

SIEMENS

SIMATIC 505

Field Interface Module

User Manual

Order Number: PPX:505-8124-5
Text Assembly Number: 2801355-0005
Fifth Edition

 **DANGER**

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

DANGER is limited to the most extreme situations.

 **WARNING**

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

 **CAUTION**

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

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

**Copyright 1996 by Siemens Energy & Automation, Inc.
All Rights Reserved — Printed in USA**

Reproduction, transmission, or use of this document or contents is not permitted without express consent of Siemens Energy & Automation, Inc. All rights, including rights created by patent grant or registration of a utility model or design, are reserved.

Since Siemens Energy & Automation, Inc., does not possess full access to data concerning all of the uses and applications of customer's products, we do not assume responsibility either for customer product design or for any infringements of patents or rights of others which may result from our assistance.

MANUAL PUBLICATION HISTORY

SIMATIC 505 Field Interface Module User Manual

Order Manual Number: PPX:505-8124-5

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

Event	Date	Description
Original Issue	03/93	Original Issue (2801355-0001)
Second Edition	08/93	Second Edition (2801355-0002)
Third Edition	12/94	Third Edition (2801355-0003)
Fourth Edition	06/95	Fourth Edition (2801355-0004)
Fifth Edition	11/96	Fifth Edition (2801355-0005)

LIST OF EFFECTIVE PAGES

Pages	Description	Pages	Description
Cover/Copyright	Fifth		
History/Effective Pages	Fifth		
Trademarks and Copyrights	Fifth		
v — xxiv	Fifth		
1-1 — 1-3	Fifth		
2-1 — 2-21	Fifth		
3-1 — 3-124	Fifth		
4-1 — 4-121	Fifth		
5-1 — 5-46	Fifth		
6-1 — 6-66	Fifth		
A-1	Fifth		
B-1 — B-3	Fifth		
Index-1 — Index-6	Fifth		
Registration	Fifth		

Trademarks and Copyrights

Belden® is a registered trademark of Belden Wire & Cable Company.

SINEC™, SIMATIC®, SIMOVERT®, SIMOREG®, and S5™ are trademarks of Siemens AG.

TISOFT1™, TISOFT2™, TISOFT3™ and Series 505™ are trademarks of Siemens Energy & Automation, Inc.

Siemens Advanced Motor Master System (SAMMSt) is a trademark of Siemens AG.

Windows® and MS-DOS® are registered trademarks of Microsoft Corporation.

IBM® is a registered trademark of International Business Machines Corporation.

All other product names or trademarks are the property of their respective owners. They are used without representation as to their release for general use.

Contents

Preface

Chapter 1 Overview

1.1	Features	1-2
1.2	LED Indicators	1-3

Chapter 2 Installation

2.1	Before Installing the Module	2-2
	Visual Inspection	2-2
	Handling the Module	2-2
	Hierarchy of Installation	2-3
2.2	Selecting the Application	2-4
	Assigning Field Interface Module Base Numbers	2-4
	Selecting the Application	2-4
2.3	Inserting the Module in the I/O Base	2-6
2.4	Communication Ports	2-8
	Overview	2-8
	Communication Port Pinouts	2-11
	Using RS-232	2-11
	Using Port 1	2-11
	Using Port 2	2-12
	Port 2 – Using the Connector	2-12
2.5	Termination	2-16
	Terminations	2-16
	Bias	2-16
	Field Interface Connection Examples	2-17
	Connector Schematics	2-18
2.6	Powering Up the Module	2-19
2.7	Logging into the Controller	2-20
2.8	FIM Software Field Upgrades	2-21

Chapter 3 Drives Interface Application

3.1	Drives Interface Overview	3-4
	Features	3-4
	System Layout	3-6
	Drives Interface Logical Diagram	3-7
	Drives Interface Functional Diagrams	3-7

3.2	Selecting the Application	3-10
	Mode of Operation	3-10
	Mute Function	3-12
	Time-out Delay Function	3-12
3.3	Communicating with the Drives	3-13
	Autobaud Operation	3-13
3.4	Connecting to Drives	3-14
	Connecting Port 2 to Drive with Two-Wire RS-485 Port	3-14
	Connecting Port 2 to Drive with Four-Wire RS-485 Port	3-15
3.5	Configuring for 10-Word Simple or 10-Word USS Protocols	3-16
	Updating the I/O Configuration Definition	3-16
	Sample Configuration	3-16
	Configuring for 10-Word Simple or 10-Word USS Protocol	3-17
	Broadcast/ Immediate Control Channel	3-17
	WX1 – WX10 (Controller Input Words)	3-17
	WY11 – WY20 (Controller Output Words)	3-17
	Configuring the Broadcast/Immediate Channel (10-Word Simple or 10-Word USS Protocol)	3-18
	Viewing the I/O Configuration Chart	3-20
3.6	Configuring for 4-Word Simple Protocol	3-22
	Updating the I/O Configuration Definition	3-22
	Sample Configuration	3-22
	Configuring the Broadcast/Immediate Channel (4-Word Simple Protocol)	3-23
	Configuring for 4-Word Simple Protocol	3-23
	Broadcast/ Immediate Control Channel	3-23
	WX1 – WX4 (Controller Input Words)	3-23
	WY5 – WY8 (Controller Output Words)	3-23
	Viewing the I/O Configuration Chart	3-25
3.7	Configuring for 5-Word USS Protocol	3-26
	Updating the I/O Configuration Definition	3-26
	Sample Configuration	3-26
	Configuring the Broadcast/Immediate Channel (5-Word USS Protocol)	3-27
	Configuring for 5-Word USS Protocol	3-27
	Broadcast/ Immediate Control Channel	3-27
	WX1 – WX6 (Controller Input Words)	3-27
	WY7 – WY12 (Controller Output Words)	3-27
	Viewing the I/O Configuration Chart	3-29

3.8	Configuring for 5-Word (Modified) USS Protocol	3-30
	Updating the I/O Configuration Definition	3-30
	Sample Configuration	3-30
	Configuring the Broadcast/Immediate Channel 5-Word (Modified) USS Protocol ...	3-31
	5-Word (Modified) USS Drive Protocol	3-31
	Configuring for 5-Word (Modified) USS Protocol	3-31
	Broadcast/Immediate Control Channel	3-31
	WX1 – WX4 (Controller Input Words)	3-32
	WY5 – WY8 (Controller Output Words)	3-32
	Viewing the I/O Configuration Chart	3-34
3.9	Programming	3-36
	Drives Update Scan	3-36
	Broadcast Request	3-40
	Broadcast Procedure	3-41
	Immediate I/O Request	3-42
	Immediate I/O Request Procedure	3-42
	Programming Drives	3-43
	Typical Drive Programming	3-44
	Typical Drive Program	3-45
3.10	Drives Troubleshooting	3-46
	Checking the Operation of the Module	3-46
	10-Word Simple and 10-Word USS Protocol	3-47
	4-Word Simple and 5-Word (Modified) USS Protocol	3-47
	5-Word USS Protocol	3-48
	Technical Assistance	3-49
3.11	SIMOREG/SIMOVERT Applications	3-50
	FIM Drive Protocols	3-50
	AC Drives Supported	3-51
	DC Drives Supported	3-52
3.12	Setting Up and Wiring 6RA24	3-54
	Required Hardware and Software	3-54
	Required Parameters	3-54
	Required Jumpers	3-59
	USS Protocols	3-59
	Setting FIM Additional Delay	3-59
3.13	Setting Up and Wiring 6SE21	3-62
	Required Parameters	3-62
	Required Jumpers	3-65
	USS Protocols	3-66
	Setting FIM Additional Delay	3-66

3.14	Setting Up and Wiring Micromaster/Midimaster Drive (6SE30/6ES31)	3-68
	Required Hardware and Software	3-68
	Required Parameters	3-68
	Required Jumpers	3-73
	USS Protocols	3-73
	Setting FIM Additional Delay	3-73
3.15	Setting Up and Wiring SI3	3-76
	Required Hardware and Software	3-76
	Required Parameters	3-76
	Required Jumpers	3-77
	Required Switches	3-77
	Setting FIM Additional Delay	3-77
3.16	Setting Up and Wiring Z1005	3-80
	Required Hardware and Software	3-80
	Required Parameters	3-80
	Required Jumpers	3-81
	Setting FIM Additional Delay	3-81
3.17	Setting Up and Wiring Z1006	3-84
	Required Hardware and Software	3-84
	Required Parameters	3-84
	Required Jumpers	3-85
	Setting FIM Additional Delay	3-85
3.18	Setting Up and Wiring Z1011	3-88
	Required Hardware and Software	3-88
	Required Parameters	3-88
	Required Jumpers	3-88
	External Power Supply	3-89
	Required Switches	3-89
	Setting FIM Additional Delay	3-89
3.19	Setting Up and Wiring Z2006	3-92
	Required Hardware and Software	3-92
	Required Parameters	3-92
	Required Jumpers	3-96
	USS Protocols	3-97
	Setting FIM Additional Delay	3-97
3.20	Setting Up and Wiring the 6SE70 Models FC and SC	3-100
	Required Hardware and Software	3-100
	Required Parameters	3-100
	Required Jumpers	3-106
	Required Switches	3-106
	USS Protocols	3-107
	Setting FIM Additional Delay	3-107

3.21	Setting Up and Wiring the 6SE70 Model VC	3-108
	Required Hardware and Software	3-108
	Required Parameters	3-108
	Required Switches	3-113
	USS Protocols	3-113
	FIM Additional Delay Set by Dipswitch S3	3-113
3.22	Setting Up and Wiring the SCB2	3-116
	Required Hardware and Software	3-116
	Required Parameters	3-116
	Required Switches	3-121
	USS Protocols	3-121
	Setting FIM Additional Delay	3-121
 Chapter 4 PROFIBUS-DP Interface Application		
4.1	Overview	4-4
	Features	4-4
	System Layout	4-5
4.2	Up and Running	4-6
	Overview	4-6
	Setting the FIM's Rotary Switches	4-7
	Setting Dipswitch S3	4-8
	Connecting the PROFIBUS-DP I/O Link	4-9
	Installing RS-485	4-10
	Connecting the FIM to the Controller	4-11
	Configuring the Programmable Controller	4-12
	Slave Address Range Selection	4-13
4.3	Token Passing	4-14
	Passing the Token	4-14
4.4	FIM I/O Update Scan	4-16
	FIM I/O Update Scan	4-16
	System Error Handling	4-16
4.5	Configuring Slaves	4-17
	Configuring Slaves	4-17
	Configuration Example 1	4-18
	Configuration Example 2	4-20

4.6	Configuring by Byte Matching	4-23
	Using Byte Match Configuration	4-23
	Procedure for Byte Matching Input Points	4-24
	Procedure for Byte Matching Output Points	4-25
	Byte Matching Configuration Example 1	4-26
	Byte Matching Configuration Example 2	4-27
	Byte Matching Configuration Example 3	4-28
	Byte Matching Configuration Data Positioning	4-30
	Byte Matching Input Points	4-32
	Overmapping Word Input Points	4-32
	Overmapping Discrete Input Points	4-34
	Byte Matching Output Points	4-36
	Overmapping Word Output Points	4-36
	Overmapping Discrete Output Points	4-38
4.7	FIM PROFIBUS-DP I/O Cable Specifications	4-40
	PROFIBUS Cable and Connector Specifications	4-40
	PROFIBUS Cable and Connector Order Numbers	4-41
4.8	Troubleshooting	4-42
	The MOD GOOD LED Is Off—What’s Wrong?	4-42
	The COMM LED Is Off—What’s Wrong?	4-43
	The CFG LED Is Off—What’s Wrong?	4-44
	The CFG LED Is Blinking—What’s Wrong?	4-45
	The CFG LED Is On, But Blinks Periodically—What’s Wrong?	4-46
	Checking the Operation of the Module	4-47
	Technical Assistance	4-48
4.9	Introducing the PROFIBUS-DP Configurator	4-49
	Overview	4-49
	When to Use the PROFIBUS-DP Configurator	4-52
	Hardware Requirements	4-54
4.10	Installation and Cabling	4-55
	Task Overview: Running the PROFIBUS-DP Configurator	4-55
	Installing the Configurator File on Your PC	4-56
	Creating an Icon in Windows	4-57
	Setting Up the PC-to-FIM Connection	4-58
4.11	File Configuration	4-61
	Configuration File Screen Area	4-61
4.12	FIM Operations	4-64
	FIM Operations Screen Area	4-64
	Troubleshooting Parameter Table Errors	4-65
	FIM Setups Dialog Box	4-66

4.13	Slave Operations	4-68
	Slave Operations Screen Area	4-68
	Edit Slave Dialog Box	4-69
	Edit I/O Configuration Dialog Box	4-73
	Edit User Specified Parameter Data Dialog Box	4-74
	Example: User Parameter Data	4-75
4.14	Status and Diagnostics	4-76
	Checking Slave Status with the Status Button	4-76
	Using Slave Diagnostics	4-77
	Diagnostic Location Example: ET 200B	4-78
	Diagnostic Location Example: ET 200U	4-79
4.15	Setting Up and Wiring the 6SE30 PROFIBUS Micromaster Drive	4-80
	Required Hardware and Software	4-80
	Required Parameters	4-80
	Required Switches	4-84
4.16	OPmP PROFIBUS Module for Micro/Midimaster (6SE31) Drives	4-86
	Required Hardware and Software	4-86
	Required Parameters	4-86
	Required Switches	4-90
4.17	Setting Up and Wiring the CB1	4-92
	Required Hardware and Software	4-92
	Required Parameters	4-92
	Required Switches	4-98
4.18	CB24 (SIMOREG 6RA24 Communications Board)	4-100
	Required Hardware and Software	4-100
	Required Parameters	4-100
	Required Switches	4-105
	Byte Order in the Controller	4-105
	External Power Supply	4-105
4.19	CS51 (SIMOREG 6RA24 and SIMOVERT 6SE12 Communications Board)	4-108
	Required Hardware and Software	4-108
	Required Parameters	4-109
	Byte Order in the Controller	4-114
	Required Switches	4-115
	External Power Supply	4-116
4.20	Setting Up and Wiring the SI3	4-118
	Required Hardware and Software	4-118
	Required Parameters	4-118
	Required Jumpers	4-119
	Required Switches	4-120

Chapter 5 SAMMS Interface Application

5.1	SAMMS Interface Overview	5-2
	Features	5-2
	System Layout	5-3
	SAMMS Interface Logical Diagram	5-4
	SAMMS Interface Functional Diagrams	5-5
5.2	Selecting the Application	5-6
	Mode of Operation	5-6
	Interface Response Times	5-7
	Configuring SAMMS Interface	5-7
	Configuration Modes	5-8
5.3	Communicating with the SAMMS Units	5-9
	Autobaud Operation	5-9
	Address Range	5-10
5.4	Connecting to SAMMS Unit	5-11
	Connecting Port 2 to CM1 Communication Module	5-11
5.5	Configuring for Control Mode	5-12
	Updating the I/O Configuration Definition	5-12
	Sample Configuration	5-12
	Configuring for Control Mode	5-14
	Broadcast/ Immediate Control Channel	5-14
	WX1 – WX14 (Controller Input Words)	5-14
	WY15 – WY16 (Controller Output Words)	5-14
	Configuring the Broadcast/Immediate Channel (Control Mode)	5-16
	Viewing the I/O Configuration Chart	5-18
5.6	Configuring for Status Poll Mode	5-20
	Updating the I/O Configuration Definition	5-20
	Sample Configuration	5-20
	Configuring the Broadcast/Immediate Channel (Status Poll Mode)	5-22
	Configuring for Status Poll Mode	5-22
	Broadcast/ Immediate Control Channel	5-22
	WX1 – WX4 (Controller Input Words)	5-23
	WY5 – WY8 (Controller Output Words)	5-23
	Viewing the I/O Configuration Chart	5-25
5.7	Programming: Broadcast and Immediate I/O Requests	5-26
	Broadcast Request	5-26
	Broadcast Procedure	5-27
	Immediate I/O Request	5-28
	Immediate I/O Request Procedure	5-28
	Monitoring Communication	5-29

5.8	Programming: Sending Requests	5-30
	Sending Requests to the SAMMS Unit	5-30
	Request Control Word	5-32
	Request Command Byte	5-32
	Request Data Length Bits	5-32
	Request Control Bits	5-33
	Send Message Bit	5-33
	Send Message Repetitively Bit	5-34
	Response Required Bit	5-34
	Request Data Block	5-34
5.9	Programming: Receiving Response Data	5-35
	Response Status Word	5-35
	Response Byte	5-35
	Response Status Bits	5-35
	Message Sent Bit	5-36
	Response Present Bit	5-36
	Response Length Bits	5-36
	Response Data Block	5-37
5.10	Programming: Application Examples	5-38
	Setting the Baud Rate and Address	5-38
	Sending Requests That Have Responses	5-40
	Sending Requests That Have No Response	5-41
	Sending Requests Repetitively	5-42
5.11	SAMMS Units Troubleshooting	5-43
	Checking the Operation of the Module	5-44
	Control Mode	5-44
	Status Poll Mode	5-44
	Monitoring Status between the Controller and FIM	5-45
 Chapter 6 SPI Application		
6.1	Introduction	6-2
	Overview	6-2
	Features	6-2
	The SPI Configurator	6-4
	Hardware Requirements	6-5
	System Layout	6-6

6.2	Up and Running	6-7
	Overview	6-7
	Setting the FIM's Rotary Switches	6-8
	Setting Dipswitch S3	6-8
	Connecting the SPI I/O Link	6-9
	Installing RS-485	6-10
	Connecting the FIM to the Controller	6-10
	Installing the Configurator File on Your PC	6-11
	Creating an Icon in Windows	6-12
	Setting Up the PC-to-FIM Connection	6-13
	Creating a Configuration	6-15
	Configuring the Programmable Controller	6-16
6.3	Troubleshooting	6-18
	The MOD GOOD LED Is Off—What's Wrong?	6-18
	The COMM LED Is Off—What's Wrong?	6-18
	The CFG LED Is Off—What's Wrong?	6-19
	The CFG LED Is Blinking—What's Wrong?	6-20
	The CFG LED Is On, But Blinks Periodically—What's Wrong?	6-21
	Checking the Operation of the Module	6-22
	Technical Assistance	6-23
6.4	Programming	6-24
	Types of Commands	6-24
	User Requests	6-24
	Random Requests	6-25
	Custom Blocks	6-26
	Blanket Polls	6-27
	Random Request Example #1	6-28
	Random Request Example #2	6-30
	Random Request Example #3	6-32
	Custom Poll Block Example	6-34
	Custom Select Block Example	6-36
	Blanket Poll Example	6-38
6.5	Error Codes	6-40
6.6	Overview of the FIM SPI Configurator	6-42
	Overview of Configurator Functions	6-42
6.7	File Configuration	6-44
	Configuration File Screen Area	6-44
6.8	FIM Operations	6-48
	FIM Operations Screen Area	6-48
	Troubleshooting Parameter Table Errors	6-49
	FIM Setups Dialog Box	6-50

6.9	SPI Device Operations	6-52
	SPI Device Operations Area	6-52
	Edit Device Dialog Box	6-54
	Edit Custom Block Dialog Box	6-56
6.10	Example—Configuring SPI Devices for the FIM	6-58
	Example 1 (FIM)	6-58
	Example 2 (FIM)	6-60
	How This Custom Poll Block Works	6-63
	Downloading the Configuration	6-63
6.11	Example—Configuring SPI Devices for the Programmable Controller	6-64
	Example 1 (Controller)	6-64
	Example 2 (Controller)	6-66
	Appendix A Application Selection	A-1
	Appendix B Specifications and Compliances	
B.1	Environmental Specifications	B-2
B.2	Additional Compliances	B-3

List of Figures

1-1	505 Field Interface Module	1-2
1-2	Field Interface Module LEDs	1-3
2-1	Installation Process	2-3
2-2	Field Interface Module Switches	2-5
2-3	Inserting the Field Interface Module into the I/O Base	2-7
2-4	Configuration of Two LANs Connected to the Field Interface Module	2-9
2-5	Connecting the Bias Circuit	2-10
2-6	Communication Port Pinouts	2-11
2-7	Connector	2-13
2-8	Routing and Cutting the Cable	2-13
2-9	Mounting the Cable on the Connector (Beginning/End of Segment)	2-14
2-10	Cutting the Cable, Stripping the Insulation, and Connecting the Cable	2-15
2-11	External Termination Resistor	2-16
2-12	External Bias Circuit	2-16
2-13	Field Interface Module Drives Interface Example 1	2-17
2-14	Field Interface Module Drives Interface Example 2	2-17
2-15	Connector Schematics	2-18
3-1	I/O System Layout for Three FIMs Running the Drives Interface Application	3-6
3-2	FIM Interface Block Diagram	3-7
3-3	Functional Block Diagram for 10-Word Simple and 10-Word USS Protocols	3-8
3-4	Functional Block Diagram for 4-Word Simple Protocol	3-8
3-5	Functional Block Diagram for 5-Word USS Protocols	3-9
3-6	Functional Block Diagram for 5-Word USS (Modified) Protocols	3-9
3-7	Field Interface Module S3 Dipswitch Settings	3-10
3-8	Connecting the Field Interface Module to Drive with 2-Wire RS-485 Port	3-14
3-9	Connecting the Field Interface Module to Drive with 4-Wire RS-485 Port	3-15
3-10	Sample I/O Configuration Chart for 10-Word Simple or 10-Word USS Protocols	3-16
3-11	I/O Configuration Chart for 10-Word Simple or 10-Word USS Protocols	3-21
3-12	Sample I/O Configuration Chart for 4-Word Simple Protocol	3-22
3-13	I/O Configuration Chart for 4-Word Simple Protocol	3-25
3-14	Sample I/O Configuration Chart for 5-Word USS Protocol	3-26
3-15	I/O Configuration Chart for 5-Word USS Protocol	3-29
3-16	Sample I/O Configuration Chart for 5-Word (Modified) USS Protocol	3-30
3-17	I/O Configuration Chart for 5-Word (Modified) USS Protocol	3-35
3-18	Control Bits for Main Control Word and Speed Setpoint	3-57
3-19	Status Bits for Standard Status Word and Speed Feedback	3-58
3-20	6RA24 Wiring: All Drives Except at End of Bus	3-60
3-21	6RA24 Wiring: Drive at End of Bus	3-61
3-22	6SE21 EPROM Label	3-62
3-23	Control Bits for Main Control Word and Speed Setpoint	3-64
3-24	Status Bits for Standard Status Word and Main Feedback	3-65

3-25	6SE21 Wiring: All Drives Except at End of Bus	3-66
3-26	6SE21 Wiring: Drive at End of Bus	3-67
3-27	Control Bits for Main Control Word and Frequency Setpoint	3-71
3-28	Status Bits for Standard Status Word and Main Feedback	3-72
3-29	6SE30/6SE31 Wiring: All Drives Except at End of Bus	3-74
3-30	6SE30/6SE31 Wiring: Drive at End of Bus	3-75
3-31	SI3 Wiring: All Drives Except at End of Bus	3-78
3-32	SI3 Wiring: Drive at End of Bus	3-79
3-33	Z1005 Wiring: All Drives Except at End of Bus	3-82
3-34	Z1005 Wiring: Drive at End of Bus	3-83
3-35	Z1006 Wiring: All Drives Except at End of Bus	3-86
3-36	Z1006 Wiring: Drive at End of Bus	3-87
3-37	Z1011 Required Switches	3-89
3-38	Z1011 Wiring: All Drives Except at End of Bus	3-90
3-39	Z1011 Wiring: Drive at End of Bus	3-91
3-40	Control Bits for Start/Stop and Speed Setpoint	3-95
3-41	Status Bits for Serial Port Status Word 1 and Speed Feedback	3-96
3-42	Z2006 Wiring: All Drives Except at End of Bus	3-98
3-43	Z2006 Wiring: Drive at End of Bus	3-99
3-44	Control Bits for Stop/Start and Speed Command	3-103
3-45	Status Bits for Status Word 1 and Main Setpoint	3-105
3-46	Master Drive Models FC and SC Wiring: All Drives Except End of Bus	3-106
3-47	Master Drive Models FC and SC Wiring: Drive at End of Bus	3-107
3-48	Control Bits for Stop/Start and Speed Command	3-111
3-49	Status Bits for Status Word 1 and Main Setpoint	3-112
3-50	6SE70 Master Drive Model VC Wiring: All Drives Except End of Bus	3-114
3-51	6SE70 Master Drive Model VC Wiring: Drive at End of Bus	3-115
3-52	Control Bits for Stop/Start and Speed Command	3-119
3-53	Status Bits for Status Word 1 and Main Setpoint	3-120
3-54	SCB2 Wiring: All Drives Except End of Bus	3-122
3-55	SCB2 Wiring: Drive at End of Bus	3-123
4-1	I/O System Layout for Three FIMs Running the PROFIBUS-DP Interface Application ...	4-5
4-2	S3 Dipswitch Settings	4-8
4-3	Communication Port Pinouts	4-9
4-4	ET 200B 32-Point 110V A/C Output	4-18
4-5	Sample I/O Configuration Chart	4-19
4-6	Slave Configuration Example	4-20
4-7	Sample I/O Configuration Chart	4-22
4-8	Slave Configuration Example	4-28
4-9	Main Configurator Window	4-51
4-10	Connecting Cable from PC to FIM	4-58

List of Figures (continued)

4-11	FIM Operations Area	4-59
4-12	PC-to-FIM Communications Setup Dialog Box	4-59
4-13	Configuration File Screen Area	4-61
4-14	Open Disk File Dialog Box	4-62
4-15	Save File Dialog Box	4-63
4-16	FIM Operations Screen Area	4-64
4-17	FIM Setups Dialog Box	4-66
4-18	Slave Operations Screen Area	4-68
4-19	Edit Slave Dialog Box	4-69
4-20	Edit I/O Configuration Dialog Box	4-73
4-21	Edit User Specified Parameter Data Dialog Box	4-74
4-22	Control Bits for Main Control Word and Frequency Setpoint	4-82
4-23	Status Bits for Standard Status Word and Main Feedback	4-83
4-24	6SE30 Wiring: All Drives Except at End of Bus	4-84
4-25	6SE30 Wiring: Drive at End of Bus	4-85
4-26	Control Bits for Main Control Word and Frequency Setpoint	4-88
4-27	Status Bits for Standard Status Word and Main Feedback	4-89
4-28	6SE31 Wiring: All Drives Except at End of Bus	4-90
4-29	6SE31 Wiring: Drive at End of Bus	4-91
4-30	Control Bits for Stop/Start and Speed Command	4-95
4-31	Status Bits for Status Word 1 and Main Setpoint	4-97
4-32	CB1 Wiring: All Drives Except at End of Bus	4-98
4-33	CB1 Wiring: Drive At End of Bus	4-99
4-34	Control Bits for Main Control Word and Speed Setpoint	4-103
4-35	Status Bits for Standard Status Word and Speed Feedback	4-105
4-36	CB24 Wiring: All Drives Except at End of Bus	4-106
4-37	CB24 Wiring: Drive At End of Bus	4-107
4-38	Control Bits for Main Control Word and Speed Setpoint	4-113
4-39	Status Bits for Standard Status Word and Speed Feedback	4-115
4-40	6SE12 Wiring: All Drives Except End of Bus	4-116
4-41	6SE12 Wiring: Drive at End of Bus	4-117
4-42	SI3 Wiring: All Drives Except End of Bus	4-120
4-43	SI3 Wiring: Drive at End of Bus	4-121
5-1	I/O System Layout for Three FIMs Running the SAMMS Interface Application	5-3
5-2	FIM Interface Block Diagram	5-4
5-3	Functional Block Diagram for Control Mode	5-5
5-4	Functional Block Diagram for Status Poll Mode	5-5
5-5	Field Interface Module S3 Dipswitch Settings	5-6
5-6	Connecting the Field Interface Module to SAMMS Unit CM1 Communication Module	5-11
5-7	Sample I/O Configuration Chart for the Control Modes	5-13
5-8	I/O Configuration Chart for Control Mode	5-19

5-9	Sample I/O Configuration Chart for Status Poll Mode	5-21
5-10	I/O Configuration Chart for Status Poll Mode	5-25
5-11	Request Control Word	5-32
5-12	Send Message Handshake Sequence	5-33
5-13	Response Status Word	5-35
5-14	Send Message/Message Sent Handshake Sequence	5-36
6-1	I/O System Layout for Three FIMs Running the SPI Interface Application	6-6
6-2	S3 Dipswitch Settings	6-8
6-3	Communication Port Pinouts	6-9
6-4	Connecting Cable from PC to FIM	6-13
6-5	FIM Operations Area	6-14
6-6	PC-to-FIM Communications Setup Dialog Box	6-14
6-7	Main Configurator Window	6-43
6-8	Configuration File Screen Area	6-44
6-9	Open Disk File Dialog Box	6-46
6-10	Save File Dialog Box	6-47
6-11	FIM Operations Screen Area	6-48
6-12	FIM Master Parameters Setup Dialog Box	6-50
6-13	SPI Device Operations Screen Area	6-52
6-14	Edit Device Dialog Box	6-54
6-15	Custom Poll Block Dialog Box	6-56
6-16	Custom Select Block Dialog Box	6-57
6-17	Configuring the Mold Temperature Controller	6-59
6-18	SPI Operations Screen Area	6-59
6-19	Configuring the Loader	6-61
6-20	Creating a Custom Poll Block for the Loader	6-62
6-21	SPI Operations Screen Area	6-63
6-22	Sample I/O Configuration Chart	6-65
6-23	Sample I/O Configuration Chart	6-66

List of Tables

1-1	LED Indicators	1-3
3-1	Protocol Selection	3-11
3-2	S3 Dipswitch Settings for Additional Delay	3-12
3-3	Recommended S3 Dipswitch Settings	3-12
3-4	Mapping the Controller Words to the Drive Parameter Words for 10-Word Simple or 10-Word USS Protocol	3-17
3-5	Mapping the 10-Word Simple or 10-Word USS Protocol Broadcast Channel	3-19
3-6	Mapping the Controller Words to the Drive Parameter Words for 4-Word Simple Protocol	3-23
3-7	Mapping the 4-Word Simple Protocol Broadcast Channel	3-24
3-8	Mapping the Controller Words to the Drive Parameter Words for 5-Word USS Protocol	3-27
3-9	Mapping the 5-Word USS Protocol Broadcast Channel	3-28
3-10	USS Drive Telegram Mappings	3-31
3-11	Mapping the Controller Words to the Drive Parameter Words for 5-Word (Modified) USS Protocol	3-32
3-12	Mapping 5-Word (Modified) USS Protocol Broadcast Channel	3-33
3-13	Typical Drive Scan Times for 10-Word Simple Protocol	3-36
3-14	Typical Drive Scan Times for 10-Word USS Protocol	3-37
3-15	Typical Drive Scan Times for 4-Word Simple	3-38
3-16	Typical Drive Scan Times for 5-Word USS Protocol and 5-Word (Modified)	3-39
3-17	Troubleshooting the Field Interface Module Using LEDs	3-46
3-18	Controller-to-Field Interface Module (FIM) Communication Status Using Controller Status Words	3-48
3-19	Monitoring Field Interface Module (FIM) to Drive Communication Status Using Controller Status Words	3-49
3-20	Specific Wiring and Set-up Information	3-53
4-1	SW2 Baud Rate Selection	4-7
4-2	Slave Address Range Selection	4-13
4-3	I/O Point Mapping	4-21
4-4	Input Bytes $WX \leftrightarrow X$	4-31
4-5	Output Bytes $WY \leftrightarrow Y$	4-31
4-6	PROFIBUS Line Specifications	4-40
4-7	PROFIBUS Line Length	4-40
4-8	PROFIBUS Cable and Connector Order Numbers	4-41
4-9	Baud Rates	4-46
4-10	Controller-to-Field Interface Module (FIM) Communication Status Using Controller Status Words	4-47
4-11	Monitoring Field Interface Module (FIM) to Slave Communication Status Using Controller Status Words	4-48
4-12	FIM Dipswitch Settings for PROFIBUS-DP	4-58
4-13	Default Bit Times Based on Baud Rate	4-67

4-14	Diagnostics Locations for the ET 200B	4-78
4-15	Diagnostics Locations for the ET 200U	4-79
5-1	Selecting Additional Delay Time	5-7
5-2	SAMMS Interface Configuration Modes	5-7
5-3	Address Range Selection	5-10
5-4	Mapping the Controller (Host) Words to the SAMMS Unit Command	5-15
5-5	Mapping the Control Mode Protocol Broadcast Channel	5-17
5-6	Mapping the Controller (Host) Words to the SAMMS Parameter Words for Status Poll Mode	5-23
5-7	Mapping the Status Poll Mode Broadcast Channel	5-24
5-8	SAMMS Unit Request Default Parameters	5-31
5-9	Response Data Block Words	5-34
5-10	Response Data Buffer Words (Control Mode)	5-37
5-11	Response Data Buffer Words (Status Poll Mode)	5-37
5-12	Troubleshooting the Field Interface Module Using LEDs	5-43
5-13	Controller-to-FIM Communication Status Using Controller Status Words	5-45
5-14	Monitoring FIM-to-SAMMS Unit Communication Status Using Controller Status Words	5-46
6-1	SPI Devices	6-3
6-2	Monitoring Controller-to-FIM Communication Status Using Controller Status Words ..	6-22
6-3	Monitoring FIM-to-Device Communication Status Using Controller Status Words	6-23
6-4	User Request Values	6-24
6-5	Error Codes Returned in Response Status Word	6-40
6-6	Response Buffer for Custom Poll Block #1	6-63
A-1	Application Selection	A-1
B-1	Environmental Specifications	B-2

Preface

This manual describes how to install and program the SIMATIC 505 Field Interface Module (PPX:505-7202).

Other Manuals

The following documents also contain information about operating or troubleshooting the 505 Field Interface Module (FIM).

- *SIMATIC 545 System Manual* (PPX:545-8101-x)
- *SIMATIC 545/555 System Manual* (PPX:545/555-8101-x)
- *SIMATIC 575 System Manual* (PPX:575-8101-x)
- *SIMATIC 545/555/575 System Manual* (PPX:505-8201-x)
- *SIMATIC 505 Programming Reference Manual* (PPX:505-8104-x)
- *SIMATIC 545/555/575 Programming Reference Manual* (PPX:505-8204-x)
- *SIMATIC 505 TISOFT2 User Manual* (PPX:TS505-8101-x)
- *SIMATIC S5 ET 200 Distributed I/O System Manual* (PPX:505-8206-x)
- *6RA24 Instruction Book*
- *Z1011 Instruction Book*
- *Z1004 Technology Module Instruction Book*
- *SAMMS Siemens Advanced Motor Master System SEAbus Protocol* (AED-000042-01-1294)

NOTE: The “x” in the manual order number designates the manual edition.

Agency Approvals

The 505 Field Interface Module meets the standards of the following agencies:

- Underwriters Laboratories, Inc., UL Listed (Industrial Control Equipment)
- Canadian Standards Association: CSA Certified (Process Control Equipment)
- Factory Mutual Research Corporation: Approved for Class I, Div. 2 Hazardous Locations
- Verband Deutscher Elektrotechniker (VDE) 0160 Clearance/Creepage for Electrical Equipment (Self-Compliance)

Series 505 products have been developed with consideration of the International Electrotechnical Commission (IEC) Standard 1131-2 for programmable controllers. Contact Siemens for a listing of the standards to which Series 505 complies.

Telephoning for Assistance

If you need information that is not included in this manual, or if you have problems using the Field Interface Module, contact your Siemens Energy & Automation, Inc., distributor or sales office. If you need assistance in contacting your U.S. distributor or sales office, call 1-800-964-4114. For U.S. Drives information, call 1-770-740-3000.

Chapter 1 Overview

1.1	Features	1-2
1.2	LED Indicators	1-3

1.1 Features

The SIMATIC 505 Field Interface Module (PPX:505-7202), shown in Figure 1-1, provides an interface between 505 CPUs and non-controller family devices using the RS-485 electrical interconnection.

- The Field Interface Module interfaces between the 545, 555, and 575 CPUs and various devices using communication protocols determined by the application.
- The Field Interface Module does not interface with current releases of the 560T/565T. Check with your Siemens Energy & Automation, Inc., distributor for more information.

The application (or communication protocol) is selected by setting Dipswitch S3 to the desired position, as shown in Chapter 2.

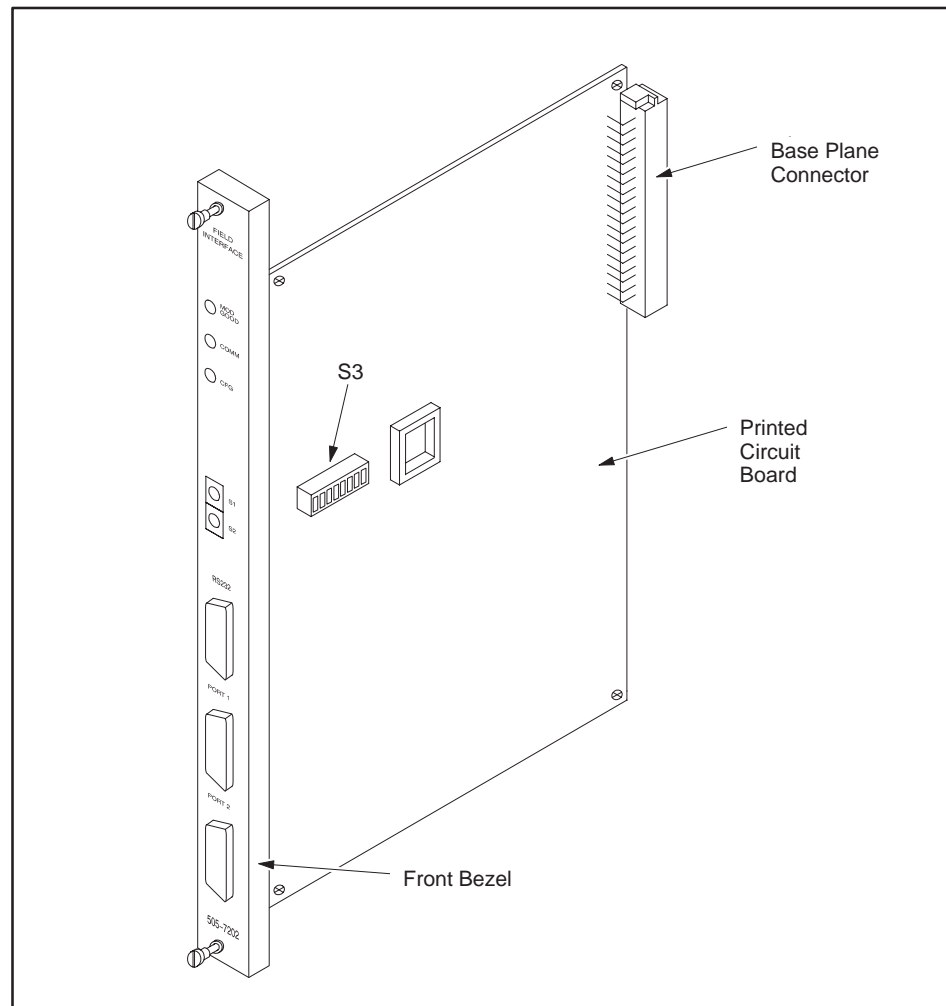


Figure 1-1 505 Field Interface Module

1.2 LED Indicators

The 505 Field Interface Module contains three LED indicators that provide a visual indication of the module status as shown in Figure 1-2. Table 1-1 describes how the LED indicators function.

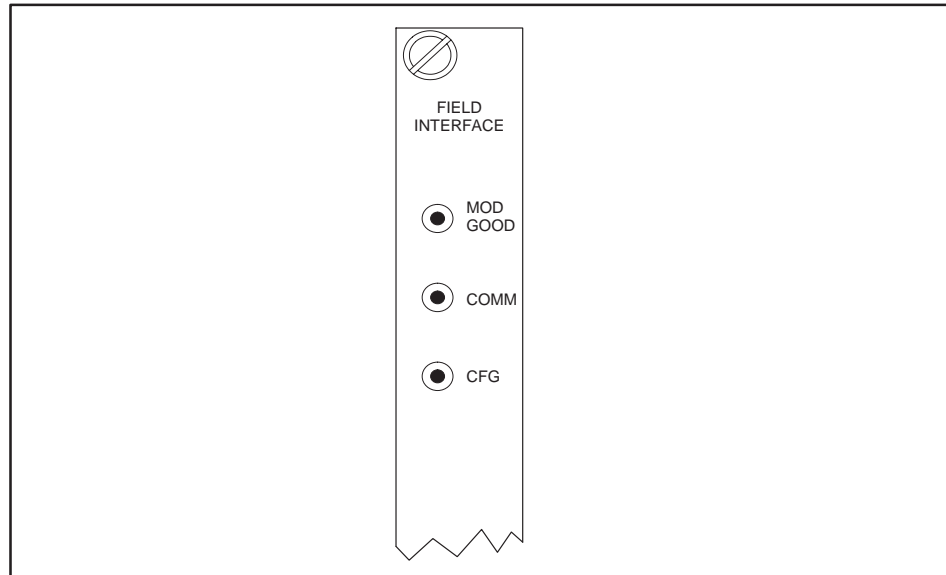


Figure 1-2 Field Interface Module LEDs

Table 1-1 LED Indicators

LED	ON	OFF	Blinking
MOD GOOD	Module functional	Power off or diagnostic failure	—
COMM	Communication established with controller	No communication established with controller	—
CFG	Configuration good	No configuration from the controller	Configuration mismatch

NOTE: The LEDs function as specified in Table 1-1 unless redefined by the specific application.

Chapter 2

Installation

2.1	Before Installing the Module	2-2
	Visual Inspection	2-2
	Handling the Module	2-2
	Hierarchy of Installation	2-3
2.2	Selecting the Application	2-4
	Assigning Field Interface Module Base Numbers	2-4
	Selecting the Application	2-4
2.3	Inserting the Module in the I/O Base	2-6
2.4	Communication Ports	2-8
	Overview	2-8
	Communication Port Pinouts	2-11
	Using RS-232	2-11
	Using Port 1	2-11
	Using Port 2	2-12
	Port 2 – Using the Connector	2-12
2.5	Termination	2-16
	Terminations	2-16
	Bias	2-16
	Field Interface Connection Examples	2-17
	Connector Schematics	2-18
2.6	Powering Up the Module	2-19
2.7	Logging into the Controller	2-20
2.8	FIM Software Field Upgrades	2-21

2.1 Before Installing the Module

Visual Inspection If there is any visible damage to the module, contact your Siemens Energy & Automation, Inc., distributor for replacement.

Handling the Module Many integrated circuit (IC) devices are susceptible to damage by the discharge of static electricity. Follow the suggestions listed below to reduce the probability of damage to these devices when you are handling a controller, a base controller, or any of the I/O modules.

Both the module and the person handling the module should be at the same ground potential. To accomplish this, ensure the following:

- The module is transported either in an anti-static container or in anti-static material.
- The work area has a conductive pad with a lead connecting it to a common ground.
- The person handling the module is grounded by making contact with the conductive pad and/or by wearing a grounded wrist strap.

Hierarchy of Installation

Figure 2-1 provides a simple flowchart of the installation process.

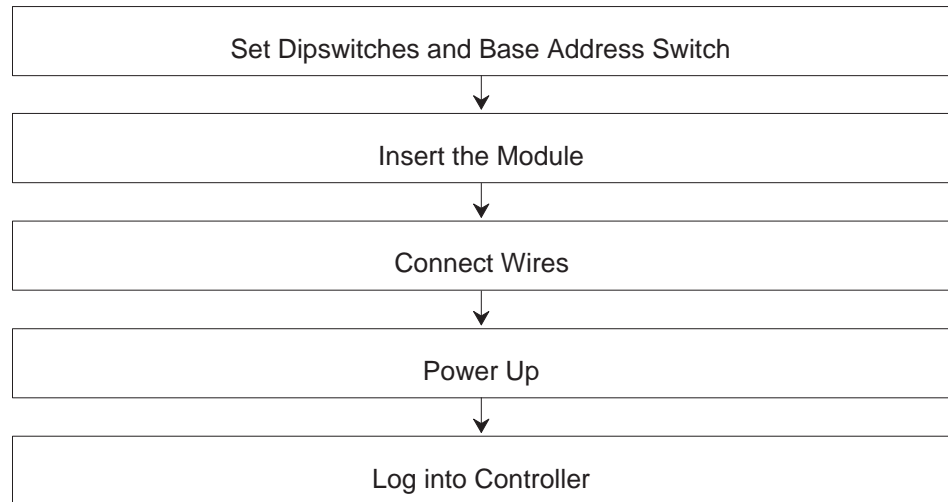


Figure 2-1 Installation Process

2.2 Selecting the Application

Prior to installing the module into the I/O backplane, configure the module by setting the switches. Figure 2-2 shows the location of the switches on the printed circuit board. Refer to the chapter specific to your application for more information on these switches.

Assigning Field Interface Module Base Numbers

Rotary switch S1 on the Field Interface Module is used to assign the base address for controller I/O system identification. If you are using more than one Field Interface Module and/or Remote Base Controller (RBC), each one must be uniquely numbered. Base numbers are the same as the base address switch.

A Field Interface Module uses the address space of one base in the Series 505 I/O system. A Series 505 I/O system can contain up to 16 total I/O bases and Field Interface Modules.

NOTE: If you are using a controller with a local base, the number 0 is reserved for local base assignment and cannot be used.

Rotary switch S2 is used if the application requires it. Refer to the chapter specific to your type of application for more information.

 CAUTION
--

If the base address switch is changed, it may cause the FIM to answer with the address of an existing FIM or remote base controller.
--

This may cause the remote base controllers or FIMs to be logged off the system.

Do not change the base address switch when the system is operating.
--

Selecting the Application

Dipswitch S3 (1 – 4) selects the application type. Dipswitch S3 (5 – 8) is set if the application requires it. Refer to the chapter specific to your application type and to Table A-1, in Appendix A.

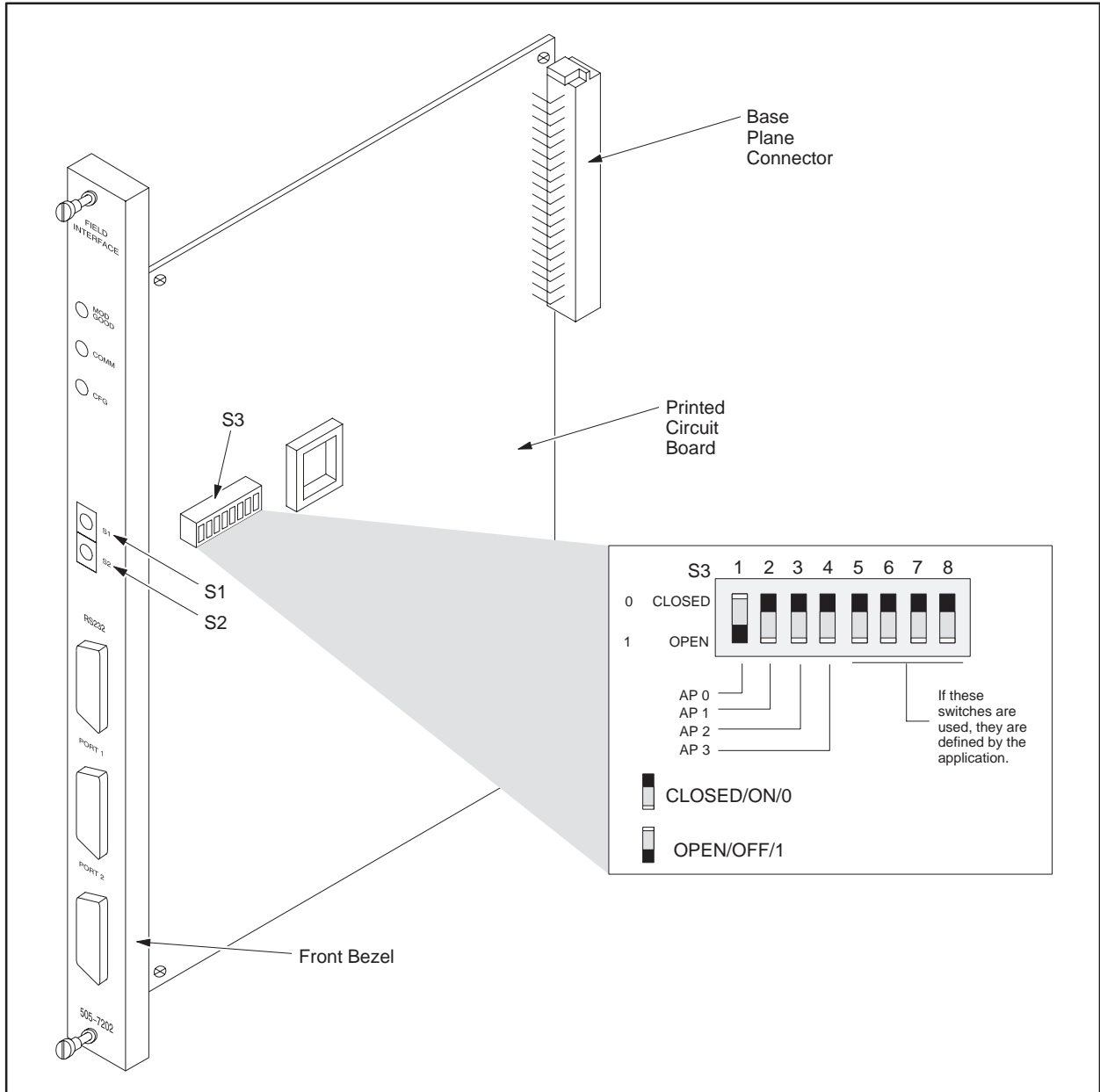


Figure 2-2 Field Interface Module Switches

2.3 Inserting the Module in the I/O Base

The Field Interface Module is a single-wide module. Insert it into any available I/O slot on any Series 505 I/O base (either local or remote). The Field Interface Module receives power from the I/O backplane. (Backplane signals are not used for communication.)

WARNING

To minimize potential shock, turn off power to the I/O base and any modules installed in the base before inserting or removing a module.

Failure to turn off power could cause unpredictable controller operation that could result in death or serious injury to personnel, and/or equipment damage.

Ensure that all power is removed from both the base and any modules before you insert or remove a module.

CAUTION

Do not touch the printed circuit board while inserting the module. Touching the board could cause electrostatic damage to the components on the board.

Insert the module as shown in Figure 2-3.

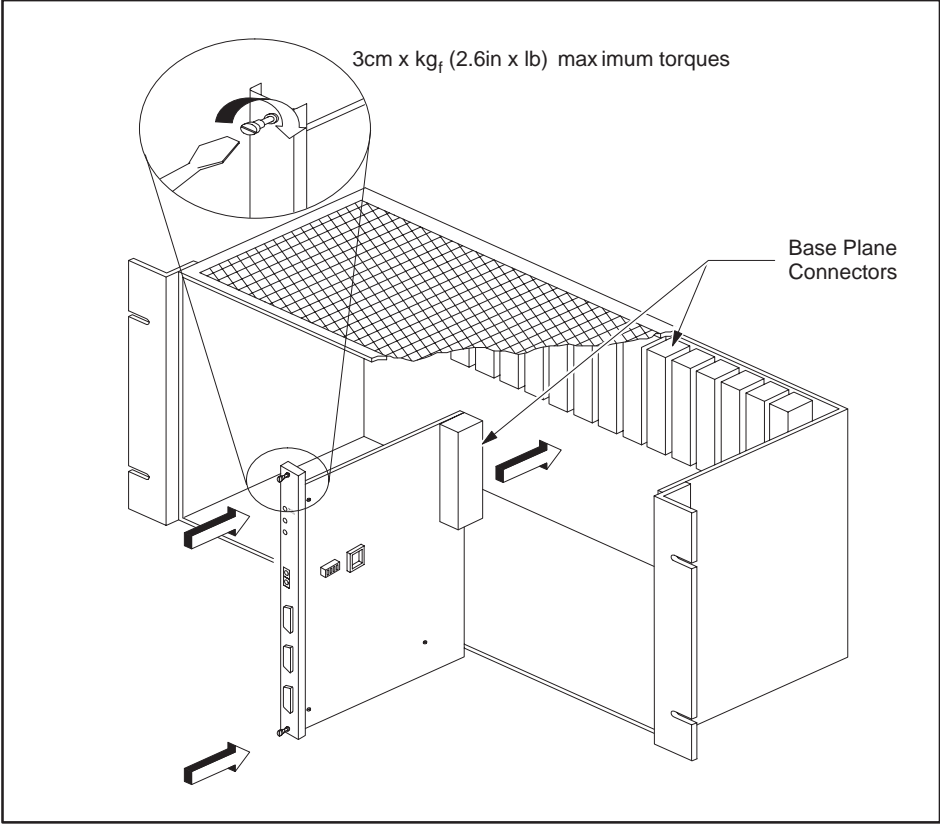


Figure 2-3 Inserting the Field Interface Module into the I/O Base

2.4 Communication Ports

Overview

Both communication Ports 1 and 2 of the Field Interface Module provide serial communication over a shielded, twisted-pair cable system. The cable can be thought of as a one-bit-wide bus or a local area network (LAN), to which multiple devices are connected in a multi-drop fashion. The devices that are polled by the FIM are called slaves.

The Field Interface Module has two ports that allow it to be connected to two different LANs. A configuration of two LANs to which the Field Interface Module is connected is shown in Figure 2-4.

- In the LAN connected to the Field Interface Module Port 1, the Field Interface Module is a slave device.
- In the LAN connected to Port 2, the Field Interface Module is a master and controls the network traffic.

In order for the communication links to function properly, they must be wired correctly. Part of the wiring of the remote I/O link includes termination at the extreme ends of the cable. Consult “Using Port 1,” on page 2-11, for references that describe this procedure. Wiring the field I/O link includes termination and bias at the extreme ends of the cable.

“Using Port 2,” on page 2-12, describes how to wire RS-485 I/O, using a special connector for each slave device and for the Field Interface Module.

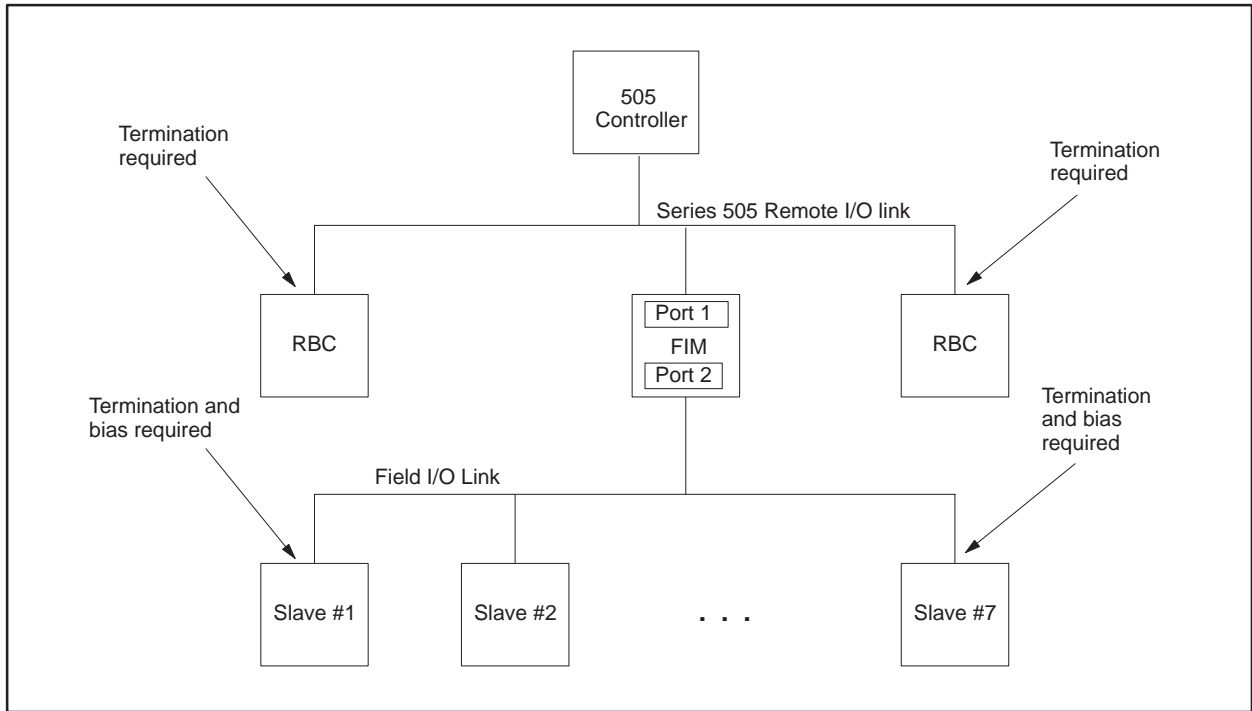


Figure 2-4 Configuration of Two LANs Connected to the Field Interface Module

Communication Ports (continued)

When you use the Field Interface Module as the Port 2 interface, the special connector can only be used on the Field Interface Module. If the Field Interface Module is located at an extreme end of the cable, the switches in the special connector for the Field Interface Module should be set to the On position (note the position of switches 1 and 2 in Figure 2-9, on page 2-14). The slave device, at the other end of the cable, must be terminated and biased.

In case the Field Interface Module is not at an extreme end of the cable, the switches in the special connector must be turned off (Figure 2-10, on page 2-15). Some slave devices provide termination as a selectable feature (generally by placing a jumper in a particular position).

Bias may be applied by way of an external circuit. In some cases, the +5 VDC supply is available at the slave device communication connector. If not, an external supply must be used. Check with your Siemens Energy & Automation, Inc., distributor for information specific to your slave device and configuration.

The bias should be applied near or at the slave device located at the extreme end of the cable. Figure 2-5 shows how to connect the bias circuit.

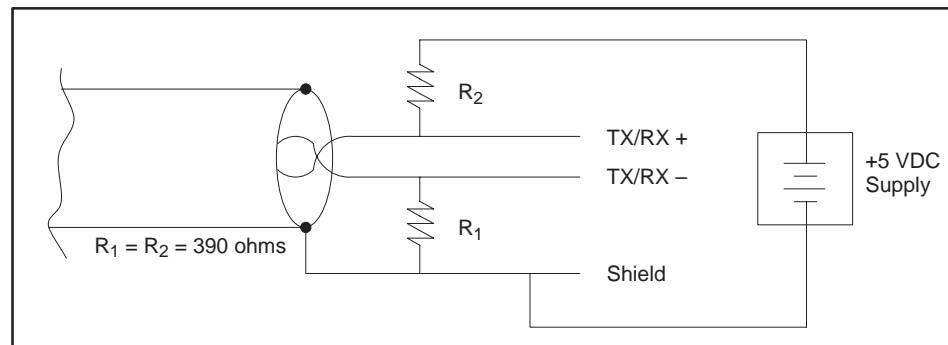


Figure 2-5 Connecting the Bias Circuit

Communication Port Pinouts

The communication port pinouts of the Field Interface Module are shown in Figure 2-6.

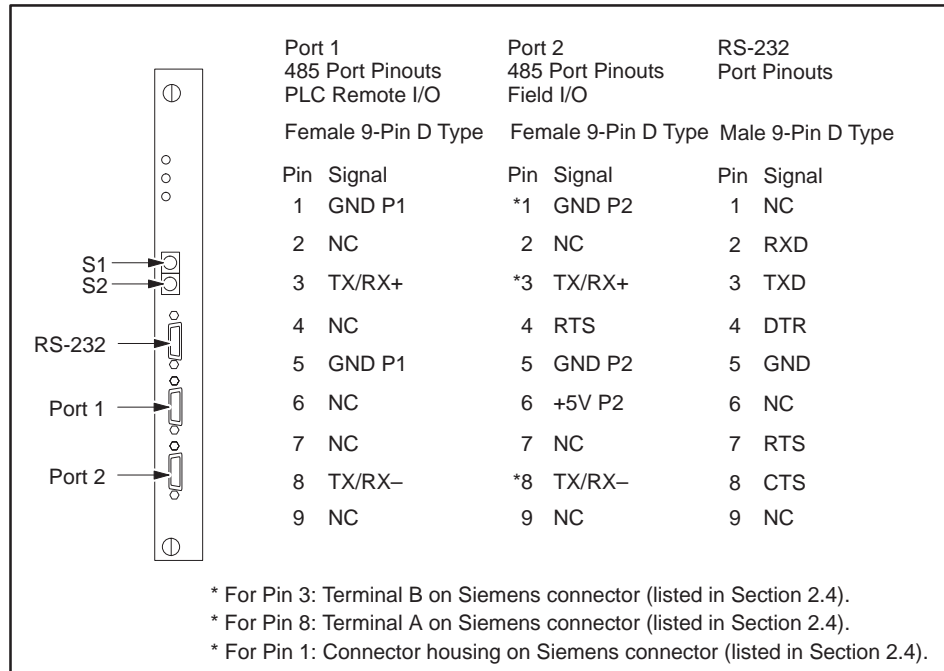


Figure 2-6 Communication Port Pinouts

Using RS-232

RS-232 is used for downloading firmware to the FIM for software upgrades. Refer to Section 2.7 in this chapter for more information.

Using Port 1

For proper wiring of Port 1, refer to the Cabling and Wiring section of your system manual:

- *SIMATIC 545 System Manual (PPX:545-8101-x)*
- *SIMATIC 545/555 System Manual (PPX:545/555-8101-x)*
- *SIMATIC 575 System Manual (PPX:575-8101-x)*
- *SIMATIC 545/555/575 System Manual (PPX:505-8201-x)*

NOTE: The “x” on the manual order number designates the manual edition.

Communication Ports (continued)

Using Port 2

When connecting the cable to Port 2, note the following information.

- Use the appropriate Siemens Energy & Automation, Inc., special cable connector (6ES7 972-0BA00-0XA0, 6ES7 972-0BB00-0XA0, 6ES7 972-0BA10-0XA0, 6ES7 972-0BB10-0XA0, 6ES7 972-0BA20-0XA0, 6ES7 972-0BB20-0XA0), and the PROFIBUS-DP cable (6XV1 830-0AH10). (Model numbers are subject to change; contact your distributor for up-to-date parts information.)
- The communication cable consists of two color-coded insulated wires that are twisted together and surrounded by a shield. The cable is encased in an insulating jacket. When wiring the system, the same color of wire must be connected to the TX/RX+ pin throughout the system.

On the special connector, terminal B connects to pin 3, which is TX/RX+, and terminal A connects to pin 8, which is TX/RX-. Crossing the wires at any point in the system causes communication problems.
- Remove enough insulation so that the shielding under the pressure saddle is exposed.

NOTE: Terminals A and B on the special connector may not necessarily match terminals A and B shown on the drives-communication terminal indicated in the Drives Manual. Be sure to connect the TX/RX+ drives-communication terminal to terminal B on the special connector and the TX/RX- drives-communication terminal to terminal A on the special connector. Refer to your Drives Manual for more information.

Port 2 – Using the Connector

Mount the cable on the connector. The following procedure describes how to use the connection, shown in Figure 2-7.

1. Open the connector housing by loosening both housing screws (see Figure 2-7).
2. Remove the cover of the housing (see Figure 2-7).
3. Wire the cable as shown in Figure 2-8, Figure 2-9, and Figure 2-10.
4. Put the cover back on the connector housing.

You can now plug a connector into Port 2 of the Field Interface Module.

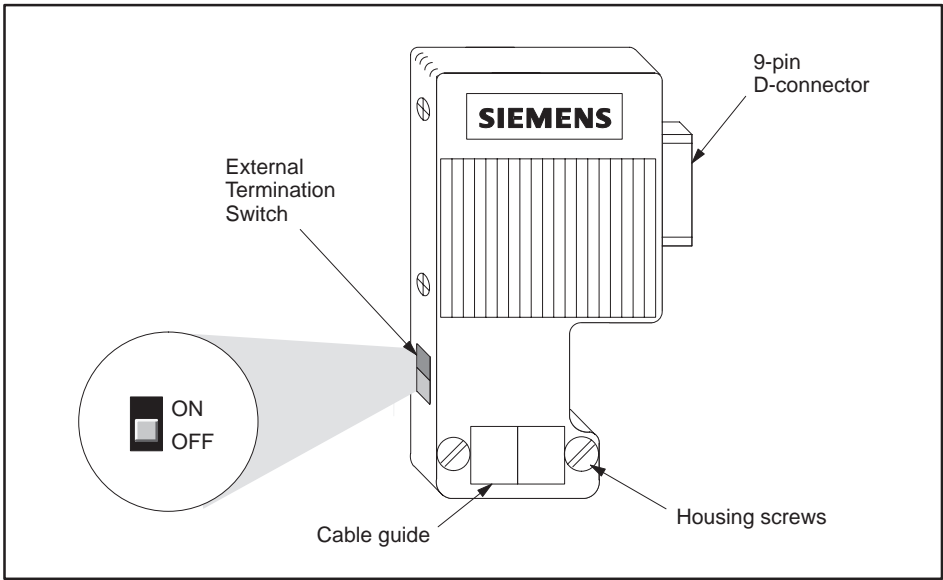


Figure 2-7 Connector

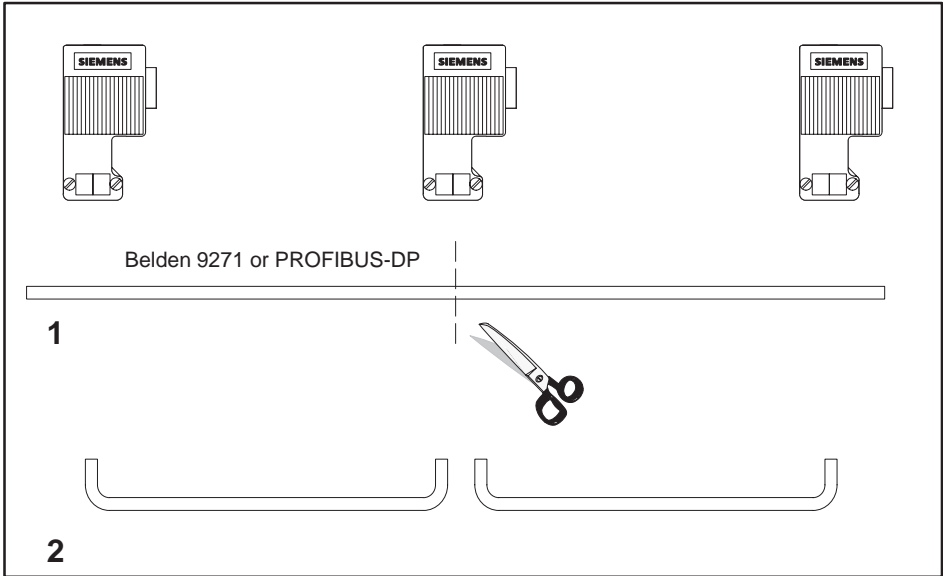


Figure 2-8 Routing and Cutting the Cable

Communication Ports (continued)

Figure 2-9 shows how to mount the cable to a Port 2 connector at the beginning or end of a segment.

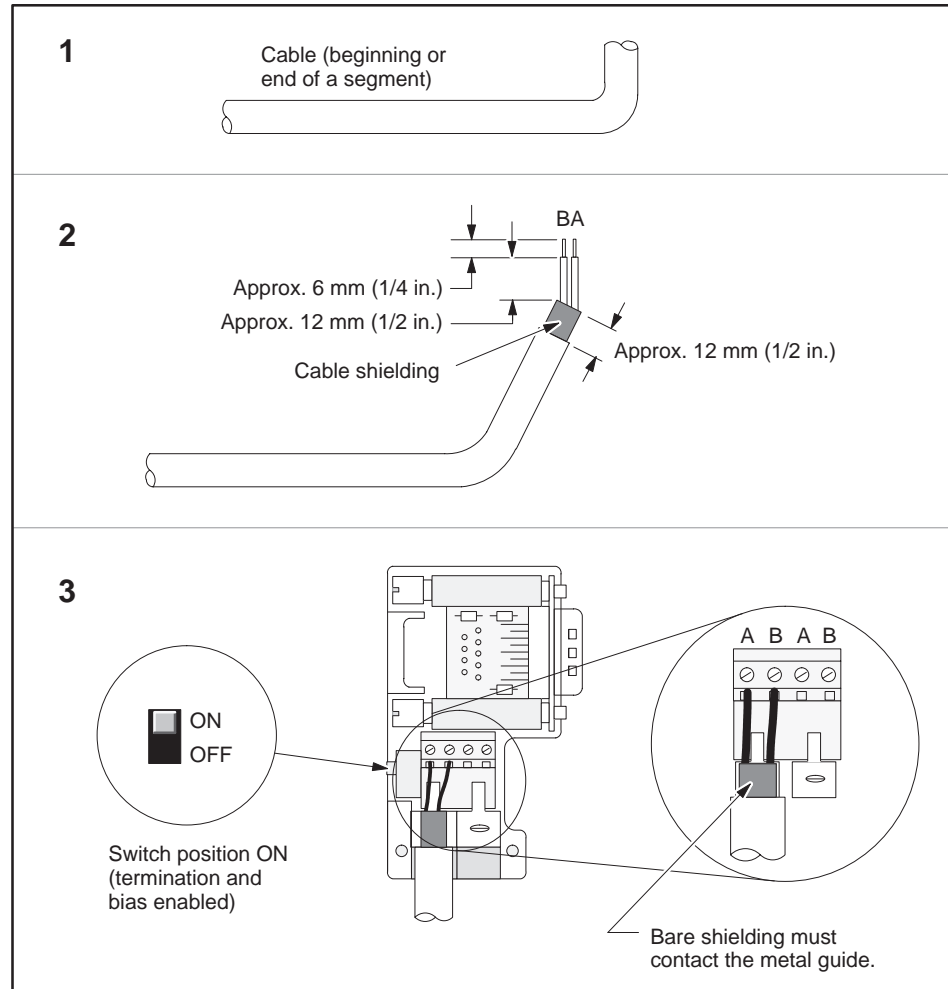


Figure 2-9 Mounting the Cable on the Connector (Beginning/End of Segment)

Figure 2-10 shows how to loop the cable through the Port 2 connector.

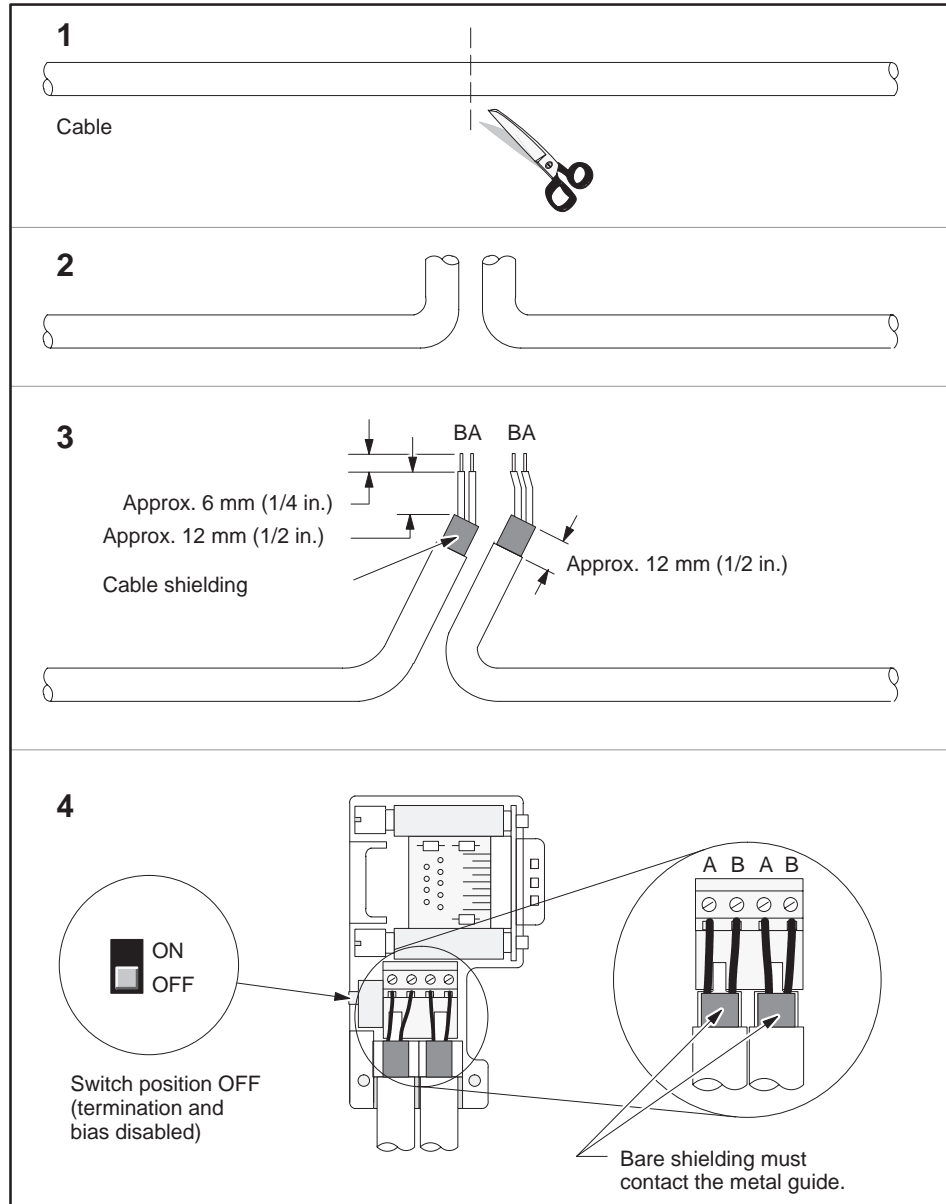


Figure 2-10 Cutting the Cable, Stripping the Insulation, and Connecting the Cable

2.5 Termination

Terminations

Proper termination and bias of RS-485 is important for reliable communication. For example, it is possible to cause a gross impedance mismatch with the cable (degrading signal integrity) if you do any of the following:

- Terminate nothing.
- Terminate everything.
- Terminate at the wrong places.

An external terminating resistor, if needed, is used as shown in Figure 2-11.

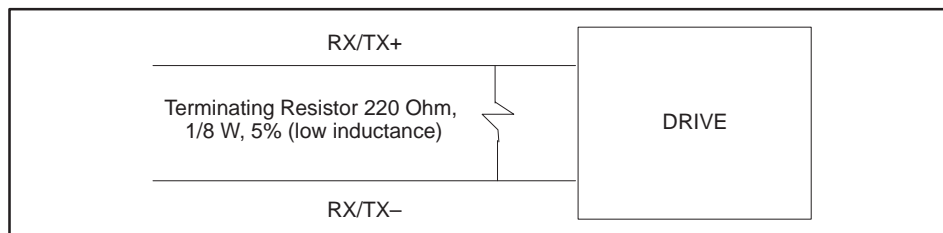


Figure 2-11 External Termination Resistor

Bias

An external bias circuit (if needed) is shown in Figure 2-12. You can use either 470 ohm or 390 ohm, 1/8 W, 5% tolerance low-inductance resistors (not wirewound).

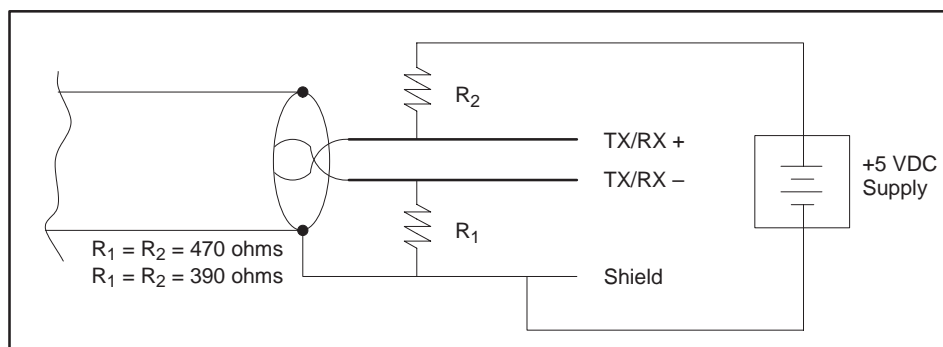


Figure 2-12 External Bias Circuit

Field Interface
Connection
Examples

Figure 2-13 and Figure 2-14 show two examples of the the correct way to connect the FIM to I/O.

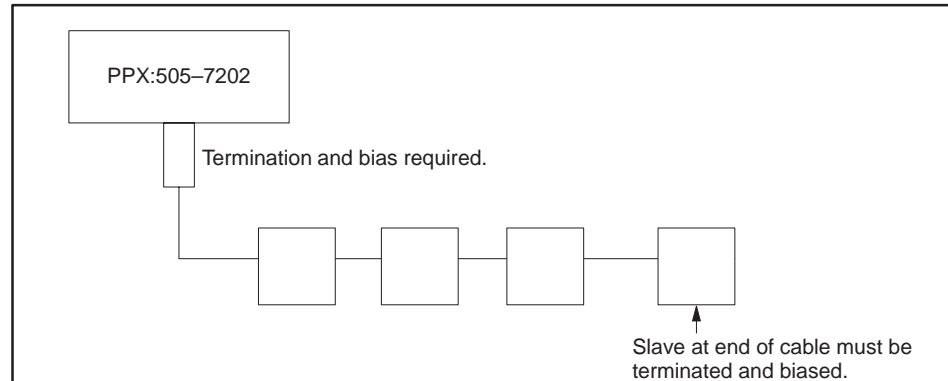


Figure 2-13 Field Interface Module Drives Interface Example 1

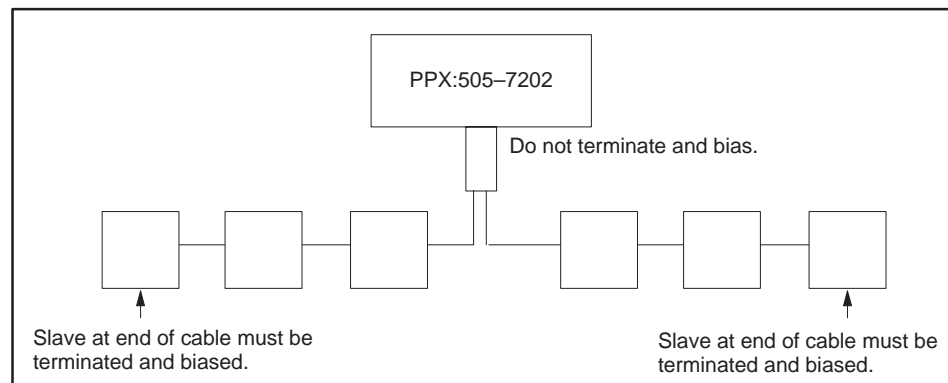


Figure 2-14 Field Interface Module Drives Interface Example 2

NOTE: For information on termination and bias options on the drives in use, contact your Siemens Energy & Automation, Inc., distributor or sales agent. If you need assistance in contacting your distributor or sales office in the United States, call 800-964-4114.

Termination (continued)

Connector Schematics

The schematics for the following PROFIBUS connectors are shown in Figure 2-15:

6ES7 972-0BA00-0XA0
6ES7 972-0BB00-0XA0
6ES7 972-0BA10-0XA0
6ES7 972-0BB10-0XA0
6ES7 972-0BA20-0XA0
6ES7 972-0BB20-0XA0

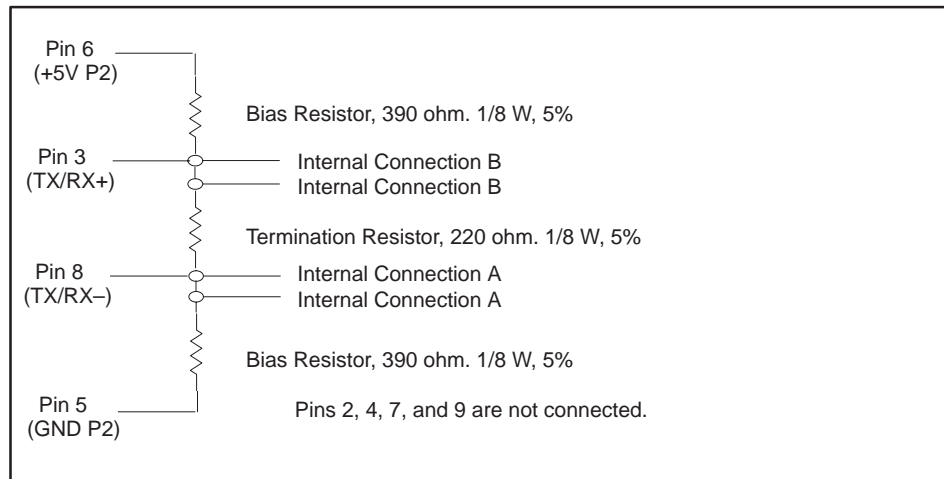


Figure 2-15 Connector Schematics

NOTE: Connector schematics and mechanical features are subject to change without notice. Check with your local Siemens Energy & Automation, Inc., distributor for the latest version.

Pin 1 is not connected to the shell of the D-shell connector and cable shield as shipped.

2.6 Powering Up the Module

WARNING

Turn off the power to the I/O base and any modules installed in the base before inserting or removing a module.

Failure to do so may cause unexpected controller performance that could result in death or serious injury to personnel, and/or damage to equipment.

Ensure that all power is removed both from the base and from any modules before you insert or remove a module.

After inserting the module in the base, restore power to the base.

- The MOD GOOD LED lights and stays on.
- The COMM light comes on if communication to the controller is good.
- The CFG light comes on and stays on if the controller I/O configuration matches the Field Interface Module.
- The CFG light stays off if the Field Interface Module base number is not configured with TISOFT or is not enabled.
- If the CFG light is blinking, the Field Interface Module may be configured incorrectly, or the module may not be communicating with all of its I/O properly.
- If problems persist, refer to Section 3.10 for drives troubleshooting, to Section 4.8 for PROFIBUS-DP troubleshooting, to Section 5.11 for SAMMS troubleshooting, and to Section 6.3 for SPI troubleshooting.

2.7 Logging into the Controller

After inserting the module into the base, update the I/O configuration in the controller. The module does not automatically configure itself. TISOFT or another type of programming device must be connected to the controller to register and verify controller-to-FIM communication.

Refer to the chapter specific to your application for more information.

2.8 FIM Software Field Upgrades

The PPX:505–7202 FIM has field upgrade capability using a standard PC and RS-232 port. For feature enhancements, the new firmware for the ROM and a PC-based download utility are available from Siemens Energy & Automation, Inc. To program the new firmware into the FIM's EEPROM (Electrically Erasable Read Only Memory), place the FIM in a special mode (see instructions supplied with the utility) and run the download utility on a PC that is connected to the FIM's RS-232 port by means of a standard 505 programmable controller programming cable.

For additional information, contact your Siemens Energy & Automation, Inc., distributor or sales agent. If you need assistance in contacting your distributor or sales office in the United States, call 800–964–4114.

Drives Interface Application

3.1	Drives Interface Overview	3-4
	Features	3-4
	System Layout	3-6
	Drives Interface Logical Diagram	3-7
	Drives Interface Functional Diagrams	3-7
3.2	Selecting the Application	3-10
	Mode of Operation	3-10
	Mute Function	3-12
	Time-out Delay Function	3-12
3.3	Communicating with the Drives	3-13
	Autobaud Operation	3-13
3.4	Connecting to Drives	3-14
	Connecting Port 2 to Drive with Two-Wire RS-485 Port	3-14
	Connecting Port 2 to Drive with Four-Wire RS-485 Port	3-15
3.5	Configuring for 10-Word Simple or 10-Word USS Protocols	3-16
	Updating the I/O Configuration Definition	3-16
	Sample Configuration	3-16
	Configuring for 10-Word Simple or 10-Word USS Protocol	3-17
	Broadcast/ Immediate Control Channel	3-17
	WX1 – WX10 (Controller Input Words)	3-17
	WY11 – WY20 (Controller Output Words)	3-17
	Configuring the Broadcast/Immediate Channel (10-Word Simple or 10-Word USS Protocol)	3-18
	Viewing the I/O Configuration Chart	3-20
3.6	Configuring for 4-Word Simple Protocol	3-22
	Updating the I/O Configuration Definition	3-22
	Sample Configuration	3-22
	Configuring the Broadcast/Immediate Channel (4-Word Simple Protocol)	3-23
	Configuring for 4-Word Simple Protocol	3-23
	Broadcast/ Immediate Control Channel	3-23
	WX1 – WX4 (Controller Input Words)	3-23
	WY5 – WY8 (Controller Output Words)	3-23
	Viewing the I/O Configuration Chart	3-25

3.7	Configuring for 5-Word USS Protocol	3-26
	Updating the I/O Configuration Definition	3-26
	Sample Configuration	3-26
	Configuring the Broadcast/Immediate Channel (5-Word USS Protocol)	3-27
	Configuring for 5-Word USS Protocol	3-27
	Broadcast/ Immediate Control Channel	3-27
	WX1 – WX6 (Controller Input Words)	3-27
	WY7 – WY12 (Controller Output Words)	3-27
	Viewing the I/O Configuration Chart	3-29
3.8	Configuring for 5-Word (Modified) USS Protocol	3-30
	Updating the I/O Configuration Definition	3-30
	Sample Configuration	3-30
	Configuring the Broadcast/Immediate Channel 5-Word (Modified) USS Protocol ...	3-31
	5-Word (Modified) USS Drive Protocol	3-31
	Configuring for 5-Word (Modified) USS Protocol	3-31
	Broadcast/Immediate Control Channel	3-31
	WX1 – WX4 (Controller Input Words)	3-32
	WY5 – WY8 (Controller Output Words)	3-32
	Viewing the I/O Configuration Chart	3-34
3.9	Programming	3-36
	Drives Update Scan	3-36
	Broadcast Request	3-40
	Broadcast Procedure	3-41
	Immediate I/O Request	3-42
	Immediate I/O Request Procedure	3-42
	Programming Drives	3-43
	Typical Drive Programming	3-44
	Typical Drive Program	3-45
3.10	Drives Troubleshooting	3-46
	Checking the Operation of the Module	3-46
	10-Word Simple and 10-Word USS Protocol	3-47
	4-Word Simple and 5-Word (Modified) USS Protocol	3-47
	5-Word USS Protocol	3-48
	Technical Assistance	3-49
3.11	SIMOREG/SIMOVERT Applications	3-50
	FIM Drive Protocols	3-50
	AC Drives Supported	3-51
	DC Drives Supported	3-52
3.12	Setting Up and Wiring 6RA24	3-54
3.13	Setting Up and Wiring 6SE21	3-62
3.14	Setting Up and Wiring Micromaster/Midimaster Drive (6SE30/6ES31)	3-68

3.15	Setting Up and Wiring SI3	3-76
3.16	Setting Up and Wiring Z1005	3-80
3.17	Setting Up and Wiring Z1006	3-84
3.18	Setting Up and Wiring Z1011	3-88
3.19	Setting Up and Wiring Z2006	3-92
3.20	Setting Up and Wiring the 6SE70 Models FC and SC	3-100
3.21	Setting Up and Wiring the 6SE70 Model VC	3-108
3.22	Setting Up and Wiring the SCB2	3-116

3.1 Drives Interface Overview

The Drives Interface Application supports the 10- and 4-Word Simple and 10- and 5-Word USS Protocols of Siemens Energy and Automation, Inc., SIMOREG/SIMOVERT drives. Only Siemens drives or drive option boards that support these protocols will work with the application. Refer to your drives manual to determine which protocol your drives support.

Features

The Drives Interface Application has the following features.

- The application interfaces with 1 to 15 drives for each Field Interface Module.
- Each Field Interface Module supports the following protocols:

4-Word Simple Protocol

10-Word Simple Protocol

5-Word USS Protocol

10-Word USS Protocol

You can only invoke one protocol for each FIM at one time.

-
- The autobaud operation automatically determines the baud rate by polling drives. All drives must be at the same baud rate.
 - The Drives Interface Application supports Broadcast Messages through a broadcast channel.
 - The Drives Interface Application supports Immediate Messages to individual drives and supplies rapid feedback for immediate I/O requests.
 - You can monitor the status of communication through the controller status words (STW). The status words indicate the status of the communication links between the Field Interface Module and the controller and between the Field Interface Module and the drives.
 - You can reset the Drives Interface Application without power cycling the base. To do this, change the protocol selection switch S2.
 - You can disable the I/O updates to the drives by using dipswitch S3-8 to mute I/O processing for communications errors between the FIM and the controller.

Drives Interface Overview (continued)

System Layout

An I/O system layout for three Field Interface Modules running the Drives Interface Application is shown in Figure 3-1.

