ProSoft TECHNOLOGY

Where Automation Connects.

inRAx®

MVI71-DFCM

PLC Platform

DF1 Interface Module

10/20/2008

USER MANUAL

Please Read This Notice

Successful application of this module requires a reasonable working knowledge of the Rockwell Automation PLC hardware, the MVI71-DFCM Module and the application in which the combination is to be used. For this reason, it is important that those responsible for implementation satisfy themselves that the combination will meet the needs of the application without exposing personnel or equipment to unsafe or inappropriate working conditions.

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

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

Information in this manual is subject to change without notice and does not represent a commitment on the part of ProSoft Technology Improvements and/or changes in this manual or the product may be made at any time. These changes will be made periodically to correct technical inaccuracies or typographical errors.

Warning: This module is not hot-swappable! Always remove power from the rack before inserting or removing this module, or damage may result to the module, the processor, or other connected devices.

Power, Input, and Output (I/O) wiring must be in accordance with Class 1, Division 2 wiring methods, Article 501-4 (b) of the National Electrical Code, NFPA 70 for installation in the U.S., or as specified in Section 18-1J2 of the Canadian Electrical Code for installations in Canada, and in accordance with the authority having jurisdiction.

A Warning - Explosion Hazard - Substitution of components may impair suitability for Class 1, Division 2.
B Warning - Explosion Hazard - When in hazardous locations, turn off power before replacing or wiring modules.
C Warning - Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

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.

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

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

MVI71-DFCM User Manual
10/20/2008

Contents

Please Read This Notice 2

Battery Life Advisory 3
ProSoft® Product Documentation 3
Your Feedback Please 3

Guide to the MVI71-DFCM User Manual 7

1 Start Here 9

1.1 System Requirements 9
1.2 Package Contents 10
1.3 Setting Jumpers 11
1.4 Install the Module in the Rack 11
1.5 Connect your PC to the Processor 13
1.6 Download the Sample Program to the Processor 14
1.7 Connect your PC to the Module 17

2 Installing and Configuring the Module 19

2.1 Example of 240 words of read and write data (cfg file=10) 20
2.2 Example of 2300 read and 3500 write data registers (cfg file = 10) 20
2.3 Module Configuration 21

3 Ladder Logic 29

4 Diagnostics and Troubleshooting 31

4.1 Reading Status Data from the Module 31
4.2 LED Status Indicators 46

5 Reference 49

5.1 Product Specifications 49
5.2 Functional Overview 51
5.3 Cable Connections 69
5.4 Pass-Through Ports 74
5.5 MVI71-DFCM Status Data Definition 74
5.6 Error Codes 76
5.7 MVI71-DFCM Configuration Data 78
5.8 Command Control 87
5.9 DF1 Command Set For ProSoft Technology Communication Modules 88
5.10 DF1 Command List Form 100

6 Support, Service & Warranty 101

6.1 How to Contact Us: Technical Support 101
6.2 Return Material Authorization (RMA) Policies and Conditions 102
6.3 LIMITED WARRANTY 104

Index 109

Guide to the MVI71-DFCM 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 46) Diagnostics and Troubleshooting (page 31)	This section describes how to verify communications with the network. Diagnostic and Troubleshooting procedures.
Reference Product Specifications Functional Overview Glossary	→	Reference (page 49) Functional Overview (page 51) Product Specifications (page 49)	These sections contain general references associated with this product, Specifications, and the Functional Overview.
Support, Service, and Warranty Index	→	Support, Service and Warranty (page 101)	This section contains Support, Service and Warranty information. Index of chapters.

1 Start Here

In This Chapter

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

Installing the MVI71-DFCM module requires a reasonable working knowledge of the Rockwell Automation hardware, the MVI71-DFCM 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 MVI71-DFCM module requires the following minimum hardware and software components:

- Rockwell Automation PLC processor, with compatible power supply and one free slot in the rack, for the MVI71-DFCM module. The module requires 800mA of available power.
- The PLC Processor must provide for at least 64 words of BTR/BTW area, otherwise the module may not function correctly.
- Rockwell Automation RSLogix 5 programming software.
- Rockwell Automation RSLinx communication software
- Pentium® 100 MHz minimum. Pentium III 700 MHz (or better) recommended
- Supported operating systems:
  - Microsoft Windows XP
  - Microsoft Windows 2000
  - Microsoft Windows NT v4.0 with Service Pack 3 or greater
  - Microsoft Windows ME
  - Microsoft Windows 98
- 64 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
- 3.5 inch floppy disk drive
- HyperTerminal or other terminal emulator program capable of file transfers using Ymodem protocol.

1.2 Package Contents

The following components are included with your MVI71-DFCM module, and are all required for installation and configuration.

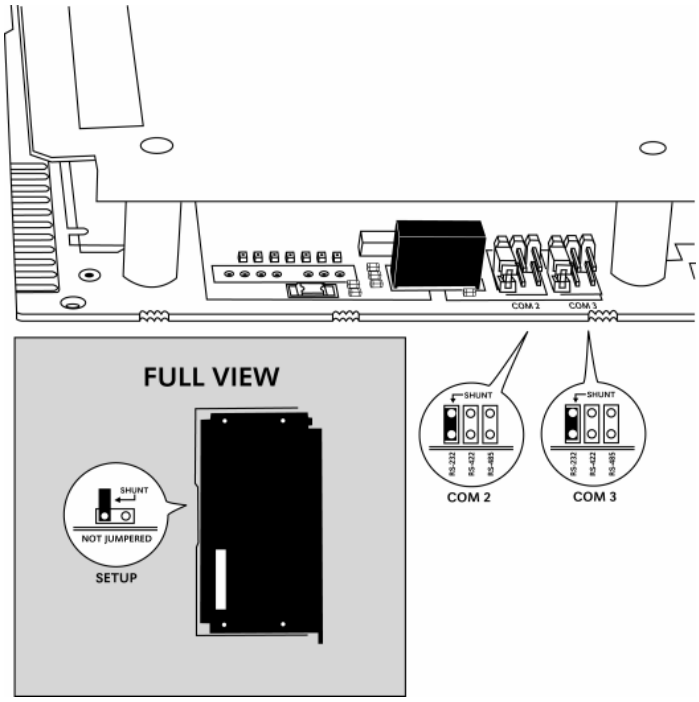
Important: Before beginning the installation, please verify that all of the following items are present.

Qty.	Part Name	Part Number	Part Description
1	MVI71-DFCM Module	MVI71-DFCM	DF1 Interface 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 MVI71-DFCM module.

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

1.3 Setting Jumpers

The following illustration shows the jumper configurations for the various RS interfaces. If you are using an interface other than RS-232 (default), you must change the jumpers as shown:



The Setup Jumper acts as "write protection" for the module's flash memory. In "write protected" mode, the Setup pins are not connected, and the module's firmware cannot be overwritten. Do not jumper the Setup pins together unless you are directed to do so by ProSoft Technical Support.

1.4 Install the Module in the Rack

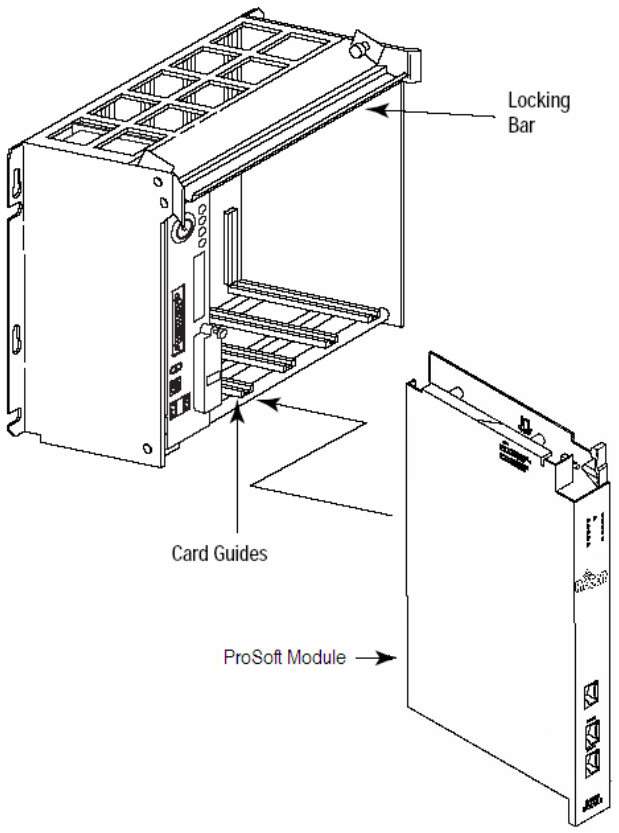
If you have not already installed and configured your PLC processor and power supply, please do so before installing the MVI71-DFCM module. Refer to your Rockwell Automation product documentation for installation instructions.

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 MVI71-DFCM into the PLC™ chassis. Use the same technique recommended by Rockwell Automation to remove and install PLC modules.

Warning: This module is not hot-swappable! Always remove power from the rack before inserting or removing this module, or damage may result to the module, the processor, or other connected devices.

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.

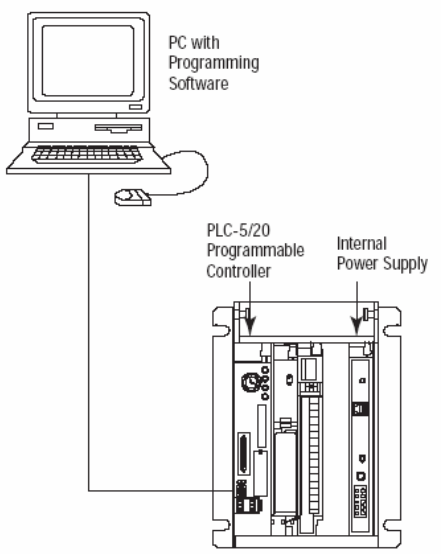


3. With a firm but steady push, snap the module into place.
4. Check that the holding clips on the top and bottom of the module are securely in the locking holes of the rack.
5. Make a note of the slot location. You will need to identify the slot in which the module is installed in order for the sample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

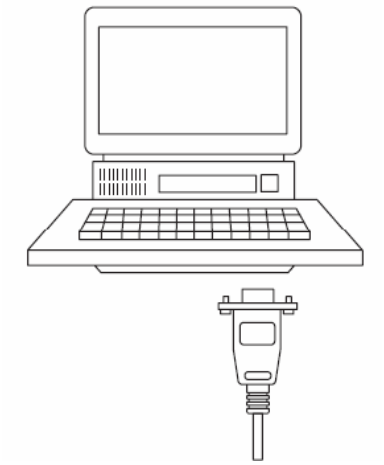
Note: If you insert the module improperly, the system may stop working, or may behave unpredictably.

1.5 Connect your PC to the Processor

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



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

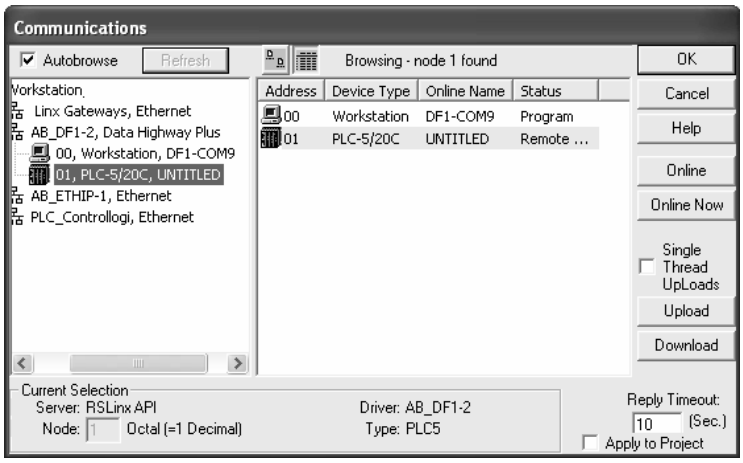


1.6 Download the Sample Program to the Processor

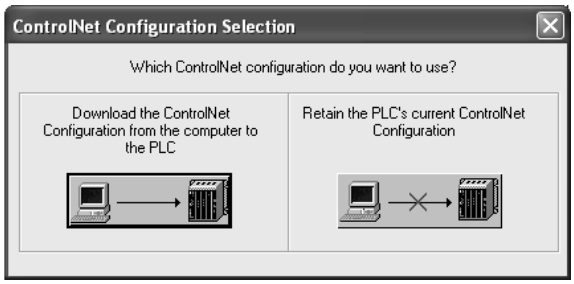
To download the sample program from RSLogix 5 to the PLC processor:

Note: The key switch on the front of the PLC processor must be in the REM position.

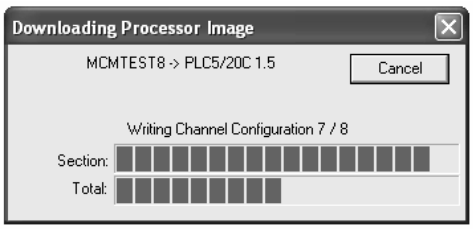
1 If you are not already online to the processor, open the Communications menu, and then choose Download. RSLogix will establish communication with the processor.



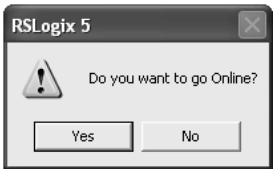
2 Click the Download button to transfer the sample program to the processor.
3 When prompted, choose Computer to PLC



4 RSLogix will compile the program and transfer it to the processor. This process may take a few minutes.



5 When the download is complete, RSLogix will open another confirmation dialog box. Click OK to switch the processor from Program mode to Run mode.

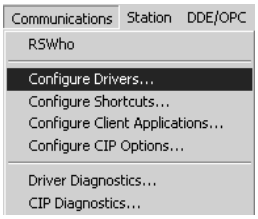


Note: If you receive an error message during these steps, refer to your RSLogix documentation to interpret and correct the error.

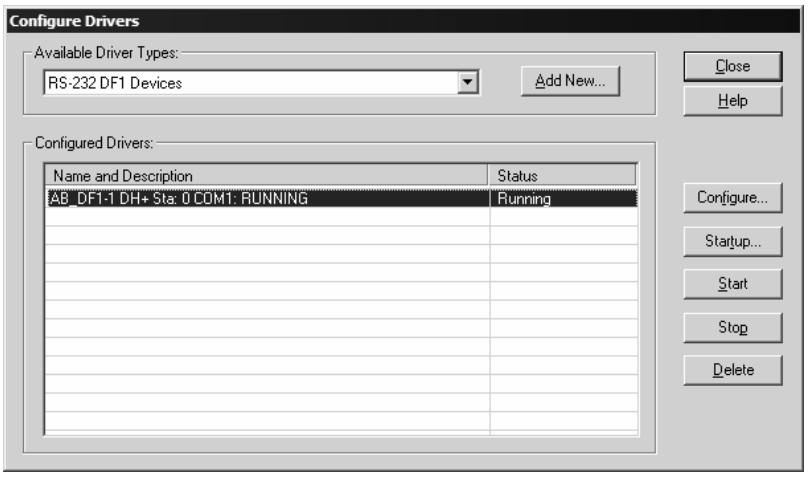
1.6.1 Configuring RSLinx

If 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.



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

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

4 Click the Auto-Configure button. RSLinx will attempt to configure your serial port to work with the selected driver.

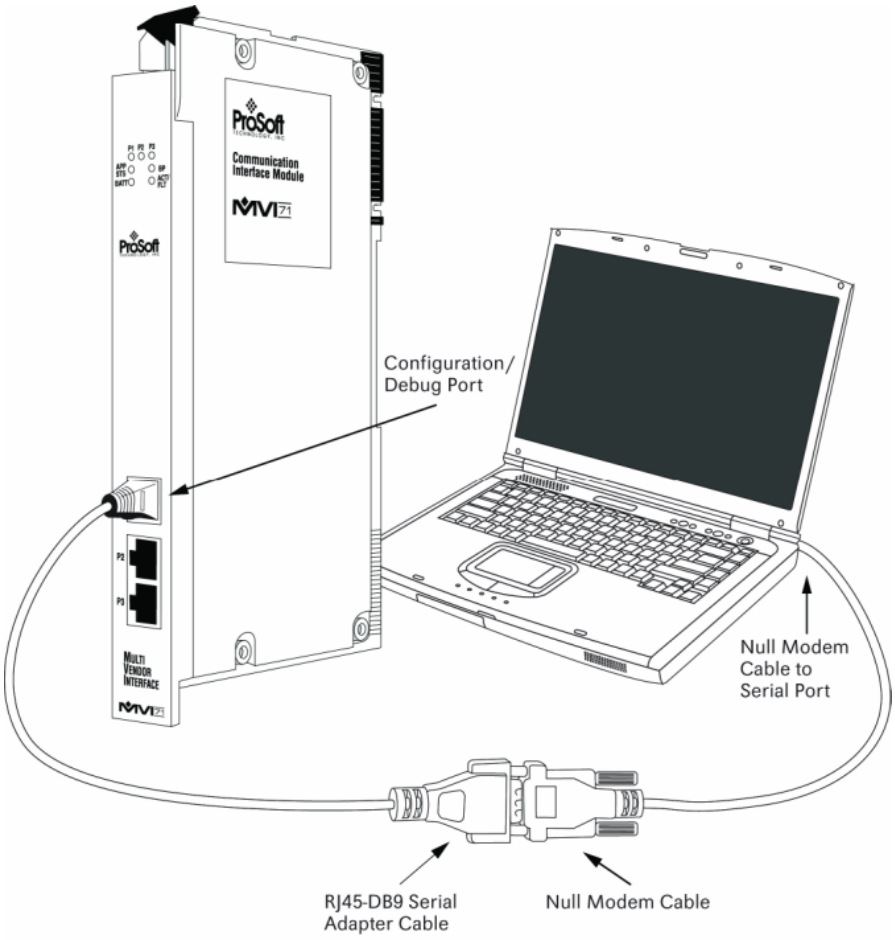
5 When you see the message "Auto Configuration Successful", click the OK button to dismiss the dialog box.

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

1.7 Connect your PC to the Module

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

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



2 Installing and Configuring the Module

In This Chapter

- Example of 240 words of read and write data (cfg file=10)..... 20
- Example of 2300 read and 3500 write data registers (cfg file = 10)..... 20
- Module Configuration 21

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

1. Modify the module's configuration files to meet the needs of your application, and copy the updated configuration to the module. Example configuration files are provided on the CD-ROM. Refer to the Modifying the Example Configuration File section, later in this chapter, for more information on the configuration files.
2. Modify the example ladder logic to meet the needs of your application, and copy the ladder logic to the processor. Example ladder logic files are provided on the CD-ROM.

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

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

First, define whether the block transfer or side-connect interface will be utilized. If the block transfer interface is to be used, remove the Compact Flash Disk from the module if it is present and insert the module into the rack with the power turned off.

If the side-connect interface is utilized, make sure the file SC_DATA.TXT on the Compact Flash Disk contains the correct configuration file number. You can run the setdnpsc.exe program to set the configuration file number to be used with your application. Install the module in the rack and turn on the power. Connect the terminal server to the module's debug/configuration port and exit the program by pressing the Esc key followed by the 'X' key. This will cause the program to exit and remain at the operating system prompt. Run the setdnpsc.exe program with a command line argument of the file number to use for the configuration file. For example, to select N10: as the configuration file, enter the following:

```
SETDNPSC 10
```

The program will build the SC_DATA.TXT on the Compact Flash Disk (C: drive in the root directory).

