

inRAx



MVI56-PNPM

ControlLogix Platform

Phantom Network Protocol Master
Communication Module

User Manual

January 02, 2008



Please Read This Notice

Successful application of this module requires a reasonable working knowledge of the Rockwell Automation ControlLogix hardware, the MVI56-PNPM Module and the application in which the combination is to be used. For this reason, it is important that those responsible for implementation satisfy themselves that the combination will meet the needs of the application without exposing personnel or equipment to unsafe or inappropriate working conditions.

This manual is provided to assist the user. Every attempt has been made to ensure that the information provided is accurate and a true reflection of the product's installation requirements. In order to ensure a complete understanding of the operation of the product, the user should read all applicable Rockwell Automation documentation on the operation of the Rockwell Automation hardware.

Under no conditions will ProSoft Technology be responsible or liable for indirect or consequential damages resulting from the use or application of the product.

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Warnings

UL Warnings

- A** Warning - Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2.
- B** Warning - Explosion Hazard - When in Hazardous Locations, turn off power before replacing or rewiring modules.
Warning - Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is known to be nonhazardous.
- C** Suitable for use in Class I, division 2 Groups A, B, C and D Hazardous Locations or Non-Hazardous Locations.

ATEX Warnings and Conditions of Safe Usage:

Power, Input, and Output (I/O) wiring must be in accordance with the authority having jurisdiction

- A** Warning - Explosion Hazard - When in hazardous locations, turn off power before replacing or wiring modules.
- B** Warning - Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
- C** These products are intended to be mounted in an IP54 enclosure. The devices shall provide external means to prevent the rated voltage being exceeded by transient disturbances of more than 40%. This device must be used only with ATEX certified backplanes.
- D** DO NOT OPEN WHEN ENERGIZED.

Electrical Ratings

- Backplane Current Load: 800 mA @ 5 V DC; 3mA @ 24V DC
- Operating Temperature: 0 to 60°C (32 to 140°F)
- Storage Temperature: -40 to 85°C (-40 to 185°F)
- Shock: 30g Operational; 50g non-operational; Vibration: 5 g from 10 to 150 Hz
- Relative Humidity 5% to 95% (non-condensing)
- All phase conductor sizes must be at least 1.3 mm(squared) and all earth ground conductors must be at least 4mm(squared).

Markings:



II 3 G 0C ≤Ta≤ 60C EEx nA IIC T4 DEMKO 07ATEX0710717X

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MVI56-PNPM User Manual

January 02, 2008

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Contents

PLEASE READ THIS NOTICE	2
Warnings	2
Your Feedback Please	3
GUIDE TO THE MVI56-PNPM USER MANUAL	7
1 START HERE	9
1.1 System Requirements.....	9
1.2 Package Contents	10
1.3 Setting Jumpers.....	11
1.4 Install the Module in the Rack.....	12
1.5 Connect your PC to the Processor	13
1.6 Download the Sample Program to the Processor	14
1.6.1 Configuring RSLinx	15
1.7 Connect your PC to the Module.....	17
2 INSTALLING AND CONFIGURING THE MODULE	19
2.1 Modifying the Module Configuration	23
2.1.1 Power Up	24
2.1.2 Changing Parameters During Operation	24
2.1.3 Module Data Object (PNPModuleDef).....	25
2.1.4 User Data Objects	28
2.1.5 Slave Polling Control and Status.....	29
3 LADDER LOGIC	30
4 DIAGNOSTICS AND TROUBLESHOOTING	31
4.1 Reading Status Data From the Module.....	31
4.1.1 The Configuration/Debug Menu	31
4.1.2 Required Hardware	32
4.1.3 Required Software.....	32
4.1.4 Using the Configuration/Debug Port.....	33
4.1.5 Main Menu	34
4.1.6 Data Analyzer.....	37
4.1.7 Data Analyzer Tips	39
4.1.8 Database View Menu	42
4.1.9 Master Command Error List Menu	44
4.1.10 Master Command List Menu	45
4.2 LED Status Indicators	46
4.2.1 Clearing a Fault Condition.....	47
4.2.2 Troubleshooting.....	48
5 REFERENCE	49
5.1 Product Specifications	49
5.1.1 Features and Benefits	49
5.1.2 General Specifications	49
5.1.3 Functional Specifications.....	50
5.1.4 Hardware Specifications.....	50
5.2 Functional Overview	51
5.2.1 General Concepts	51
5.2.2 Main Logic Loop	51
5.2.3 Backplane Data Transfer.....	52
5.2.4 Normal Data Transfer.....	53
5.2.5 Configuration Data Transfer	55
5.2.6 Master Command Data List.....	56
5.2.7 Slave Status Blocks.....	57

5.2.8	Command Control Blocks	58
5.2.9	Data Flow Between MVI56-PNPM Module and ControlLogix Processor	62
5.3	Cable Connections	64
5.3.1	RS-232 Configuration/Debug Port.....	64
5.3.2	RS-232.....	67
5.3.3	RS-422.....	69
5.3.4	RS-485.....	69
5.3.5	DB9 to RJ45 Adaptor (Cable 14).....	70
5.4	MVI56-PNPM Database Definition.....	70
5.5	MVI56-PNPM Status Data Definition	71
5.6	MVI56-PNPM Configuration Data Definition	72
5.6.1	Backplane Setup.....	72
5.6.2	Port 1 Setup	73
5.6.3	Port 2 Setup	74
5.6.4	Port 1 Commands	74
5.6.5	Port 2 Commands	74
5.6.6	Misc. Status.....	75
5.6.7	Command Control	76
5.7	Key Press Representation (Function 7).....	77
6	SUPPORT, SERVICE & WARRANTY.....	79
6.1	How to Contact Us: Sales and Support	80
6.2	Return Material Authorization (RMA) Policies and Conditions.....	81
6.2.1	All Product Returns	81
6.3	Procedures for Return of Units Under Warranty	81
6.4	Procedures for Return of Units Out of Warranty	82
6.4.1	Un-repairable Units	82
6.4.2	Purchasing Warranty Extension.....	83
6.5	LIMITED WARRANTY	83
6.5.1	What Is Covered By This Warranty	83
6.5.2	What Is Not Covered By This Warranty	84
6.5.3	DISCLAIMER REGARDING HIGH RISK ACTIVITIES.....	85
6.5.4	DISCLAIMER OF ALL OTHER WARRANTIES.....	85
6.5.5	LIMITATION OF REMEDIES**	85
6.5.6	Time Limit for Bringing Suit	85
6.5.7	No Other Warranties	86
6.5.8	Intellectual Property	86
6.5.9	Additional Restrictions Relating To Software And Other Intellectual Property	86
6.5.10	Allocation of risks	87
6.5.11	Controlling Law and Severability.....	87
INDEX.....	89

Guide to the MVI56-PNPM User Manual

Function		Section to Read	Details
Introduction (Must Do)	→	Start Here (page 9)	This Section introduces the customer to the module. Included are: package contents, system requirements, hardware installation, and basic configuration.
Verify Communication, Diagnostic and Troubleshooting	→	Verifying Communication (page 31) Diagnostics and Troubleshooting (page 31)	This section describes how to verify communications with the network. Diagnostic and Troubleshooting procedures.
Reference Product Specifications Functional Overview Glossary	→	Reference (page 49) Functional Overview (page 51) Product Specifications (page 49)	These sections contain general references associated with this product, Specifications, and the Functional Overview.
Support, Service, and Warranty Index	→	Support, Service and Warranty (page 79)	This section contains Support, Service and Warranty information. Index of chapters.

1 Start Here

In This Chapter

- System Requirements 9
- Package Contents 10
- Setting Jumpers 11
- Install the Module in the Rack 12
- Connect your PC to the Processor 13
- Download the Sample Program to the Processor 14
- Connect your PC to the Module 17

Installing the MVI56-PNPM module requires a reasonable working knowledge of the Rockwell Automation hardware, the MVI56-PNPM Module and the application in which they will be used.



Caution: It is important that those responsible for implementation can complete the application without exposing personnel, or equipment, to unsafe or inappropriate working conditions. Safety, quality and experience are key factors in a successful installation.

1.1 System Requirements

The MVI56-PNPM module requires the following minimum hardware and software components:

- Rockwell Automation ControlLogix™ processor, with compatible power supply and one free slot in the rack, for the MVI56-PNPM module. The module requires 800mA of available power.
- Rockwell Automation RSLogix 5000 programming software version 2.51 or higher.
- Rockwell Automation RSLinx communication software
- Pentium® II 450 MHz minimum. Pentium III 733 MHz (or better) recommended
- Supported operating systems:
 - Microsoft Windows XP Professional with Service Pack 1 or 2
 - Microsoft Windows 2000 Professional with Service Pack 1, 2, or 3
 - Microsoft Windows Server 2003
- 128 Mbytes of RAM minimum, 256 Mbytes of RAM recommended

- 100 Mbytes of free hard disk space (or more based on application requirements)
- 256-color VGA graphics adapter, 800 x 600 minimum resolution (True Color 1024 × 768 recommended)
- CD-ROM drive
- HyperTerminal or other terminal emulator program.

Note: You can install the module in a local or remote rack. For remote rack installation, the module requires EtherNet/IP or ControlNet communication with the processor.

1.2 Package Contents

The following components are included with your MVI56-PNPM module, and are all required for installation and configuration.

Important: Before beginning the installation, please verify that all of the following items are present.

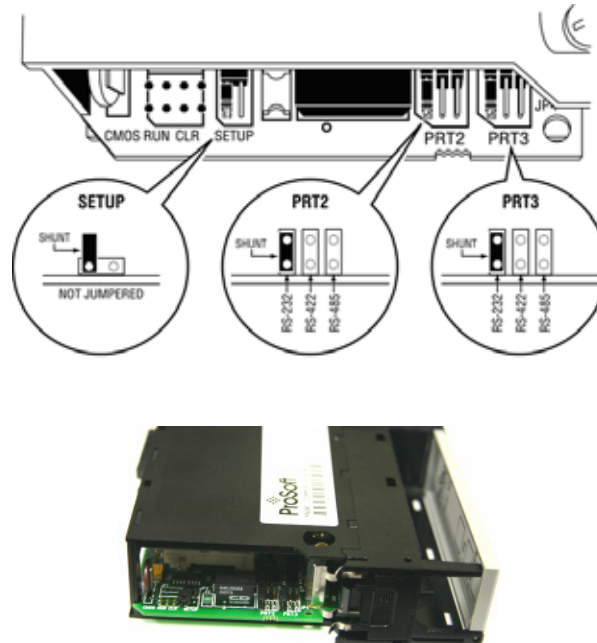
Qty.	Part Name	Part Number	Part Description
1	MVI56-PNPM Module	MVI56-PNPM	Phantom Network Protocol Master Communication Module
1	Cable	RS232 Null Modem	For RS232 Connection to the CFG Port
3	Cable	Cable #14, RJ45 to DB9 Male Adapter	For DB9 Connection to Module's Port
2	Adapter	1454-9F	Two Adapters, DB9 Female to Screw Terminal. For RS422 or RS485 Connections to Port 1 and 2 of the Module
1	ProSoft Solutions CD		Contains sample programs, utilities and documentation for the MVI56-PNPM module.

If any of these components are missing, please contact ProSoft Technology Support for replacement parts.

1.3 Setting Jumpers

If you use an interface other than RS-232 (default), you must change the jumper configuration to match the interface. There are three jumpers located at the bottom of the module.

The following illustration shows the MVI56-PNPM jumper configuration:



- 1 Set the PRT 2 (for application port 1) and PRT 3 (for application port 2) jumpers for RS232, RS422 or RS485 to match the wiring needed for your application. The default jumper setting for both application ports is RS-232.
- 2 The Setup Jumper acts as "write protection" for the module's flash memory. In "write protected" mode, the Setup pins are not connected, and the module's firmware cannot be overwritten. Do not jumper the Setup pins together unless you are directed to do so by ProSoft Technical Support.

1.4 Install the Module in the Rack

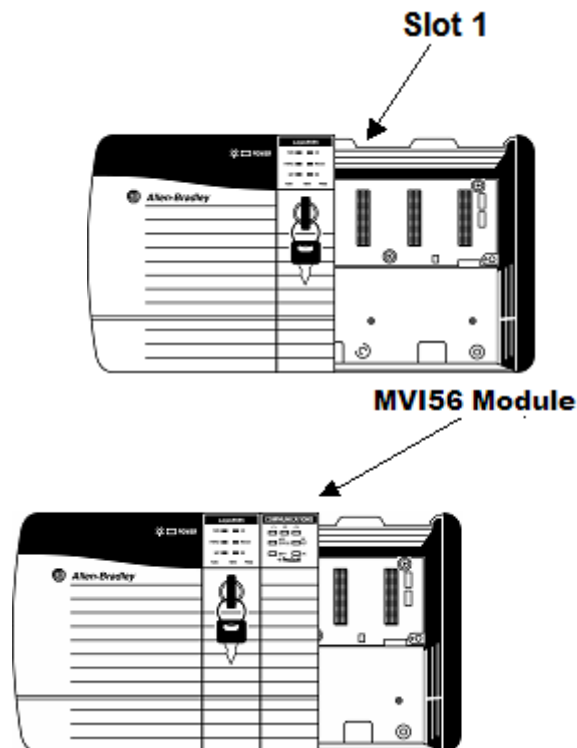
If you have not already installed and configured your ControlLogix processor and power supply, please do so before installing the MVI56-PNPM module. Refer to your Rockwell Automation product documentation for installation instructions.

Warning: You must follow all safety instructions when installing this or any other electronic devices. Failure to follow safety procedures could result in damage to hardware or data, or even serious injury or death to personnel. Refer to the documentation for each device you plan to connect to verify that suitable safety procedures are in place before installing or servicing the device.

After you have checked the placement of the jumpers, insert MVI56-PNPM into the ControlLogix chassis. Use the same technique recommended by Rockwell Automation to remove and install ControlLogix modules.

Warning: When you insert or remove the module while backplane power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Verify that power is removed or the area is non-hazardous before proceeding. Repeated electrical arcing causes excessive wear to contacts on both the module and its mating connector. Worn contacts may create electrical resistance that can affect module operation.

- 3 Turn power OFF.
- 4 Align the module with the top and bottom guides, and slide it into the rack until the module is firmly against the backplane connector.



- 5 With a firm but steady push, snap the module into place.

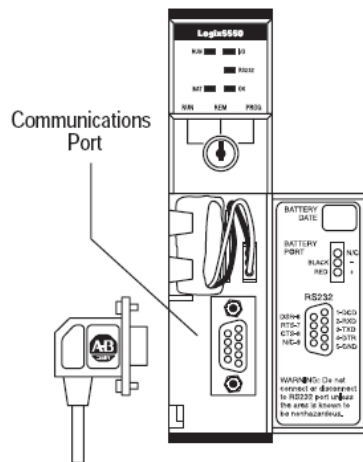
- 6 Check that the holding clips on the top and bottom of the module are securely in the locking holes of the rack.
- 7 Make a note of the slot location. You will need to identify the slot in which the module is installed in order for the sample program to work correctly. Slot numbers are identified on the green circuit board (backplane) of the ControlLogix rack.
- 8 Turn power ON.

Note: If you insert the module improperly, the system may stop working, or may behave unpredictably.

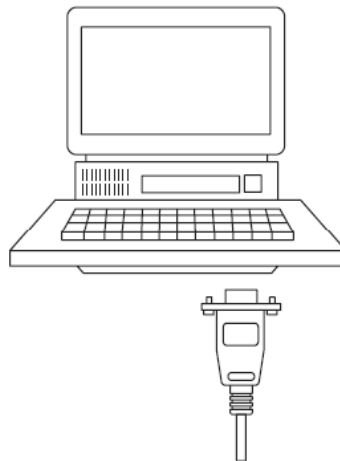
Note: If you are installing MVI56-PNPM with other modules connected to the PCI bus, the peripheral modules will not have holding clips. Make sure all of the modules are aligned with their respective slots before you snap them into place.

1.5 Connect your PC to the Processor

- 1 Connect the right-angle connector end of the cable to your controller at the communications port.



- 2 Connect the straight connector end of the cable to the serial port on your computer.

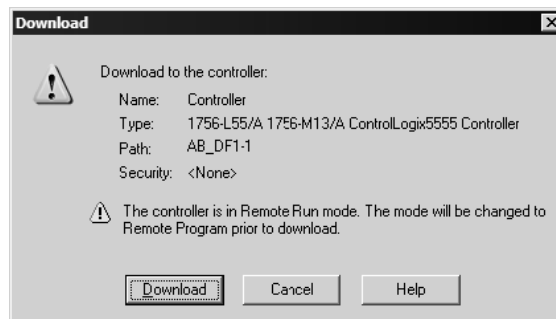


1.6 Download the Sample Program to the Processor

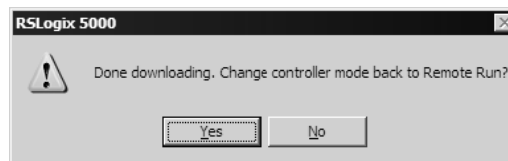
- **To download the sample program from RSLogix 5000 to the ControlLogix processor:**

Note: The key switch on the front of the ControlLogix module must be in the REM position.

- 1 If you are not already online to the processor, open the Communications menu, and then choose Download. RSLogix will establish communication with the processor.
- 2 When communication is established, RSLogix will open a confirmation dialog box. Click the Download button to transfer the sample program to the processor.



- 3 RSLogix will compile the program and transfer it to the processor. This process may take a few minutes.
- 4 When the download is complete, RSLogix will open another confirmation dialog box. Click OK to switch the processor from Program mode to Run mode.

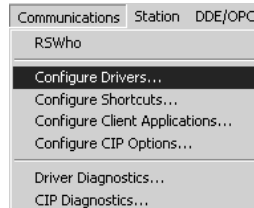


Note: If you receive an error message during these steps, refer to your RSLogix documentation to interpret and correct the error.