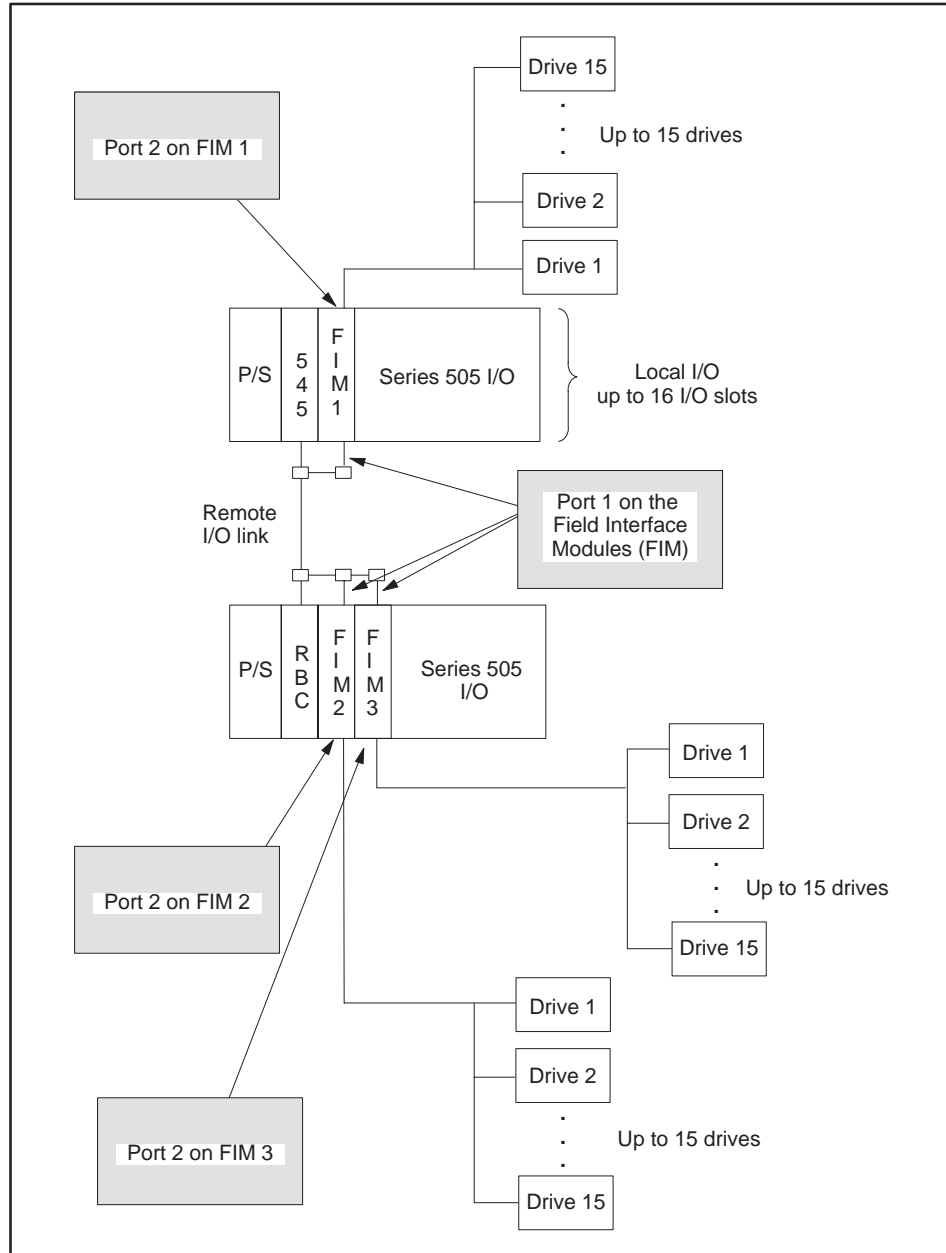


Figure 3-1 I/O System Layout for Three FIMs Running the Drives Interface Application

**Drives Interface
Logical Diagram**

The Drives Interface logical block diagram is shown in Figure 3-2. The Field Interface Module appears as a remote base controller to the Series 505 I/O system.

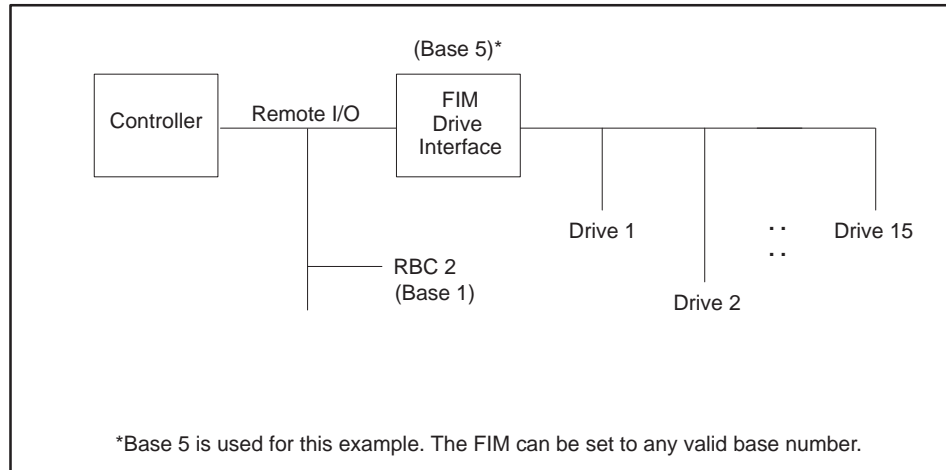


Figure 3-2 FIM Interface Block Diagram

**Drives Interface
Functional
Diagrams**

Figure 3-3 shows the Drives Interface functional block diagram for the 10-Word Simple and 10-Word USS Protocols; Figure 3-4 shows 4-Word Simple Protocol; Figure 3-5 shows 5-Word USS Protocol; and Figure 3-6 shows 5-Word USS (Modified) Protocol. The drives connected to the Field Interface Module appear as modules in a remote base.

Drives Interface Overview (continued)

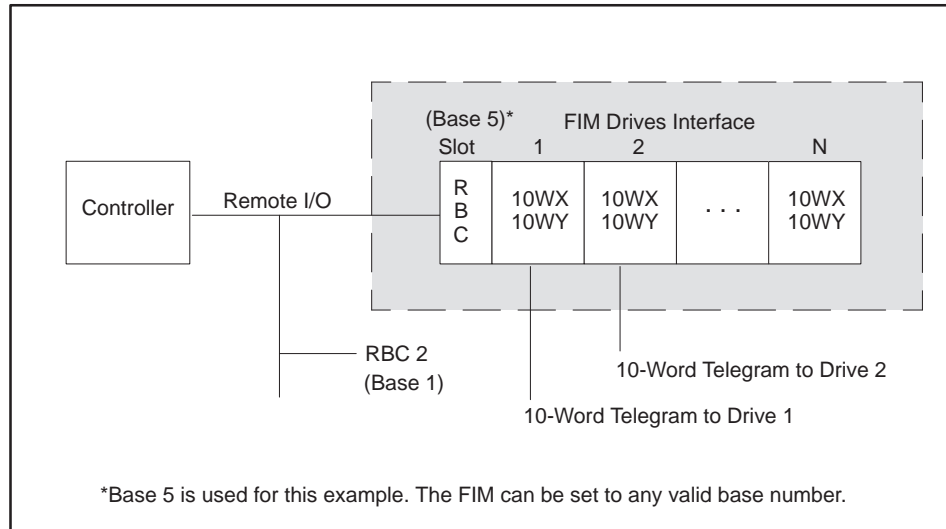


Figure 3-3 Functional Block Diagram for 10-Word Simple and 10-Word USS Protocols

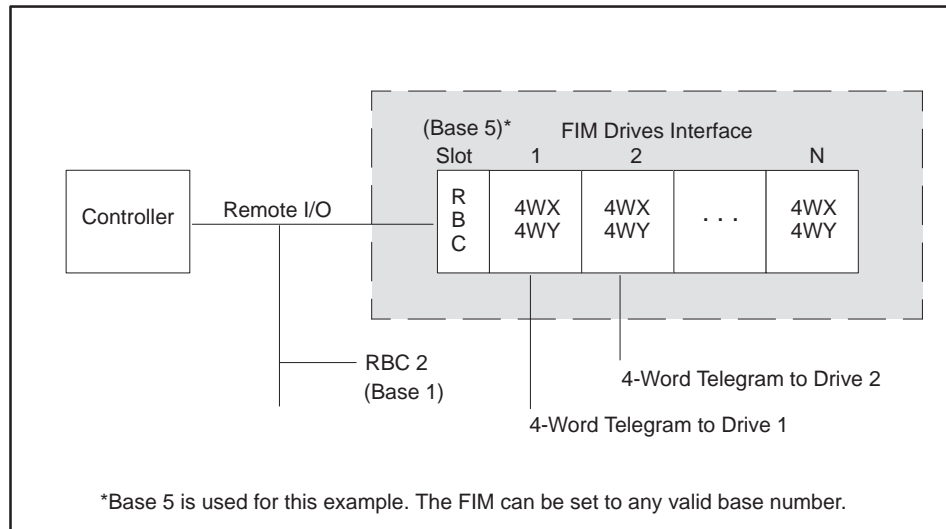


Figure 3-4 Functional Block Diagram for 4-Word Simple Protocol

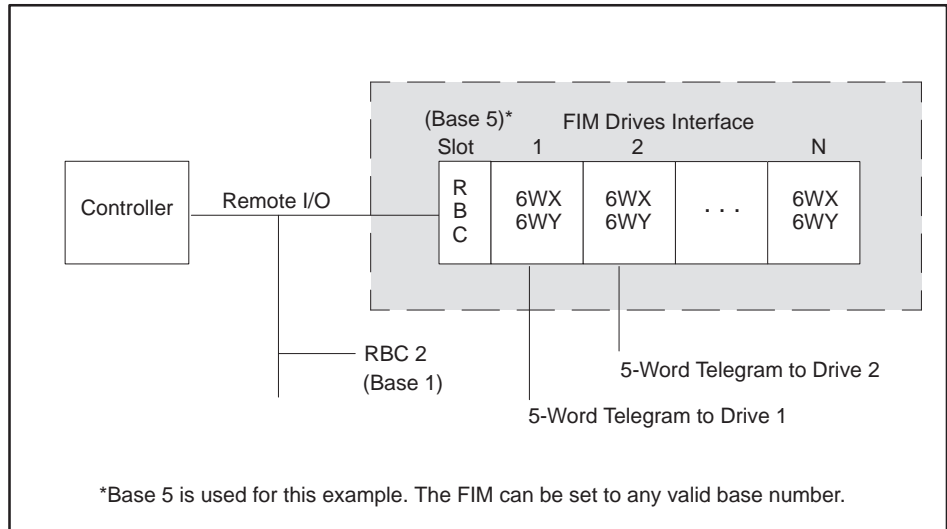


Figure 3-5 Functional Block Diagram for 5-Word USS Protocols

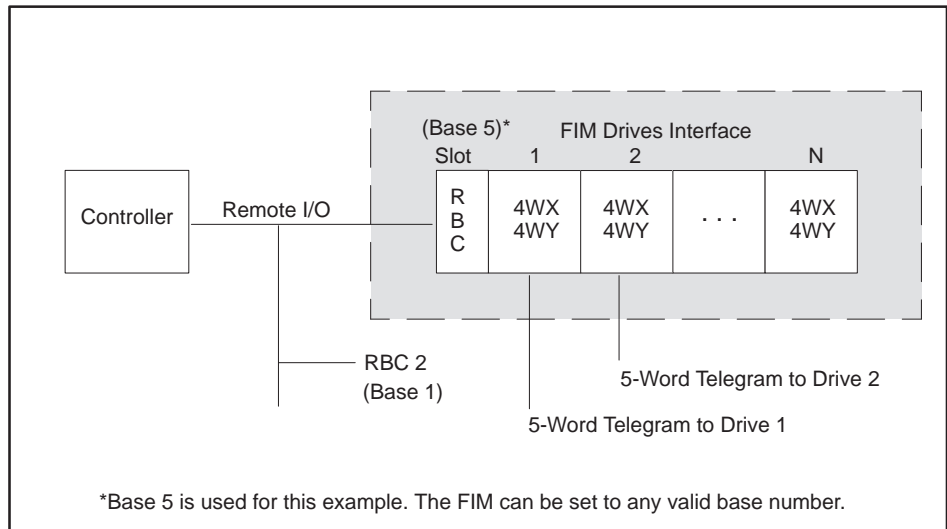


Figure 3-6 Functional Block Diagram for 5-Word USS (Modified) Protocols

3.2 Selecting the Application

Mode of Operation The mode of operation is determined by setting the S3 dipswitch, as shown in Figure 3-7. This is referred to as the application. The first four dipswitches (1 – 4) are closed for the Drives Interface Application. Switch S2, on the front bezel, selects the specific drives-interface protocol. Refer to Table 3-1 for the protocol selection.

NOTE: Early generation SIMOREG drives supported 10-Word Simple Protocol, and SIMOVERT drives supported the 4-Word Simple protocol. Later drive releases may differ. Check your appropriate SIMOREG or SIMOVERT drive manual to determine the protocol supported.

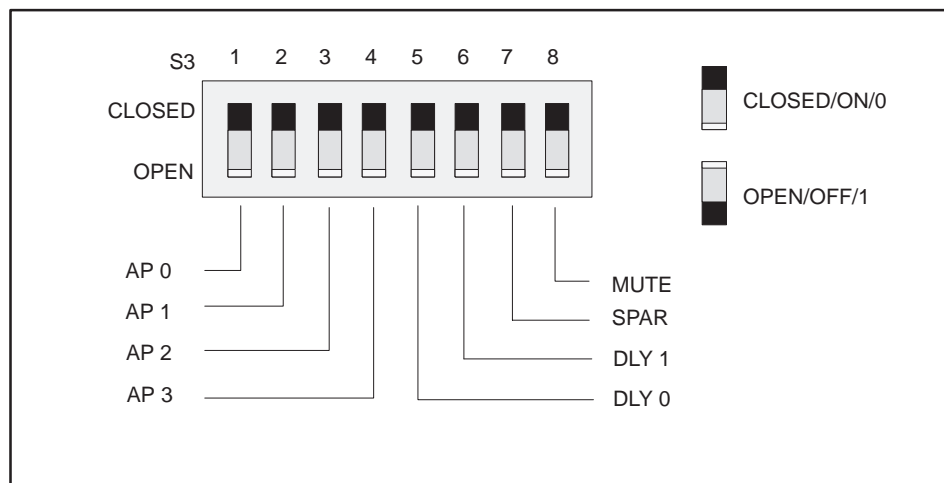


Figure 3-7 Field Interface Module S3 Dipswitch Settings

Dipswitch S3 assignments in Figure 3-7 are defined as follows.

- AP 0 – 3 = Application Number 0 – 15 (AP 0 is LSB)
- DLY 0 – 1 = Delay Number 0 – 3 (resolution 14 msec)
Refer to Table 3-2 for delay settings.
- SPAR = Spare
- MUTE = Disable I/O updates on programmable controller communication error or receipt of an OUTDIS signal from the controller; 1 is disable.

Table 3-1 Protocol Selection

Rotary Switch S2	Protocol	Programmable Controller Slot Configuration
0	4-Word Simple Protocol	4WX, 4WY
1	10-Word Simple Protocol	10WX, 10WY
2	USS (Modified) 5-Word Protocol	4WX, 4WY
3	USS 10-Word Protocol	10WX, 10WY
4	USS (Full) 5-Word Protocol	6WX, 6WY
5 – F	Undefined	Undefined

NOTE: Changing any of the switches while the module is plugged in resets the module.

NOTE: Although the drive treats the 5-Word USS and 5-Word USS (Modified) Protocols in the same way, the FIM treats them differently. The second word in the 5-Word USS (Modified) going to and from the drive is discarded. Most drives do not use this word and so allow you to configure the drive with only four words in and four words out. The 5-Word (Full) is configured as six words in and six words out because you must configure the programmable controller in even-numbered words.

You must configure the corresponding controller slot, according to Table 3-1, for each active drive connected to a FIM module. For a description of the WX and WY words in Table 3-1 through Table 3-6, refer to the protocol section of the Interface Board manual that was shipped with your drive.

Selecting the Application (continued)

Mute Function

The mute function, added in Release 2.1, is enabled by opening switch S3-8. With mute enabled, the FIM module stops sending data updates to the drive(s) anytime it either loses communication with the controller or receives an OUTDIS signal from the controller. With S3-8 closed, the mute function is disabled.

Beginning with Release 2.1, I/O data is now sent to establish/re-establish communications with a drive instead of sending zero data, provided that the slot is configured properly in the controller; otherwise, zeroes are sent. This prevents the drives from clearing sporadically on re-establishment of the link between the FIM and the drive(s) when communication errors have caused the link to be disconnected.

If you want to send zeroes to shut down a drive when a communication error occurs (and the controller is configured correctly), use RLL status words to detect a communication error, then write the zeroes to the word output locations in the controller.

Time-out Delay Function

Because some drives can take longer to respond to requests than expected, you can add extra delay to the timeout that is used when the Field Interface Module is polling for drives.

You can determine the amount of delay by setting dipswitch S3. Table 3-2 shows the amount of additional delay introduced by setting switches S3-5 and S3-6.

Table 3-2 S3 Dipswitch Settings for Additional Delay

S3-5	S3-6	Value	Time Delay (ms)
Closed	Closed	0	0
Open	Closed	1	14
Closed	Open	2	28
Open	Open	3	42

See Figure 2-2 for the location of the S3 dipswitch on the Field Interface Module. Table 3-3 lists the dipswitch settings for switch S3.

Table 3-3 Recommended S3 Dipswitch Settings

Drive Type	Time Delay (ms)
6SE21	28
All Others	0

3.3 Communicating with the Drives

Autobaud Operation

The Drives Interface Application automatically determines the baud rate of the drives connected to it. It cycles through each baud rate, starting with the lowest numbered drive (drive #1), and proceeding to the highest numbered drive (drive #15). Once communication is established with a drive, the Drives Interface Application continues to communicate at that baud rate until reset. If communication is not established, this cycling process is repeated until the Drives Interface Application locks onto a baud rate.

Each protocol defines the baud rates supported. Valid baud rates for the 10- and 4-Word Simple, 10- and 5-Word USS, and 5-Word USS (Modified) Protocols are shown below. Not all drives support all baud rates. Refer to your drive manual to determine which baud rates your drive supports.

Valid baud rates for Simple and USS Protocols are as follows:

- 38,400 bits per second
- 19,200 bits per second
- 9,600 bits per second
- 4,800 bits per second

NOTE: The Drives Interface Application communicates with the first drive found, at the baud rate for that drive. Drives set to different baud rates are not identified by the Drives Interface Application, and do not appear when base status is read by TISOFT.

3.4 Connecting to Drives

Connecting Port 2 to Drive with Two-Wire RS-485 Port

Drives with two-wire RS-485 ports connect directly to the Field Interface Module, port 2, as shown in Figure 3-8. The pin numbers for the Field Interface Module are also shown. Pin numbers on the drive port vary according to the drive type and model. Refer to your drive manual for more information about drive pin numbers.

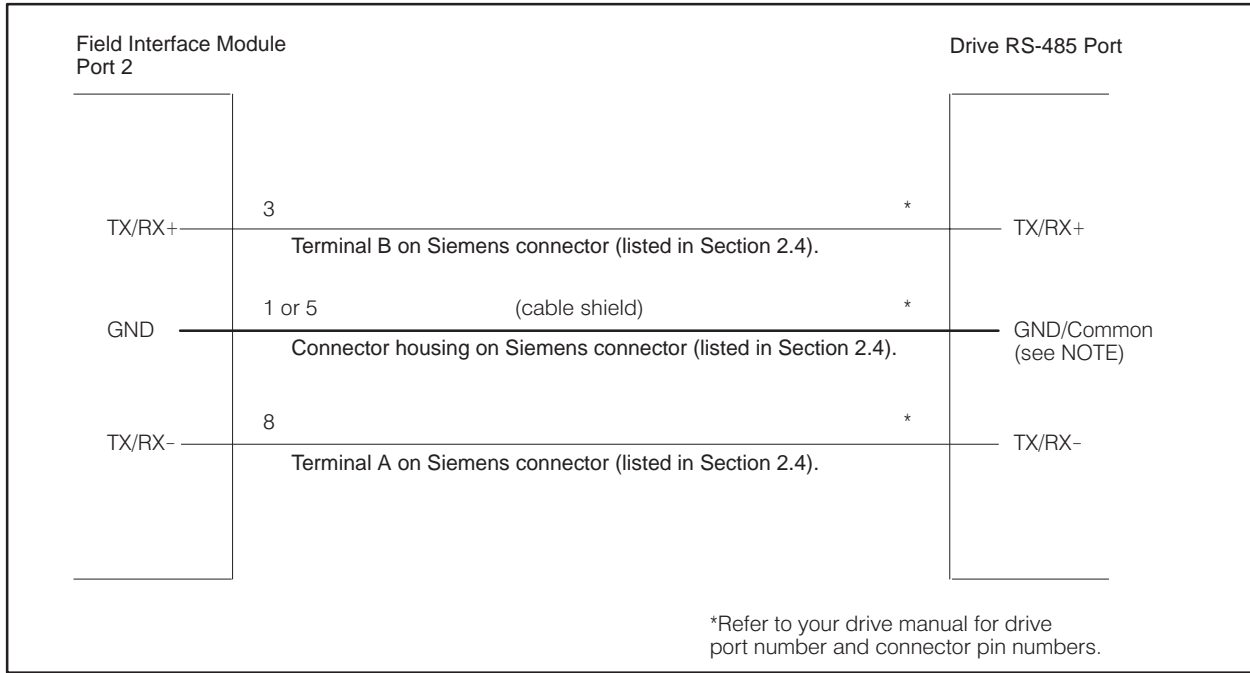


Figure 3-8 Connecting the Field Interface Module to Drive with 2-Wire RS-485 Port

NOTE: Some drive interfaces do not have a ground or common pin on the RS-485 connector. Grounding must be achieved either by using system grounds or by grounding to the connector shell of the drive connector.

Port 2 on the Field Interface Module must have a common ground reference with the drive. Otherwise, communications can become unreliable.

Connecting Port 2 to Drive with Four-Wire RS-485 Port

Drives with four-wire RS-485 ports must connect to the Field Interface Module, port 2, as shown in Figure 3-9. The pin numbers for the Field Interface Module are also shown. Pin numbers on the drive port vary according to the drive type and model. Refer to your drive manual for more information about drive pin numbers.

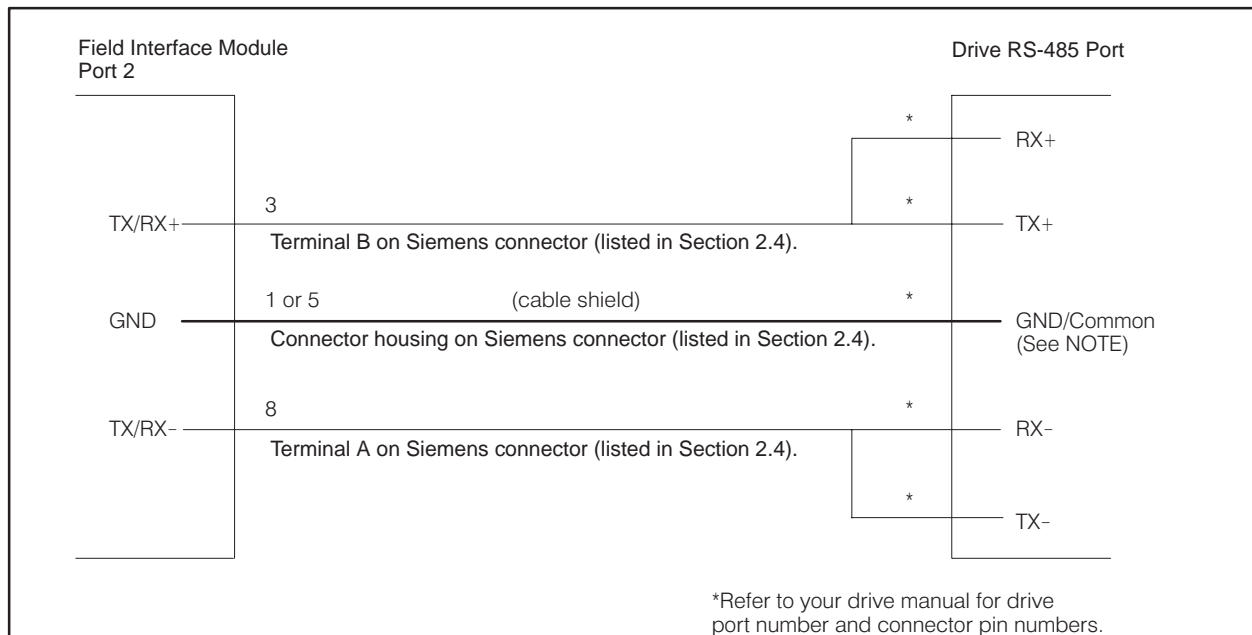


Figure 3-9 Connecting the Field Interface Module to Drive with 4-Wire RS-485 Port

NOTE: Some drive interfaces do not have a ground or common pin on the RS-485 connector. Grounding must be achieved either by using system grounds or by grounding to the connector shell of the drive connector.

Port 2 on the Field Interface Module must have a common ground reference with the drive. Otherwise, communications can become unreliable.

3.5 Configuring for 10-Word Simple or 10-Word USS Protocols

Updating the I/O Configuration Definition

After inserting the FIM into the base, you must update the I/O configuration in the controller. The module does not automatically configure itself. TISOFT, or another programming device, must be connected to the controller to both register and verify controller-to-FIM communication.

Sample Configuration

This sample configuration description uses one drive; the address switch is set to drive #1. It is configured to the sample configuration chart shown in Figure 3-10. These words can be mapped to any valid I/O address, but in this example, they start at address 1. The broadcast channel begins at address 25, indicating that 24 points are used by drive #1, but, it also can have any valid I/O address. Do not overlap I/O points across different slots.

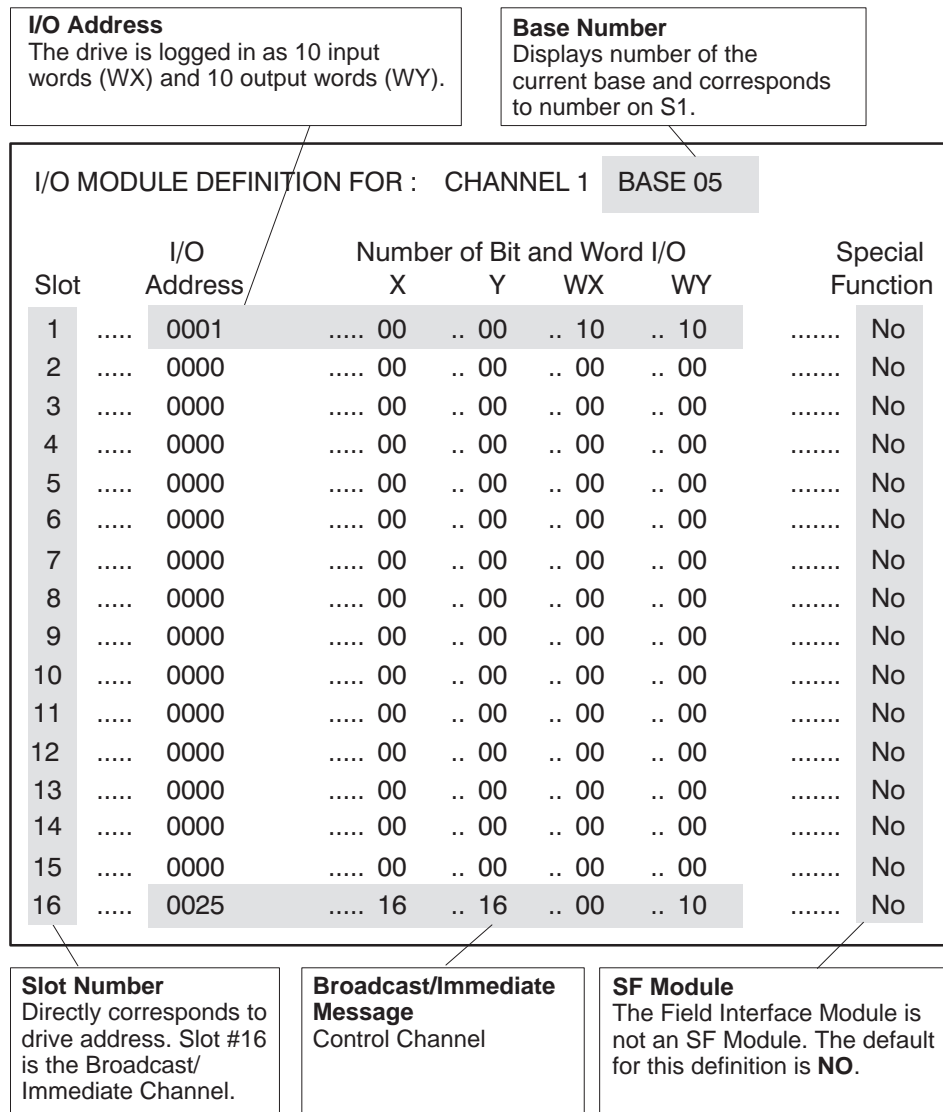


Figure 3-10 Sample I/O Configuration Chart for 10-Word Simple or 10-Word USS Protocols

Configuring for 10-Word Simple or 10-Word USS Protocol

The Drives Interface Application using the 10-Word Simple or 10-Word USS Protocol is configured as 10 word inputs (WX) and 10 word outputs (WY). It occupies 24 points of the controller's word image register for each drive. The points must be used in multiples of eight when programmed in TISOFT.

Broadcast/Immediate Control Channel

The Broadcast/Immediate Control Channel is always in slot #16. It takes up to 16 discrete input points (X), 16 discrete output points (Y), and 10 word output points (WY). The Broadcast/Immediate Control Channel occupies 48 points of controller image register for each Field Interface Module using the Drives Interface Application. The points must be used in multiples of eight when programmed in TISOFT.

WX1 – WX10 (Controller Input Words)

Words WX1 – WX10 are input words to the controller. This is the information returning from the drive from the previous request. These words map directly to the drive output words S1 – S10 as shown in Table 3-4.

WY11 – WY20 (Controller Output Words)

Words WY11 – WY20 are output words from the controller. This is the request data that goes to the drive. These words map directly to the drive input words E1 – E10 as shown in Table 3-4.

Table 3-4 Mapping the Controller Words to the Drive Parameter Words for 10-Word Simple or 10-Word USS Protocol

From the Drive (Drive to Host)		To the Drive (Host to Drive)	
Controller Input Words	Drive Output Words	Controller Output Words	Drive Input Words
WX1	S1	WY11	E1
WX2	S2	WY12	E2
WX3	S3	WY13	E3
WX4	S4	WY14	E4
WX5	S5	WY15	E5
WX6	S6	WY16	E6
WX7	S7	WY17	E7
WX8	S8	WY18	E8
WX9	S9	WY19	E9
WX10	S10	WY20	E10

Configuring for 10-Word Simple or 10-Word USS Protocols (continued)

Configuring the Broadcast/Immediate Channel (10-Word Simple or 10-Word USS Protocol)

The Broadcast/Immediate Channel is configured in this example as follows:

Immediate I/O Request Control Bits. In this example, bits Y41 – Y55 are immediate I/O request control bits, and correspond to drives 1 – 15. When set, these bits force an immediate I/O request to be sent to the corresponding drive. Setting bit Y42 forces an interruption in the Field Interface Module drives update scan, causing a request to be sent to drive #2 immediately. These bits are one-shot and edge-triggered by the Drives Interface Application. For more details, see Section 5.7.

Broadcast Control Bit. In this example, Y56 is the broadcast control bit and operates the same way as the Y41 – Y55 bits, except that setting Y56 forces a broadcast to all drives.

Immediate I/O Request Completed Bits. In this example, bits X25 – X39 are the immediate I/O request completed bits. They are set when the immediate I/O request to the corresponding drives 1 – 15 has been completed. Bits X25 – X39 are only set if bits Y41 – Y55 remain set after the immediate I/O request is made. Bits X25 – X39 are reset when the corresponding bits Y41 – Y55 are reset. Bits X25 – X39 let the program know when the immediate I/O request is complete. For more details see the programming section.

Broadcast Completed Bit. In this example, bit X40 is the broadcast completed bit and operates in the same way as X25 – X39, except that X40 indicates that a broadcast (caused by setting bit Y56) is complete.

Broadcast Data Words. In this example, controller output words WY57 – WY66 contain the information for broadcasts. They correspond to the drive input words of the broadcast request, just as words WY11 – WY20 correspond to the drive input words of drive #1. Refer to Table 3-5.

Table 3-5 Mapping the 10-Word Simple or 10-Word USS Protocol Broadcast Channel

Immediate I/O Request Completed Bits	Drive Number	Immediate I/O Request Control Bits	Broadcast Data Words (Host to Drives)	
			Controller Output Words	Drive Input Words
X25	1	Y41	WY57	E1
X26	2	Y42	WY58	E2
X27	3	Y43	WY59	E3
X28	4	Y44	WY60	E4
X29	5	Y45	WY61	E5
X30	6	Y46	WY62	E6
X31	7	Y47	WY63	E7
X32	8	Y48	WY64	E8
X33	9	Y49	WY65	E9
X34	10	Y50	WY66	E10
X35	11	Y51	X40 – This is the Broadcast Completed Bit.	
X36	12	Y52		
X37	13	Y53		
X38	14	Y54	Y56 – This is the Broadcast Control Bit.	
X39	15	Y55		

Configuring for 10-Word Simple or 10-Word USS Protocols (continued)

Viewing the I/O Configuration Chart

Use your programming device to view the I/O Configuration Chart, an example of which is shown in Figure 3-11. Use SHOW in TISOFT, and note that only a portion of this information is shown at a time.

- The slot number corresponds to the drive number. This example shows drive #1, which appears in slot #1.
- Slot #16 is always the Broadcast/Immediate Channel.
- The Drives Interface Application is configured as base 5.

I/O CONFIGURATION CHART FOR : CHANNEL ... 1 BASE 05								
I/O POINTS								
	1	2	3	4	5	6	7	8
Slot 1	WX0001	WX0002	WX0003	WX0004	WX0005	WX0006	WX0007	WX0008
	9	10	11	12	13	14	15	16
Slot 1	WX0009	WX0010	WY0011	WY0012	WY0013	WY0014	WY0015	WY0016
	17	18	19	20				
Slot 1	WY0017	WY0018	WY0019	WY0020				
Slot 2								
Slot 3								
Slot 4								
Slot 5								
Slot 6								
Slot 7								
Slot 8								
Slot 9								
Slot 10								
Slot 11								
Slot 12								
Slot 13								
Slot 14								
Slot 15								
	1	2	3	4	5	6	7	8
Slot 16	X0025	X0026	X0027	X0028	X0029	X0030	X0031	X0032
	9	10	11	12	13	14	15	16
Slot 16	X0033	X0034	X0035	X0036	X0037	X0038	X0039	X0040
	17	18	19	20	21	22	23	24
Slot 16	Y0041	Y0042	Y0043	Y0044	Y0045	Y0046	Y0047	Y0048
	25	26	27	28	29	30	31	32
Slot 16	Y0049	Y0050	Y0051	Y0052	Y0053	Y0054	Y0055	Y0056
	33	34	35	36	37	38	39	40
Slot 16	WY0057	WY0058	WY0059	WY0060	WY0061	WY0062	WY0063	WY0064
	41	42						
Slot 16	WY0065	WY0066						

Figure 3-11 I/O Configuration Chart for 10-Word Simple or 10-Word USS Protocols

3.6 Configuring for 4-Word Simple Protocol

Updating the I/O Configuration Definition

After inserting the Field Interface Module into the base, update the I/O configuration in the controller. The module does not automatically configure itself. TISOFT, or another programming device, must be connected to the controller in order to both register and verify communication between FIM and the controller.

Sample Configuration

This configuration description uses one drive; the address switch is set to drive #1. It is configured to the sample configuration chart shown in Figure 3-12. These words can be mapped to any valid I/O address, but, in this example, they start at address 1. The broadcast channel begins at address 9, indicating that eight points are used by drive #1, but it also can have any valid I/O address. Do not overlap I/O points across different slots.

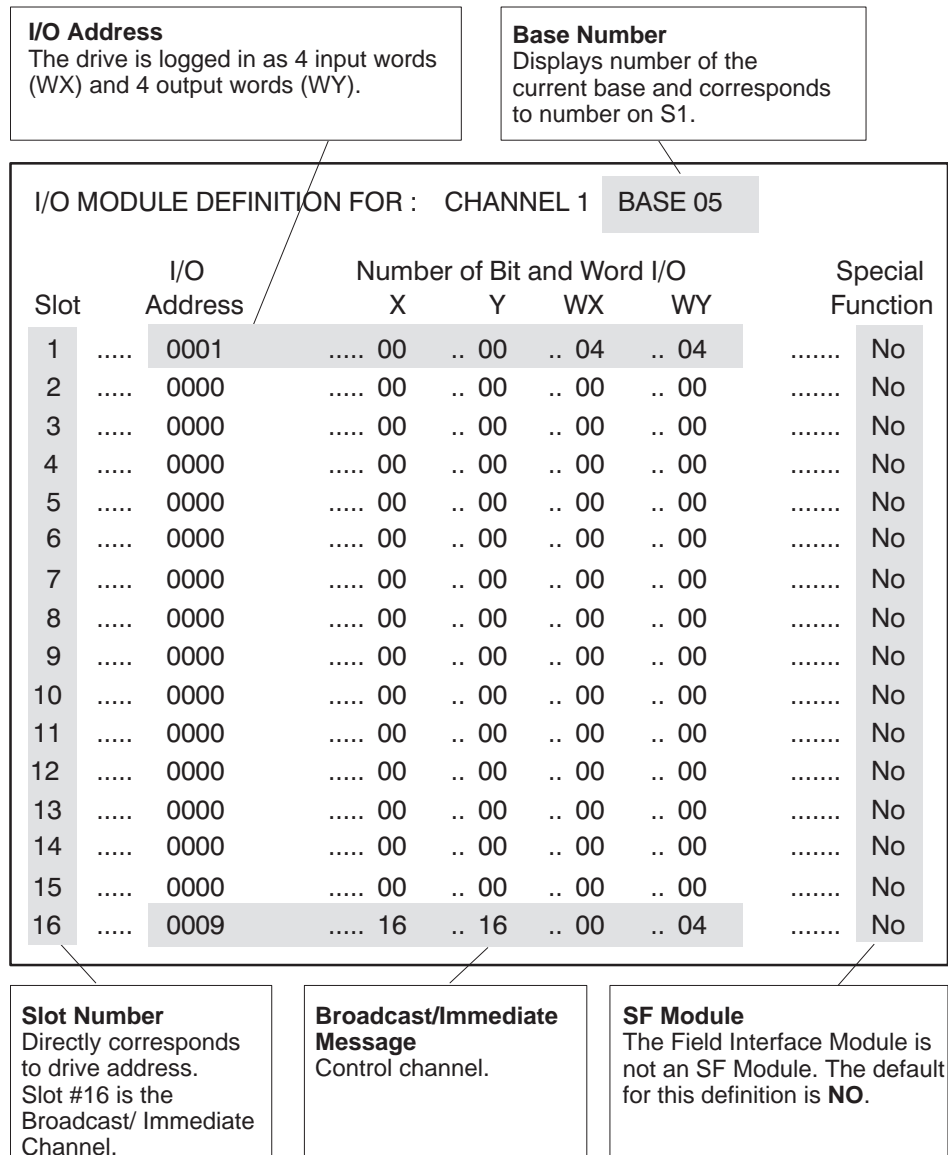


Figure 3-12 Sample I/O Configuration Chart for 4-Word Simple Protocol

Configuring the Broadcast/Immediate Channel (4-Word Simple Protocol)

The Broadcast/Immediate Channel is configured in this example as follows:

Immediate I/O Request Control Bits. In this example, bits Y25 – Y39 are immediate I/O request control bits, and correspond to drives 1 – 15. When set, these bits force an immediate I/O request to be sent to the corresponding drive. Setting bit Y26 forces an interruption in the Field Interface Module drives update scan, causing a request to be sent to drive #2 immediately. These bits are one-shot and edge-triggered by the Drives Interface Application. For more details, see the discussion of programming in Section 5.7.

Configuring for 4-Word Simple Protocol

The Drives Interface Application, using the 4-Word Simple Protocol, is configured as 4-Word inputs (WX) and 4-Word outputs (WY). It occupies 8 points of the controller word image register per drive.

Broadcast/Immediate Control Channel

The Broadcast/Immediate Control Channel is always in slot #16. It takes up 16 discrete input points (X), 16 discrete output points (Y), and 4 word output points (WY). The Broadcast/Immediate Channel occupies 40 points of controller image register for each Field Interface Module using the Drives Interface Application. This is because the points must be used in multiples of 8 when programmed in TISOFT.

WX1 – WX4 (Controller Input Words)

Words WX1 – WX4 are input words to the controller. This is the information returning from the drive from the previous request. These words map directly to the drive output words S1 – S4 as shown in Table 3-6.

WY5 – WY8 (Controller Output Words)

Words WY5 – WY8 are output words from the controller. This is the request data going to the drive. These words map directly to the drive input words E1 – E4 as shown in Table 3-6.

Table 3-6 Mapping the Controller Words to the Drive Parameter Words for 4-Word Simple Protocol

Coming from the Drive (Drive to Host)		Going to the Drive (Host to Drive)	
Controller Input Words	Drive Output Words	Controller Output Words	Drive Input Words
WX1	S1	WY5	E1
WX2	S2	WY6	E2
WX3	S3	WY7	E3
WX4	S4	WY8	E4

Configuring for 4-Word Simple Protocol (continued)

Broadcast Control Bit. In this example, bit Y40 is the broadcast control bit and operates the same way as the bits Y25 – Y39, except that setting bit Y40 forces a broadcast to all drives.

Immediate I/O Request Completed Bits. In this example, bits X9 – X23 are immediate I/O request completed bits. They are set when the immediate I/O request to the corresponding drives 1 – 15 is complete. Bits X9 – X23 are only set if bits Y25 – Y39 remain set after the immediate I/O request is made. Bits X9 – X23 are reset when the corresponding bits Y25 – Y39 are reset. They inform the program that the immediate I/O request is complete. For more details see the discussion of programming in Section 5.7.

Broadcast Completed Bit. In this example, bit X24 is the broadcast completed bit and operates in the same way as bits X9 – X23, except that bit X24 indicates that a broadcast (caused by bit Y40) is complete.

Broadcast Data Words. In this example, controller output words WY41 – WY44 contain the information for broadcasts. They correspond to the drive input words of the broadcast request, just as words WY5 – WY8 correspond to the drive input words of drive #1. Refer to Table 3-7.

Table 3-7 Mapping the 4-Word Simple Protocol Broadcast Channel

Immediate I/O Request Completed Bits	Drive Number	Immediate I/O Request Control Bits	Broadcast Data Words (Host to Drives)	
			Controller Output Words	Drive Input Words
X9	1	Y25	WY41	E1
X10	2	Y26	WY42	E2
X11	3	Y27	WY43	E3
X12	4	Y28	WY44	E4
X13	5	Y29		
X14	6	Y30		
X15	7	Y31		
X16	8	Y32		
X17	9	Y33		
X18	10	Y34		
X19	11	Y35		
X20	12	Y36		
X21	13	Y37		
X22	14	Y38		
X23	15	Y39	X24 – This is the Broadcast Completed Bit	
			Y40 – This is the Broadcast Control Bit	

Viewing the I/O Configuration Chart

Use your programming device to view the I/O Configuration Chart, an example of which is shown in Figure 3-13. Use SHOW in TISOFT, and note that only a portion of this information is shown at a time.

- The slot number corresponds to the drive number. This example shows drive #1, which appears in slot #1.
- Slot #16 is always the Broadcast/Immediate Channel.
- The Drives Interface Application is configured as base #5.

I/O CONFIGURATION CHART FOR : CHANNEL ... 1 BASE 05								
I/O POINTS								
	1	2	3	4	5	6	7	8
Slot 1	WX0001	WX0002	WX0003	WX0004	WY0005	WY0006	WY0007	WY0008
Slot 2								
Slot 3								
Slot 4								
Slot 5								
Slot 6								
Slot 7								
Slot 8								
Slot 9								
Slot 10								
Slot 11								
Slot 12								
Slot 13								
Slot 14								
Slot 15								
	1	2	3	4	5	6	7	8
Slot 16	X0009	X0010	X0011	X0012	X0013	X0014	X0015	X0016
	9	10	11	12	13	14	15	16
Slot 16	X0017	X0018	X0019	X0020	X0021	X0022	X0023	X0024
	17	18	19	20	21	22	23	24
Slot 16	Y0025	Y0026	Y0027	Y0028	Y0029	Y0030	Y0031	Y0032
	25	26	27	28	29	30	31	32
Slot 16	Y0033	Y0034	Y0035	Y0036	Y0037	Y0038	Y0039	Y0040
	33	34	35	36				
Slot 16	WY0041	WY0042	WY0043	WY0044				

Figure 3-13 I/O Configuration Chart for 4-Word Simple Protocol

3.7 Configuring for 5-Word USS Protocol

Updating the I/O Configuration Definition

After inserting the FIM into the base, update the I/O configuration in the controller. The module does not automatically configure itself. TISOFT or another programming device must be connected to the controller in order to register and verify communication between the FIM and the controller.

Sample Configuration

This configuration description uses one drive; the address switch is set to drive #1. It is configured to the sample configuration chart shown in Figure 3-14. These words can be mapped to any valid I/O address; in this example, they start at address 1. The broadcast channel begins at address 17, indicating that 16 points are used by drive #1, but it also can have any valid I/O address. Do not overlap I/O points across different slots.

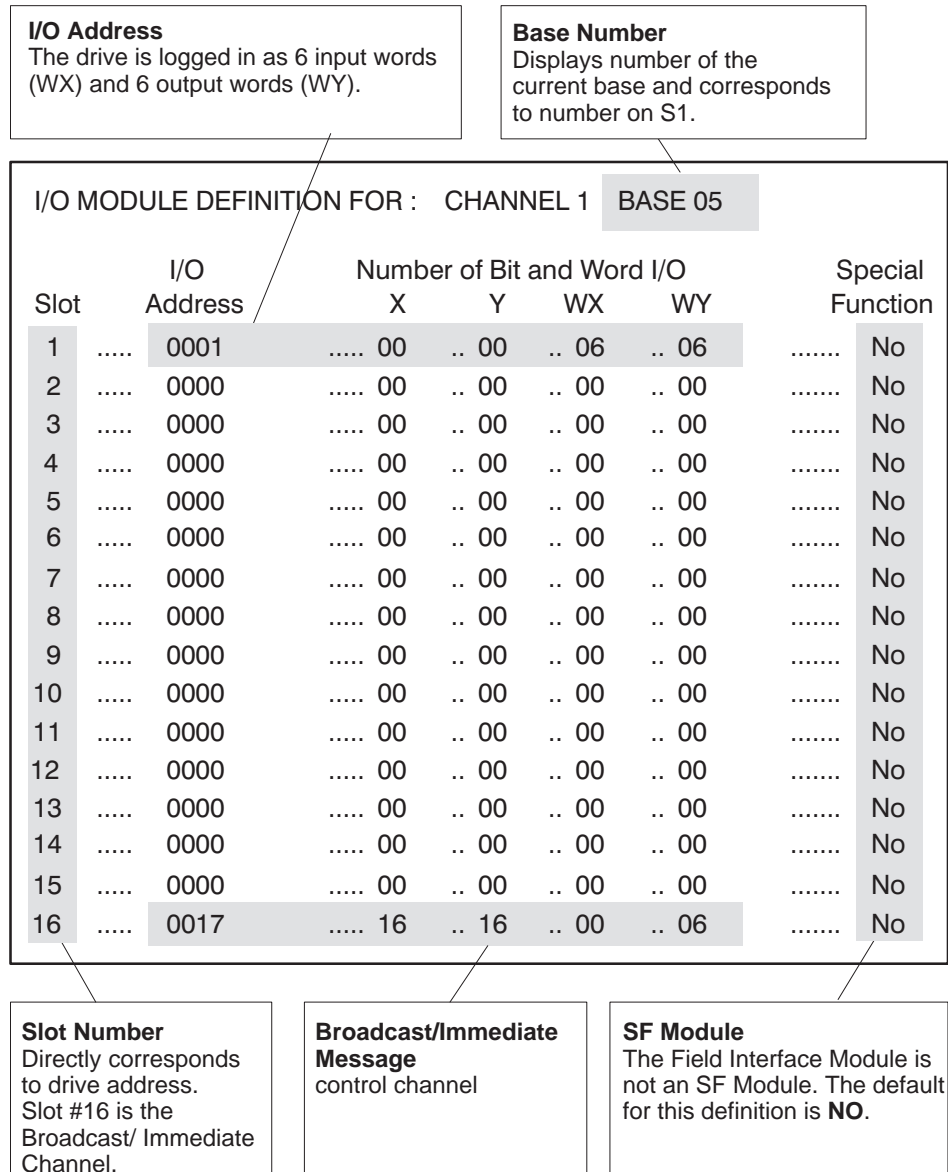


Figure 3-14 Sample I/O Configuration Chart for 5-Word USS Protocol

Configuring the Broadcast/Immediate Channel (5-Word USS Protocol)

The Broadcast/Immediate Channel is configured in this example as follows:

Immediate I/O Request Control Bits. In this example, bits Y33 – Y47 are immediate I/O request control bits, and correspond to drives 1 – 15. When set, these bits force an immediate I/O request to be sent to the corresponding drive. Setting bit Y34 forces an interruption in the Field Interface Module drives update scan, causing a request to be sent to drive #2 immediately. These bits are one-shot and edge-triggered by the Drives Interface Application. For more details, see the discussion of programming in Section 5.7.

Configuring for 5-Word USS Protocol

The Drives Interface Application, using the 5-Word USS Protocol, is configured as 6-word inputs (WX) and 6-word outputs (WY). It occupies 16 points of the controller word image register per drive.

Broadcast/Immediate Control Channel

The Broadcast/Immediate Control Channel is always in slot #16. It takes up 16 discrete input points (X), 16 discrete output points (Y), and 6 word output points (WY). The Broadcast/Immediate Control Channel occupies 40 points of controller image register for each Field Interface Module using the Drives Interface Application. This is because the points must be used in multiples of 8 when programmed in TISOFT.

WX1 – WX6 (Controller Input Words)

Words WX1 – WX6 are input words to the controller. This is the information returning from the drive from the previous request. These words map directly to the drive output words DY01 – DY05, as shown in Table 3-8.

WY7 – WY12 (Controller Output Words)

Words WY7 – WY12 are output words from the controller. This is the request data going to the drive. These words map directly to the drive input words DX01 – DX05, as shown in Table 3-8.

Table 3-8 Mapping the Controller Words to the Drive Parameter Words for 5-Word USS Protocol

Coming from the Drive (Drive to Host)		Going to the Drive (Host to Drive)	
Controller Input Words	Drive Output Words	Controller Output Words	Drive Input Words
WX1	DY01	WY7	DX01
WX2	DY02	WY8	DX02
WX3	DY03	WY9	DX03
WX4	DY04	WY10	DX04
WX5	DY05	WY11	DX05
WX6		WY12	

Configuring for 5-Word USS Protocol (continued)

Broadcast Control Bit. In this example, bit Y48 is the broadcast control bit and operates the same way as the bits Y33 – Y47, except that setting bit Y48 forces a broadcast to all drives.

Immediate I/O Request Completed Bits. In this example, bits X17 – X31 are immediate I/O request completed bits. They are set when the immediate I/O request to the corresponding drives 1 – 15 is complete. Bits X17 – X31 are only set if bits Y33 – Y47 remain set after the immediate I/O request is made. Bits X17 – X31 are reset when the corresponding bits Y33 – Y47 are reset. They inform the program that the immediate I/O request is complete. For more details see the discussion of programming in Section 5.7.

Broadcast Completed Bit. In this example, bit X32 is the broadcast completed bit and operates in the same way as bits X17 – X31, except bit X32 indicates that a broadcast (caused by bit Y48) is complete.

Broadcast Data Words. In this example, controller output words WY49 – WY54 contain the information for broadcasts. They correspond to the drive input words of the broadcast request, just as words WY7 – WY12 correspond to the drive input words of drive #1. Refer to Table 3-9.

Table 3-9 Mapping the 5-Word USS Protocol Broadcast Channel

Immediate I/O Request Completed Bits	Drive Number	Immediate I/O Request Control Bits	Broadcast Data Words (Host to Drives)	
			Controller Output Words	Drive Input Words
X17	1	Y33	WY49	DX1
X18	2	Y34	WY50	DX2
X19	3	Y35	WY51	DX3
X20	4	Y36	WY52	DX4
X21	5	Y37	WY53	DX5
X22	6	Y38	WY54	Unused
X23	7	Y39		
X24	8	Y40		
X25	9	Y41		
X26	10	Y42		
X27	11	Y43		
X28	12	Y44	X32 – This is the Broadcast Completed Bit	
X29	13	Y45		
X30	14	Y46	Y48 – This is the Broadcast Control Bit	
X31	15	Y47		

Viewing the I/O Configuration Chart

Use your programming device to view the I/O Configuration Chart, as shown in Figure 3-15. Use SHOW in TISOFT, and note that only a portion of this information is shown at a time.

- The slot number corresponds to the drive number. This example shows drive #1, which appears in slot #1.
- Slot #16 is always the Broadcast/Immediate Channel.
- The Drives Interface Application is configured as base #5.

I/O CONFIGURATION CHART FOR : CHANNEL ... 1 BASE 05								
I/O POINTS								
	1	2	3	4	5	6	7	8
Slot 1	WX0001	WX0002	WX0003	WX0004	WX0005	WX0006	WY0007	WY0008
	9	10	11	12				
Slot 1	WY0009	WY0010	WY0011	WY0012				
Slot 2								
Slot 3								
Slot 4								
Slot 5								
Slot 6								
Slot 7								
Slot 8								
Slot 9								
Slot 10								
Slot 11								
Slot 12								
Slot 13								
Slot 14								
Slot 15								
	1	2	3	4	5	6	7	8
Slot 16	X0017	X0018	X0019	X0020	X0021	X0022	X0023	X0024
	9	10	11	12	13	14	15	16
Slot 16	X0025	X0026	X0027	X0028	X0029	X0030	X0031	X0032
	17	18	19	20	21	22	23	24
Slot 16	Y0033	Y0034	Y0035	Y0036	Y0037	Y0038	Y0039	Y0040
	25	26	27	28	29	30	31	32
Slot 16	Y0041	Y0042	Y0043	Y0044	Y0045	Y0046	Y0047	Y0048
	33	34	35	36	37	38		
Slot 16	WY0049	WY0050	WY0051	WY0052	WY0053	WY0054		

Figure 3-15 I/O Configuration Chart for 5-Word USS Protocol

3.8 Configuring for 5-Word (Modified) USS Protocol

Updating the I/O Configuration Definition

After inserting the FIM into the base, update the I/O configuration in the controller. The module does not automatically configure itself. TISOFT, or another programming device, must be connected to the controller in order to register and verify communication between the controller and FIM.

Sample Configuration

This configuration description uses one drive; the address switch is set to drive #1. It is configured to the sample configuration chart shown in Figure 3-16. These words can be mapped to any valid I/O address. In this example, they start at address 1. The broadcast channel begins at address 9, indicating that 8 points are used by drive #1, but it also can have any valid I/O address. Do not overlap I/O points across different slots.

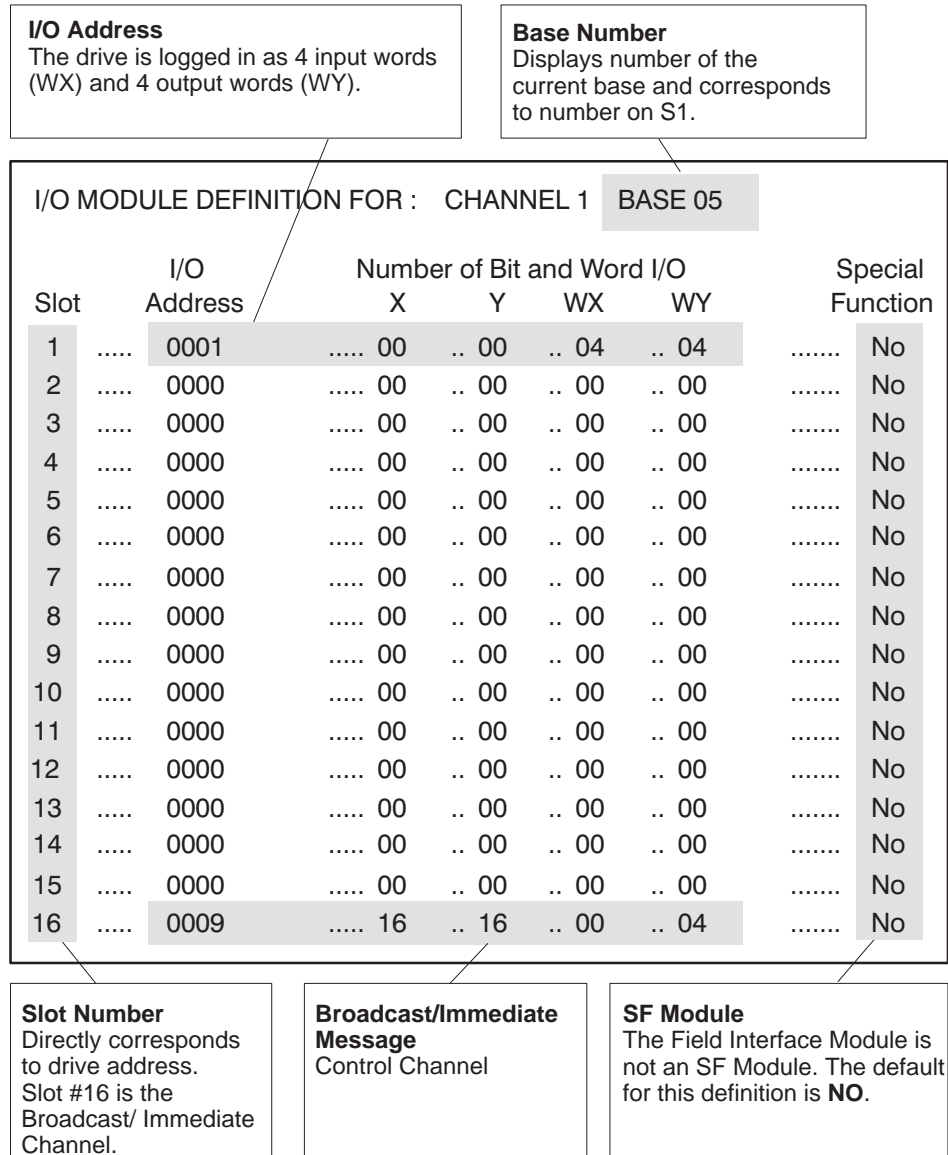


Figure 3-16 Sample I/O Configuration Chart for 5-Word (Modified) USS Protocol

Configuring the Broadcast/Immediate Channel 5-Word (Modified) USS Protocol

The following sections show how the Broadcast/Immediate Channel is configured.

Immediate I/O Request Control Bits. In this example, bits Y25 – Y39 are immediate I/O request control bits, and correspond to drives 1 – 15. When set, these bits force an immediate I/O request to be sent to the corresponding drive. Setting bit Y26 forces an interruption in the Field Interface Module drives update scan, causing a request to be sent to drive #2 immediately. These bits are one-shot and edge-triggered by the Drives Interface Application. For more details, see the discussion of programming in Section 5.7.

5-Word (Modified) USS Drive Protocol

In the 5-Word (Modified) USS Drive protocol, the FIM maps the four words sent from the controller to five words in the telegram that is sent to the drive, as shown in Table 3-10.

Table 3-10 USS Drive Telegram Mappings

Controller Output Words	Drive Telegram	Drive Telegram	Controller Input Words
Word 1 →	Word 1	Word 1 →	Word 1
	Word 2 set to 0	Word 2 is discarded	
Word 2 →	Word 3	Word 3 →	Word 2
Word 3 →	Word 4	Word 4 →	Word 3
Word 4 →	Word 5	Word 5 →	Word 4

Configuring for 5-Word (Modified) USS Protocol

The Drives Interface Application, using the 5-Word (Modified) USS Protocol, is configured as 4 word inputs (WX) and 4 word outputs (WY). It occupies 8 points of the controller word image register per drive.

Broadcast/Immediate Control Channel

The Broadcast/Immediate Control Channel is always in slot #16. It takes up 16 discrete input points (X), 16 discrete output points (Y), and 4 word output points (WY). The Broadcast/Immediate Channel occupies 40 points of controller image register for each Field Interface Module using the Drives Interface Application. (The points must be used in multiples of 8 when programmed in TISOFT.)

Configuring for 5-Word (Modified) USS Protocol (continued)

WX1 – WX4
(Controller
Input Words)

Words WX1 – WX4 are input words to the controller. This is the information returning from the drive from the previous request. These words map directly to the drive output words DY1 – DY5 as shown in Table 3-11.

WY5 – WY8
(Controller Output
Words)

Words WY5 – WY8 are output words from the controller. This is the request data going to the drive. These words map directly to the drive input words DX1 – DX5 as shown in Table 3-11.

Table 3-11 Mapping the Controller Words to the Drive Parameter Words for 5-Word (Modified) USS Protocol

Coming from the Drive (Drive to Host)		Going to the Drive (Host to Drive)	
Controller Input Words	Drive Output Words	Controller Output Words	Drive Input Words
WX1	DY1	WY5	DX1
00	DY2	Discarded	DX2
WX2	DY3	WY6	DX3
WX3	DY4	WY7	DX4
WX4	DY5	WY8	DX5

Broadcast Control Bit. In this example, bit Y40 is the broadcast control bit and operates the same as the bits Y25 – Y39, except that setting bit Y40 forces a broadcast to all drives.

Immediate I/O Request Completed Bits. In this example, bits X9 – X23 are immediate I/O request completed bits. They are set when the immediate I/O request to the corresponding drives 1 – 15 is complete. Bits X9 – X23 are only set if bits Y25 – Y39 remain set after the immediate I/O request is made. Bits X9 – X23 are reset when the corresponding bits Y25 – Y39 are reset. They inform the program that the immediate I/O request is complete. For more details, see the discussion of programming in Section 5.7.

Broadcast Completed Bit. In this example, bit X24 is the broadcast completed bit and operates in the same way as bits X9 – X23, except bit X24 indicates that a broadcast (caused by bit Y40) is complete.

Broadcast Data Words. In this example, controller output words WY41 – WY44 contain the information for broadcasts. They correspond to the drive input words of the broadcast request, just as words WY5 – WY8 correspond to the drive input words of drive #1. Refer to Table 3-12.

Table 3-12 Mapping 5-Word (Modified) USS Protocol Broadcast Channel

Immediate I/O Request Completed Bits	Drive Number	Immediate I/O Request Control Bits	Broadcast Data Words (Host to Drives)	
			Controller Output Words	Drive Input Words
X9	1	Y25	WY41	DX1
X10	2	Y26	WY42	DX3
X11	3	Y27	WY43	DX4
X12	4	Y28	WY44	DX5
X13	5	Y29		
X14	6	Y30		
X15	7	Y31		
X16	8	Y32		
X17	9	Y33		
X18	10	Y34		
X19	11	Y35		
X20	12	Y36		
X21	13	Y37		
X22	14	Y38		
X23	15	Y39	X24 – This is the Broadcast Completed Bit	
			Y40 – This is the Broadcast Control Bit	

Configuring for 5-Word (Modified) USS Protocol (continued)

Viewing the I/O Configuration Chart

Use your programming device to view the I/O Configuration Chart, as shown in Figure 3-17. Use SHOW in TISOFT, and note that only a portion of this information is shown at a time.

- The slot number corresponds to the drive number. This example shows drive #1 which appears in slot #1.
- Slot #16 is always the Broadcast/Immediate Channel.
- The Drives Interface Application is configured as base #5.

I/O CONFIGURATION CHART FOR : CHANNEL ... 1 BASE 05								
I/O POINTS								
	1	2	3	4	5	6	7	8
Slot 1	WX0001	WX0002	WX0003	WX0004	WY0005	WY0006	WY0007	WY0008
Slot 2								
Slot 3								
Slot 4								
Slot 5								
Slot 6								
Slot 7								
Slot 8								
Slot 9								
Slot 10								
Slot 11								
Slot 12								
Slot 13								
Slot 14								
Slot 15								
	1	2	3	4	5	6	7	8
Slot 16	X0009	X0010	X0011	X0012	X0013	X0014	X0015	X0016
	9	10	11	12	13	14	15	16
Slot 16	X0017	X0018	X0019	X0020	X0021	X0022	X0023	X0024
	17	18	19	20	21	22	23	24
Slot 16	Y0025	Y0026	Y0027	Y0028	Y0029	Y0030	Y0031	Y0032
	25	26	27	28	29	30	31	32
Slot 16	Y0033	Y0034	Y0035	Y0036	Y0037	Y0038	Y0039	Y0040
	33	34	35	36				
Slot 16	WY0041	WY0042	WY0043	WY0044				

Figure 3-17 I/O Configuration Chart for 5-Word (Modified) USS Protocol

3.9 Programming

Drives Update Scan

The Field Interface Module drives update scan is asynchronous with respect to the controller scan. The drive scan is generally much longer than the controller scan, so several controller scans usually occur for each drive scan. This depends on the number of drives present, the baud rate of the drives, the protocol, and, of course, the scan time of the controller.

- For typical drive scan times, see Table 3-13 for the 10-Word Simple Protocol, Table 3-14 for the 10-Word USS Protocol, Table 3-15 for 4-Word Simple or 5-Word (Modified) USS Protocol, and Table 3-16 for 5-Word USS Protocol. The default scan time of some drives may exceed drive scan times at lower baud rates. To operate at these baud rates, you must disable the scan timeout of the drive. Refer to your drive manual for more information.
- The drives update scan sends messages to all drives that are both correctly configured and communicating with the Field Interface Module. The scan begins with the lowest-numbered drive and proceeds to the next higher-numbered drive until all present and configured drives are updated. At the end of a scan, one drive, either not present or improperly configured, is polled to determine its status. Drives that begin to communicate are automatically brought online if they are properly configured. This is known as “dynamic login.”

Table 3-13 Typical Drive Scan Times for 10-Word Simple Protocol

Number of Drives	Scan Time at 4800 Baud (MS)	Scan Time at 9600 Baud (MS)	Scan Time at 19200 Baud (MS)	Scan Time at 38400 Baud (MS)
1	266	135	68	37
2	400	203	102	54
3	533	272	137	73
4	666	339	171	91
5	800	408	206	110
6	932	476	240	128
7	1068	544	273	145
8	1204	612	308	164
9	1337	680	342	182
10	1470	748	377	199
11	1603	817	410	218
12	1737	884	443	236
13	1874	952	481	254
14*	1999	1022	514	273
15*	2008	1020	511	272

* The scan time for 15 drives is similar to the scan time for 14 drives. This is because there is no polling of drives when all 15 drives are configured and communicating properly.

Table 3-14 Typical Drive Scan Times for 10-Word USS Protocol

Number of Drives	Scan Time at 4800 Baud (MS)	Scan Time at 9600 Baud (MS)	Scan Time at 19200 Baud (MS)	Scan Time at 38400 Baud (MS)
1	271	137	69	37
2	407	206	103	54
3	541	276	138	73
4	677	344	173	91
5	814	414	208	110
6	945	483	243	129
7	1078	552	276	146
8	1224	622	312	165
9	1360	691	346	183
10	1495	760	382	200
11	1630	830	415	219
12	1767	898	449	237
13	1906	967	487	256
14*	2033	1038	522	275
15*	2042	1037	519	274

* The scan time for 15 drives is similar to the scan time for 14 drives. This is because there is no polling of drives when all 15 drives are configured and communicating properly.

Table 3-15 Typical Drive Scan Times for 4-Word Simple

Number of Drives	Scan Time at 4800 Baud (MS)	Scan Time at 9600 Baud (MS)	Scan Time at 19200 Baud (MS)	Scan Time at 38400 Baud (MS)
1	129	66	35	20
2	193	100	54	28
3	257	133	71	37
4	322	166	90	48
5	387	200	106	56
6	453	234	125	67
7	518	265	142	76
8	583	301	162	84
9	646	332	178	93
10	711	366	196	103
11	775	397	215	112
12	842	432	230	122
13	906	464	249	132
14*	971	496	268	138
15*	973	495	267	140

* The scan time for 15 drives is similar to the scan time for 14 drives. This is because there is no polling of drives when all 15 drives are configured and communicating properly.

Table 3-16 Typical Drive Scan Times for 5-Word USS Protocol and 5-Word (Modified)

Number of Drives	Scan Time at 4800 Baud (MS)	Scan Time at 9600 Baud (MS)	Scan Time at 19200 Baud (MS)	Scan Time at 38400 Baud (MS)
1	134	68	36	20
2	199	103	55	28
3	266	137	73	37
4	333	171	92	48
5	401	206	109	56
6	469	241	128	68
7	536	273	146	77
8	603	310	166	85
9	669	342	183	93
10	736	377	201	104
11	802	409	221	114
12	872	446	236	124
13	938	478	256	134
14*	1005	511	275	140
15*	1007	510	274	142

* The scan time for 15 drives is similar to the scan time for 14 drives. This is because there is no polling of drives when all 15 drives are configured and communicating properly.

Programming (continued)

Broadcast Request When the broadcast request bit is set, the drive scan is interrupted. The data in the WY words of the broadcast channel are sent to all the drives using the broadcast address (32) defined by the 10-Word/4-Word Simple or 10-Word/5-Word USS protocol. The broadcast has no response data returning from the drives.

Broadcast requests are used to synchronize actions such as starting or jogging the motors simultaneously. If broadcasts are not used, it may be several seconds before all drives are updated, depending on the number of drives and baud rate. All drives receive broadcast messages.

CAUTION

If bits in the controller output words (RUN, JOG, etc.) do not correspond to drive input words, subsequent update scans may cancel requests performed by the broadcast.

If broadcast requests are canceled, synchronizing operations do not occur.

To prevent subsequent update scans from canceling broadcast requests, your program must set bits (like RUN, JOG, etc.) in the controller output words corresponding to drive input words.

There is no response to a broadcast. If the program needs to know whether or not the broadcast message was received, then it must poll the drives to determine if the request sent by the broadcast was executed.

WARNING

Connecting drives with either address 0, or with addresses greater than 15, and also sending a broadcast, could start a drive operation that the Field Interface Module cannot stop. The Field Interface Module does not update these drives, but all drives receive the broadcast.

Using drive addresses other than 1 through 15 could cause death or serious injury to personnel, and/or damage to equipment.

Do not use drive addresses other than 1 through 15.

Broadcast
Procedure

Here are the steps for the broadcast-request procedure.

1. Reset the broadcast-request bit for at least one controller scan.
2. Set the controller output words (WY) in channel #16 to the desired request values.
3. On the same scan in ladders, set the corresponding control bits/data into each of the controller output words affected by the broadcast. This prevents cancellation of the request by subsequent updates of the normal drive scan.
4. Set the broadcast-request bit.
5. This request may be repeated by resetting this control bit and setting it again on another scan of ladders.
6. The broadcast is complete when the broadcast-complete bit is set.

NOTE: If the broadcast-request bit remains set after the request is made, the broadcast-complete bit is set. If you do not use the broadcast complete bit to determine if the broadcast message has completed, you must wait at least five message times before attempting to send another broadcast message. This message time may be obtained from the typical drive scan times found in Table 3-13, Table 3-14, Table 3-15, and Table 3-16. Use the entry of 4 drives at your baud rate and add one drive time for every immediate I/O request that may occur simultaneously with this message.

7. Reset the broadcast-request bit.

Once the immediate I/O requests are complete, the immediate I/O request completed bits are set if the original immediate I/O request bits are still set.

Programming (continued)

Immediate I/O Request

The normal drive update scan can take several seconds, depending on the number of drives, the selected protocol, and the baud rate. When a drive needs to be updated faster than normal drive scan time allows, an immediate I/O request may be sent. Immediate I/O requests are made to one or more drives by setting the immediate I/O request control bit corresponding to the drive. This immediate I/O request is sent typically within one message transmit time.

Once the immediate I/O request message is sent, the response data is immediately updated in controller input words. This allows the rapid poll of data by external devices, and the immediate response of requests such as jogging or stopping the motor.

If immediate I/O requests are sent to more than one drive, an immediate I/O request is first sent to the lowest-numbered drive, followed by an immediate I/O request to the next higher-numbered drive, until all the immediate I/O requests are sent. If a broadcast request is made with immediate I/O requests, the broadcast request is sent first. After all immediate I/O requests are sent, the drive update scan resumes as normal. The immediate I/O request bits are edge-triggered and one-shot. They must be reset for one controller scan before the immediate I/O request for that drive is sent again.

Immediate I/O Request Procedure

Follow these steps to initiate an immediate I/O request.

1. Reset the immediate I/O request bit corresponding to the desired drive, for at least 1 controller scan.
2. Set the controller output data words (WY) to the desired value.
3. Set the immediate I/O request bit that corresponds to the desired drive.
4. This immediate I/O request can be repeated by resetting the immediate I/O request bit and setting it again on alternate controller scans.

The immediate I/O request is complete when the corresponding immediate I/O request complete bit is set. This bit is only set if the original immediate I/O request bit is still set.

The controller input words (WX) now reflect the response of the drive when the immediate I/O request was made.

NOTE: If the immediate I/O-request bit remains set after the request is made, the immediate I/O-complete bit is set. If you do not use the immediate I/O complete bit to determine if the immediate I/O message has completed, you must wait at least five message times before attempting to send another immediate I/O message. This message time may be obtained from the typical drive scan times found in Table 3-13, Table 3-14, Table 3-15, and Table 3-16. Use the entry of four drives at your baud rate and add one drive time for every immediate I/O request or broadcast that may occur simultaneously with this message.

NOTE: The response data words (WX) for immediate I/O request do not reflect the response of the parameter request sent to the drive. It does reflect what the drive returned when the request was made. Some requests to the drive take more time for the drive to process, and it may take several repeated requests to complete. When the drive has completed the request, the response parameter number is the same as the original request. Refer to your drive manual for more information on the drive parameter programming.

Programming Drives

Once configuration is complete, checks to controller status words allow the monitoring of communication to each drive. The drives appear as modules in a base, so in the example configuration shown in Section 3.4, the Field Interface Module running the Drive Interface Application is set to base #5. The channel number is set to 1, which is the only channel in a 545 controller.

Since this example uses base #5, controller status word 16 (STW16) is the corresponding word containing the status bits. There is one status bit for each drive. These bits are set by the controller as soon as a loss of communication to that drive is detected. These bits are also set if drives are configured incorrectly, corresponding to the drive(s) that do not match.

Slot #16 is occupied by the Drives Interface Application broadcast channel that takes up the most significant bit. By monitoring this bit, any change in the drive communication path may be detected by the user program and the proper action can be taken.

 **CAUTION**

The Drives Interface Application does not monitor the drives for internal faults. If the drive continues to communicate, then the Drives Interface Application assumes that the drive is good. You must sample drive status bits, in conjunction with controller status word bits, to ensure that the program detects reported failures.

Refer to your drives manual for more details on error reporting by the drive.

Typical Drive Programming

Drive Motion Control. Although you may modify any drive parameter from the controller using the Drives Interface Application, most of the program interface to drives deals with direction control and speed adjustments. Varying the speed of most drives involves only changing the controller output word (WY) that corresponds to the drive input word for speed reference. This provides a simple interface to ladder programs of powerful loop controls of controllers.

Changing Drive Parameters. To change a parameter in the drive, set the parameter value in the controller output word corresponding to the drive parameter value input word. The change request bit must also be set; otherwise the parameter will be read, not changed.

On the same ladder scan, set the desired change parameter for the number in the controller output word that corresponds to the drive input word that holds the parameter number of the request. Update of this new request is automatic, and the program can poll the controller input word (WX) that corresponds to the parameter number of the drive response.

When the parameter number and the parameter value match the original request, the request has been accepted by the drive and is complete.

Reading Drive Parameters. Drive parameters are read in the same way as they are changed above, except the parameter is set for requests instead of changes. Refer to your drive manual for more information on the drive programming requirements.

Typical Drive
Program

When the controller input word (WX) corresponding to the drive output word that contains the parameter number matches the original parameter word, then the controller input word corresponding to the drive parameter value output word contains the value of the requested parameter.

Although you may modify and fine tune almost all drive parameters through the Drives Interface Application, most programming consists of controlling the speed and direction of the motor. A simplified procedure for operating a drive follows.

1. Set the controller output word that corresponds to the drive speed to a value of zero.
2. Reset the stop bits, and set the run bit and the direction bit of the controller output word that corresponds to the control word of the drive.
3. Increase the controller output word that corresponds to the speed reference; the motor speed should increase accordingly. Refer to your drive manual for more details on programming drives.

3.10 Drives Troubleshooting

Common troubleshooting symptoms, causes, and corrective actions are shown in Table 3-17.

Table 3-17 Troubleshooting the Field Interface Module Using LEDs

Symptom	Probable Cause	Corrective Action
MOD GOOD Off	No power to board.	Re-seat board.
		Check for bent pins on board connector.
		Check base power supply.
	Check switch settings.	
	Bad module, failed diagnostics.	Return module for repair.
COMM Off	Broken cable on Port 1.	Repair or replace cable.
	Controller not powered up.	Power up controller.
CFG Off	Broken cable on Port 1.	Repair or replace cable.
	Base address set to 0 on controller with local base.	Set base address correctly.
	Base not configured.	Configure base.
	Base disabled.	Enable base
CFG Blinking	Configured incorrectly.	Reconfigure correctly.
	Broken cable on Port 2.	Repair or replace cable.
	Wrong base number selected on switch S1.	Set S1 to the correct base number.
	Wrong drive number selected on drive.	Refer to your drive manual for setting the drive address.
	Wrong baud rate.	Set all drives the same.
	Wrong protocol selected on switch S2.	Set to proper protocol.
	Drive(s) not powered up.	Power up all drives.
	Drive failure.	Repair or replace drive.

Checking the Operation of the Module

Use TISOFT to check the operation of the module. If you experience problems communicating with the SIMOREG or SIMOVERT drives, you can read the base status through TISOFT. The base status indicates proper communication to individual drives by the presence of I/O points in the slot number corresponding to the drive address. I/O points in slot #16 indicate good communication between the Drives Interface Application of the Field Interface Module and the controller.

10-Word Simple
and 10-Word USS
Protocol

For the 10-Word Simple and 10-Word USS Protocol:

- If the controller is communicating properly to the Drives Interface Application, slot #16 contains 16 discrete input (X), 16 discrete output (Y), and 10 word output (WY) points when base status is read.
- Good communication to individual drives is indicated by the presence of 10 word input (WX) and 10 word output (WY) points in the slot number corresponding to the drive address switch selection.
- Read the controller status words to determine I/O presence and the correct configuration of the Field Interface Module. See Table 3-18 and Table 3-19 for bit mapping.

4-Word Simple and
5-Word (Modified)
USS Protocol

For the 4-Word Simple and 5-Word (Modified) USS Protocol:

- If the controller is communicating properly to the Drives Interface Application, slot #16 will contain 16 discrete input (X), 16 discrete output (Y), and 4 word output (WY) points when base status is read.
- Good communication to individual drives is indicated by the presence of 4 word input (WX) and 4 word output (WY) points in the slot number that corresponds to the drive address switch selection.
- Read the controller status words to determine I/O presence and the correct configuration of the Field Interface Module. See Table 3-18 and Table 3-19 for bit mapping.

Drives Troubleshooting (continued)

5-Word USS Protocol

For the 5-Word USS Protocol:

- If the controller is communicating properly to the Drives Interface Application, slot #16 contains 16 discrete input (X), 16 discrete output (Y), and 6 word output (WY) points when base status is read.
- Good communication to individual drives is indicated by the presence of 6 word input (WX) and 6 word output (WY) points in the slot number that corresponds to the drive address switch selection.
- Read the controller status words to determine I/O presence and the correct configuration of the Field Interface Module. See Table 3-18 and Table 3-19 for bit mapping.

Table 3-18 shows status bits for monitoring status between the controller and the Field Interface Module for the selected base number on the Field Interface Module. Note that the status words for monitoring status between the Field Interface Module and the drives is also shown in this table.

Bit number to drive number correlation to these status words is shown in Table 3-19, using base 5 as an example.

Table 3-18 Controller-to-Field Interface Module (FIM) Communication Status Using Controller Status Words

FIM Base #	Controller to FIM Communication Status Bit	Status Word for FIM to Drive Communication Status
0	STW2 – Bit #16 – (least significant bit)	STW11
1	STW2 – Bit #15	STW12
2	STW2 – Bit #14	STW13
3	STW2 – Bit #13	STW14
4	STW2 – Bit #12	STW15
5	STW2 – Bit #11	STW16
6	STW2 – Bit #10	STW17
7	STW2 – Bit #9	STW18
8	STW2 – Bit #8	STW19
9	STW2 – Bit #7	STW20
10	STW2 – Bit #6	STW21
11	STW2 – Bit #5	STW22
12	STW2 – Bit #4	STW23
13	STW2 – Bit #3	STW24
14	STW2 – Bit #2	STW25
15	STW2 – Bit #1 – (most significant bit)	STW26

Table 3-19 Monitoring Field Interface Module (FIM) to Drive Communication Status Using Controller Status Words

Drive Address #	FIM to Drive Communication Status Bit (Using the Base 5 Example*)
1	STW16 – Bit #16 – (least significant bit)
2	STW16 – Bit #15
3	STW16 – Bit #14
4	STW16 – Bit #13
5	STW16 – Bit #12
6	STW16 – Bit #11
7	STW16 – Bit #10
8	STW16 – Bit #9
9	STW16 – Bit #8
10	STW16 – Bit #7
11	STW16 – Bit #6
12	STW16 – Bit #5
13	STW16 – Bit #4
14	STW16 – Bit #3
15	STW16 – Bit #2
FIM Broadcast Immediate Channel	STW16 – Bit #1 – (most significant bit)
* The number of the status word is determined by adding 11 to the number of the base; hence the status word for base 5 is STW16.	

Technical Assistance

If you need additional help with drive problems, call your distributor, or call the Siemens Energy & Automation, Inc., Drives Technical Support Hotline at 1-770-740-3000.

3.11 SIMOREG/SIMOVVERT Applications

FIM Drive Protocols Each Field Interface Module supports any one (but only one at a time) of the following six drive protocols.

- 4-word Simple Protocol (all 4 words available to the controller)
- 10-word Simple Protocol (all 10 words available to the controller)
- 5-word (Modified) USS Protocol (only 4 words available to the controller; word #2 removed)
- 5-word USS Protocol (all 5 words available to the controller)
- 10-word USS Protocol (all 10 words available to the controller)
- PROFIBUS-DP (PROFIBUS-DP is the latest version of the Siemens Energy & Automation, Inc., L2-DP. The FIM only supports portions of the older L2-DP.)

 WARNING
--

This equipment contains hazardous voltages and hazardous rotating mechanical parts.

Failure to follow the safety, start-up, and installation considerations described in the drive instruction manual can result in death, serious injury, and/or property damage.

Follow the instructions in this manual as well as the instructions in the manual for your drive. Systems Integrators must read and understand the instruction manuals for the SIMATIC 505 Field Interface Module and all Siemens variable speed drives and all option boards that are used in the system.

AC Drives
Supported

The following SIMOVERT models are supported:

- SIMOVERT P 6SE12 uses the Z2006 option board. The Z2006 option board uses 10-word simple protocol or USS protocol with a variable-length telegram that can be set up for either five or ten words.

PROFIBUS-DP uses the CS51 or CB24 option board. The CS51 can be used alone or in conjunction with the Z2006 technology board. The newer CB24 option board can also be used only if the Z2006 technology board is also used.

- SIMOVERT P 6SE21. The base unit has an RS-485 serial port that uses 4-word simple protocol or 5-word USS protocol.
- SIMOVERT P 6SE30 (MICROMASTER).
The base unit has an RS-485 serial port that uses 5-word USS protocol.

The PROFIBUS MICROMASTER has a built-in PROFIBUS-DP port.

- SIMOVERT 6SE31 (MICRO/MIDIMASTER).
The base unit has a RS-485 serial port that uses 5-word USS protocol.

PROFIBUS-DP: the OPmP optional device must be used. When the OPmP device is used, the USS protocol on the base unit becomes inoperable.

- SIMOVERT P PM.
The base unit has a RS-485 serial port that uses 10-word USS protocol.

PROFIBUS-DP: the SS13381 optional board must be used.

- SIMOVERT 6SE70 Master Drive. The base unit has one (on the FC and SC models) or two (on the VC model) standard RS-485 serial port(s) that use USS protocol with a variable-length telegram that can be set up for either five or ten words.

An optional serial communication board (SCB2) can be added. The serial port on the SCB2 uses USS protocol with a variable length telegram that can be set up for either five or ten words.

PROFIBUS-DP uses the CB1 option board.

- SIMOVERT P 6SE85 uses the S13 option board. The S13 uses 4-word simple protocol.

PROFIBUS-DP uses the S13 option board.

Table 3-20, on page 3-54, lists specific models and the section of this manual where they are described.

SIMOREG/SIMOVERT Applications (continued)

DC Drives Supported

Third generation SIMOREG models (also known as SIMOREG 6RA22) have the following requirements:

- One of the following option boards must be used:
Z1005 or Z1006 or Z1011 (all use 10-word simple protocol).

Fourth generation SIMOREG 6RA24 models have the following requirements:

- The base unit has a RS-485 serial port that uses USS protocol with a variable-length telegram that can be set up for either five or ten words.
- If an optional Z2006 technology board is already attached, it may be advantageous to use the serial port on the Z2006. The Z2006 uses 10-word simple protocol or USS protocol with a variable-length telegram that can be set up for either five or ten words.
- PROFIBUS-DP uses the CB24 or CS51 option board. The CB24 can be used alone or in conjunction with the Z2006 technology board. The CS51 can be used alone or with the Z2006 Technology board.

Table 3-20 lists specific models and the section of this manual where they are described.

Table 3-20 Specific Wiring and Setup Information

Model	Section
SIMOREG 6RA24	3.12
SIMOVERT 6SE21	3.13
SIMOVERT 6SE30/6SE31 MICROMASTER and MIDIMASTER	3.14
SI3 (6SE85 Serial Interface Board)	3.15
Z1005 (Digital Interface Board)	3.16
Z1006 (Coordinated Drive Interface Board)	3.17
Z1011 (Serial Interface Board)	3.18
Z2006 (6SE12 or 6RA24 Technology Board)	3.19
6SE70 (Master Drive Models FC and SC)	3.20
6SE70 (Master Drive Model VC)	3.21
SCB2 (Master Drive Serial Communications Board)	3.22

3.12 Setting Up and Wiring 6RA24

Required Hardware and Software

You can use any hardware version of the SIMOREG 6RA24; use software version 2.00 or later.

Required Parameters

The parameters required to set up the 6RA24 are as follows:

- P780 must be set to 1192, which selects USS protocol with an 11-bit frame with even parity.
- P781 sets the number of process data (PZD) words. The sum of parameters P781 + P782 must be five if 5-word USS protocol is selected on the FIM, or ten if 10-word USS protocol is selected on the FIM.
- P782 sets the number of PKW words used for parameter data to either zero or three. The sum of parameters P781 + P782 must be five if 5-word USS protocol is selected on the FIM, or ten if 10-word USS protocol is selected on the FIM.
- P783 is normally set to 38,400 baud unless some other drive requires a lower baud rate.
- P784 is set based on the *6RA24 Instruction Book* and the specific application.
- P786 must be set to the individual drive address.
- P787 initially is set to zero, which turns off the drive telegram-monitoring function. After the network is operating, decide whether or not to turn on the drive telegram-monitoring function by setting P787 to a non-zero value.

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

NOTE: Unlike some Siemens variable speed drives, the 6RA24 will not automatically be controlled by serial communications when wired and set up according to this document; it will only communicate. The process data selection (also refer to P781) defines the control word, status word, setpoints, and actual values for the interface. Definition of the process data section is very flexible. Individual input, output, and control functions must be set (parameterized) for use with serial communications. It is beyond the scope of this document to describe all of the functions and how to set (parameterize) them. Section 10.8 of the 6RA24 Instruction Book describes the control word, status word, setpoints, and actual values structures, and it is imperative that this section be read and understood completely before attempting to control a 6RA24 with a FIM module.

Setting Up and Wiring 6RA24 (continued)

The following example describes how to assign the Main Control Word and Speed Setpoint functions to the FIM.

On a Factory Default 6RA24 SIMOREG, these control functions are set to local wired inputs, not to serial port 0.

In order to control the Main Control Word function from port 0 of the drive (communicating by USS protocol to the FIM), parameter P640 must be set to 20. This sets the source of the standard control word to PZD word 1 of the telegrams on serial port 0 (USS). PZD word 1 is word 1 of the PLC data area if parameter P782 (see above) is set to 0. PZD word 1 is word 4 of the PLC data area if parameter P782 (see above) is set to 3 (words 1, 2, and 3 are PKW words).

The same concepts apply to the Speed Setpoint signal. In order to control the Speed Setpoint from port 0 of the drive (communicating by USS protocol to the FIM), parameter P628.0 must be set to 21. This sets the source of the Speed Setpoint to PZD word 2 of the telegrams on serial port 0 (USS).

In order for the motor to start, the run enable (terminal #37) and the regulator enable (terminal #38) on the base 6RA24 unit must be on. Before parameter P640 was changed, these terminals directly controlled the motor. Now they are treated as enable signals.

After P640 is set to 20, Figure 3-18 describes the function of each control bit in PZD word 1 of the information sent to the drive.

