ProSoft® TECHNOLOGY

Where Automation Connects.

ProLinx®

6202-WA-DFNT-DFCM3

ProLinx Gateway

Wireless EtherNet/IP to DF1 Master/Slave- 3 ports

2/2/2009

USER MANUAL

Important Installation Instructions

Power, Input and Output (I/O) wiring must be in accordance with Class I, 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. The following warnings must be heeded:

A WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIV. 2;
B WARNING - EXPLOSION HAZARD - WHEN IN HAZARDOUS LOCATIONS, TURN OFF POWER BEFORE REPLACING OR WIRING MODULES, and
C WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NONHAZARDOUS.
D "THIS DEVICE SHALL BE POWERED BY CLASS 2 OUTPUTS ONLY.

All ProLinx® Products

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
AVERTISSEMENT – RISQUE D'EXPLOSION – AVANT DE DÉCONNECTER L'EQUIPMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DÉSIGNÉ NON DANGEREUX.

Markings

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

243333

CL I Div 2 GP A, B, C, D
Temp Code T5
II 3 G
Ex nA nL IIC T4 X
0° C <= Ta <= 60° C
II – Equipment intended for above ground use (not for use in mines).
3 – Category 3 equipment, investigated for normal operation only.
G – Equipment protected against explosive gasses.

ProLinx Modules with Ethernet Ports

Series C ProLinx™ modules with Ethernet ports do **NOT** include the HTML Web Server. The HTML Web Server must be ordered as an option. This option requires a factory-installed hardware addition. The HTML Web Server now supports:

- 8 MB file storage for HTML files and associated graphics files (previously limited to 384K)
- 32K maximum HTML page size (previously limited to 16K)

To upgrade a previously purchased Series C model:

Contact your ProSoft Technology distributor to order the upgrade and obtain a Returned Merchandise Authorization (RMA) to return the unit to ProSoft Technology.

To Order a Series C mode with the -WEB option:

Add **-WEB** to the standard ProLinx part number. For example, **5201-MNET-MCM-WEB**.

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.

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6202-WA-DFNT-DFCM3 User Manual
2/2/2009

ProSoft® Product Documentation

In an effort to conserve paper, ProSoft Technology no longer includes printed manuals with our product shipments. User Manuals, Datasheets, Sample Ladder Files, and Configuration Files are provided on the enclosed CD and are available at no charge from our web site: http://www.prosoft-technology.com
Printed documentation is available for purchase. Contact ProSoft Technology for pricing and availability.
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Contents

Guide to the 6202-WA-DFNT-DFCM3 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 79) Diagnostics and Troubleshooting (page 57)	This section describes how to verify communications with the network. Diagnostic and Troubleshooting procedures.
Reference Product Specifications Functional Overview Glossary	→	Reference (page 99) Functional Overview (page 89) Product Specifications (page 99)	These sections contain general references associated with this product, Specifications, and the Functional Overview.
Support, Service, and Warranty Index	→	Support, Service and Warranty (page 179)	This section contains Support, Service and Warranty information. Index of chapters.

1 Start Here

In This Chapter

For most applications, the installation and configuration steps described in this section will work without additional programming. ProSoft Technology strongly recommends that you complete the steps in this chapter before developing a custom application.

1.1 System Requirements

The 6202-WA-DFNT-DFCM3 module requires the following minimum hardware and software components:

- Pentium® II 450 MHz minimum. Pentium III 733 MHz (or better) recommended
- Supported operating systems:
  - Microsoft Windows XP Professional with Service Pack 1 or 2
  - Microsoft Windows 2000 Professional with Service Pack 1, 2, or 3
  - Microsoft Windows Server 2003
- 128 Mbytes of RAM minimum, 256 Mbytes of RAM recommended
- 100 Mbytes of free hard disk space (or more based on application requirements)
- 256-color VGA graphics adapter, 800 x 600 minimum resolution (True Color 1024 × 768 recommended)
- CD-ROM drive
- 802.11b compatible wireless adapter.

1.2 Package Contents

The following components are included with your 6202-WA-DFNT-DFCM3 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	6202-WA-DFNT-DFCM3 Module	6202-WA-DFNT-DFCM3	Wireless EtherNet/IP to DF1 Master/Slave-3 ports
1	Cable	Cable #15, RS232 Null Modem	For RS232 Connection to the CFG Port
1	Cable	Cable #9, Mini-DIN8 to DB9 Male Adapter	For DB9 Connection to Module's Port. One DIN to DB-9M cable included per configurable serial port
1	Antenna	A2405S-OA	5dbi Omni Articulating Antenna
1	ProSoft Solutions CD		Contains sample programs, utilities and documentation for the 6202-WA-DFNT-DFCM3 module.

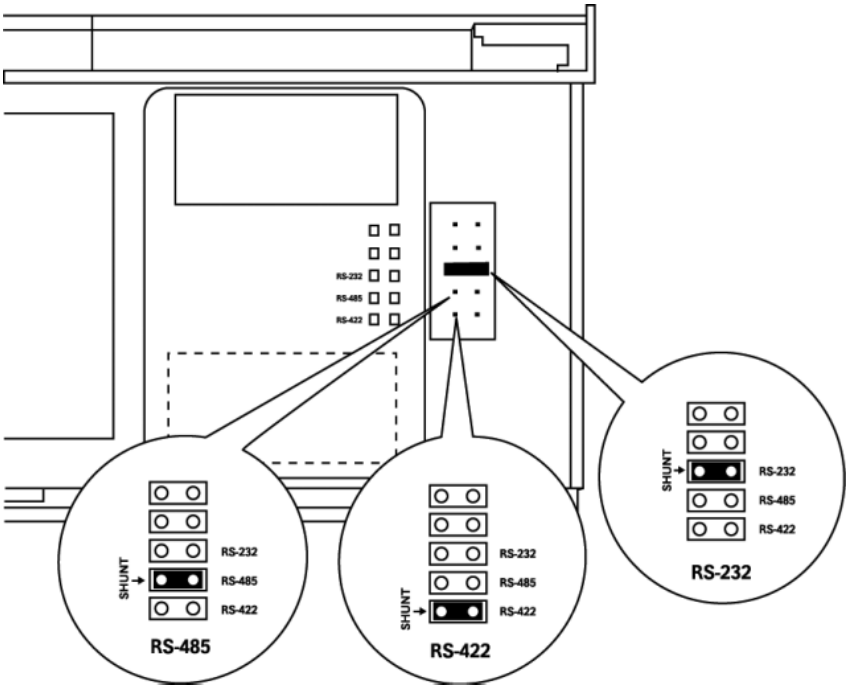
If any of these components are missing, please contact ProSoft Technology Support for replacement parts.

1.3 Setting Debug and Port 1 Configuration Jumpers

Before mounting the module on the DIN rail, you must set the jumpers for the Debug port and the Port 1 protocol port. By default, both ports are set for RS-232, and the Debug Port is fixed in this mode. This should be verified before startup to minimize problems.

Note: Series A modules have active jumpers for both ports.

