ProSoft® TECHNOLOGY

Where Automation Connects.

inRAx®

MVI56-MDA4

ControlLogix Platform

MDA Scientific CM4 Platform Master Module

3/16/2009

USER MANUAL

MVI (Multi Vendor Interface) Modules

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
AVERTISSEMENT – RISQUE D'EXPLOSION – AVANT DE DÉCONNECTER L'EQUIPMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DÉSIGNÉ NON DANGEREUX.
CL I Div 2 GP A, B, C, D
Temp Code T5
II 3 G
Ex nA nL IIC T4 X
0° C <= Ta <= 60° C
II – Equipment intended for above ground use (not for use in mines).
3 – Category 3 equipment, investigated for normal operation only.
G – Equipment protected against explosive gasses.

Warnings

North America 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:

ISA	ISA 12.12.01 Class 1 Div 2
CSA/cUL	C22.2 No. 213-1987

243333

Battery Life Advisory

All modules in the MVI series use a rechargeable Lithium Vanadium Pentoxide battery to backup the 512K SRAM memory, real-time clock, and CMOS. The battery should last for the life of the module.
The module must be powered for approximately twenty hours before it becomes fully charged. After it is fully charged, the battery provides backup power for the CMOS setup and configuration data, the real-time clock, and the 512K SRAM memory for approximately 21 days.
Before you remove a module from its power source, ensure that the battery within the module is fully charged. A fully charged battery will hold the BIOS settings (after being removed from its power source) for a limited number of days. When the battery is fully discharged, the module will revert to the default BIOS settings.

Note: The battery is not user replaceable.

Your Feedback Please

We always want you to feel that you made the right decision to use our products. If you have suggestions, comments, compliments or complaints about the product, documentation or support, please write or call us.

ProSoft Technology
1675 Chester Avenue, Fourth Floor
Bakersfield, CA 93301
+1 (661) 716-5100
+1 (661) 716-5101 (Fax)
http://www.prosoft-technology.com

MVI56-MDA4 User Manual
3/16/2009

ProSoft® Product Documentation

In an effort to conserve paper, ProSoft Technology no longer includes printed manuals with our product shipments. User Manuals, Datasheets, Sample Ladder Files, and Configuration Files are provided on the enclosed CD and are available at no charge from our web site: http://www.prosoft-technology.com
Printed documentation is available for purchase. Contact ProSoft Technology for pricing and availability.
Asia Pacific: +603.7724.2080
Europe, Middle East, Africa: +33.5.34.36.87.20
Latin America: +1.281.298.9109
North America: +1.661.716.5100

Contents

Guide to the MVI56-MDA4 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 55) Diagnostics and Troubleshooting (page 47)	This section describes how to verify communications with the network. Diagnostic and Troubleshooting procedures.
Reference Product Specifications Functional Overview Glossary	→	Reference (page 59) Functional Overview (page 61) Product Specifications (page 59)	These sections contain general references associated with this product, Specifications, and the Functional Overview.
Support, Service, and Warranty Index	→	Support, Service and Warranty (page 85)	This section contains Support, Service and Warranty information. Index of chapters.

1 Start Here

In This Chapter

Installing the MVI56-MDA4 module requires a reasonable working knowledge of the Rockwell Automation hardware, the MVI56-MDA4 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-MDA4 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-MDA4 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
- ProSoft Configuration Builder, 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-MDA4 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-MDA4 Module	MVI56-MDA4	MDA Scientific CM4 Platform Master Module
1	Cable	Cable #15, RS232 Null Modem	For RS232 Connection to the CFG Port
3	Cable	Cable #14, RJ45 to DB9 Male Adapter cable	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-MDA4 module.

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

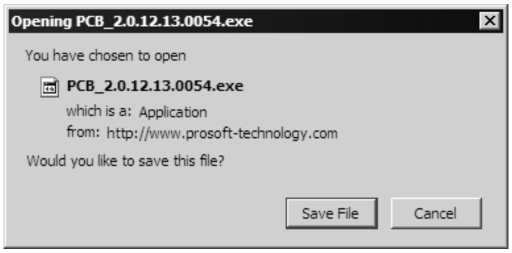
1.3 Install ProSoft Configuration Builder Software

You must install the ProSoft Configuration Builder (PCB) software in order to configure the MVI56-MDA4 module. You can always get the newest version of ProSoft Configuration Builder from the ProSoft Technology web site.

To install ProSoft Configuration Builder from the ProSoft Web Site

1. Open your web browser and navigate to http://www.prosoft-technology.com/pcb
2. Click the **Download Here** link to download the latest version of ProSoft Configuration Builder.

3 Choose "Save" or "Save File" when prompted. The following illustrations show the file download prompt for two of the most common web browsers.



Opening PCB_2.0.12.13.0054.exe

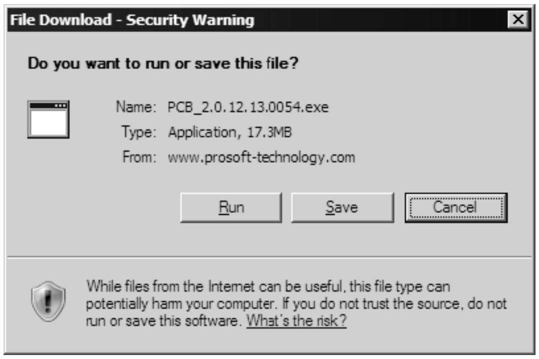
You have chosen to open

PCB_2.0.12.13.0054.exe

which is a: Application

from: http://www.prosoft-technology.com

Would you like to save this file?



File Download - Security Warning

Do you want to run or save this file?

Name: PCB_2.0.12.13.0054.exe

Type: Application, 17.3MB

From: www.prosoft-technology.com

While files from the Internet can be useful, this file type can potentially harm your computer. If you do not trust the source, do not run or save this software. What's the risk?

4 Save the file to your Desktop, so that you can find it easily when you have finished downloading.

5 When the download is complete, locate and open the file, and then follow the instructions on your screen to install the program.

If you do not have access to the Internet, you can install ProSoft Configuration Builder from the ProSoft Solutions CD-ROM, included in the package with your MVI56-MDA4 module.

To install ProSoft Configuration Builder from the Product CD

1 Insert the ProSoft Solutions Product CD into the CD drive of your PC. Wait for the startup screen to appear.

2 On the startup screen, click *Product Documentation*. This action opens an explorer window.

3 Click to open the *Utilities* folder. This folder contains all of the applications and files you will need to set up and configure your module.

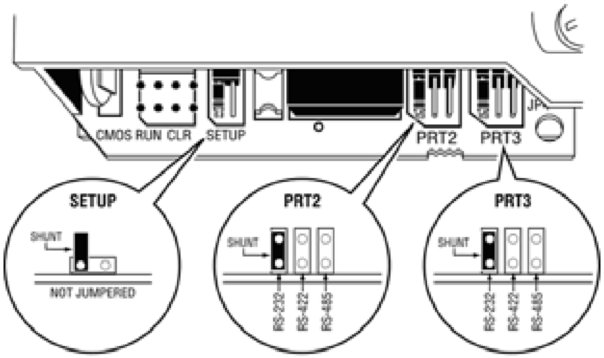
4 Double-click the *ProSoft Configuration Builder Setup* program and follow the instructions on your screen to install the software on your PC.

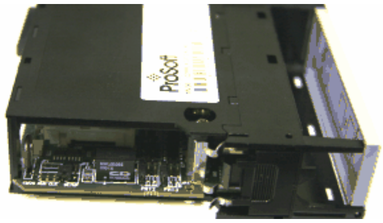
Note: Many of the configuration and maintenance procedures use files and other utilities on the CD-ROM. You may wish to copy the files from the Utilities folder on the CD-ROM to a convenient location on your hard drive.

1.4 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-MDA4 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.

1.5 Install the Module in the Rack

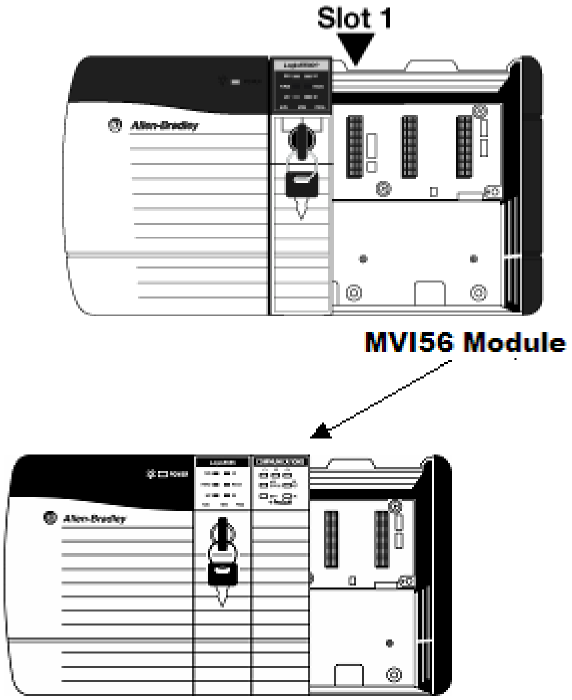
If you have not already installed and configured your ControlLogix processor and power supply, please do so before installing the MVI56-MDA4 module. Refer to your Rockwell Automation product documentation for installation instructions.

> 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-MDA4 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.

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

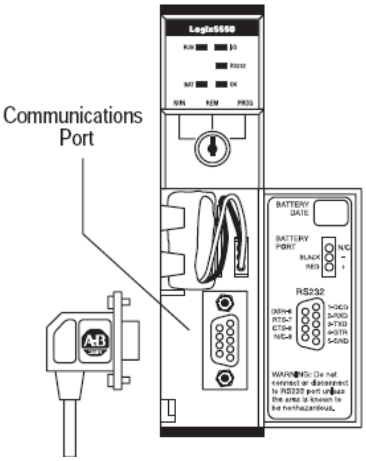


3 With a firm but steady push, snap the module into place.
4 Check that the holding clips on the top and bottom of the module are securely in the locking holes of the rack.
5 Make a note of the slot location. You will need to identify the slot in which the module is installed in order for the sample program to work correctly. Slot numbers are identified on the green circuit board (backplane) of the ControlLogix rack.
6 Turn power ON.

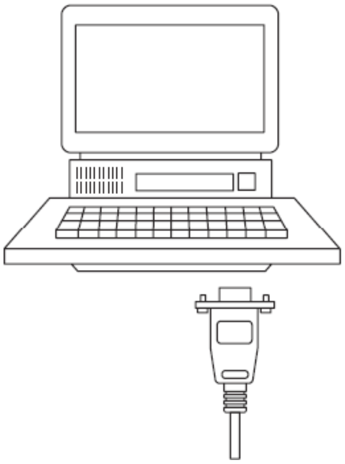
Note: If you insert the module improperly, the system may stop working, or may behave unpredictably.
Note: If you are installing MVI56-MDA4 with other modules connected to the PCI bus, the peripheral modules will not have holding clips. Make sure all of the modules are aligned with their respective slots before you snap them into place.

1.6 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.



1.7 Open the Sample Ladder Logic

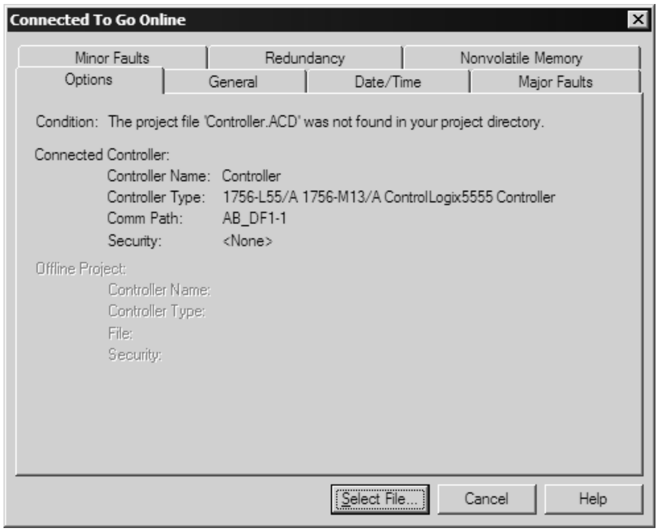
The sample program for your MVI56-MDA4 module includes custom tags, data types and ladder logic for data I/O and status monitoring. For most applications, you can run the sample ladder program without modification, or, for advanced applications, you can incorporate the sample program into your existing application.

The inRAx Solutions CD provides one or more versions of the sample ladder logic. The version number appended to the file name corresponds with the firmware version number of your ControlLogix processor. The firmware version and sample program version must match.

1.7.1 To Determine the Firmware Version of your Processor

Important: The RSLinx service must be installed and running on your computer in order for RSLogix to communicate with the processor. Refer to your RSLinx and RSLogix documentation for help configuring and troubleshooting these applications.

1 Connect an RS-232 serial cable from the COM (serial) port on your PC to the communication port on the front of the processor.
2 Start RSLogix 5000 and close any existing project that may be loaded.
3 Open the Communications menu and choose **Go Online**. RSLogix will establish communication with the processor. This may take a few moments.
4 When RSLogix has established communication with the processor, the Connected To Go Online dialog box will open.

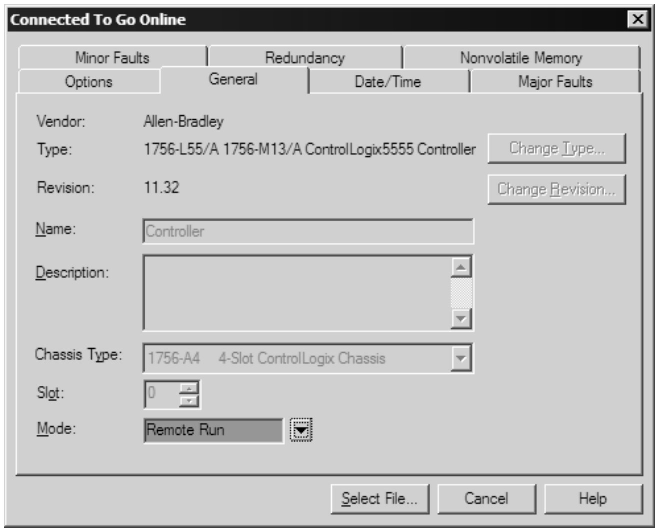


Condition: The project file 'Controller.ACD' was not found in your project directory.

Connected Controller:
Controller Name: Controller
Controller Type: 1756-L55/A 1756-M13/A ControlLogix5555 Controller
Comm Path: AB_DF1-1
Security: <None>

Offline Project:
Controller Name:
Controller Type:
File:
Security:

5 On the Connected To Go Online dialog box, click the General tab. This tab shows information about the processor, including the Revision (firmware) version. In the following illustration, the firmware version is 11.32



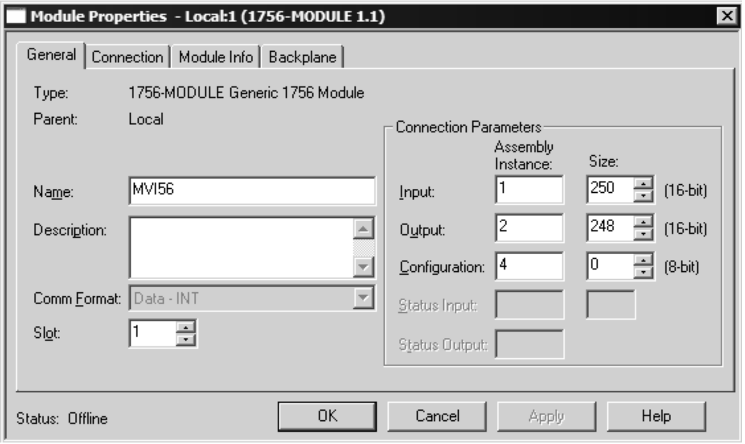
Vendor: Allen-Bradley
Type: 1756-L55/A 1756-M13/A ControlLogix5555 Controller
Revision: 11.32
Name: Controller
Description:
Chassis Type: 1756-A4 4-Slot ControlLogix Chassis
Slot: 0
Mode: Remote Run

1.7.2 Select the Slot Number for the Module

The sample application is for a module installed in Slot 1 in a ControlLogix rack. The ladder logic uses the slot number to identify the module. If you are installing the module in a different slot, you must update the ladder logic so that program tags and variables are correct, and do not conflict with other modules in the rack.