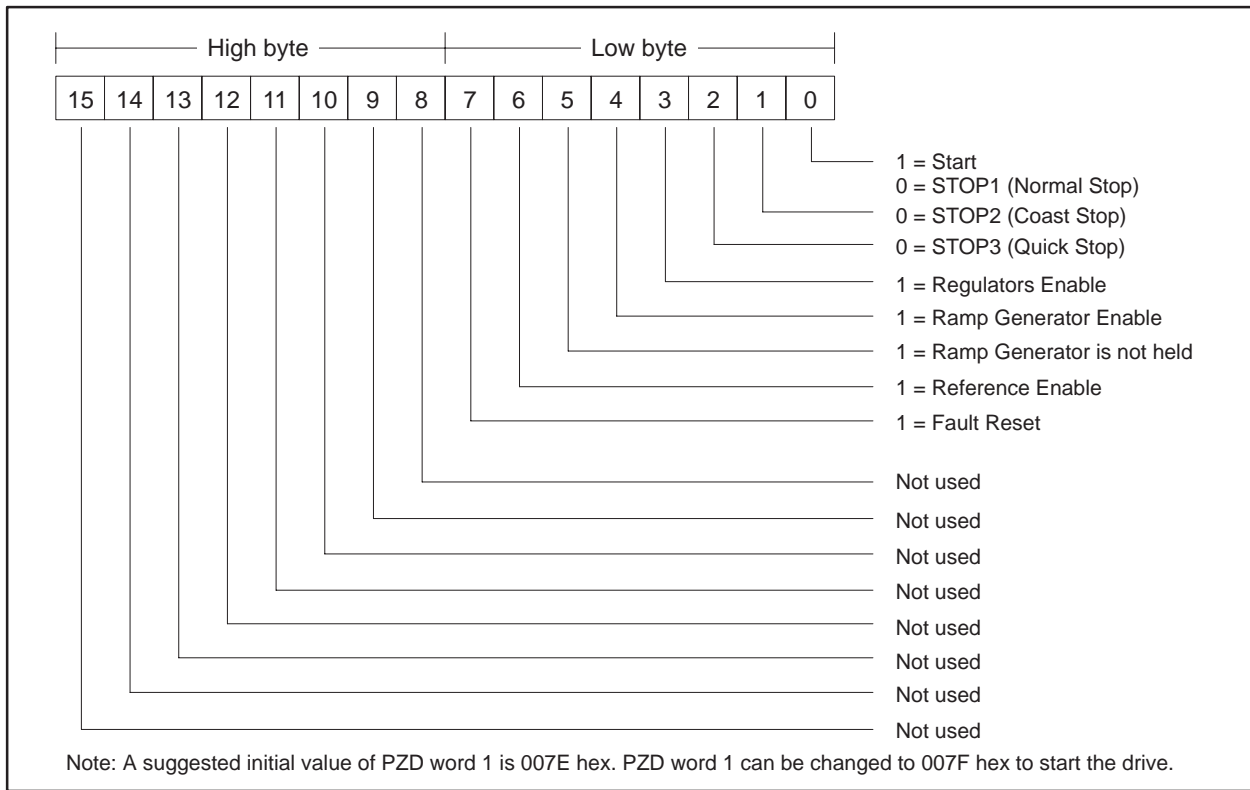


Figure 3-18 Control Bits for Main Control Word and Speed Setpoint

Also, drive status and feedback (or actual value) information such as motor speed and other information must be set (parameterized) to the appropriate destination in order to be read by the FIM module. Section 10.8 of the 6RA24 Instruction Book also explains the details.

Required Jumpers

The applicable jumpers follow.

- XJ3 Figure 3-20 and Figure 3-21 show the correct position of this jumper.
- XJ4 Figure 3-20 and Figure 3-21 show the correct position of this jumper.
- XJ5 Figure 3-20 and Figure 3-21 show the correct position of this jumper.

USS Protocols

The 5-word USS protocol implementation used by the FIM allows all five words of data to be manipulated by the Series 505 programmable controller. The FIM uses a 10-word USS protocol implementation that allows all ten words of data to be manipulated by the Series 505 programmable controller.

The FIM uses a 5-word (Modified) USS protocol implementation that only allows four words of data to be manipulated by the Series 505 programmable controller. The second word of the 5-word (Modified) USS protocol telegram sent to the drives is always set to zero. The second word of the 5-word (Modified) USS protocol received from the drives is not available to the controller.

- The FIM maps the first word sent from the controller into the first word of the 5-word (Modified) USS protocol telegram sent to the drive.
- The FIM always sends a zero as the second word of the 5-word (Modified) USS protocol telegram to the drive.
- The FIM maps the second word sent from the controller into the third word of the 5-word (Modified) USS protocol telegram sent to the drive.
- The FIM maps the third word sent from the controller into the fourth word of the 5-word (Modified) USS protocol telegram sent to the drive.
- The FIM maps the fourth word sent from the controller into the fifth word of the 5-word (Modified) USS protocol telegram sent to the drive.
- A similar technique is used to map the 5-word (Modified) USS protocol reply telegram from the drive into the 4-word reply in the controller.

NOTE: To avoid the complexities of the 5-word (Modified) USS protocol, simply use either the standard 5-word or else 10-word protocol.

Setting FIM Additional Delay

Use dipswitch S3 to set the extra delay to 0 milliseconds.

Setting Up and Wiring 6RA24 (continued)

Figure 3-20 shows the wiring for all drives except the end of the bus for the 6RA24.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

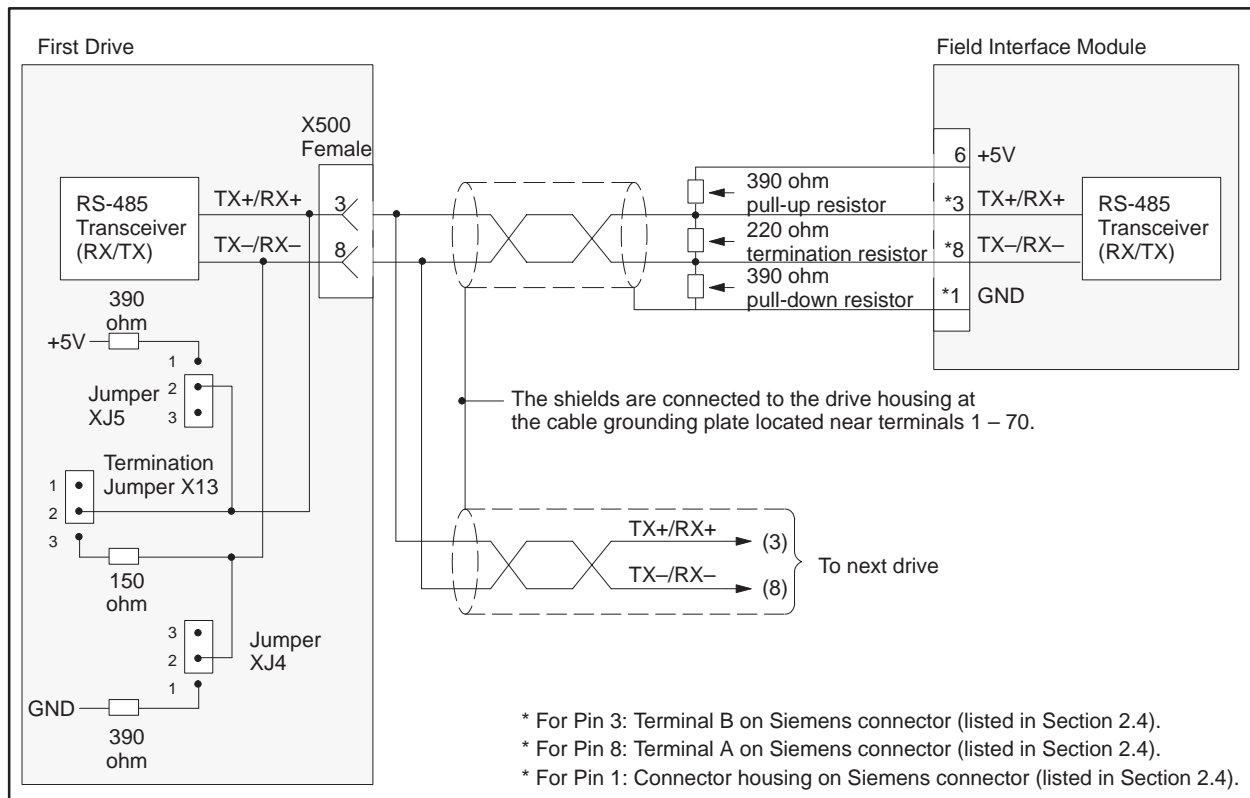


Figure 3-20 6RA24 Wiring: All Drives Except at End of Bus

Figure 3-21 shows the wiring for the drive at the end of the bus for the 6RA24.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

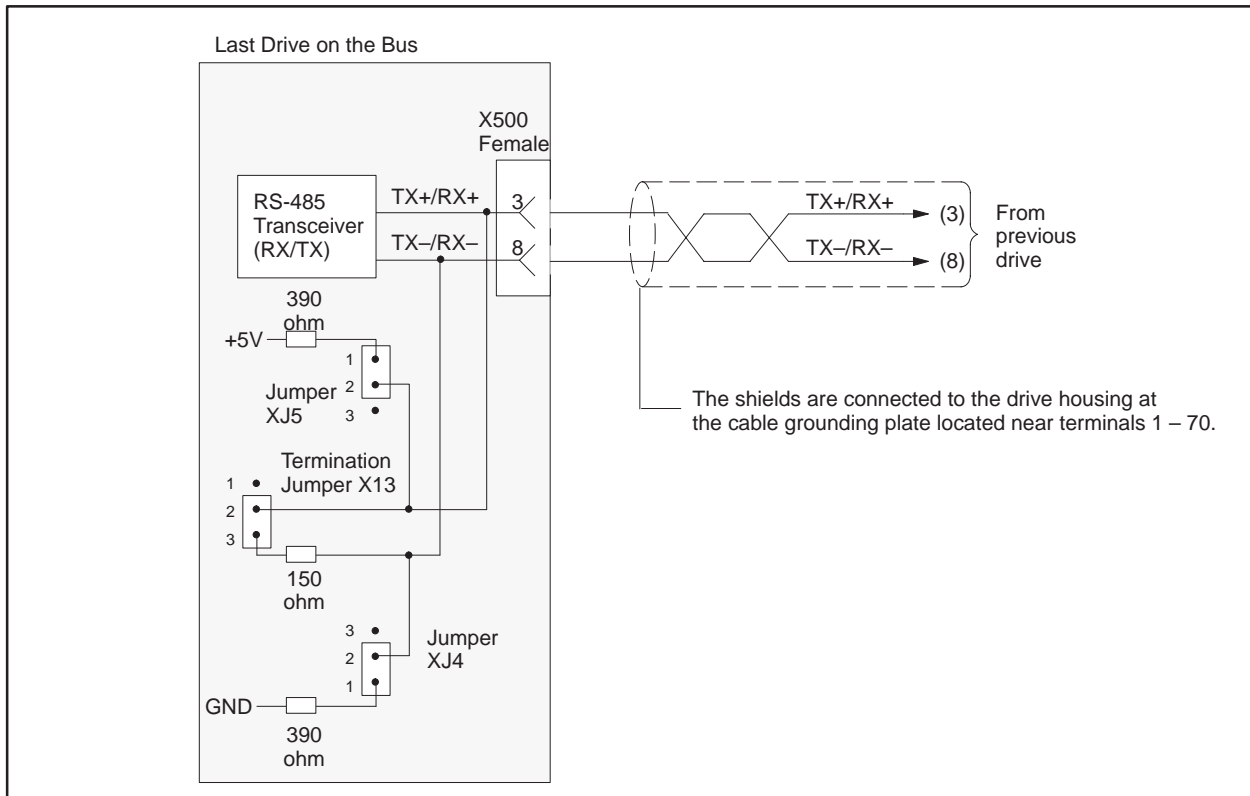


Figure 3-21 6RA24 Wiring: Drive at End of Bus

3.13 Setting Up and Wiring 6SE21

You can use any hardware version of the SIMOVERT P 6SE21. The software version of EPROM IC1 must be K or higher, and the software version of EPROM IC21 must be L or higher. The EPROM label (see Figure 3-22) indicates the software version.

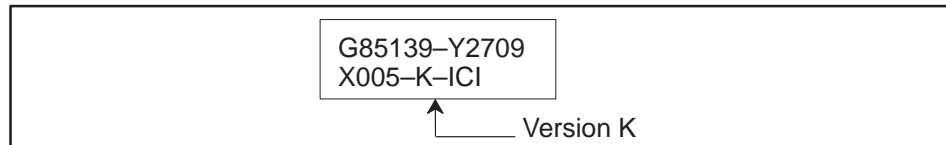


Figure 3-22 6SE21 EPROM Label

Required Parameters

The parameters required to set up the 6SE21 follow.

- P20** must be set to one of the following:
- 000 selects 4-word simple protocol, monitor mode only.
 - 001 selects 4-word simple protocol, control and monitor mode.
 - 002 selects 5-word USS protocol, monitor mode only.
 - 003 selects 5-word USS protocol, control and monitor mode.

A large number of special 6SE21 drives are in service in which the jog input terminal alters the selection of parameter P20. Contact Siemens for details on these modified 6SE21 drives.

- P21** must be set to the individual drive address.

- P22** must be set to one of the following:
- 000 selects 2400 baud with even parity.
 - 001 selects 4800 baud with even parity.
 - 002 selects 9600 baud with even parity.

- P22** is normally set to 002, which selects 9,600 baud unless some other drive requires a lower baud rate.

NOTE: Unlike some Siemens variable speed drives, the 6SE21 will automatically be controlled by serial communications when wired and set up according to this document with P20 = 001 or 003. If P20 = 000 or 002, then the 6SE21 will only communicate status and feedback information. The process data section defines the control word, status word, main setpoint and main actual value for the interface. Definition of the process data section is fixed. The document “Universal Serial Interface Protocol” E20125-D00001-S302-A1-7600 describes the control word, status word, main setpoint, and main actual value structures, and it is imperative that this document be read completely and understood before attempting to control a 6SE21 with a FIM module.

Drive status and feedback (or actual value) information such as motor speed can always be read by the FIM Module. The document Universal Serial Interface Protocol E20125–D00001–S302–A1–7600 also explains the details.

The following example describes how to access the Standard Status Word and Main Feedback from the FIM:

If P20 is set to 001 or 002 or 003, the FIM can access the standard status word in PZD word 1 from the port (USS). PZD word 1 is word 4 of the PLC data area (words 1, 2, and 3 are PKW words).

In addition, if P20 is set to 001 or 002 or 003, the FIM can access the current or frequency feedback in PZD word 2 of the telegrams from the serial port (USS). The choice between current or frequency is made by bit 15 of the control word (see above).

After P20 is set to 001 or 002 or 003, Figure 3-24 describes the function of each status bit in PZD word 1 of the information from the drive.

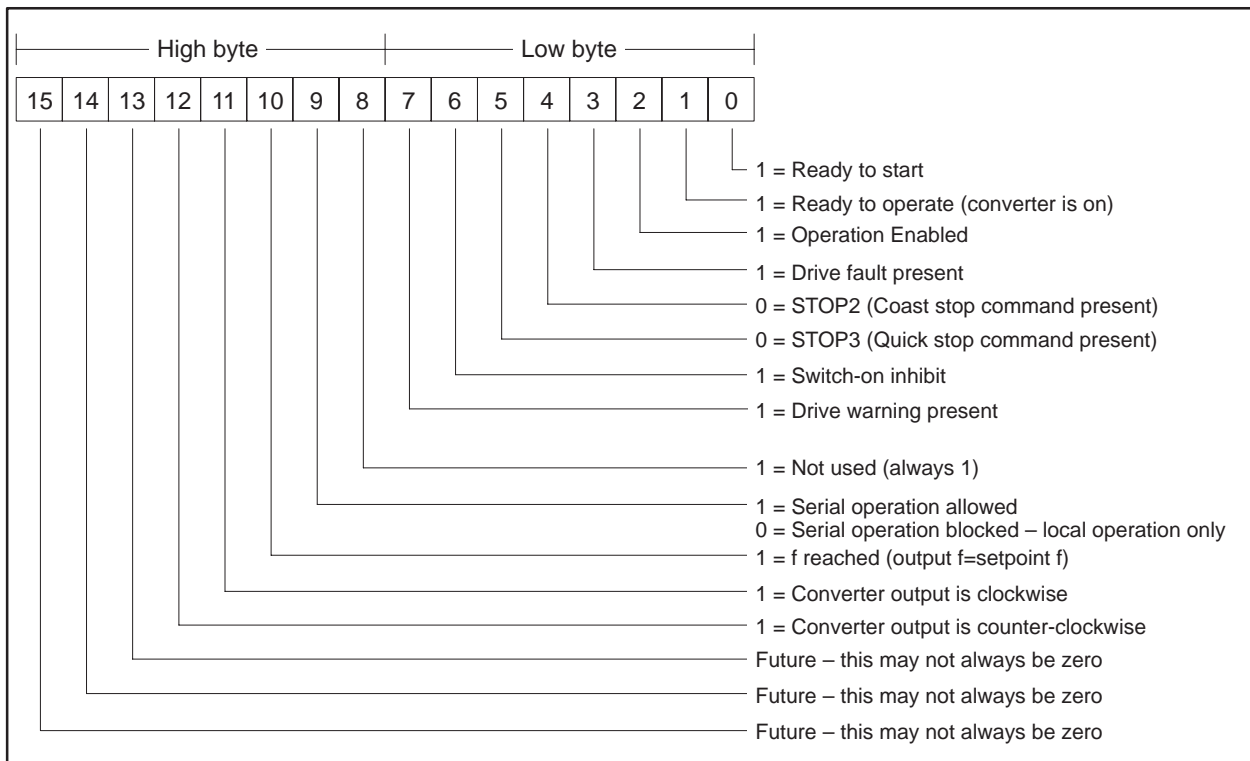


Figure 3-24 Status Bits for Standard Status Word and Main Feedback

Required Jumpers The SIMOVERT P 6SE21 has no applicable jumpers.

Setting Up and Wiring 6SE21 (continued)

USS Protocols

The 5-word (Modified) USS protocol implementation used by the FIM only allows four words of data to be manipulated by the Series 505 programmable controller. The second word of the 5-word (Modified) USS protocol telegram sent to the drives is always set to zero. The second word of the 5-word (Modified) USS protocol received from the drives is not available at the controller. On the 6SE21, the second word of the (Modified) USS protocol telegram is always the array index word (IND), which is not used on the 6SE21. On other drives, the second word of the USS protocol telegram cannot be the array index word (IND). Also, on other drives the array index word (IND) is normally used.

If other drives are to be used on the same network as the 6SE21, use the 5-word USS protocol that allows all five words of data to be manipulated by the Series 505 programmable controller.

Setting FIM Additional Delay

Use dipswitch S3 to set the extra delay to approximately 40 milliseconds.

Figure 3-25 shows the wiring for all drives except the end of the bus for the 6SE21.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

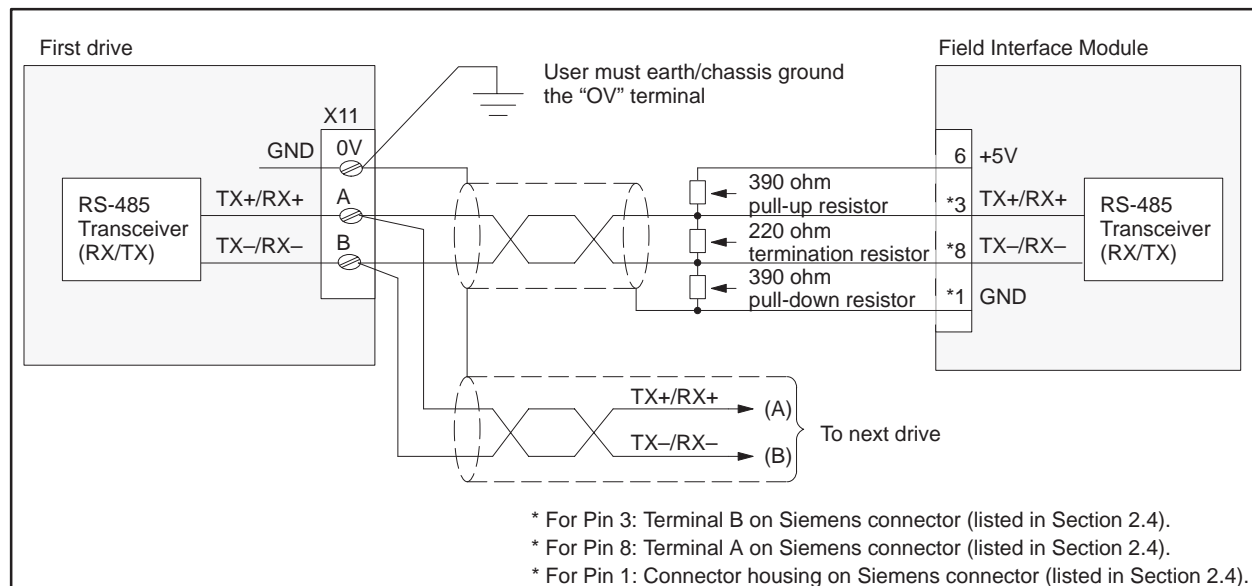


Figure 3-25 6SE21 Wiring: All Drives Except at End of Bus

Figure 3-26 shows the wiring for the drive at the end of the bus for the 6SE21.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

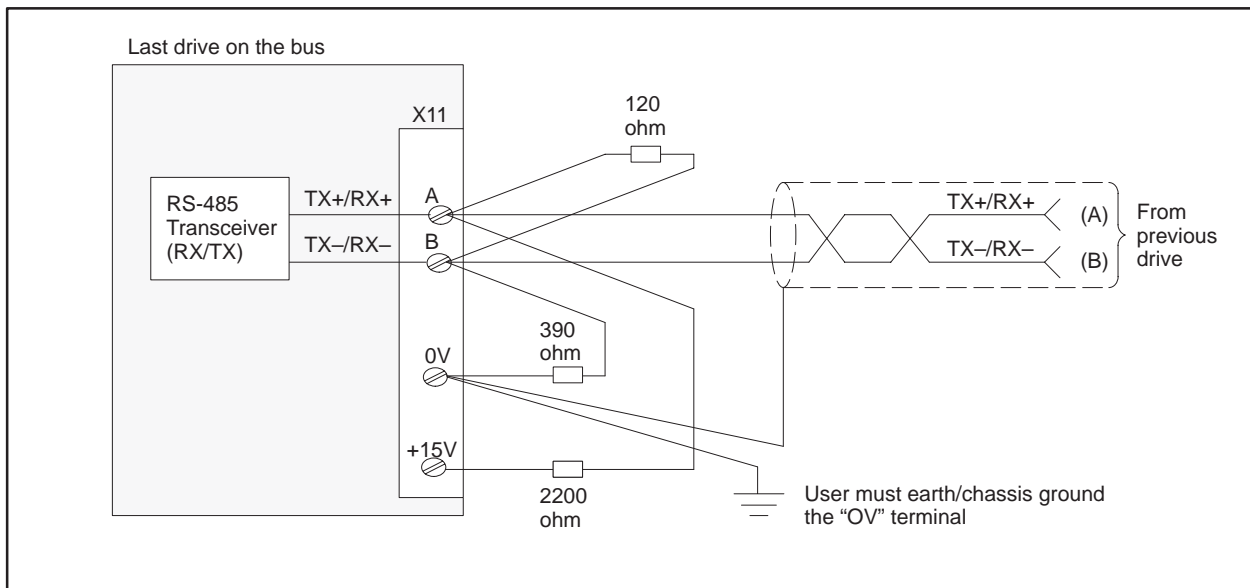


Figure 3-26 6SE21 Wiring: Drive at End of Bus

3.14 Setting Up and Wiring Micromaster/Midimaster Drive (6SE30/6ES31)

This section covers two different models of the Micromaster. The first model number is 6ES30; the second model number is 6ES31. Characteristics unique to just one model number are so noted.

Required Hardware and Software

You can use any hardware and/or software version of the Micromaster Drive SIMOVERT P 6SE30/6ES31. If the optional OPmP PROFIBUS module is used on the 6ES31, the USS protocol on the base unit becomes inoperable.

Required Parameters

The parameters required for the 6SE30/6ES31 follow:

- P091 must be set to the individual drive address.
- P092 must be set to one of the following:
 - 004 selects 2,400 baud with even parity.
 - 005 selects 4,800 baud with even parity.
 - 006 selects 9,600 baud with even parity.
 - 007 selects 19,200 baud with even parity.
- P092 is normally set to 007, which selects 19,200 baud unless some other drive requires a lower baud rate.
- P093 is initially set to zero, which turns off the drive telegram-monitoring function. After the network is operating, you can decide whether or not you want to turn on the drive telegram-monitoring function by setting P093 to a non-zero value.
- P910 must be set to one of the following:
 - 000 selects 5-word USS protocol, monitor mode only.
 - 001 selects 5-word USS protocol, control and monitor mode.
 - 002 selects 5 word USS protocol, local control (but remote control of frequency), and monitor mode. (6SE31 only)
 - 003 selects 5 word USS protocol, remote control (but local control of frequency), and monitor mode. (6ES31 only)

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

NOTE: Unlike some Siemens variable speed drives, the Micromaster will automatically be controlled by serial communications when wired and set up according to this document with P910=001. If P910=000, the Micromaster will only communicate status and feedback information. The process data section defines the control word, status word, main setpoint and main actual value for the interface. Definition of the process data section is fixed. The document Universal Serial Interface Protocol E20125-D00001-S302-A1-7600 describes the control word, status word, main setpoint and main actual value structures, and it is imperative that this document be read completely and understood before attempting to control a 6SE30/6SE31 with a FIM module.

Setting Up and Wiring Micromaster/Midimaster Drive (6SE30/6ES31) (continued)

The following example describes how to assign the Main Control Word and Frequency Setpoint functions to the FIM using 5-word USS protocol:

In order to control the Main Control Word function from the serial port of the drive (communicating by USS protocol to the FIM) parameter P910 must be set to 001 or 003 (6ES31 only). This sets the source of the standard control word to PZD word 1 of the telegrams on the serial port (USS). PZD word 1 is word 4 of the PLC data area (words 1, 2, and 3 are PKW words).

In addition when P910 is set to 001 or 002 (6ES31 only), the Frequency Setpoint from the serial port of the drive (communicating by USS protocol to the FIM) is used to control the Micromaster frequency. PZD word 2 of the telegrams on the serial port (USS) sets the frequency. The scaling is 16,384 (4000 hex) = 100% of P94.

After P910 is set to 001 or 003 (6ES31 only), Figure 3-27 describes the function of each control bit in PZD word 1 of the information sent to the drive.

Required Jumpers	The SIMOVERT P 6SE30/6SE31 has no applicable jumpers.
USS Protocols	<p>The 5-word (Modified) USS protocol implementation used by the FIM only allows four words of data to be manipulated by the Series 505 programmable controller. The second word of the 5-word (Modified) USS protocol telegram sent to the drives is always set to zero. The second word of the 5-word (Modified) USS protocol received from the drives is not available at the controller.</p> <p>On the 6SE30, the second word of the (Modified) USS protocol telegram is always the array index word (IND), which is not used on the 6SE30. On other drives, the second word of the USS protocol telegram cannot be the array index word (IND). Also, on other drives the array index word (IND) is normally used.</p> <p>If other drives are to be used on the same network as the 6SE30, use the 5-word USS protocol that allows all five words of data to be manipulated by the Series 505 programmable controller.</p>
Setting FIM Additional Delay	Use the dipswitch S3 to set the extra delay to approximately 40 milliseconds.

Setting Up and Wiring Micromaster/Midimaster Drive (6SE30/6ES31) (continued)

Figure 3-29 shows the wiring for all drives except the end of the bus for the 6SE30/6SE31 Micromaster Drive.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections. Shield must be tied to chassis ground or terminal 15. Also, terminal 2 "0V" should be tied to chassis ground.

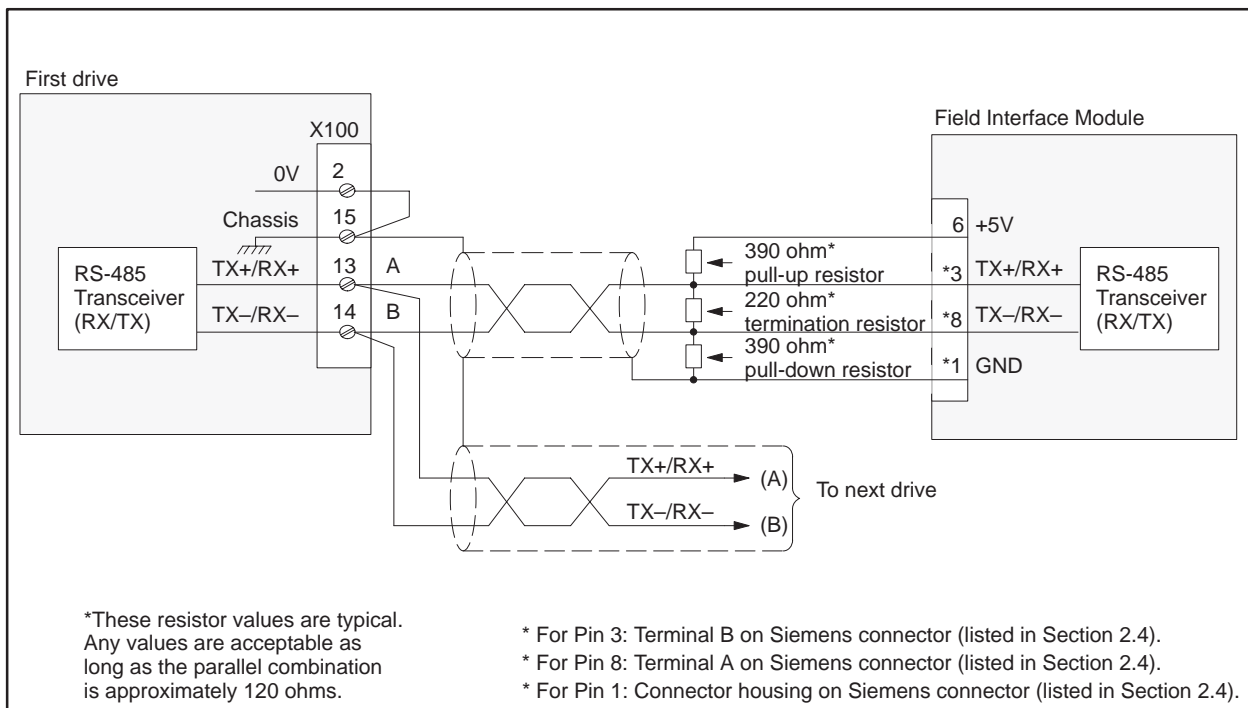


Figure 3-29 6SE30/6SE31 Wiring: All Drives Except at End of Bus

NOTE: The 6ES31 Micro/Midimaster also has a standard Siemens DB-9 female connector, where pin 3 is RX/TX+ and pin 8 is RX/TX-.

Figure 3-30 shows the wiring for the drive at the end of the bus for the 6SE30/6SE31 Micromaster Drive.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections. The user must attach the shield to chassis/earth ground or terminal 15. The customer should connect "0V" terminal 2 to chassis/earth ground.

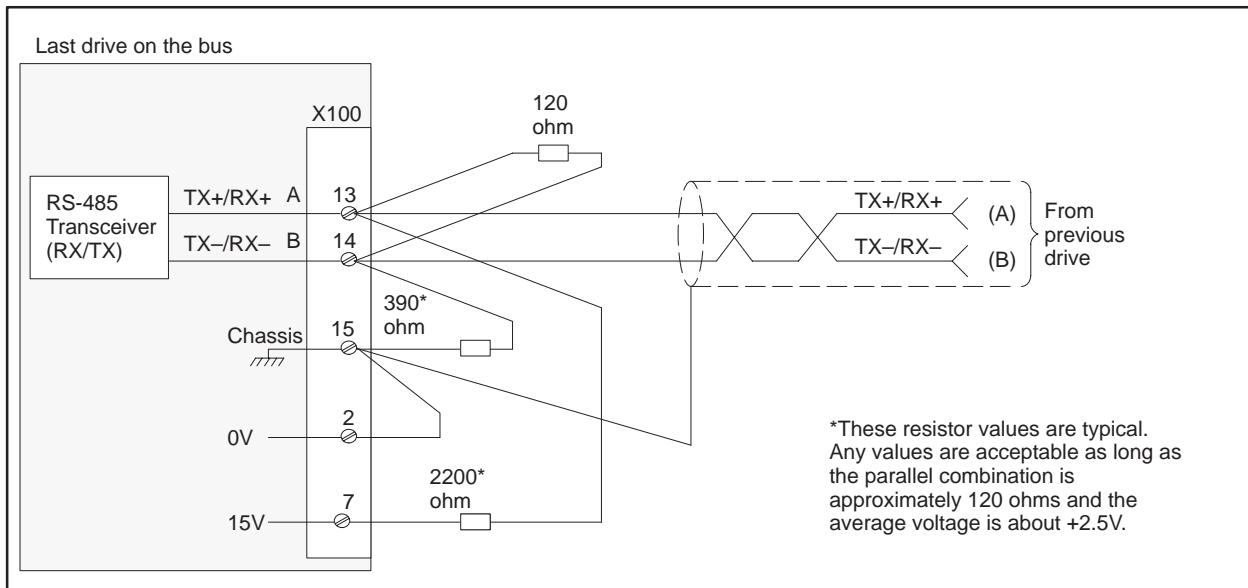


Figure 3-30 6SE30/6SE31 Wiring: Drive at End of Bus

NOTE: The 6ES31 Micro/Midimaster also has a standard Siemens DB-9 female connector, where pin 3 is RX/TX+ and pin 8 is RX/TX-.

3.15 Setting Up and Wiring SI3

Required Hardware and Software

You can use any hardware and/or any software version of the SI3 (SIMOVERT P 6SE85 Serial Interface Board).

Required Parameters

The parameters required for the SI3 follow:

Serial Mode	must be set to Port 2, which selects port 2 for serial control.
Protocol Port 2	must be set to Simple, which selects 4-word simple protocol.
Data Length Port 2	must be set to 0, which suppresses the length byte in the telegram.
Address Port 2	must be set to the individual drive address.
Baudrate Port 2	set to 38,400 baud, unless some other drive requires a lower baud rate.
Link Failure	initially set to Ignore, which turns off the drive telegram-monitoring function. After the network is operating, you can decide whether or not to turn on the drive telegram-monitoring function by setting Link Failure to Trip Drive.

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

Required Jumpers	The applicable jumpers follow: <ul style="list-style-type: none">JB1 See Figure 3-31 and Figure 3-32 for the correct position of jumper.JB2 This jumper must be set to two-wire RS-485 operation.JB3 This jumper must be in the open position.JB4 This jumper is not applicable.
Required Switches	The S13 has no applicable switches.
Setting FIM Additional Delay	Use dipswitch S3 to set the extra delay to 0 milliseconds.

Setting Up and Wiring S13 (continued)

Figure 3-31 shows the wiring for all drives except the end of the bus for the S13 (SIMOVERT P 6SE85 Serial Interface Board).

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

If a cable is removed from one of the S13 boards at a drive, the RS-485 bus is broken. If a cable must be removed and operation of the bus is required, the two 9-pin connectors of the cables at the disconnect point can be plugged together to continue the bus connection.

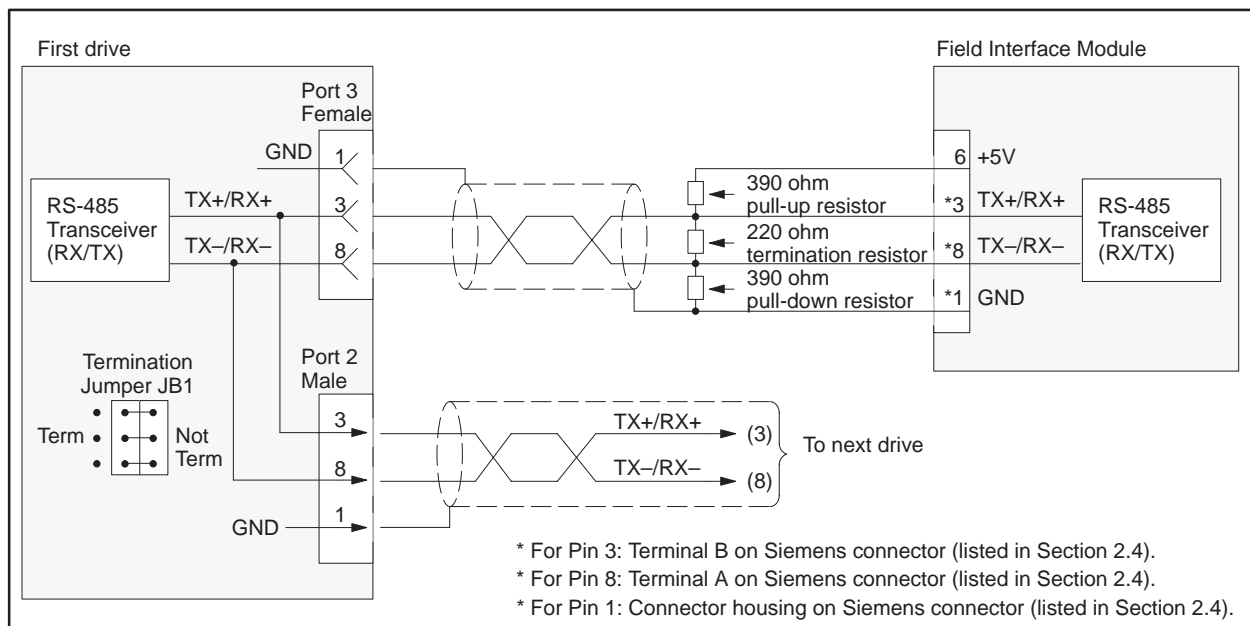


Figure 3-31 S13 Wiring: All Drives Except at End of Bus

Figure 3-32 shows the wiring for the drive at the end of the bus for the S13 (SIMOVERT P 6SE85 Serial Interface Board).

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

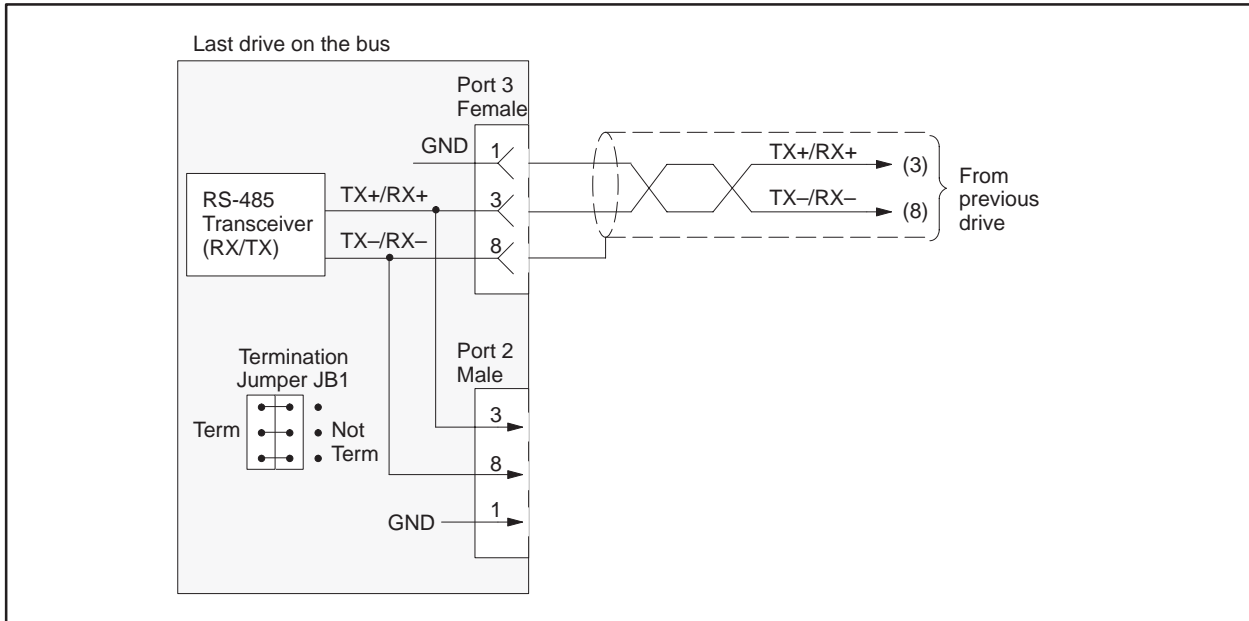


Figure 3-32 S13 Wiring: Drive at End of Bus

3.16 Setting Up and Wiring Z1005

Required Hardware and Software You can use any hardware and/or any software version of the SIMOREG Z1005 third generation Digital Interface Board.

Required Parameters The parameters required for the Z1005 follow:

H07L is initially set to 2xx, which selects 10-word simple protocol and turns off the drive telegram-monitoring function. After the network is operating, you can turn on the drive telegram-monitoring function by setting H07L to 1xx.

H07M must be set to x0x, which selects an 11-bit frame.

H07R is normally set to xx0, which selects 19,200 baud, unless some other drive requires a lower baud rate.

H08 must be set to the individual drive address.

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

Required Jumpers

The applicable jumpers follow:

- A1 This jumper must be set to A1 – A2 to select RS-485 communication.
- A2 This jumper must be set to A1 – A2 to select RS-485 communication.
- A3 This jumper must be set to A1 – A2 to select RS-485 communication.
- A4 Figure 3-33 and Figure 3-34 show the correct position for this jumper.
- A5 Figure 3-33 and Figure 3-34 show the correct position for this jumper.
- A6 Figure 3-33 and Figure 3-34 show the correct position for this jumper.

**Setting FIM
Additional Delay**

Use dipswitch S3 to set the extra delay to 0 milliseconds.

Setting Up and Wiring Z1005 (continued)

Figure 3-33 shows the wiring for all drives except the end of the bus for the SIMOREG Z1005 third generation Digital Interface Board.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

If a cable is removed from one of the Z1005 boards at a drive, the RS-485 bus is broken. If a cable must be removed and operation of the bus is required, the two 9-pin connectors of the cables at the disconnect point can be plugged together to continue the bus connection.

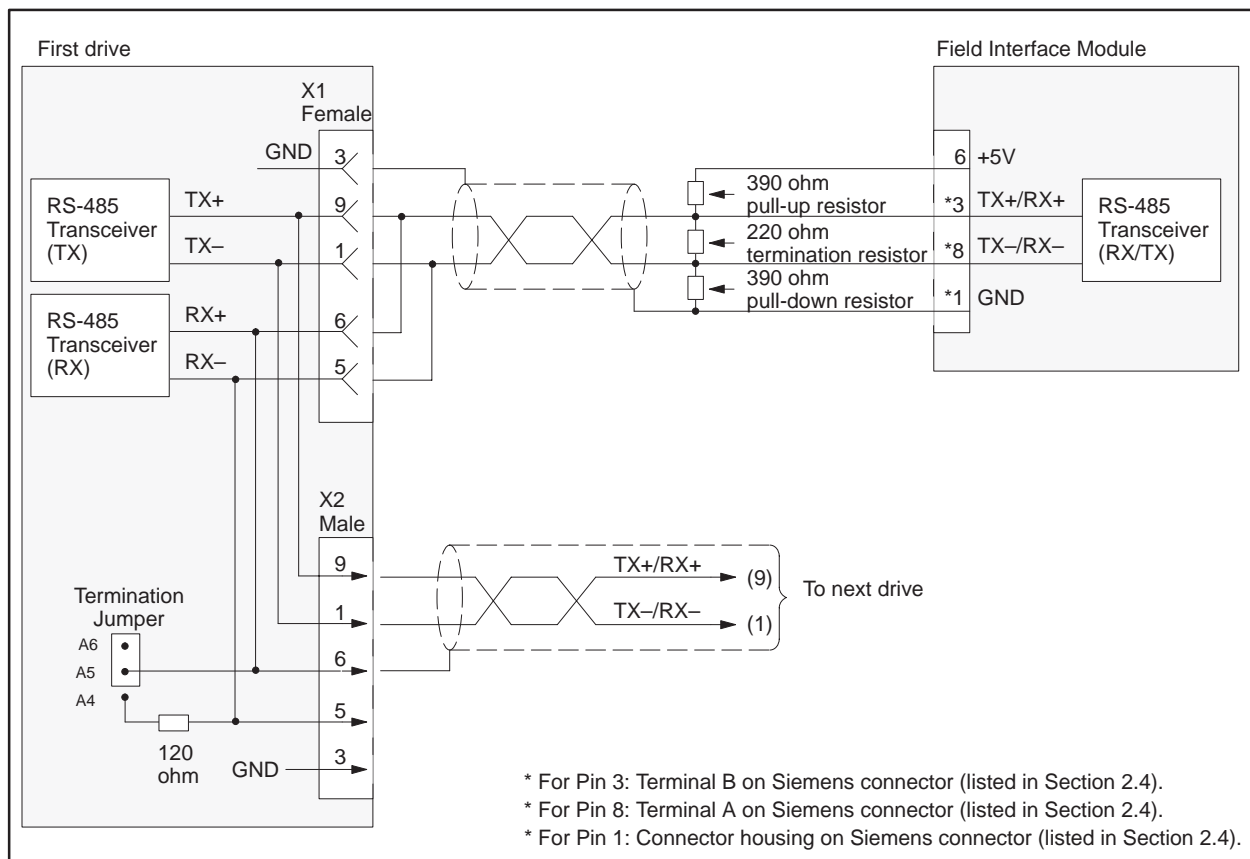


Figure 3-33 Z1005 Wiring: All Drives Except at End of Bus

Figure 3-34 shows the wiring for the drive at the end of the bus for the SIMOREG Z1005 third generation Digital Interface Board.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

If a cable is removed from one of the Z005 boards at a drive, the RS-485 bus is broken. If a cable must be removed and operation of the bus is required, the two 9-pin connectors of the cables at the disconnect point can be plugged together to continue the bus connection.

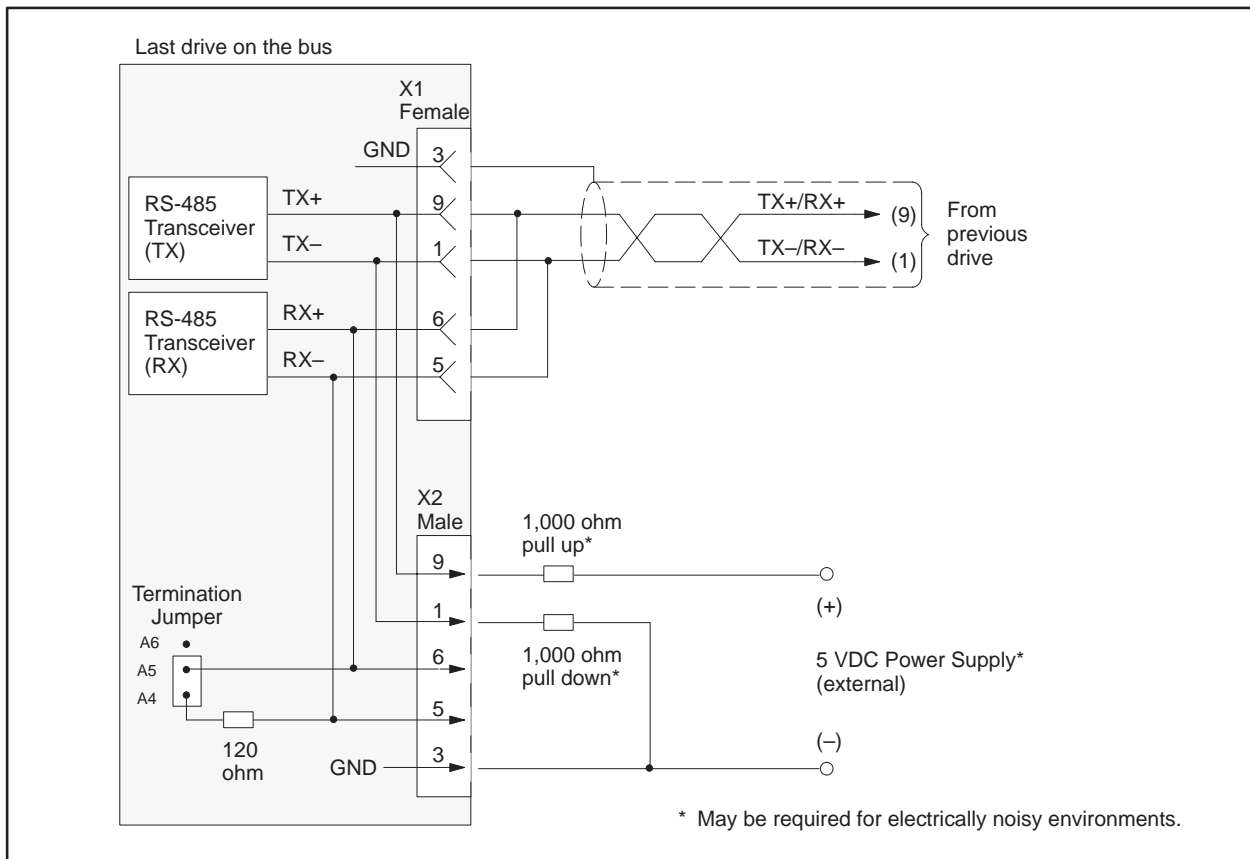


Figure 3-34 Z1005 Wiring: Drive at End of Bus

3.17 Setting Up and Wiring Z1006

Required Hardware and Software You can use any hardware version of the SIMOREG Z1006 third generation Coordinated Drive Interface Board. You must use software version 1.3.0 or later.

Required Parameters The parameters required for the Z1006 follow:

H07L is initially set to 2xx, which selects 10-word simple protocol and turns off the drive telegram-monitoring function. After the network is operating, you can turn on the drive telegram-monitoring function by setting H07L to 1xx.

H07M must be set to x0x, which selects an 11-bit frame.

H07R is normally set to xx0, which selects 19,200 baud, unless some other drive requires a lower baud rate.

H08 must be set to the individual drive address.

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

Required Jumpers

The applicable jumpers follow:

- T1 This jumper must be set to A1 – A2 to select RS-485 communication.
- T2 This jumper must be set to A1 – A2 to select RS-485 communication.
- T3 Figure 3-35 and Figure 3-36 show the correct position for this jumper.

**Setting FIM
Additional Delay**

Use dipswitch S3 to set the extra delay to 0 milliseconds.

Setting Up and Wiring Z1006 (continued)

Figure 3-35 shows the wiring for all drives except the end of the bus for the SIMOREG Z1006 third generation Coordinated Drive Interface Board.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

If a cable is removed from one of the Z1006 boards at a drive, the RS-485 bus is broken. If a cable must be removed and operation of the bus is required, the two 9-pin connectors of the cables at the disconnect point can be plugged together to continue the bus connection.

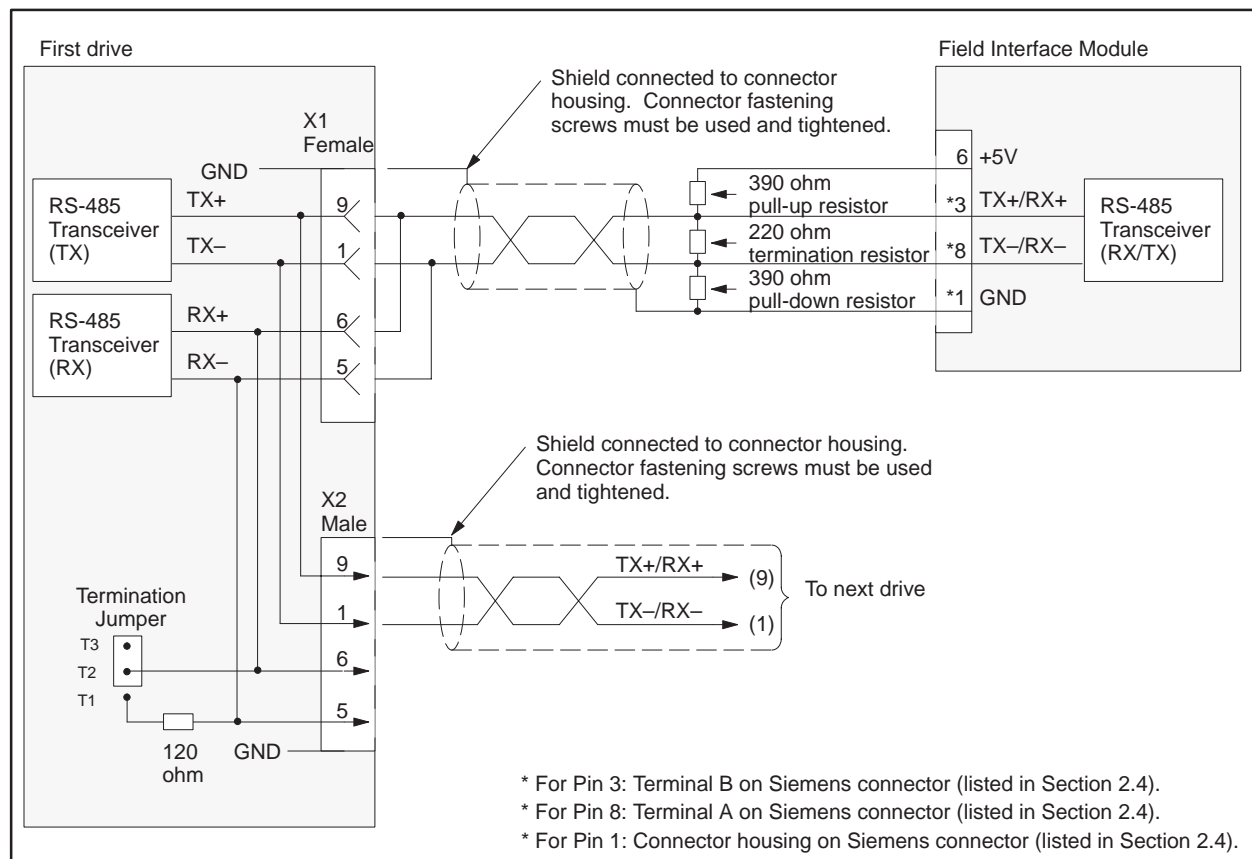


Figure 3-35 Z1006 Wiring: All Drives Except at End of Bus

Figure 3-36 shows the wiring for the drive at the end of the bus for the SIMOREG Z1006 third generation Coordinated Drive Interface Board.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

If a cable is removed from one of the Z1006 boards at a drive, the RS-485 bus is broken. If a cable must be removed and operation of the bus is required, the two 9-pin connectors of the cables at the disconnect point can be plugged together to continue the bus connection.

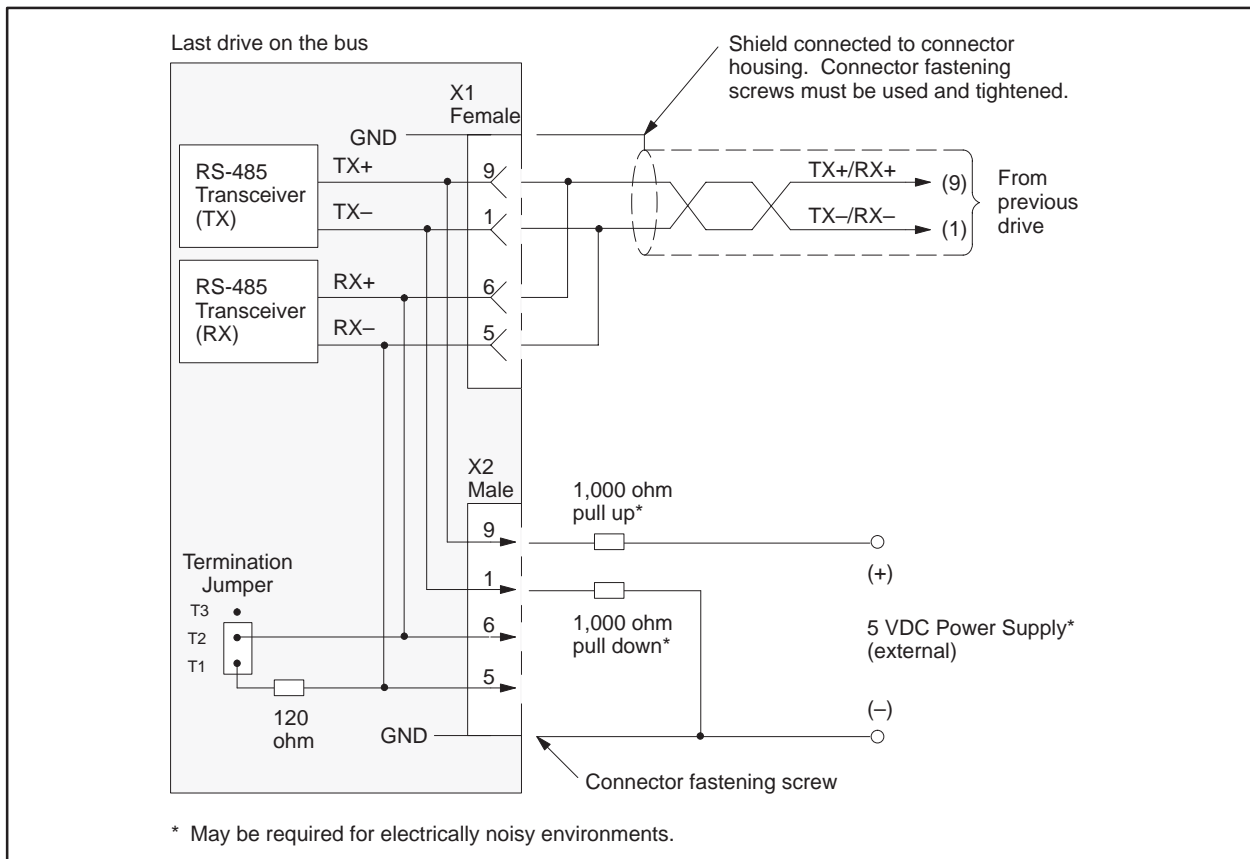


Figure 3-36 Z1006 Wiring: Drive at End of Bus

3.18 Setting Up and Wiring Z1011

Required Hardware and Software	You must use SIMOREG Z1011 third generation Serial Interface Board hardware version 9 or later and software version 3.05 or later.
Required Parameters	<p>The parameters required for the Z1011 follow.</p> <p>If used alone:</p> <p>E00 must be set to nine, which selects the Z1011 with a 10-word telegram.</p> <p>After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.</p> <p>For additional information, refer to the <i>Z1011 Instruction Book</i>, part number A1-106-008-027.</p> <p>If used with Z1004 Technology Board:</p> <p>H02L is initially set to 7xx, which selects 10-word simple protocol and turns off the drive telegram-monitoring function. After the network is operating, you can decide whether or not to turn on the drive telegram-monitoring function by setting H02L to 3xx. See Figure 3-37.</p> <p>H07L must not be set to 1xx or 2xx or 4xx or 5xx.</p> <p>After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.</p> <p>For additional information, refer to Appendix B of the appropriate <i>Z1004 Technology Module Instruction Book</i>.</p>
Required Jumpers	<p>The applicable jumpers follow.</p> <p>CST1 This jumper must be set to the CST1 (right) position.</p> <p>CST2 This jumper must be set to the CST1 (right) position.</p> <p>W1 See Figure 3-38 and Figure 3-39 for the correct position of this jumper.</p>

External Power Supply

Connect an external 24-volt DC source rated for a minimum of 150 mA to terminal block X3, with P24E as positive and M24E as common. Use a separate power supply, because this is the power source for the actual serial connection between drive and host. The resulting communications signals are optically isolated from the internal microprocessor power supplies to provide the drive system with noise immunity.

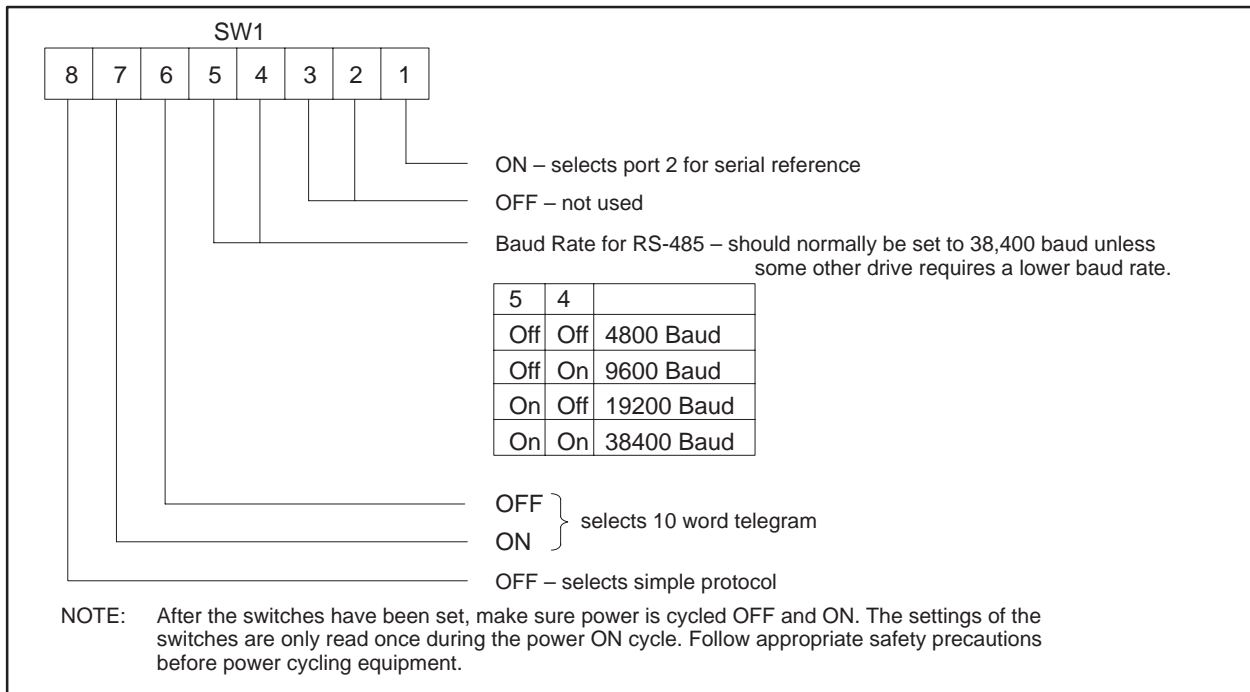


Figure 3-37 Z1011 Required Switches

Required Switches

The applicable switches follow.

SINEC NO. Set the two rotary switches labeled “SINEC NO.” to 39, which turns the RS-232 port off.

DUST NO. Set the two rotary switches labeled “DUST NO.” to the desired drive address from 00 to 30.

Setting FIM Additional Delay

Use dipswitch S3 to set the extra delay to 0 milliseconds.

Setting Up and Wiring Z1011 (continued)

Figure 3-38 shows the wiring for all drives except the end of the bus for the SIMOREG Z1011 third generation Serial Interface Board.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

If a cable is removed from one of the Z1011 boards at a drive, the RS-485 bus is broken. If a cable must be removed and operation of the bus is required, the two 9-pin connectors of the cables at the disconnect point can be plugged together to continue the bus connection.

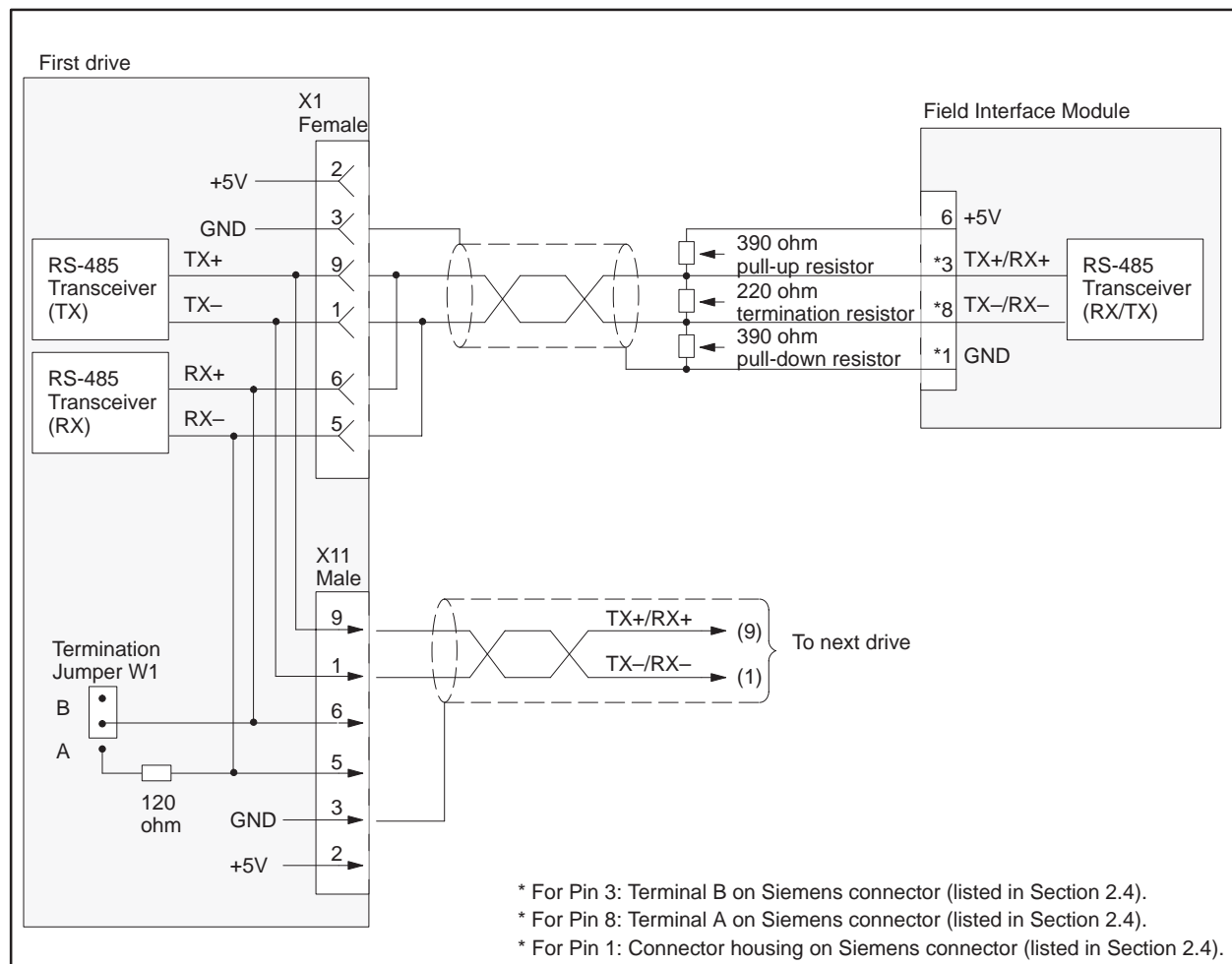


Figure 3-38 Z1011 Wiring: All Drives Except at End of Bus

Figure 3-39 shows the wiring for the drive at the end of the bus for the SIMOREG Z1011 third generation Serial Interface Board.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

If a cable is removed from one of the Z1006 boards at a drive, the RS-485 bus is broken. If a cable must be removed and operation of the bus is required, the two 9-pin connectors of the cables at the disconnect point can be plugged together to continue the bus connection.

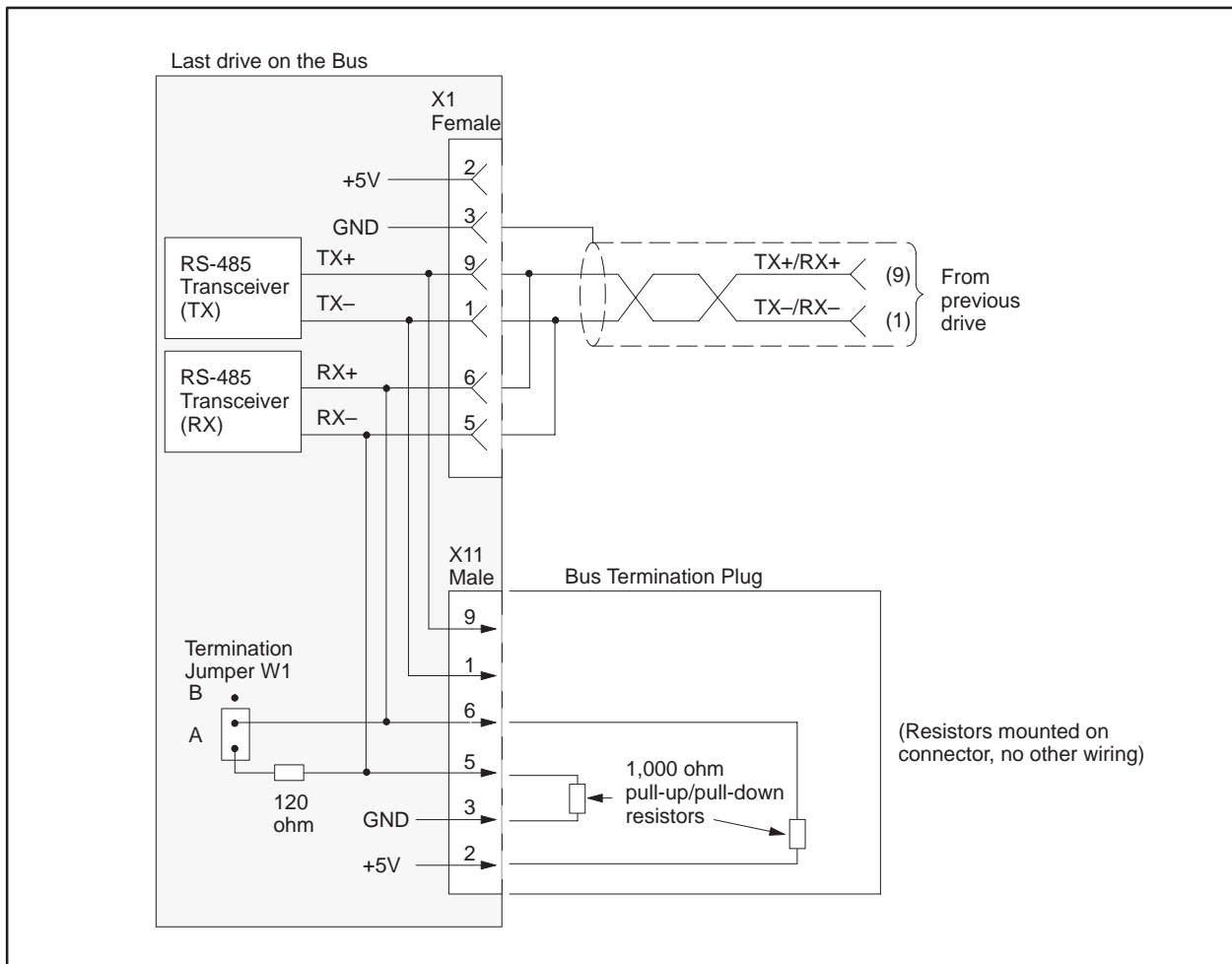


Figure 3-39 Z1011 Wiring: Drive at End of Bus

3.19 Setting Up and Wiring Z2006

Required Hardware and Software You can use any hardware and/or software version of the SIMOREG Z2006 (6SE12 or 6RA24 Technology Board).

Required Parameters The parameters required for the Z2006 follow:

PT290 must be set to either Simple Protocol or USS Protocol.

PT291 is set to 38,400 baud, unless some other drive requires a lower baud rate.

PT292 must be set to 11-bit even parity.

PT293 must be set to two-wire operation.

PT294 must be set to the individual drive address.

PT295 is initially set to zero, which turns off the drive telegram-monitoring function. After the network is operating, you can decide whether to turn on the drive telegram-monitoring function by setting PT295 to a non-zero value.

PT296 is used if PT290 is set to USS Protocol. It sets the number of process data (PZD) words. The sum of parameters PT296 + PT297 must be five if 5-word USS protocol is selected on the FIM, or ten if 10-word USS protocol is selected on the FIM.

PT297 is used if PT290 is set to USS Protocol. It sets the number of PKW words used for parameter data. It is set to either zero or three. The sum of parameters PT296 + PT297 must be five if 5-word USS protocol is selected on the FIM, or ten if 10-word USS protocol is selected on the FIM.

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

NOTE: Unlike some Siemens variable speed drives, the Z2006 will not automatically be controlled by serial communications when wired and set up according to this document, it will only communicate. The process data section (also refer to PT296) defines the control word, status word, setpoints and actual values for the interface. Definition of the process data section is very flexible. Individual input, output, and control functions must be set (parameterized) for use with serial communications. It is beyond the scope of this document to describe all of the functions and how to set (parameterize) them. Appendix B of the Z2006 Instruction Book describes the control word, status word, setpoints, and actual values structures, and it is imperative that this section be read completely and understood before attempting to control a Z2006 with a FIM Module.

Setting Up and Wiring Z2006 (continued)

The following example describes how to assign the Start/Stop and Speed Setpoint functions to the FIM using 5-word or 10-word USS protocol (see parameters PT290, PT296, and PT297 above):

On a Factory Default Z2006, these control functions are set to local wired inputs, not serial the Z2006 serial port.

In order to control the Start/Stop function from the Z2006 serial port of the drive (communicating by USS protocol to the FIM) parameter PT183 must be set to TBSP Cntl WD1.14. This sets the source of the System Start command to bit 14 of PZD word 1 of the telegrams on the Z2006 serial port (USS). PZD word 1 is word 1 of the PLC data area if parameter PT297 (see above) is set to 0. PZD word 1 is word 4 of the PLC data area if parameter PT297 (see above) is set to 3 (words 1, 2, and 3 are PKW words).

The same concepts apply to the Speed Setpoint signal. In order to control the Speed Setpoint from the Z2006 serial port of the drive (communicating by USS protocol to the FIM) parameter PT150 must be set to TBSP Ref. 1. This sets the source of the Speed Setpoint to PZD word 2 of the telegrams on the Z2006 serial port (USS).

After PT183 is set to TBSP Cntl WD1.14, Figure 3-40 describes the function of each control bit in PZD word 1 of the information sent to the Z2006.

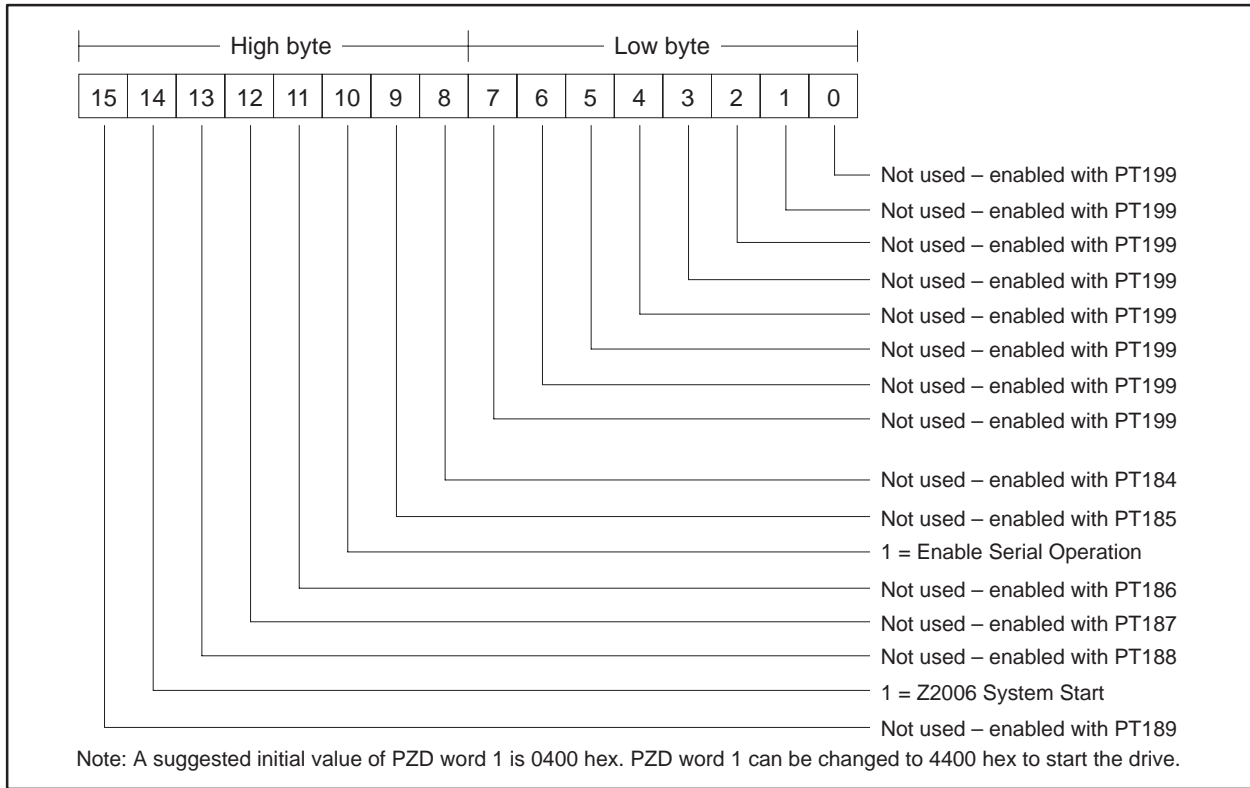


Figure 3-40 Control Bits for Start/Stop and Speed Setpoint

Also, drive status and feedback (or actual value) information such as motor speed must be set (parameterized) to the appropriate destination in order to be read by the FIM Module. Appendix B of the Z2006 Instruction Book also explains the details.

Setting Up and Wiring Z2006 (continued)

The following example describes how to access the Serial Port Status Word 1 and Speed Feedback from the FIM:

On a Factory Default Z2006, the serial port status word 1 is set up, but the actual values return information words are set to zero. The serial port status word 1 will be automatically returned in PZD word 1 of the telegrams on serial port 0 (USS). PZD word 1 is word 1 of the PLC data area if parameter PT297 (see above) is set to 0. PZD word 1 is word 4 of the PLC data area if parameter PT297 (see above) is set to 3 (words 1, 2, and 3 are PKW words).

In order to access the Speed Feedback in PZD word 2 from the Z2006 serial port of the drive (communicating by USS protocol to the FIM), parameter PT263 must be set to PT007 SpdActVal. This selects what will be returned in PZD word 2 of the telegrams on the Z2006 serial port (USS).

Figure 3-41 describes the function of each status bit in PZD word 1 of the return information from the Z2006.

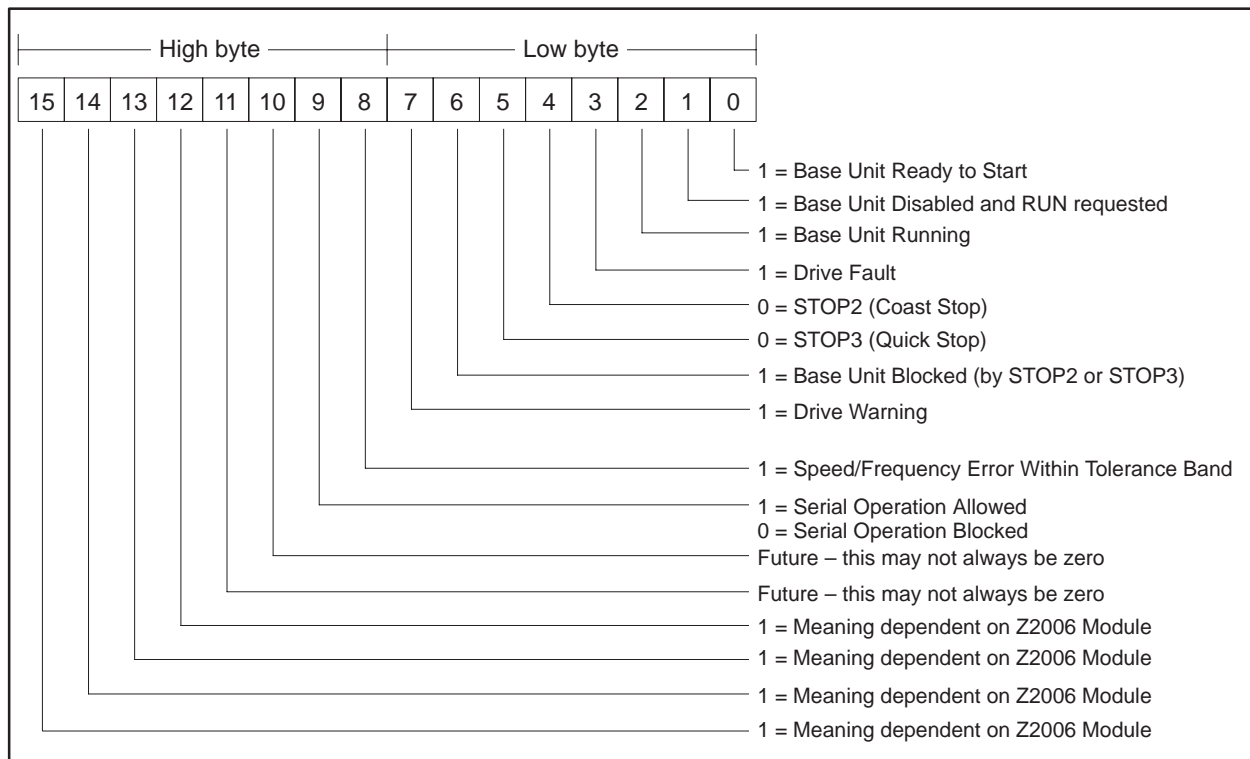


Figure 3-41 Status Bits for Serial Port Status Word 1 and Speed Feedback

Required Jumpers The Z2006 has no applicable jumpers.

USS Protocols

The 5-word USS protocol implementation used by the FIM allows all five words of data to be manipulated by the Series 505 programmable controller. The 10-word USS protocol implementation used by the FIM allows all ten words of data to be manipulated by the Series 505 programmable controller.

The 5-word (Modified) USS protocol implementation used by the FIM only allows four words of data to be manipulated by the Series 505 programmable controller. The second word of the 5-word (Modified) USS protocol telegram sent to the drives is always set to zero. The second word of the 5-word (Modified) USS protocol received from the drives is not available at the controller.

- The FIM maps the first word sent from the controller into the first word of the 5-word (Modified) USS protocol telegram sent to the drive.
- The FIM always sends a zero as the second word of the 5-word (Modified) USS protocol telegram to the drive.
- The FIM maps the second word sent from the controller into the third word of the 5-word (Modified) USS protocol telegram sent to the drive.
- The FIM maps the third word sent from the controller into the fourth word of the 5-word (Modified) USS protocol telegram sent to the drive.
- The FIM maps the fourth word sent from the controller into the fifth word of the 5-word (Modified) USS protocol telegram sent to the drive.
- A similar technique is used to map the 5-word (Modified) USS protocol reply telegram from the drive into the 4-word reply in the controller.

Setting FIM Additional Delay

Use dipswitch S3 to set the extra delay to 0 milliseconds.

Setting Up and Wiring Z2006 (continued)

Figure 3-42 shows the wiring for all drives except the end of the bus for the SIMOREG Z2006 (6SE12 or 6RA24 Technology Board).

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

If a cable is removed from one of the Z2006 boards at a drive, the RS-485 bus is broken. If a cable must be removed and operation of the bus is required, the two 9-pin connectors of the cables at the disconnect point can be plugged together to continue the bus connection.

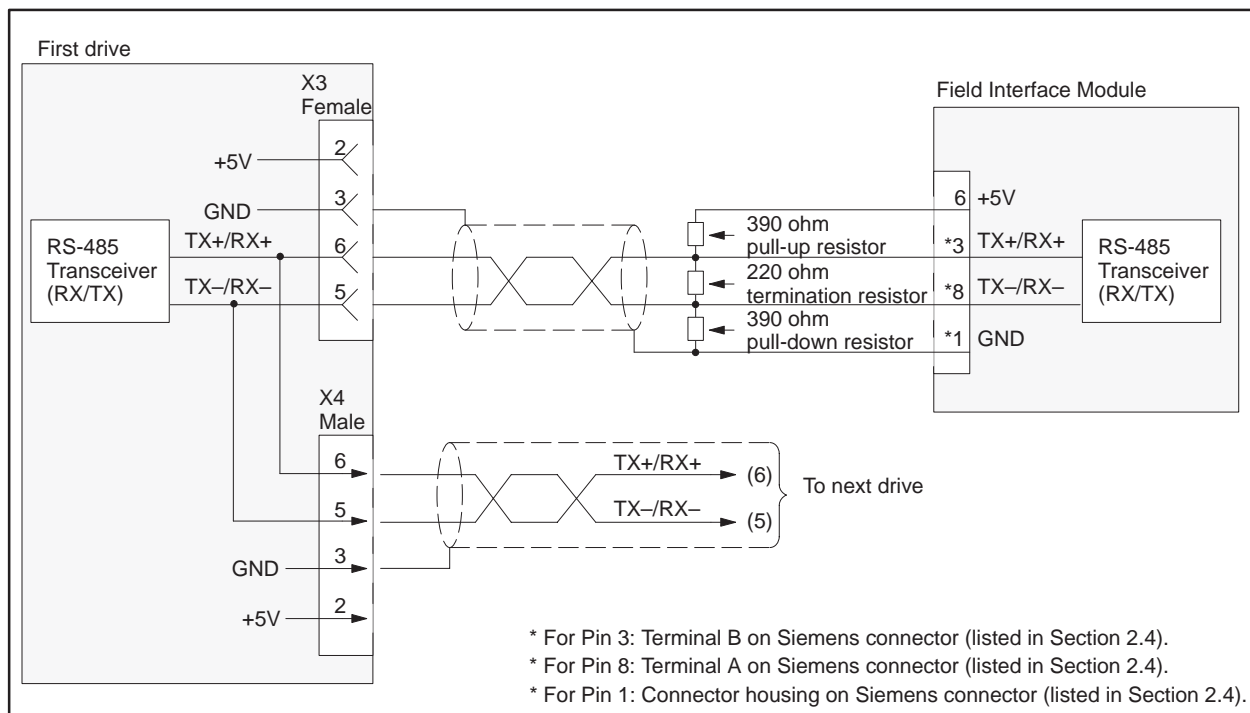


Figure 3-42 Z2006 Wiring: All Drives Except at End of Bus

Figure 3-43 shows the wiring for the drive at the end of the bus for the SIMOREG Z2006 (6SE12 or 6RA24 Technology Board).

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

If a cable is removed from one of the Z2006 boards at a drive, the RS-485 bus is broken. If a cable must be removed and operation of the bus is required, the two 9-pin connectors of the cables at the disconnect point can be plugged together to continue the bus connection.

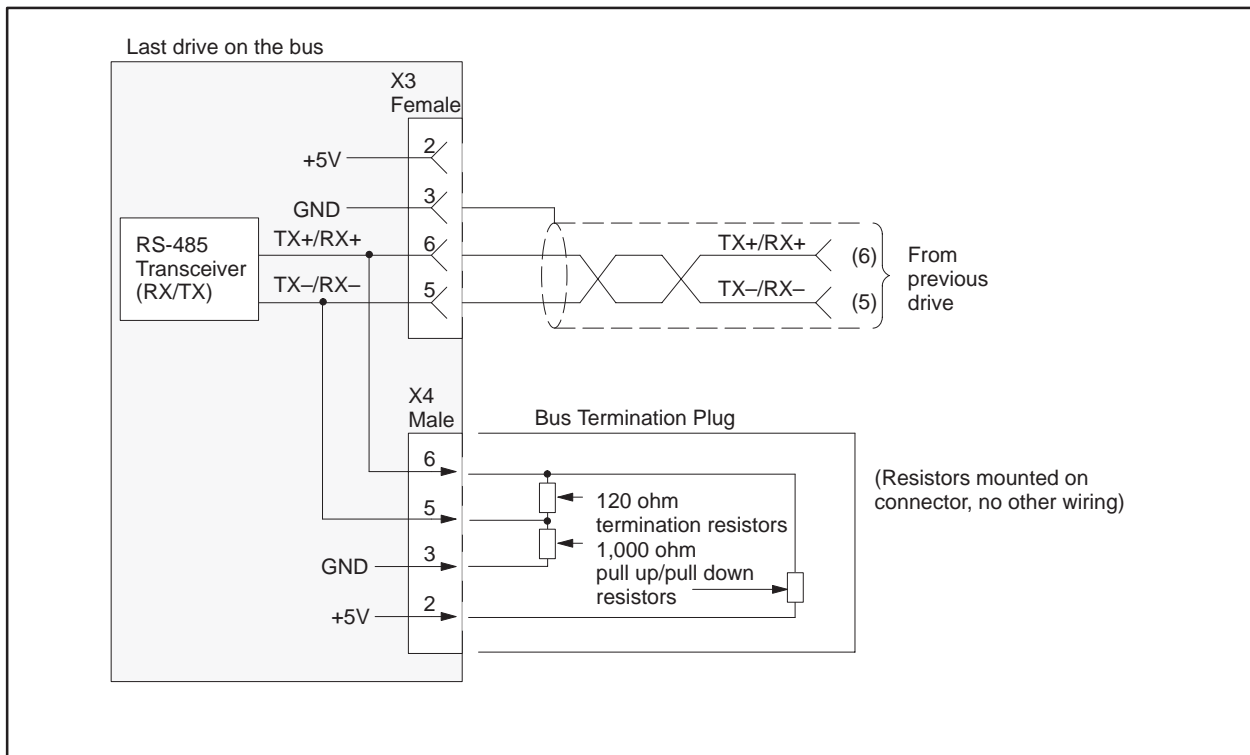


Figure 3-43 Z2006 Wiring: Drive at End of Bus

3.20 Setting Up and Wiring the 6SE70 Models FC and SC

Required Hardware and Software You can use any hardware version of the SIMOREG 6SE70 Master Drive Models FC and SC, and you can use any software version of the base microprocessor board (CU1 or CU3).

Required Parameters The 6SE70 Models FC and SC use the basic converter interface SST1 with USS protocol. Using SST1 assumes that the optional operator panel OP1 is not used; if the optional operator panel is used, you must add the optional serial communications board SCB2. Also note that SST1 is sometimes referred to as SCOM1.