Next, define the data files to be used with the application. If the block transfer interface is used, define the data files to hold the configuration, status and user data. Enter the module's configuration in the user data files. Enter the ladder

logic to handle the blocks transferred between the module and the PLC. Download the program to the PLC and test the program with the module.

If the side-connect interface is used, no ladder logic is required for data transfer. The user data files to interface with the module must reside in contiguous order in the processor. The first file to be used by the interface is the configuration file. This is file number set in the SC_DATA.TXT file using the SETDNPSC.EXE program. The following table lists the files used by the side-connect interface:

File Number	Example	Size	Description
Cfg File	N10	300	Configuration/Control/Status File
Cfg File+1	N11	to 1000	Port 1 commands 0 to 82
Cfg File+2	N12	to 1000	Port 1 commands 83 to 99
Cfg File+3	N13	to 1000	Port 2 commands 0 to 82
Cfg File+4	N14	to 1000	Port 2 commands 83 to 99
Cfg File+5	N15	to 1000	Data transferred from the module to the processor
			Other files for read data
Cfg File+5+n	N16	to 1000	Data transferred from the processor to the module
Cfg File+5+n+m			Other files for write data

n is the number of read data files minus one. Each file contains up to 1000 words.

m is the number of write data files minus one. Each file contains up to 1000 words.

Even if both files are not required for a port's commands, they still are reserved and should only be used for that purpose. The read and write data contained in the last set of files possess the data transferred between the module and the processor. The number of files required for each is dependent on the number of registers configured for each operation. Two examples are shown below:

2.1 Example of 240 words of read and write data (cfg file=10)

Data Files	Description
N15:0 to 239	Read data
N16:0 to 239	Write data

2.2 Example of 2300 read and 3500 write data registers (cfg file = 10)

Data Files	Description
N15:0 to 999	Read data words 0 to 999
N16:0 to 999	Read data words 1000 to 1999
N17:0 to 299	Read data words 2000 to 2299
N18:0 to 999	Write data words 0 to 999
N19:0 to 999	Write data words 1000 to 1999
N20:0 to 999	Write data words 2000 to 2999
N21:0 to 499	Write data words 3000 to 3499

Special care must be taken when defining the files for the side-connect interface. Because the module directly interacts with the PLC processor and its memory, any errors in the configuration may cause the processor to fault and it may even lose its configuration and program. After defining the files and populating them with the correct data, download the program to the processor, and place the processor in run mode. If everything is configured correctly, the module should start its normal operation.

If all the configuration parameters are set correctly and the module is attached to a DF1 network, the module's Application LED (APP LED) should remain off and the backplane activity LED (BP ACT) should blink very rapidly. Refer to Diagnostics and Troubleshooting (page 31) if you encounter errors. Attach a computer or terminal to Port 1 on the module and look at the status of the module using the Configuration/Debug Menu in the module.

2.3 Module Configuration

In order for the MVI71-DFCM module to function, a minimum amount of configuration data must be transferred to the module. The following table provides an overview of the different types of configuration data that the module will require, depending on the operating modes to be supported.

Module Register Address	Functional Modes Affected	Name	Description
5000 to 5009	Data Transfer	General Module Configuration	This section of the configuration data contains the module configuration data that defines the data transfer between the module and the PLC5 processor.
5010 to 5039 and 5040 to 5069	Master and Slave	Port Configuration	These sections define the characteristics of each of the DF1 serial communication ports on the module. These parameters must be set correctly for proper module operation.
5200 to 6399 and 6400 to 7599	Master	Master Command List	If the module's Master Mode functionality is to be supported on a port, the Master Command List must be set up.

The MVI71-DFCM module must be configured at least once when the card is first powered, and any time thereafter when the parameters must be changed.

2.3.1 Changing Parameters During Operation

A copy of the module's configuration data is mapped in the module's database as displayed in the table above. These values are initialized when the module first receives its configuration from the PLC5 processor. Any node on the network can change this data. A master port on the module may poll a slave for the data or a slave port could receive the data from a remote master unit. The module will not use this data until it is commanded. Ladder logic can be written to issue a Write Configuration command block (9997) to the module. A remote device can set a value of 9997 at address 7800 (N46:0) in the module to download the

configuration to the processor. Alternatively, the configuration/debug port on the module can be used to issue the command directly to the module. All three of these methods will force the module to download the configuration to the PLC5 processor. Ladder logic must exist in the processor to accept the blocks sent by the module when using the block transfer interface. If everything is configured correctly, the module can receive its configuration from a remote device.

2.3.2 Module Data Files

All data related to the MVI71-DFCM is stored in user defined data files. The user is responsible for setting up the data areas to match the specific application for which the module is used. Each data area is discussed below:

Configuration Data

Configuration of the module is performed by filling in a user defined data table. In the example ladder logic, file N10 stores the general module configuration information. N11 stores the command list for port 1. Each register in the files has an associated symbol and description to aid in filling in the data. The Reference chapter lists the items that must be configured for the module and their associated location in the file. When the side-connect interface is utilized, the file used for configuration must match that set in the SC_DATA.TXT file using the setdnpsc.exe program.

Backplane Parameters

The first five parameters of the configuration relate to the data transfer between the module and the processor as follows:

- **Write start register:** Offset in module's database where write data will be placed
- **Write register count:** Number of registers to transfer from processor to module
- **Read start register:** Offset in module's database where read data is sourced
- **Read register count:** Number of registers to transfer from module to processor
- **Backplane Fail:** Number of successive transfer failures that cause communication shutdown.

These parameters apply to both the side-connect and block transfer interfaces. For the block transfer interface, the number of blocks to transfer between the module and the processor is determined by the count values set in these parameters. Each block can transfer a maximum of 60 words. For example, if the Write Register Count parameter is set to 240, four write blocks will be transferred (1 to 4) between the processor and the module. When the side-connect interface is utilized, each block can transfer up to 1000 words of data. The user data files must be set to match the values entered in this parameter set. For example, if the Read Register Count parameter is set to 2100, three user data files must be defined. The first two must contain 1000 elements and the last one must contain at least 100 elements.

The Backplane Fail parameter determines if the module should continue communicating on the DF1 network when the backplane transfer operation fails. A value of zero indicates that the module should continue communicating when the backplane is not operational. If the value is greater than zero, the backplane will be retried the entered number of times before a failure will be reported and communication will cease on the ports. When backplane communication is restored, the module will start communicating on the network. For example, if you enter a value of 10 for the parameter, the module will stop all DF1 communications if 10 successive backplane errors are recognized. When a successful transfer is recognized, the module will resume communications on the network.

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

Port Parameters

These parameters define the operation of each of the DF1 ports on the module. Refer to MVI71-DFCM Configuration Data Definition (page 78) for the definition of each parameter. These parameters are contained in the configuration file at offsets 6 to 55. Care must be taken when filling in this data area for successful operation of the module in the user application.

DF1 Master Commands

These records define the commands in the master command list. The definition of each parameter required for each command is given below:

Command	Description
Enable	This parameter defines if the command will be executed or will be disregarded. The following values are valid ▪ 0=Disables the command and it will not execute. ▪ 1=The command will be considered for execution each scan of the command list and will be controlled by the PollInt parameter. ▪ 2=The command will only execute if the data associated with the command has changed since the command was last issued. This option is only available for write commands. ▪ 999=The command will issue a poll command to the slave unit indicated in the command. This option is only valid for a half-duplex network.
IntAddress	This parameter specifies the starting internal register address to be associated with the command. Valid entry for this parameter is 0 to 9999.
PollInt	This parameter defines the Minimum time in tenths of a second to wait between the execution of continuous commands (Enable=1). This poll interval command can be used to lighten the communications load on a busy network. Valid entry for this parameter is 0 to 65535.
Count	This parameter defines the number of registers to be considered by the command. Valid entry for this parameter is 1 to 100.

Command	Description
Swap	This parameter specifies if the data used in the command must be altered when a reading data from a node on the network. Values that can be assigned are as follows ▪ 0=no swapping of data, ▪ 1=swap word values, ▪ 2=swap word and byte values and ▪ 3=swap byte values. This option is used when interfacing the module with ASCII and floating-point data on other devices.
Node	This parameter assigns the DF1 slave node address for the module to reach with the command on the network. This parameter can be assigned values from 0 to 255.
Func	This parameter specifies the function to be performed by the command. Valid entries are those defined in the DF1 Command Set for ProSoft Technology. Communication Modules document.
Parameter_1 to Parameter_4	These are the parameters required for the selected function. Each command has its own unique set of one or more parameters. Refer to the DF1 Command Set document for a complete list of command parameters.

When using the block transfer interface, user data files containing this data can be laid out as in the example ladder logic, commands entered in a contiguous fashion, or they can be defined with each command occupying a 20-word data area. The latter method requires loading the commands one at a time in the command configuration blocks transferred to the module. When the first method is employed, the commands can be copied as a block, five at a time, into the command configuration blocks.

When the side-connect interface is utilized, the command must be contiguous in the file each one occupying a 12-word area. The file numbers used is also fixed. Port 1 commands 0 to 82 must reside in the file after the configuration file followed by a file containing Port 1 commands 83 to 99. Port 2 commands 0 to 82 reside in the next file followed by a file containing Port 2 commands 83 to 99.

2.3.3 Status Data

This data area views the status of the module. Refer to the Reference chapter for a complete listing of the data stored in this object. When the side-connect interface is used, this data is automatically updated in the configuration file starting at offset 200 approximately every second and does not include the first two registers. For the block transfer interface, the module generates blocks with a BTR block identification code of -1. Ladder logic must transfer this information into a user data file.

2.3.4 User Data

Data in the module's internal database in the register range 0 to 4999 is available to the processor. The parameters set in the configuration determine the set of data that is transferred from the module to the processor (read data) and that transferred from the processor to the module (write data). If the block transfer interface is used, ladder logic is required to handle the transfer of data between the processor and the module. BTR messages are required to handle data read from the module, and BTW messages are required to handle data written to the module. When the side-connect interface is utilized, the data is directly transferred between the module and the user data files without the requirement of ladder logic.

2.3.5 Slave Polling Control and Status

Two data areas can be allocated in the SLC to hold the polling status of each slave on the master ports. This status data can be used to determine which slaves are currently active on the port, are in communication error or have their polling suspended and disabled. Special blocks (block transfer interface) or control command (side-connect interface) are required to interface with this data. Using block (command) 3000 or 3100, slaves can be disabled for polling. They can be enabled using block (command) 3001 or 3101. Blocks 3002 to 3006 or 3102 to 3106 request the current status of each slave in the module

2.3.6 Commands Supported by the Module

The format of each command in the list is dependent on the function being executed. To simplify command construction, the module uses its own set of function codes to associate a command with a DF1 command/function type. The tables below list the functions supported by the module:

Basic Command Set Functions

Function Code	Command	Function	Definition	PLC5	SLC500 & MicroLogix	Power-monitor II	ControlLogix
1	0x00	N/A	Protected Write	X			X
2	0x01	N/A	Unprotected Read	X	X		X
3	0x02	N/A	Protected Bit Write	X			X
4	0x05	N/A	Unprotected Bit Write	X			X
5	0x08	N/A	Unprotected Write	X	X		X

PLC-5 Command Set Functions

Function Code	Command	Function	Definition	PLC5	SLC500 & MicroLogix	Power-monitor II	ControlLogix
100	0x0F	0x00	Word Range Write (Binary Address)	X			X
101	0x0F	0x01	Word Range Read (Binary Address)	X			X

Function Code	Command	Function	Definition	PLC5	SLC500 & MicroLogix	Power-monitor II	ControlLogix
102	0x0F	0x26	Read-Modify-Write (Binary Address)	X			X
150	0x0F	0x00	Word Range Write (ASCII Address)	X			X
151	0x0F	0x01	Word Range Read (ASCII Address)	X			X
152	0x0F	0x26	Read-Modify-Write (ASCII Address)	X			X

SLC-500 Command Set Functions

Function Code	Command	Function	Definition	PLC5	SLC500 & MicroLogix	Power-monitor II	ControlLogix
501	0x0F	0xA1	Protected Typed Logical Read With Two Address Fields		X		X
502	0x0F	0XA2	Protected Typed Logical Read With Three Address Fields		X	X	X
509	0x0F	0XA9	Protected Typed Logical Write With Two Address Fields		X		X
510	0x0F	0XAA	Protected Typed Logical Write With Three Address Fields		X	X	X
511	0x0F	0XAB	Protected Typed Logical Write With Mask (Three Address Fields)		X		X

Each command list record has the same general format. The first part of the record contains the information relating to the communication module and the second part contains information required to interface to the DF1 slave device.

The PLC-5 and SLC-500 command set require the use of files. These files are emulated in the module. The module defines these files each as containing 200-word registers that overlay the internal database. The following table shows the relationship of the files to the user data area of the internal database:

File	→	Database Register
N7:0	→	0
N8:0	→	200
N9:0	→	400
N10:0	→	600
N11:0	→	800
N12:0	→	1000
N13:0	→	1200
N14:0	→	1400
N15:0	→	1600
N16:0	→	1800

File	→	Database Register
N17:0	→	2000
N18:0	→	2200
N18:0	→	2400
N20:0	→	2600
N21:0	→	2800
N22:0	→	3000
N23:0	→	3200
N24:0	→	3400
N25:0	→	3600
N26:0	→	3800
N27:0	→	4000
N28:0	→	4200
N29:0	→	4400
N30:0	→	4600
N31:0	→	4800
N32:0	→	5000

Note: The way these files are emulated depends of the *First File* and *File Size* parameters. The previous example shows using the *First File* parameter set to 7 and the *File Size* parameter set to 200.

In order to retrieve data from the modules database register 200, the remote master would issue a command using the address N8:0. In order to interface with database base register 405, the remote master would use the address N9:5. The following table outlines the complete file emulation for the module:

Register Range	File Start	File End	Content	Size
0 to 4999	N7:0	N31:199	User Data	5000
5000 to 5009	N32:0	N32:9	Backplane Configuration	10
5010 to 5039	N32:10	N32:39	Port 1 Setup	30
5040 to 5069	N32:40	N32:69	Port 2 Setup	30
5070 to 5199	N32:70	N32:199	Reserved	130
5200 to 6399	N33:0	N38:199	Port 1 Commands	1200
6400 to 7599	N39:0	N44:199	Port 2 Commands	1200
7600 to 7700	N45:0	N45:199	Misc. Status Data	200
7800 to 7999	N46:0	N46:199	Command Control	200
8000 to 9999	N47:0	N56:199	Reserved	2000

All the data in the module is available to a remote host. This permits the host device to remotely configure the module and view the status data.

3 Ladder Logic

Ladder logic is required for application of the MVI71-DFCM module. Tasks that must be handled by the ladder logic are module data transfer, special block handling and status data receipt. Additionally, a power-up handler may be needed to handle the initialization of the module's data and to clear any processor fault conditions.

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

4 Diagnostics and Troubleshooting

In This Chapter

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

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

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

4.1 Reading Status Data from the Module

The MVI71-DFCM module returns two status data blocks that can be used to determine the module's operating status. This data is requested by the ladder logic and returned in the module's M1 file. This data can also be viewed using the Configuration/Debug port with a terminal emulation program. 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 3999)
- Version Information
- Control over the module (warm boot, cold boot)
- Facility to upload and download the module's configuration file

4.1.1 The Configuration/Debug Menu

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

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

4.1.2 Required Hardware

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

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

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

4.1.3 Required Software

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

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

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

4.1.4 Using the Configuration/Debug Port

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

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

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

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

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

1. Verify that the null modem cable is connected properly between your computer's serial port and the module. A regular serial cable will not work.

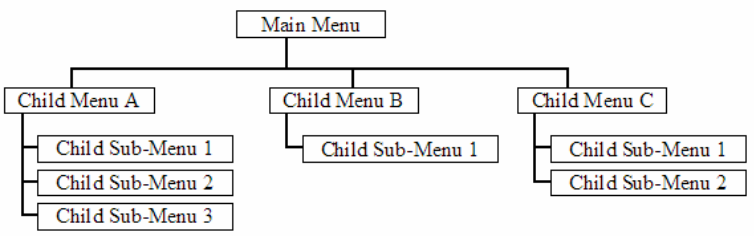
2 Verify that RSLinx is not controlling the COM port. Refer to Disabling the RSLinx Driver for the Com Port on the PC (page 72).
3 Verify that your communication software is using the correct settings for baud rate, parity and handshaking.
4 On computers with more than one serial port, verify that your communication program is connected to the same port that is connected to the module.

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

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][/]**.

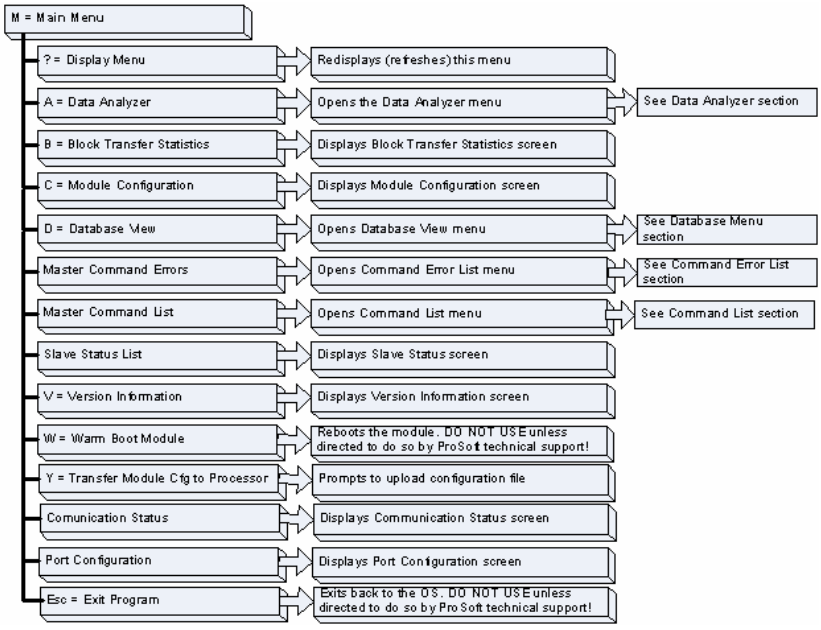
Also, take care to distinguish capital letter **[I]** from lower case letter **[l]** (L) and number **[1]**; likewise for capital letter **[O]** and number **[0]**. Although these characters look nearly the same on the screen, they perform different actions on the module.

4.1.5 Main Menu

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

```
DF1 MASTER/SLAVE COMMUNICATION MODULE
  ?=Display Menu
  A=Data Analyzer
  B=Block Transfer Statistics
  C=Module Configuration
  D=Database View
  Master Command Errors : E=Port 1   F=Port 2
  Master Command List   : I=Port 1   J=Port 2
  Slave Status List     : O=Port 1   P=Port 2
  V=Version Information
  W=Warm Boot Module
  Y=Transfer Module Cfg to Processor
  Communication Status : 1=Port 1   2=Port 2
  Port Configuration   : 6=Port 1   7=Port 2

  Esc=Exit Program
```

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



Opening the Data Analyzer Menu

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

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

Viewing Block Transfer Statistics

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

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

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

Viewing Module Configuration

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

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

Opening the Database Menu

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

Opening the Command Error List Menu

Press **[I]** to open the Command Error List. This list consists of multiple pages of command list error/status data. Press **[?]** to view a list of commands available on this menu.

Opening the Command List Menu

Press **[L]** to open the Command List menu. Use this command to view the configured command list for the module.

