SIEMENS

SIMATIC 505

PROFIBUS-FMS Communications Processor (505–CP5434–FMS)

User Manual

Order Number: PPX:505–8129–1
Text Assembly Number: 2807479–0001
Original 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.

MANUAL PUBLICATION HISTORY

SIMATIC 505 PROFIBUS-FMS Communications Processor User Manual
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Preface

About This Manual

This manual describes the SIMATIC 505 PROFIBUS-FMS Communications Processor module for the Series 505 programmable logic controller system. This manual also describes the COM5434 Configurator software package, which you use to create configuration files for the FMS CP module.

The SIMATIC 505–CP5434–FMS Communications Processor module (referred to throughout this manual as the FMS CP module) provides an interface between the Series 505 family of programmable logic controllers and Send-Receive products, S7 products, S5 products, and other Siemens products (and third-party products), all of which can communicate over a common hardware network.

The following topics are covered in this manual:

- PROFIBUS network features and physical characteristics
- FMS CP module features
- Hardware installation
- Cabling for a PROFIBUS network
- FMS CP module network communications overview
- Installation and configuration of the COM5434 Configurator software
- Communication examples
- Troubleshooting information

Related Manuals

Additional manuals you may need to consult include the following:

- The system manual(s) for your controller(s)
- The *SIMATIC 505 TISOFT2 Release 6.3 User Manual*, PPX:TS505–8101–7 or higher. This manual covers programming over PROFIBUS-FMS networks.
- The *SIMATIC 505 SoftShop for Windows Release 2.0 User Manual*, PPX:SS505–8101–3 or higher. This manual covers programming over PROFIBUS-FMS networks.
- The *SIMATIC S5 ET 200 Distributed I/O System Manual*, PPX:505–8206–x, describes the installation and use of the Siemens family of PROFIBUS-DP compatible ET 200 I/O modules. This manual includes a description of the COM PROFIBUS software.

Conventions

The following conventions are used in this manual:

- "Click" means to place the mouse cursor on an object and quickly press and release the mouse button. In most cases, only the left mouse button is used.
- "Double-click" means to place the mouse cursor on an object and quickly press and release the left mouse button twice.

Agency Approvals

Agency approvals for the SIMATIC 505 PROFIBUS-FMS Communications Processor module are listed in Appendix C.

PROFIBUS User Organization

PROFIBUS user organizations exist in a number of countries to allow PROFIBUS users to exchange information. The address of the organization in the U.S.A. is as follows:

PROFIBUS Trade Organization
Michael Bryant
5010 East Shea Boulevard, Suite C-226
Scottsdale, AZ 85254
Telephone: (602) 483-2456
Fax: (602) 483-7202

Technical Assistance

For technical assistance, contact your Siemens Energy & Automation, Inc., distributor or sales office. If you need assistance in contacting your distributor or sales office, call 800-964-4114 in the U.S.A.

For additional technical assistance, call the Siemens Technical Services Group in Johnson City, Tennessee at 423-461-2522, or contact them by e-mail at **simatic.hotline@sea.siemens.com**. For technical assistance outside the United States, call 49-911-895-7000.

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Chapter 1
Overview

1.1 The SIMATIC 505 PROFIBUS-FMS Communications Processor Module

The SIMATIC 505 PROFIBUS-FMS Communications Processor module (PPX:505-CP5434-FMS) provides an interface for 505-to-505 communications, and between Series 505 programmable logic controllers and Send-Receive products (such as S5), S7 products, and third-party and other Siemens products, all of which can communicate over a common hardware network.

The FMS CP module conforms to the PROFIBUS standard as described in EN 50 170, Volume 2, PROFIBUS. PROFIBUS-Fieldbus Message Specification (FMS) enables object-oriented data exchange between master stations.

Features

The FMS CP is a single-wide Series 505 module with the following features:

- Can be installed in a local or remote Series 505 base. (The remote base installation currently can use only the 505 remote I/O channel.)
- Has two ports: an RS-485 PROFIBUS port and an RS-232 port.
- Conforms to PROFIBUS-FMS protocol.
- Operates on a PROFIBUS network (cabling medium).
- Is configured for the network using the included COM5434 Configurator software.
- In SoftShop or TISOFT, the FMS CP is logged in as a 4WX/4WY Special Function (SF) module.
- The module firmware can be upgraded in the field using flash memory.
- Supports the following PROFIBUS cards for personal computers:

  CP 5412 (A2) ISA card, (PC AT, short slot)
  CP 5511 PCMCIA card (for notebook PCs)
  CP 5611 PCI card

Communication Services Supported

The FMS CP module supports the following communication services:

- Fieldbus Message Specification (FMS); used for SIMATIC 505, S7, or any third-party device that supports FMS protocol.
- Send-Receive Interface (data transmission on a Fieldbus Data Link connection); used for devices such as SIMATIC S5 stations.
- Peerlink II (global broadcast); for 505-to-505 communications only.
- S7 Services (server only)

Compatibility

The SIMATIC 505 PROFIBUS-FMS Communications Processor module is compatible with all SIMATIC 545, 555, 565, and 575 CPUs.

System Layout

Any compatible programmable logic controllers or field devices equipped with a PROFIBUS-FMS interface can participate on the network.

Figure 1-1 shows some examples of devices that can be used on your network.

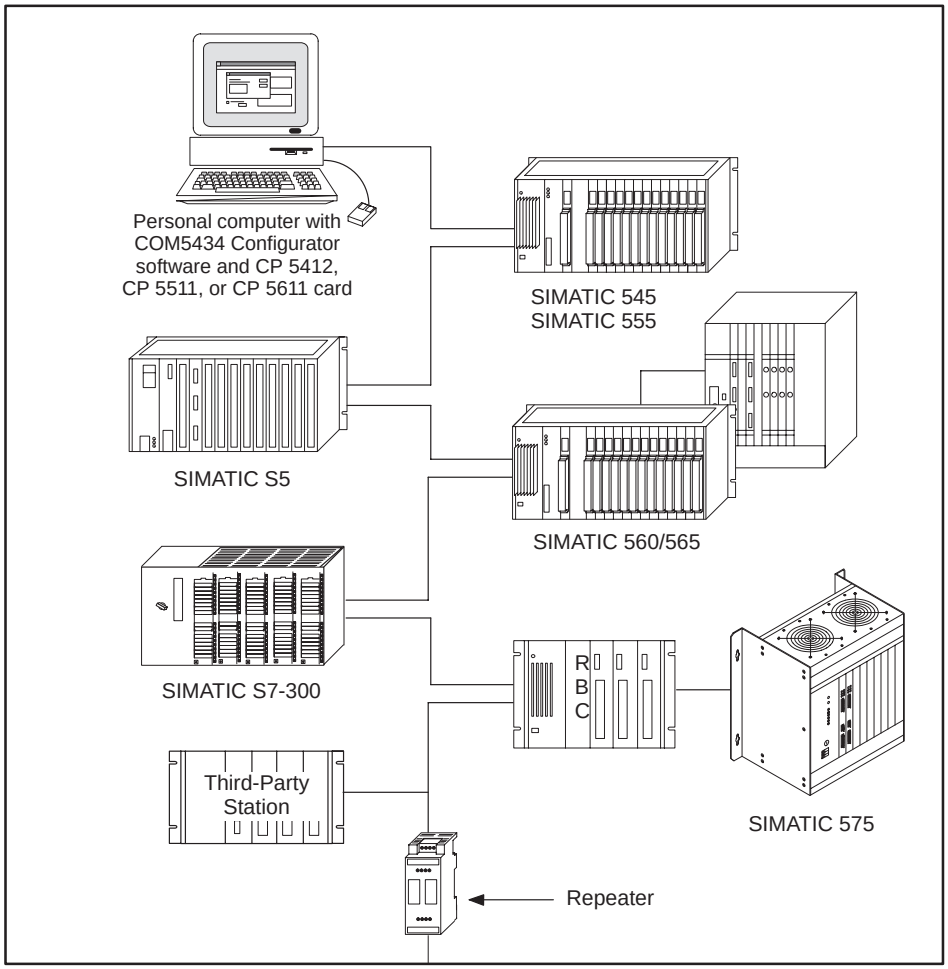

Figure 1-1 Example of Devices on an FMS Network

1.2 Hardware Overview

Bezel Features

As shown in Figure 1-2, the bezel of the FMS CP module has four status LEDs, a recessed RUN/STOP switch, a recessed RESET button, an RS-232 port, and an RS-485 PROFIBUS-FMS port.

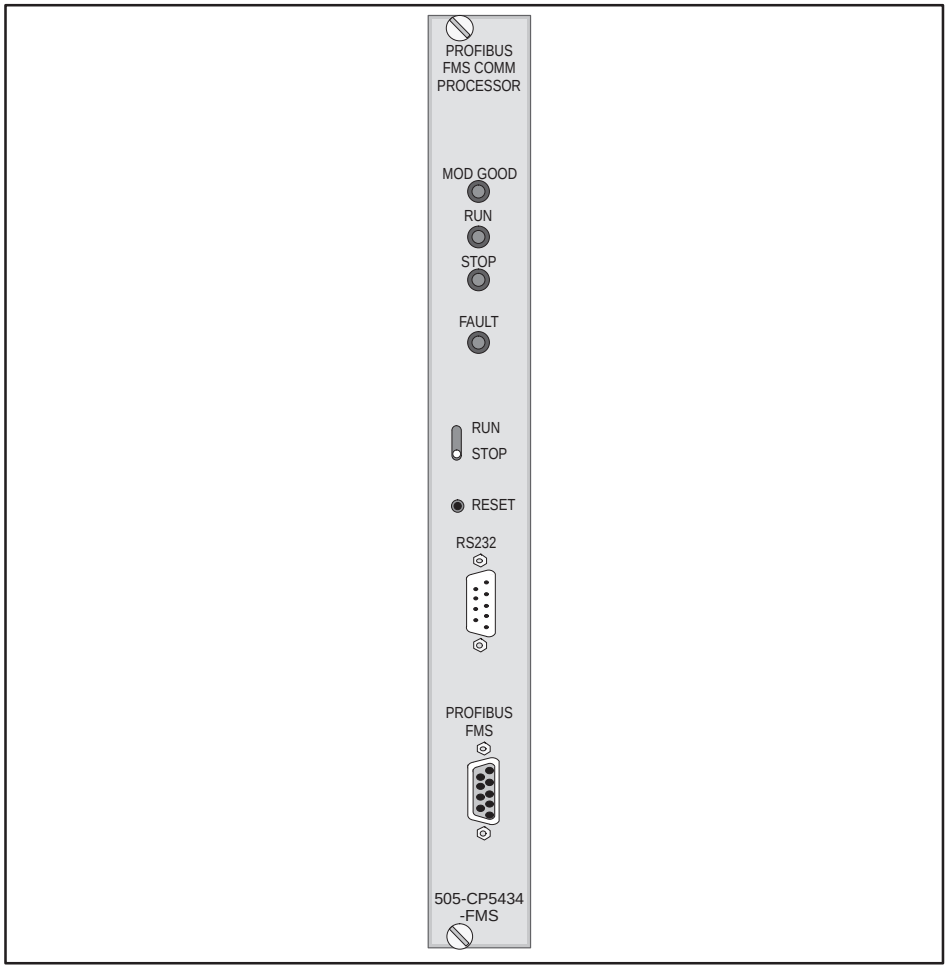

Figure 1-2 The 505-CP5434-FMS Module

Status LED Indicators

The bezel has the following status LEDs:

- MOD GOOD
- RUN
- STOP
- FAULT

The functions of the LEDs are described in Section 2.6.

RUN/STOP Switch

Below the LEDs is a recessed RUN/STOP toggle switch. The switch can be moved from one position to another using a small tool, such as a screwdriver. The switch is recessed to prevent accidental switching of the module from one state to another.

RESET Button

The RESET button is recessed to prevent accidental reset of the module. When the RESET button is pushed, the module resets as if power were turned off and then turned on. Therefore, if the RUN/STOP switch is in the RUN position and the module is functioning properly, the module begins to transmit and receive communications after going through a normal power-on start-up sequence.

⚠ WARNING

The RESET button is for the unusual circumstance in which there is a module function error that cannot be fixed with the COM5434 Configurator software. When the RESET button is pushed, the module enters the state of global reset, which is the same as a power-up. The hardware is reset, all communication is terminated on all ports, and the LEDs turn off.

Because all communication that is controlled by the module is terminated, essential messages to other nodes that control I/O functions can be disrupted. Disrupting communication during plant operation could result in damage to equipment and/or injury or death to personnel.

To avoid possible damage to equipment and/or injury or death to personnel, do not reset the module without first understanding all possible results based on the setup of your network.

RS-232 Port

The RS-232 port is a 9-pin male D-shell connector. You can set the RS-232 port to 9600 baud, 19200 baud, or 38400 baud using a jumper on the board. The baud rate of the port must be set before the FMS CP module is installed in the base. See Section 2.2 for instructions on how to set the baud rate of the port.

PROFIBUS-FMS Port

The RS-485 PROFIBUS-FMS port is a 9-pin female D-shell connector. You set the baud rate for the PROFIBUS port during network configuration using the COM5434 Configurator, as decribed in Section 5.4.

1.3 Network Overview

The PROFIBUS Standard

The Process Field Bus (PROFIBUS) standard (EN 50 170, Volume 2, PROFIBUS) defines the physical and logical parameters of a bit-serial bus network. PROFIBUS offers an interface for high-speed communications with field devices, as well as exchange of complex data between master stations. One objective of the standard is to create an open system that enables networking of programmable logic controllers and field devices from different vendors. This allows you to include in your system any device from another vendor as long as the device conforms to the standard.

While PROFIBUS includes FMS and DP protocols, there is a universal set of standard physical parameters for PROFIBUS networks, as listed in Table 1-1.

Table 1-1 PROFIBUS Physical Parameters

Features	Parameters
Access mode	Token passing with underlying master/slave
Transmission rate	9.6 Kbaud to 12 Mbaud
Transmission medium	Electrical network: shielded two-wire cable Optical network: fiber-optic cable (glass or plastic)
Maximum number of devices per segment	32 (including repeater)
Maximum number of station addresses per network	126 (not including repeaters)
Maximum cable length per network	10 km for copper cable; more for fiber-optic cable (see *Siemens SIMATIC NET Industrial Communications Networks, Catalog IK 10*).
Topology	Electrical network: line, tree Optical network: ring, line, star
Protocols	PROFIBUS-FMS PROFIBUS-DP
Data size that can be transmitted in one message	1 to 244 bytes

OSI 7 Layer Model

The Open Systems Interconnection (OSI) 7 Layer Model defines levels of communication from the physical layer to the logical layer. While the model gives functions to the protocols, it does not define the protocols themselves. PROFIBUS-FMS uses layer 1, layer 2, and layer 7. The OSI 7 Layer Model is shown in Figure 1-3.

The Layers		PROFIBUS-FMS
Application layer	7b	FMS (Fieldbus Message Specification)
	7a	LLI (Lower Layer Interface)
Presentation layer	6	Empty
Session layer	5	
Transport layer	4	
Network layer	3	
Data link layer	2	FDL (Fieldbus Data Link)
Physical layer	1	RS-485

Figure 1-3 The OSI 7 Layer Model

Masters and Slaves

Devices on a PROFIBUS network are defined as either masters or slaves. Masters are able to issue network commands without remote request when they have the right to access the network. This right is based on the token, which is discussed below. Slaves are devices on the network that do not receive the token, and therefore have no right to issue network commands. Slaves may only acknowledge received messages, or transmit messages in response to a master's request.

Token Passing on a PROFIBUS Network

PROFIBUS allows for multiple masters on a single network, where each master can control the transmission of commands by holding a token. The token is a special telegram that transfers the right of transmission from one master to another. It is circulated among all active masters on a network in a token ring.

When a network is powered up, each master enters a listening mode, checks network traffic and builds a list of active stations on the network. This establishes the token ring for the network. When the first master (lowest station number) finishes its listening mode, it passes itself the token, and gains control of the network. Possession of the token indicates the ability to initiate data transfer. Before each subsequent token pass, the master performs a gap update, polling a single sequential station address to see if another master is waiting to enter the network.

When a second master enters the network, the first master passes it the token, thereby passing control of the network. In this way, control of the network and therefore the ability to issue network commands rotates from master to master.

Figure 1-4 shows an example of token passing among masters on a PROFIBUS network.

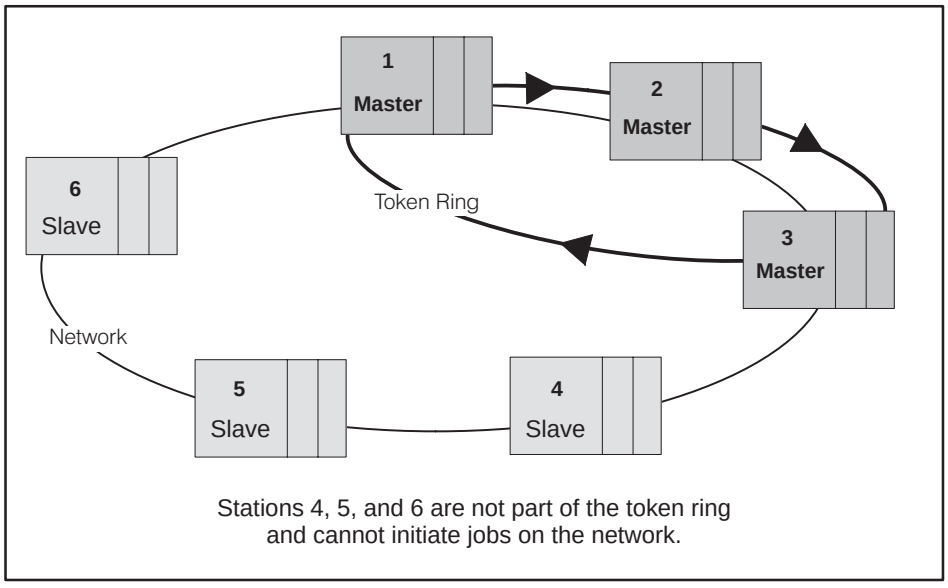

Figure 1-4 Token Passing on a PROFIBUS Network

Network Communication

Communication on the PROFIBUS network can be described from both the physical and the logical point of view.

The physical view, as shown in Figure 1-5, describes a number of stations connected to a central bus line. This view emphasizes the actual physical layout of the network cables and devices that enable the stations to communicate with each other.

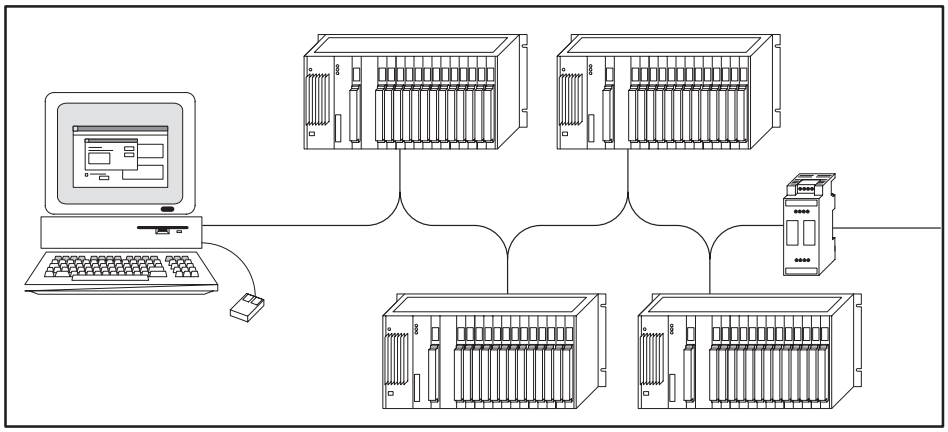

Figure 1-5 Simplified Physical View of a Network

The logical view describes how communication on a PROFIBUS network takes place through logical connections between station pairs. A logical connection relationship consists of four parts:

Local station address
Remote station address
Local LSAP (Link Service Access Point)
Remote LSAP

For each station in the connection, the local values must be equal to the remote values of the other station, as shown in Figure 1-6. On any station, a local LSAP can be used for only one connection (except for FMS slaves).

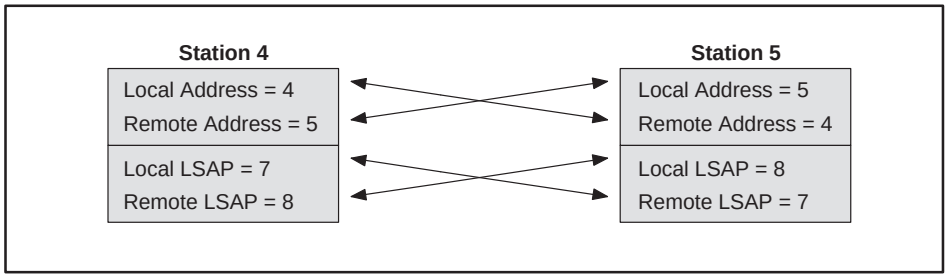

Figure 1-6 Example Connection between Stations

Figure 1-7 shows how three stations on a network are configured to communicate. The arrows represent logical connections between the stations on the network.

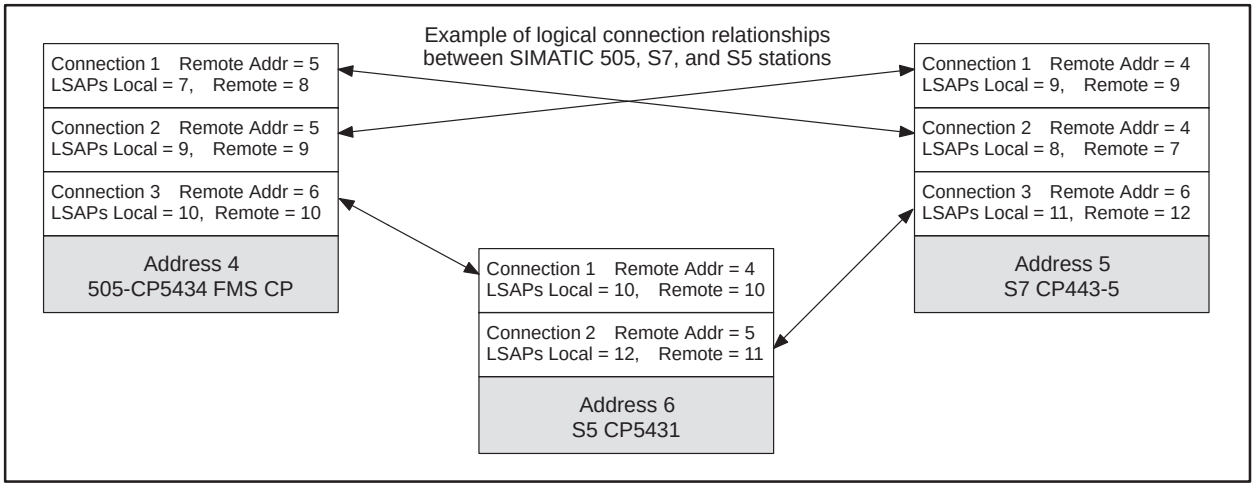

Figure 1-7 Logical View of a Network

Chapter 2

Installing the Module

2.1 Overview of Installation

Flow of Tasks

Follow the flow of tasks shown in Figure 2-1 when installing the FMS CP module.

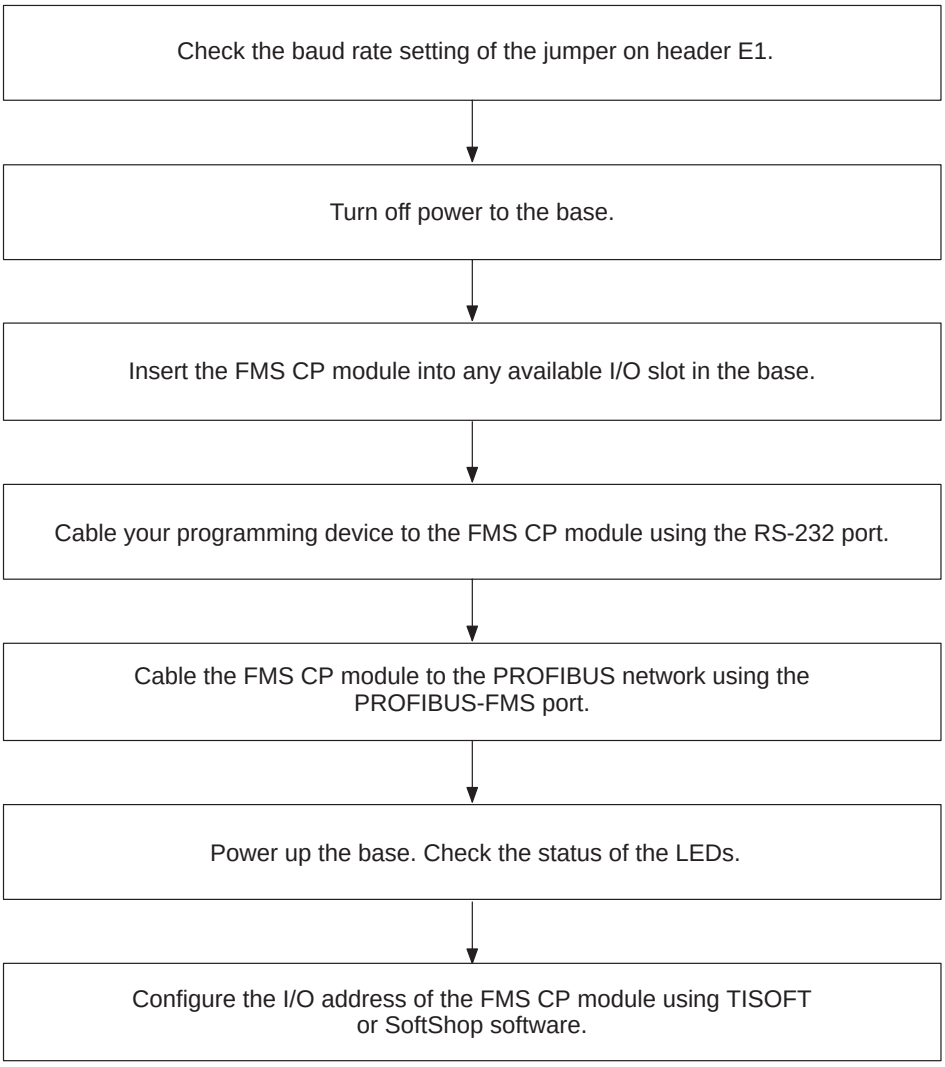

Figure 2-1 Installation Flowchart

The following sections describe these installation tasks in detail. After these tasks are completed, you are ready to install the COM5434 Configurator software, as described in Section 5.1.

⚠ CAUTION

Electronic equipment is sensitive to, and can be damaged by, electrostatic discharge.

Ensure that personnel follow the precautions described below to avoid damaging the FMS CP module by electrostatic discharge.

Handling the Module

Integrated circuits are susceptible to damage by the discharge of static electricity. Take the following precautions to avoid damaging the FMS CP module by electrostatic discharge while handling:

- Transport the FMS CP module in an anti-static container, such as the anti-static bag in which the module was originally shipped.
- Ensure that personnel make contact with a static-dissipative pad and/or wear a grounded wrist strap when handling the module.

Visual Inspection

If the FMS CP module and/or the configurator software diskettes are visibly damaged (bent or broken), contact your vendor for replacement.

2.2 Setting the Baud Rate for the RS-232 Port

Setting the Jumper on Header E1

A header labeled E1 is located on the module, as shown in Figure 2-2. The header determines the baud rate for the RS-232 port, and the jumper must be set before the module is installed in the base.

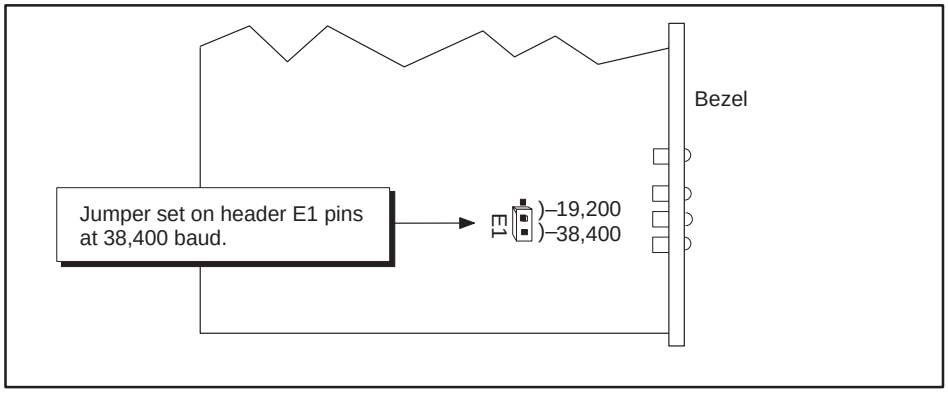

Figure 2-2 Location of Header E1

The RS-232 port can be set at 9600 baud (no jumper), 19,200 baud, or 38,400 baud (as shown in Figure 2-2). The default setting of Header E1, as shipped, is 38,400 baud. To set the RS-232 port at 9600 baud, the jumper must not connect two header pins. However, in order not to lose the jumper, the jumper should be stored on the module by hanging it on one pin only (as shown in Figure 2-3).

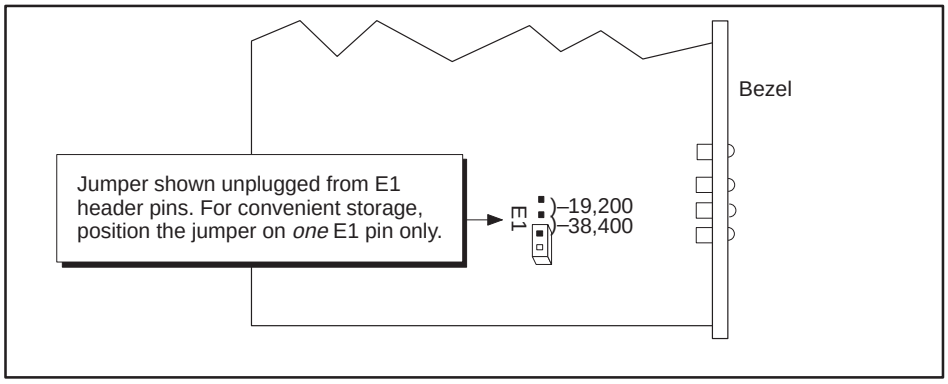

Figure 2-3 Jumper Storage at 9600 Baud

Header E2

Header E2 is shipped without a jumper, and is for factory use only. Do not alter the state of Header E2 unless instructed to do so by a Siemens Technical Support technician.

2.3 Inserting the FMS CP Module

⚠ WARNING

Electrical shock hazard is possible if you do not turn off all power to the base before attempting to insert the module.

Failure to turn off power to the base could result in death or serious injury to personnel, and/or damage to equipment.

Ensure that power is off in the base before attempting to insert the module.

Inserting the FMS CP Module

The FMS CP module is a single-wide module. You can insert it into any I/O slot in a Series 505 I/O base. Follow these steps to install the module:

1. Turn off all power to the base and the modules.
2. Hold the top and bottom of the bezel and slide the module into the slot, pushing it all the way into the base. You will feel a slight increase in resistance as the module connects with the back-plane connector.
3. Use a flat-head screwdriver to tighten the screws at the top and bottom of the bezel, as shown in Figure 2-4. Note the minimum torque required in order for the bezel screws to provide electromagnetic shielding.

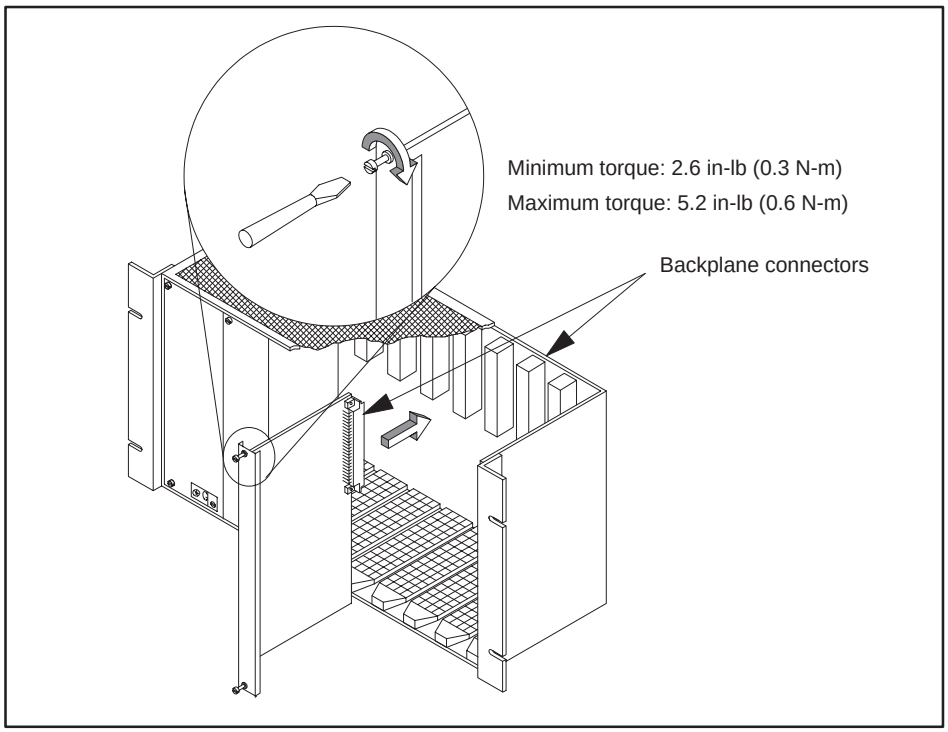

Figure 2-4 Inserting the Module into the Base

2.4 Connecting a Programming Device to the FMS CP Module

Connecting to the RS-232 Port

The RS-232 port is the interface between your programming device, such as a personal computer (PC), and the FMS CP module. Using your PC and the RS-232 port, you can configure the module.

To connect your PC to the FMS CP module, use a standard 9-pin RS-232 cable that conforms to the pinouts shown in Figure 2-5. A standard 505 programming cable that conforms to the serial cable requirements and pinouts is available through Siemens; specify PPX:2601094–8001.

NOTE: You can also use the RS-232 port on the FMS CP module to configure the programmable logic controller through the backplane using applications such as TISOFT. This feature is particularly useful if access to the RS-232 port on the CPU is limited.

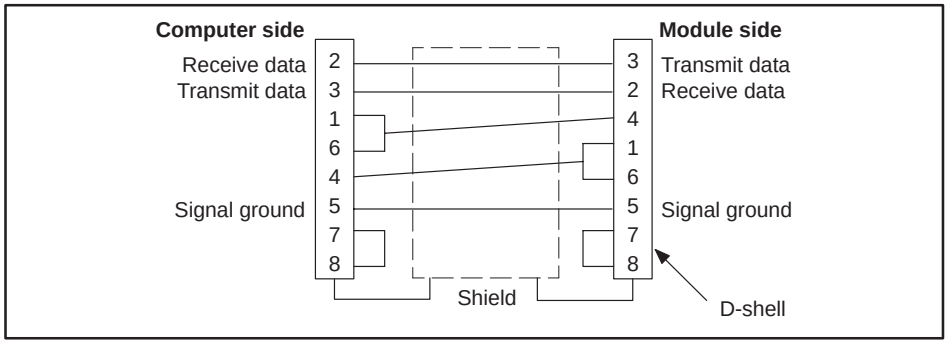

Figure 2-5 RS-232 Port Cable Pinouts

Connecting the Serial Cable

Connect one end of the RS-232 cable to the appropriate 9-pin RS-232/423 serial port on your PC and the other end to the 9-pin RS-232 port on the FMS CP module, as shown in Figure 2-6. If your computer does not have a 9-pin port, use a 25-to-9-pin converter.

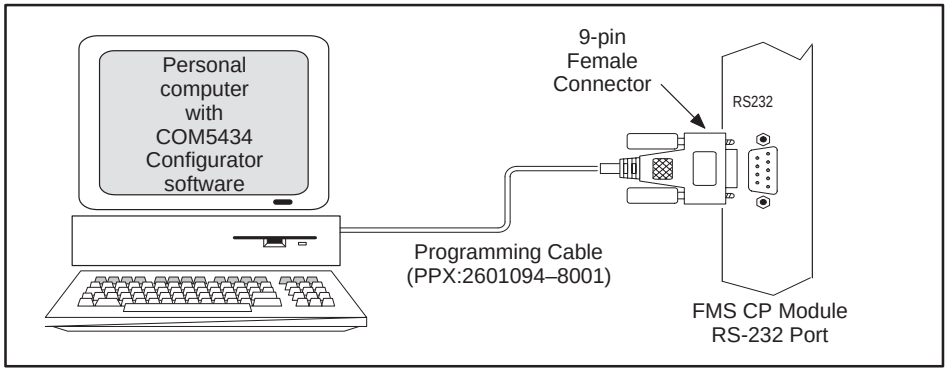

Figure 2-6 Connecting Your Computer to the FMS CP Module

2.5 Connecting the FMS CP Module to the Network

The PROFIBUS-FMS port is the interface between the FMS CP module and the PROFIBUS network. To connect the FMS CP module to the network, use a standard 9-pin RS-485 cable that conforms to the pinouts shown in Figure 2-7.

PROFIBUS-FMS Port Pinout

Figure 2-7 shows the pinouts for the PROFIBUS-FMS port on the FMS CP.

NOTE: Pins 2 and 7 are "No Connect." For some PROFIBUS products, these pins are used to provide 24 VDC for powering a programming or configuration tool. Such tools are not powered by the FMS CP module. It is acceptable for an externally-powered PROFIBUS programming or configuration tool to drive pins 2 and 7 to 24 VDC.

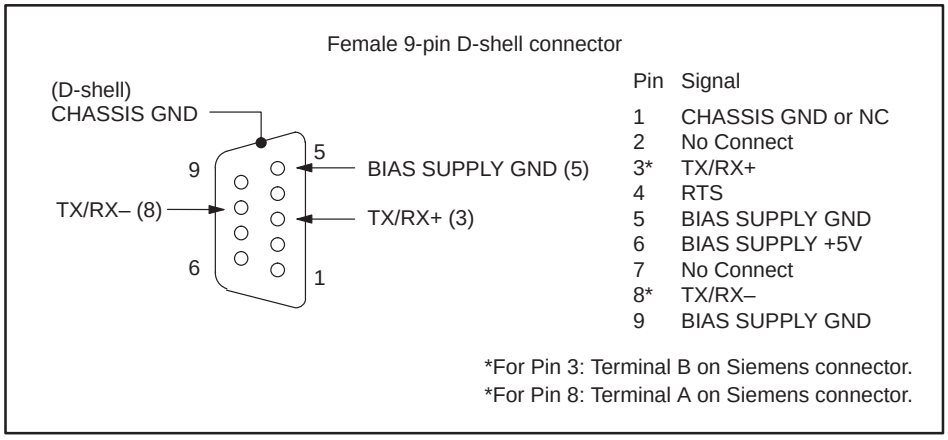

Figure 2-7 PROFIBUS-FMS Port Pinouts

⚠ CAUTION

Pin 5 (BIAS SUPPLY +5V) and Pin 6 (BIAS SUPPLY GND) on the PROFIBUS-FMS connector are designed to support the PROFIBUS-FMS network only. These pins have a limited output power capability of approximately 0.45 W, which greatly exceeds the typical PROFIBUS-FMS load; nonetheless, it is possible to overload these pins, causing internal component damage.

If the pins are overloaded, the PROFIBUS-FMS port can be rendered non-functional, requiring the unit to be returned to the factory for repair.

Do not overload the pins on the PROFIBUS-FMS connector.

Connecting to the Network

Connect the PROFIBUS cable connector to the PROFIBUS port on the FMS CP module. See Section 3.3 for information on connecting PROFIBUS cables and connectors. Standard cable connectors are available from Siemens. See Section 3.1 for ordering information of PROFIBUS connectors.

2.6 Powering Up the Base

Supplying Power to the Base

Refer to the system manual for your programmable logic controller for information on installing and wiring the power supply in the base. Follow all installation guidelines and safety precautions described in your system manual before powering up the system.

> **⚠ WARNING**
>
> **Electrical shock hazard is possible if you are not fully informed about safety precautions before you wire and/or power up the base.**
>
> **Failure to follow safety guidelines could result in death or serious injury to personnel, and/or damage to equipment.**
>
> **Review and comply with all warnings and proceedures in the system manual for your base before powering up.**

When you power up the base, the FMS CP module executes a diagnostic check. The diagnostic check takes a maximum of 30 seconds.

LED Status after Power-up

After powering up the base, observe the status of the LEDs on the bezel of the FMS CP module. The status of the LEDs is shown in Table 2-1.

NOTE: When you power up the module for the first time, the LEDs display as Stop With Fault. This is normal because you have not yet configured the module's flash memory.

Table 2-1 LED Status Diagnostic Chart

Mode of Module	LED Indicator			
	MOD GOOD	RUN	STOP	FAULT
Startup	on	flashing	on	off
Run	on	on	off	off
Stopping	on	on	flashing	off
Stop	on	off	on	off
Stop with Fault	on	off	on	on
Firmware Fault	on	off	off	on
Firmware Load	on	on	on	flashing
Fatal Error	flashing	flashing	flashing	flashing

LED Status in Operating Modes

The operating modes of the FMS CP module, which are indicated by the LED status, are defined below:

- Startup: Power-up initialization is in progress.
- Run: Normal operation.
- Stopping: Stopping is a transition state and takes a few seconds. This mode is selected by means of either the RUN/STOP switch or the COM5434 Configurator. Communications are interrupted, and all communication jobs and client/server functions are being terminated. The module cannot be configured at this point.
- Stop: This mode is selected by means of either the RUN/STOP switch or the COM5434 Configurator. Communications have been interrupted, and all communication jobs and client/server functions have been terminated. The module can be configured at this point.
- Stop with Fault: In this mode, the Run mode is not possible because of incorrect configuration data. This may be due to conflicting parameters or duplicate station addresses. Disconnect the cable while reconfiguring the module to clear the fault condition.
- Firmware Fault: Firmware validation has failed, and a firmware download to the module is required.
- Firmware Load: A firmware download to the module is in progress.
- Fatal Error: The module failed due to defective hardware or firmware, and may need to be replaced. First try a Reset. If pressing the Reset button does not restore normal operation, contact your distributor.

2.7 Configuring the I/O Address in the Programmable Logic Controller

After installing the FMS CP module in the base, you need to register the I/O starting address of the FMS CP module in your programmable logic controller memory. The module does not automatically register its I/O address in the programmable logic controller.

NOTE: Even though the module may appear to be operating correctly, if it is not configured in the I/O map, it cannot support communication jobs or Peerlink transfers, and server function requests run slowly.

To configure the I/O map and verify controller-to-module communications, connect a programming device with base configuration software (for example, TISOFT) to the programmable logic controller, and follow the steps below. For detailed instructions about using TISOFT to configure the I/O slot in the base, see the *SIMATIC 505 TISOFT2 Release 6.0 User Manual*, PPX:TS505–8101–6 or higher.

NOTE: Ensure that the FMS CP module successfully completes power-up initialization before you attempt to configure the I/O slot in the base.

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1. In TISOFT, access the Configure I/O function menu.
2. Select the appropriate channel and base number.
3. Execute the Read Base function.

   The module appears as a 4 WX 4 WY Special Function module, as shown in Figure 2-8. It uses 8 I/O address locations.
4. Assign the starting I/O address and write the completed I/O configuration to the programmable logic controller memory, using the Write PLC function.

NOTE: Because discretes and words do not share the same image register addresses, the slot 02 entry in Figure 2-8 could be address 0001.

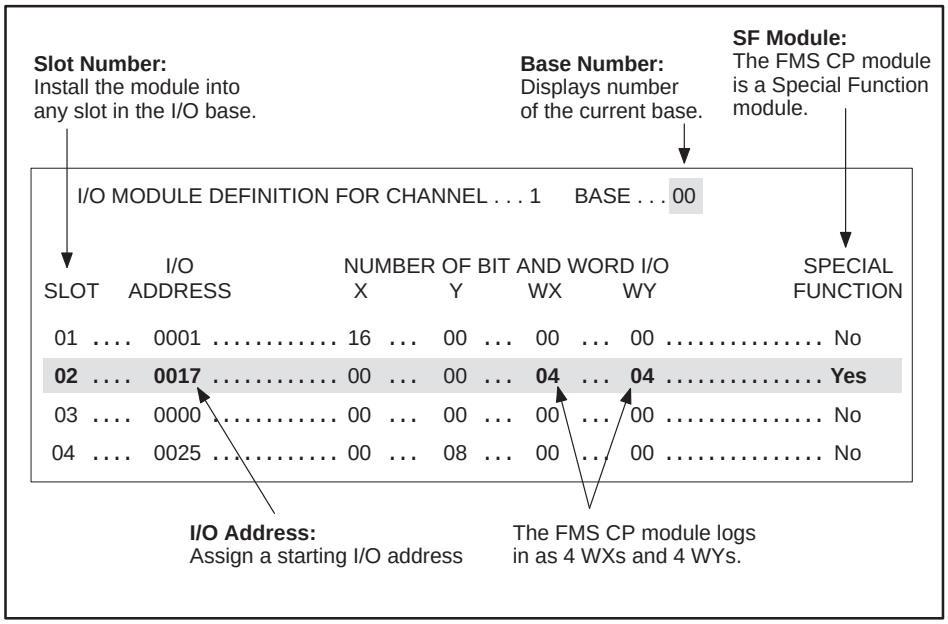


Figure 2-8 Sample I/O Module Definition Chart in TISOFT

2.8 PROFIBUS Network Card and Software Packages

You must install one of the PROFIBUS card/software packages listed in Table 2-2 on your PC in order to allow it to communicate with the FMS CP module on a PROFIBUS network. Consult the documentation provided with each package for information on installing the hardware and software.

Table 2-2 PROFIBUS Network Card/Software Packages

PROFIBUS Card	Software Package
CP 5412 (A2) 6GK1 541-2BA00 (PC-AT card)	S7-5412/Windows 95 6GK1 702-5CH00-3AA0 S7-5412/Windows NT 6GK1 702-5CB00-3AA0
CP 5511 6GK1 551-1AA00 (PCMCIA card)	SOFTNET S7/Windows 95/NT for PROFIBUS 6GK1 704-5CW00-3AA0
CP 5611 6GK1 561-1AA00 (PCI card)	

NOTE: When editing the S7 configuration on your PC, specify 01 00 for the remote TSAP of the CP 5434 FMS module.

Chapter 3

Connecting the Network

3.1 Cables and Connectors

This section describes products available from Siemens that are used to set up a PROFIBUS-FMS network.

NOTE: Product availability is subject to change. To ensure that the cables, connectors, and repeaters you choose are physically compatible with the other components you select, consult the newest edition of Siemens' *SIMATIC NET Industrial Communications Networks, Catalog IK 10*.

If you use PROFIBUS LAN products produced by vendors other than Siemens, be sure to check that all the products you select are compatible.

PROFIBUS Cable

As shown in Figure 3-1, PROFIBUS cable is shielded, twisted-pair with circular cross-section. Due to double-shielding, PROFIBUS cable is particularly suited for industrial environments. Grounding continuity is implemented through the outer shield of the cable. A standard cable that conforms to the PROFIBUS cable requirements is available through Siemens; specify 6XV1 830-0AH10.

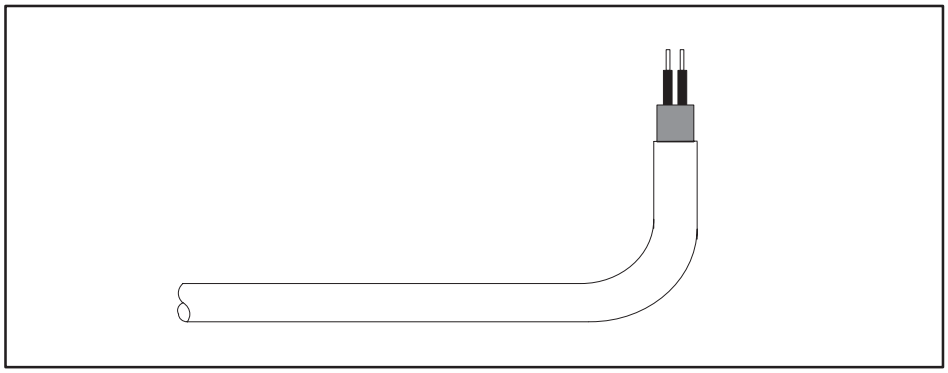


Figure 3-1 PROFIBUS Twisted-Pair Cable

PROFIBUS Bus Connectors

Standard cable connectors that conform to the PROFIBUS requirements are shown in Figure 3-2. The following standard cable connectors are available from Siemens:

- 6ES7 972-0BA10-0XA0 (for vertical connector without PG connector, 9.6 Kbits to 12 Mbits)
- 6ES7 972-0BB10-0XA0 (for vertical connector with PG connector, 9.6 Kbits to 12 Mbits)

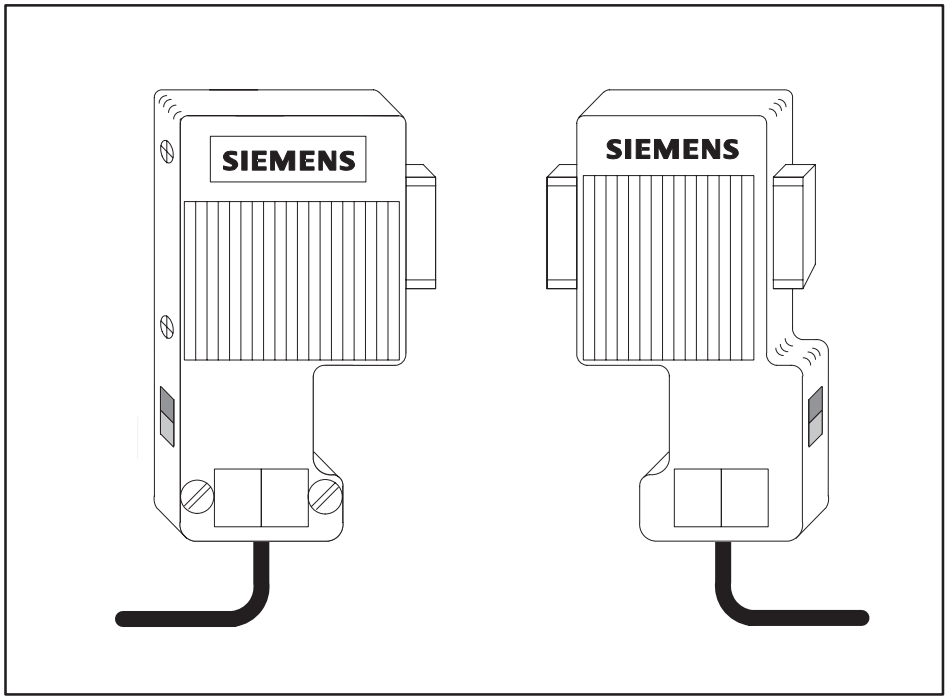


Figure 3-2 PROFIBUS Bus Connectors

PROFIBUS Repeater

A PROFIBUS repeater available from Siemens is shown in Figure 3-3. The repeater connects two RS-485 segments, enabling expanded physical networking. Nine repeaters may be used in a series. A standard PROFIBUS repeater is available from Siemens; specify 6ES7 972-0AA00-0XA0 (9.6 Kbits to 12 Mbits).