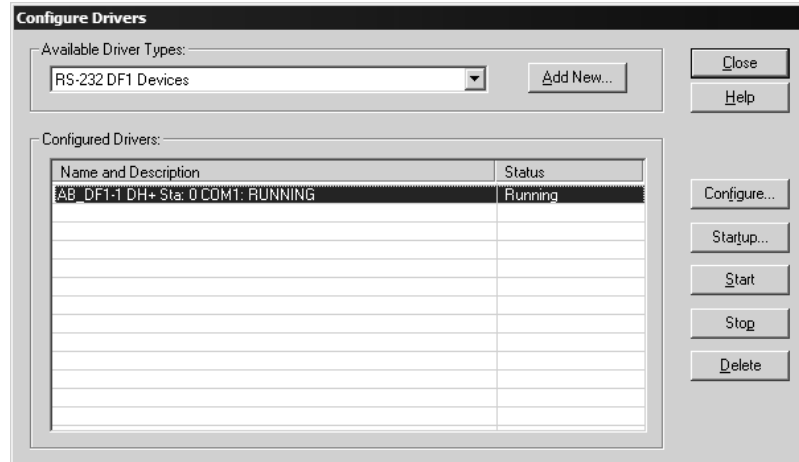
1.6.1 Configuring RSLinx

➤ **If RSLinx is unable to establish communication with the processor, follow these steps:**

- 1 Open RSLinx.
- 2 Open the Communications menu, and choose Configure Drivers.



This action opens the Configure Drivers dialog box.



Note: If the list of configured drivers is blank, you must first choose and configure a driver from the Available Driver Types list. The recommended driver type to choose for serial communication with the processor is "RS-232 DF1 Devices".

- 3 Click to select the driver, and then click Configure. This action opens the Configure Allen-Bradley DF1 Communications Device dialog box.



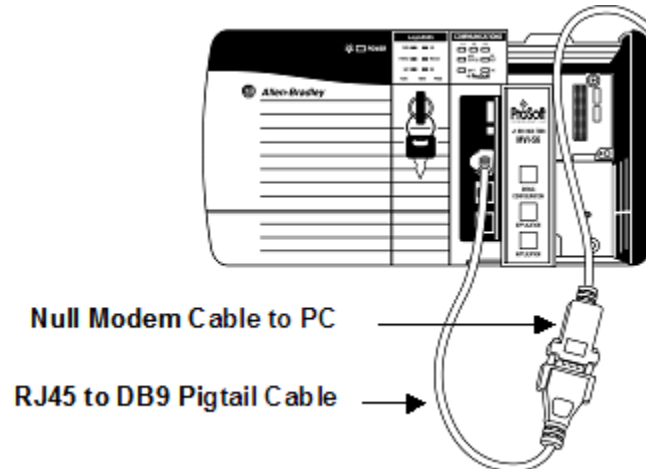
- 4 Click the Auto-Configure button. RSLinx will attempt to configure your serial port to work with the selected driver.
- 5 When you see the message "Auto Configuration Successful", click the OK button to dismiss the dialog box.

Note: If the auto-configuration procedure fails, verify that the cables are connected correctly between the processor and the serial port on your computer, and then try again. If you are still unable to auto-configure the port, refer to your RSLinx documentation for further troubleshooting steps.

1.7 Connect your PC to the Module

With the module securely mounted, connect your PC to the **Configuration/Debug** port using an RJ45-DB-9 Serial Adapter Cable and a Null Modem Cable.

- 1 Attach both cables as shown.
- 2 Insert the RJ45 cable connector into the Configuration/Debug port of the module.
- 3 Attach the other end to the serial port on your PC or laptop.



2 Installing and Configuring the Module

In This Chapter

- Modifying the Module Configuration..... 23

This chapter describes how to install and configure the module to work with your application. The configuration process consists of the following steps.

- 1 Use RSLogix 5000 to identify the module to the processor and add the module to a project.

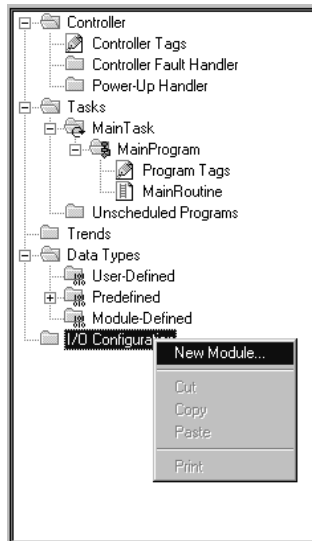
Note: The RSLogix 5000 software must be in "offline" mode to add the module to a project.

- 2 Modify the example ladder logic to meet the needs of your application, and copy the ladder logic to the processor. Example ladder logic files are provided on the CD-ROM.

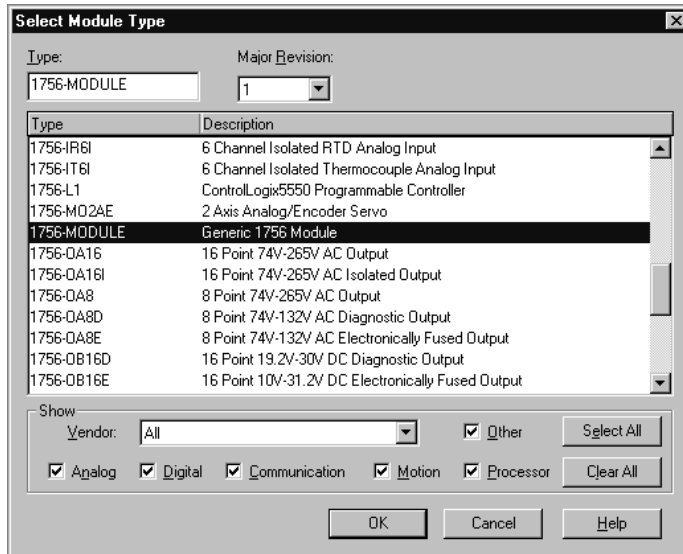
Note: If you are installing this module in an existing application, you can copy the necessary elements from the example ladder logic into your application.

The rest of this chapter describes these steps in more detail.

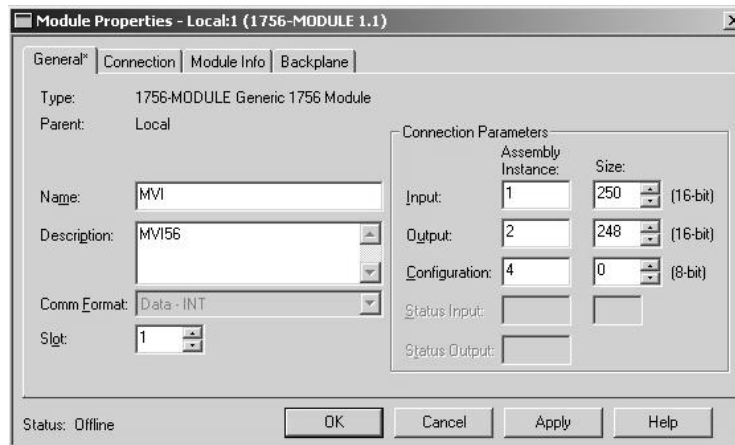
The first step in installing and configuring the module is to define the module to the system. Right-click the mouse button on the I/O Configuration option in the Controller Organization window to display a pop-up menu. Select the New Module... option from the I/O Configuration menu:



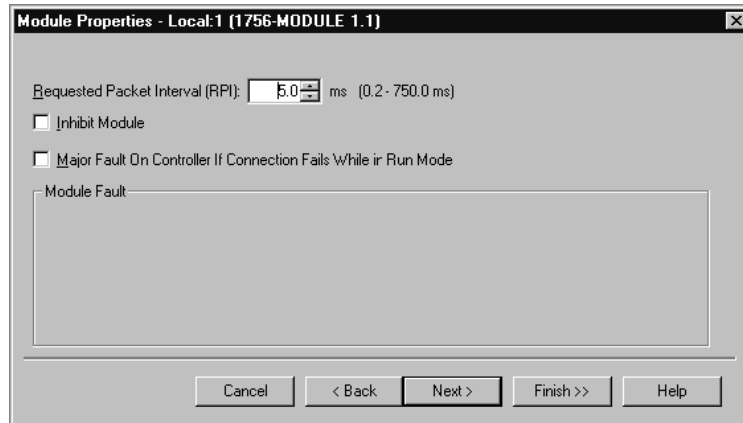
This action opens the following dialog box:



Select the 1756-Module (Generic 1756 Module) from the list and click OK. The following dialog box is displayed:

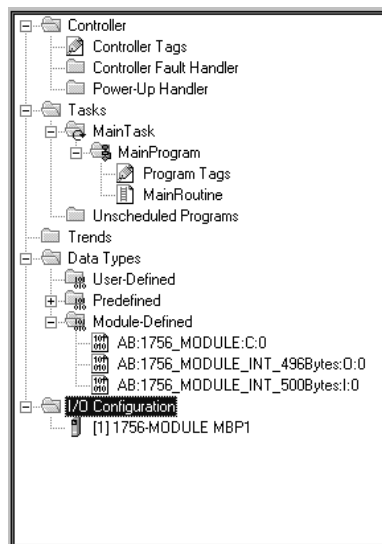


Fill in the dialog boxes as shown adjusting the Name, Description and Slot options for your application. You must select the **Comm Format** as **Data - INT** in the dialog box. Failure to set the **Assembly Instance** and **Size** values correctly will result in a module that will not communicate over the backplane of the ControlLogix rack. Click Next to display the following dialog box.

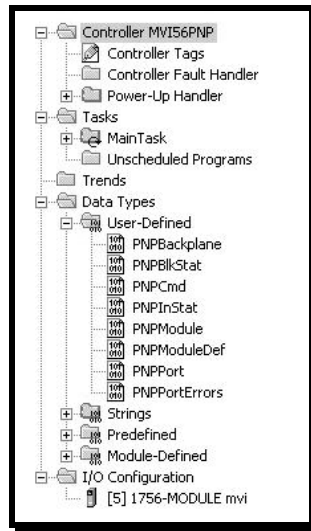


Select the Request Packet Interval value for scanning the I/O on the module. This value represents the minimum frequency the module will handle scheduled events. This value should not be set to less than 1 millisecond. Values between 1 and 10 milliseconds should work with most applications.

After completing the module setup, the Controller Organization window displays the module's presence. The data required for the module is then defined to the application, and objects are allocated in the Controller Tags data area. An example of the Controller Organization window is shown in the following example:



The next step in the module's setup is to define the User Defined Data Types to be used with the module. Copy these data types from the example ladder logic if you are not using the example. They are defined if you are starting from the example ladder logic. The Controller Organization window should display the User Defined Data Types shown in the following example:



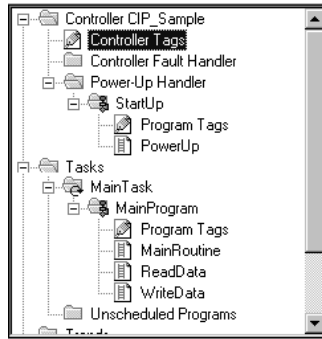
The next step in module setup is to define the data to be used to interface with the module and the ladder logic.

Open the Controller Tags Edit Tags dialog box and enter the values shown in the following example. The MVI56-PNPM module is defined in the example as PNP. You can set the tag name to any valid tag name you desire. If you are using the example ladder logic, this step has already been performed.

Tag Name	Value	Force Mask	Style	Type	Description
WarmBoot	2#0000_0000		Binary	BOOL	
string	'This is a t...	{...}	{...}	STRING	
PNP1	{...}	{...}		PNPModul...	
MJFAULTS	{...}	{...}		Decimal DINT[12]	
MBSscratch	{...}	{...}		Decimal INT[3]	
MBOffset	16			Decimal INT	
MBMsgLen	1			Decimal INT	
MBMsg	{...}	{...}		Decimal SINT[500]	
MBControl	{...}	{...}		CONTROL[5]	
MBCoil	{...}	{...}		Decimal BOOL[160]	
Local5:D	{...}	{...}		AB:1756_...	
Local5:I	{...}	{...}		AB:1756_...	
Local5:C	{...}	{...}		AB:1756_...	
EventCmd	0			Decimal BOOL	
ColdBoot	2#0000_0000		Binary	BOOL	
CmdControl	0			Decimal BOOL	
Zero	{...}	{...}		Decimal INT[7]	
RequestCfg	2#0000_0000		Binary	BOOL	

At this point, take the time to fill in the configuration values in the PNP data table and adjust array sizes. Refer to the Module Data Object section of this document for information on configuring the module.

The last step in the module setup is to add the ladder logic. If you are using the example ladder logic, adjust the ladder to fit your application. If you are not using the ladder example, copy the ladder logic shown in the Controller Organization window below to your application.



The module is now set up and ready to be used with your application.

Download the new application to the processor and place the processor in run mode. If all the configuration parameters are set correctly and the module is attached to a network, the module's Application LED (APP LED) should remain off and the backplane activity LED (BP ACT) should blink very rapidly. Refer to the **Diagnostics and Troubleshooting** section of this manual if you encounter errors. Attach a computer or terminal to Debug/Configuration port on the module and look at the status of the module using the Configuration/Debug Menu in the module.

2.1 Modifying the Module Configuration

In order for the MVI56-PNPM module to function, a minimum amount of configuration data must be transferred to the module. The following table provides an overview of the different types of configuration data that the module requires, depending on the operating modes to be supported.

Module Register Address	Functional Modes Affected	Name	Description
5000 to 5005	Data Transfer	General Module Configuration	This section of the configuration data contains the module configuration data that defines the data transfer between the module and the ControlLogix processor.
5010 to 5023 and 5030 to 5043	Master	Port Configuration	These sections define the characteristics of each of the Phantom serial communication ports on the module. These parameters must be set correctly for proper module operation.
5050 to 5849 and 5860 to 6699	Master	Master Command List	If the module's Master Mode functionality is to be supported on a port, the Master Command List must be set up.

Refer to the Installing and Configuring the Module section for a description of the configuration of the module. The MVI56-PNPM module must be configured at least once when the card is first powered, and any time thereafter when the parameters must be changed.

2.1.1 Power Up

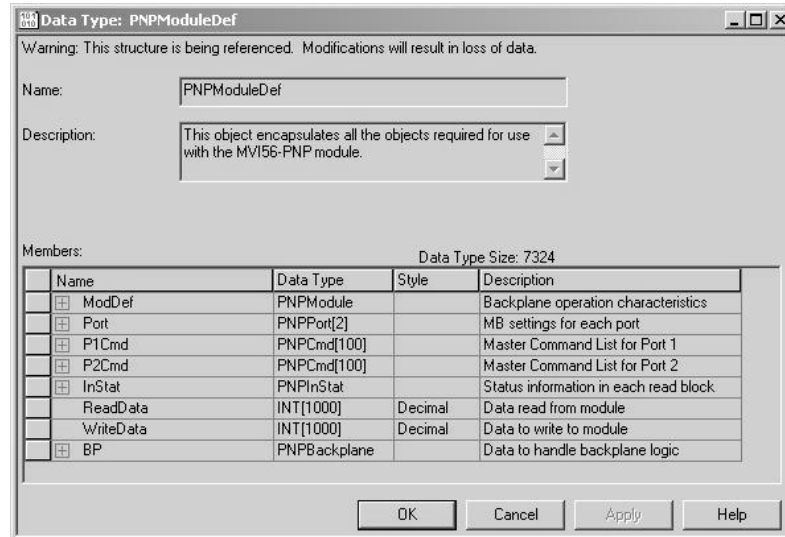
On power up, the module enters into a logical loop waiting to receive configuration data from the processor. Upon receipt, the module will begin execution of the command list if it is present.

2.1.2 Changing Parameters During Operation

A copy of the module's configuration data is mapped in the module's database as displayed in the table above. These values are initialized when the module first receives its configuration from the ControlLogix processor. Any node on the network can change this data. A master port on the module may poll a slave for the data or a slave port could receive the data from a remote master unit. The module will not use this data until it is commanded. Ladder logic can be written to issue a Write Configuration command block (9997) to the module. A remote device can set a value of 9997 at address 6800 in the module to download the configuration to the processor. Alternatively, the configuration/debug port on the module can be used to issue the command directly to the module. All three of these methods will force the module to download the configuration to the ControlLogix processor. Ladder logic must exist in the processor to accept the blocks sent by the module. If everything is configured correctly, the module can receive its configuration from a remote device.

2.1.3 Module Data Object (PNPModuleDef)

All data related to the MVI56-PNPM is stored in a user defined data type. An instance of the data type is required before the module can be used. This is done by declaring a variable of the data type in the Controller Tags Edit Tags dialog box. The structure of the object is displayed in the following figure.



This object contains objects that define the configuration, user data, status and command control data related to the module. Each of these object types is discussed in the following topics of the document.

Configuration Objects

Configuration of the module is performed by filling in the values in the module object defined in the Controller Tags Edit Tags dialog. Each parameter required by the module has a defined location in the object. The following tables and topics describe the parameters set in the dialog box. You can view these tables by opening the data type under the User Defined Data Type option in the Controller Organization window.

Data Transfer Parameters (PNPModule)

Name	Data Type	Description
WriteStartReg	INT	Start reg to transfer from PLC to module
WriteRegCnt	INT	Number of registers to write from PLC
ReadStartReg	INT	Start reg to transfer from module to PLC
ReadRegCnt	INT	Number of registers to transfer from module
BPFail	INT	Determines module operation if BP fails 0=continue,>0=number of retries before comm shutdown
ErrStatPtr	INT	Internal DB start register for status data (-1=Ignore)

This object defines the parameters for data movement between the module and the processor. Values entered determine the ladder logic and data size required in the application. The ReadData and WriteData arrays must be sized to or larger than the count values entered. The ladder logic must process the number of blocks of data to be transferred. The number of blocks is computed as follows:

$$\text{BlockCnt} = \text{INT}(\text{RegCnt}/200) + \text{if}(\text{MOD}(\text{RegCnt},200), 1,0)$$

If the register count is evenly divisible by 200, the number of blocks is easy to compute and the ladder is much simpler to write. If the number is not evenly divisible by 200, special handling of the last block of data must developed, as it must transfer less than 200 words. **It is recommended that the count values always be set to values evenly divisible by 200.**

The BPFail parameter determines if the module should continue communicating on the Phantom network when the backplane transfer operation fails. A value of zero indicates that the module should continue communicating when the backplane is not operational. If the value is greater than zero, the backplane will be retried the entered number of times before a failure will be reported and communication will cease on the ports. When backplane communication is restored, the module will start communicating on the network. For example, if you enter a value of 10 for the parameter, the module will stop all Phantom communications if 10 successive backplane errors are recognized. When a successful transfer is recognized, the module will resume communications on the network.