The following diagrams detail the jumper positions for each of the ports:



ProLinx 5000/6000 Series Module

1.4 Install the Antenna

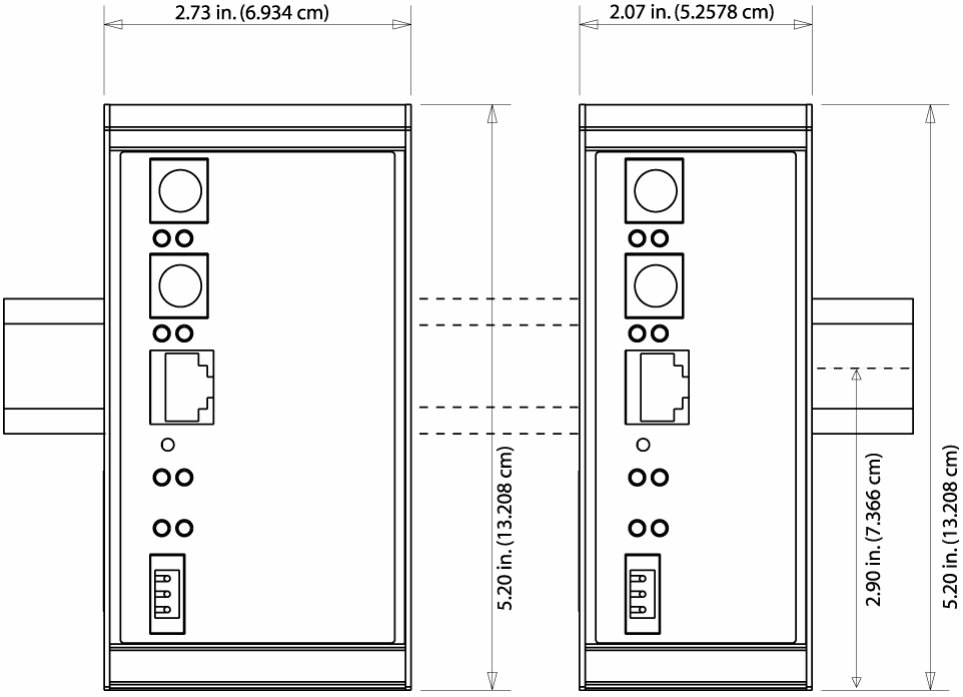
All antennas for radios communicating directly with each other should be mounted so they are within line-of-sight and have the same antenna polarity.

Antennas with a reverse polarity SMA connector can be mounted directly on the radio. Screw the antenna onto the antenna port connector until snug.

Antennas that do not have a reverse polarity SMA connector must be mounted separately and connected to the radio using a ProSoft RadioLinx adaptor cable. Because the antenna cable attenuates the RF signal, **use an antenna cable no longer than necessary to ensure optimum performance**.

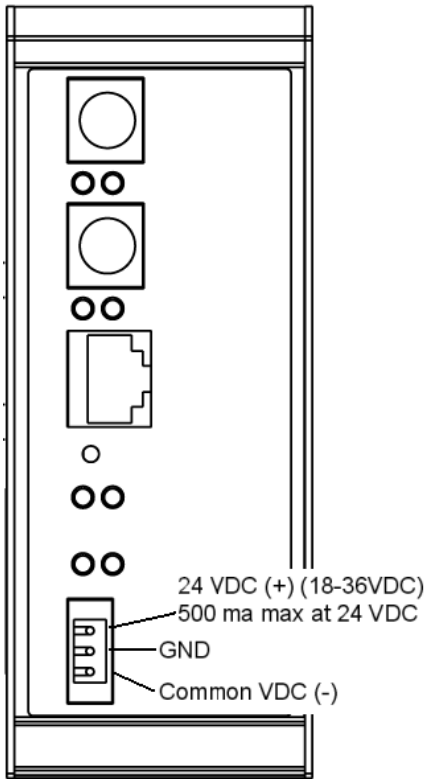
Note: It is illegal to use any antenna that is not on the ProSoft Technology approved antennas list. Contact ProSoft Technology (page 3) with any questions or browse the antenna FAQ at http://www.prosoft-technology.com

1.5 Mounting the Module on the DIN Rail



ProLinx 5000/6000 Series Module

1.6 Connecting Power to the Unit



WARNING: Ensure that you do not reverse polarity when applying power to the module. This will cause damage to the module's power supply.

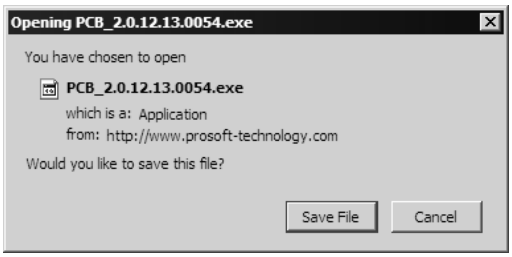
1.7 Install ProSoft Configuration Builder Software

You must install the ProSoft Configuration Builder (PCB) software in order to configure the 6202-WA-DFNT-DFCM3 module. You can always get the newest version of ProSoft Configuration Builder from the ProSoft Technology web site.

To install ProSoft Configuration Builder from the ProSoft Web Site

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

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



4 Save the file to your Desktop, so that you can find it easily when you have finished downloading.
5 When the download is complete, locate and open the file, and then follow the instructions on your screen to install the program.

If you do not have access to the Internet, you can install ProSoft Configuration Builder from the ProSoft Solutions CD-ROM, included in the package with your 6202-WA-DFNT-DFCM3 module.

To install ProSoft Configuration Builder from the Product CD

1 Insert the ProSoft Solutions Product CD into the CD drive of your PC. Wait for the startup screen to appear.
2 On the startup screen, click *Product Documentation*. This action opens an explorer window.
3 Click to open the *Utilities* folder. This folder contains all of the applications and files you will need to set up and configure your module.
4 Double-click the *ProSoft Configuration Builder Setup* program and follow the instructions on your screen to install the software on your PC.

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

1.7.1 Using the help system

Most of the information needed to help you use ProSoft Configuration Builder is provided in a help system that is always available whenever you are running ProSoft Configuration Builder. The help system does not require an Internet connection.

To view the help pages, start ProSoft Configuration Builder, open the Help menu, and then choose Contents.

2 Configure the Module

In This Chapter

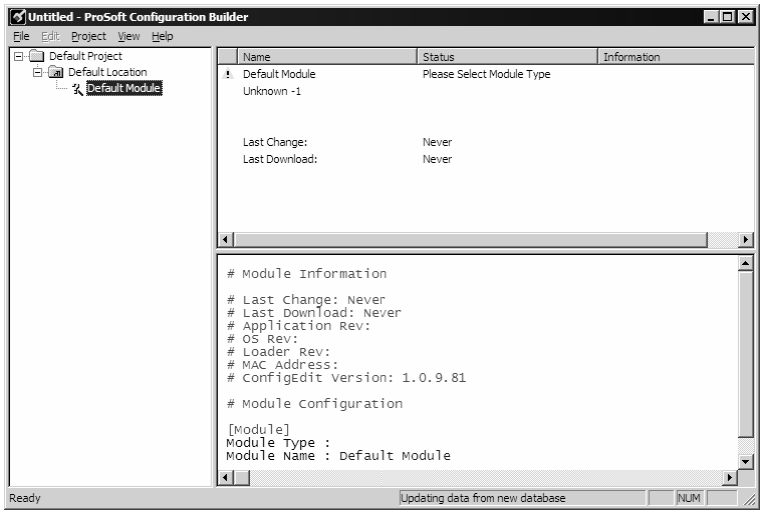
Because the task of configuring the ProLinx module can be complicated, ProSoft Technology has provided a configuration tool called ProSoft Configuration Builder (PCB) that will help you with the following tasks:

- Creating a configuration project
- Setting module parameters
- Configuring the protocols
  - PWP (page 23)
  - DFNT
  - DFCM
- Copying the project to the module.