The parameters required for the 6SE70 Models FC and SC follow:

P053 must be set to allow parameters to be changed from the FIM through SST1 (also refer to P685 i001).

P683 i001 must be set to the individual drive address.

P684 i001 is set to 38,400 baud, unless some other drive requires a lower baud rate.

P685 i001 sets the number of PKW words used for parameter data. It is set to either zero, three, or four. The sum of parameters P685 i001 + P686 i001 must be five if 5-word USS protocol is selected on the FIM, or ten if 10-word USS protocol is selected on the FIM.

P686 i001 sets the number of process data (PZD) words. The sum of parameters P685 i001 + P686 i001 must be five if 5-word USS protocol is selected on the FIM, or ten if 10-word USS protocol is selected on the FIM.

P687 i001 is initially set to zero, which turns off the drive telegram-monitoring function. After the network is operating, you can decide whether or not to turn on the drive telegram-monitoring function by setting P687 i001 to a non-zero value.

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

NOTE: Unlike some Siemens variable speed drives, the 6SE70 will not automatically be controlled by serial communications when wired and set up according to this document, it will only communicate. The process data section (also refer to P686 i001) defines the control word, status word, setpoints and actual values for the interface. Definition of the process data section is very flexible. Individual input, output, and control functions must be set (parameterized) for use with serial communications. It is beyond the scope of this document to describe all of the functions and how to set (parameterize) them. Section 4.3 of the 6SE70 Instruction Book describes the control word, status word, setpoints, and actual values structures, and it is imperative that this section be read completely and understood before attempting to control a 6SE70 with a FIM Module.

Setting Up and Wiring the 6SE70 Models FC and SC (continued)

The following example describes how to assign the Stop/Start and Speed Command functions to the FIM:

On a Factory Default 6SE70 Master Drive, these control functions are set to PMU, not serial communications SST1. The PMU is the Parameterization Unit which is the membrane keypad in the front cover of the 6SE70.

In order to control the Start/Stop function from SST1 (the FIM), parameter P554.1 should be set to 2001. This sets the source of the Start/Stop function to bit 0 of PZD word 1 of the telegrams on serial port SST1. PZD word 1 is word 1 of the PLC data area if parameter P685 i001 (see above) is set to 0. PZD word 1 is word 4 of the PLC data area if parameter P685 i001 is set to 3 (words 1, 2, and 3 are PKW words). PZD word 1 is word 5 of the PLC data area if parameter P685 i001 is set to 4 (words 1, 2, 3, and 4 are PKW words). Different values for parameter P554.x must be used if different ports and/or different words in the telegram are used.

The same concepts apply to the Speed Command (or Setpoint) signal. In order to control the Speed Command function from SST1 (the FIM), parameter P443.x must be set to 2002. This sets the source of the Speed Command function to word 2 of the incoming telegrams on serial port SST1. Different values for parameter P443.x must be used if different ports and/or different words in the telegram are used.

After P554.1 is set to 2001, Figure 3-44 describes the function of each control bit in PZD word 1 of the information sent to serial port SST1.

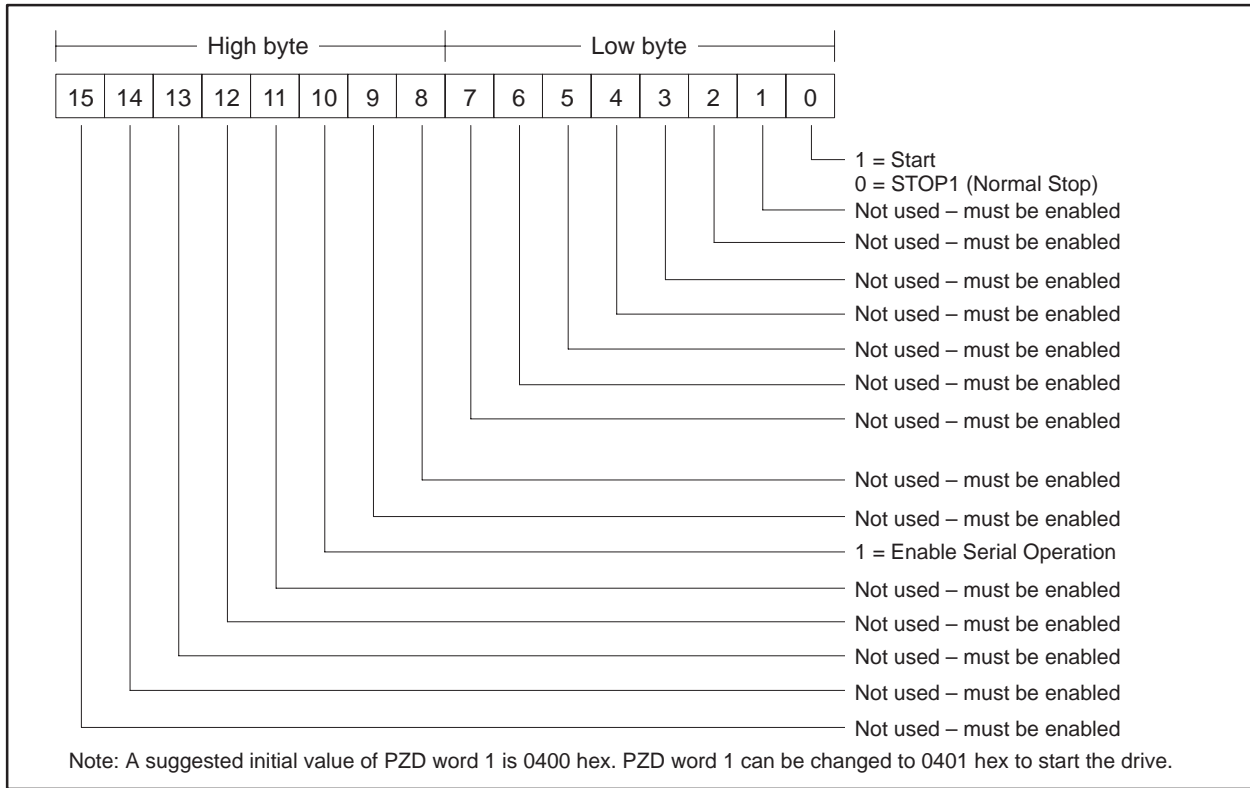


Figure 3-44 Control Bits for Stop/Start and Speed Command

The same technique must be applied to all functions such as Forward/Reverse, Fault Reset, and all other functions that are to be controlled by the FIM.

Also, drive status and feedback (or actual value) information such as motor speed and other information must be set (parameterized) to the appropriate destination in order to be read by the FIM Module. Section 4.3 of the 6SE70 Instruction Book also explains the details.

Setting Up and Wiring the 6SE70 Models FC and SC (continued)

The following example describes how to access the Status Word 1 and Main Setpoint from the FIM:

On a Factory Default 6SE70 Master Drive, the actual values return information words are set to 0. In order to access the standard status word from SST1 (the FIM), parameter P680.1 must be set to 968. This selects what will be returned in PZD word 1 of the telegrams on serial port SST1. PZD word 1 is word 1 of the PLC data area if parameter P685 i001 (see above) is set to 0. PZD word 1 is word 4 of the PLC data area if parameter P685 i001 is set to 3 (words 1, 2, and 3 are PKW words). PZD word 1 is word 5 of the PLC data area if parameter P685 i001 is set to 4 (words 1, 2, 3, and 4 are PKW words).

The same concepts apply to access the Main Setpoint in PZD word 2 from serial port SST1, parameter P680.2 must be set to 447. This selects what will be returned in PZD word 2 of the telegrams on the serial port SST1.

Figure 3-45 describes the function of each status bit in PZD word 1 of the return information from the SST1 port.

Setting Up and Wiring the 6SE70 Models FC and SC (continued)

Required Jumpers The 6SE70 Master Drive Models FC and SC have no applicable jumpers.

Required Switches The applicable switches follow:

- S1.1 Figure 3-46 and Figure 3-47 show the correct positions of this hook switch.
- S1.2 Figure 3-46 and Figure 3-47 show the correct positions of this hook switch.

Figure 3-46 shows the wiring for all drives except the end of the bus for the 6SE70 Master Drive Models FC and SC.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

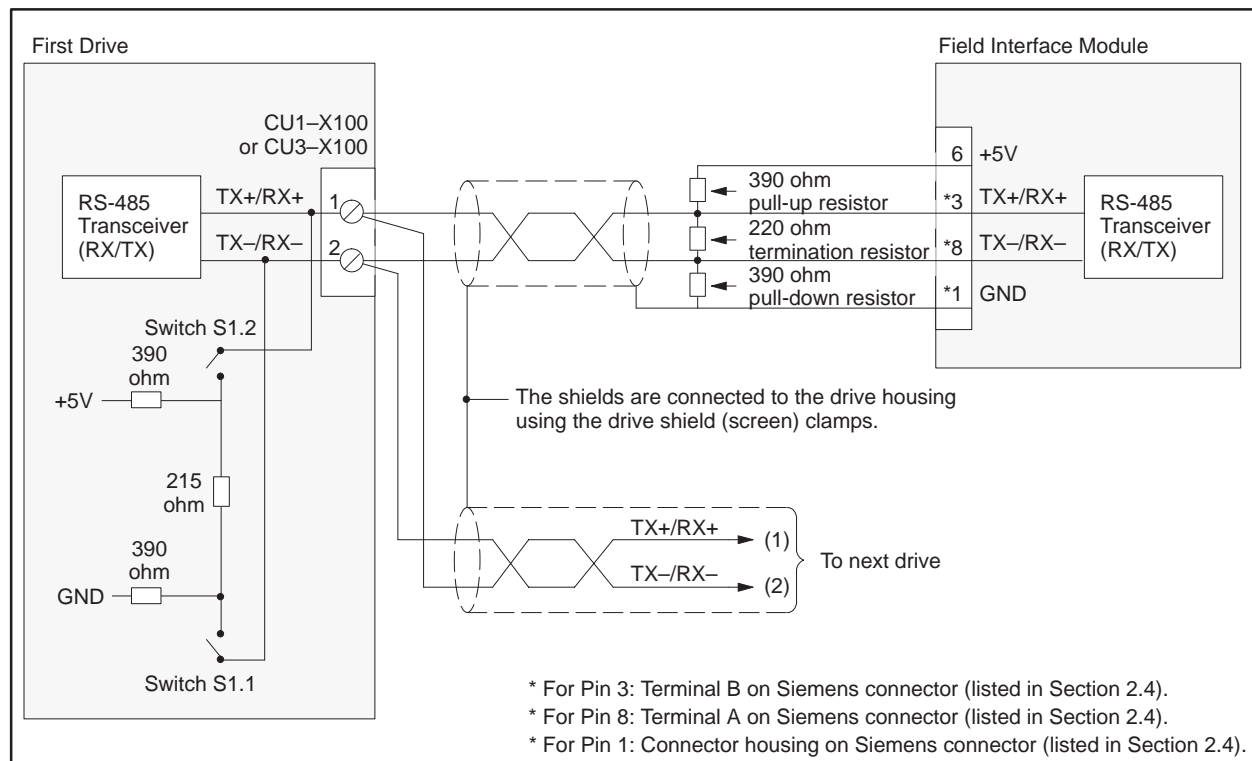


Figure 3-46 Master Drive Models FC and SC Wiring: All Drives Except End of Bus

Figure 3-47 shows the wiring for the drive at the end of the bus for the Master Drive Models FC and SC.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

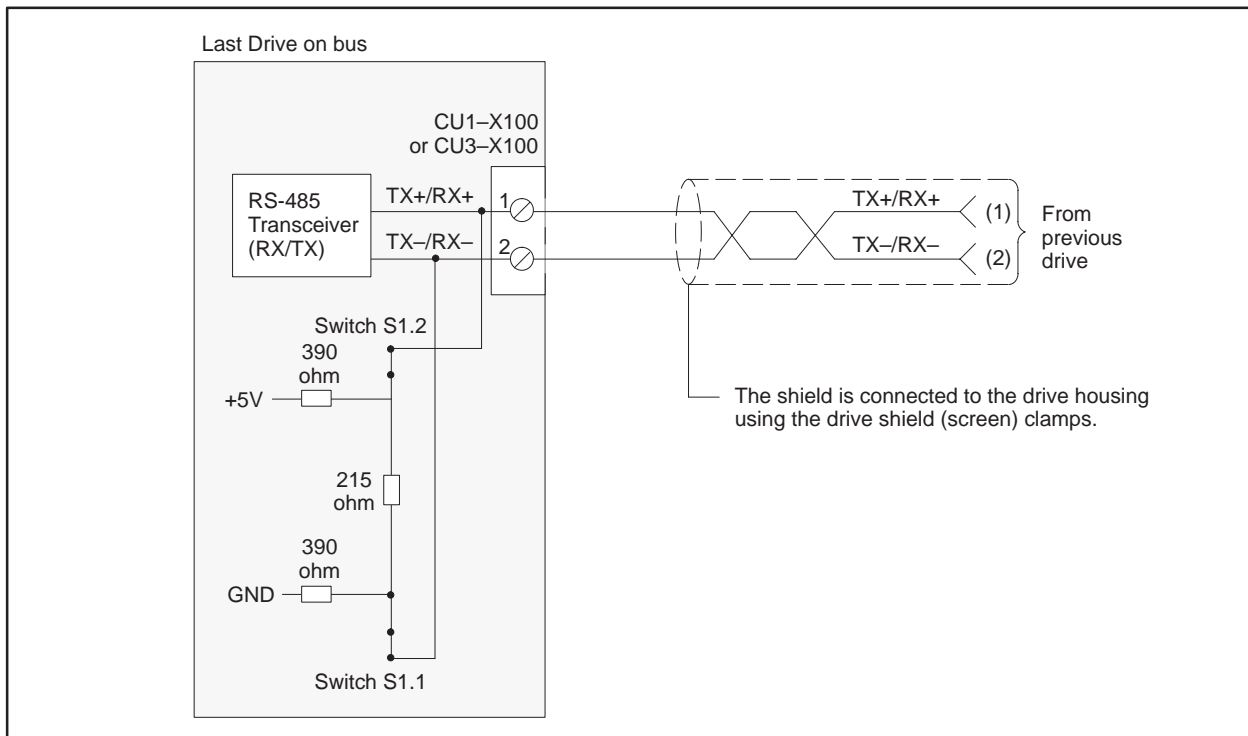


Figure 3-47 Master Drive Models FC and SC Wiring: Drive at End of Bus

USS Protocols

The 5-word USS protocol implementation used by the FIM allows all five words of data to be manipulated by the Series 505 controller; the 10-word USS protocol implementation used by the FIM allows all ten words of data to be manipulated by the Series 505 controller.

The 5-word modified USS protocol implementation used by the FIM only allows four words of data to be manipulated by the Series 505 controller. Do not use the 5-word modified USS protocol implementation with the 6SE70.

Setting FIM Additional Delay

Use dipswitch S3 to set the extra delay to 14 milliseconds for the SC model. Use dipswitch S3 to set the extra delay to 28 milliseconds for the FC model.

3.21 Setting Up and Wiring the 6SE70 Model VC

Required Hardware and Software You can use any hardware version of the 6SE70 Master Drive Model VC, and any software version of the base microprocessor board (CU2).

Required Parameters The 6SE70 Model VC uses the basic converter interface SST2 with the USS protocol.

If you wish to use the SST2 interface (also referred to as SCo2 in the *6SE70 Instruction Book*) with any device other than the 6SE70 Master Drive, you must add the optional Serial Communication Board SCB2.

P053 must be set to allow parameters to be changed from the FIM through SST2 (also refer to P685 i003).

P683 i003 must be set to the individual drive address.

P684 i003 is normally set to 38,400 baud, unless some other drive requires a lower baud rate.

P685 i003 sets the number of PKW words used for parameter data. Set it to either zero, three, or four. The sum of parameters P685 i003 + P686 i003 must be five if 5-word USS protocol is selected on the FIM, or ten if 10-word USS protocol is selected on the FIM.

P686 i003 sets the number of process data (PZD) words. The sum of parameters P685 i003 + P686 i003 must be five if 5-word USS protocol is selected on the FIM, or ten if 10-word USS protocol is selected on the FIM.

P687 i003 is initially set to zero, which turns off the drive telegram-monitoring function. After the network is operating, decide whether or not to turn on the drive telegram-monitoring function by setting P687 i003 to a non-zero value.

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

NOTE: Unlike some Siemens variable speed drives, the 6SE70 will not automatically be controlled by serial communications when wired and set up according to this document, it will only communicate. The process data section (also refer to P686 i003) defines the control word, status word, setpoints and actual values for the interface. Definition of the process data section is very flexible. Individual input, output, and control functions must be set (parameterized) for use with serial communications. It is beyond the scope of this document to describe all of the functions and how to set (parameterize) them. Section 4.3 of the 6SE70 Instruction Book describes the control word, status word, setpoints, and actual values structures, and it is imperative that this section be read completely and understood before attempting to control a 6SE70 with a FIM Module.

Setting Up and Wiring the 6SE70 Model VC (continued)

The following example describes how to assign the Stop/Start and Speed Command functions to the FIM:

On a Factory Default 6SE70 Master Drive, these control functions are set to PMU, not to serial communications SST2. The PMU is the Parameterization Unit which is the membrane keypad in the front cover of the 6SE70.

In order to control the Start/Stop function from SST2 (the FIM), parameter P554.1 should be set to 6001. This sets the source of the Start/Stop function to bit 0 of PZD word 1 of the telegrams on serial port SST2. PZD word 1 is word 1 of the PLC data area if parameter P685 i003 (see above) is set to 0. PZD word 1 is word 4 of the PLC data area if parameter P685 i003 is set to 3 (words 1, 2, and 3 are PKW words). PZD word 1 is word 5 of the PLC data area if parameter P685 i003 is set to 4 (words 1, 2, 3, and 4 are PKW words). Different values for parameter P554.x must be used if different ports and/or different words in the telegram are used.

The same concepts apply to the Speed Command (or Setpoint) signal. In order to control the Speed Command function from SST2 (the FIM), parameter P443.x must be set to 6002. This sets the source of the Speed Command function to word 2 of the incoming telegrams on serial port SST1. Different values for parameter P443.x must be used if different ports and/or different words in the telegram are used.

After P554.1 is set to 6001, Figure 3-48 describes the function of each control bit in PZD word 1 of the information sent to serial port SST2.

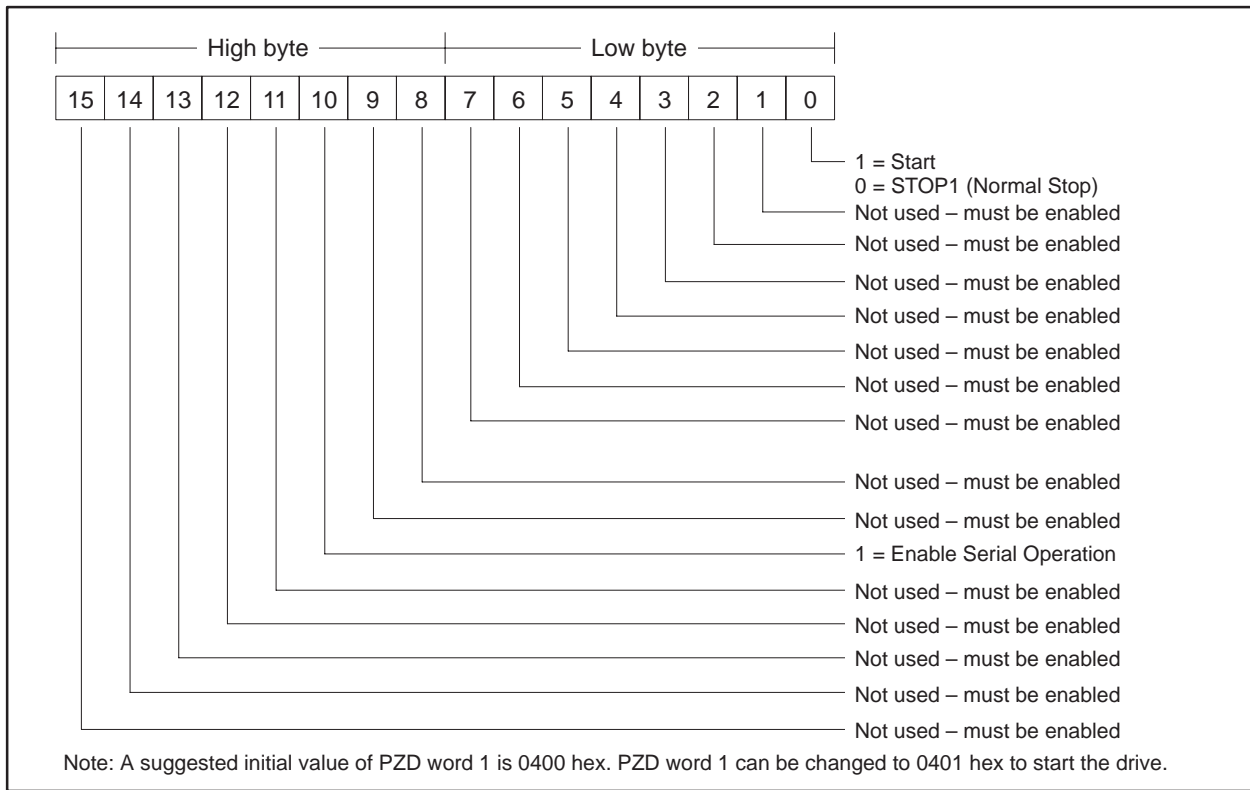


Figure 3-48 Control Bits for Stop/Start and Speed Command

The same technique must be applied to all functions such as Forward/Reverse, Fault Reset, and all other functions that are to be controlled by the FIM.

Also, drive status and feedback (or actual value) information such as motor speed and other information must be set (parameterized) to the appropriate destination in order to be read by the FIM Module. Section 4.3 of the 6SE70 Instruction Book also explains the details.

Setting Up and Wiring the 6SE70 Model VC (continued)

The following example describes how to access the Status Word 1 and Main Setpoint from the FIM:

On a Factory Default 6SE70 Master Drive, the actual values return information words are set to 0. In order to access the standard status word from SST2 (the FIM), parameter P681.1 must be set to 968. This selects what will be returned in PZD word 1 of the telegrams on serial port SST2. PZD word 1 is word 1 of the PLC data area if parameter P685 i003 (see above) is set to 0. PZD word 1 is word 4 of the PLC data area if parameter P685 i003 is set to 3 (words 1, 2, and 3 are PKW words). PZD word 1 is word 5 of the PLC data area if parameter P685 i003 is set to 4 (words 1, 2, 3, and 4 are PKW words).

The same concepts apply to access the Main Setpoint in PZD word 2 from serial port SST2, parameter P681.2 must be set to 447. This selects what will be returned in PZD word 2 of the telegrams on the serial port SST2.

Figure 3-49 describes the function of each status bit in PZD word 1 of the return information from the SST2 port.

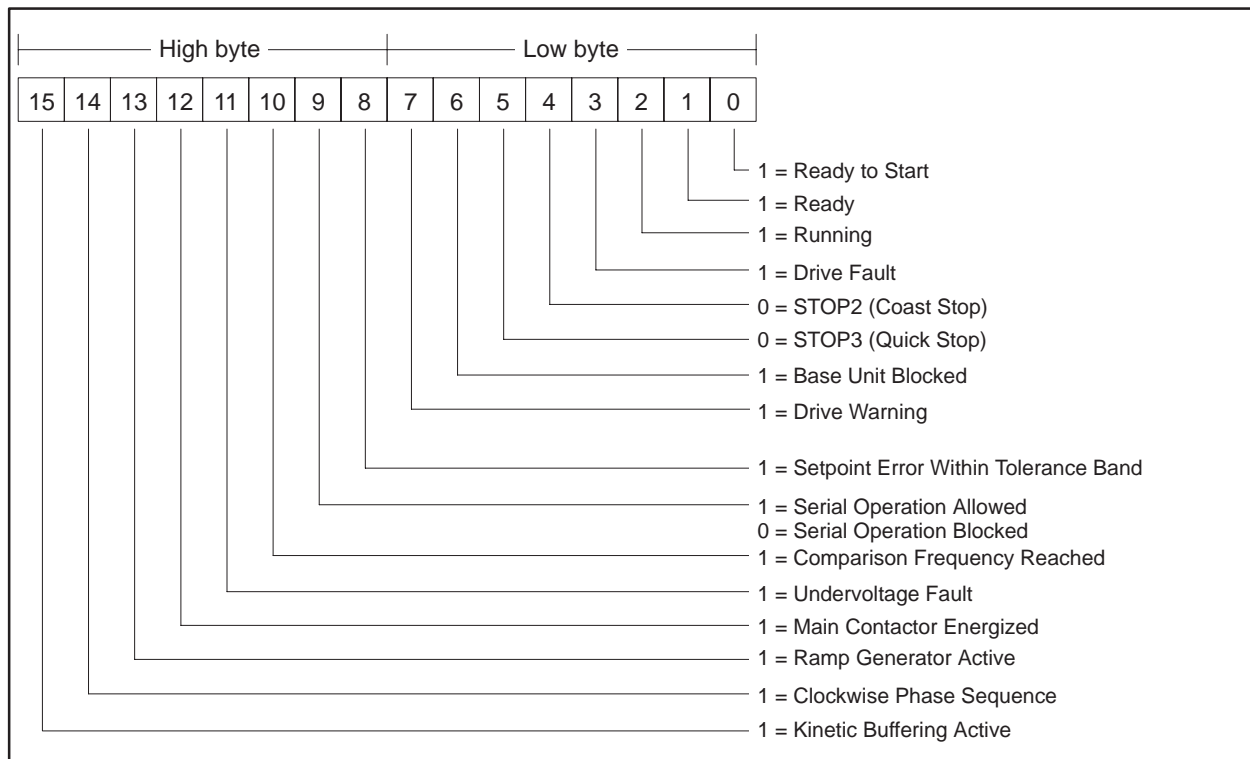


Figure 3-49 Status Bits for Status Word 1 and Main Setpoint

Required Switches	<p>The applicable switches follow:</p> <ul style="list-style-type: none">S2.1 Figure 3-50 and Figure 3-51 show the correct position of this hook switch.S2.2 Figure 3-50 and Figure 3-51 show the correct position of this hook switch.
USS Protocols	<p>The 5-word USS protocol implementation used by the FIM allows all five words of data to be manipulated by the Series 505 controller. The 10-word USS protocol implementation used by the FIM allows all ten words of data to be manipulated by the Series 505 controller.</p> <p>The 5-word (modified) USS protocol implementation used by the FIM only allows four words of data to be manipulated by the Series 505 controller. Do not use the five-word (modified) USS protocol implementation with the 6SE70.</p>
FIM Additional Delay Set by Dipswitch S3	<p>Use dipswitch S3 to set the extra delay to 14 milliseconds.</p>

Setting Up and Wiring the 6SE70 Model VC (continued)

Figure 3-50 shows the wiring for all drives except the end of the bus for the 6SE70 Master Drive Model VC.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

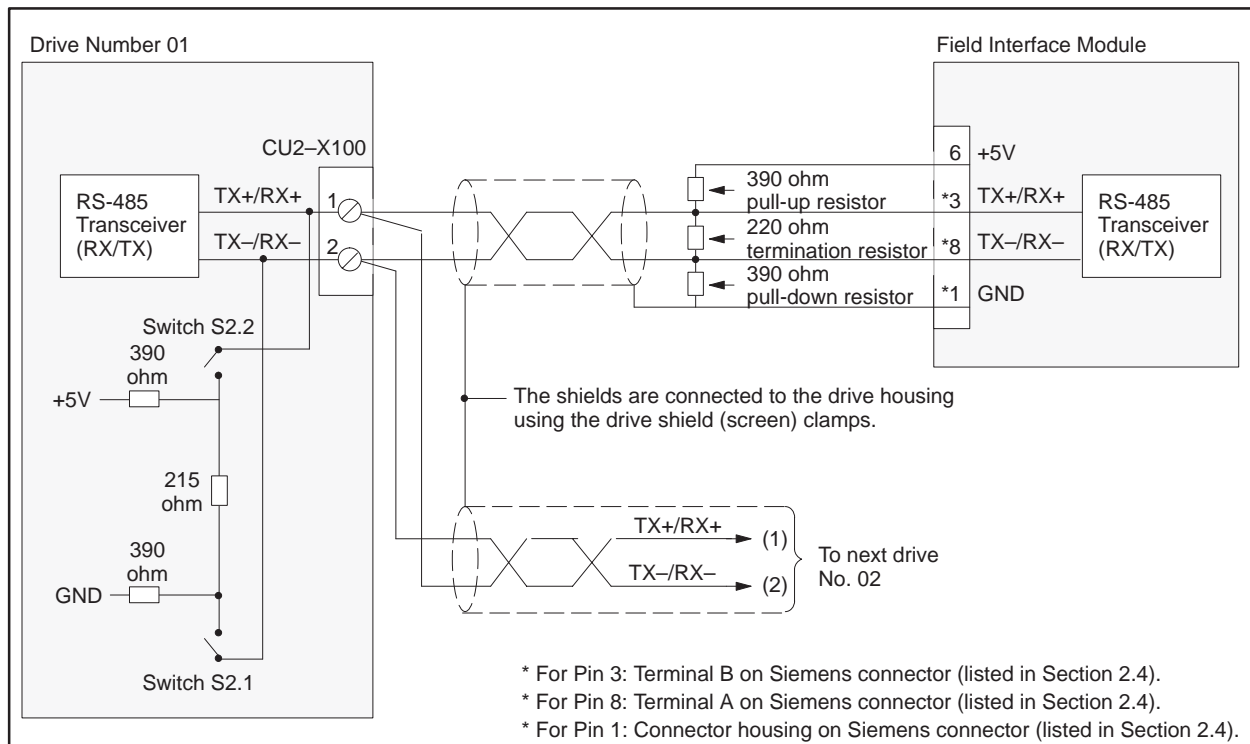


Figure 3-50 6SE70 Master Drive Model VC Wiring: All Drives Except End of Bus

Figure 3-51 shows the wiring for the drive at the end of the bus for the 6SE70 Master Drive Model VC.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

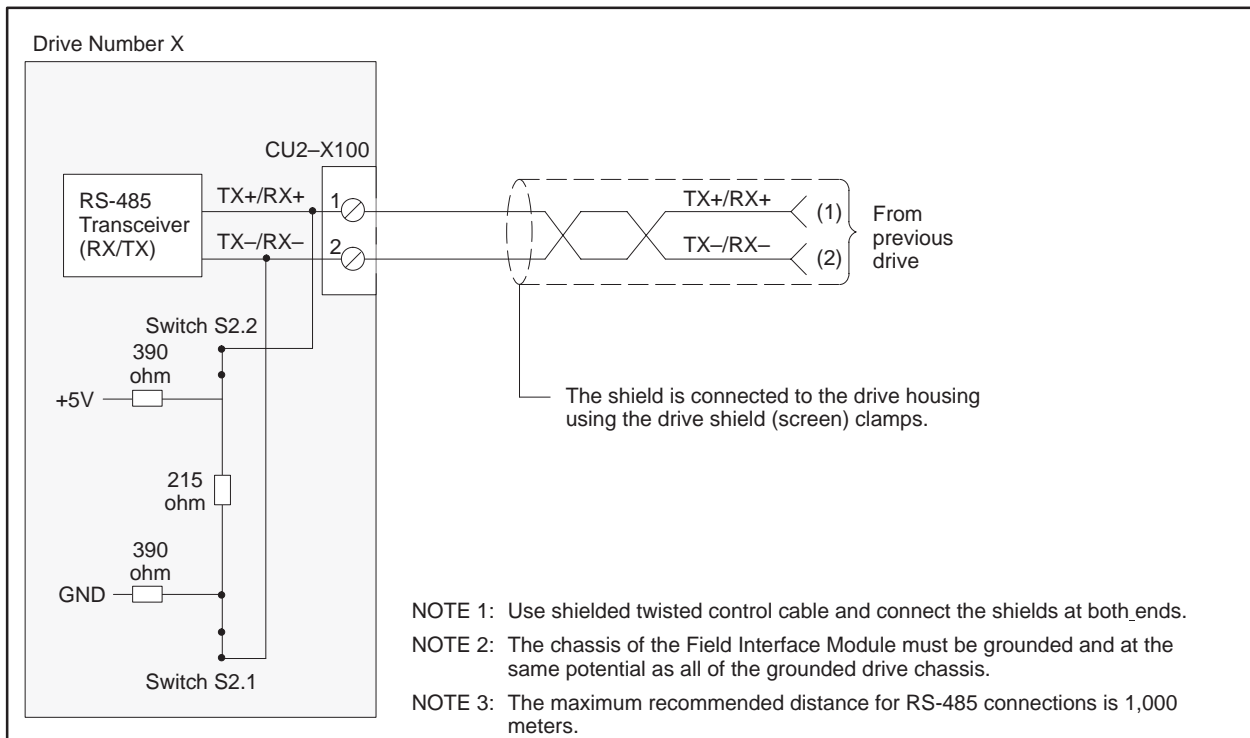


Figure 3-51 6SE70 Master Drive Model VC Wiring: Drive at End of Bus

3.22 Setting Up and Wiring the SCB2

Required Hardware and Software You can use any hardware version of the 6SE70. You can use any software version of the base microprocessor board (CU1, CU2, or CU3) and you can use any software version of the SCB2 Master Drive Serial Communications Board.

Required Parameters The serial interface on the SCB2 uses USS Protocol. Select USS Protocol with P682 for this serial interface, which is called SCB-SST [USS].

P053 must be set to allow parameters to be changed from the FIM through SCB with USS (also refer to P685 i002).

P090 or P091 must be set depending on the SCB2 hardware slot.

P682 must be set to two-wire USS.

P683 i002 must be set to the individual drive address.

P684 i002 is normally set to 38,400 baud, unless some other drive requires a lower baud rate.

P685 i002 sets the number of PKW words used for parameter data. Set it to either zero or three. The sum of parameters P685 i002 + P686 i002 must be five if 5-word USS protocol is selected on the FIM, or ten if 10-word USS protocol is selected on the FIM.

P686 i002 sets the number of process data (PZD) words. The sum of parameters P685 i002 + P686 i002 must be five if 5-word USS protocol is selected on the FIM, or ten if 10-word USS protocol is selected on the FIM.

P687 i002 is initially set to zero, which turns off the drive telegram-monitoring function. After the network is operating, decide whether to turn on the drive telegram-monitoring function by setting P687 i002 to a non-zero value.

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

NOTE: Unlike some Siemens variable speed drives, the 6SE70 will not automatically be controlled by serial communications when wired and set up according to this document, it will only communicate. The process data section (also refer to P686 i002) defines the control word, status word, setpoints and actual values for the interface. Definition of the process data section is very flexible. Individual input, output, and control functions must be set (parameterized) for use with serial communications. It is beyond the scope of this document to describe all of the functions and how to set (parameterize) them. Section 4.3 of the 6SE70 Instruction Book describes the control word, status word, setpoints, and actual values structures, and it is imperative that this section be read completely and understood before attempting to control a 6SE70 with a FIM Module.

Setting Up and Wiring the SCB2 (continued)

The following example describes how to assign the Stop/Start and Speed Command functions to the FIM:

On a Factory Default 6SE70 Master Drive, these control functions are set to PMU, not serial communications SST1. The PMU is the Parameterization Unit which is the membrane keypad in the front cover of the 6SE70.

In order to control the Start/Stop function from SCB-SST of the drive (communicating by USS protocol to the FIM), parameter P554.1 should be set to 4501. This sets the source of the Start/Stop function to bit 0 of PZD word 1 of the telegrams on serial port SCB-SST (USS). PZD word 1 is word 1 of the PLC data area if parameter P685 i002 (see above) is set to 0. PZD word 1 is word 4 of the PLC data area if parameter P685 i002 is set to 3 (words 1, 2, and 3 are PKW words). PZD word 1 is word 5 of the PLC data area if parameter P685 i002 is set to 4 (words 1, 2, 3, and 4 are PKW words). Different values for parameter P554.x must be used if different ports and/or different words in the telegram are used.

The same concepts apply to the Speed Command (or Setpoint) signal. In order to control the Speed Command function from SCB-SST of the drive (communicating by USS protocol to the FIM), parameter P443.x must be set to 4502. This sets the source of the Speed Command function to word 2 of the incoming telegrams on serial port SCB-SST (USS). Different values for parameter P443.x must be used if different ports and/or different words in the telegram are used.

After P554.1 is set to 4501, Figure 3-52 describes the function of each control bit in PZD word 1 of the information sent to serial port SCB-SST (USS).

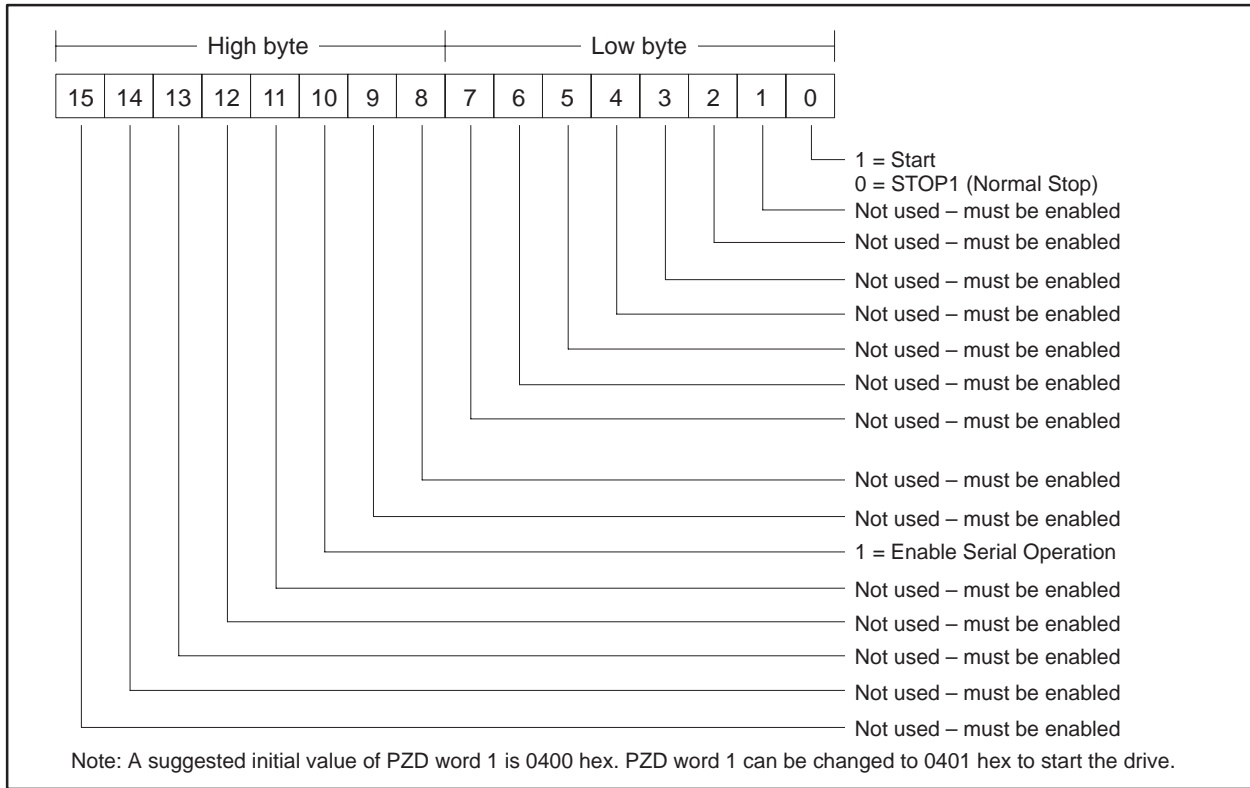


Figure 3-52 Control Bits for Stop/Start and Speed Command

The same technique must be applied to all functions such as Forward/Reverse, Fault Reset, and all other functions that are to be controlled by the FIM.

Also, drive status and feedback (or actual value) information such as motor speed must be set (parameterized) to the appropriate destination in order to be read by the FIM Module. Section 4.3 of the 6SE70 Instruction Book also explains the details.

Setting Up and Wiring the SCB2 (continued)

The following example describes how to access the Status Word 1 and Main Setpoint from the FIM:

On a Factory Default 6SE70 Master Drive, the actual values return information words are set to 0. In order to access the standard status word from SST1 (the FIM), parameter P690.1 must be set to 968. This selects what will be returned in PZD word 1 of the telegrams on serial port SST1. PZD word 1 is word 1 of the PLC data area if parameter P685 i002 (see above) is set to 0. PZD word 1 is word 4 of the PLC data area if parameter P685 i002 is set to 3 (words 1, 2, and 3 are PKW words). PZD word 1 is word 5 of the PLC data area if parameter P685 i002 is set to 4 (words 1, 2, 3, and 4 are PKW words).

The same concepts apply to access the Main Setpoint in PZD word 2 from serial port SST1, parameter P690.2 must be set to 447. This selects what will be returned in PZD word 2 of the telegrams on the serial port SST1.

Figure 3-53 describes the function of each status bit in PZD word 1 of the return information from the SST1 port.

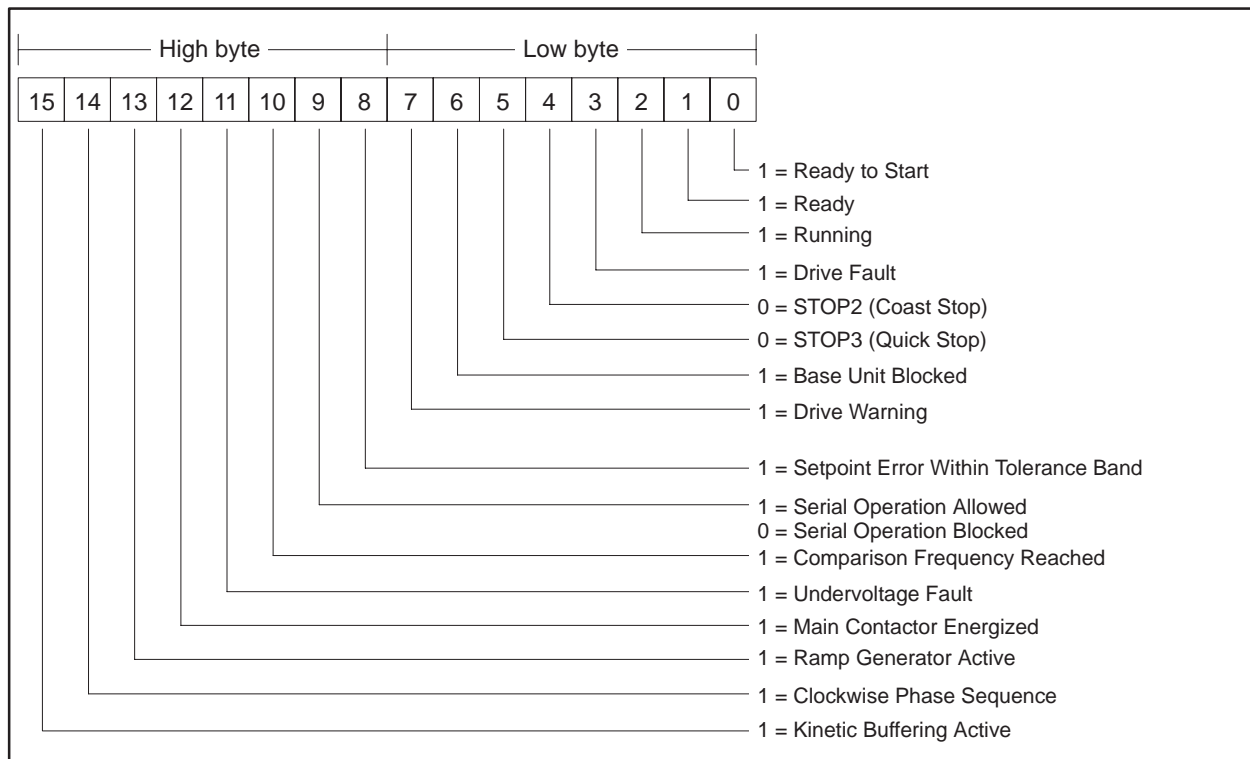


Figure 3-53 Status Bits for Status Word 1 and Main Setpoint

Required Switches

The applicable switches follow:

- S1.1 Figure 3-54 and Figure 3-55 show the correct position of this hook switch.
- S1.2 Figure 3-54 and Figure 3-55 show the correct position of this hook switch.

USS Protocols

The 5-word USS protocol implementation used by the FIM allows all five words of data to be manipulated by the Series 505 controller. The 10-word USS protocol implementation used by the FIM allows all ten words of data to be manipulated by the Series 505 controller.

The 5-word (modified) USS protocol implementation used by the FIM only allows four words of data to be manipulated by the Series 505 controller. Do not use the 5-word modified USS protocol implementation with the 6SE70.

**Setting FIM
Additional Delay**

Use dipswitch S3 to set the extra delay to 0 milliseconds.

Setting Up and Wiring the SCB2 (continued)

Figure 3-54 shows the wiring for all drives except the end of the bus for the SCB2 Master Drive Serial Communications Board.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

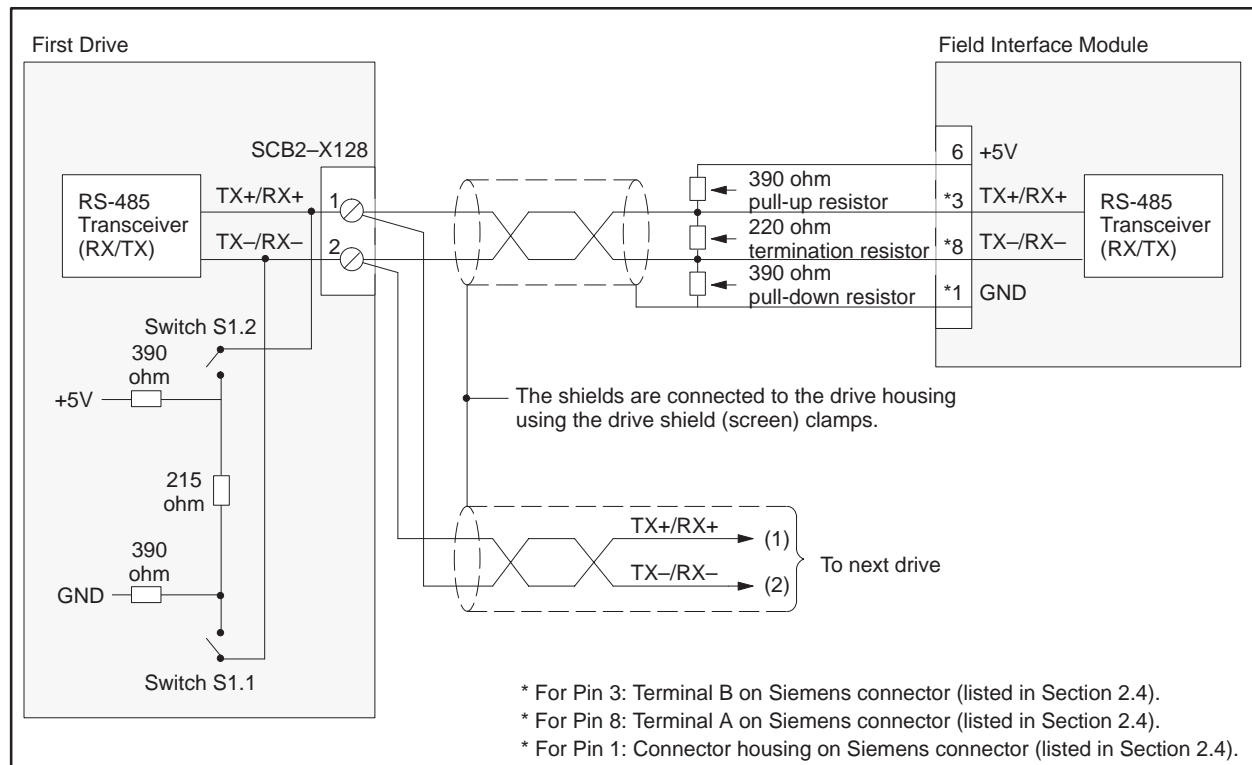


Figure 3-54 SCB2 Wiring: All Drives Except End of Bus

Figure 3-55 shows the wiring for the drive at the end of the bus for the SCB2 Master Drive Serial Communications Board.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for RS-485 connections.

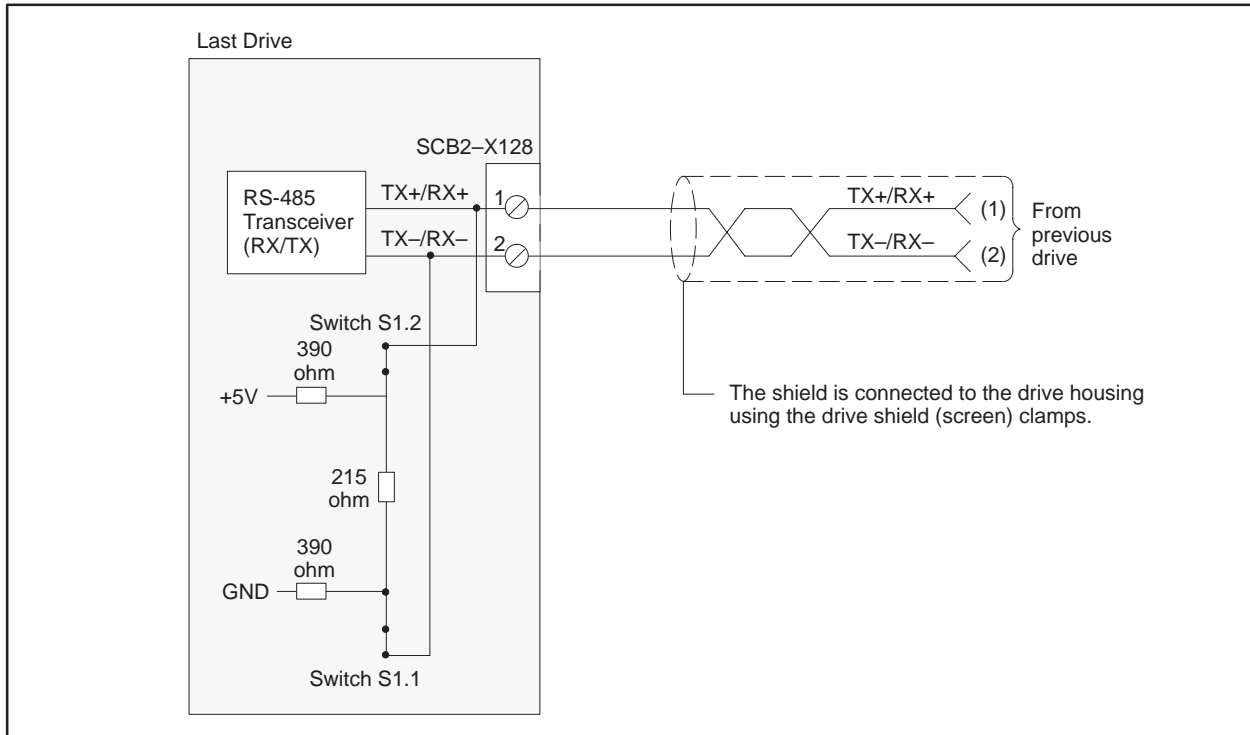


Figure 3-55 SCB2 Wiring: Drive at End of Bus

PROFIBUS-DP Interface Application

4.1	Overview	4-4
	Features	4-4
	System Layout	4-5
4.2	Up and Running	4-6
	Overview	4-6
	Setting the FIM's Rotary Switches	4-7
	Setting Dipswitch S3	4-8
	Connecting the PROFIBUS-DP I/O Link	4-9
	Installing RS-485	4-10
	Connecting the FIM to the Controller	4-11
	Configuring the Programmable Controller	4-12
	Slave Address Range Selection	4-13
4.3	Token Passing	4-14
	Passing the Token	4-14
4.4	FIM I/O Update Scan	4-16
	FIM I/O Update Scan	4-16
	System Error Handling	4-16
4.5	Configuring Slaves	4-17
	Configuring Slaves	4-17
	Configuration Example 1	4-18
	Configuration Example 2	4-20
4.6	Configuring by Byte Matching	4-23
	Using Byte Match Configuration	4-23
	Procedure for Byte Matching Input Points	4-24
	Procedure for Byte Matching Output Points	4-25
	Byte Matching Configuration Example 1	4-26
	Byte Matching Configuration Example 2	4-27
	Byte Matching Configuration Example 3	4-28
	Byte Matching Configuration Data Positioning	4-30
	Byte Matching Input Points	4-32
	Overmapping Word Input Points	4-32
	Overmapping Discrete Input Points	4-34
	Byte Matching Output Points	4-36
	Overmapping Word Output Points	4-36
	Overmapping Discrete Output Points	4-38
4.7	FIM PROFIBUS-DP I/O Cable Specifications	4-40
	PROFIBUS Cable and Connector Specifications	4-40
	PROFIBUS Cable and Connector Order Numbers	4-41

4.8	Troubleshooting	4-42
	The MOD GOOD LED Is Off—What's Wrong?	4-42
	The COMM LED Is Off—What's Wrong?	4-43
	The CFG LED Is Off—What's Wrong?	4-44
	The CFG LED Is Blinking—What's Wrong?	4-45
	The CFG LED Is On, But Blinks Periodically—What's Wrong?	4-46
	Checking the Operation of the Module	4-47
	Technical Assistance	4-48
4.9	Introducing the PROFIBUS-DP Configurator	4-49
	Overview	4-49
	When to Use the PROFIBUS-DP Configurator	4-52
	Hardware Requirements	4-54
4.10	Installation and Cabling	4-55
	Task Overview: Running the PROFIBUS-DP Configurator	4-55
	Installing the Configurator File on Your PC	4-56
	Creating an Icon in Windows	4-57
	Setting Up the PC-to-FIM Connection	4-58
4.11	File Configuration	4-61
	Configuration File Screen Area	4-61
4.12	FIM Operations	4-64
	FIM Operations Screen Area	4-64
	Troubleshooting Parameter Table Errors	4-65
	FIM Setups Dialog Box	4-66
4.13	Slave Operations	4-68
	Slave Operations Screen Area	4-68
	Edit Slave Dialog Box	4-69
	Edit I/O Configuration Dialog Box	4-73
	Edit User Specified Parameter Data Dialog Box	4-74
	Example: User Parameter Data	4-75
4.14	Status and Diagnostics	4-76
	Checking Slave Status with the Status Button	4-76
	Using Slave Diagnostics	4-77
	Diagnostic Location Example: ET 200B	4-78
	Diagnostic Location Example: ET 200U	4-79
4.15	Setting Up and Wiring the 6SE30 PROFIBUS Micromaster Drive	4-80
	Required Hardware and Software	4-80
	Required Parameters	4-80
	Required Switches	4-84

4.16	OPmP PROFIBUS Module for Micro/Midimaster (6SE31) Drives	4-86
	Required Hardware and Software	4-86
	Required Parameters	4-86
	Required Switches	4-90
4.17	Setting Up and Wiring the CB1	4-92
	Required Hardware and Software	4-92
	Required Parameters	4-92
	Required Switches	4-98
4.18	CB24 (SIMOREG 6RA24 Communications Board)	4-100
	Required Hardware and Software	4-100
	Required Parameters	4-100
	Required Switches	4-105
	Byte Order in the Controller	4-105
	External Power Supply	4-105
4.19	CS51 (SIMOREG 6RA24 and SIMOVERT 6SE12 Communications Board)	4-108
	Required Hardware and Software	4-108
	Required Parameters	4-109
	Byte Order in the Controller	4-114
	Required Switches	4-115
	External Power Supply	4-116
4.20	Setting Up and Wiring the SI3	4-118
	Required Hardware and Software	4-118
	Required Parameters	4-118
	Required Jumpers	4-119
	Required Switches	4-120

The FIM PROFIBUS-DP (Distributed Periphery) Interface Application allows the Series 505 programmable logic controllers to interface to the world of PROFIBUS-DP I/O as though each slave were an I/O module in a remote base. The original release of this application was called ET200, because it interfaced to a select group of Siemens AG remote I/O devices in the ET200 family. The new version, FIM 3.0 and later releases, interfaces to all fully compliant PROFIBUS-DP (PROFIBUS norm) devices.

PROFIBUS-DP is a token ring protocol designed to exchange I/O data in a master-to-slave configuration. Remote I/O devices, especially those that are PROFIBUS certified, connect to the FIM as slaves.

The FIM seeks these remote devices (slaves) in the selected address range and reports the existence of these devices to the programmable controller as though they were I/O in a remote base. After you configure the base and assign I/O address points to each slot (or slave), the I/O is automatically updated by the FIM with the I/O from the slave, whether input data and/or output data.

The FIM operates on an RS-485 link at baud rates from 9600 to 1.5M bits per second. The FIM supports most I/O devices that operate on the PROFIBUS-DP standard. The FIM also supports Siemens AG PROFIBUS-DP devices, which operate on an earlier release of PROFIBUS-DP called L2-DP.

Features

The FIM PROFIBUS-DP Interface Application offers the following features.

- It connects up to 16 slave devices for each FIM.
- It allows mapping of configuration points to other I/O point types in order to save I/O point count and/or match unusual arrangements.
- It supports token passing to a programming device.
- It offers user-selectable baud rates from 9600 to 1.5M bits per second.
- It has a user-selectable addressing range on the PROFIBUS network.
- It supports all consistent data requirements of PROFIBUS-DP slaves and submodules.
- It simultaneously supports the new PROFIBUS-DP, Part 3, standard, and the existing Siemens AG ET200 L2-DP I/O. This mixed protocol support is transparent to the user.

For more information on the description, usage, and installation of ET200 products, refer to the *SIMATIC S5 ET200 Distributed I/O System Manual* (PPX:505-8206-x).

System Layout

Figure 4-1 shows an I/O system for three FIMs running the PROFIBUS-DP Interface Application.

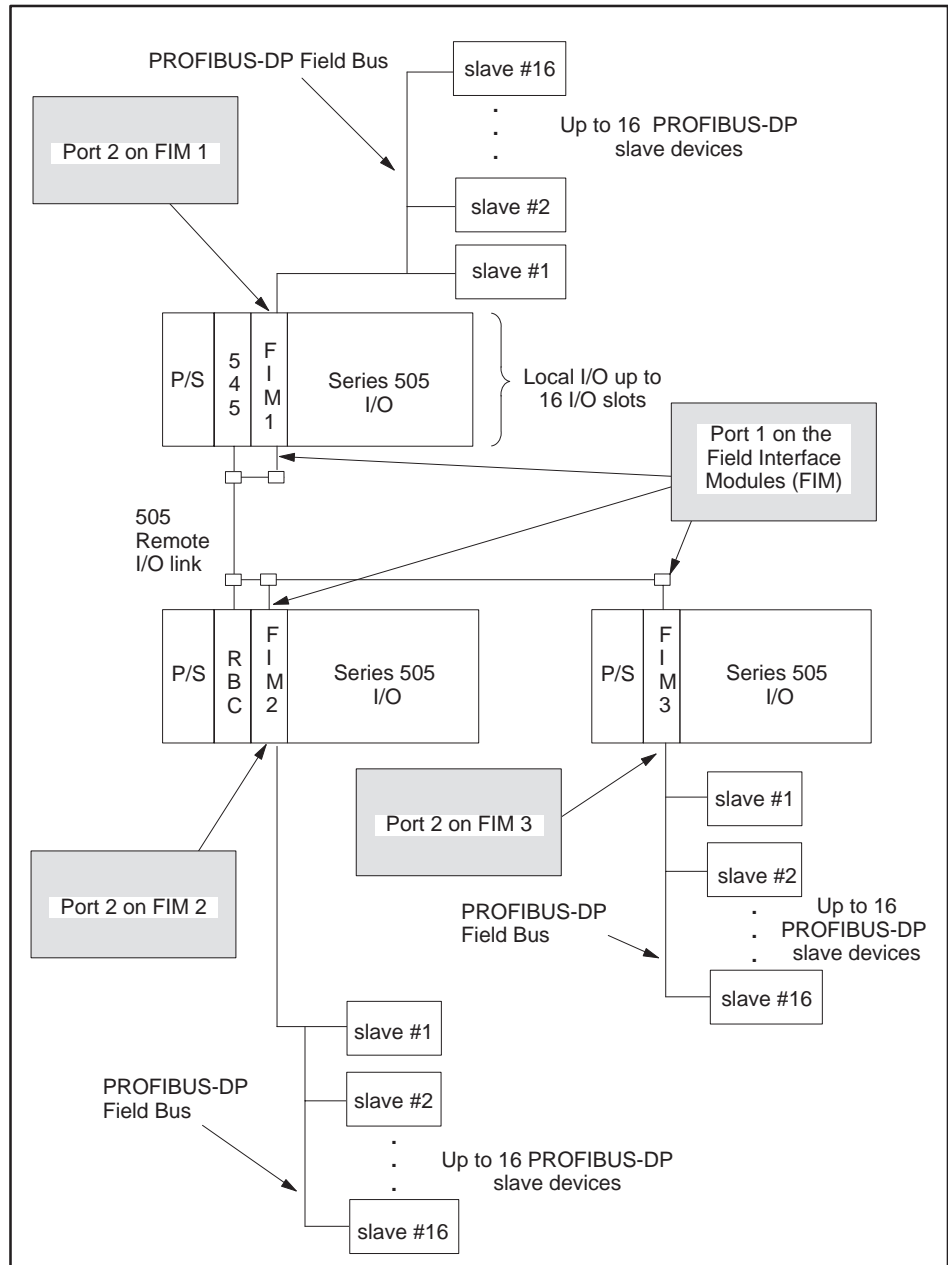


Figure 4-1 I/O System Layout for Three FIMs Running the PROFIBUS-DP Interface Application

4.2 Up and Running

Overview

Connecting the PROFIBUS-DP to the programmable controller requires you to perform the following tasks:

- Set the FIM switches.
- Connect the PROFIBUS-DP I/O link.
- Connect the FIM to the controller.
- Configure the programmable controller.

This section provides a brief description of each of those tasks. If you want more detailed information, refer to the appropriate section later in this chapter.

Setting the FIM's
Rotary Switches

To set the rotary switches on the front of the FIM, follow the steps below.

1. Set SW1 to the base address desired. For example, set SW1 to 1 for base 1, 2 for base 2, etc. Letters A – F correspond to bases 10 – 16.
2. Set SW2 to the proper communication baud rate; refer to Table 4-1.

Table 4-1 SW2 Baud Rate Selection

SW2	Baud Rate
0	1,500,000 bits per second
1	750,000 bits per second *
2	500,000 bits per second
3	375,000 bits per second *
4	187,500 bits per second
5	93,750 bits per second
6	19,200 bits per second
7	9,600 bits per second
8 – F	Reserved

*Not available on all PROFIBUS-DP modules.

NOTE: Baud rates of 750,000 and 375,000 bits per second are not available on all PROFIBUS-DP modules.

If you change the baud rate while your PROFIBUS-DP field bus is running, you must power cycle all of the PROFIBUS-DP distributed stations connected to this module.

3. Set S3-5, S3-6, and S3-7 according to the desired address range selection. Refer to Table 4-2, on page 4-13.
4. Set S3-8 to Closed/On/0 if you do not want token passing, and to Open/Off/1 if you do. Most setups do not require token passing enabled. For more information about token passing, refer to Section 4.3.

Up and Running (continued)

Setting Dipswitch S3

You determine the mode of operation (Application 0 – 15) by setting the S3 dipswitch, as shown in Figure 4-2. This is referred to as the application switch; switch S3-1 is open and switches S3 (2 – 8) are closed for the PROFIBUS-DP Interface Application.

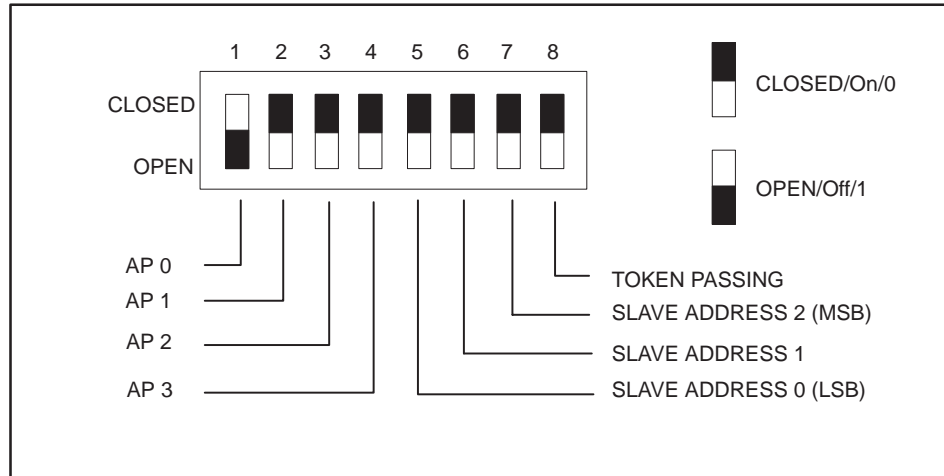


Figure 4-2 S3 Dipswitch Settings

Dipswitch S3 settings are defined as follows:

- AP 0 – 3 refer to Application Number 0 – 15 (AP 0 is the LSB)
- Slave address 0 – 2 refer to PROFIBUS-DP Slave Address Range (0 is the LSB)
- Token passing setting: 0 = Disabled; 1 = Enabled.

Table A-1 in Appendix A describes the S3 switch settings for the other applications that can be used with the FIM.

Connecting the PROFIBUS-DP I/O Link

The PROFIBUS-DP I/O link, which uses twisted pair RS-485 cable, is Port 2 on the front bezel of the FIM. The communication port pinouts of the Field Interface Module are shown in Figure 4-3.

Siemens' I/O connectors simplify the PROFIBUS-DP connection because they have selectable termination and bias built into the connectors. These connectors allow you to daisy chain the I/O link to each of the slaves. Be sure to install the RS-485 link properly.

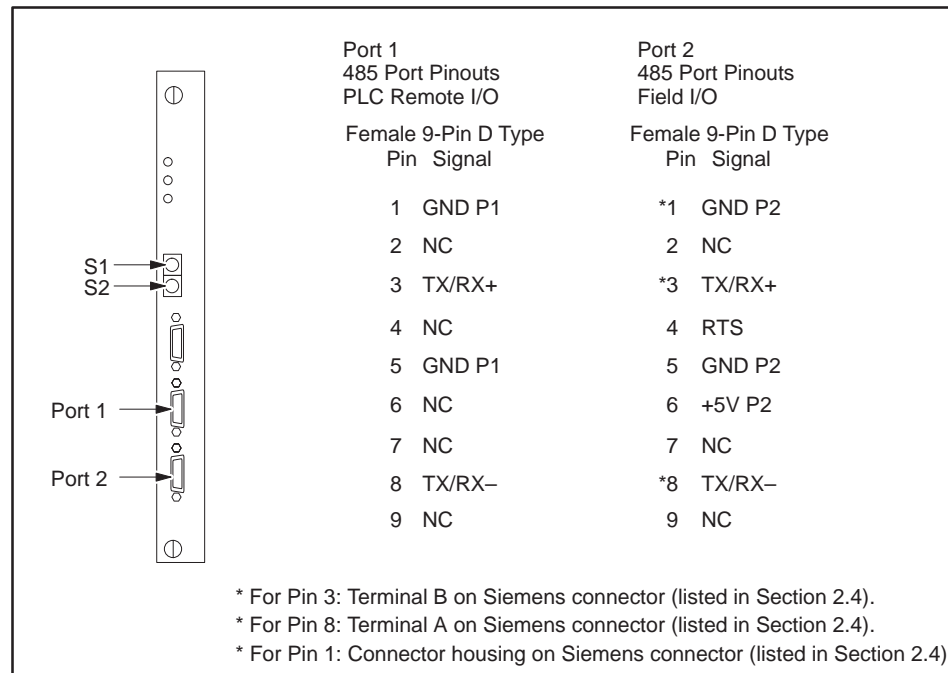


Figure 4-3 Communication Port Pinouts

Up and Running (continued)

Installing RS-485

The rules for proper installation of the RS-485 follow:

- Create a daisy-chain arrangement with the link, not a star arrangement. A daisy chain has two connectors with a single cable (bus wire) connection; all other connectors (if any) have two cable (bus wires) connections.
- Do not cross the RX/TX+ signals and the RX/TX- signals. Wire all of the RX/TX+ pins (terminal B on the Siemens connectors) together on each slave device and on the FIM. Wire all of the RX/TX- pins (terminal A on the Siemens connectors) together to each slave device and to the FIM.
- Ground the link at every connection. Ground the chassis of each slave to earth ground.
- Terminate and bias both ends of the link. The two ends are the connectors with a single cable connection between them. If you are not using Siemens connectors, refer to Section 2.5 for information on how to terminate and bias the cable. If you use Siemens connectors, either set the jumper switch to On to enable termination and bias, or to Off to disable it.
- Do not run the cables near power wires.
- Screw down the connectors on the devices and on the FIM to ensure good ground connection.

Connecting the
FIM to the
Controller

The FIM connects to the programmable controller through Port 1 on the front bezel. The wiring for this port is shown in Figure 4-3, on page 4-9.

For more information on connecting the FIM to the 505 remote I/O channel, refer to the Cabling and Wiring section of your system manual.

- *SIMATIC 545 System Manual (PPX:545-8101-x)*
- *SIMATIC 555 System Manual (PPX:555-8101-x)*
- *SIMATIC 575 System Manual (PPX:575-8101-x)*
- *SIMATIC 545/555/575 System Manual (PPX:505-8201-x)*

NOTE: The “x” in the manual order number designates the manual edition.

Up and Running (continued)

Configuring the Programmable Controller

The I/O represented by the FIM must be assigned I/O addresses in the programmable controller. You can assign addresses, or configure, the programmable controller either with TISOFT or with any other Series 505 programmable controller programming package. The steps below assume that you are using TISOFT.

1. Ensure that all of the slaves and the FIM are powered up, and that all of the slaves have a unique address within the range selected on the FIM.

Some slaves can have manual baud rate settings. Set these to the same baud rate as the FIM. Most slaves have autobaud, which automatically matches the baud rate that the FIM transmits.

2. If the FIM is communicating with the programmable controller, the COMM LED is on. If not, use TISOFT to make sure that the base with the base number of the FIM (SW1 on the FIM) is enabled.

If the base number is enabled, check the FIM's Port 1 connection to the programmable controller.

3. With the FIM communicating to the programmable controller, do a Read Base. Refer to the chapter on configuring I/O for Series 505 controllers in the *SIMATIC 505 TISOFT User Manual*.

Slaves that are communicating appear as modules in the base with X, Y, WX, and/or WY points corresponding to their I/O arrangement.

If you see the error configuration (32X, 32Y, 32WX, and 32WY) in any slot, the slave has either more than 64 points of only one point type (X, Y, WX, or WY), or else more than 32 points for any point type when using more than one point type (X, Y, WX, and/or WY).

Refer to Section 4.6, which describes configuration by byte matching, for a possible solution to this error configuration arrangement.

If each slave appears in the proper position in the base corresponding to the address of the slave, set the I/O address to the desired values. Refer to Section 4.5, which describes configuring slaves, for help in determining valid I/O addressing.

4. Perform a Write PC to write the configuration of the FIM. The CFG LED should come on and stay on (not flashing) if the I/O is working properly. If the CFG LED flashes, it means that either one or more slaves do not match the configuration or else that the FIM has lost communication with a slave either periodically or completely, which may suggest bad wiring/link setup. Check your wiring with the procedure on page 4-10 if this happens, and refer to Section 4.8 for other problems.

5. You can monitor programmable controller status words to verify your communications. Using status words STW12 (base 1) through STW27 (base 15), check to see whether or not any of these bits is a 1.

If these bits are set to 1, even for one scan, then the FIM has lost communication with the slave that corresponds to that bit. Refer to Table 4-11, on page 4-48, to determine which slave corresponds to the this bit. STW2 contains the bit that monitors the loss of communication to the FIM corresponding to the base address. Refer to Table 4-10, on page 4-47, to determine which bit corresponds to the base address on the FIM.

Slave Address Range Selection

Since the FIM has a maximum of 16 drops, and PROFIBUS-DP can have up to 126 drops, the FIM can be configured to some variation of 16 drop segments out of the 126.

The address range of the slaves, which the FIM polls, can be selected to allow the FIM to address slaves in different ranges. This selection is made on the dipswitch using switches S3-5, S3-6, and S3-7. The first address in the range corresponds to the first slot that the slave appears in, in the FIM base. The next address corresponds to the next slot in the base, and so on, until the last address in the range, which corresponds to slot 16. Table 4-2 shows the correlation of the switches to the address range.

Table 4-2 Slave Address Range Selection

S3-5	S3-6	S3-7	First Slave Address [Slot 1 in base]	Last Slave Address [Slot 16 in base]
Closed/On/0	Closed/On/0	Closed/On/0	17	32
Open/Off/1	Closed/On/0	Closed/On/0	33	48
Closed/On/0	Open/Off/1	Closed/On/0	49	64
Open/Off/1	Open/Off/1	Closed/On/0	65	80
Closed/On/0	Closed/On/0	Open/Off/1	81	96
Open/Off/1	Closed/On/0	Open/Off/1	97	112
Closed/On/0	Open/Off/1	Open/Off/1	*17	*32
Open/Off/1	Open/Off/1	Open/Off/1	*17	*32
Note: 1=Open/Off; 0=Closed/On.			Note: Slave addresses are in decimal notation.	
			* These ranges are reserved for future use.	

WARNING

Before you can use a programming device to communicate with slaves on the PROFIBUS-DP bus, you must either disable the FIM's base through TISOFT, power down the controller, or remove the Port 1 cable.

If you use a programming device on the PROFIBUS-DP bus at the same time that the FIM is configured, erratic operation of the slaves could occur that could result in death or serious injury to personnel, and/or equipment damage.

Do not use a programming device to communicate with slaves on the PROFIBUS-DP bus while the FIM is configured.

Passing the Token

Although the FIM can pass the token to an PROFIBUS-DP programming device on the link, it cannot communicate with the controller at the same time. Using the programming device while the FIM is attempting to read a slave's diagnostic information can cause erratic operation between the FIM and the PROFIBUS-DP slaves.

Before you use a programming device, such as a PG730/750, to communicate with the slaves, you must first do one of the following:

- Disable the FIM's base through TISOFT, or
- Power down the programmable logic controller, or
- Remove the Port 1 cable.

Some slaves may use the token rotation (or lack of it) to determine the status of the PROFIBUS-DP link. In these cases, the token passing is selected with dipswitch S3-8.

Dipswitch S3-8 in the Open/Off/1 position indicates that token passing is enabled and that the FIM will attempt to pass the token to another PROFIBUS-DP master at address 0.

The default for S3-8 is Closed/On/0 (token passing disabled). Use token passing only when necessary: it slightly reduces the performance of the scan. Consult your slave manual(s) for any requirements of token passing.

NOTE: The hand-held programming device requires that the master (FIM) is either removed or powered down when used to communicate with the PROFIBUS-DP slaves.

4.4 FIM I/O Update Scan

FIM I/O Update Scan

The PROFIBUS-DP link can be set at baud rates up to 1.5M bits per second. Some PROFIBUS-DP links operate at 12M bits per second, but the FIM is currently limited to 1.5M. The PROFIBUS-DP link is also a token ring network that is optimized for I/O exchange (PROFIBUS-DP), which means scan update times can be a fraction of programmable controller scan times. This also means that I/O update is virtually synchronous.

If a low baud rate is used, it is possible for the programmable controller scan to be shorter than the FIM update scan. The I/O update takes place from the last programmable controller scan update, regardless of the scan times. This means that all output data going to all slaves on a FIM comes from the same programmable controller scan. All input data going to the programmable controller from all slaves on a FIM is updated on the same programmable controller scan.

The FIM attempts to locate or add one new slave every scan. Once a new slave is identified, it is reported to the programmable controller and, if the slave has been previously configured, the FIM begins updating its I/O.

System Error Handling

Most slaves use a watchdog timer which monitors time between communications from the FIM. When communication between the FIM and the slave is broken, the watchdog timer on the slave will expire and set the output points to a safe state. The safe state may vary depending on the slave's design, but most slaves set the output points to zero. Refer to your slave manual(s) for more information about slave watchdog timer reaction.

The FIM also has a watchdog timer on the communication port to the controller. The FIM watchdog timer expires when communication between the controller and the FIM is lost. When a FIM's base number is disabled by TISOFT, or the controller detects a hard error in the system, the controller sends an OUTDIS (outputs disabled) request to the FIM. In FIM Release 3.1 and higher, the FIM's watchdog timer expiration and these OUTDIS events cause the FIM to stop all communication on the PROFIBUS-DP port. This broken communication forces the watchdog timers on the slaves to expire, which should set the output points to a safe state. When TISOFT performs a read base status, the FIM will retain the previous I/O base status until communication to the slaves is resumed.

The FIM restarts communications to the slaves in the following events:

- If an error has been detected by the controller, when the error is cleared by the controller.
- If the FIM watchdog timer has timed out, when communication between the FIM and the controller is restored.
- If the base number was disabled by TISOFT, when the base is re-enabled or when the FIM is power-cycled.

4.5 Configuring Slaves

Configuring Slaves The FIM identifies and reports slaves in terms of I/O points, as though they were actual modules in a remote base. You must configure slaves (assign I/O addresses) before the FIM will update them.

The error configuration can occur, but it depends on the amount of I/O a slave reports. The error configuration is reported as 32X, 32Y, 32WX, and 32WY, and the module reports a failed condition. This occurs when the slave has more I/O points of any one type than can be reported in one slot of a base (the FIM); for instance, if the slave has more than 64 points of any one point type, or more than 32 points of any single point type when there is more than one point type of I/O for that slave.

You can also configure the slave by byte matching. This allows other point types to be substituted for the actual point types in the slave configuration. Byte matching can also be used to conserve I/O points. For more information on byte matching, refer to Section 4.6.

NOTE: If a slave has 29, 30, 31, or 32 word points, whether word inputs or word outputs, they must be configured as 32 points, and are reported as 32 points if a Read Base is performed by TISOFT.

To configure a slave, you must enter the desired I/O address to assign to each slave in a base. Examples of slaves configured by using TISOFT follow. When the slaves are configured properly, the assigned input points are updated immediately with data from the slave, and the output points are written to the slave.

Configuring Slaves (continued)

Configuration Example 1

Example 1 uses an ET 200B block at slave address 20 (14 hexadecimal). An ET 200B block is a PROFIBUS-DP remote I/O device that contains various arrangements of input and output points. In this example, the ET 200B contains 32 discrete output points (32Y), and because of the slave address, the ET 200B appears in slot 4 in the FIM's base as 32Y (see Figure 4-4).

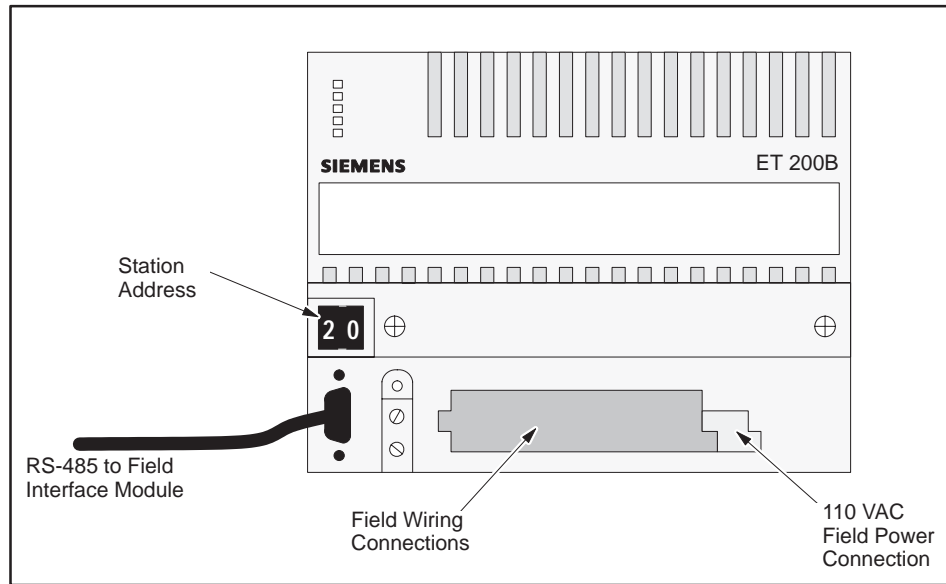


Figure 4-4 ET 200B 32-Point 110V A/C Output

The ET 200B block is assigned the starting point address of 49 (decimal). Output points Y49 – Y80 in the ladder program are mapped, or assigned to, this device; see Figure 4-5. The FIM writes these points to the slave device once during each FIM update scan. The FIM update scan is usually much faster than the programmable controller's scan, but it depends on the baud rate, the number of slaves, and the scan time of the programmable controller.

Base Number
Displays number of the current base and corresponds to number on S1.

I/O MODULE DEFINITION FOR : CHANNEL 1 BASE 05							
Slot	I/O Address	Number of Bit and Word I/O				Special Function	
		X	Y	WX	WY		
1	0000	00	00	00	00	No	
2	0000	00	00	00	00	No	
3	0000	00	00	00	00	No	
4	0049	00	32	00	00	No	
5	0000	00	00	00	00	No	
6	0000	00	00	00	00	No	
7	0000	00	00	00	00	No	
8	0000	00	00	00	00	No	
9	0000	00	00	00	00	No	
10	0000	00	00	00	00	No	
11	0000	00	00	00	00	No	
12	0000	00	00	00	00	No	
13	0000	00	00	00	00	No	
14	0000	00	00	00	00	No	
15	0000	00	00	00	00	No	
16	0000	00	00	00	00	No	

Slot Number
Corresponds to addresses for PROFIBUS-DP slave units. This example configuration uses FIM slave address range from 17 – 32.

SF Module
The Field Interface Module is not an SF Module. The default for this definition is **NO**.

Figure 4-5 Sample I/O Configuration Chart

Configuring Slaves (continued)

Configuration Example 2

Example 2 uses an IM318B at slave address 17 (11 hexadecimal). An IM318B block is a Siemens AG PROFIBUS-DP Remote I/O Base Controller that contains various arrangements of input and output modules. In this example, the IM318B contains three 8-point discrete input modules (a total of 24 X points), an 8-point and a 4-point discrete output module (a total of 12 Y points), a 3-point analog input module, and a 2-point analog output module. See Figure 4-6.

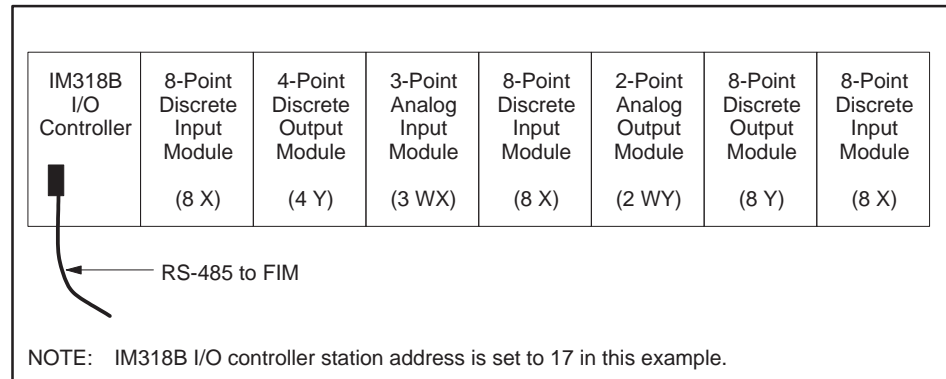


Figure 4-6 Slave Configuration Example

Figure 4-7 illustrates how these points are configured in the programmable controller and how the FIM represents non-standard (to Series 505) I/O arrangements. These can be set up on any one of its slaves. (The FIM can support up to 16 slaves.) This example appears in slot 1, remote address of 17 (11 hexadecimal).

- The discrete output points are not divisible by 8, and the Series 505/FIM interface cannot represent discrete points, unless they are divisible by 8. Therefore, the FIM corrects this by rounding the Y points up to the next divisible-by-eight number. The Y points are reported as 16Y instead of 12Y, and there are four unused discrete points.
- The four unused points are on the first discrete output module. This means that fourth, fifth, sixth, and seventh output points (Y29, Y30, Y31, and Y32 in this example) are “dummies” and do not actually exist.

There are three analog input points and the Series 505/FIM interfaces do not allow odd numbers of word or analog points. Therefore, the FIM corrects this by reporting 4 WX instead of 3 WX. This means the fourth input word (WX44 in this example) is unused.

In this example, point numbering begins with the 24 discrete input points X1 – X24; the numbering continues with the 16 discrete output points Y25 – Y40, then the 4 word input points WX41 – WX44, and finally, the 2 word output points, WY45 – WY46.

The actual configuration of the IM318B block shown in Figure 4-6 follows:

24X 12Y 3WX 2WY

When using TISOFT and performing a Read Base of the FIM's base number, the status of this slave (in slot 1) is reported as follows:

24X 16Y 4WX 2WY

You must configure the slot the way it appears when read from the base.

The IM318B block is assigned the starting point address of 1. The discrete input points are numbered first, followed by the discrete output points, followed by analog input and output points, numbered in the same way. See Figure 4-7. In Example 2, the points are mapped as shown in Table 4-3.

Table 4-3 I/O Point Mapping

Point Description	Actual Points	Points reported by FIM	First Point	Last Point Configured	Unused Points
Discrete Inputs (X)	24	24	X1	X24	–
Discrete Outputs (Y)	12	16	Y25	Y40	Y29 – Y32
Analog Inputs (WX)	3	4	WX41	WX44	WX44
Analog Outputs (WY)	2	2	WY45	WY46	–

Configuring Slaves (continued)

Base Number
Displays number of the current base and corresponds to number on S1.

I/O MODULE DEFINITION FOR : CHANNEL 1 **BASE 05**

Slot	I/O Address	Number of Bit and Word I/O				Special Function
		X	Y	WX	WY	
1	0001	24	16	04	02	No
2	0000	00	00	00	00	No
3	0000	00	00	00	00	No
4	0000	00	00	00	00	No
5	0000	00	00	00	00	No
6	0000	00	00	00	00	No
7	0000	00	00	00	00	No
8	0000	00	00	00	00	No
9	0000	00	00	00	00	No
10	0000	00	00	00	00	No
11	0000	00	00	00	00	No
12	0000	00	00	00	00	No
13	0000	00	00	00	00	No
14	0000	00	00	00	00	No
15	0000	00	00	00	00	No
16	0000	00	00	00	00	No

Slot Number
Corresponds to addresses for PROFIBUS-DP slave units. This example configuration uses FIM slave address range from 17 – 32.

SF Module
The Field Interface Module is not an SF Module. The default for this definition is **NO**.

Figure 4-7 Sample I/O Configuration Chart

4.6 Configuring by Byte Matching

Using Byte Match Configuration

Byte match configuration is an alternative technique that you can use to configure a FIM slot with different point types than it actually has. TISOFT, Rel. 5.1 or later, is required to do some byte-matching configurations. Use byte matching in the following instances.

- When the slave's actual I/O point count is greater than the Series 505 programmable controllers allow for any one slot, you get an error configuration (namely, 32X, 32Y, 32WX, and 32WY). The Series 505 programmable controllers limit the I/O point count of one slot (a slave to the FIM) in a base (the FIM itself) to a maximum of 64 of one point type (X, Y, WX, or WY), and up to 32 of each point type if multiple point types are used.
- To save I/O points and represent discrete points as word points.

A byte is referred to as eight bits: eight discrete points equal one byte. A word or analog point equals two bytes.

When you apply byte matching to input points (X and WX), the number of configured input bytes must equal the number of actual input bytes. When you apply byte matching to output points (Y and WY), the number of configured output bytes must equal the number of actual output bytes.

When you configure the programmable controller/base with TISOFT, you are telling the FIM how many bytes you expect, in terms of X, Y, WX, and WY points on your PROFIBUS-DP slaves. You are also assigning the bytes an address for your ladder program. In order for the FIM and the programmable controller to exchange these bytes, this configuration must agree with what the FIM actually finds connected to its communication link.

With byte matching, you can tell the FIM to treat groups of 16 discrete points (X and Y) as though they were one word point (WX or WY), and vice versa.

You can apply byte matching to input points (X and WX) and to output points (Y and WY) in a mutually exclusive manner. You can configure the outputs normally, and apply byte matching to the input points only, or vice versa. You can also apply it to both inputs and outputs at the same time.

Configuring by Byte Matching (continued)

Procedure for Byte Matching Input Points

Follow the steps below to byte match input points:

1. Determine the actual number of discrete (X) and word (WX) input points present on the slave.

NOTE: You may not be able to determine the actual number of discrete input points using the Read Base function of TISOFT, because the FIM adjusts the represented number of points to meet the Series 505 requirements. Also, the FIM may be returning the error configuration for that slave. For more information about the configuration process, refer to Section 4.5.

2. Determine the number of input bytes:

Divide the number of discrete input points (Xs) by eight. Multiply the number of word or analog input points (WXs) by two. Add the results together. For example:

$$\text{Input Bytes} = (\#X \text{ points} / 8) + (2 * \#WX \text{ points})$$

3. Determine how you want to represent these bytes; use any valid combination of X or WX points.

You must use multiples of four bytes (2 WX = 4 bytes) when assigning some of the bytes to analog points. You cannot have more than a total of 32 of these word or analog points if more than one of these point types is used, or more than 64 of these word or analog points if only one point type is used. You are limited to four bytes (32X = 4 bytes) when you are assigning bytes to discrete inputs because of the 32 point limit, or eight bytes (64X = 8 bytes) if only one point type is used.