The ErrStatPtr parameter defines the location in the module's database where the error/status data will be stored. If the value is set to -1, the data will not be stored in the user data area. A value between 0 and 4939 will cause the module's program to store the data at the specified location.

Phantom Port Parameters (PNPPort)

Name	Data Type	Description
Enabled	INT	0=Port Disabled,1=Port Enabled
MinResp	INT	0-65535 mSec minimum time before response to request
CmdCount	INT	Command list count
RespTO	INT	0-65535 mSec response timeout for command
Retry_Count	INT	Retry count for failed request
MinCmdDelay	INT	0-65535 mSec minimum time between each command
ErrorDelayCntr	INT	0-65535 Command cycle count if error

This object defines the parameters for the operation of each of the Phantom ports on the module. Refer to MVI56-PNPM Configuration Data Definition (page 72) for the definition of each parameter.

Phantom Master Commands (PNPCmd)

Name	Data Type	Description
Enable	INT	0=Disable,1=Continuous,2=Event Command
IntAddress	INT	Module's internal address associated with the command
StringAddress	INT	Module's string internal address

Name	Data Type	Description
PollInt	INT	Minimum number of seconds between issuance of command (0-65535 Sec)
Swap	INT	Swap code used with command
NodeAddress	INT	Network Node Address
Func	INT	Function code for the command
DbAddress	INT	Internal database address

This object defines the parameters for each command in the master command list. The **PNPModuleDef** object contains an array of these objects that define the complete list for each port. The definition of each parameter required for each command is given below:

Parameter	Description
Enable	This parameter defines if the command will be executed or will be disregarded. The following values are valid: 0=Disables the command and it will not execute. 1=The command will be considered for execution each scan of the command list and will be controlled by the PollInt parameter. And 2=The command will only execute if the data associated with the command has changed since the command was last issued. This option is only available for write commands.
IntAddress	This parameter specifies the starting internal register address to be associated with the command. Valid entry for this parameter is 0 to 4999 registers or 0 to 65535 bits when addressing bit-level command.
String Address	This parameter specifies the starting internal register address to be associated with the command. Valid entry for this parameter is 0 to 4999 registers or 0 to 65535 bits when addressing bit-level command.
PollInt	This parameter defines the minimum number of seconds to wait between the execution of continuous commands (Enable=1). This poll interval command can be used to lighten the communications load on a busy network. Valid entry for this parameter is 0 to 65535.
Swap	This parameter specifies if the data used in the command must be altered when a function code 3 reads data from a node on the network. Values that can be assigned are as follows: 0=no swapping of data, 1=swap word values, 2=swap word and byte values and 3=swap byte values. This option is used when interfacing the module with ASCII and floating-point data on other devices.
Node Address	This parameter specifies PNPM device ID for Function Code 11.
Func	This parameter specifies the function to be performed by the command. Valid entries are 7, 11, 12, and 13.
DevAddress	This parameter defines the starting address in the device being considered by the command. Values entered in this field are dependent on the node's database definition. Refer to the specific manufacturer's database definition for the device to determine the location of the data to be interfaced.

Status Object (PNPInStat)

This object views the status of the module. The **PNPInStat** object shown below is updated each time a read block is received by the processor. Use this data to monitor the state of the module at a "real-time rate".

Name	Data Type	Description
PassCnt	INT	Program cycle counter
Product	INT[2]	Product Name
Rev	INT[2]	Revision Level Number
OP	INT[2]	Operating Level Number
Run	INT[2]	Run Number
PrtErrs	PNPPortErrors[2]	Port error statistics
CmdReq	INT	Total number of command list requests sent
CmdResp	INT	Total number of command list responses received
CmdErr	INT	Total number of command list errors
Requests	INT	Total number of requests for port
Responses	INT	Total number of responses for port
ErrSent	INT	Total number of errors sent
ErrRec	INT	Total number of errors received
BlkErrs	PNPBlkStat	Block transfer statistics
Read	INT	Total number of read block transfers
Write	INT	Total number of write block transfers
Parse	INT	Total number of blocks parsed
Event	INT	Total number of event blocks received
Cmd	INT	Total number of command blocks received
Err	INT	Total number of block transfer errors
Port1CurErr	INT	Current error/index for Port 1
Port1LErr	INT	Last error/index for Port 1
Port2CurErr	INT	Current error/index for Port 2
Port2LErr	INT	Last error/index for Port 2

Refer to [Status Data](#) for a complete listing of the data stored in this object.

2.1.4 User Data Objects

These objects hold data to be transferred between the processor and the MVI56-PNP module. The user data is the read and write data transferred between the processor and the module as "pages" of data up to 200 words long.

ReadData	INT[600]	Decimal	Data read from module
WriteData	INT[600]	Decimal	Data to write to module

The read data (**ReadData**) is an array set to match the value entered in the **ReadRegCnt** parameter of the **PNPModule** object. For ease of use, this array should be dimensioned as an even increment of 200 words. This data is paged up to 200 words at a time from the module to the processor. The ReadData task is responsible for placing the data received into the proper position in the read data array. Use this data for status and control in the ladder logic of the processor.

The write data (**WriteData**) is an array set to match the value entered in the **WriteRegCnt** parameter of the **PNPModule** object. For ease of use, this array should be dimensioned as even increments of 200 words. This data is paged up to 200 words at a time from the processor to the module. The WriteData task is responsible for placing the write data into the output image for transfer to the module. This data is passed from the processor to the module for status and control information for use in other nodes on the network. If this array is > 600 registers, change the High LIM value in ReadData rung 2 and WriteData rung 10 of the ladder file.

2.1.5 Slave Polling Control and Status

Two arrays are allocated in the module's primary object to hold the polling status of each slave on the master ports. This status data can be used to determine which slaves are currently active on the port, are in communication error or have their polling suspended and disabled. Ladder logic in the processor can be written to monitor and control the status of each slave on a master port. The objects used are displayed in the following diagram:

P1Slaves	INT[32]	Decimal	
P2Slaves	INT[32]	Decimal	

Using special blocks, the processor can request the current data for the slaves. Through the use of other blocks, the processor can enable or disable the polling of selected slaves.

3 Ladder Logic

Ladder logic is required for application of the MVI56-PNPM module. Tasks that must be handled by the ladder logic are module data transfer, special block handling and status data receipt. Additionally, a power-up handler may be needed to handle the initialization of the module's data and to clear any processor fault conditions.

The sample ladder logic, on the ProSoft Solutions CD-ROM, is extensively commented, to provide information on the purpose and function of each rung. For most applications, the sample ladder will work without modification.

4 Diagnostics and Troubleshooting

In This Chapter

- Reading Status Data From the Module 31
- LED Status Indicators 46

The module provides information on diagnostics and troubleshooting in the following forms:

- Status data values are transferred from the module to the processor.
- Data contained in the module can be viewed through the Configuration/Debug port attached to a terminal emulator.
- LED status indicators on the front of the module provide information on the module's status.

4.1 Reading Status Data From the Module

The MVI56-PNPM module returns a 29-word Status Data block that can be used to determine the module's operating status. This data is located in the module's database at registers 6670 to 6698 and at the location specified in the configuration. This data is transferred to the ControlLogix processor continuously with each read block. For a complete listing of the status data object, refer to the **Module Set Up** section.

4.1.1 The Configuration/Debug Menu

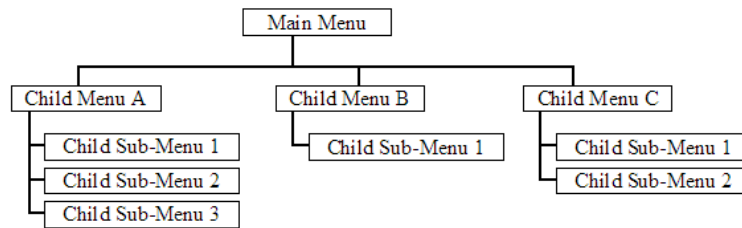
The Configuration and Debug menu for this module is arranged as a tree structure, with the Main Menu at the top of the tree, and one or more sub-menus for each menu command. The first menu you see when you connect to the module is the Main menu.

Because this is a text-based menu system, you enter commands by typing the command letter from your computer keyboard in the terminal application (for example, HyperTerminal). The module does not respond to mouse movements or clicks. The command executes as soon as you press the command letter — you do not need to press **[Enter]**. When you type a command letter, a new screen will be displayed in your terminal application.

Navigation

All of the sub-menus for this module contain commands to redisplay the menu or return to the previous menu. You can always return from a sub-menu to the next higher menu by pressing **[M]** on your keyboard.

The organization of the menu structure is represented in simplified form in the following illustration:



The remainder of this section shows you the menus available for this module, and briefly discusses the commands available to you.

Keystrokes

The keyboard commands on these menus are almost always non-case sensitive. You can enter most commands in lower case or capital letters.

The menus use a few special characters ([**?**], [**-**], [**+**], [**@**]) that must be entered exactly as shown. Some of these characters will require you to use the [**Shift**], [**Ctrl**] or [**Alt**] keys to enter them correctly. For example, on US English keyboards, enter the [**?**] command as [**Shift**]/.

Also, take care to distinguish capital letter [**I**] from lower case letter [**i**] (L) and number [**1**]; likewise for capital letter [**O**] and number [**0**]. Although these characters look nearly the same on the screen, they perform different actions on the module.

4.1.2 Required Hardware

You can connect directly from your computer's serial port to the serial port on the module to view configuration information and perform maintenance.

ProSoft Technology recommends the following minimum hardware to connect your computer to the module:

- 80486 based processor (Pentium preferred)
- 1 megabyte of memory
- At least one serial communications port available
- A null modem serial cable.

4.1.3 Required Software

In order to send and receive data over the serial port (COM port) on your computer to the module, you must use a communication program (terminal emulator).

A simple communication program called HyperTerminal is pre-installed with recent versions of Microsoft Windows operating systems. If you are connecting from a machine running DOS, you must obtain and install a compatible communication program. The following table lists communication programs that have been tested by ProSoft Technology.

DOS	ProComm, as well as several other terminal emulation programs
Windows 3.1	Terminal
Windows 95/98	HyperTerminal
Windows NT/2000/XP	HyperTerminal

4.1.4 Using the Configuration/Debug Port

To connect to the module's Configuration/Debug port:

- 1 Connect your computer to the module's port using a null modem cable.
- 2 Start the communication program on your computer and configure the communication parameters with the following settings:

Baud Rate	57,600
Parity	None
Data Bits	8
Stop Bits	1
Software Handshaking	None

- 3 Open the connection. When you are connected, press the [?] key on your keyboard. If the system is set up properly, you will see a menu with the module name followed by a list of letters and the commands associated with them.

If there is no response from the module, follow these steps:

- 1 Verify that the null modem cable is connected properly between your computer's serial port and the module. A regular serial cable will not work.
- 2 Verify that RSLinx is not controlling the COM port. Refer to [Disabling the RSLinx Driver for the Com Port on the PC](#) (page 65).
- 3 Verify that your communication software is using the correct settings for baud rate, parity and handshaking.
- 4 On computers with more than one serial port, verify that your communication program is connected to the same port that is connected to the module.

If you are still not able to establish a connection, you can contact ProSoft Technology Technical Support for further assistance.

4.1.5 Main Menu

When you first connect to the module from your computer, your terminal screen will be blank. To activate the main menu, press the [?] key on your computer's keyboard. If the module is connected properly, the following menu will appear on your terminal screen:

```
PHANTOM METAL DETECTOR COMMUNICATION MODULE (MVI56-PNPM) MENU
?=Display Menu
A=Data Analyzer
B=Client Configuration
C=Module Configuration
D=Phantom Database Uiew
PNPM Command Errors : E=Port 1 F=Port 2
PNPM Command List : I=Port 1 J=Port 2
Slave Status List : O=Port 1 P=Port 2
U=Version Information
W=Warm Boot Module
Y=Transfer Module Cfg to Processor
Communication Status : 1=Port 1 2=Port 2
Port Configuration : 6=Port 1 7=Port 2
Esc=Exit Program
```

Caution: Some of the commands available to you from this menu are designed for advanced debugging and system testing only, and can cause the module to stop communicating with the processor or with other devices, resulting in potential data loss or other failures. Only use these commands if you are specifically directed to do so by ProSoft Technology Technical Support staff. Some of these command keys are not listed on the menu, but are active nevertheless. Please be careful when pressing keys so that you do not accidentally execute an unwanted command.

Opening the Data Analyzer Menu

Press **[A]** to open the Data Analyzer Menu. Use this command to view all bytes of data transferred on each port. Both the transmitted and received data bytes are displayed. Refer to Data Analyzer for more information about this menu.

Important: When in analyzer mode, program execution will slow down. Only use this tool during a troubleshooting session. Before disconnecting from the Config/Debug port, please press **[S]** to stop the data analyzer, and then press **[M]** to return to the main menu. This action will allow the module to resume its normal high speed operating mode.

Viewing Block Transfer Statistics

Press **[B]** from the Main Menu to view the Block Transfer Statistics screen.

Use this command to display the configuration and statistics of the backplane data transfer operations between the module and the processor. The information on this screen can help determine if there are communication problems between the processor and the module.

Tip: To determine the number of blocks transferred each second, mark the numbers displayed at a specific time. Then some seconds later activate the command again. Subtract the previous numbers from the current numbers and divide by the quantity of seconds passed between the two readings.

Viewing Module Configuration

Press **[C]** to view the Module Configuration screen.

Use this command to display the current configuration and statistics for the module.

Opening the Database Menu

Press **[D]** to open the Database View menu. Use this menu command to view the current contents of the module's database.

Opening the Command Error List Menu

Press **[E]** (port 1) or **[F]** (port 2) to open the Command Error List. This list consists of multiple pages of command list error/status data. Press **[?]** to view a list of commands available on this menu.

Opening the Command List Menu

Press **[I]** (port 1) or **[J]** (port 2) to open the Command List menu. Use this command to view the configured command list for the module.

Viewing the Slave Status List (Port 1 and 2)

Press **[O]** (port 1) or **[P]** (port 2) to view the 256 slave status values associated with the ports. The slave status values are defined as follows:

- 0 = slave is not used,
- 1 = slave being actively polled,
- 2 = slave suspended

Viewing Version Information

Press **[V]** to view Version information for the module.

Use this command to view the current version of the software for the module, as well as other important values. You may be asked to provide this information when calling for technical support on the product.

Values at the bottom of the display are important in determining module operation. The Program Scan Counter value is incremented each time a module's program cycle is complete.

Tip: Repeat this command at one-second intervals to determine the frequency of program execution.

Warm Booting the Module

Caution: Some of the commands available to you from this menu are designed for advanced debugging and system testing only, and can cause the module to stop communicating with the processor or with other devices, resulting in potential data loss or other failures. Only use these commands if you are specifically directed to do so by ProSoft Technology Technical Support staff. Some of these command keys are not listed on the menu, but are active nevertheless. Please be careful when pressing keys so that you do not accidentally execute an unwanted command.

Press **[W]** from the Main Menu to warm boot (restart) the module. This command will cause the program to exit and reload, refreshing configuration parameters that must be set on program initialization. Only use this command if you must force the module to re-boot.

Transferring Module Configuration to the Processor

Press **[Y]** to transfer the module's configuration data to the processor. Ladder logic is required in the processor to receive and implement the updated configuration. You will be prompted to confirm the transfer.

If the operation is not successful, an error code will be returned.

Code	Description
0	Transfer successful
-1	Error transferring module configuration data (block -9000)
-2	Error transferring device definition data (blocks -9100 to -9103)
-3	Error transferring master command list data (blocks -6000 to -6007)

After successful data transfer, the module will perform a warm-boot operation to read in the new data.

Viewing Port Communication Status

Press **[1]** or **[2]** from the Main Menu to view the port communication status for Ports 1 and 2.

Use this command to view communication status and statistics for the selected port. This information can be informative when troubleshooting communication problems.

Viewing Port Configuration

Press **[6]** or **[7]** from the Main Menu to view configuration information for ports 1 and 2.

Use this command to display detailed configuration information for the selected port.

Displaying Timing Marks in the Data Analyzer

You can display timing marks for a variety of intervals in the data analyzer screen. These timing marks can help you determine communication-timing characteristics.

Key	Interval
[5]	1 milliseconds ticks
[6]	5 milliseconds ticks
[7]	10 milliseconds ticks
[8]	50 milliseconds ticks
[9]	100 milliseconds ticks
[0]	Turn off timing marks

Removing Timing Marks in the Data Analyzer

Press **[0]** to turn off timing marks in the Data Analyzer screen.

Viewing Data in Hexadecimal Format

Press **[H]** to display the data on the current page in hexadecimal format.

Viewing Data in ASCII (Text) Format

Press **[A]** to display the data on the current page in ASCII format. This is useful for regions of the database that contain ASCII data.