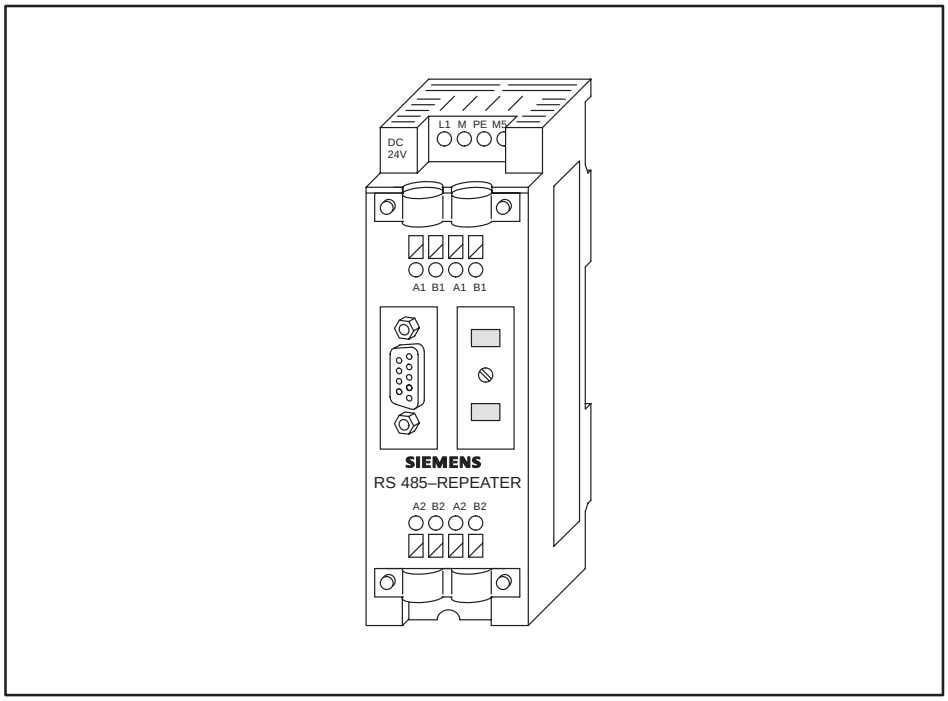


Figure 3-3 PROFIBUS Repeater

3.2 Cable Routing

Guidelines

Follow these suggestions when planning your cable routing.

- Allow for system growth. Provide for attachment of future bases by routing cable through all possible areas of plant expansion.
- Take steps to bypass or eliminate noise sources in order to reduce system data error rates. The following are common sources of electrical noise:
  - ☐ Power distribution mains
  - ☐ Arcing motors and motor starters
  - ☐ Fluorescent lighting
  - ☐ Undesired signal transfer between adjacent circuits
  - ☐ Poor terminations of cable connector
- Do not allow cable to come into contact with any other electrical conductor.
- If cabling is installed inside a conduit, the conduit should be grounded according to applicable electrical codes.

Cable Routing Methods

The type of routing is usually determined by the type of building in which the cables are being installed. Any combination of the following may be used to route the cables: under-floor, in-ceiling, or surface duct.

⚠ WARNING

Electrical and fire safety must be considered in planning the installation.

Safety codes exist to limit the danger of fire and smoke hazards caused by cable installations.

To ensure safety compliance, observe local installation code guidelines.

Under-Floor Routing

In under-floor routing, the cable can be enclosed in ducts or, with raised flooring, in the open air.

- Duct systems are better protected against unauthorized taps or terminal blocks, but expansion is more difficult and expensive than with open air systems.
- Open air systems provide more freedom of access, and allow maximum system expansion flexibility.

Cable Routing (continued)

In-Ceiling Routing

For in-ceiling routing, cables are usually supported in troughs or with hooks and clamps every 10 to 15 feet (3 to 4.5 m).

Some advantages of in-ceiling routing are listed below.

- Flexibility
- Low-cost installation
- Accessibility of cabling

Some disadvantages of in-ceiling routing are listed below.

- Collection of dust and other debris in ceilings
- Hazardous working conditions in ceilings
- Impracticality for buildings without drop ceilings

Surface Duct Routing

Surface duct routing is usually installed along baseboards or attached to walls at desktop height. While surface duct routing protects cables from both physical and electro-magnetic effects, it usually requires I/O bases to be positioned near a wall.

NOTE: Consult your cable vendor for proper cable-pulling techniques so that no kinks occur in the cable during installation.

3.3 Installing PROFIBUS Cables

Media Options

The PROFIBUS-FMS port provides communication over shielded twisted pair (RS-485) cable media.

System Layout

Figure 3-4 shows a sample system layout for the PROFIBUS network.

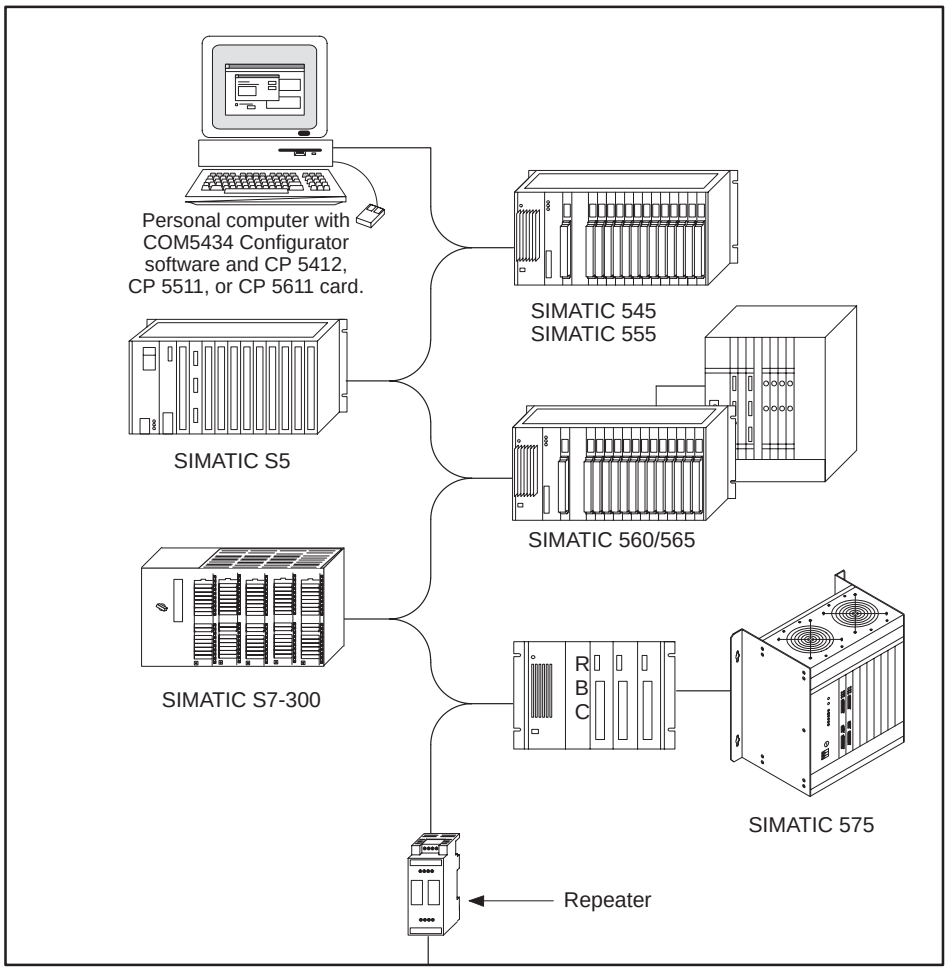


Figure 3-4 Sample System Layout for PROFIBUS-FMS

PROFIBUS Cable Specifications

Table 3-1 lists the PROFIBUS EN 50 170 cable line specifications.

Table 3-1 PROFIBUS Cable Specifications

Feature	Specification
Impedance	135 Ohm to 165 Ohm (3 MHz to 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 AWG to 22 AWG (0.3 mm^2 to 0.5 mm^2)
Cable Diameter	0.315 in. ± 0.02 in. (8 mm ± 0.5 mm)

PROFIBUS Line Length Limits

Up to 10 bus segments can be connected in series. Line length limits are determined by baud rate. The distance between the two most widely separated stations must not exceed the values shown in Table 3-2. Use repeaters between each cable segment. (For fiber-optic cable line length limits, consult the newest edition of Siemens' *SIMATIC NET Industrial Communications Networks, Catalog IK 10*.)

Table 3-2 PROFIBUS Line Length Limits

Baud Rate	Maximum Segment Length	Maximum Installation Length
9.6 to 93.75 KBaud	3,930 ft. (1,200 m)	39,300 ft. (12,000 m)
187.5 KBaud	3,280 ft. (1,000 m)	32,800 ft. (10,000 m)
500 KBaud	1,310 ft. (400 m)	13,100 ft. (4,000 m)
1.5 MBaud	660 ft. (200 m)	6,600 ft. (2,000 m)
3 Mbaud to 12 MBaud	330 ft. (100 m)	3,300 ft. (1,000 m)

Installing PROFIBUS Cable

The rules for proper PROFIBUS installation follow:

- Create a daisy-chain arrangement, not a star arrangement.
- You can connect up to 32 devices on one cable segment. Each repeater counts as a device.
- Do not run the cables near power wires.
- 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.
- Do not cross the TX/RX+ signals and the TX/RX– signals. Wire all of the TX/RX+ pins (terminal B on the Siemens connectors) together. Wire all of the TX/RX– pins (terminal A on the Siemens connectors) together. Crossing the wires at any point in the system causes communication problems.
- Proper termination and bias of PROFIBUS cable is important for reliable communication. The device at each end of a PROFIBUS cable segment must be terminated and biased; any devices connected between the end nodes of a segment must not be terminated or biased. See the following pages for more information about termination and bias.
- All PROFIBUS cable connectors must be properly grounded. With a Siemens PROFIBUS connector, proper grounding is accomplished when the bare cable shield contacts the metal connector ground.
- Tighten screws on all PROFIBUS connectors throughout your system to a maximum torque of 8 in-lb (0.9 N-m) in order to ensure a good ground connection.

Termination and Bias

The device at each extreme end of a PROFIBUS cable must be terminated and biased; any connections made between segment ends must not be terminated or biased. See Figure 3-5.

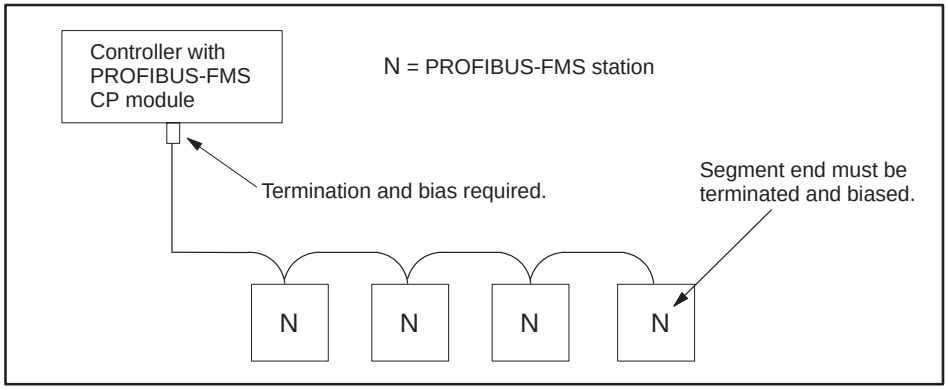


Figure 3-5 Terminate the Network at the Endpoints

Using a Termination Selection Switch

Siemens PROFIBUS connectors have selectable termination and bias built in. The connectors are designed to handle baud rates from 9600 baud to 12 Mbaud and have an external switch (see Figure 3-6). You set the selection switch to the On position to enable termination and bias, or Off to disable termination and bias.

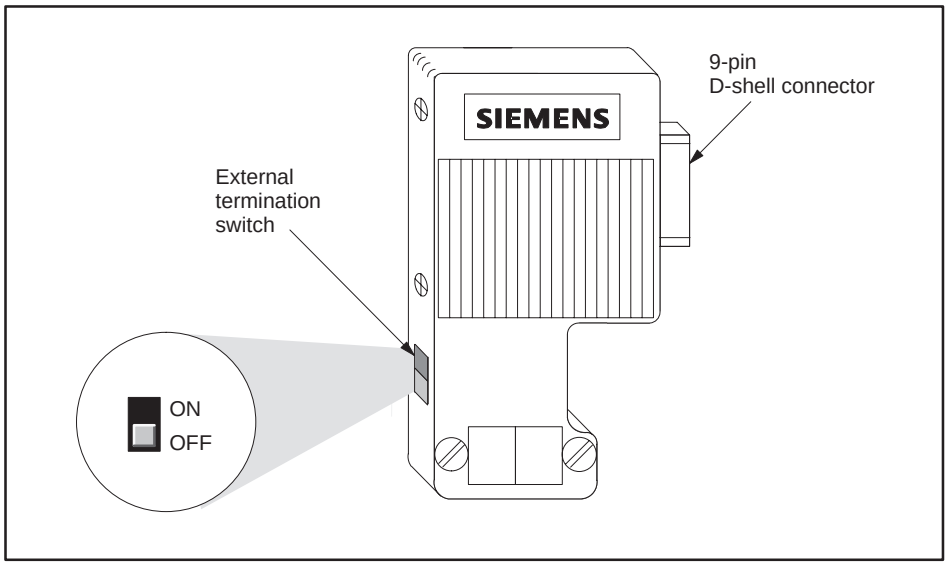


Figure 3-6 Siemens Connector, External Termination Switch

PROFIBUS Connector Schematics

Figure 3-7 shows the schematic for PROFIBUS connectors designed to handle all baud rates, from 9600 baud to 12 Mbaud.

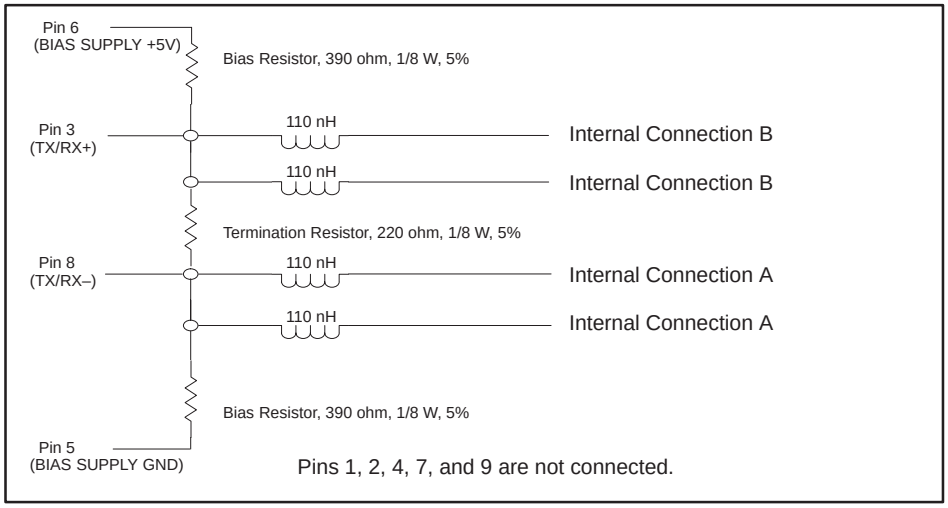


Figure 3-7 9600 baud to 12 Mbaud Connector Schematic

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

Installing a PROFIBUS Connector

The following procedure describes how to attach a Siemens PROFIBUS connector to your cable. Also consult the instructions that come with your specific Siemens connector.

1. Open the connector housing by loosening both housing screws (see Figure 3-8).

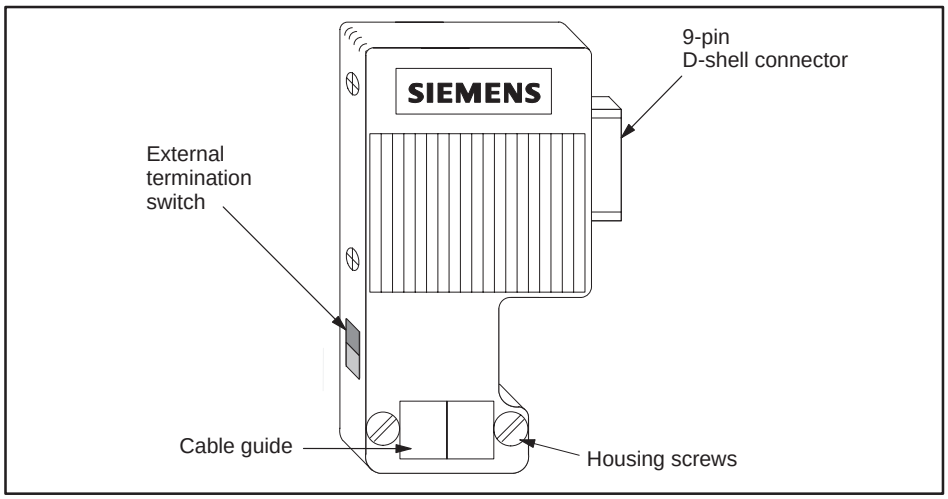


Figure 3-8 Typical PROFIBUS Connector

2. Remove the cover of the housing.

3. Remove 1.25 inches (30 mm) of the cable sheath to expose the shielding below. See Figure 3-9.

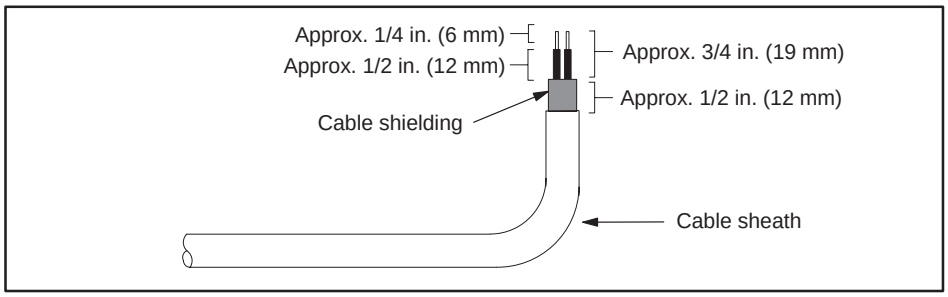


Figure 3-9 Stripping the Wires

4. Remove a 0.75-inch (19 mm) portion of the cable shielding to expose the two signal wires.

   To ensure that the connection is properly grounded, you must leave enough exposed cable shielding (0.5 inches, 12 mm) to make a proper contact with the metal cable guide on the connector. See Figure 3-9.

5. Remove 0.25 inches (6 mm) of insulation at the wire ends.

6. Insert the signal wires into the cable terminals.

   Be sure to connect the same wire color to the TX/RX+ pin for every device throughout your system. Crossing the wires at any point creates communications problems.

7. Set the termination switch to the correct position. See Figure 3-10.

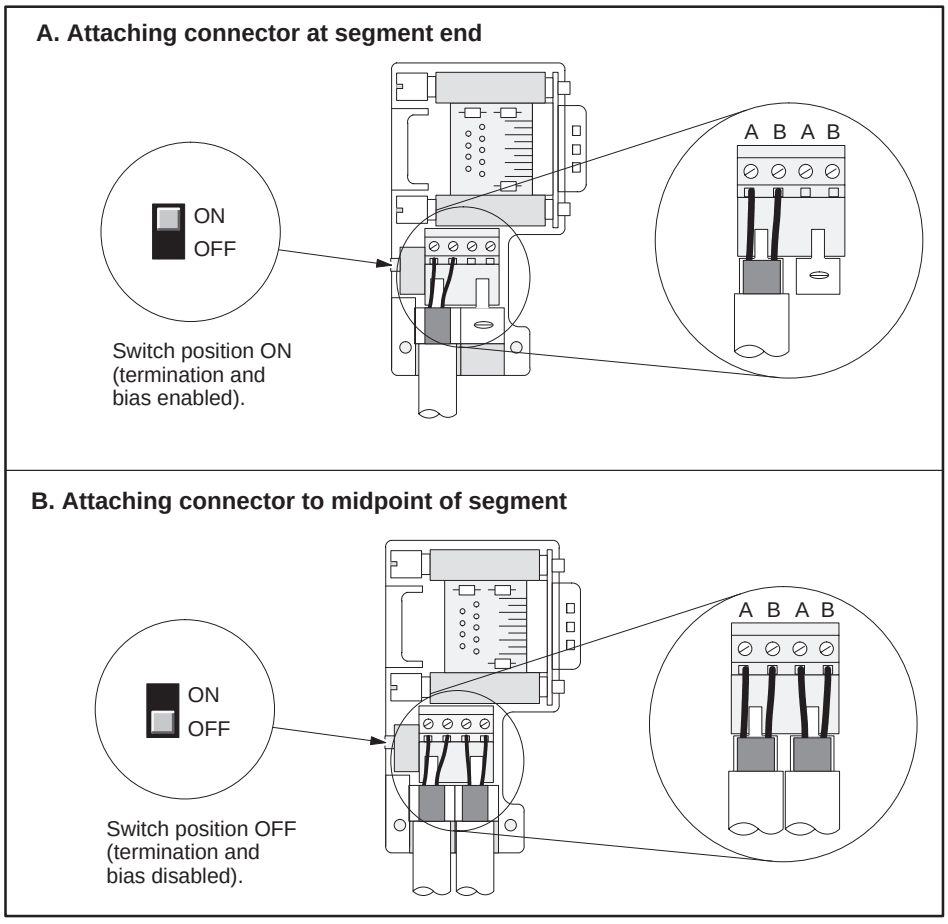


Figure 3-10 Attaching Connector and Selecting Termination

8. Put the cover back on the connector housing.

   Be sure that the bare cable shielding makes contact with the metal cable guide on the connector, to ensure proper grounding for the connection.

9. Tighten the connector housing screws to a maximum torque of 8 in-lb (0.9 N-m) in order to ensure a good connection.

Chapter 4

Communication Services

4.1 Overview

Communication Services

The FMS CP module supports the following types of communication services:

- Fieldbus Message Specification (FMS) services are based on layer 7, the application layer of the OSI 7 Layer model. FMS services use an industry-standard, open protocol, which allows for communication between SIMATIC and third-party FMS devices.
- Send-Receive services are based on layer 2, the data link layer of the OSI 7 Layer model, a flexible, lower-level protocol (using bytes as opposed to named variables). Because Send-Receive services use layer 2, transmission is limited to a single network segment. Send-Receive services are supported by the module to allow for communication between the FMS CP module and Send-Receive devices, such as S5.
- S7 services are based on layer 7, the application layer of the OSI 7 Layer model. S7 services use a proprietary protocol for communication between SIMATIC S7 devices.
- Peerlink II services are based on layer 2, the data link layer of the OSI 7 Layer model. Because Peerlink II services use layer 2, transmission is limited to a single network segment. Peerlink II services are supported by SIMATIC 505 only. Peerlink II offers more flexibility with greater data handling ability than Peerlink.

These services can all be used concurrently up to the network capacity.

Functional Modes of Communication

The FMS CP module can act as a client or as a server when you configure FMS and Send-Receive services; it can initiate, or respond to, requests for data. The FMS CP module acts only as a server for S7 services, responding to remote requests from S7 devices on the network (see Table 4-1).

Table 4-1 Service Modes of the FMS CP Module

Service	Client	Server
FMS Services	YES	YES
Send-Receive Services	YES	YES
S7 Services	NO	YES

Connections

Connections are the logical links between stations on the network. You define connections for the FMS CP module using the COM5434 Configurator. The FMS CP module supports the following connection types:

- FMS connections
- FDL connections
- S7 connections (as server only; connections are not configured in the FMS CP module, and have no associated jobs)

You must define connections before you can define communication jobs.

Communication Jobs

A communication job is a pre-defined collection of variables that can be triggered within the user program to read from or write to another network station. Communication jobs allow you to use the FMS CP module as a client to transfer complex data over logical links on the network. You configure communication jobs using the COM5434 Configurator. The FMS CP module supports the following job types:

- FMS jobs
- Send-Receive jobs

Peerlink II Services

Peerlink II services allow the global broadcast of data (up to 234 bytes) on your network to other SIMATIC 505 FMS CP modules. You configure Peerlink II services using the COM5434 Configurator. The FMS CP supports the following Peerlink II services:

- Transmission of 1 peer block
- Reception of up to 31 peer blocks

Server Functions

Server functions allow the FMS CP module to respond to requests received from clients on the network. The FMS CP module supports the following functions:

- FMS server functions — require you to configure FMS variables using the COM5434 Configurator.
- S7 server functions — require no job or variable configurations.

Communication between the PLC and the FMS CP Module

The FMS CP module is registered in the I/O memory map of its controller as a 4 word input (WX) and 4 word output (WY) Special Function (SF) module. You must assign the starting I/O address, as described in Section 2.7, in order for the programmable logic controller to be able to communicate with the FMS CP module.

NOTE: The designations WX1, 2, 3, 4 and WY5, 6, 7, 8, shown in the COM5434 Configurator, are relative to the actual starting address that you assign in TISOFT or SoftShop for the slot where the FMS CP module is installed. (See Section 2.7.) For example, if you assign 9 as the starting address, then the programmable logic controller reads WX1, 2, 3, 4, and WY5, 6, 7, 8 as WX9, 10, 11, 12 and WY13, 14, 15, 16. Of course, if you configure the starting address as 1, the actual addresses match the relative addresses shown in the COM5434 Configurator.

Each bit in the first three words corresponds to a job. For example, if WX1 is configured as the first word input and WY5 is configured as the first word output for the module, then bit 1 in WY5 is the Job Start Bit for Job1, while bit 1 in WX1 is the Job Active Bit for that same Job1 (see Figure 4-1).

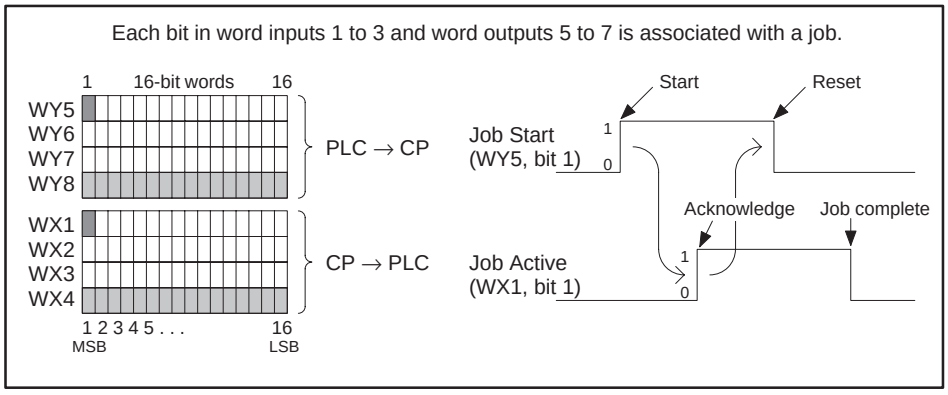


Figure 4-1 Communication between the PLC and the FMS CP Module

These bits are used to synchronize (handshake) communication between the user program and the FMS CP module during communication jobs.

- The Job Start Bit is a user-selected bit in one of the available output words (WY) assigned to the FMS CP module. The Job Start bit is used in the user program to trigger a data transfer job. The FMS CP module must see a 0 to 1 transition on the Job Start Bit to begin a data transfer job.

- The Job Active Bit is a corresponding bit in the input word (WX) set by the FMS CP module. The Job Active bit signals that a requested data transfer job is in progress. When this bit goes back to 0, the controller knows that the job has been completed and can then initiate another job by setting the corresponding WY bit to 1.

- The bits in the first three output words assigned to the FMS CP module are available as the Job Start Bits. In this example, any of the 48 bits in WY5, WY6, and WY7 can be used as the Job Start Bit for a job as needed. The corresponding bit in WX1, WX2, or WX3 (the Job Active Bit) signals a job in progress.

The handshaking, or synchronizing, of a job such as the one shown in Figure 4-1 can be summarized as follows:

1. With the WY bit set to 0, the programmable logic controller must wait for the corresponding WX bit to become 0 before a job can be initiated.

2. The controller sets the WY bit from 0 to 1 to trigger the job.

3. The FMS CP module registers the rising edge on the WY bit, sets the corresponding WX bit to 1, and starts the job.

NOTE: For a job to execute, the FMS CP module must see the transition of the WY job start bit. Either a reset of the FMS CP module, or a power cycle of the entire programmable logic controller base, may result in the ladder logic program setting a WY job start bit prior to the FMS CP module recovery. When this condition occurs, the FMS CP module does not execute the job.

A timer instruction (TMR or TMRF) may be implemented in the controller. The timer is enabled when the WY job start bit is set. The timer is reset in response to the WX job active bit. If the WX job active bit never responds to a WY job start bit, the timer is allowed to time out and clears the current WY job active bit. The next execution of the ladder logic starts the WY job start bit under normal operating conditions. To allow ample FMS CP module startup time, set the timer preset value to 30 seconds.

---

4. The programmable logic controller recognizes the WX bit transition to 1, and then resets the WY bit to 0.

5. The FMS CP module completes the job, stores the job status in programmable logic controller V-memory, and, when it sees WY bit reset to 0, resets the WX bit to 0.

6. The programmable logic controller sees WX return to 0, indicating that the job is complete. It can check the status word for errors: if none, the programmable logic controller knows that the data was sent/received successfully.

7. The programmable logic controller can start the job again, whenever it is ready, by repeating the sequence from Step 2.

4.2 Addressing on Your Network

Multiplexed Addressing

PROFIBUS networks use a system of multiplexed addressing (multi-tiered) for connections, as shown in Figure 4-2. The most basic address of a device is the PROFIBUS network station address. The next level of addressing is a Link Service Access Point (LSAP). Each station address is associated with multiple LSAPs.

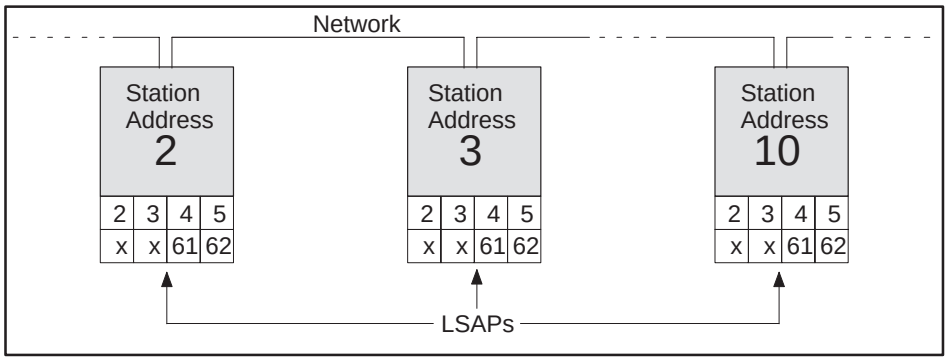


Figure 4-2 Multiplexed Addressing

Station Address

When you set up your network, you assign each device a station address, and then use this address when you configure the FMS CP module.

LSAPs

As shown in Figure 4-2, each device has a number of LSAPs that you use for addressing FMS and FDL connections. Each LSAP can be used for one connection only (except for FMS slaves). Some LSAPs are unavailable because they are dedicated to other functions. If you select an LSAP that has been previously dedicated, you receive a message to select a different LSAP for your connection. Refer to Table A-10 for LSAP assignment restrictions.

For example, an FMS connection could be set up between LSAP 3 on Station Address 2, and LSAP 5 on Station Address 10 (as shown on the example network in Figure 4-3). However, LSAP 3 on Station Address 2 and LSAP 5 on Station Address 10 are then occupied and may not be reused.

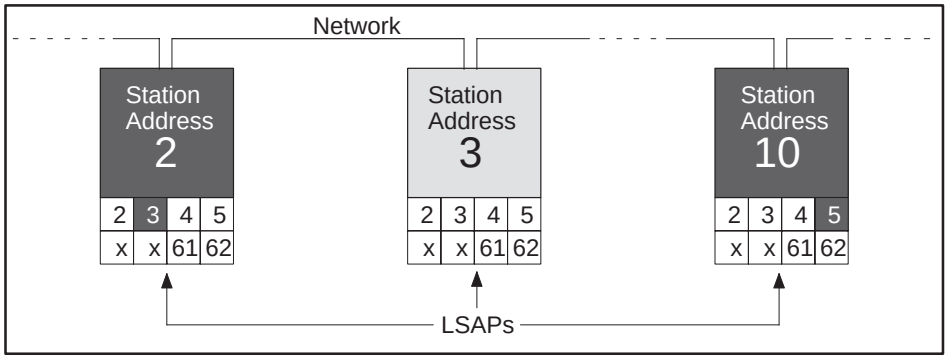


Figure 4-3 Network Addressing Example

4.3 FMS Services

FMS Connections

Before you configure an FMS communication job, you must first define an FMS connection using the COM5434 Configurator. To establish a successful connection, the services of the communication partners must be matched. As requester, you specify the services that you expect from the partner device. As responder, you specify the services you provide for the partner device.

NOTE: The software generates an "Object Dictionary" that contains the names and index numbers of the FMS variables you configure. To enable partners to access variables by name, enable the Get Object Dictionary service when configuring an FMS connection. (Refer to Figure 5-15.)

To define an FMS connection using the COM5434 Configurator, follow the steps described in Section 5.6.

FMS Communication Job Types

The FMS CP module acts as a client (initiator) for the following FMS jobs:

- Read – reads data from a data area of the communication partner specified by a name or index.
- Write – transfers data from a specified local data area to a data area of the communication partner.
- Information Report – allows unconfirmed transmission of variables by an FMS server.
- Status – the partner device sends logical and physical status information that may include the following items: whether communication is possible, for example, CPU is in RUN; physical status of CPU, for example, maintenance is required. (Refer to Section A.3 for more information about Status request responses.)
- Identify – the partner device sends three ASCII strings that provide the following information: name of the device vendor, name of the device model, and revision or version of the device. (Refer to Section A.3 for more information about Identify request responses.)

The FMS job types are described and illustrated in Figure 4-4.

These coordinated client jobs must be configured in the client module. To configure an FMS job, follow the steps described in Section 5.9.

FMS Server Functions

The server station must also be configured to coordinate with the client station. You must configure coordinating FMS connections for all FMS job types, and FMS variables for Read and Write jobs in the server station.

FMS Jobs

Figure 4-4 shows the data flow of each FMS communication job. Each FMS communication job is configured in the shaded module.

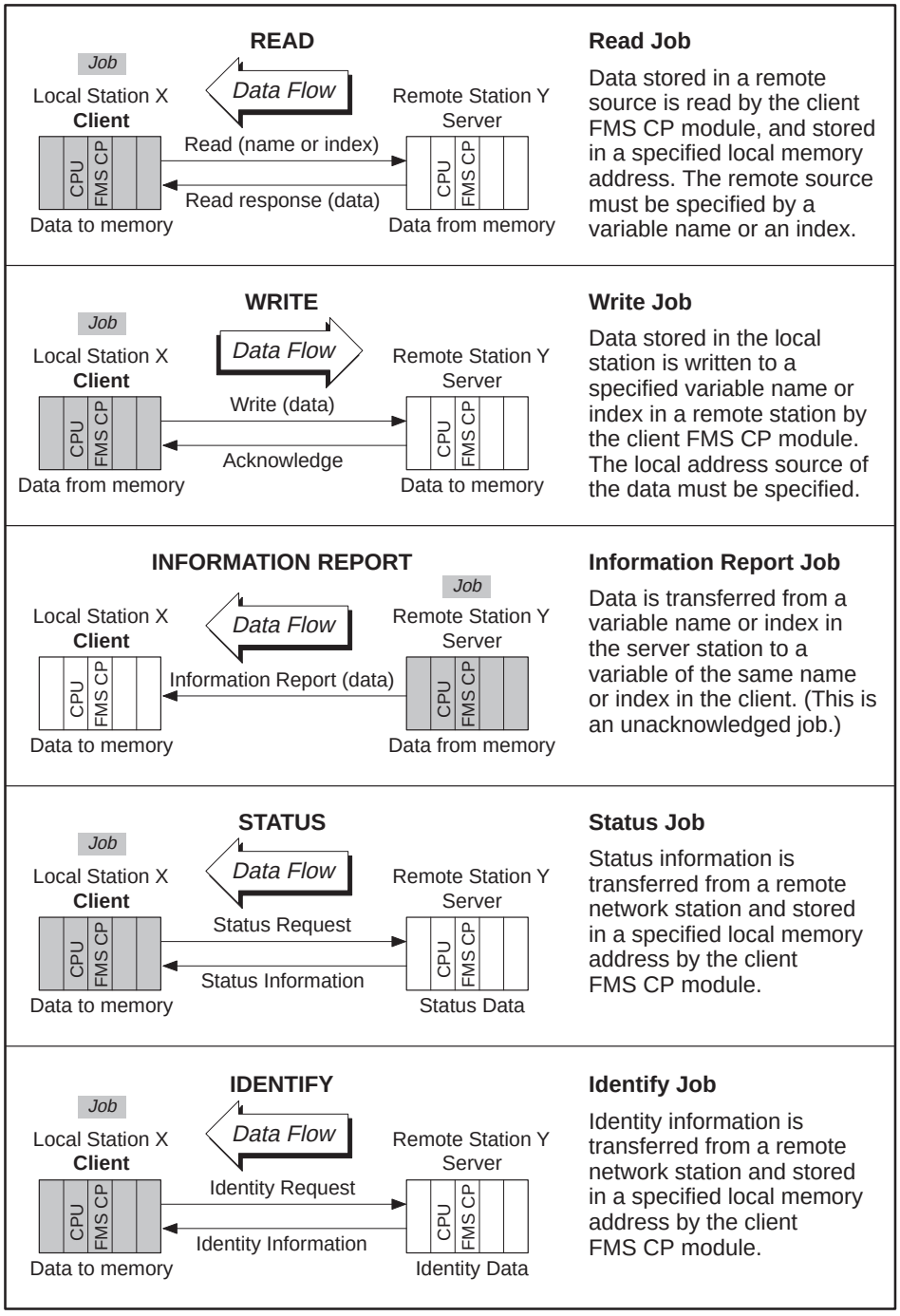


Figure 4-4 FMS Communication Jobs

Specifying Access Rights to Variables in FMS Connections

When you define an FMS connection, you must specify access rights to the variables you have configured (which are listed in the Object Dictionary). Access rights are determined in two ways: passwords and group numbers. (Refer to Figure 4-5.)

Password Access to a variable is only possible with the identical password setting on the partner.

- **0**: The FMS client must specify the password "0" for authorization when the connection is established. Access is possible for *all* FMS clients that specify the password.
- **>0**: The FMS client must specify this password for authorization during connection establishment.

Group Numbers Access to a variable is only possible when at least one group number is selected to match the setting on the partner. Selecting group numbers is a further method for selectively restricting access rights. You assign Groups 0 to 7 for each connection and for each variable.

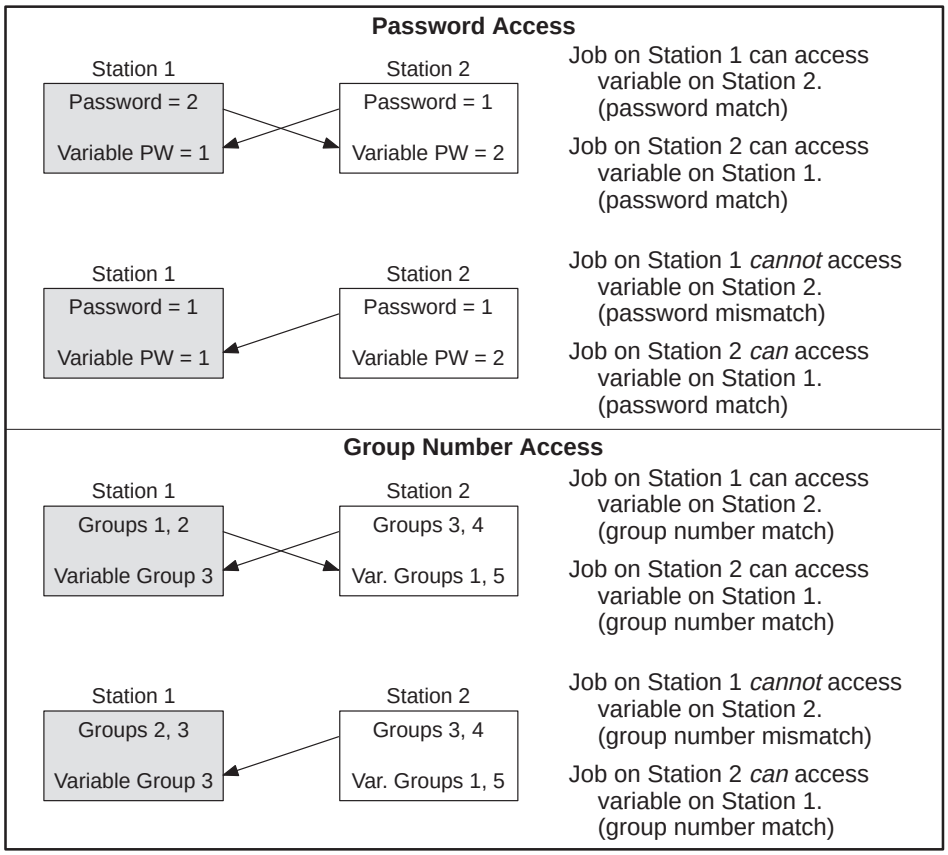


Figure 4-5 Access to Variables via Passwords and Group Numbers

4.4 Send-Receive Services

FDL Connections

Before you configure a Send-Receive job, you must first define an FDL connection using the COM5434 Configurator. To define an FDL connection, follow the steps described in Section 5.7.

Send-Receive Jobs

The FMS CP module supports Send and Receive job types with FDL connections. To configure a Send or Receive job, follow the steps described in Section 5.10.

Figure 4-6 shows the data flow of each Send-Receive communication job. Each job must be configured in both the module executing the Send job and the module executing the Receive job.

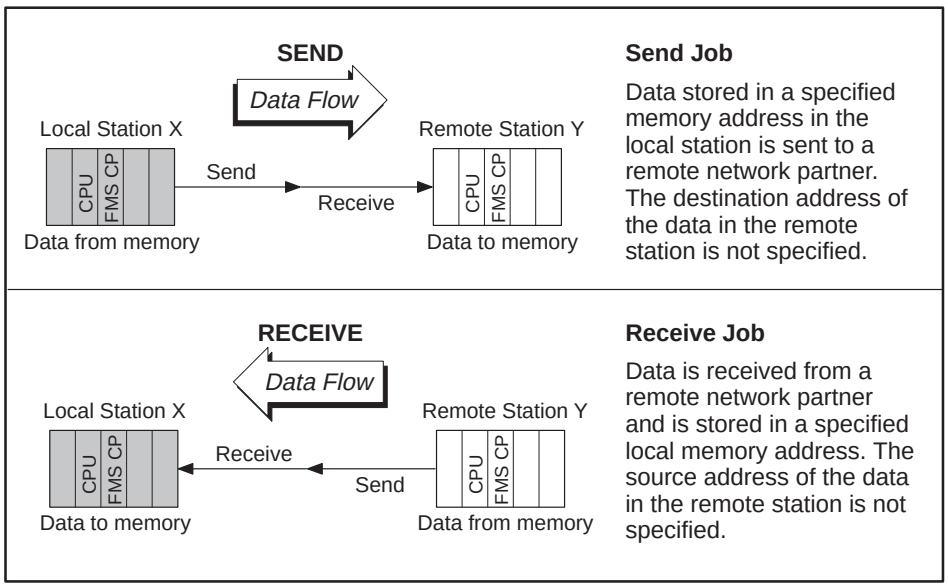


Figure 4-6 Send-Receive Communication Jobs

NOTE: In general, it is best not to configure more than one Send or Receive job for each FDL connection.

⚠ CAUTION

The FMS CP module fails if you try to execute two Receive jobs at the same time on a single FDL connection. Module failure could cause unexpected results in your control application, which could result in personal injury, and/or damage to property.

To avoid this problem, do not program more than one Send or Receive job to execute simultaneously on a single connection.

4.5 Peerlink II Services

Transmitting and Receiving Peer Blocks

Peerlink II is an unacknowledged broadcast service that allows the FMS CP module to transmit one peer block to other stations and receive up to 31 peer blocks from other FMS CP modules on a scan-by-scan (cyclic) basis, as shown in Figure 4-7.

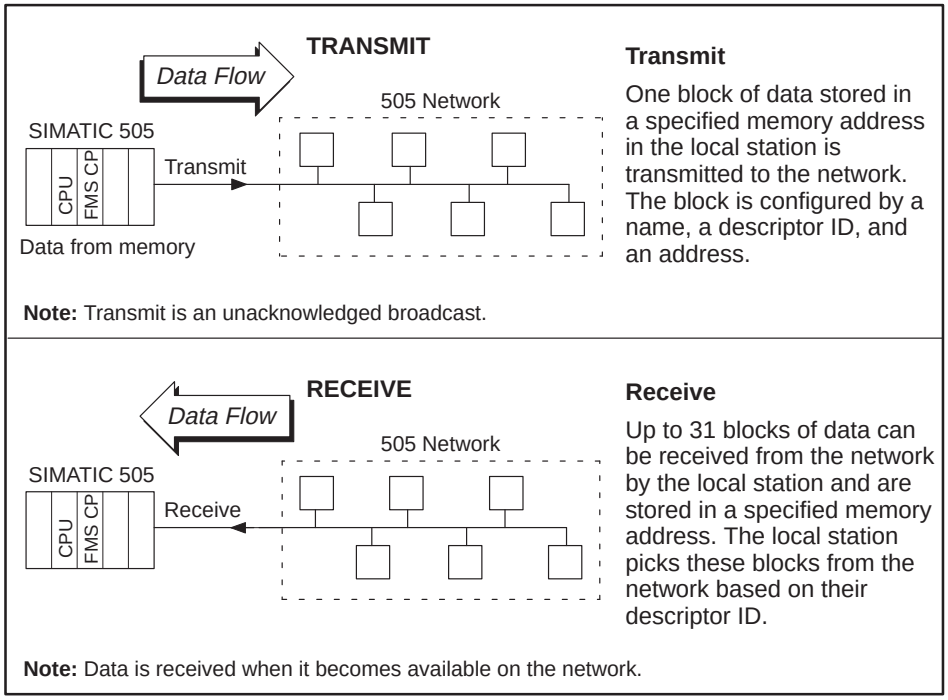


Figure 4-7 Peerlink II Services Data Flow

Transmission Intervals

You configure the interval between transmissions of the data as a number of programmable logic controller scans (see Section 5.5). If the FMS CP module is unable to transmit at the rate selected, it transmits as often as possible. Received data is stored by the FMS CP module. If the FMS CP module is unable to process received data at the rate at which it is received, it stores the most recently processed data.

NOTE: No status information is stored by Peerlink II services. If the FMS CP module is unable to process data at the requested transmission interval rate, the FMS CP module does not generate an error message in the status report. (Refer to Chapter 7 for information on viewing actual peer transmit intervals in the Peer Block Status diagnostics dialog.)

4.6 S7 Services

S7 Services Supported

S7 services allow S7 devices to read and write data in the 505 CPU memory. The FMS CP module also responds to Status requests from an S7 station. S7 services supported by the FMS CP module are shown in Figure 4-8. Refer to Section A.2 for details of S7-to-505 memory addressing.

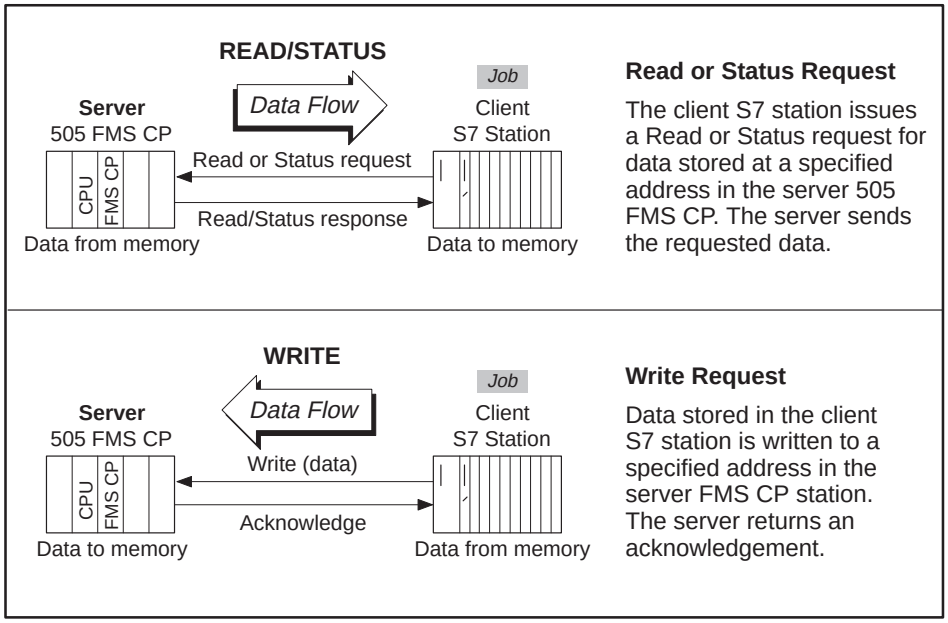


Figure 4-8 S7 Services Supported as a Server

NOTE: The 505 FMS CP module requires no configuration of connections or variables to support S7 read, write, or status request services.