To change the slot number

1 In the Controller Organization list, select the module [1] 1756-MODULE MVI56, and then click the right mouse button to open a shortcut menu.
2 On the shortcut menu, choose **Properties**. This action opens the Module Properties dialog box.



Type: 1756-MODULE Generic 1756 Module
Parent: Local
Name: MVI56
Description:
Comm Format: Data - INT
Slot: 1

Connection Parameters

	Assembly Instance:	Size:	
Input:	1	250	(16-bit)
Output:	2	248	(16-bit)
Configuration:	4	0	(8-bit)
Status Input:			
Status Output:			

Status: Offline

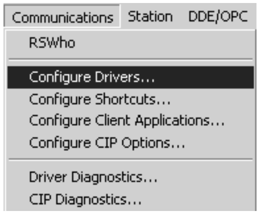
3 In the **Slot:** field, use the spinners on the right side of the field to select the slot number where the module will reside in the rack, and then click OK.

RSLogix will automatically apply the slot number change to all tags, variables and ladder logic rungs that use the MVI56-MDA4 slot number for computation.

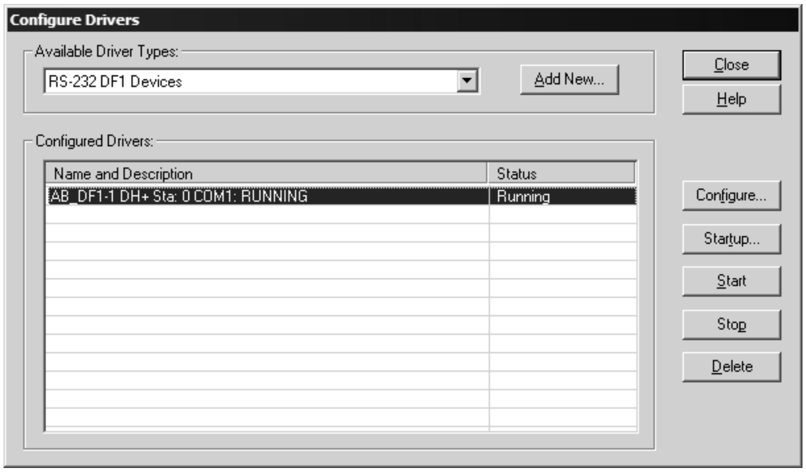
1.7.3 Configuring RSLinx

If RSLogix 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.



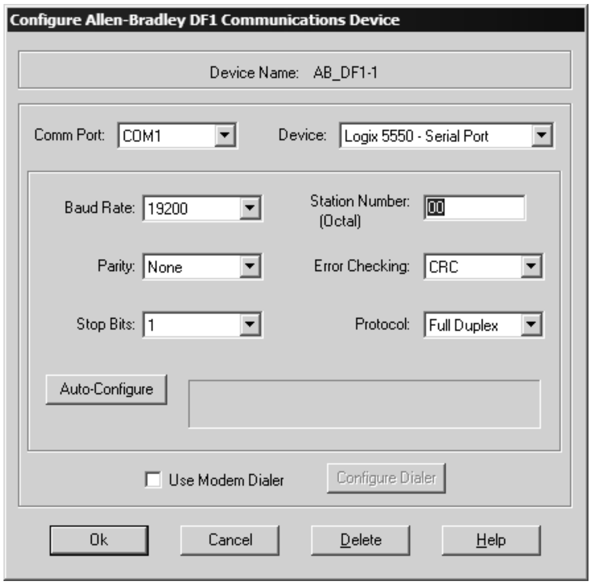
Available Driver Types: RS-232 DF1 Devices

Configured Drivers:

Name and Description	Status
AB_DF1-1 DH+ Sta: 0 COM1: RUNNING	Running

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.



Configure Allen-Bradley DF1 Communications Device

Device Name: AB_DF1-1

Comm Port: COM1

Device: Logix 5550 - Serial Port

Baud Rate: 19200

Station Number: (Octal) 00

Parity: None

Error Checking: CRC

Stop Bits: 1

Protocol: Full Duplex

☐ Use Modem Dialer

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.

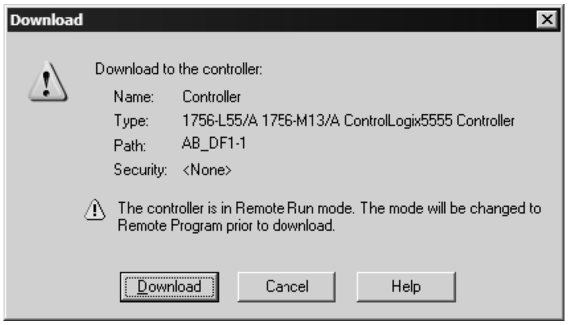
1.8 Download the Sample Program to the Processor

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

To download the sample program from RSLogix 5000 to the ControlLogix processor

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.



Download

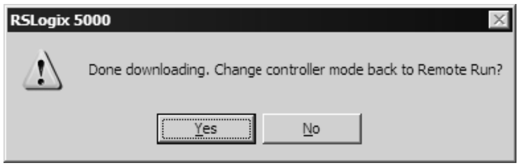
Download to the controller:

Name: Controller
Type: 1756-L55/A 1756-M13/A ControlLogix5555 Controller
Path: AB_DF1-1
Security: <None>

The controller is in Remote Run mode. The mode will be changed to Remote Program prior to download.

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.



RSLogix 5000

Done downloading. Change controller mode back to Remote Run?

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

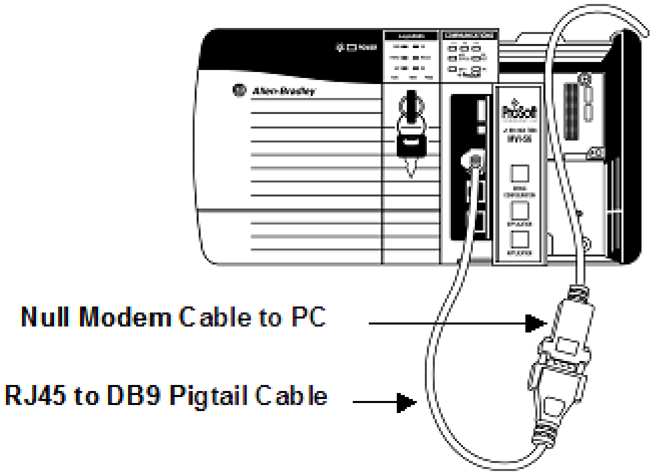
1.9 Connect your PC to the Module

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.



2 Configuring the MVI56-MDA4 Module

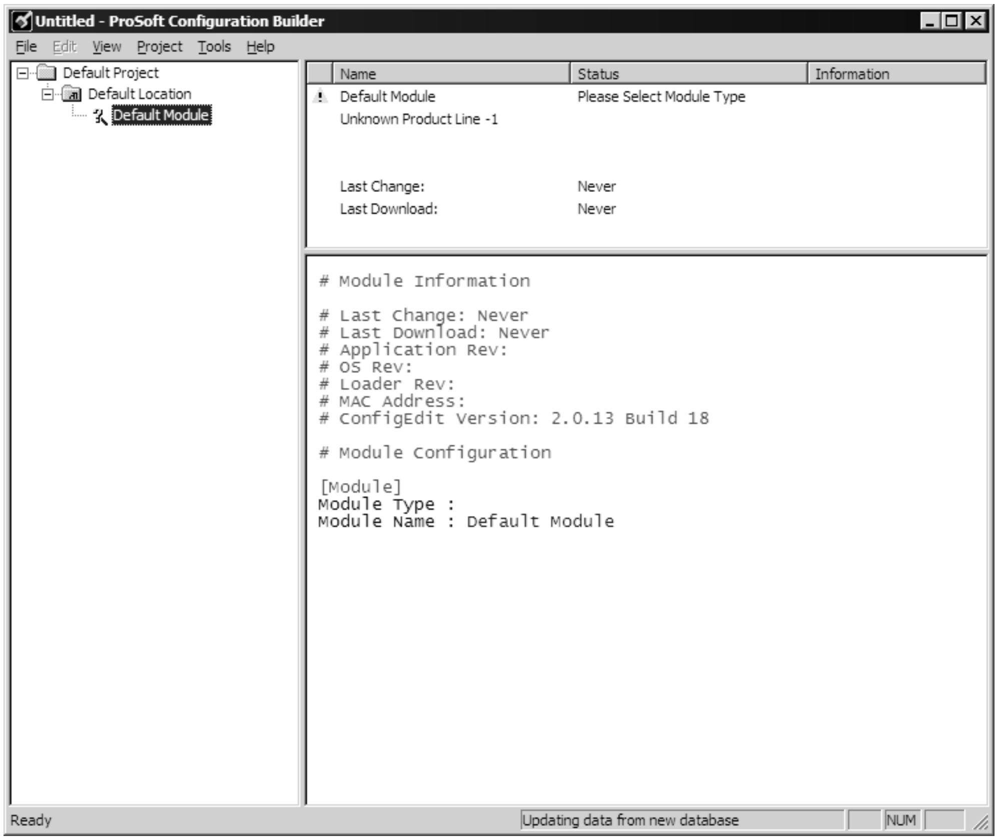
In This Chapter

2.1 ProSoft Configuration Builder

ProSoft Configuration Builder (PCB) provides a quick and easy way to manage module configuration files customized to meet your application needs. PCB is not only a powerful solution for new configuration files, but also allows you to import information from previously installed (known working) configurations to new projects.

2.1.1 Set Up the Project

To begin, start ProSoft Configuration Builder. If you have used other Windows configuration tools before, you will find the screen layout familiar. ProSoft Configuration Builder's window consists of a tree view on the left, an information pane and a configuration pane on the right side of the window. When you first start ProSoft Configuration Builder, the tree view consists of folders for Default Project and Default Location, with a Default Module in the Default Location folder. The following illustration shows the ProSoft Configuration Builder window with a new project.



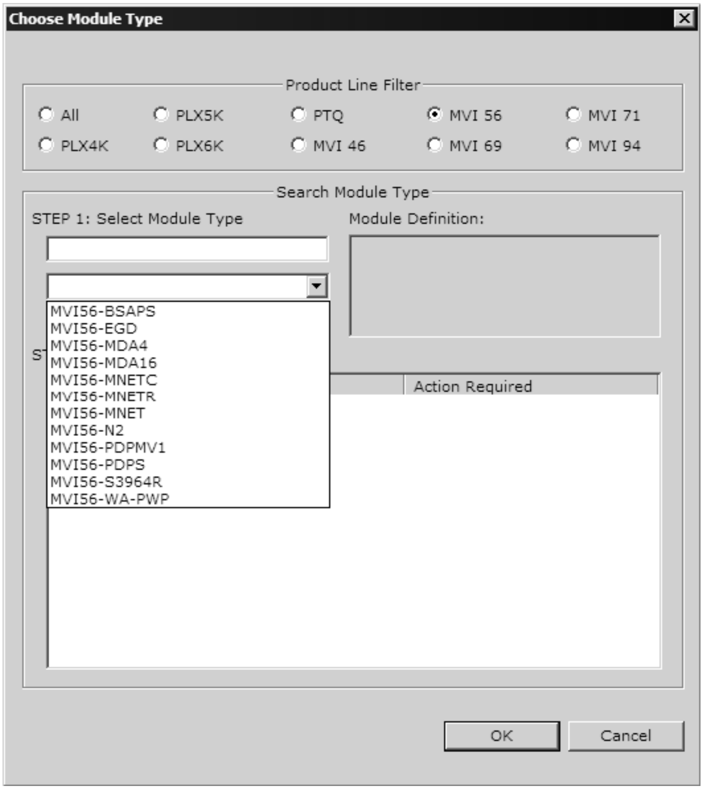
Name	Status	Information
Default Module	Please Select Module Type	
Unknown Product Line -1		
Last Change:	Never	
Last Download:	Never	

```
# Module Information

# Last Change: Never
# Last Download: Never
# Application Rev:
# OS Rev:
# Loader Rev:
# MAC Address:
# ConfigEdit Version: 2.0.13 Build 18

# Module Configuration

[Module]
Module Type :
Module Name : Default Module
```

Your first task is to add the MVI56-MDA4 module to the project.

1 Use the mouse to select "Default Module" in the tree view, and then click the right mouse button to open a shortcut menu.

2 On the shortcut menu, choose "Choose Module Type". This action opens the Choose Module Type dialog box.



3 In the Product Line Filter area of the dialog box, select MVI56. In the Select Module Type dropdown list, select MVI56-MDA4, and then click OK to save your settings and return to the ProSoft Configuration Builder window.

The next task is to set the module parameters.

Adding a Project

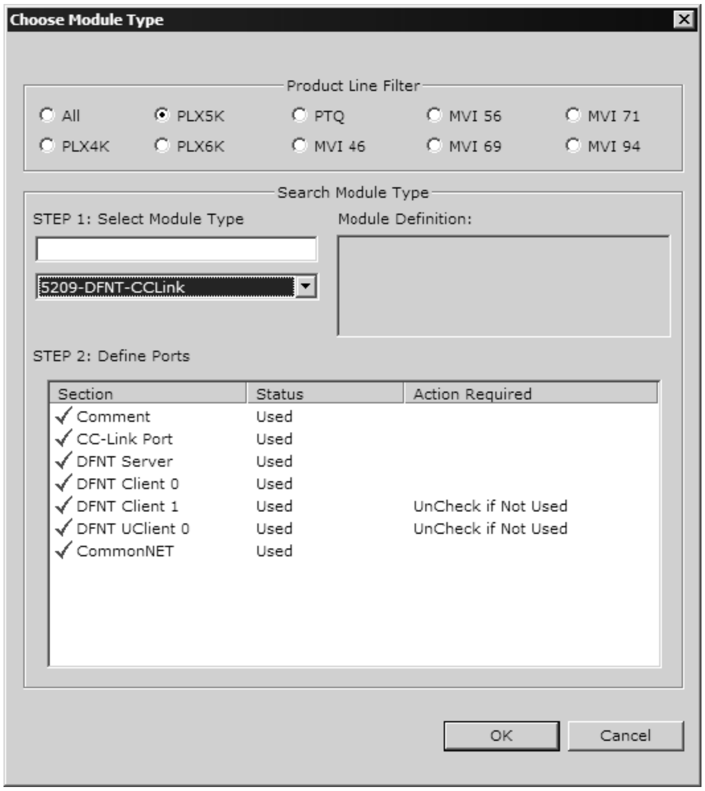
To add a project to an existing project file:

1 Select the Default Project icon.
2 Choose Project from the Project menu, then choose Add Project. A new project folder appears.

