tool are byte addresses while the I and O addresses in the SLC are word addresses.

Addresses in the Q range appear in the M0 area (outputs) and the M1 area (inputs).

Addresses Q0 to Q255 map to M1:0-127 for inputs and M0:0-127 for outputs.

Note

Q addresses in the configuration tool are byte addresses while the M0 and M1 addresses in the SLC are word addresses.

For analog or word modules, assign addresses on even boundaries.

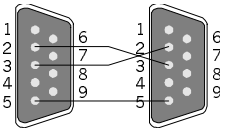
For 8-bit modules, if the address is even, the module occupies the low byte of the register. If the address is odd, it occupies the high byte.

Whenever possible, assign addresses so that everything maps into the I and O areas of memory. Accessing data in the M0 and M1 area slows the overall SLC scan.

5.4 Uploading the I/O Configuration to the Scanner

Use the serial CONFIG port on the front of the scanner to upload configuration files to the scanner.

The serial cable for a standard PC COM port must have lines 2 and 3 swapped. No handshaking is required. Pins 2 and 3 are wired the same as a PC 9-pin COM port.



Connect to the serial port using any communication software. The scanner serial port supports any baud rate from 9600 baud to 115 Kbaud, with no parity, 8 data bits, 1 stop bit. The scanner automatically detects the baud rate you are using.

When configuring the scanner, the SLC must be in program mode. Type an asterisk (*) to get the scanner's attention. You may need to type several asterisks to let the scanner auto-detect the baud rate being used. The scanner displays the message:

Profibus DP ONLY
Copyright (c) 1999 SST, a division of Woodhead Canada Limited
For SST-PFB-SLC Card
Version x.xx

and a, ">" prompt at the terminal.

The scanner is now in CONFIG mode. While in config mode, the scanner LEDs flash amber alternately. You cannot put the scanner online until you exit from config mode.

Listing Available Commands

Once you are talking to the scanner, type `Help` to view a summary of the available commands. Not all available commands are listed in the main help. There are several additional help commands to show the other commands.

The following table lists commonly used serial port commands.

Command	Description
HelpNet	Lists commands to set network parameters
HelpMas	Lists commands related to DP master operation
HelpSlv	Lists commands related to DP slave operation. Refer to section 7 for information on how to use the scanner as a DP slave.
ShowNet	Displays network parameters
ShowMas	Displays the DP master configuration
ShowSlv	Displays the DP slave configuration. Refer to section 7 for information on how to use the scanner as a DP slave.
Rec2bfXmodem	Upload a DP master configuration exported as a binary file from Siemens COM PROFIBUS
UpdFlash	Store the current network, DP master and DP slave configuration into flash memory
Ver	Displays the version number of the firmware running on the scanner
RecbssXmodem	Upload a DP master configuration exported as a binary file from the SST ProfiBus Configuration Tool
Exit	Exits terminal mode and restarts module

Uploading an I/O Configuration to the Scanner

To upload the DP master configuration file *.bss*:

1. Issue the *RecbssXmodem* command, then initiate an XModem file upload from your communication software. Refer to the documentation supplied with your communication software for more detailed information.

You can also upload a DP master configuration file *.2bf* using the *Rec2bfXmodem* command.

When you upload a configuration file to the scanner, the configuration is stored in memory on the scanner. If there are problems with the addresses you have assigned in COM PROFIBUS, you may get error messages and corresponding error codes (in hexadecimal). Use the 'UpdFlash' command to store the configuration into flash memory.

5.4.1 Network Parameter Errors

The following status errors may occur when setting the network parameters.

02h	STS_BAD_BAUD
03h	STS_BAD_STN_ADR
04h	STS_BAD_HI_STN_ADR
05h	STS_BAD_TOK_ROT
06h	STS_BAD_SLOT_TME
07h	STS_BAD_IDLE_1
08h	STS_BAD_IDLE_2
09h	STS_BAD_RDY_TME
0ah	STS_BAD_QUI_TME
0bh	STS_BAD_GAP_UPD
0ch	STS_BAD_TOK_RETRY
0dh	STS_BAD_MSG_RETRY
0eh	STS_BAD_TOK_ERR_LIM
0fh	STS_BAD_RSP_ERR_LIM
10h	STS_BAUD_DET_ERROR

5.4.2 Binary File Configuration Errors

The following errors occur when configuring the scanner using a binary file generated by your configuration software.

20h	STS_CFG_BAD_CHK_PATTERN
21h	STS_CFG_BIN_TOO_SHORT
22h	STS_CFG_BIN_TOO_LONG
23h	STS_CFG_BAD_CHKSUM
24h	STS_CFG_INVALID_CPU_HDR
25h	STS_CFG_INVALID_SLV_REC_TYP
26h	STS_CFG_RX_OVERFLOW
27h	STS_CFG_TX_OVERFLOW
35h	STS_CFG_MAS_EXT_ALLOC_ERROR

Error 20h occurs if you are using old firmware with the SST ProfiBus Configuration Tool or when you are using firmware version 1.5x or later with the old beta of the SST configuration tool (ver 0.x).

Error 23h typically occurs when new firmware was just loaded. Issue the ClrMas command and try downloading again.

Error 25h occurs when you use the incorrect command. Use Rec2bfXmodem for binary files from Siemens COM PROFIBUS and RecbssXmodem for binary files from the SST ProfiBus Configuration Tool.

5.4.3 Flash Programming Errors

The following errors may occur when programming flash memory.

30h	STS_CFG_NO_CONFIG	no configuration present to program into flash
31h	STS_FLASH_BAD_ID	internal flash error
32h	STS_FLASH_ERASE_ERR	internal flash error
33h	STS_FLASH_PROG_ERR	internal flash error
34h	STS_FLASH_VRFY_ERR	internal flash error

5.4.4 COM PROFIBUS Address Assignment Errors

37h	Address out of range. The address assigned in COM PROFIBUS is outside the allowed range, for example, P66
38h	Copy table overflow. This happens when I/O modules addresses are too fragmented. Try putting modules at consecutive addresses, grouping input and output modules, etc.

5.4.5 Fatal Errors

The following are fatal errors. You must power down the system and restart to clear these errors.

80h	STS_CFG_INTERNAL_ERROR	internal error
81h	STS_OUT_OF_APBS	out of application blocks
82h	FATAL ERROR:pfb Status=82,errArg=00,interr=00	host did not kick watchdog within the watchdog period.
83h	STS_HEAP_ALLOC_FAIL	internal error
84h	STS_SH_HEAP_ALLOC_FAIL	internal error

If the status register contains STS_CFG_INTERNAL_ERROR (80h) there has been an internal error on the scanner. Record the contents of the errInternal and errArg registers and contact technical support at SST. The errInt is stored in the high byte of register 4129 of the m1 file. The errArg is stored in the low byte of register 4130 of the M1 file and also in register 4012 of the M1 file.

Exiting Config Mode

To exit configuration and let the scanner complete its start-up, issue the 'exit' command. You must do this before the scanner can be put online. The scanner turns off both LEDs when it is no longer in config mode.

If there have been changes to the configuration, the scanner asks you whether you want to store those changes in flash before you exit.

Using Windows 95/98 Hyperterminal to Access the Scanner

Use the following steps:

1. Start HyperTerminal and create a new connection.
2. For 'Connect using:', select 'Direct to Com n' where n is the serial port you are using.
3. Select 115200 Bits per second, 8 Data bits, set Parity to None, select 1 Stop Bit, and set Flow control to None.

You should now be able to communicate with the scanner serial port.

5.5 Running the Scanner

With the SLC in run mode, the scanner scans the Profibus I/O network. You can now begin accessing the data at the addresses that have been assigned in the configuration tool.

SLC Modes

The scanner mode of operation follows the SLC mode of operation (program, test, run).

- When the SLC is in program mode, the scanner outputs are off and inputs hold their last state.
- When the SLC is in test mode, inputs are read and updated but outputs are off.
- When the SLC is in run mode, the scanner updates inputs and outputs.

SLC Fault Codes

The scanner may fault the SLC with one of the following error codes (x is the slot number of the slot occupied by the scanner).

Code	Possible Reason
x61	Configuration faults. This happens when you try to go online with invalid configuration information.
	I/O faults. This can be caused by slaves in error or by mismatches between the configured and actual slave types.
x62	You are in configuration mode (using the serial port to talk to the scanner) and try to put the SLC in RUN MODE
x70	Catastrophic internal failure. Call SST for technical support.
x71	Catastrophic failure. Record the flash LED sequence.

5.6 Using the Watch-Dog Timer

Under "brown-out" power conditions the AB SLC Processor can enter a reset condition, while the SST-PFB-SLC module remains fully functional. Although all installations of the SLC Scanner products should have adequate power conditioning and power failure equipment, these "brown-out" conditions can still occur. To ensure that the SST-PFB-SLC returns the fieldbus to a known, safe state, a watch-dog timer has ben implemented in the firmware.

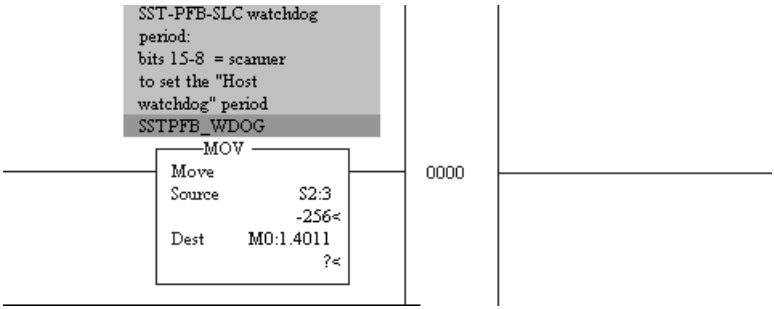
5.6.1 How the Host Watch Dog works

After the SST-PFB-SLC has been reset or powered up, a default time of 100 ms is used for the watchdog period, which exists for communications with the SLC Processor. If the SST-PFB-SLC does not get an update of I/O from the SLC processor with the 100 ms period, the scanner faults.