Chapter 5

Using the COM5434 Configurator

5.1 Installing the Software for the FMS CP Module

Software Package

The COM5434 Configurator software package for the FMS CP module is contained on two 3.5-inch disks.

Operating System Requirements

To run the COM5434 Configurator software, the operating system and hardware of your PC must meet the following requirements:

- Windows 95 or Windows NT
- 486 or greater, with at least 8 Mb of RAM

Installing the COM5434 Configurator Software

For Windows 95, you can use the procedure shown in Figure 5-1 to install the COM5434 Configurator software.

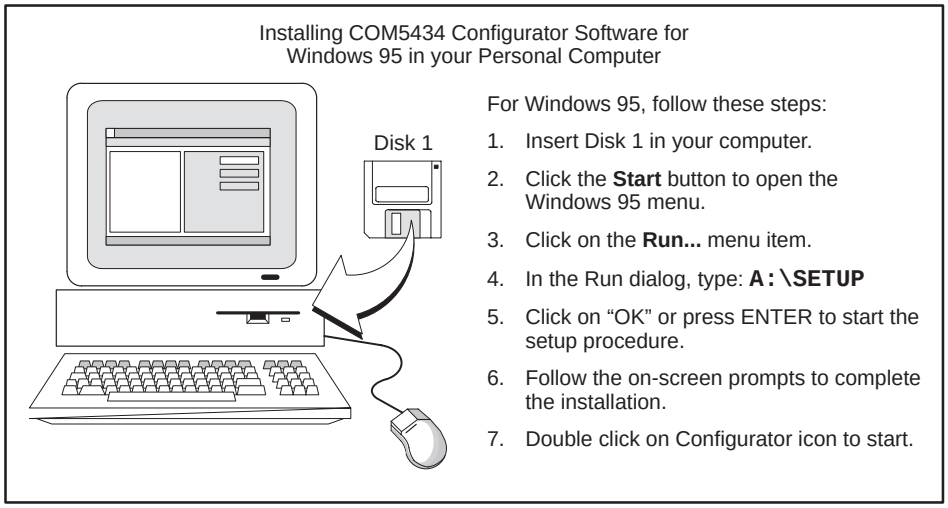


Figure 5-1 Installing the COM5434 Configurator Software

For Windows NT or Windows 95, you can use the following procedure to install the COM5434 Configurator software:

1. Insert Disk 1 in your computer's disk drive.
2. Use the Windows Explorer to access your disk drive and display the contents of Disk 1.
3. Select the file named SETUP. EXE.
4. Double click on SETUP. EXE or press ENTER to start the setup procedure.
5. Follow the on-screen setup prompts to complete the installation.

Starting the COM5434 Configurator Software

If you have successfully installed the COM5434 Configurator software, you can start it in one of the following ways:

- Double-click on the icon that appears on your Windows desktop.
- Click the Start button to open the Windows 95 menu, select Programs, then locate and click on the COM5434 program in the sub-menu.

Configuring PC-to-FMS CP Module Communications

Refer to Section 2.4 for information on connecting the programming cable from your PC to the FMS CP module. Once the programming cable is installed properly, you need to configure the communication setup.

1. Select the menu command **Transfer → Communications Setup...** as shown in Figure 5-2. The first dialog allows you to select which port you want to configure. Select the PC Serial Port.

2. Click on the "Configure Port" button to access the PC-to-Module Serial Port Dialog.

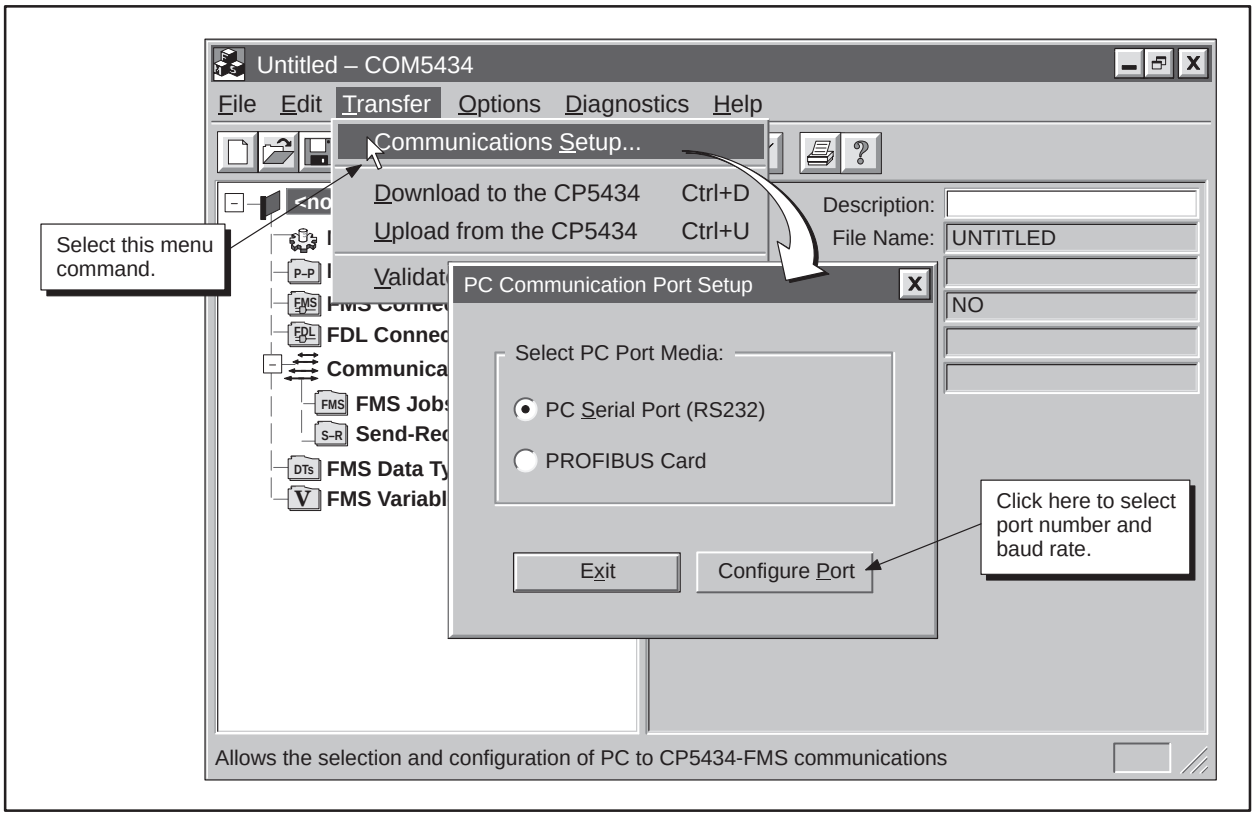


Figure 5-2 Configuring the Communications Setup

3. Select the port number that corresponds to the port on your PC, and select the communications baud rate that matches the jumper setting on the module (see Section 2.2), as shown in Figure 5-3.

4. Click on the "Test" button to verify the communication setup.

5. Click on OK when the "Communication Successful" message appears. (If a "Comm Failed" message appears, check your port number or baud rate, make adjustments as needed, and try again.)

6. Click on "Exit" to exit each of the communication setup dialogs.

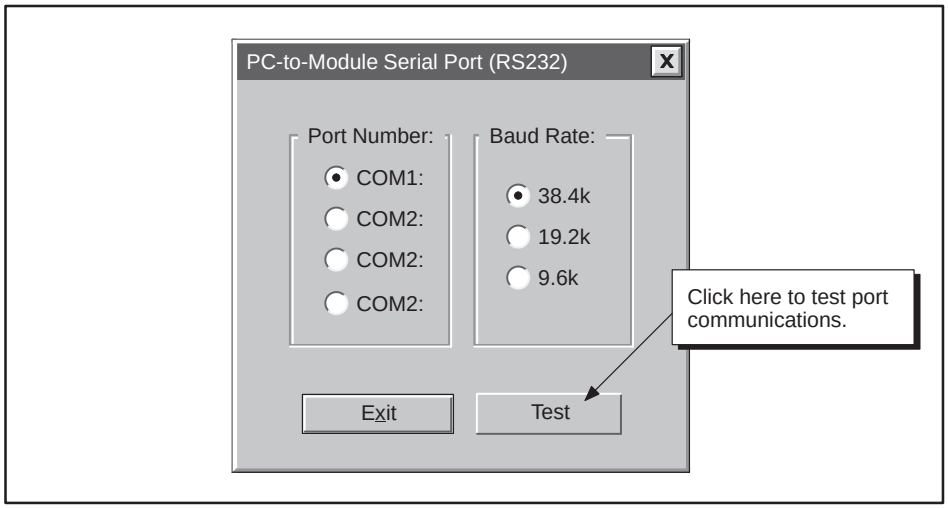


Figure 5-3 PC-to-Module Serial Port Setup Dialog

Configuring PROFIBUS Card Communications

To allow your PC to communicate with the FMS CP module on a PROFIBUS network, you must install one of the PROFIBUS card/software packages listed in Table 2-2 on your PC.

NOTE: You must configure the local module parameters using the RS-232 port *before* you can use a PROFIBUS card. The Local Module Configuration parameters are not downloaded when using a PROFIBUS card because this would change the PROFIBUS communications and possibly cause an interruption during download. To change these parameters, reconnect the RS-232 cable.

Use the following procedure to configure your PC to communicate on a PROFIBUS network:

1. Select the menu command **Transfer → Communications Setup...** as shown in Figure 5-2. The first dialog allows you to select which port you want to configure. Select the PROFIBUS Card option button.

2. Click on the "Configure Port" button to access the Select PROFIBUS Connection Dialog, shown in Figure 5-4.

3. Select Device. The device represents a PROFIBUS card and driver.

4. Select VFD. The Virtual Field Device is a group of connections configured for a given device.

5. Select Connection. The connections represent actual connections on the PROFIBUS network.

6. Click on the "Test" button to verify the communication setup.

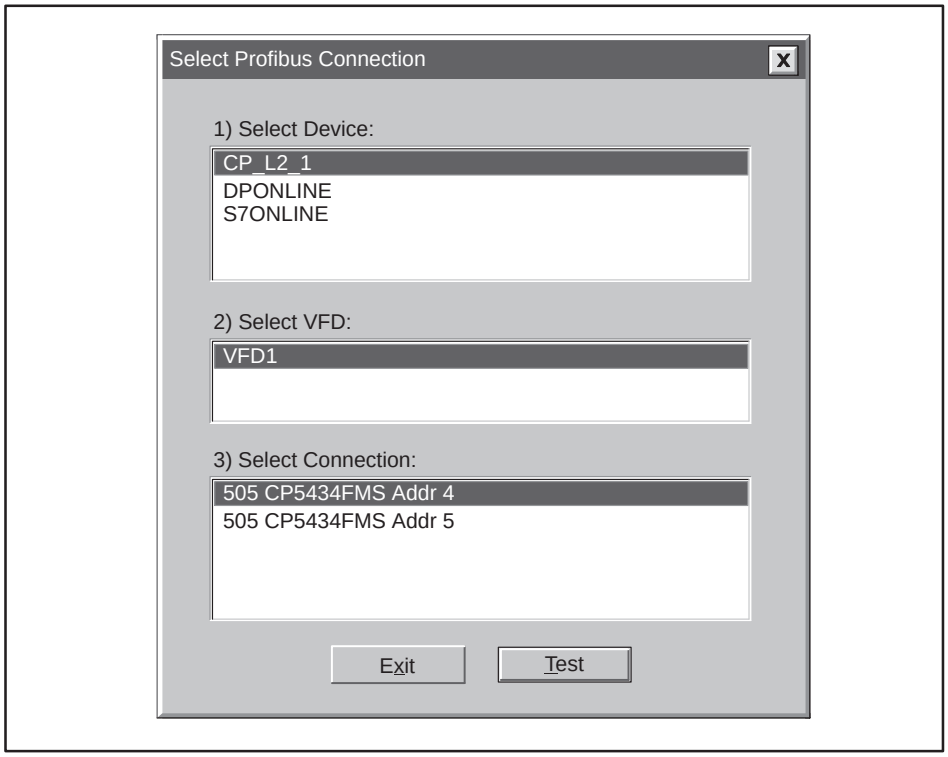


Figure 5-4 PROFIBUS Connection Dialog

5.2 Features and Functions of the COM5434 Configurator Software

Getting Started

To use all of the commands and features described in this chapter, you must have installed the COM5434 Configurator software and connected your PC to the FMS CP module. From your Windows screen, double-click on the configurator icon to start the COM5434 Configurator.

To access commands in the COM5434 Configurator, point to an item in the menu bar with the mouse and click to open the drop-down menu.

- Windows menu items may also be selected by pressing the Alt key and the underlined letter of the menu item. For example, to select File, either click on the word **File**, or press Alt F. This opens the drop-down menu.
- Pressing the Esc key (escape) is the same as selecting the Cancel button in a window.

Figure 5-5 shows the main screen of the COM5434 Configurator.

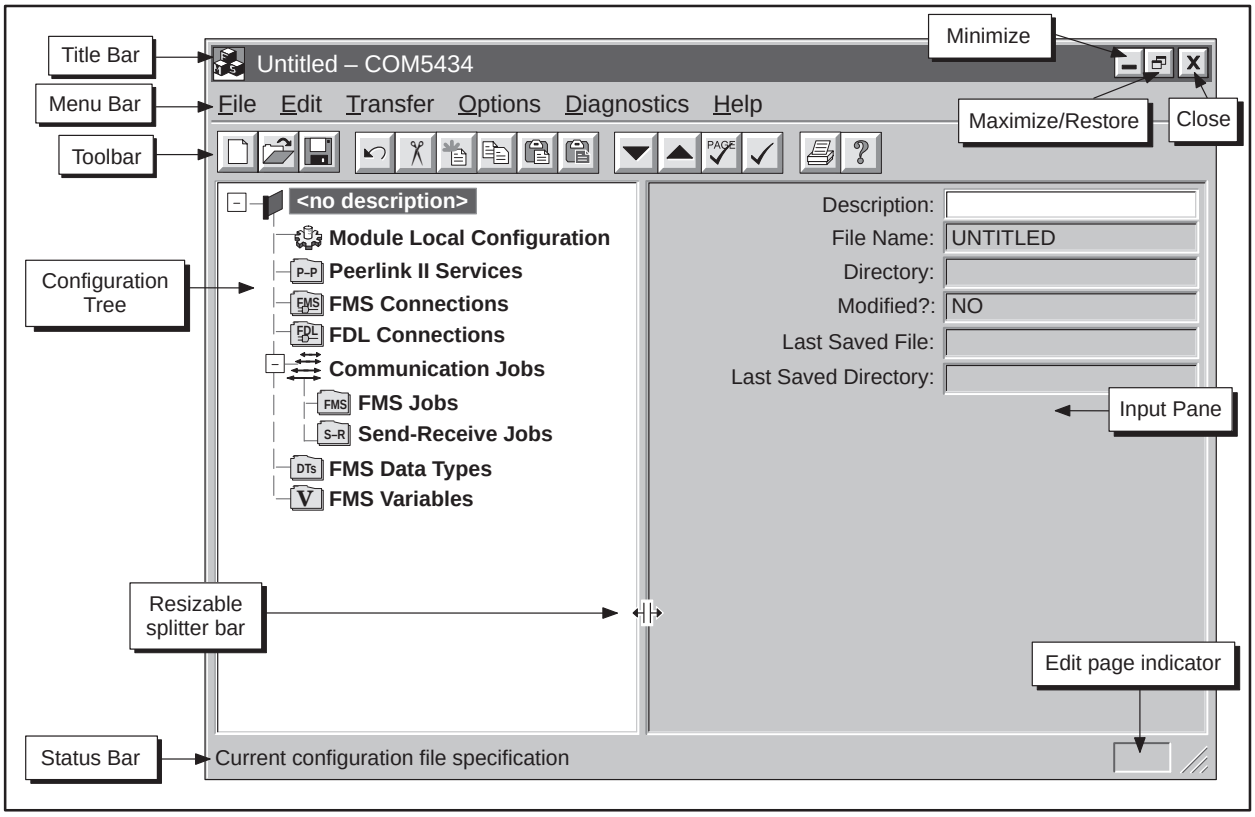


Figure 5-5 COM5434 Configurator Screen

Main Screen Features

The main features of the COM5434 Configurator screen (shown in Figure 5-5) are described below.

Title Bar The title bar contains the title of the current configuration file and Windows-based buttons that allow you to change the size of the configurator screen: a minimize button, a maximize/restore button, and a close button.

Menu Bar The menu bar contains drop-down menu commands. The menu commands allow you to perform the functions of the configurator software. The menu commands are described in the following pages.

Toolbar The toolbar contains buttons which you can use as shortcuts to perform frequently used menu commands. The toolbar buttons are described in the following pages.

Configuration Tree The configuration tree displays the structure of the current configuration. Branches of the tree can be expanded and collapsed. For example, if you have configured five FMS connections, and you do not want the connections to display, double-click on the FMS Connections branch, and the connection names are hidden. Double-click again and the tree expands, displaying the connection names.

Status Bar The status bar contains a description of an item currently in focus or an item that corresponds to the current location of the cursor.

Input Pane The input pane is the right pane of the configurator screen where you enter configuration parameters into named fields.

Splitter Bar The splitter bar allows you to resize the width of the input pane if needed to prevent the field descriptions from wrapping.

Edit Page Indicator Indicates that you are in edit mode in the current configuration input pane.

Menu Commands of the COM5434 Configurator Software

Table 5-1 describes the functions of each of the menu commands of the COM5434 Configurator software main screen.

Table 5-1 Menu Commands

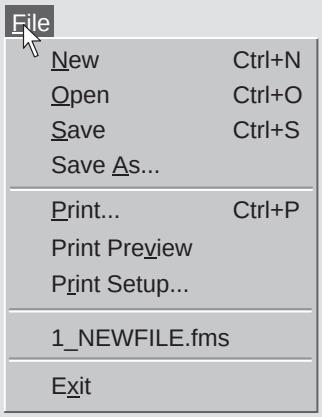
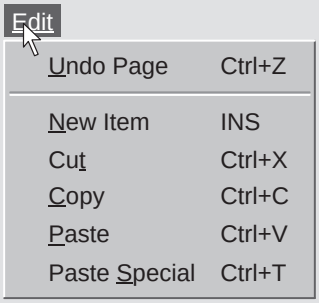
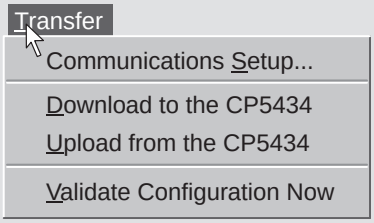
Menu Commands	Description
	**New** creates a new configuration. **Open** opens an existing configuration file. **Save** saves the work in the current file. **Save As** saves the current configuration with a new file name. **Print** sends the configuration to a printer. **Print Preview** allows you to see what the output will look like before you print it. **Print Setup** allows you to configure printer settings. **Recent File** opens an existing configuration file; the menu displays the names of the most recent saved files (for example, 1_newfile.fms) **Exit** exits from the COM5434 Configurator.
	**Undo Page** reverses all changes made to the current input pane of the configuration. **New Item** creates a new item (connection, job, etc.) in the configuration. **Cut** cuts highlighted text from the configuration to the clipboard. **Copy** copies highlighted text from the configuration to the clipboard. **Paste** pastes copied or cut material from the clipboard to the cursor location in the configuration. **Paste Special** reverses local and remote information as it inserts clipboard contents.
	**Communications Setup** allows you to select and configure your communication port. **Download to the CP5434** downloads a configuration to the FMS CP module. **Upload from the CP5434** uploads a configuration from the FMS CP module. **Validate Configuration Now** forces an immediate validation check of the current configuration.

Table 5-1 Menu Commands (continued)

Menu Commands	Description
Options ✔ Automatically Generate Names ✔ Validate Page After Edits	**Automatically Generate Names** automatically generates unique names for each new item name field. **Validate Page After Edits** automatically checks your work each time that you switch input panes in the configuration.
Diagnostics CP Status Active Stations Profibus Statistics FMS Connection Status FDL Connection Status Job Status Peer Block Status	**CP Status** allows you to examine the status of the FMS CP module on your network. **Active Stations** displays a list of all stations present on the network and the status of each. **Profibus Statistics** displays a list of bus activity statistics and current status. **FMS Connection Status** displays a list of all configured FMS connections and their status. **FDL Connection Status** displays a list of all configured FDL connections and their status. **Job Status** displays a list of all FMS and Send-Receive jobs and their current status. **Peer Block Status** displays a list of all configured Peer Blocks and their status.
Help Contents Index About	**Contents** accesses the contents directory of the online help system. **Index** accesses the index of the online help system. **About** displays version and copyright information about the COM5434 Configurator.

Drag-and-Drop Operations

You can also perform some of the editing functions with "Drag-and-Drop" mouse actions. For example, if you open another instance of the configurator and have two windows visible, you can use the drag-and-drop operation to edit in the following ways:

- **Copy and Paste:** Select an item from one configuration tree and hold the mouse button down while you move (drag) the item to a location in another configuration and then release the button. This makes an exact copy of a configured item and pastes it into another configuration.

- **Copy and Paste Special:** You can use the drag-and-drop operation as described above while pressing the Ctrl key on your keyboard. This makes a copy of a configured item with reversed local/remote settings and pastes it into another configuration.

Toolbar Commands

The toolbar, located below the menu bar, consists of buttons which duplicate frequently used menu commands. A tool tip displays the name of each button when you place the mouse cursor over it for a few seconds. The toolbar buttons are described in Table 5-2.

Table 5-2 Toolbar Buttons

Button	Menu Equivalent	Description
	File → New	Creates a new configuration.
	File → Open	Opens an existing configuration file.
	File → Save	Saves the work that you have done in the current file.
	Edit → Undo Page	Reverses all changes to the current input pane.
	Edit → Cut	Cuts highlighted item from the configuration and sends it to the clipboard.
	Edit → New Item	Creates a new item in the configuration.
	Edit → Copy	Copies highlighted item from the configuration to the clipboard.
	Edit → Paste	Pastes copied or cut material from the clipboard to the cursor location in the configuration.
	Edit → Paste Special	Pastes clipboard contents while automatically reversing local and remote information.
	Transfer → Download to the CP5434	Downloads a configuration to the FMS CP module.
	Transfer → Upload from the CP5434	Uploads a configuration from the FMS CP module to the COM5434 Configurator.
	Options → Validate Page After Edits	Validates entries to the current input pane before you start another configuration page.
	Transfer → Validate Configuration Now	Forces an immediate validation check of the current configuration.
	File → Print	Sends the configuration to a printer.
	Help → Contents	Accesses the contents directory of the online help system.

Right Mouse Button Editor

When your mouse cursor is on an item in the configuration tree, you can click the right mouse button to call up a pop-up menu. This menu duplicates most of the commands on the Edit menu. With the mouse cursor in a data entry field, the right mouse button calls up a different pop-up menu that offers edit commands for selected or nonselected data (see Figure 5-6).

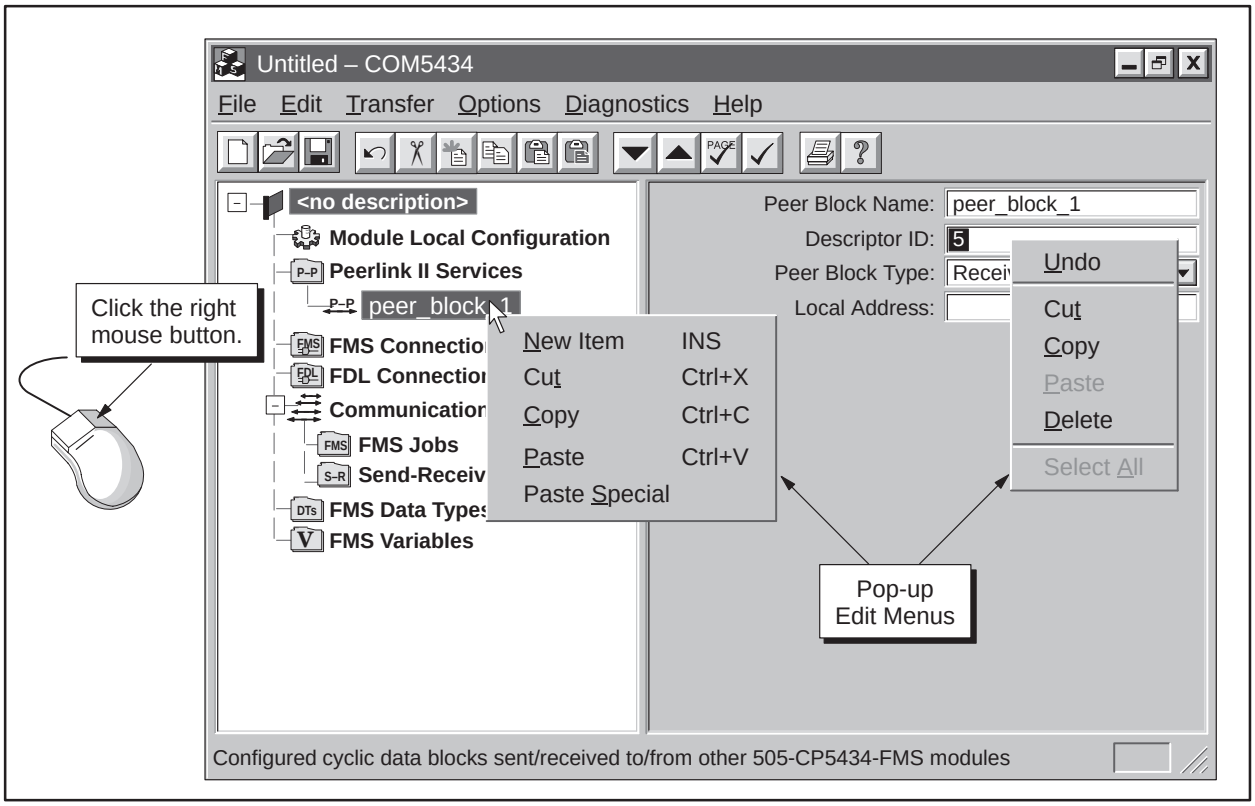


Figure 5-6 Right Mouse Button Editor

New Item Allows you to create a new item (connection, job, etc.) in the configuration.

Cut Allows you to cut a highlighted field or item from the configuration. The cut material is sent to the clipboard.

Copy Allows you to copy a highlighted field or item from the configuration to the clipboard.

Paste Allows you to paste a copied or cut item from the clipboard to the cursor location in the configuration.

Paste Special Allows you to paste a copy of a connection or job to another configuration and automatically complement the connection settings.

5.3 Describing the Configuration File

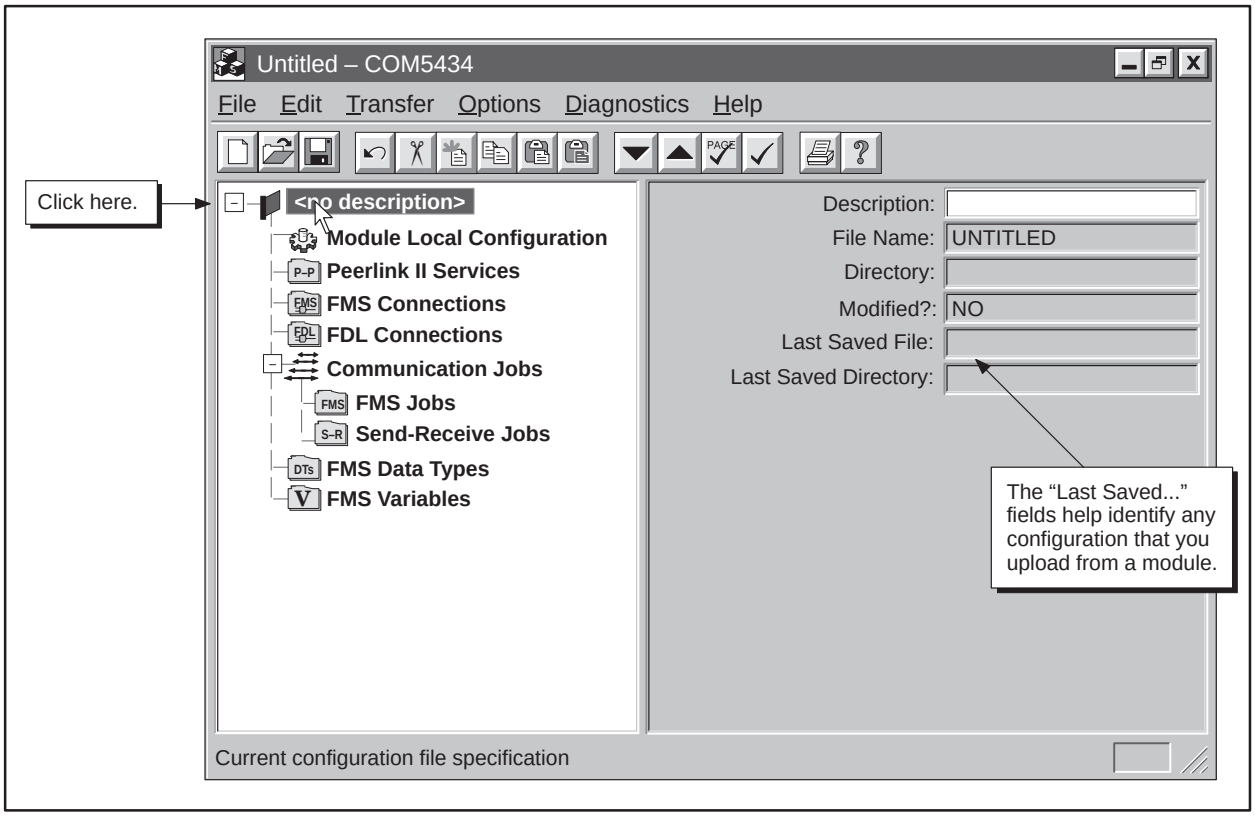


Figure 5-7 Naming the File

Entering a Title for Your Configuration File

The input pane shown in Figure 5-7 allows you to provide a descriptive title for your configuration file. Click in the **Description** field in the input pane, and enter a descriptive title, up to 32 characters, for your configuration.

The remaining fields in this input pane display the following information:

File Name A read-only field that displays the name of the current configuration file after you have saved and named the file.

Directory A read-only field that displays the directory location of the current configuration file after you have saved and named the file.

Modified? A read-only field that indicates whether or not the configuration file has been modified since the last time it was saved.

Last Saved File A read-only field that displays the name of the file that the configuration was last saved in.

Last Saved Directory A read-only field that displays the location of the directory that the configuration was last saved in.

5.4 Defining the Module Local Configuration

What Is the Module Local Configuration?

The module local configuration, shown in Figure 5-8, identifies the local station address where the FMS CP module resides and defines the communication parameters used by the FMS network. You cannot configure connections or communication services for an FMS CP module unless you define the local configuration for that module.

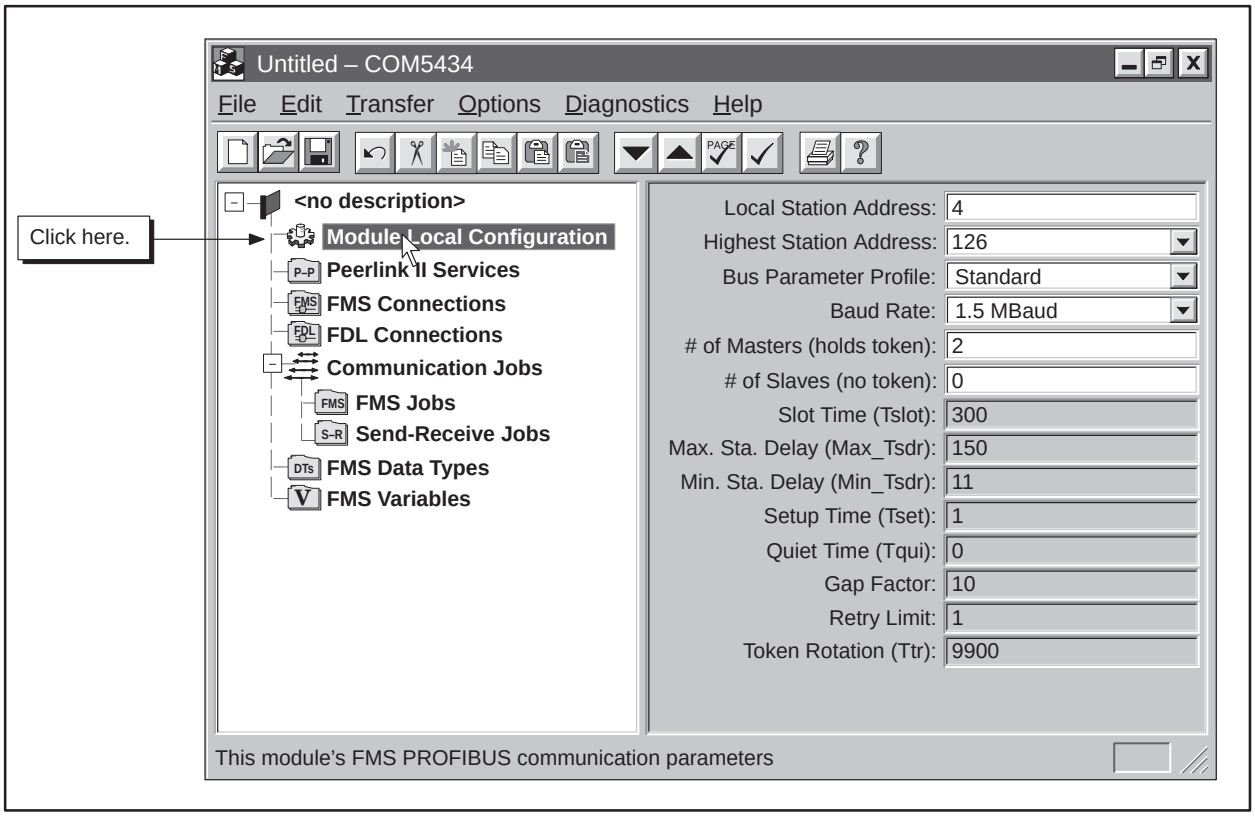


Figure 5-8 Module Local Configuration

Defining the Module Local Configuration

To define the module local configuration, follow the steps below:

1. Click on **Module Local Configuration** on the configuration tree.
2. Fill in the following fields in the input pane:

   Local Station Address Enter the local station address, within a range of 0 to 126, (PROFIBUS network address) where the FMS CP module resides.

Highest Station Address Use the drop-down list to select the value that is equal to or greater than the highest PROFIBUS network station address in use on your network. This number is used by the COM5434 Configurator to calculate the token rotation time for your network. You may need to adjust this number when you add or subtract stations from your network. Valid HSA values are 15, 31, 63, and 126.

NOTE: If the number configured is higher than the real highest station address, you may experience a small loss of speed on your network, but the network will function properly. If the number configured is lower than the real highest station address on your network, then any stations above the highest station address will not be added to the token ring. If you try to add this station to a network ring with a higher station address than the one you specified as the HSA, an error will occur and your station will not be allowed to enter the ring.

Bus Parameter Profile Bus parameters must match in all the stations on the network. For most networks, selecting one of the parameter profiles provided by the COM5434 Configurator will help simplify the process of configuring the network. The default profile is Standard, but you can choose Standard-Mixed, FMS-DP Universal, or Custom. Each profile provides values for the remaining fields on the input pane except for Baud Rate, # of Masters, and # of Slaves, which you must supply. If you want to customize values for any of the other fields, select Custom from the drop-down list. In general, you can use the following profiles:

- Standard for 505-to-505 communications
- Standard-Mixed for 505-to-S7 communications*
- FMS-DP Universal for 505-to-S5 communications, and if the network includes DP devices

Baud Rate Use the drop-down list to select the appropriate baud rate that the module will use for network communications.

# of Masters (holds token) Enter the number of masters on the network. Masters are the devices on the network that take turns holding the token.

# of Slaves (no token) Enter the number of slaves on the network. Slaves are devices that do not hold the token.

*Standard-Mixed matches the current release of STEP 7; earlier releases of STEP 7 may have different bus parameters, requiring you to select Custom to match parameters.

NOTE: If you customize the Bus Parameter Profile by selecting Custom in the Bus Parameter Profile field and changing values in any of the fields below, every device on your network must have the same or a compatible profile. Otherwise, your system cannot function properly.

If you selected Custom in the Bus Parameter Profile field, you can change the following parameters for your module local configuration:

Slot Time (Tslot) Enter the maximum time, in bit times, that a master station on your network waits for a response after sending a message.

Max. Sta. Delay (Max_Tsdr) Enter the maximum time, in bit times, that a responder delays before beginning a response.

Min. Sta. Delay (Min_Tsdr) Enter the minimum time, in bit times, that a responder delays before beginning a response.

Setup Time (Tset) Enter the time, in bit times, between events and the necessary reaction.

Quiet Time (Tqui) Enter the minimum time, in bit times, that a transmitting station must wait between sending a message and enabling its receiver.

Gap Factor Enter a number that indicates when the master must perform a gap update. For example, if you choose a gap factor of 10, the master can hold the token for 9 turns without performing a gap update; on the 10th turn, the master must begin to poll the gap, checking one station each time it receives the token.

Retry Limit Enter the number of times a master may retry a transmission.

Token Rotation (Ttr) Enter the anticipated time, in bit times, for one token round on your network, including allowances for high and low priority transactions, errors, and polling the gap.

5.5 Defining Peerlink II Services

Peerlink II Services

The FMS CP module supports a maximum of 32 Peerlink II services, as shown in Figure 5-9. The FMS CP module transmits and receives data (in the form of peer blocks) to and from other SIMATIC 505 FMS CP modules on your network on a scan-by-scan basis. When you click on Peerlink II Services on the configuration tree, the COM5434 Configurator displays the number of Transmit and Receive blocks available.

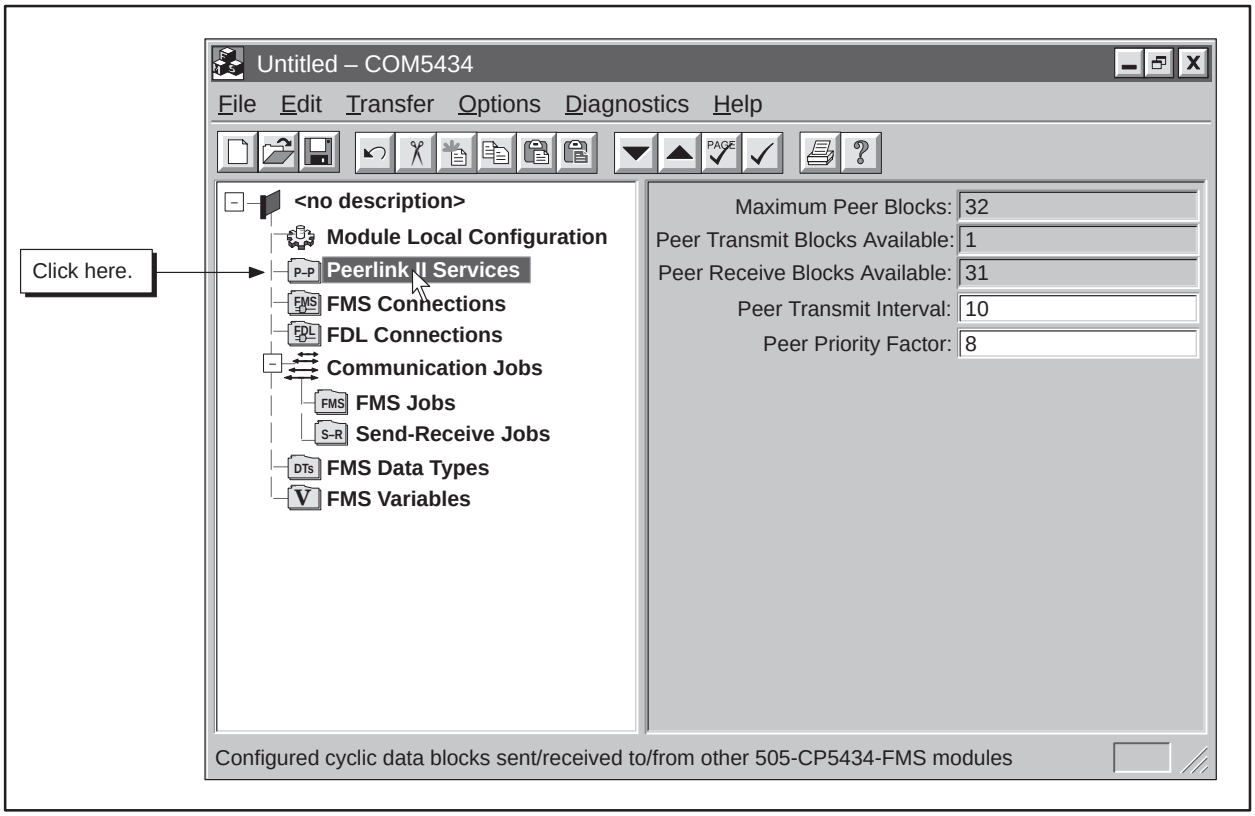


Figure 5-9 Peerlink II Services Available

To configure Peerlink II Services, define the desired transmission interval and priority factor, and then configure the individual peer function blocks.

Peer Transmit Interval Enter a numeric value, from 0 to 65,535 (scan cycles), to specify how often the Transmit peer block transmission is attempted.

Peer Priority Factor Enter a numeric value, from 0 to 8, to specify the priority for writing received peer data blocks to the PLC versus other communications activities (e.g., FMS jobs). A factor of 8 specifies the highest priority for received peer data, but still allows other activities if no peer receives are pending. A factor of 0 is the lowest priority, but still allows peer receives if no other activities are pending.

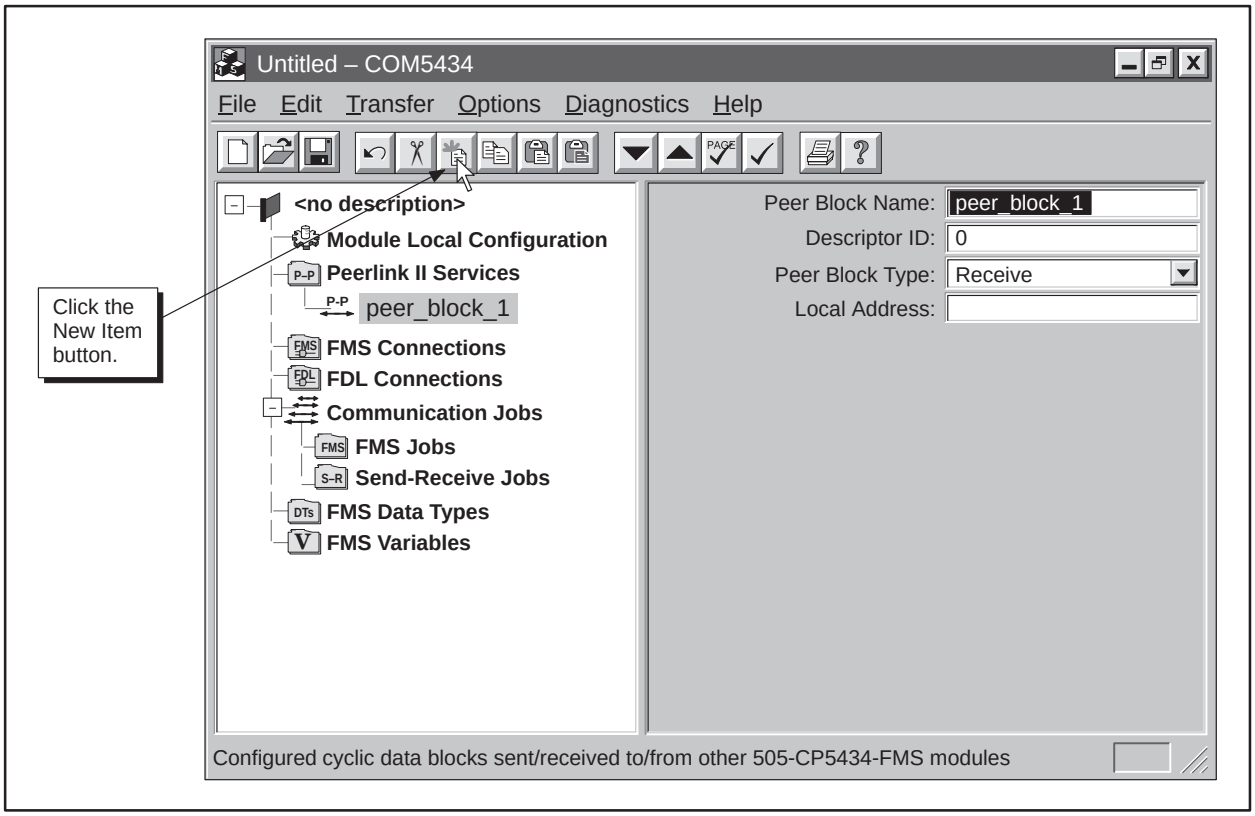


Figure 5-10 Defining a Peer Block

Defining a Peer Block

To define a peer block, follow the steps below:

1. Click on **Peerlink II Services** on the configuration tree.
2. Click on the **New Item** button on the toolbar. A new peer block appears in the configuration tree and the input fields change (see Figure 5-10).
3. Fill in the following fields in the input pane:

   Peer Block Name Enter a unique name, up to 32 characters, for the peer block. (If you have selected Automatically Generate Names from the Options menu, the COM5434 Configurator enters a name for the peer block, but you can change it if you want.)

   Descriptor ID Enter a unique numeric value for each peer block. The Descriptor ID is a method of identifying each peer block. The FMS CP module uses this identifier to search for the peer blocks that the module is configured to receive, and to encode the peer block that it is configured to transmit. The valid range for this field is from 0 to 255.

Peer Block Type Select either Receive or Transmit for each peer block. (Remember that each FMS CP module supports only one transmit block and up to 31 receive blocks.)

Local Address Enter the location where the FMS CP module retrieves data it is transmitting or stores data received during the job. The local address consists of the programmable controller memory type (V, K, X, Y, etc.), the starting address, and the number of locations (the configurator automatically calculates them as a bit, byte, or word, based on the memory type selection). When you click on the Local Address field, a button appears. Click on the button, and the PLC Memory Type Editor dialog box appears. Fill in the fields in the dialog box to complete the local address. Then select **OK**.

Figure 5-11 shows an example of the editor after the drum count preset (DCP) memory type has been selected, which causes the Step # field to appear.

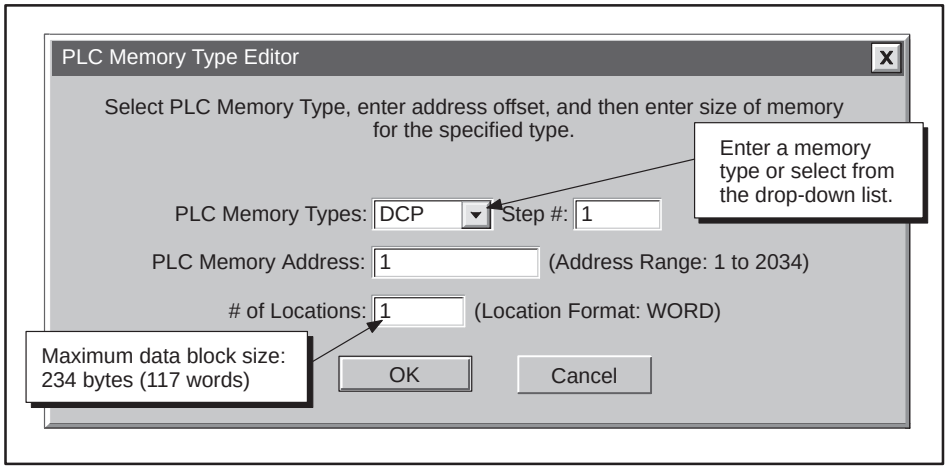


Figure 5-11 PLC Memory Type Editor Dialog Box

5.6 Defining FMS Connections

FMS Connections

The FMS CP module supports up to 32 FMS connections, as shown in Figure 5-12.

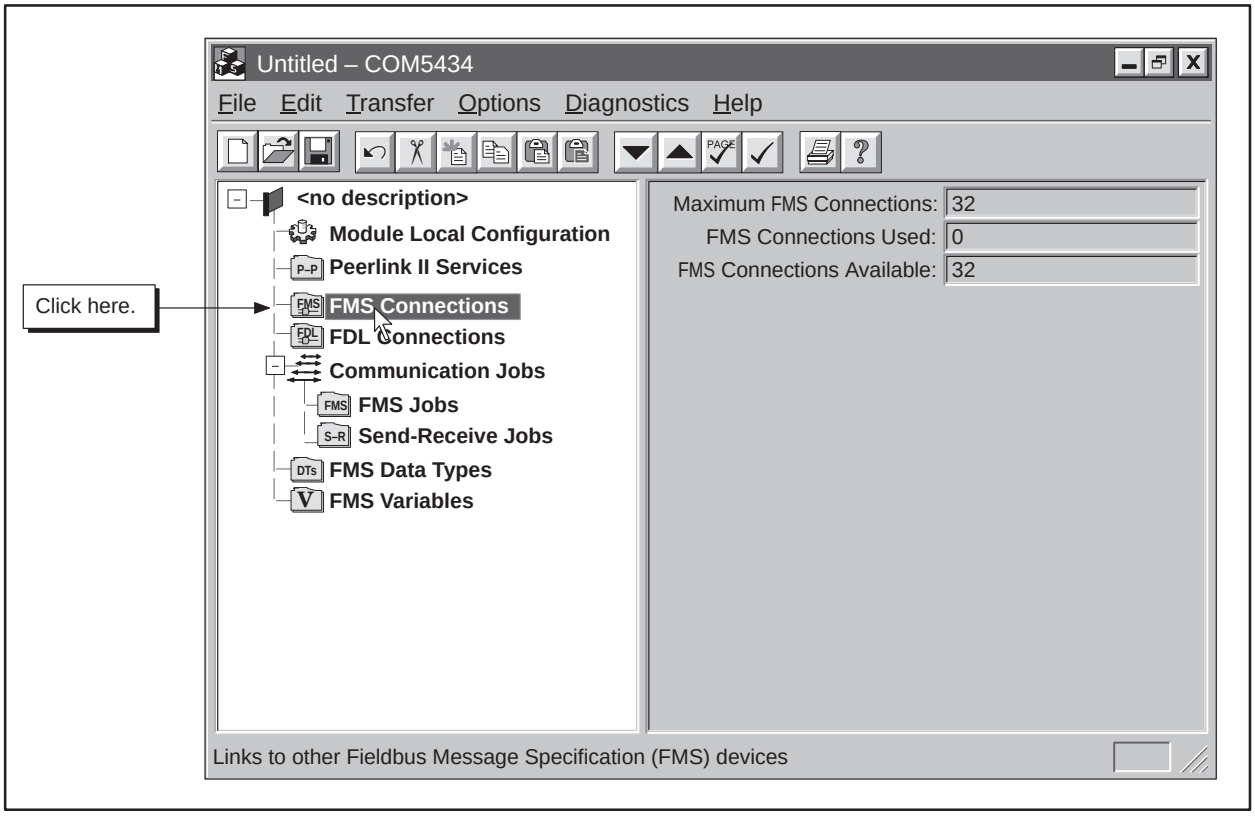


Figure 5-12 FMS Connections Available

Maximum FMS Connections This field displays the total number of FMS connections supported by the FMS CP module.