Viewing the Slave Status List (Port 1 and 2)

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

0 = slave is not used,

1 = slave being actively polled,

2 = slave suspended and

3 = slave disabled.

Viewing Version Information

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

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

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

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

Warm Booting the Module

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

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

Transferring Module Configuration to the Processor

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

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

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

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

Viewing Communication Status

Press **[1]** to view the communication status and statistics of the DFCM Network for the module's node address. This command is useful for troubleshooting purposes.

Viewing Port Configuration

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

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

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.

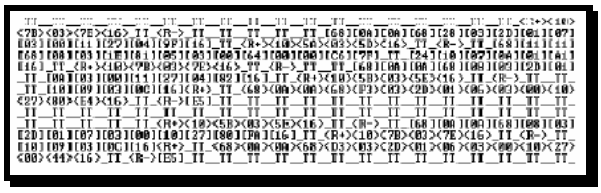
4.1.6 Data Analyzer

The data analyzer mode allows you to view all bytes of data transferred on each port. Both the transmitted and received data bytes are displayed. Use of this feature is limited without a thorough understanding of the protocol.

Note: The Port selection commands on the Data Analyzer menu differs very slightly in different modules, but the functionality is basically the same. Use the illustration above as a general guide only. Refer to the actual data analyzer menu on your module for the specific port commands to use.
Important: When in analyzer mode, program execution will slow down. Only use this tool during a troubleshooting session. Before disconnecting from the Config/Debug port, please press [S] to stop the data analyzer, and then press [M] to return to the main menu. This action will allow the module to resume its normal high speed operating mode.

Analyzing Data for the first application port

Press **[1]** to display I/O data for the first application port in the Data Analyzer. The following illustration shows an example of the Data Analyzer output.



Analyzing Data for the second application port

Press **[2]** to display I/O data for the second application port in the Data Analyzer.

Displaying Timing Marks in the Data Analyzer

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

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

Removing Timing Marks in the Data Analyzer

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

Viewing Data in Hexadecimal Format

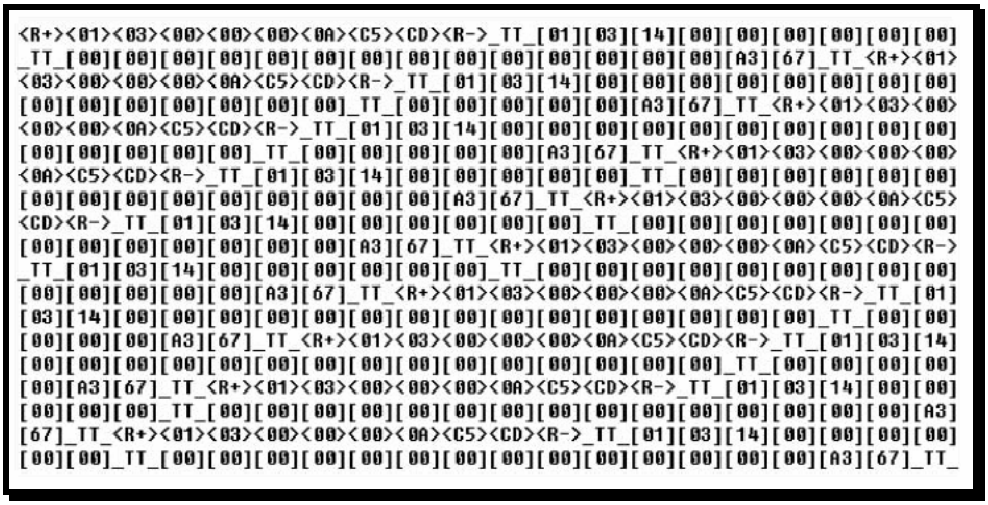
Press **[H]** to display the data on the current page in hexadecimal format.

Viewing Data in ASCII (Text) Format

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

Starting the Data Analyzer

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



The Data Analyzer displays the following special characters:

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

Stopping the Data Analyzer

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

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

Returning to the Main Menu

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

4.1.7 Data Analyzer Tips

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

```
Data Analyzer Mode Selected
```

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

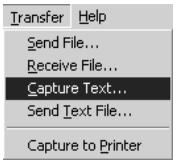
```
DATA ANALYZER VIEW MENU
 ?=Display Menu
 1=Select Port 1
 2=Select Port 2
 5=1 mSec Ticks
 6=5 mSec Ticks
 7=10 mSec Ticks
 8=50 mSec Ticks
 9=100 mSec Ticks
 0=No mSec Ticks
 H=Hex Format
 A=ASCII Format
 B=Start
 S=Stop
 M=Main Menu

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

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

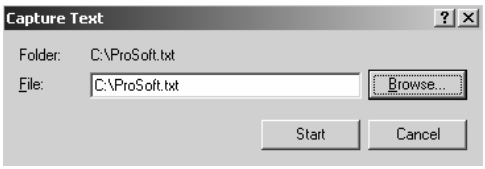
For most applications, HEX is the best format to view the data, and this does include ASCII based messages (because some characters will not display on HyperTerminal and by capturing the data in HEX, we can figure out what the corresponding ASCII characters are supposed to be).

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

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



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



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

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

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

```
[03][00][04][00][05][00][06][00][07][00][08][00][09][FB][B7]_TT__TT_<R+><01><02>
<00><00><00><0A><F8><0D><R->_TT__TT__TT_[01][02][02][00][00][B9][B8]_TT__TT_<R+>
<01><03><00><00><00><0A><C5><CD><R->_TT__TT_[01][03][14][00][00][00][01][00]_TT_
[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][CD][51]_TT__TT_<R+>
<01><01><00><00><00><A0><3C><72><R->_TT__TT_[01][01][14][00][00][01][00][02]_TT_
[00][03][00][04][00][05][00][06][00][07][00][08][00][09][00][B7][52]_TT__TT_<R+>
<01><04><00><00><00><0A><70><0D><R->_TT__TT_[01][04][14][00][00][00][01][00]_TT_
[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][FB][B7]_TT__TT_<R+>
<01><02><00><00><00><0A><F8><0D><R->_TT__TT__TT_[01][02][02][00][00][B9][B8]_TT_
_TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT__TT_[01][03][14][00][00][00][01]
[00]_TT_[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][CD][51]_TT_
_TT_<R+><01><01><00><00><00><A0><3C><72><R->_TT__TT__TT_[01][01][14][00][00][01]
[00][02]_TT_[00][03][00][04][00][05][00][06][00][07][00][08][00][09][00][B7][52]
_TT__TT_<R+><01><04><00><00><00><0A><70><0D><R->_TT__TT_[01][04][14][00][00][00]
[01][00]_TT_[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][FB][B7]
_TT__TT_<R+><01><02><00><00><00><0A><F8><0D><R->_TT__TT_[01][02][02][00][00][B9]
[B8]_TT__TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT__TT_[01][03][14][00][00]
[00][01][00]_TT_[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][CD]
[51]_TT__TT_<R+><01><01><00><00><00><A0><3C><72><R->_TT__TT__TT_[01][01][14][00]
[00][01][00][02]_TT_[00][03][00][04][00][05][00][06][00][07][00][08][00][09][00]
[B7][52]_TT__TT_<R+><01><04><00><00><00><0A><70><0D><R->_TT__TT_[01][04][14][00]
[00][00][01][00]_TT_[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09]
[FB][B7]_TT__TT_<R+><01><02><00><00><00><0A><F8><0D><R->_TT__TT__TT_[01][02][02]
[00][00][B9][B8]_TT__TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT__TT_
```

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

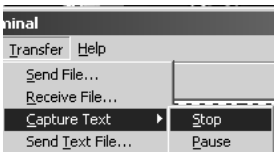
All characters shown in <> brackets are characters being sent out by the module.

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

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

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

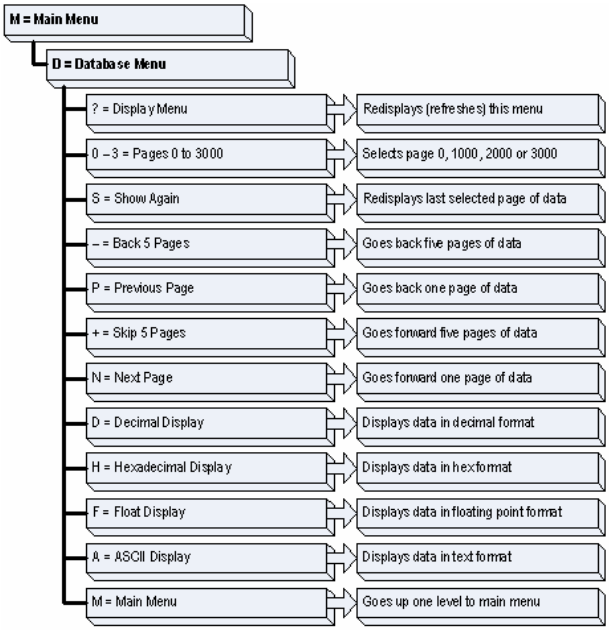
When you have captured the data you want to save, open the Transfer menu and choose Capture Text. On the secondary menu, choose Stop.



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

4.1.8 Database View Menu

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



Viewing Register Pages

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

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

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

Displaying the Current Page of Registers Again