Starting the Data Analyzer

Press **[B]** to start the data analyzer. After the key is pressed, all data transmitted and received on the currently selected port will be displayed. An example display is shown below:

```

<R+><01><03><00><00><00><0A><C5><CD><R->_TT_[01][03][14][00][00][00][00][00][00]
_TT_[00][00][00][00][00][00][00][00][00][00][00][00][A3][67]_TT_<R+><01>
<03><00><00><00><0A><C5><CD><R->_TT_[01][03][14][00][00][00][00][00][00][00]
[00][00][00][00][00][00][00]_TT_[00][00][00][00][00][A3][67]_TT_<R+><01><03><00>
<00><00><0A><C5><CD><R->_TT_[01][03][14][00][00][00][00][00][00][00][00][00]
[00][00][00][00]_TT_[00][00][00][00][00][A3][67]_TT_<R+><01><03><00><00><00>
<0A><C5><CD><R->_TT_[01][03][14][00][00][00][00][00][00][00][00][00]
[00][00][00][00][00][00][00][00][A3][67]_TT_<R+><01><03><00><00><00><0A><C5>
<CD><R->_TT_[01][03][14][00][00][00][00][00][00][00][00][00][00][00]
[00][00][00][00][00][00][00][00][A3][67]_TT_<R+><01><03><00><00><00><0A><C5><CD><R->
_TT_[01][03][14][00][00][00][00][00][00][00][00][00][00][00][00]
[00][00][00][00][00][A3][67]_TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT_[01]
[00][00][00][00][00][00][00][00][00][00][00][00][00][00][00]_TT_[00][00]
[00][00][00][A3][67]_TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT_[01][03][14]
[00][00][00][00][00][00][00][00][00][00][00][00][00][00][00]_TT_[00][00]
[00][A3][67]_TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT_[01][03][14][00][00]
[00][00][00]_TT_[00][00][00][00][00][00][00][00][00][00][00][00][00][00][A3]
[67]_TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT_[01][03][14][00][00][00][00]
[00][00]_TT_[00][00][00][00][00][00][00][00][00][00][00][00][00][A3][67]_TT_
    
```

The Data Analyzer displays the following special characters:

Character	Definition
[]	Data enclosed in these characters represent data received on the port.
< >	Data enclosed in these characters represent data transmitted on the port.
<R+>	These characters are inserted when the RTS line is driven high on the port.
<R->	These characters are inserted when the RTS line is dropped low on the port.
<CS>	These characters are displayed when the CTS line is recognized high.
TT	These characters are displayed when the timing mark interval has been reached. This parameter is user defined.

Stopping the Data Analyzer

Press **[S]** to stop the data analyzer. Use this option to freeze the display so the data can be analyzed. To restart the analyzer, press **[B]**.

Important: When in analyzer mode, program execution will slow down. Only use this tool during a troubleshooting session. Before disconnecting from the Config/Debug port, please press **[S]** to stop the data analyzer, and then press **[M]** to return to the main menu. This action will allow the module to resume its normal high speed operating mode.

Returning to the Main Menu

Press **[M]** to return to the Main Menu.

4.1.7 Data Analyzer Tips

From the main menu, press **[A]** for the "Data Analyzer". You should see the following text appear on the screen:

```
Data Analyzer Mode Selected
```

After the "Data Analyzer" mode has been selected, press **[?]** to view the Data Analyzer menu. You will see the following menu:

```
DATA ANALYZER VIEW MENU
?=Display Menu
1=Select Port 1
2=Select Port 2
5=1 mSec Ticks
6=5 mSec Ticks
7=10 mSec Ticks
8=50 mSec Ticks
9=100 mSec Ticks
0=No mSec Ticks
H=Hex Format
A=ASCII Format
B=Start
S=Stop
M=Main Menu

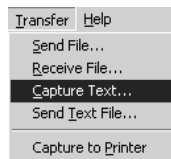
Port = 1, Format=HEX, Tick=10
```

From this menu, you can select the "Port", the "format", and the "ticks" that you can display the data in.

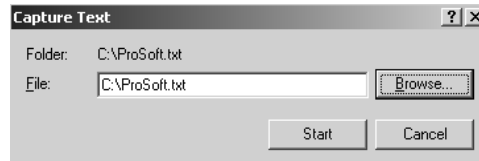
For most applications, HEX is the best format to view the data, and this does include ASCII based messages (because some characters will not display on HyperTerminal and by capturing the data in HEX, we can figure out what the corresponding ASCII characters are supposed to be).

The Tick value is a timing mark. The module will print a `_TT` for every xx milliseconds of no data on the line. Usually 10milliseconds is the best value to start with.

After you have selected the Port, Format, and Tick, we are now ready to start a capture of this data. The easiest way to do so is to go up to the top of you HyperTerminal window, and do a **Transfer / Capture Text** as shown below:



After selecting the above option, the following window will appear:



Next name the file, and select a directory to store the file in. In this example, we are creating a file ProSoft.txt and storing this file on our root C: drive. After you have done this, press the button.

Now you have everything that shows up on the HyperTerminal screen being logged to a file called ProSoft.txt. This is the file that you will then be able to email to ProSoft Technical Support to assist with issues on the communications network.

To begin the display of the communications data, you will then want to press 'B' to tell the module to start printing the communications traffic out on the debug port of the module. After you have pressed 'B', you should see something like the following:

```
[03][00][04][00][05][00][06][00][07][00][08][00][09][FB][B7]_TT__TT_<R+><01><02>
<00><00><00><0A><F8><0D><R->_TT__TT__TT_[01][02][02][00][00][B9][B8]_TT__TT_<R+>
<01><03><00><00><00><0A><C5><CD><R->_TT__TT_[01][03][14][00][00][00][01][00]_TT_
[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][CD][51]_TT__TT_<R+>
<01><01><00><00><00><0A><3C><72><R->_TT__TT__[01][01][14][00][00][01][00][02]_TT_
[00][03][00][04][00][05][00][06][00][07][00][08][00][09][00][B7][52]_TT__TT_<R+>
<01><04><00><00><00><0A><70><0D><R->_TT__TT__[01][04][14][00][00][00][01][00]_TT_
[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][FB][B7]_TT__TT_<R+>
<01><02><00><00><00><0A><F8><0D><R->_TT__TT__[01][02][02][00][00][B9][B8]_TT_
TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT__TT__[01][03][14][00][00][00][01]
[00]_TT_[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][CD][51]_TT_
TT_<R+><01><01><00><00><00><0A><3C><72><R->_TT__TT__[01][01][14][00][00][01]
[00][02]_TT_[00][03][00][04][00][05][00][06][00][07][00][08][00][09][00][B7][52]
TT__TT_<R+><01><04><00><00><00><0A><70><0D><R->_TT__TT__[01][04][14][00][00][00]
[01][00]_TT_[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][FB][B7]
TT__TT_<R+><01><02><00><00><00><0A><F8><0D><R->_TT__TT__[01][02][02][00][00][B9]
[B8]_TT__TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT__TT__[01][03][14][00][00]
[00][01][00]_TT_[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][CD]
[51]_TT__TT_<R+><01><01><00><00><00><0A><3C><72><R->_TT__TT__[01][01][14][00]
[00][01][00][02]_TT__[00][03][00][04][00][05][00][06][00][07][00][08][00][09][00]
[B7][52]_TT__TT_<R+><01><04><00><00><00><0A><70><0D><R->_TT__TT__[01][04][14][00]
[00][00][01][00]_TT_[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09]
[FB][B7]_TT__TT_<R+><01><02><00><00><00><0A><F8><0D><R->_TT__TT__[01][02][02]
[00][00][B9][B8]_TT__TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT__TT__
```

The <R+> means that the module is transitioning the communications line to a transmit state.

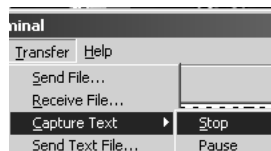
All characters shown in <> brackets are characters being sent out by the module.

The <R-> shows when the module is done transmitting data, and is now ready to receive information back.

And finally, all characters shown in the [] brackets is information being received from another device by the module.

After taking a minute or two of traffic capture, you will now want to stop the "Data Analyzer". To do so, press the 'S' key, and you will then see the scrolling of the data stop.

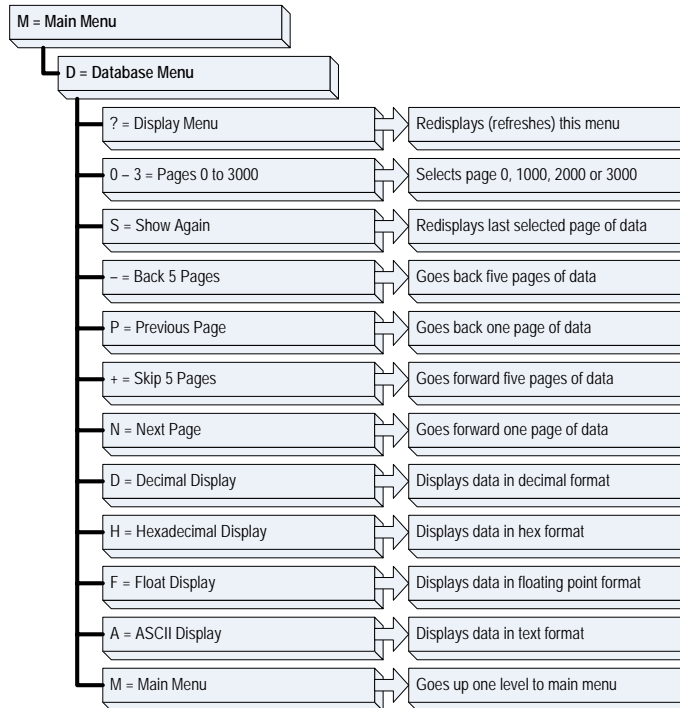
When you have captured the data you want to save, open the Transfer menu and choose Capture Text. On the secondary menu, choose Stop.



You have now captured, and saved the file to your PC. This file can now be used in analyzing the communications traffic on the line, and assist in determining communication errors.

4.1.8 Database View Menu

Press **[D]** from the Main Menu to open the Database View menu. Use this menu command to view the current contents of the module's database. Press **[?]** to view a list of commands available on this menu.



Viewing Register Pages

To view sets of register pages, use the keys described below:

Command	Description
[0]	Display registers 0 to 99
[1]	Display registers 1000 to 1099
[2]	Display registers 2000 to 2099

And so on. The total number of register pages available to view depends on your module's configuration.

Displaying the Current Page of Registers Again

```

DATABASE DISPLAY 0 TO 99 <DECIMAL>
100  101  102  4   5   6   7   8   9   10
 11  12  13  0   0   0   0   0   0   0
 0   0   0   0   0   0   0   0   0   0
 0   0   0   0   0   0   0   0   0   0
 0   0   0   0   0   0   0   0   0   0
 0   0   0   0   0   0   0   0   0   0
 0   0   0   0   0   0   0   0   0   0
 0   0   0   0   0   0   0   0   0   0
 0   0   0   0   0   0   0   0   0   0
  
```

This screen displays the current page of 100 registers in the database.

Moving Back Through 5 Pages of Registers

Press **[-]** from the Database View menu to skip back to the previous 500 registers of data.

Viewing the Previous 100 Registers of Data

Press **[P]** from the Database View menu to display the previous 100 registers of data.

Skipping 500 Registers of Data

Hold down **[Shift]** and press **[=]** to skip forward to the next 500 registers of data.

Viewing the Next 100 Registers of Data

Press **[N]** from the Database View menu to select and display the next 100 registers of data.

Viewing Data in Decimal Format

Press **[D]** to display the data on the current page in decimal format.

Viewing Data in Hexadecimal Format

Press **[H]** to display the data on the current page in hexadecimal format.

Viewing Data in Floating Point Format

Press **[F]** from the Database View menu. Use this command to display the data on the current page in floating point format. The program assumes that the values are aligned on even register boundaries. If floating-point values are not aligned as such, they are not displayed properly.

Viewing Data in ASCII (Text) Format

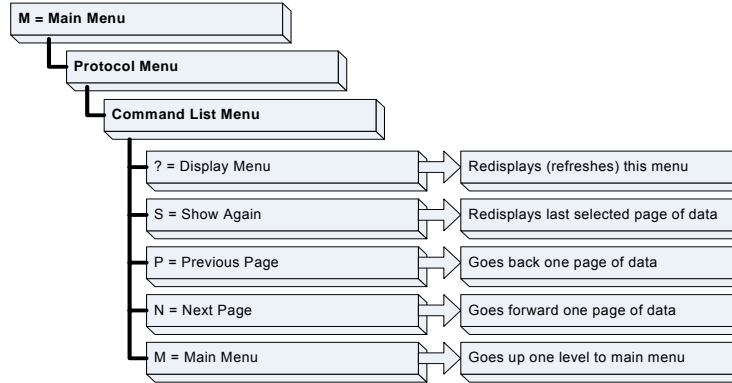
Press **[A]** to display the data on the current page in ASCII format. This is useful for regions of the database that contain ASCII data.

Returning to the Main Menu

Press **[M]** to return to the Main Menu.

4.1.9 Master Command Error List Menu

Use this menu to view the command error list for the module. Press **[?]** to view a list of commands available on this menu.



Redisplaying the Current Page

Press **[S]** to display the current page of data.

Viewing the Previous 20 Commands

Press **[-]** to display data for the previous 20 commands.

Viewing the Previous Page of Commands

Press **[P]** to display the previous page of commands.

Viewing the Next 20 Commands

Press **[+]** to display data for the next 20 commands.

Viewing the Next Page of Commands

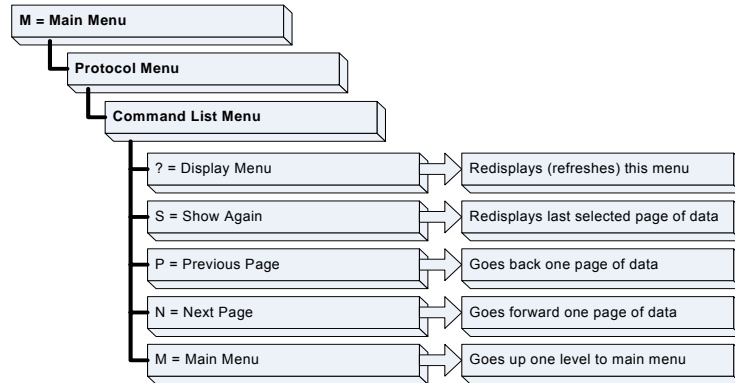
Press **[N]** to display the next page of commands.

Returning to the Main Menu

Press **[M]** to return to the Main Menu.

4.1.10 Master Command List Menu

Use this menu to view the command list for the module. Press **[?]** to view a list of commands available on this menu.



Redisplaying the Current Page

Press **[S]** to display the current page of data.

Viewing the Previous 50 Commands

Press **[-]** to view the previous 50 commands.

Viewing the Previous Page of Commands

Press **[P]** to display the previous page of commands.

Viewing the Next 50 Commands

Press **[+]** to view the next 50 commands from the master command list.

Viewing the Next Page of Commands

Press **[N]** to display the next page of commands.

Returning to the Main Menu

Press **[M]** to return to the Main Menu.

4.2 LED Status Indicators

The LEDs indicate the module's operating status as follows:

ProSoft Module	Color	Status	Indication
CFG	Green	On	Data is being transferred between the module and a remote terminal using the Configuration/Debug port.
		Off	No data is being transferred on the Configuration/Debug port.
P1	Green	On	Data is being transferred between the module and the network on Port 2.
		Off	No data is being transferred on the port.
P2	Green	On	Data is being transferred between the module and the network on Port 3.
		Off	No data is being transferred on the port.
APP	Amber	On	The MVI56-PNPM is working normally.
		Off	The MVI56-PNPM module program has recognized a communication error on one of its ports.
BP ACT	Amber	On	The LED is on when the module is performing a write operation on the backplane.
		Off	The LED is off when the module is performing a read operation on the backplane. Under normal operation, the LED should blink rapidly on and off.
OK	Red/ Green	Off	The card is not receiving any power and is not securely plugged into the rack.
		Green	The module is operating normally.
		Red	The program has detected an error or is being configured. If the LED remains red for over 10 seconds, the program has probably halted. Remove the card from the rack and re-insert the card to restart the module's program.
BAT	Red	Off	The battery voltage is OK and functioning.
		On	The battery voltage is low or battery is not present. Allow battery to charge by keeping module plugged into rack for 24 hours. If BAT LED still does not go off, contact ProSoft Technology, as this is not a user serviceable item.

During module configuration, the OK will be red and the APP and BP ACT LEDs will be on. If the LEDs are latched in this mode for a long period of time, look at the configuration error words in the configuration request block. The structure of the block is shown in the following table:

Offset	Description	Length
0	Reserved	1
1	9000	1
2	Module Configuration Errors	1
3	Port 1 Configuration Errors	1
4	Port 2 Configuration Errors	1
5 to 248	Spare	244
249	-2 or -3	1

The bits in each configuration word are shown in the following table. The module configuration error word has the following definition:

Bit	Description	Value
0	Read block start value is greater than the database size.	0x0001
1	Read block start value is less than zero.	0x0002
2	Read block count value is less than zero.	0x0004
3	Read block count + start is greater than the database size.	0x0008
4	Write block start value is greater than the database size.	0x0010
5	Write block start value is less than zero.	0x0020
6	Write block count value is less than zero.	0x0040
7	Write block count + start is greater than the database size.	0x0080
8	Spare	0x0100
9	Spare	0x0200
10	Spare	0x0400
11	Spare	0x0800
12	Command Count parameter is not valid.	0x1000
13		0x2000
14		0x4000
15		0x8000

Correct any invalid data in the configuration for proper module operation. When the configuration contains a valid parameter set, all the bits in the configuration words will be clear. This does not indicate that the configuration is valid for the user application. Make sure each parameter is set correctly for the specific application.

If the APP, BP ACT and OK LEDs blink at a rate of every one-second, this indicates a serious problem with the module. Call Prosoft Technology support to arrange for repairs.

4.2.1 Clearing a Fault Condition

Typically, if the OK LED on the front of the module turns red for more than ten seconds, a hardware problem has been detected in the module, or the program has exited.

To clear the condition, follow these steps:

- 1 Turn off power to the rack
- 2 Remove the card from the rack
- 3 Verify that all jumpers are set correctly
- 4 If the module requires a Compact Flash card, verify that the card is installed correctly
- 5 Re-insert the card in the rack and turn the power back on
- 6 Verify the configuration data being transferred to the module from the ControlLogix processor.

If the module's OK LED does not turn green, verify that the module is inserted completely into the rack. If this does not cure the problem, contact ProSoft Technology Support.

4.2.2 Troubleshooting

Use the following troubleshooting steps if you encounter problems when the module is powered up. If these steps do not resolve your problem, please contact ProSoft Technology Technical Support.