FMS Connections Used This field displays the number of FMS connections that have been defined for the FMS CP module.

FMS Connections Available This field displays the total number of unused FMS connections.

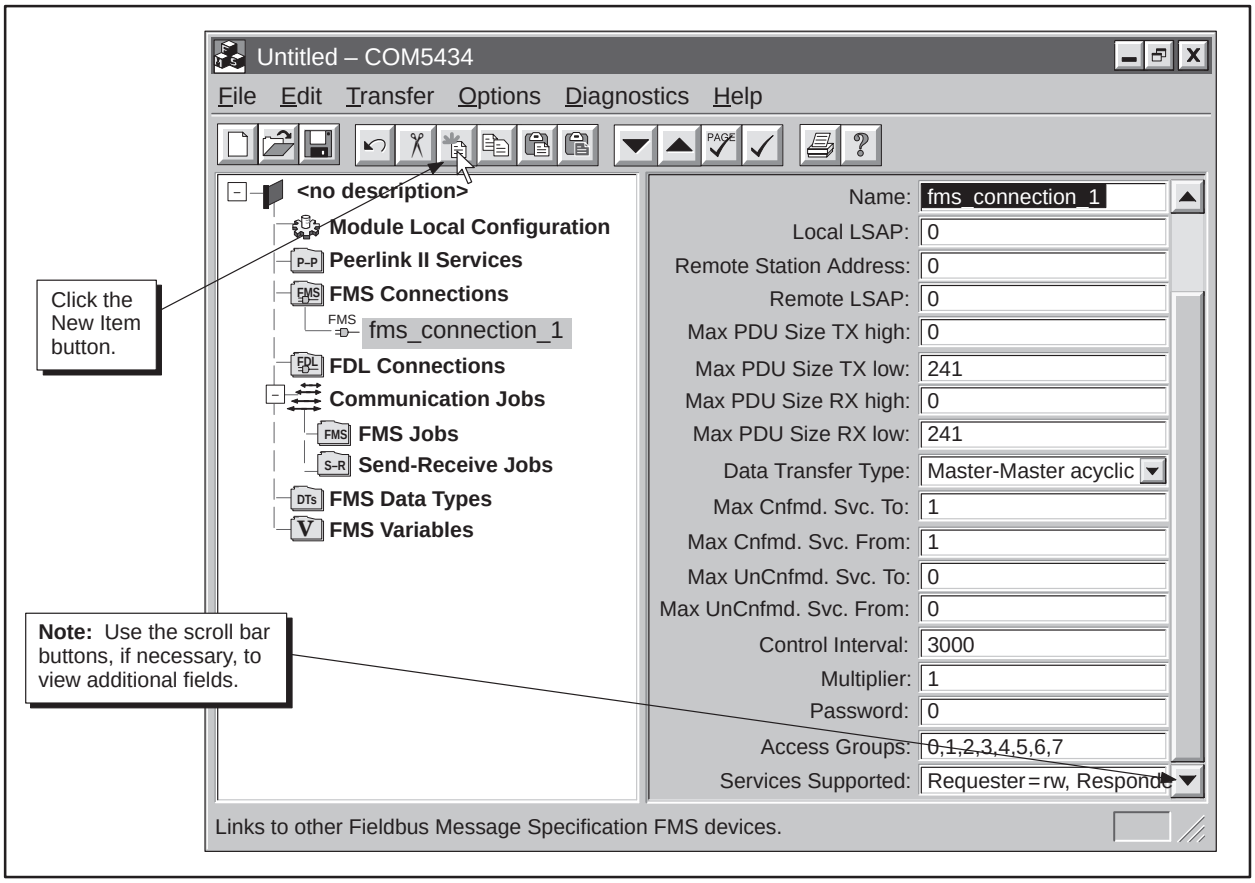


Figure 5-13 Defining FMS Connections

Defining an FMS Connection

To define an FMS connection, follow the steps below:

1. Click on **FMS Connections** on the configuration tree.
2. Click on the **New Item** button on the toolbar. An FMS connection appears in the configuration tree and the input fields change (see Figure 5-13).
3. Fill in the following fields in the input pane:

   Name Enter a unique name, up to 32 characters, for each FMS connection. (If you have selected Automatically Generate Names from the Options menu, the COM5434 Configurator enters a name for you, but you can change it if you want.)

   Local LSAP Enter a numeric value for the Link Service Access Point for the FMS connection on the local FMS CP module. You cannot use the same LSAP more than once per module. Choose a value between 2 and 62, except for 58 (refer to Table A-10 for LSAP assignment restrictions).

Remote Station Address Enter the PROFIBUS network address used by the remote device.

Remote LSAP Enter a numeric value for the Link Service Access Point for the FMS connection on the remote device. Choose a value between 2 and 62. You cannot use the same LSAP more than once at the same remote station (refer to Table A-10 for LSAP assignments).

Maximum PDU Size TX High Specify the maximum number of bytes for Protocol Data Units that can be sent on high priority transmissions.

Maximum PDU Size TX Low Specify the maximum number of bytes for Protocol Data Units that can be sent on low priority transmissions.

Maximum PDU Size RX High Specify the maximum number of bytes for Protocol Data Units that can be received on high priority receptions.

Maximum PDU Size RX Low Specify the maximum number of bytes for Protocol Data Units that can be received on low priority receptions.

Data Transfer Type Select the type of data transfer and relationship between the remote device and the FMS CP module. (See Table A-8 for details on transfer types and jobs allowed.)

Maximum Confirmed Services To Specify the maximum number of confirmed concurrent services that can be sent to the remote station.

Maximum Confirmed Services From Specify the maximum number of confirmed concurrent services that can be received from the remote station.

Maximum Unconfirmed Services To Specify the maximum number of unconfirmed concurrent services that can be sent to the remote station.

Maximum Unconfirmed Services From Specify the maximum number of unconfirmed concurrent services that can be received from the remote station.

Control Interval Specify the maximum time allowed between commands on the bus in 10 ms intervals.

Multiplier Specify how many times this connection is entered into the poll-list. A higher value gives this connection a higher priority relative to other connections (used only for some master-slave connections).

Password Enter a numeric value as the password. This password, if used, must match the password specified for the variable at the remote partner. 0 = Access is possible for *all* FMS clients that specify a password of 0. To specify access restricted by password, the valid range is 1 to 255. Refer to Section 4.3 for more information.

Access Groups When you click on the Access Groups field, a button appears in the field. Click on the button to view the Access Group Rights dialog box (shown in Figure 5-14). Select the groups that have access by clicking on the group boxes. Click on **OK**. The dialog box disappears, and the selected groups are displayed in the Access Groups field. (Refer to Section 4.3 for more information.)

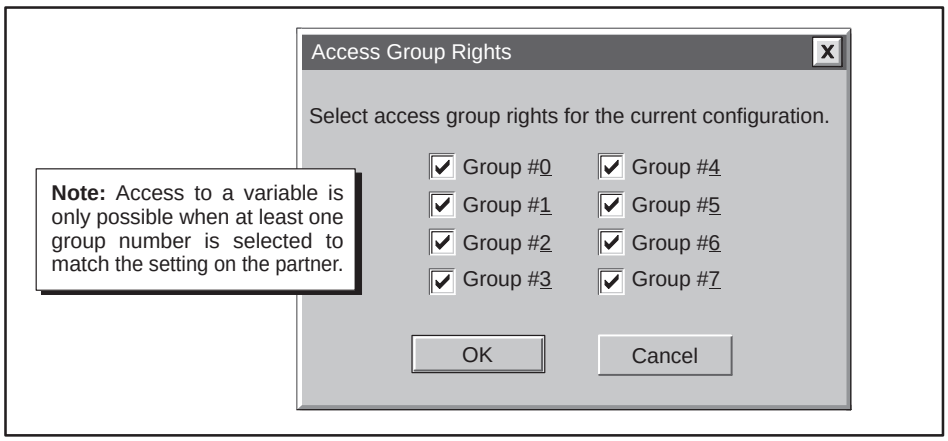


Figure 5-14 FMS Access Group Rights Dialog Box

Services Supported When you click on the Services Supported field, a button appears in the field. Click on the button to view the Services Supported dialog box (shown in Figure 5-15). Select the services by clicking on the boxes, and then select **OK**. The dialog box disappears, and the selected services are displayed in the corresponding field.

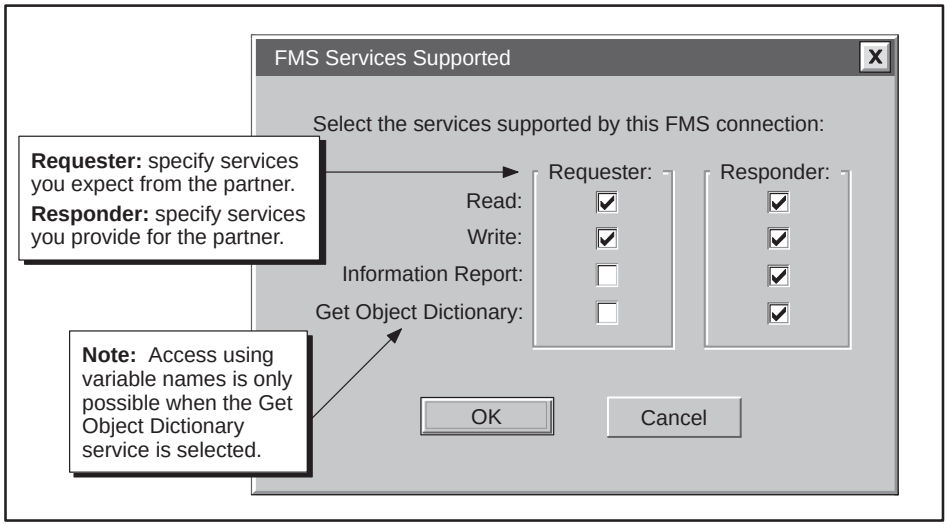


Figure 5-15 FMS Services Supported Dialog Box

5.7 Defining FDL Connections

FDL Connections

The FMS CP module supports up to 32 FDL connections, as shown in Figure 5-16. FDL connections are used for Send-Receive jobs.

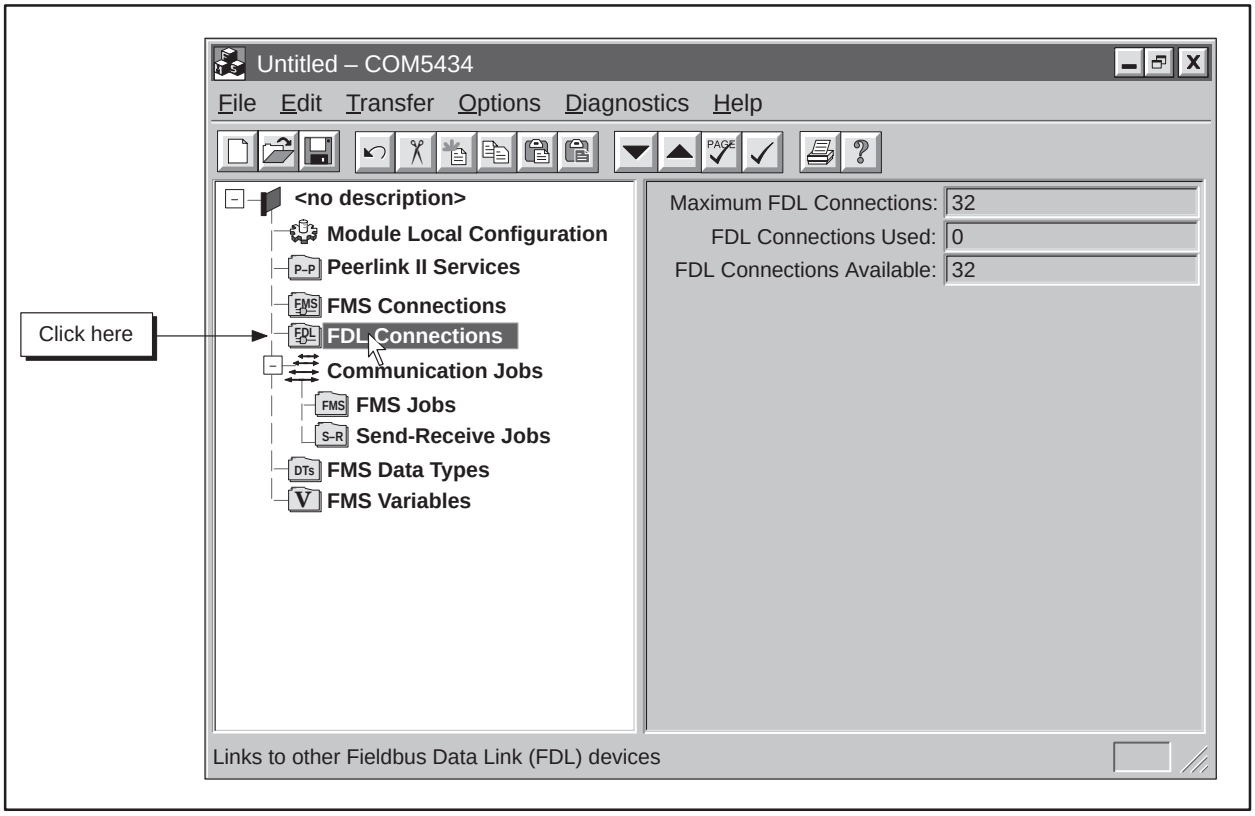


Figure 5-16 FDL Connections Available

Maximum FDL Connections This field displays the total number of FDL connections supported by the FMS CP module.

FDL Connections Used This field displays the number of FDL connections that have been defined for the FMS CP module.

FDL Connections Available This field displays the total number of unused FDL connections.

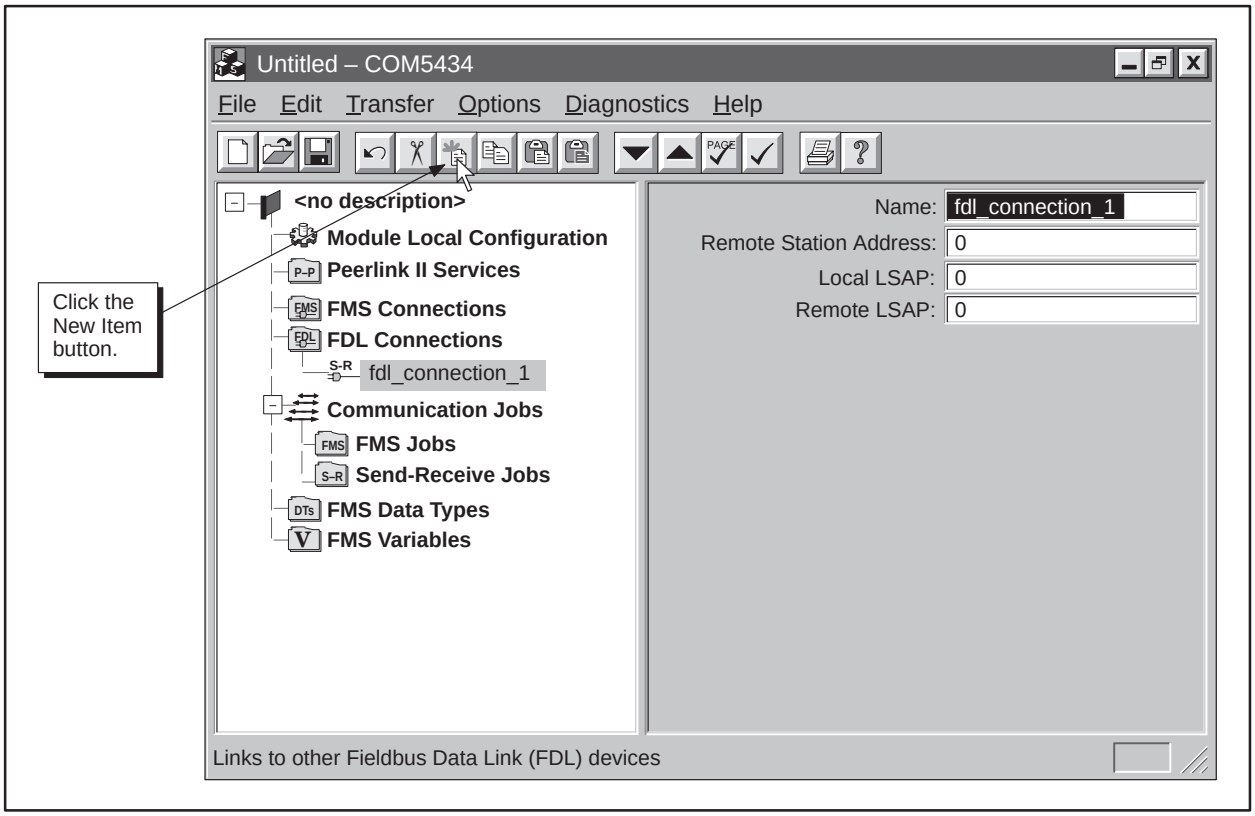


Figure 5-17 Defining FDL Connections

Defining an FDL Connection

To define an FDL connection, follow the steps below:

1. Click on **FDL Connections** on the configuration tree.
2. Click on the **New Item** button on the toolbar. An FDL connection appears in the configuration tree and the input fields change (see Figure 5-17).
3. Fill in the following fields in the input pane:

   Name Enter a unique name for each FDL connection. (If you have selected Automatically Generate Names from the Options menu, the COM5434 Configurator enters a name for the connection, but you can change it if you want.)

   Remote Station Address Enter the PROFIBUS network address used by the remote device.

Local LSAP Enter a numeric value for the local Link Service Access Point for the FDL connection on the local module. Choose a value between 2 and 33. You cannot use the same local LSAP more than once.

Remote LSAP Enter a numeric value for the remote Link Service Access Point for the FDL connection on the remote device. Choose a value between 2 and 33. You cannot use the same remote LSAP more than once per remote address.

If the value you select is assigned to a system function, you are prompted to select another value.

5.8 Overview of Communication Jobs

The FMS CP module supports a maximum of 48 communication jobs, as shown in Figure 5-18. When you click on Communication Jobs on the configuration tree, the COM5434 Configurator displays the number of each type of communication job you have used, and the number of available communication jobs remaining.

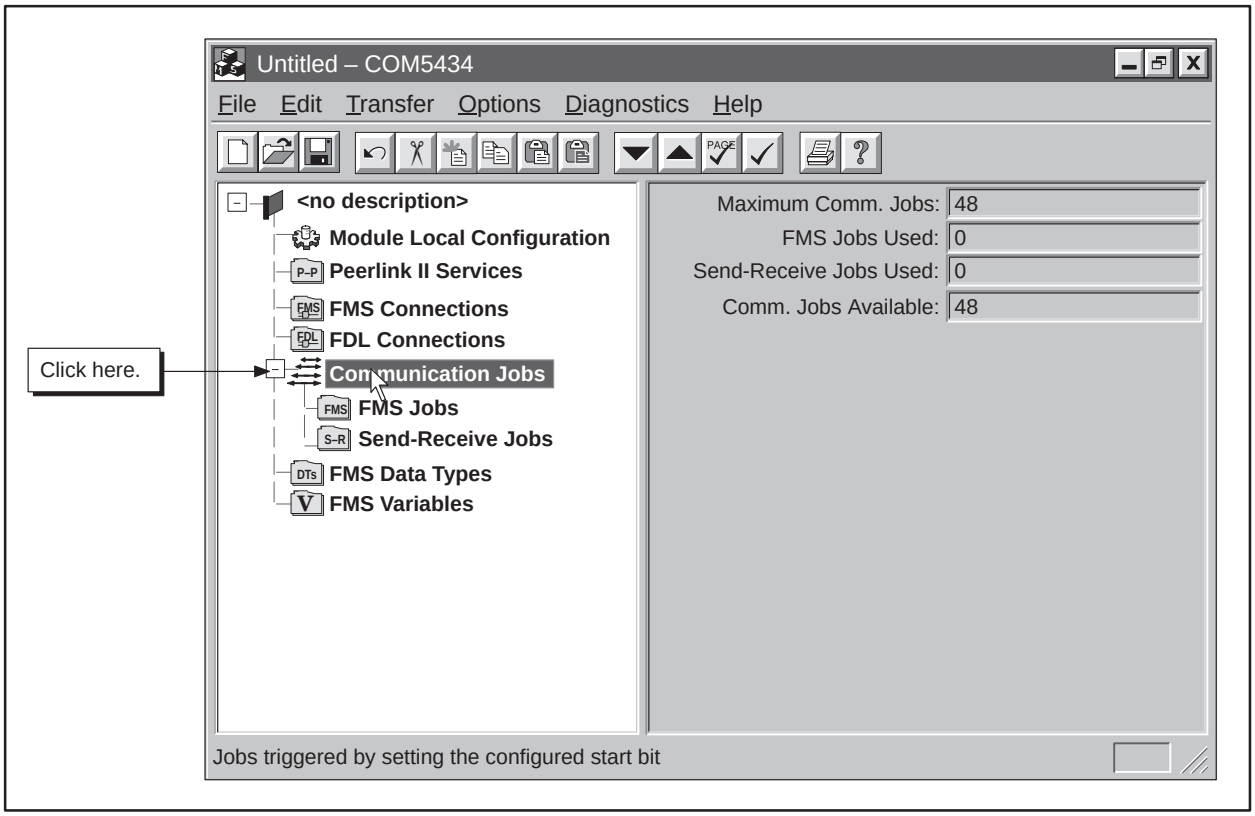


Figure 5-18 Communication Jobs

Maximum Communication Jobs This field displays the number of communication jobs supported by the FMS CP module.

FMS Jobs Used This field displays the number of FMS jobs that have been defined for the FMS CP module.

Send-Receive Jobs Used This field displays the number of Send-Receive jobs that have been defined for the FMS CP module.

Communication Jobs Available This field displays the total number of unused communication jobs.

5.9 Configuring FMS Jobs

FMS Jobs

Before you can configure an FMS job, you must have defined an FMS connection between the local FMS CP module and the remote device (see Section 5.6). Click on FMS Jobs on the configuration tree to see the number of communication jobs available, as shown in Figure 5-19.

The FMS CP module supports five types of FMS communication jobs: Read, Write, Information Report, Status, and Identify. For more detail on these FMS jobs, see Section 4.3.

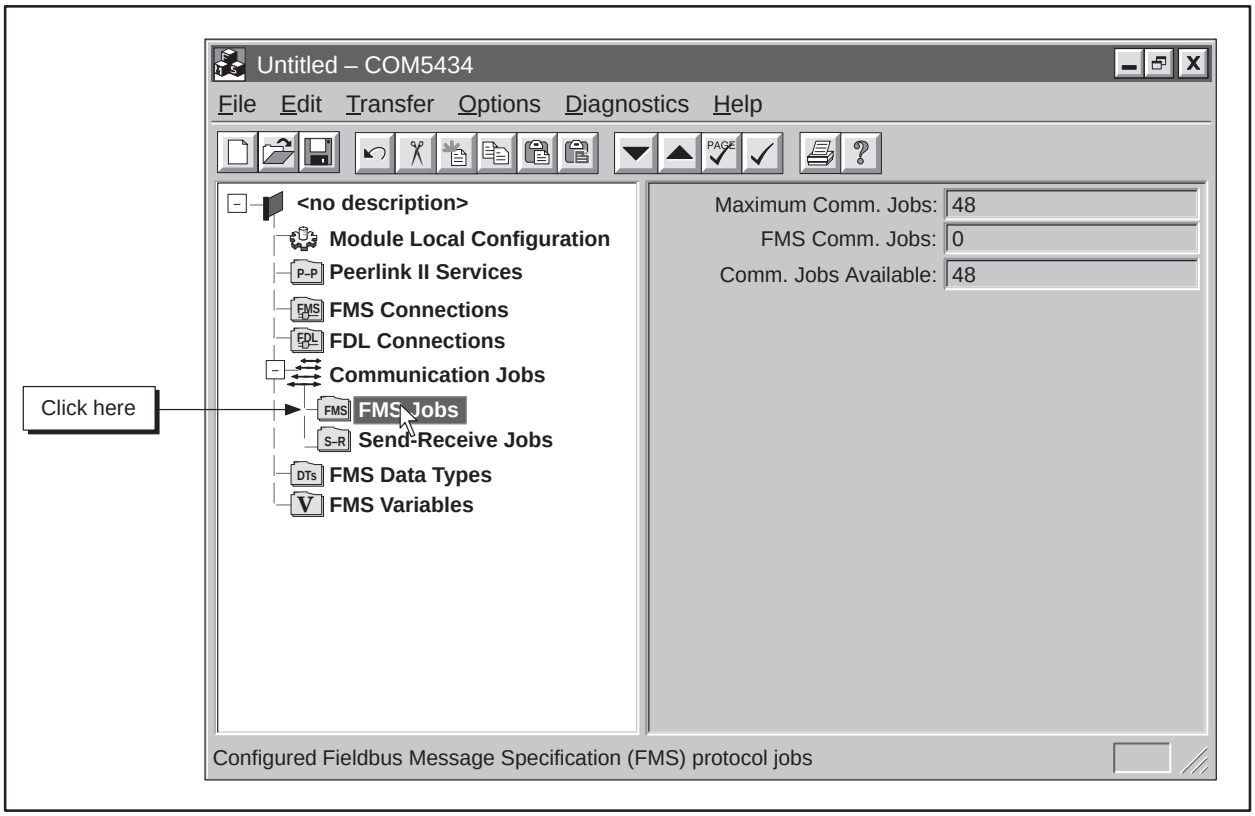


Figure 5-19 FMS Jobs Available

Maximum Communication Jobs This field displays the total number of communication jobs supported by the FMS CP module.

FMS Communication Jobs This field displays the number of FMS jobs that have been defined for the FMS CP module.

Communication Jobs Available This field displays the total number of unused communication jobs.

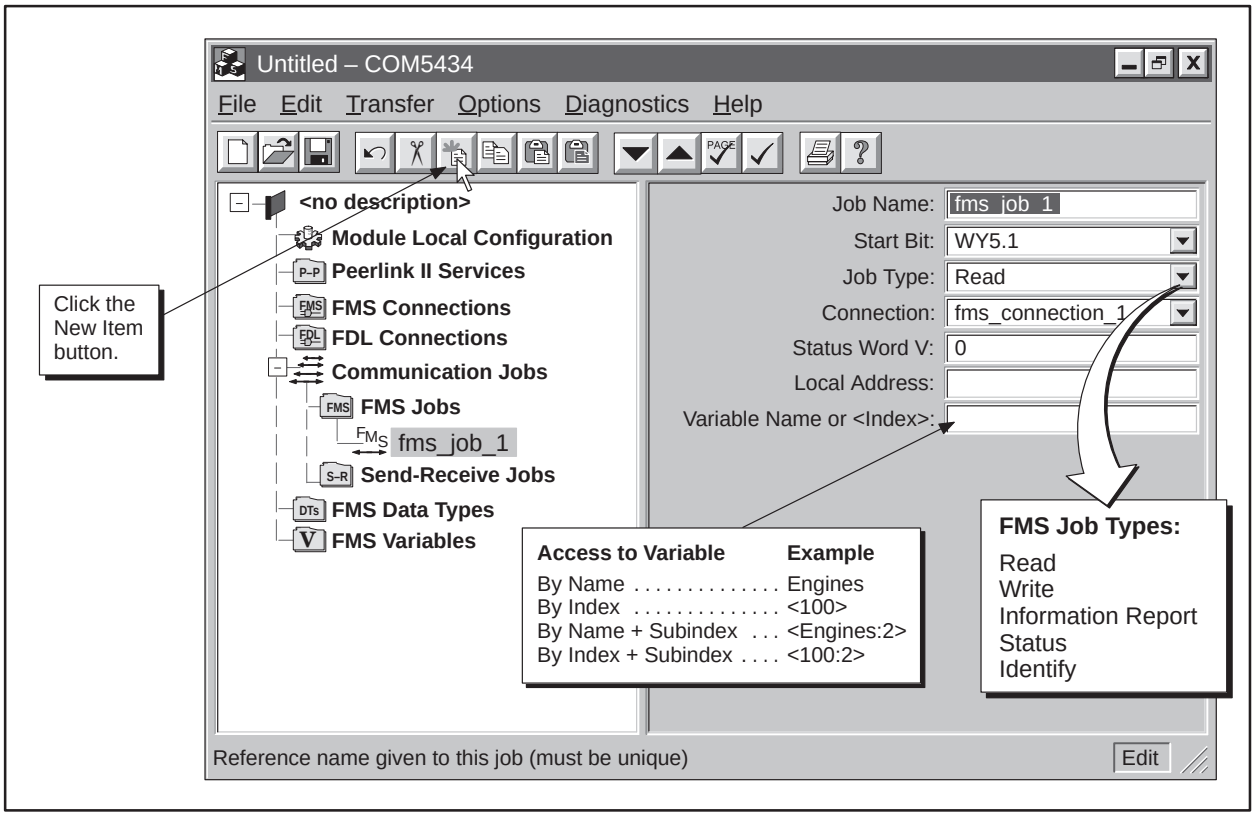


Figure 5-20 Configuring FMS Jobs

Defining an FMS Job

To define an FMS job, follow the steps below:

1. Click on **FMS Jobs** on the configuration tree.

2. Click on the **New Item** button on the toolbar. An FMS job appears in the configuration tree and the input fields change (see Figure 5-20).

3. Fill in the following fields in the input pane:

   Job Name Enter a unique name for each FMS job. (If you have selected Automatically Generate Names from the Options menu, the COM5434 Configurator enters a name for the FMS job, but you can change it if you want.)

   Start Bit Each FMS job requires a start bit to trigger the job. The start bit for each job must be unique. When you select a start bit for the job from the drop-down menu in the Start Bit field, that bit is no longer available as a selectable bit for other jobs. (The corresponding "job active" bit is automatically assigned when you select the start bit.)

Job Type Select Read, Write, Information Report, Status, or Identify from the drop-down list. (See Section 4.3 for descriptions of the FMS job types.)

Connection Select an FMS connection that you have previously defined in the FMS Connections branch of the configuration tree. The COM5434 Configurator automatically lists your connection choices in a drop-down menu.

Status Word V The status word is a memory location in V-memory which is updated each time a job completes. This allows you to check the status of each job you configure. If you specify a value of zero in this field, job status is not reported to a status word. (You can examine the status of job communications by selecting the menu command **Diagnostics** → **Job Status**.)

Local Address Enter the location where the FMS CP module retrieves the data it is transmitting or stores the data it receives during the job. The local address consists of the programmable controller memory type (V, K, X, Y, etc.), the starting address, and the number of locations (the configurator automatically calculates them as a bit, byte, or word, based on the memory type selection). When you click on the Local Address field, a button appears. Click on the button, and the dialog box shown in Figure 5-21 appears. Fill in the fields in the dialog box to complete the local address. Then select **OK**. (You can also enter an address manually; for example, V1, 1.)

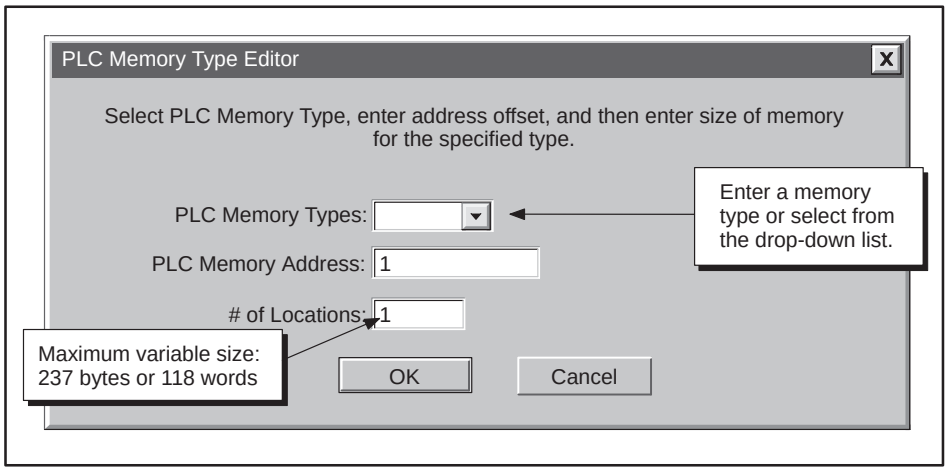


Figure 5-21 PLC Memory Type Editor Dialog Box

Variable Name or <Index> Enter the variable name or variable index where the remote device stores the data that is transmitted during the job. You can also specify a subindex by using a colon (:) followed by the element number of the variable (user data type or array); for example, <100:2> indicates the second element of variable 100.

5.10 Configuring Send-Receive Jobs

Send-Receive Jobs

Before you can configure a Send-Receive job, you must have defined an FDL connection between the local FMS CP module and the remote device (see Section 5.7). The FMS CP module supports 48 communication jobs, which may be a combination of FMS and Send-Receive jobs. Click on Send-Receive Jobs on the configuration tree to see the number of communication jobs available, as shown in Figure 5-22.

For more detail on these jobs, see Section 4.4.

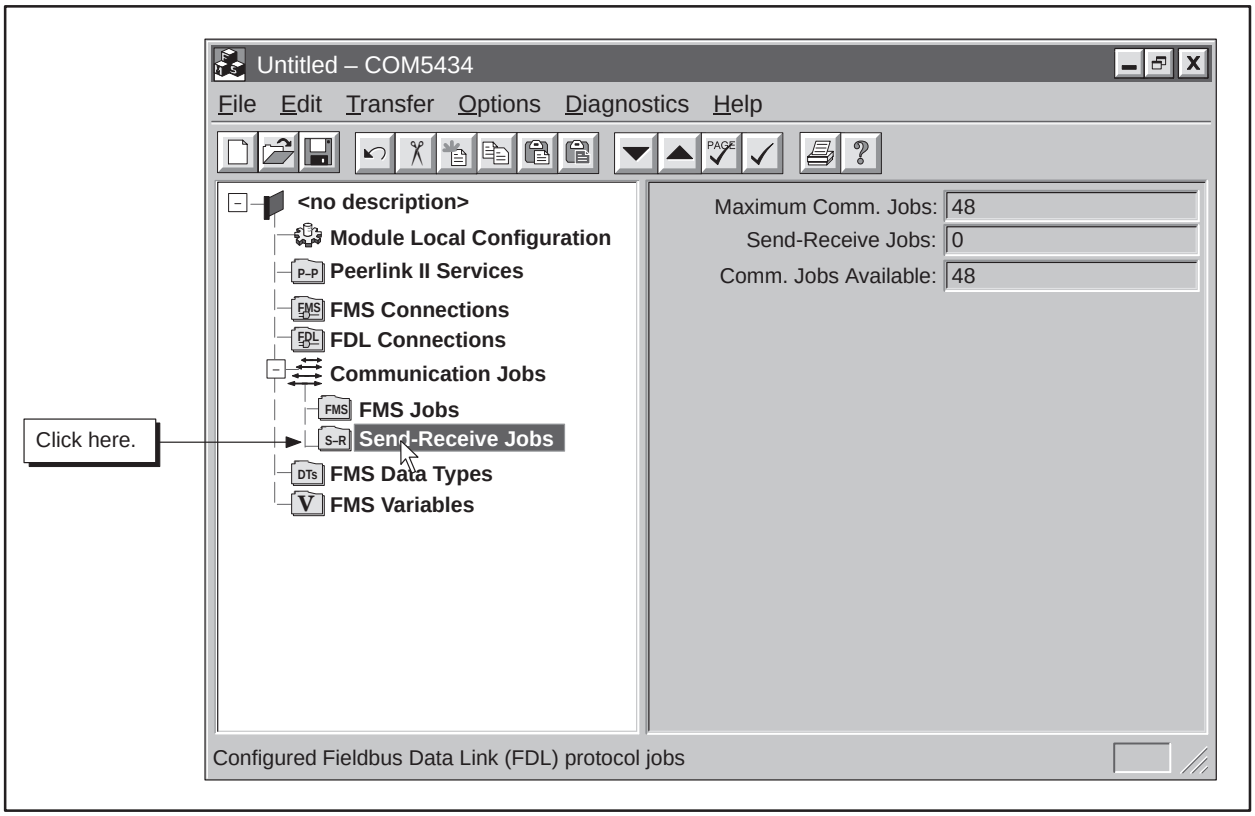


Figure 5-22 Send-Receive Jobs

Maximum Communication Jobs This field displays the total number of communication jobs supported by the FMS CP module.

Send-Receive Jobs This field displays the number of Send-Receive jobs that have been defined for the FMS CP module.

Communication Jobs Available This field displays the total number of unused communication jobs.

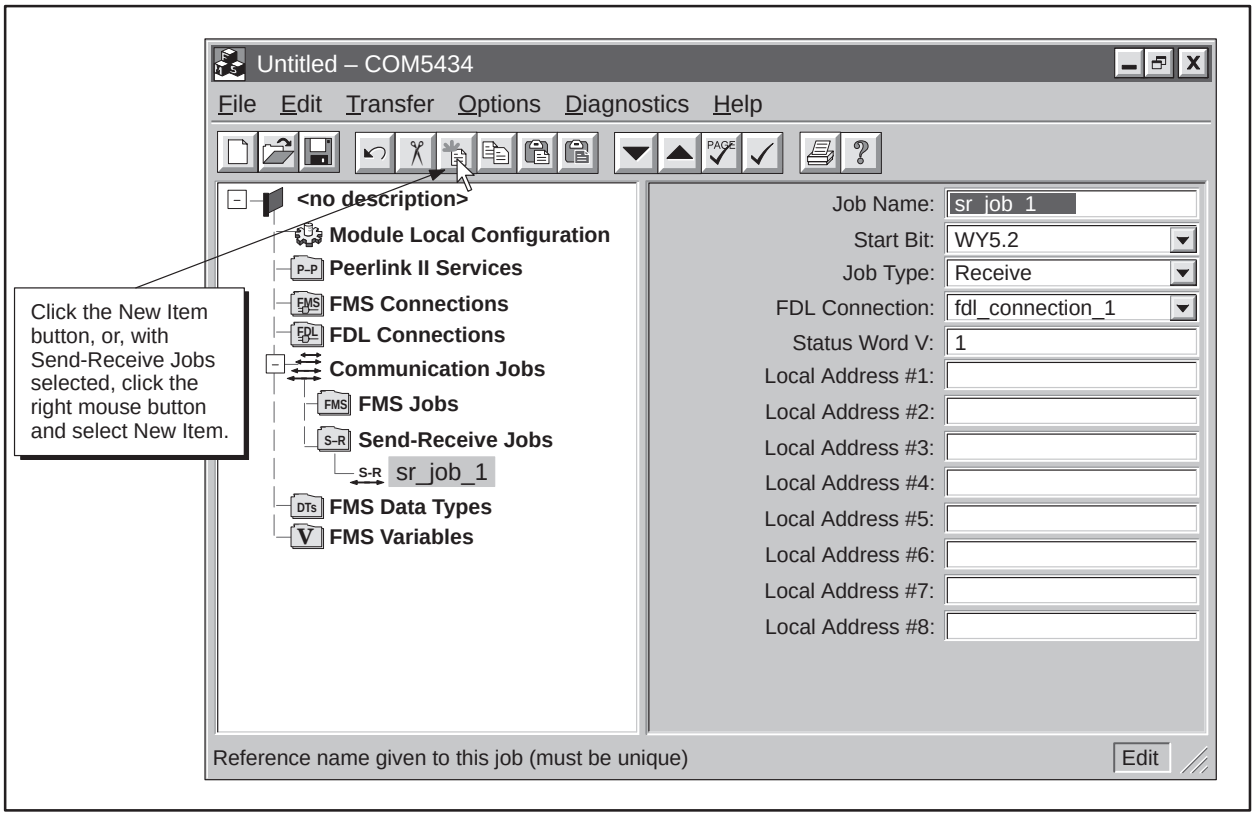


Figure 5-23 Configuring Send-Receive Jobs

Defining a Send-Receive Job

To define a Send-Receive job, follow the steps below:

1. Click on **Send-Receive Jobs** on the configuration tree.

2. Click on the **New Item** button on the toolbar. A Send-Receive job appears in the configuration tree and the input fields change (see Figure 5-23).

3. Fill in the following fields in the input pane:

   Job Name Enter a unique name for each Send-Receive job. (If you have selected Automatically Generate Names from the Options menu, the COM5434 Configurator enters a name for the job, but you can change it if you want.)

   Start Bit Each Send-Receive job requires a start bit to trigger the job. The start bit for each job must be unique. When you select a start bit for the job from the drop-down menu, that bit is no longer available as a selectable bit for other jobs. (The corresponding "job active" bit is automatically assigned when you select the start bit.)

Job Type Select Send or Receive from the drop-down list.

FDL Connection Select an FDL connection that you have previously defined. The COM5434 Configurator automatically lists your connection choices.

Status Word V The Status Word is a memory location in V memory which is updated each time a job completes. This allows you to check the status of each job you configure. If you specify a value of zero in this field, job status is not reported to a status word. (You can examine the status of job communications by selecting the menu command **Diagnostics → Job Status**.)

Local Address #*n* Enter the address for each location where the FMS CP module retrieves the data it is transmitting or stores the data it receives during the job. Each local address consists of the programmable controller memory type (V, K, X, Y, etc.), the starting address, and the number of locations (the configurator automatically calculates them as a bit, byte, or word, based on the memory type selection). The total number of bytes of all the memory locations added together cannot exceed 240 bytes.

When you click on one of the Local Address fields, a button appears. Click on the button, and the dialog box shown in Figure 5-24 appears. Fill in the fields in the dialog box to complete the local address. Then select **OK**. (You can also enter an address manually; for example, V1, 1.)

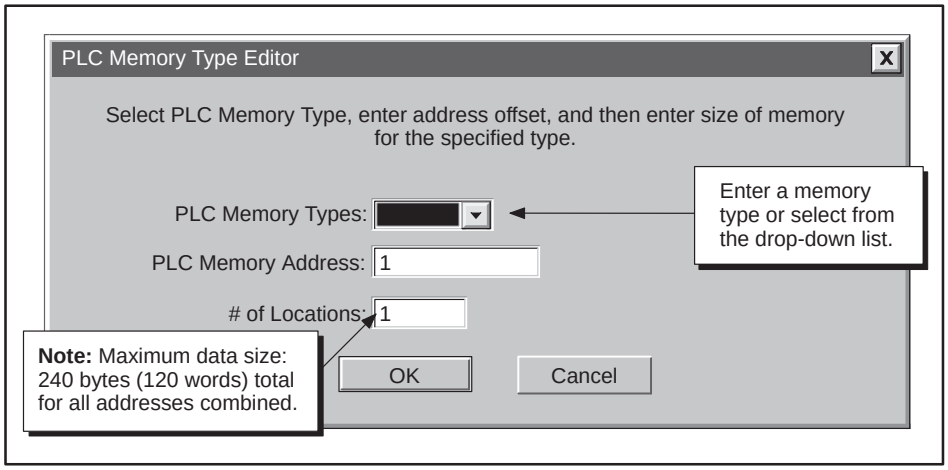


Figure 5-24 PLC Memory Type Editor Dialog Box

5.11 Creating FMS Data Types

FMS Data Types

The FMS CP module supports up to 85 FMS data types. You can construct a user data type to hold a combination of information types, and then define a variable that uses that special data type.

Click on FMS Data Types on the configuration tree to see the number of user data types available, as shown in Figure 5-25.

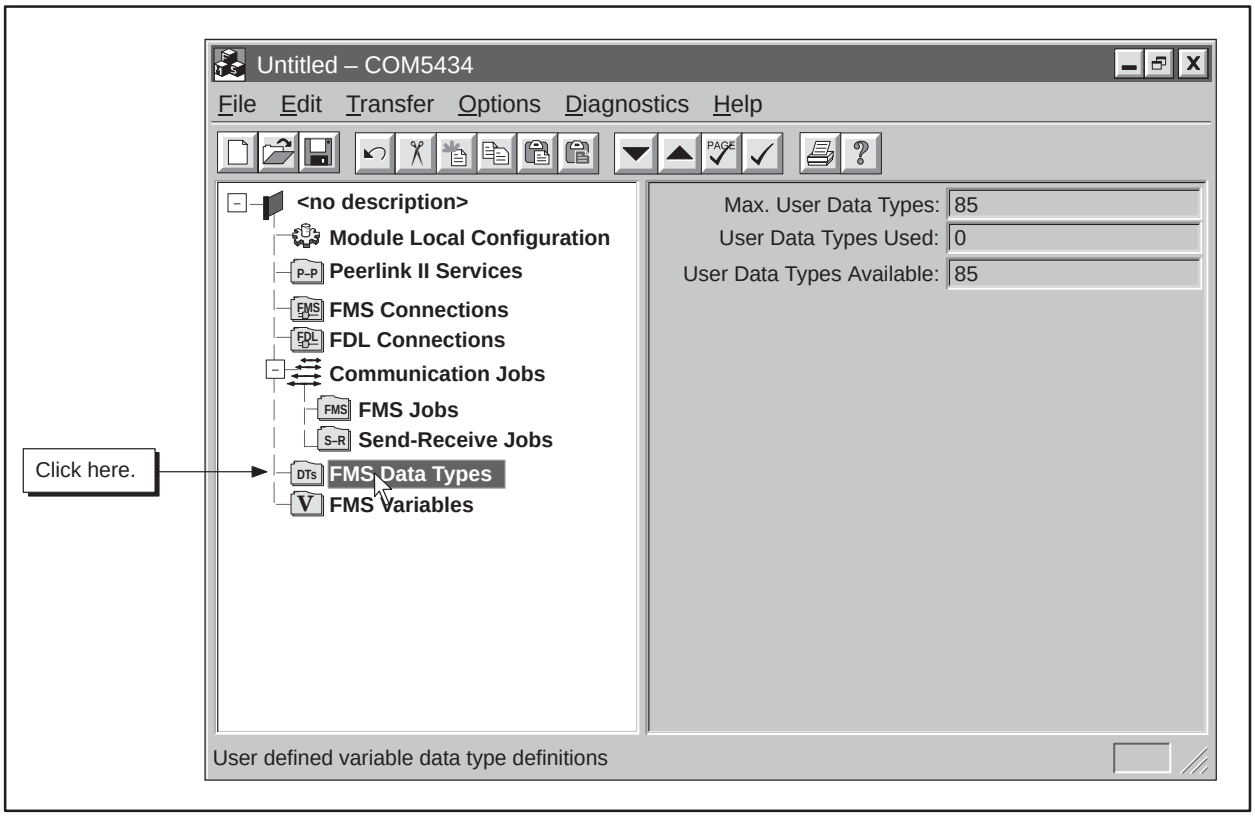


Figure 5-25 FMS Data Types Available

Maximum User Data Types This field displays the total number of FMS user data types that are supported by the FMS CP module.

User Data Types Used This field displays the number of user data types that have been created.

User Data Types Available This field displays the number of user data types that can be constructed.

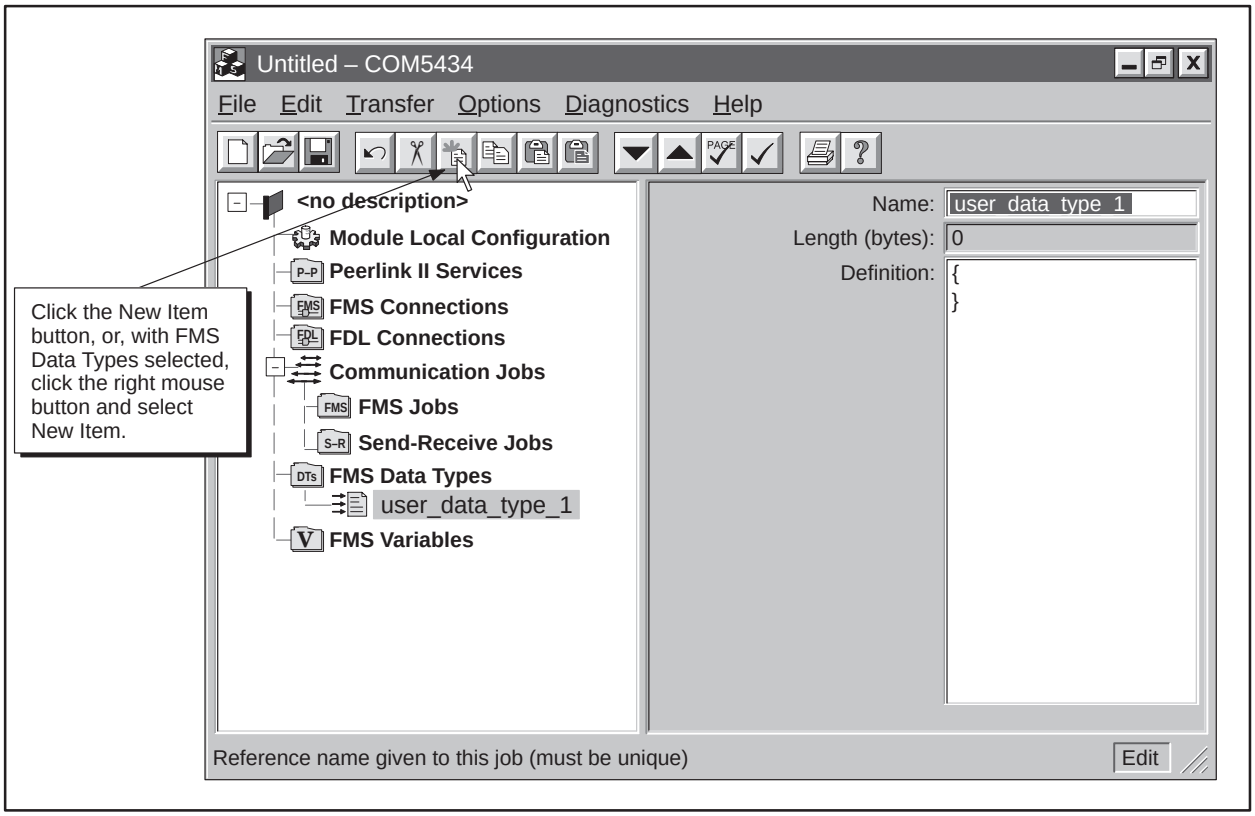


Figure 5-26 Creating a User Data Type

Creating a User Data Type

To create a User Data Type, follow the steps below:

1. Click on **FMS Data Types** on the configuration tree.
2. Click on the **New Item** button on the toolbar. A User Data Type appears in the configuration tree and the input fields change (see Figure 5-26).
3. Fill in the following fields in the input pane:

   Name Enter a unique name for each user data type. (If you have selected Automatically Generate Names from the Options menu, the COM5434 Configurator enters a name for the data type, but you can change it if you want.)