The period of the watchdog timer may be set to a different value by writing the contents of the S:3 work (from the SLC Processor's status file) to the M:0[slot].4011 register. The firmware takes the upper 8 bits of the S:3 word (the user maximum scan time setting) and applies it as the new watchdog period. in this way, the user's program can control the watchdog time for the SST-PFB-SLC scanner and avoid any false faults that result from an extended SLC processor scan time.

Logic Example

The following rung of logic can be used in the your program to automatically have the SST-PFB-SLC scanner's watchdog period track that of the SLC processor.



The SST-PFB-SLC is located in the first slot of the SLC rack. The watchdog register is M0:1.4011.

6

DP Master Application Examples

6.1 Addressing

The scanner occupies slot 2 in the SLC rack. The following table shows the modules in the I/O configuration, the address assigned in COM PROFIBUS, and the location of the I/O data in the SLC.

Module	Address in COM PROFIBUS	Address in SLC
32DO	P0	O:2.0 O:2.1
8DO/DI	out P4	O:2.2 low byte
	in P4	I:2.2 low byte
32DI	P0	I:2.0 I:2.1
8DO/24DI	out P6	O:2.3 low byte
	in P6	I:2.3 I:2.4 low byte

6.2 32 Discrete Output Module

The following table shows where the data appears in the SLC for a Siemens ET200B 32DO module mapped at different addresses in COM PROFIBUS (The scanner is in slot 2.).

	Module starting address in COM PROFIBUS			
Module data address	**P0**	**P1**	**Q0**	**Q1**
Q0.0	O:2.0/0	O:2.0/8	M0:2.0/0	M0:2.0/8
Q0.7	O:2.0/7	O:2.0/15	M0:2.0/7	M0:2.0/15
Q1.0	O:2.0/8	O:2.1/0	M0:2.0/8	M0:2.1/0
Q1.7	O:2.0/15	O:2.1/7	M0:2.0/15	M0:2.1/7
Q2.0	O:2.1/0	O:2.1/8	M0:2.1/0	M0:2.1/8
Q2.7	O:2.1/7	O:2.1/15	M0:2.1/7	M0:2.1/15
Q3.0	O:2.1/8	O:2.2/0	M0:2.1/8	M0:2.2/0
Q3.7	O:2.1/15	O:2.2/7	M0:2.1/15	M0:2.2/7

6.3 32 Discrete Input Module

The following table shows where the data appears in the SLC for a Siemens ET200B 32DI module mapped at different addresses in COM PROFIBUS (The scanner is in slot 2.).

	Module starting address in COM PROFIBUS			
Module data address	**P0**	**P1**	**Q0**	**Q1**
I0.0	I:2.0/0	I:2.0/8	M1:2.0/0	M1:2.0/8
I0.7	I:2.0/7	I:2.0/15	M1:2.0/7	M1:2.0/15
I1.0	I:2.0/8	I:2.1/0	M1:2.0/8	M1:2.1/0
I1.7	I:2.0/15	I:2.1/7	M1:2.0/15	M1:2.1/7
I2.0	I:2.1/0	I:2.1/8	M1:2.1/0	M1:2.1/8
I2.7	I:2.1/7	I:2.1/15	M1:2.1/7	M1:2.1/15
I3.0	I:2.1/8	I:2.2/0	M1:2.1/8	M1:2.2/0
I3.7	I:2.1/15	I:2.2/7	M1:2.1/15	M1:2.2/7

6.4 Example: M0/M1 Addressing

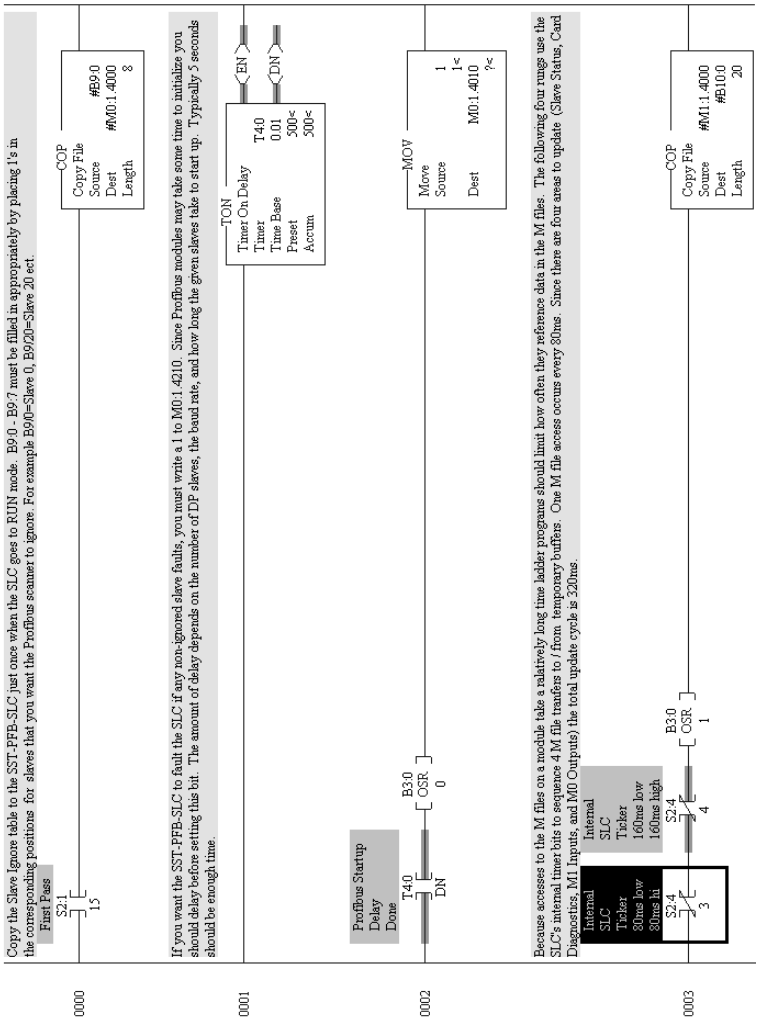
The scanner occupies slot 2 in the SLC rack. An 8DO/24DI module is assigned output address Q240 and input address Q250 in COM PROFIBUS. The output data is found at M0:2.120 low byte. The input data is found at M1:2.125 and M1:2.126 low byte.

6.5 Example: Accessing Data

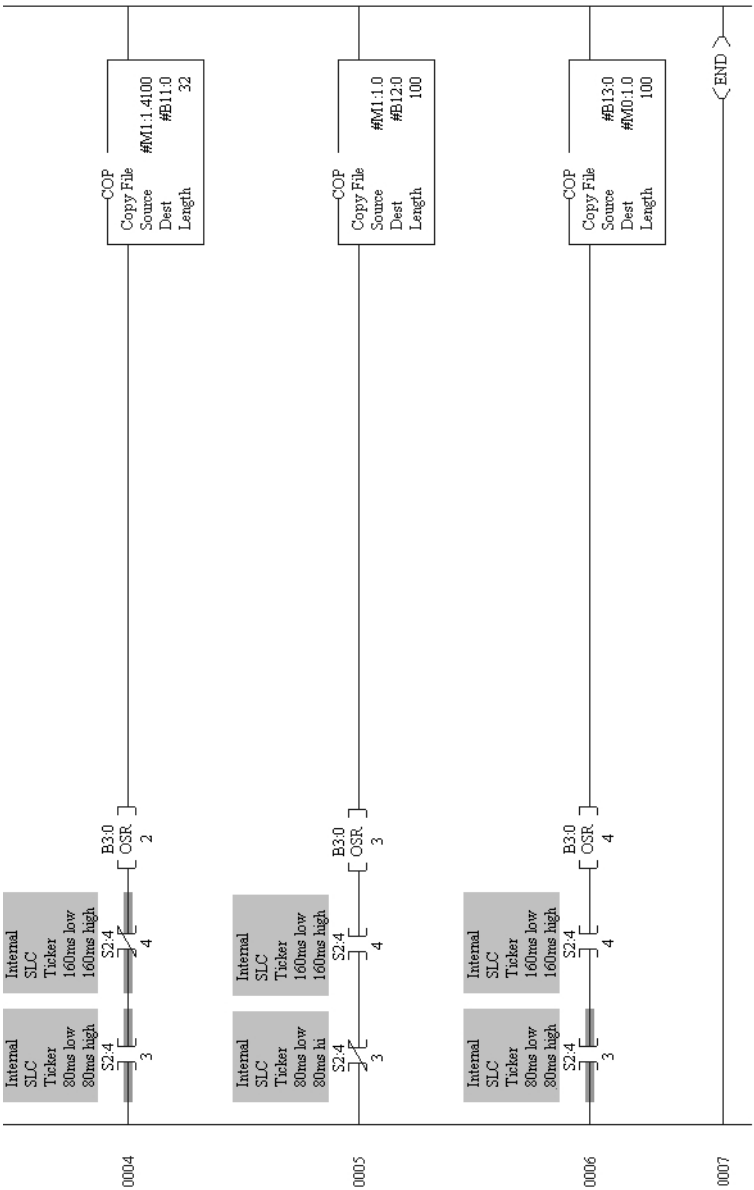
The following example shows how to:

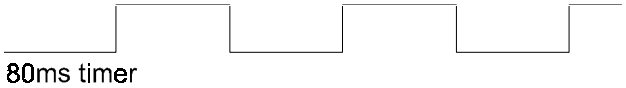
- use an internal SLC file to set up the Ignore Slave Status table (see section 9.3) and copy it to the scanner on the first scan
- use a delay at startup to allow slaves to come online before you configure the module to generate a fault if any DP slaves are faulted
- use internal SLC timers to distribute access to the M0 and M1 files over time to minimize the impact on the SLC logic scan

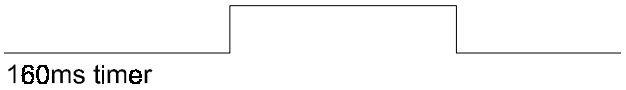
Sample Program



Sample continued







The program uses 80 ms and 160 ms internal timers to implement four states, with a combined period of 320 ms. The OSR instructions ensure that the SLC executes the COP instruction only at the start of one of these states. The result is that all four blocks are accessed within the 320 ms combined period of the two timers.