4. Once you have determined the arrangement of input bytes, configure the programmable controller both with this arrangement of input bytes and any output points. If the bytes match, then, when you perform a Read Base, the FIM reports this configuration as though the I/O were actually as you have it configured. If there is a mismatch, then the FIM reports either the actual I/O arrangement or the error configuration.

Procedure for Byte
Matching Output
Points

Follow the steps below to byte match output points:

1. Determine the actual number of discrete (Y) and word (WY) output points present on the slave.

NOTE: You may not be able to determine the actual number of discrete points present on the slave using the Read Base function of TISOFT, because the FIM adjusts the represented number of points to meet the Series 505 requirements, instead of adjusting the actual number of output points. Also, the FIM may be returning the error configuration for this slave. For more information about the configuration process, refer to Section 4.5.

2. Determine the number of output bytes you have:

Divide the number of discrete output points (Ys) by eight.
Multiply the number of word or analog output points (WYs) by two.
Add the results together. For example:

$$\text{Output Bytes} = (\#Y \text{ points} / 8) + (2 * \#WY \text{ points})$$

3. Determine how you want to represent these bytes; use any valid combination of Y or WY points.

You must use multiples of four bytes (2 WY = 4 bytes) when assigning some of the bytes to analog points. You cannot have more than a total of 32 of these word or analog points if more than one of these point types are used, or more than 64 of these word or analog points if only one point type is used. You are limited to four bytes (32Y = 4 bytes) when you are assigning them to discrete outputs because of the 32 point limit, or eight bytes (64Y = 8 bytes) if only one point type is used.

4. Once you have determined the arrangements of output bytes, configure the programmable controller with both this arrangement of output bytes and any input configuration. If the bytes match, then when you perform a Read Base, the FIM reports this configuration as though the I/O were actually as you have it configured. If there is a mismatch, the FIM reports either the actual I/O arrangement or the error configuration.

Configuring by Byte Matching (continued)

Byte Matching Configuration Example 1

Using the ET 200B block in Figure 4-4 (see page 4-18), you can demonstrate a byte match configuration. In this example, we have 32 discrete output points (32Y) and no other point types.

You can conserve I/O points and represent this ET 200B slave as word output points (WY). Use the procedure for byte matching output points: first, determine the number of discrete output points (32) and word output points (0) that are actually on the slave; then, determine the number of output bytes as follows:

$$\text{Output Bytes} = (32Y / 8) + (0WY * 2) = 4$$

You can place as many of the output bytes into word point types as possible by dividing the number of bytes by two to get the number of words (2WY). In the example, the Y points took addresses 49 – 80.

Configure the points as WY49 and WY50. A slot in a base (or slave on a FIM) must be configured in multiples of eight. Addresses 49 – 56 are used (even though there are only two points used), but addresses 57 – 80 are available for other uses, and the same data is sent to the programmable controller from the slave. In ladder logic, you can use the individual bits of word points the same way as you use discrete points; there is no disadvantage to mapping discrete I/O as word I/O.

**Byte Matching
Configuration
Example 2**

Figure 4-6 (page 4-20) illustrates byte match configuring with the actual status of the IM318B. The following example uses the actual status of the slave, IM318B:

24X	12Y	3WX	2WY
-----	-----	-----	-----

The FIM reports this I/O arrangement as follows:

24X	16Y	4WX	2WY
-----	-----	-----	-----

Since word points must be in even numbers, 1WX or word point is not used. Use byte matching both to reduce the point count and to use that unused point. To implement byte matching, apply the “Procedure for Byte Matching Input Points,” described on page 4-24. Determine the number of discrete input points (24X) and word input points (3WX) that are actually on the slave. Next, use the following formula to determine the number of input bytes from these points:

$$\begin{aligned} \text{Input Bytes} &= (24X / 8) + (3WX * 2) \\ \text{Input Bytes} &= 3 + 6 = 9 \text{ bytes} \end{aligned}$$

Take the nine bytes and divide by two to determine how many of these bytes to use as word points. This gives eight bytes, or 4WX points. Determine the number of bytes left that must be applied to the discrete points. There is one byte left, and, since each byte gives eight discrete points, then $(1 * 8) = 8X$. You configure the slot in the base with:

8X	16Y	4WX	2WY
----	-----	-----	-----

With this configuration, the FIM matches the slave I/O and begins updating the IM318B. The only unused points are the four discrete output points (Y), but all four word input points are now used, and the number of points taken up is reduced by 16 points because the 24X is now 8X (with the other 16 points appearing in the first analog word). The FIM now reports the I/O arrangement of the IM318B just as it is shown above, as though this were the actual I/O configuration.

Configuring by Byte Matching (continued)

Byte Matching Configuration Example 3

Byte matching in example 3 illustrates a more complex byte matching configuration. See Figure 4-8.

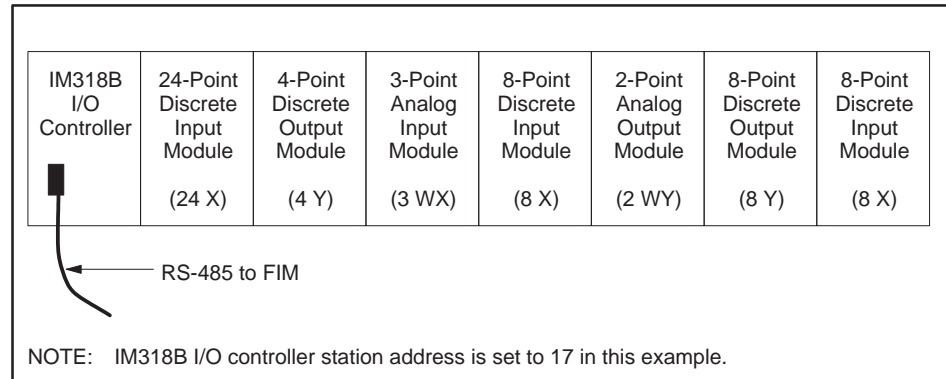


Figure 4-8 Slave Configuration Example

Figure 4-8 is similar to Figure 4-6, but the first 8-point discrete input module is replaced with a 24-point discrete input module in the IM318B I/O controller. The actual status of this slave (IM318B) follows:

40X 12Y 3WX 2WY

The FIM cannot report this configuration, because there are more than 32 points of any one point type (40X). Instead, the FIM reports the error configuration which follows:

32X 32Y 32WX 32WY

When you see this configuration, you know that there are more points of any one type than can be represented. In most cases, this can be resolved using byte matching, which you must do if this slave is to be used as it is here. To implement byte matching, apply the “Procedure for Byte Matching Input Points,” described on page 4-24. Determine the number of discrete input points (40X) and word input points (3WX) that are actually on the slave. Next, use the following formula to determine the number of input bytes from these points:

$$\begin{aligned} \text{Input Bytes} &= (40X / 8) + (3WX * 2) \\ \text{Input Bytes} &= 5 + 6 = 11 \text{ bytes} \end{aligned}$$

To determine how many bytes can be used as word points, take the number of bytes (11) and divide by two, because word points must be an even number. The result is 4WX points, or eight bytes. You cannot use ten bytes, because this equals 5WX points when divided by two.

Next, determine the number of remaining bytes that must be applied to the discrete points. There are three bytes left, and since each byte gives eight discrete points, then $(3 * 8) = 24X$. Now, configure the slot in the base as shown below:

24X	16Y	4WX	2WY
-----	-----	-----	-----

With this configuration, the FIM matches the configuration and begins updating the IM318B. The FIM reports the I/O arrangement of the IM318B just as it is shown above, as though this were the actual I/O configuration.

Configuring by Byte Matching (continued)

Byte Matching Configuration Data Positioning

When you perform byte matching, the data is placed in different positions. There are two ways of determining these new positions.

- You can turn on a given I/O point and read it in the programmable controller (in the case of an input point); or you can FORCE it in the programmable controller and then check to see whether or not that point is energized (in the case of an output point).
- You can determine the positioning of inputs first, then determine the positioning of the outputs. The Series 505 programmable controller numbers the bits in decreasing order within a word. The tables below show you which byte of a word the eight bits (Xs or Ys) are applied to. However, the discrete points are numbered in increasing order. The orientation of the bits within a word are shown in Table 4-4 and Table 4-5.

Table 4-4 Input Bytes WX<->X

MSB of byte	Most Significant Byte (MSB) of WX1						LSB of byte	MSB of byte	Least Significant Byte (LSB) of WX1						LSB of byte
	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6			bit 7	bit 8	bit 9	bit 10	bit 11	bit 12	
X16	X15	X14	X13	X12	X11	X10	X9	X8	X7	X6	X5	X4	X3	X2	X1

Table 4-5 Output Bytes WY<->Y

MSB of byte	Most Significant Byte (MSB) of WY1						LSB of byte	MSB of byte	Least Significant Byte (LSB) of WY1						LSB of byte
	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6			bit 7	bit 8	bit 9	bit 10	bit 11	bit 12	
Y16	Y15	Y14	Y13	Y12	Y11	Y10	Y9	Y8	Y7	Y6	Y5	Y4	Y3	Y2	Y1

Configuring by Byte Matching (continued)

Byte Matching Input Points

If there are more configured word input points than actual word input points, use the “Overmapping Word Input Points” procedure; if there are fewer configured word input points than actual word input points, use the “Overmapping Discrete Input Points” procedure. Descriptions of both procedures follow.

Overmapping Word Input Points

If there are more configured word input points than actual word input points, use the procedure described below.

This example uses an actual arrangement of:

40X 8Y 1WX

and is configured to:

24X 8Y 2WX

1. Group the actual discrete input bytes together, and the actual word input bytes together, as shown below.

Byte #	1	2	3	4	5	6	7
Actual Input Bytes	X1 – X8	X9 – X16	X17 – X24	X25 – X32	X33 – X40	1WX LSB	1WX MSB

2. Group the configured discrete input bytes together, and the configured word input bytes together, as shown below.

Byte #	1	2	3	4	5	6	7
Configured Input Bytes	X1 – X8	X9 – X16	X17 – X24	1WX LSB	1WX MSB	2WX LSB	2WX MSB

3. If there are any configured discrete input bytes, they are applied first to the actual discrete input bytes, byte for byte. For example, the first byte of actual discrete input goes to the first byte of configured discrete inputs, the second byte of actual discrete inputs goes to the second byte of configured discrete inputs, and so forth.

Actual Input Bytes	X1 – X8	X9 – X16	X17 – X24	X25 – X32	X33 – X40	1WX LSB	1WX MSB
Configured Input Bytes	X1 – X8	X9 – X16	X17 – X24				

-
4. Beginning with the remaining actual discrete input bytes from step 3 (or the first actual discrete input bytes if there were no configured input bytes in step 3), apply the first configured word points. When applying two bytes of discretely to the two bytes of a word, the lowest numbered discrete byte is applied to the Least Significant Byte (LSB) of the word, and the next higher numbered discrete input byte is applied to the Most Significant Byte (MSB) of the word.

Actual Input Bytes	X1 – X8	X9 – X16	X17 – X24	X25 – X32	X33 – X40	1WX LSB	1WX MSB
Configured Input Bytes	X1 – X8	X9 – X16	X17 – X24	1WX LSB	1WX MSB		

5. If there are actual word points, then apply them directly to the next available configured word points from step 4. For example, the lowest numbered actual input word is applied to the lowest numbered available in the configuration input word, and so forth.

Actual Input Bytes	X1 – X8	X9 – X16	X17 – X24	X25 – X32	X33 – X40	1WX LSB	1WX MSB
Configured Input Bytes	X1 – X8	X9 – X16	X17 – X24	1WX LSB	1WX MSB	2WX LSB	2WX MSB

Configuring by Byte Matching (continued)

Overmapping Discrete Input Points

If there are fewer configured word input points than actual word input points, use the procedure described below.

This example uses an actual arrangement of:

8X 8Y 3WX

and is configured to:

24X 8Y 2WX

1. Group the actual discrete input bytes together, and the actual word input bytes together, as shown below.

Byte #	1	2	3	4	5	6	7
Actual Input Bytes	X1 – X8	1WX LSB	1WX MSB	2WX LSB	2WX MSB	3WX LSB	3WX MSB

2. Group the configured discrete input bytes together, and the configured word inputs bytes together, as shown below.

Byte #	1	2	3	4	5	6	7
Configured Input Bytes	X1 – X8	X9 – X16	X17 – X24	1WX LSB	1WX MSB	2WX LSB	2WX MSB

3. If there are any actual discrete input bytes, they are applied to the configured discrete input bytes, byte for byte. For example, the first byte of actual discrete input goes to the first byte of configured discrete inputs, and so forth.

Actual Input Bytes	X1 – X8	1WX LSB	1WX MSB	2WX LSB	2WX MSB	3WX LSB	3WX MSB
Configured Input Bytes	X1 – X8						

-
4. Beginning with the first actual word input byte, apply the remaining configured discrete input bytes (or first configured discrete input bytes if there were no actual discrete input bytes from step 3).

When applying the two bytes of an input word to two bytes of discrete input, the Least Significant Byte (LSB) of the word is applied to the lowest numbered discrete input byte, and the Most Significant Byte (MSB) of the word is applied to the next higher numbered discrete input byte.

Actual Input Bytes	X1 – X8	1WX LSB	1WX MSB	2WX LSB	2WX MSB	3WX LSB	3WX MSB
Configured Input Bytes	X1 – X8	X9 – X16	X17 – X24				

5. If there are configured word points, then apply them directly to the next available actual input word points from step 4. For example, the lowest numbered available actual word input is applied to the lowest numbered configured input word, and so forth.

Actual Input Bytes	X1 – X8	1WX LSB	1WX MSB	2WX LSB	2WX MSB	3WX LSB	3WX MSB
Configured Input Bytes	X1 – X8	X9 – X16	X17 – X24	1WX LSB	1WX MSB	2WX LSB	2WX MSB

Configuring by Byte Matching (continued)

Byte Matching Output Points

If there are more configured word output points than actual word output points, use the “Overmapping Word Output Points” procedure. If there are fewer configured word output points than actual word output points, use the “Overmapping Discrete Output Points” procedure. Descriptions of both procedures follow.

Overmapping Word Output Points

If there are more configured word output points than actual word output points, use the procedure described below.

This example uses an actual arrangement of:

8X 40Y 1WY

and is configured to:

8X 24Y 2WY

1. Group the actual discrete output bytes together, and the actual word output bytes together, as shown below.

Byte #	1	2	3	4	5	6	7
Actual Output Bytes	Y1 – Y8	Y9 – Y16	Y17 – Y24	Y25 – Y32	Y33 – Y40	1WY LSB	1WY MSB

2. Group the configured discrete output bytes together, and the configured word outputs bytes together, as shown below.

Byte #	1	2	3	4	5	6	7
Configured Output Bytes	Y1 – Y8	Y9 – Y16	Y17 – Y24	1WY LSB	1WY MSB	2WY LSB	2WY MSB

3. If there are any configured discrete output bytes, they are applied first to the actual discrete output bytes, byte for byte. For example, the first byte of configured discrete outputs goes to first byte of actual discrete outputs, and so forth.

Configured Output Bytes	Y1 – Y8	Y9 – Y16	Y17 – Y24	1WY LSB	1WY MSB	2WY LSB	2WY MSB
Actual Output Bytes	Y1 – Y8	Y9 – Y16	Y17 – Y24				

-
4. Beginning with the remaining actual discrete output bytes from step 3 (or the first actual discrete output bytes if there were no configured output bytes in step 3), apply discrete output bytes to the first configured word points.

When applying two bytes of discretely to the two bytes of a word, the lowest numbered discrete byte is applied to the LSB of the output word, and the next higher numbered discrete output byte is applied to the MSB of the output word.

Configured Output Bytes	Y1 – Y8	Y9 – Y16	Y17 – Y24	1WY LSB	1WY MSB	2WY LSB	2WY MSB
Actual Output Bytes	Y1 – Y8	Y9 – Y16	Y17 – Y24	Y25 – Y32	Y33 – Y40		

5. If there are actual output word points, then apply them directly to the next available configured output word points from step 4. For example, the lowest numbered available configured output word is applied to the lowest numbered actual output word, and so forth.

Configured Output Bytes	Y1 – Y8	Y9 – Y16	Y17 – Y24	1WY LSB	1WY MSB	2WY LSB	2WY MSB
Actual Output Bytes	Y1 – Y8	Y9 – Y16	Y17 – Y24	Y25 – Y32	Y33 – Y40	1 WY LSB	1WY MSB

Configuring by Byte Matching (continued)

Overmapping Discrete Output Points

If there are fewer configured word output points than actual word output points, use the procedure described below.

This example uses an actual arrangement of:

8X 8Y 3WY

and is configured to:

8X 24Y 2WY

1. Group the actual discrete output bytes together, and the actual word output bytes together, as shown below.

Byte #	1	2	3	4	5	6	7
Actual Output Bytes	Y1 – Y8	1WY LSB	1WY MSB	2WY LSB	2WY MSB	3WY LSB	3WY MSB

2. Group the configured discrete output bytes together, and the configured word output bytes together, as shown below.

Byte #	1	2	3	4	5	6	7
Configured Output Bytes	Y1 – Y8	Y9 – Y16	Y17 – Y24	1WY LSB	1WY MSB	2WY LSB	2WY MSB

3. If there are any actual discrete output bytes, they are applied to the configured discrete output bytes, byte for byte. For example, the first byte of configured outputs goes to the first byte of actual outputs, and so forth.

Configured Output Bytes	Y1 – Y8	Y9 – Y16	Y17 – Y24	1WY LSB	1WY MSB	2WY LSB	2WY MSB
Actual Output Bytes	Y1 – Y8						

-
4. Beginning with the first actual word output byte, apply the remaining configured discrete output bytes (or first configured discrete output bytes if there were no actual discrete output bytes from step 3).

When applying the two bytes of an output word to two bytes of discrete output, the LSB of the output word is applied to the lowest numbered discrete output byte and the MSB of the output word is applied to the next higher numbered discrete output byte.

Configured Output Bytes	Y1 – Y8	Y9 – Y16	Y17 – Y24	1WY LSB	1WY MSB	2WY LSB	2WY MSB
Actual Output Bytes	Y1 – Y8	1WY LSB	1WY MSB				

5. If there are configured output word points, then apply them directly to the next available actual output word points from step 4. For example, the lowest numbered configured output word is applied to the lowest numbered available in the actual output word, and so forth.

Configured Output Bytes	Y1 – Y8	Y9 – Y16	Y17 – Y24	1WY LSB	1WY MSB	2WY LSB	2WY MSB
Actual Output Bytes	Y1 – Y8	1WY LSB	1WY MSB	2WY LSB	2WY MSB	3WY LSB	3WY MSB

4.7 FIM PROFIBUS-DP I/O Cable Specifications

PROFIBUS Cable and Connector Specifications

Table 4-6, Table 4-7, and Table 4-8 list the PROFIBUS DIN 19245 specifications. Two of the baud rates (375K and 750K) supported by the FIM are non-standard for PROFIBUS DIN 19245 and linear interpolations are made to derive the values in Table 4-7.

Table 4-6 PROFIBUS Line Specifications

Parameter	Value
Impedance	135 – 165 Ohm (3 – 20 MHz)
Capacitance	9.1 pF/ft. (<30 nF/km)
Resistance	33.5 Ω/1000 ft. (<110 Ohm/km)
Attenuation	0.27 dB/100 ft. (0.9 dB/100 m (f=200kHz))
Conductor Area	20 – 22 AWG (0.3 mm ² ... 0.5 mm ²)
Cable Diameter	0.315 in. ± 0.02 in. (8 mm ± 0.5 mm)

Table 4-7 PROFIBUS Line Length

PROFIBUS Line Length				
Baud Rate	Distance	Repeaters (1)	Repeaters (2)	Repeaters (3)
9.6k baud	1200m	2400m	3600m	4800m
19.2k baud	1200m	2400m	3600m	4800m
93.75k baud	1200m	2400m	3600m	4800m
187.5k baud	1000m	1200m	1800m	2400m
*375k baud	640m	720m	1080m	1440m
500k baud	400m	400m	600m	800m
*750k baud	350m			
1500k baud	200m			
* Derived from linear interpolations of adjacent baud rates.				
Note: The maximum number of repeaters between two stations is 3.				

**PROFIBUS Cable
and Connector
Order Numbers**

The order number for the PROFIBUS LAN Cable is 6XV1 830-0AH10.
See Table 4-8 for PROFIBUS connector order numbers.

Table 4-8 PROFIBUS Cable and Connector Order Numbers

PROFIBUS Connector Order Numbers	Comment
6ES7 972-0BA00-0XA0	without PG connection; maximum baud rate 1.5M bps
6ES7 972-0BB00-0XA0	with PG connection; maximum baud rate 1.5M bps
6ES7 972-0BA10-0XA0	without PG connection
6ES7 972-0BB10-0XA0	with PG connection
6ES7 972-0BA20-0XA0	without PG connection; has pivoting strain relief
6ES7 972-0BB20-0XA0	with PG connection; has pivoting strain relief

4.8 Troubleshooting

The following pages present common troubleshooting symptoms, causes, and corrective actions.

The MOD GOOD LED Is Off—What's Wrong?

When the MOD GOOD LED is off, this indicates that the module is not receiving power or has failed. Use the following checklist to troubleshoot this condition:

- Re-seat the board.
- Check for bent pins on the board connector.
- Check the power supply of the base.
- Check switch settings.

If none of these suggestions works, the module has probably failed. Return it to the factory for repair.

The COMM LED Is Off—What's Wrong?

When the COMM LED is off, this indicates that the FIM is not communicating with the CPU. When the FIM establishes good communication to the CPU, the COMM LED turns on. Use the following checklist to troubleshoot this condition:

- Make sure the CPU and the FIM are powered up and working. The MOD GOOD LED on the FIM should be on, and the CPU GOOD LED on the CPU should be on.
- Check the dipswitches on the FIM. Dipswitch S3 selects the application type. See page 4-8 to ensure that the FIM is set correctly for PROFIBUS-DP.
- Make sure the base number for the FIM is enabled in the controller. The FIM is a remote base, like an RBC. If all remote bases are disabled (1–15), then the CPU does not communicate to the FIM or any other base on the remote link. Also, check to make sure the base address for the FIM is set to the proper base number. The base address switch is on the front bezel of the FIM and is labeled as S1.

NOTE: Base #0 is the local base of the CPU and cannot be used as a remote base except with CPUs that do not have a local base.

- Check the connection of the RS-485 cable between the CPU's I/O port and the FIM's Port 1. Check the physical connections of the cable, check the cable pinouts for proper wiring, check the cable wire. Try replacing the cable with a different cable.
- If the CPU is communicating with other FIMs or RBCs, then try replacing this FIM.
- If the CPU is not communicating with other FIMs or RBCs, then try replacing the CPU.

Troubleshooting (continued)

The CFG LED Is Off—What's Wrong?

When the CFG LED is off, this indicates that the FIM has not received the user configuration from the CPU. Use the following checklist to troubleshoot this problem:

- Make sure the FIM's COMM LED is on before attempting to get the CFG LED on.
- Check to make sure the base address for the FIM is set to the proper base number. The base address switch is on the front bezel of the FIM and is labeled as S1.

NOTE: Base #0 is the local base of the CPU and cannot be used as a remote base except with CPUs that do not have a local base.

- Check to make sure that the base used by the FIM is enabled and is configured with I/O. If the base corresponding to the FIM is written to the CPU as an empty base, then no user configuration is sent to the FIM.
- Check the cable and connection to Port 1.

If none of these suggestions works, the FIM has probably failed. Return it to the factory for repair.

The CFG LED Is Blinking—What's Wrong?

When the CFG LED is blinking, this indicates that while the FIM is communicating with the CPU, and the FIM has been configured by the CPU, the I/O with which the FIM is communicating does not match the user configuration. Use the following checklist to troubleshoot this problem:

- Check to make sure the base address for the FIM is set to the proper base number. The base address switch is on the front bezel of the FIM and is labeled as S1.

NOTE: Base #0 is the local base of the CPU and cannot be used as a remote base except with CPUs that do not have a local base.

- Check the address range dipswitch selection on the FIM. The FIM does not normally communicate with slaves set to addresses outside this range. The FIM can communicate with any slave addresses that have been defined using the Edit Slave dialog box.
- Check the baud rate setting on the FIM. The baud rate switch is labeled S2 on the front bezel of the FIM.
- Check the user configuration using TISOFT. Make sure the I/O is arranged correctly. You can use the Compare Base function of TISOFT to determine which slots are suspect. Each slave device corresponds to a slot in the base.
- Make sure that all of the I/O devices are powered up. If an I/O device is not communicating with the FIM for any reason, but the device is configured in the CPU, it shows up as a configuration error on the FIM.
- Check the slave device settings for the proper slave address, baud rate, etc.
- Check the configuration to see if an improper slave address is configured for the slave.
- Check the cable and connections between the FIM and the CPU.
- Wiring may require termination and bias. Refer to Section 2.5 for details on termination and bias requirements, and Section 4.2 for tips on how to build proper RS-485 connections.

If none of these suggestions works, the slave device has probably failed. Return it to the factory for repair or replacement.

Troubleshooting (continued)

The CFG LED Is On,
But Blinks
Periodically—
What's Wrong?

A periodic blink of the CFG LED means that all slaves match the configuration, but communication to one or more slaves is being lost for some period of time. The following list suggests guidelines for troubleshooting this condition:

- Check to make sure there are no slaves that require parameterization or are incorrectly parameterized. Check each slave's manual to determine if there are user parameterization requirements. The status button feature of the Configurator indicates if a slave is correctly parameterized.
- Check the wiring for loose or broken connections between the FIM's Port 2 and the slaves. The connections must be in a daisy-chain configuration.
- Wiring may require termination and bias. Refer to Section 2.5 for details on termination and bias requirements, and Section 4.2 for tips on how to build proper RS-485 connections.
- Check for proper polarity of the RS-485 wire. All connections must have RX/TX+ , RX/TX-, and GROUND common throughout the system.
- Make sure you are using the proper cable and not exceeding the maximum distance for cable and baud rate. See Table 4-9 for baud rates. Refer to Section 4.7 for line specifications and cable type requirements.
- Check for the cable running too close to any magnetic fields (motors, high current wires, relays, etc.).

Table 4-9 Baud Rates

S2	Baud Rate	S2	Baud Rate
0	1500K	8	Reserved
1	750K	9	Reserved
2	500K	A	Reserved
3	375K	B	Reserved
4	187.5K	C	Reserved
5	93.75K	D	Reserved
6	19.2K	E	Reserved
7	9.6K	F	Reserved

Checking the
Operation of the
Module

Use TISOFT to check the operation of the module. If you experience problems communicating with the slaves, you can read the base status through TISOFT. The base status indicates proper communication to individual slaves by the presence of I/O points in the slot number that corresponds to the station address.

Read the controller status words to determine I/O presence, and the correct configuration of the Field Interface Module. See Table 4-10 and Table 4-11 for bit mapping.

Table 4-10 shows status bits for monitoring status between the controller and the Field Interface Module. The status words for monitoring status between the Field Interface Module and the slaves are also shown in Table 4-10.

Bit number to slave number correlation to these status words is shown in Table 4-11.

Table 4-10 Controller-to-Field Interface Module (FIM) Communication Status Using Controller Status Words

FIM Base #	Controller to FIM Communication Status Bit	Status Word for FIM to Slave Communication Status
0	STW2 – Bit #16 – (least significant bit)	STW11
1	STW2 – Bit #15	STW12
2	STW2 – Bit #14	STW13
3	STW2 – Bit #13	STW14
4	STW2 – Bit #12	STW15
5	STW2 – Bit #11	STW16
6	STW2 – Bit #10	STW17
7	STW2 – Bit #9	STW18
8	STW2 – Bit #8	STW19
9	STW2 – Bit #7	STW20
10	STW2 – Bit #6	STW21
11	STW2 – Bit #5	STW22
12	STW2 – Bit #4	STW23
13	STW2 – Bit #3	STW24
14	STW2 – Bit #2	STW25
15	STW2 – Bit #1 – (most significant bit)	STW26

Troubleshooting (continued)

Table 4-11 shows bit number to slave number correlation for the status words from Table 4-10, using base 5 as an example.

Table 4-11 Monitoring Field Interface Module (FIM) to Slave Communication Status Using Controller Status Words

Slave Address # (Using Address Range 17 - 32 Selected on the FIM)	FIM to Slave Communication Status Bit (Using the Base 5 Example[*])
17	STW16 - Bit #16 - (least significant bit)
18	STW16 - Bit #15
19	STW16 - Bit #14
20	STW16 - Bit #13
21	STW16 - Bit #12
22	STW16 - Bit #11
23	STW16 - Bit #10
24	STW16 - Bit #9
25	STW16 - Bit #8
26	STW16 - Bit #7
27	STW16 - Bit #6
28	STW16 - Bit #5
29	STW16 - Bit #4
30	STW16 - Bit #3
31	STW16 - Bit #2
32	STW16 - Bit #1 - (most significant bit)
* The number of the status word is determined by adding 11 to the number of the base; hence the status word for base 5 is STW16.	

Technical Assistance

If you have questions concerning this information, contact your Siemens distributor or sales office. If you require assistance in contacting your distributor or sales office in the United States, phone 1-800-964-4114. For U.S. Drives information, call 1-770-740-3000.

4.9 Introducing the PROFIBUS-DP Configurator

Overview

The SIMATIC 505 FIM PROFIBUS-DP Configurator is a Windows® 3.1 application that allows you to override default parameters set by the FIM PROFIBUS-DP master. It is designed to provide support for SIMATIC ET 200B analog blocks and other DP slaves that must be configured by the master upon powerup in order to function on the PROFIBUS-DP I/O channel. The Configurator also allows you to change PROFIBUS master parameters for the FIM itself.

With the Configurator, you can create configuration files and write the configuration to the FIM. The configuration is stored in the FIM's non-volatile memory, which is sometimes called flash memory. The FIM uses this configuration to initialize the network each time it is power cycled. The configuration files are stored on your computer with the file extension *.fim*. You can also read the configuration that is stored in the FIM and save it to a file.

Introducing the PROFIBUS-DP Configurator (continued)

The main window of the PROFIBUS-DP Configurator is divided into three screen areas. See Figure 4-9. To learn more about each area of the Configurator, consult the appropriate section in this manual, or use the on-line help that is part of the Configurator package.

- **Configuration File:** allows you to save your work to a file. See Section 4.11.
- **FIM Operations:** allows you to modify the FIM setup (optional), to write your configuration changes to the FIM and read them back, and to configure communications. See Section 4.12.
- **Slave Operations:** allows you to edit parameters for your I/O, and to examine slave status. The Status button (accessed from Slave Operations) allows you to debug unsuccessful configuration attempts. See Section 4.13.

Figure 4-9 shows the main window of the PROFIBUS-DP Configurator.

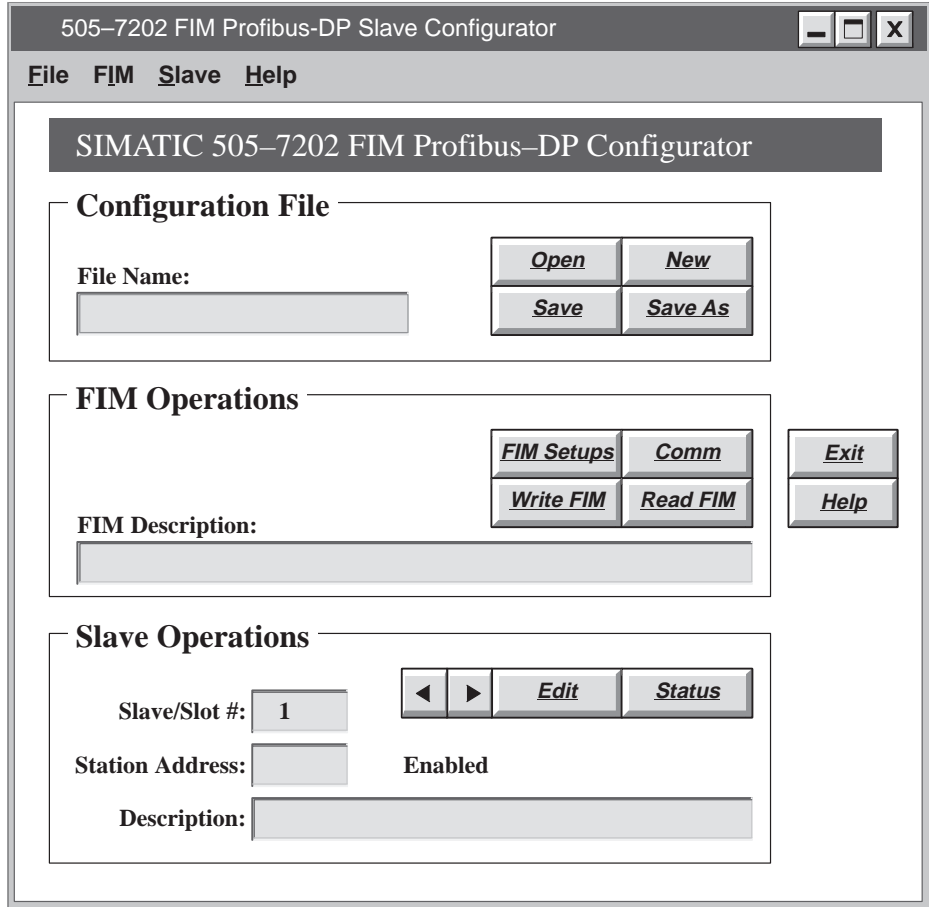


Figure 4-9 Main Configurator Window

Introducing the PROFIBUS-DP Configurator (continued)

When to Use the PROFIBUS-DP Configurator

Use the configurator only if the parameter default established by the FIM does not correspond to the setting needed for a given slave, or if the slave requires configuration of a parameter that the FIM does not automatically supply. Unlike COM ET 200, the Configurator does not require you to configure every slave device.

You do not need to manually enter settings for every slave; it is better to accept the defaults established by the FIM unless you have a specific reason for changing them. When you edit slave settings, you are not required to edit every field; make changes only to the specific item or items that you know must be modified, and leave the other settings alone.

The quickest way to determine if the slave needs special configuration is to connect it. If the FIM and slave cooperate (and if you do not want diagnostic data from the slave), then you probably do not need the Configurator. The following list of conditions can help you determine whether you need the Configurator for your configuration:

User Parameter Data This is slave-specific information about operational modes of the slave. User parameter data is written to the slave by the FIM when the slave is logged in to the system. The FIM has no way of predicting what this data is, so it must be entered by the user for any slave that requires it. Check your slave manual for requirements pertaining to user parameter data.

Diagnostics Location This is the V-memory location where the diagnostic data, read from the slave, is to be written by the FIM when the slave reports a diagnostic change. It is impractical for the FIM to determine by a default which V-memory locations that are not being used by the user program, and which slave(s) the user wants to capture the diagnostic information. The Configurator must be used to tell the FIM which slaves (if any) provide diagnostic information, and where to place the diagnostic information it receives from the slave(s).

Disabling unused slaves The FIM attempts to poll all 16 slaves, in order to identify new slaves dynamically as they appear. This increases the FIM's update time for the DP network, because of the time required to poll a slave. Since the FIM cannot predict where and how many slaves are to be used, use the Configurator to disable slave positions where there is not (and never will be) a slave. This eliminates unnecessary polling.

Global control messages Some slaves require global control messages to be sent periodically to enable (or disable) their I/O. The Configurator allows the enabling of global control messages. The FIM does not normally send these messages.

Specification of station address The FIM normally polls slaves based on the position of the slave within a given address range. For instance, addresses 17–32 are typically used to poll positions 1–16. (Section 4.5 has examples of address range selection.) However, some slaves have an address outside of the selected range, and their address may not be modifiable (or not easily changed). For these slaves, you can specify the station address individually, while leaving the default for slaves that are in the standard address range.

Specific parameters Some parameters tend to be slave-specific, such as watchdog time, minimum scan time, etc. For instance, you may want to increase (or decrease) the watchdog time for a specific slave. The FIM's watchdog time defaults are based on the network baud rate. The FIM cannot predict these parameters in order to configure the individual slaves. The Configurator allows you to configure or adjust these parameters selectively as needed.

Tuning the network You can adjust certain slave parameters, such as slot time, trdy, retries, and minimum scan time, to adjust overall performance. For instance, you may want to increase the number of retries for a network in a very noisy environment, to add robustness. The Configurator gives you the capability of modifying these parameters.

Introducing the PROFIBUS-DP Configurator (continued)

Hardware Requirements

To use the PROFIBUS-DP Configurator, your system must meet the following minimum requirements:

- PPX:505–7202 FIM, Release 3.2 or higher.

NOTE: The PPX:505–7201 FIM cannot be upgraded to Release 3.2; it lacks the flash memory and serial port required for the configurator.

- IBM®-compatible personal computer (PC) with Windows 3.1, MS-DOS® 5.0 or higher, 4 Mbytes RAM, and 1 Mbyte available hard disk space for storage of configurator files.
- Available 9-pin RS-232 communications port and cable. (You can use the same cable and PC port for the configurator that you use to communicate between your Series 505 CPU and the PC where you run TISOFT, if the PROFIBUS-DP Configurator and TISOFT applications are not used simultaneously.)

You also need the Release 1.0 PROFIBUS-DP Configurator diskette, which ships with Release 3.2 or higher of the FIM.

4.10 Installation and Cabling

Task Overview: Running the PROFIBUS-DP Configurator

To run the PROFIBUS-DP Configurator, you need to perform the following tasks, which are described in detail on the pages that follow.

- Install the configurator files (which are shipped on a diskette) on your personal computer.
- If necessary, create an icon to represent the PROFIBUS-DP Configurator in your Windows environment.
- Set the dipswitches on the back of the FIM to select the PROFIBUS-DP Interface Application.
- Connect cable between your PC and the FIM. You can use the Series 505 programming cable that is already on the serial port of your PC; disconnect the cable from the CPU and attach it to the FIM.
- Invoke the PROFIBUS-DP Configurator and edit I/O settings as necessary. The configurator has extensive, context-sensitive on-line help available to guide you through the features of the application.

Installation and Cabling (continued)

Installing the Configurator File on Your PC

The PROFIBUS-DP Configurator application ships on a diskette. To install the configurator on your PC, follow the procedure below.

1. From DOS, create a directory for the configurator files on the desired hard drive of your PC. For instance, if you intend to use drive C:, type the following.

```
md c:\dpcfg
```

{If C: is not suitable, substitute the desired drive. "dpcfg" is the name of the directory where your FIM configurator files will be stored.}

2. Insert your diskette into the diskette drive (e.g., the A: drive) and copy all files onto the hard drive by typing the following.

```
copy a:\*.* c:\dpcfg
```

3. Exit DOS by typing the following.

```
exit
```

Creating an Icon in Windows

To create an icon for your PROFIBUS-DP Configurator in Windows, follow the procedure below.

1. Select the Windows File Manager icon and choose File → New.
2. In the New Program Object window, choose the Program Item field.
3. Complete the Description field as follows.

FIM DP Configurator

4. Complete the Command Line field as follows.

c:\dpcfg\dpcfg.exe

{If you used a different drive or directory name when you installed your configuration files, type that path instead.}

5. Complete the Working Directory field as follows.

c:\dpcfg

6. Click on OK to confirm these settings.

The PROFIBUS-DP Configurator icon appears on your Windows desktop.

Installation and Cabling (continued)

Setting Up the PC-to-FIM Connection

Follow these steps to set up the PC-to-FIM connection.

1. Turn off power to the I/O base and any modules installed in the base with the FIM.
2. Remove the FIM and set the dipswitch S3 as shown in Table 4-12:

Table 4-12 FIM Dipswitch Settings for PROFIBUS-DP

FIM Dipswitch (S3) Settings	
S3-1 = Open/OFF	S3-5 = x (don't care)
S3-2 = Closed/ON	S3-6 = x (don't care)
S3-3 = Closed/ON	S3-7 = x (don't care)
S3-4 = Closed/ON	S3-8 = x (don't care)

3. Insert the FIM into the I/O base and apply power to the I/O base.
4. Connect a cable from the serial port of the computer that has the Configurator software to the RS-232 port of the FIM. See Figure 4-10. A suitable cable may be ordered from Siemens using part number PPX:2601094-8001, which is the standard TISOFT programming cable.

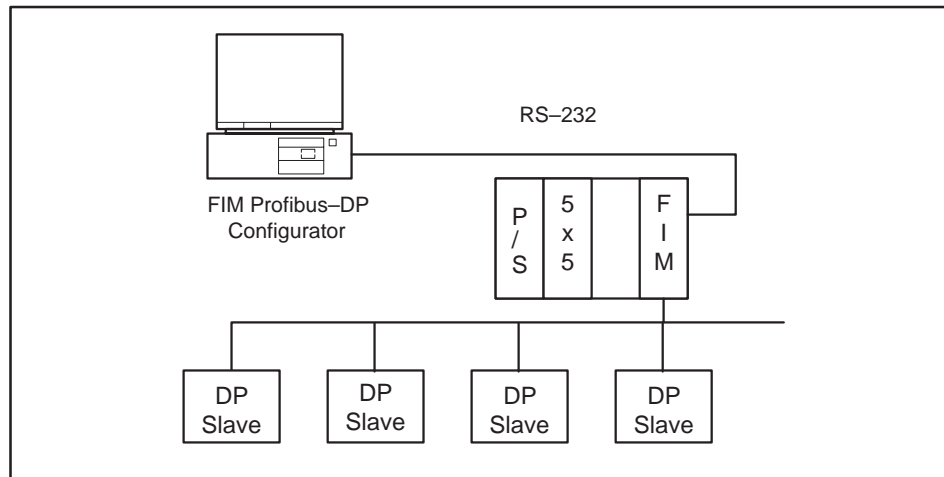


Figure 4-10 Connecting Cable from PC to FIM

5. Start the Configurator software on your computer.

NOTE: To invoke the PROFIBUS-DP Configurator, double-click on the application icon or run it from the File Manager.

-
6. Select the Comm button in the FIM Operations area. (See Figure 4-11.)

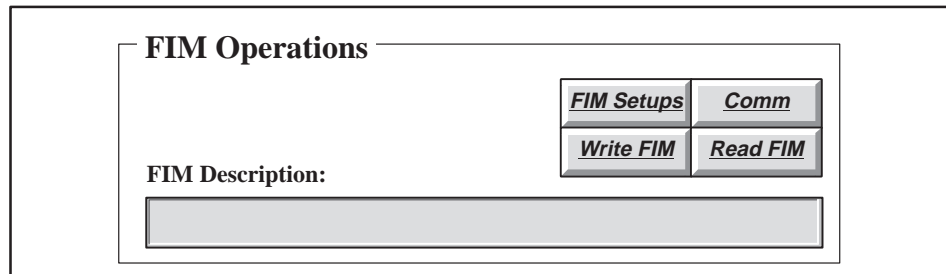


Figure 4-11 FIM Operations Area

Result: The PC-to-FIM Communications Setup dialog box appears, as shown in Figure 4-12.

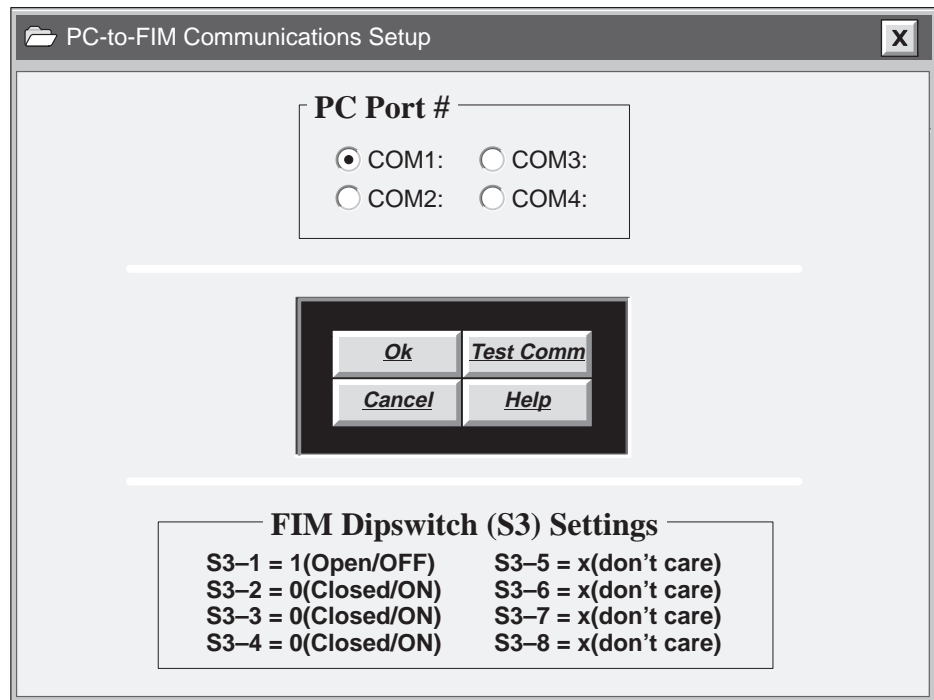


Figure 4-12 PC-to-FIM Communications Setup Dialog Box

7. Select the PC Port # that corresponds to the serial port in your computer that is connected to the FIM.

NOTE: The baud rate for the PC-to-FIM interface on the FIM is fixed at 19.2K bps.

Installation and Cabling (continued)

8. Select the Test Comm button (shown in Figure 4-12). If everything is connected properly, a confirmation message is displayed; otherwise, a failure message is displayed.
9. Select the Ok button to save the port selection.

NOTE: Pinouts for the RS-232 port should conform to those specified in Chapter 2, in the section on communication port pinouts.

4.11 File Configuration

Configuration File Screen Area

The Configuration File screen area shown in Figure 4-13 provides button selections for loading and saving a configuration file. The same options are available under the File menu.

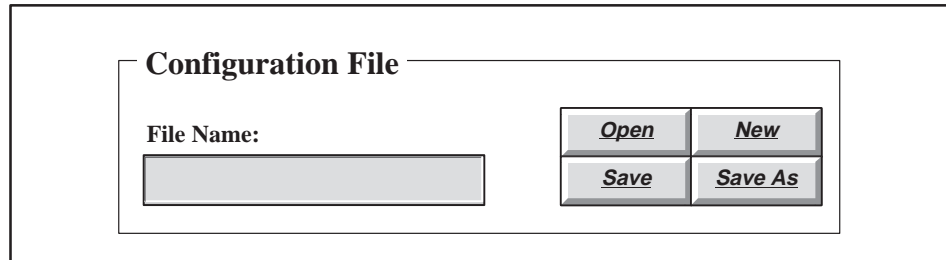


Figure 4-13 Configuration File Screen Area

File Name This field displays the name of the configuration file that is currently open. This field is blank if you have selected the New command, or have not yet specified a file name.

Open Use this command to open an existing configuration file. The Configurator displays the Open Disk File dialog box (see Figure 4-14).

New Use this command to clear the existing configuration. Using the New command and then writing the cleared configuration to the FIM resets the FIM to its default operation with respect to slave devices.

Save Use this command to save the configuration file with its current name and directory. When you save a document for the first time, the Configurator displays the Save File dialog box so you can name your configuration file. (See Figure 4-15.) If you want to change the name and directory of an existing configuration file before you save it, choose the Save As command.

Save As Use this command to save and name the current configuration. The Configurator displays the Save File dialog box so you can name your configuration. (See Figure 4-15.)

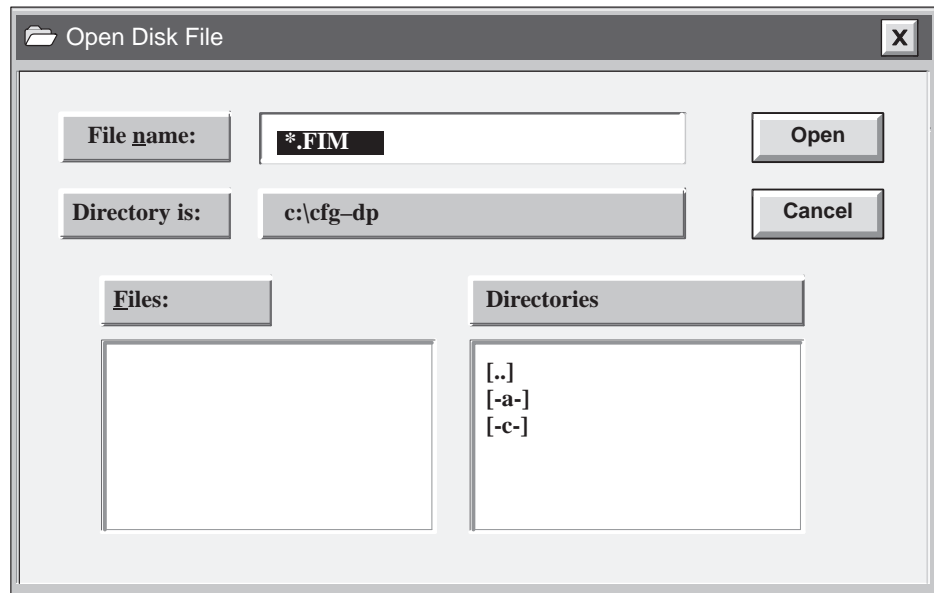


Figure 4-14 Open Disk File Dialog Box

The Open Disk File dialog box shown in Figure 4-14 contains the following fields, which enable you to specify which file to open:

File Name Type or select the name of the file that you want to open.

Directory is Displays the currently selected drive and directory.

Files Displays the configuration files available in the currently selected drive and directory.

Directories Select the directory where the file that you want to open is stored.

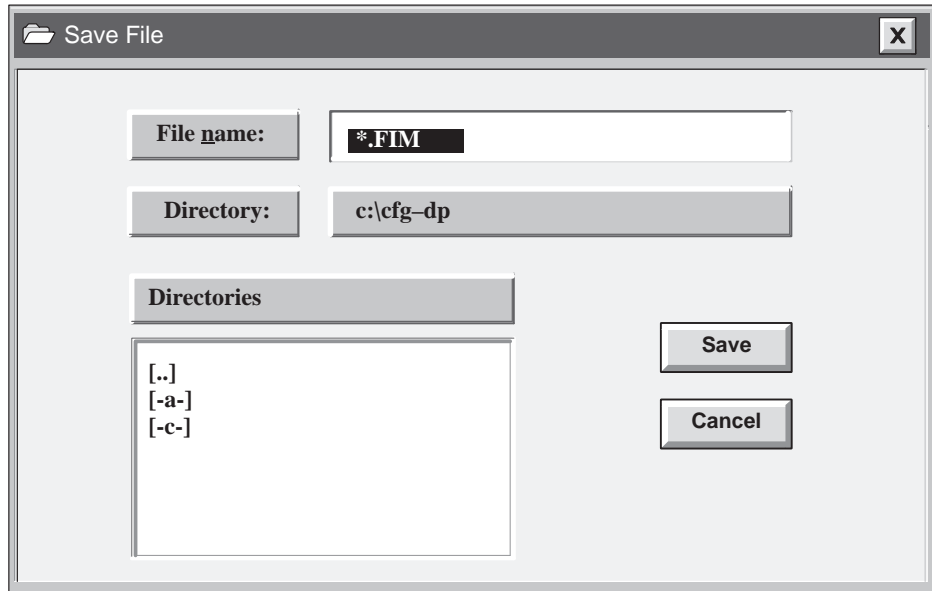


Figure 4-15 Save File Dialog Box

The Save File dialog box shown in Figure 4-15 contains the following fields, which enable you to specify the name and location of the file that you are about to save:

File Name Type a new file name to save a configuration with a different name. A file name can contain up to eight characters, with an extension of up to three characters.

Directory Displays the currently selected drive and directory.

Directories Select the directory in which you want to store the configuration.

4.12 FIM Operations

FIM Operations Screen Area

The FIM Operations screen area shown in Figure 4-16 provides the following button selections for configuring the PROFIBUS master parameters of the FIM, for establishing communications with the FIM, and for reading or writing configurations from or to the FIM. The same options are available under the File menu.

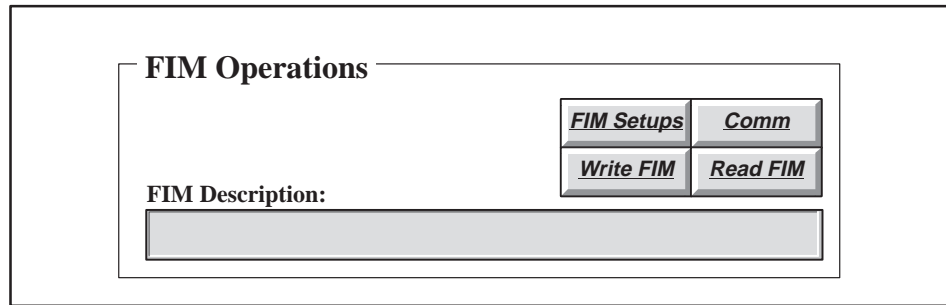


Figure 4-16 FIM Operations Screen Area


Setups (FIM Setups button) This function allows you to override certain parameters that define how the FIM operates as a master. For more information, see page 4-66.

Communications (Comm button) This function allows you to define and test serial port assignments for PC-to-FIM communications. For a description of the procedure involved, see page 4-59.

NOTE: The TestComm button (available when you select the Comm button) tests your communication settings and the connection to the FIM, and displays a message that states whether or not communications are working properly. You can modify PC serial port settings in the PC-to-FIM Communications Setup dialog box; a list of required dipswitch settings is also displayed, and you can manually alter any switches on the back of the FIM as needed.

Read Configuration (Read FIM button) This function reads the current configuration from the FIM into the Configurator. This operation takes approximately thirty seconds to complete.

Write Configuration (Write FIM button) This function writes the current configuration from the Configurator to the FIM.

 WARNING
<p>Writing a configuration to the FIM causes the FIM to go offline for approximately thirty seconds.</p> <p>Taking the FIM offline could cause unpredictable operation of your process, potentially resulting in death or serious injury to personnel, and/or damage to equipment.</p> <p>Only qualified personnel should issue a Write FIM. Be advised that when the FIM goes offline, slave devices trip their watchdog timers and return outputs to predefined safe states; the FIM then reinitializes each slave based on the information provided in the configuration that you write to the FIM.</p>

FIM Description This text field displays the description that you entered in the FIM Setups dialog box to identify this specific configuration. This information is optional and is not used by the FIM. This field is provided for your convenience to document your application.

Troubleshooting Parameter Table Errors

The parameter table contains the configuration information that you created in the Configurator and wrote to the FIM. The following conditions cause a parameter table error message:

- You powered up the FIM and tried to use the Configurator to Read FIM. The FIM does not have any configuration information stored in its parameter table as you receive it from the factory. Solution: You must create the configuration with the Configurator and then use Write FIM to store the configuration information in the parameter table.
- You installed a new release of the FIM firmware using fimutl.exe. The firmware load utility, fimutl, clears the parameter table. Solution: After you load new firmware into the FIM, use the Configurator to open your configuration file, then Write FIM.
- The parameter table information in the FIM's EEPROM has been corrupted. Solution: Use the Configurator to open your configuration file, then Write FIM. If this condition continues to occur, return your FIM for repair.

FIM Operations (continued)

FIM Setups Dialog Box

The FIM Setups dialog box shown in Figure 4-17 allows you to override certain parameters that define how the FIM operates as a master on the PROFIBUS network. You do not need to change any of these parameters to set up a configuration. Change them only when you want to override the default operation.

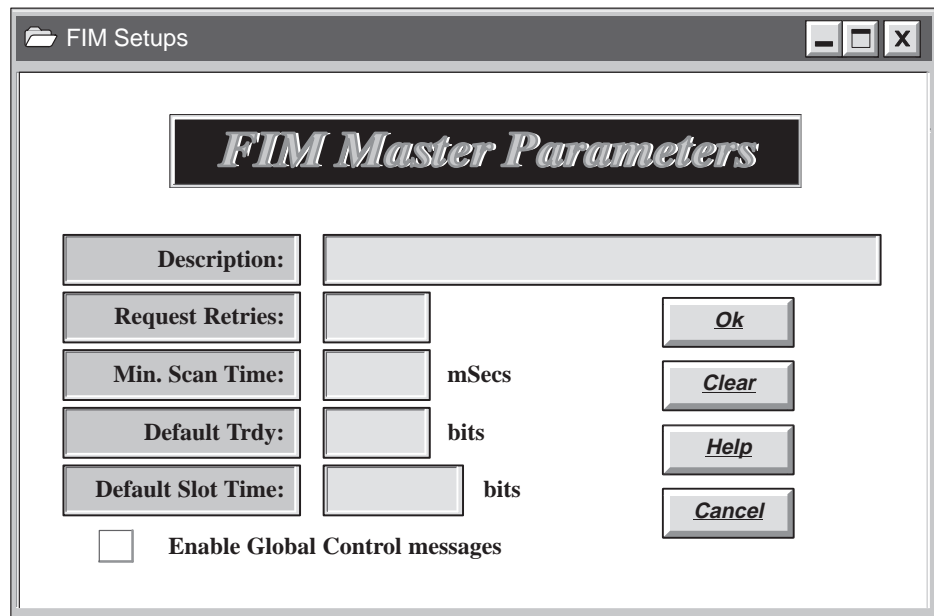


Figure 4-17 FIM Setups Dialog Box

Description This text field allows you to enter a description of the current configuration file. This field is not used by the FIM; it is provided to help you document your configuration.

Request Retries This field determines the maximum number of times the FIM retries a message to a slave after the initial request message is sent. The range for this field is 1 to 4. The default is 2.

Min. Scan Time This field determines the time the FIM performs background processing before starting another I/O update cycle. The range for this field is 0 to 200 ms. The default is zero.

Default Trdy This field determines the minimum number of bit times a slave waits before it responds to a message from the master. The range for this field is 11 to 55. The default is defined by the baud rate. The default is 11 if token passing is disabled, and 55 if token passing is enabled.

Default Slot Time This field determines the maximum number of bit times that a slave can take to complete transmission of the first character in its response before the FIM times it out. The range for this field is 30 to 5,000. The default bit times for each baud rate are listed in Table 4-13.

Table 4-13 Default Bit Times Based on Baud Rate

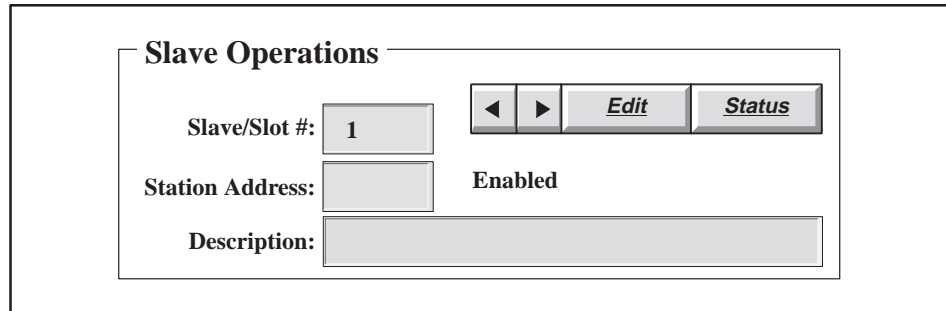
Baud Rate	Bit Times	Baud Rate	Bit Times
1.5 M	2250	187.5 K	200
750 K	1150	93.75 K	100
500 K	750	19.2 K	100
375 K	563	9.6 K	100

Enable Global Control Messages When selected, this causes the FIM to send the Global Control message after every fourth update scan. The Global Control message forces I/O on for DP slaves that do not default to On. However, sending this message adds additional overhead time to the network. This function is disabled by default. Select this parameter if your network contains the SIMATIC 505 PROFIBUS-DP RBC (PPX:505-6870); otherwise your Series 505 output modules in the PROFIBUS-DP RBC do not update their output data.

4.13 Slave Operations



Slave Operations Screen Area

The Slave Operations screen area shown in Figure 4-18 provides button selections for configuring slave modules.



The screenshot shows a window titled "Slave Operations". Inside the window, there are three input fields: "Slave/Slot #:" with the value "1", "Station Address:", and "Description:". To the right of the "Slave/Slot #:" field are two navigation buttons (left and right arrows) and two action buttons labeled "Edit" and "Status". Below the "Station Address:" field, the text "Enabled" is displayed.

Figure 4-18 Slave Operations Screen Area

Slave/Slot # This field displays the currently selected slave number. The FIM supports up to 16 slaves, numbered 1 to 16, corresponding to slot numbers 1 to 16. Selecting  displays the information for the previous slave. Selecting  displays the information for the next slave. Select one of these buttons repeatedly to cycle through the slave list.

Station Address This field displays the PROFIBUS slave address for the slave at this slot.

Enabled This area displays the selected state of the slave. By default, each slave is enabled in the configuration for polling and displays as Enabled in the Slave Operations area. When you select Slave disabled (Not polled) from the Edit Slave dialog box, the Slave Operations area displays Disabled for that slave.

Description This field displays the text that you entered in the Edit Slave dialog box to describe this particular slave device.

Edit This button summons the Edit Slave dialog box. (See page 4-69.)

Status This button allows you to check the status of a slave. (See page 4-76.)

**Edit Slave Dialog
Box**

The Edit Slave dialog box shown in Figure 4-19 allows you to override the default operation of specific slave devices on the PROFIBUS network.

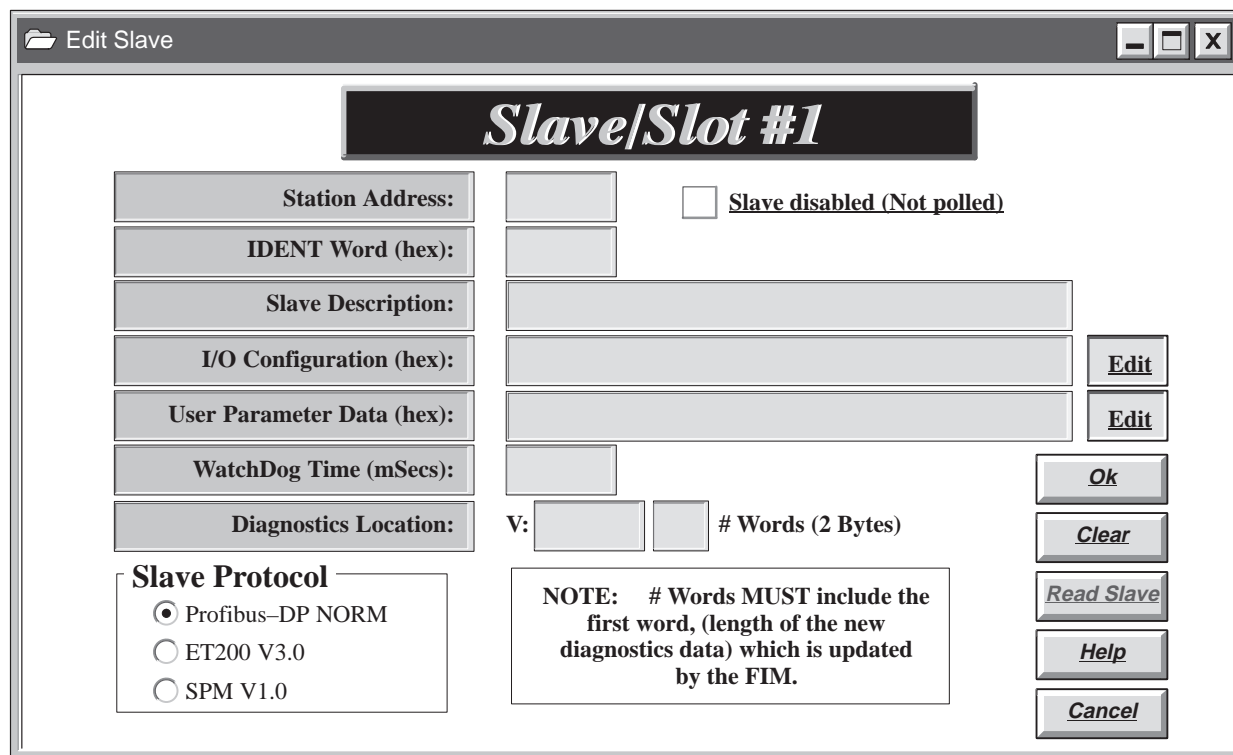


Figure 4-19 Edit Slave Dialog Box

NOTE: Change or provide only the information that is necessary for the operation of the slave device. You do not have to edit every field.

Station Address This field determines the PROFIBUS network address for the slave device. Valid addresses for slaves range from 4 to 126. If the slave is outside of the address range selected for the FIM (by dipswitch setting), you must enter a value in this field before selecting the Read Slave button.

Slave Operations (continued)

Slave disabled (Not polled) Select this checkbox to specify that the FIM should not poll for a slave at this slave position. (Remember that other slave positions can be set to have this slave's address in the poll range.) The FIM can poll up to sixteen slave devices on a PROFIBUS network. If a slave does not exist, the FIM continues to poll and retry that slave address. If you have fewer than sixteen slaves, you can reduce the overall scan time by setting this checkbox for the slave addresses that do not exist. The FIM does not poll or retry the disabled addresses.

IDENT Word (hex) The IDENT word number is used for the precise identification of the device type of a DP slave on the network. All DP slave devices must have an IDENT word number for reading diagnostics data and writing parameterization data. This number permits the DP masters to identify the DP slaves with a minimum of protocol. You do not need to fill in the IDENT Word field unless your device does not properly return its default IDENT word number.

Be sure to select a protocol (see the description of Slave Protocol on page 4-72) before editing the IDENT Word field. Selecting any protocol other than PROFIBUS-DP NORM erases the contents of this field and prevents you from editing it.

The IDENT word number for a device is usually identified in the manufacturer's equipment manual. An individual IDENT word number is assigned to each manufacturer by the PNO (PROFIBUS User Organization). This number is not a serial number. After a manufacturer receives an IDENT word number from the PNO for a device type, the manufacturer can use the same number for every device of this type. If you do not know what the IDENT word number is, enter the address in the Station Address field and select the Read Slave button. The FIM reads and fills in this value.

Slave Description This optional text field describes the slave device. Enter any descriptive information that helps you identify this particular slave. This field is not used by the FIM; it is provided for your convenience to document your application. Up to 45 characters can be displayed in the field at one time. Left-click the mouse in the field to set the edit cursor in the field. The END key moves the cursor to the end of the text, and the HOME key moves the cursor to the beginning of the text. You can press either the up or left arrow to move the cursor one character to the left; press the down or right arrow to move the cursor one character to the right.

I/O Configuration (hex) This field is the hexadecimal representation of the slave's I/O configuration data. You can enter the hexadecimal data in this field, or you can select the Edit button, and complete the Edit I/O Configuration dialog box. (See page 4-73.)

Be sure to select a protocol (see the description of Slave Protocol on page 4-72) before editing the I/O Configuration field. Selecting the SPM V1.0 protocol disables this field and prevents you from editing it. Reselecting the previous protocol setting after selecting the SPM V1.0 setting restores the values set under the previous protocol setting.

If you do not know what the I/O configuration value is, enter the address in the Station Address field, left-click the mouse in this field, and select the Read Slave button. The FIM then reads and fills in this value.

Up to 24 bytes are displayed in the field at one time. Left-click the mouse in the field to set the edit cursor in the field. The END key moves the cursor to the end of the text, and the HOME key moves the cursor to the beginning of the text. You can press either the up or left arrow to move the cursor one nibble to the left; press the down or right arrow to move the cursor one nibble to the right.

User Parameter Data This field is required by some slave devices to configure their operation. For example, the ET 200B-4AI (6ES7 134-0HF00-0XB0) and the ET 200B-4AO (6ES7 135-0HF00-0XB0) both require User Parameter Data to define the analog value range and other data. You can enter the hexadecimal data in this field, or you can select the Edit button, and complete the Edit User Parameter dialog box (described on page 4-74).

Be sure to select a protocol (see the description of Slave Protocol on page 4-72) before editing the User Parameter Data field. Selecting any protocol other than PROFIBUS-DP NORM erases the contents of this field and prevents you from editing it.

Up to 24 bytes are displayed in the field at one time. Left-click the mouse in the field to set the edit cursor in the field. The END key moves the cursor to the end of the text, and the HOME key moves the cursor to the beginning of the text. You can press either the up or left arrow to move the cursor one nibble to the left; press the down or right arrow to move the cursor one nibble to the right.

WatchDog Time (hex) The value in this field specifies how long the slave waits without hearing from the master before it sets its outputs to its predefined safe state. The watchdog time is sent to the slave device when the FIM configures the slave.

Be sure to select a protocol (see the description of Slave Protocol on page 4-72) before editing this field. Selecting the SPM V1.0 protocol disables this field and prevents you from editing it. Reselecting the previous protocol setting after selecting the SPM V1.0 setting restores the values set under the previous protocol setting.

Slave Operations (continued)

Diagnostics Location This field specifies the V-memory location in the controller where the FIM stores the station diagnostics information for this slave. The first word (two bytes) at this V-memory location is the length of the diagnostics data returned by the FIM. You must specify the amount of diagnostic data in words (multiples of two bytes). For example, if you have three bytes of diagnostic data, specify two words plus one word for the length, for a total of three words. If the slave returns more diagnostic data than you have allocated space for, the data is truncated to the length that you specified.

Be sure to select a protocol (see the description of Slave Protocol) before editing this field. Selecting any protocol other than PROFIBUS-DP NORM erases the contents of this field and prevents you from editing it.

Slave Protocol These radio buttons specify the PROFIBUS-DP protocol version that the slave device uses.

PROFIBUS-DP NORM, also known as DP Standard, is used for all slave devices that are PROFIBUS-DP compliant. This is also the protocol for the IM 318-B when the dipswitch is set to the PROFIBUS-DP NORM setting.

ET 200 V3.0 is for earlier slave devices that use the DP-Siemens protocol.

SPM V1.0 is for slave devices that incorporate the SPM. Two such modules are the ET 200B units, 6ES5-451-2BA11 (16 Discrete Output, 24 VDC, 0.5 A) and 6ES5-454-2BA11 (16 Discrete Output, 24 VDC, 2.0 A).

If you do not know what the protocol setting is for a given slave, enter the address in the Station Address field, select one of the protocol radio buttons, and select the Read Slave button. The FIM reads and fills in this value.

You can select the Read Slave button to read the IDENT word, I/O configuration, and slave protocol information for the specified slave address from the FIM. If the slave is outside of the address range selected for the FIM (by dipswitch setting), you must first enter a value in the Slave Address field. Then place the cursor in the field you want to read and select the Read Slave button. This provides you with the information that the FIM gathered when it initialized the PROFIBUS network.

Edit I/O
Configuration
Dialog Box

The Edit I/O Configuration dialog box shown in Figure 4-20 provides fields for configuring individual I/O positions.

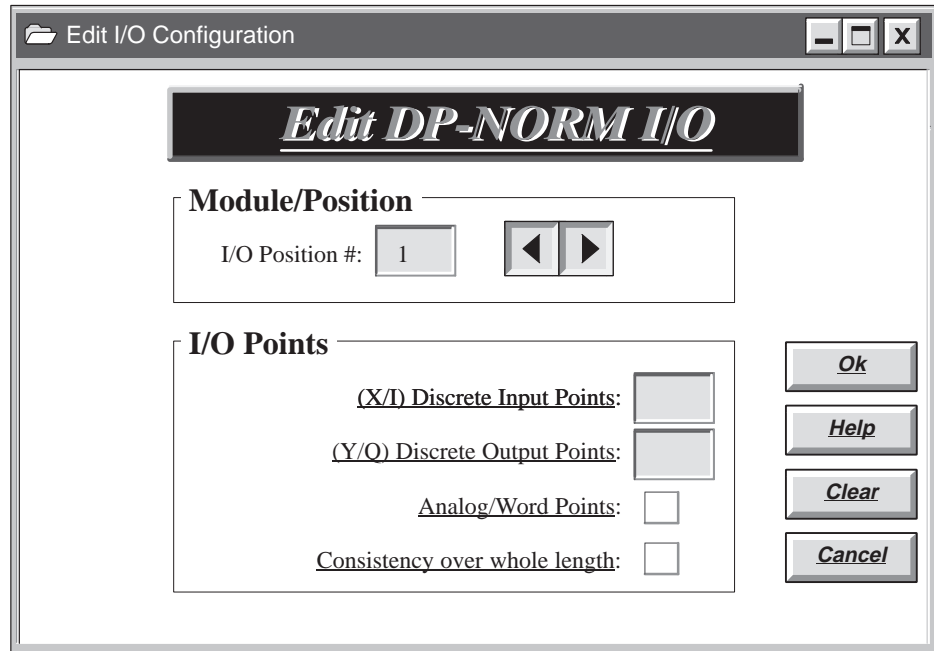




Figure 4-20 Edit I/O Configuration Dialog Box

Module/Position This field identifies the position of the module in the bus interface. You can connect up to 32 modules to a DP slave, corresponding to positions 1 through 32. ET 200B slave devices configure with only one module position, since they are not modular. Click on  to select the next position; click on  to select the previous position.

(X/I) Discrete Input Points This field identifies the total number of discrete input points.

(Y/Q) Discrete Output Points This field identifies the total number of discrete output points. (The 6ES5 422-8MA11 16-point Discrete Input Module requires you to define 16 output points.)

Analog/Word Points Select this checkbox to define the module position as analog/word, as opposed to discrete. The point count fields above the checkbox are then transformed to show the number of analog input points and analog output points.

Consistency over whole length Select this checkbox to define the module position as having consistency over the whole length.

Slave Operations (continued)

Edit User Specified Parameter Data Dialog Box

The Edit User Specified Parameter Data dialog box shown in Figure 4-21 provides fields for configuring user parameter data.

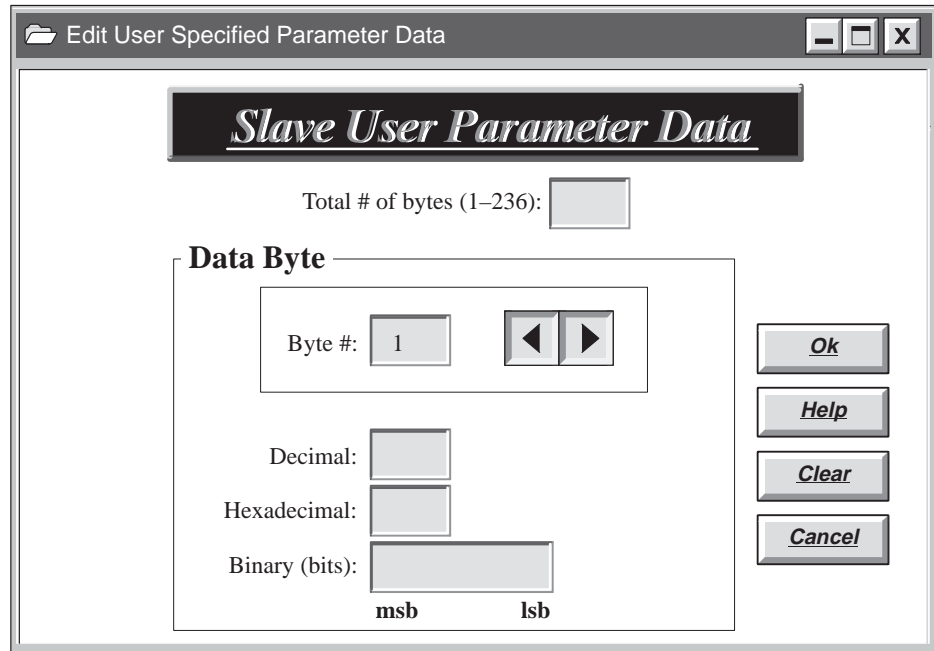




Figure 4-21 Edit User Specified Parameter Data Dialog Box

Total # of bytes (1-236) This field identifies the total number of User Parameter Data bytes that you want to configure. Enter the value for this field first.

Byte # This field identifies the specific byte and its data value, as specified in decimal, hexadecimal, and binary. You can enter the value in any one of the number bases; the Configurator automatically fills in the other number base values. Click on  to select the next byte; click on  to select the previous byte.

The following example shows how you might define the User Parameter Data for the ET 200B-4AO (6ES7 135-0HF00-0XB0) 4-channel analog output module.

**Example: User
Parameter Data**

The ET 200B analog modules require a 25-byte parameterization frame to define the diagnostics characteristics and the necessary defaults for analog value measurement or analog value output.

Byte #	Hex Code	Description	
1	13		
2	00		
3	00		
4	?	The four least significant bits determine whether diagnostics are enabled or disabled for each of the four channels. For example: 00 – Diagnostics disabled for all channels. 0F – Diagnostics enabled for all channels. 05 – Diagnostics enabled for Channels 2 and 0.	
5	00		
6	00		
7	00		
8	?	Type and range of measurement for Channel 0.	For voltage measurement: 18 – 0 to 10V 19 – ± 10V For current measurement: 22 – 0 to 20mA 23 – 4 to 20mA 24 – ± 20mA
9	?	Type and range of measurement for Channel 1.	
10	?	Type and range of measurement for Channel 2.	
11	?	Type and range of measurement for Channel 3.	
12	00		
13	00		
14	00		
15	00		
16	00		
17	00		
18	00		
19	00		
20	06		
21	FF		
22	00		
23	00		
24	00		
25	00		

4.14 Status and Diagnostics

Checking Slave Status with the Status Button

The Status button feature of the Configurator is designed to help diagnose parameterization and configuration errors on individual slaves. Status cannot be used with SPM V1.0 slave devices. To use the Status button feature, follow these steps:

1. Configure the user I/O for each slave using TISOFT.
2. With the Configurator program running on a PC and connected to the FIM (as described on page 4-58), move to a slave whose status you wish to check.
3. Click on the Status button.
4. Interpret the result. Possible results are described below.

Normally, if the slave is communicating, you get a response dialog box indicating the current status of the slave. If the slave is a PROFIBUS-DP NORM slave you see all the following status terms; if it is a ET 200 V3.0 then you do not see the first two.

- **Slave Ident # correct?** This indicates whether the IDENT word of the slave has been set, and if so, whether it matches what the slave requires. If no IDENT word has been set, then the prompt displays NOT SPECIFIED. YES indicates that the specified IDENT word matches what the slave requires; NO indicates that the specified IDENT word does not match what the slave requires (PROFIBUS-DP NORM only).
- **Parameterization correct?** This indicates whether or not the slave rejected the parameterization data. Rejection usually means that the User Parameter Data has not been specified or is specified incorrectly. Rejection can also indicate that the IDENT word is not specified, and needs to be, or that the IDENT word is specified incorrectly (PROFIBUS-DP NORM only).
- **I/O Configuration correct?** This indicates whether or not the slave rejected the I/O configuration. The I/O configuration may be rejected because you specified the configuration incorrectly, or because you failed to specify I/O when a slave requires it.
- **Slave ready for I/O** This indicates whether or not a slave is ready to exchange I/O with the FIM. Some slaves ignore minor configuration and parameterization messages and exchange I/O regardless.
- **Slave diagnostic buffer** This is the data field from the slave diagnostic buffer. You must have the protocol specification (DIN 19245, Part 3) to interpret this data.

You may also receive one of the following error messages instead of the status dialog box:

- **FIM cannot communicate with this slave!** This means that the slave did not respond to the FIM at the slave address set to this slave position. This could be due to an incorrect address on the slave, an incorrect address configured for this slave position, an incorrect address range setting for the FIM (if the address is not configured for this slave position), an incorrect baud rate on a slave, an incorrect baud rate on the FIM, a wiring problem, or a slave that is not powered up.
- **Slave is an SPM V1.0.** This means that the slave answering at this slave position has an SPM V1.0 ASIC in it. These devices do not have slave I/O configurations or parameterization, so status checks are irrelevant.
- **Could not talk to the FIM!** Communication between the PC running the Configurator software and the FIM could not be established. Check for the proper port selection on the Configurator, the correct setting for dipswitches on the FIM, and proper cable connection between the FIM and PC.

Using Slave Diagnostics

The FIM is capable of returning extended diagnostic data for PROFIBUS-DP slaves (DP-Siemens and SPM V1.0 devices are excluded). When a slave signals the FIM that diagnostic information is present, the FIM reads the data and stores it in the V-memory location specified in the Edit Slave dialog box. The data in the V-memory area remains until the slave signals the FIM again or your ladder logic program writes into this area.

To handle the extended diagnostic data, set up your ladder logic following this procedure:

1. Fill the first V-memory word with zeros on initial startup.
2. Compare the first V-memory word to zero. If non-zero, set a contact that causes a subroutine to execute.
3. In the subroutine, process the diagnostics data and perform any alert actions. Then fill the first V-memory word with zeros again.

The format of the extended diagnostic data is dependent on the slave device. The following examples show how to reference the diagnostic data in your ladder logic program.

Status and Diagnostics (continued)

Diagnostic
Location Example:
ET 200B

Table 4-14 shows the Diagnostics Location fields for an ET 200B. The ET 200B analog modules use ten bytes or five words per slave station for device diagnostics information. In this example, the diagnostics location is placed at V101; the number of words is 6 (5 + 1 for the diagnostics length word).

Table 4-14 Diagnostics Locations for the ET 200B

V-Memory Location	Diagnostics Information
V101	Length of diagnostics data (word).
V102	Beginning of device-related diagnostic information (header word).
V103.9	Wrong parameterization frame.
V103.13	Channel fault exists.
V103.14	External fault, for example, wirebreak.
V103.15	Internal fault of the ET 200B.
V103.16	Diagnostics message pending.
V105.4	Internal error of the ET 200B (analog-digital conversion, ET 200B-4AO only).
V105.6	Internal fault of the ET 200B (EEPROM error, ET 200B-4AI only).
V105	Lower byte: type of analog ET 200B: 71h – 4AI, 4/8AI 73h – 4AO.
V106	Lower byte: number of channels.

Diagnostic
Location Example:
ET 200U

Table 4-15 shows the Diagnostics Location fields for an ET 200U. The ET 200U slave stations use eight bytes or four words per slave station for the station and module diagnostics information. In this example, the diagnostics location is placed at V101; the number of words is 5 (4 + 1 for the diagnostics length word).

Table 4-15 Diagnostics Locations for the ET 200U

V-Memory Location	Diagnostics Information	V-Memory Location	Diagnostics Information
V101	Length of diagnostics data (word).	V104.6	Module in slot 10 is faulty.
V102	Beginning of device-related diagnostic information.	V104.7	Module in slot 9 is faulty.
V102.11	An output has been activated incorrectly (short circuit L+).	V104.8	Module in slot 8 is faulty.
V102.12	Load voltage missing or output short circuit of M.	V104.9	Module in slot 23 is faulty.
V102.15	Wrong number of identifiers configured.	V104.10	Module in slot 22 is faulty.
V102.16	Slave station is in slow mode.	V104.11	Module in slot 21 is faulty.
V103	Beginning of module-related diagnostic information.	V104.12	Module in slot 20 is faulty.
V103.9	Module in slot 7 is faulty.	V104.13	Module in slot 19 is faulty.
V103.10	Module in slot 6 is faulty.	V104.14	Module in slot 18 is faulty.
V103.11	Module in slot 5 is faulty.	V104.15	Module in slot 17 is faulty.
V103.12	Module in slot 4 is faulty.	V104.16	Module in slot 16 is faulty.
V103.13	Module in slot 3 is faulty.	V105.1	Module in slot 31 is faulty.
V103.14	Module in slot 2 is faulty.	V105.2	Module in slot 30 is faulty.
V103.15	Module in slot 1 is faulty.	V105.3	Module in slot 29 is faulty.
V103.16	Module in slot 0 is faulty.	V105.4	Module in slot 28 is faulty.
V104.1	Module in slot 15 is faulty.	V105.5	Module in slot 27 is faulty.
V104.2	Module in slot 14 is faulty.	V105.6	Module in slot 26 is faulty.
V104.3	Module in slot 13 is faulty.	V105.7	Module in slot 25 is faulty.
V104.4	Module in slot 12 is faulty.	V105.8	Module in slot 24 is faulty.
V104.5	Module in slot 11 is faulty.		

4.15 Setting Up and Wiring the 6SE30 PROFIBUS Micromaster Drive

Required Hardware and Software You can use any hardware and/or software version of the 6SE30 PROFIBUS Micromaster Drive.

Required Parameters The parameters required for the 6SE30 follow:

- P700 display only – shows the software version.
- P701 determines the equipment system number. It has no operational effect.
- P710 display only – shows the motor current.
- P711 display only – shows the motor torque.
- P712 display only – shows the motor slip.
- P720 determines which input/output signals can be controlled or monitored by PROFIBUS.
- P721 display only – shows the analog input voltage.
- P722 display only – shows the PTC input voltage.
- P723 display only – shows the status of the drive digital inputs.
- P724 display only – shows the status of the drive relay output.
- P880 display only – indexed parameter diagnostic data – for troubleshooting.
- P918 must be set to the individual drive PROFIBUS address. For use with the FIM, the first valid drive address is 17.
- P927 selects local or remote parameter control.
0 selects local parameter control.
1 selects remote (PROFIBUS) parameter control.
- P928 selects local or remote drive control.
0 selects local drive control, monitor mode only for PROFIBUS.
1 selects remote (PROFIBUS) drive control.
- P947 display only – indexed parameter fault log – for troubleshooting.
- P958 display only – warning code.

P963 display only – shows the baud rate of the PROFIBUS serial bus. This is set automatically in PROFIBUS mode.

0 baud rate not found

96 9600 baud

187 187.5 Kbaud

192 19.2 Kbaud

500 500 Kbaud

937 93.75 Kbaud

1500 1.5 Mbaud

P967 display only – shows the latest received control word in bit array format.

P968 display only – shows the latest drive status word in bit array format.

P971 selects if PROFIBUS parameter changes are stored in the drive EEPROM.

0 parameter changes are not stored in EEPROM.

1 parameter changes are stored in EEPROM.

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

NOTE: Unlike some Siemens variable speed drives, the PROFIBUS Micromaster will automatically be controlled via serial communications when wired and set up according to this document with P928=1. If P928=0, then the PROFIBUS Micromaster will only communicate status and feedback information. The process data section defines the control word, status word, main setpoint and main actual value for the interface. Definition of the process data section is fixed. The PROFIBUS Micromaster only supports PPO types 1 and 3. Type 1 is 4 PKW words and 2 PZD words. Type 3 is 2 PZD words.

Setting Up and Wiring the 6SE30 PROFIBUS Micromaster Drive (continued)

The following example describes how to assign the Main Control Word and Frequency Setpoint functions to the FIM using 6 word PPO type 1 protocol:

In order to control the Main Control Word function from the PROFIBUS host (the FIM), parameter P928 must be set to 1. This sets the source of the standard control word to PZD word 1 of the telegrams on the PROFIBUS port. PZD word 1 is word 5 of the PLC data area (words 1, 2, 3, and 4 are PKW words).

In addition, when P928 is set to 1, the Frequency Setpoint from the PROFIBUS port (the FIM) is used to control the PROFIBUS Micromaster frequency. PZD word 2 of the telegrams on the PROFIBUS port sets the frequency. The scaling is 16,384 (4000 hex) = 100% of P94.

After P928 is set to 1, Figure 4-22 describes the function of each control bit in PZD word 1 of the information sent to the drive.

Drive status and feedback (or actual value) information such as motor speed can always be read by the FIM Module.

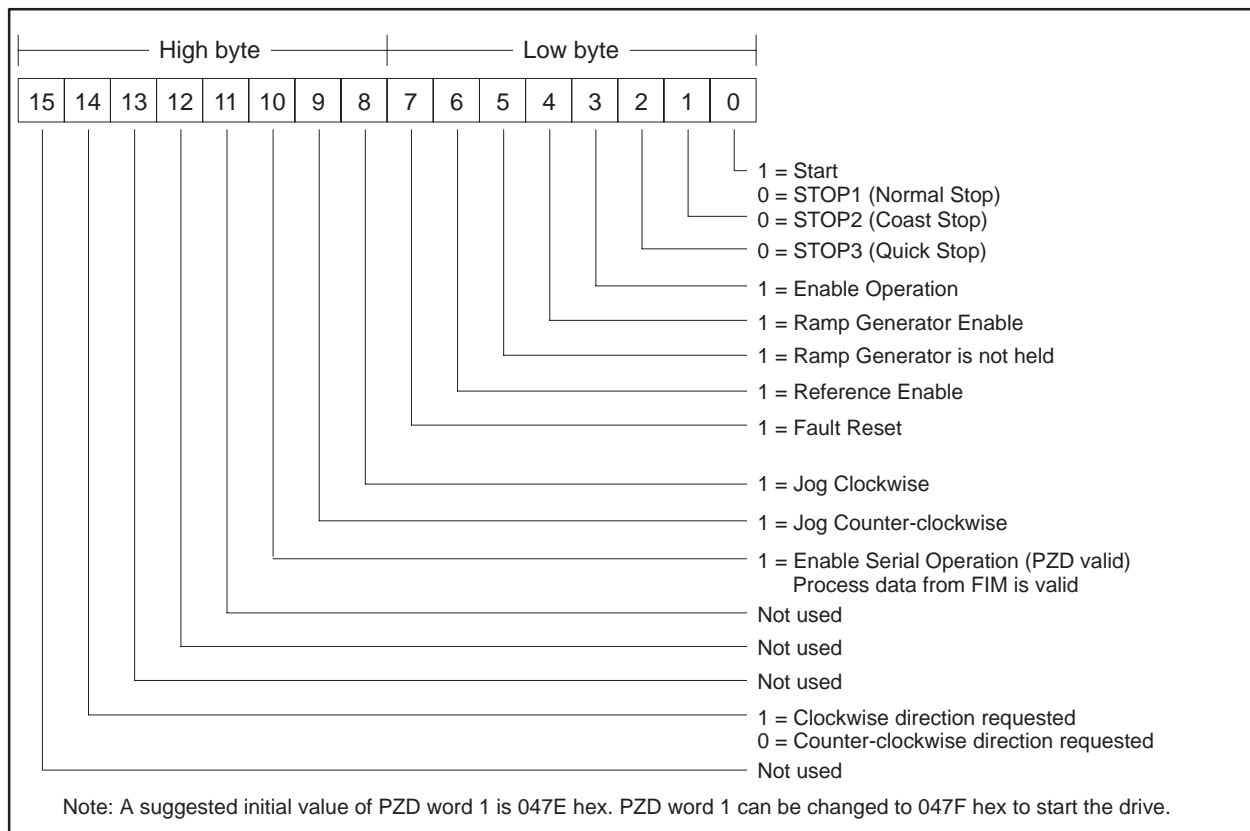


Figure 4-22 Control Bits for Main Control Word and Frequency Setpoint

The following example describes how to access the Standard Status Word and Main Feedback from the FIM:

If P928 is set to 0 or 1, the FIM can access the standard status word in PZD word 1 from the PROFIBUS port. PZD word 1 is word 5 of the PLC data area (words 1, 2, 3, and 4 are PKW words).