   Length (bytes) The length of the data type you create is determined by the combination of pre-defined types you select. The COM5434 Configurator automatically calculates this information for you after you define the user data type.

Definition When you click on the Definition field, a button appears. Click on the button to bring up the User Data Type Editor dialog box (shown in Figure 5-27). Use the drop-down list of available data types together with the insert or delete buttons to build your data type definition. Then click on OK in the dialog box to complete the User Data Type. (Refer to Section A.3 for more details on data types.)

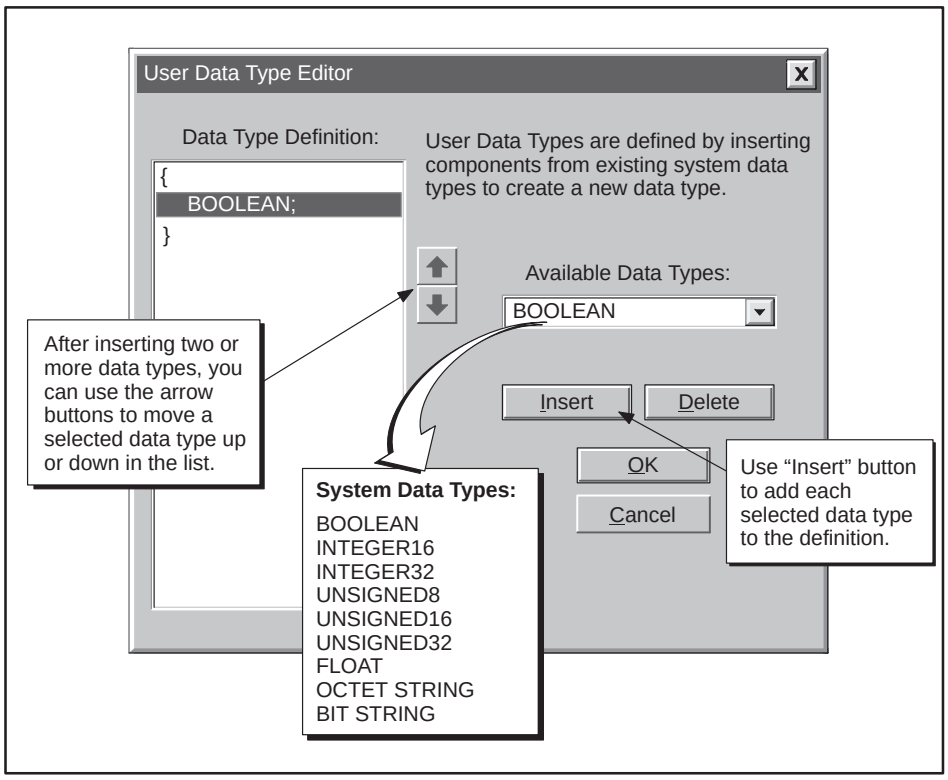


Figure 5-27 User Data Type Editor Dialog Box

5.12 Creating FMS Variables

FMS Variables

The FMS CP module supports up to 100 FMS variables.

Click on FMS Variables on the configuration tree to see the number of variables available, as shown in Figure 5-28.

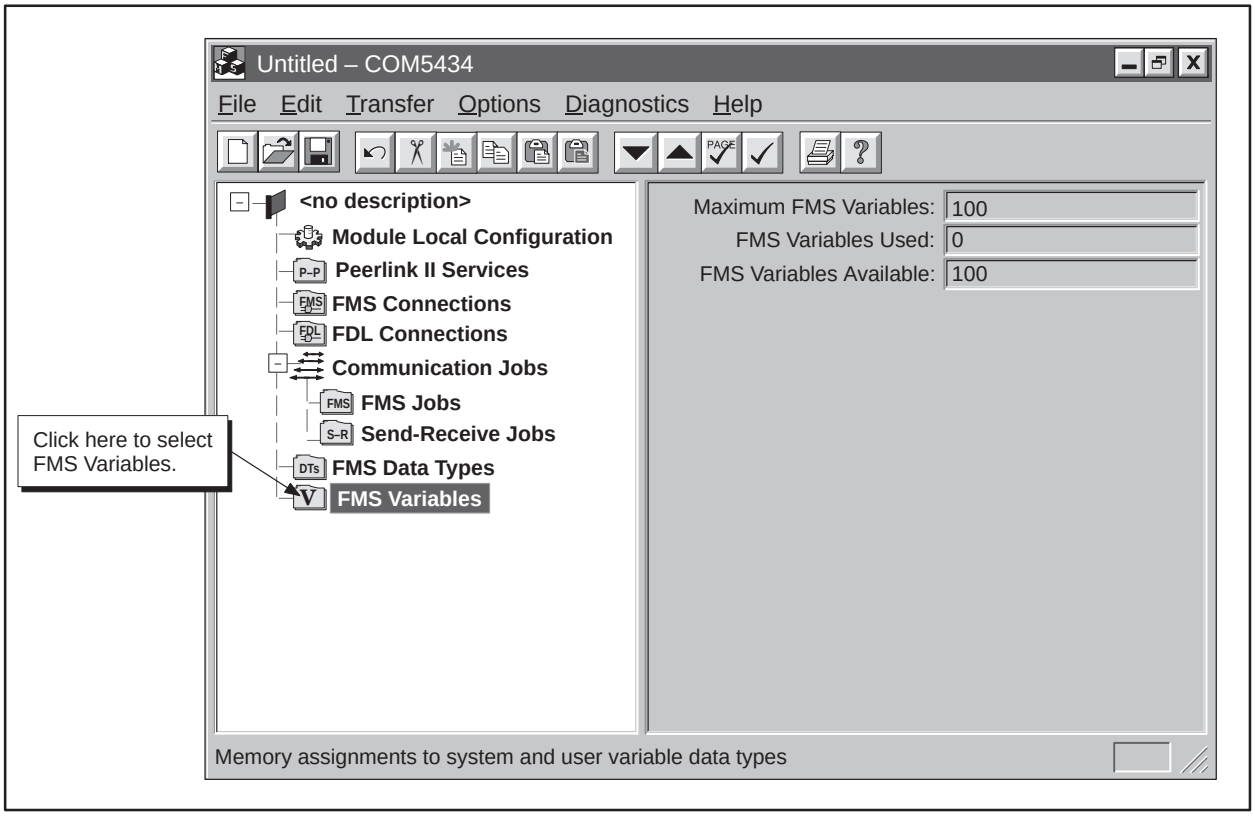


Figure 5-28 FMS Variables Available

Maximum FMS Variables This field displays the total number of FMS variables that are supported by the FMS CP module.

FMS Variables Used This field displays the number of FMS variables that have been created.

FMS Variables Available This field displays the number of FMS variables that can be constructed.

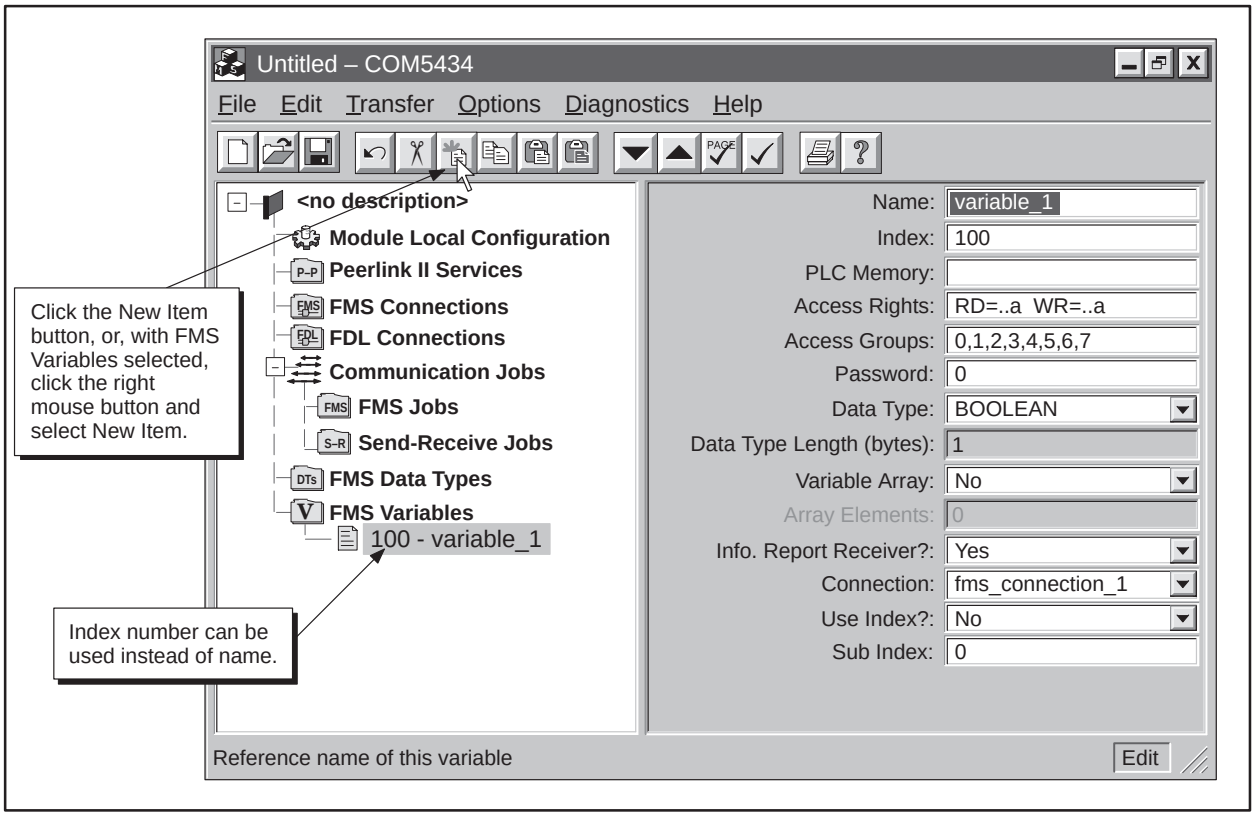


Figure 5-29 Defining FMS Variables

Defining an FMS Variable

To define an FMS variable, follow the steps below:

1. Click on **FMS Variables** on the configuration tree.
2. Click on the **New Item** button on the toolbar. An FMS Variable appears in the configuration tree and the input fields change (see Figure 5-29).
3. Fill in the following fields in the input pane:

   Name Enter a unique name for each FMS variable. (If you have selected Automatically Generate Names from the Options menu, the COM5434 Configurator enters a name for the variable, but you can change it if you want.) This name is added to the Object Dictionary generated by the software.

   Index This field displays the index number (from 15 to 65535) that is automatically assigned to each FMS variable, but you can change it if you want. This index number is added to the Object Dictionary generated by the software.

PLC Memory When you click on the PLC Memory field, a button appears in the field. Click on the button to view the PLC Memory Type Editor dialog box (shown in Figure 5-30). Select a PLC memory type from the top drop-down menu, enter a PLC memory address in the bottom field, and then select **OK**. The dialog box disappears, and the PLC memory address is displayed in the PLC Memory field.

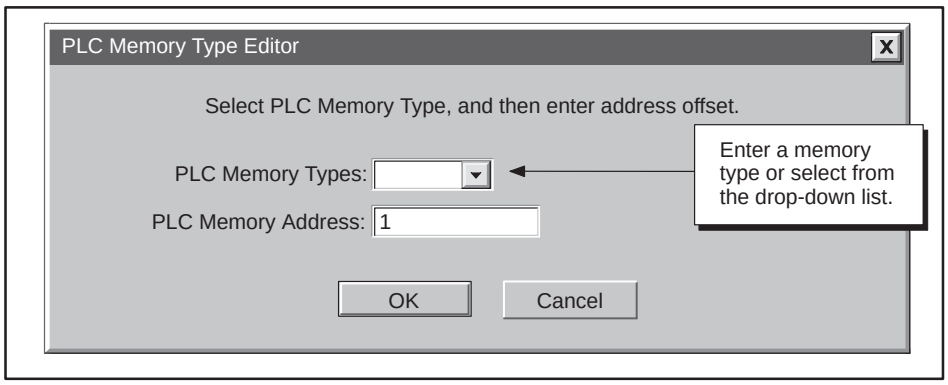


Figure 5-30 PLC Memory Editor Dialog Box

Access Rights When you click on this field, a button appears in the field. Click on the button to view the Variable Access Rights dialog box (shown in Figure 5-31). Click on the boxes to configure access privileges for this variable, and then select **OK**. The dialog box disappears, and the selected privileges are displayed in the Access Rights field. (Refer also to Table A-9 for more information about access rights.)

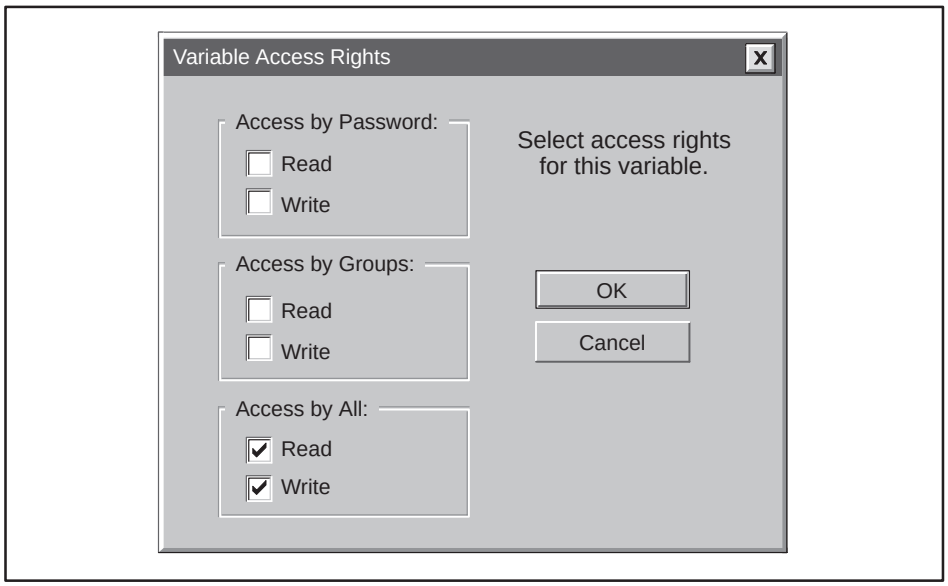


Figure 5-31 FMS Variable Access Rights Dialog Box

Access Groups When you click on the Access Groups field, a button appears in the field. Click on the button to view the Variable Access Groups dialog box (shown in Figure 5-32). Define which groups can have access to the variable by clicking on the group boxes, and then select **OK**. The dialog box disappears, and the selected groups are displayed in the Access Groups field. (Refer to Section 4.3 for more information about access groups.)

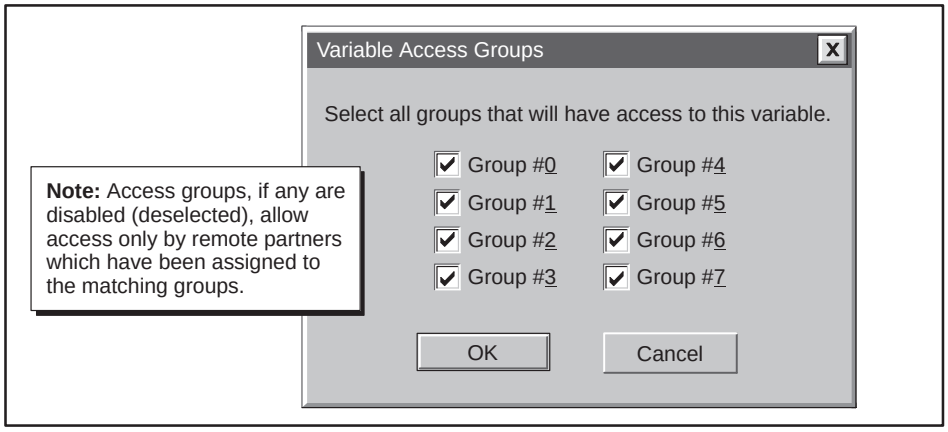


Figure 5-32 FMS Variable Access Groups Dialog Box

Password Enter a numeric value as the password required to access the FMS variable. This password, if used, limits access to a remote partner specifying the same password. (Refer to Section 4.3 for more information about passwords.)

Data Type Select a data type for the variable from the drop-down menu. (FMS data types that you create appear in the list along with the standard FMS data types.) Refer to Section A.3 for more details on data types.

Data Type Length (bytes) The length of the FMS variable you create is automatically entered into this field by the COM5434 Configurator. If the data type is a string type (octet or bit), enter a value here.

Variable Array Select whether the data type is an array of the selected type or a simple data type by selecting Yes or No.

Array Elements If the data type is an array, this field shows the number of elements contained in the array.

Info. Report Receiver? Select Yes to specify that the variable can be used to receive Information Reports.

Connection Specify which connection is allowed to send Information Reports to this variable.

Use Index? Select Yes to specify that the Information Report is to be stored as an index, or select No to store it by name.

Sub Index You can specify an element number if the variable is an array or a structure (if the structure is not an array). For example, if your variable consists of an array of 10 elements of data type INTEGER16, a subindex value of 4 specifies the fourth 16-bit integer in the variable array.

5.13 Saving and Downloading the Configuration

Validating and Saving the Configuration to a File

You can save your configuration to a file before you download the file to the FMS CP module. To save a configuration, follow these steps:

1. To ensure that all configuration parameters are valid before saving, select the menu command **Transfer → Validate Configuration Now** or click on the Validate button: 

   Correct any invalid parameters as described by each error message.

2. Select the menu command **File → Save As...** or click on the Save button: 

3. Use the drop-down list box at the top of the Save As dialog to select a directory to store the saved file.

4. Enter a file name, as shown in Figure 5-33.

5. Click on **Save**.

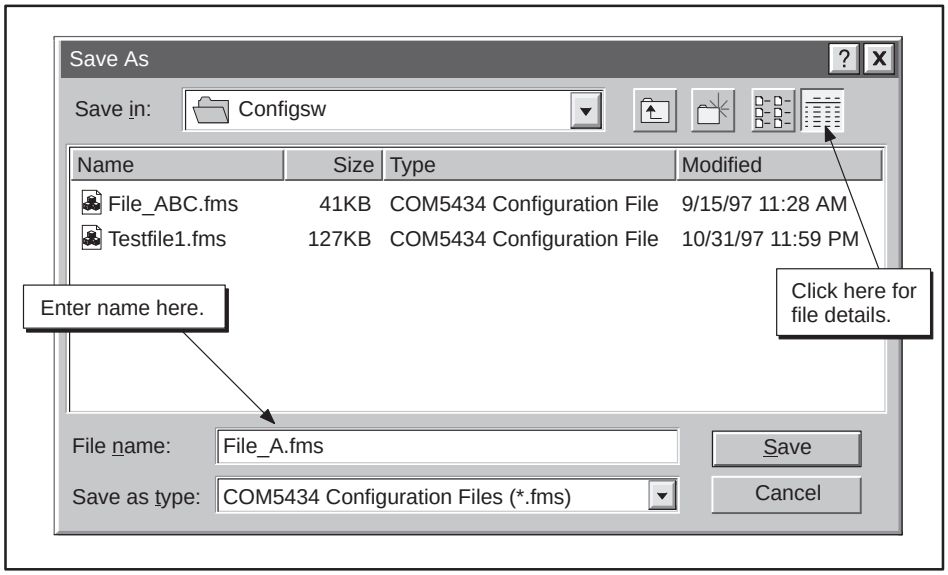


Figure 5-33 Saving Your Configuration to a File

NOTE: Be sure to save your configuration for each module in a safe place, according to your company's requirements. In case a module ever fails, you will need your archived configuration file to configure the replacement module exactly as the original module.

Printing the Configuration

It is always a good practice to produce and archive accurate documentation for each configuration. A printed record of your configuration is one way to do this. To print the complete configuration or selected parts of it, follow these steps:

1. Validate and save the configuration, as described on page 5-41.
2. Select the menu command **File** → **Print...** or click on the  button.
3. The Print dialog allows you to select all (the default) or part of the configuration for printing. Select the sections you want to print.
4. Click on **OK**.

Downloading the Configuration to the FMS CP Module

After validating and saving your configuration file, you can download it to the FMS CP module.

⚠ WARNING

Downloading a configuration to an FMS CP module on line in a network will cause interruption of network communications with that module only. If the download is successful, network communications will resume after the module returns to RUN mode.

Any interruption to network communications could cause unpredictable machine or process operation, possibly resulting in death or serious injury to personnel, and/or damage to equipment.

To avoid problems resulting from interruption of network communications, design your installation to tolerate interruptions in network communications, and/or stop your process in a safe state before you download configurations to any network FMS CP module.

⚠ WARNING

If you download new Module Local Configuration parameters (such as station address and network baud rate) to a module in an active network, and the new parameters are not compatible with the network configuration already in use, the download operation may be unsuccessful and could cause a disruption in the network communications.

Disrupting network communications could cause unpredictable machine or process operation, possibly resulting in death or serious injury to personnel, and/or damage to equipment.

To avoid a download failure and a disruption in network communications, stop your process in a safe state and disconnect the PROFIBUS cable from the FMS CP module before downloading new module configuration parameters. Reconnect the module to the network and ensure proper network operation before reactivating your process.

To download a configuration to the FMS CP module, follow these steps:

1. Make sure that the programming cable is connected between the serial port on your PC and the RS-232 port on the FMS CP module, and that the baud rate setting in the software matches the jumper-selected baud rate on the module, (see Section 2.2 and Figure 5-3).

2. Select the menu command **Transfer → Download to the CP5434**, or click on the Download button: 

3. If the module is currently configured, select **Yes** on the information message to overwrite the existing configuration with the new one.

4. Click on **OK**.

Chapter 6

Configuration Examples

6.1 Overview

This chapter describes how to define connections and jobs for the FMS CP module using the COM5434 Configurator. Several configuration examples are provided. The configuration examples are based on the example network shown in Figure 6-1.

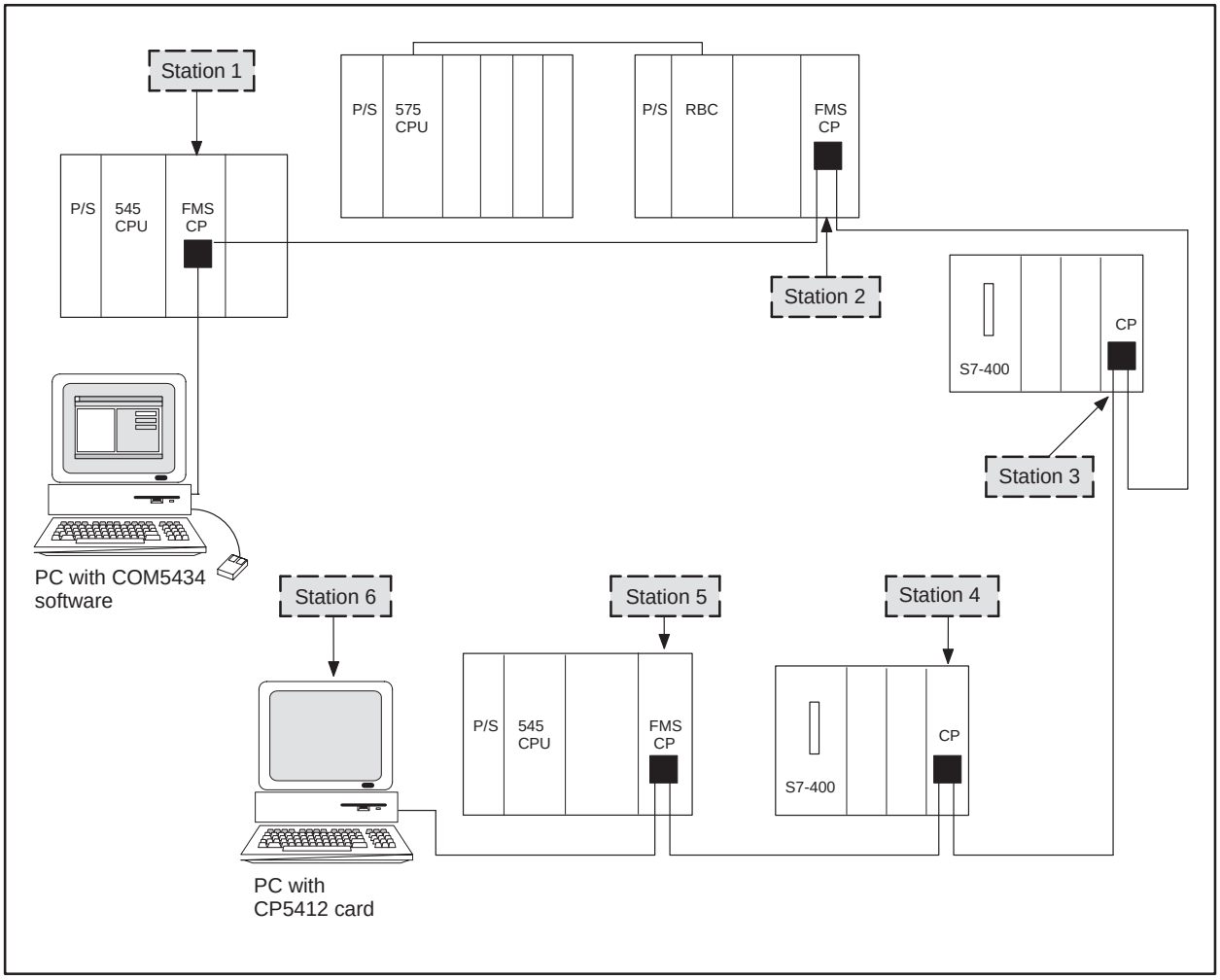


Figure 6-1 Example Network

Figure 6-2 shows the configuration tasks you must complete to configure the FMS CP module using the COM5434 Configurator.

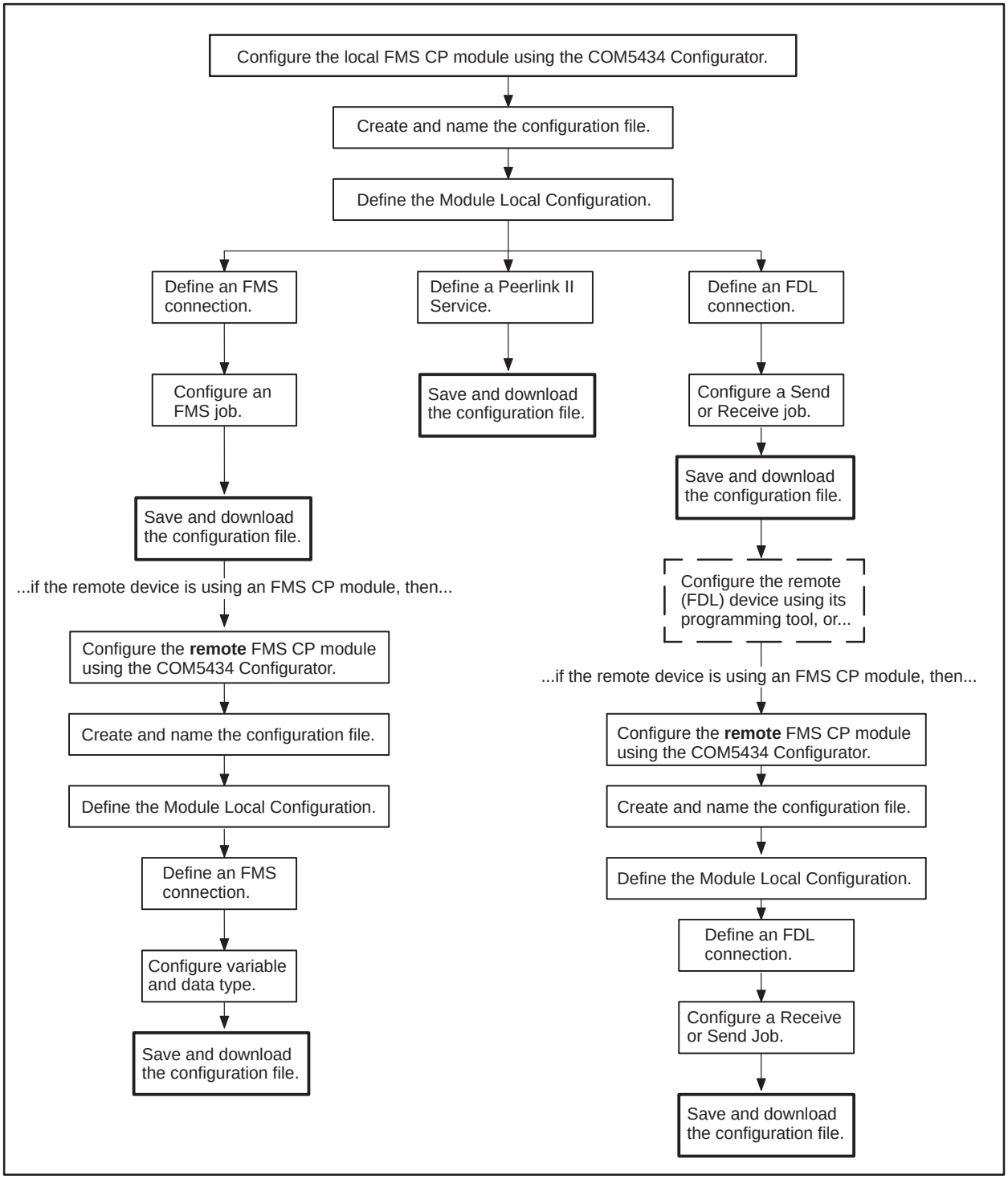


Figure 6-2 Configuration Tasks

6.2 Example of an FMS Read Job

Figure 6-3 shows the flow of data during an FMS Read job configured between Station 1 (FMS CP) and Station 2 (FMS CP) on the example network. Station 1 is the client and initiates the request for data. Station 2 is the server, responding to the request with a transfer of data from the FMS variable specified by Station 1.

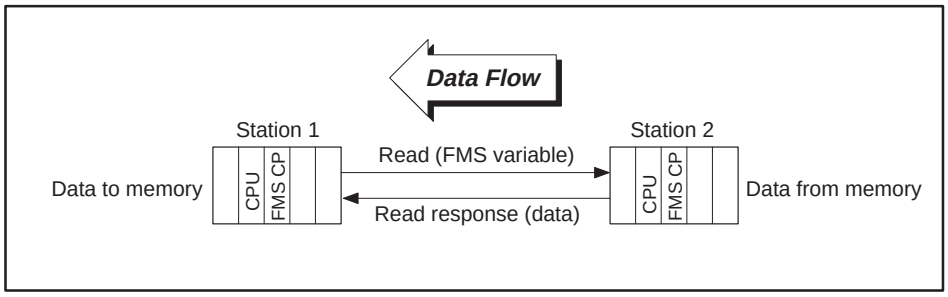


Figure 6-3 Data Flow for FMS Read Example

Configuration Tasks for an FMS Read Job

Using the COM5434 Configurator, configure the FMS Read job between Station 1 and Station 2 by completing the following tasks:

- ☐ Create and name the configuration file for Station 1.
- ☐ Define the Module Local Configuration for Station 1.
- ☐ Define an FMS connection for Station 1.
- ☐ Configure an FMS Read job for Station 1.
- ☐ Save and download the configuration file to the FMS CP module at Station 1.

THEN...

- ☐ Create and name the configuration file for Station 2.
- ☐ Define the Module Local Configuration for Station 2.
- ☐ Define an FMS connection for Station 2 using the same addressing as the connection created for Station 1.
- ☐ Define an FMS variable.
- ☐ Save and download the configuration file to the FMS CP module at Station 2.

These tasks are described in detail on the following pages.

Creating the Configuration File for Station 1

The first step in the process is to create the configuration file. Click on the top icon of the configuration tree, which says **<no description>**. Then enter a description for this file in the Description field, as shown below and in Figure 6-4.

Description: `File_A`

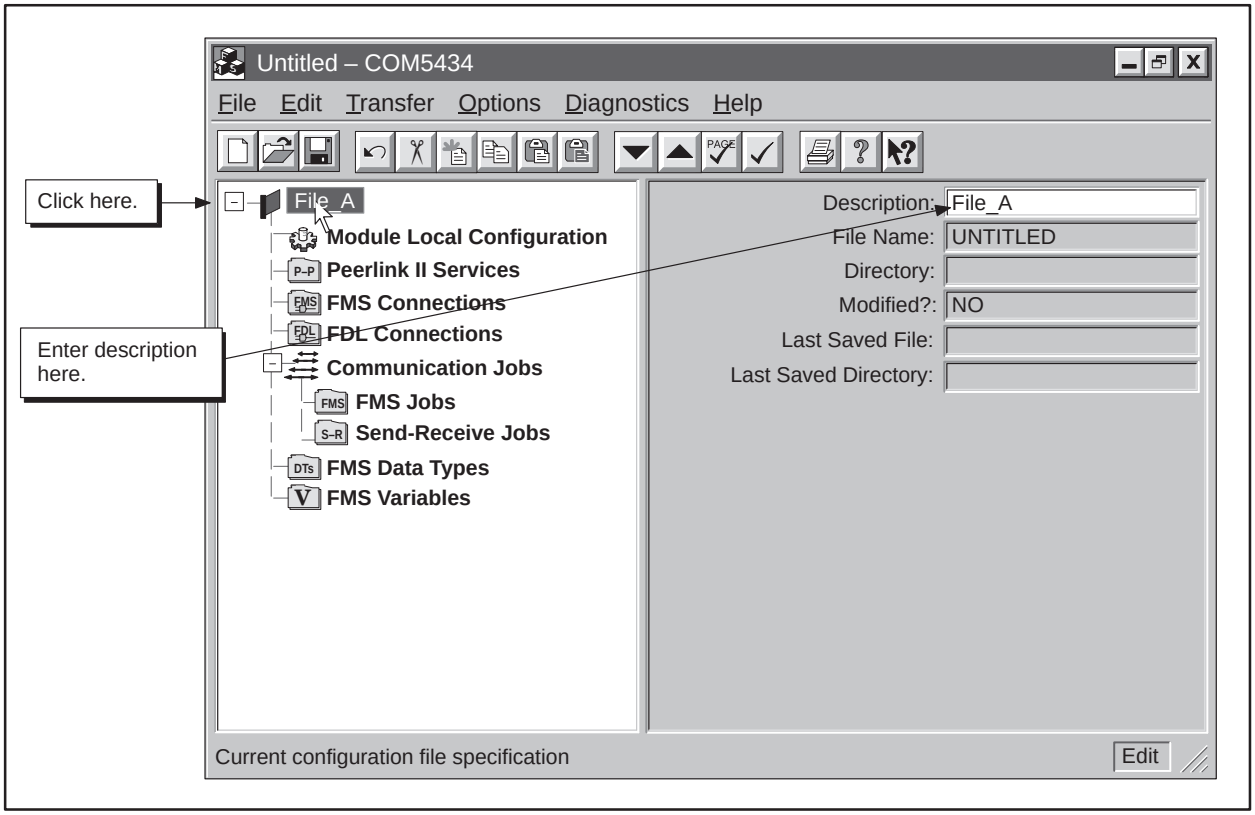


Figure 6-4 Creating a Configuration File

Defining the Module Local Configuration for Station 1

Next, you must define the Module Local Configuration of the FMS CP module for Station 1.

1. Click on the Module Local Configuration icon.

2. Complete the fields listed below (and shown in Figure 6-5) to define the Module Local Configuration:

   Local Station Address: `1`

   Highest Station Address: `15`

   Bus Parameter Profile: `FMS-DP Universal`

   Baud Rate: `1.5 MBaud`

   # of Masters (holds token): `6`

   # of Slaves (no token): `0`

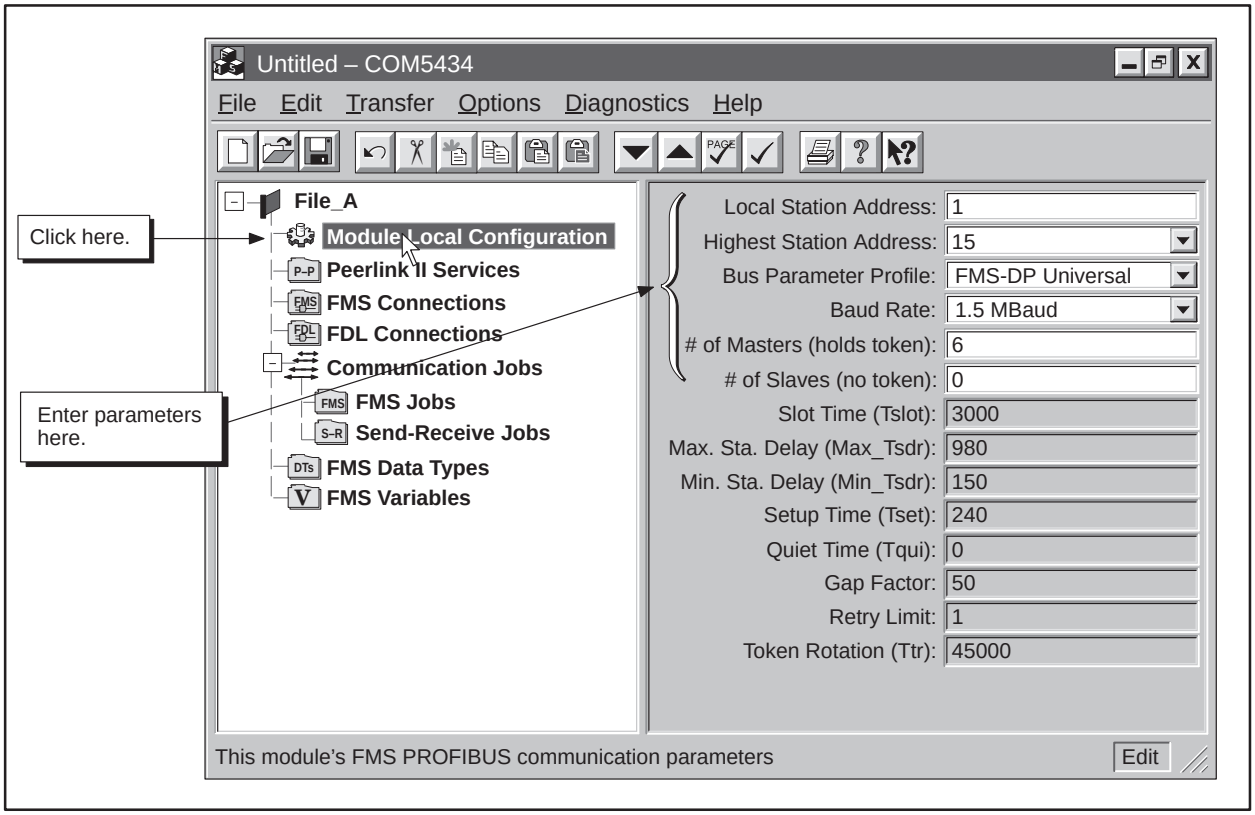


Figure 6-5 Module Local Configuration Example

Defining an FMS Connection for Station 1

Continue configuring the FMS Read job by defining the FMS connection for the FMS CP module at Station 1.

1. Click on the FMS Connections icon of the configuration tree.
2. Click on the New Item button on the toolbar.
3. Complete the fields listed below (and shown in Figure 6-6) to define the FMS connection for Station 1:

   Name: pumpconnect

   Local LSAP: 3

   Remote Station Address: 2

   Remote LSAP: 5

   Leave the remaining fields at their default values.

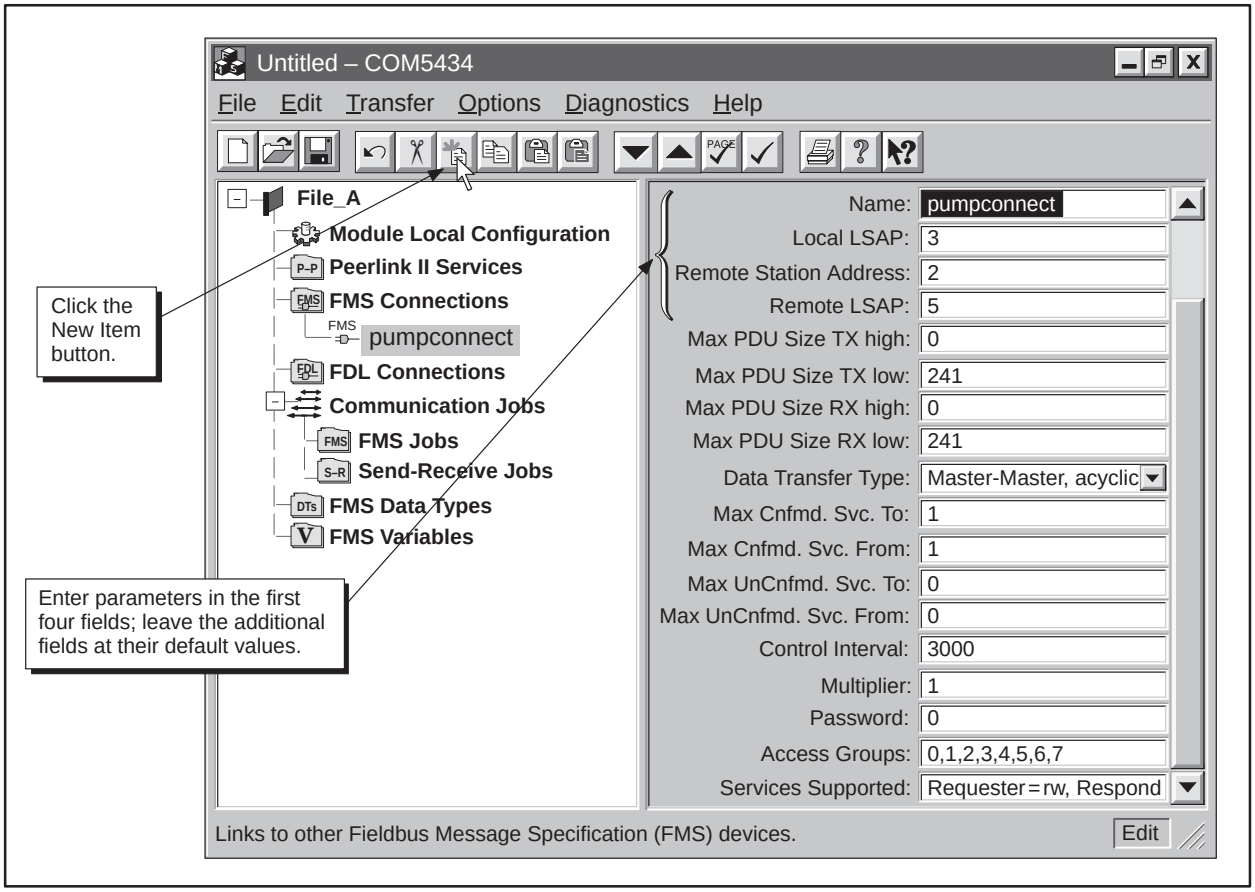


Figure 6-6 Defining an FMS Connection Example

Example of an FMS Read Job (continued)

Configuring the FMS Read Job for Station 1

Once you have defined the Module Local Configuration and the FMS connection, you can configure the FMS Read job for Station 1.

1. Click on the FMS Jobs icon on the configuration tree.
2. Click on the New Item button on the toolbar.
3. Complete the fields listed below (and shown in Figure 6-7) to configure the FMS Read job.

Job Name: `pump_1`

Start Bit: `WY5.2`

Job Type: `Read`

Connection: `pumpconnect`

Status Word V: `1`

Local Address: `V100,10`

Variable Name or <Index>: `<100>`

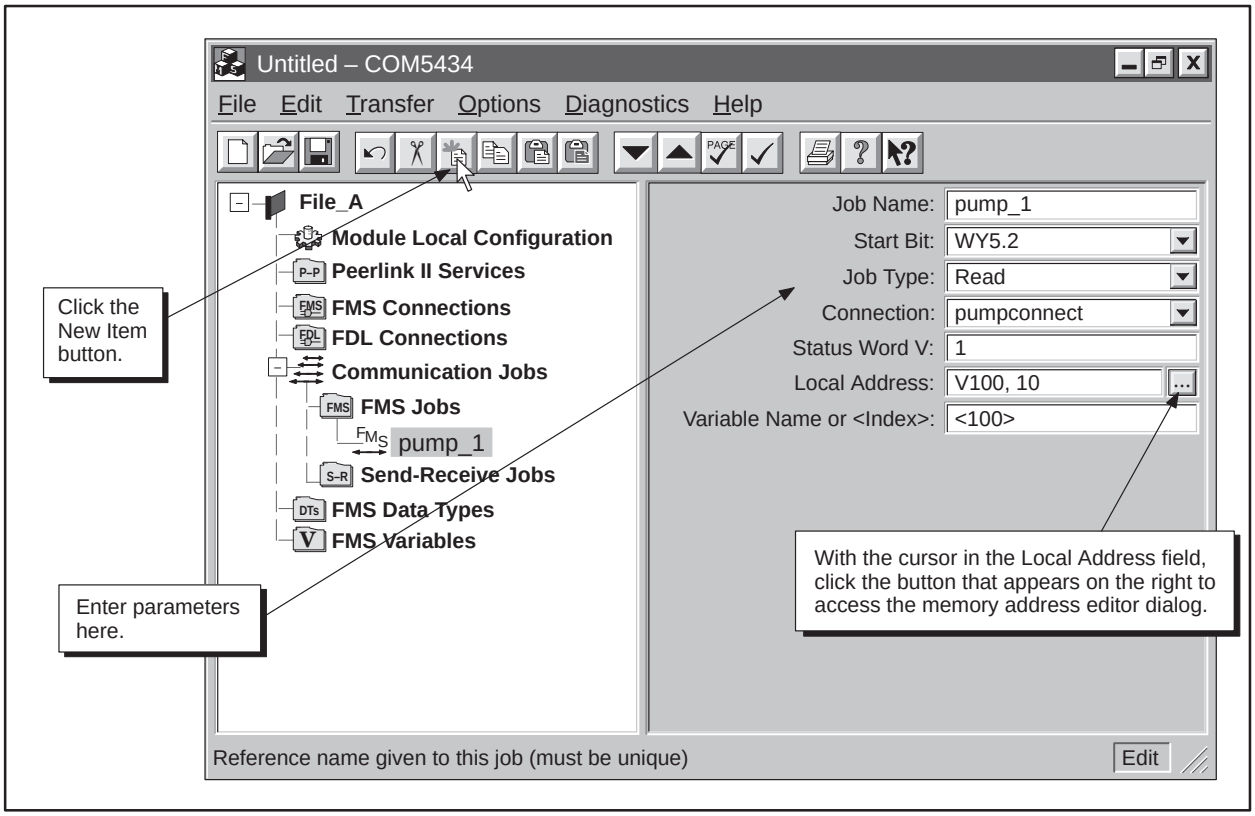


Figure 6-7 FMS Read Job Example

Saving the Configuration File to Disk

Save your file to disk before attempting to transfer the file to the FMS CP module. Follow these steps:

1. Select the menu command **File** → **Save As...** or click on the Save button: 
2. Select a directory to store the saved file.
3. Enter a file name, as shown in Figure 6-8.
4. Click on **Save**.

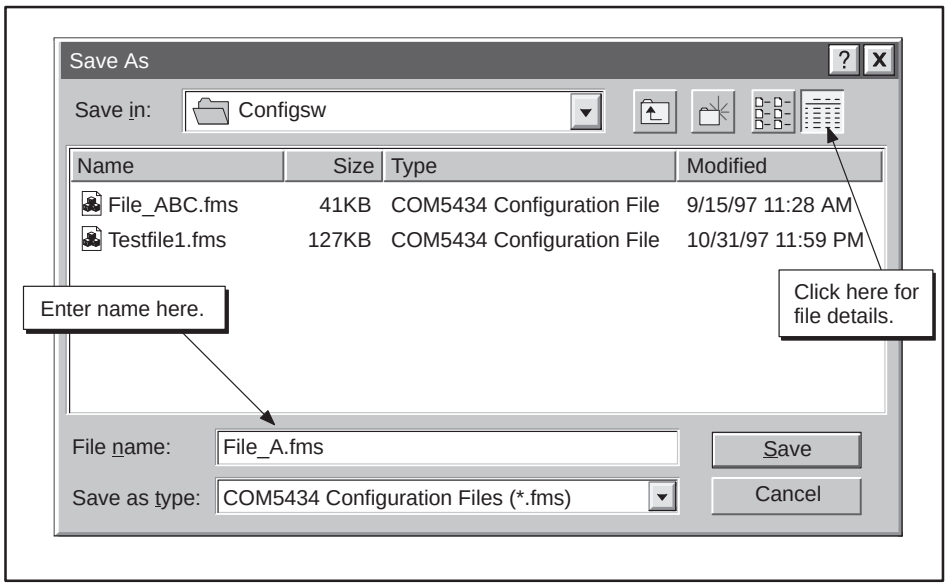


Figure 6-8 Save As Dialog

Transferring the Configuration to the FMS CP Module at Station 1

After saving your configuration file, download it to the FMS CP module at Station 1 by following these steps:

1. Select the menu command **Transfer** → **Download to the CP5434**, or click on the Download button: 
2. Click on **OK**.