6.6 Example: Using Flex I/O

When you configure the Flex I/O using COM PROFIBUS, always configure 18 slots, even if the slots are empty. The first two slots are used for status, with the first slot configured as an input word and the second slot as an output word. The remaining 16 slots are used for I/O modules. For each module, configure two slots.

The following table shows how to configure the various Flex I/O modules. An entry of 000 means do not configure a length for that slot.

Configure the I/O address as a P address so that the data maps into the I or O file in the SLC for fast access, and the status part of the address as a Q address so that the data maps into the M area.

Module	First Slot	Second Slot
1794-IB16	1 word in	1 word out
1794-OB16	000	1 word out
1794-IB8S	1 word in	1 word out
1794-IA8	1 word in	1 word out
1794-OA8	000	1 word out
1794-OW8	000	1 word out
1794-IE8	9 words in	1 word out
1794-OE4	1 word in	6 words out
1794-IEX4OE2	5 words in	4 words out
1794-IR8	11 words in	3 words out
1203-FM1	6 words in	5 words out
1794-IB16 full format	1 word in	000
1794-OB16 full format	000	1 word out
1794-IB8S full format	1 word in	000
1794-IA8 full format	1 word in	000
1794-OA8 full format	000	1 word out
1794-OW8 full format	000	1 word out
1794-IE8 full format	9 words in	000
1794-OE4 full format	1 word in	4 words out
1794-IEX4OE2 full format	5 words in	2 words out
1794-IR8 full format	11 words in	000
1203-FM1 full format	4 words in	3 words out

Assign an address for each slot with a configured length.

In the following example, the first module is a 1794-IB16, the second is a 1794-OB16, and the third is a 1794-IE8. The SST-PFB-SLC scanner is in slot 2 of the SLC rack.

Module	Slot	Assigned type	I Addr	O Addr
pre-assigned	0	1AI	Q0	-
pre-assigned	1	1AO	-	Q2
1794-IB16	2	1AI	P0	-
	3	1AO	-	Q4
1794-OB16	4	000	-	-
	5	1AO	-	P2
1794-IE8	6	9AI	P4	-
	7	1AO	-	Q6
empty	8	000	-	-
	9	000	-	-
empty	10	000	-	-
	11	000	-	-
empty	12	000	-	-
	13	000	-	-
empty	14	000	-	-
	15	000	-	-
empty	16	000	-	-
	17	000	-	-

The input data for the 1794-IB16 maps into I:2/0 to I:2/15.

The output data for the 1794-OB16 module maps into O:2/16 to O:2/31.

7

Using the Scanner Module as a DP Slave

This chapter describes:

- how to use the scanner module as a DP slave.

You can configure the scanner module to act as a DP slave to another DP master on the same network.

For example, use this feature to pass data in a distributed system or to pass data to or from an operator interface. The DP slave operation can only be configured from the serial port.

Note

The scanner module does not check for address conflicts between the DP master and DP slave operations. You are responsible for ensuring that addresses have been assigned without conflicts or overlaps.

7.1 Slave Received Data

Received data is data received from the remote master. You can have from 0 to 122 words of received data. Received data can be configured to be partly in the input file and partly in the M1 file. You can put up to 32 words of received data in the input file. You can choose to put all the received data in the M1 file. Data in the input file can be accessed more quickly than data in the M1 file but the more DP slave data you put in the input file, the less input data you can scan with the module acting as a DP master.

DP slave received data in the M1 file always starts at offset 1000.

To set the received data length and location, use the SlvRxLen command.

SlvRxLen <io> <il> <ml>

<io> is the offset of the received data in the input file (0-31)

<il> is the length of received data in the input file (0-32)

<ml> is the length of received data in the M1 file (0-122)

Enter all three parameters.

Example

If you enter:

SlvRxLen 30 2 10

there will be two words of received data in the input file starting at offset 30 and ten words of received data in the M1 file starting at offset 1000. There are a total of 12 words of received data.

7.2 Slave Transmit Data

Transmit data is the data the scanner module sends to the remote master. You can have from 0 to 122 words of transmit data. Transmit data can be configured to be partly in the output file and partly in the M0 file. Up to 32 words of transmit data can be placed in the output file. Data in the output file can be accessed more quickly than data in the M0 file but the more DP slave data you put in the output file, the less output data you can scan with the module acting as a DP master.

Transmit data in the M0 file always starts at offset 1000.

To set the transmit data length and location, use the SlvTxLen command.

SlvTxLen <oo> <ml>

<oo> is the offset of the transmit data in the output file (0-31)

 is the length of transmit data in the output file (0-32)

<ml> is the length of transmit data in the M0 file (0-122)

You must enter all three parameters.

Example

If you enter:

SlvTxLen 31 1 100

there will be one word of transmit data in the out file starting at offset 31 and one hundred words of transmit data in the M0 file starting at offset 1000. There are a total of 101 words of transmit data.

7.3 Displaying the DP Slave Configuration

If you issue the *ShowSlv* command from the serial port, the module displays the DP slave configuration.

Example

If you use the ShowSlv command after issuing the configuration commands in the previous examples, the scanner displays:

DP Slave Configuration:

SlvTxLen O:x.31 Len=1 M0:x.1000 Len=100

SlvRxLen I:x.30 Len=2 M1:x.1000 Len=10

7.4 Disabling DP Slave Operation

To clear the DP slave configuration data and disable DP slave operation, issue the *ClrSlv* command from the serial port.

7.5 Using the Module Only as a DP Slave

If you use the scanner module only as a DP slave, set several network parameters from the serial port before putting the module online. At minimum, set the local station number and the baud rate and make sure that the station is passive, not active. The module sets appropriate default values for the remaining network parameters.

If the station is to be active, and if there are repeaters or FMS devices on the network, set network options so that the module can set appropriate values for the network parameters. Most of them are not needed if the station is passive.

7.5.1 Local Station

To set the local station number, issue the *LocStn* command with the station number (0-126) as a parameter .

Example

```
LocStn 22
```

7.5.2 Active/Passive

To set the station to be passive, issue the command *Active 0*.

7.5.3 Baud Rate

To set the baud rate, issue the *Baud* command with the baud rate as a parameter. Allowed values for the baud rate parameter are 9k6, 19k2, 93k75, 187k5, 500k, 750k, 1m5, 3m, 6m, and 12m.

Example

```
Baud 1m5
```

sets the baud rate to 1.5 Mbaud.

7.5.4 Other Network Options

To tell the module that there are one or more repeaters on the network, issue the command *Repeater 1* from the serial port.

To tell the module that there are FMS devices on the network, issue the command *FmsDevices1* from the serial port.

7.5.5 Displaying Network Settings

To display the current network parameter settings, issue the *ShowNet* command from the serial port.

7.6 Configuring the Module as a Slave Using COM Profibus

If you are configuring the SST-PFB-SLC as a master with its own slaves and also as a slave to another master on the network, you must create the master files separately. Otherwise, the SST-PFB-SLC is assigned as a slave in its own master configuration.

8

Using FDL

8.1 FDL (Layer 2) Messaging

The SST-PFB-SLC can send and receive FDL (layer 2) messages. Features include:

- supports up to 4 Service Access Points (SAPs)
- supports up to 4 message request blocks

Messages and SAPs are enabled from the serial port and any required configuration is done from the SLC.

Caution

If you are using FDL, the scanner uses words I:31 and O:31 in the I/O tables for FDL control and status. You must not configure any I/O modules to use these words or unpredictable operation will occur.

The scanner sets the bits in the input file; the SLC application sets the bits in the output file.

8.1.1 Input Table I:31

The scanner uses the following bits in the input word:

Message/SAP block	0	1	2	3
SAP indication update	0	1	2	3
Message done	8	9	10	11
Message error	12	13	14	15

The subsequent sections explain how these bits are used.

Output Table O:31

The SLC application uses the following bits in the output word:

Message/SAP block	0	1	2	3
SAP indication acknowledge	0	1	2	3
Message trigger	8	9	10	11

The subsequent sections explain how these bits are used.

M0 and M1 Files

The scanner uses areas in the M0 and M1 files for FDL message and SAP configuration information and data.

M0 offsets	Use
1122-1251	FDL message control/Tx buffer 0
1252-1381	FDL message control/Tx buffer 1
1382-1511	FDL message control/Tx buffer 2
1512-1641	FDL message control/Tx buffer 3
1642-1771	FDL SAP Tx buffer 0
1772-1901	FDL SAP Tx buffer 1
1902-2031	FDL SAP Tx buffer 2
2032-2161	FDL SAP Tx buffer 3

M1 offsets	Use
1122-1251	FDL message status/Rx buffer 0
1252-1381	FDL message status/Rx buffer 1
1382-1511	FDL message status/Rx buffer 2
1512-1641	FDL message status/Rx buffer 3
1642-1771	FDL SAP Status/Rx buffer 0
1772-1901	FDL SAP Status/Rx buffer 1
1902-2031	FDL SAP Status/Rx buffer 2
2032-2161	FDL SAP Status/Rx buffer 3

8.2 FDL Messages

To enable FDL messages, issue the *EnaMsg* command from the serial port while in configuration mode and talking to the scanner. The state of FDL messages (enabled/disabled) is stored in flash when you exit configuration mode.