Adding a Module

To add a module to your project:

1 Double-click the Default Module icon to open the Choose Module Type dialog box.



Choose Module Type

Product Line Filter

○ All ● PLX5K ○ PTQ ○ MVI 56 ○ MVI 71
○ PLX4K ○ PLX6K ○ MVI 46 ○ MVI 69 ○ MVI 94

Search Module Type

STEP 1: Select Module Type: 5209-DFNT-CCLink

Module Definition:

STEP 2: Define Ports

Section	Status	Action Required
✓ Comment	Used	
✓ CC-Link Port	Used	
✓ DFNT Server	Used	
✓ DFNT Client 0	Used	
✓ DFNT Client 1	Used	UnCheck if Not Used
✓ DFNT UClient 0	Used	UnCheck if Not Used
✓ CommonNET	Used	

2 On the Choose Module Type dialog box, select the module type.

Or

1 Open the Project menu and choose Location.
2 On the Location menu, choose Add Module.

To add a module to a different location:

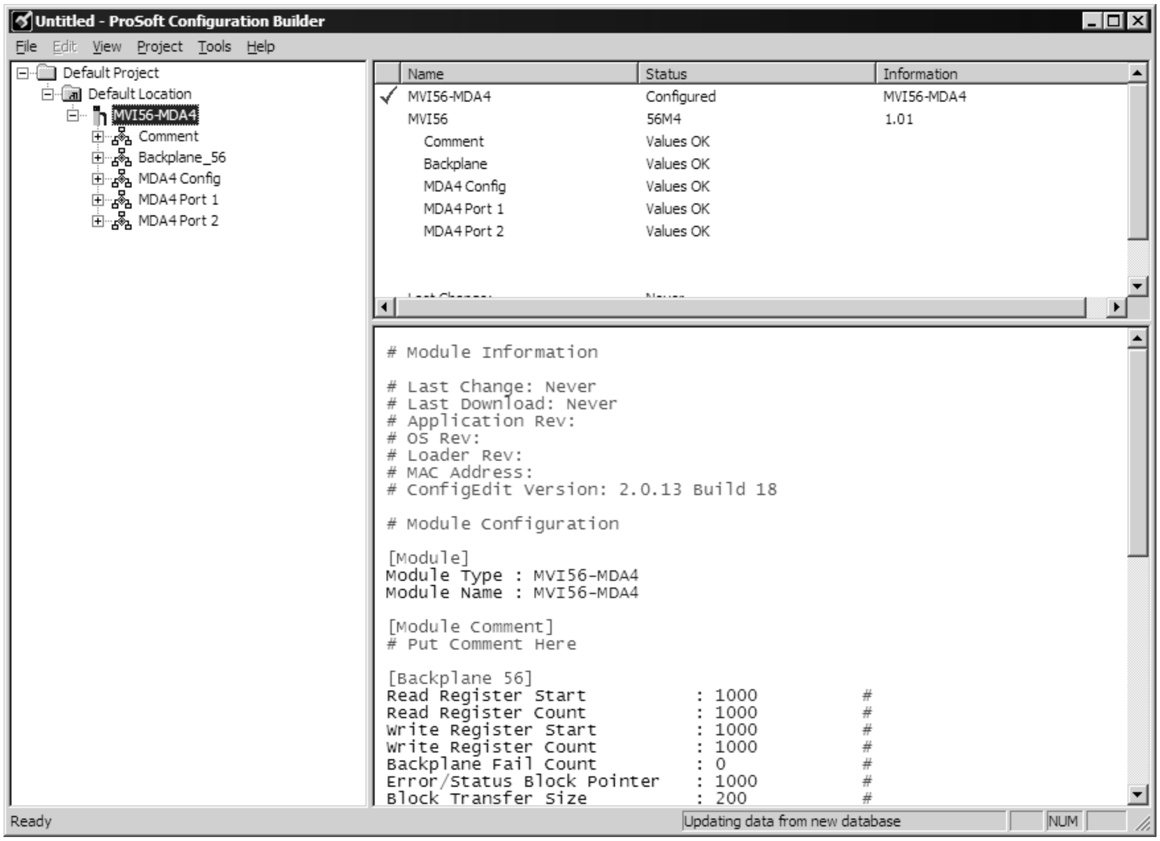
1 Right-click the Location folder and choose Add Module. A new module icon appears.

Or

1 Select the Location icon.
2 From the Project menu, select Location, then select Add Module.

2.1.2 Set Module Parameters

Notice that the contents of the information pane and the configuration pane changed when you added the MVI56-MDA4 module to the project.



	Name	Status	Information
✓	MVI56-MDA4	Configured	MVI56-MDA4
	MVI56	56M4	1.01
	Comment	Values OK	
	Backplane	Values OK	
	MDA4 Config	Values OK	
	MDA4 Port 1	Values OK	
	MDA4 Port 2	Values OK	

```
# Module Information

# Last Change: Never
# Last Download: Never
# Application Rev:
# OS Rev:
# Loader Rev:
# MAC Address:
# ConfigEdit Version: 2.0.13 Build 18

# Module Configuration

[Module]
Module Type : MVI56-MDA4
Module Name : MVI56-MDA4

[Module Comment]
# Put Comment Here

[Backplane 56]
Read Register Start          : 1000          #
Read Register Count          : 1000          #
Write Register Start         : 1000          #
Write Register Count         : 1000          #
Backplane Fail Count         : 0             #
Error/Status Block Pointer   : 1000          #
Block Transfer Size          : 200           #
```

At this time, you may wish to rename the "Default Project" and "Default Location" folders in the tree view.

To rename an object:

1. Select the object, and then click the right mouse button to open a shortcut menu. From the shortcut menu, choose Rename.
2. Type the name to assign to the object.
3. Click away from the object to save the new name.

Module Entries

To configure module parameters

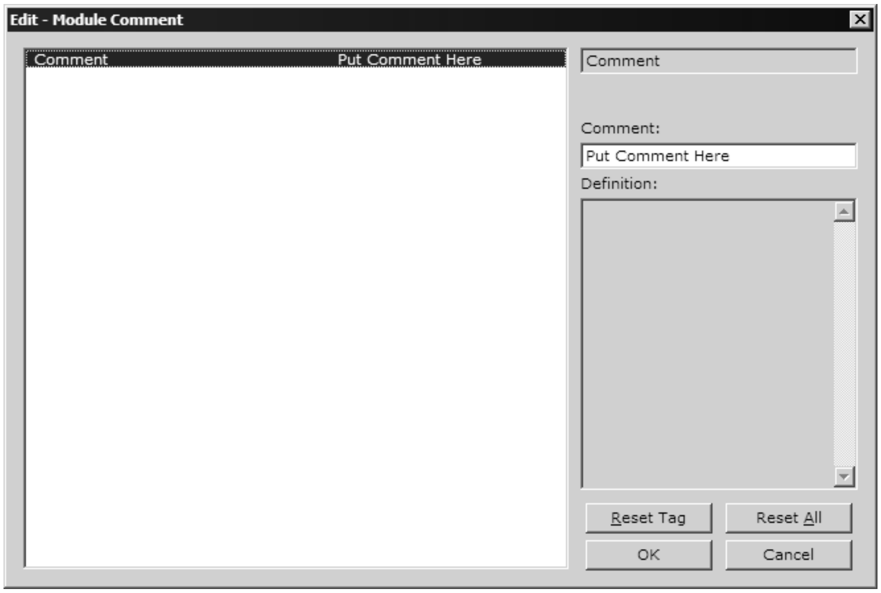
1. Click on the plus sign next to the icon ⊞ Comment to expand module information.
2. Double-click the Module Comment icon to open the Edit dialog box.
3. To edit a parameter, select the parameter in the left pane and make your changes in the right pane.
4. Click OK to save your changes.

Comment Entries

To add comments to your configuration file:

1 Click the plus sign to the left of the ⊞ Comment icon to expand the Module Comments.

2 Double-click the Module Comment icon. The Edit - Module Comment dialog appears.


Edit - Module Comment

Comment	Put Comment Here

Comment

Comment: Put Comment Here

Definition:

3 Enter your comment and click OK to save your changes.

Printing a Configuration File

To print a configuration file:

1 Select the Module icon, and then click the right mouse button to open a shortcut menu.

2 On the shortcut menu, choose View Configuration. This action opens the View Configuration window.

3 On the View Configuration window, open the File menu, and choose Print. This action opens the Print dialog box.

4 On the Print dialog box, choose the printer to use from the dropdown list, select printing options, and then click OK.

2.2 [Backplane 56]

This section designates database addresses for input and output on the module and on the processor, and identifies the method of failure for the communications for the module if the processor is not in run mode.

```
[Backplane 56]
Read Register Start         :   200 # Starting register in virtual database to
                                    # read from the processor
Read Register Count         :  4000 # Number of registers to read from the
                                    # processor
Write Register Start        :     0 # Starting register in virtual database to
                                    # write to the processor
Write Register Count        :   200 # Number of registers to write to the
                                    # processor
Backplane Fail Count        :    10 # Number of consecutive backplane transfer
                                    # failures before halting communications
Error/Status Block Pointer  :  6000 # Start of Status Table
Block Transfer Size         :   200 # Number of words in block (40/200)
```

2.2.1 Read Register Count

0 to 5000

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.

2.2.2 Write Register Start

0 to 4999

This parameter specifies the starting register in the module where the data will be transferred from the processor to the module. Valid range for this parameter is 0 to 4999.

2.2.3 Write Register Count

0 to 5000

This parameter specifies the number of registers to transfer from the processor to the module. Valid entry for this parameter is 0 to 5000 words.

2.2.4 Backplane Fail Count

0 to 65535

This parameter specifies the number of consecutive backplane transfer failures that can occur before communications should be halted.

2.2.5 Error/Status Block Pointer

-1 to 4955

Starting register location in virtual Modbus database for the error/status table. If a value of -1 is entered, the error/status data will not be placed in the database. All other valid values determine the starting location of the data. This data area includes the module version information and all server error/status data. Refer to Status Data Definition for more information.

2.2.6 Block Transfer Size

40 or 200

Choose the block transfer size to use for this module. Select 40 for remote rack installations, or systems where bandwidth is limited. Select 200 for local rack installations where bandwidth is sufficient to transfer large blocks during each processor scan cycle.

2.3 [MDA4 Config]

This section is used to define the MDA4 configuration data.

```
[MDA4 Config]
Number Of Slaves        :    2 # (1 - 10)
Reduced Data Structure  :   No # (Y/N)
Protocol Version        :    1 # (1/2)
Polling Delay           : 1000 # Polling delay in ms
```

2.3.1 Number of Slaves

0 to 10

This value should represent the total number of slaves which this module will be polling between the two ports. The module will support up to 10 CM4 units between the two ports. If not all 10 slots are being used, the operation of the module can be optimized by accurately selecting the number of slaves.

The optimization comes primarily from reduced number of data block transfers.

If 0 is configured the module assumes that all 10 slots are active.

2.3.2 Reduced Data Structure

Yes or No (default No)

The reduced data structure supports only:

- Communication Counter
- Communication Status Error
- Second
- Maintenance Status
- Last Concentration Pt.1
- Alarm Status Pt.1
- Last Concentration Pt.2

- Alarm Status Pt.2
- Last Concentration Pt.3
- Alarm Status Pt.3
- Last Concentration Pt.4
- Alarm Status Pt.4

2.3.3 Protocol Version

1 or 2 (default 1)

This is the protocol version that the CM4 slave unit is configured for. Newer machines support version 1 and 2, older machines support only version 1.

2.3.4 Polling Delay

0 to 65535 milliseconds (default 1000)

This is the time between polls from the master (MVI56-MDA4) to the slave. The master polls on this time interval sending the commands that are configured.

2.4 [MDA4 Port x]

This section is used to configure the application port for the MDA4 protocol.

```
[MDA4 Port 1]
Enable            :   Yes # No=Port Disabled,Yes=Port Enabled
Baud Rate         :  9600 # Baud rate for port (300, 600, 1200, 2400, 4800,
                          # 9600, 19200, 38400, 57600, 115200)
Parity : None  #N=None,O=Odd,E=Even
Data Bits         :     8 # 7 or 8 data bits for messages
Stop Bits         :     1 # 1 or 2 stop bits for messages
RTS On            :     0 # Delay after RTS set before message sent (mSec)
RTS Off           :     0 # Delay after message before RTS dropped (mSec)
Use CTS Line      :    No # Monitor CTS modem line (Y/N)
Response Timeout  : 50000 # Maximum number of mSec to receive complete response
                          # (1-65535ms)
```

2.4.1 Enabled

Yes or No

This flag specifies if the port on the module will be utilized. If the parameter is set to No, the port will not be used. If the parameter is set to Yes, the port will be used supporting the MDA4 protocol.

2.4.2 Baud Rate

This parameter specifies the baud rate to be used on the communication channel (port). Values from 300 to 115K are supported.

2.4.3 Parity

None, Odd, Even

Parity is a simple error checking algorithm used in serial communication. This parameter specifies the type of parity checking to use.

All devices communicating through this port must use the same parity setting.

2.4.4 Data Bits

7 or 8

This parameter sets the number of data bits for each word used by the protocol. All devices communicating through this port must use the same number of data bits.

2.4.5 Stop Bits

1 or 2

Stop bits signal the end of a character in the data stream. For most applications, use one stop bit. For slower devices that require more time to resynchronize, use two stop bits.

All devices communicating through this port must use the same number of stop bits.

2.4.6 RTS On

0 to 65535 milliseconds

This parameter sets the number of milliseconds to delay after RTS is asserted before the data will be transmitted.

2.4.7 RTS Off

0 to 65535 milliseconds

This parameter sets the number of milliseconds to delay after the last byte of data is sent before the RTS modem signal will be set low.

2.4.8 Use CTS Line

Yes or No

This parameter specifies if the CTS modem control line is to be used. If the parameter is set to No, the CTS line will not be monitored. If the parameter is set to Yes, the CTS line will be monitored and must be high before the module will send data. Normally, this parameter is required when half-duplex modems are used for communication (2-wire).

2.4.9 Response Timeout

0 to 65535 milliseconds

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.

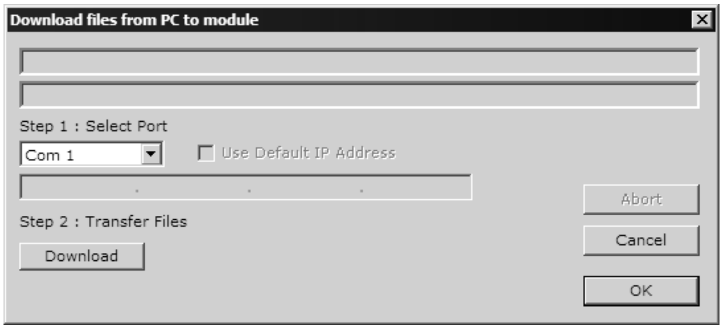
2.5 Download the Project to the Module

In order for the module to use the settings you configured, you must download (copy) the updated Project file from your PC to the module.

To Download the Project File

1 In the tree view in ProSoft Configuration Builder, click once to select the MVI56-MDA4 module.

2 Open the **Project menu,** and then choose **Module / Download**. The program will scan your PC for a valid com port (this may take a few seconds). When PCB has found a valid com port, the following dialog box will open.

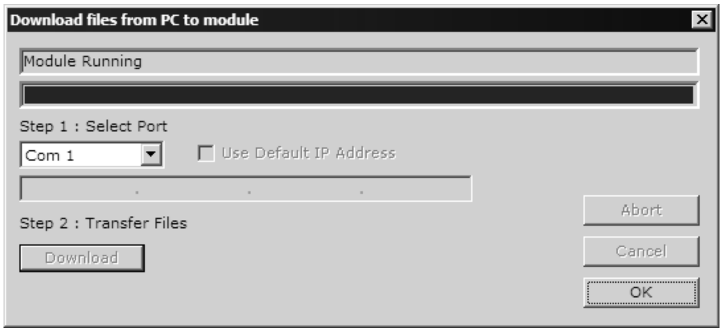

Download files from PC to module

Step 1 : Select Port: Com 1

☐ Use Default IP Address

3 Choose the com port to use from the dropdown list, and then click the Download button.

The module will perform a platform check to read and load its new settings. When the platform check is complete, the status bar in ProSoft Configuration Builder will be updated with the message *"Module Running*".