Example of an FMS Read Job (continued)

Creating the Configuration File for Station 2

After you configure the FMS Read job for Station 1, you need to create a configuration file for Station 2 by following these steps:

1. Select the menu command **File** → **New** to create an empty configuration file.
2. Enter a description for this file in the Description field, as shown below:

   Description: `File_AB`

Setting the Module Local Configuration for Station 2

Next, you must define the Module Local Configuration of the FMS CP module at Station 2.

1. Click on the Module Local Configuration icon.
2. Complete the fields listed below to define the Module Local Configuration for Station 2.

   Local Station Address: `2`

   Highest Station Address: `15`

   Bus Parameter Profile: `FMS-DP Universal`

   Baud Rate: `1.5 MBaud`

   # of Masters (holds token): `6`

   # of Slaves (no token): `0`

Defining an FMS Connection for Station 2

Continue configuring the FMS Read job by defining the FMS connection for the FMS CP module at Station 2.

1. Click on the FMS Connections icon of the configuration tree.
2. Click on the New Item button on the toolbar.
3. Complete the fields listed below to define the FMS connection for Station 2:

   Name: `Pump`

   Local LSAP: `5`

   Remote Station Address: `1`

   Remote LSAP: `3`

   Leave the remaining fields at their default values.

Defining an FMS Variable for Station 2

Continue configuring the FMS Read job by defining an FMS variable for the FMS CP module at Station 2.

1. Click on the FMS Variables icon of the configuration tree.
2. Click on the New Item button on the toolbar.
3. Complete the fields listed below (and shown in Figure 6-9) to define the FMS variable for Station 2:

   Name: `PumpControl`

   PLC Memory: `V200`

   Data Type: `UNSIGNED16`

   Variable Array: `Yes`

   Array Elements: `10`

   Leave the remaining fields at their default values.

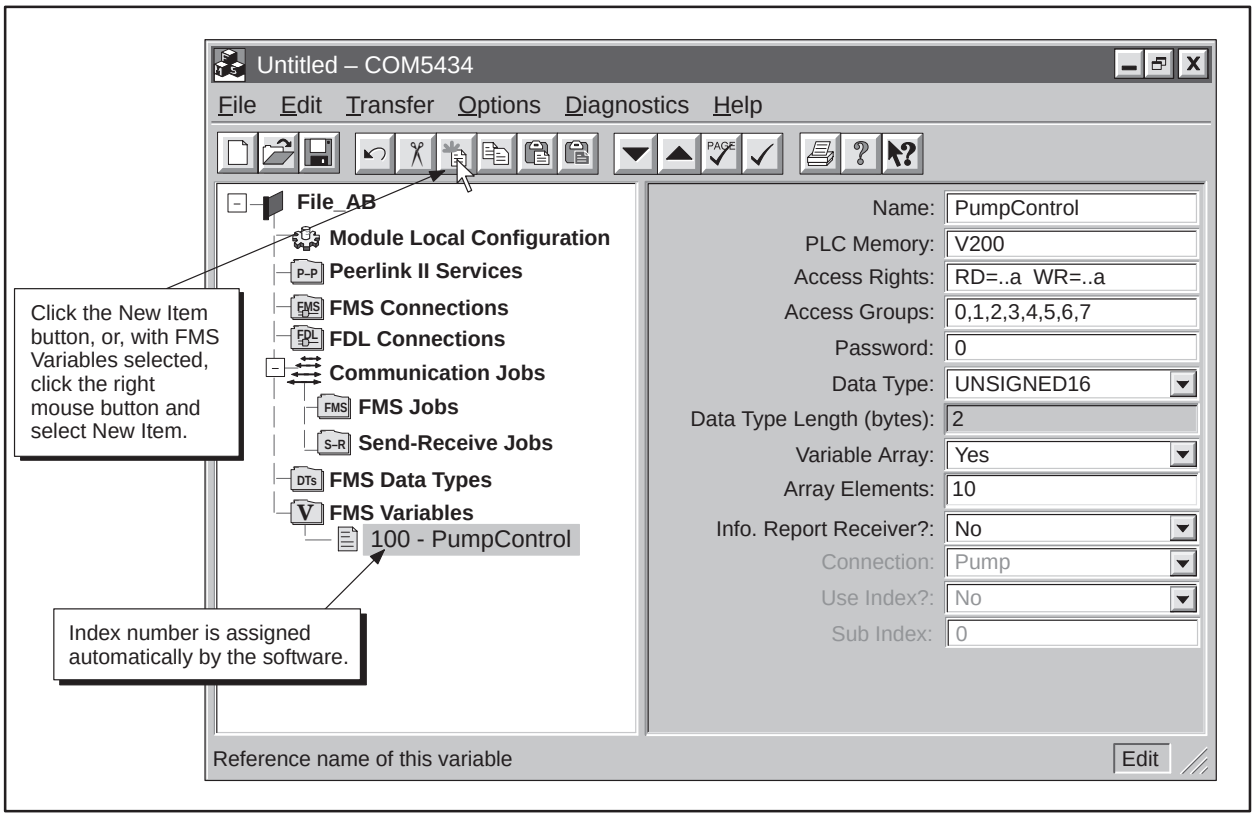


Figure 6-9 Defining an FMS Variable

Example of an FMS Read Job (continued)

Saving the Configuration File to Disk

Save your file to disk before attempting to transfer the file to the FMS CP module. Follow these steps:

1. Select the menu command **File** → **Save As...** or click on the Save button: 
2. Select a directory to store the saved file.
3. Enter a file name.
4. Click on **Save**.

Transferring the Configuration to the FMS CP Module at Station 2

After saving your configuration file, download it to the FMS CP module at Station 2 by following these steps:

1. Disconnect the programming cable from the FMS CP module at Station 1, and reconnect the cable to the RS-232 port on the FMS CP module at Station 2.
2. Select the menu command **Transfer** → **Download to the CP5434**, or click on the Download button: 
3. Click on **OK**.

Example RLL Code for FMS Read Job at Station 1

The Relay Ladder Logic example in Figure 6-10 demonstrates a typical scenario for using the FMS Read service of the FMS CP module. This section assumes that you are familiar with Series 505 programmable logic controller language.

NOTE: If the Read job is to be executed only one time, you must take appropriate action to disable Xn after the data transfer has been made.

NOTE: This relay ladder logic assumes good transactions, and does not contain status word checking. Error recovery must be implemented in ladder logic appropriate to your application. The WX and WY locations used in this RLL example correspond to module I/O addresses that have been configured in programmable logic controller memory using the Configure I/O function in TISOFT.

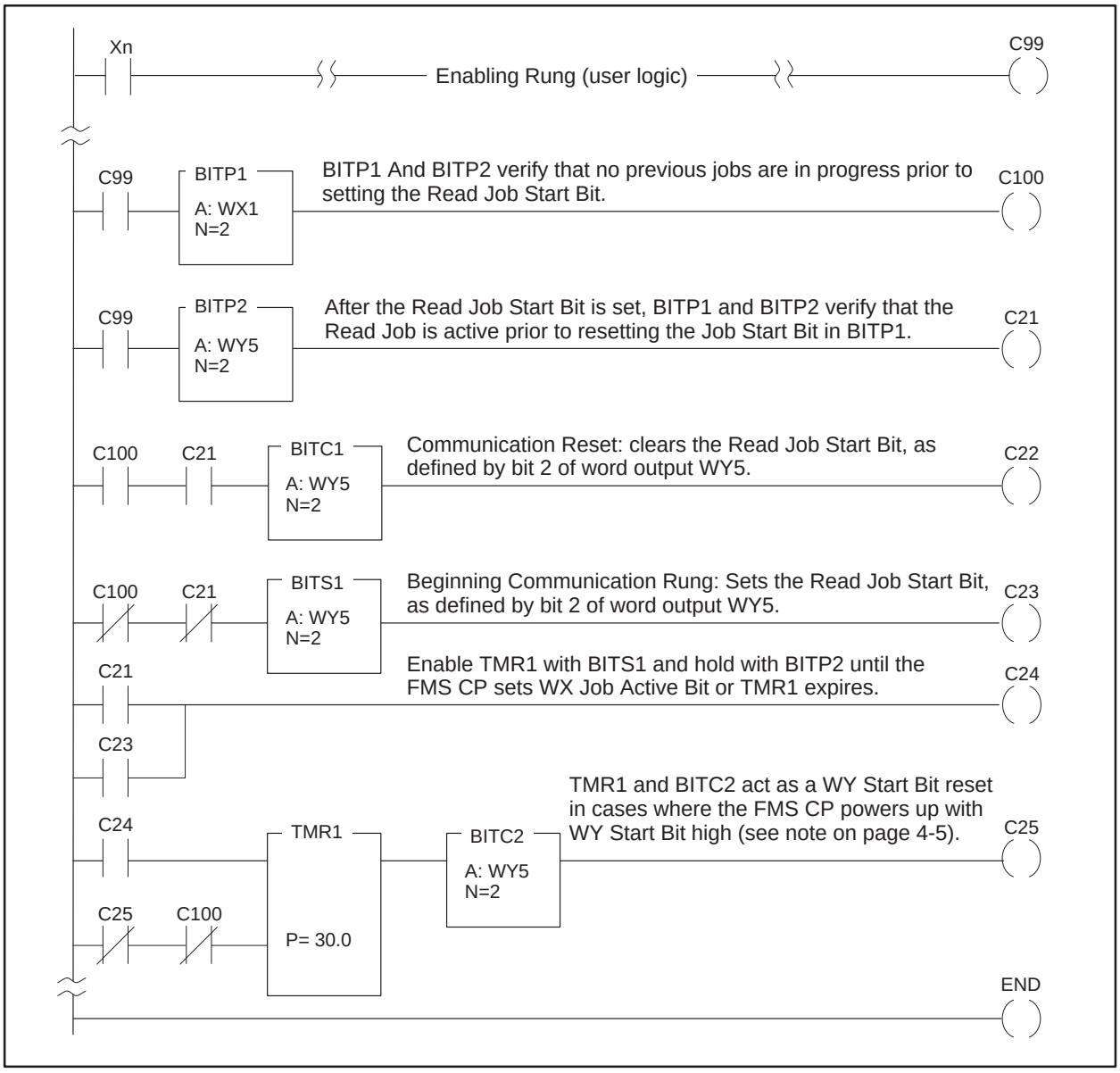


Figure 6-10 FMS Read Job Relay Ladder Logic for Station 1

6.3 Example of a Send-Receive Job

Figure 6-11 shows the flow of data during Send-Receive jobs configured between Station 1 (FMS CP) and Station 5 (FMS CP) on the example network. Station 1 sends the data. Station 5 receives the data from Station 1.

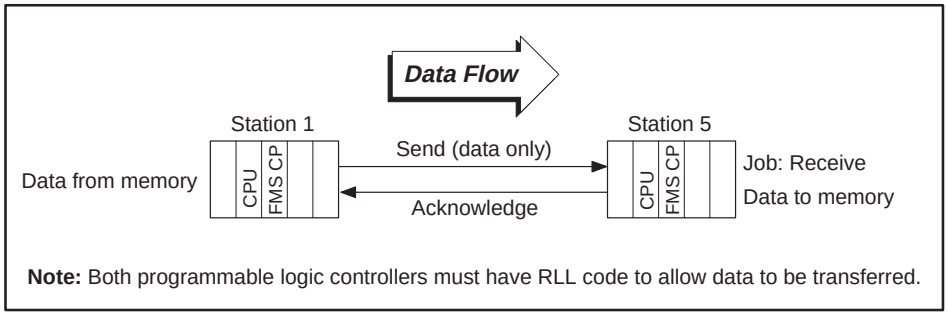


Figure 6-11 Send-Receive Job Data Flow Example

Configuration Tasks for a Send-Receive Job

Using the COM5434 Configurator, configure the Send and Receive jobs between Station 1 and Station 5 by completing the following tasks:

- ☐ Create and name the configuration file for Station 1.
- ☐ Define the Module Local Configuration for Station 1.
- ☐ Define an FDL connection for Station 1.
- ☐ Configure the Send job for Station 1.
- ☐ Save and download the configuration file to the FMS CP module at Station 1.

THEN...

- ☐ Create and name the configuration file for Station 5.
- ☐ Define the Module Local Configuration for Station 5.
- ☐ Define an FDL connection for Station 5 using the same addressing as the connection created for Station 1.
- ☐ Configure the Receive job for Station 5.
- ☐ Save and download the configuration file to the FMS CP module at Station 5.

These tasks are described in detail on the following pages.

Creating the Configuration File for Station 1

The first step in the process is to create the configuration file.

1. Select the menu command **File** → **New** to create an empty configuration file.

2. Enter a description for this file in the Description field, as shown below (and in Figure 6-12):

   Description: `File_B`

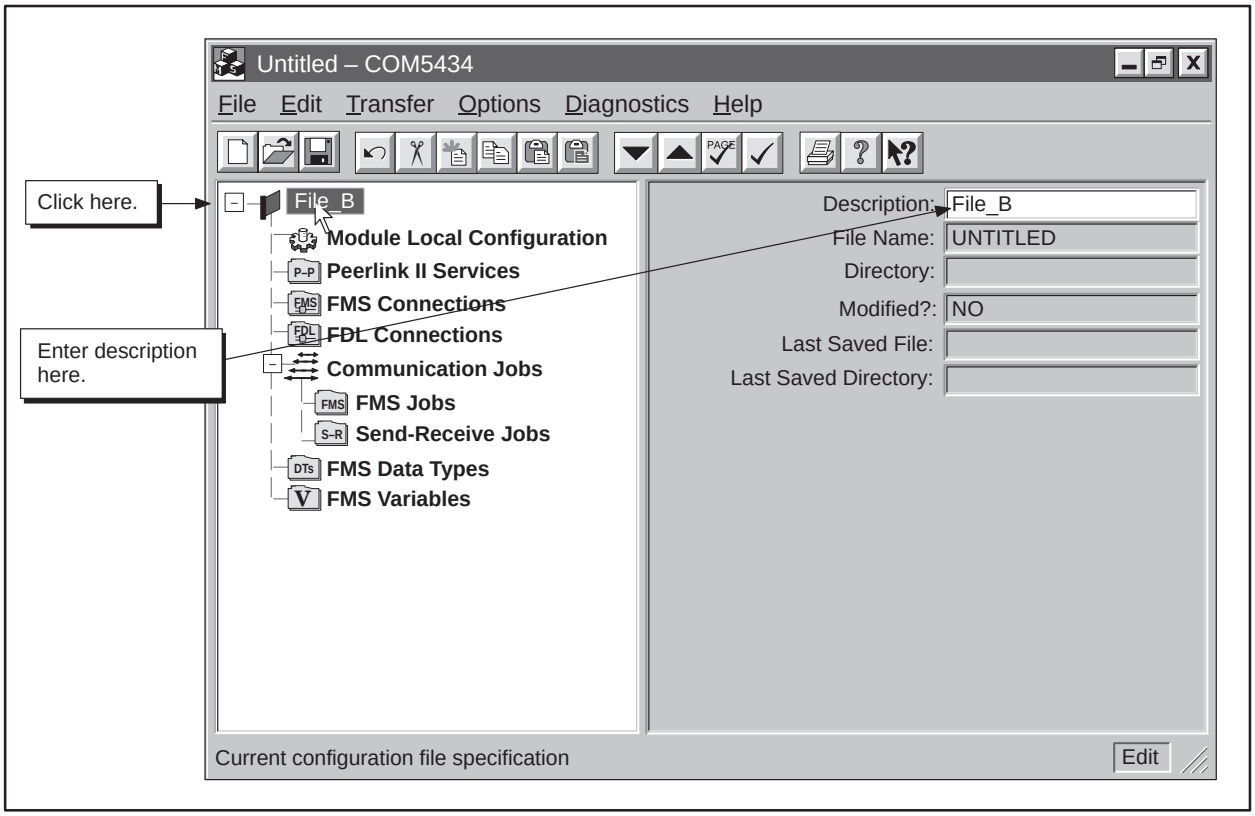


Figure 6-12 Creating a Configuration File

Setting the Module Local Configuration for Station 1

Next, you must define the Module Local Configuration of the FMS CP module for Station 1.

1. Click on the Module Local Configuration icon.

2. Complete the fields listed below (and shown in Figure 6-13) to define the Module Local Configuration:

   Local Station Address: `1`

   Highest Station Address: `15`

   Bus Parameter Profile: `FMS-DP Universal`

   Baud Rate: `1.5 MBaud`

   # of Masters (holds token): `6`

   # of Slaves (no token): `0`

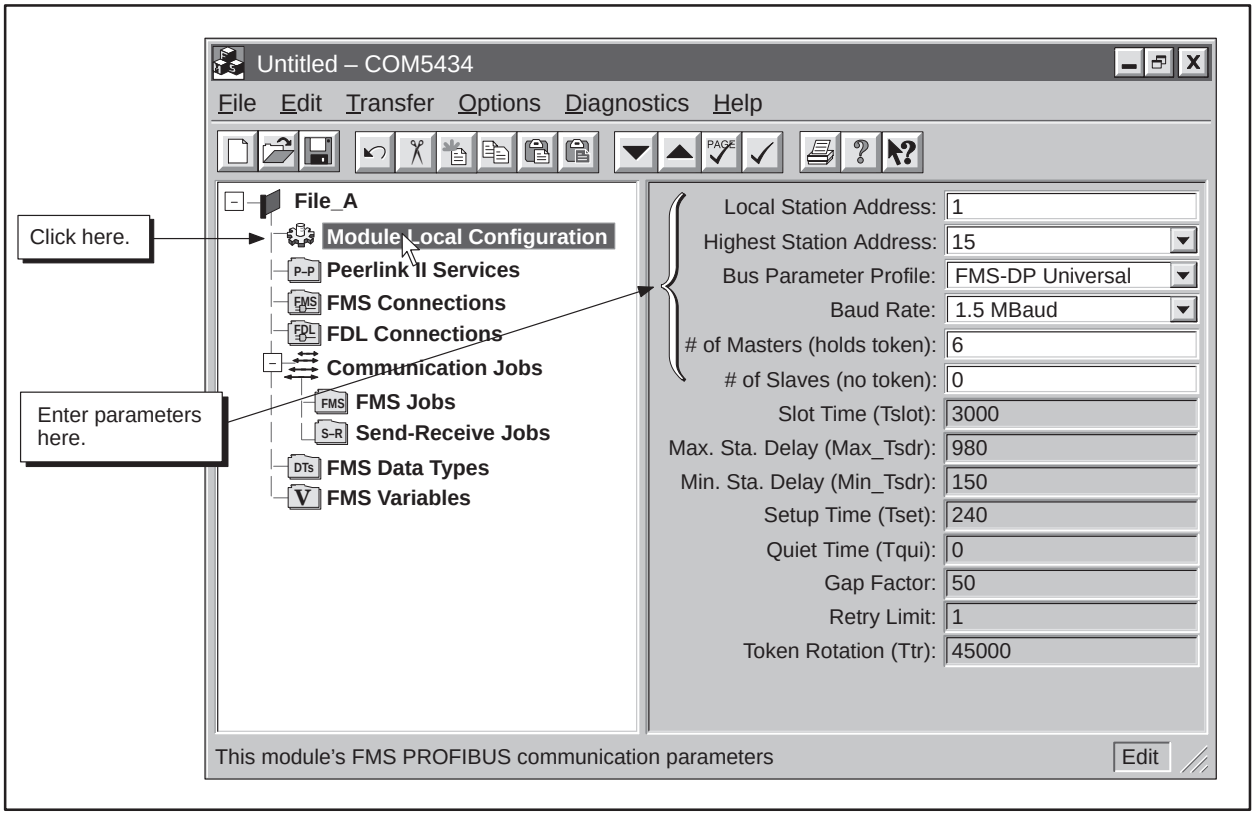


Figure 6-13 Module Local Configuration Example

Defining an FDL Connection for Station 1

Continue configuring the Send job for Station 1 by defining the FDL connection for the FMS CP module at Station 1.

1. Click on the FDL Connections icon of the configuration tree.
2. Click on the New Item button on the toolbar.
3. Complete the fields listed below (and shown in Figure 6-14) to define the FDL connection for Station 1.

   Name: `Motor`

   Remote Station Address: 5

   Local LSAP: 4

   Remote LSAP: 5

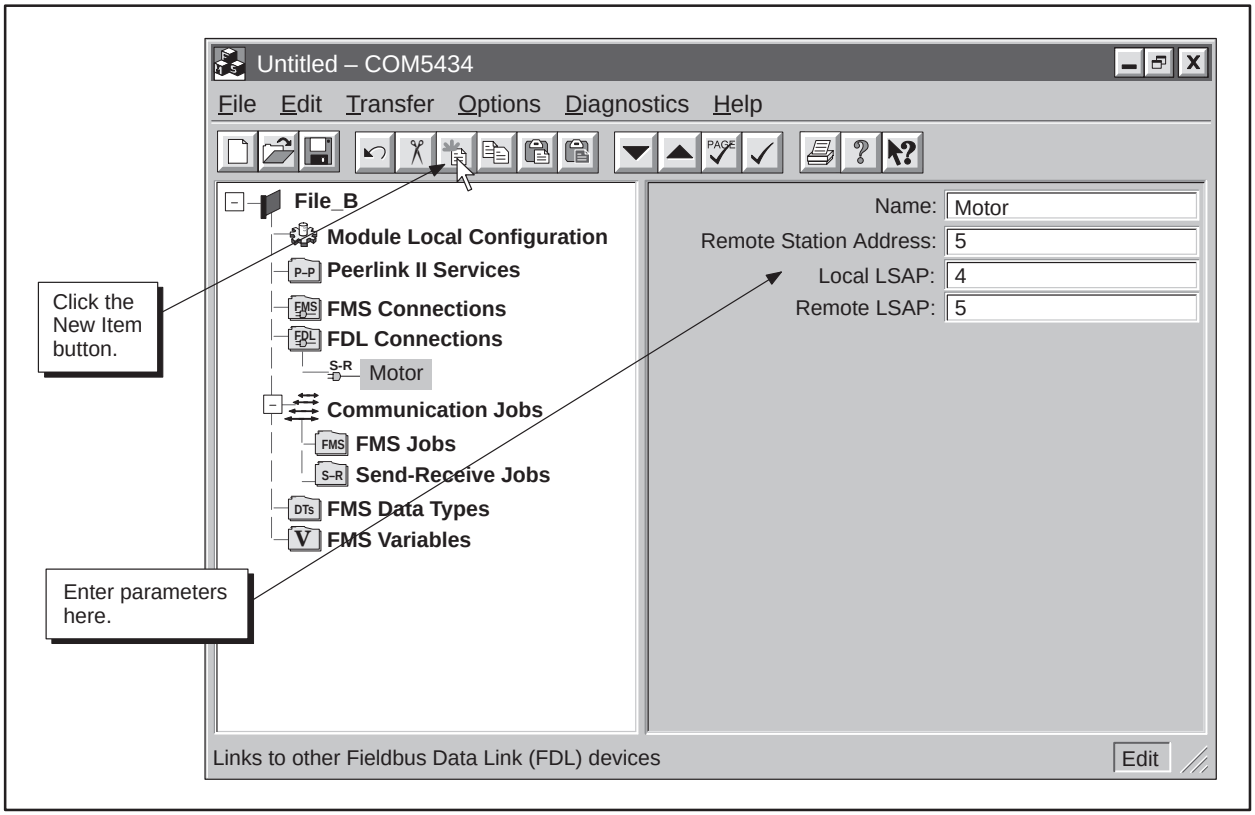


Figure 6-14 FDL Connection for Station 1

Configuring the Send Job for Station 1

Once you have defined the Module Local Configuration and the FDL connection, you can configure a Send job for Station 1.

1. Click on the Send-Receive Jobs icon of the configuration tree.
2. Click on the New Item button on the toolbar.
3. Complete the fields listed below (and shown in Figure 6-15) to configure the Send job for Station 1.

   Job Name: `Motorsend`

   Start Bit: `WY5.3`

   Job Type: `Send`

   FDL Connection: `Motor`

   Status Word V: `6`

   Local Address #1: `V101,2`

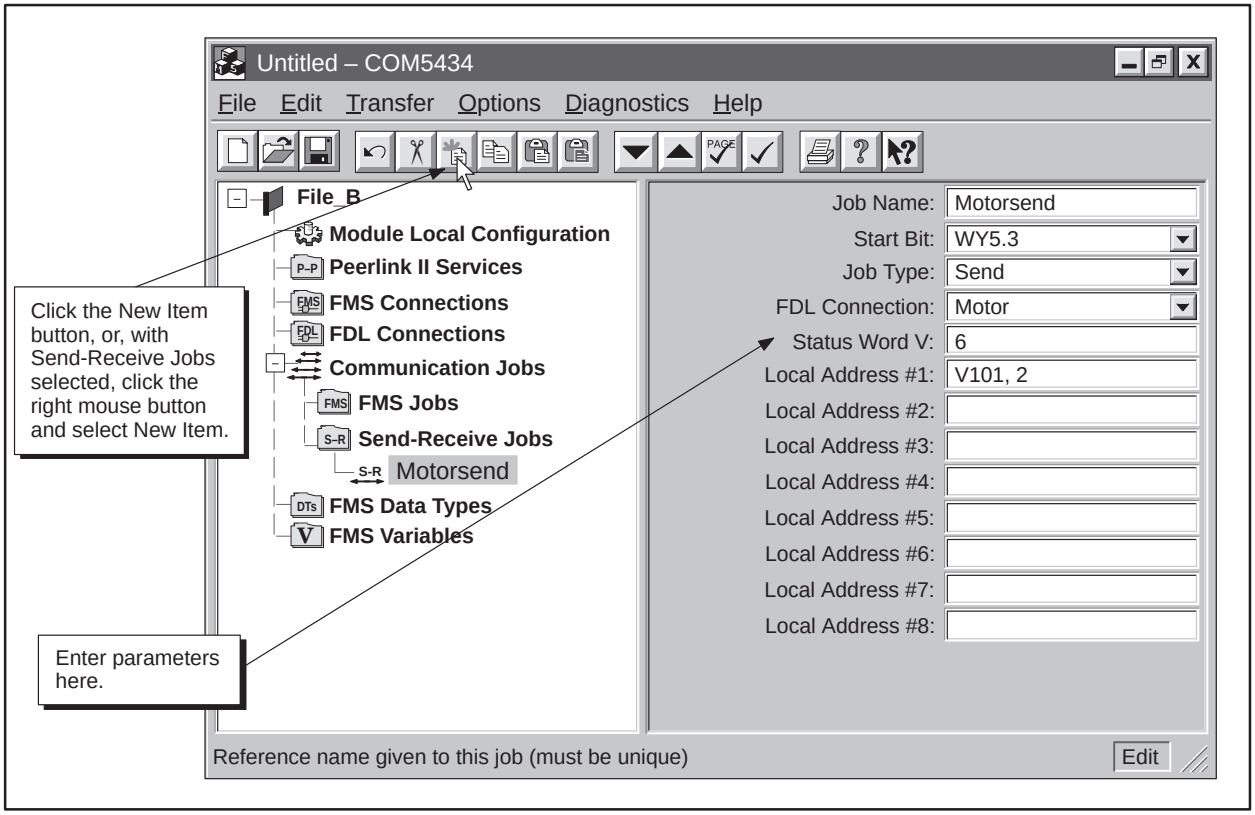


Figure 6-15 Send Job for Station 1

Saving the Configuration File to Disk

You should save your file to disk before attempting to transfer the file to the FMS CP module. To save the file to disk, follow these steps:

1. Select the menu command **File** → **Save As...** or click on the Save button: 
2. Select a directory to store the saved file.
3. Enter a file name.
4. Click on **Save**.

Transferring the Configuration to the FMS CP Module at Station 1

After saving your configuration file, download it to the FMS CP module at Station 1 by following these steps:

1. Select the menu command **Transfer** → **Download to the CP5434**, or click on the Download button: 
2. Click on **OK**.

Example of a Send-Receive Job (continued)

Creating the Configuration File for Station 5

After you create a Send job for Station 1, you need to create a configuration file for Station 5.

1. Select the menu command **File** → **New** to create an empty configuration file.
2. Enter a description for this file in the Description field as shown below:

   Description: `File_BA`

Setting the Module Local Configuration for Station 5

Next, you must define the Module Local Configuration of the FMS CP module at Station 5.

1. Click on the Module Local Configuration icon.
2. Complete the fields listed below to define the Module Local Configuration for Station 5:

   Local Station Address: `5`

   Highest Station Address: `15`

   Bus Parameter Profile: `FMS-DP Universal`

   Baud Rate: `1.5 MBaud`

   # of Masters (holds token): `6`

   # of Slaves (no token): `0`

Defining an FDL Connection for Station 5

Continue configuring the Receive job for Station 5 by defining the FDL connection for the FMS CP module at Station 5.

1. Click on the FDL Connections icon of the configuration tree.
2. Click on the New Item button on the toolbar.
3. Complete the fields listed below to define the FDL connection for Station 5:

   Name: `Motor`

   Remote Station Address: `1`

   Local LSAP: `5`

   Remote LSAP: `4`

Configuring the Receive Job for Station 5

Once you have defined the Module Local Configuration and the FDL connection, you can configure a Receive job for Station 5.

1. Click on the Send-Receive Jobs icon of the configuration tree.
2. Click on the New Item button on the toolbar.
3. Complete the fields listed below to configure the Receive job for Station 5:

   Job Name: `Motorrec`

   Start Bit: `WY7.3`

   Job Type: `Receive`

   Connection: `Motor`

   Status Word V: `5`

   Local Address #1: `V101,2`

Saving the Configuration File to Disk

You should save your file to disk before attempting to transfer the file to the FMS CP module. To save the file to disk, follow these steps:

1. Select the menu command **File** → **Save As...** or click on the Save button: 
2. Select a directory to store the saved file.
3. Enter a file name.
4. Click on **Save**.

Transferring the Configuration to the FMS CP Module at Station 5

After saving your configuration file, download it to the FMS CP module at Station 5 by following these steps:

1. Disconnect the programming cable from the FMS CP module at Station 1, and reconnect the cable to the RS-232 port on the FMS CP module at Station 5.
2. Select the menu command **Transfer** → **Download to the CP5434**, or click on the Download button: 
3. Click on **OK**.

After you successfully load the configuration files to both programmable logic controller stations, you must add RLL coding to the RLL programs of both programmable logic controllers to activate the transfer of data. Refer to Figure 6-16 for an example of RLL code to activate the Send request and to Figure 6-17 for an example of RLL code to activate the Receive request.

Example RLL Code for Send Job at Station 1

The Relay Ladder Logic example in Figure 6-16 demonstrates a typical scenario for enabling a Send request. This section assumes that you are familiar with Series 505 programmable logic controller language. The WX and WY locations used in this RLL example correspond to module I/O addresses that have been configured in programmable logic controller memory using the Configure I/O function in TISOFT.

The logic shown in Figure 6-16 performs as described in Table 6-1:

Table 6-1 Description of Send Logic

C98	Enables condition logic, defined by the application (Xn), which must remain active until job completion.
MOVW1	Sets status word V300 to a positive value (1) prior to each transaction. This positive value is used for job completion check in CMP1.
BITP3/BITP4	Ensures that no pending jobs exist prior to starting a Send job. (defined for Bit 1 of FMS CP module, located at I/O address WY5).
BITC3	Clears the FMS CP job defined for Bit 3 of the FMS CP module located at WY5 after the Job Active bit WX1 is set.
BITS2	Sets the Start Bit defined for Bit 3 of the FMS CP module located at WY5 to invoke a data transfer function.
CMP1	Tests the completion status of the data transfer by the same FMS CP, placed in V300, against a zero constant stored at location V15. When the Send job has completed, the value of status word V300 is zero—good transaction—or a non-zero value—bad transaction (see Table B-1 and Table B-4). You must take appropriate action in the USER ERROR CONTROL LOGIC ladder rung at this time. If the job is to be executed only one time, you must take action to disable Xn after the Status word changes value from its preset condition.
C41/C43	The parallel net of C41 and C43 act together to start and hold TMR2 on until either the FMS CP recognizes that the Job Start bit WY5.3 has been set and responds by setting the Job Active bit WX1.3 or else TMR2 time expires.
TMR2 BITC4	TMR2 and BITC4 are used to clear an unrecognized Job Start bit WY5.3. Either a reset of the FMS CP or a power cycle of the entire base may cause the programmable logic controller ladder to set a WY Job Start bit prior to FMS CP recovery. When this condition occurs, the FMS CP module does not execute the job (see note on page 4-5).

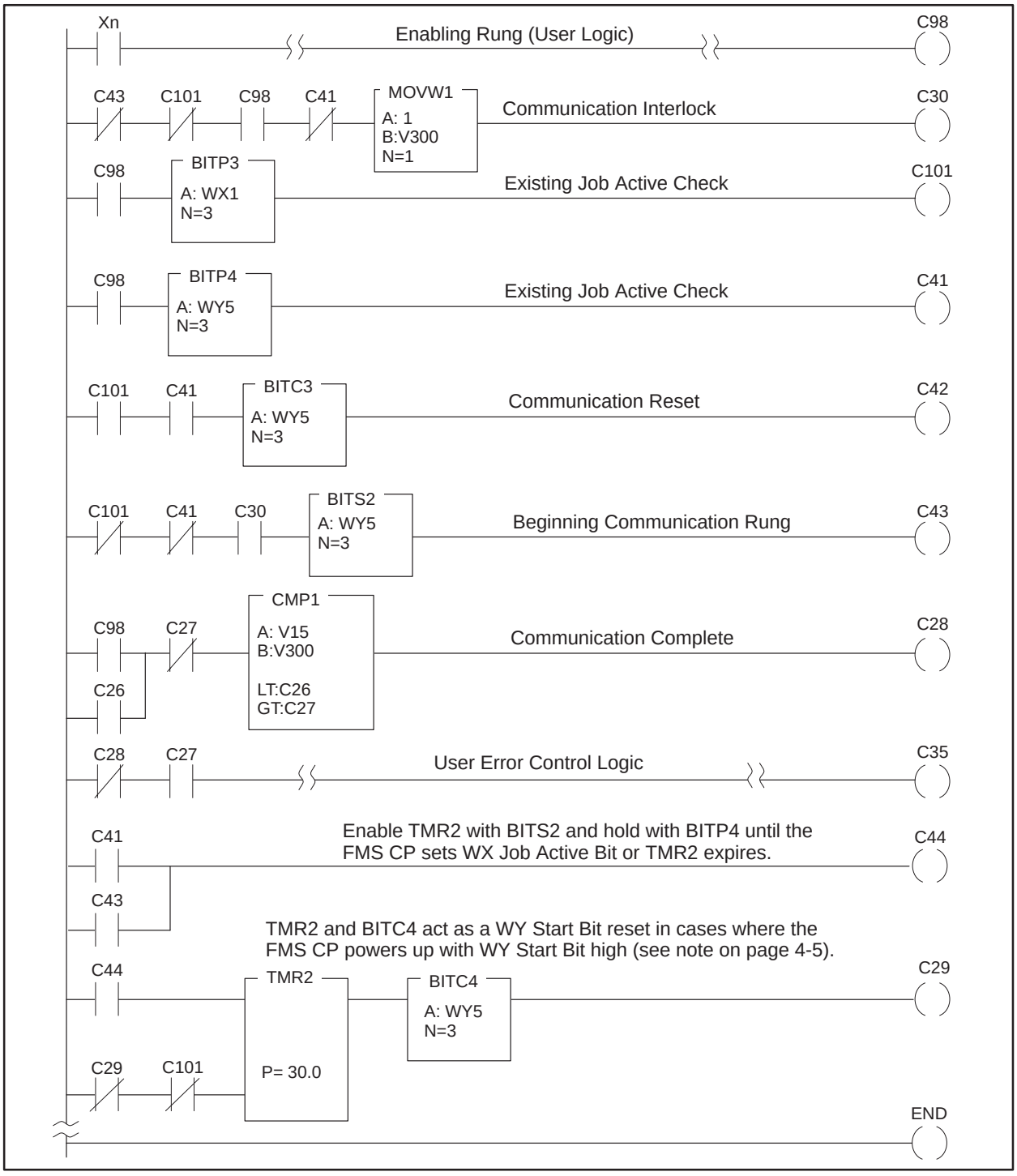


Figure 6-16 Send Relay Ladder Logic for Station 1

Example RLL Code for Receive Job at Station 5

The Relay Ladder Logic example in Figure 6-17 demonstrates a typical scenario for enabling a Receive acknowledgement. This section assumes that you are familiar with Series 505 programmable logic controller language. The WX and WY locations used in this RLL example correspond to module I/O addresses that have been configured in programmable logic controller memory using the Configure I/O function.

The logic shown in Figure 6-17 performs as described in Table 6-2:

Table 6-2 Description of Receive Logic

C49	Enables condition logic, defined by the application (Xn), which must remain active until job completion.
MOVW1	Sets status word V302 to a positive value (1) prior to each transaction. This positive value is used for job completion check in CMP1.
BITP1/BITP2	Ensures that no pending jobs exist prior to starting a Receive job defined for Bit 3 of FMS CP module, located at I/O address WY7.
BITC1	Clears the job defined for Bit 3 of the FMS CP module located at WY7 after the Job Active bit WX3 is set.
BITS1	Sets the Job Start Bit defined for Bit 3 of the FMS CP module located at WY7 to invoke a data transfer function.
CMP1	Tests the completion status of the data transfer by the same FMS CP module, placed in V302, against a zero constant stored at location V25. When the Peer job has completed, the value of status word V302 is zero—good transaction—or a non-zero value—the corresponding SEND job has not executed or some other error has occurred (see Table B-1 and Table B-4). You must take appropriate action in the USER ERROR CONTROL LOGIC ladder rung at this time. If the job is to be executed only one time, you take must take action to disable Xn after the Status word changes value from its preset condition.
C31/C33	The parallel net of C31 and C33 act together to start and hold TMR1 on until either the FMS CP recognizes that the Job Start bit WY7.3 has been set and responds by setting the Job Active bit WX3.3 or else TMR1 time expires.
TMR1 BITC2	TMR1 and BITC2 are used to clear an unrecognized Job Start bit WY7.3. Either a reset of the CP or a power cycle of the entire base may cause the programmable logic controller ladder to set a WY Job Start bit prior to FMS CP recovery. When this condition occurs, the FMS CP module does not execute the job (see the note on page 4-5).

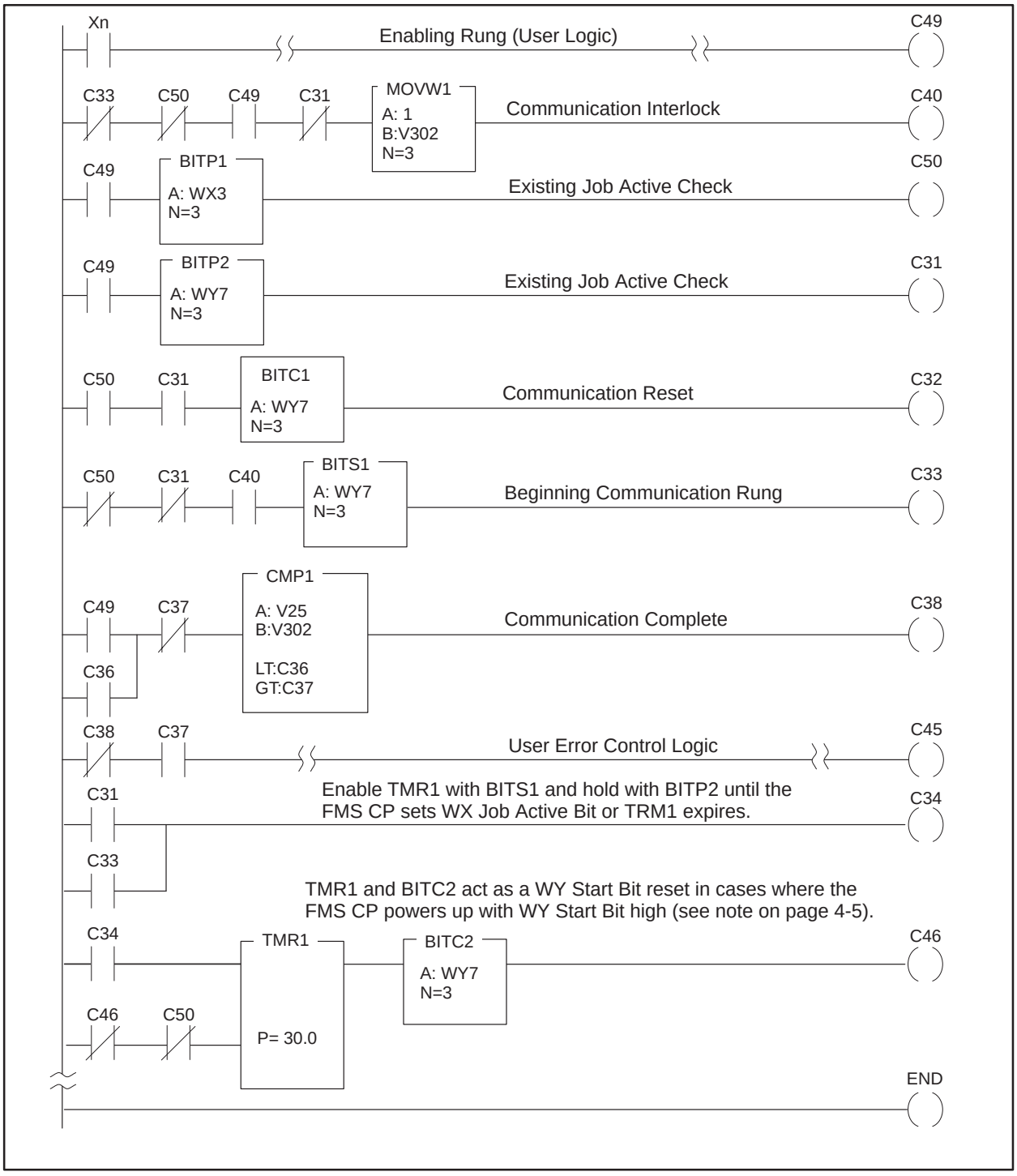


Figure 6-17 Receive Relay Ladder Logic for Station 5

Successful Timing Example

Figure 6-18 shows the sequence of events for a successful FDL transaction.

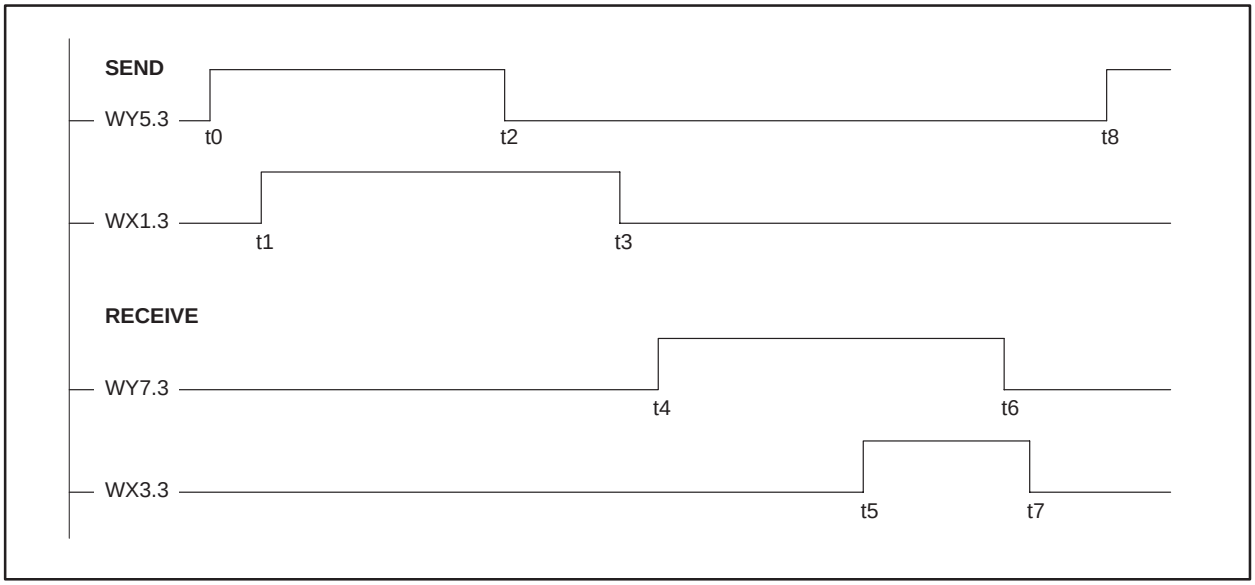


Figure 6-18 Successful Timing Example

The list below explains the sequence of events.

t0 Send Job RLL requests that data transfer be invoked.

t1 Send Job Active bit is set by the FMS CP. Data transfer begins.

t2 Send Job Start Bit is reset to inactive by Send job RLL in response to Job Active bit going high.

t3 Send job completes the data transfer. Send job resets Job Active bit. Send job is complete.

t4 Receive job RLL requests that received data be processed and stored.

t5 Receive Job Active bit is set by the FMS CP module. FMS CP begins storage of received data.

t6 Receive Job Start Bit is reset to inactive by Receive job RLL in response to Job Active bit going high.

t7 Receive job has stored received data in programmable logic controller memory. Receive job resets Job Active bit. Receive job is complete and stores job status of 0 (successful transaction).

t8 Send job re-enables the data transfer for another data transfer if required.

Unsuccessful Timing Example

Figure 6-19 shows the sequence of events for an unsuccessful FDL transaction.

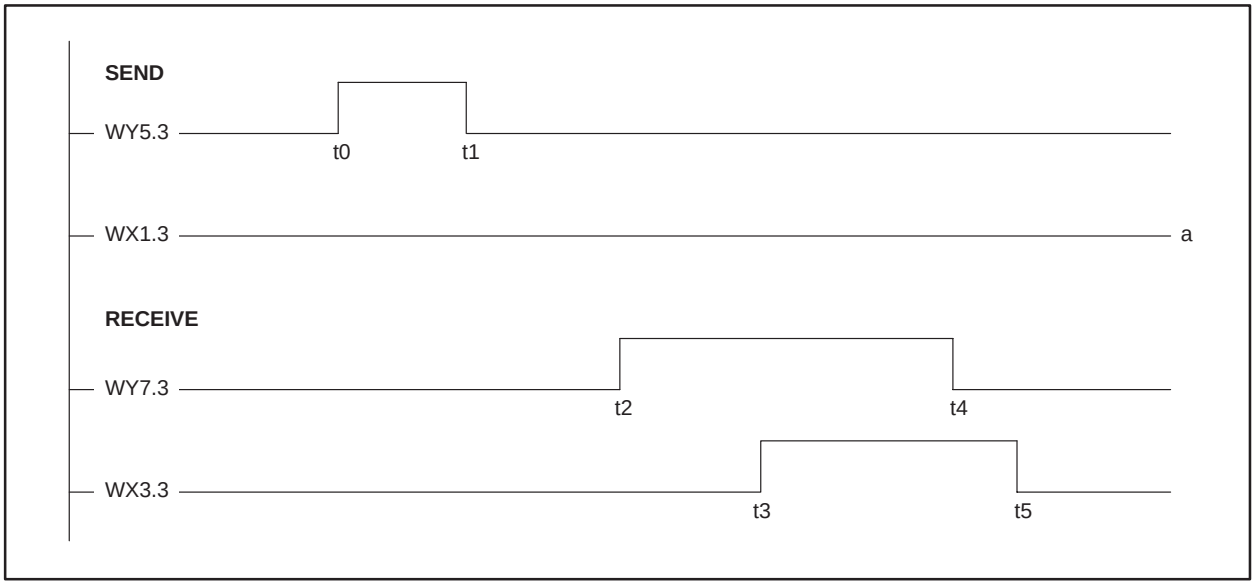


Figure 6-19 Unsuccessful Timing Example

The list below explains the sequence of events.

t0 Send job RLL requests that a data transfer be invoked.

t1 Programmable logic controller sets WY5.3 low *before* seeing WX1.3 go high. (RLL code prematurely resets WY5.3 to zero.)

a WX1.3 never goes high; that is, the job never starts and no data is sent.

t2 Receive job RLL requests that received data be processed and stored.

t3 Receive Job Active bit is set active by the FMS CP. However, no data was sent.

t4 Receive job Start Bit is reset to inactive by Receive job RLL in response to FMS CP Job Active bit.

t5 Receive job has completed but no data was received. Receive job resets Job Active bit and stores job status E0E0 instead of 0.

6.4 Example of a Peerlink II Transmit and Receive Service

Configuration Tasks for a Peerlink II Service

Figure 6-20 shows Transmit and Receive services between two stations. Using the COM5434 Configurator, configure these Peerlink II Services by completing the following tasks:

- ☐ Create and name the configuration file for Station 1.
- ☐ Define the Module Local Configuration for Station 1.
- ☐ Set the peer transmit interval and peer priority factor.
- ☐ Configure a Transmit service.
- ☐ Configure a Receive service.
- ☐ Save and download the configuration file to the FMS CP module at Station 1.
- ☐ Repeat the steps above for Station 5.

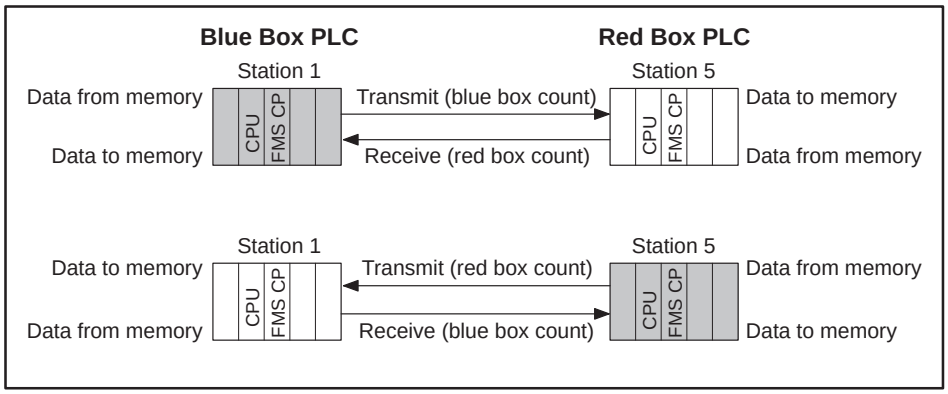


Figure 6-20 Peerlink Data Block Transfer Services

These tasks are described in detail on the following pages.