Setting up a Message

To set up a message block, select which message block (0-3) being used. This determines which of the areas in the M0 and M1 files will be used.

Set the appropriate values in the FDL message control block for the message, in the corresponding area of the M0 file.

The following table shows the offsets to the message control block elements for each of the four message control blocks (0-3), and their locations in the M0 file.

Offset	Name	0	1	2	3
0	CntCfg	1122	1252	1382	1512
1	reserved	1123	1253	1383	1513
2	reserved	1124	1254	1384	1514
3	DstStn	1125	1255	1385	1515
4	DstSap	1126	1256	1386	1516
5	SrcSap	1127	1257	1387	1517
6	FrmCntrl	1128	1258	1388	1518
7	TxLen	1129	1259	1389	1519
8-129	TxData	1130-1251	1260-1381	1390-1511	1520-1641

To set up a message, set:

- bits in the Control/Config register, CntCfg, if necessary

  If you set bit 2, the scanner sends the message to the high priority queue on the scanner. The scanner maintains two FDL message queues. When it gets the token, the scanner can send one message from the high priority queue when it gets the token, even if the token hold time has expired.

Note

This high priority refers to how the message is processed by the scanner in getting it out on the network and has nothing to do with a high priority frame control value. For example, if the message type is SRDL, the message is processed as a low priority message at the destination.

  If you set bit 4 in the CntCfg register, the scanner does not include this message block when it is displaying the status of FDL messages on the LED.

- the destination station, DstStn. The allowed range is 0 to 126.
- the destination SAP, DstSap, if required. This is almost always needed. The default value is 255, which means the message gets sent to the default SAP at the destination. You usually send the message to some specific SAP. The allowed range is 0 to 63, or 255.

  When you send a message with a destination SAP, the scanner automatically sets the high bit in the destination station number when it sends the message. Do not set the high bit when you set the destination station number.

- the source SAP, SrcSap, if required. If you are sending a destination SAP, you almost always want to send a source SAP. The default value is 255. The use of the source SAP is application and module dependent; the destination station may or may not require or use the source SAP.

- The message type, or frame control, FrmCntrl. The message type can be one of the following:

FC_SDAl	03h	Send Data with Ack Lo Pri (SDAL)
FC_SDAh	05h	Send Data with Ack Hi Pri (SDAH)
FC_SDNl	04h	Send Data No Ack Lo Pri (SDNL)
FC_SDNh	06h	Send Data No Ack Hi Pri (SDNH)
FC_SRDl	0Ch	Send and Request Data Lo Pri (SRDL)
FC_SRDh	0Dh	Send and Request Data Hi Pri (SRDH)
FC_SmTime1	00h	First SM time message
FC_SmTime2	80h	Second SM time message
FC_SmSDN	02h	SM Send Data No ack
FC_SmSRD	01h	SM Send and Request Data
FC_SmSRDSltDel	0Ah	SM Send and Request Data Slot Del
FC_SmSRDSltKeep	0Bh	SM Send and Request Data Slot Keep
FC_DdbSRD	07h	DDB Send and Request Data
FC_DiagSRD	08h	Diagnosis Send and Request Data
FC_ReqFDL	09h	Request FDL status
FC_ReqId	0Eh	Request ID
FC_ReqLSAPSts	0Fh	Request LSAP Status

- the transmit data length, TxLen, in bytes. The allowed values are 0 to 244.
- the transmit data, TxData.

Sending the Message

To send the message, set the appropriate trigger bit in word O:31 of the output file for the message block.

Message block	**0**	**1**	**2**	**3**
Message trigger	8	9	10	11

The scanner sends the message. Wait for the message done bit to be set and check the error bit in word I:31 of the input file.

Message block	0	1	2	3
Message done	8	9	10	11
Message error	12	13	14	15

If there is an error with the message, both the done bit and the error bit will be set.

Message Replies

The scanner module always fills in the message reply area in the M1 file. Some of the data comes from the destination station; some comes from the scanner.

Offset	Name	0	1	2	3
0	reserved	1122	1252	1382	1512
1	status	1123	1253	1383	1513
2	error	1124	1254	1384	1514
3	reserved	1125	1255	1385	1515
4	RspStatus	1126	1256	1386	1516
5	reserved	1127	1257	1387	1517
6	reserved	1128	1258	1388	1518
7	RxLen	1129	1259	1389	1519
8-129	RxData	1130-1251	1260-1381	1390-1511	1520-1641

Status has bit 7 set if the message has good status.

The value in Error is 1 if the scanner could not deliver the message. Look in RspStatus for more information on the cause. The value in Error is 3 if the transmit length was greater than 244.

RspStatus contains the value returned by the LAN controller when it encounters an error. Mask the value with BFh and use the following table to determine the meaning. X indicates "do not care" values in the upper half of the byte.

Value, hex	Meaning
X0	OK
X1	user error, SAP locked, the destination station did not accept the message because the SAP was locked
X2	no resource for send data, the SAP could not accept the message. For example, this happens when the SAP's receive buffer is too small.
X3	no service available (destination SAP doesn't exist, or when strict frame control checking is enabled on the destination station and there's a mismatch)
X4	access point blocked
80	short character, problems with wiring, termination, etc.
9F	no access, the destination station isn't there
AF	double token detected, problems with wiring, termination, etc.
BF	response buffer too small
8F	noise at SM command, problems with wiring, termination, etc.

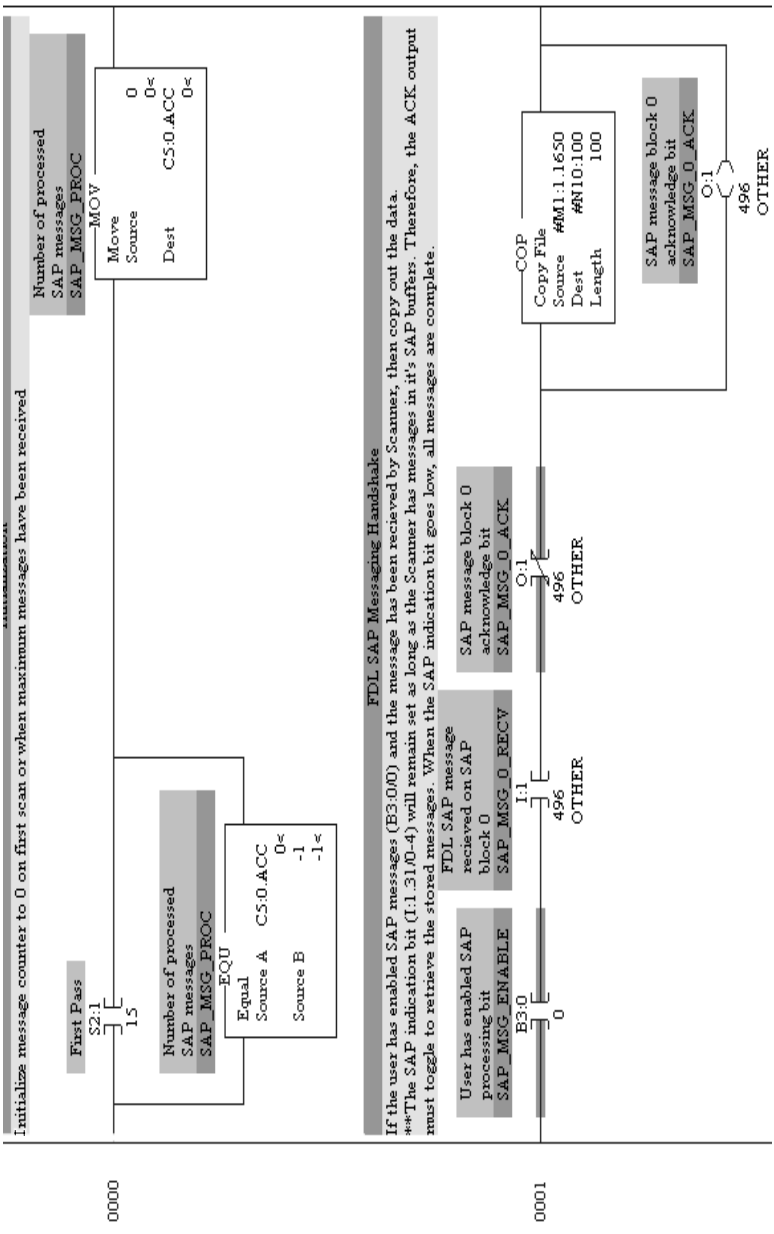
If the destination station sends reply data, the reply data length in bytes is in RxLen. Possible values are 0 to 244. The reply data itself is found in RxData.