Processor Errors

Problem Description	Steps to take
Processor Fault	Verify that the module is plugged into the slot that has been configured for the module. Verify that the slot in the rack configuration has been set up correctly in the ladder logic.
Processor I/O LED flashes	This indicates a problem with backplane communications. Verify that all modules in the rack are configured in the ladder logic.

Module Errors

Problem Description	Steps to take
BP ACT LED remains off or blinks slowly	This indicates that backplane transfer operations are failing. Connect to the module's Configuration/Debug port to check this. To establish backplane communications, verify the following items: <ul style="list-style-type: none"> ▪ The processor is in Run mode. ▪ The backplane driver is loaded in the module. ▪ The module is configured for read and write block data transfer. ▪ The ladder logic handles all read and write block situations. ▪ The module is configured in the processor.
OK LED remains red	The program has halted or a critical error has occurred. Connect to the Configuration/Debug port to see if the module is running. If the program has halted, turn off power to the rack, remove the card from the rack and re-insert the card in the rack, and then restore power to the rack.

5 Reference

In This Chapter

- Product Specifications..... 49
- Functional Overview..... 51
- Cable Connections..... 64
- MVI56-PNPM Database Definition 70
- MVI56-PNPM Status Data Definition..... 71
- MVI56-PNPM Configuration Data Definition 72
- Key Press Representation (Function 7) 77

5.1 Product Specifications

The MVI56 Phantom Network Protocol Master Communication Module allows ControlLogix I/O compatible processors to easily interface with Phantom metal detector devices.

5.1.1 Features and Benefits

The MVI56-PNPM module acts as a gateway between the Phantom network and the ControlLogix processor. The data transfer from the ControlLogix processor is asynchronous from the actions on the Phantom network. A 5000-word register space in the module is used to exchange data between the processor and the Phantom network.

5.1.2 General Specifications

- Single Slot - 1756 backplane compatible
- Local or remote rack
- The module is recognized as an Input/Output module and has access to processor memory for data transfer between processor and module
- Ladder Logic is used for data transfer between module and processor.
- Configuration data obtained through user-defined ladder. Sample ladder file included

5.1.3 Functional Specifications

A port configured as a virtual Phantom master device on the MVI56-PNPM module will actively issue Phantom commands to other nodes on the Phantom network. One hundred commands are supported on each port. Additionally, the master ports have an optimized polling characteristic that will poll slaves with communication problems less frequently. The ControlLogix processor can be programmed to control the activity on the port by actively selecting commands from the command list to execute or issuing commands directly from the ladder logic. The ControlLogix processor also has the ability to control the scanning of slaves on the port.

5.1.4 Hardware Specifications

Specification	Description
Backplane Current Load	800 mA @ 5 V DC; 3mA @ 24V DC
Operating Temperature	0 to 60°C (32 to 140°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Shock	30g Operational 50g non-operational Vibration: 5 g from 10 to 150 Hz
Relative Humidity	5% to 95% (non-condensing)
LED Indicators	Module Status Backplane Transfer Status Application Status Serial Activity
Debug/Configuration port (CFG)	
CFG Port (CFG)	RJ45 (DB-9M with supplied cable) RS-232 only
Application ports (PRT1 & PRT2)	
Full hardware handshaking control, providing radio, modem and multi-drop support	
Software configurable communication parameters	Baud rate: 110 to 115,200 baud, depending on protocol RS-232 and 422 Parity: none, odd or even Data bits: 5, 6, 7, or 8 Stop bits: 1 or 2 RTS on/off delay: 0 to 65535 milliseconds
App Ports (P1,P2) (Serial modules)	RJ45 (DB-9M with supplied cable) RS-232 handshaking configurable 500V Optical isolation from backplane
Shipped with Unit	RJ45 to DB-9M cables for each port 6-foot RS-232 configuration cable

5.2 Functional Overview

This section provides an overview of how the MVI56-PNPM module transfers data using the PNPM protocol. You should understand the important concepts in this chapter before you begin installing and configuring the module.

5.2.1 General Concepts

The following topics describe several concepts that are important for understanding the operation of the MVI56-PNPM module.

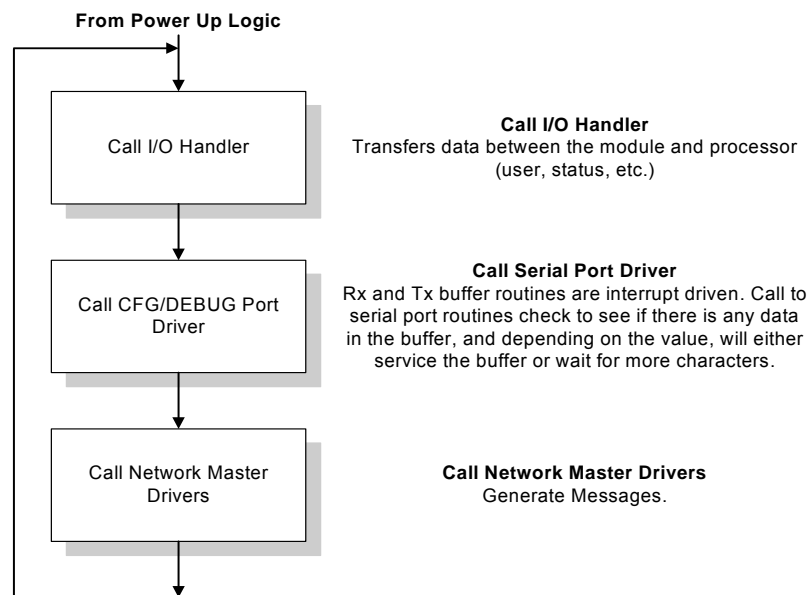
On power up the module begins performing the following logical functions:

- 1 Initialize hardware components
 - Initialize ControlLogix backplane driver
 - Test and Clear all RAM
 - Initialize the serial communication ports
- 2 Wait for Module Configuration from ControlLogix processor
- 3 Initialize Module Register space
- 4 Enable Master Driver on selected ports

After the module has received the Module Configuration Block from the processor, the module will begin communicating with other nodes on the network, depending on the configuration.

5.2.2 Main Logic Loop

Upon completing the power up configuration process, the module enters an infinite loop that performs the following functions:



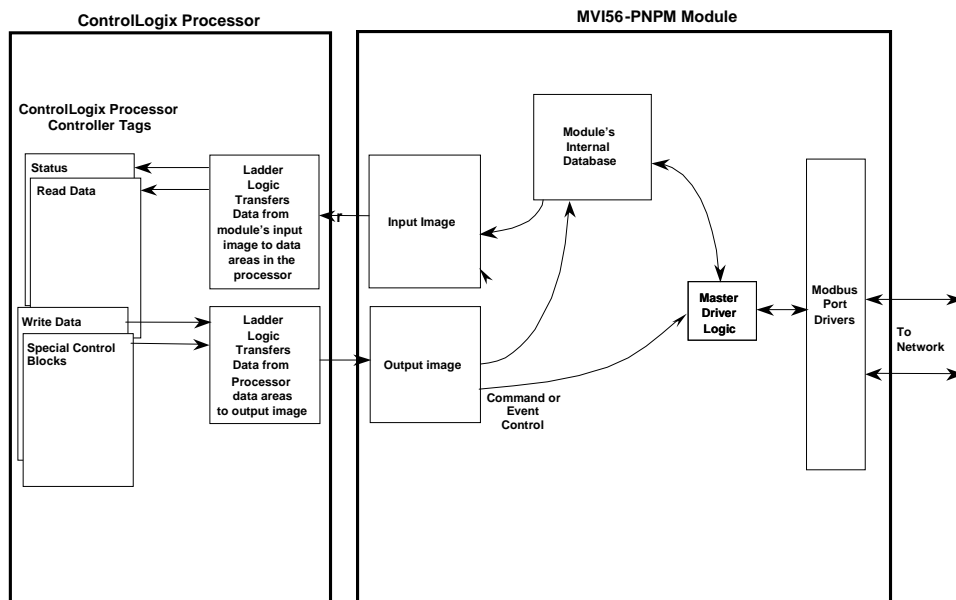
5.2.3 Backplane Data Transfer

The MVI56-PNPM module communicates directly over the ControlLogix backplane. Data is paged between the module and the ControlLogix processor across the backplane using the module's input and output images. The update frequency of the images is determined by the scheduled scan rate defined by the user for the module and the communication load on the module. Typical updates are in the range of 2 to 10 milliseconds.

This bi-directional transference of data is accomplished by the module filling in data in the module's input image to send to the processor. Data in the input image is placed in the Controller Tags in the processor by the ladder logic. The input image for the module is set to 250 words. This large data area permits fast throughput of data between the module and the processor.

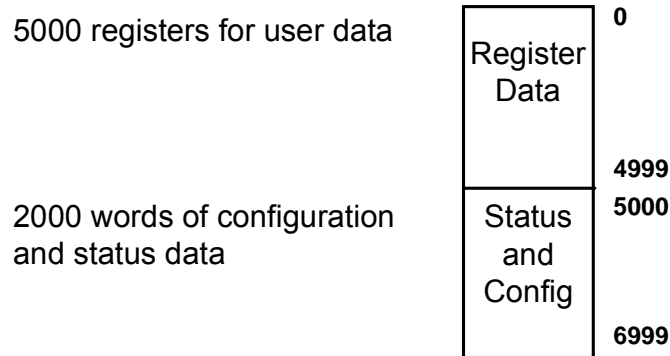
The processor inserts data to the module's output image to transfer to the module. The module's program extracts the data and places it in the module's internal database. The output image for the module is set to 248 words. This large data area permits fast throughput of data from the processor to the module.

The following illustration shows the data transfer method used to move data between the ControlLogix processor, the MVI56-PNPM module and the Phantom Network.



As shown in the diagram above, all data transferred between the module and the processor over the backplane is through the input and output images. Ladder logic must be written in the ControlLogix processor to interface the input and output image data with data defined in the Controller Tags. All data used by the module is stored in its internal database. This database is defined as a virtual data table with addresses from 0 to 6999. The following illustration shows the layout of the database:

Module's Internal Database Structure



Data contained in this database is paged through the input and output images by coordination of the ControlLogix ladder logic and the MVI56-PNPM module's program. Up to 248 words of data can be transferred from the module to the processor at a time. Up to 247 words of data can be transferred from the processor to the module. Each image has a defined structure depending on the data content and the function of the data transfer as defined below.

5.2.4 Normal Data Transfer

Normal data transfer includes the paging of the user data found in the module's internal database in registers 0 to 4999 and the status data. These data are transferred through read (input image) and write (output image) blocks. Refer to the **Module Set Up** section for a description of the data objects used with the blocks and the ladder logic required. The structure and function of each block is discussed below.

Read Block

These blocks of data transfer information from the module to the ControlLogix processor. The structure of the input image used to transfer this data is shown in the following table:

Offset	Description	Length
0	Reserved	1
1	Write Block ID	1
2 to 201	Read Data	200

Offset	Description	Length
202	Program Scan Counter	1
203 to 204	Product Code	2
205 to 206	Product Version	2
207 to 208	Operating System	2
209 to 210	Run Number	2
211 to 217	Port 1 Error Status	7
218 to 224	Port 2 Error Status	7
225 to 230	Data Transfer Status	6
231	Port 1 Current Error/Index	1
232	Port 1 Last Error/Index	1
233	Port 2 Current Error/Index	1
234	Port 2 Last Error/Index	1
235 to 248	Spare	14
249	Read Block ID	1

The Read Block ID is an index value used to determine the location of where the data will be placed in the ControlLogix processor controller tag array of module read data. Each transfer can move up to 200 words (block offsets 2 to 201) of data. In addition to moving user data, the block also contains status data for the module. This last set of data is transferred with each new block of data and is used for high-speed data movement.

The Write Block ID associated with the block requests data from the ControlLogix processor. Under normal, program operation, the module sequentially sends read blocks and requests write blocks. For example, if three read and two write blocks are used with the application, the sequence will be as follows:

R1W1 → R2W2 → R3W1 → R1W2 → R2W1 → R3W2 → R1W1 →

This sequence will continue until interrupted by other write block numbers sent by the controller or by a command request from a node on the network or operator control through the module's Configuration/Debug port.

Write Block

These blocks of data transfer information from the ControlLogix processor to the module. The structure of the output image used to transfer this data is shown in the following table:

Offset	Description	Length
0	Write Block ID	1
1 to 200	Write Data	200
201 to 247	Spare	47

The Write Block ID is an index value used to determine the location in the module's database where the data will be placed. Each transfer can move up to 200 words (block offsets 1 to 200) of data.

5.2.5 Configuration Data Transfer

When the module performs a restart operation, it will request configuration information from the ControlLogix processor. This data is transferred to the module in specially formatted write blocks (output image). The module will poll for each block by setting the required write block number in a read block (input image). Refer to the **Module Set Up** section for a description of the data objects used with the blocks and the ladder logic required. The format of the blocks for configuration is given in the following topics.

Module Configuration Data

This block sends general configuration information from the processor to the module. The data is transferred in a block with an identification code of 9000. The structure of the block is displayed in the following table:

Offset	Description	Length
0	9000	1
1 to 6	Backplane Setup	6
7 to 20	Port 1 Configuration	14
21 to 34	Port 2 Configuration	14
35 to 247	Spare	213

The read block used to request the configuration has the following structure:

Offset	Description	Length
0	Reserved	1
1	9000	1
2	Module Configuration Errors	1
3	Port 1 Configuration Errors	1
4	Port 2 Configuration Errors	1
5 to 248	Spare	244
249	-2 or -3	1

If there are any errors in the configuration, the bit associated with the error will be set in one of the three configuration error words. The error must be corrected before the module starts operating.

5.2.6 Master Command Data List

Each port on the module can be configured as a Phantom master device containing its own list of one hundred commands. The commands are read from the processor using the following Write Block ID's: Port 1 - 6000 to 6003 and Port 2 - 6100 to 6103. The module will sequentially poll for each block from the processor. Ladder logic must handle each and every one of the data transfers. The structure of each block is shown in the following table.

Offset	Description	Length
0	6000 to 6003 and 6100 to 6103	1
1 to 8	Command Definition	8
9 to 16	Command Definition	8
17 to 24	Command Definition	8
25 to 32	Command Definition	8
33 to 40	Command Definition	8
41 to 48	Command Definition	8
49 to 56	Command Definition	8
57 to 64	Command Definition	8
65 to 72	Command Definition	8
73 to 80	Command Definition	8
81 to 88	Command Definition	8
89 to 96	Command Definition	8
97 to 104	Command Definition	8
105 to 112	Command Definition	8
113 to 120	Command Definition	8
121 to 128	Command Definition	8
129 to 136	Command Definition	8
137 to 144	Command Definition	8
145 to 152	Command Definition	8
153 to 160	Command Definition	8
161 to 168	Command Definition	8
169 to 176	Command Definition	8
177 to 184	Command Definition	8
185 to 192	Command Definition	8
193 to 200	Command Definition	8

5.2.7 Slave Status Blocks

Slave status blocks send status information of each slave device on a master port. Slaves attached to the master port can have one of the following states:

0	The slave is inactive and not defined in the command list for the master port.
1	The slave is actively being polled or controlled by the master port and communications is successful.
2	The master port has failed to communicate with the slave device. Communications with the slave is suspended for a user defined period based on the scanning of the command list.

Slaves are defined to the system when the module opens a channel to a slave. Each slave defined will be set to a state of one in this initial step. If the master port fails to communicate with a slave device (retry count expired on a command), the master will set the state of the slave to a value of 2 in the status table. This suspends communication with the slave device for a user specified scan count (**ErrorDelayCntr** value in the **PNPPort** object for each port). Each time a command in the list is scanned that has the address of a suspended slave, the delay counter value will be decremented. When the value reaches zero, the slave state will be set to one. This will enable polling of the slave.

Block ID	Description
3000	Request for first 32 slave status values for Port 1
3100	Request for first 32 slave status values for Port 2

The format of these blocks is as shown in the following table:

Offset	Description	Length
0	3000 or 3100	1
1 to 247	Spare	246

The module will recognize the request by receiving the special write block code and respond with a read block with the following format:

Offset	Description	Length
0	Reserved	1
1	Write Block ID	1
2 to 129	Slave Poll Status Data	128
130 to 248	Spare	119
249	3000 or 3100	1

5.2.8 Command Control Blocks

Command control blocks are special blocks used to control the module or request special data from the module. The current version of the software supports five command control blocks: event command control, command control, write configuration, warm boot and cold boot.

Event Command

Event command control blocks send Phantom commands directly from the ladder logic to one of the master ports. The format for these blocks is displayed in the following table:

Offset	Description	Length
0	1000 or 2000	1
1	Data Parameter Address	1
2	String Parameter Address	1
3	Swap Code	1
4	Function Code	1
5	Device Database Address	1
6 to 247	Spare	242

The block number defines the Phantom port to be considered. Blocks in the 1000 range are directed to Port 1, and blocks in the 2000 range are directed to Port 2. The other parameters passed with the block construct the command. The **Data Parameter Address** parameter specifies the module's database locations to associate with the command. The **Swap Code** is used with function 3 requests to change the word or byte order. The **Function Code** has one of the following values: 7, 11, 12, or 13. The **Device Database Address** is the register or point in the remote slave device to be associated with the command. When the command receives the block, it will process it and place it in the command queue. The module will respond to each event command block with a read block with the following format:

Offset	Description	Length
0	Reserved	1
1	Write Block ID	1
2	0 = Fail, 1 = Success	1
3 to 248	Spare	246
249	1000 or 2000	1

Word two of the block can be used by the ladder logic to determine if the command was added to the command queue of the module. The command will only fail if the command queue for the port is full (100 commands for each queue).

Command Control

Command control blocks place commands in the command list into the command queue. Each port has a command queue of up to 100 commands. The module services commands in the queue before the master command list. This gives high priority to commands in the queue. Commands placed in the queue through this mechanism must be defined in the master command list. Under normal command list execution, the module will only execute commands with the Enable parameter set to one or two. If the value is set to zero, the command is skipped. Commands may be placed in the command list with an Enable parameter set to zero. These commands can then be executed using the command control blocks.

One to six commands can be placed in the command queue with a single request. The following table describes the format for this block.