Creating the Configuration File for Station 1

The first step in the process is to create the configuration file for Station 1.

1. Select the menu command **File** → **New** to create an empty configuration file.

2. Enter a description for this file in the Description field, as shown below (and in Figure 6-21):

   Description: `Blue Box CPU`

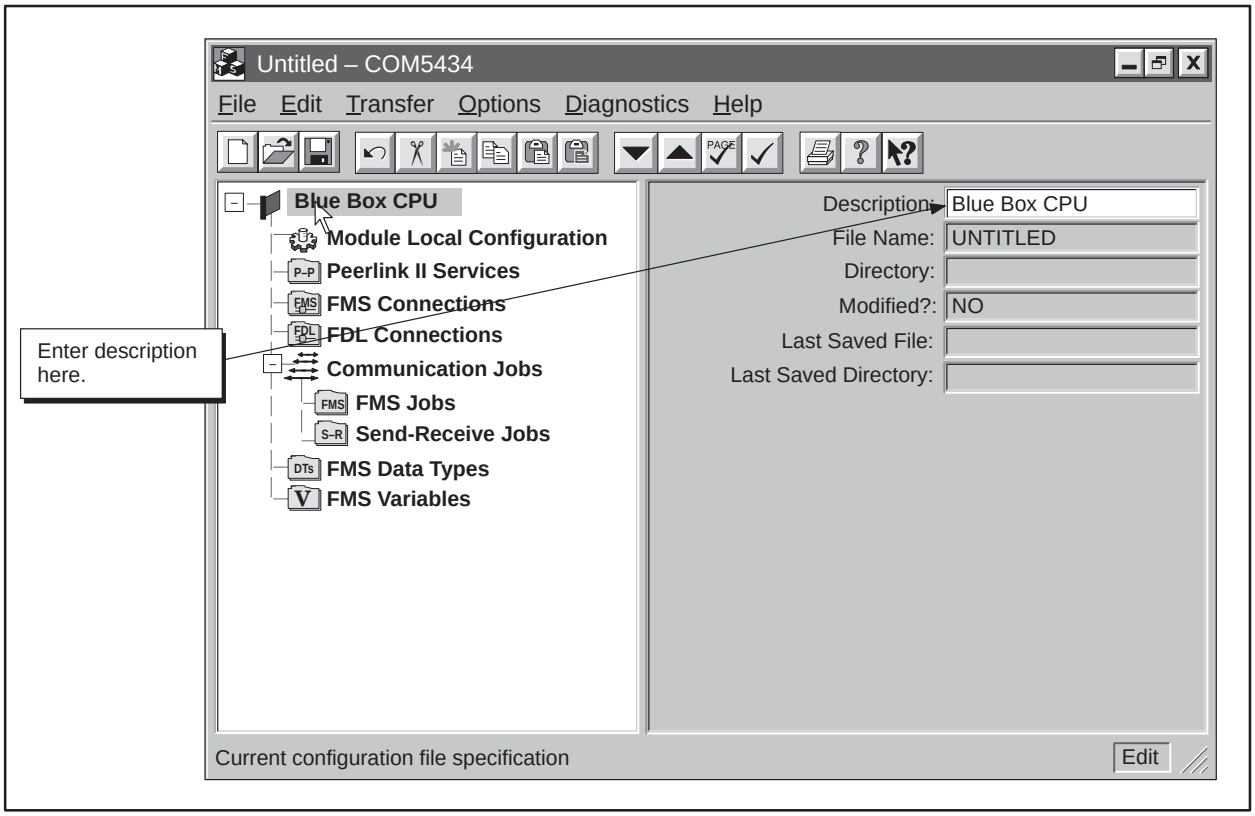


Figure 6-21 Creating a Configuration File Example

Setting the Module Local Configuration for Station 1

Next, you must define the Module Local Configuration of the FMS CP module for Station 1.

1. Click on the Module Local Configuration icon.

2. Complete the fields listed below (and shown in Figure 6-22) to define the Module Local Configuration:

   Local Station Address: `1`

   Highest Station Address: `15`

   Bus Parameter Profile: `FMS-DP Universal`

   Baud Rate: `1.5 MBaud`

   # of Masters (holds token): `6`

   # of Slaves (no token): `0`

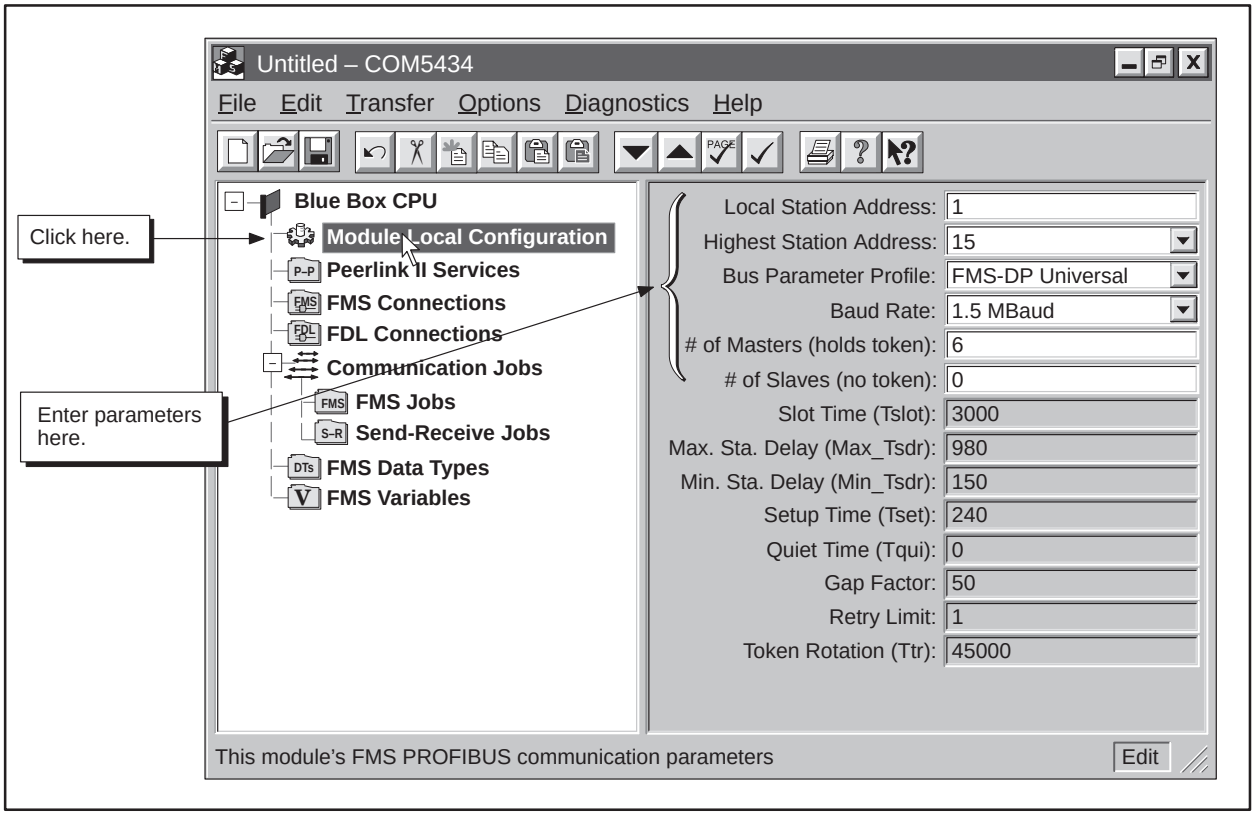


Figure 6-22 Module Local Configuration Example

Configuring the Peerlink II Transmit Service

Once you have defined the Module Local Configuration, you can configure the peer transmit interval and priority factor, (as shown in Figure 6-23).

1. Click on the Peerlink II Services icon of the configuration tree.
2. Enter the parameters listed below:

   Peer Transmit Interval: `10`

   Peer Priority Factor: `8`

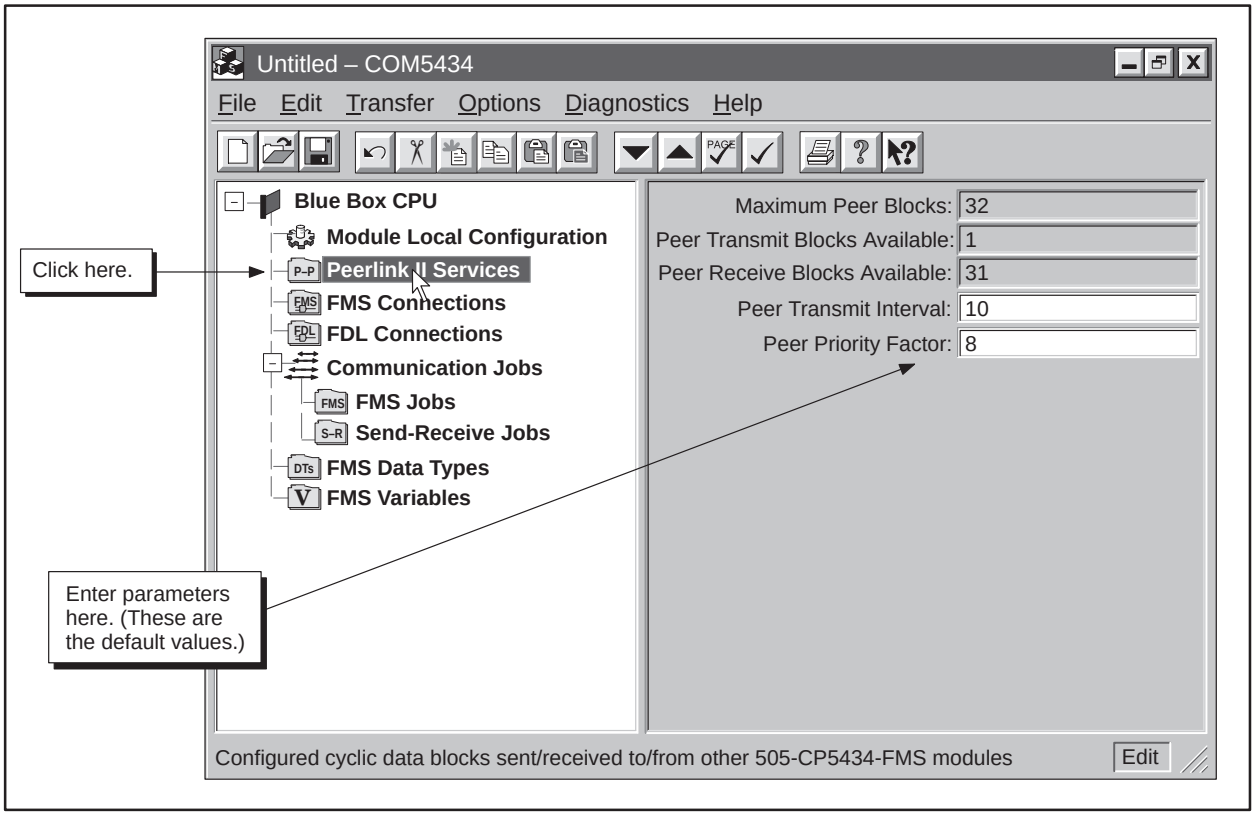


Figure 6-23 Peerlink Service Configuration Example

3. Click on the New Item button on the toolbar.

4. Complete the fields listed below (and shown in Figure 6-24) to configure the Peerlink II Transmit service:

   Peer Job Name: `Blue Box Count`

   Descriptor ID: `1`

   Peer Job Type: `Transmit`

   Local Address: `V200, 50`

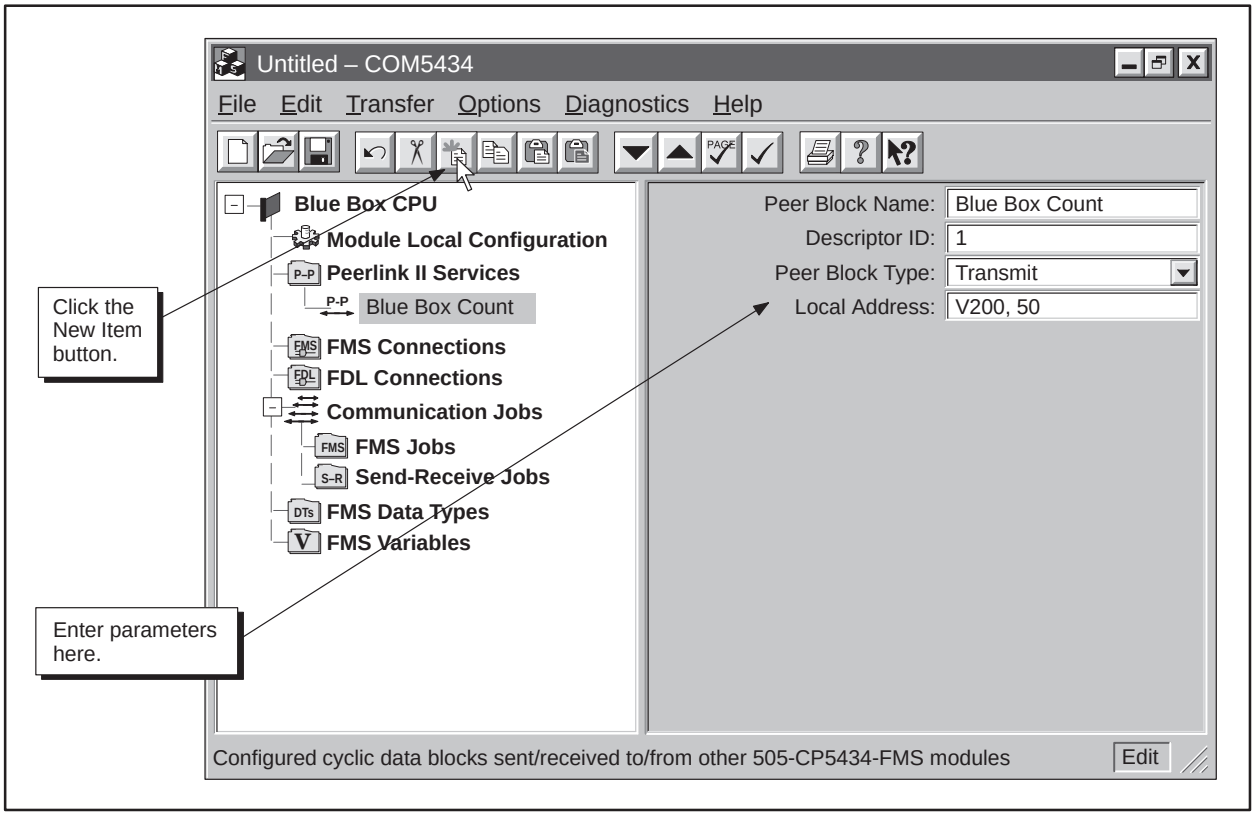


Figure 6-24 Peerlink II Services Example

Configuring the Peerlink II Receive Service

Continue by configuring the parameters for a Receive service.

1. Click on the New Item button on the toolbar.
2. Complete the fields listed below to configure the Receive service:

   Peer Job Name: `Red Box Count`

   Descriptor ID: `2`

   Peer Job Type: `Receive`

   Local Address: `V300, 50`

Saving the Configuration File to Disk

Next, save your file to disk before attempting to transfer the file to the FMS CP module. To save the file to disk, follow these steps:

1. Select the menu command **File** → **Save As...** or click on the Save button: 
2. Select a directory to store the saved file.
3. Enter a file name.
4. Click on **Save**.

Transferring the Configuration to the FMS CP Module at Station 1

After saving your configuration file, download it to the FMS CP module at Station 1 by following these steps:

1. Select the menu command **Transfer** → **Download to the CP5434**, or click on the Download button: 
2. Click on **OK**.

Creating the Configuration File for Station 5

The second step in the process is to create the configuration file for Station 5.

1. Select the menu command **File** → **New** to create an empty configuration file.

2. Enter a description for this file in the Description field, as shown below (and in Figure 6-25):

   Description: `Red Box CPU`

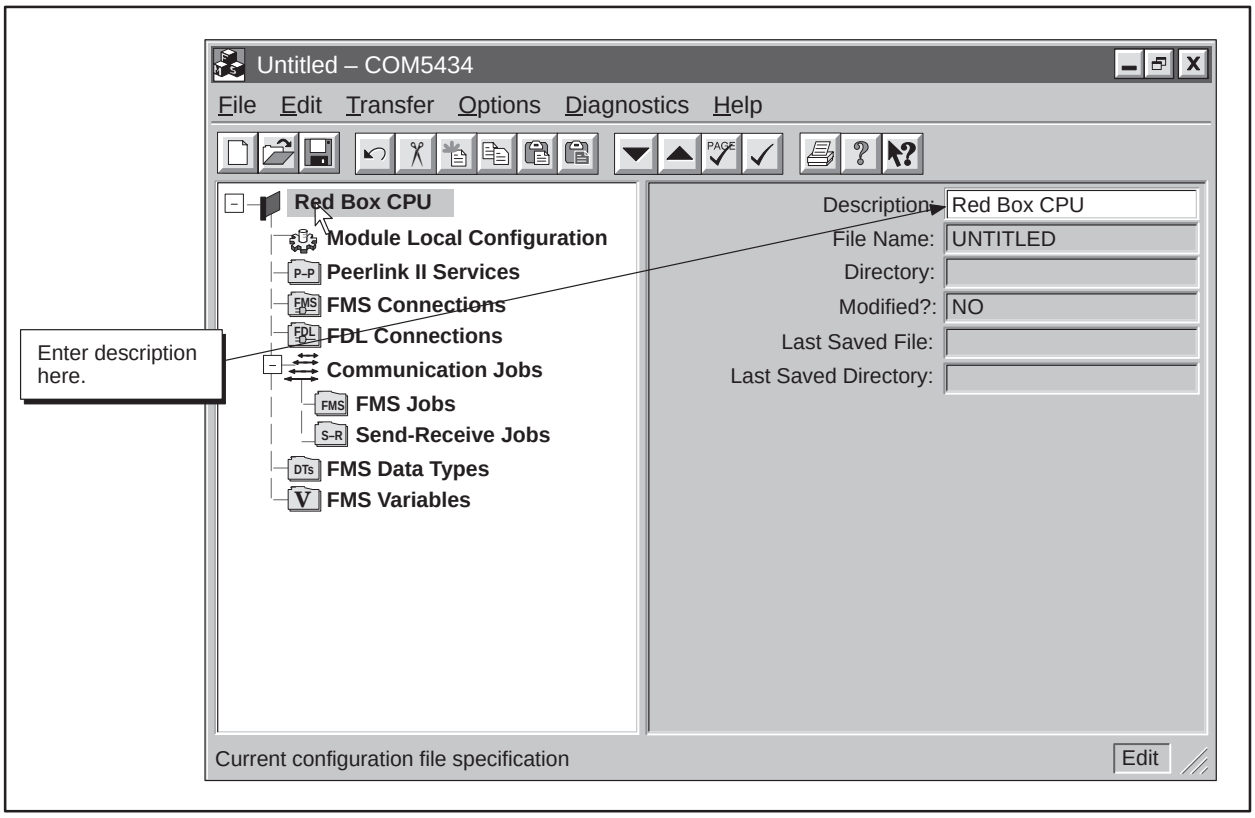


Figure 6-25 Creating a Configuration File for Station 5 Example

Setting the Module Local Configuration for Station 5

Next, you must define the Module Local Configuration of the FMS CP module for Station 5.

1. Click on the Module Local Configuration icon.

2. Complete the fields listed below (and shown in Figure 6-26) to define the Module Local Configuration:

   Local Station Address: `5`

   Highest Station Address: `15`

   Bus Parameter Profile: `FMS-DP Universal`

   Baud Rate: `1.5 MBaud`

   # of Masters (holds token): `6`

   # of Slaves (no token): `0`

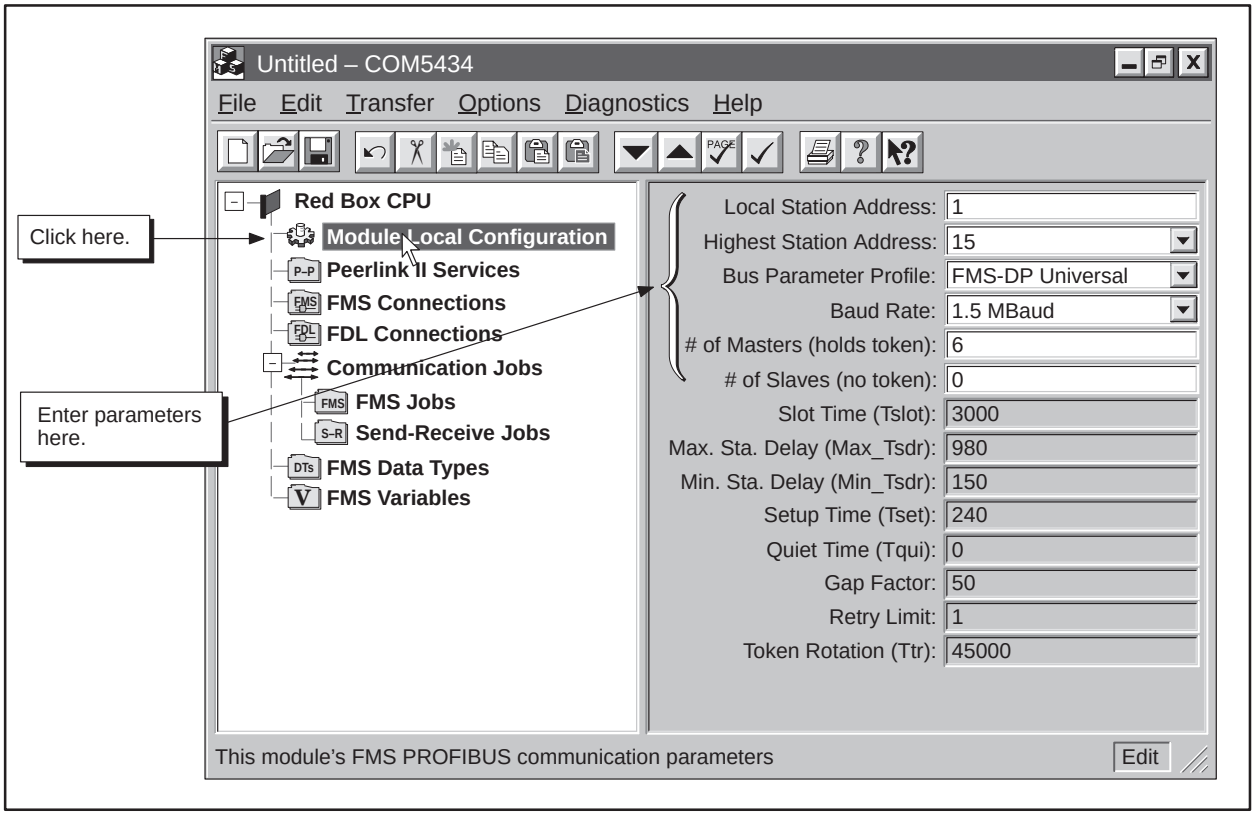


Figure 6-26 Module Local Configuration Example

Configuring the Peerlink II Transmit Service

Once you have defined the Module Local Configuration, you can configure the peer transmit interval and priority factor, (as shown in Figure 6-27).

1. Click on the Peerlink II Services icon of the configuration tree.
2. Enter the parameters listed below:

   Peer Transmit Interval: `10`

   Peer Priority Factor: `8`

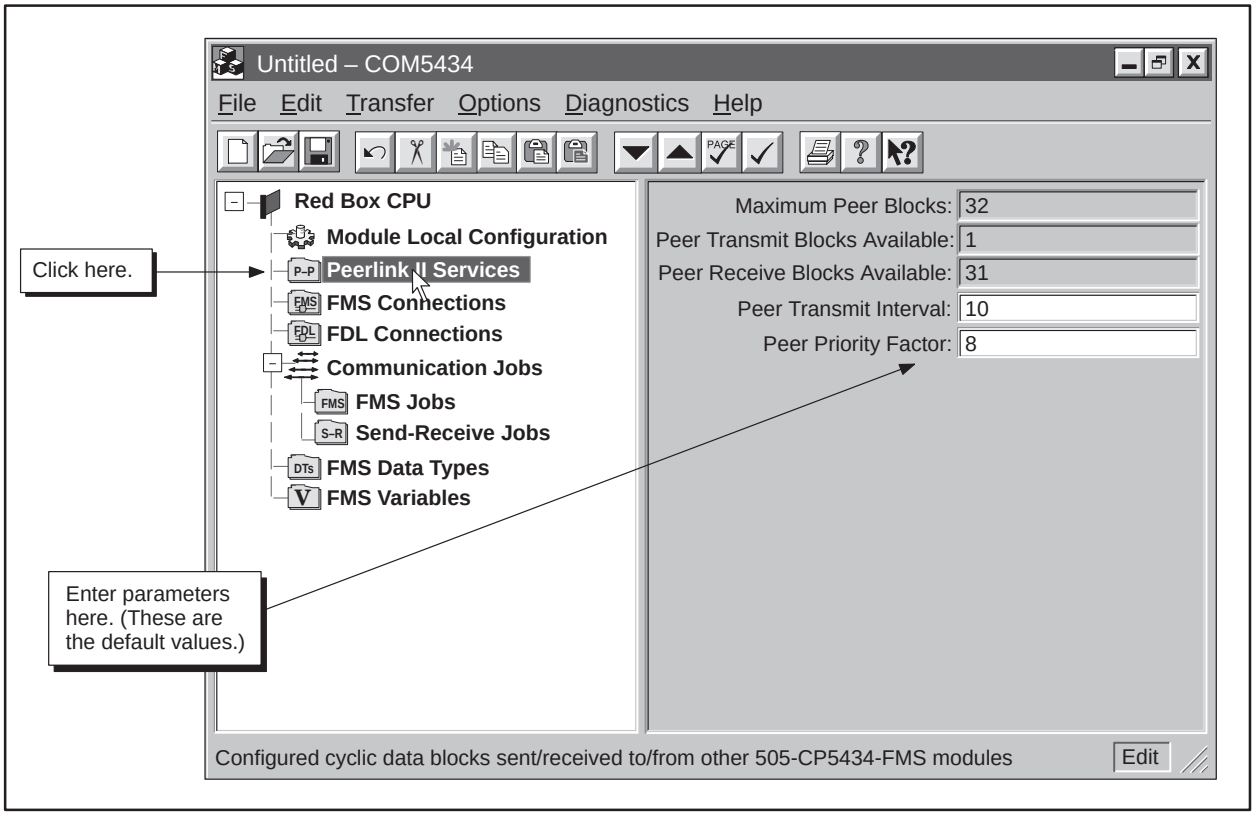


Figure 6-27 Peerlink Service Configuration Example

3. Click on the New Item button on the toolbar.

4. Complete the fields listed below (and shown in Figure 6-28) to configure the Peerlink II Transmit service:

   Peer Job Name: `Red Box Count`

   Descriptor ID: `2`

   Peer Job Type: `Transmit`

   Local Address: `V200, 50`

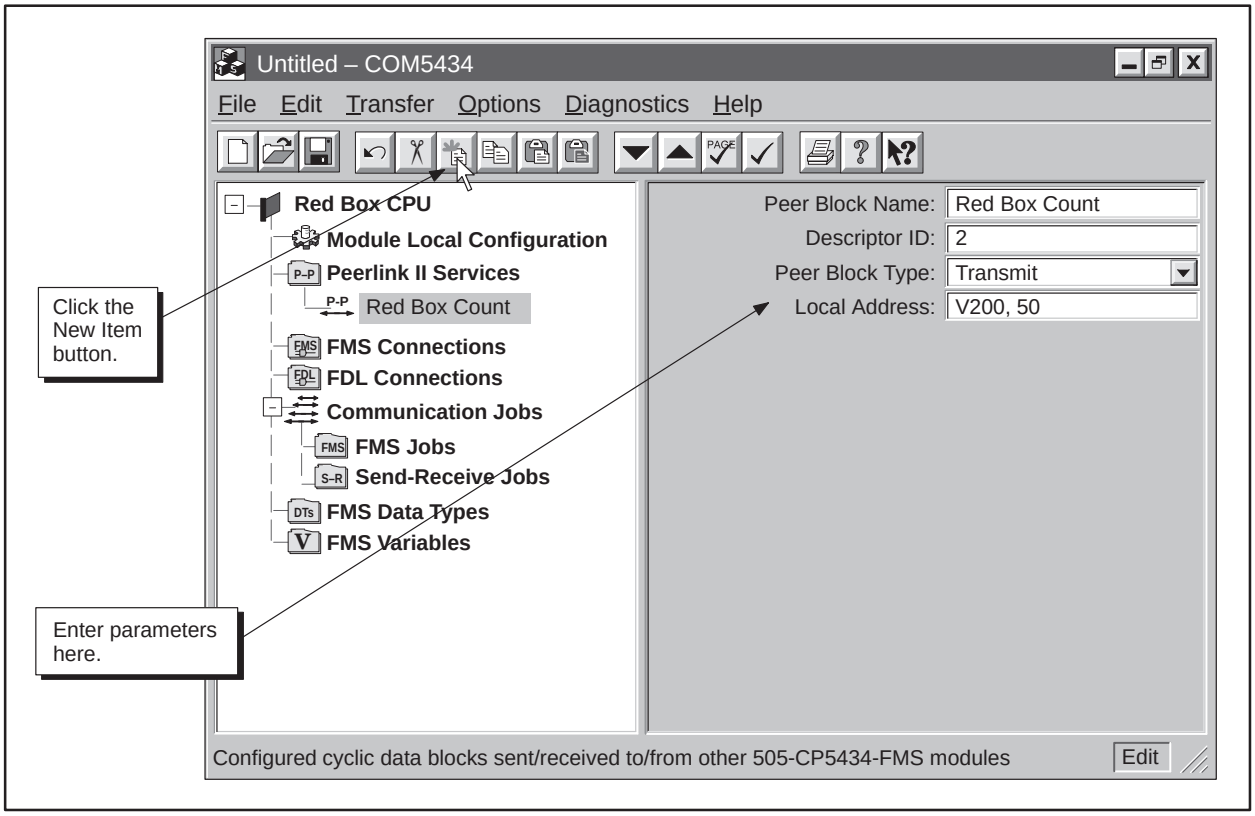


Figure 6-28 Peerlink II Transmit Service Example

Configuring the Peerlink II Receive Service

Continue by configuring the parameters for a Receive service.

1. Click on the New Item button on the toolbar.
2. Complete the fields listed below (and shown in Figure 6-29) to configure the Receive service:

   Peer Job Name: `Blue Box Count`

   Descriptor ID: `1`

   Peer Job Type: `Receive`

   Local Address: `V300, 50`

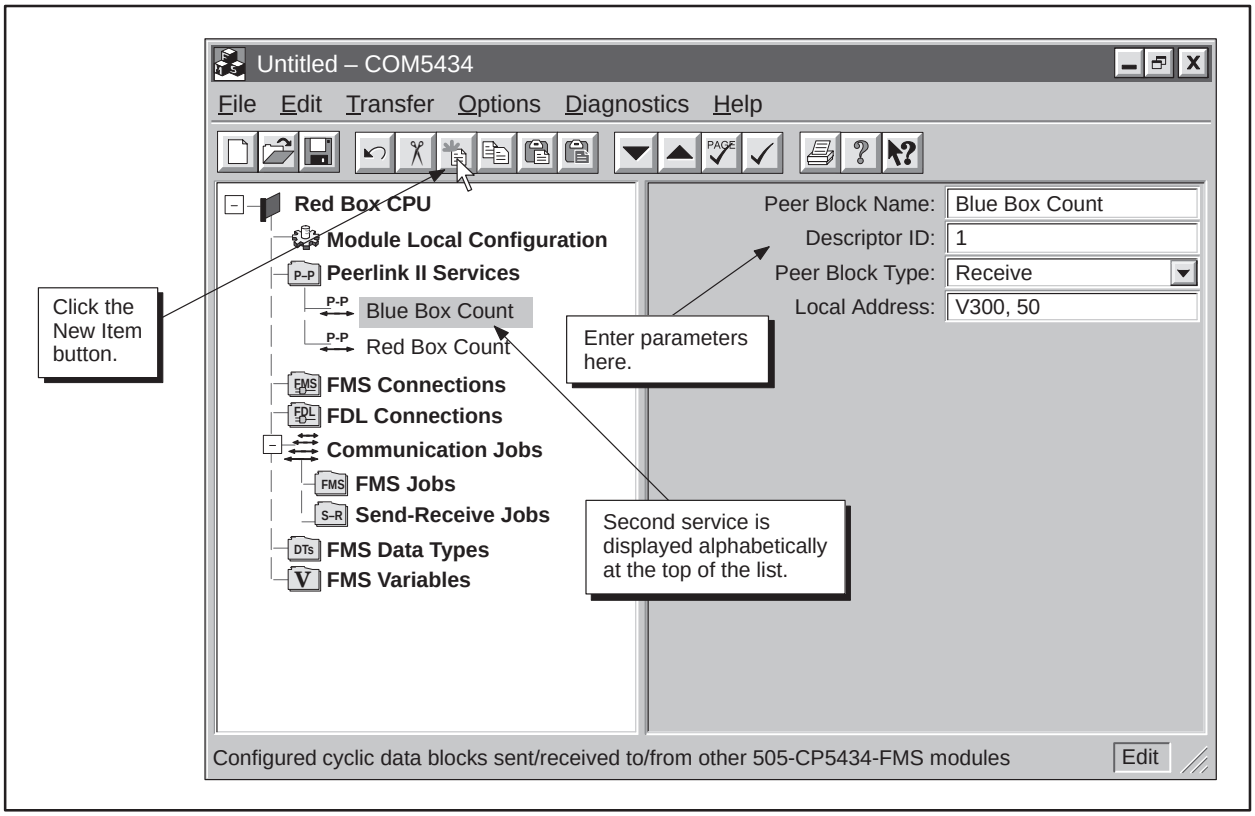


Figure 6-29 Peerlink II Services Example

Saving the Configuration File to Disk

Next, save your file to disk before attempting to transfer the file to the FMS CP module. To save the file to disk, follow these steps:

1. Select the menu command **File** → **Save As...** or click on the Save button: 
2. Select a directory to store the saved file.
3. Enter a file name, as shown in Figure 6-30.
4. Click on **Save**.

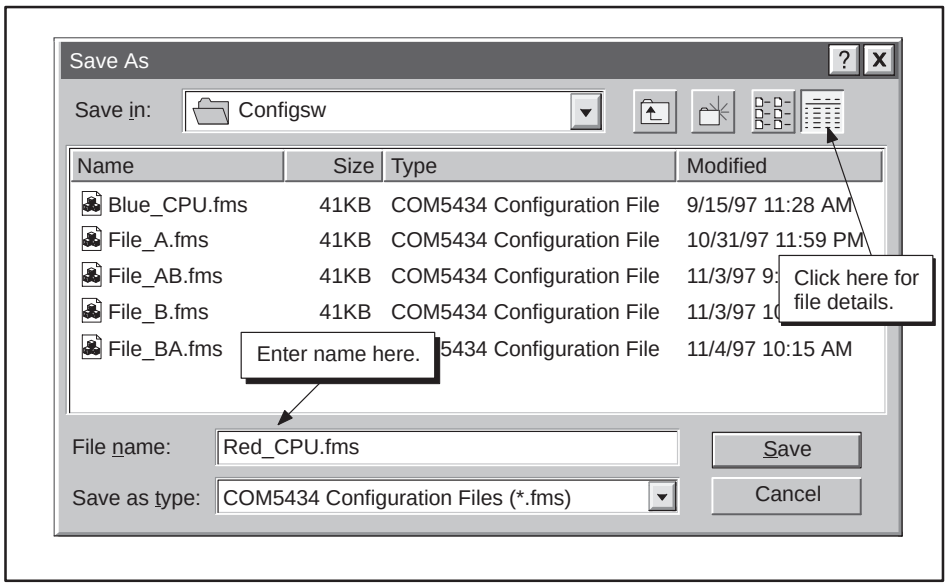


Figure 6-30 Save As Dialog

Transferring the Configuration to the FMS CP Module at Station 1

After saving your configuration file, download it to the FMS CP module at Station 1 by following these steps:

1. Select the menu command **Transfer** → **Download to the CP5434**, or click on the Download button: 
2. Click on **OK**.

Chapter 7
Diagnostics

7.1 CP Status

Viewing the Status of the FMS CP Module

The Read CP Status dialog provides useful information on the operating status of the module. To view this information, select the menu command **Diagnostics → CP Status**. The Read CP Status dialog appears, as shown in Figure 7-1.

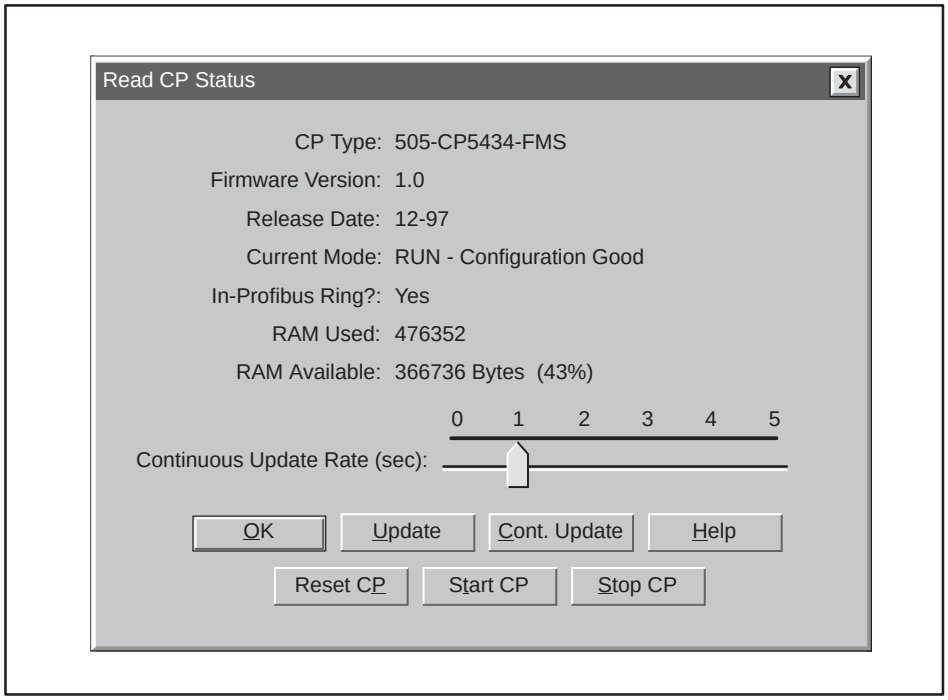


Figure 7-1 Read CP Status Dialog Box

Setting the Status Update Rate

The default diagnostic mode is a single (current) reading of the operating status of the module. You can set the mode to provide a continuous update of the operating status by clicking on the "Cont. Update" button. Then drag the slider control to adjust the update rate within a range of 0 to 5 seconds. (When you select continuous update, the button changes to "Stop Update," which you can click to return to the current status in noncontinuous mode.)

Controlling CP Operation Modes

The CP Status dialog also provides buttons that allow you to use the software to put the FMS CP module in STOP mode or RUN mode, or to initiate a module reset (equivalent to the Reset button in the module faceplate).

- Click on the "Stop CP" button to switch the module to STOP mode.
- Click on the "Start CP" button to switch the module to RUN mode.
- Click on the "Reset CP" button to initiate a module reset.

7.2 Active Stations

Viewing the List of Active Stations on the Bus

The List of Active Stations dialog lists all stations on the bus and the current status of each. To view this information, select the menu command **Diagnostics → Active Stations**. The List of Active Stations dialog appears, as shown in Figure 7-2.

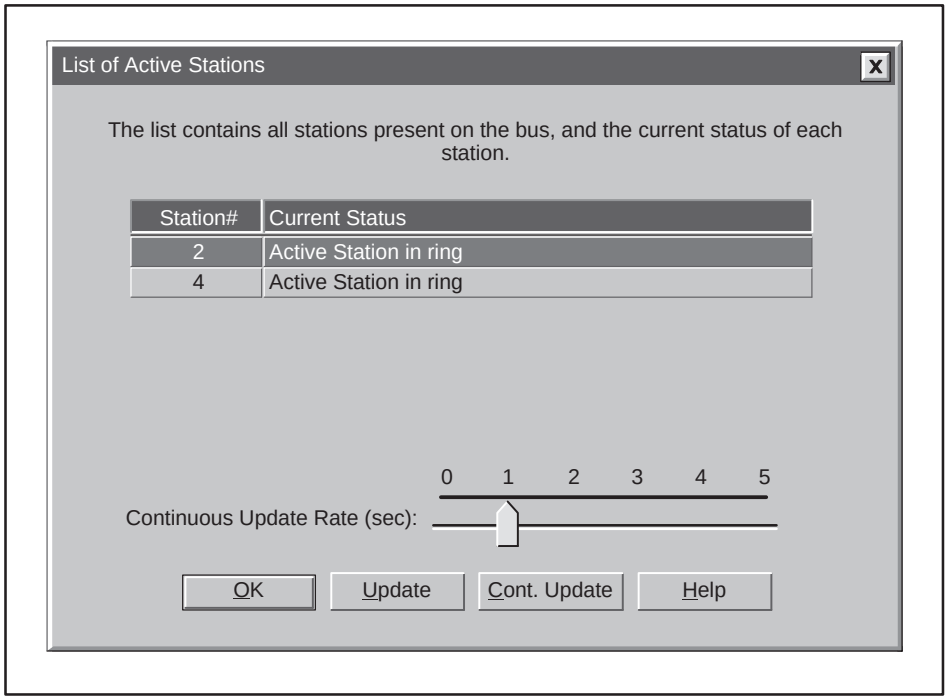


Figure 7-2 List of Active Stations Dialog Box

7.3 PROFIBUS Statistics

Viewing the PROFIBUS Statistics

The PROFIBUS Statistics dialog provides statistical information about the status of the PROFIBUS communications. To view this information, select the menu command **Diagnostics → PROFIBUS Statistics**. The PROFIBUS dialog appears, as shown in Figure 7-3.

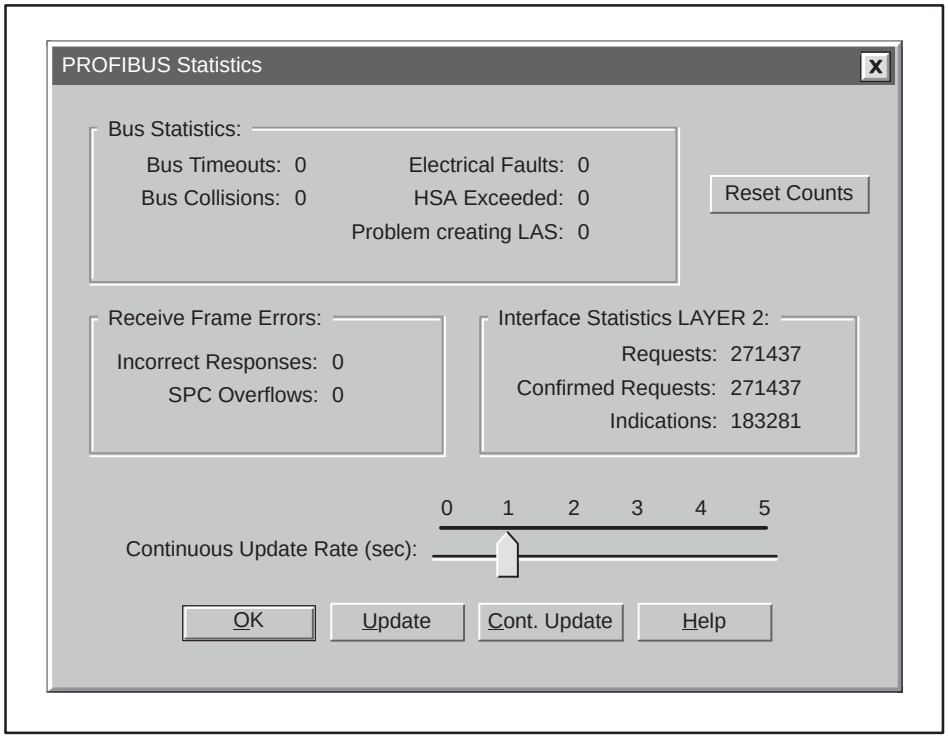


Figure 7-3 PROFIBUS Statistics Dialog Box

PROFIBUS Errors

Some of the possible PROFIBUS errors are the following:

- The bus statistic “HSA Exceeded” refers to Highest Station Address.
- The bus statistic “Problem creating LAS” refers to List of Active Stations.
- “SPC Overflows” indicates how many times the memory buffer in the Siemens PROFIBUS Controller chip has been exceeded.

7.4 FMS Connection Status

Viewing the Status of FMS Connections

The List of FMS Connections dialog lists the existing configured FMS connections and the current status of each. To view this information, select the menu command **Diagnostics → FMS Connection Status**. The List of Configured FMS Connections dialog appears, as shown in Figure 7-4.

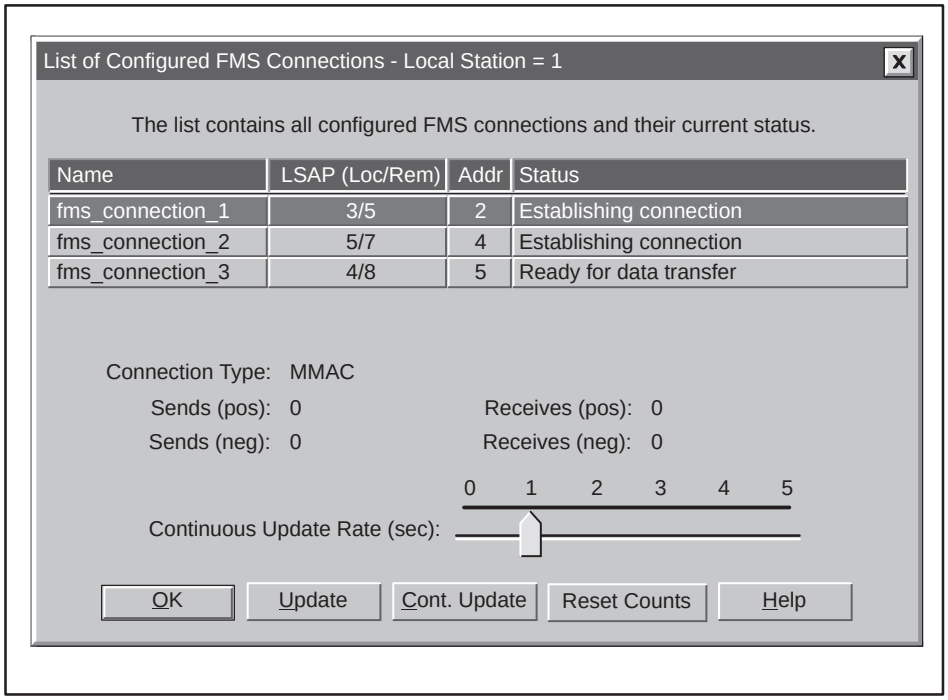


Figure 7-4 List of Configured FMS Connections Dialog Box

FMS Connection Types

According to which row in the list is highlighted, the "Connection Type" field below the list displays one of the following connection types:

MMAC – Master-master on acyclic connection

MSAC – Master-slave on acyclic connection

MSAC_SI – Master-slave on acyclic connection with slave initiative

MSCY – Master-slave on cyclic connection

For more information on these connection types, see Section A.5.

7.5 FDL Connection Status

Viewing the Status of FDL Connections

The List of FDL Connections dialog lists the existing configured FDL connections and the current status of each. To view this information, select the menu command **Diagnostics → FDL Connection Status**. The List of Configured FDL Connections dialog appears, as shown in Figure 7-5.

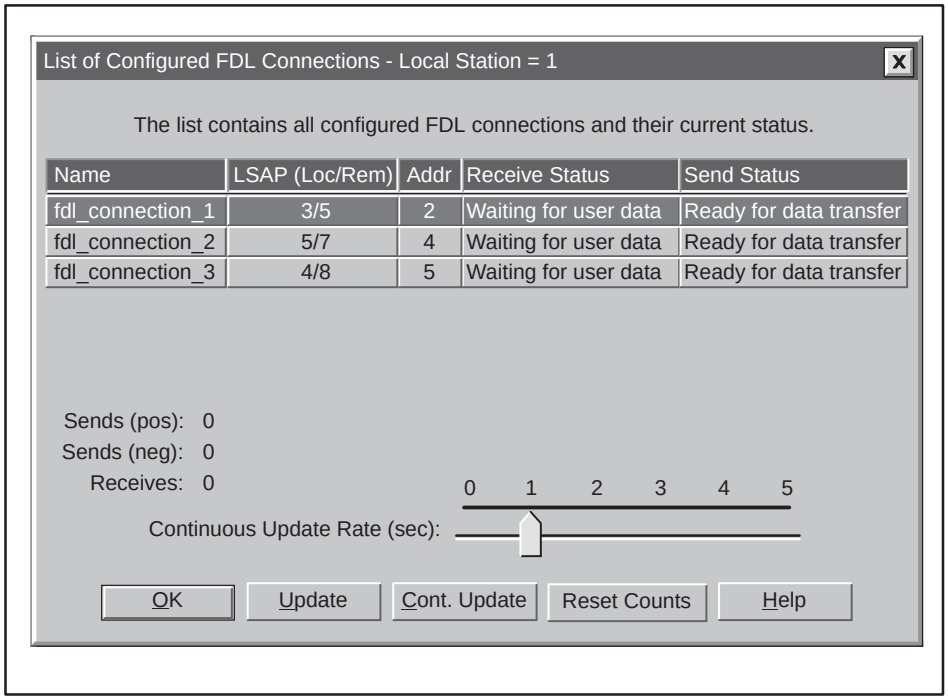


Figure 7-5 List of Configured FDL Connections Dialog Box

7.6 Job Status

Viewing the Status of FMS and Send-Receive Jobs

The List of FMS/Send-Receive Jobs dialog lists the existing FMS jobs and Send-Receive jobs and the status of each. To view this information, select the menu command **Diagnostics** → **Job Status**. The List of Configured FMS/Send-Receive Jobs dialog appears, as shown in Figure 7-6.