In addition, if P928 is set to 0 or 1, the FIM can access the frequency feedback in PZD word 2 of the telegrams from the PROFIBUS port.

After P928 is set to 0 or 1, Figure 4-23 describes the function of each status bit in PZD word 1 of the information from the drive.

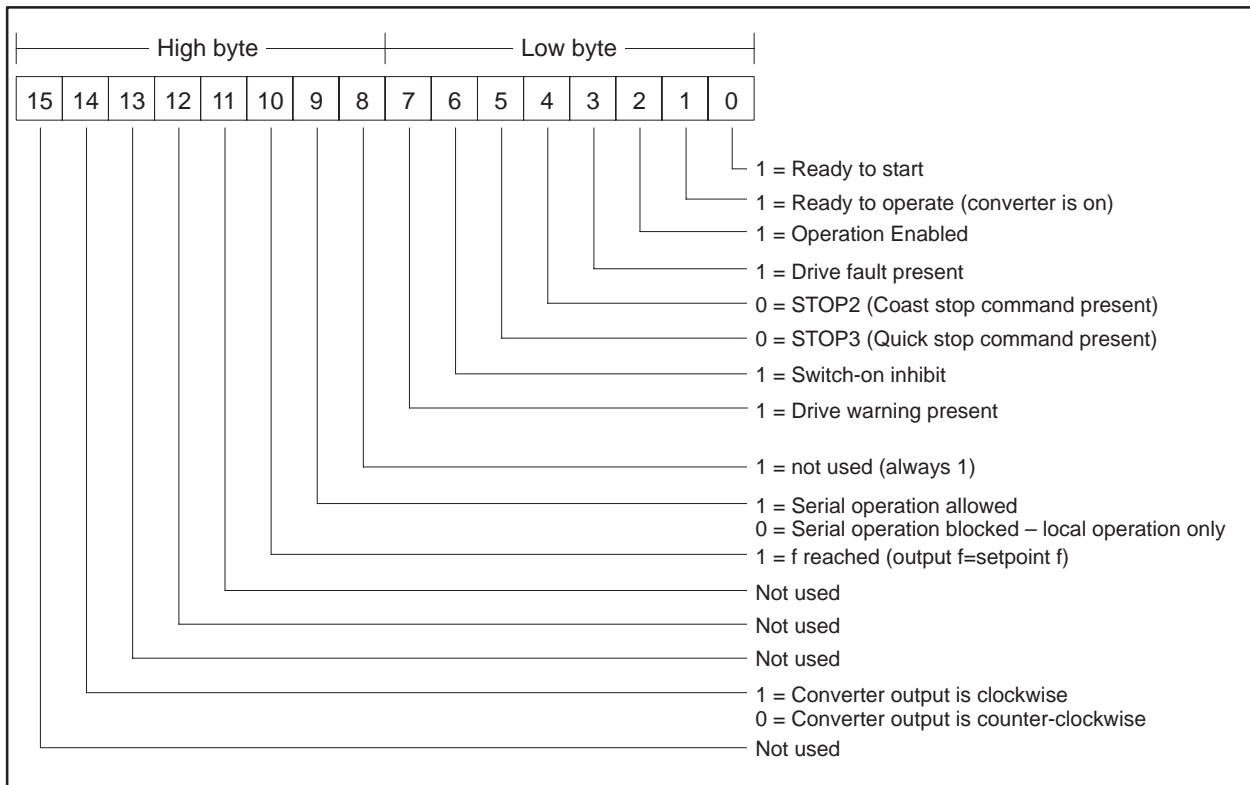


Figure 4-23 Status Bits for Standard Status Word and Main Feedback

Setting Up and Wiring the 6SE30 PROFIBUS Micromaster Drive (continued)

Required Switches The applicable switches follow.

SW2-2 Is on for the PROFIBUS mode.

SW2-3 Figure 4-24 and Figure 4-25 show the correct positions for these switches.
 SW2-4

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for the RS-485 connection.

Figure 4-24 shows the wiring for the 6SE30 PROFIBUS Micromaster Drive for all drives except the end of the bus.

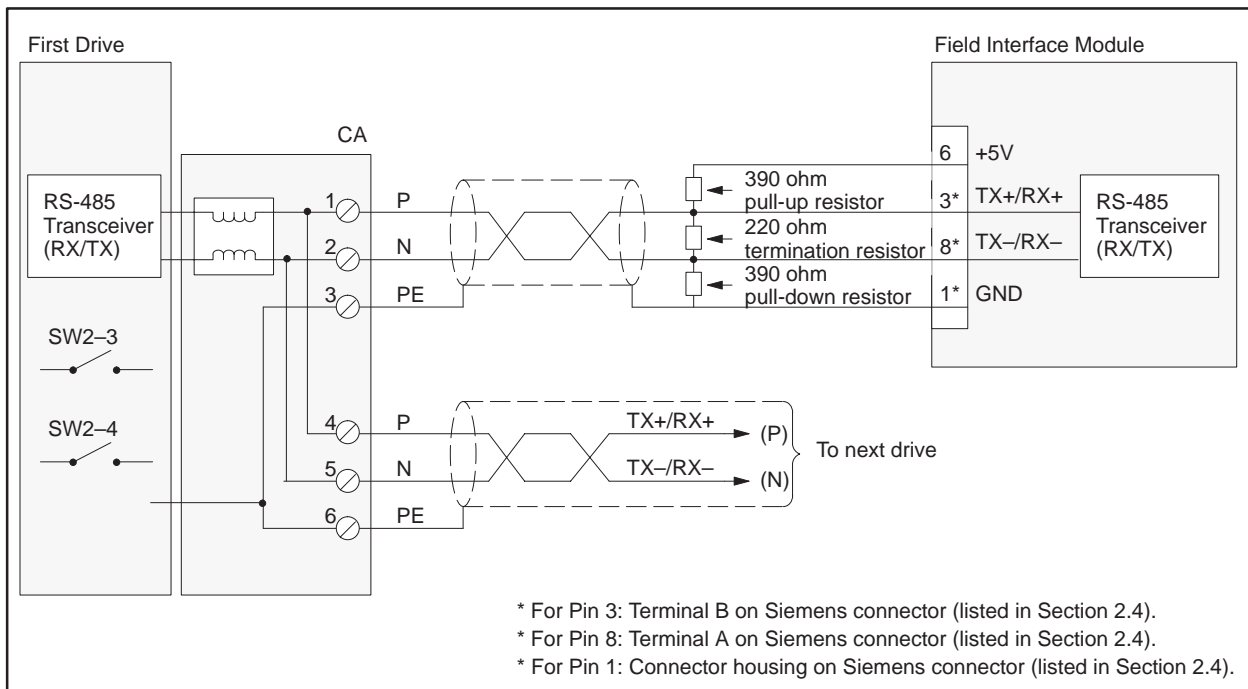


Figure 4-24 6SE30 Wiring: All Drives Except at End of Bus

4.16 OPmP PROFIBUS Module for Micro/Midimaster (6SE31) Drives

Required Hardware and Software	Any hardware version of the OPmP device may be used. Any software version may be used. If the OPmP module is used, the USS protocol on the base unit becomes inoperable.
Required Parameters	<p>P700 display only – shows the software version.</p> <p>P701 determines the equipment system number. It has no operational effect.</p> <p>P880 display only – indexed parameter diagnostic data – for troubleshooting.</p> <p>P918 must be set to the individual drive PROFIBUS address. For use with the FIM, the first valid drive address is 17.</p> <p>P927 selects local or remote parameter control. 0 selects local parameter control. 1 selects remote (PROFIBUS) parameter control</p> <p>P928 selects local or remote drive control 0 selects local drive control, monitor mode only for PROFIBUS. 1 selects remote (PROFIBUS) drive control.</p> <p>P947 display only – indexed parameter fault log– for troubleshooting.</p> <p>P958 display only – warning code.</p> <p>P963 display only – shows the baud rate of the PROFIBUS serial bus. This is set automatically in PROFIBUS mode. 0 baud rate not found. 96 9600 baud 187 187.5 Kbaud 192 19.2 Kbaud 500 500 Kbaud 937 93.75 Kbaud 1500 1.5 Mbaud</p> <p>P967 display only – shows the latest received control word in bit array format.</p> <p>P968 display only – shows the latest drive status word in bit array format.</p> <p>P971 selects if PROFIBUS parameter changes are stored in the drive EEPROM. 0 parameter changes are not stored in EEPROM. 1 parameter changes are stored in EEPROM.</p>

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

NOTE: Unlike some devices, the OPmP will automatically be controlled via serial communications when wired up and set up per this document with P928=1. If P928=0, then the OPmP will only communicate status and feedback information. The process data section defines the control word, status word, main setpoint and main actual value for the interface. Definition of the process data section is fixed. The OPmP only supports PPO types 1 and 3. Type 1 is 4 PKW words and 2 PZD words. Type 3 is 2 PZD words.

OPmP PROFIBUS Module for Micro/Midimaster (6SE31) Drives (continued)

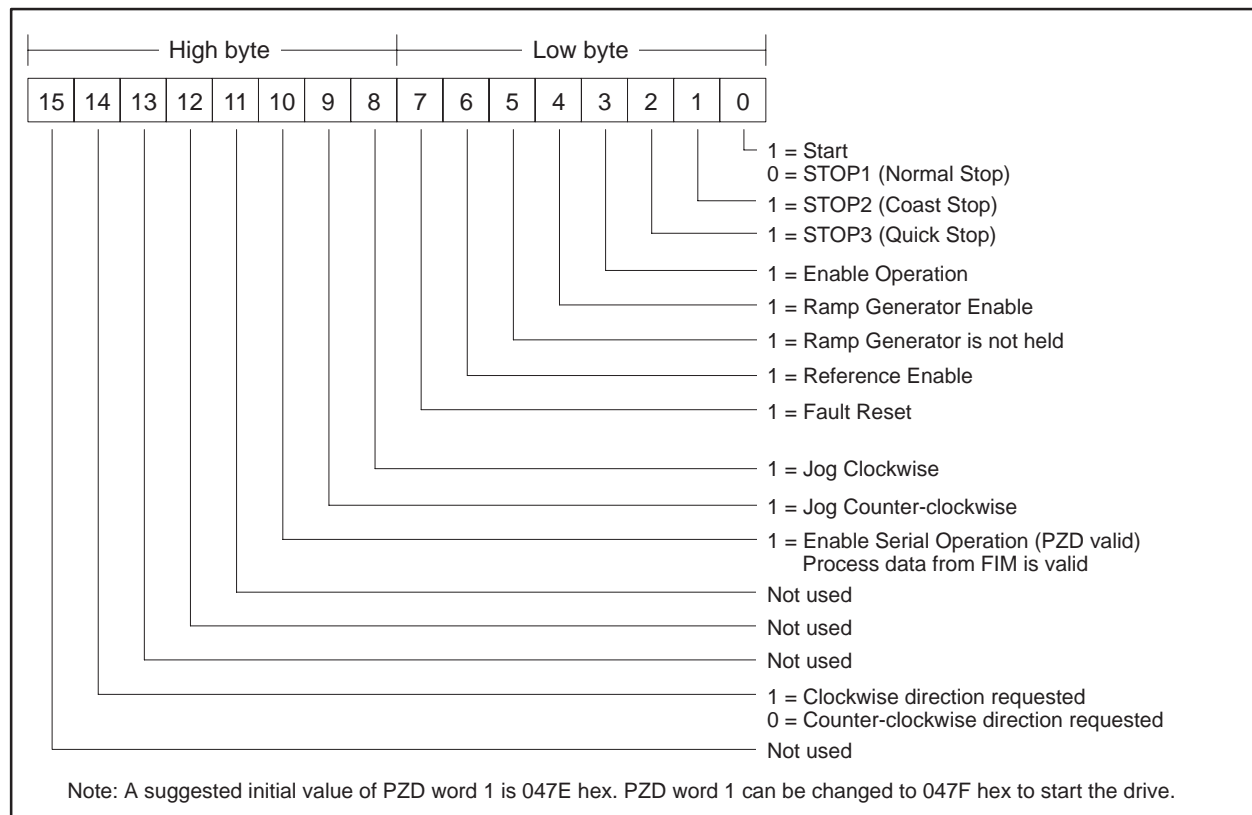
The following example describes how to assign the Main Control Word and Frequency Setpoint functions to the FIM using 6 word PPO type 1 protocol:

In order to control the Main Control Word function from the PROFIBUS host (the FIM), parameter P928 must be set to 1. This sets the source of the standard control word to PZD word 1 of the telegrams on the PROFIBUS port. PZD word 1 is word 5 of the PLC data area (words 1, 2, 3, and 4 are PKW words).

In addition, when P928 is set to 1, the Frequency Setpoint from the PROFIBUS port (the FIM) is used to control the PROFIBUS Micromaster frequency. PZD word 2 of the telegrams on the PROFIBUS port sets the frequency. The scaling is 16,384 (4000 hex) = 100% of P94.

After P928 is set to 1, Figure 4-26 describes the function of each control bit in PZD word 1 of the information sent to the drive.

Drive status and feedback (or actual value) information such as motor speed can always be read by the FIM Module.



Note: A suggested initial value of PZD word 1 is 047E hex. PZD word 1 can be changed to 047F hex to start the drive.

Figure 4-26 Control Bits for Main Control Word and Frequency Setpoint

The following example describes how to access the Standard Status Word and Main Feedback from the FIM:

If P928 is set to 0 or 1, the FIM can access the standard status word in PZD word 1 from the PROFIBUS port. PZD word 1 is word 5 of the PLC data area (words 1, 2, 3, and 4 are PKW words).

In addition, if P928 is set to 0 or 1, the FIM can access the frequency feedback in PZD word 2 of the telegrams from the PROFIBUS port.

After P928 is set to 0 or 1, Figure 4-27 describes the function of each status bit in PZD word 1 of the information from the drive.

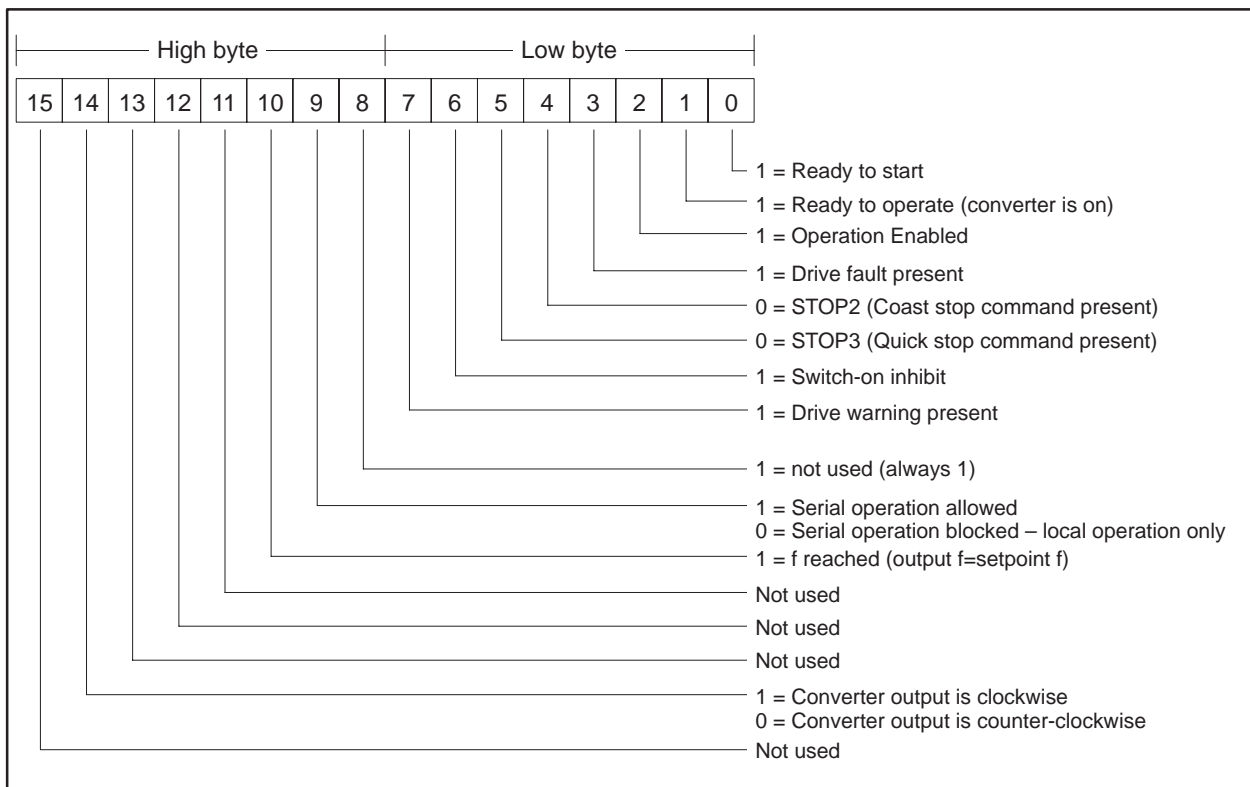


Figure 4-27 Status Bits for Standard Status Word and Main Feedback

OPmP PROFIBUS Module for Micro/Midimaster (6SE31) Drives (continued)

Required Switches Bus termination resistors are part of the OPmP module and are controlled by a switch on the front, mounted beneath a removable plug. The internal termination switch should be closed only on the OPmP at the end of the bus.

Figure 4-28 shows the wiring for the 6SE31 PROFIBUS Micromaster Drive for all drives except the end of the bus.

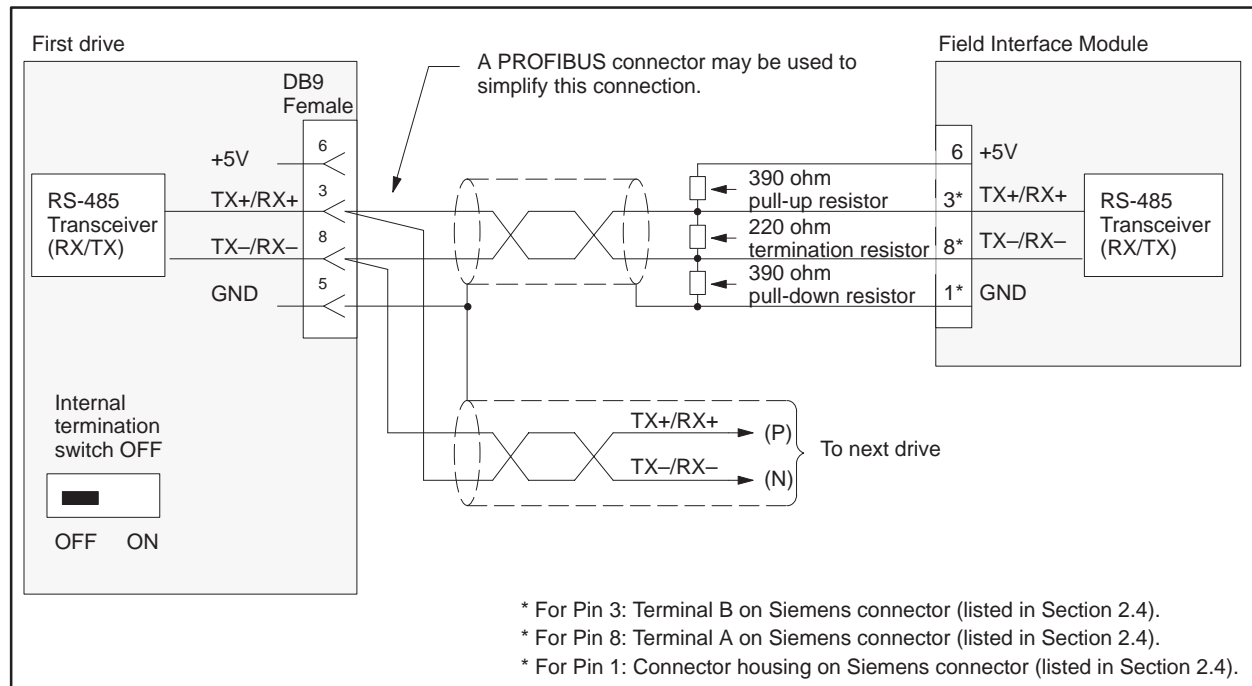


Figure 4-28 6SE31 Wiring: All Drives Except at End of Bus

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for the RS-485 connection.

Figure 4-29 shows the wiring for the 6SE31 PROFIBUS Micromaster Drive for the drive at the end of the bus.

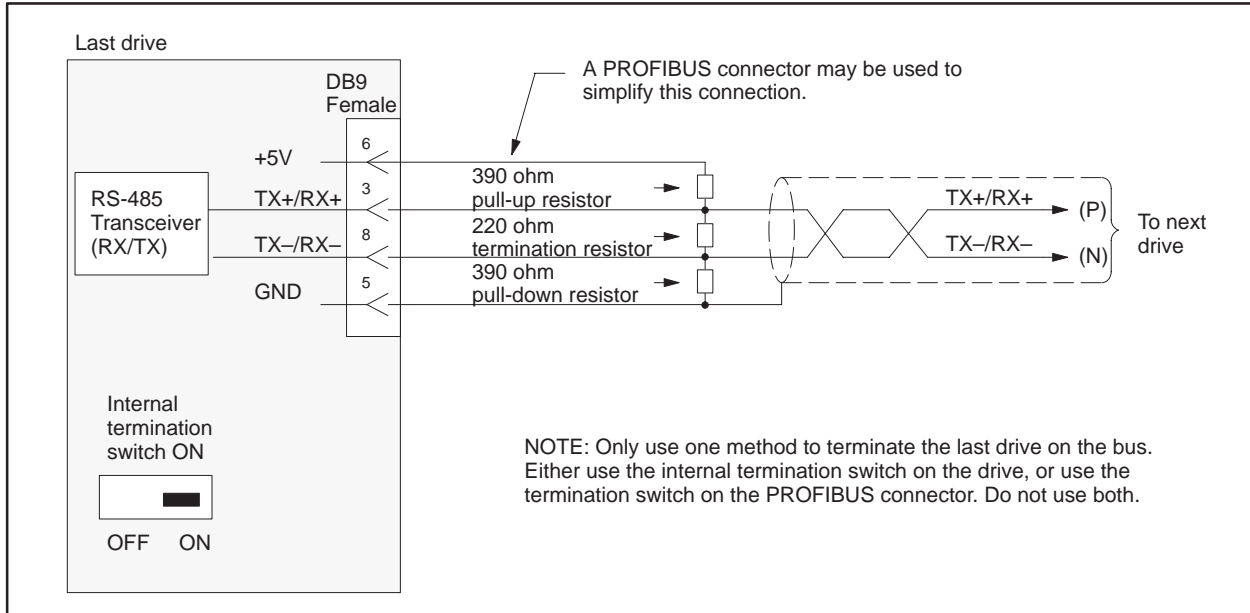


Figure 4-29 6SE31 Wiring: Drive at End of Bus

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for the RS-485 connection.

4.17 Setting Up and Wiring the CB1

Required Hardware and Software	You can use any hardware version of the 6SE70. You can use any software version of the base microprocessor board (CU1 or CU2) and any software version of the CB1 Master Drive Communications Board.	
Required Parameters	Use the serial interface (CB) on the CB1.	
	P053	must be set to allow parameters to be changed from the FIM through CB1 (also refer to P697).
	P090 or P091	must be set, depending on the CB1 hardware slot.
	P695	initially is set to 0, which turns off the drive telegram-monitoring function. After the network is operating, you can decide whether or not to turn on the drive telegram-monitoring function by setting P695 to a value of 10.
	P696	selects special diagnostic information. It is 0 for standard operation.
	P697	selects the PPO type of the useful data. If the host system can specify the PPO type at the converter using identification bytes, this parameter is set to 0. If the host system cannot specify the PPO type at the converter using identification bytes, this parameter selects the PPO type. The selection follows:
	range	
	P697 = 0	PPO type 1 PKW data = 4 words PZD words = 2 words
	P697 = 2	PPO type 2 PKW data = 4 words PZD words = 6 words
	P697 = 3	PPO type 3 PKW data = 0 words PZD words = 2 words
	P697 = 4	PPO type 4 PKW data = 0 words PZD words = 6 words
	P697 = 5	PPO type 5 PKW data = 4 words PZD words = 10 words
	P918	must be set to the individual drive PROFIBUS address. For use with the FIM, the first valid drive address is 17 if the slave address range selection dipo switches are set to all closed. Refer to Table 4-2 for more information on setting the slave address range selection.

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

NOTE: Unlike some Siemens variable speed drives, the 6ES70 will not automatically be controlled by serial communications when wired and set up according to this document; it will only communicate. The process data section defines the control word, status word, setpoints and actual values for the interface. Definition of the process data section is very flexible. Individual input, output, and control functions must be set (parameterized) for use with serial communications. It is beyond the scope of this document to describe all of the functions and how to set (parameterize) them. Section 4.3 of the 6SE70 Instruction Book describes the control word, status word, setpoints, and actual values structures, and it is imperative that this section be read completely and understood before attempting to control a 6ES70 with a FIM module.

Setting Up and Wiring the CB1 (continued)

The following example describes how to assign the Stop/Start and Speed Command functions to the FIM:

On a Factory Default 6ES70 Master Drive, these control functions are set to PMU, not serial communications CB. The PMU is the Parameterization Unit which is the membrane keypad in the front cover of the 6ES70.

In order to control the Start/Stop function from CB (the FIM), parameter P554.1 should be set to 3001. This sets the source of the Start/Stop function to bit 0 of PZD word 1 of the telegrams on serial port CB. PZD word 1 is word 1 of the PLC data area if parameter P697 (see above) is set to 3 or 4. PZD word 1 is word 5 of the PLC data area if parameter P697 is set to 0, 2, or 5 (words 1, 2, 3, and 4 are PKW words). Different values for parameter P554.x must be used if different ports and/or different words in the telegram are used.

The same concepts apply to the Speed Command (or Setpoint) signal. In order to control the Speed Command function from CB (the FIM), parameter P443.x must be set to 3002. This sets the source of the Speed Command function to PZD word 2 of the incoming telegrams on serial port CB. Different values for parameter P443.x must be used if different ports and/or different words in the telegram are used.

After P554.1 is set to 3001, Figure 4-30 describes the function of each control bit in PZD word 1 of the information sent to the CSB-SST (USS).

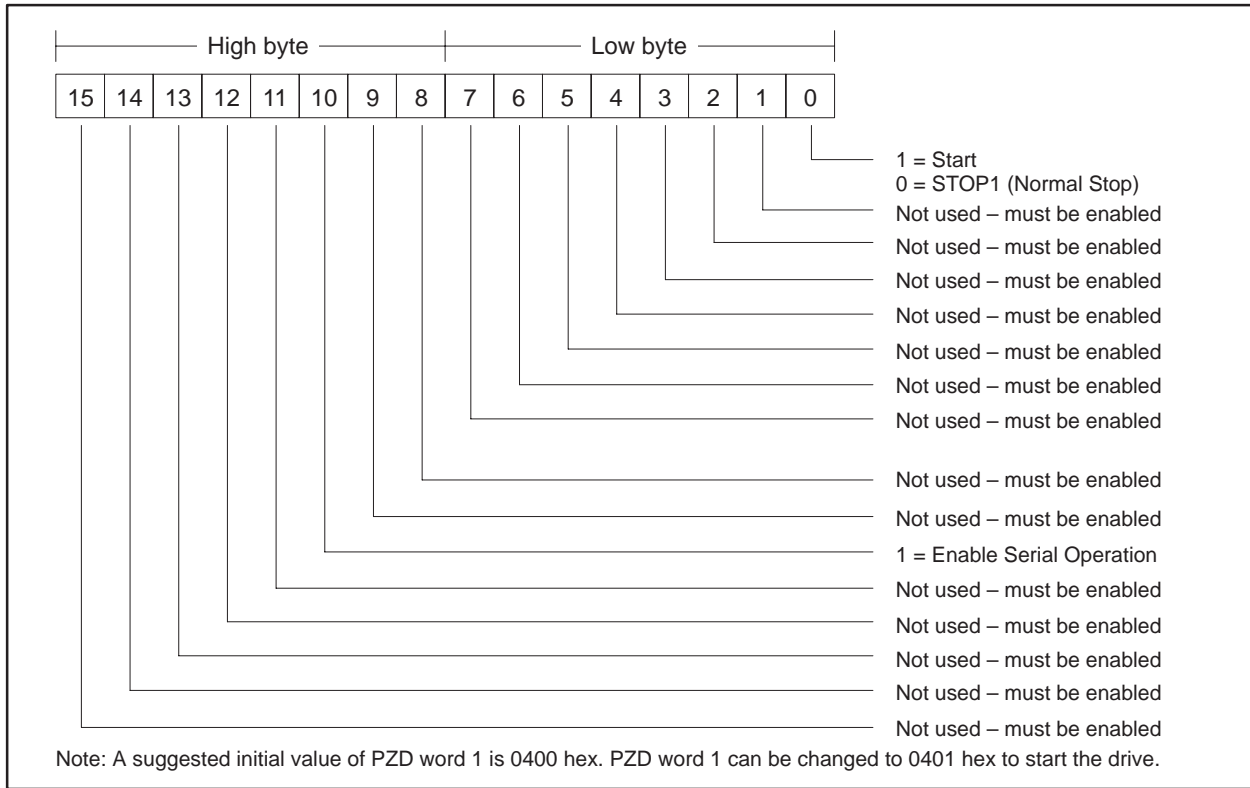


Figure 4-30 Control Bits for Stop/Start and Speed Command

This same technique must be applied to all functions such as Forward/Reverse, Fault Reset, and all other functions that are to be controlled by the FIM.

Also, drive status and feedback (or actual value) information such as motor speed and other information must be set (parameterized) to the appropriate destination in order to be read by the FIM Module. Section 4.3 of the 6SE70 Instruction Book also explains the details.

Setting Up and Wiring the CB1 (continued)

The following example describes how to access the Status Word 1 and Main Setpoint from the FIM:

On a Factory Default 6SE70 Master Drive, the actual values returned by the information words are set to zero. In order to access the standard status word from CB (the FIM), parameter P694.1 must be set to 968. This selects what will be returned in PZD word 1 of the telegrams on serial port CB. PZD word 1 is word 1 of the PLC data area if parameter P697 (see above) is set to 3 or 4. PZD word 1 is word 5 of the PLC data area if parameter P697 is set to 0, 2, or 5 (words 1, 2, 3, and 4 are PKW words).

The same concepts apply to access the Main Setpoint in PZD word 2 from serial port SST1; parameter P694.2 must be set to 447. This selects what will be returned in PZD word 2 of the telegrams on the serial port CB.

Setting Up and Wiring the CB1 (continued)

Required Switches The applicable switches follow.

S1.3 Figure 4-32 and Figure 4-33 show the correct positions of this switch.

S1.4 Figure 4-32 and Figure 4-33 show the correct positions of this switch.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for the RS-485 connection. Refer to the entire Chapter 3 in the CB1 instructions manual for details on the PROFIBUS connector, wiring, and shielding.

Figure 4-32 shows the wiring for the 6SE70, using a CB1 card, for all drives except the end of the bus.

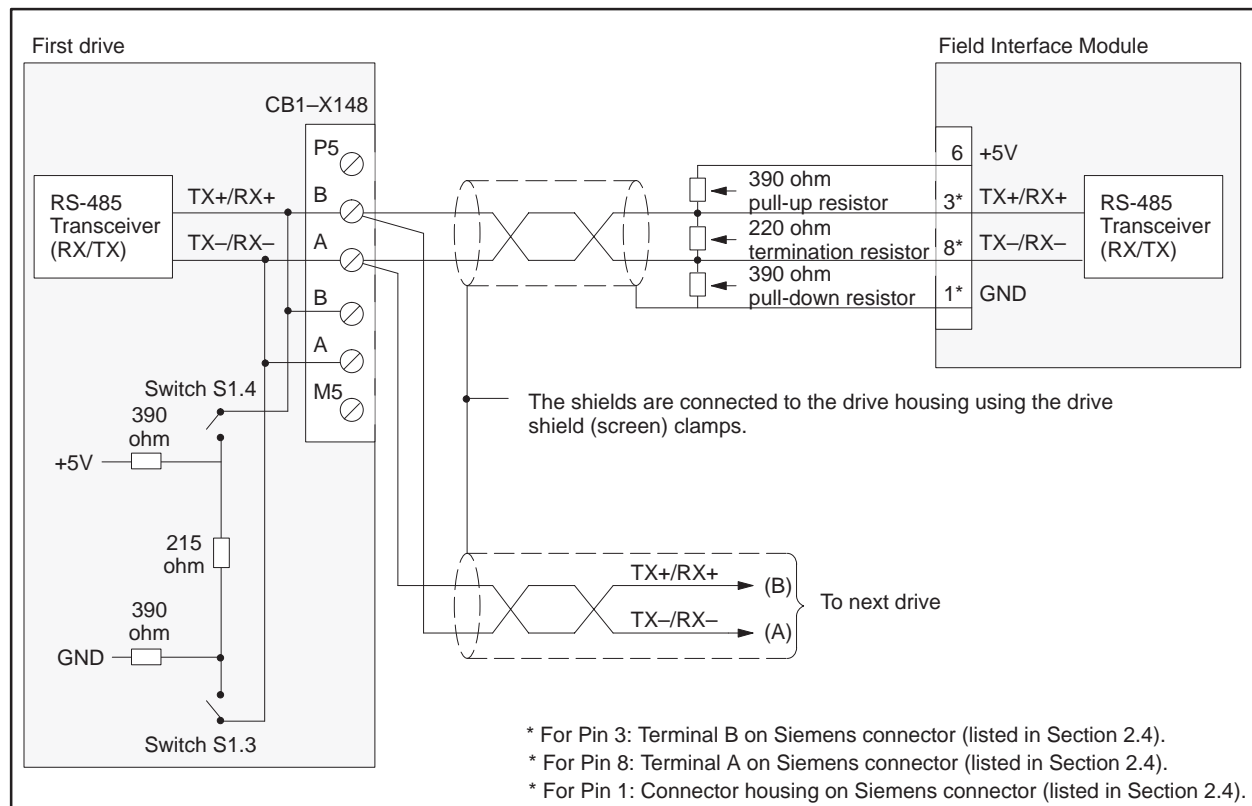


Figure 4-32 CB1 Wiring: All Drives Except at End of Bus

Figure 4-33 shows the wiring for the 6SE70, using a CB1 card, for the drive at the end of the bus.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for the RS-485 connection. Refer to the entire Chapter 3 in the CB1 instructions manual for details on the PROFIBUS connector, wiring, and shielding.

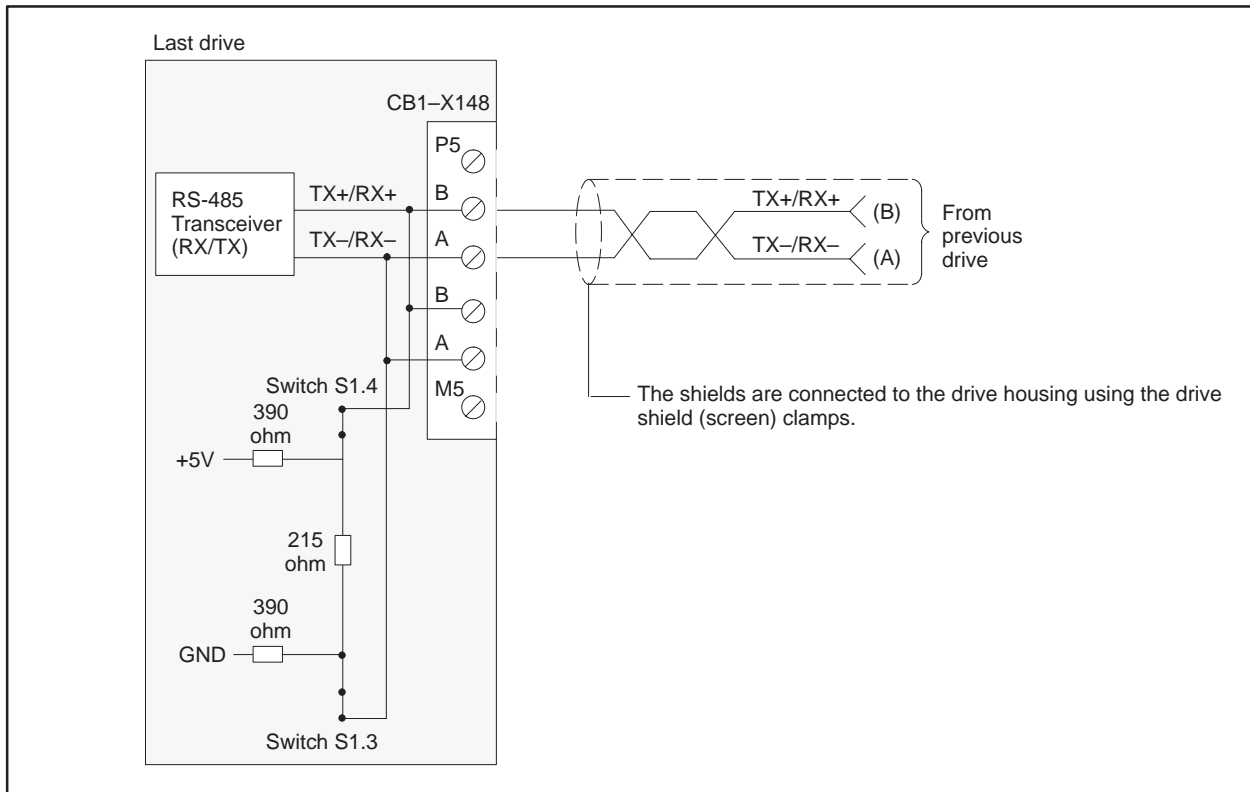


Figure 4-33 CB1 Wiring: Drive At End of Bus

4.18 CB24 (SIMOREG 6RA24 Communications Board)

Required Hardware and Software	<p>For the SIMOREG 6RA24 with CB24 only, any hardware version of the 6RA24 may be used. The 6RA24 software version must be version 2.10 or higher. Any hardware and software version of the CB24 may be used.</p> <p>For the SIMOREG 6RA24 with Z2006 and CB24, any hardware version of the 6RA24 may be used. The 6RA24 software version must be version 2.00 or higher. The Z2006 hardware Revision or Issue No. must be 11 or higher. The Type 1 (Sectional) software version must be 1.40 or higher, type 3 (CEMF Winder) software version must be 1.10 or higher, type 4 (Armature Winder) software version must be 1.20 or higher. Any hardware and software version of the CB24 may be used.</p>
Required Parameters	<p>Serial port 1 on the CB24 is used. This serial port is also referred to as CBP1 (Communication Board Port 1).</p>

NOTE: After the following parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

- P900 must be set to a 2 (CS5 Only) if only a CB24 is attached to the drive or a 4 CS5&ThBd if both a CB24 and a Z2006 are attached to the drive.
- P902 must be set to a 9 L2-DP to select PROFIBUS-DP on port 1 of the CB24.
- P904 must be set to the individual drive PROFIBUS address. For use with the FIM, the first valid drive address is 17.
- P905 selects the PROFIBUS baud rate.
 - P905 = 1 9,600 baud
 - P905 = 2 19,200 baud
 - P905 = 3 93,750 baud
 - P905 = 4 187,500 baud
 - P905 = 6 500,000 baud
 - P905 = 9 1.5 Mbaud
- P906 must be set to a 1 (not used) to turn off port 2 of the CB24.
- P910 must be set to 4 to allow parameters to be changed from the FIM through port 1 of the CB24 (also refer to P925).
- P911 must be set to 4 or 5 to allow process data to be changed from the FIM through port 1 of the CB24 (also refer to P924).
- P916 selects the actual values that are sent to the host in the PZD section (also refer to P924).

P924 sets the number of PZD (process data) words in the PROFIBUS telegram. The 6RA24 supports 5 PPO types with the CB24:

PPO type 1	PKW data = 4 words	PZD words = 2 words
PPO type 2	PKW data = 4 words	PZD words = 6 words
PPO type 3	PKW data = 0 words	PZD words = 2 words
PPO type 4	PKW data = 0 words	PZD words = 6 words
PPO type 5	PKW data = 4 words	PZD words = 10 words

Therefore, the only valid choices for P924 are 2, 6, or 10.

P925 sets the number of PKW (Parameter data) words in the PROFIBUS telegram. Refer to P924 for the 5 PPO types supported by the drive. Therefore, the only valid choices for P925 are 0 or 4.

P926 should initially be set to 0, which turns off the drive telegram monitoring function on port 1 of the CB24. After the network is operating, the user should decide if the drive telegram monitoring function should be turned on by setting P695 to a non-zero value.

P929 should be set to 0, which turns off the drive telegram monitoring function on port 2 of the CB24, since port 2 does not exist.

The CB24 inverts bit 5 of the main control word (ramp generator enable) before sending it to the 6RA24 or the Z2006.

NOTE: Unlike some Siemens variable speed drives, the 6RA24 will not automatically be controlled by serial communications when wired and set up according to this document; it will only communicate. The process data section (also refer to P924) defines the control word, status word, setpoints and actual values for the interface. Definition of the process data section is very flexible. Individual input, output, and control functions must be set (parameterized) for use with serial communications. Refer to the CB24 Instruction Book and connectors K052 through K067 in section 10.1 of the 6RA24 Instruction Book and section 3 of the Z2006 Instruction Book (if included) and the specific application. It is beyond the scope of this document to describe all of the functions and how to set (parameterize) them. Section 10 of the 6RA24 Instruction Book describes the control word, status word, setpoints, and actual values structures and it is imperative that this section be read completely and understood before attempting to control a 6RA24 with a FIM module. Similarly, Appendix F of the Z2006 Instruction Book describes the control word, status word, setpoints, and actual values structures, and it is imperative that this section be read completely and understood before attempting to control a Z2006/6RA24 combination with a FIM Module.

The following example describes how to assign the Main Control Word and Speed Setpoint functions to the FIM:

On a Factory Default 6RA24 SIMOREG, these control functions are set to local wired inputs, not port CBP1.

In order to control the Main Control Word function from port CBP1 (PROFIBUS-DP) (the FIM), parameter P640 must be set to 52. This sets the source of the standard control word to PZD word 1 of the telegrams on port CBP1 (PROFIBUS-DP). PZD word 1 is word 1 of the PLC data area if parameter P925 (see above) is set to 0. PZD word 1 is word 5 of the PLC data area if parameter P925 (see above) is set to 4 (words 1, 2, 3, and 4 are PKW words).

The same concepts apply to the Speed Setpoint signal. In order to control the Speed Setpoint from CBP1 (PROFIBUS-DP) (the FIM), parameter P628.0 must be set to 53. This sets the source of the Speed Setpoint to PZD word 2 of the telegrams on port CBP1 (PROFIBUS-DP).

The following example describes how to access the Standard Status Word and Speed Feedback from the FIM:

On a Factory Default 6RA24 SIMOREG, these return information words are set to zero. In order to access the standard status word in PZD word 1 from port CBP1 (PROFIBUS-DP) (the FIM), parameter P916.0 must be set in 325. This selects what will be returned in PZD word 1 of the telegrams on port CBP1 (PROFIBUS-DP). PZD word 1 is word 1 of the PLC data area if parameter P925 (see above) is set to 0. PZD word 1 is word 5 of the PLC data area if parameter P925 (see above) is set to 4 (words 1, 2, 3, and 4 are PKW words).

The same concepts apply to the Speed Feedback (or Actual Value) signal. In order to access the Speed Feedback in PZD word 2 from port CBP1 (PROFIBUS-DP) (the FIM), parameter P916.1 must be set to 167. This selects what will be returned in PZD word 2 of the telegrams on serial port CBP1 (PROFIBUS-DP).

After P916.0 is set to 325, Figure 4-35 describes the function of each status bit in PZD word 1 of the return information from the drive.

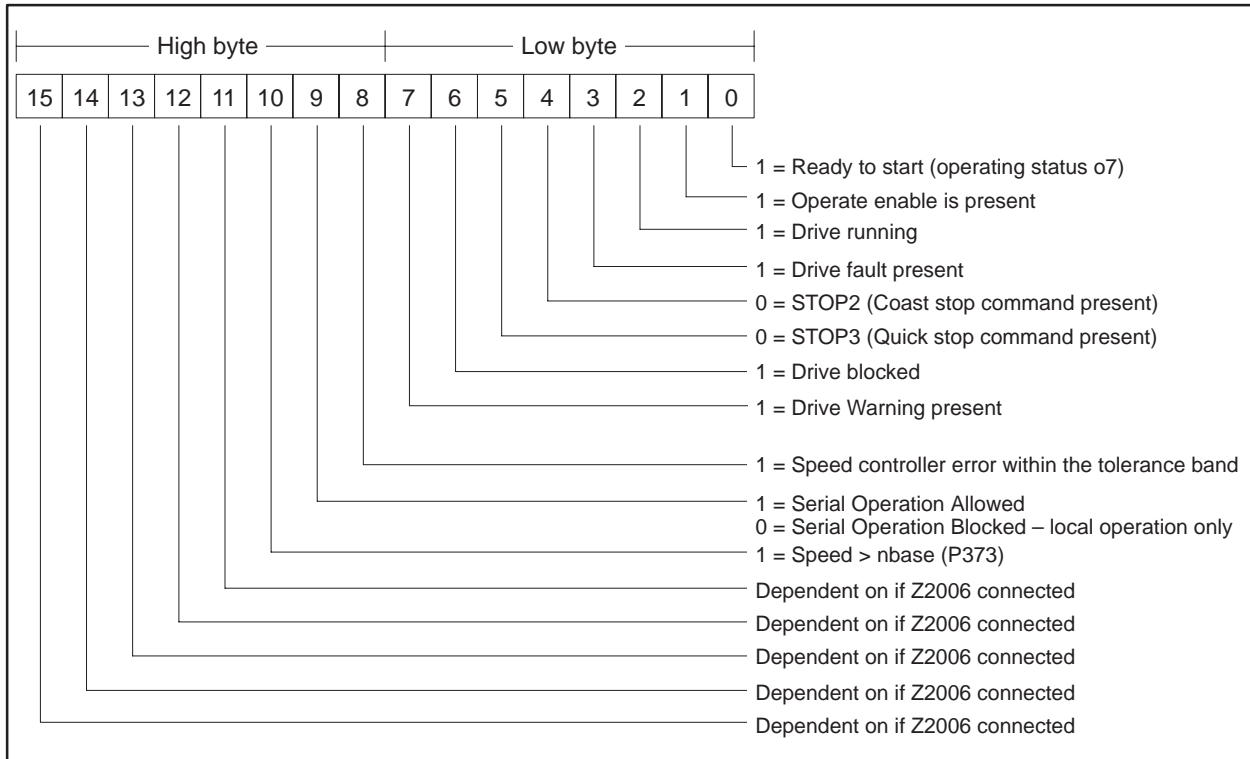


Figure 4-35 Status Bits for Standard Status Word and Speed Feedback

Required Switches Bus termination resistors are part of the CB24 board and are controlled by hook switches S1.3 and S1.4. Switches S1.3 and S1.4 should be closed only on the CB24 at the end of the bus.

Switches S1.1 and S1.2 are not used on the CB24.

Byte Order in the Controller When the data to and from the CB24 is displayed in word format in the SIMATIC 505 PLC, the bytes are correct, the high byte is in the high byte position, the low byte is in the low byte position. The documentation in the 6RA24, CB24, and Z2006 instruction books can be used directly.

External Power Supply The CB24 does not require an external 24-volt DC source.

CB24 (SIMOREG 6RA24 Communications Board) (continued)

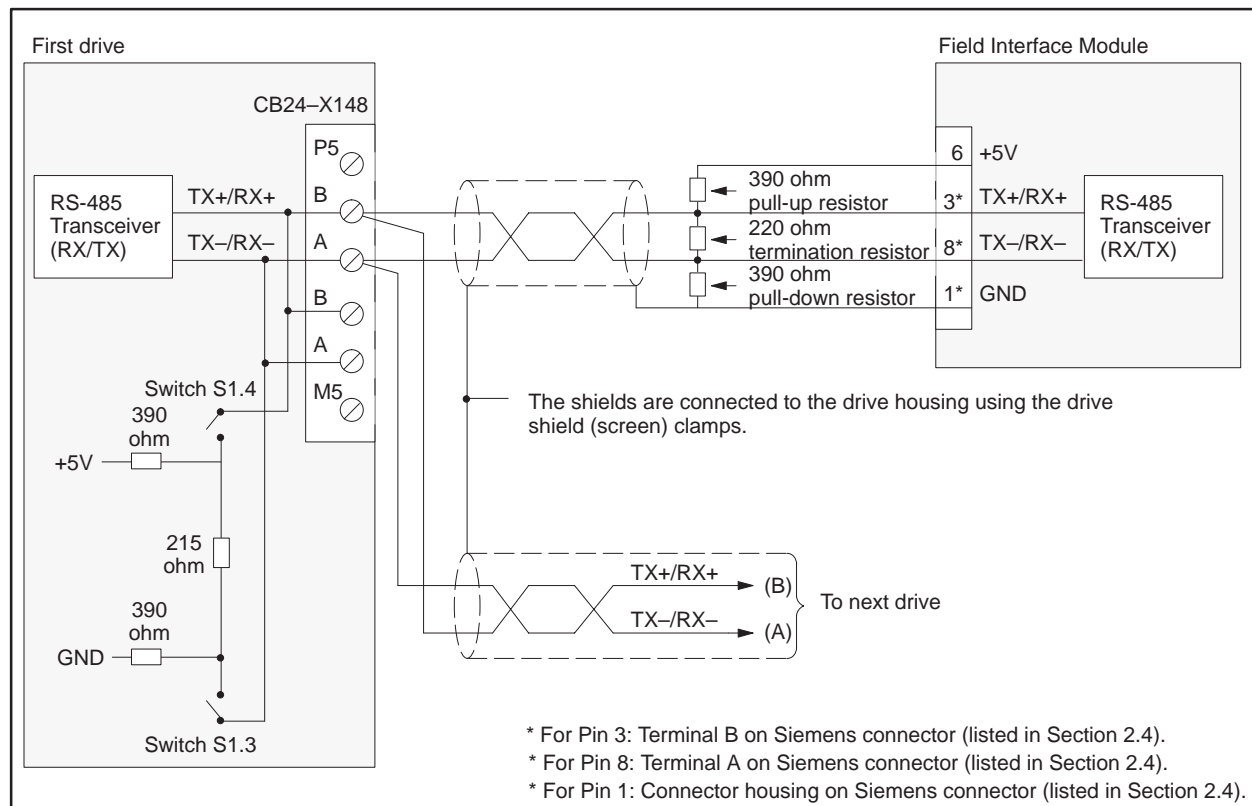


Figure 4-36 CB24 Wiring: All Drives Except at End of Bus

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for the RS-485 connection. Refer to the entire Chapter 3 in the CB1 instruction manual for details on PROFIBUS connectors, wiring, and shielding.

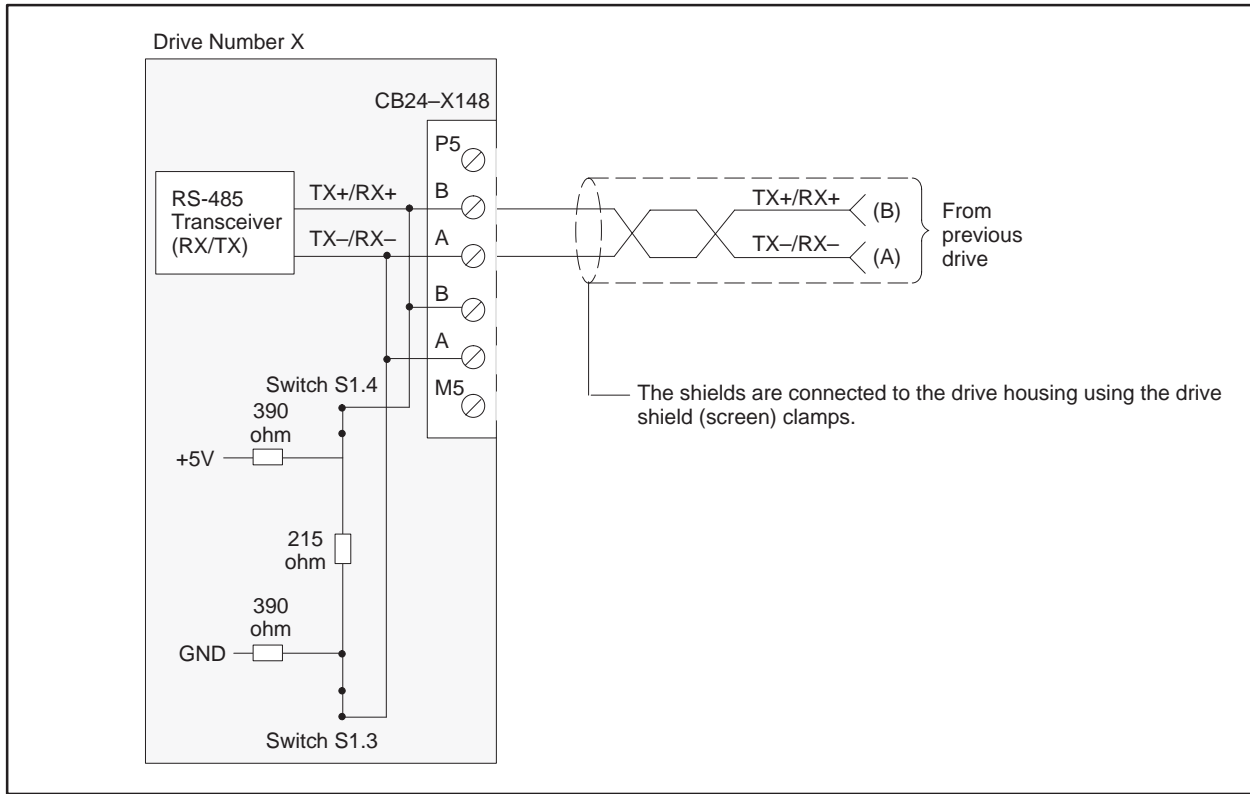


Figure 4-37 CB24 Wiring: Drive At End of Bus

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for the RS-485 connection. Refer to the entire Chapter 3 in the CB1 instruction manual for details on PROFIBUS connectors, wiring, and shielding.

4.19 CS51 (SIMOREG 6RA24 and SIMOVERT 6SE12 Communications Board)

Required Hardware and Software

For the SIMOREG 6RA24 with CS51 only, any hardware version of the 6RA24 may be used. The 6RA24 software version must be version 2.00 or higher. The version of the CS51 (which includes hardware and software) should be version H or higher.

For the SIMOVERT 6SE12 with CS51 only, any hardware version of the 6SE12 may be used. The 6SE12 software version must be version 3.3 or higher. The version of the CS51 (which includes hardware and software) should be version H or higher.

For the SIMOREG 6RA24 with Z2006 and CS51, any hardware version of the 6RA24 may be used. The 6RA24 software version must be version 2.00 or higher. The Z2006 hardware Revision or Issue No. must be 11 or higher. The Type 1 (Sectional) software version must be 1.40 or higher, type 3 (CEMF Winder) software version must be 1.10 or higher, type 4 (Armature Winder) software version must be 1.20 or higher. The version of the CS51 (which includes hardware and software) should be version H or higher.

For the SIMOVERT 6SE12 with Z2006 and CS51, any hardware version of the 6SE12 may be used. The 6SE12 software version must be version 3.3 or higher. The Z2006 hardware Revision or Issue No. must be 10 or higher. The Type 1 (Sectional) software version must be 1.40 or higher, type 3 (CEMF Winder) software version must be 1.10 or higher, type 4 (Armature Winder) software version must be 1.20 or higher. The version of the CS51 (which includes hardware and software) should be version H or higher.

**Required
Parameters**

Use serial port 1, the Communication Board Port 1 (CBP1), on the CS51.

- P900 must be set to a 2 (CS5 Only appears on the screen) if only a CS51 is attached to the drive, or to a 4 (CS5&ThBd appears on the screen), if both a CS51 and a Z2006 are attached to the drive.
- P902 must be set to a 9 (L2-DP appears on the screen) to select PROFIBUS-DP on port 1 of the CS51.
- P904 must be set to the individual drive's PROFIBUS address. When used with the FIM, the first valid drive address is 17 if the slave address range selection dipswitches are all set to closed. Refer to Table 4-2 for more information on setting the slave address range selection.
- P905 selects the PROFIBUS baud rate.
- | | |
|----------|--------------|
| P905 = 1 | 9,600 baud |
| P905 = 2 | 19,200 baud |
| P905 = 3 | 93,750 baud |
| P905 = 4 | 187,500 baud |
| P905 = 6 | 500,000 baud |
| P905 = 9 | 1.5 Mbaud |
- P906 must be set to 1 (that is, not used) to turn off port 2 of the CS51.
- P910 6RA24 only – must be set to 4 to allow parameters to be changed from the FIM through port 1 of the CS51 (also refer to P925).
- P911 6RA24 only – must be set to 4 or 5 to allow process data to be changed from the FIM through port 1 of the CS51 (also refer to P924).
- P915 6SE12 only – must be set to allow process data parameters to be changed from the FIM through port 1 of the CS51.
- P916 selects the actual values that are sent to the host in the PZD section (also refer to P924).
- P924 sets the number of PZD (process data) words in the PROFIBUS telegram. The 6RA24 and the 6SE12 support four PPO types:
- | | |
|-------------------------------|---------------------|
| PPO type 1 PKW data = 4 words | PZD words = 2 words |
| PPO type 2 PKW data = 4 words | PZD words = 6 words |
| PPO type 3 PKW data = 0 words | PZD words = 2 words |
| PPO type 4 PKW data = 0 words | PZD words = 6 words |

The only valid choices for P924 are 2 or 6.

CS51 (SIMOREG 6RA24 / SIMOVERT 6SE12 Communications Board) (continued)

- P925 sets the number of PKW (Parameter data) words in the PROFIBUS telegram. Refer to P924 for the 4 PPO types supported by the drive. The only valid choices for P925 are 0 or 4.
- P926 initially is set to 0, which turns off the drive telegram-monitoring function on port 1 of the CS51. After the network is operating, you can decide whether or not to turn on the drive telegram-monitoring function by setting P695 to a non-zero value.
- P929 is set to 0, which turns off the drive telegram-monitoring function on port 2 of the CS51 because port 2 is not used.
- P1005 determines whether PROFIBUS parameter changes are stored in the drive EEPROM. P1005 is reset to 0 when the drive power on. P1005 can only be accessed and changed through the PROFIBUS:
- 0 means that parameter changes are not stored in EEPROM.
1 means that parameter changes are stored in EEPROM.

After the above parameters have been changed, the drive should be powered down for at least 10 seconds and then powered back on. This power cycling allows the drive to initialize communications with the FIM.

NOTE: Note that the CS51 inverts bit 5 of the main control word (ramp generator enable) before sending it to the 6RA24 or 6SE12 or Z2006.

NOTE: For the SIMOREG 6RA24, the drive will not automatically be controlled by serial communications when wired and set up according to this document; it will only communicate. The process data section (also refer to P924) defines the control word, status word, setpoints and actual values for the interface. Definition of the process data section is very flexible. Individual input, output, and control functions must be set (parameterized) for use with serial communications. Refer to the CS51 Instruction Book and connectors K052 through K067 in section 10.1 of the 6RA24 Instruction Book and section 3 of the Z2006 Instruction Book (if included) and the specific application. It is beyond the scope of this document to describe all of the functions and how to set (parameterize) them. Section 10 of the 6RA24 Instruction Book describes the control word, status word, setpoints, and actual values structures, and it is imperative that this section be read completely and understood before attempting to control a 6RA24 with a FIM module. Similarly, Appendix F of the Z2006 Instruction Book describes the control word, status word, setpoints, and actual values structures, and it is imperative that this section be read completely and understood before attempting to control a Z2006/6RA24 combination with a FIM Module.

The following example describes how to assign the Main Control Word and Speed Setpoint functions to the FIM:

On a Factory Default 6RA24 SIMOREG, these control functions are set to local wired inputs, not port CBP1.

In order to control the Main Control Word function from port CBP1 (communicating by PROFIBUS-DP protocol to the FIM), parameter P640 must be set to 52. This sets the source of the standard control word to PZD word 1 of the telegrams on port CBP1 (PROFIBUS-DP). PZD word 1 is word 1 of the PLC data area if parameter P925 (see above) is set to 0. PZD word 1 is word 5 of the PLC data area if parameter P925 is set to 4 (words 1, 2, 3, and 4 are PKW words).

The same concepts apply to the Speed Setpoint signal. In order to control the Speed Setpoint from CBP1 (PROFIBUS-DP) (the FIM), parameter P628.0 must be set to 53. This sets the source of the Speed Setpoint to PZD word 2 of the telegrams on port CBP1 (PROFIBUS-DP).

In order for the motor to start, the run enable (terminal 37) and the regulator enable (terminal 38) on the base 6RA24 unit must be on. These terminals used to control the motor directly. Now parameter P640 has been changed, so that they are treated as enable signals.

After P640 is set to 52, Figure 4-38 describes the function of each control bit in PZD word 1 of the information sent to the drive.

NOTE: As discussed later in this section (see page 4-114), it is assumed that the byte order will be reversed by the PLC on the output words immediately before they are sent to the drive.

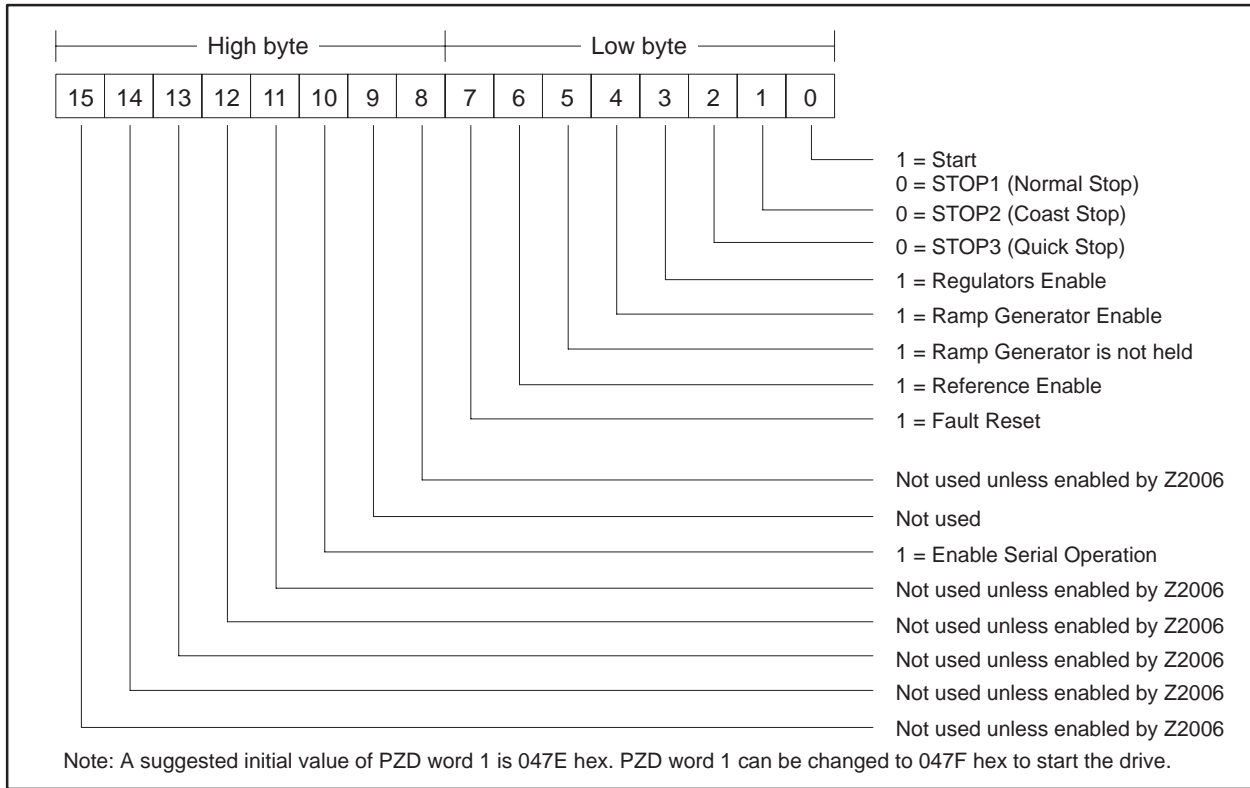


Figure 4-38 Control Bits for Main Control Word and Speed Setpoint

Also, drive status and feedback (or actual value) information such as motor speed and other information must be set (parameterized) to the appropriate destination in order to be read by the FIM Module. Section 10.8 of the 6RA24 Instruction Book also explains the details.

CS51 (SIMOREG 6RA24 / SIMOVERT 6SE12 Communications Board) (continued)

The following example describes how to access the Standard Status Word and Speed Feedback from the FIM:

On a Factory Default 6RA24 SIMOREG, these return information words are set to zero. In order to access the standard status word in PZD word 1 from port CBP1 (communicating by PROFIBUS-DP protocol to the FIM), parameter P916.0 must be set in 325. This selects what will be returned in PZD word 1 of the telegrams on port CBP1 (PROFIBUS-DP). PZD word 1 is word 1 of the PLC data area if parameter P925 (see above) is set to 0. PZD word 1 is word 5 of the PLC data area if parameter P925 (see above) is set to 4 (words 1, 2, 3, and 4 are PKW words).

The same concepts apply to the Speed Feedback (or Actual Value) signal. In order to access the Speed Feedback in PZD word 2 from port CBP1 (communicating by PROFIBUS-DP to the FIM), parameter P916.1 must be set to 167. This selects what will be returned in PZD word 2 of the telegrams on serial port CBP1 (PROFIBUS-DP).

After P916.0 is set to 325, Figure 4-39 describes the function of each status bit in PZD word 1 of the return information from the drive.

NOTE: It is assumed that the byte order will be reversed by the PLC on the input words from the drive before any processing starts.

Byte Order in the Controller

When the data to and from the CS51 is displayed in word format in the Series 505 controller, the bytes are reversed in each word. This reversal is caused by the CS51. To avoid confusion, the controller reverses the byte order on the input words before any processing starts. Similarly, the controller reverses the byte order on the output words immediately before they are sent to the drive. Doing these byte reversals allows the documentation in the 6RA24, 6SE12, CS51, and Z2006 instructions books to be used directly.

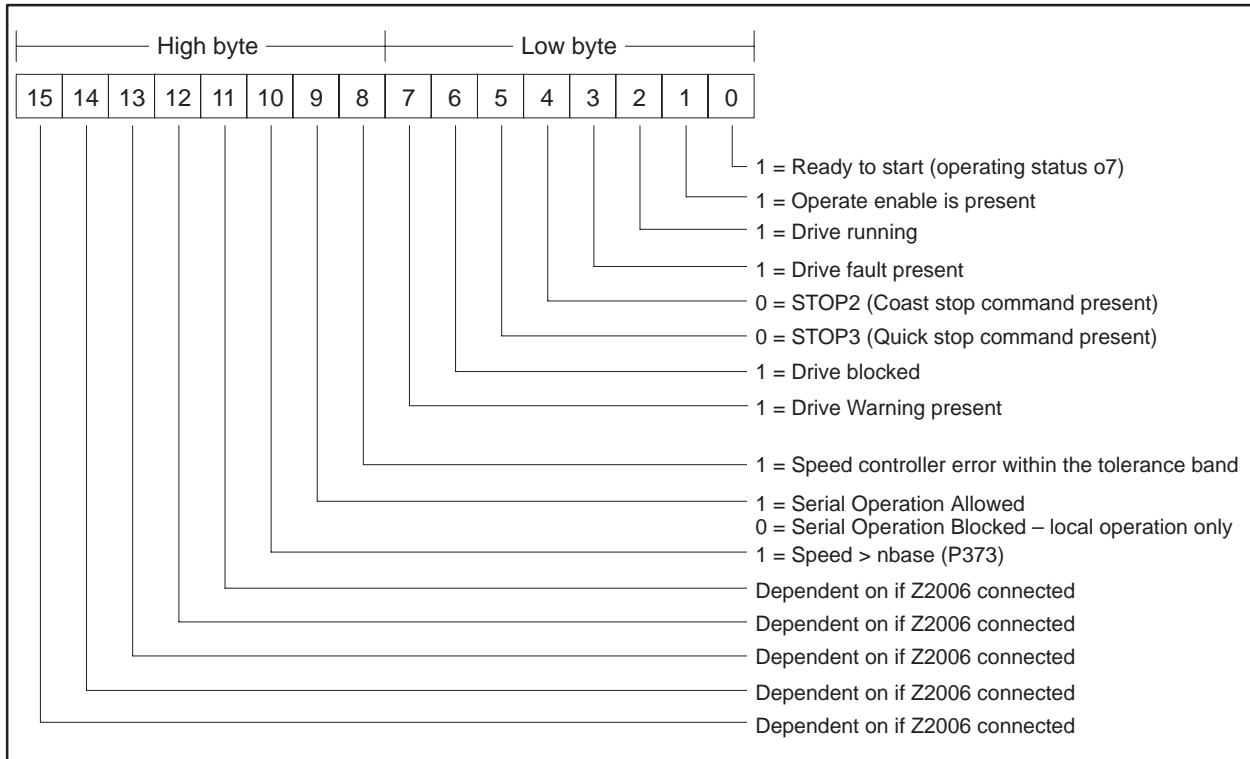


Figure 4-39 Status Bits for Standard Status Word and Speed Feedback

For the SIMOVERT 6SE12, the process data section (also refer to P924) defines the control word, status word, setpoints, and actual values for the interface. Definition of the process data section is flexible. Refer to the *CS51 Instruction Book*, parameter P915 of the *6SE12 Instruction Book*, Section 3 of the *Z2006 Instruction Book* (if included), and the specific application.

NOTE: The CS51 inverts bit 5 of the main control word (ramp generator enable) before sending it to the 6RA24 or 6ES12 or Z2006.

Required Switches The CS51 has no applicable switches.

CS51 (SIMOREG 6RA24 / SIMOVERT 6SE12 Communications Board) (continued)

External Power Supply

Connect an external 24 VDC source to terminal block X9 with pin 1 as +24 V and pin 2 as common. Use a separate power supply, because this is the power source for the actual serial connection between drive and host. The resulting communications signals are optically isolated from the internal microprocessor power supplies to provide the drive system with noise immunity.

Figure 4-40 shows the wiring for the CS51 SIMOREG 6RA24 and SIMOVERT 6SE12 Communications Board for all drives except the end of the bus.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for the RS-485 connection.

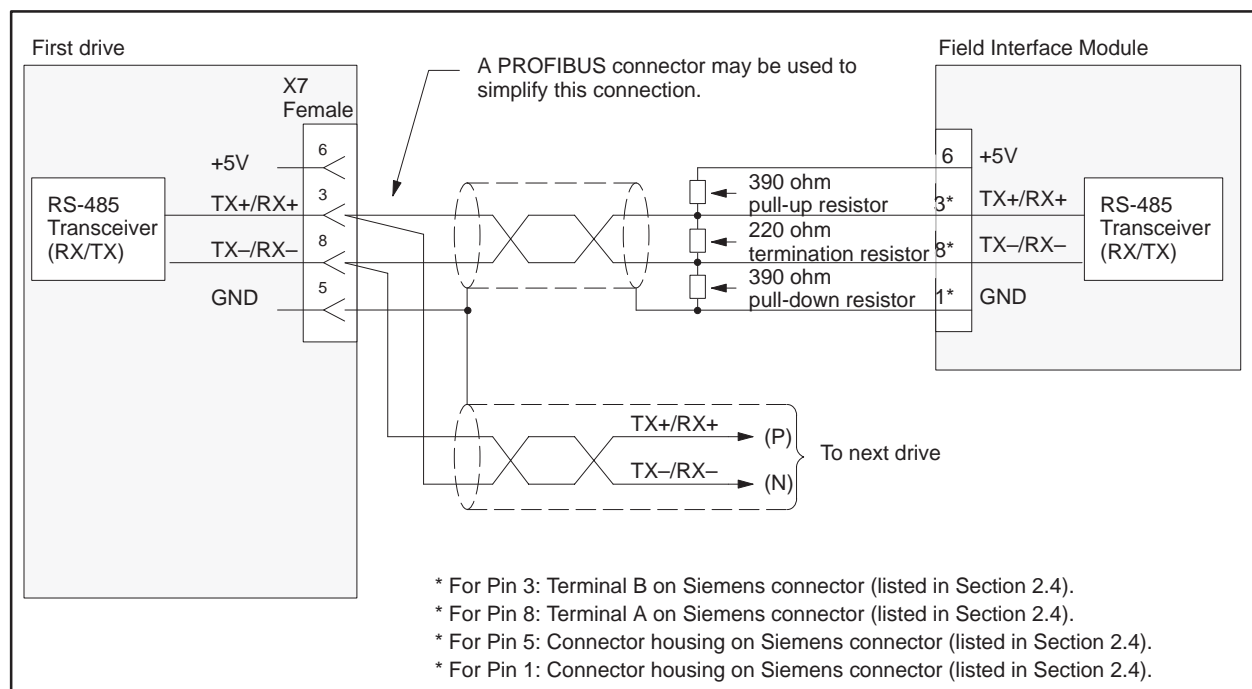


Figure 4-40 6SE12 Wiring: All Drives Except End of Bus

Figure 4-41 shows the wiring for the CS51 SIMOREG 6RA24 and SIMOVERT 6SE12 Communications Board for the drive at the end of the bus.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for the RS-485 connection.

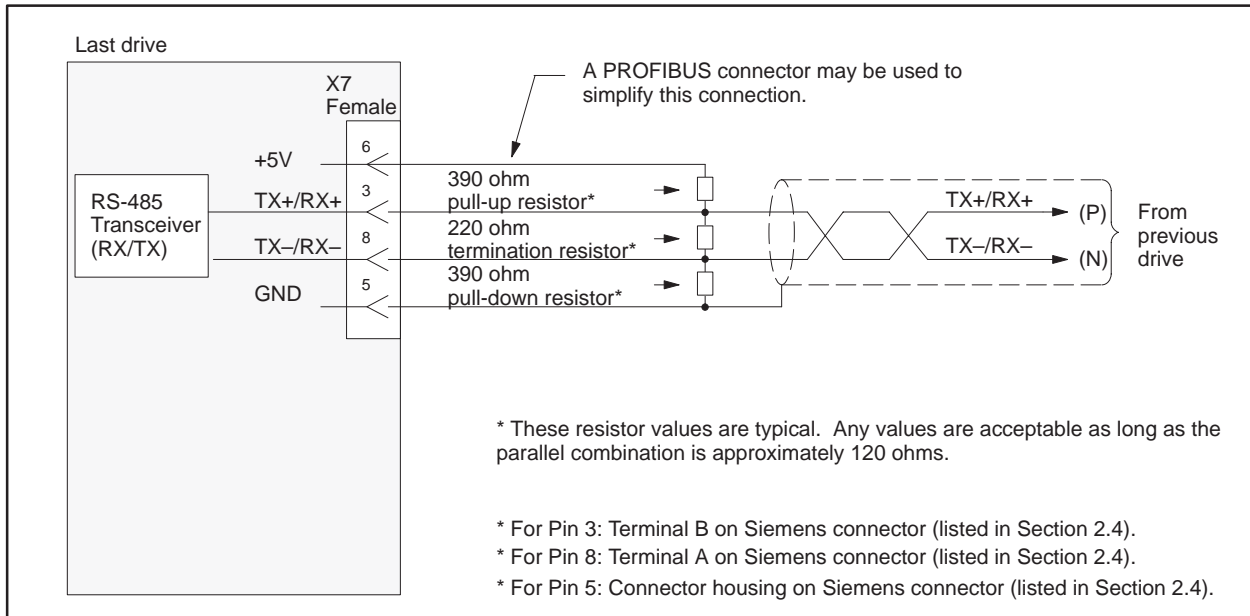


Figure 4-41 6SE12 Wiring: Drive at End of Bus

4.20 Setting Up and Wiring the SI3

Required Hardware and Software You can use any hardware and/or software version of the SI3 (6SE85 Serial Interface Board).

Required Parameters The parameters required to set up the 6SE85 follow.

Serial Mode	must be set to port 2, which selects port 2 for serial control.
Protocol Port 2	must be set to L2-DP, which selects 4-word PROFIBUS-DP protocol.
Data Length Port 2	must be set to 8, which includes the length byte in the telegram.
Address Port 2	must be set to the individual drive's PROFIBUS address. When used with the FIM, the first valid drive address is 17 if the slave address range selection is set to all closed. Refer to Table 4-2 for more information on the slave address range selection.
Baudrate Port 2	is normally set to 185.5K baud, unless some other drive requires a lower baud rate.
Link Failure	is initially set to Ignore, which turns off the drive telegram-monitoring function. After the network is operating, you can decide whether or not to turn on the drive telegram-monitoring function by setting Link Failure to Trip Drive.

The fixed 4-word (8-byte) data section defines the control word, status word, setpoints, actual values, and parameter information for the interface. Definition of the data section is fixed. Refer to the *SI3 Instruction Book* and the section on the specific configuration; this serial interface is called port 2 in that instruction book.

Required Jumpers

The applicable jumpers follow:

- JB1 Figure 4-42 and Figure 4-43 show the correct position of this jumper.
- JB2 This jumper must be set to two-wire RS-485 operation.
- JB3 This jumper must be in the open position.
- JB4 This jumper is not applicable.

Setting Up and Wiring the SI3 (continued)

Required Switches The SI3 has no applicable switches.

Figure 4-42 shows the wiring for the SI3 (6SE85 Serial Interface Board) for all drives except the end of the bus.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for the RS-485 connection.

If a cable is removed from one of the SI3 boards at a drive, the RS-485 bus is broken. If a cable must be removed and operation of the bus is required, the two 9-pin connectors of the cables at the disconnect point can be plugged together to continue the bus connection.

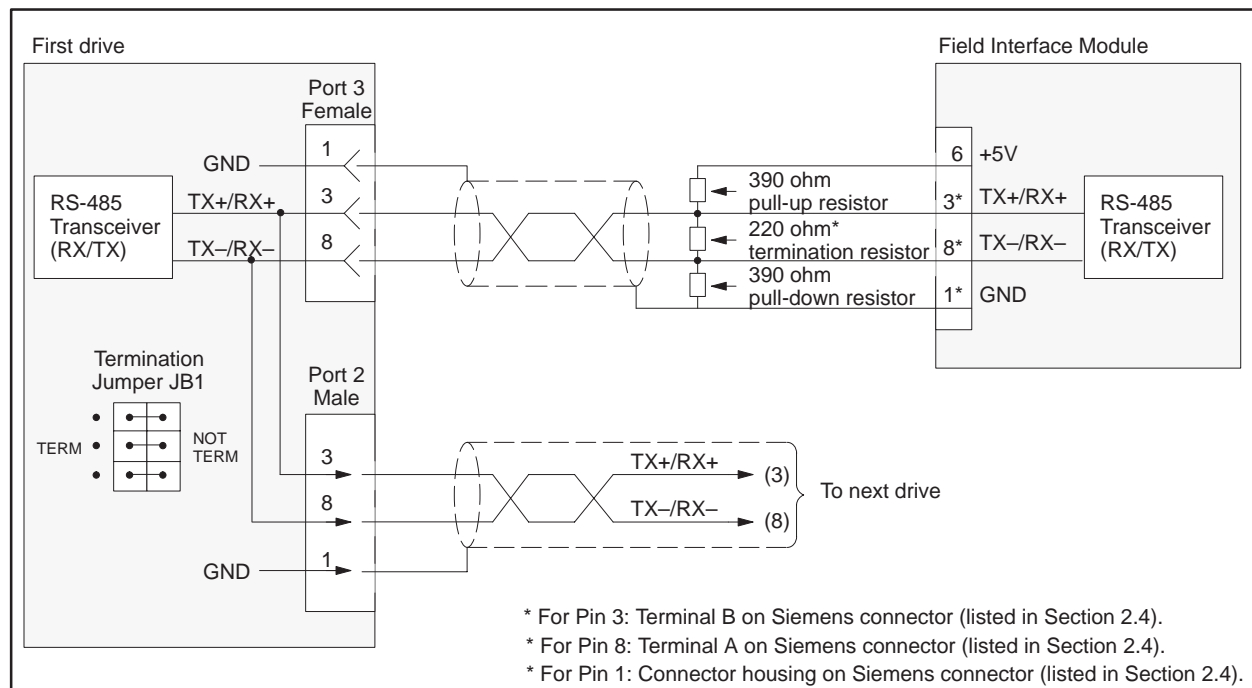


Figure 4-42 SI3 Wiring: All Drives Except End of Bus

Figure 4-43 shows the wiring for the SI3 (6SE85 Serial Interface Board) for the drive at the end of the bus.

NOTE: Use shielded, twisted, control cable and connect the shields to ground at both ends. Be sure that the chassis of the Field Interface Module is grounded and at the same potential as all of the grounded drive chassis. Do not exceed 1,000 meters for the RS-485 connection.

If a cable is removed from one of the SI3 boards at a drive, the RS-485 bus is broken. If a cable must be removed and operation of the bus is required, the two 9-pin connectors of the cables at the disconnect point can be plugged together to continue the bus connection.

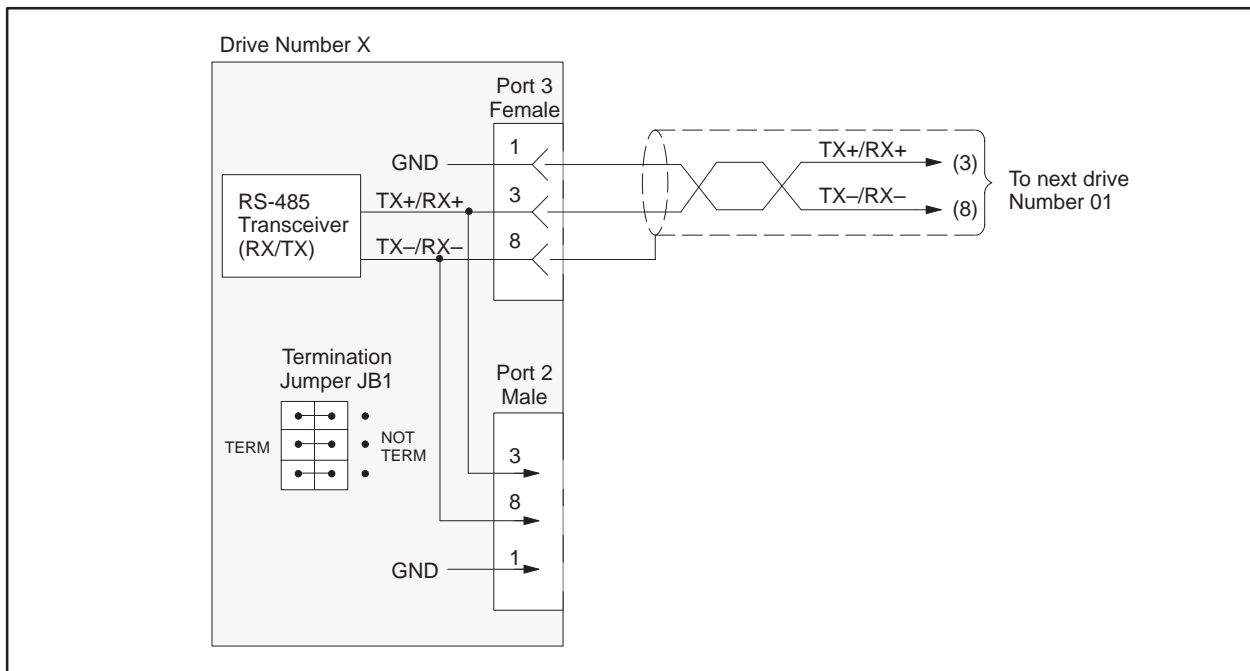


Figure 4-43 SI3 Wiring: Drive at End of Bus

SAMMS Interface Application

5.1	SAMMS Interface Overview	5-2
5.2	Selecting the Application	5-6
5.3	Communicating with the SAMMS Units	5-9
5.4	Connecting to SAMMS Unit	5-11
5.5	Configuring for Control Mode	5-12
5.6	Configuring for Status Poll Mode	5-20
5.7	Programming: Broadcast and Immediate I/O Requests	5-26
5.8	Programming: Sending Requests	5-30
5.9	Programming: Receiving Response Data	5-35
5.10	Programming: Application Examples	5-38
5.11	SAMMS Units Troubleshooting	5-43

5.1 SAMMS Interface Overview

The SAMMS Interface Application supports the SEAbus protocol of the Siemens Advanced Motor Master System (SAMMS) of Siemens Energy and Automation, Inc.

Features

The SAMMS Interface Application has the following features.

- It interfaces with 1 to 15 SAMMS units for each Field Interface Module.
- The autobaud operation automatically determines the baud rate by polling SAMMS units. All SAMMS units must be at the same baud rate.
- It supports Broadcast Messages through a broadcast channel.
- It supports Immediate Messages to individual SAMMS units and supplies rapid feedback for immediate I/O requests.
- The status of communication can be monitored through the controller status words (STW). This can be done both for the Field Interface Module and controller communication link, and for the Field Interface Module and SAMMS communication link.
- The SAMMS Interface Application can be reset without power cycling the base. To do this, change the SAMMS unit address range switch (S2).

System Layout

An I/O system layout for three Field Interface Modules running the SAMMS Interface Application is shown in Figure 5-1.

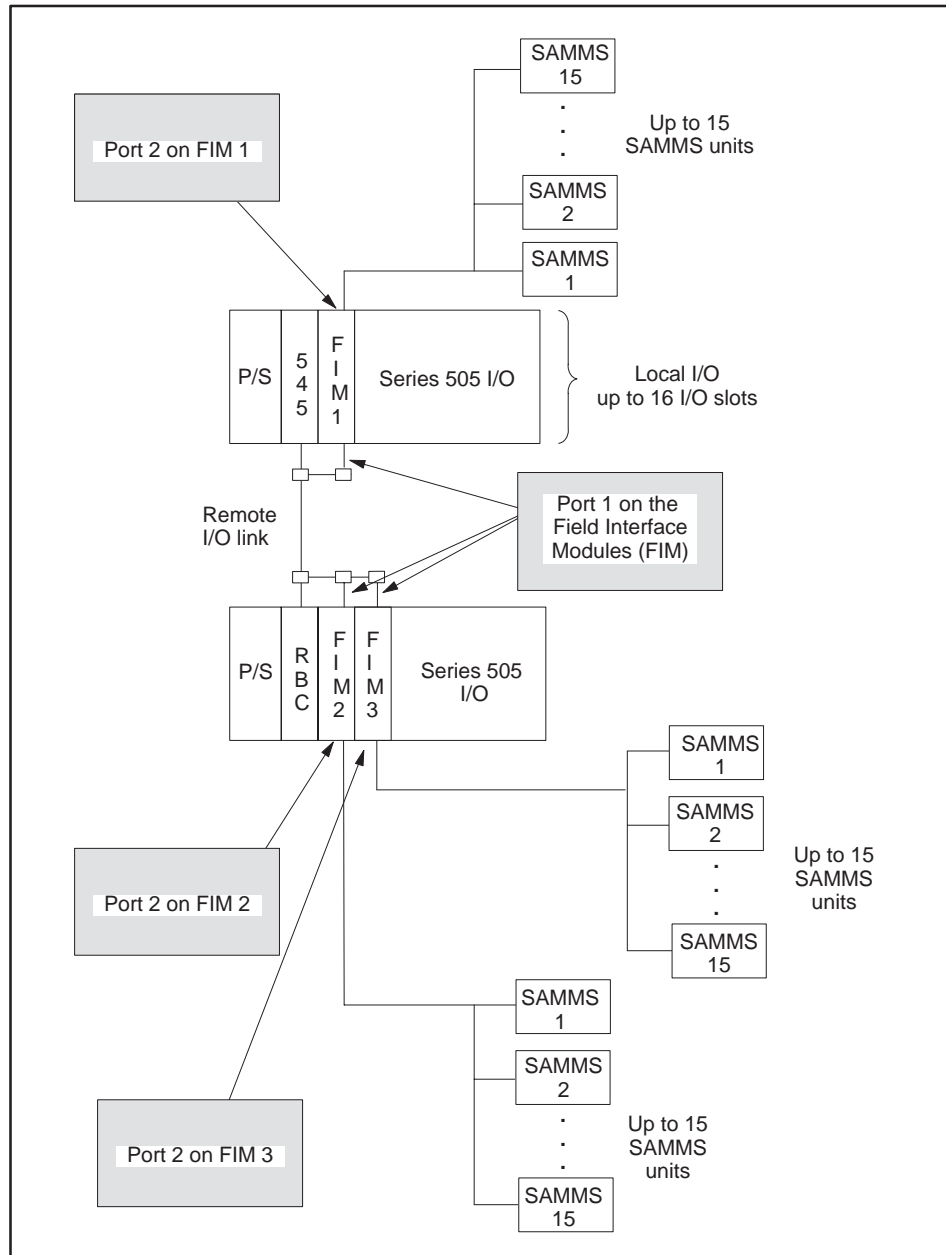


Figure 5-1 I/O System Layout for Three FIMs Running the SAMMS Interface Application

Overview (continued)

SAMMS Interface Logical Diagram

The SAMMS Interface logical block diagram is shown in Figure 5-2. The Field Interface Module appears as a remote base controller to the Series 505 I/O system.