```
DATABASE DISPLAY 0 TO 99 (DECIMAL)
   100   101   102     4     5     6     7     8     9    10
    11    12    13    14    15    16     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
     0     0     0     0     0     0     0     0     0     0
```

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

Moving Back Through 5 Pages of Registers

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

Viewing the Previous 100 Registers of Data

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

Skipping 500 Registers of Data

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

Viewing the Next 100 Registers of Data

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

Viewing Data in Decimal Format

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

Viewing Data in Hexadecimal Format

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

Viewing Data in Floating Point Format

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

Viewing Data in ASCII (Text) Format

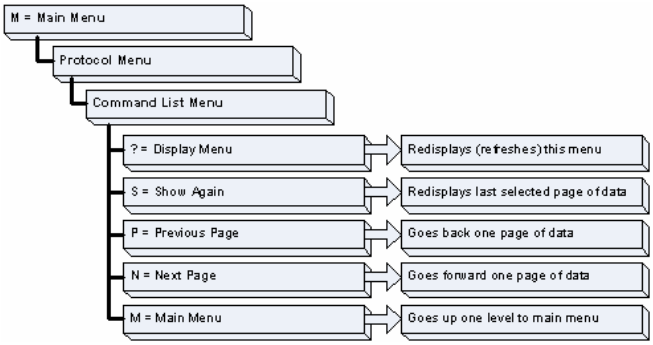
Press **[A]** to display the data on the current page in ASCII format. This is useful for regions of the database that contain ASCII data.

Returning to the Main Menu

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

4.1.9 Master Command Error List Menu

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



Redisplaying the Current Page

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

Viewing the Previous 20 Commands

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

Viewing the Previous Page of Commands

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

Viewing the Next 20 Commands

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

Viewing the Next Page of Commands

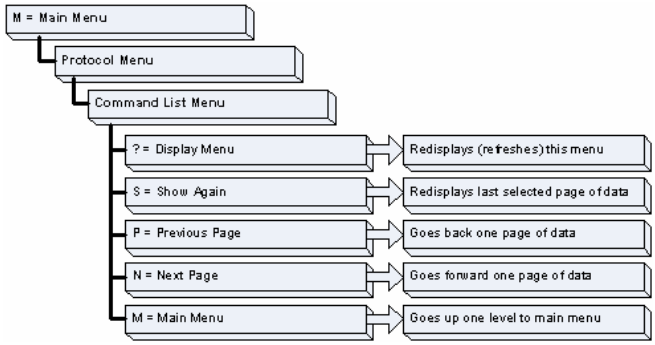
Press **[N]** to display the next page of commands.

Returning to the Main Menu

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

4.1.10 Master Command List Menu

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



Redisplaying the Current Page

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

Viewing the Previous 50 Commands

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

Viewing the Previous Page of Commands

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

Viewing the Next 50 Commands

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

Viewing the Next Page of Commands

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

Returning to the Main Menu

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

4.2 LED Status Indicators

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

Module	Color	Status	Indication
CFG	Green	On	Data is being transferred between the module and a remote terminal using the Configuration/Debug port.
		Off	No data is being transferred on the Configuration/Debug port.
P1	Green	On	Data is being transferred between the module and the DF1 network on Port 1.
		Off	No data is being transferred on the port.
P2	Green	On	Data is being transferred between the module and the DF1 network on Port 2.
		Off	No data is being transferred on the port.
APP Status	Amber	Off	The MVI71-DFCM is working normally.
		On	The MVI71-DFCM module program has recognized a communication error on one of its ports.
BP	Amber	On	The LED is on when the module is performing a write operation on the backplane.
		Off	The LED is off when the module is performing a read operation on the backplane. Under normal operation, the LED should blink rapidly on and off.
OK	Red/ Green	Off	The card is not receiving any power and is not securely plugged into the rack.
		Green	The module is operating normally.
		Red	The program has detected an error or is being configured. If the LED remains red for over 10 seconds, the program has probably halted. Remove the card from the rack and re-insert the card to restart the module's program.
BAT	Red	Off	The battery voltage is OK and functioning.
		On	The battery voltage is low or battery is not present. Allow battery to charge by keeping module plugged into rack for 24 hours. If BAT LED still does not go off, contact ProSoft Technology, as this is not a user serviceable item.

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

Offset	Description	Length
0	9000	1
1 to 6	Backplane Set Up	6
7 to 31	Port 1 Configuration	25
32 to 56	Port 2 Configuration	25
57 to 63	Spare	7

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

Bit	Description	Value
0	Read block start value is greater that the database size.	0x0001
1	Read block start value is less than zero.	0x0002
2	Read block count value is less than zero.	0x0004
3	Read block count + start is greater than the database size.	0x0008
4	Write block start value is greater that the database size.	0x0010
5	Write block start value is less than zero.	0x0020
6	Write block count value is less than zero.	0x0040
7	Write block count + start is greater than the database size.	0x0080
8		0x0100
9		0x0200
10		0x0400
11		0x0800
12		0x1000
13		0x2000
14		0x4000
15		0x8000

The port configuration error words have the following definitions:

Bit	Description	Value
0	Type code is not valid. Enter a value of 0 (master) or 1 (slave).	0x0001
1	Protocol parameter is not valid.	0x0002
2	Termination type parameter is not valid.	0x0004
3	Baud rate parameter is not valid.	0x0008
4	Parity parameter is not valid.	0x0010
5	Data bits parameter is not valid.	0x0020
6	Stop bits parameter is not valid.	0x0040
7	Command count parameter is not valid.	0x0080
8	Retry count parameter is not valid.	0x0100
9	Spare	0x0200
10	Spare	0x0400
11	Spare	0x0800
12	Spare	0x1000
13	Spare	0x2000
14	Spare	0x4000
15	Spare	0x8000

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

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

4.2.1 Clearing a Fault Condition

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

To clear the condition, follow these steps:

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

- Product Specifications 49
- Functional Overview 51
- Cable Connections 69
- Pass-Through Ports 74
- MVI71-DFCM Status Data Definition 74
- Error Codes 76
- MVI71-DFCM Configuration Data 78
- Command Control 87
- DF1 Command Set For ProSoft Technology Communication Modules 88
- DF1 Command List Form 100

5.1 Product Specifications

The MVI71 DF1 Master/Slave Communication Module is a PLC backplane compatible module that allows Rockwell Automation PLC I/O compatible processors to interface easily with DF1 protocol compatible devices and hosts. Devices commonly supporting the protocol include Rockwell Automation PLCs and power monitoring equipment, as well as several other third party devices in the marketplace.

The module has two serial ports supporting the DF1 protocol, with each port user-configurable to act as a master or as a slave. Data transfer between the module and the PLC processor is asynchronous to the DF1 network, with the module's internal database being used to exchange data between the processor and the DF1 network.

The MVI71-DFCM Master/Slave Communications module allows Rockwell Automation PLC I/O compatible processors to interface easily with other DF1 protocol compatible devices. Compatible devices include not only Rockwell Automation PLCs (which all support the DF1 protocol) but also a wide assortment of end devices.

The module has two serial ports supporting the DF1 protocol, with each port user-configurable to act as a master or as a slave. Data transfer between the module and the PLC processor is asynchronous to the DF1 network, with the module's internal database being used to exchange data between the processor and the DF1 network.

5.1.1 General Specifications

- Single Slot - 1771 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.
- Configuration data obtained through user-defined ladder. Sample ladder file included

5.1.2 Hardware Specifications

Specification	Description
Form Factor	Single Slot 1771 chassis compatible BTR/BTW data transfer Local or remote rack
Backplane current load	800 mA @ 5 V
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 10150 Hz
Relative humidity	5% to 95% (non-condensing)
LED Indicators	Module status Backplane transfer status Application status Serial activity and error LED status
Debug/Configuration port (CFG)	
CFG Port (P1)	RJ45 (DB-9M with supplied cable) RS-232 only
Configuration Connector	RJ45 RS-232 Connector (RJ45 to DB-9 cable shipped with unit)
Application Ports	
Application Serial port (P2, P3) (Serial Modules)	Two RJ45 RS-232/422/485 Application ports

5.1.3 Functional Specifications

DF1 ports

- Full and half duplex modes supported
- CRC and BCC error checking
- Full hardware handshaking control provides radio, modem and multi-drop support
- User-definable module memory usage, supporting the storage and transfer of up to 5000 registers to/from the control processor
- Up to 125 word read and write command lengths supported
- Floating point data movement supported

DF1 Master Protocol Specifications

The ports on the DF1 module can be individually configured as Master ports. When configured in master mode, the DFCM module is capable of reading and writing data to remote DF1 devices, enabling the PLC platform to act as a SCADA sub-master.

- Command List: Up to 100 commands per Master port, each fully-configurable for function, slave address, register to/from addressing and word/byte count
- Status Data: Error codes available on an individual command basis. In addition, a slave status list is maintained per active master port
- Polling of Command List: User-configurable polling of commands, including disabled, continuous, and on change of data (write only)

DF1 Slave Protocol Specifications

The module accepts DF1 commands from an attached DF1 master unit to read/write data stored in the module's internal registers. This data can be derived from other DF1 slave devices on the network through a master port or from the processor and is easily transferred to the processor's data registers.

Tested Hardware Connections

Several hardware connections have been tested by ProSoft Technology or have been customer field tested. The following physical connections have been tested successfully:

- RA Panel view (Full Duplex point-point, DFCM as slave)
- RA Processors (Full/Half duplex, DFCM as either master or slave)
- RA Power Monitors (485 Half-Duplex DFCM as Master)

5.2 Functional Overview

This section provides an overview of how the MVI71-DFCM module transfers data using the DFCM protocol. You should understand the important concepts in this chapter before you begin installing and configuring the module.

5.2.1 General Concepts

The following discussion explains several concepts that are important for understanding the operation of the MVI71-DFCM module.

Module Power Up

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

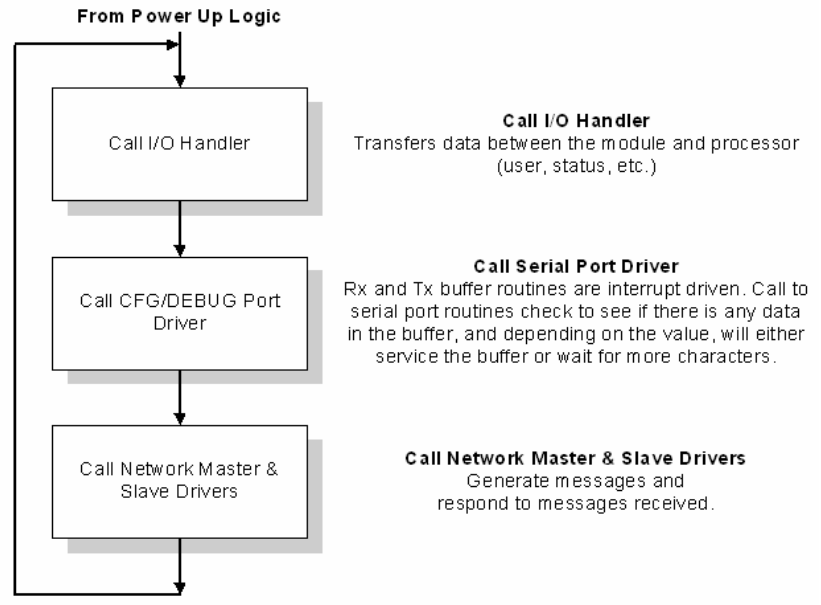
1. Initialize hardware components
2. Initialize PLC5 backplane driver
   - Test and Clear all RAM
   - Initialize the serial communication ports
   - Determine the interface to the backplane (side-connect or block transfer)
3. Wait for Module Configuration from PLC5 processor

4 Initialize Module Register space
5 Enable Slave Driver on selected ports
6 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.

Main Logic Loop

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



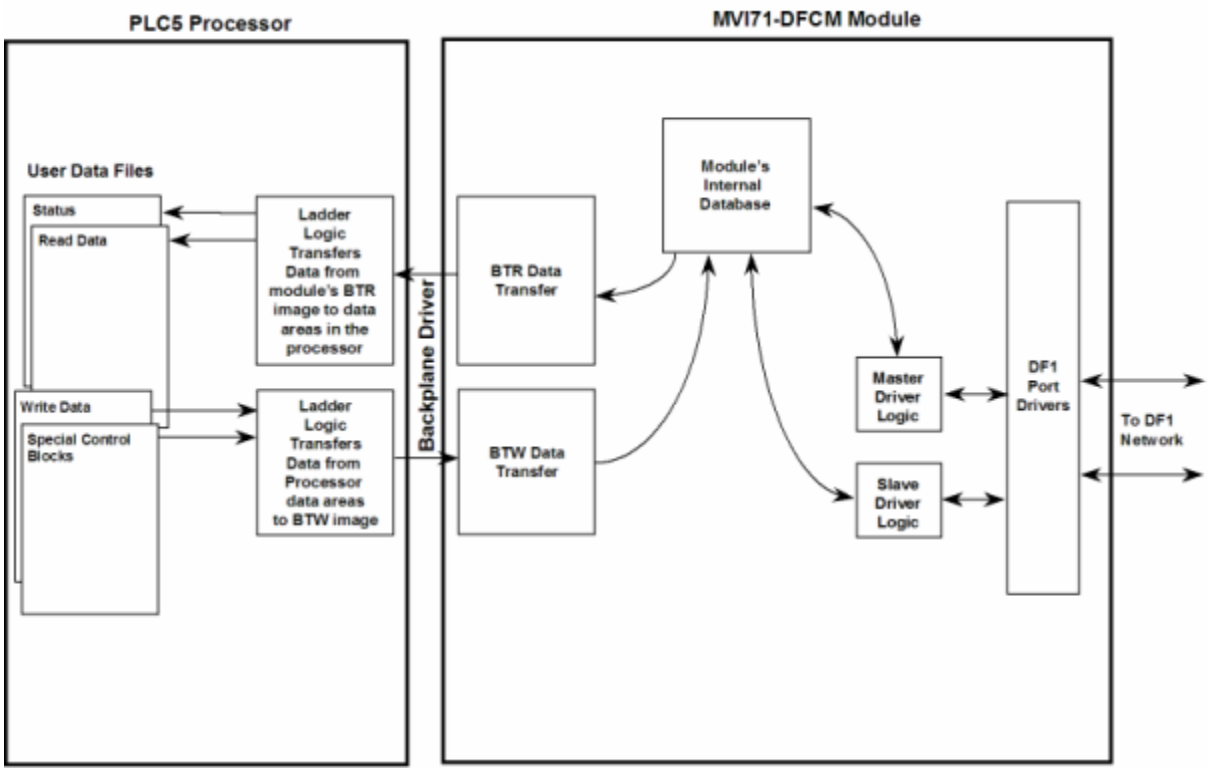
PLC5 Processor Not in Run

Whenever the module detects that the processor has gone out of the Run mode (for example Fault or PGM), the DF1 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.

5.2.2 Backplane Data Transfer

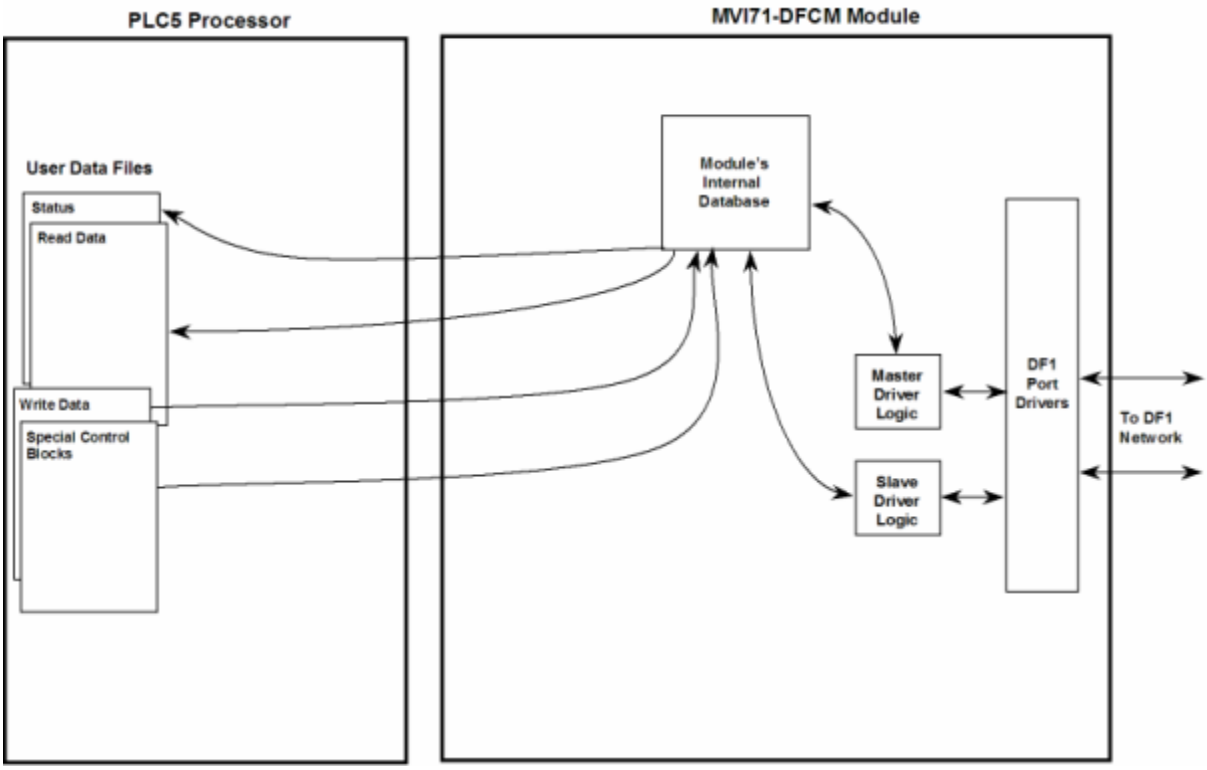
The MVI71-DFCM module communicates directly over the PLC backplane. Data is paged between the module and the PLC5 processor across the backplane using BTR/BTW messages or directly to the processor using the side-connect interface. The update frequency of the data is determined by the scheduled scan rate defined by the user for the module and the communication load on the module.

The following illustration shows the data transfer method used to move data between the PLC5 processor and the module when the block transfer interface is utilized:



Ladder logic is required in the PLC to handle the BTR and BTW messages that transfer the data between the processor and the module. Data transferred from the module to the processor are passed in BTR blocks. This data is transferred from the message block to the user data file in the PLC as controlled by the ladder logic. BTW blocks are utilized to transfer data from the processor to the module. Ladder logic copies information from the user data files into the message blocks; then activates a BTW operation. The module receives this message and places the data received in the module's database.

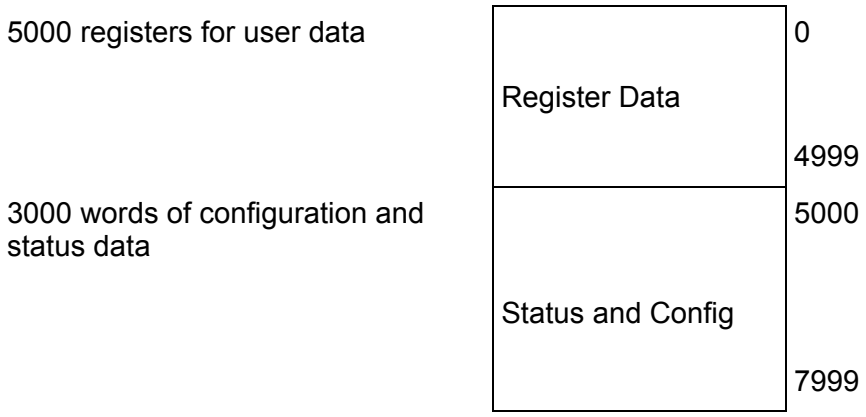
The following illustration shows the data transfer operations used when the side-connect interface is utilized:



When the side-connect interface is used, data is transferred directly between the processor and the module. The module's program directly interfaces to the set of user data files established in the PLC to pass all data between the two devices. No ladder logic is required for data transfer, only the establishment of the data files.

As shown in the diagrams above, all data transferred between the module and the processor is between the user data files and the module's internal database. All data used by the module is stored in its internal database. The following illustration shows the layout of the database:

Module's Internal Database Structure



When the block transfer interface is utilized, a block identification code is used in each block to identify its function. The first word of each block is reserved for this purpose. The following table lists the block identification codes used for the block transfer interface:

Block Range	Descriptions
-9000	Configuration data (sent from module)
-6100 to -6119	Port 2 commands (sent from module)
-6000 to -6019	Port 1 commands (sent from module)
-1	Status data block on BTR
0	Null block
1 to 167	Read or write data
1000	Event Port 1
2000	Event Port 2
3000 to 3001	Port 1 slave polling control
3002 to 3006	Port 1 slave status
3100 to 3101	Port 2 slave polling control
3102 to 3106	Port 2 slave status
5000 to 5006	Port 1 command control
5100 to 5106	Port 2 command control
6000 to 6019	Port 1 commands (sent to module)
6100 to 6119	Port 2 commands (sent to module)
9000	Configuration data (sent to module)
9997	Write configuration to controller
9998	Warm-boot control block
9999	Cold-boot control block

Ladder logic must handle each of the blocks used in a user application. The following topics define the structure and content of these blocks.

When the side-connect interface is utilized, data is directly transferred between the processor and the module. Ladder logic can be written to control the operation of the module using a reserved data area in the configuration file (registers 80 to 139).

The control codes recognized by the module are listed in the following table.

Control Commands	Descriptions
1000	Event Port 1
2000	Event Port 2
3000 to 3001	Port 1 slave polling control
3002 to 3006	Port 1 slave status
3100 to 3101	Port 2 slave polling control
3102 to 3106	Port 2 slave status
5000 to 5006	Port 1 command control
5100 to 5106	Port 2 command control
9997	Write configuration to controller
9998	Warm-boot control block
9999	Cold-boot control block

The structure of this data area is identical to that of the block transfer interface for the respective block identification codes. The sections below define the structure of the control command data areas.

Normal Data Transfer

Normal data transfer includes the paging of the user data found in the module's internal database in registers 0 to 4999 and the status data. These data are transferred through read (BTR) and write (BTW) blocks when the block transfer interface is employed. Refer to Module Configuration (page 21) 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 (1 to 167)

These blocks of data transfer information from the module to the PLC5 processor. The structure of the BTR message used to transfer this data is shown below:

Offset	Description	Length
0	Read Block ID	1
1	Write Block ID	1
2 to 61	Read Data	60
62 to 63	Spare	2

The Read Block ID is an index value used to determine the location of where the data will be placed in the PLC5 processor user data table. Each transfer can move up to 60 words (block offsets 2 to 61) of data.

The Write Block ID associated with the block requests data from the PLC5 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 DF1 network or operator control through the module's Configuration/Debug port.

Write Block (1 to 167)

These blocks of data transfer information from the PLC5 processor to the module. The structure of this block image used to transfer this data is shown below:

Offset	Description	Length
0	Write Block ID	1
1 to 60	Write Data	60
61 to 63	Spare	3

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 60 words (block offsets 1 to 60) of data.

Status Data Block (-1)

Approximately, every second the module will build a BTR block to transfer the module's status information to the processor. This information can be utilized by the PLC program to determine the "health" of the module. Ladder logic should be constructed to transfer the information in this block to a user data file. The structure of this block is shown in the following table.

Offset	Content	Description
0	Read Block ID	Block identification code -1 to indicate a status
1	Write Block ID	Block requested from the processor by the module.
2	Program Scan Count	This value is incremented each time a complete program cycle occurs in the module.
3 to 4	Product Code	These two registers contain the product code of "DFCM"
5 to 6	Product Version	These two registers contain the product version for the current running software.
7 to 8	Operating System	These two registers contain the month and year values for the program operating system.
9 to 10	Run Number	These two registers contain the run number value for the currently running software.
11	Port 1 Command List Requests	This field contains the number of requests made from this port to slave devices on the network.
12	Port 1 Command List Response	This field contains the number of slave response messages received on the port.
13	Port 1 Command List Errors	This field contains the number of command errors processed on the port. These errors could be due to a bad response or command.
14	Port 1 Requests	This field contains the total number of messages sent out of the port.
15	Port 1 Responses	This field contains the total number of messages received on the port.
16	Port 1 Errors Sent	This field contains the total number of message errors sent out of the port.

Offset	Content	Description
17	Port 1 Errors Received	This field contains the total number of message errors received on the port.
18	Port 2 Command List Requests	This field contains the number of requests made from this port to slave devices on the network.
19	Port 2 Command List Response	This field contains the number of slave response messages received on the port.
20	Port 2 Command List Errors	This field contains the number of command errors processed on the port. These errors could be due to a bad response or command.
21	Port 2 Requests	This field contains the total number of messages sent out the port.
22	Port 2 Responses	This field contains the total number of messages received on the port.
23	Port 2 Errors Sent	This field contains the total number of message errors sent out of the port.
24	Port 2 Errors Received	This field contains the total number of message errors received on the port.
25	Read Block Count	This field contains the total number of read blocks transferred from the module to the processor.
26	Write Block Count	This field contains the total number of write blocks transferred from the processor to the module.
27	Parse Block Count	This field contains the total number of blocks successfully parsed that were received from the processor.
28	Command Event Block Count	This field contains the total number of command event blocks received from the processor.
29	Command Block Count	This field contains the total number of command blocks received from the processor.
30	Error Block Count	This field contains the total number of block errors recognized by the module.