The following topics of this chapter explain each task step-by-step.

2.1 Set Up the Project

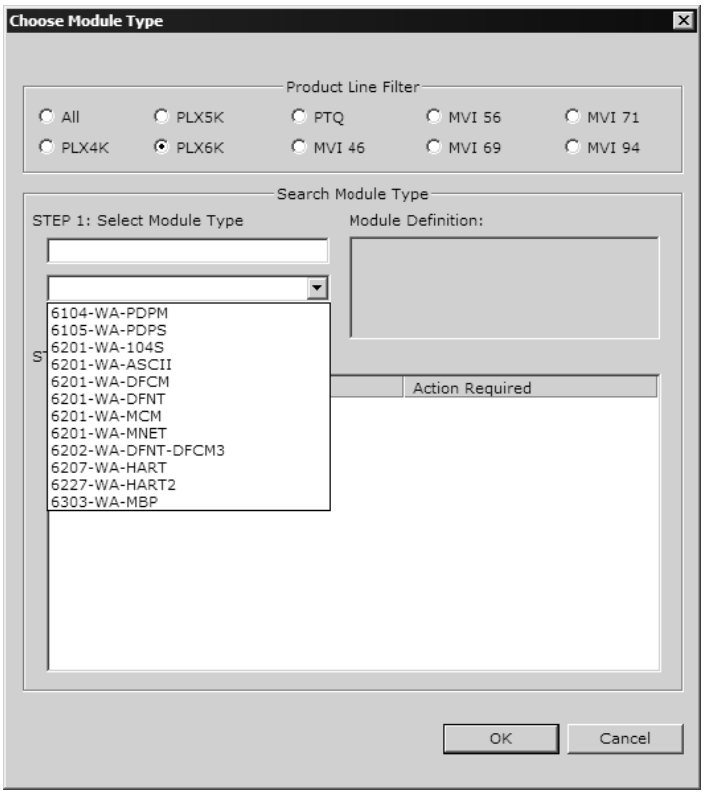
To begin, start ProSoft Configuration Builder. If you have used Windows configuration tools before, you will find the screen layout familiar. ProSoft Configuration Builder's window consists of a tree view on the left, an information pane and a configuration pane on the right side of the window. When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



Your first task is to add the 6202-WA-DFNT-DFCM3 module to the project.

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

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



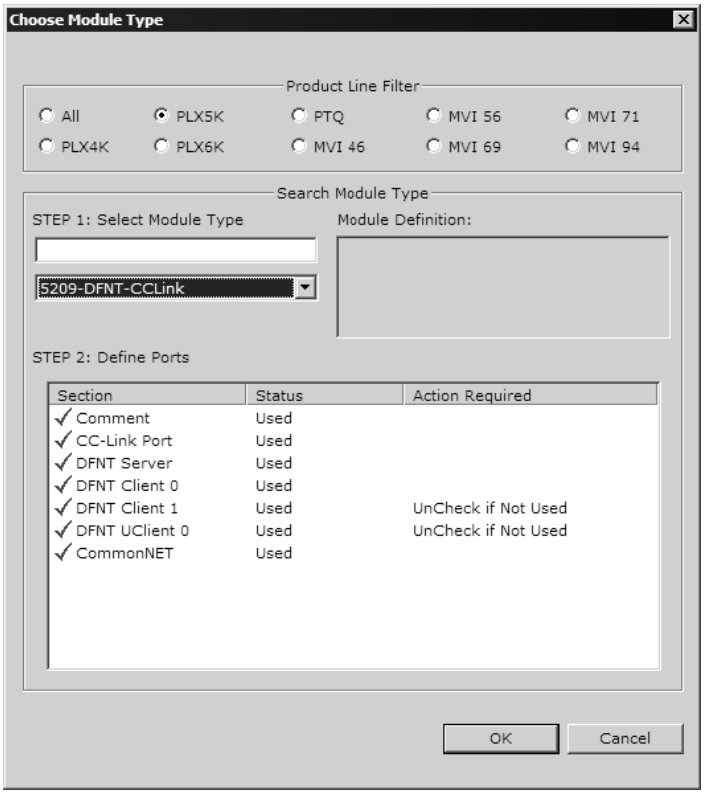
3 In the Product Line Filter area of the dialog box, select PLX6K. In the Select Module Type dropdown list, select 6202-WA-DFNT-DFCM3, and then click OK to save your settings and return to the ProSoft Configuration Builder window.

The next task is to set the module parameters.

2.2 Adding a Module

To add a module to your project:

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



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

Or

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

To add a module to a different location:

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

Or

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

2.3 Module Entries

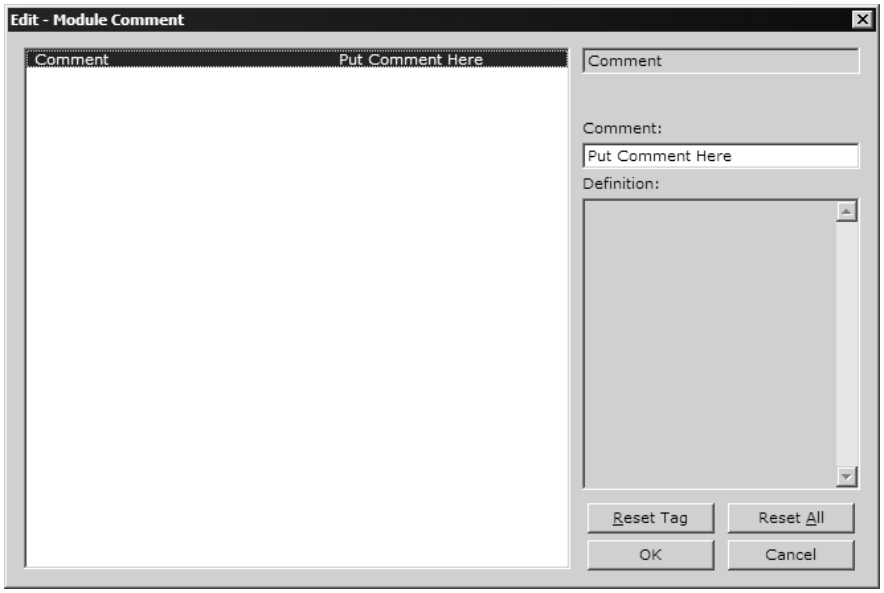
To configure module parameters

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

2.4 Comment Entries

To add comments to your configuration file:

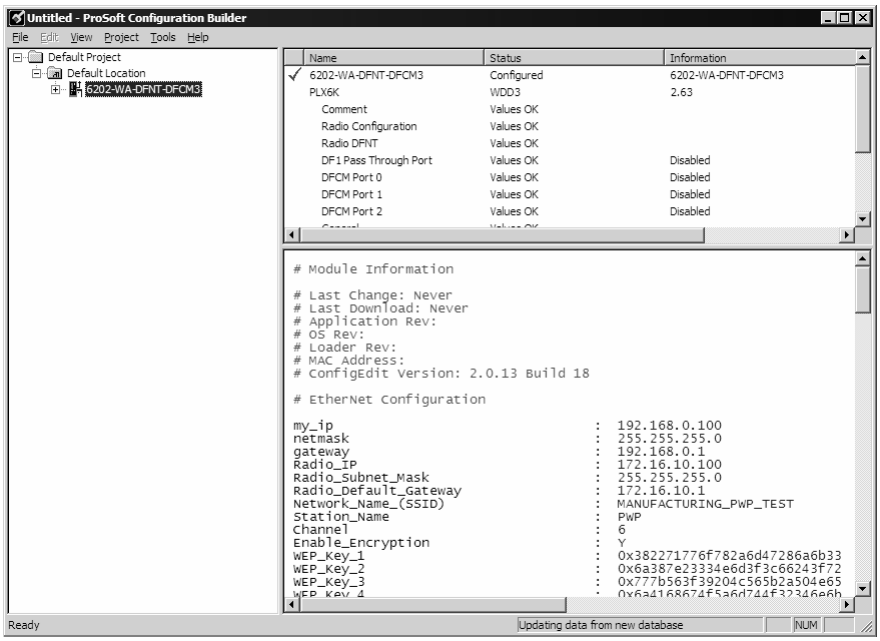
1. Click the plus sign to the left of the Comment icon to expand the Module Comments.
2. Double-click the Module Comment icon. The Edit - Module Comment dialog appears.



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

2.5 Set module parameters

Notice that the contents of the information pane changed when you added the 6202-WA-DFNT-DFCM3 module to the project. A red "X" icon in the information pane indicates that the module's configuration is incomplete.



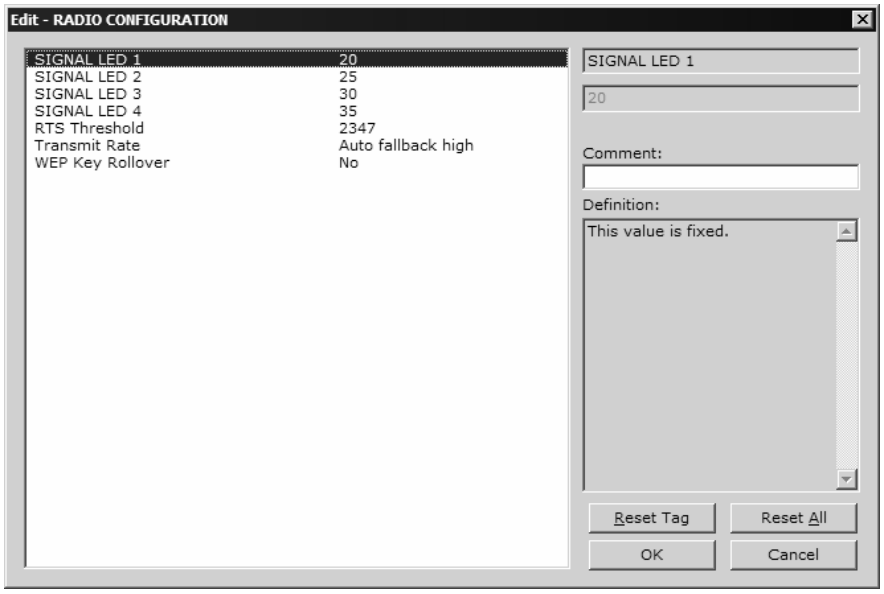
At this time, you may wish to rename the "Default Project" and "Default Location" folders in the tree view.

To rename an object:

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

2.5.1 [Radio Configuration]

The Radio Configuration section contains basic configuration parameters for the radio. The following settings configure the radio.



Signal LED 1, 2, 3, 4

SIGNAL LED 1: 20

SIGNAL LED 2: 25

SIGNAL LED 3: 30

SIGNAL LED 4: 35

The Signal LEDs on the front of the module indicate the current quality (signal strength minus noise) of the radio signal. The parameter for each LED determines the signal strength level at which the LED will illuminate.

After the module powers up, all signal LEDs will be off. When the module establishes a connection to another module, the signal LEDs will display the strength of the radio signal.

If the radio communication is dropped when in ad-hoc mode (for example, if the other radio is turned off), the signal strength LEDs will flash periodically at a rate of approximately 10 seconds on and one second off.

Transmit Rate

This parameter defines the data rate(s) for transmission of directed messages. Possible values are outlined in the following table.

Value	Definition
1	Fixed 1 Mbit (1)
2	Fixed 2 Mbit (2)

Value	Definition
3	Auto fallback high (11, 5.5, 2, 1)
4	Fixed medium rate (5.5)
5	Fixed high rate (11)
6	Auto fallback standard (2, 1)
7	Auto fallback medium (5.5, 2, 1)

Important: For Multicast mode, use transmit rates of 1 or 2 Mbps for best results.

RTS Threshold

60 to 2347

RTS/CTS handshake threshold byte count. Less than 60 will interfere with control packets.

WEP Key Rollover

Yes or No

WEP (Wireless Encryption Protocol) is an encryption method that allows devices on a wireless network to transmit data securely.

This parameter interacts with the WATTCP parameter "Enable Encryption", and the values for WEP Keys 1 through 4. When the WEP Key Rollover parameter is enabled, the module will randomly change the WEP key.

2.5.2 [Radio SNTP Client]

The [Radio SNTP Client] section specifies the parameters for the Simple Network Time Protocol (SNTP) client provided with the protocol driver. This client is required in order to keep the driver's internal clock set correctly. This version of the driver supports the unicast implementation of the SNTP Revision 3 and stratum between 1 and 14.

The module can be configured to periodically synchronize its clock with a remote SNTP server. Approximately every 6 minutes the module sends 10 consecutive requests to the remote SNTP client (at approximately 6 second intervals). You can check these requests and responses by looking at the SNTP Client Configuration Menu (press the N key at the Configuration/Debug Main Menu). If the module receives a valid response from the SNTP server, the computations value will be also be incremented. After 10 consecutive successful requests and responses, the module will synchronize its internal clock (an average is performed based on all 10 responses for better accuracy). The Time Set Cnt value is incremented every time the clock is synchronized.

After the synchronization is performed, the time valid register is set to Yes. If the module cannot connect to the remote SNTP server after 3 consecutive attempts, the time valid register is set to No. You can also configure the GMT settings to use, and the database address where the date and time information can be copied.