Offset	Description	Length
0	5001 to 5006 or 5101 to 5106	1
1	Command index (PNP1.P2.CMD [<i>command index value</i>])	1
2	Command index (PNP1.P2.CMD [<i>command index value</i>])	1
3	Command index (PNP1.P2.CMD [<i>command index value</i>])	1
4	Command index (PNP1.P2.CMD [<i>command index value</i>])	1
5	Command index (PNP1.P2.CMD [<i>command index value</i>])	1
6	Command index (PNP1.P2.CMD [<i>command index value</i>])	1
7 to 247	Spare	241

Blocks in the range of 5001 to 5006 are used for Phantom Port 1, and blocks in the range of 5101 to 5106 are used for Phantom Port 2. The last digit in the block code defines the number of commands to process in the block. For example, a block code of 5003 contains 3 command indexes that are to be used with Phantom Port 1. The Command index parameters in the block have a range of 0 to 99 and correspond to the master command list entries.

The module responds to a command control block with a block containing the number of commands added to the command queue for the port. The following table describes the format for this block.

Offset	Description	Length
0	Reserved	1
1	Write Block ID	1
2	Number of commands added to command queue	1
3 to 248	Spare	246
249	5000 to 5006 or 5100 to 5106	1

Write Configuration

This block is sent from the ControlLogix processor to the module to force the module to write its current configuration back to the processor. This function is used when the module's configuration has been altered remotely using database write operations. The write block contains a value of -9000 in the first word. The module will respond with blocks containing the module configuration data. Ladder logic must handle the receipt of these blocks. The blocks transferred from the module are as follows:

Block -9000, General Configuration Data:

Offset	Description	Length
0	Reserved	1
1	-9000	1
2 to 7	Backplane Setup	6
8 to 21	Port 1 Configuration	14
22 to 35	Port 2 Configuration	14
36 to 248	Spare	213

Blocks -6000 to -6003 and -6100 to -6103, Master Command List Data for ports 1 and 2, respectively:

Offset	Description	Length
0	Reserved	1
1	-6000 to -6003 and -6100 to -6103	1
2 to 9	Command Definition	8
10 to 17	Command Definition	8
18 to 25	Command Definition	8
26 to 33	Command Definition	8
34 to 41	Command Definition	8
42 to 49	Command Definition	8
50 to 57	Command Definition	8
58 to 65	Command Definition	8
66 to 73	Command Definition	8
74 to 81	Command Definition	8
82 to 89	Command Definition	8
90 to 97	Command Definition	8
98 to 105	Command Definition	8
106 to 113	Command Definition	8
114 to 121	Command Definition	8
122 to 129	Command Definition	8
130 to 137	Command Definition	8
138 to 145	Command Definition	8
146 to 153	Command Definition	8
154 to 161	Command Definition	8
162 to 169	Command Definition	8

Offset	Description	Length
170 to 177	Command Definition	8
178 to 185	Command Definition	8
186 to 193	Command Definition	8
194 to 201	Command Definition	8
202 to 248	Spare	47
249	-6000 to -6003 and -6100 to -6103	1

Each of these blocks must be handled by the ladder logic for proper module operation.

Warm Boot

This block is sent from the ControlLogix processor to the module (output image) when the module is required to perform a warm-boot (software reset) operation. This block is commonly sent to the module any time configuration data modifications are made in the controller tags data area. This will force the module to read the new configuration information and to restart. The structure of the control block is shown in the following table:

Offset	Description	Length
0	9998	1
1 to 247	Spare	247

Cold Boot

This block is sent from the ControlLogix processor to the module (output image) when the module is required to perform the cold boot (hardware reset) operation. This block is sent to the module when a hardware problem is detected by the ladder logic that requires a hardware reset. The structure of the control block is shown in the following table:

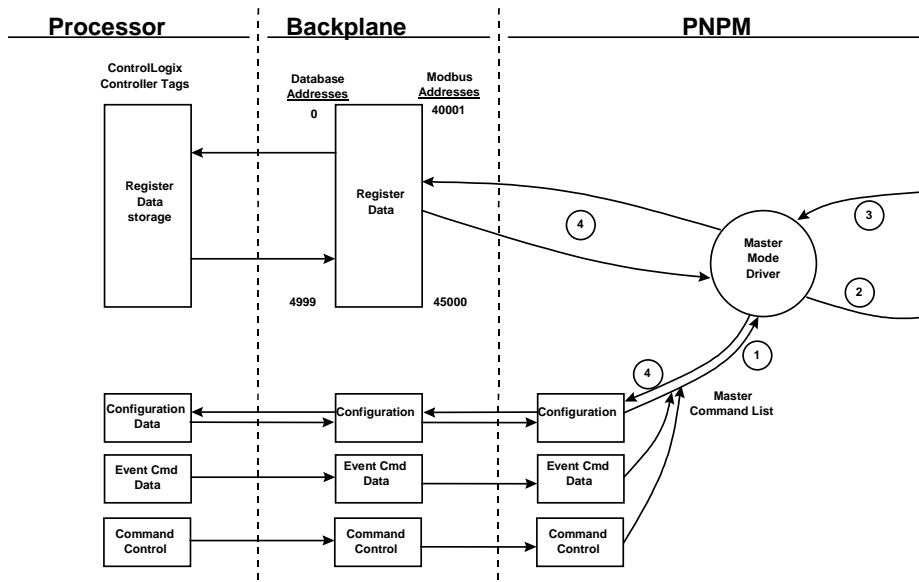
Offset	Description	Length
0	9999	1
1 to 247	Spare	247

5.2.9 Data Flow Between MVI56-PNPM Module and ControlLogix Processor

The following topics describe the flow of data between the two pieces of hardware (ControlLogix processor and MVI56-PNPM module) and other nodes on the Phantom network under the module's different operating modes. Each port on the module is configured to emulate a Phantom master device. The operation of each port is dependent on this configuration. The sections below discuss the operation of each mode.

Master Driver Mode

In the Master mode, the MVI56-PNPM module is responsible for issuing read or write commands to slave devices on the Phantom network. These commands are user configured in the module via the Master Command List received from the ControlLogix processor or issued directly from the ControlLogix processor (event command control). Command status is returned to the processor for each individual command in the command list status block. The location of this status block in the module's internal database is user defined. The following flow chart and associated table describe the flow of data into and out of the module.



Step	Description
1	The Master driver obtains configuration data from the ControlLogix processor. The configuration data obtained includes the number of commands and the Master Command List. These values are used by the Master driver to determine the type of commands to be issued to the other nodes on the Phantom network.
2	After configuration, the Master driver begins transmitting read and/or write commands to the other nodes on the network. If writing data to another node, the data for the write command is obtained from the module's internal database to build the command.
3	Presuming successful processing by the node specified in the command, a response message is received into the Master driver for processing.
4	Data received from the node on the network is passed into the module's internal database, assuming a read command.

Refer to the **Module Set Up** section for a complete description of the parameters required to define the virtual master port. Refer to the **PNPM Driver** documentation for a complete discussion of the structure and content of each command. Care must be taken in constructing each command in the list for predictable operation of the module. If two commands write to the same internal database address of the module, the results will not be as desired. All commands containing invalid data are ignored by the module.

Master Command List

In order to function in the Master Mode, the module's Master Command List must be defined. This list contains up to 100 individual entries, with each entry containing the information required to construct a valid command. This includes the following:

- Command enable mode ((0) disabled, (1) continuous or (2) conditional)
- Database Source and Destination Register Address: Determines where data will be placed and/or obtained

As the list is read in from the processor and as the commands are processed, an error value is maintained in the module for each command. This error list can be transferred to the processor. The errors generated by the module are displayed in the following tables.

Standard Protocol Errors

Code	Description
1	Illegal Function
2	Illegal Data Address
3	Illegal Data Value
4	Failure in Associated Device
5	Acknowledge
6	Busy, Rejected Message

Module Communication Error Codes

Code	Description
-1	CTS modem control line not set before transmit
-2	Timeout while transmitting message
-11	Timeout waiting for response after request

Response Command Errors

Code	Description
244	Invalid escape sequence in the packet
245	Receive packet before ack on last packet
246	Packet too big
247	Wrong size string argument
248	No string argument was sent
249	Wrong number of integer arguments sent.

Code	Description
250	Arg 3 invalid or out of range
251	Arg 2 invalid or out of range
252	Arg 1 invalid or out of range
253	RPC type byte not sent
254	Incorrect function code in response or not sent
255	Invalid CRC/LRC value in response

Command List Entry Errors

Code	Description
-41	Invalid enable code
-42	Internal address > maximum address
-43	Invalid node address (< 0 or > 32)
-44	Count parameter set to 0
-45	Invalid function code
-46	Invalid swap code

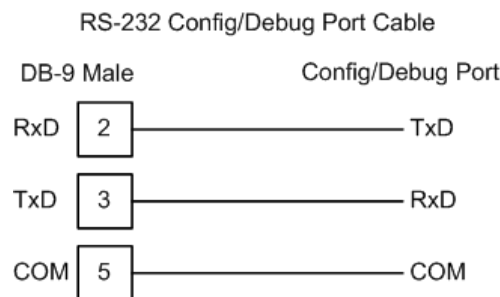
5.3 Cable Connections

The application ports on the MVI56-PNPM module support RS-232, RS-422, and RS-485 interfaces. Please inspect the module to ensure that the jumpers are set correctly to correspond with the type of interface you are using.

Note: When using RS-232 with radio modem applications, some radios or modems require hardware handshaking (control and monitoring of modem signal lines). Enable this in the configuration of the module by setting the UseCTS parameter to 1.

5.3.1 RS-232 Configuration/Debug Port

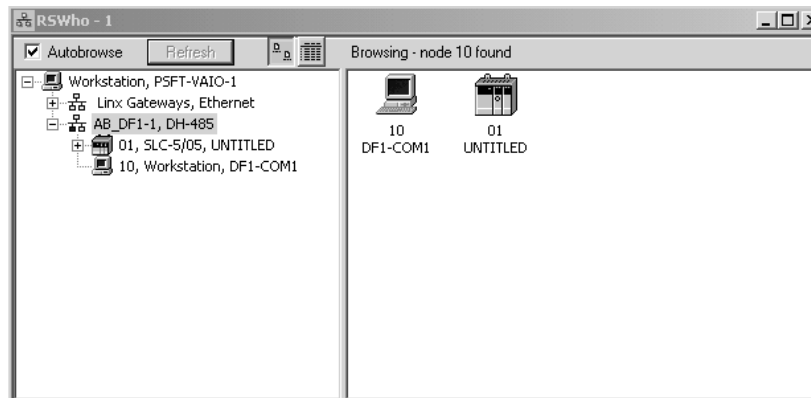
This port is physically an RJ45 connection. An RJ45 to DB-9 adapter cable is included with the module. This port permits a PC based terminal emulation program to view configuration and status data in the module and to control the module. The cable for communications on this port is shown in the following diagram:



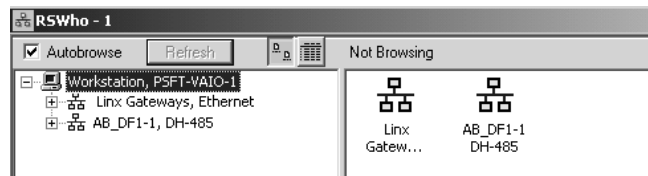
Disabling the RSLinx Driver for the Com Port on the PC


The communication port driver in RSLinx can occasionally prevent other applications from using the PC's COM port. If you are not able to connect to the module's configuration/debug port using ProSoft Configuration Builder (PCB), HyperTerminal or another terminal emulator, follow these steps to disable the RSLinx Driver.

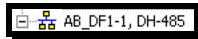
- 1 Open RSLinx and go to Communications>RSWho
- 2 Make sure that you are not actively browsing using the driver that you wish to stop. The following shows an actively browsed network:



- 3 Notice how the DF1 driver is opened, and the driver is looking for a processor on node 1. If the network is being browsed, then you will not be able to stop this driver. To stop the driver your RSWWho screen should look like this:

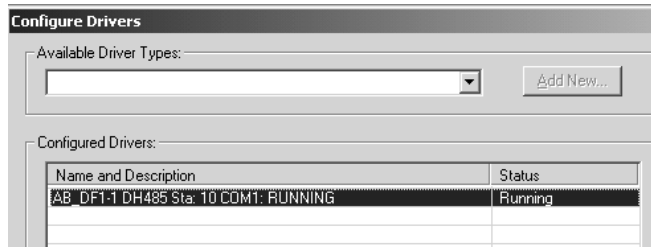


Branches are displayed or hidden by clicking on the  or the  icons.

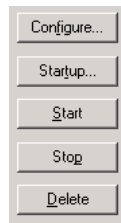


- 4 When you have verified that the driver is not being browsed, go to **Communications>Configure Drivers**

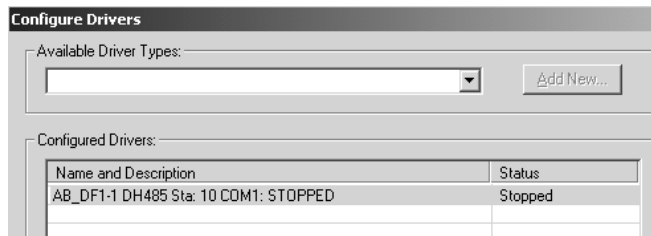
You may see something like this:



If you see the status as running, you will not be able to use this com port for anything other than communication to the processor. To stop the driver press the "Stop" on the side of the window:



5 After you have stopped the driver you will see the following:

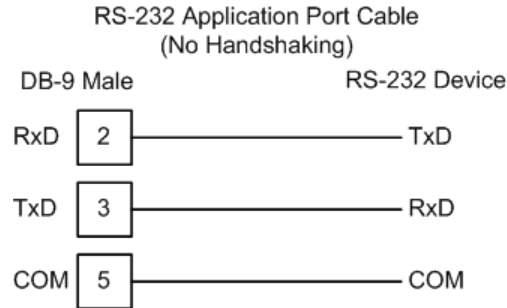


6 Upon seeing this, you may now use that com port to connect to the debug port of the module.

Note: You may need to shut down and restart your PC before it will allow you to stop the driver (usually only on Windows NT machines). If you have followed all of the above steps, and it will not stop the driver, then make sure you do not have RSLogix open. If RSLogix is not open, and you still cannot stop the driver, then reboot your PC.

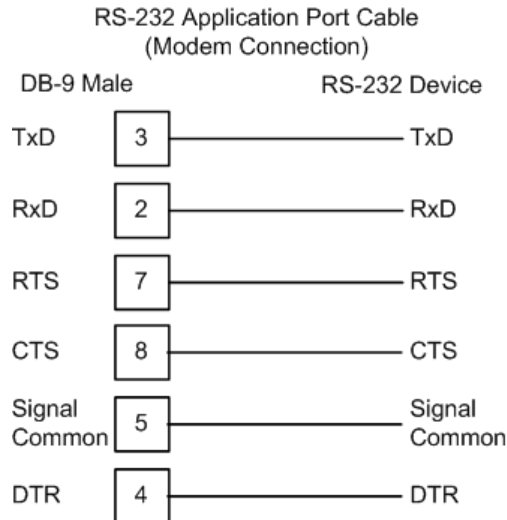
5.3.2 RS-232

When the RS-232 interface is selected, the use of hardware handshaking (control and monitoring of modem signal lines) is user definable. If no hardware handshaking will be used, the cable to connect to the port is as shown below:



RS-232: Modem Connection

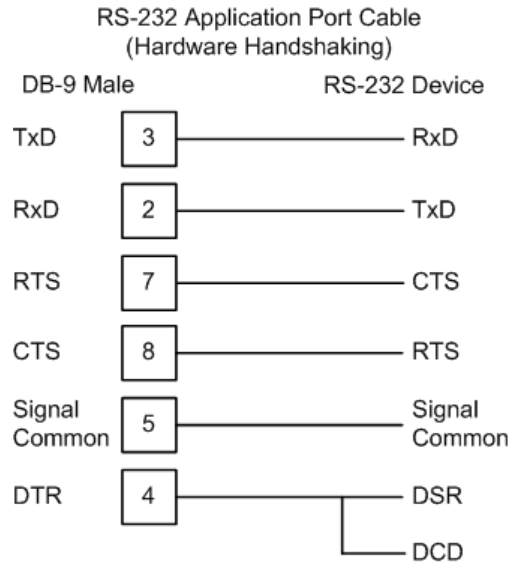
This type of connection is required between the module and a modem or other communication device.



The "Use CTS Line" parameter for the port configuration should be set to 'Y' for most modem applications.

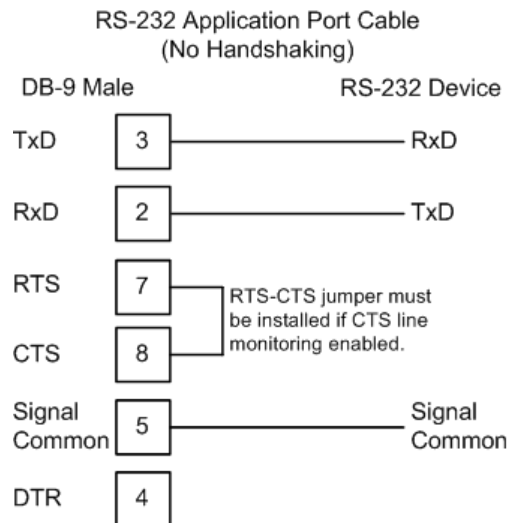
RS-232: Null Modem Connection (Hardware Handshaking)

This type of connection is used when the device connected to the module requires hardware handshaking (control and monitoring of modem signal lines).



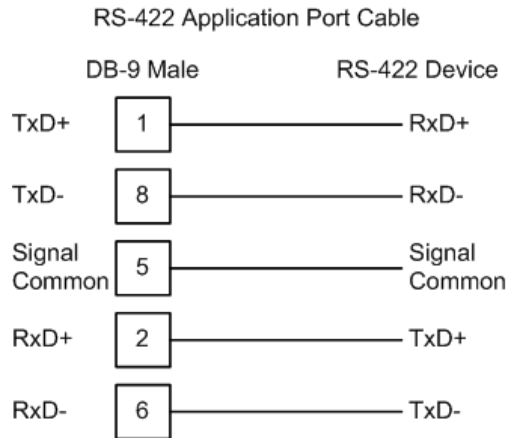
RS-232: Null Modem Connection (No Hardware Handshaking)

This type of connection can be used to connect the module to a computer or field device communication port.