31	Port 1 Current Error	For a slave port, this field contains the value of the current error code returned. For a master port, this field contains the index of the currently executing command.
32	Port 1 Last Error	For a slave port, this field contains the value of the last error code returned. For a master port, this field contains the index of the command with an error.
33	Port 2 Current Error	For a slave port, this field contains the value of the current error code returned. For a master port, this field contains the index of the currently executing command.
34	Port 2 Last Error	For a slave port, this field contains the value of the last error code returned. For a master port, this field contains the index of the command with an error.

Configuration Data Transfer

When the module performs a restart operation, it will request configuration information from the PLC5 processor. If the side-connect interface is used, this data is read directly from the user data files into the module. This data is transferred to the module in specially formatted write blocks when the block transfer interface is utilized. The module will poll for each block by setting the required write block number in a read block (BTR). Refer to the **Module Set Up** section for a description of the data objects used with the blocks and the ladder logic required. The format of the blocks for configuration is given in the following topics.

Module Configuration Data

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

Offset	Description	Length
0	9000	1
1 to 6	Backplane Set Up	6
7 to 31	Port 1 Configuration	25
32 to 56	Port 2 Configuration	25
57 to 63	Spare	7

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

Offset	Description	Length
0	-2 or -3	1
1	9000	1
2	Module Configuration Errors	1
3	Port 1 Configuration Errors	1
4	Port 2 Configuration Errors	1
5 to 63	Spare	59

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

Master Command List Data

Each port on the module can be configured as a DF1 master device containing its own list of one hundred commands. The commands are read from the processor using the following Write Block ID's: DF1 Port 1 - 6000 to 6019 and DF1 Port 2 - 6100 to 6119. Each block transfers data for 5 commands. The module will sequentially poll for each block from the processor. Ladder logic must handle each and every one of the data transfers. The structure of each block is shown below:

Offset	Description	Length
0	6000 to 6019 and 6100 to 6119	1
1 to 12	Command Definition	12
13 to 24	Command Definition	12

Offset	Description	Length
25 to 36	Command Definition	12
37 to 48	Command Definition	12
49 to 60	Command Definition	12
61 to 63	Spare	3

5.2.3 Slave Status Blocks

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

State	Description
0	The slave is inactive and not defined in the command list for the master port.
1	The slave is actively being polled or controlled by the master port.
2	The master port has failed to communicate with the slave device. Communications with the slave is suspended for a user defined period based on the scanning of the command list.
3	Communications with the slave has been disabled by the ladder logic. No communication will occur with the slave until this state is cleared by the ladder logic.

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

In order to read the slave status table, ladder logic must be written. The ladder logic must send a special block to the module to request the data. Each port has a specific set of blocks to request the data as follows:

Block ID	Description
3002	Request for slave status values for Port 1 slaves 0 to 59
3003	Request for slave status values for Port 1 slaves 60 to 119
3004	Request for slave status values for Port 1 slaves 120 to 179
3005	Request for slave status values for Port 1 slaves 180 to 239
3006	Request for slave status values for Port 1 slaves 240 to 255
3102	Request for first 60 slave status values for Port 2
3103	Request for slave status values for Port 2 slaves 60 to 119
3104	Request for slave status values for Port 2 slaves 120 to 179
3105	Request for slave status values for Port 2 slaves 180 to 239
3106	Request for slave status values for Port 2 slaves 240 to 255

The format of these blocks is as shown below:

Offset	Description	Length
0	3002 to 3006 or 3102 to 3106	1
1 to 63	Spare	63

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

Offset	Description	Length
0	3002 to 3006 or 3102 to 3106	1
1	Write Block ID	1
2 to 61	Slave Poll Status Data	60
62 to 64	Spare	2

Ladder logic can be written to override the value in the slave status table to disable slaves (state value of 3) by sending a special block of data from the processor to the slave. Port 1 slaves are disabled using block 3000, and Port 2 slaves are disabled using block 3100. Each block contains the slave node addresses to disable. The structure of the block is shown in the following table.

Offset	Description	Length
0	3000 or 3100	1
1	Number of Slaves in Block	1
2 to 61	Slave indexes	60
62 to 64	Spare	2

The module will respond with a block with the same identification code received and indicate the number of slaves acted on with the block. The format of this response block is shown in the following table.

Offset	Description	Length
0	3000 or 3100	1
1	Write Block ID	1
2	Number of slaves processed	1
3 to 63	Spare	61

Ladder logic can be written to override the value in the slave status table to enable the slave (state value of 1) by sending a special block. Port 1 slaves are enabled using block 3001, and Port 2 slaves are enabled using block 3101. Each block contains the slave node addresses to enable. The format of the block is shown in the following table.

Offset	Description	Length
0	3001 or 3101	1
1	Number of Slaves in Block	1
2 to 61	Slave indexes	60
62 to 64	Spare	2

The module will respond with a block with the same identification code received and indicate the number of slaves acted on with the block. The format of this response block is shown in the following table.

Offset	Description	Length
0	3001 or 3101	1
1	Write Block ID	1
2	Number of slaves processed	1
3 to 63	Spare	61

5.2.4 Command Control Blocks

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

Event Command

Event command control blocks send DF1 commands directly from the ladder logic to one of the master ports. The format for these blocks is shown in the following table.

Offset	Description	Length
0	1000 or 2000	1
1	Internal DB Address	1
2	Point Count	1
3	Swap Code	1
4	Node Address	1
5	Function Code	1
6	Parameter #1	1
7	Parameter #2	1
8	Parameter #3	1
9	Parameter #4	1
10 to 63	Spare	54

The block number defines the DF1 port to be considered. Block 1000 commands are directed to Port 1, and block 2000 commands are directed to Port 2. The parameters passed with the block construct the command. The **Internal DB Address** parameter specifies the module's database location to associate with the command. The **Point Count** parameter defines the number of registers for the command. The **Swap Code** changes the word or byte order. The **Node Address** parameter defines the device on the DF1 network to consider. The **Function Code** parameter is one of those defined in the ProSoft DF1 Command Set documentation. The parameter fields in the block should be completed as required by the selected function code. Each command has its own set of parameters. When the block is received, the module will process it and place the command in the command queue. The module will respond to each event command block with a read block with the following format:

Offset	Description	Length
0	1000 or 2000	1
1	Write Block ID	1
2	0=Fail, 1=Success	1
3 to 63	Spare	61

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

Command Control

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

One to six commands can be placed in the command queue with a single request. The format of the block is shown in the following table.

Offset	Description	Length
0	5001 to 5006 or 5101 to 5106	1
1	Command index	1
2	Command index	1
3	Command index	1
4	Command index	1
5	Command index	1
6	Command index	1
7 to 63	Spare	57

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

The module responds to a command control block with a block containing the number of commands added to the command queue for the port. The format of the block is displayed below:

Offset	Description	Length
0	5000 to 5006 or 5100 to 5106	1
1	Write Block ID	1
2	Number of commands added to command queue	1
3 to 63	Spare	61

Write Configuration

This block is sent from the PLC5 processor to the module to force the module to write its current configuration back to the processor. This function is used when the module's configuration has been altered remotely using database write operations. The write block contains a value of -9000 in the first word. The module will respond with blocks containing the module configuration data. Ladder logic must handle the receipt of these blocks. The blocks transferred from the module are as follows:

Block -9000, General Configuration Data:

Offset	Description	Length
0	-9000	1
1	-9000	1
2 to 7	Backplane Set Up	6
8 to 32	Port 1 Configuration	25
33 to 57	Port 2 Configuration	25
58 to 63	Spare	6

Blocks -6000 to -6019 and -6100 to 6119, Master Command List Data for ports 1 and 2, respectively:

Offset	Description	Length
0	-6000 to -6019 and -6100 to -6119	1
1	-6000 to -6019 and -6100 to -6119	1
2 to 13	Command Definition	12
14 to 25	Command Definition	12
26 to 37	Command Definition	12
38 to 49	Command Definition	12
50 to 61	Command Definition	12
62 to 63	Spare	2

Each of these blocks must be handled by the ladder logic for proper module operation. The processor can request the module's configuration by sending a configuration read request block, block code 9997, to the module. The format of this request block is as follows:

Offset	Description	Length
0	9997	1
1 to 63	Spare	63

When the module receives this command block, it will transfer the module's current configuration to the processor. If the block transfer interface is used, the blocks defined above (-9000 and -6000 series blocks) will be sent from the module. If the side-connect interface is utilized, the user data files will be updated directly by the module.

Warm Boot

This block is sent from the PLC5 processor to the module 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 user data file. This will force the module to read the new configuration information and to restart. The structure of the control block is shown below:

Offset	Description	Length
0	9998	1
1 to 63	Spare	63

Cold Boot

This block is sent from the PLC5 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.

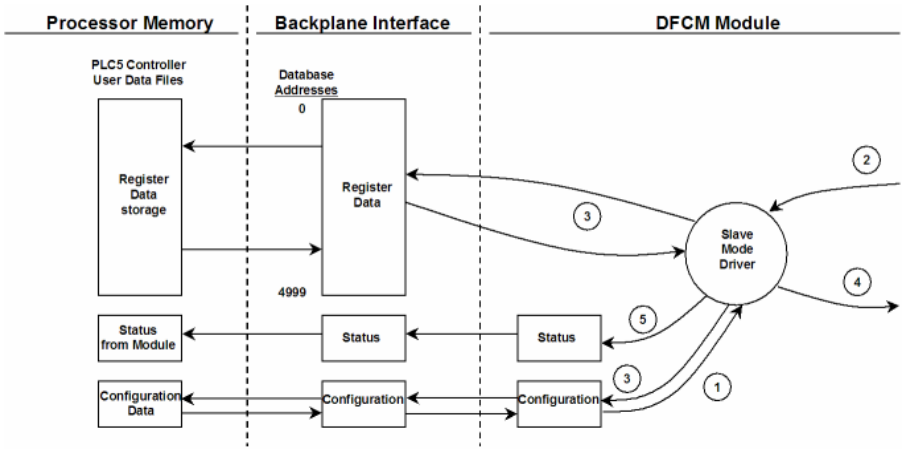
Offset	Description	Length
0	9999	1
1 to 63	Spare	63

5.2.5 Data Flow between MVI71-DFCM Module and PLC5 Processor

The following topics describe the flow of data between the two pieces of hardware (PLC5 processor and MVI71-DFCM module) and other nodes on the DF1 network under the module's different operating modes. Each port on the module is configured to emulate a DF1 master device or a DF1 slave device. The operation of each port is dependent on this configuration. The following topics discuss the operation of each mode.

Slave Driver Mode

The Slave Driver Mode allows the MVI71-DFCM module to respond to data read and write commands issued by a master on the DF1 network. The following flow chart and associated table describe the flow of data into and out of the module.



Step	Description
1	The DF1 slave port driver receives the configuration information from the PLC5 processor. This information configures the serial port and define the slave node characteristics. The module simulates N-files to permit remote access of the database. Each file has a fixed length of 200-word registers.
2	A Host device, such as the Rockwell Automation PLC or an HMI application issues a read or write command to the module's node address. The port driver qualifies the message before accepting it into the module.

Step	Description
3	After the module accepts the command, the data is immediately transferred to or from the internal database in the module. If the command is a read command, the data is read out of the database and a response message is built. If the command is a write command, the data is written directly into the database and a response message is built.
4	After the data processing has been completed in Step 3, the response is issued to the originating master node.
5	Counters are available in the Status Block that permit the ladder logic program to determine the level of activity of the Slave Driver.

Review Module Configuration (page 21) for a complete list of the parameters that must be defined for a slave port. The slave driver supports the following DF1 command set:

Basic Command Set Functions

Function Code	Command	Function	Definition	PLC5	SLC500 & MicroLogix	Power-monitor II	ControlLogix
1	0x00	N/A	Protected Write	X			X
2	0x01	N/A	Unprotected Read	X	X		X
3	0x02	N/A	Protected Bit Write	X			X
4	0x05	N/A	Unprotected Bit Write	X			X
5	0x08	N/A	Unprotected Write	X	X		X

PLC-5 Command Set Functions

Function Code	Command	Function	Definition	PLC5	SLC500 & MicroLogix	Power-monitor II	ControlLogix
100	0x0F	0x00	Word Range Write (Binary Address)	X			X
101	0x0F	0x01	Word Range Read (Binary Address)	X			X
102	0x0F	0x26	Read-Modify-Write (Binary Address)	X			X
150	0x0F	0x00	Word Range Write (ASCII Address)	X			X
151	0x0F	0x01	Word Range Read (ASCII Address)	X			X
152	0x0F	0x26	Read-Modify-Write (ASCII Address)	X			X

SLC-500 Command Set Functions

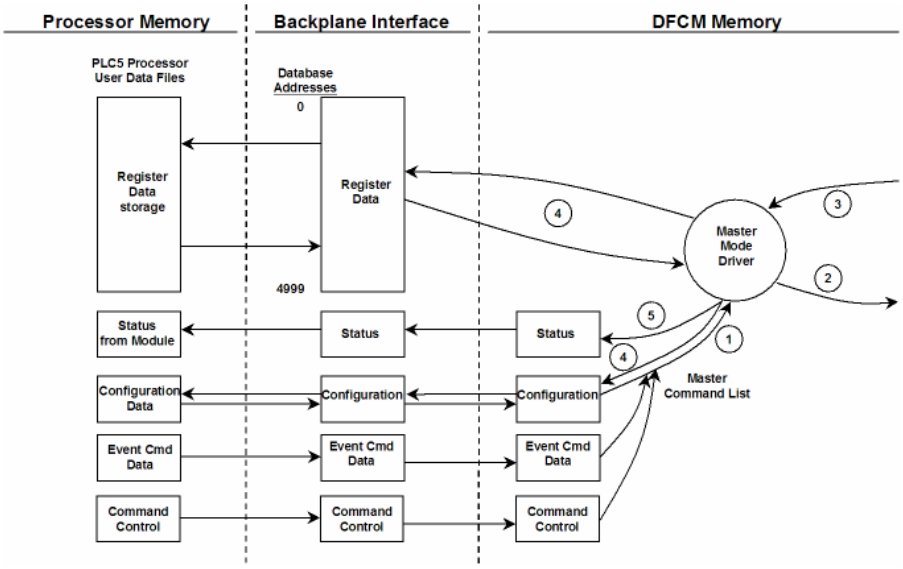
Function Code	Command	Function	Definition	PLC5	SLC500 & MicroLogix	Power-monitor II	ControlLogix
501	0x0F	0xA1	Protected Typed Logical Read With Two Address Fields		X		X
502	0x0F	0XA2	Protected Typed Logical Read With Three Address Fields		X	X	X
509	0x0F	0XA9	Protected Typed Logical Write With Two Address Fields		X		X

Function Code	Command	Function	Definition	PLC5	SLC500 & MicroLogix	Power-monitor II	ControlLogix
510	0x0F	0XAA	Protected Typed Logical Write With Three Address Fields		X	X	X
511	0x0F	0XAB	Protected Typed Logical Write With Mask (Three Address Fields)		X		X

Each command list record has the same general format. The first part of the record contains the information relating to the communication module and the second part contains information required to interface to the DF1 slave device.

Master Driver Mode

In the Master mode, the MVI71-DFCM module is responsible for issuing read or write commands to slave devices on the DF1 network. These commands are user configured in the module via the Master Command List received from the PLC5 processor or issued directly from the PLC5 processor (event command control). Command status is returned to the processor for each individual command in the command list status block. The location of this status block in the module's internal database is user defined. The following flow chart and associated table describe the flow of data into and out of the module.



Step	Description
1	The Master driver obtains configuration data from the PLC5 processor. The configuration data obtained includes the number of commands and the Master Command List. These values are used by the Master driver to determine the type of commands to be issued to the other nodes on the DF1 network.
2	After configuration, the Master driver begins transmitting read and/or write commands to the other nodes on the network. If writing data to another node, the data for the write command is obtained from the module's internal database to build the command.

Step	Description
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 PLC5 processor for each command in the Master Command List.

Refer to the **Module Set Up** section for a complete description of the parameters required to define the virtual DF1 master port. Refer to the **DF1 Command Set for ProSoft Technology, Communication Modules** documentation for a complete discussion of the structure and content of each command. Care must be taken in constructing each command in the list for predictable operation of the module. If two commands write to the same internal database address of the module, the results will not be as desired. All commands containing invalid data will be ignored by the module. The module does not support the PLC-5 ASCII Address commands (150 to 152) as outlined in the DF1 Command Set documentation. The following table describes the functions supported by the module and the format of each command:

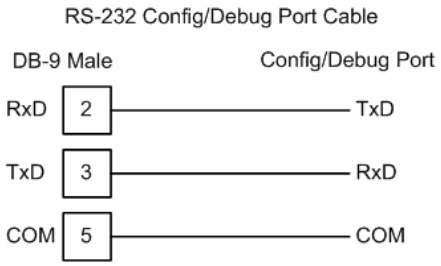
	Module Information Data ←					→ Device Information Data					
Col #	1	2	3	4	5	6	7	8	9	10	11
Function Code	Enable Code	Internal Address	Poll Interval Time	Count	Swap Code	Node Address	Function Code	Function Parameters			
FC 1	Code	Register	Seconds	Count	Code	Node	1	Word Address			
FC 2	Code	Register	Seconds	Count	Code	Node	2	Word Address			
FC 3	Code	Register	Seconds	Count	0	Node	3	Word Address			
FC 4	Code	Register	Seconds	Count	0	Node	4	Word Address			
FC 5	Code	Register	Seconds	Count	Code	Node	5	Word Address			
FC 100	Code	Register	Seconds	Count	Code	Node	100	File Number	Element	Sub-Element	
FC 101	Code	Register	Seconds	Count	Code	Node	101	File Number	Element	Sub-Element	
FC 102	Code	Register	Seconds	Count	0	Node	102	File Number	Element	Sub-Element	
FC 501	Code	Register	Seconds	Count	Code	Node	501	File Type	File Number	Element	
FC 502	Code	Register	Seconds	Count	Code	Node	502	File Type	File Number	Element	Sub-Element
FC 509	Code	Register	Seconds	Count	Code	Node	509	File Type	File Number	Element	
FC 510	Code	Register	Seconds	Count	Code	Node	510	File Type	File Number	Element	Sub-Element
FC 511	Code	Register	Seconds	Count	0	Node	511	File Type	File Number	Element	Sub-Element

Node Address = Destination Address for Message

If the DF1 master port is configured to support the DF1 half-duplex protocol, the master port can be used to route messages between slaves. Peer-to-peer communication is accomplished by the master constantly polling all the slaves on the network and relaying the messages received. The slaves must contain ladder logic with MSG commands to generate and accept messages. This routing can be used in conjunction with the normal command processing discussed above. If the slave node to be polled is not included in the command list, a special command is required in the command list. Enter a 999 in the **Enable Code** and the slave's node address in the **Node Address** fields of the command. No other parameters are required for a device poll message. This command will force the master port to issue an enquiry request to the slave device without first issuing a command. Any messages held in the slave's message queue will be sent to the master and the master will route the messages that do not contain the master's station code.

5.3 Cable Connections

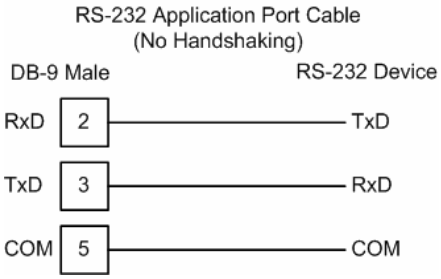
The application ports on the MVI71-DFCM module support RS-232 interfaces. Please look at the module to ensure that the jumpers are set correctly to correspond with the type of interface you are using. The following diagrams show the cable configurations for the various interfaces:



Note: When using RS-232 with radio modem applications, the module requires hardware handshaking.

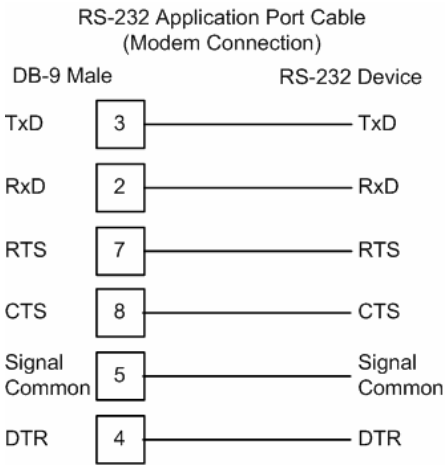
5.3.1 RS-232

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



RS-232: Modem Connection

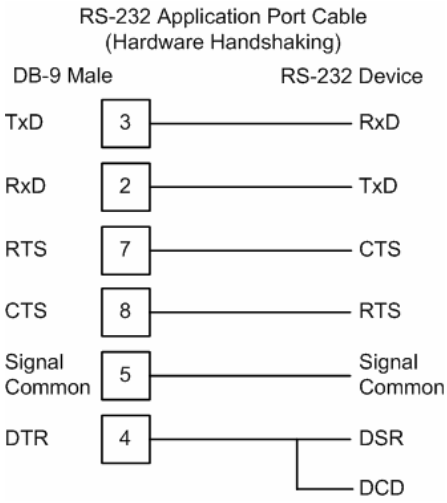
This type of connection is required between the module and a modem or other communication device.



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

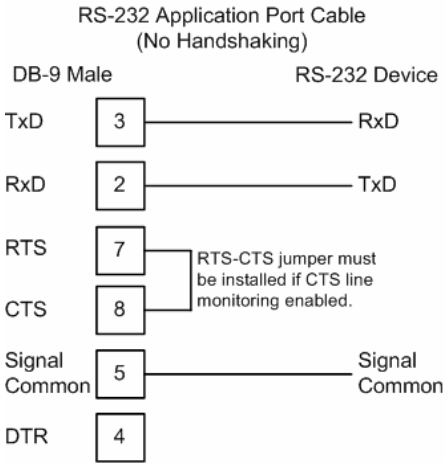
RS-232: Null Modem Connection (Hardware Handshaking)

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



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

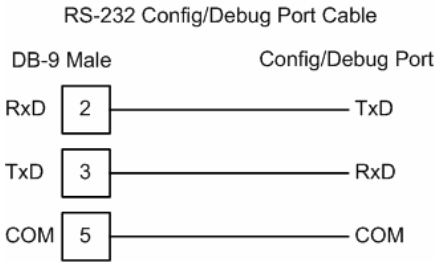
This type of connection can be used to connect the module to a computer or field device communication port.



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

5.3.2 RS-232 Configuration/Debug Port

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

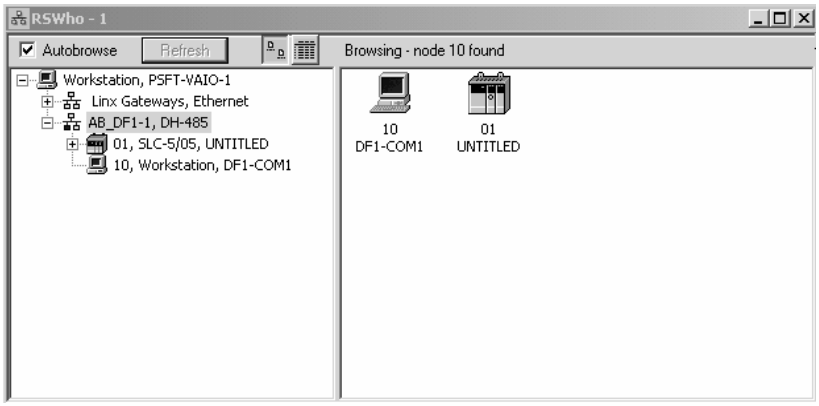


Disabling the RSLinx Driver for the Com Port on the PC

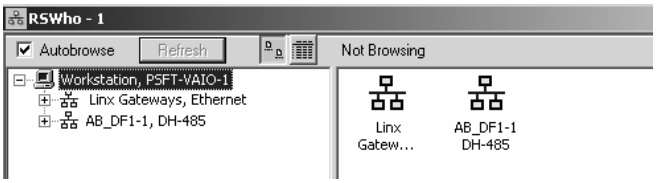
The communication port driver in RSLinx can occasionally prevent other applications from using the PC's COM port. If you are not able to connect to the module's configuration/debug port using ProSoft Configuration Builder (PCB), HyperTerminal or another terminal emulator, follow these steps to disable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