The following parameters set up the SNTP client:

```
[RADIO SNTP CLIENT]
NTP SERVER IP ADDRESS     : 0.0.0.0 # IP address for NIST, Boulder, Colorado
TIME ZONE                 :       8 # Number of hours from GMT (-11 to +11)
USE DAYLIGHT SAVINGS TIME :      No # Yes or No
DATABASE REGISTER         :    3000 # database word location where to store
                                    # time (-1=ignore).
```

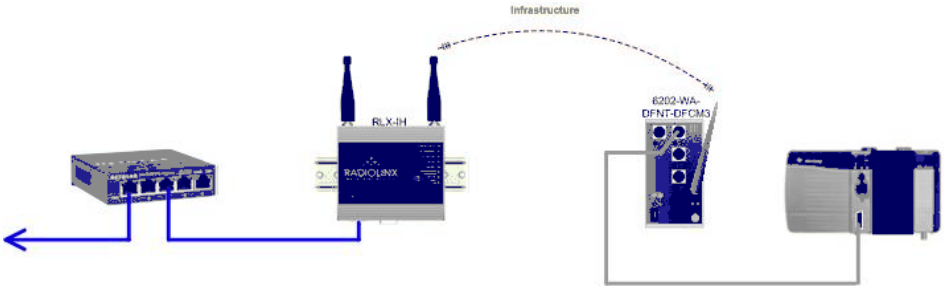
The database register parameter defines a database register where the SNTP time and date values are copied. It occupies 4 words as follows:

Word Offset	Description
0 and 1	Date and time in Unix format (long integer)
2 and 3	Microseconds (long integer)

SNTP setup

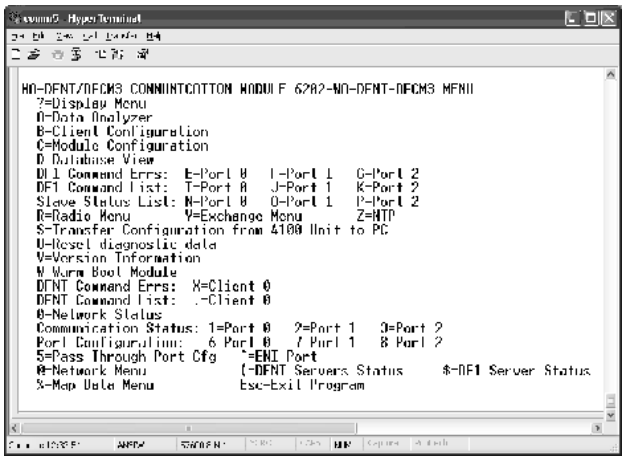
This section describes how to set up the SNTP time sync with an Ethernet connection.

As long as a valid IP address is present, the SNTP feature is always enabled, but to function properly it must be configured correctly. The following drawing gives more detail:



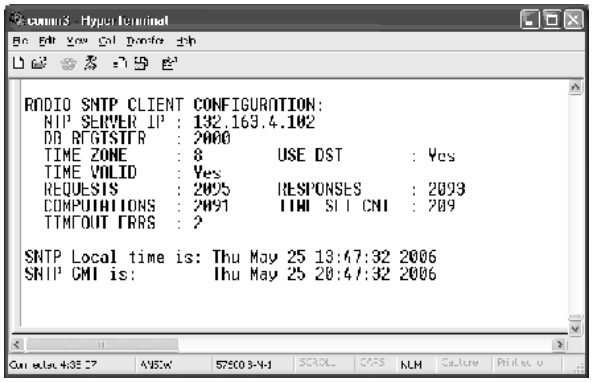
Note: Radiolinx or any access point (peer to peer) will not time sync.

From Main Menu



Press **[Z]** to show the NTP menu.

Your configuration data should look similar to the following if it was configured correctly:



NTP Server IP Address

Enter in dotted notation

This parameter sets the IP address of the NTP server to contact for time acquisition. Select an NTP server with the greatest accuracy that is available all the time from your network. Set this IP address to 0.0.0.0 to disable SNTP server requests.

Time Zone

-11 to 11

This parameter sets the time zone offset from UTC. Positive values are for time zones west of UTC, and negative values are for time zones east of UTC. Set this value to 0 to use UTC in the module.

Use Daylight Savings Time

Yes or No

This parameter specifies if daylight savings time will be used in the time computation.

Database Register

-1 or 0 to 3992 as an even value

This parameter specifies if the NTP time computed by the driver is to be placed into the module's database. If a value of -1 is specified, the time will not be placed into the database. If the value is between 0 and 3992, the time will be placed in the database. The first 4 bytes represent the seconds since 1/1/1970, and the second 4 bytes represent the number of microseconds. An even value should be used for the register value in order for the data to be stored correctly.

2.5.3 [RADIO PWP Exchanges]

In order to interface the module with PWP devices, you must construct an exchange list. The exchanges specify messages that will be produced or consumed at a user-defined frequency using the module's internal database. Messages can be broadcast to all nodes on the network, sent to a multicast group on the network or associated with a single node on the network. Up to 100 exchanges can be defined for the driver. Up to 680 word registers can be produced or consumed in a single exchange.

The [RADIO PWP Exchanges] section defines the messages that will be produced and consumed by the driver. The UDP protocol on the IP network is used to transport these over Ethernet between all the PWP devices.

For the exchanges to operate correctly, the other PWP devices must be configured and correctly set up. The primary reason for user problems with the module is failure to provide devices that are correctly configured. Before trying to connect the module to the network, the remote device must be able to communicate with ProSoft Configuration Builder. You must understand and document all parameters.

Exch Type

Producer: exchange will be producing data to other stations

Consumer: exchange will be consuming data from another station

The Exchange Type field defines the type of exchange used in the exchange as either producer or consumer. Producer exchanges (P) are generated by the driver using the module's database. Consumer exchanges (C) are those received from other DFNT devices with the data in the message being placed in the module's database.

Cast Type

When the Exchange Type is **Producer,** the cast type field determines if the exchange is a unicast ('U' = point-to-point) exchange, multicast ('M'=multicast group) or a broadcast ('B' = all nodes) exchange.

- Producer Unicast - produce message to another station
- Producer Multicast - produce message to a group of stations. In order to use this option you need to configure the same Multicast IP address used in the exchange also at the [RADIO PWP MULTICAST GROUP LIST] section.

Important: For Multicast mode, use transmit rates (page 23) of 1 or 2 for best results.

- Producer Broadcast - produce message to all stations (set exchange IP address to 255.255.255.255)

When the Exchange Type is **Consumer,** the cast type field determines how the local database area associated to this exchange will be updated in case an RF Error (timeout) occurs.

- Consumer No DB Change on RF Error
- Consumer Set DB to -1 On RF Error

- Consumer Set DB to 0 On RF Error
- Consumer Set DB to 1 On RF Error

DB Reg

The DB Register field defines the starting database register in the module where data sourced (produced data) or placed (consumed data) is determined by the value entered in the DB Reg column. This parameter can have a value of 0 to 3999. The validity of the entry is dependent on the number of registers (Reg Count) to be produced or consumed. The sum of the two values cannot exceed 4000, as this would be outside the range of the module's database.

Reg Count

Number of database registers to transfer/accept in message.

Swap Code

0, 1, 2 or 3

The Swap Code field sets byte and word swapping of data produced or consumed. Swapping of words and/or bytes in the message may be required for different protocol and operating systems as their representation of multi-byte values may not be the same as that of the DFNT protocol.