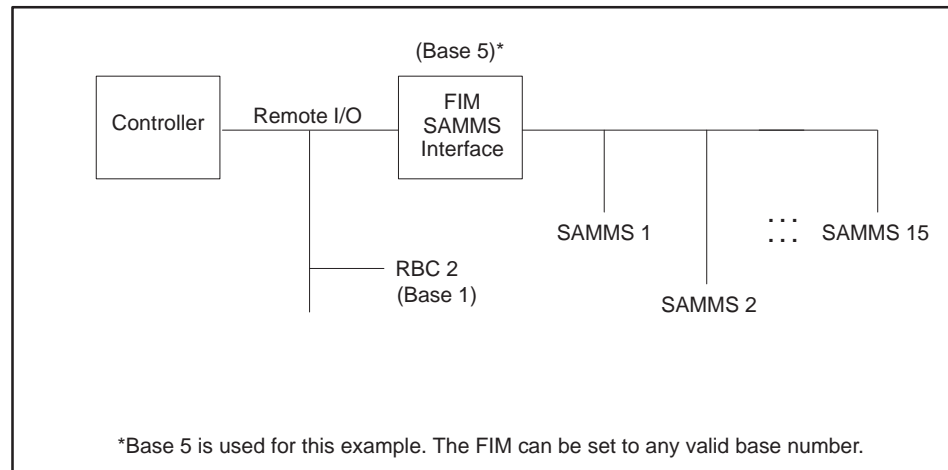


Figure 5-2 FIM Interface Block Diagram

**SAMMS Interface
Functional
Diagrams**

Figure 5-3 shows the SAMMS Interface functional block diagram for Control mode, and Figure 5-4 illustrates the functional block for Status Poll mode. The SAMMS units that are connected to the Field Interface Module appear as modules in a remote base.

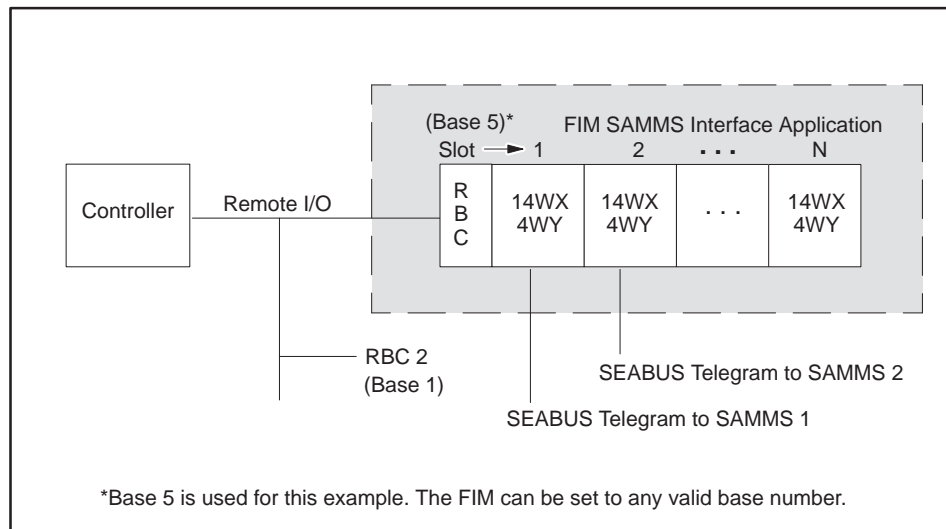


Figure 5-3 Functional Block Diagram for Control Mode

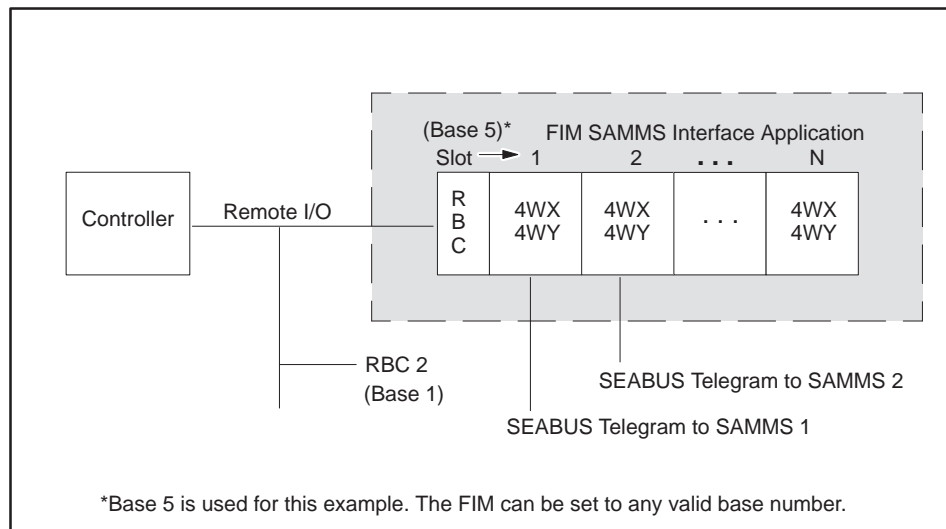


Figure 5-4 Functional Block Diagram for Status Poll Mode

5.2 Selecting the Application

Mode of Operation The mode of operation, called the application, is determined by setting the S3 dipswitch, as shown in Figure 5-5. Switches S3-1, S3-3, and S3-4 are closed and switch S3-2 is open for the SAMMS Interface Application.

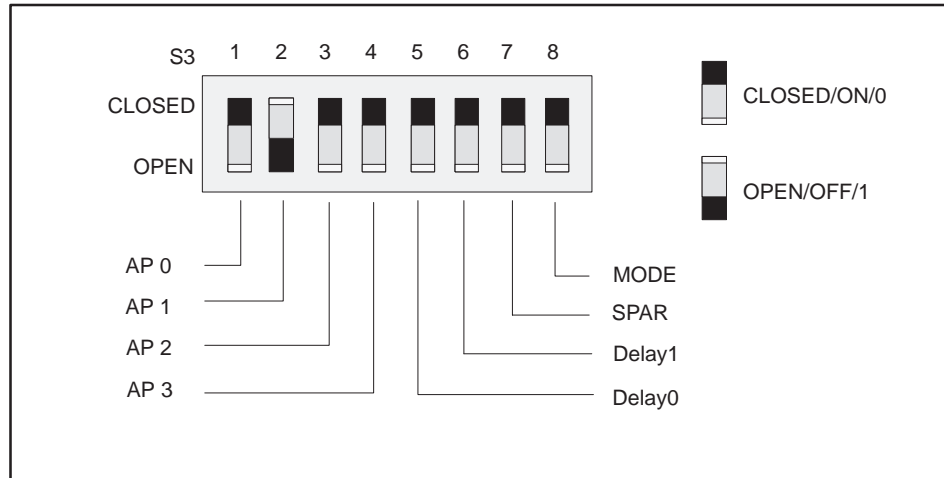


Figure 5-5 Field Interface Module S3 Dipswitch Settings

Dipswitch S3 assignments, shown in Figure 5-5, are defined as follows.

- AP 0 – 3 = Application Number 0 – 15 (AP 0 is the LSB)
- MODE = 0 – Control Mode
1 – Status Poll Mode
- SPAR = Spare
- Delay 1 = Additional delay time; see Table 5-1.
- Delay 0 = Additional delay time; see Table 5-1.

Table A-1 in Appendix A describes the S3 switch settings for the other applications that can be used with the FIM.

Interface Response Times

The SAMMS interface has response times that are optimized for communications with the SAMMS units. This optimization reduces the overall scan time of the SAMMS interface. Future releases of SAMMS units, however, may require longer response delays than are allowed by the optimizations. In order to accommodate potential future changes to the SAMMS units, Table 5-1 shows the additional delay time that SAMMS interface allows. Normally, no additional time is required; leave Delay0 and Delay1 in the Closed/On/0 position.

Table 5-1 Selecting Additional Delay Time

Delay1	Delay0	Additional Delay
Closed/On/0	Closed/On/0	0 mSec
Closed/On/0	Open/Off/1	7 mSec
Open/Off/1	Closed/On/0	21 mSec
Open/Off/1	Open/Off/1	42 mSec

NOTE: Changing any of the switches while the module is plugged in resets the module.

Configuring SAMMS Interface

You must configure the corresponding controller slot according to Table 5-2 for each active SAMMS unit that is connected to a FIM module. For a description of the WX and WY words, refer to Table 5-4 through Table 5-6.

Table 5-2 SAMMS Interface Configuration Modes

Dipswitch S3-8	Mode	Controller Slot Configuration
Closed/On/0	Control Mode	14WX, 4WY
Open/Off/1	Status Poll Mode	4WX, 4WY

Selecting the Application (continued)

Configuration Modes

If you do not require more than six bytes of data from any SAMMS request, you can select the Status Poll mode. Status poll mode will reduce the amount of I/O required for each SAMMS unit.

Status Poll Mode The Status Poll mode causes the SAMMS units to appear as 4WX, 4WY. The advantage of this mode is that it requires only eight words of I/O for each SAMMS unit, and reduces the overall controller scan time. The disadvantage in using this mode is that the maximum amount of data returned for responses is six bytes.

Control Mode The Control mode causes the SAMMS units to appear as 14WX, 4WY. The advantage of this mode is that it can return up to 26 bytes of data from the SAMMS responses to requests. The disadvantage of using this mode is that it takes up to 24 words of I/O because the controller must be configured in multiples of eight points, and it increases the controller scan time for each SAMMS unit.

5.3 Communicating with the SAMMS Units

Autobaud Operation

The SAMMS Interface Application automatically determines the baud rate of the SAMMS units connected to it. It cycles through each baud rate, starting with the lowest numbered SAMMS unit (SAMMS 1), and proceeding to the highest numbered SAMMS unit (SAMMS 15). Once communication is first established with any SAMMS unit, the SAMMS Interface Application continues to communicate at that baud rate until reset. If communication is not established, this cycling process is repeated until it locks onto a baud rate.

Valid baud rates for the SAMMS Interface Application follow:

- 9,600 bits per second
- 4,800 bits per second
- 2,400 bits per second

NOTE: The SAMMS Interface Application communicates with the first SAMMS unit found, at its baud rate. SAMMS units set to different baud rates are not identified by the SAMMS Interface Application, and do not appear when base status is read by TISOFT.

Communicating with the SAMMS Units (continued)

Address Range

The SAMMS Interface Application allows the selection of the address range for the SAMMS units. The address range is a block of 15 addresses that the SAMMS Interface Application uses to communicate with the SAMMS units. The addresses correspond to slot 1 through slot 15. You select this address range using the S2 rotary switch on the front bezel of the FIM. The address of the SAMMS unit for a given slot can be calculated by multiplying the value of the rotary switch S2 by 15 and adding the product to the slot number in which the SAMMS unit appears in the unit, as shown below:

$$\text{SAMMS_address} = (\text{S2_value} * 15) + \text{slot number}$$

The slot number that corresponds to a SAMMS unit can be calculated by multiplying the value of the rotary switch S2 by 15, and subtracting the product from the SAMMS unit address, as shown below:

$$\text{slot number} = \text{SAMMS_address} - (\text{S2_value} * 15)$$

The corresponding address ranges for the values of S2 are shown in Table 5-3.

Table 5-3 Address Range Selection

S2 Value	Lowest Address (Slot 1)	Highest Address (Slot 15)
0	1	15
1	16	30
2	31	45
3	46	60
4	61	75
5	76	90
6	91	105
7	106	120
8	121	135
9	136	150
A	151	165
B	166	180
C	181	195
D	196	210
E	211	225
F	226	240

5.4 Connecting to SAMMS Unit

Connecting Port 2 to CM1 Communication Module

The SAMMS unit connects to port 2 in the Field Interface Module through the CM1 Communication Module; see Figure 5-6. Figure 5-6 also shows the pin numbers for port 2 of the Field Interface Module.

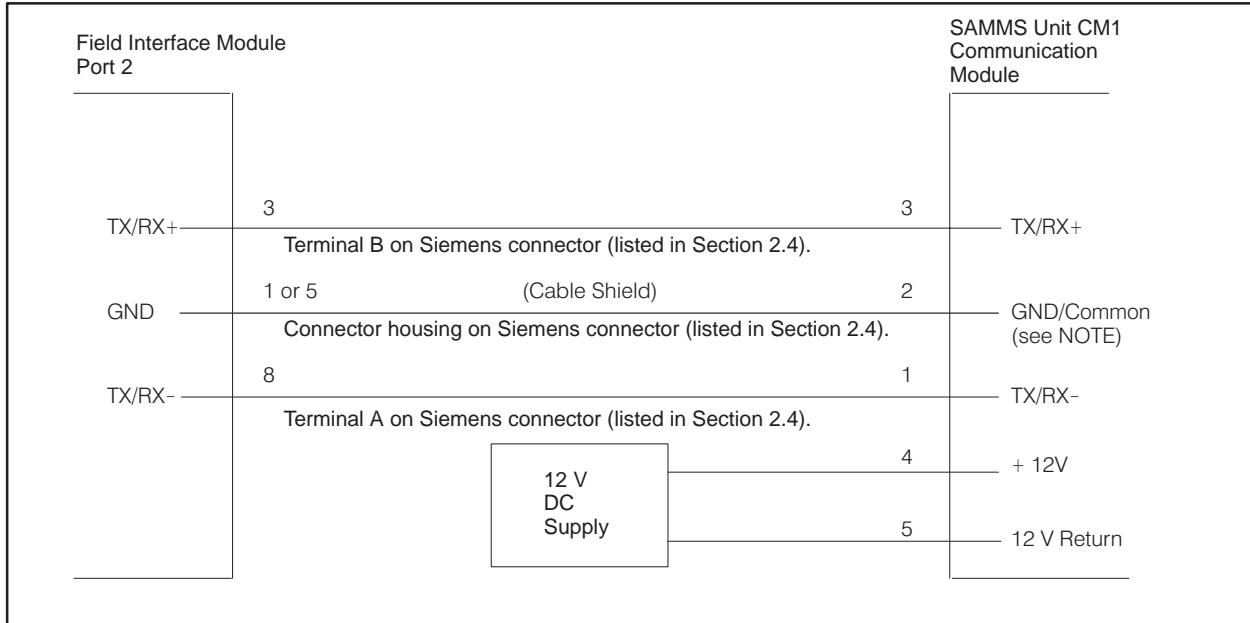


Figure 5-6 Connecting the Field Interface Module to SAMMS Unit CM1 Communication Module

NOTE: Port 2 on the Field Interface Module must have a common ground reference with the SAMMS unit. Otherwise, communications can become unreliable.

5.5 Configuring for Control Mode

Updating the I/O Configuration Definition	After inserting the FIM into the base, you must update the I/O configuration in the controller. The module does not automatically configure itself. TISOFT, or another programming device, must be connected to the controller to both register and verify controller-to-FIM communication.
Sample Configuration	This sample configuration description uses one SAMMS unit; the address is set to SAMMS unit 1 and S2 is set to 0, which selects address range 1 to 15 for the SAMMS units. Addresses 1 – 15 correspond to slots 1 to 15 of the controller. Refer to Table 5-3 for information on address range selection. Table 5-3 is configured to the sample configuration chart, shown in Figure 5-10. These words can be mapped to any valid I/O address; in this example, they start at address 1. The broadcast/immediate channel begins at address 25, indicating that 24 points are taken up by the SAMMS unit because the I/O points of the controller must be configured in multiples of eight. The broadcast/immediate channel can, however, also have any valid I/O address. Do not overlap I/O points across different slots.

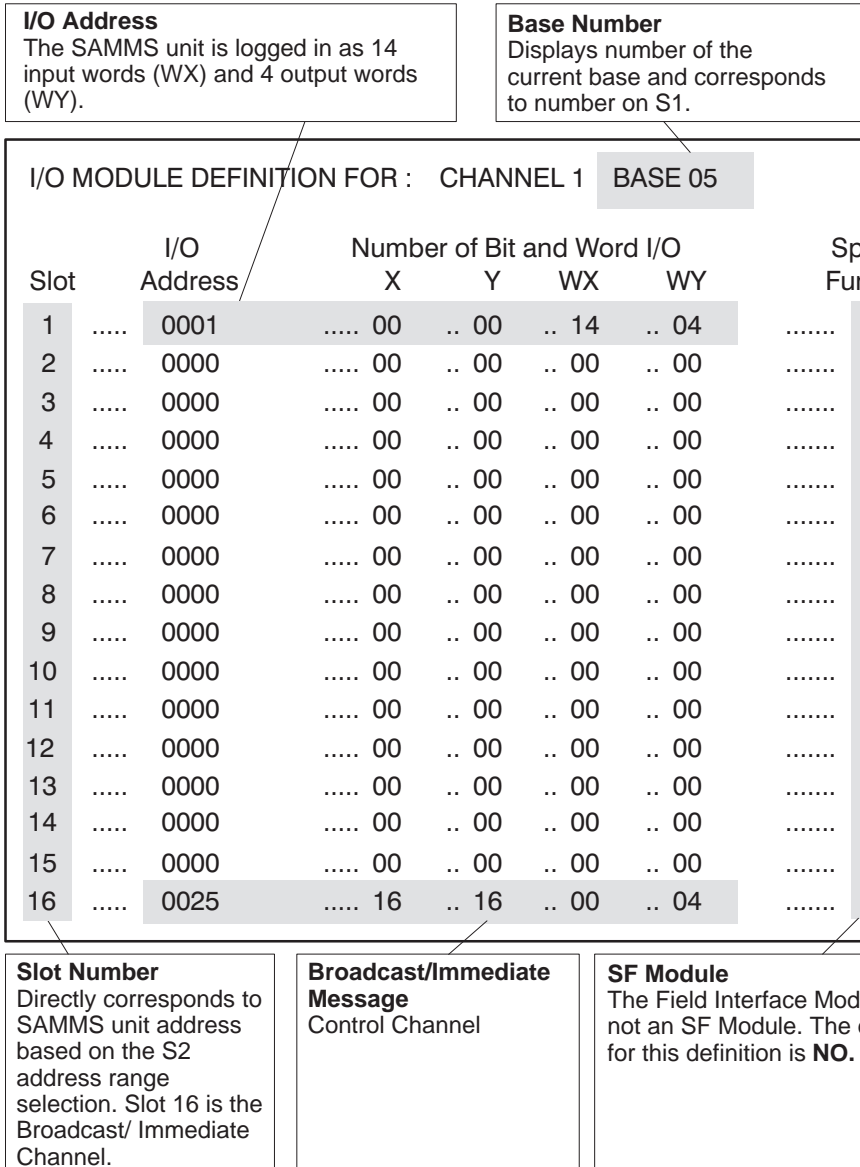


Figure 5-7 Sample I/O Configuration Chart for the Control Modes

Configuring for Control Mode (continued)

Configuring for Control Mode	The SAMMS Interface Application using the Control mode is configured as 14 word inputs (WX) and 4 word outputs (WY). It occupies 24 points of the controller's word image register for each SAMMS unit. The points must be used in multiples of eight when programmed in TISOFT.
Broadcast/Immediate Control Channel	The Broadcast/Immediate Control Channel is always in slot 16. It takes up to 16 discrete input points (X), 16 discrete output points (Y), and 4 word output points (WY). The Broadcast/Immediate Control Channel occupies 40 points of controller image register for each Field Interface Module using the SAMMS Interface Application. The points must be configured in multiples of eight when programmed in TISOFT.
WX1 – WX14 (Controller Input Words)	WX1 to WX14 are input words to the controller. WX1 contains the SAMMS response byte in the least significant byte (LSB), and the response data length of received data and response status bits in the most significant byte (MSB). WX2 to WX14 contain the data from the response according to the length of the data returned in WX1. The length of data is in bytes. The first data byte is in the LSB of WX2; the second data byte is in the MSB of WX2 and so on, through the MSB of WX14. See Table 5-4 for the correlation of controller input words to SAMMS unit request bytes.
WY15 – WY16 (Controller Output Words)	WY15 to WY18 are the output words from the controller. WY15 contains the request command in the LSB, and the request data length bits and control bits in the MSB. The length of data is in bytes and the first byte of data is in the LSB of WY16, the second data byte is in the MSB of WY16, and so on, through the MSB of WY18.

Table 5-4 Mapping the Controller (Host) Words to the SAMMS Unit Command

From the SAMMS Unit (SAMMS Unit to Host)			To the SAMMS Unit (Host to SAMMS Unit)		
Controller Input Words	SAMMS Unit Response Data		Controller Output Words	SAMMS Unit Request Data	
	MSB	LSB		MSB	LSB
WX1	Response Data Length/ Status Bits	Response Byte	WY15	Request Data Length/ Control Bits	Request Byte
WX2	Data 1	Data 0	WY16	Data 1	Data 0
WX3	Data 3	Data 2	WY17	Data 3	Data 2
WX4	Data 5	Data 4	WY18	Data 5	Data 4
WX5	Data 7	Data 6			
WX6	Data 9	Data 8			
WX7	Data 11	Data 10			
WX8	Data 13	Data 12			
WX9	Data 15	Data 14			
WX10	Data 17	Data 16			
WX11	Data 19	Data 18			
WX12	Data 21	Data 20			
WX13	Data 23	Data 22			
WX14	Data 25	Data 24			

Configuring for Control Mode (continued)

Configuring the Broadcast/Immediate Channel (Control Mode)

The Broadcast/Immediate Channel in this example is configured as follows:

Immediate I/O Request Control Bits. In this example, bits Y41 to Y55 are Immediate I/O request control bits and correspond to SAMMS units 1 – 15. When set, these bits force an immediate I/O request to be sent to the corresponding SAMMS unit. Setting bit Y42 forces an interruption in the Field Interface Module SAMMS Interface Application update scan, causing a request to be sent to SAMMS unit 2 immediately. These bits are one-shot and are edge-triggered by the SAMMS Interface Application.

Broadcast Control Bit. In this example, Y56 is the broadcast control bit and operates the same way as the Y41 to Y55 bits, except that setting Y56 forces a broadcast to all SAMMS units.

Immediate I/O Request Completed Bits. In this example, bits X25 to X39 are the Immediate I/O Request Completed bits. They are set when the immediate I/O request to the corresponding SAMMS units 1 – 15 has been completed. Bits X25 to X39 are only set if bits Y41 to Y55 remain set after the immediate I/O request is made. If you require confirmation that the immediate I/O request has been completed, then leave the Immediate I/O Request Control bit set until the corresponding Immediate I/O Request Completed bit is set by the SAMMS Interface Application. Bits X25 to X39 are reset when the corresponding bits Y41 to Y55 are reset. Bits X25 to X39 let the program know when the Immediate I/O Request is complete. For more details see the programming section.

Broadcast Completed Bit. In this example, bit X40 is the broadcast completed bit and operates in the same way as X25 to X39, except that X40 indicates that a broadcast (caused by setting bit Y56) is complete.

Broadcast Data Words. In this example, controller output words WY57 to WY60 contain the information for broadcasts. They correspond to the SAMMS request input words of the broadcast request, just as words WY15 to WY18 correspond to the SAMMS input words of SAMMS unit 1. Refer to Table 5-5. The request control bits are meaningless in the broadcast channel.

Table 5-5 Mapping the Control Mode Protocol Broadcast Channel

Immediate I/O Request Completed Bits	SAMMS Address Number	Immediate I/O Request Control Bits	To the SAMMS Unit (Host to SAMMS Unit)					
			Controller Output Words	SAMMS Unit Request Data				
				MSB	LSB			
X25	1	Y41	WY57	Data Length	Request Byte			
X26	2	Y42	WY58	Data 1	Data 0			
X27	3	Y43	WY59	Data 3	Data 2			
X28	4	Y44	WY60	Data 5	Data 4			
X29	5	Y45						
X30	6	Y46						
X31	7	Y47						
X32	8	Y48						
X33	9	Y49						
X34	10	Y50						
X35	11	Y51						
X36	12	Y52				X40 – This is the Broadcast Completed Bit		
X37	13	Y53						
X38	14	Y54				Y56 – This is the Broadcast Control Bit		
X39	15	Y55						

Configuring for Control Mode (continued)

Viewing the I/O Configuration Chart

Use your programming device to view the I/O Configuration Chart, shown in Figure 5-8. Use `SHOW` in TISOFT, and be aware that only a portion of this information is shown at a time.

- The slot number corresponds to the SAMMS number. This example shows SAMMS 1, which appears in slot 1.
- Slot 16 is always the Broadcast/Immediate Channel.
- The SAMMS Interface Application is configured as base 5.

I/O CONFIGURATION CHART FOR : CHANNEL ... 1 BASE 05								
I/O POINTS								
	1	2	3	4	5	6	7	8
Slot 1	WX0001	WX0002	WX0003	WX0004	WX0005	WX0006	WX0007	WX0008
	9	10	11	12	13	14	15	16
Slot 1	WX0009	WX0010	WX0011	WX0012	WX0013	WX0014	WY0015	WY0016
	17	18						
Slot 1	WY0017	WY0018						
Slot 2								
Slot 3								
Slot 4								
Slot 5								
Slot 6								
Slot 7								
Slot 8								
Slot 9								
Slot 10								
Slot 11								
Slot 12								
Slot 13								
Slot 14								
Slot 15								
	1	2	3	4	5	6	7	8
Slot 16	X0025	X0026	X0027	X0028	X0029	X0030	X0031	X0032
	9	10	11	12	13	14	15	16
Slot 16	X0033	X0034	X0035	X0036	X0037	X0038	X0039	X0040
	17	18	19	20	21	22	23	24
Slot 16	Y0041	Y0042	Y0043	Y0044	Y0045	Y0046	Y0047	Y0048
	25	26	27	28	29	30	31	32
Slot 16	Y0049	Y0050	Y0051	Y0052	Y0053	Y0054	Y0055	Y0056
	33	34	35	36				
Slot 16	WY0057	WY0058	WY0059	WY0060				
Slot 16								

Figure 5-8 I/O Configuration Chart for Control Mode

5.6 Configuring for Status Poll Mode

Updating the I/O Configuration Definition	After you insert the Field Interface Module into the base, update the I/O configuration in the controller. The module does not automatically configure itself. TISOFT, or another programming device, must be connected to the controller in order to both register and verify communication between the FIM and the controller.
Sample Configuration	This configuration description uses one SAMMS unit; the address is set to SAMMS unit 1. S2 is set to 0, which selects address range 1 to 15, corresponding to slot 1 to 15. The example uses the configuration chart shown in Figure 5-9. Word I/O can be mapped to any valid I/O address, but in this example, they start at address 1. The broadcast/immediate channel begins at address 9, indicating that 8 points are used by the SAMMS unit, although the broadcast/immediate channel can have any valid I/O address. Do not overlap I/O points across different slots.

I/O Address SAMMS Unit
The SAMMS unit is logged in as 4 input words (WX) and 4 output words (WY).

Base Number
Displays number of the current base and corresponds to number on S1.

I/O MODULE DEFINITION FOR : CHANNEL 1 BASE 05

Slot	I/O Address	Number of Bit and Word I/O				Special Function
		X	Y	WX	WY	
1	0001	00	00	04	04	No
2	0000	00	00	00	00	No
3	0000	00	00	00	00	No
4	0000	00	00	00	00	No
5	0000	00	00	00	00	No
6	0000	00	00	00	00	No
7	0000	00	00	00	00	No
8	0000	00	00	00	00	No
9	0000	00	00	00	00	No
10	0000	00	00	00	00	No
11	0000	00	00	00	00	No
12	0000	00	00	00	00	No
13	0000	00	00	00	00	No
14	0000	00	00	00	00	No
15	0000	00	00	00	00	No
16	0009	16	16	00	04	No

Slot Number
Directly corresponds to SAMMS unit address based on the S2 address range selection. Slot 16 is the Broadcast/Immediate Channel.

Broadcast/Immediate Message
Control Channel

SF Module
The Field Interface Module is not an SF Module. The default for this definition is **NO**.

Figure 5-9 Sample I/O Configuration Chart for Status Poll Mode

Configuring for Status Poll Mode (continued)

Configuring the Broadcast/Immediate Channel (Status Poll Mode)

The Broadcast/Immediate Channel is configured in this example as follows:

Immediate I/O Request Control Bits. In this example, bits Y25 to Y39 are immediate I/O request control bits, and correspond to SAMMS units 1 – 15. When set, these bits force an immediate I/O request to be sent to the corresponding SAMMS unit. Setting bit Y26 forces an interruption in the Field Interface Module SAMMS units update scan, causing a request to be sent to SAMMS unit 2 immediately. These bits are one-shot and edge-triggered by the SAMMS Interface Application. For more programming information, see Section 5.7.

Configuring for Status Poll Mode

The SAMMS Interface Application, using the Status Poll mode, is configured as 4 word inputs (WX) and 4 word outputs (WY). It occupies 8 points of the controller word image register for each SAMMS unit.

Broadcast/Immediate Control Channel

The Broadcast/Immediate Channel is always in slot 16. It takes up 16 discrete input points (X), 16 discrete output points (Y), and 4 word output points (WY). The Broadcast/Immediate Channel occupies 40 points of controller image register for each Field Interface Module using the SAMMS Interface Application. This is because the points must be configured in multiples of eight when programmed in TISOFT.

WX1 – WX4
(Controller
Input Words)

WX1 to WX4 are input words to the controller. WX1 contains the SAMMS response byte in the least significant byte (LSB), and the response data length of received data and response status bits in the most significant byte (MSB). WX2 to WX4 contain the data from the response according to the length of the data returned in WX1. The length of data is in bytes, and the first data byte is in LSB of WX2, the second data byte in the MSB of WX2 and so on, through the MSB of WX4. See Table 5-6 for the correlation of controller input words to SAMMS unit request bytes.

WY5 – WY8
(Controller Output
Words)

WY5 to WY8 are the output words from the controller. WY5 contains the request byte command in the LSB and the request data length bits and request control bits of the MSB. The length of data is in bytes. The first byte of data is in the LSB of WY6, the second data byte in the MSB of WY6, and so on, through the MSB of WY8.

Table 5-6 Mapping the Controller (Host) Words to the SAMMS Parameter Words for Status Poll Mode

From the SAMMS Unit (SAMMS Unit to Host)			To the SAMMS Unit (Host to SAMMS Unit)		
Controller Input Words	SAMMS Unit Response Data		Controller Output Words	SAMMS Unit Request Data	
	MSB	LSB		MSB	LSB
WX1	Response Data Length/Status Bits	Response Byte	WY5	Request Data Length/Request Control Bits	Request Byte
WX2	Data 1	Data 0	WY6	Data 1	Data 0
WX3	Data 3	Data 2	WY7	Data 3	Data 2
WX4	Data 5	Data 4	WY8	Data 5	Data 4

Configuring for Status Poll mode (continued)

Broadcast Control Bit. In this example, bit Y40 is the broadcast control bit and operates the same way as the bits Y25 to Y39, except that setting bit Y40 forces a broadcast to all SAMMS units.

Immediate I/O Request Completed Bits. In this example, bits X9 to X23 are immediate I/O request completed bits. They are set when the immediate I/O request to the corresponding SAMMS units 1 – 15 is complete. Bits X9 to X23 are only set if bits Y25 to Y39 remain set after the immediate I/O request is made. Bits X9 to X23 are reset when the corresponding bits Y25 to Y39 are reset. They inform the program that the immediate I/O request is complete.

Broadcast Completed Bit. In this example, bit X24 is the broadcast completed bit and operates in the same way as bits X9 to X23, except that bit X24 indicates that a broadcast (caused by bit Y40) is complete.

Broadcast Data Words. In this example, controller output words WY41 to WY44 contain the information for broadcasts. They correspond to the SAMMS unit input words of the broadcast request, just as words WY5 to WY8 correspond to the SAMMS unit input words of SAMMS unit 1. Refer to Table 5-7. The request control bits are meaningless in the broadcast channel.

Table 5-7 Mapping the Status Poll Mode Broadcast Channel

Immediate I/O Request Completed Bits	SAMMS Unit Number	Immediate I/O Request Control Bits	To the SAMMS Unit (Host to SAMMS Unit)		
			Controller Output Words	SAMMS Unit Request Data	
				MSB	LSB
X9	1	Y25			
X10	2	Y26	WY41	Data Length	Request Byte
X11	3	Y27	WY42	Data 1	Data 0
X12	4	Y28	WY43	Data 3	Data 2
X13	5	Y29	WY44	Data 5	Data 4
X14	6	Y30			
X15	7	Y31			
X16	8	Y32			
X17	9	Y33			
X18	10	Y34	X24 – This is the Broadcast Completed Bit.		
X19	11	Y35			
X20	12	Y36			
X21	13	Y37	Y40 – This is the Broadcast Control Bit.		
X22	14	Y38			
X23	15	Y39			

Viewing the I/O Configuration Chart

Use your programming device to view the I/O Configuration Chart, as shown in Figure 5-10. Use SHOW in TISOFT, and be aware that only a portion of this information is shown at a time.

- The slot number corresponds to the SAMMS unit number. This example shows SAMMS unit 1 which appears in slot 1.
- Slot 16 is always the Broadcast/Immediate Channel.
- The SAMMS Interface Application is configured as base 5.

I/O CONFIGURATION CHART FOR : CHANNEL ... 1 BASE 05								
I/O POINTS								
	1	2	3	4	5	6	7	8
Slot 1	WX0001	WX0002	WX0003	WX0004	WY0005	WY0006	WY0007	WY0008
Slot 2								
Slot 3								
Slot 4								
Slot 5								
Slot 6								
Slot 7								
Slot 8								
Slot 9								
Slot 10								
Slot 11								
Slot 12								
Slot 13								
Slot 14								
Slot 15								
	1	2	3	4	5	6	7	8
Slot 16	X0009	X0010	X0011	X0012	X0013	X0014	X0015	X0016
	9	10	11	12	13	14	15	16
Slot 16	X0017	X0018	X0019	X0020	X0021	X0022	X0023	X0024
	17	18	19	20	21	22	23	24
Slot 16	Y0025	Y0026	Y0027	Y0028	Y0029	Y0030	Y0031	Y0032
	25	26	27	28	29	30	31	32
Slot 16	Y0033	Y0034	Y0035	Y0036	Y0037	Y0038	Y0039	Y0040
	33	34	35	36				
Slot 16	WY0041	WY0042	WY0043	WY0044				

Figure 5-10 I/O Configuration Chart for Status Poll Mode

5.7 Programming: Broadcast and Immediate I/O Requests

Broadcast Request When the broadcast request bit is set, the SAMMS unit scan is interrupted. The data in the WY words of the broadcast channel is sent to all the SAMMS units using the broadcast address (256) defined by the SEAbus protocol. The broadcast has no response data returning from the SAMMS units.

Broadcast requests are used to synchronize actions such as starting or jogging the motors simultaneously. If broadcasts are not used, it may be several seconds before all SAMMS units are updated, depending on the number of SAMMS units and baud rate. All SAMMS units receive broadcast messages.

CAUTION

If bits in the controller output words do not correspond to normal SAMMS unit input words, subsequent update scans may cancel requests performed by the broadcast.

If broadcast requests are canceled, synchronizing operations do not occur.

To prevent subsequent update scans from canceling requests performed by the broadcast, your program must coordinate requests in the controller output words so that they correspond to normal SAMMS unit input words.

The SAMMS unit does not respond directly to a broadcast. If the program needs to know whether or not the broadcast message was received, then it must poll the SAMMS units to determine if the request sent by the broadcast was executed.

 **WARNING**

Connecting SAMMS units with addresses outside of the address range selected on S2, and also sending a broadcast, could start a SAMMS unit operation that the Field Interface Module cannot stop. The Field Interface Module does not update these SAMMS units, but all SAMMS units receive the broadcast.

Using SAMMS unit addresses outside the selected range could cause unpredictable operation, resulting in death or serious injury to personnel, and/or damage to equipment.

Do not use SAMMS unit addresses outside the selected range.

**Broadcast
Procedure**

Follow the steps below for the broadcast-request procedure.

1. Reset the broadcast-request bit for at least one controller scan.
2. Set the controller output words (WY) in channel 16 to the desired request values.
3. On the same scan in ladders, set the corresponding control bits/data into each of the controller output words affected by the broadcast. This prevents cancellation of the request by subsequent updates of the normal SAMMS unit scan.
4. Set the broadcast-request bit.
5. The broadcast is complete when the broadcast-complete bit is set.
6. Reset the broadcast-request bit.
7. You may send another broadcast when the broadcast-completed bit is reset by the SAMMS Interface Application.

Programming: Broadcast and Immediate I/O Requests (continued)

Immediate I/O Request

The normal SAMMS unit update scan can take several seconds, depending on the number of SAMMS units, and on the baud rate. When a SAMMS unit needs to be updated faster than the normal SAMMS unit scan time allows, an immediate I/O request may be sent. Immediate I/O requests are made to one or more SAMMS units by setting the immediate I/O request control bit corresponding to the SAMMS unit. This immediate I/O request is sent typically within one message transmit time.

Once the immediate I/O request message is sent, the response data is immediately updated in controller input words. This allows the rapid poll of data by external devices, and the immediate response of requests such as jogging or stopping the motor.

If immediate I/O requests are sent to more than one SAMMS unit, an immediate I/O request is first sent to the lowest-numbered SAMMS unit, followed by an immediate I/O request to the next higher-numbered SAMMS unit, until all the immediate I/O requests are sent. If a broadcast request is made with immediate I/O requests, the broadcast request is sent first. After all immediate I/O requests are sent, the SAMMS unit update scan resumes as normal. The immediate I/O request bits are edge-triggered and one-shot. They must be reset for one controller scan before the immediate I/O request for that SAMMS unit is sent again.

Once the immediate I/O requests are complete, the immediate I/O request completed bits are set if the original immediate I/O request bits are still set.

Immediate I/O Request Procedure

Follow these steps to initiate an immediate I/O request.

1. Reset the immediate I/O request bit corresponding to the desired SAMMS unit for at least 1 controller scan.
2. Set the controller output data words (WY) to the desired value.
3. Set the immediate I/O request bit that corresponds to the desired SAMMS unit.
4. The immediate I/O request is complete when the corresponding immediate I/O request complete bit is set. This bit is only set if the original immediate I/O request bit is still set.
5. You may send another immediate request after the immediate I/O request complete-bit is reset. To do this, repeat steps 2 through 4.

-
- The controller input words (WX) now reflect the response of the SAMMS unit when the immediate I/O request was made.

NOTE: The response data words (WX) for the immediate I/O request do not reflect the response of the parameter request sent to the SAMMS unit. The response data words do reflect what the SAMMS unit returned when the request was made. Some requests to the SAMMS unit take more time for the SAMMS unit to process, and it may take several repeated requests for the SAMMS unit to complete the request. When the SAMMS unit has completed the request, the response parameter number is the same as the original request. Refer to your SAMMS unit manual for more information on the SAMMS unit parameter programming.

Monitoring Communication

Once configuration is complete, checks of controller status words allow the monitoring of communication to each SAMMS unit. The SAMMS units appear as modules in a base. In the sample configuration shown in Section 5.5, the Field Interface Module running the SAMMS unit Interface Application is set to base 5. The channel number is set to 1, which is currently the only channel in a 545/555 controller.

Since this example uses base 5, controller status word 16 (STW16) is the corresponding word containing the status bits. There is one status bit for each SAMMS unit. These bits are set by the controller as soon as a loss of communication to that SAMMS unit is detected. These bits are also set if SAMMS units are configured incorrectly. The status bits that are set correspond to the SAMMS unit(s) that do not match.

Slot 16 is occupied by the SAMMS Interface Application broadcast/immediate channel that takes up the most significant bit. By monitoring this bit, any interruption in the SAMMS unit communication path can be detected by the user program and the proper action can be taken.

CAUTION

The SAMMS Interface Application does not monitor the SAMMS units for internal faults.

If the SAMMS unit continues to communicate, then the SAMMS Interface Application assumes that the SAMMS unit is good. You must sample SAMMS unit status bits, in conjunction with controller status word bits, to ensure that the program detects reported failures.

Refer to your SAMMS units manual for more details on error reporting by the SAMMS unit.

5.8 Programming: Sending Requests

Sending Requests to the SAMMS Unit

A request to a given SAMMS unit is constructed in the WY (word output) points that are configured for that unit's corresponding I/O slot. Some requests to SAMMS units have no response. The SAMMS Interface Application uses a table similar to Table 5-8 to determine if a message has a response and how much data to send from the request data buffer. This can be overridden by bits in the Request Control word. If a request has a response, then the response data is placed into the WX (word input) locations for that unit. A request is made up of two basic parts: Request Control Word and Request Data Block or Buffer (some requests). A response is also made up of two basic parts: Response Status Word and Response Data Block or Buffer.

Table 5-8 SAMMS Unit Request Default Parameters

Request Byte	Description	Request Data Length (Bytes)	Response ?
001H	Request discrete data	0	Y
002H	Request configuration data	0	Y
003H	Request detailed data	0	Y
004H	Request ambient temp. and pickup currents	0	Y
005H	5A CT ratios for OL relays 1 and 2	0	Y
006H	Motor type, cold stall time	0	Y
030H	5A CT ratio for overload relay 1	1	N
031H	5A CT ratio for overload relay 2	1	N
032H	CT size for overload relay 1	1	N
033H	CT size for overload relay 2	1	N
041H	Full-load current for overload relay 1	1	N
042H	Full-load current for overload relay 2	1	N
043H	Overload trip class	1	N
044H	Programmable timer 1	1	N
045H	Programmable timer 2	1	N
046H	Control parameters	1	N
047H	Process current	1	N
049H	Address setting	1	N
04AH	Ambient temperature	1	N
04BH	Ground fault pickup current	2	N
04CH	Jam pickup current	1	N
04DH	Loss of load pickup current	1	N
04EH	Motor type	1	N
04FH	Cold stall time	1	N
051H	Emulate button push	3	N
0A1H	Baud rate setting	2	N
0FFH	Request device type	0	Y

Programming: Sending Requests (continued)

Request Control Word

The Request Control Word is the first output word location and contains three basic parts: the request command byte, the request data block length, and the request control bits. Figure 5-11 shows the request control word with the SAMMS Interface Application set for the Status Poll mode (4WX, 4WY) starting at address 1. In this example, there are four input words (WX1 – WX4), and the first output word (the Request Control Word) begins at WX5.

16 msb	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1 lsb
WY 5.1	WY 5.2	WY 5.3	WY 5.4	WY 5.5	WY 5.6	WY 5.7	WY 5.8	WY 5.9	WY 5.10	WY 5.11	WY 5.12	WY 5.13	WY 5.14	WY 5.15	WY 5.16
			Request Data Length (Override)				Request Byte								
Message Requires a Response (Override)															
Send Message Repetitively															
Send Message (handshake)															

Figure 5-11 Request Control Word

Request Command Byte

The Request Command byte is the LSB of the request control word; it contains the request number to send to the SAMMS unit. Normally, the SAMMS Interface Application determines whether a response is required, and determines the number of bytes of data that is required for SAMMS commands by the request command byte. You may override these parameters by setting the bits in the most significant byte of the request control word to a value other than zero. Do this only if the request format of SAMMS unit messages changes from that of Table 5-8, or if new commands are introduced that are not in the table. Not having to specify these parameters simplifies programming of the individual requests.

Request Data Length Bits

The SAMMS Interface Application generates a request message from the command byte and the data block. The SAMMS Interface Application knows how much data is to be sent with the commands in Table 5-8, and does not require the length to be specified.

NOTE: Future enhancements to SAMMS units may change the amount of data associated with a command, or new commands may be added. To facilitate this, the request may have a data length specified, which is placed into the five least significant bits in the MSB of the first WY location with the command byte. If these bits are reset (all zero), then the SAMMS Interface Application uses the byte count listed in the command table. If a new command is added to a SAMMS unit, then it can still be used by the SAMMS Interface Application by specifying the length of the data block when the request is generated. If the request length byte is greater than the six bytes of data, only the first six bytes are sent (maximum size of the request data block).

Request Control Bits

There are three bits in the most significant byte of the request control word that control the sending of a request to the SAMMS unit. They are the Send Message bit, the Send Message Repetitively bit, and the Response Required bit.

Send Message Bit

The Send Message bit forces (or “triggers”) the sending of a request from the request buffer to the SAMMS unit. The transition of this bit from the reset state to the set state forces the sending of the request in the request byte of the request control word. This bit has no meaning in the broadcast channel. Figure 5-12 diagrams the handshake sequence for the Send Message bit, using the example above in the Status Poll mode.

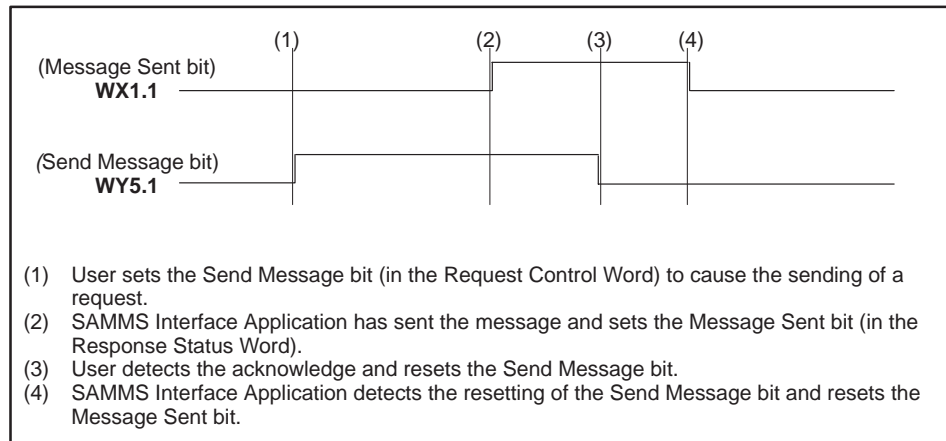


Figure 5-12 Send Message Handshake Sequence

Programming: Sending Requests (continued)

Send Message Repetitively Bit

The Send Message Repetitively bit causes the request in the request buffer to be sent to the configured SAMMS unit on every scan of the SAMMS Interface Application. When this bit is set, then the Send Message bit is ignored and the request is sent regardless of its state or previous state. This bit has no meaning in the broadcast channel.

Response Required Bit

The Response Required bit forces the SAMMS Interface Application to wait for a response to the request sent from a SAMMS unit. The purpose of this bit is to indicate whether or not a SAMMS unit should respond to the request for a new message or whether it should override the default parameters from Table 5-8. This bit has no meaning in the broadcast channel.

CAUTION

Setting the Response required bit causes the SAMMS Interface Application to require the SAMMS unit to respond to this request.

If the SAMMS unit does not respond, then it is treated as a failed unit and logged out of the system.

Do not use the Response Required bit unless a command in the SAMMS unit is added or modified and does not agree with the response required setting in Table 5-8.

Request Data Block

Some requests require data. This data must be placed into the data block in the remaining WY locations, beginning with the second WY location. Data is stored in bytes (eight bits) and the controller uses words. You must understand the difference between words and bytes to place the data that is associated with the request into the proper locations. Data bytes are placed into the memory starting with the LSB of the first word; the next byte is placed in the MSB of the word. Do the same for the next word, until all bytes are placed into the data block. Table 5-9 shows the location of the bytes in the response data block beginning with WY6, since the Request Control Word was WY5 in Figure 5-11.

Table 5-9 Response Data Block Words

Output Word	MSB	LSB
WY6	Request Data Byte 1	Request Data Byte 0
WY7	Request Data Byte 3	Request Data Byte 2
WY8	Request Data Byte 5	Request Data Byte 4

5.9 Programming: Receiving Response Data

If a request requires a response, then the SAMMS Interface Application waits for the response from the SAMMS unit after it sends the request. The response data is placed into the WX locations in an arrangement similar to the request. You can detect the completion of a request and the presence of a response in the response buffer by reading the response status bits in the MSB of the Response Status Word. If there is no response for a request, then only the Message Sent bit is set in the Response Status Word. The response byte, response data length bits, and the response present bits are reset (all zero).

Response Status Word

The first word of the WX word inputs for a given slot is the Response Status Word. This word contains the status and response byte (if any) of the last request sent to the SAMMS unit. See Figure 5-13.

16 msb	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1 lsb			
WX 1.1	WX 1.2	WX 1.3	WX 1.4	WX 1.5	WX 1.6	WX 1.7	WX 1.8	WX 1.9	WX 1.10	WX 1.11	WX 1.12	WX 1.13	WX 1.14	WX 1.15	WX 1.16			
			Response Data Length					Response Byte										
			MSB				LSB				MSB				LSB			
Response Present in Data Buffer																		
Undefined																		
Message has been sent (acknowledge handshake)																		

Figure 5-13 Response Status Word

Response Byte

The response byte is the command value placed into the LSB of the Response Status Word. This byte is derived from the response received from the SAMMS unit from the last request sent.

Response Status Bits

The most significant byte of the Response Status Word contains the Response Status bits that indicate the status of a completed-request and the presence of a response to that request, if any.

Programming: Response Data (continued)

Message Sent Bit

The Message Sent bit indicates that the requested message was sent to the corresponding SAMMS unit. The state of this bit follows the state of the Send Message bit. That is, while the Send Message bit remains set, the SAMMS Interface Application sets the Message Sent bit after it sends the request and leaves it set as long as the Send Message bit is set. The SAMMS Interface Application resets this bit when the Send Message bit is reset. Figure 5-14 shows the handshake sequence of these two bits.

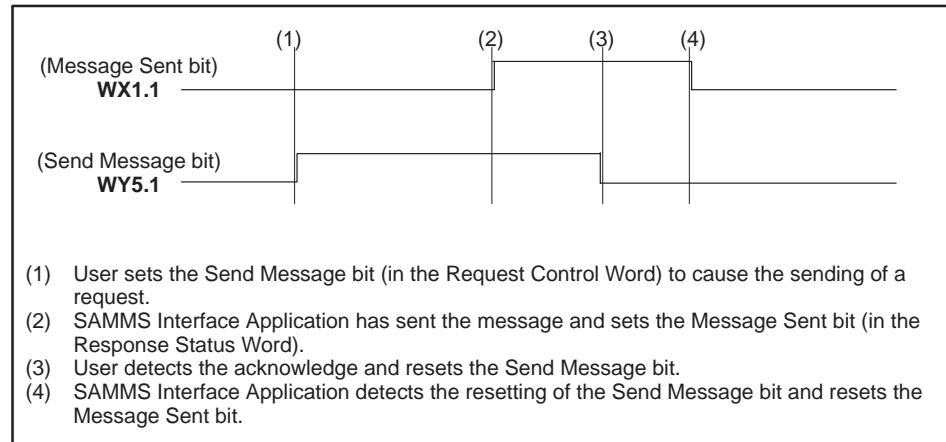


Figure 5-14 Send Message/Message Sent Handshake Sequence

Response Present Bit

The Response Present bit indicates that a response was received from the last request and has been placed into the response buffer. This bit is reset on requests that have no response.

Response Length Bits

The length of the response data is placed into five least significant bits of the MSB of the response status word. This length contains the number of bytes that were placed in the response data block, not necessarily the number of bytes that were received from the response. If the response data received is larger than the data block, then the SAMMS Interface Application will place only as many bytes of data into the response data block as it has available.

Response Data Block

The data from the response message is placed into the remaining WX locations beginning with the second WX location. Data is stored in bytes (eight bits), and the controller uses words. You must understand the difference between words and bytes to get the data associated with the request from the proper locations. The data bytes are placed into the memory starting with the LSB of the word, then the next byte is placed in the MSB of the word. This is repeated for the next word, until all bytes are placed into the data block. Table 5-10 shows the location of bytes in the Response Data block for a SAMMS unit starting at I/O address 1 and the SAMMS Interface Application in the Control Mode. Table 5-11 shows the location of bytes in the Response Data block for a SAMMS unit starting at I/O address 1 and the SAMMS Interface Application in the Status Poll Mode.

Table 5-10 Response Data Buffer Words (Control Mode)

Input Word	MSB	LSB
WX2	Response Data Byte 1	Response Data Byte 0
WX3	Response Data Byte 3	Response Data Byte 2
WX4	Response Data Byte 5	Response Data Byte 4
WX5	Response Data Byte 7	Response Data Byte 6
WX6	Response Data Byte 9	Response Data Byte 8
WX7	Response Data Byte 11	Response Data Byte 10
WX8	Response Data Byte 13	Response Data Byte 12
WX9	Response Data Byte 15	Response Data Byte 14
WX10	Response Data Byte 17	Response Data Byte 16
WX11	Response Data Byte 19	Response Data Byte 18
WX12	Response Data Byte 21	Response Data Byte 20
WX13	Response Data Byte 23	Response Data Byte 22
WX14	Response Data Byte 25	Response Data Byte 24

Table 5-11 Response Data Buffer Words (Status Poll Mode)

Input Word	MSB	LSB
WX2	Response Data Byte 1	Response Data Byte 0
WX3	Response Data Byte 3	Response Data Byte 2
WX4	Response Data Byte 5	Response Data Byte 4

5.10 Programming: Application Examples

Setting the Baud Rate and Address

SAMMS units are currently shipped from the factory with a default address of 200 and a default baud rate of 4800. You can change these parameters by using the hand-held programming device on the front panel of the SAMMS unit. If you do not have a hand-held programming device, then change these settings using the FIM. You can change any parameter through the normal I/O channel by setting the SAMMS Interface Application to the proper address range and then configuring the parameters through the normal requests. The example in this section, however, describes how to change parameters by using the broadcast feature of the SAMMS Interface Application.

Before you can use the broadcast feature of the SAMMS Interface Application, you must set up the FIM by setting the S2 rotary switch to the D position. This selects the address range, in which the SAMMS Interface Application polls for SAMMS units, to addresses 196 to 210. This allows the SAMMS Interface Application to autobaud to the powered-up SAMMS unit so that it can send the broadcast message at that SAMMS unit's current baud rate. You must configure the Broadcast/Immediate channel to a unique address in the controller. For the following example, use I/O address 1 for the Broadcast channel. This means that the Broadcast Control words are at WY33 – WY36. The Broadcast Control bit is at Y32.

Follow the steps on page 5-39 to set the baud rate to 9600 and to set the address of the powered-up SAMMS unit. You must repeat this procedure in order to set the baud rate and address for each SAMMS unit. Before you begin, you must power down all SAMMS units except the one in which you are setting the address.

NOTE: Any SAMMS unit that is powered up is set to the same address because the broadcast message is received by every communicating SAMMS unit. Setting two units to the same address causes communication conflicts.

-
1. Power up the SAMMS unit to be reprogrammed. Power down all other SAMMS units.
 2. Power cycle the base in which the FIM is located. (Turn it off and then on). This causes the FIM to start autobaud again.
 3. Reset bit Y32. This is the Broadcast Control bit.
 4. Set word WY34 to 9600 (2580h). This is the baud rate.
 5. Set word WY33 to 161 (00A1h). This is the command number to request a change of baud rate.
 6. Set bit Y32. This forces the SAMMS Interface Application to send the broadcast request to the SAMMS unit. If you leave Y32 set, bit X16 is set when the broadcast is complete.
 7. Reset bit Y32 again to prepare for another broadcast.
 8. Power cycle the base in which the FIM is located (turn the base off and then on again) because the SAMMS unit is now responding to a new baud rate. This causes the SAMMS Interface Application to start autobaud again.
 9. Set word WY34 to the new address value desired for the SAMMS unit that is currently powered up.
 10. Set word WY33 to 73 (0049h). This is the command number to change the SAMMS unit address.
 11. Set bit Y32. This sends the request to change the address to the SAMMS unit. If you leave Y32 set, bit X16 is set when the broadcast is complete.
 12. Reset bit Y32.

Repeat this procedure to change the baud rates and addresses to the desired values for each additional SAMMS unit.

Programming Application Examples (continued)

Sending Requests That Have Responses

Data message requests have responses that contain various data parameters in the SAMMS unit. The following procedure sends the Request Detailed Data message to the SAMMS unit in the control mode configuration example (see Figure 5-7). This particular message has 25 bytes of response data to be returned by the SAMMS unit. In this example, the SAMMS unit is set to the first address in the address range that is selected by the rotary switch on the front bezel; the switch appears in slot 1 of the base. The I/O configuration address starts at 1 in this example and creates the following I/O arrangement:

WX1: Response Control word for SAMMS unit 1.

WX2 – WX14: Response Data Buffer for SAMMS unit 1.

WY15: Request Control word for SAMMS unit 1.

WY16 – WY18: Request Data Buffer for SAMMS unit 1.

1. Place a 3 into the Request Control word (WY15). This is the command number for the Request Detailed Data request message of the SAMMS unit. This also resets any control bit that may be set from a previous request.
2. You can send the new request by setting the Send Message Bit (WY15.1) in the Request Control word after the Message Sent bit (WX1.1) is reset by the SAMMS Interface Application.

When the Message Sent bit is set, the Send Message request is complete. For this example, the Response Present bit (WX1.3) is set to indicate that there is a response from this completed request in the Response Data buffer (WX2 – WX14).

The most significant byte of the Response Status word (WX1) contains the length of bytes from the response in the five least significant bits. You can mask these bits to get the response length, if you want to use it, by ANDing the byte with 31 (1Fh). The length of the sample response message is 25 (19h) bytes. The first two bytes of the response data are the Last Trip Current (refer to the SEABUS for SAMMS programming manual), and are found in WX2: byte 1 is in the LSB and byte 2 is in the MSB. This is followed by byte 3 in the LSB in WX3, then the MSB for byte 4, and so on through the rest of Response Data buffer to the LSB of WX14, which contains byte 25.

**Sending Requests
That Have No
Response**

Configuration message requests have no response. The following procedure sends the Set Programmable Timer 1 message to the SAMMS unit in the control mode configuration example (see Figure 5-7). This particular message sends one byte of data with the request. In this example, the SAMMS unit is set to the first address in the address range selected by the rotary switch on the front bezel: it appears in slot 1 of the base. The I/O configuration address starts at 1 in this example and creates the following I/O arrangement:

WX1: Response control word for SAMMS unit 1.

WX2 – WX14: Response Data Buffer for SAMMS unit 1.

WY15: Request control word for SAMMS unit 1.

WY16 – WY18: Request Data Buffer for SAMMS unit 1.

1. Place a 68 (44h) into the Request Control word (WY15), which is the command number for the Set Programmable Timer 1 request message of the SAMMS unit. This also resets any control bit that may be set from a previous request.
2. Place a 40 (28h) into the first byte (least significant byte) of the Request Data buffer (WY16). This is the data for the request that sets Timer 1 to 40 seconds.
3. You can send the new request by setting the Send Message Bit (WY15.1) in the Request Control word after the Message Sent bit (WX1.1) is reset by the SAMMS Interface Application.

When the Message Sent bit is set, it indicates that the Send Message request is complete. There is no response to this request, so the Response Present bit (WX1.3) is reset.

Programming Application Examples (continued)

Sending Requests Repetitively

You may want to send a request, such as poll of inputs from the SAMMS unit, continually. The following procedure sends the Request Discrete Data message, repetitively, to the SAMMS unit in the control mode configuration example (see Figure 5-7). This particular message has four bytes of response data to be returned by the SAMMS unit. In this example, the SAMMS unit is set to the first address in the address range selected by the rotary switch on the front bezel: the SAMMS unit appears in slot 1 of the base. The I/O configuration address starts at 1 in this example and creates the following I/O arrangement:

WX1: Response control word for SAMMS unit 1.

WX2 – WX14: Response Data Buffer for SAMMS unit 1.

WY15: Request control word for SAMMS unit 1.

WY16 – WY18: Request Data Buffer for SAMMS unit 1.

1. Place a 1 into the Request Control word (WY15), which is the command number for the Request Discrete Data request message of the SAMMS unit. This also resets any control bit that may be set from a previous request.
2. Set the Send Message Repetitively bit (WY15.2) to in the Request Control word to begin sending this message.

The most significant byte of the Response Status word (WX1) contains the length of bytes from the response in the five least significant bits. You can mask these bits to get the response length, if you want to use it, by ANDing it with 31 (1Fh). The length of the sample response message is four bytes. As long as the Send Message Repetitively bit remains set, this request is sent on every scan of the SAMMS Interface Application.

5.11 SAMMS Units Troubleshooting

Common troubleshooting symptoms, causes and corrective actions are shown in Table 5-12. If you need additional help, contact your distributor or sales office.

Table 5-12 Troubleshooting the Field Interface Module Using LEDs

Symptom	Probable Cause	Corrective Action
MOD GOOD Off	No power to board.	Re-seat board.
		Check for bent pins on board connector.
		Check base power supply.
		Check switch settings.
	Bad module, failed diagnostics.	Return module for repair.
COMM Off	Broken cable on Port 1.	Repair or replace cable.
	Controller not powered up.	Power up controller.
CFG Off	Broken cable on Port 1.	Repair or replace cable.
	Base address set to 0 on controller with local base.	Set base address correctly.
	Base not configured.	Configure base.
	Base disabled.	Enable base
CFG Blinking	Configured incorrectly.	Reconfigure correctly.
	Broken cable on Port 2.	Repair or replace cable.
	Wrong base number selected on switch S1.	Set S1 to the correct base number.
	Wrong address range selected on switch S2.	Set S2 to the correct address range.
	Wrong SAMMS unit number selected on SAMMS unit.	Refer to your SAMMS unit manual for setting the SAMMS unit address.
	Wrong baud rate.	Set all SAMMS units to the same baud rate.
	SAMMS unit(s) not powered up.	Power up all SAMMS units.
	SAMMS unit failure.	Repair or replace SAMMS unit.

SAMMS Units Troubleshooting (continued)

Checking the Operation of the Module

Use TISOFT to check the operation of the module. If you experience problems communicating with the SAMMS units, you can read the base status through TISOFT. Refer to your TISOFT manual for more information on reading a base. The base status indicates proper communication to individual SAMMS units by the presence of I/O points in the slot number corresponding to the SAMMS unit address. I/O points in slot 16 indicate good communication between the SAMMS Interface Application of the Field Interface Module and the controller.

Control Mode

For the Control mode:

- If the controller is communicating properly to the SAMMS Interface Application, slot 16 contains 16X, 16Y, and 4WY points when base status is read.
- Good communication to individual SAMMS units is indicated by the presence of 14WX and 4WY points in the slot number that corresponds to the SAMMS unit address based on the S2 address range selection.
- Read the controller status words to determine I/O presence and the correct configuration of the Field Interface Module. See Table 5-13 and Table 5-14 for bit mapping.

Status Poll Mode

For the Status Poll Mode:

- If the controller is communicating properly to the SAMMS Interface Application, slot 16 contains 16X, 16Y, and 4WY points when base status is read.
- Good communication to individual SAMMS units is indicated by the presence of 4WX and 4WY points in the slot number that corresponds to the SAMMS unit address based on the S2 address range selection.
- Read the controller status words to determine I/O presence and the correct configuration of the Field Interface Module. See Table 5-13 and Table 5-14 for bit mapping.

Table 5-13 shows status bits for monitoring status between the controller and the Field Interface Module for the selected base number on the Field Interface Module. Note that the status words for monitoring status between the Field Interface Module and the SAMMS units is also shown in this table.

Bit number to SAMMS unit number correlation to these status words is shown in Table 5-14, using base 5 as an example.

**Monitoring Status
between the
Controller and FIM**

Table 5-13 shows status bits for monitoring status between the controller and the Field Interface Module for the selected base number on the Field Interface Module. The status words for monitoring status between the Field Interface Module and the SAMMS units is also shown in this table.

The bit number to SAMMS unit number correlation to these status words is shown in Table 5-14, using base 5 as an example.

Table 5-13 Controller-to-FIM Communication Status Using Controller Status Words

FIM Base Number	Controller to FIM Communication Status Bit	Status Word for FIM to SAMMS Unit Communication Status
0	STW2 – Bit 16 – (least significant bit)	STW11
1	STW2 – Bit 15	STW12
2	STW2 – Bit 14	STW13
3	STW2 – Bit 13	STW14
4	STW2 – Bit 12	STW15
5	STW2 – Bit 11	STW16
6	STW2 – Bit 10	STW17
7	STW2 – Bit 9	STW18
8	STW2 – Bit 8	STW19
9	STW2 – Bit 7	STW20
10	STW2 – Bit 6	STW21
11	STW2 – Bit 5	STW22
12	STW2 – Bit 4	STW23
13	STW2 – Bit 3	STW24
14	STW2 – Bit 2	STW25
15	STW2 – Bit 1 – (most significant bit)	STW26

SAMMS Units Troubleshooting (continued)

Table 5-14 Monitoring FIM-to-SAMMS Unit Communication Status Using Controller Status Words

SAMMS Unit Address Number	FIM to SAMMS Unit Communication Status Bit (Using the Base 5 Example*)
(S2 setting x 15) + 1	STW16 – Bit 16 – (least significant bit)
(S2 setting x 15) + 2	STW16 – Bit 15
(S2 setting x 15) + 3	STW16 – Bit 14
(S2 setting x 15) + 4	STW16 – Bit 13
(S2 setting x 15) + 5	STW16 – Bit 12
(S2 setting x 15) + 6	STW16 – Bit 11
(S2 setting x 15) + 7	STW16 – Bit 10
(S2 setting x 15) + 8	STW16 – Bit 9
(S2 setting x 15) + 9	STW16 – Bit 8
(S2 setting x 15) + 10	STW16 – Bit 7
(S2 setting x 15) + 11	STW16 – Bit 6
(S2 setting x 15) + 12	STW16 – Bit 5
(S2 setting x 15) + 13	STW16 – Bit 4
(S2 setting x 15) + 14	STW16 – Bit 3
(S2 setting x 15) + 15	STW16 – Bit 2
FIM Broadcast Immediate Channel	STW16 – Bit 1 – (most significant bit)
* The number of the status word is determined by adding 11 to the number of the base; hence the status word for base 5 is STW16.	

Chapter 6

SPI Application

6.1	Introduction	6-2
6.2	Up and Running	6-7
6.3	Troubleshooting	6-18
6.4	Programming	6-24
6.5	Error Codes	6-40
6.6	Overview of the FIM SPI Configurator	6-42
6.7	File Configuration	6-44
6.8	FIM Operations	6-48
6.9	SPI Device Operations	6-52
6.10	Example—Configuring SPI Devices for the FIM	6-58
6.11	Example—Configuring SPI Devices for the Programmable Controller	6-64

6.1 Introduction

Overview The FIM SPI Interface Application operates according to the protocol developed by the Society of the Plastics Industry for the purpose of standardizing communications between plastics processing machines and peripheral devices. The SPI Interface Application allows the Series 505 programmable logic controllers to interface to the SPI I/O as though each device were an I/O module in a remote base. The FIM and the SPI devices operate in a master/slave relationship: the FIM is the master, and the SPI devices are slaves. The FIM seeks the configured SPI devices, at the assigned baud rate, and maps them into I/O slots. After you configure the base and assign I/O address points to each slot (or device), the FIM automatically maintains communications with the devices, and issues polls and selects as stipulated by the user program. The FIM establishes communication dynamically: that is to say, if any devices are configured but are not responding, the FIM attempts to locate and add one new device each FIM scan until all devices are responding. Once a new device is identified, it is reported to the controller. If the device is properly configured in the controller, the FIM begins updating its I/O.

Features The FIM SPI Interface Application offers the following features.

- Supports up to 16 devices for each FIM.
- Operates on an RS-485 link, at baud rates from 1200 to 19.2K bits per second.
- Provides a Windows-based configuration tool, the FIM SPI Configurator, for configuring your SPI devices.
- Directly supports most SPI devices (see Table 6-1) and indirectly supports all others.

Table 6-1 SPI Devices

SPI Device ID (hex)	Description
20	Mold Temperature Controller
21	Chiller
22	Dryer
23	Loader
24	Melt Pump
25	Additive Feeder
26	Self-tuning General-Purpose Temperature Controller
28	Blender (Volumetric)
29	Blender (Continuous Weight)
2A	Blender (Batch Weight)

NOTE: The FIM indirectly supports alternate/unlisted devices. However, the FIM does not support blanket polls for these devices. If you want to send a block of commands for an alternate/unlisted device, you must create a custom block.

Also, for alternate/unlisted devices, you need to provide the device ID code when you configure the device, and include the data length (in bytes) for all poll and select requests; the FIM does not handle these matters automatically.

Introduction (continued)

The SPI Configurator

The FIM SPI Configurator is a Windows 3.1 tool, provided with the SPI Interface Application. The Configurator enables you to configure communications between the PPX:505-7202 FIM and SPI devices.

Using the SPI Configurator, you create configuration files and write the configuration to the FIM. The configuration is stored in the FIM's non-volatile memory, which is sometimes called flash memory. The FIM uses this configuration to initialize the network each time it is power cycled. The configuration files are stored on your computer with the file extension .spi. You can also read the configuration that is stored in the FIM and save it to a file.

**Hardware
Requirements**

To use the SPI Configurator, your system must meet the following minimum requirements:

- PPX:505–7202 FIM, Release 3.3 or higher.

NOTE: The PPX:505–7201 FIM cannot be upgraded to Release 3.3; it lacks the flash memory and serial port required for the configurator.

- IBM-compatible personal computer (PC) with Windows 3.1, MS-DOS 5.0 or higher, 4 Mbytes of RAM, and 1 Mbyte available hard disk space for storage of configurator files.
- Available 9-pin RS-232 communications port and cable. (You can use the same cable and PC port for the Configurator that you use to communicate between your Series 505 CPU and the PC where you run TISOFT, if the SPI Configurator and TISOFT are not used simultaneously.)

You also need the SPI Configurator diskette, Release 1.0 or higher, which ships with Release 3.3 or higher of the FIM.

System Layout

Figure 6-1 shows an I/O system for three FIMs running the SPI Interface Application.

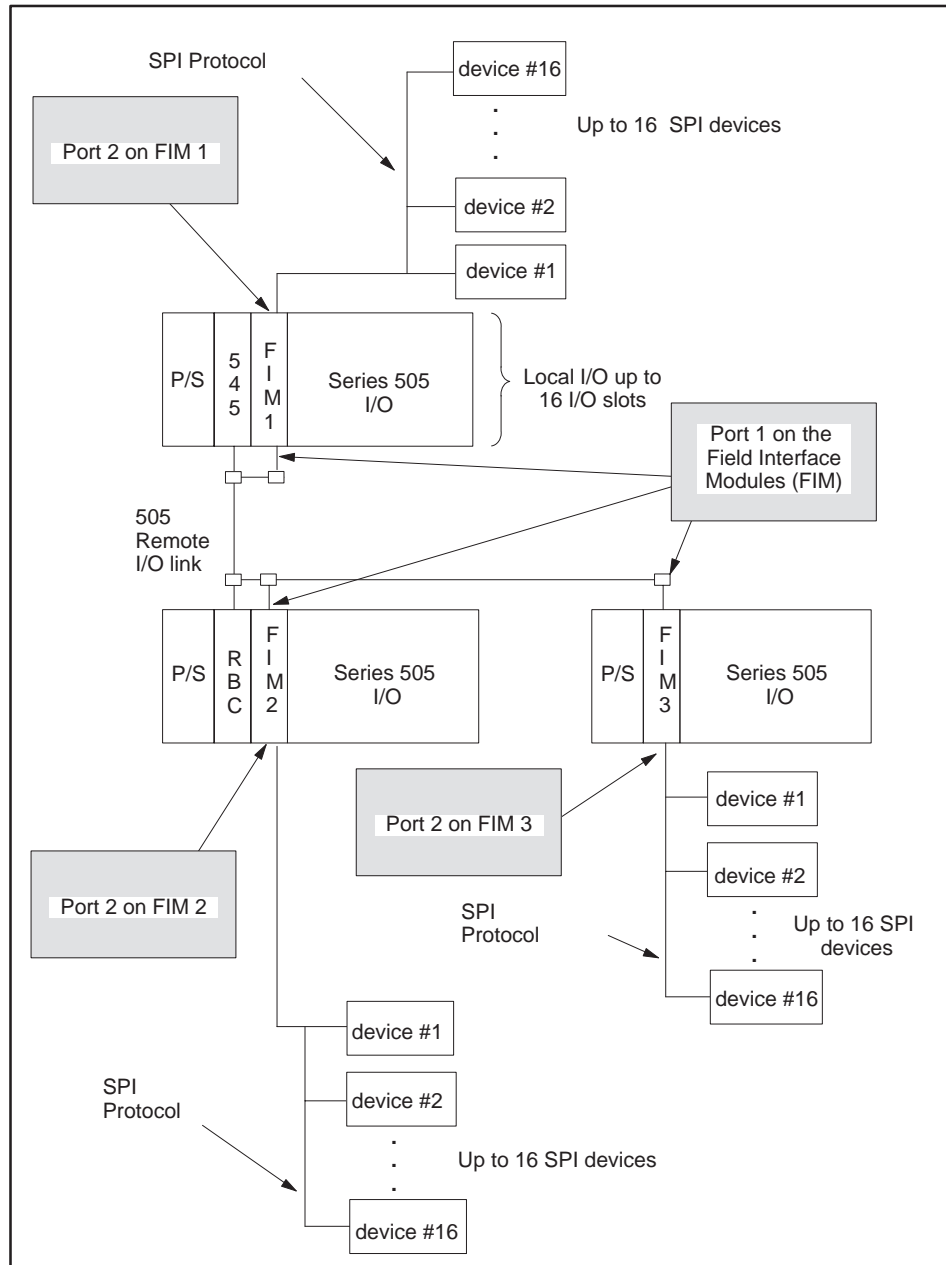


Figure 6-1 I/O System Layout for Three FIMs Running the SPI Interface Application

6.2 Up and Running

Overview

Connecting the FIM SPI application to the programmable controller requires you to perform the following tasks:

- Set the FIM switches.
- Connect the SPI I/O link.
- Connect the FIM to the controller.
- Connect the FIM to the PC that contains the FIM SPI Configurator.
- Configure SPI devices using the FIM SPI Configurator.
- Configure the programmable controller.

This section provides a brief description of each of those tasks. If you want more detailed information, refer to the appropriate section later in this chapter.

Up and Running (continued)

Setting the FIM's Rotary Switches

To set the rotary switches on the front of the FIM, set SW1 to the base address desired. For example, set SW1 to 1 for base 1, 2 for base 2, etc. Letters A – F correspond to bases 10 – 16. (Rotary switch SW2 is not used; leave it in the position set by the factory (0).)

Setting Dipswitch S3

You determine the mode of operation (Application 0 – 15) by setting the S3 dipswitch on the board of the FIM. This is referred to as the application switch. AP 0 – 3 refer to Application Number 0 – 15 (AP 0 is the LSB), as shown in Figure 6-2. For the SPI Interface Application, switches S3-1 and S3-2 are open and switches S3 (3– 8) are closed.

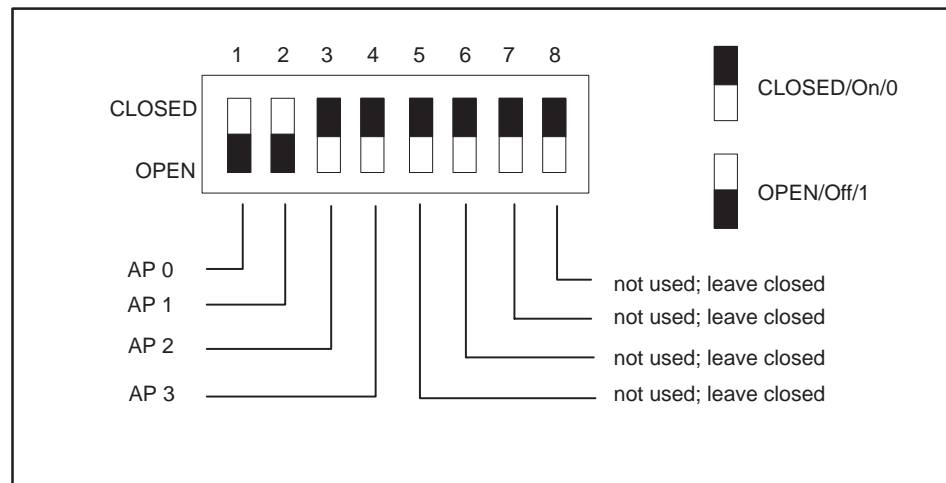


Figure 6-2 S3 Dipswitch Settings

Table A-1 in Appendix A describes the S3 switch settings for the other applications that can be used with the FIM.

Connecting the SPI I/O Link

The SPI I/O link, which uses twisted pair RS-485 cable, is Port 2 on the front bezel of the FIM. The communication port pinouts of the Field Interface Module are shown in Figure 6-3.

Siemens I/O connectors simplify the SPI connection because they have selectable termination and bias built into the connectors. These connectors allow you to daisy chain the I/O link to each of the devices. Be sure to install the RS-485 link properly.

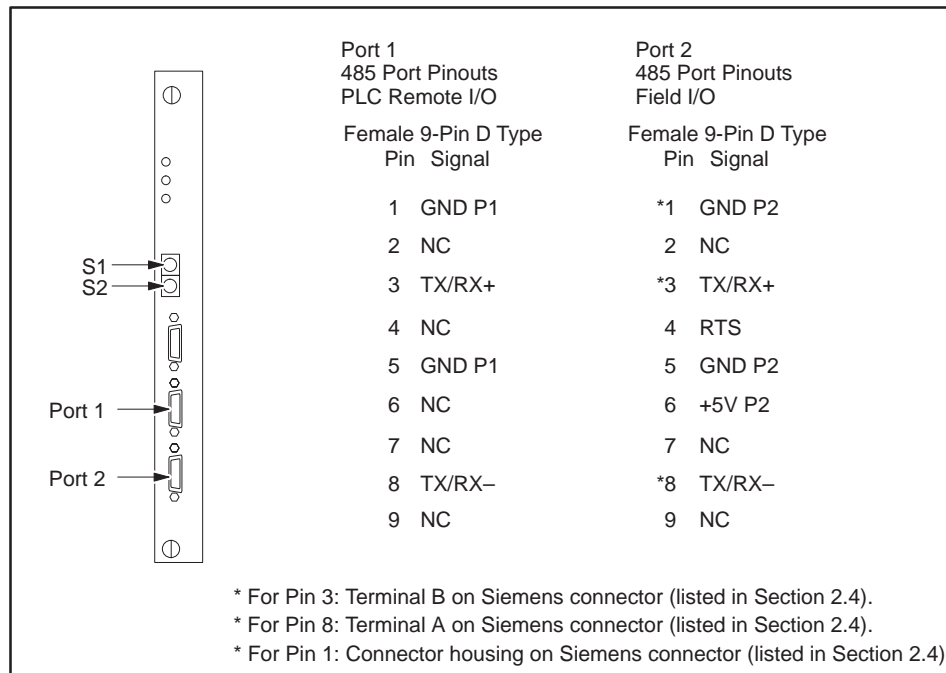


Figure 6-3 Communication Port Pinouts

Up and Running (continued)

Installing RS-485

The rules for proper installation of the RS-485 follow:

- Create a daisy-chain arrangement with the link, not a star arrangement. A daisy chain has two connectors with a single cable (bus wire) connection; all other connectors (if any) have two cable (bus wire) connections.
- Do not cross the RX/TX+ signals and the RX/TX– signals. Wire all of the RX/TX+ pins (terminal B on the Siemens connectors) together on each device and on the FIM. Wire all of the RX/TX– pins (terminal A on the Siemens connectors) together to each device and to the FIM.
- Ground the link at every connection. Ground the chassis of each device to earth ground.
- Terminate and bias both ends of the link. The two ends are the connectors with a single cable connection between them. If you are not using Siemens connectors, refer to Section 2.5 for information on how to terminate and bias the cable. If you use Siemens connectors, either set the jumper switch to On to enable termination and bias, or to Off to disable it.
- Do not run the cables near power wires.
- Screw down the connectors on the devices and on the FIM to ensure good ground connection.

Connecting the FIM to the Controller

The FIM connects to the programmable controller through Port 1 on the front bezel. The wiring for this port is shown in Figure 6-3, on page 6-9.

For more information on connecting the FIM to the 505 remote I/O channel, refer to the Cabling and Wiring section of your system manual.

- *SIMATIC 545 System Manual* (PPX:545–8101–x)
- *SIMATIC 555 System Manual* (PPX:555–8101–x)
- *SIMATIC 575 System Manual* (PPX:575–8101–x)
- *SIMATIC 545/555/575 System Manual* (PPX:505–8201–x)

NOTE: The “x” in the manual order number designates the manual edition.

**Installing the
Configurator File
on Your PC**

The SPI Configurator application ships on a diskette. To install the configurator on your PC, follow the procedure below.

1. From DOS, create a directory for the configurator files on the desired hard drive of your PC. For instance, if you intend to use drive C:, type the following.

```
md c:\spicfg
```

{If C: is not suitable, substitute the desired drive. "spicfg" is the name of the directory where your FIM configurator files will be stored.}

2. Insert your diskette into the diskette drive (e.g., the A: drive) and copy all files onto the hard drive by typing the following.

```
copy a:\*.* c:\spicfg
```

3. Exit DOS by typing the following.

```
exit
```

Up and Running (continued)

Creating an Icon in Windows

To create an icon for your SPI Configurator in Windows, follow the procedure below.

1. Select the Windows File Manager icon and choose File → New.
2. In the New Program Object window, choose the Program Item field.
3. Complete the Description field as follows.

FIM SPI Configurator

4. Complete the Command Line field as follows.

c:\spicfg\spicfg.exe

{If you used a different drive or directory name when you installed your configuration files, type that path instead.}

5. Complete the Working Directory field as follows.

c:\spicfg

6. Click on OK to confirm these settings.

The SPI Configurator icon appears on your Windows desktop.

Setting Up the
PC-to-FIM
Connection

Follow these steps to set up the PC-to-FIM connection.

1. Connect a cable from the serial port of the computer that has the Configurator software to the RS-232 port of the FIM. See Figure 6-4. A suitable cable may be ordered from Siemens using part number PPX:2601094-8001, which is the standard TISOFT programming cable.

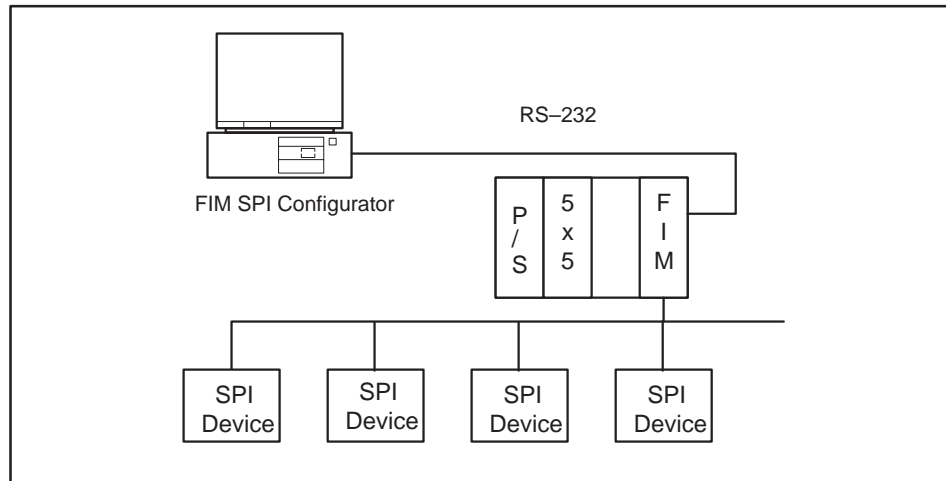


Figure 6-4 Connecting Cable from PC to FIM

2. Power up the FIM and the SPI devices.
3. Start the Configurator software on your computer.

NOTE: To invoke the SPI Configurator, double-click on the application icon or run it from the File Manager.

Procedure continues on next page.

4. Select the Comm button in the FIM Operations area. (See Figure 6-5.)

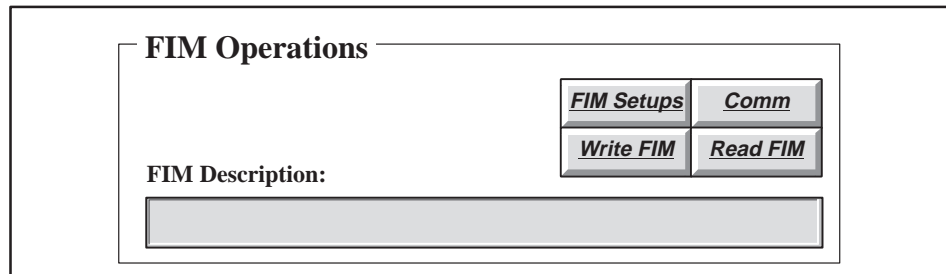


Figure 6-5 FIM Operations Area

Result: The PC-to-FIM Communications Setup dialog box appears, as shown in Figure 6-6.

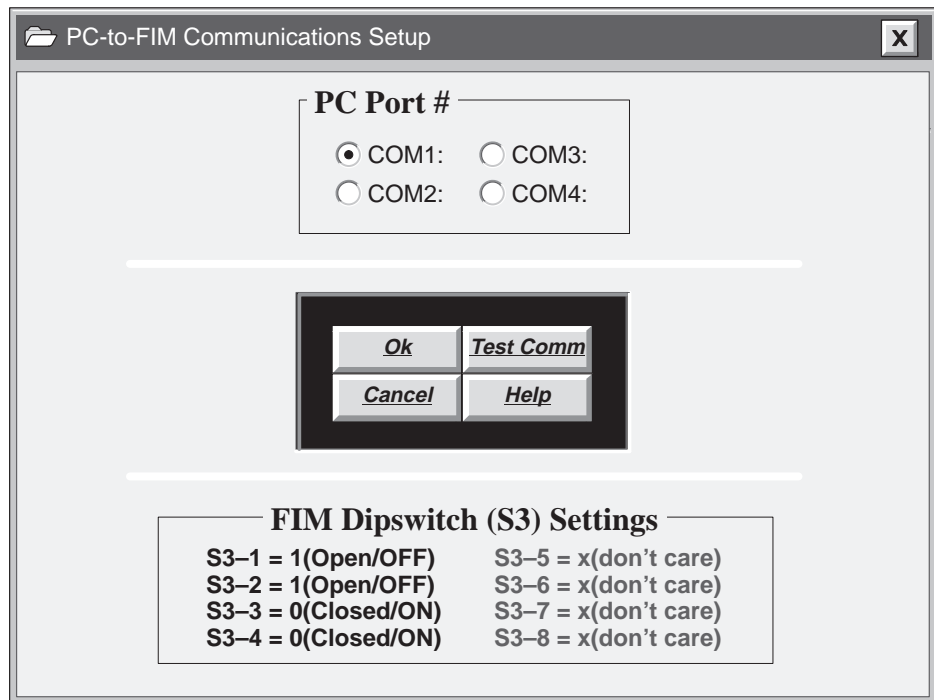


Figure 6-6 PC-to-FIM Communications Setup Dialog Box

5. Select the PC Port # that corresponds to the serial port in your computer that is connected to the FIM.

NOTE: The baud rate for the PC-to-FIM interface on the FIM is fixed at 19.2K bps.

-
6. Select the Test Comm button (shown in Figure 6-6). If everything is connected properly, a confirmation message is displayed; otherwise, a failure message is displayed.
 7. Select the Ok button to save the port selection.

NOTE: Pinouts for the RS-232 port should conform to those specified in Chapter 2, in the section on communication port pinouts.

Creating a Configuration

Once you establish satisfactory communications between the PC and the FIM, you can use the FIM SPI Configurator to perform the following tasks:

- Configure the baud rate and general parameters for the SPI link, using the Configurator's FIM Setups dialog box.
- Configure all of your SPI devices, using the Edit Device, and, if appropriate, Edit Custom Block, dialog boxes.
- Download your configuration from the PC to the FIM (Write FIM).

If you need detailed information about these tasks, see Sections 6.6 through 6.9. However, be sure to come back to this section; your configuration work is not complete until you assign I/O addresses for your SPI devices in the programmable controller. The process of configuring the programmable controller, which is the last configuration task, is described on page 6-16.

Up and Running (continued)

Configuring the Programmable Controller

The SPI I/O devices represented by the FIM must be assigned I/O addresses in the programmable controller. You can assign addresses, or configure, the programmable controller either with TISOFT or with any other Series 505 programmable controller programming package. The steps below assume that you are using TISOFT.

1. Ensure that all of the devices and the FIM are powered up, and that all of the devices are set to the address and baud rate that you configured for them using the FIM SPI Configurator. (See “Creating a Configuration” on page 6-15.)
2. If the FIM is communicating with the programmable controller, the COMM LED is on. If not, use TISOFT to make sure that the base with the base number of the FIM (SW1 on the FIM) is enabled.

If the base number is enabled, check the FIM's Port 1 connection to the programmable controller.

3. With the FIM communicating to the programmable controller, do a Read Base. Refer to the chapter on configuring I/O for Series 505 controllers in the *SIMATIC 505 TISOFT User Manual*.

Devices that are communicating appear as modules in the base with WX and WY points corresponding to their configured input words and output words.