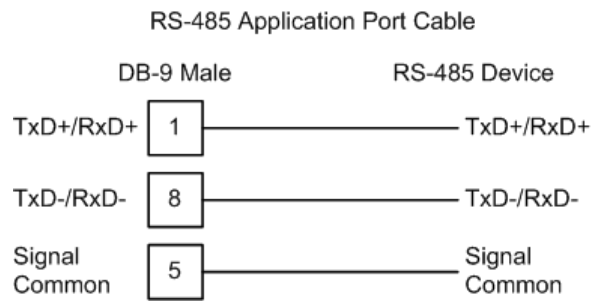
Note: If the port is configured with the "Use CTS Line" set to 'Y', then a jumper is required between the RTS and the CTS line on the module connection.

5.3.3 RS-422



5.3.4 RS-485

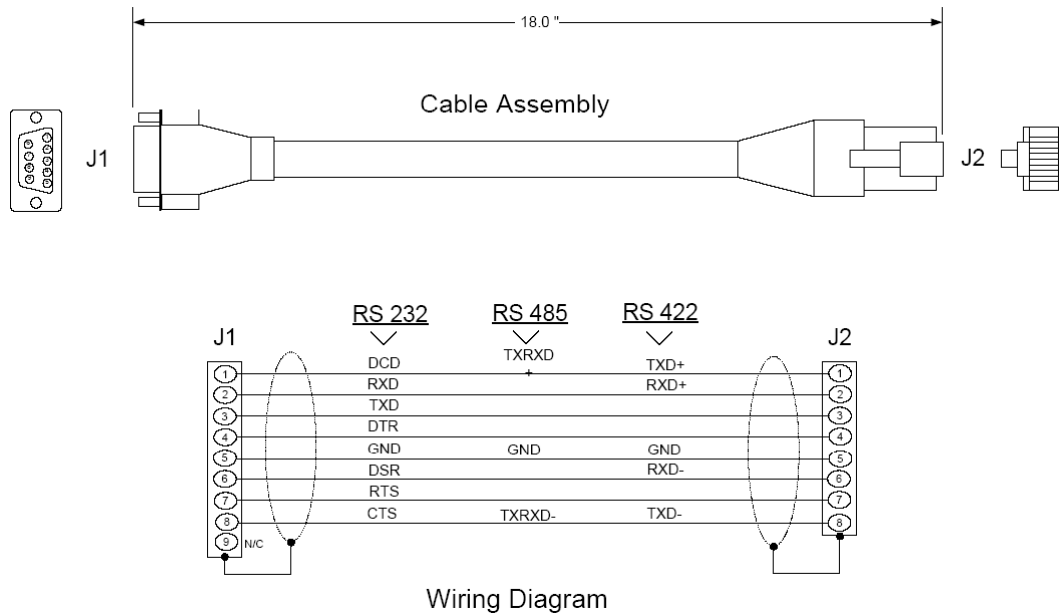
The RS-485 interface requires a single two or three wire cable. The Common connection is optional and dependent on the RS-485 network. The cable required for this interface is shown below:



RS-485 and RS-422 Tip

If communication in the RS-422/RS-485 mode does not work at first, despite all attempts, try switching termination polarities. Some manufacturers interpret +/- and A/B polarities differently.

5.3.5 DB9 to RJ45 Adaptor (Cable 14)



5.4 MVI56-PNPM Database Definition

This section contains a listing of the internal database of the MVI56-PNPM module. This information can be used to interface other devices to the data contained in the module.

Register Range	Content	Size
0 to 4999	User Data	5000
5000 to 5005	<u>Backplane Configuration</u> (page 72)	6
5010 to 5023	Port 1 Setup	14
5030 to 5043	Port 2 Setup	14
5050 to 5849	Port 1 Commands	800
5860 to 6659	Port 2 Commands	800
6670 to 6703	<u>Misc. Status Data</u>	33
6800 to 6999	<u>Command Control</u> (page 58)	200

The User Data area holds data collected from other nodes on the network (master read commands) or data received from the processor (write blocks).

Additionally, this data area is used as a data source for the processor (read blocks) or other nodes on the network (write commands).

5.5 MVI56-PNPM Status Data Definition

This section contains a description of the members present in the **PNPInStat** object. This data is transferred from the module to the processor as part of each read block.

Offset	Content	Description
202	Program Scan Count	This value is incremented each time a complete program cycle occurs in the module.
203 to 204	Product Code	These two registers contain the product code of "PNP".
205 to 206	Product Version	These two registers contain the product version for the current running software.
207 to 208	Operating System	These two registers contain the month and year values for the program operating system.
209 to 210	Run Number	These two registers contain the run number value for the currently running software.
211	Port 1 Command List Requests	This field contains the number of requests made from this port to slave devices on the network.
212	Port 1 Command List Response	This field contains the number of slave response messages received on the port.
213	Port 1 Command List Errors	This field contains the number of command errors processed on the port. These errors could be due to a bad response or command.
214	Port 1 Requests	This field contains the total number of messages sent out of the port.
215	Port 1 Responses	This field contains the total number of messages received on the port.
216	Port 1 Errors Sent	This field contains the total number of message errors sent out of the port.
217	Port 1 Errors Received	This field contains the total number of message errors received on the port.
218	Port 2 Command List Requests	This field contains the number of requests made from this port to slave devices on the network.
219	Port 2 Command List Response	This field contains the number of slave response messages received on the port.
220	Port 2 Command List Errors	This field contains the number of command errors processed on the port. These errors could be due to a bad response or command.
221	Port 2 Requests	This field contains the total number of messages sent out the port.
222	Port 2 Responses	This field contains the total number of messages received on the port.
223	Port 2 Errors Sent	This field contains the total number of message errors sent out the port.
224	Port 2 Errors Received	This field contains the total number of message errors received on the port.
225	Read Block Count	This field contains the total number of read blocks transferred from the module to the processor.
226	Write Block Count	This field contains the total number of write blocks transferred from the module to the processor.

Offset	Content	Description
227	Parse Block Count	This field contains the total number of blocks successfully parsed that were received from the processor.
228	Command Event Block Count	This field contains the total number of command event blocks received from the processor.
229	Command Block Count	This field contains the total number of command blocks received from the processor.
230	Error Block Count	This field contains the total number of block errors recognized by the module.
231	Port 1 Current Error	For a slave port, this field contains the value of the current error code returned. For a master port, this field contains the index of the currently executing command.
232	Port 1 Last Error	For a slave port, this field contains the value of the last error code returned. For a master port, this field contains the index of the command with the error.
233	Port 2 Current Error	For a slave port, this field contains the value of the current error code returned. For a master port, this field contains the index of the currently executing command.
234	Port 2 Last Error	For a slave port, this field contains the value of the last error code returned. For a master port, this field contains the index of the command with an error.

5.6 MVI56-PNPM Configuration Data Definition

This section contains listings of the MVI56-PNPM module's database related to the module's configuration. This data is available to any node on the network and is read from the ControlLogix processor when the module first initializes.

5.6.1 Backplane Setup

Register	Content	Description
5000	Write Start Reg	This parameter specifies the starting register in the module where the data transferred from the processor will be placed. Valid range for this parameter is 0 to 4999.
5001	Write Reg Count	This parameter specifies the number of registers to transfer from the processor to the module. Valid entry for this parameter is 0 to 5000.
5002	Read Start Reg	This parameter specifies the starting register in the module where data will be transferred from the module to the processor. Valid range for this parameter is 0 to 4999.
5003	Read Reg Count	This parameter specifies the number of registers to be transferred from the module to the processor. Valid entry for this parameter is 0 to 5000.

Register	Content	Description
5004	Backplane Fail	This parameter specifies the number of successive transfer errors that must occur before the communication ports are shut down. If the parameter is set to zero, the communication ports will continue to operate under all conditions. If the value is set larger than 0 (1 to 65535), communications will cease if the specified number of failures occur.
5005	Error Status Pointer	This parameter specifies the register location in the module's database where module status data will be stored. If a value less than zero is entered, the data will not be stored in the database. If the value specified in the range of 0 to 4940, the data will be placed in the user data area.
5006 to 5009	Spare	

5.6.2 Port 1 Setup

Register	Content	Description
5010	Enable	This parameter defines if this port will be used. If the parameter is set to 0, the port is disabled. A value of 1 enables the port.
5011	Minimum Response Time	This parameter specifies the minimum number of milliseconds to delay before responding to a request message. This pre-send delay is applied before the RTS on time. This may be required when communicating with slow devices.
5012	Command Count	This parameter specifies the number of commands to be processed by the master port.
5015	Minimum Command Delay	This parameter specifies the number of milliseconds to wait between issuing each command. This delay value is not applied to retries.
5013	Response Timeout	This parameter represents the message response timeout period in 1-millisecond increments. This is the time that a port configured as a master will wait before re-transmitting a command if no response is received from the addressed slave. The value is set depending upon the communication network used and the expected response time of the slowest device on the network.
5014	Retry Count	This parameter specifies the number of times a command will be retried if it fails. If the master port does not receive a response after the last retry, the slave devices communication will be suspended on the port for Error Delay Counter scans.
5016	Error Delay Counter	This parameter specifies the number of polls to skip on the slave before trying to re-establish communications. After the slave fails to respond, the master will skip commands to be sent to the slave the number of times entered in this parameter.
5017 to 5029	Spare	

5.6.3 Port 2 Setup

Register	Content	Description
5032	Command Count	This parameter specifies the number of commands to be processed by the master port.
5035	Minimum Command Delay	This parameter specifies the number of milliseconds to wait between issuing each command. This delay value is not applied to retries.
5033	Response Timeout	This parameter represents the message response timeout period in 1-millisecond increments. This is the time that a port configured as a master will wait before re-transmitting a command if no response is received from the addressed slave. The value is set depending upon the communication network used and the expected response time of the slowest device on the network.
5034	Retry Count	This parameter specifies the number of times a command will be retried if it fails. If the master port does not receive a response after the last retry, the slave devices communication will be suspended on the port for Error Delay Counter scans.
5036	Error Delay Counter	This parameter specifies the number of polls to skip on the slave before trying to re-establish communications. After the slave fails to respond, the master will skip commands to be sent to the slave the number of times entered in this parameter.
5037 to 5039	Spare	

5.6.4 Port 1 Commands

Register	Content	Description
5050 to 5077	Command #1	This set of registers contains the parameters for the first command in the master command list. The structure of this data area is as described in the data object section of the documentation.
5058 to 5065	Command #2	Command #2 data set
-	-	-
5842 to 5849	Command #100	Command #100 data set

5.6.5 Port 2 Commands

Register	Content	Description
5860 to 5867	Command #1	This set of registers contains the parameters for the first command in the master command list. The structure of this data area is as described in the data object section of the documentation.
5868 to 5875	Command #2	Command #2 data set
-	-	-
6652 to 6659	Command #100	Command #100 data set

5.6.6 Misc. Status

Register	Content	Description
6670	Program Scan Count	This value is incremented each time a complete program cycle occurs in the module.
6671 to 6672	Product Code	These two registers contain the product code of "PNP".
6673 to 6674	Product Version	These two registers contain the product version for the current running software.
6675 to 6676	Operating System	These two registers contain the month and year values for the program operating system.
6677 to 6678	Run Number	These two registers contain the run number value for the currently running software.
6679	Port 1 Command List Requests	This field contains the number of requests made from this port to slave devices on the network.
6680	Port 1 Command List Response	This field contains the number of slave response messages received on the port.
6681	Port 1 Command List Errors	This field contains the number of command errors processed on the port. These errors could be due to a bad response or command.
6682	Port 1 Requests	This field contains the total number of messages sent out of the port.
6683	Port 1 Responses	This field contains the total number of messages received on the port.
6684	Port 1 Errors Sent	This field contains the total number of message errors sent out of the port.
6685	Port 1 Errors Received	This field contains the total number of message errors received on the port.
6686	Port 2 Command List Requests	This field contains the number of requests made from this port to slave devices on the network.
6687	Port 2 Command List Response	This field contains the number of slave response messages received on the port.
6688	Port 2 Command List Errors	This field contains the number of command errors processed on the port. These errors could be due to a bad response or command.
6689	Port 2 Requests	This field contains the total number of messages sent out the port.
6690	Port 2 Responses	This field contains the total number of messages received on the port.
6691	Port 2 Errors Sent	This field contains the total number of message errors sent out the port.
6692	Port 2 Errors Received	This field contains the total number of message errors received on the port.
6693	Read Block Count	This field contains the total number of read blocks transferred from the module to the processor.
6694	Write Block Count	This field contains the total number of write blocks transferred from the module to the processor.
6695	Parse Block Count	This field contains the total number of blocks successfully parsed that were received from the processor.

Register	Content	Description
6696	Command Event Block Count	This field contains the total number of command event blocks received from the processor.
6697	Command Block Count	This field contains the total number of command blocks received from the processor.
6698	Error Block Count	This field contains the total number of block errors recognized by the module.
6699	Port 1 Current Error	For a slave port, this field contains the value of the current error code returned. For a master port, this field contains the index of the currently executing command.
6700	Port 1 Last Error	For a slave port, this field contains the value of the last error code returned. For a master port, this field contains the index of the command with the error.
6701	Port 2 Current Error	For a slave port, this field contains the value of the current error code returned. For a master port, this field contains the index of the currently executing command.
6702	Port 2 Last Error	For a slave port, this field contains the value of the last error code returned. For a master port, this field contains the index of the command with an error.
6703 to 6749	Spare	
6750	Port 1 Use Guard Band	Use packet gap timeout for messages (Yes or No). Use only in multi-drop applications.
6751	Port 1 Guard Band Time	A value of 0 uses the default baud rate or you can set a timeout value in milliseconds.
6752	Port 1 Fcn 99 Offset	Internal DB offset to Function 99 counter.
6753 to 6759	Spare	
6760	Port 2 Use Guard Band	Use packet gap timeout for messages (Yes or No). Use only in multi-drop applications.
6761	Port 2 Guard Band Time	A value of 0 uses the default baud rate or you can set a timeout value in milliseconds.
6762	Port 2 Fcn 99 Offset	Internal DB offset to Function 99 counter.
6763 to 6799	Spare	

5.6.7 Command Control

Register	Content	Description
6800	Command Code	Enter one of the valid control command codes in this register to control the module (9997, 9998, or 9999).
6801	Command Data	Not Used
-	-	-
6999	Command Data	Not Used

5.7 Key Press Representation (Function 7)

The following table indicates the numbers used to represent keys.

Key	Number
None	0
Soft Key 1	1
Soft Key 2	2
Soft Key 3	3
	4
Enter	5
Exit	6
Menu	7
+	8
-	9
<-	10
->	11
Sensitivity	12
Select Product	13
Calibrate	14
Test	15
Select Unit	16

6 Support, Service & Warranty

In This Chapter

- How to Contact Us: Sales and Support..... 80
- Return Material Authorization (RMA) Policies and Conditions 81
- Procedures for Return of Units Under Warranty..... 81
- Procedures for Return of Units Out of Warranty..... 82
- LIMITED WARRANTY 83

Be sure and read the full Warranty that can be found on our web site at www.prosoft-technology.com for details and other terms and conditions. The content in this summary is subject to change without notice. The content is current at date of publication.

ProSoft Technology, Inc. strives to provide meaningful support to its customers. Should any questions or problems arise, please feel free to contact us at:

Internet	Web Site: http://www.prosoft-technology.com/support
	E-mail address: support@prosoft-technology.com

Those of us at ProSoft Technology, Inc. want to provide the best and quickest support possible, so before calling please have the following information available. You may wish to fax this information to us prior to calling.

- 1 Product Version Number
- 2 System architecture
- 3 Network details

In the case of hardware, we will also need the following information:

- 1 Module configuration and contents of file
- 2 Module Operation
- 3 Configuration/Debug status information
- 4 LED patterns
- 5 Information about the processor and user data files as viewed through the development software and LED patterns on the processor
- 6 Details about the networked devices interfaced, if any

For technical support calls within the United States, an after-hours answering system allows pager access to one of our qualified technical and/or application support engineers at any time to answer your questions.

6.1 How to Contact Us: Sales and Support

All ProSoft Technology Products are backed with full technical support. Contact our worldwide Technical Support team and Customer Service representatives directly by phone or email:

USA / Latin America (excluding Brasil) (Office in California)

+1(661) 716-5100
+1(661) 716-5101 (Fax)
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Bakersfield, California 93301
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Languages spoken include: English, Spanish

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Languages spoken include: Chinese, English

Europe / Middle East / Africa (office in Toulouse, France)

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Languages spoken include: French, English

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+55-11-5083-3776 (Fax)
Rua Vergueiro, 2949 - sala 182 - Edifício Vergueiro Work Center
Vila Mariana - São Paulo
Cep: 04101-300 - Brasil
+55-11-5084-5178, eduardo@prosoft-technology.com
Languages spoken include: Portuguese, English

6.2 Return Material Authorization (RMA) Policies and Conditions

The following RMA Policies and Conditions apply to any returned product. These RMA Policies are subject to change by ProSoft without notice. For warranty information, see Section C below entitled "Limited Warranty". In the event of any inconsistency between the RMA Policies and the Warranty, the Warranty shall govern.

6.2.1 All Product Returns

- 1 In order to return a Product for repair, exchange or otherwise, the Customer must obtain a Returned Material Authorization (RMA) number from ProSoft and comply with ProSoft shipping instructions.
- 2 In the event that the Customer experiences a problem with the Product for any reason, Customer should contact ProSoft Technical Support at one of the telephone numbers listed above in Section A. A Technical Support Engineer will request several tests in an attempt to isolate the problem. If after these tests are completed, the Product is found to be the source of the problem, ProSoft will issue an RMA.
- 3 All returned Products must be shipped freight prepaid, in the original shipping container or equivalent, to the location specified by ProSoft, and be accompanied by proof of purchase. The RMA number is to be prominently marked on the outside of the shipping box. Customer agrees to insure the Product or assume the risk of loss or damage in transit. Products shipped to ProSoft without an RMA number will be returned to the Customer, freight collect. Contact ProSoft Technical Support for further information.
- 4 Out of warranty returns are not allowed on RadioLinX accessories such as antennas, cables, and brackets.