Swap Code	Description
0	None - No Change is made in the byte ordering (1234 = 1234)
1	Words - The words are swapped (1234=3412)
2	Words & Bytes - The words are swapped then the bytes in each word are swapped (1234=4321)
3	Bytes - The bytes in each word are swapped (1234=2143)

P/C Time

The P/C Time field defines the number of milliseconds between productions of the exchange data and for consumed exchanges. This value defines the number of milliseconds to wait for a produced exchanged before a timeout condition is present.

- For a producer exchange it defines the number of milliseconds between consecutive producer exchanges.
- For a consumer exchange it defines the number of milliseconds to wait for a produced message before a timeout error is set. It is suggested to use a value at least four times greater than the value used in the producer exchange.

For consumed messages, set this value to approximately 4 times the produced time of the exchange on the other device. This will prevent the exchange from constantly timing out on a busy network. If this parameter is set to zero, the message will not be produced.

A zero value for a consumed message indicates that the exchange will never timeout. The zero value can be used for exchanges that will interface with the command service port (7937) to handle data read and write requests from another device.

IP Address

The IP Address field should be set to the IP address of destination device (produced data) or source device (consumed data).

Producer Exchange IP address: If the cast type is set to 'U' for a produced exchange, the address should be set to IP address of the specific node to receive (consume) the data. If the cast type is set to 'B' for produced data, set the IP to either a network (255.255.255.255) or subnet (192.168.0.255) broadcast address. If the cast type is set to 'M' for produced data, set the IP address to a valid multicast address.

Multicast Address Assignments

Important: Use Multicast whenever the module produces data to at least two other modules. Using Unicast for these applications can cause data transmission delay when at least one of the consumer modules is powered down.

Multicast group addresses 224.0.7.1 to 224.0.7.32 are reserved. The module does not place this limit for messages but the user should consider using the reserved group addresses. The following table shows the relationship between multicast group parameters and IP addresses. Refer to Underlying Protocol Requirements and Constraints for more detailed information on IP and UDP addresses.

Parameter	IP Address
Group 1	224.0.7.1
Group 2	224.0.7.2
…	…
Group 32	224.0.7.32

Important: For Multicast mode, use transmit rates (page 23) of 1 or 2 for best results.

Consumer Exchange IP address: For consumed messages both Broadcast and Multicast type messages should be set to the IP address of the producer generating the specific exchange. The combination of the IP address and the exchange ID uniquely identify the exchange to the system.

Exch ID

1 to 16383

The Exch ID field defines the Exchange ID for this message, and must be unique for each node. For produced exchanges, the module IP address and the entered exchange ID uniquely define the exchange to the network. Defined consumer exchanges use the IP address in the message along with this exchange ID to determine which exchange to associate with the message. The parameters defined in the exchange then determine how much data is present in the message and where to place it into the module's internal database.

CS Major, CS Minor

This is an optional functionality that can be used to prevent unexpected results when changes are performed to existing producer and consumer exchanges.

The Configuration Signature consists of two one-byte integer value (CS Major and CS Minor). The CS Major must be equal for both Producer and Consumer exchanges. The CS Minor reflects backward compatible modifications made to an exchange (for example: adding registers to the producer exchange count). Truncating data within an exchange is not backward compatible and requires a change in the major number.

The purpose of the Configuration Signature (CS) is to guarantee that the produced exchange will contain data in a format expected by a consumer module. Therefore it prevents the consumer module to process received data if it is not compatible because of later modifications.

Whenever a consumer module receives an exchange message, it will look for a configured consumer exchange that contains the same Exchange ID. If it finds a matching consumer exchange it will compare the Configuration Signature for validation.

If the exchange is not validated then the data will not be consumed.

Because this functionality is optional, the modules will exchange data even if the Configuration Signature validation is disabled. To disable this functionality, configure all exchanges with both CS Major and CS Minor values equal to zero.

The following rules are used by the consumer module to validate an exchange based on its Configuration Signature:

Rules for CS Validation

An exchange will be considered valid if at least one of the following conditions is true:

- Producer CS Major and CS Minor are both equal to 0
- Consumer CS Major and CS Minor are both equal to 0
- Producer CS Major is equal than Consumer CS Major AND Producer CS Minor is greater or equal than Consumer CS Minor

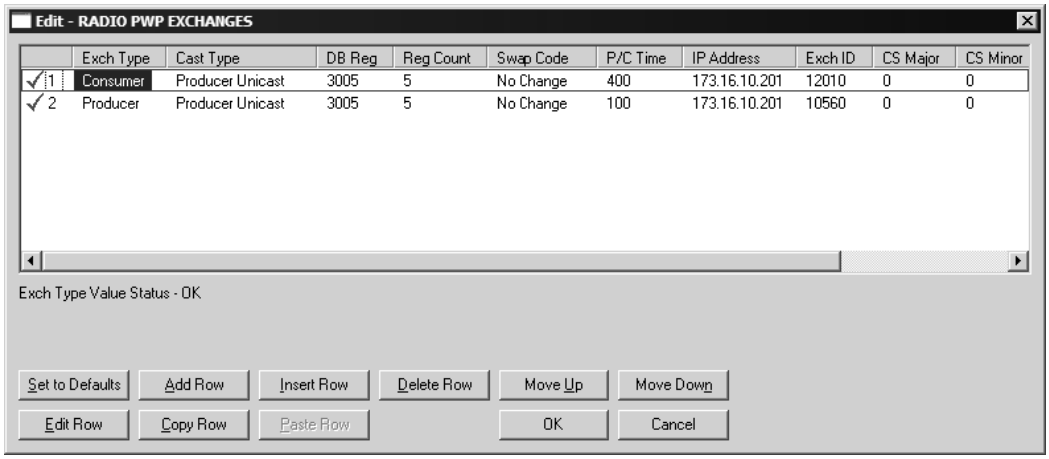
The following table contains some examples that will help you to understand the consumer criteria to validate received exchanges based on the Configuration Signature:

Producer CS Major	Producer CS Minor	Consumer CS Major	Consumer CS Minor	Will Data be Consumed?	Comment
0	0	0	0	Yes	Same CS value of 0.0 (Major.Minor) validates the exchange
0	0	1	2	Yes	Producer CS value of 0.0 (Major.Minor) validates the exchange
1	2	0	0	Yes	Consumer CS value of 0.0 (Major.Minor) validates the exchange
1	2	1	2	Yes	Same CS value (1.2) validates the exchange
2	2	1	2	No	CS Major mismatch - exchange is not validated
1	2	2	2	No	CS Major mismatch - exchange is not validated

Producer CS Major	Producer CS Minor	Consumer CS Major	Consumer CS Minor	Will Data be Consumed?	Comment
1	2	1	1	Yes	Same CS Major and Consumer CS Minor is less than Producer CS Minor - exchange is validated
1	2	1	3	No	Same CS Major but Consumer CS Minor is greater than Producer CS Minor - exchange is not validated

Radio PWP Exchange Command List Example

The following is an example section from the [PWP Exchanges] section:



2.5.4 [Radio PWP Multicast Group List]

This section contains the list of multicast group addresses the PWP server should process (consumer messages for this server produced on other units). This list may contain up to 16 IP addresses. The reserved group addresses for the PWP protocol are 224.0.7.1 to 224.0.7.32. The module will support other group addresses than this data set.