Download files from PC to module

Module Running

Step 1 : Select Port: Com 1

☐ Use Default IP Address

3 Ladder Logic

In This Chapter

Ladder logic is required for application of the MVI56-MDA4 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.

3.1 Module Data

This section describes the controller tags that are defined in the example logic to interface with the module. The user can extend these tags to meet the specifications required for their application. Additional data is required if the MSG instructions pass data between the module and the processor.

3.1.1 Module Status Data and Variables (MDA4)

All status and variable data related to the MVI56-MDA4 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 following table describes the structure of this object.

Name	Data Type	Description
Backplane	MDA4Backplane	
Statistics	MDA4InStat	
Data	MDA4Data	
ActiveSlaves	MDA4PollingList	
CmndCtrlBlock	CommandControlBlock[10]	
Result	INT[4]	
SubScript	INT	

This object contains objects that define variables to be used with the module and status data related to the module. Each of these object types is discussed in the following topics of the document.

Status Object (MDA4InStat)

This object stores the status data of the module. The MDA4InStat 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[4]	Product Name
Code	INT[2]	
Rev	INT[2]	Revision Level Number
OP	INT[2]	Operating Level Number
Run	INT[2]	Run Number
PrtErrs	MDA4PortErrors[2]	Port error statistics
BlkErrs	MDA4BlkStat	Block transfer statistics
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

Within the MDA4InStat objects are objects containing the status information for each application port. Refer to Status Data Definition (page 83) for a complete listing of the data stored in this object.

- For the Reduced Data Block, this data is acquired from the module using a MSG instruction.
- For the Large Data Block, this data is acquired with each block.

Channel Status Object (MDA4PortErrors)

The MDA4PortErrors object holds the status data related to a single CM4 port. The following table describes the structure of this object.

Name	Data Type	Description
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

This information is passed to the controller from the module with each normal read block image.

Backplane Object (MDA4Backplane)

The MDA4Backplane object stores all the variables required for the data transfer operation between the module and the controller. The LastRead data member is used as the handshaking byte to indicate the arrival of new data from the module. The following table describes the structure of the object.

Name	Data Type	Description
LastRead	INT	Index of last read block
LastWrite	INT	Index of last write block
BlockIndex	INT	Computed block offset for data table

The other members of the object are utilized in the ladder logic to assist in the data transfer operation.

3.1.2 Data Object

Data for the module is stored in MDAData tag for the example ladder logic. The read data (data transferred from the module to the processor) is stored in the controller tag MDA4.Response[ ].

Name	Data Type	Description
Response	Response[10]	

3.1.3 Command Control Block Object

In order to send commands to the module, two controller tags are constructed, CommandControl and MDA4PollingList. The bits in the array trigger the commands. The following table describes the structure of this object.

CommandControlBlock

Name	Data Type	Description
ReadCmdEnable	INT	
WriteCmdEnable	INT	
AlarmFaultResetSel	INT	
LockKbdCmd	INT	
LockKbdKeycode	INT	
Reserved1	INT	
Reserved2	INT	
Reserved3	INT	
Reserved4	INT	
Reserved5	INT	

MDA4PollingList

Name	Data Type	Description
PortSelect1	INT	Port select (0/1)
SlaveID1	INT	Slave ID (1/255)
PortSelect2	INT	Port select (0/1)
SlaveID2	INT	Slave ID (1/255)
PortSelect3	INT	Port select (0/1)
SlaveID3	INT	Slave ID (1/255)
PortSelect4	INT	Port select (0/1)
SlaveID4	INT	Slave ID (1/255)
PortSelect5	INT	Port select (0/1)
SlaveID5	INT	Slave ID (1/255)
PortSelect6	INT	Port select (0/1)
SlaveID6	INT	Slave ID (1/255)
PortSelect7	INT	Port select (0/1)
SlaveID7	INT	Slave ID (1/255)
PortSelect8	INT	Port select (0/1)

Name	Data Type	Description
SlaveID8	INT	Slave ID (1/255)
PortSelect9	INT	Port select (0/1)
SlaveID9	INT	Slave ID (1/255)
PortSelect10	INT	Port select (0/1)
SlaveID10	INT	Slave ID (1/255)

3.1.4 User Data Objects

These objects hold data to be transferred between the processor and the MVI56-MDA4 module. The user data is the read data transferred between the processor and the module as "pages" of data up to 200 words long.

Name	Data Type	Description
CommCounter	INT	Increments each time communication with the slave occurs
CommStatusError	INT	Communication Status
ReadComDone	INT	
WriteCmdDone	INT	
AlarmResetStatus	INT	
LockKbdStatus	INT	
EndPntLockResults	INT	
StartPntLockResults	INT	
Spare1	INT	
Spare2	INT	
Month	INT	
Day	INT	
Year	INT	
Hour	INT	
Minute	INT	
Second	INT	
NumberOfAlarms	INT	
Spare3	INT	
Spare4	INT	
Spare5	INT	
SerialNumber	INT	
SoftwareRev	INT	
VIP	INT	
PromCsumMsb	INT	
PromCsumLsb	INT	
StatusReadVerified	INT	
GeneralStatus	INT	
FlashMemRemain	INT	
ChemcassetteWinRemain	INT	

Name	Data Type	Description
ChemcassetteDaysRemain	INT	
InternalFilterdays	INT	
ExternalFilterDays	INT	
FlowRatePt1	INT	
FlowRatePt2	INT	
FlowRatePt3	INT	
FlowRatePt4	INT	
StatusOpticsCalMaint	INT	
Spare6	INT	
Spare7	INT	
Spare8	INT	
MDAGasAbrv1Pt1	INT	
MDAGasAbrv2Pt1	INT	
MDAGasAbrv3Pt1	INT	
FormatCodePt1	INT	
FlowRateCurrentPt1	INT	
TWAStartDatePt1	INT	
TWAStartTimePt1	INT	
TWAEndDatePt1	INT	
TWAEndTimePt1	INT	
TWAConcPt1	INT	
LastConcPt1	INT	
AlarmStatusPt1	INT	
PointStatusPt1	INT	
PointCfgStatusPt1	INT	
AlarmLevel1Pt1	INT	
AlarmLevel2Pt1	INT	
Spare1Pt1	INT	
Spare2Pt1	INT	
Spare3Pt1	INT	
Spare4Pt1	INT	
MDAGasAbrv1Pt2	INT	
MDAGasAbrv2Pt2	INT	
MDAGasAbrv3Pt2	INT	
FormatCodePt2	INT	
FlowRateCurrentPt2	INT	
TWAStartDatePt2	INT	
TWAStartTimePt2	INT	
TWAEndDatePt2	INT	
TWAEndTimePt2	INT	
TWAConcPt2	INT	

Name	Data Type	Description
LastConcPt2	INT	
AlarmStatusPt2	INT	
PointStatusPt2	INT	
PointCfgStatusPt2	INT	
AlarmLevel1Pt2	INT	
AlarmLevel2Pt2	INT	
Spare1Pt2	INT	
Spare2Pt2	INT	
Spare3Pt2	INT	
Spare4Pt2	INT	
MDAGasAbrv1Pt3	INT	
MDAGasAbrv2Pt3	INT	
MDAGasAbrv3Pt3	INT	
FormatCodePt3	INT	
FlowRateCurrentPt3	INT	
TWAStartDatePt3	INT	
TWAStartTimePt3	INT	
TWAEndDatePt3	INT	
TWAEndTimePt3	INT	
TWAConcPt3	INT	
LastConcPt3	INT	
AlarmStatusPt3	INT	
PointStatusPt3	INT	
PointCfgStatusPt3	INT	
AlarmLevel1Pt3	INT	
AlarmLevel2Pt3	INT	
Spare1Pt3	INT	
Spare2Pt3	INT	
Spare3Pt3	INT	
Spare4Pt3	INT	
MDAGasAbrv1Pt4	INT	
MDAGasAbrv2Pt4	INT	
MDAGasAbrv3Pt4	INT	
FormatCodePt4	INT	
FlowRateCurrentPt4	INT	
TWAStartDatePt4	INT	
TWAStartTimePt4	INT	
TWAEndDatePt4	INT	
TWAEndTimePt4	INT	
TWAConcPt4	INT	
LastConcPt4	INT	

Name	Data Type	Description
AlarmStatusPt4	INT	
PointStatusPt4	INT	
PointCfgStatusPt4	INT	
AlarmLevel1Pt4	INT	
AlarmLevel2Pt4	INT	
Spare1Pt4	INT	
Spare2Pt4	INT	
Spare3Pt4	INT	
Spare4Pt4	INT	
AI1DateStamp	INT	
AI1TimeStamp	INT	
AI1GasAbrv1	INT	
AI1GasAbrv2	INT	
AI1GasAbrv3	INT	
AI1PtNumber	INT	
AI1Formatcode	INT	
AI1Concentration	INT	
AI1AlarmLevel	INT	
AI1Spare	INT	
AI2DateStamp	INT	
AI2TimeStamp	INT	
AI2GasAbrv1	INT	
AI2GasAbrv2	INT	
AI2GasAbrv3	INT	
AI2PtNumber	INT	
AI2Formatcode	INT	
AI2Concentration	INT	
AI2AlarmLevel	INT	
AI2Spare	INT	
AI3DateStamp	INT	
AI3TimeStamp	INT	
AI3GasAbrv1	INT	
AI3GasAbrv2	INT	
AI3GasAbrv3	INT	
AI3PtNumber	INT	
AI3Formatcode	INT	
AI3Concentration	INT	
AI3AlarmLevel	INT	
AI3Spare	INT	
AI4DateStamp	INT	
AI4TimeStamp	INT	

Name	Data Type	Description
AI4GasAbrv1	INT	
AI4GasAbrv2	INT	
AI4GasAbrv3	INT	
AI4PtNumber	INT	
AI4Formatcode	INT	
AI4Concentration	INT	
AI4AlarmLevel	INT	
AI4Spare	INT	
AI5DateStamp	INT	
AI5TimeStamp	INT	
AI5GasAbrv1	INT	
AI5GasAbrv2	INT	
AI5GasAbrv3	INT	
AI5PtNumber	INT	
AI5Formatcode	INT	
AI5Concentration	INT	
AI5AlarmLevel	INT	
AI5Spare	INT	
AI6DateStamp	INT	
AI6TimeStamp	INT	
AI6GasAbrv1	INT	
AI6GasAbrv2	INT	
AI6GasAbrv3	INT	
AI6PtNumber	INT	
AI6Formatcode	INT	
AI6Concentration	INT	
AI6AlarmLevel	INT	
AI6Spare	INT	
AI7DateStamp	INT	
AI7TimeStamp	INT	
AI7GasAbrv1	INT	
AI7GasAbrv2	INT	
AI7GasAbrv3	INT	
AI7PtNumber	INT	
AI7Formatcode	INT	
AI7Concentration	INT	
AI7AlarmLevel	INT	
AI7Spare	INT	
AI8DateStamp	INT	
AI8TimeStamp	INT	
AI8GasAbrv1	INT	

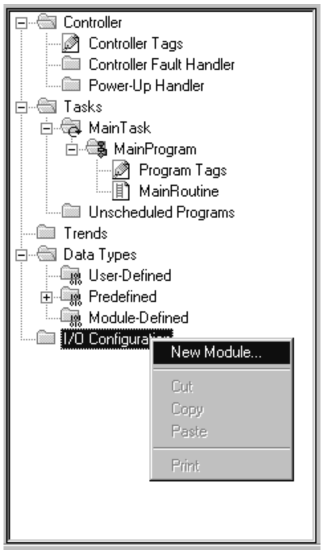
Name	Data Type	Description
AI8GasAbrv2	INT	
AI8GasAbrv3	INT	
AI8PtNumber	INT	
AI8Formatcode	INT	
AI8Concentration	INT	
AI8AlarmLevel	INT	
AI8Spare	INT	
AI9DateStamp	INT	
AI9TimeStamp	INT	
AI9GasAbrv1	INT	
AI9GasAbrv2	INT	
AI9GasAbrv3	INT	
AI9PtNumber	INT	
AI9Formatcode	INT	
AI9Concentration	INT	
AI9AlarmLevel	INT	
AI9Spare	INT	
AI10DateStamp	INT	
AI10TimeStamp	INT	
AI10GasAbrv1	INT	
AI10GasAbrv2	INT	
AI10GasAbrv3	INT	
AI10PtNumber	INT	
AI10Formatcode	INT	
AI10Concentration	INT	
AI10AlarmLevel	INT	
AI10Spare	INT	
AI11DateStamp	INT	
AI11TimeStamp	INT	
AI11GasAbrv1	INT	
AI11GasAbrv2	INT	
AI11GasAbrv3	INT	
AI11PtNumber	INT	
AI11Formatcode	INT	
AI11Concentration	INT	
AI11AlarmLevel	INT	
AI11Spare	INT	
AI12DateStamp	INT	
AI12TimeStamp	INT	
AI12GasAbrv1	INT	
AI12GasAbrv2	INT	

Name	Data Type	Description
AI12GasAbrv3	INT	
AI12PtNumber	INT	
AI12Formatcode	INT	
AI12Concentration	INT	
AI12AlarmLevel	INT	
AI12Spare	INT	
AI13DateStamp	INT	
AI13TimeStamp	INT	
AI13GasAbrv1	INT	
AI13GasAbrv2	INT	
AI13GasAbrv3	INT	
AI13PtNumber	INT	
AI13Formatcode	INT	
AI13Concentration	INT	
AI13AlarmLevel	INT	
AI13Spare	INT	
AI14DateStamp	INT	
AI14TimeStamp	INT	
AI14GasAbrv1	INT	
AI14GasAbrv2	INT	
AI14GasAbrv3	INT	
AI14PtNumber	INT	
AI14Formatcode	INT	
AI14Concentration	INT	
AI14AlarmLevel	INT	
AI14Spare	INT	
AI15DateStamp	INT	
AI15TimeStamp	INT	
AI15GasAbrv1	INT	
AI15GasAbrv2	INT	
AI15GasAbrv3	INT	
AI15PtNumber	INT	
AI15Formatcode	INT	
AI15Concentration	INT	
AI15AlarmLevel	INT	
AI15Spare	INT	
AI16DateStamp	INT	
AI16TimeStamp	INT	
AI16GasAbrv1	INT	
AI16GasAbrv2	INT	
AI16GasAbrv3	INT	

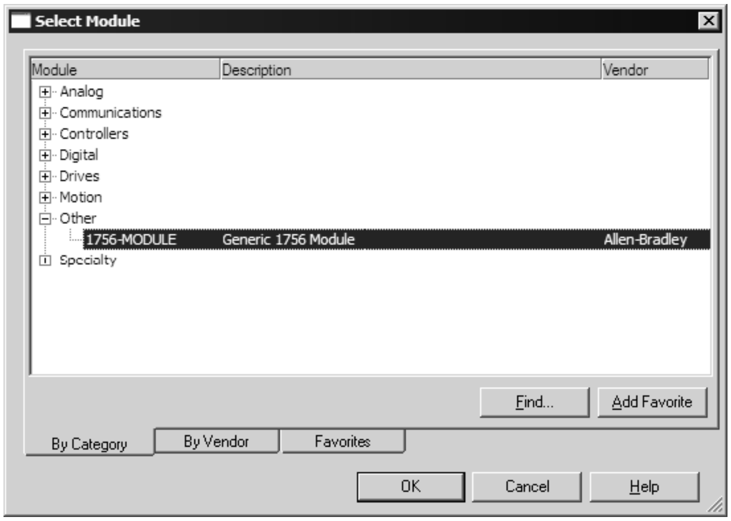
Name	Data Type	Description
AI16PtNumber	INT	
AI16Formatcode	INT	
AI16Concentration	INT	
AI16AlarmLevel	INT	
AI16Spare	INT	
Reserved	INT[20]	