1 Open RSLinx and go to Communications>RSWho

2 Make sure that you are not actively browsing using the driver that you wish to stop. The following shows an actively browsed network:



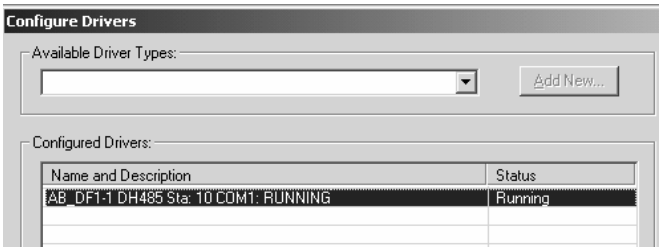
3 Notice how the DF1 driver is opened, and the driver is looking for a processor on node 1. If the network is being browsed, then you will not be able to stop this driver. To stop the driver your RSWho screen should look like this:



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

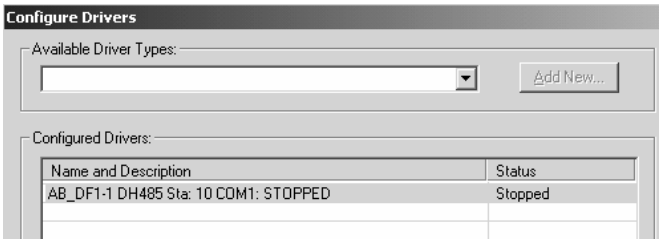
4 When you have verified that the driver is not being browsed, go to

Communications>Configure Drivers
You may see something like this:



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

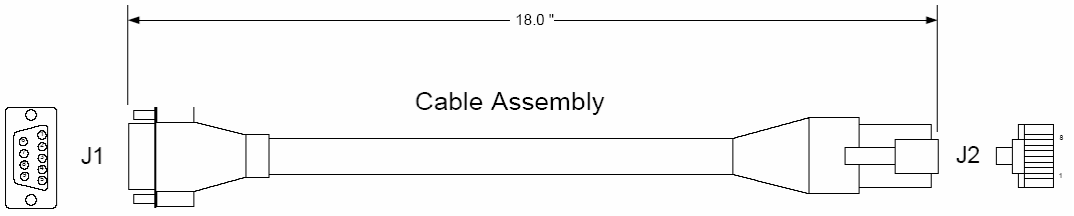
5 After you have stopped the driver you will see the following:

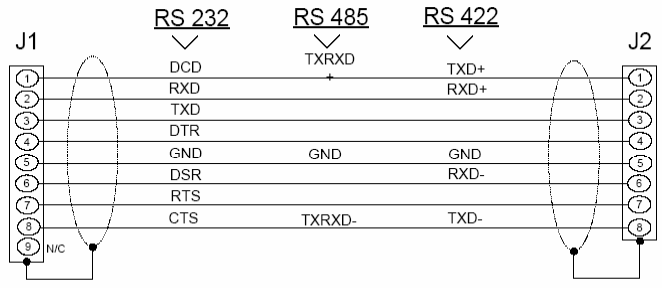


6 Upon seeing this, you may now use that com port to connect to the debug port of the module.

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

5.3.3 DB9 to RJ45 Adaptor (Cable 14)

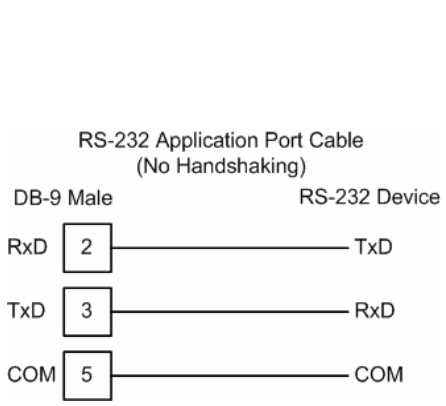


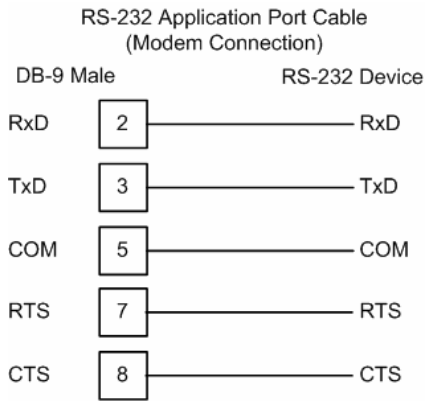


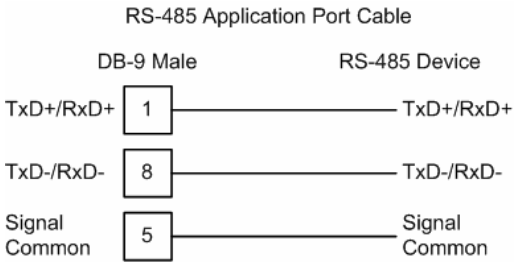
Wiring Diagram

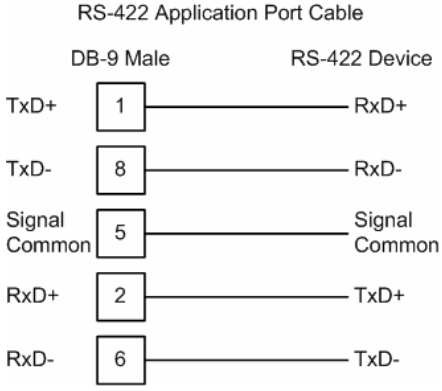
5.4 Pass-Through Ports

Two pass-through ports are provided on the module. Port 2 can be connected to the processor's Channel 0 port and Port 3 can be connected to a remote DF1 master device. The cable configuration used on the ports is dependent on the RS-interface selected for the port using the jumpers located on the MVI circuit board (see Jumper Settings). The following are port pin-outs for several configurations of the ports:









5.5 MVI71-DFCM Status Data Definition

This section contains a description of the data contained in the status data block. This data is transferred from the module to the processor either through a BTR block -1 (block transfer interface) or directly into the configuration file (side-connect interface).

Offset	Content	Description
0	Read Block ID	Block identification code -1 to indicate a status block.
1	Write Block ID	Block requested from the processor by the module.
2	Program Scan Count	This value is incremented each time a complete program cycle occurs in the module.
3 to 4	Product Code	These two registers contain the product code of "DFCM"

Offset	Content	Description
5 to 6	Product Version	These two registers contain the product version for the current running software.
7 to 8	Operating System	These two registers contain the month and year values for the program operating system.
9 to 10	Run Number	These two registers contain the run number value for the currently running software.
11	Port 1 Command List Requests	This field contains the number of requests made from this port to slave devices on the network.
12	Port 1 Command List Response	This field contains the number of slave response messages received on the port.
13	Port 1 Command List Errors	This field contains the number of command errors processed on the port. These errors could be due to a bad response or command.
14	Port 1 Requests	This field contains the total number of messages sent out of the port.
15	Port 1 Responses	This field contains the total number of messages received on the port.
16	Port 1 Errors Sent	This field contains the total number of message errors sent out of the port.
17	Port 1 Errors Received	This field contains the total number of message errors received on the port.
18	Port 2 Command List Requests	This field contains the number of requests made from this port to slave devices on the network.
19	Port 2 Command List Response	This field contains the number of slave response messages received on the port.
20	Port 2 Command List Errors	This field contains the number of command errors processed on the port. These errors could be due to a bad response or command.
21	Port 2 Requests	This field contains the total number of messages sent out the port.
22	Port 2 Responses	This field contains the total number of messages received on the port.
23	Port 2 Errors Sent	This field contains the total number of message errors sent out of the port.
24	Port 2 Errors Received	This field contains the total number of message errors received on the port.
25	Read Block Count	This field contains the total number of read blocks transferred from the module to the processor.
26	Write Block Count	This field contains the total number of write blocks transferred from the processor to the module.
27	Parse Block Count	This field contains the total number of blocks successfully parsed that were received from the processor.
28	Command Event Block Count	This field contains the total number of command event blocks received from the processor.
29	Command Block Count	This field contains the total number of command blocks received from the processor.
30	Error Block Count	This field contains the total number of block errors recognized by the module.

Offset	Content	Description
31	Port 1 Current Error	For a slave port, this field contains the value of the current error code returned. For a master port, this field contains the index of the currently executing command.
32	Port 1 Last Error	For a slave port, this field contains the value of the last error code returned. For a master port, this field contains the index of the command with an error.
33	Port 2 Current Error	For a slave port, this field contains the value of the current error code returned. For a master port, this field contains the index of the currently executing command.
34	Port 2 Last Error	For a slave port, this field contains the value of the last error code returned. For a master port, this field contains the index of the command with an error.

5.6 Error Codes

The module error codes are listed in this section. Error codes returned from the command list process are stored in the command list error memory region. A word is allocated for each command in the memory area. The error codes are formatted in the word as follows: The least-significant byte of the word contains the extended status code and the most-significant byte contains the status code.

Use the error codes returned for each command in the list to determine the success or failure of the command. If the command fails, use the error code to determine the cause of failure.

Note: The Module Specific error codes (not DF1 compliant) are returned from within the module and never returned from an attached DF1 slave device. These are error codes that are part of the DF1 protocol or are extended codes unique to this module. The standard DF1 error codes can be found in the DF1 Protocol and Command Set Reference Manual (Publication 1770-6.5.16) from Rockwell Automation. The most common errors for the DF1 protocol are shown in the following tables:

5.6.1 Local STS Error Codes

Code (Int)	Code (Hex)	Description
0	0x0000	Success, no error
256	0x0100	DST node is out of buffer space
512	0x0200	Cannot guarantee delivery (Link Layer)
768	0x0300	Duplicate token holder detected
1024	0x0400	Local port is disconnected
1280	0x0500	Application layer timed out waiting for response
1536	0x0600	Duplicate node detected
1792	0x0700	Station is offline
2048	0x0800	Hardware fault

5.6.2 Remote STS Error Codes

Code (Int)	Code (Hex)	Description
0	0x0000	Success, no error
4096	0x1000	Illegal command or format
8192	0x2000	Host has a problem and will not communicate
12288	0x3000	Remote node host is missing, disconnected or shut down
16384	0x4000	Host could not complete function due to hardware fault
20480	0x5000	Addressing problem or memory protect rungs
24576	0x6000	Function not allowed due to command protection selection
26872	0x7000	Processor is in Program mode
-32768	0x8000	Compatibility mode file missing or communication zone problem
-28672	0x9000	Remote node cannot buffer command
-24576	0xA000	Wait ACK (1775-KA buffer full)
-20480	0xB000	Remote node problem due to download
-16384	0xC000	Wait ACK (1775-KA buffer full)
-12288	0xD000	Not used
-8192	0xE000	Not used
	0xF0nn	Error code in the EXT STS byte (nn contains EXT error code)

5.6.3 Errors When EXT STS Is Present

Code (Int)	Code (Hex)	Description
-4096	0xF000	Not used
-4095	0xF001	A field has an illegal value
-4094	0xF002	Less levels specified in address than minimum for any address
-4093	0xF003	More levels specified in address than system supports
-4092	0xF004	Symbol not found
-4091	0xF005	Symbol is of improper format
-4090	0xF006	Address does not point to something usable
-4089	0xF007	File is wrong size
-4088	0xF008	Cannot complete request
-4087	0xF009	Data or file is too large
-4086	0xF00A	Transaction size plus word address is too large
-4085	0xF00B	Access denied, improper privilege
-4084	0xF00C	Condition cannot be generated - resource is not available
-4083	0xF00D	Condition already exists - resource is already available
-4082	0xF00E	Command cannot be executed
-4081	0xF00F	Histogram overflow
-4080	0xF010	No access
-4079	0xF011	Illegal data type
-4078	0xF012	Invalid parameter or invalid data
-4077	0xF013	Address reference exists to deleted area
-4076	0xF014	Command execution failure for unknown reason
-4075	0xF015	Data conversion error
-4074	0xF016	Scanner not able to communicate with 1771 rack adapter
-4073	0xF017	Type mismatch
-4072	0xF018	1171 module response was not valid
-4071	0xF019	Duplicate label
-4070	0xF01A	File is open; another node owns it

Code (Int)	Code (Hex)	Description
-4069	0xF01B	Another node is the program owner
-4068	0xF01C	Reserved
-4067	0xF01D	Reserved
-4066	0xF01E	Data table element protection violation
-4065	0xF01F	Temporary internal problem

5.6.4 Module Specific Error (not DFNT Compliant)

Code (Int)	Code (Hex)	Description
-1	0xFFFF	CTS modem control line not set before transmit
-2	0xFFFE	Timeout while transmitting message
-10	0xFFF6	Timeout waiting for DLE-ACK after request
-11	0xFFF5	Timeout waiting for response after request
-12	0xFFF4	Reply data does not match requested byte count
-20	0xFFEC	DLE-NAK received after request
-21	0xFFEB	DLE-NAK sent after response

5.7 MVI71-DFCM Configuration Data

This section contains listings of the MVI71-DFCM module's database that are related to the module's configuration. This data is available to any node on the network and is read from the PLC5 processor when the module first initializes. Additionally, this section contains the miscellaneous status data and command control database layout.

5.7.1 Backplane Setup

Cfg File	File	Register	Content	Description
N10:0	N32:0	5000	Write Start Reg	This parameter specifies the starting register in the module where the data transferred from the processor will be placed. Valid range for this parameter is 0 to 4999.
N10:1	N32:1	5001	Write Reg Count	This parameter specifies the number of registers to transfer from the processor to the module. Valid entry for this parameter is 0 to 5000.
N10:2	N32:2	5002	Read Start Reg	This parameter specifies the starting register in the module where data will be transferred from the module to the processor. Valid range for this parameter is 0 to 4999.
N10:3	N32:3	5003	Read Reg Count	This parameter specifies the number of registers to be transferred from the module to the processor. Valid entry for this parameter is 0 to 5000.
N10:4	N32:4	5004	Backplane Fail	This parameter specifies the number of successive transfer errors that must occur before the communication ports are shut down. If the parameter is set to 0, the communication ports will continue to operate under all conditions. If the value is set larger than 0 (1 to 65535), communications will cease if the specified number of failures occur.

Cfg File	File	Register	Content	Description
N10:5	N32:5	5005	Error Status Pointer	This parameter specifies the register location in the module's database where module status data will be stored. If a value less than 0 is entered, the data will not be stored in the database. If the value specified is in the range of 0 to 4940, the data will be placed in the user data area.
	N32:6	5006	Spare	
	N32:7	5007	Spare	
	N32:8	5008	Spare	
	N32:9	5009	Spare	

5.7.2 Port 1 Setup

Cfg File	File	Register	Content	Description
N10:6	N32:10	5010	Enable	This parameter defines if this port will be utilized. If the parameter is set to 0, the port is disabled. A value of 1 will enable the port.
N10:7	N32:11	5011	Type	This parameter defines if the port will emulate a master or slave device. Enter 0 to emulate a master device and 1 to emulate a slave device.
N10:8	N32:12	5012	Local Station ID	This parameter specifies the local station ID for all DF1 messages sent from this master port. A value of 255 is not permitted as this is the broadcast address. Enter a value in the range of 0 to 254.
N10:9	N32:13	5013	Protocol	0=full duplex, 1=half-duplex
N10:10	N32:14	5014	Termination Type	This parameter specifies the error checking for all DF1 messages. 0=BCC, 1=CRC
N10:11	N32:15	5015	Baud Rate	This is the baud rate to be used on the port. Enter the baud rate as a value. For example, to select 19K baud, enter 19200.

Baud Rate	Parameter Value
110	110
150	150
300	300
600	600
1200	12 or 1200
2400	24 or 2400
4800	48 or 4800
9600	96 or 9600
14,400	14, 114 or 14400
19,200	19, 192 or 19200
28,800	28, 288 or 28800
38,400	38, 384 or 38400
57,600	57 or 576
115,200	115 or 1152

Cfg File	File	Register	Content	Description
N10:12	N32:16	5016	Parity	This is the Parity code to be used for the port. The coded values are as follows: 0=None, 1=Odd, 2=Even, 3=Mark and 4=Space.
N10:13	N32:17	5017	Data Bits	This parameter sets the number of data bits for each word used by the protocol. Enter a value in the range of 5 to 8.
N10:14	N32:18	5018	Stop Bits	This parameter sets the number of stop bits to be used with each data value sent. Enter a value of 1 or 2.
N10:15	N32:19	5019	Minimum Response Delay	This parameter sets the number of milliseconds to wait before a response message is sent out of the port. This parameter is required when interfacing to a slow responding device. Enter a value in the range of 0 to 65535.
N10:16	N32:20	5020	RTS On Delay	This parameter sets the number of milliseconds to delay after RTS is asserted before the data will be transmitted. Enter a value in the range of 0 to 65535.
N10:17	N32:21	5021	RTS Off Delay	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. Enter a value in the range of 0 to 65535.
N10:18	N32:22	5022	Use CTS Line	This parameter specifies if the CTS modem control line is to be used. If the parameter is set to 0, the CTS line will not be monitored. If the parameter is set to 1, 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).
N10:19	N32:23	5023	ENQ Delay	This parameter specifies the number of milliseconds to wait after a DLE-ACK is received from a slave using half-duplex mode before the DLE-ENQ request is made for data. Enter a value in the range of 0 to 65535.
N10:20	N32:24	5024	Command Count	This parameter specifies the number of commands to be processed for the port. Enter a value of 0 to 100.
N10:21	N32:25	5025	Minimum Command Delay	This parameter specifies the number of milliseconds to wait between the initial issuance of a command. This parameter can be used to delay all commands sent to slaves to avoid "flooding" commands on the network. This parameter does not affect retries of a command as they will be issued when failure is recognized. Enter a value in the range of 0 to 65535.
N10:22	N32:26	5026	Command Error Pointer	This parameter sets the address in the internal DF1 database where the command error data will be placed. If the value is set to -1, the data will not be transferred to the database. Enter a value of 0 to 4999.

Cfg File	File	Register	Content	Description
N10:23	N32:27	5027	Response Timeout	This parameter represents the message response timeout period in 1-ms 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.
N10:24	N32:28	5028	Retry Count	This parameter specifies the number of times a command will be retried if it fails. Enter a value in the range of 0 to 10.
N10:25	N32:29	5029	Error Delay Count	This parameter specifies the number of polls to be skipped on the slave before trying to re-establish communications. After the slave fails to respond, the master will skip commands to be sent to the slave the number of times entered in this parameter. Enter a value in the range of 0 to 65535.
N10:26	N32:30	5030	Slave List Pointer	This parameter specifies the starting address in the virtual database where the 256 slave status values will be written. If the parameter is set to -1, the slave data will not be placed in the database. Enter a value in the range of -1 to 4743.
N10:27	N32:31	5031	Slave List Frequency	This parameter specifies the number of program cycles to delay before updating the slave list data in the virtual database. If the parameter is set to 0, the data will not be placed in the database. Enter a value in the range of 0 to 65535.
N10:28	N32:32	5032	First File	This parameter is used when a request for a file is received on the communication port. This field is required when responding to PLC5 and SLC DF1 commands. Use this parameter to define the virtual file(s) to be simulated on the module. Enter a value in the range of 0 to 100.
N10:29	N32:33	5033	File Size	This parameter specifies the size of each file to be simulated on the module. All files simulated are defined to have the same assigned size. Enter a value in the range of 0 to 1000.
N10:30	N32:34	5034	File Offset	This parameter sets the database register location of the first element in the first file simulated in the module. All offsets in the first file and subsequent files will be computed using the address specified. Enter a value in the range of 0 to 4999.
	N32:35	5035	Spare	
	N32:36	5036	Spare	
	N32:37	5037	Spare	
	N32:38	5038	Spare	
	N32:39	5039	Spare	

5.7.3 Port 2 Setup

Cfg File	File	Register	Content	Description
N10:31	N32:40	5040	Enable	This parameter defines if this port will be utilized. If the parameter is set to 0, the port is disabled. A value of 1 will enable the port.
N10:32	N32:41	5041	Type	This parameter defines if the port will emulate a master or slave device. Enter 0 to emulate a master device and 1 to emulate a slave device.
N10:33	N32:42	5042	Local Station ID	This parameter specifies the local station ID for all DF1 messages sent from this master port. A value of 255 is not permitted as this is the broadcast address. Enter a value in the range of 0 to 254.
N10:34	N32:43	5043	Protocol	0=full duplex, 1=half-duplex
N10:35	N32:44	5044	Termination Type	This parameter specifies the error checking for all DF1 messages. 0=BCC, 1=CRC
N10:36	N32:45	5045	Baud Rate	This is the baud rate to be used on the port. Enter the baud rate as a value. For example, to select 19K baud, enter 19200.
N10:37	N32:46	5046	Parity	This is the Parity code to be used for the port. The coded values are as follows: 0=None, 1=Odd, 2=Even, 3=Mark and 4=Space.
N10:38	N32:47	5047	Data Bits	This parameter sets the number of data bits for each word used by the protocol. Enter a value in the range of 5 to 8.
N10:39	N32:48	5048	Stop Bits	This parameter sets the number of stop bits to be used with each data value sent. Enter a value of 1 or 2.
N10:40	N32:49	5049	Minimum Response Delay	This parameter sets the number of milliseconds to wait before a response message is sent out of the port. This parameter is required when interfacing to a slow responding device. Enter a value in the range of 0 to 65535.

Baud Rate	Parameter Value
110	110
150	150
300	300
600	600
1200	12 or 1200
2400	24 or 2400
4800	48 or 4800
9600	96 or 9600
14,400	14, 114 or 14400
19,200	19, 192 or 19200
28,800	28, 288 or 28800
38,400	38, 384 or 38400
57,600	57 or 576
115,200	115 or 1152

Cfg File	File	Register	Content	Description
N10:41	N32:50	5050	RTS On Delay	This parameter sets the number of milliseconds to delay after RTS is asserted before the data will be transmitted. Enter a value in the range of 0 to 65535.
N10:42	N32:51	5051	RTS Off Delay	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. Enter a value in the range of 0 to 65535.
N10:43	N32:52	5052	Use CTS Line	This parameter specifies if the CTS modem control line is to be used. If the parameter is set to 0, the CTS line will not be monitored. If the parameter is set to 1, 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).