Sending Broadcast and Multicast Messages

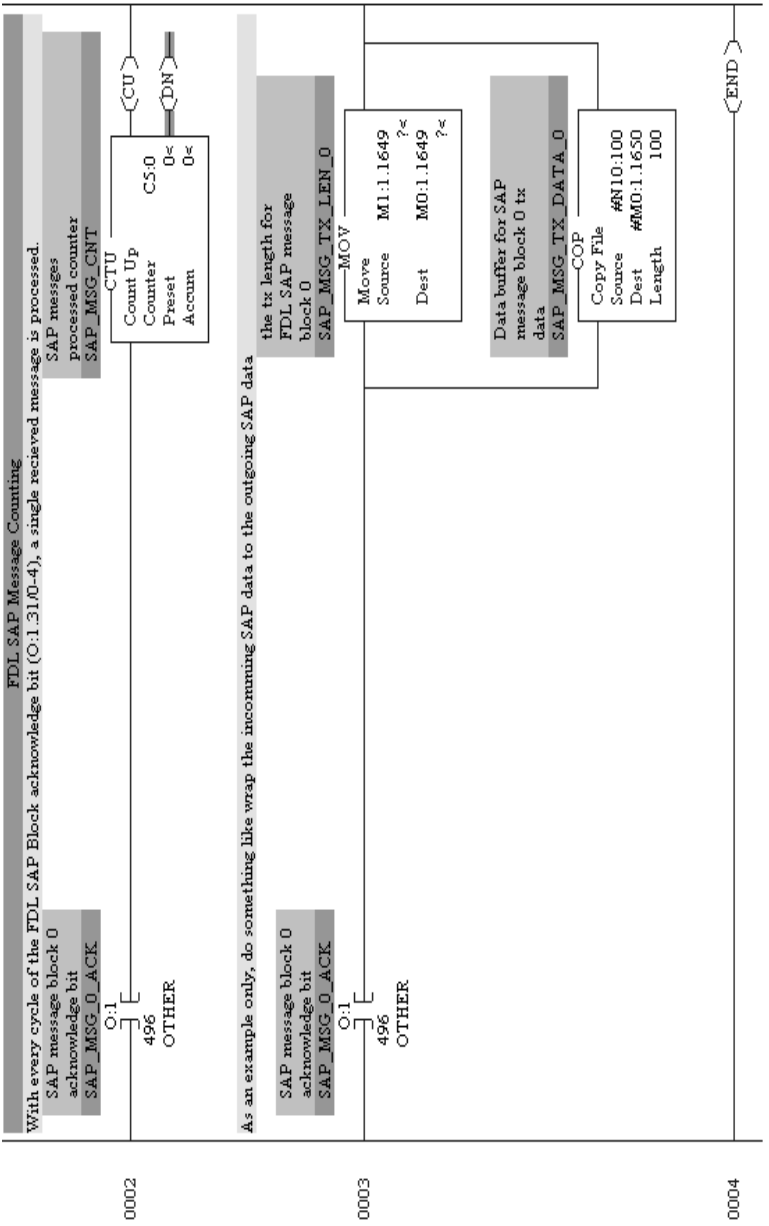
Broadcast and multicast messages are sent to destination station 127. Broadcast messages are sent to destination SAP 63. The frame control must be SDNl or SDNh as all broadcast/multicast messages are unconfirmed.

In order for the destination station to receive a broadcast or multicast message, it must have strict station checking disabled. To receive a broadcast message, it must have a SAP configured on SAP 63.

Sample Program



Sample Continued



8.3 FDL SAPs

You can enable up to four Service Access Points (SAPs) on the scanner. You enable SAPs from the serial port, using the ‘SAPBlk’ command. The syntax is:

SAPBlk <blk> <sap>

where <blk> is the block number, 0 to 3

and <sap> is the SAP number, 0 to 63.

To disable all SAPs, use the ‘ClrSap’ command.

SAPs are used to receive FDL messages from remote stations.

When the scanner receives an update on a configured SAP, it sets the corresponding bit in input word I:31 and sends reply data if you have set up reply data.

SAP block	**0**	**1**	**2**	**3**
SAP indication update	0	1	2	3

You acknowledge the SAP update by setting the corresponding bit in output word O:31.

SAP block	**0**	**1**	**2**	**3**
SAP indication ACK	0	1	2	3

Setting the SAP indication ACK bit tells the scanner to clear the SAP indication update bit in the input word and also transfers the current reply data from the area in the M0 file for this SAP block to the area the scanner uses to send a reply the next time the SAP is updated.

Important: In order for the scanner to have reply data when the SAP is first updated, you must set the SAP indication ACK bit for the SAP block when your program starts.

When the scanner clears the SAP indication update bit in the input word, your application should clear the SAP indication acknowledge bit.

8.3.1 SAP Receive Buffers

Whenever a SAP is updated, the scanner fills in the appropriate receive buffer in the M1 file. Some of the data comes from the source station; some comes from the scanner.

Offset	Name	0	1	2	3
0	reserved	1642	1772	1902	2032
1	status	1643	1773	1903	2033
2	error	1644	1774	1904	2034
3	reserved	1645	1775	1905	2035
4	SrcStn	1646	1776	1906	2036
5	SrcSap	1647	1777	1907	2037
6	reserved	1648	1778	1908	2038
7	RxLen	1649	1779	1909	2039
8-129	RxData	1650-1771	1780-1901	1910-2031	2040-2161

Bit 7 in Status is set if the SAP is operating with no problems. If this bit is 0, there is a problem with this SAP.

If there is a problem with this SAP, Error contains the value 1.

SrcStn contains the number of the station that updated the SAP. Bit 7 is set if the message was sent with a source SAP.

SrcSap is the source SAP sent in the message and is valid only if bit 7 in SrcStn is set.

RxLen is the length of received data, in bytes. Possible values are 0 to 244.

RxData contains the received data.

8.3.2 SAP Transmit Buffers

If you are sending reply data, you must set up an FDL transmit buffer in the M0 file.

Offset	Name	0	1	2	3
0-6	reserved	1642-1648	1772-1778	1902-1908	2032-2038
7	TxLen	1649	1779	1909	2039
8-129	TxData	1650-1771	1780-1901	1910-2031	2040-2161

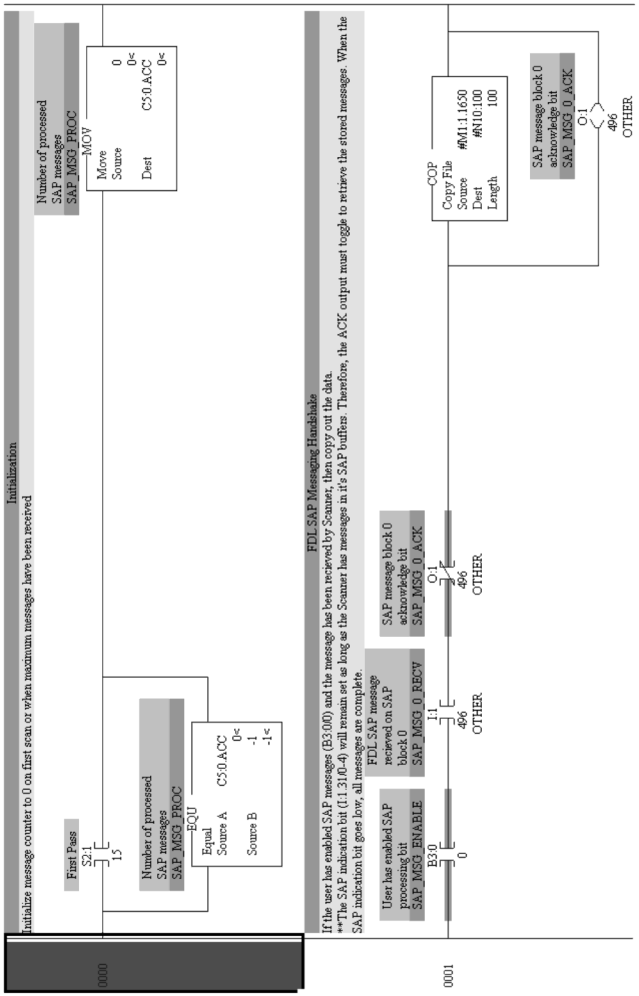
Write the transmit length, in bytes, to TxLen and write the transmit data in TxData.

The scanner automatically sends the reply data when the SAP is updated. In order for the scanner to have reply data ready when the SAP is first updated, you must set the SAP indication ACK bit for the SAP block when your program starts.

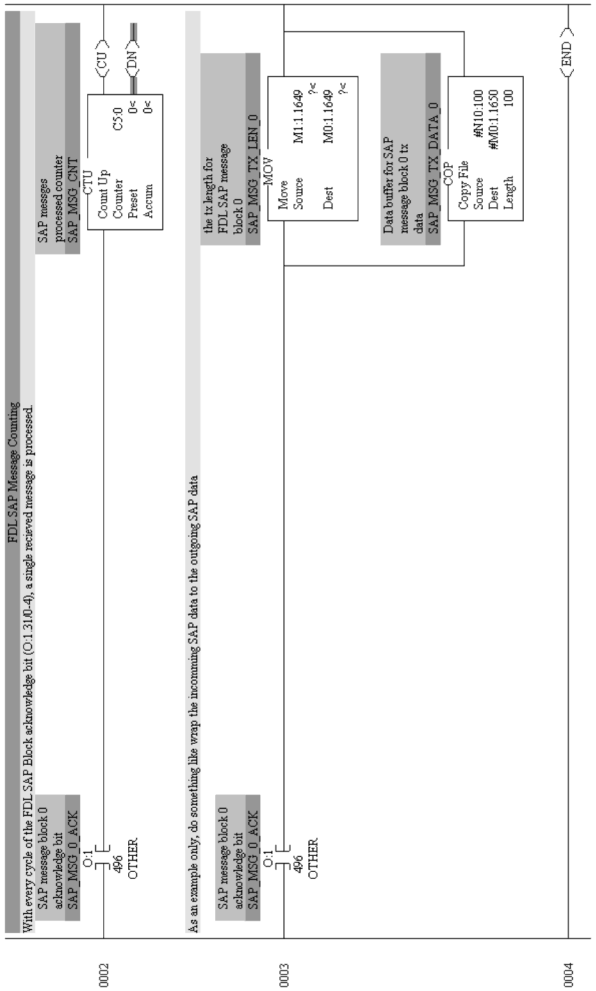
8.3.3 Receiving Broadcast/Multicast Messages

To receive broadcast messages, you must have a SAP configured on SAP number 63. To receive a multicast message, you must have a SAP configured to match what the sender is using.