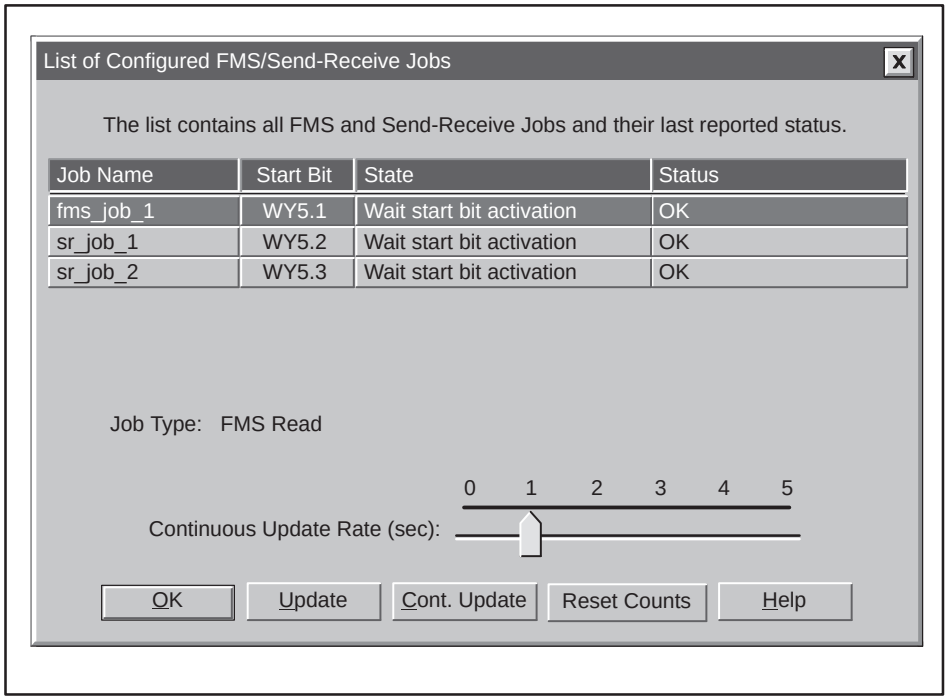


Figure 7-6 List of Configured FMS/Send-Receive Jobs Dialog Box

Job Types

According to which row in the list is highlighted, the "Job Type" field below the list displays one of the following job types: Read, Write, Information Report, Status, or Identify for FMS jobs; Send or Receive.

7.7 Peer Block Status

Viewing the Status of Peer Blocks

The List of Configured Peer Blocks dialog lists the existing configured Peer Blocks and the current status of each. To view this information, select the menu command **Diagnostics → Peer Block Status**. The List of Configured Peer Blocks dialog appears, as shown in Figure 7-7.

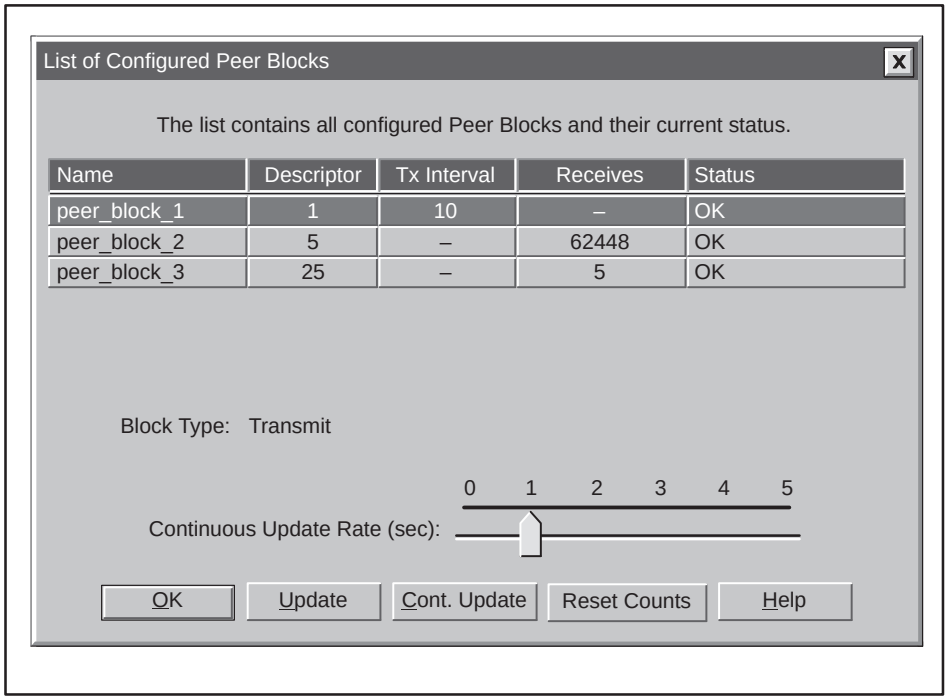


Figure 7-7 List of Configured Peer Block Dialog Box

NOTE: The "Tx Interval" value shown is the actual peer transmit interval. This may differ from the configured transmit interval if the FMS CP module is too heavily loaded to keep up with the configured interval.

Appendix A

Reference Data

A.1 Data Element List

SIMATIC 505 Data Types and S7 Addressing

Table A-1 shows the allowed data types (elements) for local or remote SIMATIC 505 PLCs. It also shows the SIMATIC S7 data type to use when accessing a Series 505 PLC from an S7 PLC.

Table A-1 Data Element List

Data Element Description	Notes	Name	PLC TT	Access	PLC Representation	S7 Area (DB=84H)	S7 Subarea Hex (Dec)
Variable Memory		V	01	read/write	integer	DB	100–2FF (256–767)
Constant		K	02	r/w	integer	DB	300–4FF (768–1279)
Discrete Input		X	03	r/w	Boolean	DB	03 (3)
Discrete Output		Y	04	r/w	Boolean	DB	04 (4)
Control Register		C	05	r/w	Boolean	DB	05 (5)
Discrete Input Packed		XP	06	r/w	packed	I (81H)	not used
Discrete Output Packed		YP	07	r/w	packed	Q (82H)	not used
Control Register Packed		CP	08	r/w	packed	M (83H)	not used
Word Input		WX	09	r/w	integer	DB	09 (9)
Word Output		WY	0A	r/w	integer	DB	0A (10)
Timer/Counter Preset		TCP	0E	r/w	integer	DB	0E (14)
Timer/Counter Current		TCC	0F	r/w	integer	DB	0F (15)
Drum Step Preset		DSP	10	r/w	integer	DB	10 (16)
Drum Step Current		DSC	11	r/w	integer	DB	11 (17)
Drum Count Preset	1	DCP	12	r/w	integer	DB	12 (18)
System Status Words		STW	1A	r/w	16-bit	DB	1A (26)
Drum Current Count		DCC	1B	read	32-bit	DB	1B (27)
Loop Status		LS	1E	read	16-bit	DB	1E (30)
Loop Mode		LM	1F	r/w	16-bit	DB	1F (31)
Loop Gain		LKC	20	r/w	real	DB	20 (32)
Loop Reset time (minutes)		LTI	21	r/w	real	DB	21 (33)
Loop Rate time (minutes)		LTD	22	r/w	real	DB	22 (34)
Loop High Alarm Limit		LHA	23	r/w	real	DB	23 (35)
Loop Low Alarm Limit		LLA	24	r/w	real	DB	24 (36)
Loop Process Variable		LPV	25	r/w	real	DB	25 (37)
Loop PV High Limit		LPVH	26	r/w	real	DB	26 (38)
Loop PV Low Limit		LPVL	27	r/w	real	DB	27 (39)
Loop Orange Deviation Alarm Limit		LODA	28	r/w	real	DB	28 (40)
Loop Yellow Deviation Alarm Limit		LYDA	29	r/w	real	DB	29 (41)
Loop Sample rate (seconds)		LTS	2A	r/w	real	DB	2A (42)
Loop Setpoint		LSP	2B	r/w	real	DB	2B (43)
Loop Output (percent)		LMN	2C	r/w	real	DB	2C (44)
Loop V-flags	2	LVF	2D	r/w	16-bit	DB	2D (45)

Table A-1 Data Element List (continued)

Data Element Description	Notes	Name	PLC TT	Access	PLC Representation	S7 Area (DB=84H)	S7 Subarea Hex (Dec)
Loop C-flags		LCF	2E	r/w	32-bit	DB	2E (46)
Loop Ramp/Soak Status Flags	2	LRSF	2F	r/w	16-bit	DB	2F (47)
Loop Error		LERR	30	read	real	DB	30 (48)
Loop Bias		LMX	31	r/w	real	DB	31 (49)
Loop High-High Alarm Limit		LHHA	32	r/w	real	DB	32 (50)
Loop Low-Low Alarm Limit		LLLA	33	r/w	real	DB	33 (51)
Loop Rate-of-Change Alarm Limit		LRCA	34	r/w	real	DB	34 (52)
Loop Setpoint High Limit		LSPH	35	r/w	real	DB	35 (53)
Loop Setpoint Low Limit		LSPL	36	r/w	real	DB	36 (54)
Loop Alarm Deadband		LADB	37	r/w	real	DB	37 (55)
Loop Raw High Alarm Limit		LHAR	38	r/w	integer	DB	38 (56)
Loop Raw Low Alarm Limit		LLAR	39	r/w	integer	DB	39 (57)
Loop Raw Process Variable		LPVR	3A	r/w	integer	DB	3A (58)
Loop Raw Orange Deviation Alarm Limit		LODAR	3B	r/w	integer	DB	3B (59)
Loop Raw Yellow Deviation Alarm Limit		LYDAR	3C	r/w	integer	DB	3C (60)
Loop Raw Output		LMNR	3D	r/w	integer	DB	3D (61)
Loop Raw Setpoint		LSPR	3E	r/w	integer	DB	3E (62)
Loop Raw Error		LERRR	3F	read	integer	DB	3F (63)
Loop Raw High/High Alarm Limit		LHHAR	40	r/w	integer	DB	40 (64)
Loop Raw Low/Low Alarm Limit		LLLAR	41	r/w	integer	DB	41 (65)
Loop Raw Alarm Deadband		LADBR	42	r/w	integer	DB	42 (66)
Loop Raw Bias		LMXR	48	r/w	integer	DB	48 (72)
Loop Raw Setpoint Low Limit		LSPLR	49	r/w	integer	DB	49 (73)
Loop Raw Setpoint High Limit		LSPHR	4A	r/w	integer	DB	4A (74)
Loop Most-significant word loop C-flags		LCFH	4B	r/w	integer	DB	4B (75)
Loop Least-significant word loop C-flags		LCFL	4C	r/w	integer	DB	4C (76)
Loop Derivative Gain Limiting Coefficient		LKD	4D	r/w	real	DB	4D (77)
Loop Ramp/Soak Step Number		LRSN	4E	r/w	integer	DB	4E (78)
Loop Alarm Acknowledge Flags		LACK	4F	r/w	integer	DB	4F (79)
High Alarm Limit	3	AHA	50	r/w	real	DB	50 (80)
Low Alarm Limit	3	ALA	51	r/w	real	DB	51 (81)
Process Variable	3	APV	52	r/w	real	DB	52 (82)
PV High Limit	3	APVH	53	r/w	real	DB	53 (83)
PV Low Limit	3	APVL	54	r/w	real	DB	54 (84)
Orange Deviation Alarm Limit	3	AODA	55	r/w	real	DB	55 (85)
Yellow Deviation Alarm Limit	3	AYDA	56	r/w	real	DB	56 (86)
Sample rate in seconds	3	ATS	57	r/w	real	DB	57 (87)
Alarm Setpoint	3	ASP	58	r/w	real	DB	58 (88)

Table A-1 Data Element List (continued)

Data Element Description	Notes	Name	PLC TT	Access	PLC Representation	S7 Area (DB=84H)	S7 Subarea Hex (Dec)
Alarm V-flags	2, 3	AVF	59	r/w	16-bit	DB	59 (89)
Alarm C-flags	3	ACF	5A	r/w	32-bit	DB	5A (90)
Alarm Error	3	AERR	5B	read	real	DB	5B (91)
High-High Alarm Limit	3	AHHA	5C	r/w	real	DB	5C (92)
Low-Low Alarm Limit	3	ALLA	5D	r/w	real	DB	5D (93)
Rate-of-change Alarm Limit	3	ARCA	5E	r/w	real	DB	5E (94)
Setpoint High Limit	3	ASPH	5F	r/w	real	DB	5F (95)
Setpoint Low Limit	3	ASPL	60	r/w	real	DB	60 (96)
Alarm Deadband	3	AADB	61	r/w	real	DB	61 (97)
Raw High Alarm Limit	3	AHAR	62	r/w	integer	DB	62 (98)
Raw Low Alarm Limit	3	ALAR	63	r/w	integer	DB	63 (99)
Raw Process Variable	3	APVR	64	r/w	integer	DB	64 (100)
Raw Orange Deviation Alarm Limit	3	AODAR	65	r/w	integer	DB	65 (101)
Raw Yellow Deviation Alarm Limit	3	AYDAR	66	r/w	integer	DB	66 (102)
Alarm Raw Setpoint	3	ASPR	67	r/w	integer	DB	67 (103)
Raw Alarm Deadband	3	AADBR	68	r/w	integer	DB	68 (104)
Alarm Raw Error	3	AERRR	69	read	integer	DB	69 (105)
Raw High-High Alarm Limit	3	AHHAR	6A	r/w	integer	DB	6A (106)
Raw Low-Low Alarm Limit	3	ALLAR	6B	r/w	integer	DB	6B (107)
Raw Setpoint Low Limit	3	ASPLR	6F	r/w	integer	DB	6F (111)
Raw Setpoint High Limit	3	ASPHR	70	r/w	integer	DB	70 (112)
Most-significant word Alarm C-flags	3	ACFH	71	r/w	integer	DB	71 (113)
Least-significant word Alarm C-flags	3	ACFL	72	r/w	integer	DB	72 (114)
Alarm Acknowledge Flags	3	AACK	73	r/w	integer	DB	73 (115)
VME (575 only) A24 Space	4	VMM	D3	r/w	integer	DB	500–6FF (1280–1791)
VME (575 only) A16 Space	4	VMS	D4	r/w	integer	DB	D4 (212)
GZ (Application Z global Variables)	5	GZ	D5	r/w	integer	DB	D5 (213)
GY (Application Y global Variables)	5	GY	D6	r/w	integer	DB	D6 (214)
GX (Application X global Variables)	5	GZ	D7	r/w	integer	DB	D7 (215)
GW (Application W global Variables)	5	GW	D8	r/w	integer	DB	D8 (216)
GV (Application V global Variables)	5	GV	D9	r/w	integer	DB	D9 (217)
GU (Application U global Variables)	5	GU	DA	r/w	integer	DB	DA (218)
GT (Application T global Variables)	5	GT	DB	r/w	integer	DB	DB (219)
GS (Application S global Variables)	5	GS	DC	r/w	integer	DB	DC (220)
GR (Application R global Variables)	5	GR	DD	r/w	integer	DB	DD (221)
GQ (Application Q global Variables)	5	GQ	DE	r/w	integer	DB	DE (222)
GP (Application P global Variables)	5	GP	DF	r/w	integer	DB	DF (223)

Table A-1 Data Element List (continued)

Data Element Description	Notes	Name	PLC TT	Access	PLC Representation	S7 Area (DB=84H)	S7 Subarea Hex (Dec)
GO (Application O global Variables)	5	GO	E0	r/w	integer	DB	E0 (224)
GN (Application N global Variables)	5	GN	E1	r/w	integer	DB	E1 (225)
GM (Application M global Variables)	5	GM	E2	r/w	integer	DB	E2 (226)
GL (Application L global Variables)	5	GL	E3	r/w	integer	DB	E3 (227)
GK (Application K global Variables)	5	GK	E4	r/w	integer	DB	E4 (228)
GJ (Application J global Variables)	5	GJ	E5	r/w	integer	DB	E5 (229)
GI (Application I global Variables)	5	GI	E6	r/w	integer	DB	E6 (230)
GH (Application H global Variables)	5	GH	E7	r/w	integer	DB	E7 (231)
GG (Application G global Variables)	5	GG	E8	r/w	integer	DB	E8 (232)
GF (Application F global Variables)	5	GF	E9	r/w	integer	DB	E9 (233)
GE (Application E global Variables)	5	GE	EA	r/w	integer	DB	EA (234)
GD (Application D global Variables)	5	GD	EB	r/w	integer	DB	EB (235)
GC (Application C global Variables)	5	GC	EC	r/w	integer	DB	EC (236)
GB (Application B global Variables)	5	GB	ED	r/w	integer	DB	ED (237)
GA (Application A global Variables)	5	GA	EE	r/w	integer	DB	EE (238)
G (Local Application Global Variables)	6	G	EF	r/w	integer	DB	EF (239)

Note 1. The DCP address is a three-byte address containing a drum number in the most significant 20 bits and a step number in the least significant 4 bits.

Note 2. These flags have a “control” part and a “status” part. When written, only the control part is written. When read, the status part is returned with the control part set to zero.

Note 3. This data element is an Analog Alarm type.

Note 4. VMS corresponds to VME address modifier 29 (short non-privileged access). VMM corresponds to VME address modifier 39 (standard non-privileged data access.) The access size is always 16 bits. The offset field contains the relative word of the specified address space.

Note 5. Each PLC in a 575 system may contain one or more application process. These applications are identified by a single letter ranging from Application A through Application Z. Associated with each application is a G Memory partition. Access to the G memory partitions (in the 575 PLC) associated with a PLC application is provided through plcTT D5 through EE (hex). Addressing (plcTT offset) of these partitions is 24-bit zero relative.

Note 6. The G memory partitions (in the 575 PLC) are global memories accessible by the local PLC as well as by other bus masters. Access to the G memory partition associated with the local PLC is provided through plcTT EF (hex). The addressing of this partition is 24-bit zero relative; (that is, the first element of G memory is G1, which has an offset of 0).

A.2 Data Access between SIMATIC S7 and SIMATIC 505 Systems

SIMATIC 505 Addressing

Variables in the SIMATIC 505 system are addressed sequentially starting from 1 regardless of the data size, and the quantity of data is measured in multiples of the variable size. For example, V1, 1 represents 16 bits of data and LSP1, 1 represents 32 bits of data.

SIMATIC S7 Addressing

In the SIMATIC S7 system, variables are numbered from 0 and use "byte.bit" addressing, and the quantity of data is measured in multiples of a specified data type. For example, DB1 DBX0.0 WORD 1 represents 16 bits of data and DB1 DBX0.0 DWORD 1 represents 32 bits of data.

Special Considerations

Packed bits (XP, YP, CP) can only be accessed in multiples of 8 bits using S7 addresses. Use the S7 data type BYTE to access packed bits.

Each unpacked bit (X, Y, C) in the SIMATIC 505 is represented by eight bits, which correspond to the S7 BOOL data type. However, S7 addressing restricts BOOL data to single items. To access multiple unpacked bits, use the BYTE data type.

Addressing Examples

Table A-2 shows examples of the equivalent addressing formats between a SIMATIC 505 programmable controller system and a SIMATIC S7 system. These examples show how to use S7 protocol read and write requests to access data in the SIMATIC 505 system.

Table A-2 Equivalent Address Formats for SIMATIC 505 and S7 Systems

505 Addressing Format	S7 Addressing Format
V1, 1 V2, 1 V3, 1 V4, 1 V1, 2	DB256 DBX0.0 WORD 1 DB256 DBX2.0 WORD 1 DB256 DBX4.0 WORD 1 DB256 DBX6.0 WORD 1 DB256 DBX0.0 WORD 2
V32768, 1 V32769, 1 V32770, 1	DB256 DBX65534.0 WORD 1 DB257 DBX0.0 WORD 1 DB257 DBX2.0 WORD 1
X1, 1 Y2, 1	DB3 DBX0.0 BOOL 1 DB4 DBX1.0 BOOL 1
XP1, 8 YP1, 8 CP1, 8	I 0.0 BYTE 1* Q 0.0 BYTE 1* M 0.0 BYTE 1
WX1, 1 TCC1, 1 LSP1, 1 LSP2, 1	DB9 DBX0.0 WORD 1 DB15 DBX0.0 WORD 1 DB43 DBX0.0 DWORD 1 DB43 DBX4.0 DWORD 1
DCP6 S4, 2	DB18 DBX10.3 WORD 2
*I 0.0 and Q 0.0 are the mnemonics used in the International Mnemonic set. The equivalent mnemonics in the SIMATIC set are E 0.0 and A 0.0, respectively.	

Using S7 Addressing to Specify 505 Variables

To derive the SIMATIC S7 address for a SIMATIC 505 variable, use the following steps:

1. Subtract 1 from the 505 address; (for example, V2, 1 becomes V1, 1).
2. Multiply the 505 address by the number of bytes in the 505 variable; (V1, 1 becomes V2, 1).
3. Convert to “byte.bit” address; (V2, 1 becomes V2.0, 1).
4. Substitute the 505 memory type for the corresponding S7 type; (V2.0, 1 becomes DB256 DBX2.0, 1).
5. Replace the 505 quantity with the S7 data type; (DB256 DBX2.0, 1 becomes DB256 DBX2.0 WORD 1).

Figure A-1 shows a few additional examples of how to derive S7 addressing to access 505 variables.

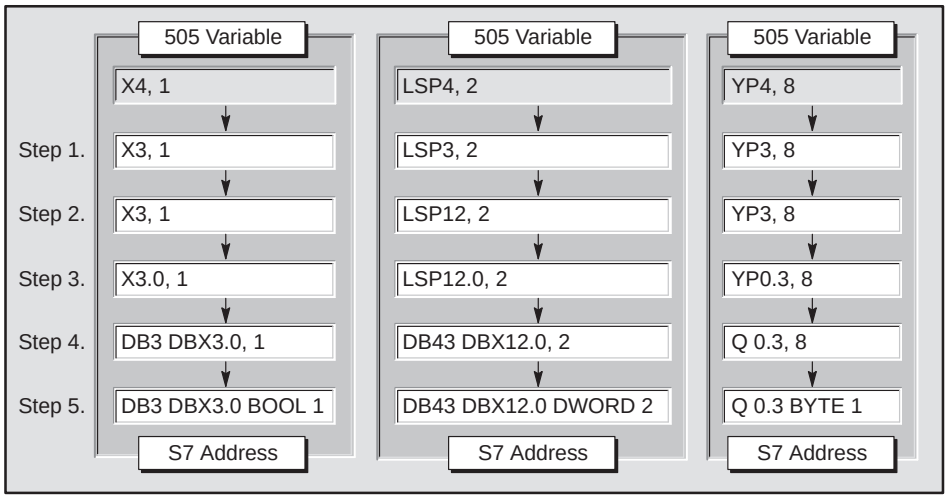


Figure A-1 SIMATIC 505 to S7 Addressing Examples

A.3 Mapping of FMS Variables onto 505 Memory

Simple Variables

Figure A-2 shows examples of how simple variables are mapped in SIMATIC 505 V-memory.

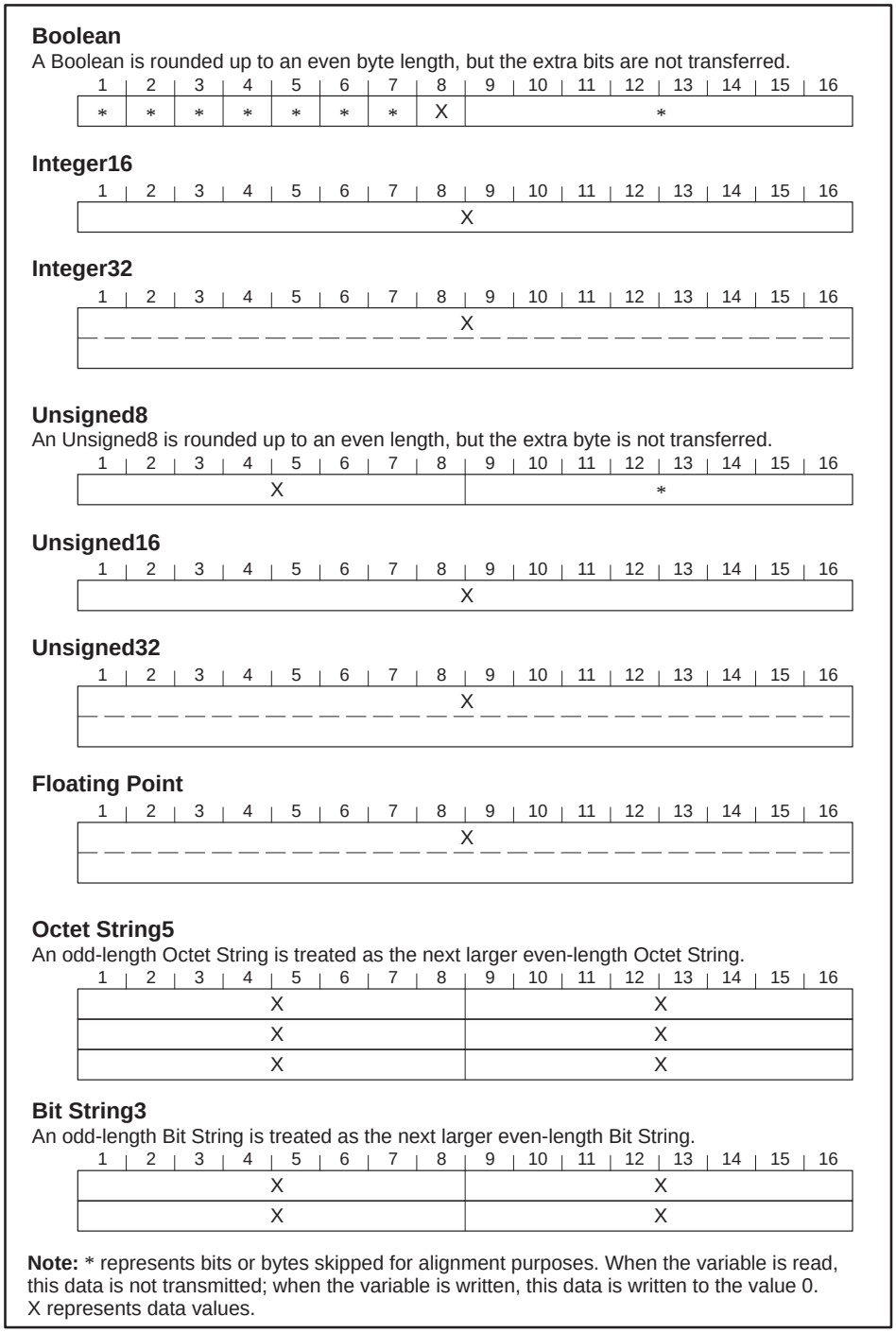


Figure A-2 Mapping of Simple Variables in 505 Memory

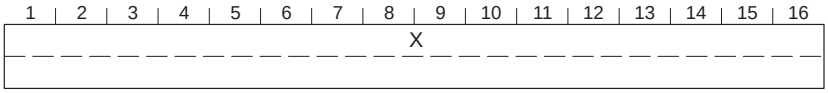
Visible String5[1]

A Visible String is preceded by two bytes which record the length of the string. The first byte is the maximum length of the string, and the second is the actual length. When read from the 505, the string transmitted is always of the maximum length with any unused characters sent as spaces. All characters of the string must be printable ASCII characters. An odd-length Visible String is rounded up to an even length, but the extra byte is not transferred.

1 – 8	9 – 16
05	05
X	X
X	X
X	*

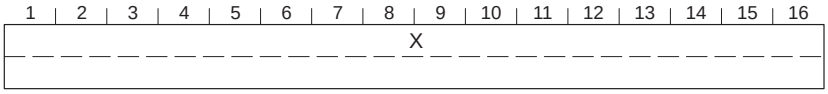
Time Difference[1]

Time Difference is stored as a 32-bit number.
Minimum: –24 Days 20 Hours 31 Minutes 23 Seconds 648 Milliseconds 8000 0000
Maximum: 24 Days 20 Hours 31 Minutes 23 Seconds 647 Milliseconds 7FFF FFFF



Time-of-day[1]

Time-of-day is stored as a 32-bit number.
Minimum: 00:00:00.000 0000 0000
Maximum: 23:59:59.999 0526 5BFF



Date[1]

Date values are stored as BCD numbers. The ranges are as follows:

Year	00 – 99
Month	01 – 12
Day	01 – 31
Hour	00 – 23
Minute	00 – 59
Second	00 – 59
Millisecond	000 – 999
Weekday	1 – 7

1 – 8	9 – 16
Year	Month
Day	Hour
Minute	Second
Millisecond	Weekday

Note: * represents bits or bytes skipped for alignment purposes. When the variable is read, this data is not transmitted; when the variable is written, this data is written to the value 0.
X represents data values.

[1]The FMS CP does not allow the use of this data type in the definition of a local variable; however, data of this type can be transferred to and from a remote station if that station uses this data type.

Figure A-2 Mapping of Simple Variables in 505 Memory (continued)

Variable Arrays

Figure A-3 shows how variable arrays are mapped in SIMATIC 505 memory.

Array[10] of Boolean

An array of Boolean is rounded up to an even byte length, but the extra bits are not transferred.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
X8	X7	X6	X5	X4	X3	X2	X1	*	*	*	*	*	*	X10	X9

Array[4] of Boolean

A Boolean array of 4 requires two bytes (one word), but the extra bits are not transferred.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
*	*	*	*	X4	X3	X2	X1	*	*	*	*	*	*	*	*

Array[2] of Integer16

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
X1															
X2															

Array[3] of Unsigned8

An odd-length array of Unsigned8 is rounded up to an even length, but the extra byte is not transferred.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
X1								X2							
X3								*							

Array[2] of Octet String5

An odd-length Octet String is treated as the next larger even-length Octet String.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
X1								X1							
X1								X1							
X1								X1							
X2								X2							
X2								X2							
X2								X2							

Array[2] of Visible String5[1]

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
05								05							
X1								X1							
X1								X1							
X1								*							
05								05							
X2								X2							
X2								X2							
X2								*							

Note: * represents bits or bytes skipped for alignment purposes. When the variable array is read, this data is not transmitted; when the array is written, this data is written to the value 0. X represents data values.

[1]The FMS CP does not allow the use of this data type in the definition of a local variable; however, data of this type can be transferred to and from a remote station if that station uses this data type.

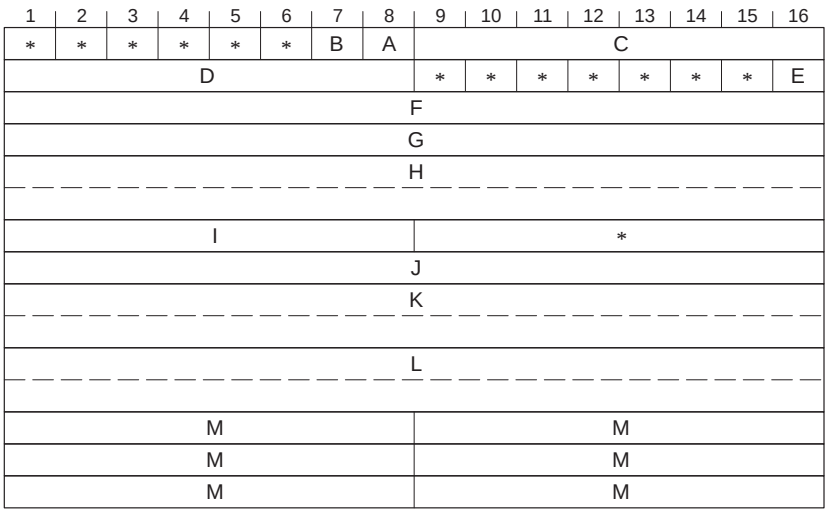
Figure A-3 Mapping of Variable Arrays in 505 Memory

Structures

Figure A-4 shows how an example structure of data types is mapped in SIMATIC 505 memory.

```
        STRUCT
        {
(A)     Boolean
(B)     Boolean
(C)     Unsigned8
(D)     Unsigned8
(E)     Boolean
(F)     Integer16
(G)     Integer16
(H)     Integer32
(I)     Unsigned8
(J)     Unsigned16
(K)     Unsigned32
(L)     Floating Point
(M)     Octet String[6]
        }
```

Structure



Note: * represents bits or bytes skipped for alignment purposes. When the structure is read, this data is not transmitted; when the structure is written, this data is written to the value 0. X represents data values.

Octet String[5] and Octet String[6] behave identically. Both transfer 6 bytes on both read and write.

Figure A-4 Mapping of a Structure in 505 Memory

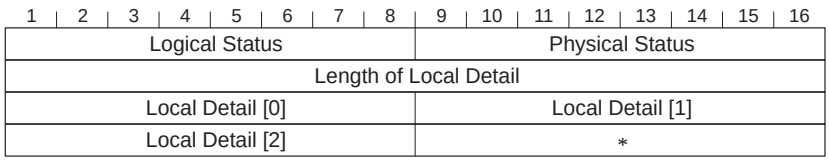
Mapping of FMS Status Response in 505 Memory

The FMS Status request function allows status information to be requested from the communications partner on the specified FMS connection. The following information is available in the response:

- Logical status of the device (whether communication is possible)
- Physical status of the device (device is operational, or maintenance is required)
- Local detail (vendor-specific information)

Figure A-5 shows how an FMS Status response is mapped in SIMATIC 505 memory.

FMS Status Response



Note: * represents bytes skipped for alignment purposes.

Figure A-5 Mapping of FMS Status Response

Table A-3 provides information about the codes that the partner device can supply as a response to an FMS Status request.

Table A-3 FMS Status Response Codes

Logical Status	Physical Status	Local Detail
00H – Ready for communication	10H – Operational	Vendor-specific
02H – Limited services	11H – Partly operational	—
—	12H – Not operational	—
—	13H – Maintenance required	—

Mapping of FMS Identify Response in 505 Memory

The FMS Identify request function allows the following information to be obtained from the partner device:

- Name of the device vendor (vendor name)
- Name or model number of the device
- Revision (or version) of the device

Figure A-6 shows how an FMS Identify response is mapped in SIMATIC 505 memory. Each byte contains the Hex code that represents an ASCII character, spelling out the vendor name and other device information.

FMS Identify Response

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Length of Vendor Name															
Vendor Name [0]								Vendor Name [1]							
Vendor Name [2]								Vendor Name [3]							
. . .															
Vendor Name [n]								*							
Length of Model Number															
Model Number [0]								Model Number [1]							
Model Number [2]								Model Number [3]							
. . .															
Model Number [n]								*							
Length of Revision															
Revision [0]								Revision [1]							
Revision [2]								Revision [3]							
. . .															
Revision [n]								*							

Note: * represents bytes skipped for alignment purposes.

Figure A-6 Mapping of FMS Identify Response

A.4 Protocol Implementation Conformance Statements (PICS)

Definition

The Protocol Implementation Conformance Statements (PICS) provide further information about the implementation of FMS (range and complexity) on the FMS CP module.

This information is required for connections to systems of other manufacturers.

Table A-4 PICS Part 1: Implementation in the System

System Parameters	Detail
Implementation vendor name	Siemens E & A
Implementation model name	Model number of the CPU
Implementation revision identifier	—
Vendor name of FMS	Siemens Energy & Automation
Controller type of FMS	ASPC2
Hardware release of FMS	A_._
Software release of FMS	V_._
Profile number	0
Calling FMS user (enter YES or NO)	YES
Called FMS user (enter YES or NO)	YES

Table A-5 PICS Part 2: Supported Services

Service	Primitive
Initiate	req, con, ind, rsp
Abort	req, ind
Reject	ind
Status	req, con
Unsolicited Status	Not supported
Identify	req, con
Read	req, con
Write	req, con
Information Report	ind
Get Object Dictionary (short version)	req, con
Get Object Dictionary (long version)	req, con
Read CRL Loc	req, con

Table A-6 PICS Part 3: FMS Parameters and Options

FMS Parameters and Options	Detail
Addressing by name	YES
Maximum length for names	32
Access protection supported	—
Maximum length for extension	32
Maximum length for extension arguments	0

Table A-7 PICS Part 4: Local Implementation Values

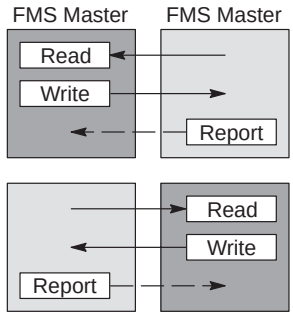
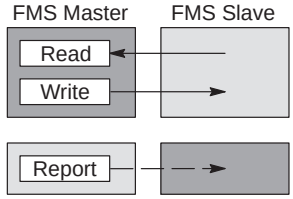
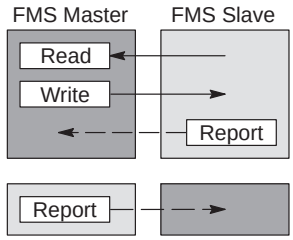
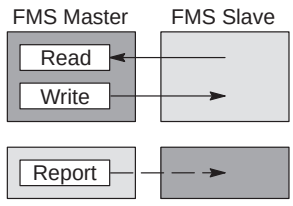
Local Implementation Values	Detail
Maximum length of FMS PDU	241
Maximum number of services outstanding calling (for SAC or SCC)	4
Maximum number of services outstanding called (for RAC or RCC)	4
Syntax and semantics of the execution argument	—
Syntax and semantics of extension	—

A.5 FMS Connection Types and Variables

FMS Connection Types and Possible Job Types

When configuring FMS connections, you must specify the connection type. Table A-8 shows which job types are available for data transfer with each connection type.

Table A-8 FMS Connection Types and Jobs Allowed

Connection Type	Possible Job Types	Client vs. Server
MMAC – Master-master on acyclic connection	Read, Write, and Report possible in both directions.	
MSAC – Master-slave on acyclic connection	Read, Write, and Report possible for the FMS master.	
MSAC_SI – Master-slave on acyclic connection with slave initiative	Read, Write, and Report possible for the FMS master. The FMS slave can also report once the master has assigned the appropriate rights.	
MSCY – Master-slave on cyclic connection	Read, Write, and Report possible for the FMS master.	
Legend: ——→ Confirmed service; – – – –→ Unconfirmed service		Client function; Server function

Configuring Read/Write Access to Variables

You can enable and disable read or write access to each variable in your configuration. The Access Rights dialog in the FMS Variable input pane allows you to specify read or write access by password, by groups, or by all. The effects of these choices with passwords are shown in Table A-9.

Table A-9 Read/Write Access to Variables with Password

Read Access	Write Access	Password	Result
✓	✓	0	Read and write access are permitted.
✓	—	0	Only read access is permitted.
—	✓	0	Only write access is permitted.
✓	✓	>0	Read and write access are permitted with a password.
✓	—	>0	Only read access with password is permitted.
—	✓	>0	Only write access with password is permitted.

A.6 Local LSAP Assignments

Table A-10 lists the available LSAP assignment numbers and any restrictions that may apply.

Table A-10 Local LSAP Assignments

LSAP	Conditions
0, 1	Reserved
2 to 33 2 to 52	Available for FDL connections Available for FMS connections
53	Cannot be used if Peer Blocks are defined
54 to 57	Available for FMS connections
58	Restricted to FMS slave connections
59 to 62	Available for FMS connections
63 to FF	Reserved

NOTE: Ordinarily, the FMS CP module cannot repeat local LSAP numbers. Each connection must have a unique local LSAP number. The exception to this is FMS slave connections. All FMS slave connections must use LSAP 58. LSAP 58 cannot be used for connections to any other type of device.

Appendix B

Troubleshooting

B.1 Using the RESET Button

First attempt to reset the module using the COM5434 Configurator software before resetting the module with the RESET button. If resetting the module using the COM5434 Configurator does not solve the problem, make sure to check all connections, communication cables, and the configuration of the FMS CP in the base using TISOFT.

However, if there is a serious hardware error, the module resets due to a signal from the watchdog timer, encounters the same problem again, and repeats the reset over and over. If this occurs, call the Siemens Technical Services Group for technical assistance. You may be advised to return the module to the factory for repair.

B.2 Job Status Codes

Job Status Codes

Table B-1 lists the status codes and their meanings for FMS or Send-Receive jobs.

Table B-1 FMS or Send-Receive Job Status

Error	Description
0000	Job executed successfully; no errors.
D000	Job not yet triggered by WY bit (Note: code appears in Job Status screen only, not in V memory status word.)
D001	More data received than expected, data written to PLC.
D002	Less data received than expected, data written to PLC.

Locally Detected Errors in FMS Jobs

Table B-2 lists the error code numbers and their meanings for FMS jobs.

Table B-2 Local FMS Job Status Codes

Error	Description
0001	Communications problem.
0002	Function cannot be executed: either negative acknowledgment by the CP or error in the sequence.
0003	The connection is not configured (invalid ID specified). If the connection is configured, the error indicates that the permitted parallel job processing limit has been exceeded. For example, SAC=0 is configured and a Report job is sent.
0004	The receive data area is too short or the data types do not match.
0005	A reset request has been received from the CP.
0006	The corresponding job execution on the CP is in the Disabled state, or a reset request has been received from the CP; the transfer is therefore incomplete.
0007	The corresponding job execution on the CP is in the wrong state. With Report: error is specified in greater detail in diagnostic buffer.
0008	Job execution on the CP signals an error accessing the user memory.
000A	Access to the local user memory is not possible (for example, the DB has been deleted).
000B	Warning: the job is already active.
0014	Not enough work or load memory available.
0200	Unspecified application reference error.
0201	The configured connection cannot be established at present; for example, the LAN connection is not established.
0300	Unspecified definition error.
0301	Object with requested index/name is not defined.
0302	Object attributes are inconsistent.

Table B-2 Local FMS Job Status Codes (continued)

Error	Description
0303	Name already exists.
0400	Unspecified resource error.
0401	No memory available.
0500	Unspecified service error.
0501	Conflict due to object status.
0502	Configured PDU size exceeded.
0503	Conflict due to object restrictions.
0504	Inconsistent parameters.
0505	Illegal parameters.
0600	Unspecified access error.
0601	Invalid object; cable off; bad bus parameter; or partner CP in reset.
0602	Hardware error.
0603	Object access was denied.
0604	Invalid address.
0605	Inconsistent object attributes.
0606	Object access not supported.
0607	Variable read or written does not exist on server.
0608	Type conflict (source data too large or too small for variable).
0609	Access using names not supported.
0700	Unspecified object dictionary error.
0701	Permitted name length exceeded.
0702	Overflow of the object dictionary.
0703	Object dictionary is write-protected.
0704	Overflow of the extension length.
0705	Overflow of the object description length.
0706	Processing problem.
0100	Unspecified VFD status error.
0102	Bad FMS–PDU.
0105	PDU length error: variable is too long; see Table C-1.
0106	Service not supported.
0108	RCC/SAC/RAC error.
0800	Unspecified error.
EF02	You have attempted to run more than one FMS job simultaneously on a single FMS connection. This means not enough resources are available. You can correct the problem by setting the parameter “Max Cnfmd Svc To” for the client and “Max Cnfmd Svc From” for the server to the number of jobs sharing the connection. If the jobs are not run simultaneously, then the default value of 1 is acceptable.

Errors Signaled by the FMS Partner

Table B-3 lists FMS job error codes signaled by the communication partner.

Table B-3 Errors Signaled by the FMS Partner

Error	Description
8200	Unspecified application reference error.
8201	Application (for example, user program) not obtainable.
8300	Unspecified definition error.
8301	Object with requested index/name is not defined.
8302	Object attributes are inconsistent.
8303	Name exists already.
8400	Unspecified resource error.
8401	No memory available.
8402	Not allowed in current state; check Maximum Confirmed Service To and Maximum Confirmed Service From parameters.
8500	Unspecified service error.
8501	Conflict due to object status.
8502	Configured PDU size exceeded.
8503	Conflict due to object restrictions.
8504	Inconsistent parameters.
8505	Illegal parameters.
8600	Unspecified access error.
8601	Invalid object.
8602	Hardware error.
8603	Object access was denied.
8604	Invalid address.
8605	Inconsistent object attributes.
8606	Object access is not supported.
8607	Object does not exist.
8608	Type conflict.
8609	Access using names is not supported.
8700	Unspecified object dictionary (OD) error.
8701	Permitted name length exceeded.
8702	Overflow of the object dictionary.
8703	Object dictionary is write-protected.
8704	Overflow of the extension length.
8705	Overflow of the object description length.
8706	Processing problem.
8100	Unspecified VFD status error.
8104	Too much data transferred on Write.
8000	Unspecified error detected by partner.

Send-Receive Job Error Codes

Table B-4 lists the error codes and their meanings for Send-Receive jobs.

Table B-4 Send-Receive Job Error Codes

Error	Description
E0E0	Receive Job: no data available. This error occurs when a Receive job is executed but no corresponding Send job has occurred.
E0E1	Connection is not configured by CP.
E0E2	No LAN connection to remote.
E0E3	Invalid request.
E0E4	S7–Read/Write buffer too small.
E0E5	DS–Number out of range 1..64, 1..32.
E0E6	S7–Prot–error
E0E8	L2: remote LSAP is not active.
E0E9	Send Job: no remote receive resources. This error occurs when 2 or more Send jobs are executed but no corresponding Receive jobs have occurred.
E0EA	L2: service on remote LSAP rejected.
E0EB	L2: remote address not available.
E0EC	L2: bus fault.

B.3 CP-to-Controller Status Codes

Table B-5 CP-to-Attached Controller Error Codes for FMS and Send-Receive Jobs

Status Code (Hex)	Description
80xx	xx is task code error response from attached PLC; see PLC documentation. These errors usually indicate a problem in accessing data in the attached PLC caused by a firmware error in the CP rather than a user error.
9000	Invalid request to PLC; a firmware error in the CP rather than a user error.
9001	Memory type request from PLC is not defined for any 505 PLC. The Configurator guards against the use of undefined data types when configuring communications between 505 PLCs, so this should not occur. If the accessed plcTT type is unsupported or not configured in the attached PLC, error code 9003 occurs (see below).
9002	Reserved for invalid request for PLC mode. Currently, CP does not produce this error.
9003	Memory type requested from PLC is not supported or not configured. For example, the 560 does not support loop data types. It also occurs if the requested data type is not configured in the PLC (e.g., unconfigured analog alarm data types). Access of data types undefined for any 505 PLC results in error 9001.
9004	Starting memory address accessed in PLC is invalid. This occurs if memory type is defined, supported, and configured, but the starting address is out of range for the data type. For example, if the starting address is V27000 and only 52K bytes of V-memory are configured (allowing a maximum V-address of 26624), then this error occurs. If you reconfigured the PLC memory after installing and initializing the CP module, reset the CP module so that it can read the new memory configuration in the PLC.
9005	Memory type cannot be written since it is read-only.
9006	PLC communication time-out. Due to extremely heavy load on the PLC or CP, the data access to the PLC took longer than expected. This error may also occur if the CP resides in a remote base and the I/O cable becomes disconnected. If this error occurs, retry the job.
9007	Starting memory address OK, but the number of items requested is causing invalid memory access. For example, this error ocuurs if 2000 words of V-memory starting at V26000 are requested but only 52K bytes of V-memory are configured (V26624 is highest configured address). If you reconfigured PLC memory after installing and initializing the CP module, reset the CP module so that it can read the new memory configuration in the PLC.
9008	Slot into which CP module is placed is not configured. This error does not explicitly appear for any job. It may be indicated on the job diagnostic display by the message “Waiting for WY bit to trigger Job”, with a job status D000, even when the PLC is setting the WY bit. If the base is not configured, the module is unable to detect the WY Job Start Bits required for the jobs.

Appendix C
Specifications

Table C-1 Communication Capacities

Communication Type	Maximum Number or Size
FMS Connections	32
FDL Connections	32
S7 Connections	48
Total number of connections	59 (or 60 if Peerlink service is not used)
FMS variable size	Maximum PDU size = 241 bytes 237 bytes for Read jobs (241 – 4 bytes) ≤234 bytes for Write and Information Report jobs, depending on name length, index or subindex (see Table C-2)
Send-Receive data size	240 bytes
Peerlink data transfer size	234 bytes

Table C-2 provides a formula for calculating the maximum size of an FMS variable that can be transmitted. The maximum PDU size for an FMS job is 241 bytes. For Write and Information Report jobs, the PDU includes the addressing information, which must then be subtracted from 241 bytes to determine the maximum amount of data that can be specified in the variable.

Table C-2 Calculating Variable Length

Access Using...	Write or Information Report
Index	8 bytes
Subindex	10 bytes
Name	x + name length (number of characters) x = 7 for name length ≥ 15 x = 6 for name length < 15

Example: For a variable named “PumpControl” (name length = 11), which is less than 15 characters, add 6 to the name length and subtract from 241, as shown below:

241 – (x + name length)
241 – (6 + 11)
241 – 17 = 224 bytes of user data

Table C-3 Specifications

Operating temperature (Based on the immediate surrounding air at the device.)	0 to 60°C (32 to 140°F)
Storage temperature	–40 to +70°C (–40 to 158°F)
Shock	IEC 68-2-27; Test Ea; half sine, 15 g, 11 ms
Pollution degree	2, IEC 664, 664A
Noise immunity, conducted	IEC 801, Part 4, Level 3 MIL STD 461B, Part 4 CS01, CS02, CS06 IEC 255-4, Appendix E NEMA DC33 NEMA ICS 2–230.45 IEC 255
Noise immunity, radiated	IEC 801 Part 3, Level 3 MIL STD 461B, Part 4 RS01, RS02
Electrostatic discharge	IEC 801, Part 2, Level 4, (15 kV)
Minimum torque for bezel screws	2.6 in-lb (0.3 N-m)
Maximum torque for bezel screws	4.12 in-lb (0.6 N-m)
Module power required from base	5.0 W of +5 V 0.2 W of –5 V
Relative humidity	5% to 95% noncondensing
Vibration	Sinusoidal IEC 68-2-6, Test Fc 0.15 mm peak-to-peak, 10–57 Hz; 1.0 g, 57–150 Hz Random IEC 68-2-34, Test Fdc, equivalent to NAVMAT P–9492 0.04 g^2/Hz, 80–350 Hz
Corrosion protection	All parts of corrosion-resistant material or plated or painted as corrosion protection
Agency approvals	Underwriters Laboratories: UL Listed (Industrial Control Equipment) Canadian Standards Association: CSA Certified (Process Control Equipment) Factory Mutual Approved; Class I, Div. 2 Hazardous Locations Verband Deutscher Elektrotechniker (VDE) 0160 Electrical Equipment (self-compliance) EN61131-2 (1995) Programmable Controllers Equipment requirements and test EMC Directive 89/336/EEC Low Voltage Directive 73/23/EEC

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