N10:44	N32:53	5053	ENQ Delay	This parameter specifies the number of milliseconds to wait after a DLE-ACK is received from a slave using half-duplex mode before the DLE-ENQ request is made for data. Enter a value in the range of 0 to 65535.
N10:45	N32:54	5054	Command Count	This parameter specifies the number of commands to be processed for the port. Enter a value of 0 to 100.
N10:46	N32:55	5055	Minimum Command Delay	This parameter specifies the number of milliseconds to wait between the initial issuance of a command. This parameter can be used to delay all commands sent to slaves to avoid "flooding" commands on the network. This parameter does not affect retries of a command as they will be issued when failure is recognized. Enter a value in the range of 0 to 65535.
N10:47	N32:56	5056	Command Error Pointer	This parameter sets the address in the internal DF1 database where the command error data will be placed. If the value is set to -1, the data will not be transferred to the database. Enter a value of 0 to 4999.
N10:48	N32:57	5057	Response Timeout	This parameter represents the message response timeout period in 1-ms 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.
N10:49	N32:58	5058	Retry Count	This parameter specifies the number of times a command will be retried if it fails. Enter a value in the range of 0 to 10.

Cfg File	File	Register	Content	Description
N10:50	N32:59	5059	Error Delay Count	This parameter specifies the number of polls to be skipped on the slave before trying to re-establish communications. After the slave fails to respond, the master will skip commands to be sent to the slave the number of times entered in this parameter. Enter a value in the range of 0 to 65535.
N10:51	N32:60	5060	Slave List Pointer	This parameter specifies the starting address in the virtual database where the 256 slave status values will be written. If the parameter is set to -1, the slave data will not be placed in the database. Enter a value in the range of -1 to 4743.
N10:52	N32:61	5061	Slave List Frequency	This parameter specifies the number of program cycles to delay before updating the slave list data in the virtual database. If the parameter is set to 0, the data will not be placed in the database. Enter a value in the range of 0 to 65535.
N10:53	N32:62	5062	First File	This parameter is used when a request for a file is received on the communication port. This field is required when responding to PLC5 and SLC DF1 commands. Use this parameter to define the virtual file(s) to be simulated on the module. Enter a value in the range of 0 to 100.
N10:54	N32:63	5063	File Size	This parameter specifies the size of each file to be simulated on the module. All files simulated are defined to have the same assigned size. Enter a value in the range of 0 to 1000.
N10:55	N32:64	5064	File Offset	This parameter sets the database register location of the first element in the first file simulated in the module. All offsets in the first file and subsequent files will be computed using the address specified. Enter a value in the range of 0 to 4999.
	N32:65	5065	Spare	
	N32:66	5066	Spare	
	N32:67	5067	Spare	
	N32:68	5068	Spare	
	N32:69	5069	Spare	

5.7.4 Port 1 Commands

Cfg File	File	Register	Content	Description
N11:0 to 11	N33:0 to N33:11	5200 to 5211	Command # 1	This set of registers contains the parameters for the first command in the master command list. The structure of this data area is as described in the data object section of the documentation.
N11:12 to 23	N33:12 to N33:23	5212 to 5223	Command # 2	Command #2 data set
N12:	N38:188 to N38:199	6388 to 6399	Command # 100	Command #100 data set

5.7.5 Port 2 Commands

Cfg File	File	Register	Content	Description
N13:0 to 11	N39:0 to N39:11	6400 to 6411	Command # 1	This set of registers contains the parameters for the first command in the master command list. The structure of this data area is as described in the data object section of the documentation.
N13:12 to 23	N39:12 to N39:23	6412 to 6423	Command # 2	Command #2 data set
N14:	N44:188 to N44:199	7588 to 7599	Command # 100	Command #100 data set

5.7.6 Miscellaneous Status

Cfg File	File	Register	Content	Description
N10:200	N45:0	7600	Program Scan Count	This value is incremented each time a complete program cycle occurs in the module.
N10:201	N45:1	7601	Product Code	These two registers contain the product code of "DFCM"
N10:202	N45:2	7602		
N10:203	N45:3	7603	Product Version	These two registers contain the product version for the currently running software
N10:204	N45:4	7604		
N10:205	N45:5	7605	Operating System	These two registers contain the month and year values for the program operating system.
N10:206	N45:6	7606		
N10:207	N45:7	7607	Run Number	These two registers contain the run number value for the currently running software
N10:208	N45:8	7608		
N10:209	N45:9	7609	Port 1 Command List Requests	This field contains the number of requests made from this port to slave devices on the network.
N10:210	N45:10	7610	Port 1 Command List Response	This field contains the number of slave response messages received on the port.
N10:211	N45:11	7611	Port 1 Command List Errors	This field contains the number of command errors processed on the port. These errors could be due to a bad response or command.
N10:212	N45:12	7612	Port 1 Requests	This field contains the total number of messages sent out the port.
N10:213	N45:13	7613	Port 1 Responses	This field contains the total number of messages received on the port.
N10:214	N45:14	7614	Port 1 Errors Sent	This field contains the total number of message errors sent out the port.
N10:215	N45:15	7615	Port 1 Errors Received	This field contains the total number of message errors received on the port.
N10:216	N45:16	7616	Port 2 Command List Requests	This field contains the number of requests made from this port to slave devices on the network.

Cfg File	File	Register	Content	Description
N10:217	N45:17	7617	Port 2 Command List Response	This field contains the number of slave response messages received on the port.
N10:218	N45:18	7618	Port 2 Command List Errors	This field contains the number of command errors processed on the port. These errors could be due to a bad response or command.
N10:219	N45:19	7619	Port 2 Requests	This field contains the total number of messages sent out the port.
N10:220	N45:20	7620	Port 2 Responses	This field contains the total number of messages received on the port.
N10:221	N45:21	7621	Port 2 Errors Sent	This field contains the total number of message errors sent out the port.
N10:222	N45:22	7622	Port 2 Errors Received	This field contains the total number of message errors received on the port.
N10:223	N45:23	7623	Read Block Count	This field contains the total number of read blocks transferred from the module to the processor.
N10:224	N45:24	7624	Write Block Count	This field contains the total number of write blocks transferred from the processor to the module.
N10:225	N45:25	7625	Parse Block Count	This field contains the total number of blocks successfully parsed that were received from the processor.
N10:226	N45:26	7626	Command Event Block Count	This field contains the total number of command event blocks received from the processor.
N10:227	N45:27	7627	Command Block Count	This field contains the total number of command blocks received from the processor.
N10:228	N45:28	7628	Error Block Count	This field contains the total number of block errors recognized by the module.
N10:229	N45:29	7629	Port 1 Current Error/Index	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.
N10:230	N45:30	7630	Port 1 Last Error/Index	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.
N10:231	N45:31	7631	Port 2 Current Error/Index	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.
N10:232	N45:32	7632	Port 2 Last Error/Index	For a slave port, this field contains the value of the last error code returned. For a master port, this field contains the index of the command with an error.

5.7.7 Command Control

Cmd Ctrl	File	Register	Content	Description
N10:80	N46:0	7800	Command Code	Enter one of the valid control command codes in this register to control the module (9997, 9998 or 9999). Refer to the Reference chapter for more information.
N10:81	N46:1	7801 to	Command Data -	Data for command
N10:140	N46:60	7861	Command Data	Data for command

5.8 Command Control

Command Control data is received from other nodes on the network that can control the MVI71-DFCM module. Specific values are written to regions of this block to control the module. Currently, the module is programmed to handle the receipt of the following requests: write configuration to processor, warm boot and cold boot.

The remote node controls the module by writing one of the following values to register 7800 (address N46:0):

Value	Description
9997	Write configuration in database to the processor and warm boot the module
9998	Warm boot the module
9999	Cold boot the module

The control register is cleared (a value of 0) after the operation is executed with the exception of the 9997 command. If the module fails to successfully transfer the configuration to the processor, an error code will be returned in the control register as follows:

Value	Description
0	No error, transfer successful
-1	Error transferring general configuration information
-2	Error transferring DF1 Port 1 master command list
-3	Error transferring DF1 Port 2 master command list

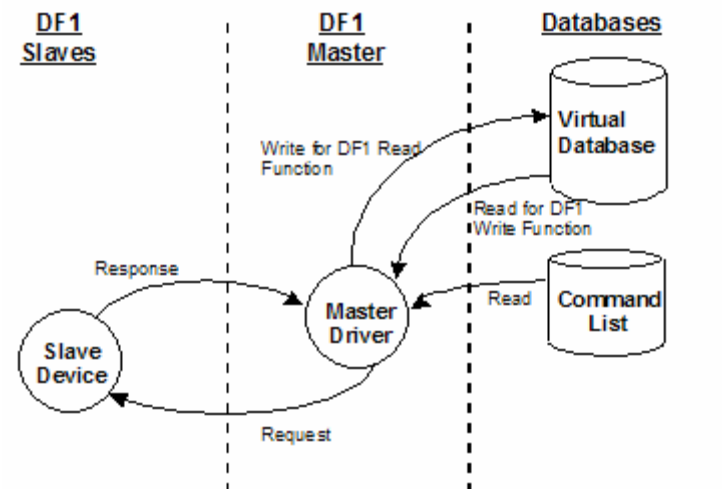
Ladder logic must handle the 9997 command if the block transfer interface is utilized. No ladder logic is required when using the warm or cold boot commands.

5.9 DF1 Command Set For ProSoft Technology Communication Modules

5.9.1 Introduction

This document contains a complete description of the command set required to communicate with DF1 protocol devices using a ProSoft communication module. ProSoft communication modules that contain a virtual DF1 master device use this command set to control and monitor data in DF1 protocol devices. These include Rockwell Automation PLC, SLC, MicroLogix and ControlLogix controllers and field devices supporting the DF1 protocol. ProSoft supports the DF1 protocol on both the serial and network interface. The network interface requires the use of the port service address 0xAF12 as specified in the ControlNet Specification. Rockwell Automation supports this feature in the ControlLogix 5550, PLC5 xx/E and SLC 5/05 processors.

The ProSoft modules contain a virtual database that is defined by the user. This database is used as the source for write commands and the destination for read commands issued on the virtual DF1 master devices. The module interfaces data contained in remote DF1 slave devices to the virtual database using the DF1 master. User commands are issued out of the DF1 master from a command list. These commands gather or control data in the DF1 slave devices. The following illustration shows the relationships discussed above:



Each command issued from the DF1 master contains a field that indicates the location in the virtual database to be associated with the command. Care must be taken when designing a system to be sure the read and write data regions for the database do not overlap for a single device. The read area of one device can overlap the write section of another device to transfer the data from one slave device to another.

5.9.2 Command Function Codes

This section describes DFCM commands to be configured by the user.

	Module Information Data			←	→	Device Information Data				
1	2	3	4	5	6	7	8	9	10	11
Enable Code	Internal Address	Poll Interval Time	Count	Swap Code	Node Address	Function Code	Function Parameters			

Function Code #1 - Protected Write (Basic Command Set)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled, 1=Continuous and 2=Conditional.	
2	Virtual Database Address	This parameter defines the database address of the first data point to be associated with the command.	
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: 0=None, 1=Swap words, 2=Swap words & bytes and 3=swap bytes in each word.	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 1	Protected Write Function	
8	Word Address	Word address where to start the write operation.	P1
9 to 11	Not Used	These fields are not used by the command. Values entered in these columns will be ignored.	P2 to P4

This function writes one or more words of data into a limited area of the slave device. This function should work on the following devices: 1774-PLC, PLC-2, PLC-3, PLC-5 and PLC-5/250.

Function Code #2 - Unprotected Read (Basic Command Set)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled and 1=Continuous.	
2	Virtual Database Address	This parameter defines the database address of the first data point to be associated with the command.	
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: 0=None, 1=Swap words, 2=Swap words & bytes and 3=swap bytes in each word.	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 2	Unprotected Read Function	
8	Word Address	Word address where to start the read operation.	P1
9 to 11	Not Used	These fields are not used by the command. Values entered in these columns will be ignored.	P2 to P4

This function reads one or more words of data from the PLC memory. This function should work on the following devices: 1774-PLC, PLC-2, PLC-3, PLC-5, SLC 500, SLC 5/03, SLC 5/04 and MicroLogix 1000.

Function Code #3 - Protected Bit Write (Basic Command Set)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled, 1=Continuous and 2=Conditional.	
	Virtual Database Address	This parameter defines the database address for the data to be associated with the command. The address defined represents a register address and not a bit address. This function will update one or more words of data as defined by the count parameter.	
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: Always zero (0).	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 3	Protected Bit Write Function	
8	Word Address	Word address where to start the write operation.	P1
9 to 11	Not Used	These fields are not used by the command. Values entered in these columns will be ignored.	P2 to P4

This function sets or resets individual bits within a limited area of the PLC data table. This function should work on the following devices: 1774-PLC, PLC-2, PLC-3, PLC-5 and PLC-5/250.

Function Code #4 - Unprotected Bit Write (Basic Command Set)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled, 1=Continuous and 2=Conditional.	
2	Virtual Database Address	This parameter defines the database address for the data to be associated with the command. The address defined represents a register address and not a bit address. This function will update one or more words of data as defined by the count parameter.	
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: Always zero (0).	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 4	Unprotected Bit Write Function	
8	Word Address	Word address where to start the write operation.	P1
9 to 11	Not Used	These fields are not used by the command. Values entered in these columns will be ignored.	P2 to P4

This function sets or resets individual bits within a limited area of the PLC data table. This function should work on the following devices: 1774-PLC, PLC-2, PLC-3 and PLC-5.

Function Code #5 - Unprotected Write (Basic Command Set)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled, 1=Continuous and 2=Conditional.	
2	Virtual Database Address	This parameter defines the database address of the first data point to be associated with the command.	
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: 0=None, 1=Swap words, 2=Swap words & bytes and 3=swap bytes in each word.	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 5	Unprotected Write Function	
8	Word Address	Word address where to start the write operation.	P1
9 to 11	Not Used	These fields are not used by the command. Values entered in these columns will be ignored.	P2 to P4

This function writes one or more words of data to the PLC memory. This function should work on the following devices: 1774-PLC, PLC-2, PLC-3, PLC-5, SLC 500, SLC 5/03, SLC 5/04 and MicroLogix 1000.

Function Code #100 - Word Range Write (PLC-5 Command) (Binary Address)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled, 1=Continuous and 2=Conditional.	
2	Virtual Database Address	This parameter defines the database address of the first data point to be associated with the command.	
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: 0=None, 1=Swap words, 2=Swap words & bytes and 3=swap bytes in each word.	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 100	Word Range Write Command.	
8	File Number	PLC-5 file number to be associated with the command. If a value of -1 is entered for the parameter, the field will not be used in the command, and the default file will be used.	P1
9	Element Number	The parameter defines the element in the file where write operation will start. If a value of -1 is entered for the parameter, the field will not be used in the command, and the default element will be used.	P2
10	Sub-Element Number	This parameter defines the sub-element to be used with the command. Refer to the AB documentation for a list of valid sub- element codes. If the value is set to -1, the default sub-element number will be used.	P3
11	Not Used	This field is not used by the command. Values entered in this column will be ignored.	P4

This function writes one or more words of data to a PLC data table. This function should work on the following devices: PLC-5.

Function Code #101 - Word Range Read (PLC-5 Command) (Binary Address)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled and 1=Continuous.	
2	Virtual Database Address	This parameter defines the database address of the first data point to be associated with the command.	
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: 0=None, 1=Swap words, 2=Swap words & bytes and 3=swap bytes in each word.	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 101	Word Range Write Command.	
8	File Number	PLC-5 file number to be associated with the command. If a value of -1 is entered for the parameter, the field will not be used in the command, and the default file will be used.	P1
9	Element Number	The parameter defines the element in the file where write operation will start. If a value of -1 is entered for the parameter, the field will not be used in the command, and the default element will be used.	P2
10	Sub-Element Number	This parameter defines the sub-element to be used with the command. Refer to the AB documentation for a list of valid sub- element codes. If the value is set to -1, the default sub-element number will be used.	P3
11	Not Used	This field is not used by the command. Values entered in this column will be ignored.	P4

This function reads one or more words of data from a PLC data table. This function should work on the following devices: PLC-5.

Function Code #102 - Read-Modify-Write (PLC-5 Command) (Binary Address)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled, 1=Continuous and 2=Conditional.	
2	Virtual Database Address	This parameter defines the database address for the data to be associated with the command.	
3	Poll Interval	Minimum number of seconds to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: Always zero (0).	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 102	Read-Modify-Write Command.	
8	File Number	PLC-5 file number to be associated with the command. If a value of -1 is entered for the parameter, the field will not be used in the command, and the default file will be used.	P1

Column	Parameter	Description	Parameter
9	Element Number	The parameter defines the element in the file where write operation will start. If a value of -1 is entered for the parameter, the field will not be used in the command, and the default element will be used.	P2
10	Sub-Element Number	This parameter defines the sub-element to be used with the command. Refer to the AB documentation for a list of valid sub-element codes. If the value is set to -1, the default sub-element number will be used.	P3
11	Not Used	This field is not used by the command. Values entered in this column will be ignored.	P4

This function writes one or more words of data to a PLC data table. This function should work on the following devices: PLC-5. The command constructed contains an AND mask and an OR mask. Values in the AND mask have the following definitions: 0=Reset and 1=Leave the Same. Values in the OR mask have the following definitions: 0=Leave the Same and 1=Set. The module is responsible for setting the mask values to correctly construct the message from the virtual database values.