Sample Program



Sample Continued



8.4 FDL Diagnostic Counters

The scanner maintains several diagnostic counters for FDL operation.

Name	Location	Description
diagLay2MsgOk	4116	FDL messages sent OK
errLay2MsgNotOk	4117L	FDL message errors
diagLay2SapOk	4118	FDL SAP requests processed OK
errLay2SapNotOk	4119L	FDL SAP errors

The scanner increments diagLay2MsgOk whenever it sends an FDL message and receives the appropriate acknowledge or response data.

The scanner increments errLay2MsgNotOk whenever it sends a FDL message and doesn't receive an appropriate acknowledge or response data.

The scanner increments diagLay2SapOk when it processes an FDL SAP request with no errors.

The scanner increments errLay2SapNotOk when there is an error receiving a SAP request.

8.5 FDL Network Parameters

If you are using the scanner only for FDL, you must also set several network parameters from the serial port before putting the module online. At minimum, set the local station number and the baud rate. If you are sending FDL messages, make sure that the station is active. The station does not have to be an active station to send replies to SAP updates. The scanner sets appropriate default values for the remaining network parameters.

If the station is to be active, and if there are repeaters or FMS devices on the network, set network options so that the scanner can set appropriate values for the network parameters. Most of them are not needed if the station is passive.

You may also want to change the high station address to optimize performance. The default high station address is 126.

Local Station

To set the local station number, issue the *LocStn* command with the station number (0-126) as a parameter.

Example

```
LocStn 22
```

Active/Passive

To set the station to be active, issue the command *Active 1*.

Baud Rate

To set the baud rate, issue the *Baud* command with the baud rate as a parameter. Allowed values for the baud rate parameter are 9k6, 19k2, 93k75, 187k5, 500k, 750k, 1m5, 3m, 6m, and 12m.

Example

```
Baud 1m5
```

sets the baud rate to 1.5 Mbaud.

Other Network Options

To tell the module that there are one or more repeaters on the network, issue the command *Repeater 1* from the serial port.

To tell the module that there are FMS devices on the network, issue the command *FmsDevices 1* from the serial port.

Displaying Network Settings

To display the current network parameter settings, issue the *ShowNet* command from the serial port.

9

Diagnostics

This chapter describes:

- system diagnostics

The scanner maintains a variety of diagnostic information in the M1 file in the area from 4000 to 4200.

9.1 Status Register

Register 4011 in the M1 file is the Profibus status register. The following tables show possible status register values.

If the status register contains STS_CFG_INTERNAL_ERROR (80h) there has been an internal error on the scanner. Record the contents of the errInternal and errArg registers and contact technical support at SST. ErrInt is stored in the high byte of register 4129 of the m1 file. ErrArg is stored in the low byte of register 4130 of the M1 file and also in register 4012 of the M1 file.

If the status register contains STS_OUT_OF_APBS (81h), the scanner has run out of application blocks. The DP slave uses 2 application blocks. The DP master uses 2 application blocks per configured slave. There are a total of 835 application blocks. If you get this error, reduce the number of application blocks you use.

If the status register contains STS_HEAP_ALLOC_FAIL (83h) or STS_SH_HEAP_ALLOC_FAIL (84h), there has been an internal error in allocating memory. Contact technical support at SST.

9.2 Scanner Firmware Version Number

The version number of the scanner firmware is stored in register 4014 in the M1 file. For example, if the value is 0122h, the firmware is version 1.22.

9.3 DP Master Slave Status Table

The area in the M1 file from 4000 to 4007 contains the status of the slaves, one bit per slave. For example, if the slave at station address 1 is good, bit 1 of register 4000 is set.

In addition, if the status of all slaves is good, bit 0 of register 4013 is set. If this bit is 0, one or more slaves have bad status.

bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4000	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4001	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
4002	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
4003	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
4004	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
4005	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
4006	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96
4007		126	125	124	123	122	121	120	119	118	117	116	115	114	113	112

This table can be used in conjunction with the global fault enable, bit 0 of register 4010 in the M0 file, and the ignore slave fault table, 4000-4007 in the M0 file, to fault the SLC if slaves are in error.

If the global fault enable bit is 0, the scanner will not fault the SLC when there are slave errors. This is the default.

If the global fault enable bit is 1, the scanner will fault the SLC when there are slave errors. However you can use the ignore slave fault table to tell the scanner to ignore the status of some slaves.

The ignore slave fault table is organized exactly like the slave status table above. Set the bit that corresponds to a slave if you want the scanner to ignore the status of that slave. If the bit for a slave is set, the slave status is shown in the slave status table but it is not included in the all slaves good flag, bit 0 of register 4013.

Wait an appropriate time before you turn on the global fault enable bit. It takes some time for DP slaves to start up. The amount of time depends on the baud rate and the startup time for the slaves on the network.

9.4 DP Master Slave Error Table

The area in the M1 file from 4020 to 4027 shows slaves that are in error, one bit per slave. For example, if the slave at station address 1 is in error, bit 1 of register 4020 is set.

bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4020	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4021	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
4022	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
4023	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
4024	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
4025	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
4026	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96
4027		126	125	124	123	122	121	120	119	118	117	116	115	114	113	112

This table is similar to the slave status table, except that it shows errors rather than stations with good status.

9.5 DP Master Slave Extended Status Table

The area in the M1 file from 4030 to 4037 shows slaves that are reporting extended status, one bit per slave. For example, if the slave at station address 1 is reporting extended status, bit 1 of register 4030 is set.

bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4030	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
4031	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
4032	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32
4033	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48
4034	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64
4035	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80
4036	111	110	109	108	107	106	105	104	103	102	101	100	99	98	97	96
4037		126	125	124	123	122	121	120	119	118	117	116	115	114	113	112

9.5.1 Reading the Extended Status

To read the extended status of a slave, write the station number to the diagnostic status station select register, register 3828 in the M1 file. The scanner then retrieves the diagnostics for that slave. If the scanner successfully gets the diagnostics, it puts them in registers 3829-3950 and sets the high byte of the diagnostic status station select register to 80h. If there is an error in getting the extended diagnostics, the scanner sets the high byte of the diagnostic status station select register to 40h.

9.6 DP Master Error Information Table

The area in the M1 file from 3700 to 3827 contains error information about each slave, one register per station number. This table can be used in conjunction with the slave status table (4000-4007) or the slave error table (4020-4027) to determine the cause of the error.

Register	Slave															
3700	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
3716	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
3732	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
3748	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
3764	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79
3780	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
3796	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111
3812	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	

The scanner sets various values in the high byte to indicate the cause of any problems with the slave. Some errors occur during parameterizing the slave, others occur at runtime. If there are multiple errors, only the last one is shown. The host acknowledges these errors by clearing the register.

Value	Cause
01h	failure while trying to configure slave
02h	slave real ID does not match slave's configured ID
03h	frame delivery problem while updating slave data
04h	frame delivery problem while reading slave diagnostics
05h	error in diagnostic status byte #1 during configure
06h	error in diagnostic status byte #2 during configure
07h	error in diagnostic status byte #1 during diagnostic read
08h	error in diagnostic status byte #2 during diagnostic read
09h	station address from diagnostic read does not match
0ah	timeout waiting for i/o update
0bh	warning: slave watchdog is not enabled

For some values in the high byte, the scanner provides additional information in the low byte to help pinpoint the cause of the problem.

The following tables list possible values in the low byte.

high byte = 01h (failure while trying to configure slave)

Value	Description
1	No response or NAK after sending the first diagnostic status request to the slave
2	No response or NAK after sending parameter data to the slave
3	No response or NAK after sending configuration check data to the slave
4	No response or NAK after sending the second diagnostic status request to the slave
5	Invalid response after sending the first diagnostic status request to the slave
6	Invalid response after sending parameter data to the slave

Value	Description
7	Invalid response after sending configuration check data to the slave
8	Response to configuration check packet was non-zero length (slave should never return anything)
9	Invalid response after sending the second diagnostic status request to the slave

high byte = 03h （frame delivery problem while updating slave data)

Value	Description
1	error in data update during configuration
2	No response or NAK when updating data while online

high byte = 04h (frame delivery problem while reading slave diagnostics)

Value	Description
1	Invalid response when reading slave diagnostics while online
2	No response or NAK when reading slave diagnostics while online

high byte = 05h (error in diagnostic status byte #1 during configure)

The value in the low byte depends on the value returned by the slave in the first station status byte when the master reads diagnostics during configuration. Mask the value with 0F5h and any bits that are set in the result should not be set. Mask the value in the low byte with 02h and bit 1 should be set.

The bits in station status byte 1 are:

Bit	Meaning
7	DP slave has been parameterized by another master
6	Slave received an invalid parameter frame, wrong Ident, wrong length, invalid parameters, etc.
5	Invalid response from the slave
4	Master requested a function that the slave does not support
3	An entry exists in the slave specific diagnostic area.
2	Configuration check data for the slave was incorrect
1	Slave is not ready for data transfer
0	DP slave non-existent

high byte = 07h (error in diagnostic status byte #1 during diagnostic read)

The value in the low byte depends on the value returned by the slave in the first station status byte when the master reads diagnostics while online. Mask the value with 0F7h and any bits that are set should not be set. The bits in station status 1 are shown in the above table.

high byte = 06h (error in diagnostic status byte #2 during configure)

The value in the low byte depends on the value returned by the slave in the second station status byte when the master reads diagnostics during configuration. Mask the value with 080h and any bits that are set in the result should not be set. Mask the value in the low byte with 04h and bit 2 should be set.