Important: Use Multicast whenever the module produces data to at least two other modules. Using Unicast for these applications can cause data transmission delay when at least one of the consumer modules is powered down.

2.5.5 [Radio DFNT Server]

DFNT Server File Size

100 or 1000

Sets the maximum file size (100 or 1000) for the servers

2.5.6 [Radio DF1 Pass-Through Server]

Note: This section of the configuration file is applicable to third party port re-routing software that can RSLinx a serial port driver to an IP address port. When such software is not neccesary, this section is ignored by the module.

Enabled

Yes or No

This parameter determines if the server will be utilized by the module. If a value of 'Yes' is entered, the server will be used. Any other value will disable the server.

Service Port Number

1 to 65535

This parameter sets the TCP/IP service port for this server. Each server can have its own unique service port or can share the same number with other servers.

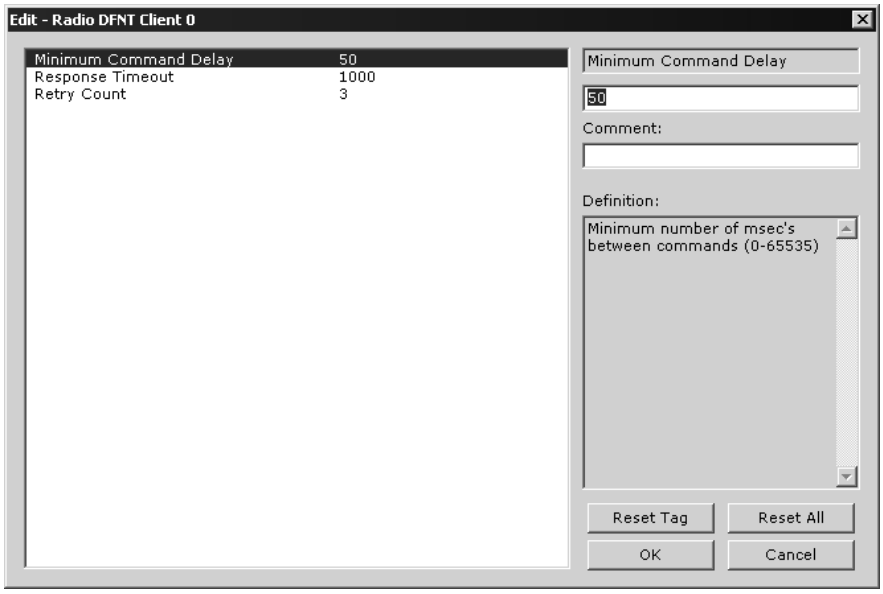
Busy Timeout

100 to 65535 milliseconds

This parameter sets the number of milliseconds the server will wait for the pass-through port to become available. Valid data range for this parameter is 100 to 65535.

2.5.7 [Radio DFNT Client 0]

This section is used to define the configuration for the master device simulated on network port



Minimum Command Delay

0 to 65535

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.

Response Timeout

0 to 65535 milliseconds

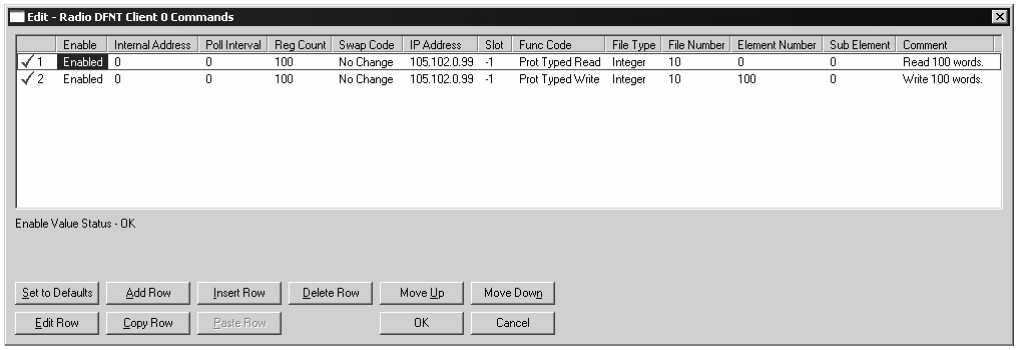
This parameter represents the message response timeout period in 1 millisecond increments. This is the time that a port configured as a master will wait before re-transmitting a command if no response is received from the addressed slave. The value is set depending upon the communication network used and the expected response time of the slowest device on the network.

Retry Count

0 to 10

This parameter specifies the number of times a command will be retried if it fails.

2.5.8 [Radio DFNT Client 0 Commands]



Command List

In order to interface the virtual database with DF1 slave devices, you must construct a command list. The commands in the list specify the DF1 slave device to be utilized, the function to be performed (read or write), the data area in the device to interface with and the position in the virtual database to be associated with the device data. There is a separate command list for each DF1 master device emulated. The list is processed from top (command #0) to bottom. A poll interval parameter is associated with each command to specify a minimum delay time between the issuance of a command. If the user specifies a value of 10 for the parameter, the command will be executed no more frequently than every 10 seconds for the serial implementation and 1 second for the network implementation.

Write commands have a special feature, as they can be set to execute only if the data in the write command changes. If the data in the command has not changed since the command was last issued, the command will not be executed. If the data in the command has changed since the command was last issued, the command will be executed. Use of this feature can lighten the load on the DF1 network. In order to implement this feature; set the enable code for the command to a value of 2.

If the module is configured for the serial DF1 half-duplex protocol, the module can act as a master device routing messages between attached slave devices. This peer-to-peer communication is defined in the DF1 protocol specification. The master polls each DF1 slave device until no more data is available from the device. Response messages from the slaves that have a destination address that do not match the module are routed with a request message header back out onto the network. This facility offers communication between the slave devices for control and data monitoring. This feature is not available if the module is configured for DF1 full-duplex mode (point-to-point).

The module supports numerous commands. This permits the module to interface with a wide variety of DF1 protocol devices. This includes PLC2, PLC5, SLC-500 series, MicroLogix and ControlLogix processors. Additionally, other devices supplied by Rockwell Automation that use the DF1 protocol are supported.

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
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

Command Entry Formats

The format of each command in the list is dependent on the function being executed. Refer to Command Function Codes (page 35, page 117) for a complete discussion of the commands supported by the module and of the structure and content of each command.

The following table shows the structure of the configuration data necessary for each of the supported commands.