3.2 Adding the Module to an Existing Project

1 Add the MVI56-MDA4 **module to the project.** 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.



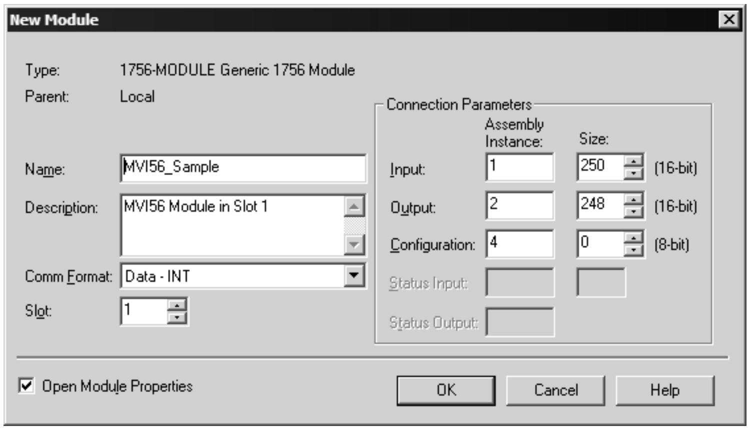
This action opens the following dialog box:



Select Module

Module	Description	Vendor
⊞ Analog		
⊞ Communications		
⊞ Controllers		
⊞ Digital		
⊞ Drives		
⊞ Motion		
⊟ Other		
1756-MODULE	Generic 1756 Module	Allen-Bradley
⊞ Specialty		

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



New Module

Type: 1756-MODULE Generic 1756 Module
Parent: Local
Name: MVI56_Sample
Description: MVI56 Module in Slot 1
Comm Format: Data - INT
Slot: 1

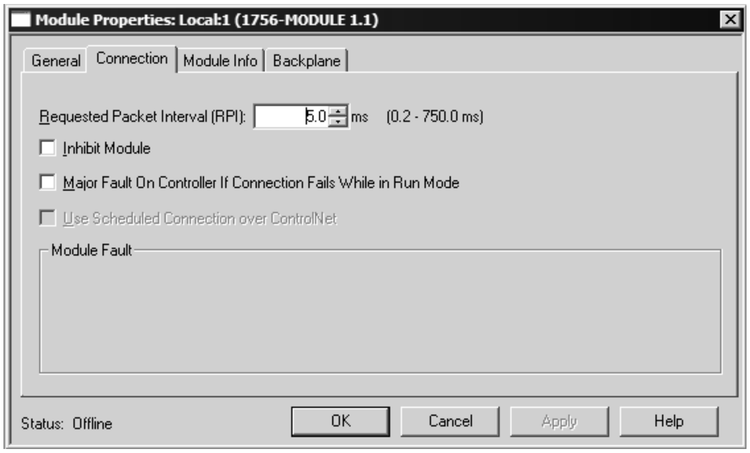
Connection Parameters

	Assembly Instance:	Size:	
Input:	1	250	(16-bit)
Output:	2	248	(16-bit)
Configuration:	4	0	(8-bit)
Status Input:			
Status Output:			

☑ Open Module Properties

Enter the Name, Description and Slot options for your application. You must select the **Comm Format** as **Data - INT** in the dialog box, otherwise the module will not communicate over the backplane of the ControlLogix rack. Click OK to continue.

2 **Edit the Module Properties.** Select the Requested Packet Interval value for scanning the I/O on the module. This value represents the minimum frequency that the module will handle scheduled events. This value should not be set to less than 1 millisecond. The default value is 5 milliseconds. Values between 1 and 10 milliseconds should work with most applications.



Requested Packet Interval (RPI): 5.0 ms (0.2 - 750.0 ms)

□ Inhibit Module

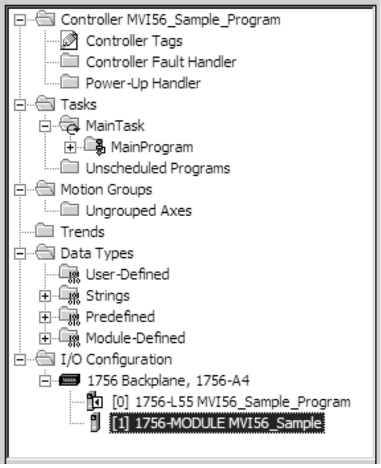
□ Major Fault On Controller If Connection Fails While in Run Mode

□ Use Scheduled Connection over ControlNet

Module Fault

Status: Offline

3 Save the module. Click OK to dismiss the dialog box. The Controller Organization window now displays the module's presence. The following illustration shows the Controller Organization window:



```
Controller MVI56_Sample_Program
    Controller Tags
    Controller Fault Handler
    Power-Up Handler
Tasks
    MainTask
        MainProgram
    Unscheduled Programs
Motion Groups
    Ungrouped Axes
Trends
Data Types
    User-Defined
    Strings
    Predefined
    Module-Defined
I/O Configuration
    1756 Backplane, 1756-A4
        [0] 1756-L55 MVI56_Sample_Program
        [1] 1756-MODULE MVI56_Sample
```

4 Copy the Controller Tags from the sample program.
5 Copy the User Defined Data Types from the sample program.
6 Copy the Ladder Rungs from the sample program.
7 Save and Download (page 18) the new application to the controller and place the processor in run mode.

4 Diagnostics and Troubleshooting

In This Chapter

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-MDA4 module returns a 29-word Status Data Block that may be used to determine the module's operating status. This data is located in the module's database in registers 5000 through 5028.

This data is transferred to the ControlLogix processor continuously with each read block.

The Configuration/Debug port provides the following functionality:

- Full view of the module's configuration data
- View of the module's status data
- Complete display of the module's internal database (registers 0 to 6999)
- Version Information
- Control over the module (warm boot, cold boot, transfer configuration)

4.1.1 Required Hardware

You can connect directly from your computer's serial port to the serial port on the module to view configuration information, perform maintenance, and send (upload) or receive (download) configuration files.

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 UART hardware-based serial communications port available. USB-based virtual UART systems (USB to serial port adapters) often do not function reliably, especially during binary file transfers, such as when uploading/downloading configuration files or module firmware upgrades.
- A null modem serial cable.

4.1.2 The Configuration/Debug Menu

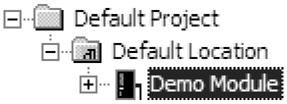
The Configuration and Debug menu for this module is arranged as a tree structure, with the Main Menu at the top of the tree, and one or more sub-menus for each menu command. The first menu you see when you connect to the module is the Main menu.

Because this is a text-based menu system, you enter commands by typing the command letter from your computer keyboard in the diagnostic window in ProSoft Configuration Builder (PCB). 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.

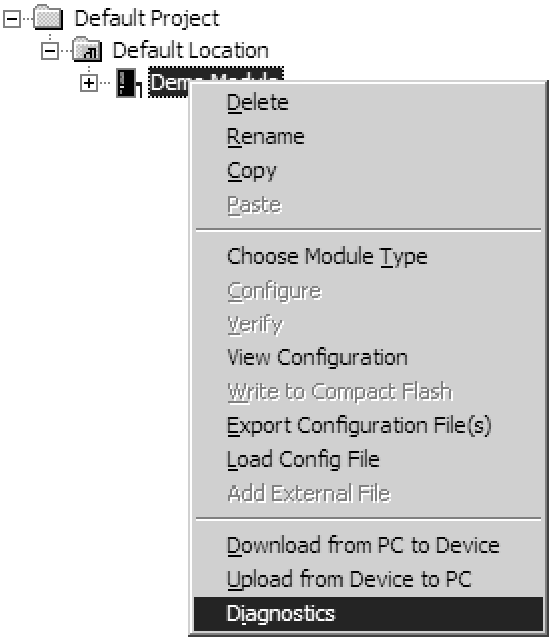
Using the Diagnostic Window in ProSoft Configuration Builder

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

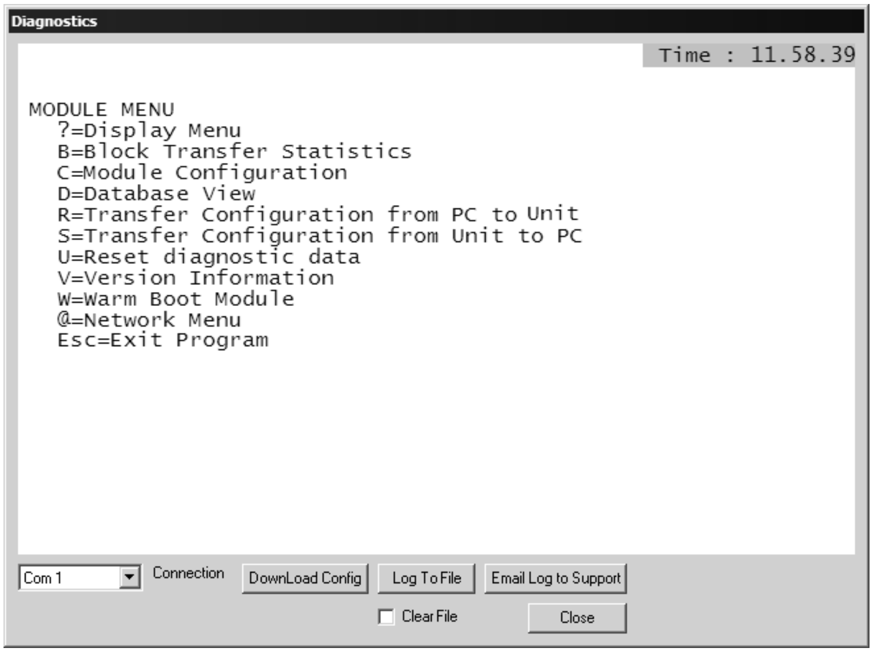
1 Start PCB program with the application file to be tested. Right click over the module icon.



2 On the shortcut menu, choose Diagnostics.



3 This action opens the Diagnostics dialog box. Press "?" to display the Main Menu.



```
                                                  Time : 11.58.39

MODULE MENU
  ?=Display Menu
  B=Block Transfer Statistics
  C=Module Configuration
  D=Database View
  R=Transfer Configuration from PC to Unit
  S=Transfer Configuration from Unit to PC
  U=Reset diagnostic data
  V=Version Information
  W=Warm Boot Module
  @=Network Menu
  Esc=Exit Program
```

Important: The illustrations of configuration/debug menus in this section are intended as a general guide, and may not exactly match the configuration/debug menus in your own module.

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

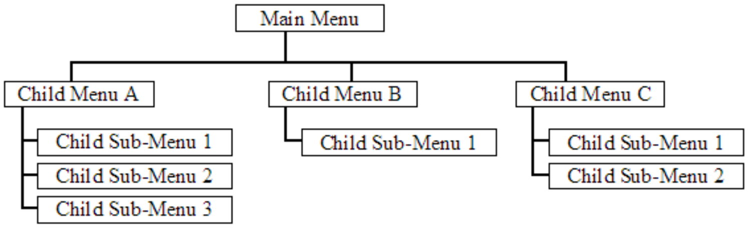
1 Verify that the null modem cable is connected properly between your computer's serial port and the module. A regular serial cable will not work.
2 On computers with more than one serial port, verify that your communication program is connected to the same port that is connected to the module.

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

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

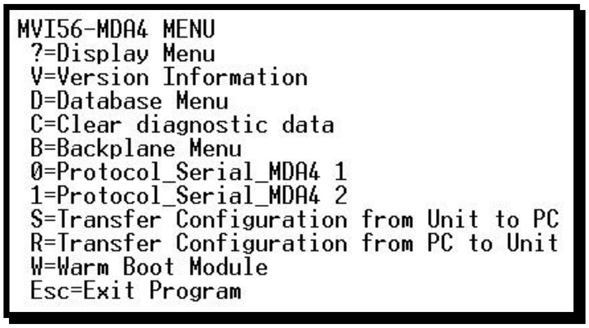
The keyboard commands on these menus are almost always non-case sensitive. You can enter most commands in lower case or capital letters.

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 **[l]** (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.