The bits in station status byte 2 are:

Bit	Meaning
7	Slave has been marked inactive by the master
6	reserved
5	The slave has received a Sync command
4	The slave has received a freeze command
3	The slave watchdog has been activated
2	The slave sets this bit to 1
1	Slave is requesting a diagnostic read.
0	Slave is requesting reparameterization

high byte = 08h (error in diagnostic status byte #2 during diagnostic read)

The value in the low byte depends on the value returned by the slave in the second station status byte when the master reads diagnostics while online. Mask the value with 080h and any bits that are set should not be set. Mask the value in the low byte with 04h and bit 2 should be set. The bits in station status 2 are shown in the above table.

9.7 DP Slave Status Register

The scanner reports the status its operation as a DP slave by setting bits in the slave status register, register 4017 in the M1 file.

The scanner sets bit 6, SLV_STS_RUN_MODE, if it’s being scanned by a DP master in run mode.

The scanner sets bit 7, SLV_STS_OK, if the current slave status is OK. This means parameterization was successful and the slave watchdog hasn’t timed out.

9.8 DP Slave Error Register

The scanner module sets the slave error register, register 4018 in the M1 file, to the following values to report various error conditions in its operation as a DP slave. If there are multiple errors, the register contains the value for the last error encountered.

Error	Value	Description
SLV_ERR_ID_MISM	01h	ID from master does not match configured ID
SLV_ERR_READY_TIME_MISM	02h	pfbReadyTime does not match what master sent
SLV_ERR_UNSUP_REQ	03h	master is requesting Freeze or Sync, which is not supported
SLV_ERR_RX_LEN_MISM	04h	length of data from master is incorrect
SLV_ERR_TX_LEN_MISM	05h	length of data to master is incorrect
SLV_ERR_WD_FACT_INV	06h	one of the watchdog factors from the master was 0
SLV_ERR_TIME_OUT	07h	slave watchdog time out (check response timeout)
SLV_ERR_WARN_WD_DIS	08h	slave timeout watchdog disabled from master

All these errors except timeout happen when the slave is being parameterized by the master.

If the value is SLV_ERR_ID_MISM, the slave ID does not match the slave ID configured in the master. If there is a mismatch, the slave won't communicate with the master.

If the value is SLV_ERR_READY_TIME_MISM, the ready time for the card is different from the value configured in the master. The card can communicate as a slave even if the times are different but you may experience network errors.

If the value is SLV_ERR_UNSUP_REQ, the master has requested Sync or Freeze during parameterization, which the card does not support.

If the value is SLV_ERR_RX_LEN_MISM, the data received from the master has a length different from the length configured on the card. If there is a receive length mismatch, the card won't communicate as a slave.

If the value is SLV_ERR_TX_LEN_MISM, the master has requested data from the slave with a length different from the length configured for the slave. If there is a transmit length mismatch, the card won't communicate as a slave

If the value is SLV_ERR_WD_FACT_INV, one of the two slave watchdog factors is zero, which is not allowed.

If the value is SLV_ERR_TIME_OUT, the slave's watchdog timed out. The slave goes offline and must be reinitialized by the master.

If the value is SLV_ERR_WARN_WD_DIS, the master has disabled the slave watchdog.

9.9 Diagnostic Counters

The scanner maintains a variety of diagnostic counters to indicate:

- general statistics on messages sent and received, etc.
- the state of the master
- network statistics

The counters are located in the M1 file from 4100 to 4200.

To reset these counters to 0, set the low byte of register 4100 to a non-zero value. The scanner then clears the counters to 0 and clears register 4100 back to 0 to indicate that it has cleared the counters.

The counters are also cleared when you put the SLC in program mode.

In the following, counters with a name beginning with "diag" roll over to zero when they reach their maximum value. Counters with a name beginning with "err" hold their maximum value. 'L' indicates low byte; 'H' indicates high byte.

Name	Location	Description
pfbInitCtrs	4100L	If non-zero, scanner clears counters
errLanOffline	4100H	LAN went offline because of errors
diagConf	4101	Total confirmations
diagInd	4102	Total indications
errNotOk	4103	Total not OK confirmations and indications
diagTokHldTime	4104-4105	Instantaneous token hold time

Name	Location	Description
diagMinTokHldTime	4106-4107	Minimum token hold time
diagMasterUpdate	4108	Master I/O update cycles completed
errMasErr	4109L	Master->DP slave errors
errMasReConfig	4109H	Master->DP went offline and had to be reconfigured
diagMasScanTime	4110-4111	Master scan time (us)
diagMasMaxScanTime	4112-4113	Maximum master scan time (us)
diagSlaveUpdate	4114	Slave updates
errSlvErr	4115L	Slave configuration failures
errSlvTout	4115H	Slave watchdog timeouts
diagLay2MsgOk	4116	FDL messages sent OK
errLay2MsgNotOk	4117L	FDL message errors
diagLay2SapOk	4118	FDL SAP requests processed OK
errLay2SapNotOk	4119L	FDL SAP errors
errInvReqLen	4124L	Invalid request length errors
errFifo	4124H	FIFO overflow errors
errRxOverun	4125L	Receive overrun errors
errDblTok	4125H	Double token errors
errRespErr	4126L	response errors
errSyniErr	4126H	SYNI errors
errNetTout	4127L	Network timeout errors
errHsa	4127H	Station higher than HSA was heard
errStn	4128L	Duplicate station detected
errPasTok	4128H	Unable to pass token
errLasBas	4129L	Active station list invalid
ErrInternal	4129H	Internal error
errArg	4130L	Internal error

9.9.1 General Statistics

These counters relate to the overall operation of the scanner on Profibus.

The errLanOffline counter, the high byte of register 4100, increments when the LAN encountered errors and went offline.

The diagConf counter, register 4101, counts total confirmations, that is, good replies to messages that this station has generated.

The diagInd counter, register 4102, counts total indications, that is, unsolicited messages to this station.

The errNotOk counter, register 4103, counts the Total Not OK confirmations and indications, that is, total bad replies and bad unsolicited messages (indications).

The scanner stores the instantaneous token hold time, in Tbits, in diagTokHldTime, registers 4104 and 4105. This time is the time available to send messages when the scanner gets the token.

The scanner stores the minimum token hold time, in Tbits, in diagMinTokHldTime, registers 4106 and 4107. This time is the minimum value of diagTokHldTime. If this number is 0, you may need to increase the target token rotation time or delta TTR in COM PROFIBUS.

9.9.2 DP Master Statistics

These counters relate to the operation of the scanner as a DP master.

The diagMasterUpdate counter, register 4108, is the number of Master I/O update cycles completed.

The errMasErr counter, the low byte of register 4109, is the number of DP master to DP slave communication errors. It increments any time the message failed because of retries exceeded, etc.

The errMasReConfig counter, the high byte of register 4109, is the number of times a DP slave went offline and had to be reconfigured, that is, the scanner was actively updating a node and got a faulty message. It increments after the scanner has retried the message the number of times specified in pfbMsgRetryLimit (set by COM PROFIBUS).

The diagMasScanTime register, registers 4110 and 4111, contains the instantaneous master scan time in microseconds, that is, the time to scan all the slaves assigned to this master. The scanner adds 100 microseconds to the measured time to allow for overhead in starting the timer, etc.

The diagMasMaxScanTime register, registers 4112 and 4113, contains the maximum value that diagMasScanTime has reached since it was last cleared.

9.9.3 DP Slave Statistics

These counters relate to the operation of the card as a DP slave.

The card increments the diagSlaveUpdate counter when it receives an I/O data update from the master.

The card increments the errSlvErr counter when there are errors while the master is parameterizing the slave.

The card increments the errSlvTout counter when the slave hasn't received a message from the master within the master timeout period.

9.9.4 ASPC2 PROFIBUS Controller Statistics

The ASPC2 LAN controller maintains the following counters. They are all 1 byte long. When these counters reach 255, they hold at 255 until cleared.

The errInvReqLen counter, the low byte of register 4124, counts invalid request length errors. These errors occur when the scanner software gives the LAN controller a message that is too long. This error is an internal error and should never occur.

The errFifo counter, the high byte of register 4124, counts FIFO overflow errors. These errors occur when the LAN controller couldn't write to memory fast enough. This error is an internal error and should never occur.

The errRxOverun counter, the low byte of register 4125, counts receive overrun errors. This error is an internal error and should never occur.

The errDblTok counter, the high byte of register 4125, counts double token errors. These errors may occur when more than one node thinks it has the token or they may occur due to wiring errors, duplicate nodes, etc. The scanner withdraws to the "not hold token" state (decides it doesn't have the token) and waits until it gets the token passed to it again.

The errRespErr counter, the low byte of register 4126, counts response errors, when a message failed or there was no response from destination. This error may be due to bad hardware or faulty wiring.

The errSyniErr counter, the high byte of register 4126, indicates general network errors. These errors occur when there are problems on the network but before you get a network timeout error.

The errNetTout counter, the low byte of register 4127, counts network timeout errors. These errors occur when the network is dead. If a timeout occurs, the scanner enters the claim token state.

The errHsa counter, the high byte of register 4127, increments when a station higher than the set high station address is heard. If the scanner is going online, it increments the counter and stays offline.

The errStn counter, the low byte of register 4128, increments when a duplicate station is detected. If this error occurs when the scanner is going online, the scanner increments the errStn counter and stays offline.