If each device appears in the proper position in the base corresponding to the address of the device, set the I/O address to the desired values. Refer to Section 6.9, which describes configuring devices, for help in determining valid I/O addressing.

4. Perform a Write PC to write the configuration of the FIM. The CFG LED should come on and stay on (not flashing) if the I/O is working properly. If the CFG LED flashes, it means that either one or more devices do not match the configuration or else that the FIM has lost communication with a device either periodically or completely, which may suggest bad wiring/link setup. Check your wiring with the procedure on page 6-10 if this happens, and refer to Section 6.3 for other problems.

-
5. You can monitor programmable controller status words to verify your communications. Using status words STW12 (base 1) through STW27 (base 15), check to see whether or not any of these bits is a 1.

If these bits are set to 1, even for one scan, then the FIM has lost communication with the device that corresponds to that bit. Refer to Table 6-3, on page 6-23, to determine which device corresponds to the this bit. STW2 contains the bit that monitors the loss of communication to the FIM corresponding to the base address. Refer to Table 6-2, on page 6-22, to determine which bit corresponds to the base address on the FIM.

Once you assign addresses to your SPI devices in the programmable controller, your configuration work is complete. An example scenario, where two SPI devices are configured for the FIM and for the programmable controller, is provided in Section 6.10 and Section 6.11 for reference only.

6.3 Troubleshooting

The following pages present common troubleshooting symptoms, their causes, and corrective actions.

The MOD GOOD LED Is Off—What's Wrong?

When the MOD GOOD LED is off, this indicates that the FIM is not receiving power or has failed. Use the following checklist to troubleshoot this condition:

- Re-seat the board.
- Check for bent pins on the board connector.
- Check the power supply of the base.
- Check switch settings.

If none of these suggestions works, the FIM has probably failed. Return it to the factory for repair.

The COMM LED Is Off—What's Wrong?

When the COMM LED is off, this indicates that the FIM is not communicating with the CPU. When the FIM establishes good communication to the CPU, the COMM LED turns on. Use the following checklist to troubleshoot this condition:

- Make sure the CPU and the FIM are powered up and working. The MOD GOOD LED on the FIM should be on, and the CPU GOOD LED on the CPU should be on.
- Check the dipswitches on the FIM. Dipswitch S3 selects the application. See page 6-8 to ensure that the FIM is set correctly for SPI.
- Make sure the base number for the FIM is enabled in the controller. The FIM is a remote base, like an RBC. If all remote bases are disabled (1–15), then the CPU does not communicate to the FIM or any other base on the remote link. Also, check to make sure the base address for the FIM is set to the proper base number. The base address switch is on the front bezel of the FIM and is labeled as S1.

NOTE: Base 0 is the local base of the CPU and cannot be used as a remote base except with CPUs that do not have a local base.

-
- Check the connection of the RS-485 cable between the CPU's I/O port and the FIM's Port 1. Check the physical connections of the cable, check the cable pinouts for proper wiring, check the cable wire. Try replacing the cable with a different cable.
 - If the CPU is communicating with other FIMs or RBCs, then try replacing this FIM.
 - If the CPU is not communicating with other FIMs or RBCs, then try replacing the CPU.

The CFG LED Is Off—What's Wrong?

When the CFG LED is off this indicates that the FIM has not received the user configuration from the CPU. Use the following checklist to troubleshoot this problem:

NOTE: The CFG LED indicates whether the I/O configuration in the controller matches your actual field I/O, as located by the FIM. If you configure an SPI device in the FIM, but do not hook it up, and do not configure it in the controller, the actual field I/O matches the configuration in the controller, and so the CFG LED does not indicate a configuration mismatch. This condition does not cause a problem in the field; the FIM simply polls for the device on each scan. If you hook up the device later, and do not modify the I/O configuration in your controller, then the CFG LED indicates a mismatch.

- Make sure the FIM's COMM LED is on before attempting to get the CFG LED on.
- Check to make sure the base address for the FIM is set to the proper base number. The base address switch is on the front bezel of the FIM and is labeled as S1.

NOTE: Base 0 is the local base of the CPU and cannot be used as a remote base except with CPUs that do not have a local base.

- Check to make sure the base used by the FIM is configured with I/O. If the base corresponding to the FIM is written to the CPU as an empty base, then no user configuration is sent to the FIM.
- Check the cable and connection to Port 1.

If none of these suggestions works, the FIM has probably failed. Return it to the factory for repair.

Troubleshooting (continued)

The CFG LED Is Blinking—What's Wrong?

When the CFG LED is blinking, this indicates that while the FIM is communicating with the CPU, and the FIM has been configured by the CPU, the I/O with which the FIM is communicating does not match the user configuration. Use the following checklist to troubleshoot this problem.

- Check to make sure the base address for the FIM is set to the proper base number. The base address switch is on the front bezel of the FIM and is labeled as S1.

NOTE: Base 0 is the local base of the CPU and cannot be used as a remote base except with CPUs that do not have a local base.

- Check the user configuration using TISOFT. Make sure the I/O is arranged correctly. You can use the Compare Base function of TISOFT to determine which slots are suspect. Each SPI device corresponds to a slot in the base.
- Make sure all of the I/O devices are powered up. If an I/O device is not communicating with the FIM (for any reason) and is configured in the CPU, it shows up as a configuration error on the FIM.
- Check the device settings for the proper address, baud rate, device type supported, etc.
- Check the configuration to see if an improper address is configured for this device.
- Check the cable and connections between the FIM and the CPU.
- Wiring may require termination and bias. Refer to Section 2.5 for details on termination and bias requirements, and page 6-10 for tips on how to build proper RS-485 connections.

The CFG LED Is On,
But Blinks
Periodically—
What's Wrong?

A periodic blink of the CFG LED means that all SPI devices match the configuration, but communication to one or more devices is being lost for some period of time. The following list suggests guidelines for troubleshooting this condition:

- Check the wiring for loose or broken connections between the FIM's Port 2 and the SPI devices. The connections must be in a daisy-chain configuration.
- Wiring may require termination and bias. Refer to Section 2.5 for details on termination and bias requirements, and page 6-10 for tips on how to build proper RS-485 connections.
- Check for proper polarity of the RS-485 wire. All connections must have RX/TX+ , RX/TX-, and GROUND common throughout the system.
- Make sure you are using the proper cable and not exceeding the maximum distance for cable and baud rate. Refer to the SPI specification, or to the EIA 485 standard, for cable length restrictions.
- Check for the cable running too close to any magnetic fields (motors, high current wires, relays, etc.).

Troubleshooting (continued)

Checking the Operation of the Module

Use TISOFT to check the operation of the module. If you experience problems communicating with the devices, you can read the base status through TISOFT. The base status indicates proper communication to individual devices by the presence of I/O points in the slot number that corresponds to the device address.

Read the controller status words to determine I/O presence, and the correct configuration of the Field Interface Module. See Table 6-2 and Table 6-3 for bit mapping.

Table 6-2 shows status bits for monitoring status between the controller and the Field Interface Module. The status words for monitoring status between the Field Interface Module and the devices are also shown in Table 6-2.

Bit number to device number correlation to these status words is shown in Table 6-3.

Table 6-2 Monitoring Controller-to-FIM Communication Status Using Controller Status Words

FIM Base #	Controller to FIM Communication Status Bit	Status Word for FIM to Device Communication Status
0	STW2 – Bit #16 (least significant bit)	STW11
1	STW2 – Bit #15	STW12
2	STW2 – Bit #14	STW13
3	STW2 – Bit #13	STW14
4	STW2 – Bit #12	STW15
5	STW2 – Bit #11	STW16
6	STW2 – Bit #10	STW17
7	STW2 – Bit #9	STW18
8	STW2 – Bit #8	STW19
9	STW2 – Bit #7	STW20
10	STW2 – Bit #6	STW21
11	STW2 – Bit #5	STW22
12	STW2 – Bit #4	STW23
13	STW2 – Bit #3	STW24
14	STW2 – Bit #2	STW25
15	STW2 – Bit #1 (most significant bit)	STW26

Table 6-3 shows bit number to device number correlation for the status words from Table 6-2, using base 5 as an example.

Table 6-3 Monitoring FIM-to-Device Communication Status Using Controller Status Words

Device/Slot #	FIM to Device Communication Status Bit (Example Using Base 5*)
1	STW16 – Bit #16 (least significant bit)
2	STW16 – Bit #15
3	STW16 – Bit #14
4	STW16 – Bit #13
5	STW16 – Bit #12
6	STW16 – Bit #11
7	STW16 – Bit #10
8	STW16 – Bit #9
9	STW16 – Bit #8
10	STW16 – Bit #7
11	STW16 – Bit #6
12	STW16 – Bit #5
13	STW16 – Bit #4
14	STW16 – Bit #3
15	STW16 – Bit #2
16	STW16 – Bit #1 (most significant bit)
* The number of the status word is determined by adding 11 to the number of the base; hence the status word for base 5 is STW16.	

Technical Assistance

If you have questions concerning this information, contact your Siemens distributor or sales office. If you require assistance in contacting your distributor or sales office in the United States, phone 1-800-964-4114.

6.4 Programming

When the FIM and the controller have been properly configured, and the FIM is communicating satisfactorily with all of the SPI devices, the CFG LED of the FIM comes on and stays on. Now commands can be sent to the SPI devices.

Types of Commands

An SPI command is either a poll, meaning that the FIM reads data from the SPI device, or a select, meaning that the FIM writes data to the SPI device. The following types of commands are supported:

Random poll/select request A single command, either a poll or a select.

Custom poll/select block A block of up to 10 commands, defined in the FIM SPI Configurator. The block must contain only one type of command; you cannot mix polls and selects in a custom block.

Blanket poll A predefined block of poll commands. Most SPI devices have one unique block, or blanket poll, associated with them; consult your device manual for more information.

User Requests

To initiate a random request, custom block, or blanket poll, you place a user request value in the control word of your request. This tells the FIM what type of command to expect. See Table 6-4.

Table 6-4 User Request Values

Request WY (1) (hex)	Action	Response WX (1) (hex)	Result
0000	Identification only; poll message. (No response data put into input word buffer.)	0000	None.
0100	Send blanket poll block.	0100	Data from poll block is put into response buffer.
0200	Send custom poll block #1.	0200	Commands in custom poll block #1 are sent to SPI device.
0300	Send custom poll block #2.	0300	Commands in custom poll block #2 are sent to SPI device.
0400	Send custom select block #1.	0400	Commands in custom select block #1 are sent to SPI device.
0500	Send custom select block #2.	0500	Commands in custom select block #2 are sent to SPI device.
06xx ¹	Send random poll or select request.	06xx	The random poll or select request is sent.
<p>¹ The value 0600 is used for most random requests; xx signifies that the length of data to be exchanged must be specified in the least significant byte of the request word when you use an alternate/unlisted SPI device or issue a random request that the FIM does not recognize.</p>			

CAUTION

The FIM actively examines user requests and data buffers every scan. If your program does not send complete commands and complete data in the course of a single scan, the FIM operates based on the incomplete data it finds.

If your program does not take this feature of FIM operation into account, your data can become corrupt.

Always zero out the request control word and make sure that the FIM and the controller are in sync before issuing SPI commands. Also, make sure that the SPI command and its associated data buffer are changed in the same scan, so the FIM cannot read one without the other. Leave the request control word at zero until the entire buffer is complete; do not issue a request with an incomplete data buffer.

Random Requests

To send an individual poll or select, use a random request. SPI requests consist of two byte commands, referred to as Command 1 (CMD1) and Command 2 (CMD2). Polls are distinguished by an even value in the CMD2 byte; selects have an odd value in CMD2. Typically, the CMD1 byte contains either a value of 20 (hex) or the zone for the request.

Ordinarily, you do not have to specify the expected data length when you issue a random poll or select. However, if the SPI device that you are configuring is not directly supported by the FIM (see page 6-3), or if the command is not listed in the I/O list of the *SPI Matching Division, Communication Protocol, Version 3.01*, Section 2, then you must specify the expected response length, in bytes, in the least significant byte of the request word.

When a random request is issued, the FIM attempts to send the poll or select, and update the response buffer (for a poll), for as long as the user request (06xx) remains in the request control word. Once the FIM successfully completes the random request, the user request (06xx) is placed in the response word to indicate that the FIM has finished an update. On the next scan, the FIM checks the request control word again; if the user request has not been updated, then the FIM repeats the previous request.

Custom Blocks

Sending multiple commands individually takes several scans and requires extra coding in order to process the commands. An alternative is to create a custom block with the FIM SPI Configurator (see page 6-54 and following for information about how to create one). A custom block is like a macro, in which you can define up to 10 SPI commands to be sent with one request. You cannot mix command types within a block; each block must be either all polls (i.e., the FIM is reading data from an SPI device, or all selects (i.e., the FIM is writing data to an SPI device). You have the option of creating up to 2 custom poll blocks and 2 custom select blocks, for a total of 4 custom blocks.

Before sending a block of commands, the FIM validates each command and determines if there is enough room to process all the commands, by examining input words for a custom poll block or output words for a custom select block. If any of the commands are invalid, or if there is insufficient room for the data generated by the command, the FIM returns the relevant error code (see Section 6.5). Otherwise, the FIM attempts to send the polls or selects, and to update the response buffer (for polls), for as long as the user request (0200, 0300, 0400, or 0500) remains in the request control word. Once the FIM successfully completes the custom block, the user request (0200, 0300, 0400, or 0500) is placed in the response word to indicate that the FIM has finished an update. On the next scan, the FIM checks the request control word again; if the user request has not been updated, then the FIM repeats the previous request.

Blanket Polls

The SPI specification defines SPI devices and the commands that are valid for each device. Most SPI devices have a blanket poll request defined; however, the FIM must directly support the device for you to be able to use its blanket poll. (See page 6-3 for a list of the devices that are directly supported by the FIM.) The blanket poll option allows several data items to be read from the device with one request.

When a blanket poll is issued, the FIM attempts to send the poll request, and to update the response buffer, for as long as the user request (0100) remains in the request control word. Once the FIM successfully completes the poll request, the user request (0100) is placed in the response word to indicate that the FIM has finished an update. The data is returned with the respective CMD1 and CMD2 preceding each value. On the next scan, the FIM checks the request control word again; if the user request has not been updated, then the FIM repeats the previous request.

Programming (continued)

The following examples illustrate how a random request, custom block, and blanket poll operate.

For the purpose of these examples, assume that the SPI device you are programming is a loader (device ID 23) that has 10 input words (WX65 – WX74) and 12 output words (WY75 – WY86) configured. (The same device is used in configuration examples later in this chapter; refer to Section 6.10 and Section 6.11.)

Random Request Example #1

This example uses several random requests to read and overwrite load times.

To read a value for Load Time A, using SPI command 2050, follow the steps below:

1. Place a zero into WY75 and wait for WX65 to be zeroed by the FIM.

Result: This ensures that the FIM and the controller are synchronized.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0
WX66 – WX74	not used	WY76 – WY86	not used

2. Place the value 2050 (hex) into WY76.

Result: The request buffer takes the value for CMD1, namely 20 (hex), in byte 1, and the value for CMD2, namely 50 (hex), in byte 2.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0
WX66 – WX74	not used	WY76	2050 (hex)
		WY77 – WY86	not used

3. Place the value 0600 (hex) into WY75.

Result: The FIM sees the user request (0600) and attempts to execute the random poll request.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0600 (hex)
WX66 – WX74	not used	WY76	2050 (hex)
		WY77 – WY86	not used

When the FIM finishes, it writes the value read from the loader device, in numeric (floating point) format, into WX66 and WX67, and writes the user request (0600) to WX65 to indicate that the poll has executed successfully.

Input Buffer	Contents	Output Buffer	Contents
WX65	0600 (hex)	WY75	0600 (hex)
WX66 – WX67	value read from loader device	WY76	2050 (hex)
WX68 – WX74	not used	WY77 – WY86	not used

NOTE: Series 505 controllers do not support numeric (floating point) format directly from RLL. To modify or convert a floating point number from RLL, you must use the SFSUB instruction to call an SF subroutine. Refer to the section on Call SF Subroutines from RLL, in the RLL Instruction Set chapter of the *SIMATIC 505 Programming Reference User Manual*.

Programming (continued)

Random Request Example #2

Next, you can change the value for Load Time A, by issuing a select instead of a poll. Follow these steps:

1. Place a zero into WY75 and wait for WX65 to be zeroed by the FIM.

Result: This ensures that the FIM and the controller are synchronized.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0
WX66 – WX74	not used	WY76 – WY86	not used

2. Place the value 2051 (hex) into WY76.

Result: The request buffer takes the value for CMD1, namely 20 (hex), in byte 1, and the value for CMD2, namely 51 (hex), in byte 2.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0
WX66 – WX74	not used	WY76	2051 (hex)
		WY77 – WY86	not used

NOTE: Odd CMD2s, such as 51, are selects, whereas the even CMD2 in the previous example (50) was a poll.

3. Place the value that is to be written to the loader into WY77 and WY78.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0
WX66 – WX74	not used	WY76	2051 (hex)
		WY77 – WY78	value for loader
		WY79 – WY86	not used

-
4. Place the value 0600 (hex) into WY75.

Result: The FIM sees the user request (0600) and attempts to execute the random select request.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0600 (hex)
WX66 – WX74	not used	WY76	2051 (hex)
		WY77 – WY78	value for loader
		WY79 – WY86	not used

Once the FIM writes the value read from WY77 – WY78 into the loader, it is finished, and it writes the user request (0600) to WX65 to indicate that the select has executed successfully. The loader has a new setpoint for Load Time A.

Input Buffer	Contents	Output Buffer	Contents
WX65	0600 (hex)	WY75	0600 (hex)
WX66 – WX74	not used	WY76	2051 (hex)
		WY77 – WY78	value for loader
		WY79 – WY86	not used

Programming (continued)

Random Request Example #3

In the examples above, it was not necessary to include a value for the command length. However, in the case of valid commands that are added to the SPI specification after the release of the FIM, you must use the least significant byte of the request word to specify the number of bytes that the command sends or reads. If you fail to specify the length for a command that the FIM does not recognize, the FIM rejects the request, and writes the error code for Illegal Command into the response word.

In the following scenario, assume that the manufacturer of your SPI device has added a command for the loader that the FIM does not recognize, namely, Load Time C (CMD1=20, CMD2=54). To read the value for Load Time C, follow these steps:

1. Place a zero into WY75 and wait for WX65 to be zeroed by the FIM.

Result: This ensures that the FIM and the controller are synchronized.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0
WX66 – WX74	not used	WY76 – WY86	not used

2. Place the value 2054 (hex) into WY76.

Result: The request buffer takes the value for CMD1, namely 20 (hex), in byte 1, and the value for CMD2, namely 54 (hex), in byte 2.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0
WX66 – WX74	not used	WY76	2054 (hex)
		WY77 – WY86	not used

-
3. Place the value 0604 (hex) into WY75.

Result: The FIM sees the user request (0604) and attempts to execute the random poll request.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0604 (hex)
WX66 – WX74	not used	WY76	2054 (hex)
		WY77 – WY86	not used

NOTE: The 04 value in the user request tells the FIM that this command reads a numeric value that occupies 4 bytes.

When the FIM finishes, it writes the value read from the loader device, in numeric (floating point) format, into WX66 and WX67, and writes the user request (0604) to WX65 to indicate that the poll has executed successfully.

Input Buffer	Contents	Output Buffer	Contents
WX65	0604 (hex)	WY75	0604 (hex)
WX66 – WX67	value read from loader device	WY76	2054 (hex)
WX68 – WX74	not used	WY77 – WY86	not used

Programming (continued)

Custom Poll Block Example

In this example, the FIM executes Custom Poll Block #1, which you have configured to hold two commands, Material Mode Status (CMD1=20, CMD2=48) and Load Time A Setpoint (CMD1=20, CMD2=50).

1. Place a zero into WY75 and wait for WX65 to be zeroed by the FIM.

Result: This ensures that the FIM and the controller are synchronized.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0
WX66 – WX74	not used	WY76 – WY86	not used

2. Place the value 0200 (hex) into WY75.

Result: The FIM sees the user request (0200) and attempts to execute Custom Poll Block #1.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0200 (hex)
WX66 – WX74	not used	WY76 – WY86	not used

When the FIM finishes (assuming no errors), it writes the data from the Material Mode Status into WX66 and the data from the Load Time A Setpoint into WX67 and WX68. The FIM writes the user request (0200) to WX65 to indicate that the poll has executed successfully.

Input Buffer	Contents	Output Buffer	Contents
WX65	0200 (hex)	WY75	0200 (hex)
WX66	value read from Material Mode	WY76 – WY86	not used
WX67 – WX68	value read from Load Time A Setpoint		
WX69 – WX74	not used		

Programming (continued)

Custom Select Block Example

In this example, the FIM executes Custom Select Block #1, which you have configured to hold two commands, Material Mode Status (CMD1=20, CMD2=49) and Load Time A Setpoint (CMD1=20, CMD2=51).

1. Place a zero into WY75 and wait for WX65 to be zeroed by the FIM.

Result: This ensures that the FIM and the controller are synchronized.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0
WX66 – WX74	not used	WY76 – WY86	not used

2. Place the values that are to be written to the loader into WY76 and WY77 – WY78.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0
		WY76	value for Material Mode
		WY77 – WY78	value for Load Time A Setpoint
		WY79 – WY86	not used

-
3. Place the value 0400 (hex) into WY75.

Result: The FIM sees the user request (0400) and attempts to execute Custom Select Block #1.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0400
WX66 – WX74	not used	WY76	value for Material Mode
		WY77 – WY78	value for Load Time A Setpoint
		WY79 – WY86	not used

Once the FIM writes the values from WY76 – WY78 into the loader, it is finished, and it writes the user request (0400) to WX65 to indicate that Custom Select Block #1 has executed successfully.

Input Buffer	Contents	Output Buffer	Contents
WX65	0400	WY75	0400
WX66 – WX74	not used	WY76	value for Material Mode
		WY77 – WY78	value for Load Time A Setpoint
		WY79 – WY86	not used

Programming (continued)

Blanket Poll Example

In this example, the loader issues the blanket poll that is associated with it. (For a description of this blanket poll, consult the SPI specifications.)

1. Place a zero into WY75 and wait for WX65 to be zeroed by the FIM.

Result: This ensures that the FIM and the controller are synchronized.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0
WX66 – WX74	not used	WY76 – WY86	not used

2. Place the value 0100 (hex) into WY75.

Result: The FIM sees the user request (0100) and attempts to execute the blanket poll.

Input Buffer	Contents	Output Buffer	Contents
WX65	0	WY75	0100 (hex)
WX66 – WX74	not used	WY76 – WY86	not used

When the FIM finishes (assuming no errors), the input buffer (WX66 – WX73) contains 16 bytes of data read from the blanket poll, per the SPI specifications. The FIM writes the user request (0100) to WX65 to indicate that the poll has executed successfully.

Input Buffer	Contents	Output Buffer	Contents
WX65	0100 (hex)	WY75	0100 (hex)
WX66	2050 (hex)	WY76 – WY86	not used
WX67 – WX68	Value read for Load Time A		
WX69	2052 (hex)		
WX70 – WX71	Value read for Load Time B		
WX72	2040 (hex)		
WX73	Value read for Process Status		
WX74	not used		

If an SPI request is not successful, then an error code is returned in the response status word. The error code is provided to help you diagnose the problem with the request. All error codes except the Illegal Request error code have the CMD1 CMD2 commands in the second input word, and the length of the command in the most significant byte of the third input word. Table 6-5 illustrates how the error codes are returned. Specific error codes are listed below.

Table 6-5 Error Codes Returned in Response Status Word

Location	Value (hex)	Description
WX(n)	FF??	Error code
WX(n+1)	C1C2	CMD1 (C1) and CMD2 (C2)
WX(n+2)	LLxx	LL=Length of data for command, in bytes

FF00—Negative Acknowledge Indicates that a request was sent, but the SPI device returned a Negative Acknowledge, because the device did not recognize the command that was sent. Check the command itself, and then check the SPI specification to see which commands are valid for that particular device type.

FF01—Illegal Command Indicates that a request was entered (either a random request, or a custom block) as a standard command; however, the request was not recognized as a standard command by the FIM. It may be that the FIM cannot send the command because it does not know how much data is to be polled or selected by the command. Check the SPI specification to see if the command is valid for the selected device type; if the command is invalid, you must correct it, and if the command is valid, you need to specify the data length so that the FIM can transmit it successfully.

FF02—No Data Indicates that a poll command was sent, and the device responded to the command but did not return data. Polls must return data. Check to see if the correct command was specified, and to see if a service on the device has been disabled. The device manual should provide information about the services available for that device.

FF03—Bad Request Indicates that a request was made that is not valid or recognized by the FIM. This means that the value entered into the request word is not recognized, or (in the case of custom poll and select blocks) that there are no commands in a block request. If you are sending a block request, check the corresponding block using the configurator: 0200 for custom poll block #1; 0300 for custom poll block #2; 0400 for custom select block #1; 0500 for custom select block #2. The block must contain at least one command. If you are not sending a block, then only 0100 and 06xx are allowed for requests. Entering an illegal request word, such as 0700, would produce this error.

FF04—Output Buffer Underrun Indicates that a select request (random or block) requires more data than there are output words configured to handle. This is typically caused by select block commands that total more data bytes than the available output bytes configured in the output words.

The number of bytes available in the output buffer for random selects can be calculated according to this formula:

$$\text{output_buffer_size} = (\#\text{output_words} - 2) \times 2$$

The number of bytes available in the output buffer for custom select blocks can be calculated according to this formula:

$$\text{output_buffer_size} = (\#\text{output_words} - 1) \times 2$$

To resolve this problem, configure more output words, or else reduce the requests in the custom select block.

FF05—Input Buffer Overflow Indicates that a poll request (random, block, or blanket) contains more data than there are input words configured to handle. This is typically caused by poll block commands that total more data bytes than the available input bytes configured in the input words.

The number of bytes available in the input buffer for random polls and/or custom poll blocks can be calculated according to this formula:

$$\text{input_buffer_size} = (\#\text{input_words} - 1) \times 2$$

To resolve this problem, configure more input words, or else reduce the requests in the custom poll block.

FF06—Poll Data Length Error Indicates that a poll request (random, block, or blanket) returned less or more data than expected. Check the SPI specification for the amount of data to be sent with this command. You have probably either specified an incorrect data length, or failed to specify the data length for a device that deviates from the SPI specification, in which case the data length must be specified. See your device manual for information about possible deviations.

6.6 Overview of the FIM SPI Configurator

Overview of Configurator Functions

The SIMATIC 505–7202 FIM SPI Configurator application allows you to perform all the steps necessary for configuring an SPI device for the FIM:

- Create a configuration file in which to save your work.
- Define and test parameters for PC-to-FIM communications.
- Define general parameters for your FIM-to-SPI device communications.
- Define specific parameters for each SPI device.
- Create custom blocks for each device.
- Write the configuration to the FIM.
- Read the configuration from the FIM.

The main window of the SPI Configurator is divided into three screen areas. See Figure 6-7. To learn more about each area of the Configurator, consult the appropriate section in this chapter, or use the on-line help that is part of the Configurator package.

- **Configuration File:** allows you to save your work to a file. See Section 6.7.
- **FIM Operations:** allows you to modify the FIM setup (optional), to write your configuration changes to the FIM and read them back, and to configure communications. See Section 6.8.
- **SPI Device Operations:** allows you to edit parameters for each device and create custom poll and select blocks. See Section 6.9.

For a detailed example of how to construct a configuration using the FIM SPI Configurator, see Section 6.10.

Figure 6-7 shows the main window of the SPI Configurator.

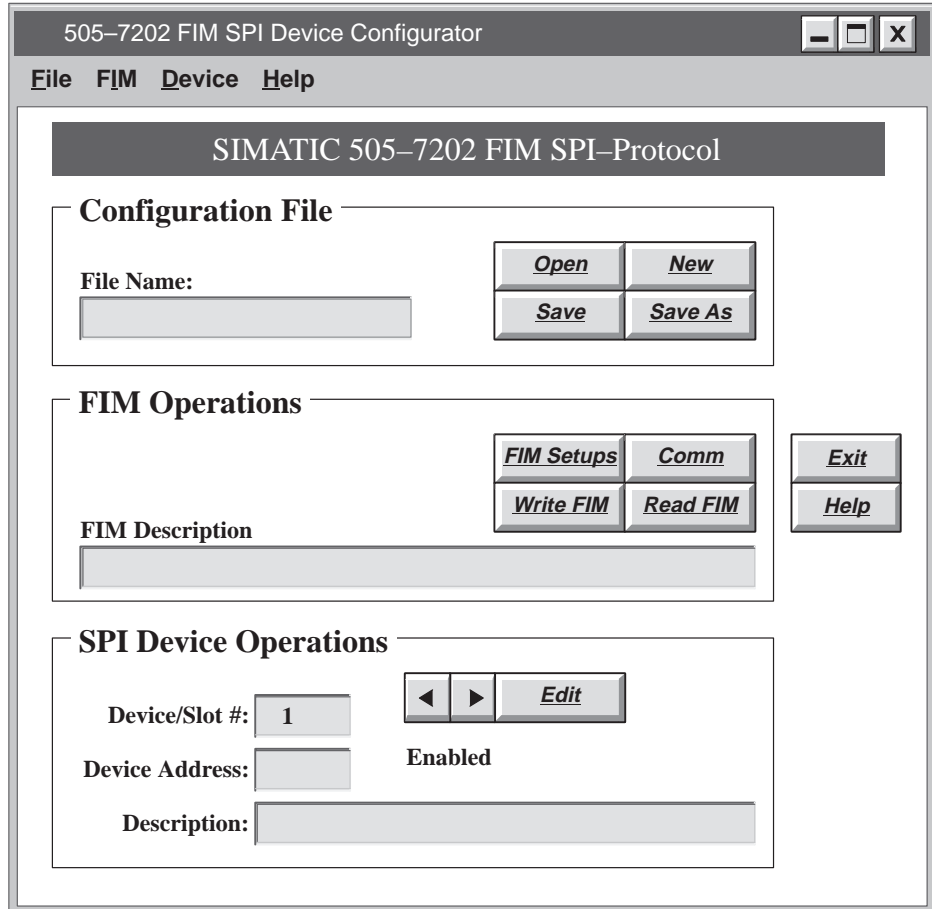


Figure 6-7 Main Configurator Window

6.7 File Configuration

Configuration File Screen Area

The Configuration File screen area shown in Figure 6-8 provides the following button selections for loading and saving a configuration file. The same options are available under the File menu.

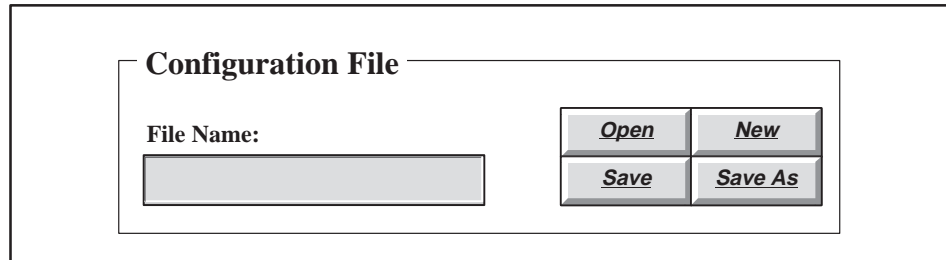


Figure 6-8 Configuration File Screen Area

File Name This field displays the name of the configuration file that is currently open. This field is blank if you have selected the New command, or have not yet specified a file name.

Open Use this command to open an existing configuration file. The Configurator displays the Open Disk File dialog box (see Figure 6-9).

New Use this command to create a new configuration in the Configurator.

NOTE: Issuing the New command after you have already configured your SPI devices clears the existing configuration. If you do not want the existing configuration to be overwritten, use the Save command to save the configuration before issuing the New command.

Save Use this command to save the configuration file with its current name and directory. When you save a document for the first time, the Configurator displays the Save File dialog box so you can name your configuration file. (See Figure 6-10.) If you want to change the name and directory of an existing configuration file before you save it, choose the Save As command.

Save As Use this command to save and name the current configuration. The Configurator displays the Save File dialog box so you can name your configuration. (See Figure 6-10.)

Exit Use this command to end your Configurator session.

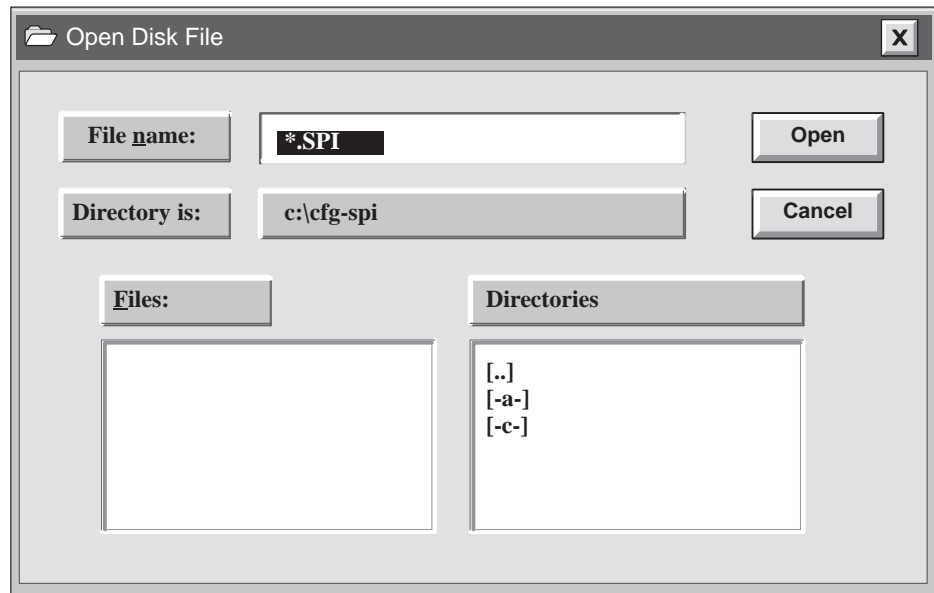


Figure 6-9 Open Disk File Dialog Box

The Open Disk File dialog box shown in Figure 6-9 contains the following fields, which enable you to specify which file to open:

File Name Type or select the name of the file that you want to open.

Directory is Displays the currently selected drive and directory.

Files Displays the configuration files available in the currently selected drive and directory.

Directories Select the directory where the file that you want to open is stored.

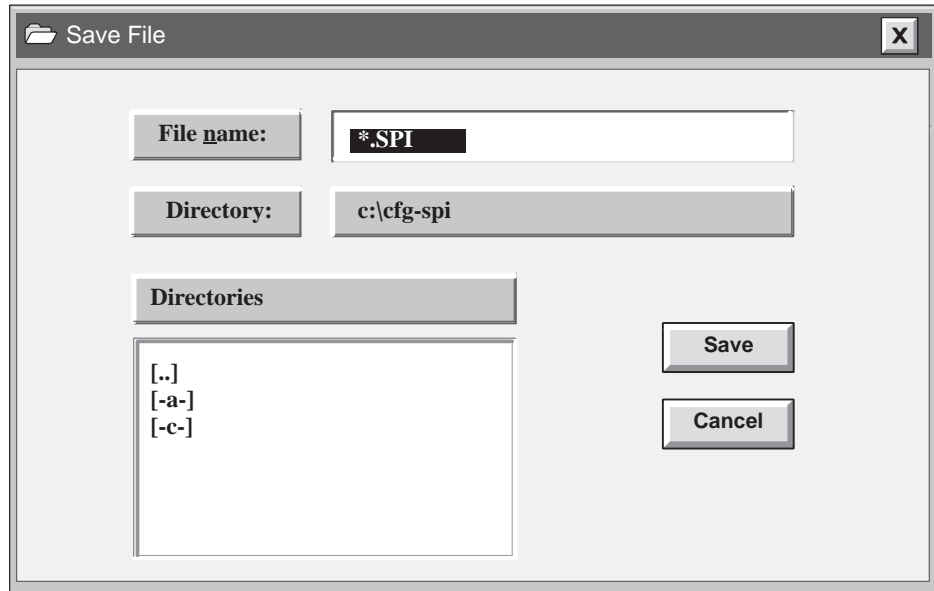


Figure 6-10 Save File Dialog Box

The Save File dialog box shown in Figure 6-10 contains the following fields, which enable you to specify the name and location of the file that you are about to save:

File Name Type a new file name to save a configuration with a different name. A file name can contain up to eight characters, with an extension of up to three characters.

Directory Displays the currently selected drive and directory.

Directories Select the directory in which you want to store the configuration.

6.8 FIM Operations

FIM Operations Screen Area

The FIM Operations screen area shown in Figure 6-11 provides the following button selections for establishing general SPI communications, making PC port assignments, and reading or writing configurations from or to the FIM. The same options are available under the FIM menu.

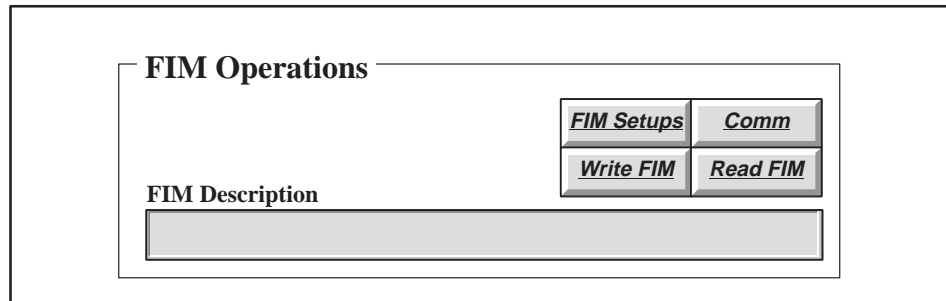


Figure 6-11 FIM Operations Screen Area

Setups (FIM Setups button) This function allows you to assign general parameters that govern communications between the FIM and your SPI devices. For more information, see page 6-50.

Communications (Comm button) This function allows you to define and test serial port assignments for PC-to-FIM communications. For a description of the procedure involved, see page 6-14.

NOTE: The TestComm button (available when you select the Comm button) tests your communication settings and the connection to the FIM, and displays a message that states whether or not communications are working properly. You can modify PC serial port settings in the PC-to-FIM Communications Setup dialog box; a list of required dipswitch settings is also displayed, and you can manually alter any switches on the back of the FIM as needed.

Read Configuration (Read FIM button) This function reads the current configuration from the FIM into the Configurator. This operation takes approximately thirty seconds to complete.

Write Configuration (Write FIM button) This function writes the current configuration from the Configurator to the FIM.

 **CAUTION**

Writing a configuration to the FIM causes the FIM to go offline for approximately thirty seconds.

The FIM cannot update I/O during the period that it is offline.

Before you issue a Write FIM, ensure that going offline will not cause undue disruption of your process.

FIM Description This text field displays the description that you entered in the FIM Setups dialog box to identify this specific configuration. This information is optional and is not used by the FIM. This field is provided for your convenience to document your application.

Troubleshooting
Parameter Table
Errors

The parameter table contains the configuration information that you create in the Configurator and write to the FIM. The following conditions cause a parameter table error message:

- You powered up the FIM and tried to use the Configurator to Read FIM. The FIM does not have any configuration information stored in its parameter table as you receive it from the factory. Solution: You must create the configuration with the Configurator and then use Write FIM to store the configuration information in the parameter table.
- You installed a new release of the FIM firmware using fimutl.exe. The firmware load utility, fimutl, clears the parameter table. Solution: After you load new firmware into the FIM, use the Configurator to open your configuration file, then Write FIM.
- The parameter table information in the FIM's EEPROM has been corrupted. Solution: Use the Configurator to open your configuration file, then Write FIM. If this condition continues to occur, return your FIM for repair.

FIM Operations (continued)

FIM Setups Dialog Box

The FIM Setups dialog box shown in Figure 6-12 allows you to assign general parameters that govern communications between the FIM and your SPI devices.

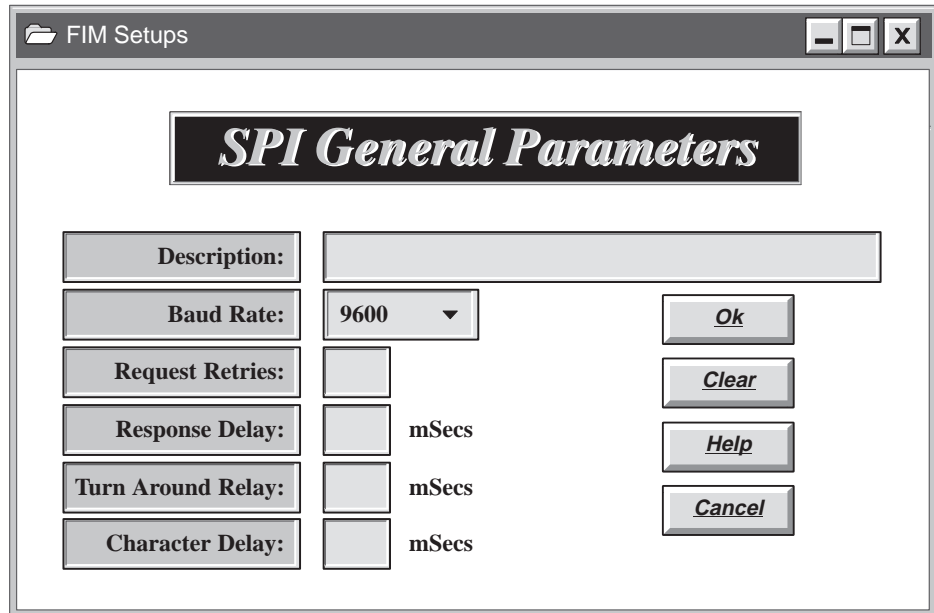


Figure 6-12 FIM Master Parameters Setup Dialog Box

Description This text field allows you to enter a description of the current configuration file. This field is not used by the FIM; it is provided to help you document your configuration.

Baud Rate Accept the default rate of 9600 bits per second, or click on the button to display a drop-down list, from which you can select another valid baud rate. The valid baud rates are as follows: 1200, 2400, 4800, 9600, and 19200.

Request Retries Numeric value that determines how many times the FIM retries a request that has been sent to a device. The range is 1 to 4; the default value is 2.

NOTE: Accept the default value unless the communication link has noise, or you have an SPI device that sometimes takes a long period of time to respond.

Response Delay Numeric value that determines the minimum number of milliseconds in which a response from a device must be completed. The range is 2 to 2000. The default value is 500 milliseconds.

NOTE: Accept the default value unless you know that a device tends to delay its response.

Turn Around Delay Numeric value that determines the number of milliseconds that the FIM must wait after any transmission on the link (either from the FIM or from a device) before starting a new message to another device. The range is 2 to 255 ms. The default value is 30 milliseconds.

NOTE: Accept the default value unless you know that it takes too long for a device to prepare for a new request.

Character Delay Numeric value that determines the number of milliseconds that the FIM must wait before concluding that the device has completed its response and that no additional characters should be expected. The range is 2 to 255 ms. The default value is determined from the baud rate.

6.9 SPI Device Operations

SPI Device Operations Area

The SPI Device Operations screen area shown in Figure 6-13 provides the following button selections for configuring SPI devices. The same options are available under the Device menu.

The screenshot shows a window titled "SPI Device Operations". Inside the window, there are three input fields: "Device/Slot #" with the value "1", "Device Address", and "Description". To the right of the "Device/Slot #" field are three buttons: a left arrow, a right arrow, and an "Edit" button. Below the "Device/Slot #" field is the text "Enabled".

Figure 6-13 SPI Device Operations Screen Area

Device/Slot # This field displays the currently selected device number. The FIM supports up to 16 devices, numbered 1 to 16, corresponding to slot numbers 1 to 16. Selecting ◀ displays the information for the previous device. Selecting ▶ displays the information for the next device. Select one of these buttons repeatedly to cycle through the device list.

Device Address This field displays the address for the SPI device at this slot.

Enabled area This area displays the selected state of the device. By default, each device is enabled in the configuration for polling and displays as Enabled in the SPI Device Operations area. When you select Device disabled (Not polled) from the Edit Device dialog box, the SPI Device Operations area displays Disabled for that device.

Description This field displays the text that you entered in the Edit Device dialog box to describe this particular SPI device.

Edit This button summons the Edit Device dialog box. (See page 6-54.)

SPI Device Operations (continued)

Edit Device Dialog Box

The Edit Device dialog box shown in Figure 6-14 is invoked by the Edit button in the SPI Device operations area of the main Configurator window. The Edit Device dialog box allows you to configure parameters for your SPI devices.

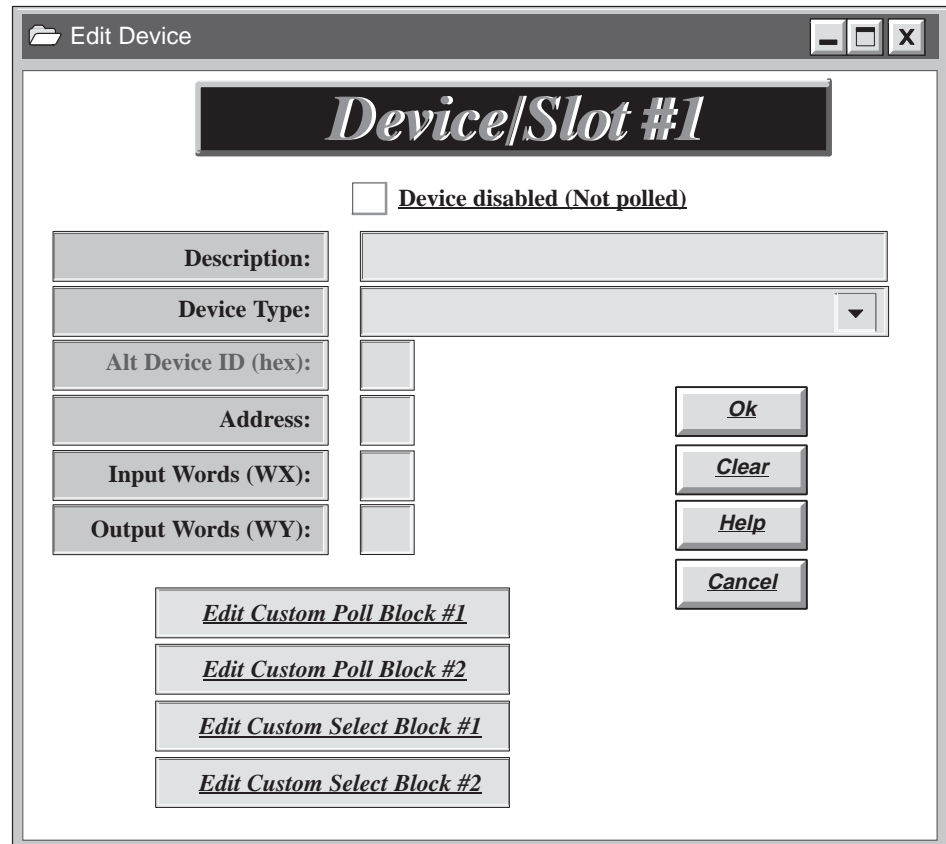


Figure 6-14 Edit Device Dialog Box

Device disabled (Not polled) Select this checkbox to specify that the FIM should not poll a device at this position. The FIM can poll up to 16 SPI devices. If a device does not exist, the FIM continues to poll and retry that position. If you have fewer than 16 SPI devices, you can reduce the overall scan time by setting this checkbox for any positions where devices do not exist. The FIM does not poll or retry the disabled positions.

Description This optional field allows you to describe the function of the SPI device, using up to 51 characters.

Device Type Complete this field to select the SPI type of your device (for devices directly supported by the FIM), or to specify an alternate/unlisted device.

NOTE: If you specify a non-standard device, the Alt Device ID field is activated and must be completed.

Alt Device ID (hex) If you specified an Alternate/Unlisted Device in the Device Type field, you must complete this field. Use a hexadecimal value to assign an ID to your SPI device. The range of valid IDs is 20 to FF (hex).

Address Complete this field to specify the address of the SPI device at this slot. Use a decimal value. The range of valid addresses is from 32 to 256.

Input Words (WX) Complete this field to specify the number of words to be allocated for input data (that is, data that the FIM sends to the controller). The range is even word numbers from 4 to 32, excluding 30 words. If you do not enter a value in this field, the Configurator assigns a default value of 8.

Output Words (WY) Complete this field to specify the number of words to be allocated for output data (that is, data that the FIM receives from the controller). The range is even word numbers from 4 to 32, excluding 30 words. If you do not enter a value in this field, the Configurator assigns a default value of 8.

Edit Custom Poll Block #1	These buttons summon the Edit Custom Block dialog box for a poll or select block. (See page 6-56.)
Edit Custom Poll Block #2	
Edit Custom Select Block #1	
Edit Custom Select Block #2	

SPI Device Operations (continued)

Edit Custom Block Dialog Box

The button selections at the bottom of the Edit Device dialog box allow you to create custom poll and custom select blocks. You have the option of creating up to 2 custom poll blocks and 2 custom select blocks, for a total of 4 custom blocks. A custom block is like a macro, in which you can define up to 10 SPI commands to be sent with one request. Each SPI command is composed of two command bytes (CMD1 and CMD2) and a data length byte. (The data length byte should only be specified when you use commands or devices that the FIM does not recognize.) You cannot mix command types within a block; each block must be either all polls (i.e., the FIM is reading data from an SPI device), or all selects (i.e., the FIM is writing data to an SPI device).

Figure 6-15 shows the Custom Poll Block dialog box.

	CMD1 # (hex)	CMD2 (hex)	# data bytes
1	<input type="text"/>	<input type="text"/>	<input type="text"/>
2	<input type="text"/>	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>	<input type="text"/>
6	<input type="text"/>	<input type="text"/>	<input type="text"/>
7	<input type="text"/>	<input type="text"/>	<input type="text"/>
8	<input type="text"/>	<input type="text"/>	<input type="text"/>
9	<input type="text"/>	<input type="text"/>	<input type="text"/>
10	<input type="text"/>	<input type="text"/>	<input type="text"/>

Note: The # data bytes should only be specified for non-standard SPI commands/devices.

Figure 6-15 Custom Poll Block Dialog Box

Figure 6-16 shows the Custom Select Block dialog box.

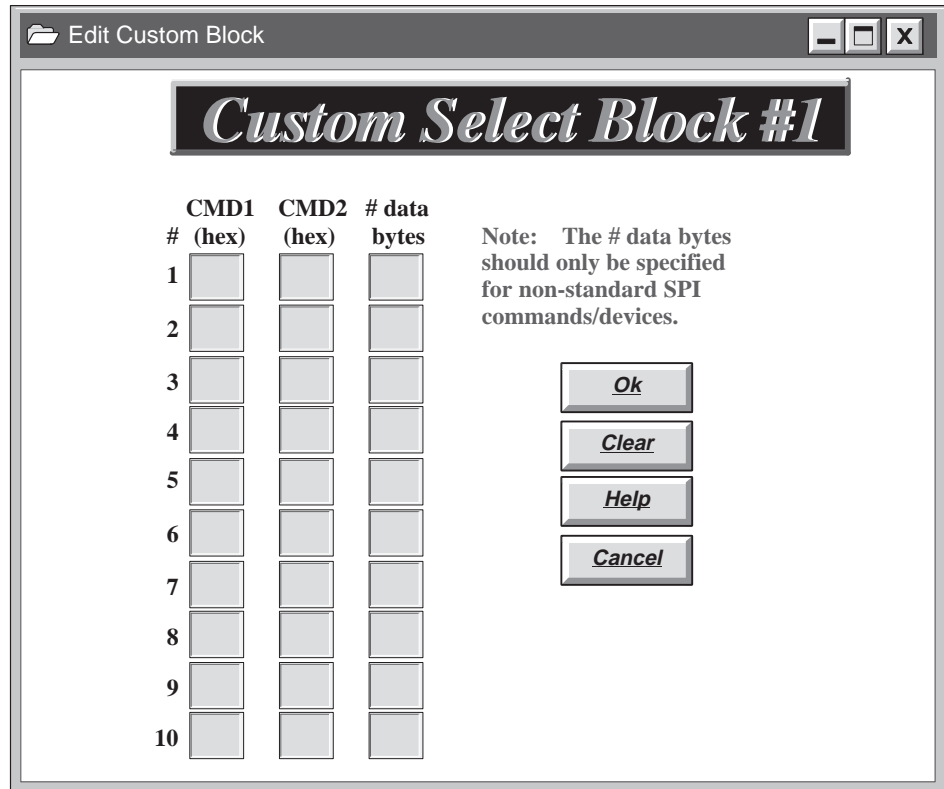


Figure 6-16 Custom Select Block Dialog Box

CMD1 (hex) Holds the value for the CMD1 byte of an SPI command.

CMD2 (hex) Holds the value for the CMD2 byte of an SPI command.

Data Bytes If the SPI device that you are configuring is not directly supported by the FIM (see page 6-3), or if the command is not listed in the I/O list of the *SPI Matching Division, Communication Protocol, Version 3.01*, Section 2, then you must enter the expected response length, in bytes, in this field. (Ordinarily, you do not need to complete this field.)

6.10 Example—Configuring SPI Devices for the FIM

This example illustrates how to assign configuration parameters to an SPI device and create a custom block, using the FIM SPI Configurator. Section 6.11 continues the example configuration scenario for a programmable controller, using TISOFT.

Example 1 (FIM)

If you wish, you can enter the values described below into a configuration file on the FIM, for practice. Example 1 presents a minimal configuration for an SPI mold temperature controller (Device ID 20).

1. From the SPI Operations area of the Configurator's main screen, click once on the Edit button.

Result: The Edit Device dialog box appears.

NOTE: To move through the dialog box fields, you can either use the Tab key, or click with the mouse in the field where you want to type.

2. In the Description field, type the following text:

Mold Temperature Controller in Building C

3. From the drop-down list in the Device Type field, select the following line:

(20) Mold Temperature Controller

4. In the Address field, type the following value:

36

NOTE: It is not necessary to enter a value for Input Words (WX) or Output Words (WY) unless you want to modify the default value of 8 in the field.

Figure 6-17 shows the settings for the Edit Device dialog box.

5. Click on the Ok button.

Result: The Edit Device dialog box closes, and you return to the main screen of the FIM SPI Configurator. The SPI Operations area now displays the values that you assigned to the mold temperature controller. See Figure 6-18.

Figure 6-17 shows the completed Edit Device dialog box for the Mold Temperature Controller.

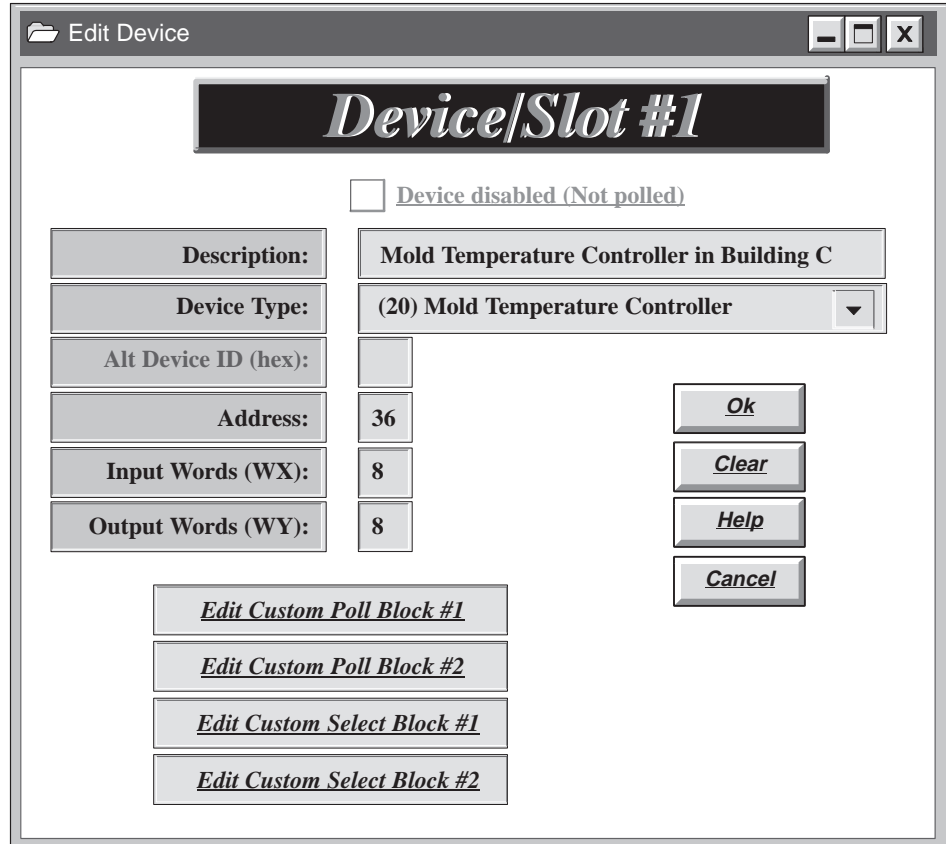


Figure 6-17 Configuring the Mold Temperature Controller

Figure 6-18 shows the values that are displayed in the SPI Operations screen area after the Mold Temperature Controller is configured.

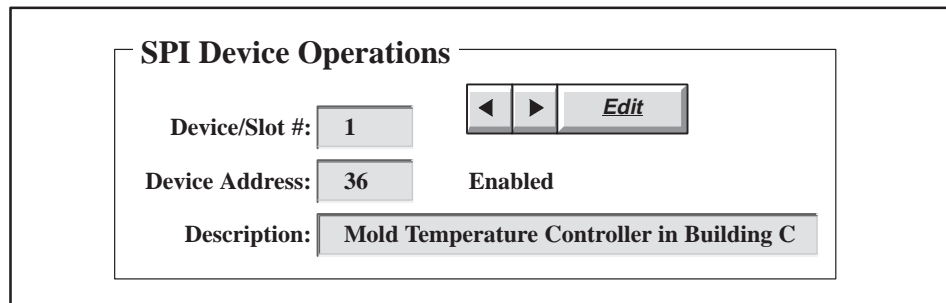


Figure 6-18 SPI Operations Screen Area

Example—Configuring SPI Devices for the FIM (continued)

Example 2 (FIM)

Example 2 presents a full configuration for an SPI loader (Device ID 23), including the creation of a custom block.

1. From the SPI Operations area of the Configurator's main screen, use the arrow keys to toggle the Device/Slot # position from 1 to 2.

Result: The value 2 appears in the Device/Slot # field.

NOTE: Be sure to change the Device/Slot # value before you click on the Edit button; otherwise, any work you do in the Edit Device dialog box is applied to the device at the existing position, overwriting the first values that you assigned.

2. Click on the Edit button.

Result: The Edit Device dialog box appears.

3. In the Description field, type the following text:

Loader in Building D

4. From the drop-down list in the Device Type field, select the following line:

(23) Loader

5. In the Address field, type the following value:

57

6. In the Input Words (WX) field, type the following value:

10

7. In the Output Words (WY) field, type the following value:

12

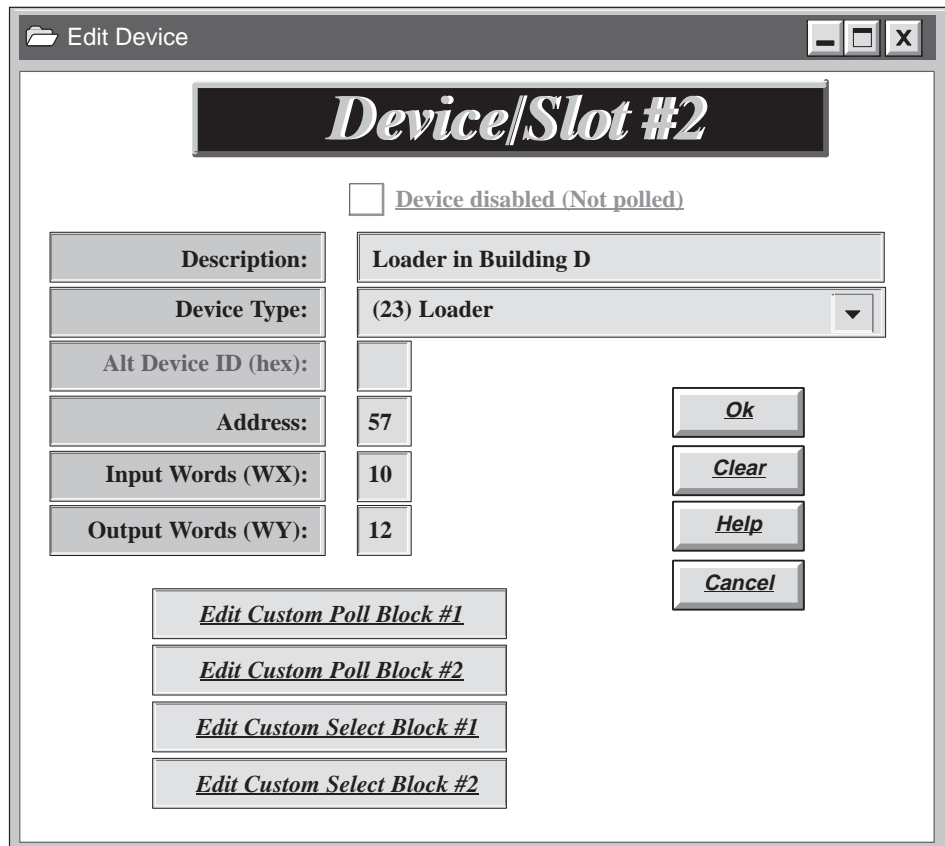


Figure 6-19 Configuring the Loader

8. Click on the Edit Custom Poll Block #1 button. (See Figure 6-19.)

Result: The Edit Custom Block dialog box appears.

Procedure continues on next page.

Example—Configuring SPI Devices for the FIM (continued)

- In the top row (labeled 1), type 20 in the CMD1 box, and 48 in the CMD2 box.
- In the next row (labeled 2), type 20 in the CMD1 box, and 50 in the CMD2 box. See Figure 6-20.

NOTE: You do not need to enter a value in the # Data Bytes column, because you are configuring a custom block for an SPI device (the loader) that is directly supported by the FIM. (See page 6-57.)

	CMD1 # (hex)	CMD2 (hex)	# data bytes
1	20	48	
2	20	50	
3			
4			
5			
6			
7			
8			
9			
10			

Note: The # data bytes should only be specified for non-standard SPI commands/devices.

Ok
Clear
Help
Cancel

Figure 6-20 Creating a Custom Poll Block for the Loader

- Click on the Ok button.

Result: A custom poll block is created with two SPI commands, 20:48 (Material Mode Status) and 20:50 (Load Time A Setpoint). The Edit Custom Block dialog box closes, and you return to the Edit Device dialog box.

12. Click on the Ok button.

Result: The Edit Device dialog box closes, and you return to the main screen of the FIM SPI Configurator. The SPI Operations area now displays the values that you assigned to the loader. See Figure 6-21.

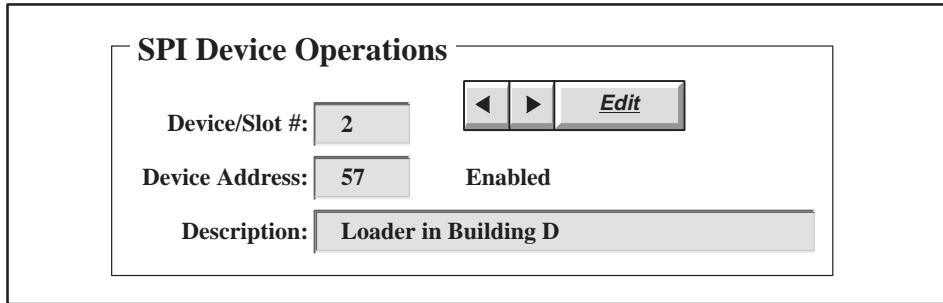


Figure 6-21 SPI Operations Screen Area

How This Custom Poll Block Works

When a 0200H value is entered into the request word of the WY75, the FIM sends out both commands of Custom Poll Block #1 (that is, 20:48 and 20:50). When the FIM completes the request, a 0200H is sent to WX65 to indicate that the request is complete. The data appears in the response buffer as shown in Table 6-6. (For an explanation of the WX and WYs, see page 6-66.)

Table 6-6 Response Buffer for Custom Poll Block #1

Input Word	Value	Meaning
WX65	0200	Poll block #1 completed.
WX66	xxxx	Value of Material Mode Status.
WX67	xxxx	Least significant word of Load Time A Setpoint (command 20:50).
WX68	xxxx	Most significant word of Load Time A Setpoint (command 20:50).
WX69–74		Don't care (i.e., not used by this command).

Downloading the Configuration

When you are satisfied with your configuration, you can download it from the PC to the FIM. Saving the file, although optional, is recommended.

1. From the Configuration File area of the FIM's main screen, choose Save, and complete the Save File dialog box. (See page 6-45.)
2. From the FIM Operations area of the FIM's main screen, choose Write FIM to download the configuration to the FIM. Click Ok when you receive the warning about taking the FIM offline. See page 6-49.

Result: Your configuration is downloaded from the PC to the FIM.

6.11 Example—Configuring SPI Devices for the Programmable Controller

The FIM identifies and reports SPI devices in terms of I/O points, as though they were actual modules in a remote base. You must configure devices (i.e., assign starting I/O addresses and word inputs and outputs) before the FIM can update them. Examples of devices configured by using TISOFT follow. When the devices are configured properly, the assigned input points are updated immediately with data from the device, and the output points are written to the device.

To configure a device, you need to know the slot number and number of WX and WY points that were configured from the FIM, and you need to choose a starting I/O address for the device in TISOFT.

Example 1 (Controller)

Example 1 uses the mold temperature controller. This device was assigned a position in slot 1, with 8 word input points and 8 word output points, from the FIM. From TISOFT, the mold temperature controller is assigned the starting I/O point address of 49 (decimal). Input words WX49 – WX56 and output words WY57 – WY64 in the ladder program are mapped, or assigned to, this device; see Figure 6-22. The FIM writes these points to the device once during each FIM update scan.

Figure 6-22 shows the TISOFT I/O configuration for the mold temperature controller example. Assume that the FIM resides in remote base 5.

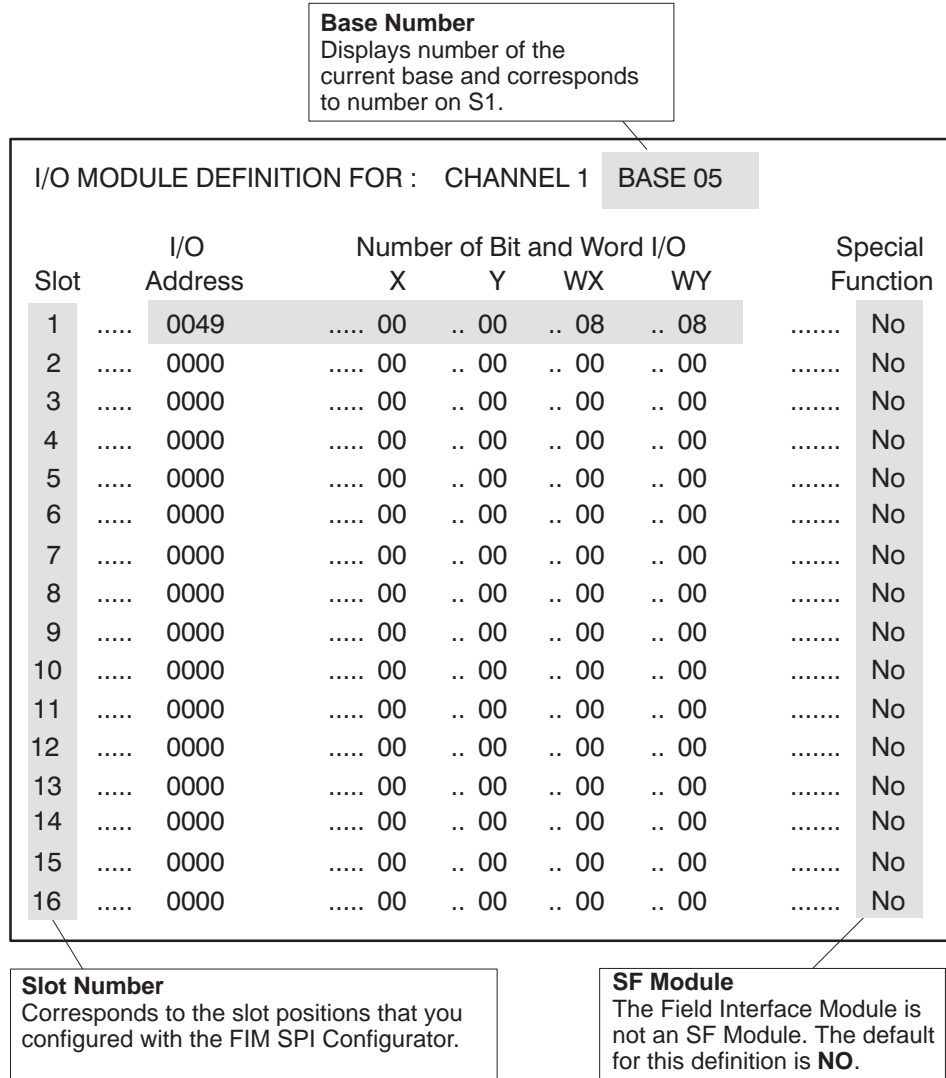


Figure 6-22 Sample I/O Configuration Chart

Example—Configuring SPI Devices for the Programmable Controller (continued)

Example 2 (Controller)

Example 2 uses the loader. This device was assigned a position in slot 2, with 10 word input points and 12 word output points, from the FIM. From TISOFT, the loader is assigned the starting I/O point address of 65 (decimal). Input words WX65 – WX74 and output words WY75 – WY86 in the ladder program are mapped, or assigned to, this device; see Figure 6-23. The FIM writes these points to the device once during each FIM update scan.

I/O MODULE DEFINITION FOR : CHANNEL 1 BASE 05

Slot	I/O Address	Number of Bit and Word I/O				Special Function
		X	Y	WX	WY	
1	0049	00	00	08	08	No
2	0065	00	00	10	12	No
3	0000	00	00	00	00	No
4	0000	00	00	00	00	No
5	0000	00	00	00	00	No
6	0000	00	00	00	00	No
7	0000	00	00	00	00	No
8	0000	00	00	00	00	No
9	0000	00	00	00	00	No
10	0000	00	00	00	00	No
11	0000	00	00	00	00	No
12	0000	00	00	00	00	No
13	0000	00	00	00	00	No
14	0000	00	00	00	00	No
15	0000	00	00	00	00	No
16	0000	00	00	00	00	No

Base Number
Displays number of the current base and corresponds to number on S1.

Slot Number
Corresponds to the slot positions that you configured with the FIM SPI Configurator.

SF Module
The Field Interface Module is not an SF Module. The default for this definition is **NO**.

Figure 6-23 Sample I/O Configuration Chart

Appendix A

Application Selection

A description of switch settings for the application is shown in Table A-1.
Refer to your application chapter for more information on switch definitions.

Table A-1 Application Selection

Application	S1	S2	S3							
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Drives Interface Application	Base address	Protocol selection	closed	closed	closed	closed	Additional delay 0	Additional delay 1	Not used	Mute function
PROFIBUS-DP Interface Application	Base address	Baud Rate	open	closed	closed	closed	Address range 0	Address range 1	Address range 2	Enable token rotation
SAMMS Unit Interface Application	Base address	Address range selection	closed	open	closed	closed	Additional delay 0	Additional delay 1	Not used	Mode selection
SPI Interface Application	Base address	Not used	open	open	closed	closed	Not used	Not used	Not used	Not used
PROFIBUS-DP Slave Simulator (Internal Use)	Slave address	Baud (PROFIBUS-DP)	open	open	closed	open	Address range 0	Address range 1	Address range 2	LAX mode
FTU (Internal Use)	Base address	Not used	closed	closed	open	open	Not used	Not used	Not used	Not used
Burn-in Test (Internal Use)	Base address 1=master	Not used	open	closed	open	open	Not used	Not used	Not used	Not used
Manual Test Application (Internal Use)	Base address	Baud rate/port#	closed	open	open	open	Not used	Not used	Not used	Not used
Final Test Application (Internal Use)	Not used	Not used	open	open	open	open	Not used	Not used	Not used	Not used

Appendix B

Specifications and Compliances

B.1	Environmental Specifications	B-2
B.2	Additional Compliances	B-3

B.1 Environmental Specifications

Environmental specifications of the ET200 Interface Module are shown in Table B-1.

Table B-1 Environmental Specifications

Operating Temperature	0° to 60°C (32° to 140°F)
Storage Temperature	-40° to 70°C (-40° to 158°F)
Relative Humidity	5% to 95% noncondensing
Module Power Required from Base	3.5 W of +5 VDC 0 W of -5 VDC
Pollution Degree	2, IEC 664, 664 A
Vibration	
Sinusoidal	IEC 68-2-6, Test Fc 0.15 mm, peak-to-peak, 10-57 Hz; 1.0 g 57-150 Hz
Random	NAVMAT P-9492 or IEC 68-2-34, Test Fdc with 0.04 g ² /Hz, 80-350 Hz and 3 dB/octave rolloff, 80-20 Hz and 350-2000 Hz at 10 min/axis
Impact Shock	IEC 68-2-27, Test Ea; Half Sine, 15 g, 11 ms
Electrostatic Discharge ¹	IEC 801, Part 2, Level 4 (15 kV) ²
Electrical Noise Immunity	
Conducted ²	IEC 801, Part 4, Level 3 MIL STD 461B, Part 4; CS01, CS02, CS06 ¹ IEC 255-4, Appendix E ¹ EEC 4517/79 Com(78) 766 Final, Part 4 IEEE 472, 2.5 kV
Radiated	IEC 801, Part 3, Level 3 MIL STD 461B, Part 4; RS01, RS02
Corrosion Protection	All parts are of corrosion resistant material or are plated or painted with corrosion protection.
Agency Approvals	UL Listed, CSA Certified, FM Approved
¹ The module responds to noise signals at its count or inhibits inputs that are within its passband.	
² The unfiltered reset input may be susceptible to these types of EMI.	

B.2 Additional Compliances

In addition, the system complies with applicable requirements of Verband Deutscher Elektrotechniker (VDE) 0160: Electrical Equipment.

Series 505 products have been developed with consideration of the standard for programmable controllers put forward by the International Electrotechnical Commission Committee (IEC-1132-2).

Information concerning product reliability and compliance to the IEC or other standards can be provided upon request. Contact your Siemens Energy & Automation, Inc., distributor for additional information.

A

- Address range, slaves, 4-13
- Agency approvals, B-2
- Application
 - setting, 1-2
 - using dipswitches to select, A-1

B

- Base address, assigning, 2-4
- Base number, assigning, 2-4
- Baud rate, SAMMS interface
 - changing, 5-38
 - using broadcast bit, 5-38
- Baud rates
 - for PROFIBUS-DP, 4-7
 - for SPI, 6-50
 - SAMMS interface, 5-9
 - USS protocol, 3-13
 - word simple protocols, 3-13
- Bias circuit, connecting, 2-10
- Broadcast bits
 - SAMMS interface
 - control mode, 5-16
 - setting baud rate, 5-38
 - status poll mode, 5-24
 - USS protocol
 - 10 word, 3-18–3-20
 - 5 word, 3-27–3-29
 - 5 word modified, 3-31, 3-33
 - word simple protocol
 - 10 word, 3-18–3-20
 - 4 word, 3-24
- Broadcast channel
 - USS protocol
 - 10 word, 3-19
 - 5 word, 3-28
 - 5 word modified, 3-33
 - word simple protocol
 - 10 word, 3-19
 - 5 word, 3-24
- Broadcast messages, programming, 3-40, 3-41
- Broadcast request bit, SAMMS units, 5-26
- Broadcast/immediate channel
 - SAMMS interface, 5-14–5-16
 - status poll mode, 5-22–5-25
 - USS protocol
 - 10 word, 3-17–3-19
 - 5 word, 3-27–3-29
 - 5 word modified, 3-31–3-33
 - word simple protocol
 - 10 word, 3-17–3-19
 - 4 word, 3-23
- Byte matching
 - configuration data positioning, 4-30
 - configuration example, 4-26, 4-27, 4-28
 - configuring input points, 4-24
 - configuring output points, 4-25
 - configuring PROFIBUS-DP, 4-23
 - input discrete overmapped, 4-34
 - input word overmapped, 4-32
 - output discrete overmapped, 4-38
 - output words overmapped, 4-36

C

- Cable
 - connecting on port 2, 2-12
 - cutting and connecting, 2-15
 - mounting on connector for port 2, 2-12
 - ports 1 and 2, 2-8
 - PROFIBUS connectors, 2-18–2-21
 - PROFIBUS-DP specifications, 4-40
 - terminating, 2-16–2-19
- Communication port, pinouts, 4-9, 6-9
- Communication status, monitoring using status words, 3-48–3-50
- Connector
 - mounting cable, 2-14
 - routing and cutting, 2-13
- Control mode
 - I/O configuration chart, SAMMS interface, 5-19
 - mapping broadcast channel, 5-18
 - SAMMS interface, configuring, 5-12

Control mode (continued)
troubleshooting, 5-44

Controller, logging into, 2-20

Controller words
SAMMS interface, 5-14–5-16
USS protocol
10 word, 3-17
5 word, 3-27–3-29
5 word modified, 3-32
word simple protocol
10 word, 3-17
4 word, 3-24

Controller/FIM status, troubleshooting, 5-45

D

Dipswitches
location of, 2-5
rotary, 3-11, 4-7, 5-10, 6-8
S3, 3-10, 4-8, 5-6, 6-8
setting
address range for PROFIBUS-DP slaves,
4-13
address range for SAMMS units, 5-10
for Drives Interface, 3-10
for mute function, 3-12
for PROFIBUS-DP, 4-8
for SAMMS Interface, 5-6
for SPI, 6-8
for time delay, 3-12
for token passing, 4-15
using for applications, A-1

Drive programming
changing drive parameters, 3-44
drive motion control, 3-44
reading drive parameters, 3-44
typical program, 3-45

Drive scan time
USS protocol
10 word, 3-37
5 word, 3-39
5 word modified, 3-39
word simple protocol
10 word, 3-36
4 word, 3-38

Drives interface
communicating with, 3-13
connecting to, 3-14–3-16

Drives interface (continued)
functional diagrams, 3-8–3-10
logical diagram, 3-7
overview, 3-4
programming, 3-44
system layout, 3-6

Drives update scan, programming, 3-36

E

Environmental specifications, B-2

Error handling, 4-16

F

Features
FIM, 1-2
PROFIBUS-DP application, 4-4
SPI application, 6-2

floating point values, using, 6-29

G

Grounding, handling the module, 2-2

I

I/O
cable specifications, 4-40
configuring, 4-19
SPI for controller, 6-64
SPI for FIM, 6-58
drives interface application, 3-6
immediate request, 3-42
point mapping for slaves, 4-21

I/O configuration chart
SAMMS interface, 5-13, 5-18
slaves, 4-19, 4-22
SPI devices, 6-65, 6-66
status poll mode, SAMMS interface, 5-21
USS protocol
10 word, 3-16, 3-20–3-22
5 word, 3-26
5 word modified, 3-30, 3-34–3-36
word simple protocol
10 word, 3-16, 3-20–3-22

I/O configuration chart
word simple protocol (continued)
4 word, 3-22, 3-25

Immediate request, 3-42
SAMMS unit, 5-28

Immediate request bits
SAMMS interface
control mode, 5-16
status poll mode, 5-24–5-27
USS protocol
10 word, 3-18–3-20
5 word, 3-27–3-29
5 word modified, 3-31, 3-33
word simple protocol
10 word, 3-18–3-20
4 word, 3-24

Input words
SAMMS interface, 5-14–5-16
USS protocol
10 word, 3-17
5 word, 3-27
5 word modified, 3-32–3-34
word simple protocol
10 word, 3-17
4 word, 3-23

Installation, flowchart, 2-3

L

LED
functions, 1-3
indicators, 1-3
using in troubleshooting, 3-46, 4-42, 6-18

M

Mapping, SAMMS interface, status poll mode,
5-24

Module
checking operation, 3-46, 4-42, 6-18
connecting to I/O, 2-17
inserting into I/O base, 2-6
powering up, 2-19

Mounting the cable, connector, 2-14
Mute function, enabling, 3-12

O

Output points, 4-20
Output words
SAMMS interface, 5-14–5-16
USS protocol
10 word, 3-17
5 word, 3-27
5 word modified, 3-32–3-34
word simple protocol
10 word, 3-17
4 word, 3-23

P

Parameters, SAMMS units
changing, 5-30
changing with broadcast bit, 5-38
reading, 5-30

Pinouts, all ports, 2-11

Port 1, using, 2-11

Port 2
using, 2-12
using the connector, 2-12

Ports, connecting to drive, 3-14–3-16

PROFIBUS-DP
analog input points, 4-21
bias circuit for cables, 4-10
cable specifications, 4-40
configuring the controller, 4-12
installing, 4-10
setting baud rate for, 4-7
setting up, summary, 4-6

Programming
broadcast messages, 3-40, 3-41
drives, 3-44
drives update scan, 3-36
SAMMS units, 5-26
example, 5-38

R

- Request command byte, SAMMS units, 5-32
- Request data length bits, SAMMS units, 5-32

S

SAMMS interface

- broadcast bits
 - control mode, 5-16
 - status poll mode, 5-24
- broadcast/immediate channel, 5-14–5-16
- configuring, 5-7
- control mode functional diagram, 5-5
- delay times, 5-6
- immediate request bits
 - control mode, 5-16
 - status poll mode, 5-24–5-27
- input words, 5-14–5-16
- logical diagram, 5-4
- output words, 5-14–5-16
- overview, 5-2
- response times, 5-6
- status poll functional diagram, 5-5
- status poll mode, 5-20
- system layout, 5-3

SAMMS interface applicaton, features, 5-2

SAMMS units

- broadcast request, 5-26
- changing parameters, 5-30
- communicating with, 5-9
- immediate I/O request, 5-28
- message sent bit, 5-36
- monitoring communication, 5-29
- ports, 5-11
- programming, 5-26
- reading parameters, 5-30
- request command byte, 5-32
- request control bits, 5-33
- request control word, 5-32
- request data block, 5-34
- request data length bits, 5-32
- request required bit, 5-34
- request status bit, 5-35
- response byte, 5-35
- response data block, 5-37
- response length bits, 5-36
- response present bit, 5-36

SAMMS units (continued)

- response status word, 5-35
- responses from, 5-34
- send message bit, 5-33
- send message repetitively bit, 5-33
- sending requests, 5-29
- troubleshooting, 5-43–5-47

Scan, FIM I/O, 4-16

SIMOREG

- 6RA24 version, 3-54
- 6SE70 models FC and SC, 3-100
- Z1005 version, 3-80
- Z1006 version, 3-84
- Z1011 version, 3-88
- Z2006 version, 3-92

SIMOREG drives, parameters, 3-54

SIMOVERT

- 6SE21 version, 3-62
- 6SE30 version, 3-68, 3-76
- serial interface board, 3-76

SIMOVERT and SIMOREG, drives supported, 3-51

SIMOVERT drives, overview, 3-50

Slave, configuration example, 4-18, 4-20

Slaves

- address range, 4-13
- autobaud, 4-12
- configuring, 4-17, 4-20

Specifications, environmental, B-2

SPI

- baud rate
 - network communications, 6-50
 - PC-to-FIM, 6-14
- bias circuit for cables, 6-10
- communications
 - character delay, 6-51
 - request retries, 6-50
 - response delay, 6-51
 - turn around delay, 6-51
- configuring devices, 6-54
 - for controller, 6-64
 - for FIM, 6-58
- configuring the controller, 6-16
- configuring the FIM, 6-42
- devices supported, 6-3
- editing custom blocks, 6-56
- editing devices, 6-54
- general communications parameters, 6-50

SPI (continued)
installing, 6-10
PC-to-FIM connection, 6-13
programming
 blanket polls, 6-27
 custom blocks, 6-26
 error codes, 6-40
 examples, 6-28
 overview, 6-24
 random requests, 6-25
 user requests, 6-24
selecting PC port, 6-14
setting up, summary, 6-7
SPI device operations area, 6-52
system layout, 6-6

SPI Configurator
configuration file area, 6-44
creating icon for, 6-12
FIM operations area, 6-48
FIM setups button, 6-50
hardware requirements, 6-5
installing file on PC, 6-11
overview, 6-4, 6-42
parameter table errors, 6-49
read FIM button, 6-49
write FIM button, 6-49

Status poll mode
SAMMS interface, 5-22–5-25
 broadcast/immediate channel, 5-22–5-25
 configuring, 5-20–5-22
troubleshooting, 5-44

Status words, using to monitor communication,
3-48–3-50

Switches. *See* Dipswitch

System layout, SAMMS interface application,
5-3

T

Time delay, switch settings, 3-12

TISOFT
configuration chart
 10 word, 3-20
 4 word, 3-25
 5 word, 3-29
 5 word modified, 3-34–3-36
 SAMMS interface, 5-13

TISOFT (continued)
 I/O configuration chart for status poll mode,
 view, 5-25

Token passing, dipswitch S3–8, 4-15

Troubleshooting
 checking FIM, 4-42, 6-18
 checking operation of module, 3-46
 control mode, 5-44
 controller/FIM status, 5-45
 SAMMS units, using LEDs, 5-43–5-47
 status poll mode, 5-44
 using LEDs, 3-46, 4-42, 6-18
 using status words, 3-48

USS protocol
 10 word, 3-47
 5 word, 3-48
 5 word modified, 3-47

word simple protocol
 10 word, 3-47
 4 word, 3-47

U

USS protocol
 10 word
 baud rates, 3-13
 broadcast bits, 3-18–3-20
 broadcast channel, 3-19
 configuring, 3-17
 configuring I/O, 3-16
 drive scan time, 3-37
 immediate request bits, 3-18–3-20
 input words, 3-17
 mapping controller words, 3-17
 troubleshooting, 3-47

 5 word
 broadcast bits, 3-27
 broadcast channel, 3-28
 broadcast/immediate channel, 3-27
 configuring I/O, 3-26, 3-29
 drive scan times, 3-39–3-41
 immediate request bits, 3-27–3-29
 input words, 3-27
 mapping controller words, 3-27–3-29
 output words, 3-27
 troubleshooting, 3-48

 5 word modified
 broadcast bits, 3-31
 broadcast channel, 3-33
 broadcast/immediate channel, 3-31

USS protocol

- 5 word modified (continued)
 - configuration chart, 3-34–3-36
 - configuring, 3-31
 - configuring I/O, 3-30
 - drive scan times, 3-39–3-41
 - input words, 3-32–3-34
 - mapping controller words, 3-32, 3-33
 - output words, 3-32–3-34
 - troubleshooting, 3-47

W

Word simple protocol

- 10 word
 - broadcast bits, 3-18–3-20
 - broadcast channel, 3-19

Word simple protocol

- 10 word (continued)
 - configuring, 3-17
 - configuring I/O, 3-16
 - drive scan time, 3-36
 - immediate request bits, 3-18–3-20
 - input words, 3-17
 - mapping, 3-17
 - troubleshooting, 3-47
 - valid baud rates, 3-13
- 4 word
 - broadcast bits, 3-24
 - broadcast channel, 3-24
 - configuring I/O, 3-22, 3-25
 - drive scan times, 3-38
 - immediate request bits, 3-24
 - mapping, 3-24
 - mapping controller words, 3-23
 - troubleshooting, 3-47

Customer Response

We would like to know what you think about our user manuals so that we can serve you better. How would you rate the quality of our manuals?

	Excellent	Good	Fair	Poor
Accuracy	_____	_____	_____	_____
Organization	_____	_____	_____	_____
Clarity	_____	_____	_____	_____
Completeness	_____	_____	_____	_____
Graphics	_____	_____	_____	_____
Examples	_____	_____	_____	_____
Overall design	_____	_____	_____	_____
Size	_____	_____	_____	_____
Index	_____	_____	_____	_____

Would you be interested in giving us more detailed comments about our manuals?

Yes! Please send me a questionnaire.

No. Thanks anyway.

Your Name: _____

Title: _____

Telephone Number: (____) _____

Company Name: _____

Company Address: _____

Manual Name: SIMATIC 505 Field Interface Module User Manual

Edition: Fifth

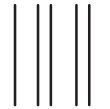
Text Assembly Number: 2801355-0005

Date: 11/96

Order Number: PPX:505-8124-5

FOLD

SIEMENS ENERGY & AUTOMATION INC
3000 BILL GARLAND ROAD
PO BOX 1255
JOHNSON CITY TN 37605-1255



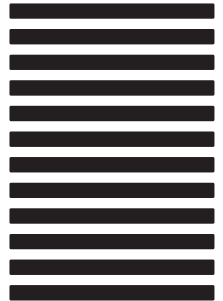
NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO.3 JOHNSON CITY, TN

POSTAGE WILL BE PAID BY ADDRESSEE

ATTN TECHNICAL COMMUNICATIONS M/S 519
SIEMENS ENERGY & AUTOMATION INC
PO BOX 1255
JOHNSON CITY TN 37605-1255



FOLD

Belden® is a registered trademark of Belden Wire & Cable Company.

SINEC™, SIMATIC®, SIMOVERT®, SIMOREG®, and S5™ are trademarks of Siemens AG.

TISOFT1™, TISOFT2™, TISOFT3™ and Series 505™ are trademarks of Siemens Energy & Automation, Inc.

Siemens Advanced Motor Master System (SAMMS™) is a trademark of Siemens AG.

All other product names or trademarks are the property of their respective owners. They are used without representation as to their release for general use.