4.1.3 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:



```
MVI56-MDA4 MENU
 ?=Display Menu
 V=Version Information
 D=Database Menu
 C=Clear diagnostic data
 B=Backplane Menu
 0=Protocol_Serial_MDA4 1
 1=Protocol_Serial_MDA4 2
 S=Transfer Configuration from Unit to PC
 R=Transfer Configuration from PC to Unit
 W=Warm Boot Module
 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.

Redisplaying the Menu

Press **[?]** to display the current menu. Use this command when you are looking at a screen of data, and want to view the menu choices available to you.

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.

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.

Clearing Diagnostic Data

Press **[C]** to clear diagnostic data from the module's memory.

Viewing Backplane Diagnostic Information

Press **[B]** from the Configuration/Debug Menu to view the Backplane Diagnostic Information 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: Repeat this command at one-second intervals to determine the number of blocks transferred each second.

Opening the Protocol Serial MDA4 Menu

Press **[0]** (port 1) or **[1]** (port 2) to open the Protocol Serial menu for the MVI56-MDA4 module.

The Protocol Serial Menu (page 54) section has more information about the commands on this menu.

Receiving the Configuration File

Press **[R]** to download (receive) the current configuration file from the module. For more information on receiving and sending configuration files, please see Uploading and Downloading the Configuration File.

Sending the Configuration file

Press **[R]** to upload (send) an updated configuration file to the module.

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.

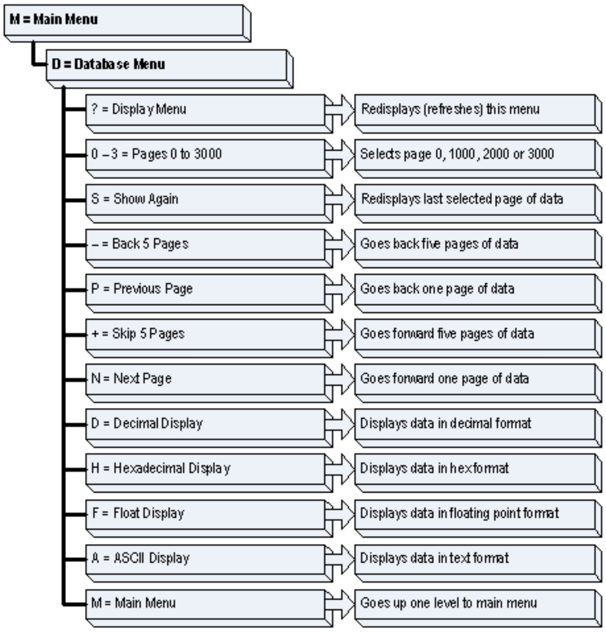
Exiting the Program

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.

Press **[Esc]** to restart the module and force all drivers to be loaded. The module will use the configuration stored in the module's Flash ROM to configure the module.

4.1.4 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.


M = Main Menu
D = Database Menu
? = Display Menu
Redisplays (refreshes) this menu
0 – 3 = Pages 0 to 3000
Selects page 0, 1000, 2000 or 3000
S = Show Again
Redisplays last selected page of data
– = Back 5 Pages
Goes back five pages of data
P = Previous Page
Goes back one page of data
+ = Skip 5 Pages
Goes forward five pages of data
N = Next Page
Goes forward one page of data
D = Decimal Display
Displays data in decimal format
H = Hexadecimal Display
Displays data in hex format
F = Float Display
Displays data in floating point format
A = ASCII Display
Displays data in text format
M = Main Menu
Goes up one level to main menu

Viewing Database Pages 0 to 3000

The database is divided into pages that correspond with a specific number of registers. The total number of database pages and registers depends on the memory capacity and configuration of the module.

Use the keyboard commands **[0]** through **[3]** to display database contents starting from 0 (zero), 1000, 2000 and 3000 respectively.

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

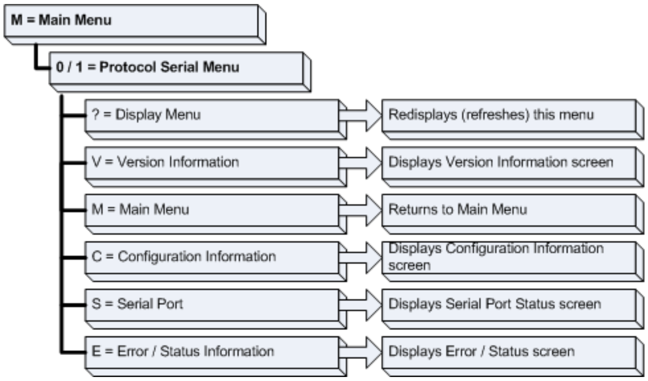
Press **[A]** to display the data on the current page in ASCII format. This is useful for regions of the database that contain ASCII data.

Returning to the Main Menu

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

4.1.5 Protocol Serial Menu

Use this menu to display the communication status and statistics of port 1 [0] and port 2 [1], respectively.


M = Main Menu
0 / 1 = Protocol Serial Menu
? = Display Menu
Redisplays (refreshes) this menu
V = Version Information
Displays Version Information screen
M = Main Menu
Returns to Main Menu
C = Configuration Information
Displays Configuration Information screen
S = Serial Port
Displays Serial Port Status screen
E = Error / Status Information
Displays Error / Status screen

Redisplaying the Menu

Press **[?]** to display the current menu. Use this command when you are looking at a screen of data, and want to view the menu choices available to you.

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.

Returning to the Main Menu

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

Viewing Configuration Information

Press **[C]** to view configuration information for the selected port, protocol, driver or device.

Viewing Serial Port status

Press **[V]** to view serial port status.

Viewing Program Status

Press **[E]** from the Protocol Serial Menu to view the Program Status screen.

4.2 LED Status Indicators

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

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 being transferred between master and port 1.
		Off	No data
P2	Green	On	Data being transferred between master and port 2.
		Off	No data
APP Status	Amber	Off	The MVI56-MDA4 module program has recognized a communication error.
		On	The MVI56-MDA4 is working normally.
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.

Module	Color	Status	Indication
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.

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: ▪ 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

5.1 Product Specifications

The MVI56 MDA Scientific CM4 Gas Analyzer Master Module allows ControlLogix processors to interface easily as a host with MDA Scientific CM4 gas monitoring hardware (See MVI56-MDA16 for a System 16 solution).

The MVI56-MDA4 module acts as an input/output module between the CM4 network and the ControlLogix processor. The data transfer from the ControlLogix processor is asynchronous from the actions on the CM4 network. A 5000-word register space in the module is used to exchange data between the processor and the CM4 network.

5.1.1 General Specifications

- Single Slot - 1756 backplane compatible
- 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. Sample ladder file included.
- Configuration data obtained from configuration text file downloaded to module. Sample configuration file included
- Local or remote rack

5.1.2 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

Specification	Description
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, 485 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 Specifications

- Support for the storage and transfer of up to 5000 registers to/from the ControlLogix processor's data files
- Two CM4 master ports
- Configurable parameters include:
  - Baud Rate 110 to 115,200
  - Parity None, Odd and Even
  - Data Bits 5 to 8
  - Stop Bits 1 or 2
  - RTS On and Off Timing 0 to 65535 milliseconds
  - Use of CTS Modem Line Yes or No
  - Response Timeout 0 to 65535 milliseconds
  - Number of Slaves 1 to 10
  - Reduced Data Structure Y/N
  - Protocol Version 1 or 2
  - Polling Delay 0 to 65535 milliseconds

A port configured as a virtual CM4 master device on the MVI56-MDA4 module will actively issue CM4 commands to other nodes on the CM4 network. Four read and five write commands are supported.

The MDA-4 product includes the following standard features:

- Two fully configurable serial ports, each capable of supporting the CM4 Master functionality
- Supports up to 10 CM4 units per serial port, 10 total per module
- Support movement of binary, integer, ASCII, and floating point data types
- Memory mapping will be pre-defined in the module to ease implementation in the ladder program
- RS-485 connection from each port directly to the CM4 units
- Software configuration (from processor ladder logic)
  - Slave Addr: 0 to 31
  - Command: Select command to be executed
- Supported CM4 command codes:
  - Read Commands
- 0x30 Get System Information
- 0x31 Get Unit Status
- 0x36 Get Alarm History
- 0x37 Get Current Point Status
  - Write Commands
- 0x51 Reset Fault or Alarm
- 0x52 Set Key-Code
- 0x53 Lock Keyboard
- 0x60 End Point Lock-On
- 0x61 Start Point Lock-On
- Operating Mode returned to ladder processor
- Error Codes returned to the ladder processor

5.3 Functional Overview

This section provides an overview of how the MVI56-MDA4 module transfers data using the MDA4 protocol. You should understand the important concepts in this chapter before you begin installing and configuring the module.

5.3.1 Introduction

The MVI56-MDA4 ("MDA Scientific CM4 Platform Master Module") allows Rockwell Automation ControlLogix I/O compatible processors to interface easily with CM4 compatible devices.

The MVI56-MDA4 module acts as an input/output module between the CM4 network and the Rockwell Automation backplane. The data transfer from the ControlLogix processor is asynchronous from the actions on the CM4 network. A 5000-word register space in the module exchanges data between the processor and the CM4 network.

General Concepts

The following topics describe several concepts that are important for understanding the operation of the MVI56-MDA4 module.

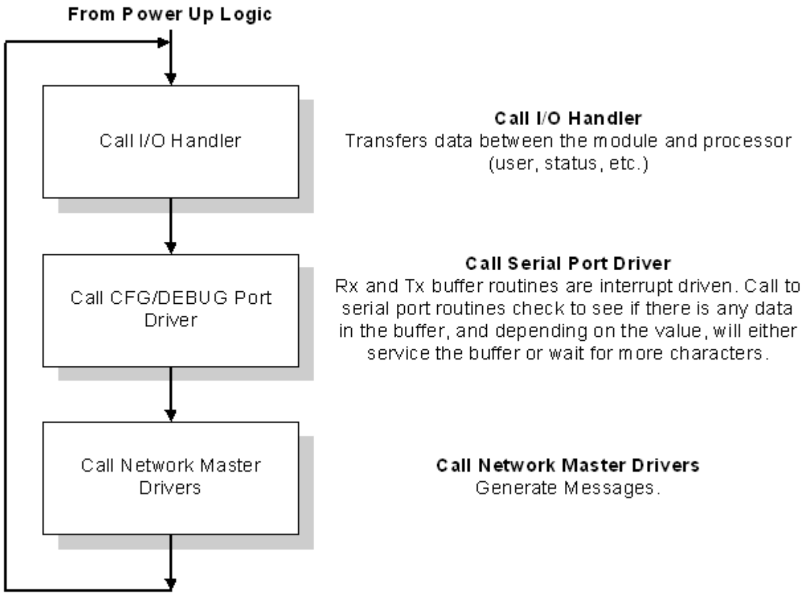
On power up the module begins performing the following logical functions:

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.

5.3.2 Main Logic Loop

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


From Power Up Logic
Call I/O Handler
Call CFG/DEBUG Port Driver
Call Network Master Drivers
Call I/O Handler
Transfers data between the module and processor (user, status, etc.)
Call Serial Port Driver
Rx and Tx buffer routines are interrupt driven. Call to serial port routines check to see if there is any data in the buffer, and depending on the value, will either service the buffer or wait for more characters.
Call Network Master Drivers
Generate Messages.

5.3.3 ControlLogix Processor Not in Run

Whenever the module detects that the processor has gone out of the Run mode (that is, Fault or PGM), the CM4 ports can be shut down as prescribed in the user configuration. When the processor is returned to a running state, the module will resume communications on the network.

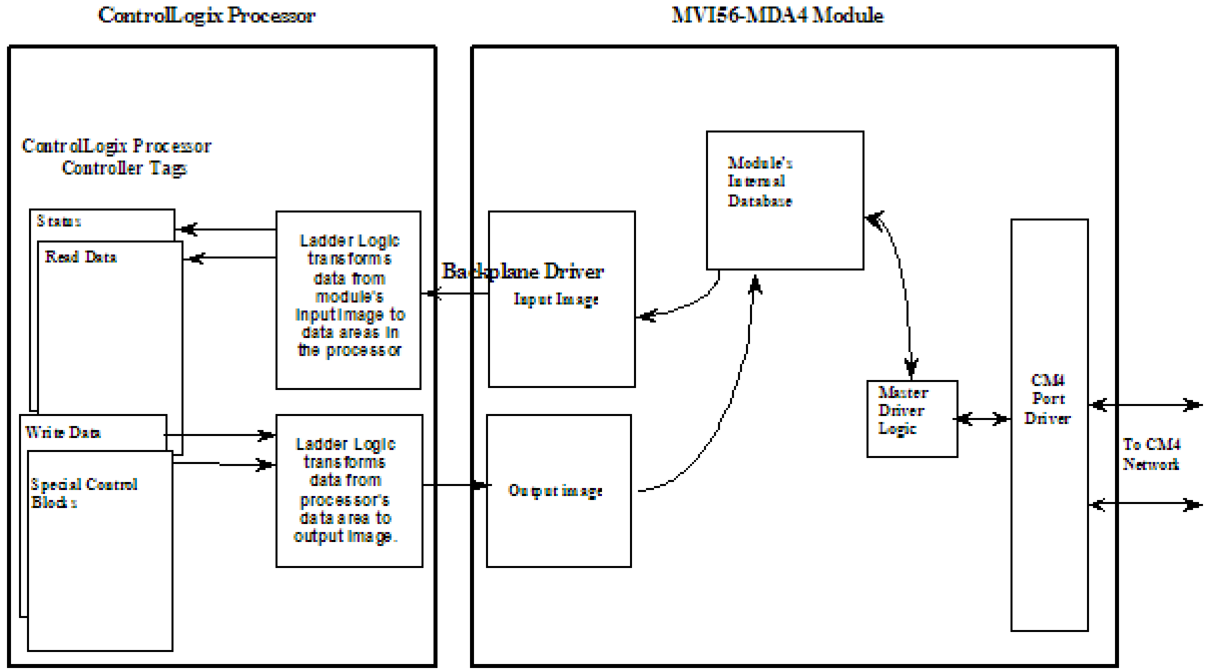
5.3.4 Backplane Data Transfer

The MVI56-MDA4 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 configurable for 250 or 42 words. The larger data area permits fast throughput of data between the module and the processor. The smaller data area lends itself to use in a remote rack.

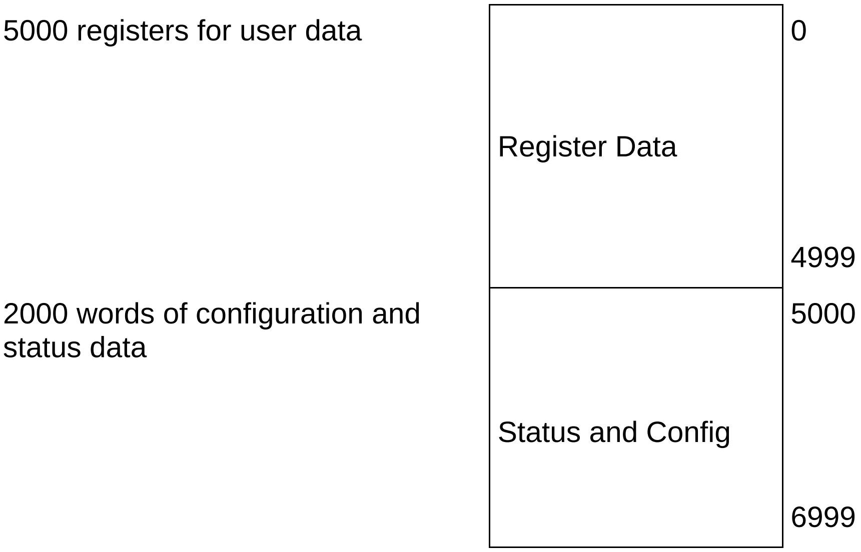
The processor inserts data to the module's output image to transfer to the module. The module's program extracts the data and places it in the module's internal database. The output image for the module is configurable to 248 or 42 words.

The following illustration shows the data transfer method used to move data between the ControlLogix processor, the MVI56-MDA4 module and the CM4 network.


ControlLogix Processor
MVI56-MDA4 Module
ControlLogix Processor Controller Tags
Status
Read Data
Write Data
Special Control Blocks
Ladder Logic transforms data from module's input image to data areas in the processor
Ladder Logic transforms data from processor's data area to output image.
Backplane Driver
Input Image
Output image
Module's Internal Database
Master Driver Logic
CM4 Port Driver
To CM4 Network

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 with addresses from 0 to 6999. The following illustration shows the layout of the database:

Module's Internal Database Structure


5000 registers for user data
Register Data
0
4999
2000 words of configuration and status data
Status and Config
5000
6999

Data contained in this database is paged through the input and output images by coordination of the ControlLogix ladder logic and the MVI56-MDA4 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.

5.3.5 Data Transfer

Data transfer includes the paging of the user data found in the module's internal database in registers 0 to 1599 and the status data. These data are transferred through read (input image) and write (output image) blocks. Refer to Module Data (page 33) 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

Offset	Description	Length
2 to 201	Read Data	200
202	Program Scan Counter	1
203 to -206	Product 4	
207 to 208	Product Code	2
209 to 210	Product Version	2
211 to 212	Operating System	2
213 to 214	Run Number	2
215 to 218	Port 1 Error Status	7
219 to 222	Port 2 Error Status	7
223 to 226	Data Transfer Status	6
227	Port 1 Current Error/Index	1
228	Port 1 Last Error/Index	1
229	Port 2 Current Error/Index	1
230	Port 2 Last Error/Index	1
231 to 248	Spare	19
249	Read Block ID	1

Reduced Read Block

Offset	Description	Length
0	Reserved	1
1	Write Block ID	1
2 to 41	Read Data	40

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 CM4 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

Reduced Write Block

Offset	Description	Length
0	Write Block ID	1
1 to 40	Write Data	40
41	Spare	1

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.

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

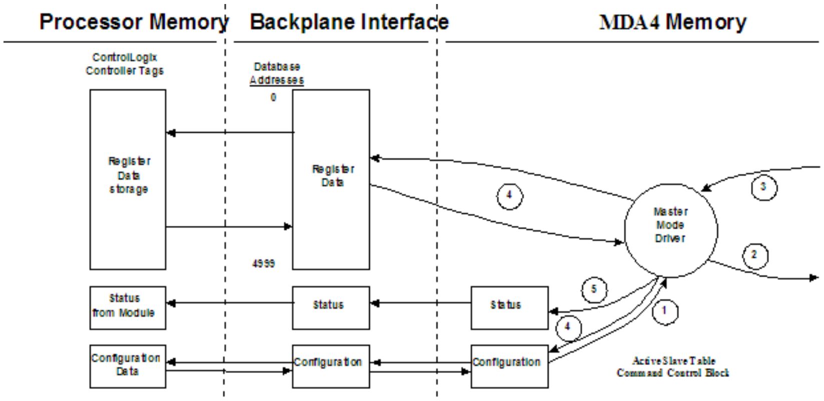
Cold Boot

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

Master Driver Mode

The MVI56-MDA4 module issues read or write commands to slave devices on the CM4 network. These commands are user configured in the module via the Command Control Block received from the ControlLogix processor. Command status is returned to the processor for each individual command in the data response area.