The errPasTok counter, the high byte of register 4128, increments when the scanner is unable to pass the token. This is usually caused by bad wiring (usually shorted) or other hardware problems. The scanner tries to pass the token, fails to hear its own token pass message, and puts itself offline.

The errLasBad counter, the low byte of register 4129, increments when the active station list on the ASPC2 LAN controller is invalid because of multiple network errors. This error is caused by bad wiring or hardware.

The locations errInternal, the high byte of register 4129, and errArg, the low byte of register 4130, are reserved. If a fatal error occurs, the values in these registers may indicate the source of the problem. Record them for technical support. However, the scanner uses these locations for other purposes. If there is a value in one of these locations, it doesn't necessarily indicate that a fatal error has occurred.

The scanner also copies errArg to the low byte of register 4012.

9.10 Summary of Diagnostic Locations

The following tables summarize the locations used.

9.10.1 M1 File

Locations	Use
3700-3827	DP Master error information
3828	DP master diagnostic station select
3829-3950	DP master diagnostic status buffer
4000-4007	Slave status table
4011	Profibus status
4012	errArg
4013	Bit 0 = all slaves good flag
4014	Firmware revision
4017	DP slave status
4018	DP slave error
4020-4027	DP master slave error table
4030-4037	DP master extended status table
4100-4200	Diagnostic counters

9.10.2 M0 File

Locations	Use
4000-4007	Ignore slave fault table
4010	Global fault enable

10

Upgrading the Scanner Firmware

This chapter describes:

- the steps required to upgrade the scanner firmware

Use the serial CONFIG port on the front of the scanner to upload configuration files to the scanner.

The serial cable for a standard PC COM port must have lines 2 and 3 swapped. It doesn't require any handshaking. Pins 2 and 3 are wired the same as a PC 9-pin COM port.

Connect to the serial port using any communication software. The scanner serial port supports any baud rate from 9600 baud to 115 kbaud, with no parity, 8 data bits, 1 stop bit. The scanner automatically detects the baud rate being used.

1. Cycle power on the SLC.
2. When the SLC is powering up, the SYS LED flashes for 2 seconds. While it is flashing, hit the exclamation mark (!) in your communication software to tell the scanner that you want to upload software. You may need to press it several times while the scanner tries to autodetect the baud rate.
3. The LEDs flash alternately red to tell you the scanner is in system configuration mode. The commands available are:

Command	Description
ver	to display the current firmware revision number
help	to display available commands
LoadFlash	to load new firmware into flash
Run	to exit system configuration mode
Run Aux	reserved, do not use

4. Type `LoadFlash`, and the scanner responds with a query.
5. Initiate an Xmodem send of the module firmware file using your communication software.
6. When the upload is complete, the scanner asks if you want to program the new module into flash. Type '`y`' to confirm.
7. When the module has been programmed into flash, use the ver command to confirm that the version number is correct.
8. Use the `Run` command to exit System Configuration mode and resume normal operation. The scanner turns off the LEDs.

11

Network Parameter Defaults

This chapter describes:

- network defaults

The following tables show the default values assigned by the scanner for the network parameters. The values depend on:

- the baud rate
- whether there are repeaters on the network
- whether there are FMS devices on the network

Idle time 1 is the time the scanner waits after it receives a response before it sends, and corresponds to the Profibus Idle Time.

Idle time 2 is the time the scanner waits after it sends before it sends again, and corresponds to the Profibus Max TSDR.

No repeater, no FMS					
Baud rate	**Slot time**	**Idle time 1**	**Idle time 2**	**Ready time**	**Qui Time**
9600	100	37	60	11	0
19200	100	37	60	11	0
93.75 K	100	37	60	11	0
187.5K	100	37	60	11	0
500K	200	37	100	11	0
750K	300	37	140	11	0
1.5M	300	37	150	11	0
3M	400	45	250	11	3
6M	500	55	350	11	6
12M	750	75	550	11	9

No repeater, FMS					
Baud rate	**Slot time**	**Idle time 1**	**Idle time 2**	**Ready time**	**Qui Time**
9600	125	37	60	30	0
19200	250	61	120	60	0
93.75 K	600	126	250	125	0
187.5K	1500	251	500	250	0
500K	3500	251	1000	250	0
750K	3000	251	990	250	0
1.5M	3000	151	980	150	0
3M	400	45	250	11	3
6M	500	55	350	11	6
12M	750	75	550	11	9

Repeater, no FMS					
Baud rate	**Slot time**	**Idle time 1**	**Idle time 2**	**Ready time**	**Qui Time**
9600	100	37	60	11	0
19200	100	37	60	11	0
93.75 K	100	37	60	11	0
187.5K	100	37	60	11	0
500K	200	37	100	11	0
750K	300	37	140	11	0
1.5M	300	37	150	11	0
3M	400	45	250	11	3
6M	500	55	350	11	6
12M	750	75	550	11	9

Repeater, FMS					
Baud rate	**Slot time**	**Idle time 1**	**Idle time 2**	**Ready time**	**Qui Time**
9600	125	37	60	30	0
19200	250	61	120	60	0
93.75 K	600	126	250	125	0
187.5K	1500	251	500	250	0
500K	3500	251	1000	250	0
750K	3000	251	990	250	0
1.5M	3000	151	980	150	0
3M	400	45	250	11	3
6M	500	55	350	11	6
12M	750	75	550	11	9

12

M0 and M1 Files

Note

The following is based on information in the SLC 500 Instruction Set Reference Manual, Allen-Bradley publication 1747.6.15, and is provided here for reference.

M0 and M1 files are files that reside in specialty I/O modules only. There is no image for these files in the processor memory. This means that when an application running on the SLC accesses the data, the SLC must go out to the module and read the data. The application of these files depends on the function of the particular specialty I/O module. Both M0 and M1 files are considered read/write files by the SLC processor.

M0 and M1 files can be addresses in your ladder program and they can also be acted upon by the specialty I/O module, independent of the processor scan. It is important that you keep the following in mind in creating and applying your ladder logic.

During the processor scan, M0 and M1 data can be changed by the processor according to ladder diagram instructions addressing the M0 and M1 files. During the same scan, the specialty I/O module can change the M0 and M1 data, independent of the rung logic applied during the scan.

12.1 Addressing M0 and M1 Files

The addressing format for M0 and M1 files is:

Mf:e.s/b

where

f = file type, 0 or 1

e = slot (1 to 30)

s = word (0 to maximum supplied by module)

b = bit, (0 to 15)

12.1.1 Restrictions on Using M0-M1 Data File Addresses

M0 and M1 data file addresses can be used in all instructions except the OSR instruction and the instruction parameters noted below.

Instruction	**Parameter (uses file indicator #)**
BSL,BSR	File (bit array)
SQO, SQC, SQL	File (sequencer file)
LFL, LFU	LIFO (stack)
FFL, FFU	FIFO (stack)

12.1.2 Monitoring Bit Addresses

M0 and M1 Bit Monitoring Disabled

When monitoring a ladder program in run or test mode, the following bit instructions, addressed to an M0 or M1 file, are indicated as false regardless of their actual true/false logical state.

```
--|  |--   --|/|--  --( )--  --(L)--  --(U)--
```

M0 and M1 Bit Monitoring Disabled

The SLC 5/03 and SLC 5/04 processors allow you to monitor the actual state of each addressed M0/M1 address (or data table). The highlighting appears normal when compared with the other processor data files. The SLC 5/03's performance will be degraded to the degree of M0/M1 referenced screen data. For example, if your screen has 69 M0/M1 elements, degradation will be significant.

If you need to show the state of the M0 or M1 addressed bit, transfer the state to an internal processor bit.

12.1.3 Transferring Data between Processor Files and M0/M1 Files

The SLC processor does not contain an image of the M0 or M1 file. As a result, you must edit and monitor M0 and M1 file data via instructions in your ladder program. For example, you can copy a block of data from a processor data file to an M0 or M1 data file or vice versa using the COP instruction in your ladder program. Refer to Chapter 6 of this manual for more detailed information.

Access Time

During the program scan, the SLC processor must access the scanner card to read or write M0 or M1 data. This access time must be added to the execution time of each instruction referencing M0 or M1 data. The SLC 500 Instruction Set Reference Manual contains details about this access time.

Minimizing the SLC Scan Time

Keep the SLC processor scan time at a minimum by minimizing the use of instructions that address M0 or M1 files. You can further reduce their impact by making such rungs true only periodically.

Refer to Chapter 6 of this manual for more detailed information.

A

Technical Data

Part number	SST-PFB-SLC
Function	SLC-500 scanner for ProfiBus networks
SLC Interface	32 words direct Input and Output data
	1000 words of M0, M1 mapped data
Environmental	storage temperature -40°C to 85°C
	operating temperature 0°C to 50°C
	operating RH level 5% to 95%
	Pollution Degree 1 - no pollution or only non-conductive or non-corrosive pollution
Backplane current consumption	700 mA @ 5 VDC*

*The 5VDC backplane voltage must be from a supply delivering Separated Extra Low Voltage (SELV).

CISPR22 Compliance

Marking of this equipment with the symbol CE indicates compliance with European Council Directive 89/336/EEC - The EMC Directive. This equipment meets or exceeds the following technical standards:

This device meets or exceeds the requirements of the following standard:

- EN 50081-2:1994 - "Electromagnetic compatibility - Generic emission standard Part 2. Industrial Environment."
- EN 50082-2:1995 - "Electromagnetic compatibility - Generic immunity standard Part 2. Industrial Environment."

Caution

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Note

To maintain compliance with the limits and requirements of the EMC Directive it is required to use quality interfacing cables and connectors when connecting to this device. Refer to the cable specifications in this manual for selection of cable types.

Index

U

V

W