Function Code #150 - Word Range Write (PLC-5 Command) (ASCII Address)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled, 1=Continuous and 2=Conditional.	
2	Virtual Database Address	This parameter defines the database address of the first data point to be associated with the command.	
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: 0=None, 1=Swap words, 2=Swap words & bytes and 3=swap bytes in each word.	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 150	Word Range Write Command.	
8	File String	PLC-5 address as specified as an ASCII string. For example, N10:300.	P1
9 to 11	Not Used	These fields are not used by the command. Values entered in these columns will be ignored.	P2 to P4

This function writes one or more words of data to a PLC data table. This function should work on the following devices: PLC-5.

Function Code #151 - Word Range Read (PLC-5 Command) (ASCII Address)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled and 1=Continuous.	
2	Virtual Database Address	This parameter defines the database address of the first data point to be associated with the command.	
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	

Column	Parameter	Description	Parameter
5	Swap Type Code	Swap type code for command: 0=None, 1=Swap words, 2=Swap words & bytes and 3=swap bytes in each word.	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 151	Word Range Read Command.	
8	File String	PLC-5 address as specified as an ASCII string. For example, N10:300.	P1
9 to 11	Not Used	These fields are not used by the command. Values entered in these columns will be ignored.	P2 to P4

This function reads one or more words of data from a PLC data table. This function should work on the following devices: PLC-5.

Function Code #152 - Read-Modify-Write (PLC-5 Command) (ASCII Address)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled, 1=Continuous and 2=Conditional.	
2	Virtual Database Address	This parameter defines the database address for the data to be associated with the command. The first database register is used as the AND mask for the command, and the second is used for the OR mask. Values in the AND mask have the following definitions: 0=Reset and 1=Leave the Same. Values in the OR mask have the following definitions: 0=Leave the Same and 1=Set.	
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: Always zero (0).	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 152	Read-Modify-Write Command.	
8	File String	PLC-5 address as specified as an ASCII string. For example, N10:300.	P1
9 to 11	Not Used	These fields are not used by the command. Values entered in these columns will be ignored.	P2 to P4

This function writes one or more words of data to a PLC data table. This function should work on the following devices: PLC-5. The command constructed contains an AND mask and an OR mask. Values in the AND mask have the following definitions: 0=Reset and 1=Leave the Same. Values in the OR mask have the following definitions: 0=Leave the Same and 1=Set. The module is responsible for setting the mask values to correctly construct the message from the virtual database values.

Function Code #501 - Protected Typed Logical Read (Two Address Fields)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled and 1=Continuous.	
2	Virtual Database Address	This parameter defines the database address of the first data point to be associated with the command.	

Column	Parameter	Description	Parameter
3	Poll Interval	Minimum number of seconds to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: 0=None, 1=Swap words, 2=Swap words & bytes and 3=swap bytes in each word.	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 501	Logical Read Command	
8	File Type	SLC file type letter as used in file name string. Valid values for the system are N, S, F, A, ….	P1
9	File Number	SLC file number to be associated with the command.	P2
10	Element Number	The parameter defines the element in the file where write operation will start.	P3
11	Not Used	This field is not used by the command. Values entered in this column will be ignored.	P4

This function reads one or more words of data from a PLC data table.

Function Code #502 - Protected Typed Logical Read (Three Address Fields)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled and 1=Continuous.	
2	Virtual Database Address	This parameter defines the database address of the first data point to be associated with the command.	
3	Poll Interval	Minimum number of seconds to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: 0=None, 1=Swap words, 2=Swap words & bytes and 3=swap bytes in each word.	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 502	Logical Read Command	
8	File Type	SLC file type letter as used in file name string. Valid values for the system are N, S, F, A, ….	P1
9	File Number	SLC file number to be associated with the command.	P2
10	Element Number	The parameter defines the element in the file where write operation will start.	P3
11	Sub-Element Number	This parameter defines the sub-element to be used with the command. Refer to the AB documentation for a list of valid sub-element codes.	P4

This function reads one or more words of data from a PLC data table. This function should work on the following devices: SLC 500, SLC 5/03 and SLC 5/04.

Function Code #509 - Protected Typed Logical Write (Two Address Fields)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled, 1=Continuous and 2=Conditional.	
2	Virtual Database Address	This parameter defines the database address of the first data point to be associated with the command.	

Column	Parameter	Description	Parameter
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: 0=None, 1=Swap words, 2=Swap words & bytes and 3=swap bytes in each word.	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 509	Logical Write Command	
8	File Type	SLC file type letter as used in file name string. Valid values for the system are N, S, F, A, ….	P1
9	File Number	SLC file number to be associated with the command.	P2
10	Element Number	The parameter defines the element in the file where write operation will start.	P3
11	Not Used	This field is not used by the command. Values entered in this column will be ignored.	P4

This function writes one or more words of data to a PLC data table.

Function Code #510 - Protected Typed Logical Write (Three Address Fields)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled, 1=Continuous and 2=Conditional.	
2	Virtual Database Address	This parameter defines the database address of the first data point to be associated with the command.	
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: 0=None, 1=Swap words, 2=Swap words & bytes and 3=swap bytes in each word.	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 510	Logical Write Command	
8	File Type	SLC file type letter as used in file name string. Valid values for the system are N, S, F, A, ….	P1
9	File Number	SLC file number to be associated with the command.	P2
10	Element Number	The parameter defines the element in the file where write operation will start.	P3
11	Sub-Element Number	This parameter defines the sub-element to be used with the command. Refer to the AB documentation for a list of valid sub-element codes.	P4

This function writes one or more words of data to a PLC data table. This function should work on the following devices: SLC 500, SLC 5/03 and SLC 5/04.

Function Code #511 - Protected Typed Logical Write with Mask (Three Address Fields)

Column	Parameter	Description	Parameter
1	Enable/Type Word	0=Disabled, 1=Continuous and 2=Conditional.	
2	Virtual Database Address	This parameter defines the database address of the data to be associated with the command. The first word of data contains the bit mask and the second word contains the data.	
3	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.	
4	Count	Number of data word values to be considered by the function.	
5	Swap Type Code	Swap type code for command: Always zero (0).	
6	Node Address	Address of unit to reach on the data highway.	
7	Function Code = 511	Logical Write with mask	
8	File Type	SLC file type letter as used in file name string. Valid values for the system are N, S, F, A, ….	P1
9	File Number	SLC file number to be associated with the command.	P2
10	Element Number	The parameter defines the element in the file where write operation will start.	P3
11	Sub-Element Number	This parameter defines the sub-element to be used with the command. Refer to the AB documentation for a list of valid sub-element codes.	P4

This function writes one or more words of data from a PLC data table controlling individual bits in the table. The bit mask used for the command is 0xFFFF. This provides direct manipulation of the data in the device with the internal data of the module. The function requires that all data associated with the command use the same mask.

5.9.3 PLC-5 Processor Specifics

This section contains information specific to the PLC-5 processor with relation to the DF1 command set. The commands specific to the PLC-5 processor contain a sub-element code field. This field selects a sub-element field in a complex data table. For example, to obtain the current accumulated value for a counter or timer, the sub-element field should be set to 2. The tables below show the sub-element codes for PLC-5 complex data tables.

PLC-5 Sub-Element Codes

Timer / Counter

Code	Description
0	Control
1	Preset
2	Accumulated

Control

Code	Description
0	Control
1	Length
2	Position

PD*

Code	Description
0	Control
2	SP
4	Kp
6	Ki
8	Kd
26	PV

*All PD values are floating point values, so they are two words long.

BT

Code	Description
0	Control
1	RLEN
2	DLEN
3	Data file #
4	Element #
5	Rack/Grp/Slot

MG

Code	Description
0	Control
1	Error
2	RLEN
3	DLEN

5.9.4 SLC Processor Specifics

This section contains information specific to the SLC processor based family when used with the DF1 command set. The SLC processor commands support a file type field entered as a single character to denote the data table to interface with in the command. The following table defines the relationship of the file types accepted by the module and the SLC file types:

SLC File Types

File Type	File Type Command Code	Description
S	83	Status
B	66	Bit
T	84	Timer
C	67	Counter
R	82	Control
N	78	Integer
F	70	Floating-point
Z	90	String
A	65	ASCII

The File Type Command Code is the ASCII character code value of the File Type letter. This is the value to enter into the "File Type" parameter of the DF1 Command configurations in the data tables in the ladder logic.

Additionally, the SLC specific functions (502, 510 and 511) support a sub-element field. This field selects a sub-element field in a complex data table. For example, to obtain the current accumulated value for a counter or timer, the sub-element field should be set to 2.

5.9.5 MicroLogix Processor Specifics

This section contains information specific to the MicroLogix processor based family when used with the DF1 command set. The MicroLogix processor commands support a file type field entered as a single character to denote the data table to interface with in the command. This field is the same as that used for a SLC processor. The following table defines the relationship of the file types accepted by the module and the SLC file types:

SLC File Types

File Type	File Type Command Code	Description
S	83	Status
B	66	Bit
T	84	Timer
C	67	Counter
R	82	Control
N	78	Integer
F	70	Floating-point
Z	90	String
A	65	ASCII

The File Type Command Code is the ASCII character code value of the File Type letter. This is the value to enter into the "File Type" parameter of the DF1 Command configurations in the data tables in the ladder logic.

Additionally, the SLC specific functions (502, 510 and 511) support a sub-element field. This field selects a sub-element field in a complex data table. For example, to obtain the current accumulated value for a counter or timer, the sub-element field should be set to 2.

5.9.6 ControlLogix Processor Specifics

This section contains information specific to the ControlLogix processor when used with the DF1 command set. The current implementation of the DF1 command set does not use functions that can directly interface with the ControlLogix Tag Database. In order to interface with this database, the table-mapping feature provided by RSLogix 5000 must be used. The software permits the assignment of ControlLogix Tag Arrays to virtual PLC 5 data tables. The ProSoft module using the PLC 5 command set defined in this document can then reach this controller data.

5.10 DF1 Command List Form

	Module Information Data ←					→ Device Information Data					
Column #	1	2	3	4	5	6	7	8	9	10	11
Function Code	Enable Code	Internal Address	Poll Interval Time	Count	Swap Code	Node Address	Function Code	Function Parameters			

6 Support, Service & Warranty

In This Chapter

- How to Contact Us: Technical Support 101
- Return Material Authorization (RMA) Policies and Conditions 102
- LIMITED WARRANTY 104

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 (http://www.prosoft-technology.com/support) E-mail address: support@prosoft-technology.com (mailto:support@prosoft-technology.com)

Asia Pacific

+603.7724.2080, support.asia@prosoft-technology.com (mailto: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 (mailto: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 (mailto: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 (mailto: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 101). 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 104)". 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 104) 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

A

All Product Returns: • 102
Allocation of Risks • 107
Analyzing Data for the first application port • 37
Analyzing Data for the second application port • 37

B

Backplane Data Transfer • 53
Backplane Parameters • 22
Backplane Setup • 78
Basic Command Set Functions • 25, 66
Battery Life Advisory • 3
BT • 98

C

Cable Connections • 69
Changing Parameters During Operation • 21
Clearing a Fault Condition • 48
Cold Boot • 65
Command Control • 63, 87
Command Control Blocks • 62
Command Function Codes • 89
Commands Supported by the Module • 25
Configuration Data • 22
Configuration Data Transfer • 59
Configuring RSLinx • 15
Connect your PC to the Module • 17
Connect your PC to the Processor • 13
Control • 97
Controlling Law and Severability • 107
ControlLogix Processor Specifics • 99

D

Data Analyzer • 37
Data Analyzer Tips • 39
Data Flow between MVI71-DFCM Module and PLC5 Processor • 65
Database View Menu • 42
DB9 to RJ45 Adaptor (Cable 14) • 73
DF1 Command List Form • 100
DF1 Command Set For ProSoft Technology Communication Modules • 88
DF1 Master Commands • 23
Diagnostics and Troubleshooting • 7, 21, 31
Disabling the RSLinx Driver for the Com Port on the PC • 33, 72
Disclaimer of all Other Warranties • 106
Disclaimer Regarding High Risk Activities • 105
Displaying the Current Page of Registers Again • 42
Displaying Timing Marks in the Data Analyzer • 38
Download the Sample Program to the Processor • 14

E

Error Codes • 76
Errors When EXT STS Is Present • 77
Event Command • 62
Example of 2300 read and 3500 write data registers (cfg file = 10) • 20
Example of 240 words of read and write data (cfg file=10) • 20
Exiting the Program • 37

F

Function Code #1 - Protected Write (Basic Command Set) • 89
Function Code #100 - Word Range Write (PLC-5 Command) (Binary Address) • 91
Function Code #101 - Word Range Read (PLC-5 Command) (Binary Address) • 92
Function Code #102 - Read-Modify-Write (PLC-5 Command) (Binary Address) • 92
Function Code #150 - Word Range Write (PLC-5 Command) (ASCII Address) • 93
Function Code #151 - Word Range Read (PLC-5 Command) (ASCII Address) • 93
Function Code #152 - Read-Modify-Write (PLC-5 Command) (ASCII Address) • 94
Function Code #2 - Unprotected Read (Basic Command Set) • 89
Function Code #3 - Protected Bit Write (Basic Command Set) • 90
Function Code #4 - Unprotected Bit Write (Basic Command Set) • 90
Function Code #5 - Unprotected Write (Basic Command Set) • 91
Function Code #501 - Protected Typed Logical Read (Two Address Fields) • 94
Function Code #502 - Protected Typed Logical Read (Three Address Fields) • 95
Function Code #509 - Protected Typed Logical Write (Two Address Fields) • 95
Function Code #510 - Protected Typed Logical Write (Three Address Fields) • 96
Function Code #511 - Protected Typed Logical Write with Mask (Three Address Fields) • 97
Functional Overview • 7, 51
Functional Specifications • 50

G

General Concepts • 51
General Specifications • 50
Guide to the MVI71-DFCM User Manual • 7

H

Hardware Specifications • 50
How to Contact Us
Technical Support • 101, 102

I

Install the Module in the Rack • 11
Installing and Configuring the Module • 19

Intellectual Property Indemnity • 105
Introduction • 88

K

Keystrokes • 33

L

Ladder Logic • 29
LED Status Indicators • 7, 46
Limitation of Remedies ** • 106
LIMITED WARRANTY • 103, 104
Local STS Error Codes • 76

M

Main Logic Loop • 52
Main Menu • 34
Master Command Error List Menu • 44
Master Command List Data • 59
Master Command List Menu • 45
Master Driver Mode • 67
MG • 98
MicroLogix Processor Specifics • 99
Miscellaneous Status • 85
Module Configuration • 21, 56, 66
Module Configuration Data • 59
Module Data Files • 22
Module Power Up • 51
Module Specific Error (not DFNT Compliant) • 78
Moving Back Through 5 Pages of Registers • 43
MVI71-DFCM Configuration Data • 23, 78
MVI71-DFCM Status Data Definition • 74

N

Navigation • 33
No Other Warranties • 107
Normal Data Transfer • 56

O

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

P

Package Contents • 10
Pass-Through Ports • 74
PD* • 98
Pinouts • 2, 69, 73
PLC-5 Command Set Functions • 25, 66
PLC5 Processor Not in Run • 52
PLC-5 Processor Specifics • 97
PLC-5 Sub-Element Codes • 97
Please Read This Notice • 2
Port 1 Commands • 84
Port 1 Setup • 79
Port 2 Commands • 85
Port 2 Setup • 82
Port Parameters • 23
Procedures for Return of Units Out of Warranty: • 103
Procedures for Return of Units Under Warranty: • 103
Product Specifications • 7, 49
ProSoft® Product Documentation • 3
Purchasing Warranty Extension: • 103

R

Read Block (1 to 167) • 56
Reading Status Data from the Module • 31
Redisplaying the Current Page • 44, 45
Reference • 7, 49
Remote STS Error Codes • 77
Removing Timing Marks in the Data Analyzer • 38
Required Hardware • 32
Required Software • 32
Return Material Authorization (RMA) Policies and Conditions • 102
Returning to the Main Menu • 39, 43, 44, 45
RS-232 • 69
  Modem Connection • 70
  Null Modem Connection (Hardware Handshaking) • 70
  Null Modem Connection (No Hardware Handshaking) • 71
RS-232 Configuration/Debug Port • 71

S

Setting Jumpers • 11
Skipping 500 Registers of Data • 43
Slave Driver Mode • 65
Slave Polling Control and Status • 25
Slave Status Blocks • 60
SLC File Types • 98, 99
SLC Processor Specifics • 98
SLC-500 Command Set Functions • 26, 66
Start Here • 7, 9
Starting the Data Analyzer • 38
Status Data • 24
Status Data Block (-1) • 57
Stopping the Data Analyzer • 39
Support, Service & Warranty • 7, 101
System Requirements • 9

T

The Configuration/Debug Menu • 31
Time Limit for Bringing Suit • 107
Timer / Counter • 97
Transferring Module Configuration to the Processor • 36
Troubleshooting • 48

U

User Data • 25
Using the Configuration/Debug Port • 32

V

Viewing Block Transfer Statistics • 35
Viewing Communication Status • 36
Viewing Data in ASCII (Text) Format • 38, 43
Viewing Data in Decimal Format • 43

Viewing Data in Floating Point Format • 43
Viewing Data in Hexadecimal Format • 38, 43
Viewing Module Configuration • 35
Viewing Port Configuration • 37
Viewing Register Pages • 42
Viewing the Next 100 Registers of Data • 43
Viewing the Next 20 Commands • 44
Viewing the Next 50 Commands • 45
Viewing the Next Page of Commands • 44, 45
Viewing the Previous 100 Registers of Data • 43
Viewing the Previous 20 Commands • 44
Viewing the Previous 50 Commands • 45
Viewing the Previous Page of Commands • 44, 45
Viewing the Slave Status List (Port 1 and 2) • 35
Viewing Version Information • 36

W

Warm Boot • 64
Warm Booting the Module • 36
What Is Covered By This Warranty • 104, 106
What Is Not Covered By This Warranty • 104
Write Block (1 to 167) • 57
Write Configuration • 63

Y

Your Feedback Please • 3