Step	Description
1	The Master driver obtains configuration data from the ControlLogix processor. The configuration data obtained includes the Active Slave Table and Command Control Block. These values are used by the Master driver to determine the type of commands to be issued to the other nodes on the CM4 network (Refer to the MVI56-MDA4 Module Set Up Guide).
2	After it is configured, the Master driver begins transmitting read and/or write commands to the other nodes on the network.
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.
5	Status is returned to the ControlLogix processor for each command in the Master Command List.

Refer to Module Set Up for a complete description of the parameters required to define the virtual CM4 master port. Refer to the **MDA4 Driver** documentation for a complete discussion of the structure and content of each command.

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
254	Invalid CRC value in response

Returned from CM4

Code	Description
1	NAK error
2	BAD command
4	UNKNOWN command
5	BAD OP Code

Changing parameters during operation

The Polling List / Port Select data structure for the module is outlined in the following table. These configuration values select the slave address for each of the 10 possible slaves (that is, what device addresses to poll for data), and to select which port to poll the slave address on.

Data Addr	Name	Description
MDA4, Active Slaves - Port Select and - Slave ID	Slave Address Port Select	The Port Select is configured as follows: **Value Description** 1 Port 1 selected 2 Port 2 selected The Slave Address is configured as follows: **Value Description** 0 Inactive - (Master Address) 0 to 255 Slave Device Address

Writing Control Block to Module[BTW Block ID 0 and 1]

Data Addr	Name	Description
MDA4, CmndCtrlBlock[ ]. ReadCmdEnable	Read Command Enable Bits Slaves 1 to 10	This register is a bit mapped set of enable bits that will allow the application programmer to control the execution of the read commands, and therefore the relative update timing. **Bit Description** 0 Get System Information - 0x30 1 Get Unit Status - 0x31 2 Get Point #1 Status - 0x37 3 Get Point #2 Status - 0x37 4 Get Point #3 Status - 0x37 5 Get Point #4 Status - 0x37 6 Get Alarm History - 0x36 7 Get Point Cfg #1 - 0x35 8 Get Point Cfg #2 - 0x35 9 Get Point Cfg #3 - 0x35 10 Get Point Cfg #4 - 0x35

Data Addr	Name	Description
MDA4, CmndCtrlBlock[ ]. WriteCmdEnable	Write Command Enable Bits Slaves 1 to 10	This register is a bit mapped set of enable bits that will allow the application programmer to control the execution of the write commands to a slave. **Bit Description** 0 Alarm/Fault Reset - 0x51 1 Lock Keyboard - 0x53 2 Start Point #1 Lock - 0x61 3 Start Point #2 Lock - 0x61 4 Start Point #3 Lock - 0x61 5 Start Point #4 Lock - 0x61 6 End Point Lock - 0x60
.AlarmFaultResetSel	Alarm/Fault Reset Selection Slaves 1 to 10	This register is a bit mapped set of bits that will allow the application programmer to control which point alarms are cleared and if the faults are to be cleared. **Bit Description** 0 Point 1 Alarms 1 Point 2 Alarms 2 Point 3 Alarms 3 Point 4 Alarms 4 Faults
.LockKbdCmd	Lock Keyboard Command Slaves 1 to 10	This register is a bit mapped set of enable bits that will allow the application programmer to control the locking/unlocking of the keyboard. This selection is used in conjunction with the configurable keycode parameter in the next register. **Bit Description** 0 0 = Unlocked 1 = Locked
.LockKbdKeycode	Lock Keyboard Keycode Slaves 1 to 10	This register is a bit mapped set of enable bits that will allow the application programmer to control the execution of the write commands to a slave. **Value Description** 0 to 9999 Keycode entry sent to CM4

5.3.6 The Slave Data Block Structure

The data structure for each slave is predefined and was developed during the development of the module. As discussed above, the individual slave data is stored in a 300 word data block. The structure of the data block is as follows:

<table>
<tr><th>Data Addr Offset</th><th>Name</th><th>Description</th></tr>
<tr><td>0</td><td>Communication Counter</td><td>This value represents a 0 to 32767 rollover counter that increments each time communication with the slave occurs. Incrementing is independent of the command executed.</td></tr>
<tr><td>1</td><td>Communication Status Error</td><td>This register indicates that status of communications between the module and the particular slave. A non-zero number indicates the type of communication problem which is occurring. This value is not latched and will therefore clear to 0 on the first successful communications. The values which can be expected in the field are:
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>0</td><td>All OK</td></tr>
<tr><td>-1</td><td>CTS modem control line not set before transmit</td></tr>
<tr><td>- 2</td><td>Timeout while transmitting message</td></tr>
<tr><td>- 11</td><td>Timeout Error</td></tr>
<tr><td>254</td><td>Checksum Error</td></tr>
</table></td></tr>
<tr><td>2</td><td>Read Command Done Bits</td><td>These bits indicate the execution of the particular command. The module will clear the bits immediately after the block transfer to assure that they are not held on.
<table>
<tr><th>Value</th><th>Description</th></tr>
<tr><td>0</td><td>Get System Information - 0X30</td></tr>
<tr><td>1</td><td>Get Unit Status - 0x31</td></tr>
<tr><td>2</td><td>Get Point #1 Status - 0x37</td></tr>
<tr><td>3</td><td>Get Point #2 Status - 0x37</td></tr>
<tr><td>4</td><td>Get Point #3 Status - 0x37</td></tr>
<tr><td>5</td><td>Get Point #4 Status - 0x37</td></tr>
<tr><td>6</td><td>Get Alarm History - 0x36</td></tr>
<tr><td>7</td><td>Get Point Cfg #1 - 0x35</td></tr>
<tr><td>8</td><td>Get Point Cfg #2 - 0x35</td></tr>
<tr><td>9</td><td>Get Point Cfg #3 - 0x35</td></tr>
<tr><td>10</td><td>Get Point Cfg #4 - 0x35</td></tr>
</table></td></tr>
</table>

Data Addr Offset	Name	Description
3	Write Command Done Bits	These bits indicate the execution of the particular write command. The module will clear its bit image immediately after the block transfer to assure that they are cleared during the subsequent block transfers. **Value Description** 0 Alarm/Fault Reset - 0x51 1 Lock Keyboard - 0x53 2 Start Point #1 Lock - 0x61 3 Start Point #2 Lock - 0x61 4 Start Point #3 Lock - 0x61 5 Start Point #4 Lock - 0x61 6 End Point Lock - 0x60
4	Alarm Reset Status	Value returned from a 0x51
5	Lock Keyboard Status	Value returned from a 0x53
6	End Point Lock-on Results	Value returned from a 0x60
7	Start Point Lock-on Results	Value returned from a 0x61
8	Spare	
9	Spare	
10 11 12	Month Day Year	Date returned from the instrument during the last execute read command. Each read command returns the date, so these registers should continuously be getting updated by the CM4.
13 14 15	Hour Minute Second	Time returned from the instrument during the last execute read command. Each read command returns the time, so these registers should continuously be getting updated by the CM4.
16	Number of Alarms	Value returned from a 0x36 - Get Alarm History command.
17	Spare	
18	Spare	
19	Spare	
20	Serial Num	
21	software rev	
22	VIP	
23	Prom csum msb	
24	Prom csum lsb	
25	Status - read verified	
26	General Status	
27	Flash Mem remaining	
28	Chemcassette windows remaining	
29	Chemcassette days remaining	
30	Internal Filter Days in Use	
31	External Filter Days in Use	

Data Addr Offset	**Name**	**Description**
32	Flow Rate Point 1	
33	Flow Rate Point 2	
34	Flow Rate Point 3	
35	Flow Rate Point 4	
36	Status - Optics Cal and Maint Status	Optics in High byte and Maintenance in Low byte
37	Spare	
38	Spare	
39	Spare	
40	MDA Gas Abbrev	Pt 1
41	MDA Gas Abbrev	Pt 1
42	MDA Gas Abbrev	Pt 1
43	Format code	Pt 1
44	Flow Rate - Current Flow	Pt 1
45	TWA Start Data	Pt 1
46	TWA Start Time	Pt 1
47	TWA End Date	Pt 1
48	TWA End Time	Pt 1
49	TWA Concentration	Pt 1
50	Last Concentration	Pt 1
51	Alarm Status	Pt 1
52	Point Status	Pt 1
53	Point Cfg Status	Pt 1
54	Alarm Level 1	Pt 1
55	Alarm Level 2	Pt 1
56	Spare	Pt 1
57	Spare	Pt 1
58	Spare	Pt 1
59	Spare	Pt 1
60	MDA Gas Abbrev	Pt 2
61	MDA Gas Abbrev	Pt 2
62	MDA Gas Abbrev	Pt 2
63	Format code	Pt 2
64	Flow Rate - Current Flow	Pt 2
65	TWA Start Data	Pt 2
66	TWA Start Time	Pt 2
67	TWA End Date	Pt 2
68	TWA End Time	Pt 2
69	TWA Concentration	Pt 2
70	Last Concentration	Pt 2
71	Alarm Status	Pt 2

Data Addr Offset	Name	Description
72	Point Status	Pt 2
73	Point Cfg Status	Pt 2
74	Alarm Level 1	Pt 2
75	Alarm Level 2	Pt 2
76	Spare	Pt 2
77	Spare	Pt 2
78	Spare	Pt 2
79	Spare	Pt 2
80	MDA Gas Abbrev	Pt 3
81	MDA Gas Abbrev	Pt 3
82	MDA Gas Abbrev	Pt 3
83	Format code	Pt 3
84	Flow Rate - Current Flow	Pt 3
85	TWA Start Data	Pt 3
86	TWA Start Time	Pt 3
87	TWA End Date	Pt 3
88	TWA End Time	Pt 3
89	TWA Concentration	Pt 3
90	Last Concentration	Pt 3
91	Alarm Status	Pt 3
92	Point Status	Pt 3
93	Point Cfg Status	Pt 3
94	Alarm Level 1	Pt 3
95	Alarm Level 2	Pt 3
96	Spare	Pt 3
97	Spare	Pt 3
98	Spare	Pt 3
99	Spare	Pt 3
100	MDA Gas Abbrev	Pt 4
101	MDA Gas Abbrev	Pt 4
102	MDA Gas Abbrev	Pt 4
103	Format code	Pt 4
104	Flow Rate - Current Flow	Pt 4
105	TWA Start Data	Pt 4
106	TWA Start Time	Pt 4
107	TWA End Date	Pt 4
108	TWA End Time	Pt 4
109	TWA Concentration	Pt 4
110	Last Concentration	Pt 4
111	Alarm Status	Pt 4
112	Point Status	Pt 4

Data Addr Offset	Name	Description
113	Point Cfg Status	Pt 4
114	Alarm Level 1	Pt 4
115	Alarm Level 2	Pt 4
116	Spare	Pt 4
117	Spare	Pt 4
118	Spare	Pt 4
119	Spare	Pt 4
120	Alarm 1	See Alarm Data block structure below
130	Alarm 2	See Alarm Data block structure below
140	Alarm 3	See Alarm Data block structure below
150	Alarm 4	See Alarm Data block structure below
160	Alarm 5	See Alarm Data block structure below
170	Alarm 6	See Alarm Data block structure below
180	Alarm 7	See Alarm Data block structure below
190	Alarm 8	See Alarm Data block structure below
200	Alarm 9	See Alarm Data block structure below
210	Alarm 10	See Alarm Data block structure below
220	Alarm 11	See Alarm Data block structure below
230	Alarm 12	See Alarm Data block structure below
240	Alarm 13	See Alarm Data block structure below
250	Alarm 14	See Alarm Data block structure below
260	Alarm 15	See Alarm Data block structure below
270	Alarm 16	See Alarm Data block structure below
280 to 399	Spare	

5.3.7 Alarm Data Block Structure

Up to 16 Alarm Data Blocks are returned from each CM4. The Alarm Data has been turned into a 10 word structure to allow viewing in the PLC/SLC data table to be easier. The structure of this data is as follows:

Note that the Alarm Data structure is shown only for Alarm #1. This structure repeats itself 16 times on 10 words offsets.

Data Addr Offset	Name	Description
120	Date Stamp	MDA format Date field (2 bytes packed with MDY)
121	Time Stamp	MDA format Time field (2 bytes packed with HMS)
122 123 124	Gas Abbreviation	

Data Addr Offset	Name	Description
125	Point Number	Point number in alarm. **Value** **Description** 0 Point #1 1 Point #2 2 Point #3 3 Point #4
126	Format Code	
127	Concentration	
128	Alarm Level	Alarm level: **Value** **Description** 0 Level 1 1 Level 2
129	Spare	

5.3.8 Protocol Commands

The ProSoft Technology MDA-4 module Master driver supports several commands from the MDA-4 Command set.

MDA-4 Read Data Commands

The MDA-4 module supports a command subset of the Protocol Specification consisting primarily of the commands required to initialize and read data from several units. The following topics detail the different commands supported by the module.

0x30 - Get System Information

This command requests information about the slave system only and the software revision currently in use.

0x31 - Get Unit Status

This command requests the current condition or status of the salve. This command allows the master to inquire about the general operating condition of the system.

0x36 - Get Alarm History

This command queries the unit for any alarms. The unit saves only the 16 most recent alarms regardless of point. The alarms can all be on one point or there can be alarms from several points.

0x37 - Get Current Point Status

The command queries an individual point for its current status.

0x35 - Get Point Configuration

The command queries an individual point for its current configuration.

MDA-4 Write and Control Commands

The MDA-4 module supports a command subset of the Protocol Specification consisting primarily of the commands required to initialize and read data from several units. The following topics detail the different

0x51 - Reset Faults or Alarms

This command allows a remote reset of any faults or alarm conditions.

0x53 - Lock Keyboard

This command allows the ladder program to lock out the keyboard. The keyboard can be disabled, preventing unauthorized user intervention by enabling the keypad lock out and sending a valid key code.

0x60 - End Point Lock-on

This command unlocks the unit from a single pont lock-on to all other points that are enabled. When this command is issued, a new TWA start for all points.

0x61 - Start Point Lock-on