The following policy applies for Non-Warranty Credit Returns:

- A 10% Restocking Fee if Factory Seal is *not* broken
- B 20% Restocking Fee if Factory Seal is broken

ProSoft retains the right, in its absolute and sole discretion, to reject any non-warranty returns for credit if the return is not requested within three (3) months after shipment of the Product to Customer, if the Customer fails to comply with ProSoft's shipping instructions, or if the Customer fails to return the Product to ProSoft within six (6) months after Product was originally shipped.

6.3 Procedures for Return of Units Under Warranty

- 1 A Technical Support Engineer must pre-approve all product returns.
- 2 Module is repaired or replaced after a Return Material Authorization Number is entered and a replacement order is generated.
- 3 Credit for the warranted item is issued within 10 business days after receipt of product and evaluation of the defect has been performed by ProSoft. The credit will only be issued provided the product is returned with a valid Return Material Authorization Number and in accordance with ProSoft's shipping instructions.

- a) If no defect is found, a credit is issued.
- b) If a defect is found and is determined to be customer generated or if the defect is otherwise not covered by ProSoft's Warranty, or if the module is not repairable, a credit is not issued and payment of the replacement module is due.

6.4 Procedures for Return of Units Out of Warranty

- 1 Customer sends unit in for evaluation.
- 2 If no defect is found, Customer will be charged the equivalent of US \$100 plus shipping, duties and taxes that may apply. A new Purchase Order will be required for this evaluation fee.
If the unit is repaired the charge to the Customer will be 30%* of the list price plus any shipping, duties and taxes that may apply. A new Purchase Order will be required for a product repair.
- 3 For an immediate exchange, a new module may be purchased and sent to Customer while repair work is being performed. Credit for purchase of the new module will be issued when the new module is returned in accordance with ProSoft's shipping instructions and subject to ProSoft's policy on non-warranty returns. This is in addition to charges for repair of the old module and any associated charges to Customer.
- 4 If, upon contacting ProSoft Customer Service, the Customer is informed that unit is believed to be unrepairable, the Customer may choose to send unit in for evaluation to determine if the repair can be made. Customer will pay shipping, duties and taxes that may apply. If unit cannot be repaired, the Customer may purchase a new unit.

6.4.1 Un-repairable Units

- 3150-All
- 3750
- 3600-All
- 3700
- 3170-All
- 3250
- 1560 can be repaired, if defect is the power supply
- 1550 can be repaired, if defect is the power supply
- 3350
- 3300
- 1500-All

*** 30% of list price is an estimated repair cost only. The actual cost of repairs will be determined when the module is received by ProSoft and evaluated for needed repairs.**

6.4.2 Purchasing Warranty Extension

As detailed below in ProSoft's Warranty, the standard Warranty Period is one year (or in the case of RadioLinx modules, three years) from the date of delivery. The Warranty Period may be extended for an additional charge, as follows:

- Additional 1 year = 10% of list price
- Additional 2 years = 20% of list price
- Additional 3 years = 30% of list price

6.5 LIMITED WARRANTY

This Limited Warranty ("Warranty") governs all sales of hardware, software and other products (collectively, "Product") manufactured and/or offered for sale by ProSoft, and all related services provided by ProSoft, including maintenance, repair, warranty exchange, and service programs (collectively, "Services"). By purchasing or using the Product or Services, the individual or entity purchasing or using the Product or Services ("Customer") agrees to all of the terms and provisions (collectively, the "Terms") of this Limited Warranty. All sales of software or other intellectual property are, in addition, subject to any license agreement accompanying such software or other intellectual property.

6.5.1 What Is Covered By This Warranty

- A** *Warranty On New Products:* ProSoft warrants, to the original purchaser only, that the Product that is the subject of the sale will (1) conform to and perform in accordance with published specifications prepared, approved, and issued by ProSoft, and (2) will be free from defects in material or workmanship; provided these warranties only cover Product that is sold as new. This Warranty expires one year (or in the case of RadioLinx modules, three years) from the date of shipment (the "Warranty Period"). If the Customer discovers within the Warranty Period a failure of the Product to conform to specifications, or a defect in material or workmanship of the Product, the Customer must promptly notify ProSoft by fax, email or telephone. In no event may that notification be received by ProSoft later than 15 months (or in the case of RadioLinx modules, 39 months) from the date of delivery. Within a reasonable time after notification, ProSoft will correct any failure of the Product to conform to specifications or any defect in material or workmanship of the Product, with either new or used replacement parts. Such repair, including both parts and labor, will be performed at ProSoft's expense. All warranty service will be performed at service centers designated by ProSoft. If ProSoft is unable to repair the Product to conform to this Warranty after a reasonable number of attempts, ProSoft will provide, at its option, one of the following: a replacement product, a full refund of the purchase price or a credit in the amount of the purchase price. All replaced product and parts become the property of ProSoft. These remedies are the Customer's only remedies for breach of warranty.
- B** *Warranty On Services:* Material and labor used by ProSoft to repair a verified malfunction or defect are warranted on the terms specified above

- for new Product, provided said warranty will be for the period remaining on the original new equipment warranty or, if the original warranty is no longer in effect, for a period of 90 days from the date of repair.
- C** The Warranty Period for RadioLinx accessories (such as antennas, cables, brackets, etc.) are the same as for RadioLinx modules, that is, three years from the date of shipment.

6.5.2 What Is Not Covered By This Warranty

- A** ProSoft makes no representation or warranty, expressed or implied, that the operation of software purchased from ProSoft will be uninterrupted or error free or that the functions contained in the software will meet or satisfy the purchaser's intended use or requirements; the Customer assumes complete responsibility for decisions made or actions taken based on information obtained using ProSoft software.
- B** With the exception of RadioLinx accessories referenced in paragraph 1(c) this Warranty does not cover any product, components, or parts not manufactured by ProSoft.
- C** This Warranty also does not cover the failure of the Product to perform specified functions, or any other non-conformance, defects, losses or damages caused by or attributable to any of the following: (i) shipping; (ii) improper installation or other failure of Customer to adhere to ProSoft's specifications or instructions; (iii) unauthorized repair or maintenance; (iv) attachments, equipment, options, parts, software, or user-created programming (including, but not limited to, programs developed with any IEC 61131-3 programming languages, or "C") not furnished by ProSoft; (v) use of the Product for purposes other than those for which it was designed; (vi) any other abuse, misapplication, neglect or misuse by the Customer; (vii) accident, improper testing or causes external to the Product such as, but not limited to, exposure to extremes of temperature or humidity, power failure or power surges outside of the limits indicated on the product specifications; or (viii) disasters such as fire, flood, earthquake, wind or lightning.
- D** The information in this Agreement is subject to change without notice. ProSoft shall not be liable for technical or editorial errors or omissions made herein; nor for incidental or consequential damages resulting from the furnishing, performance or use of this material. The user guides included with your original product purchased by you from ProSoft, contains information protected by copyright. No part of the guide may be duplicated or reproduced in any form without prior written consent from ProSoft.

6.5.3 *DISCLAIMER REGARDING HIGH RISK ACTIVITIES*

PRODUCT MANUFACTURED OR SUPPLIED BY PROSOFT IS NOT FAULT TOLERANT AND IS NOT DESIGNED, MANUFACTURED OR INTENDED FOR USE IN HAZARDOUS ENVIRONMENTS REQUIRING FAIL-SAFE PERFORMANCE (INCLUDING, WITHOUT LIMITATION, THE OPERATION OF NUCLEAR FACILITIES, AIRCRAFT NAVIGATION OF COMMUNICATION SYSTEMS, AIR TRAFFIC CONTROL, DIRECT LIFE SUPPORT MACHINES OR WEAPONS SYSTEMS), IN WHICH THE FAILURE OF THE PRODUCT COULD LEAD DIRECTLY OR INDIRECTLY TO DEATH, PERSONAL INJURY, OR SEVERE PHYSICAL OR ENVIRONMENTAL DAMAGE (COLLECTIVELY, "HIGH RISK ACTIVITIES"). PROSOFT SPECIFICALLY DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR HIGH RISK ACTIVITIES.

6.5.4 *DISCLAIMER OF ALL OTHER WARRANTIES*

THE WARRANTIES SET FORTH IN PARAGRAPH 1 ABOVE ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

6.5.5 *LIMITATION OF REMEDIES***

IN NO EVENT WILL PROSOFT (OR ITS DEALER) BE LIABLE FOR ANY SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES BASED ON BREACH OF WARRANTY, BREACH OF CONTRACT, NEGLIGENCE, STRICT TORT, OR ANY OTHER LEGAL THEORY. DAMAGES THAT PROSOFT AND ITS DEALER WILL NOT BE RESPONSIBLE FOR INCLUDE, BUT ARE NOT LIMITED TO: LOSS OF PROFITS; LOSS OF SAVINGS OR REVENUE; LOSS OF USE OF THE PRODUCT OR ANY ASSOCIATED EQUIPMENT; LOSS OF DATA; COST OF CAPITAL; COST OF ANY SUBSTITUTE EQUIPMENT, FACILITIES, OR SERVICES; DOWNTIME; THE CLAIMS OF THIRD PARTIES, INCLUDING CUSTOMERS OF THE PURCHASER; AND INJURY TO PROPERTY.

** Some areas do not allow time limitations on an implied warranty, or allow the exclusion or limitation of incidental or consequential damages. In such areas the above limitations may not apply. This Warranty gives you specific legal rights, and you may also have other rights which vary from place to place.

6.5.6 *Time Limit for Bringing Suit*

Any action for breach of warranty must be commenced within 15 months (or in the case of RadioLinx modules, 39 months) following shipment of the Product.

6.5.7 No Other Warranties

Unless modified in writing and signed by both parties, this Warranty is understood to be the complete and exclusive agreement between the parties, suspending all oral or written prior agreements and all other communications between the parties relating to the subject matter of this Warranty, including statements made by salesperson. No employee of ProSoft or any other party is authorized to make any warranty in addition to those made in this Warranty. The Customer is warned, therefore, to check this Warranty carefully to see that it correctly reflects those terms that are important to the Customer.

6.5.8 Intellectual Property

- A** Any documentation included with Product purchased from ProSoft is protected by copyright and may not be photocopied or reproduced in any form without prior written consent from ProSoft.
- B** ProSoft's technical specifications and documentation that are included with the Product are subject to editing and modification without notice.
- C** Transfer of title shall not operate to convey to Customer any right to make, or have made, any Product supplied by ProSoft.
- D** Customer is granted no right or license to use any software or other intellectual property in any manner or for any purpose not expressly permitted by any license agreement accompanying such software or other intellectual property.
- E** Customer agrees that it shall not, and shall not authorize others to, copy software provided by ProSoft (except as expressly permitted in any license agreement accompanying such software); transfer software to a third party separately from the Product; modify, alter, translate, decode, decompile, disassemble, reverse-engineer or otherwise attempt to derive the source code of the software or create derivative works based on the software; export the software or underlying technology in contravention of applicable US and international export laws and regulations; or use the software other than as authorized in connection with use of Product.

6.5.9 Additional Restrictions Relating To Software And Other Intellectual Property

In addition to complying with the Terms of this Warranty, Customers purchasing software or other intellectual property shall comply with any license agreement accompanying such software or other intellectual property. Failure to do so may void this Warranty with respect to such software and/or other intellectual property.

6.5.10 Allocation of risks

This Warranty allocates the risk of product failure between ProSoft and the Customer. This allocation is recognized by both parties and is reflected in the price of the goods. The Customer acknowledges that it has read this Warranty, understands it, and is bound by its Terms.

6.5.11 Controlling Law and Severability

This Warranty shall be governed by and construed in accordance with the laws of the United States and the domestic laws of the State of California, without reference to its conflicts of law provisions. If for any reason a court of competent jurisdiction finds any provisions of this Warranty, or a portion thereof, to be unenforceable, that provision shall be enforced to the maximum extent permissible and the remainder of this Warranty shall remain in full force and effect. Any cause of action with respect to the Product or Services must be instituted in a court of competent jurisdiction in the State of California.

Index

A

Additional Restrictions Relating To Software
And Other Intellectual Property • 86
All Product Returns • 81
Allocation of risks • 87
Analyzing Data for the first application port •
37
Analyzing Data for the second application
port • 37

B

Backplane Data Transfer • 52
Backplane Setup • 72

C

Cable Connections • 64
Changing Parameters During Operation • 24
Clearing a Fault Condition • 47
Cold Boot • 61
Command Control • 59, 76
Command Control Blocks • 58, 70
Configuration Data Transfer • 55
Configuration Objects • 25
Configuring RSLinx • 15
Connect your PC to the Module • 17
Connect your PC to the Processor • 13
Controlling Law and Severability • 87

D

Data Analyzer • 37
Data Analyzer Tips • 39
Data Flow Between MVI56-PNPM Module
and ControlLogix Processor • 62
Data Transfer Parameters (PNPModule) • 25
Database View Menu • 42
DB9 to RJ45 Adaptor (Cable 14) • 70
Diagnostics and Troubleshooting • 7, 31
Disabling the RSLinx Driver for the Com Port
on the PC • 33, 65
DISCLAIMER OF ALL OTHER
WARRANTIES • 85
DISCLAIMER REGARDING HIGH RISK
ACTIVITIES • 85
Displaying the Current Page of Registers
Again • 42
Displaying Timing Marks in the Data
Analyzer • 38

Download the Sample Program to the
Processor • 14

E

Error Codes • 35, 44
Event Command • 58
Exiting the Program • 37

F

Features and Benefits • 49
Functional Overview • 7, 51
Functional Specifications • 50

G

General Concepts • 51
General Specifications • 49
Guide to the MVI56-PNPM User Manual • 7

H

Hardware Specifications • 50
How to Contact Us
Sales and Support • 80

I

Install the Module in the Rack • 12
Installing and Configuring the Module • 19
Intellectual Property • 86

K

Key Press Representation (Function 7) • 77
Keystrokes • 32

L

Ladder Logic • 30
LED Status Indicators • 46
LIMITATION OF REMEDIES** • 85
LIMITED WARRANTY • 83

M

Main Logic Loop • 51
Main Menu • 34
Master Command Data List • 56
Master Command Error List Menu • 44
Master Command List • 63
Master Command List Menu • 45
Master Driver Mode • 62
Misc. Status • 75
Modifying the Module Configuration • 23
Module Configuration Data • 55
Module Data Object (PNPModuleDef) • 25

Moving Back Through 5 Pages of Registers • 43
MVI56-PNPM Configuration Data Definition • 26, 70, 72
MVI56-PNPM Database Definition • 70
MVI56-PNPM Status Data Definition • 28, 70, 71

N

Navigation • 31
No Other Warranties • 86
Normal Data Transfer • 53

O

Opening the Command Error List Menu • 35
Opening the Command List Menu • 35
Opening the Data Analyzer Menu • 34
Opening the Database Menu • 35

P

Package Contents • 10
Phantom Master Commands (PNPCmd) • 26
Phantom Port Parameters (PNPPort) • 26
Please Read This Notice • 2
Port 1 Commands • 74
Port 1 Setup • 73
Port 2 Commands • 74
Port 2 Setup • 74
Power Up • 24
Procedures for Return of Units Out of Warranty • 82
Procedures for Return of Units Under Warranty • 81
Product Specifications • 7, 49
Purchasing Warranty Extension • 83

R

Read Block • 53
Reading Status Data From the Module • 7, 31
Redisplaying the Current Page • 44, 45
Reference • 7, 49
Removing Timing Marks in the Data Analyzer • 38
Required Hardware • 32
Required Software • 32
Return Material Authorization (RMA) Policies and Conditions • 81
Returning to the Main Menu • 39, 43, 44, 45
RS-232 • 67
 Modem Connection • 67
 Null Modem Connection (Hardware Handshaking) • 68
 Null Modem Connection (No Hardware Handshaking) • 68

RS-232 Configuration/Debug Port • 64
RS-422 • 69
RS-485 • 69
RS-485 and RS-422 Tip • 69

S

Setting Jumpers • 11
Skipping 500 Registers of Data • 43
Slave Polling Control and Status • 29
Slave Status Blocks • 57
Start Here • 7, 9
Starting the Data Analyzer • 38
Status Object (PNPInStat) • 28
Stopping the Data Analyzer • 39
Support, Service & Warranty • 7, 79
System Requirements • 9

T

The Configuration/Debug Menu • 31
Time Limit for Bringing Suit • 85
Transferring Module Configuration to the Processor • 36
Troubleshooting • 48

U

Un-repairable Units • 82
User Data Objects • 28
Using the Configuration/Debug Port • 33

V

Viewing Block Transfer Statistics • 34
Viewing Data in ASCII (Text) Format • 38, 43
Viewing Data in Decimal Format • 43
Viewing Data in Floating Point Format • 43
Viewing Data in Hexadecimal Format • 38, 43
Viewing Module Configuration • 35
Viewing Port Communication Status • 36
Viewing Port Configuration • 36
Viewing Register Pages • 42
Viewing the Next 100 Registers of Data • 43
Viewing the Next 20 Commands • 44
Viewing the Next 50 Commands • 45
Viewing the Next Page of Commands • 44, 45
Viewing the Previous 100 Registers of Data • 43
Viewing the Previous 20 Commands • 44
Viewing the Previous 50 Commands • 45
Viewing the Previous Page of Commands • 44, 45
Viewing the Slave Status List (Port 1 and 2) • 35
Viewing Version Information • 35

W

- Warm Boot • 61
- Warm Booting the Module • 36
- Warnings • 2
- What Is Covered By This Warranty • 83
- What Is Not Covered By This Warranty • 84
- Write Block • 54
- Write Configuration • 60

Y

- Your Feedback Please • 3