This command locks the unit to one specific pont. When this command is issued, all other points are disabled and locked-on point continues to monitor for concentration and TWA.

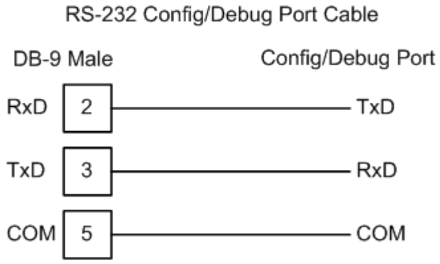
5.4 Cable Connections

The application ports on the MVI56-MDA4 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.

5.4.1 RS-232 Configuration/Debug Port

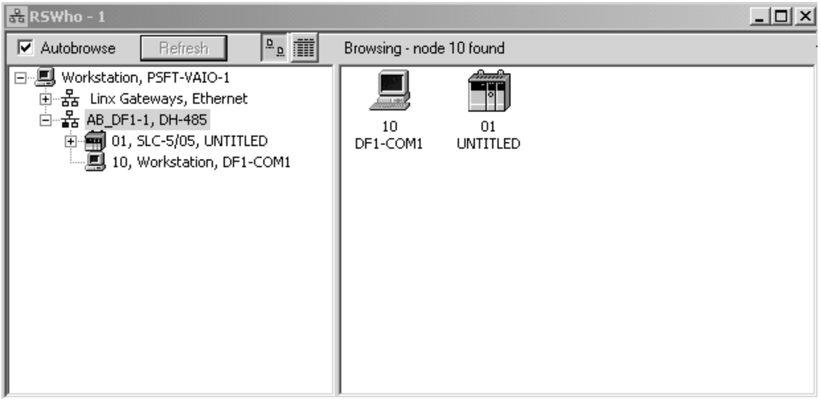
This port is physically an RJ45 connection. An RJ45 to DB-9 adapter cable is included with the module. This port permits a PC based terminal emulation program to view configuration and status data in the module and to control the module. The cable for communications on this port is shown in the following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



Disabling the RSLinx Driver for the Com Port on the PC

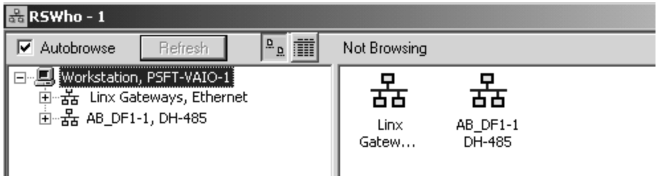
The communication port driver in RSLinx can occasionally prevent other applications from using the PC's COM port. If you are not able to connect to the module's configuration/debug port using ProSoft Configuration Builder (PCB), HyperTerminal or another terminal emulator, follow these steps to disable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



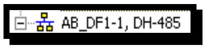
Browsing - node 10 found

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 RSWho screen should look like this:



Not Browsing

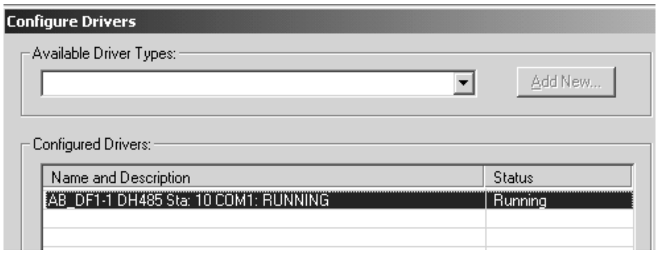
Branches are displayed or hidden by clicking on the ⊞ or the ⊟ icons.



4 When you have verified that the driver is not being browsed, go to

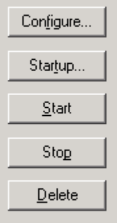
Communications>Configure Drivers

You may see something like this:

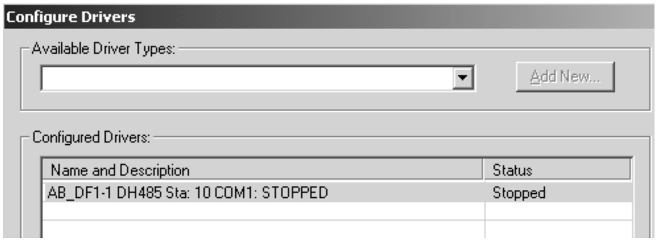


Name and Description	Status
AB_DF1-1 DH485 Sta: 10 COM1: RUNNING	Running

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:



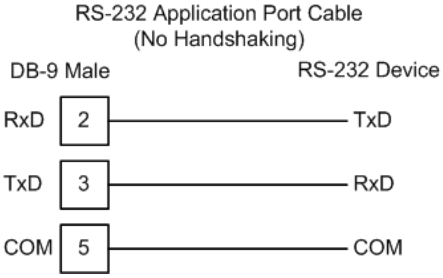
Name and Description	Status
AB_DF1-1 DH485 Sta: 10 COM1: STOPPED	Stopped

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.

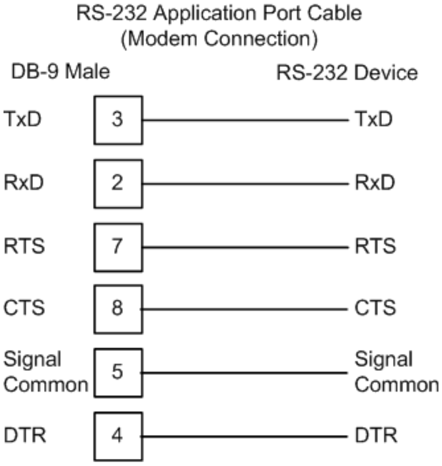
5.4.2 RS-232

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:



<u>*RS-232: Modem Connection*</u>

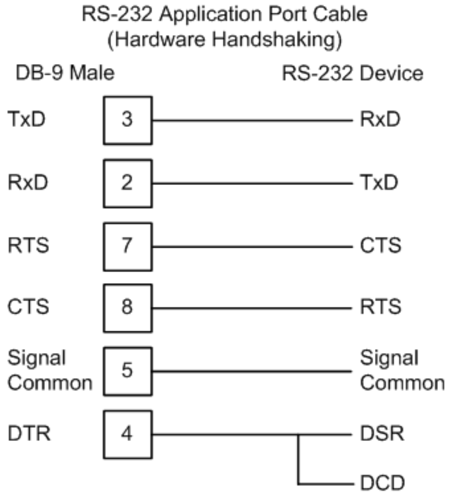
This type of connection is required between the module and a modem or other communication device.



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

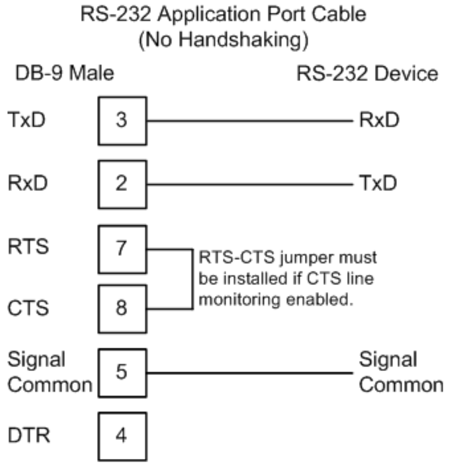
RS-232: Null Modem Connection (Hardware Handshaking)

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



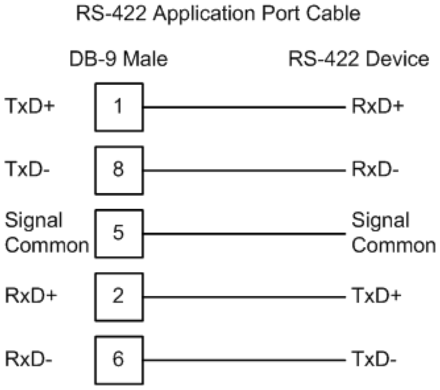
RS-232: Null Modem Connection (No Hardware Handshaking)

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


RS-232 Application Port Cable
(No Handshaking)
DB-9 Male
RS-232 Device
TxD
3
RxD
RxD
2
TxD
RTS
7
CTS
8
RTS-CTS jumper must be installed if CTS line monitoring enabled.
Signal Common
5
Signal Common
DTR
4

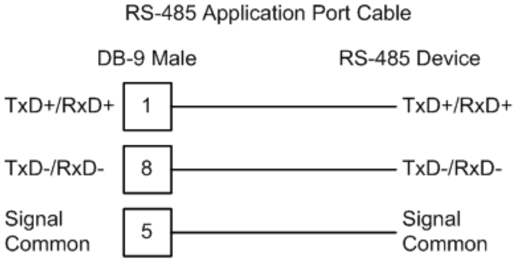
Note: If the port is configured with the "Use CTS Line" set to 'Y', then a jumper is required between the RTS and the CTS line on the module connection.

5.4.3 RS-422



5.4.4 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:

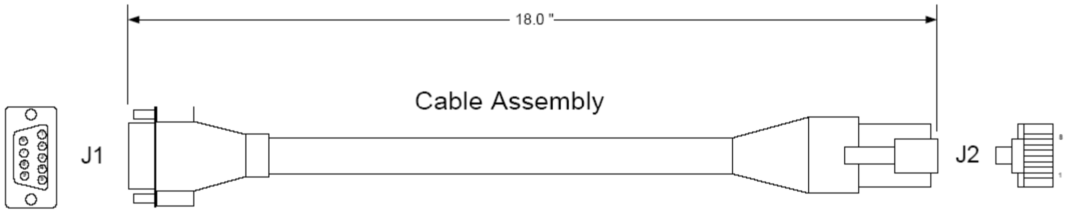


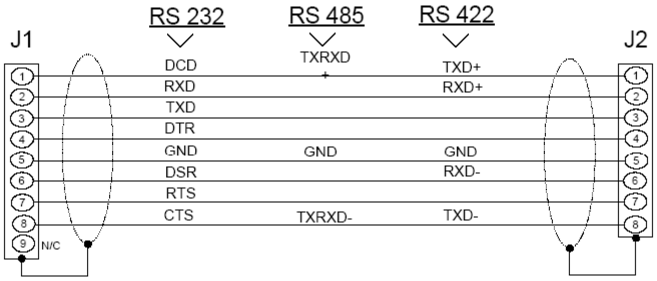
Note: Terminating resistors are generally not required on the RS-485 network, unless you are experiencing communication problems that can be attributed to signal echoes or reflections. In this case, install a 120 ohm terminating resistor on the RS-485 line.

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.

5.4.5 DB9 to RJ45 Adaptor (Cable 14)





Wiring Diagram

5.5 MVI56-MDA4 Database Definition

This section contains a listing of the internal database of the MVI56-MDA4 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 5028	Status	29

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).

Detailed definition of the miscellaneous status data area can be found in MVI56-MDA4 Status Data Definition (page 83).

Definition of the configuration data areas can be found in the data definition section of this document and in the MVI56-MDA4 Configuration File on the ProSoft Solutions CD.

Command Control Block Object (page 35) contains a discussion of the command control section of the database.

5.6 MVI56-MDA4 Status Data Definition

This section contains a description of the members present in the **MDA4InStat** object. This data is transferred from the module to the processor as part of each read block.

Offset	Content	Description
202	Program cycle counter	This value is incremented each time a complete program cycle occurs in the module.
203 to 206	Product Name	
207 to 208	Product Code as ASCII string	This register contains the product code of "MDA4"
209 to 210	Revision level as ASCII string	This register contains the product version for the current software.
211 to 212	Operating system level as ASCII string	This register contains the month and year values for the program operating system.
213 to 214	Run number as ASCII string	This register contains the run number value for the current software.
215	Number of requests - Port 1	Contains the number of port messages sent out of the port.
216	Number of responses - Port 1	Contains the total number of messages received on the port.
217	Number of errors sent - Port 1	Contains the total number of message errors sent out of the port.
218	Number of errors received - Port 1	Contains the total number of message errors received on the port.
219	Number of requests - Port 2	Contains the total number of messages sent out the port.
220	Number of responses - Port 2	Contains the total number of messages received on the port.
221	Number of errors sent - Port 2	Contains the total number of message errors sent out the port.
222	Number of errors received - Port 2	Contains the total number of message errors received on the port.
223	Backplane Transfer Writes	Contains the total number of write blocks transferred from the processor to the module.
224	Backplane Transfer Reads	Contains the total number of read blocks transferred from the module to the processor.
225	Backplane Blocks Parsed	
226	Backplane Transfer Errors	Contains the total number of block errors recognized by the module.
227	Current Error - Port 1	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.
228	Last Error - Port 1	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.

Offset	Content	Description
229	Current Error - Port 2	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 current executing command.
230	Last Error - Port 2	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.

6 Support, Service & Warranty

In This Chapter

ProSoft Technology, Inc. (ProSoft) is committed to providing the most efficient and effective support possible. Before calling, please gather the following information to assist in expediting this process:

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

If the issue is hardware related, we will also need information regarding:

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

6.1 How to Contact Us: Technical Support

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

Asia Pacific

+603.7724.2080, support.asia@prosoft-technology.com
Languages spoken include: Chinese, English

Europe (location in Toulouse, France)

+33 (0) 5.34.36.87.20, support.EMEA@prosoft-technology.com
Languages spoken include: French, English

North America/Latin America (excluding Brasil) (location in California)

+1.661.716.5100, support@prosoft-technology.com
Languages spoken include: English, Spanish
*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.*

Brasil (location in Sao Paulo)

+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 (collectively, "RMA Policies") apply to any returned Product. These RMA Policies are subject to change by ProSoft without notice. For warranty information, see "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:

a) 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.
b) 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 (page 85). A Technical Support Engineer will request that you perform several tests in an attempt to isolate the problem. If after completing these tests, the Product is found to be the source of the problem, we will issue an RMA.
c) 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 and receipt date. 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 using a shipment method other than that specified by ProSoft or shipped without an RMA number will be returned to the Customer, freight collect. Contact ProSoft Technical Support for further information.
d) A 10% restocking fee applies to all warranty credit returns whereby a Customer has an application change, ordered too many, does not need, etc.

6.2.2 Procedures for Return of Units Under Warranty:

A Technical Support Engineer must approve the return of Product under ProSoft's Warranty:

a) A replacement module will be shipped and invoiced. A purchase order will be required.
b) Credit for a product under warranty will be issued upon receipt of authorized product by ProSoft at designated location referenced on the Return Material Authorization.

6.2.3 Procedures for Return of Units Out of Warranty:

a) Customer sends unit in for evaluation
b) If no defect is found, Customer will be charged the equivalent of $100 USD, plus freight charges, duties and taxes as applicable. A new purchase order will be required.

c) If unit is repaired, charge to Customer will be 30% of current list price (USD) plus freight charges, duties and taxes as applicable. A new purchase order will be required or authorization to use the purchase order submitted for evaluation fee.

The following is a list of non-repairable units:

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

6.2.4 Purchasing Warranty Extension:

a) ProSoft's standard warranty period is three (3) years from the date of shipment as detailed in "Limited Warranty (page 87)". The Warranty Period may be extended at the time of equipment purchase 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

6.3 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.

6.3.1 What Is Covered By This Warranty

a) *Warranty On New Products*: ProSoft warrants, to the original purchaser, 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 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 39 months. 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.

b) *Warranty On Services*: Materials and labor performed by ProSoft to repair a verified malfunction or defect are warranteed in 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.

6.3.2 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) This Warranty 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, "C" or any variant of "C" programming languages) 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; or (viii) disasters such as fire, flood, earthquake, wind and lightning.

c) 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 guide included with your original product purchase 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.

6.3.3 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 and 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.

6.3.4 Intellectual Property Indemnity

Buyer shall indemnify and hold harmless ProSoft and its employees from and against all liabilities, losses, claims, costs and expenses (including attorney's fees and expenses) related to any claim, investigation, litigation or proceeding (whether or not ProSoft is a party) which arises or is alleged to arise from Buyer's acts or omissions under these Terms or in any way with respect to the Products. Without limiting the foregoing, Buyer (at its own expense) shall indemnify and hold harmless ProSoft and defend or settle any action brought against such Companies to the extent based on a claim that any Product made to Buyer specifications infringed intellectual property rights of another party. ProSoft makes no warranty that the product is or will be delivered free of any person's claiming of patent, trademark, or similar infringement. The Buyer assumes all risks (including the risk of suit) that the product or any use of the product will infringe existing or subsequently issued patents, trademarks, or copyrights.

a) Any documentation included with Product purchased from ProSoft is protected by copyright and may not be duplicated 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.

f) **Additional Restrictions Relating To Software And Other Intellectual Property**

In addition to compliance 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.

6.3.5 Disclaimer of all Other Warranties

The Warranty set forth in What Is Covered By This Warranty (page 88) 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.

*6.3.6 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 or its Dealer will not be responsible for included, 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.

6.3.7 Time Limit for Bringing Suit

Any action for breach of warranty must be commenced within 39 months following shipment of the Product.

6.3.8 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.

6.3.9 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.

6.3.10 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