Module Information Data							Device Information Data					
Column #	1	2	3	4	5	6	7	8	9	10	11	12
Function Code	Enable Code	Internal Address	Poll Interval Time	Count	Swap Code	IP Address	Slot Number	Function Code	Function Parameters			
FC 1	Code	Register	Seconds	Count	Code	Node	Slot	1	Word Address			
FC 2	Code	Register	Seconds	Count	Code	Node		2	Word Address			
FC 3	Code	Register	Seconds	Count	Code	Node		3	Word Address			
FC 4	Code	Register	Seconds	Count	Code	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	Code	Node		102	File Number	Element	Sub-Element	
FC 150	Code	Register	Seconds	Count	Code	Node		150	File String			
FC 151	Code	Register	Seconds	Count	Code	Node		151	File String			
FC 152	Code	Register	Seconds	Count	Code	Node		152	File String			
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	Code	Node		511	File Type	File Number	Element	Sub-Element

IP Address = IP address of processor to reach
Slot Number = -1 for PLC5 & SLC, processor slot number of ControlLogix 5550

The first part of the record is the Module Information, which relates to the module. The second part contains information required to interface to the Server device. An example of a command list section of the configuration file is shown in the following illustration.

```
[DFNT Client 0 Commands]
#
# The file contains examples for a ControlLogix processor with the N7 file
# configured.  This example uses SLC and PLC5 commands.
#
# LOCATION     :
# DATE         : 04/05/2000
# CONFIGURED BY: RAR
# MODIFIED     :
#
#   1     2      3     4    5  6                  7    8    9   10   11   12
#        DB   Poll       Swap                      Func File File  Elm  Sub
#Enab  Addr  Delay Count Code  Node IP Address Slot Code Type    #    #  Elm
START
#     1  2000      0    10    0  192.168.0.100      0  501    N   11    0
#     1  2000      0    10    0  192.168.0.100      0  509    N   12    0
#
#        DB   Poll       Swap                      Func File  Elm  Sub
#Enab  Addr  Delay Count Code  Node IP Address Slot Code    #    #  Elm
END
```

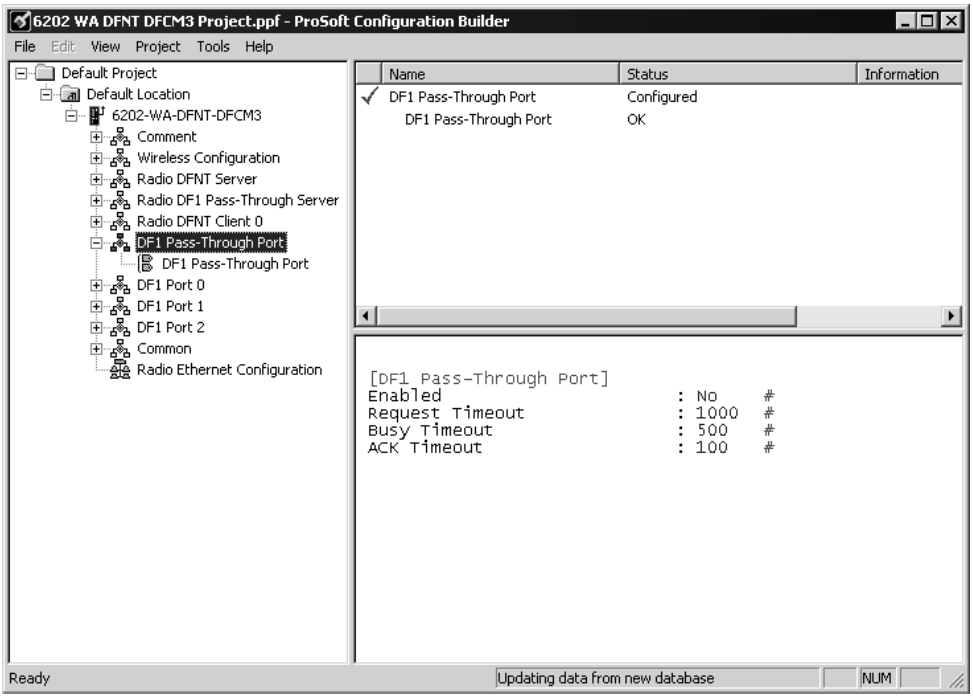
The following table describes each parameter:

Parameter	Range	Description
Enable	0, 1, 2	This field defines whether or not the command is to be executed and under what conditions. 0 = The command is disabled and will not be executed in the normal polling sequence. 1 = The command is executed each scan of the command list if the Poll Interval Time is set to zero. If the Poll Interval time is set, the command is executed when the interval timer expires. 2 = The command executes only if the internal data associated with the command changes. This value is valid for write commands only.
Internal Address	0 to 3999	This field specifies the database address in the module's internal database to be associated with the command. If the command is a read function, the data received in the response message is placed at the specified location. If the command is write function, data used in the command is sourced from the specified data area.
Poll Delay	0 to 1000	This parameter specifies the minimum interval to execute continuous commands (Enable code of 1). The parameter is entered in 1/10th of a second. Therefore, if a value of 100 is entered for a command, the command executes no more frequently than every 10 seconds.
Count	Command dependent. See Command Function Codes (page 35, page 117) for information	This parameter specifies the number of registers or digital points to be associated with the command.

<table>
<tr><th>Parameter</th><th>Range</th><th>Description</th></tr>
<tr><td>Swap Code</td><td>0,1,2,3</td><td>This parameter defines if the data received from the Server is to be ordered differently than that received from the Server device. This parameter is helpful when dealing with floating-point or other multi-register values, as there is no standard method of storage of these data types in Server devices. This parameter can be set to order the register data received in an order useful by other applications. The following table defines the values and their associated operations:
<table>
<tr><th>Swap Code</th><th>Description</th></tr>
<tr><td>0</td><td>None - No Change is made in the byte ordering (1234 = 1234)</td></tr>
<tr><td>1</td><td>Words - The words are swapped (1234=3412)</td></tr>
<tr><td>2</td><td>Words & Bytes - The words are swapped then the bytes in each word are swapped (1234=4321)</td></tr>
<tr><td>3</td><td>Bytes - The bytes in each word are swapped (1234=2143)</td></tr>
</table>
The words should be swapped only when using an even number of words.</td></tr>
<tr><td>Node IP Address</td><td>xxx.xxx.xxx.xxx</td><td>The IP address of the device being addressed by the command.</td></tr>
<tr><td>Slot</td><td></td><td>Use a value of -1 when interfacing to an SLC 5/05 or a SLC5. These devices do not have a slot parameter. When addressing a ControlLogix processor, the slot number corresponds to the slot in the rack containing the controller being addressed. In the ControlLogix platform, the controller can be placed in any slot and the rack may contain multiple processors. This parameter uniquely selects a controller in the rack.</td></tr>
<tr><td>Function Code</td><td>See Command Function Codes (page 35, page 117)</td><td>These parameters specify the function to be executed by the command. The Reference chapter in this manual describes the meaning of these values for each of the available supported commands. Following is a complete list of the command supported by the Client driver.
Function Code Listing
Basic Command Set
<table>
<tr><td>1</td><td>Protected Write</td></tr>
<tr><td>2</td><td>Unprotected Read</td></tr>
<tr><td>3</td><td>Protected Bit Write</td></tr>
<tr><td>4</td><td>Unprotected Bit Write</td></tr>
<tr><td>5</td><td>Unprotected Write</td></tr>
</table>
PLC-5 Command Set (0x0F)
<table>
<tr><td>100</td><td>Word Range Write (Binary Address)</td></tr>
<tr><td>101</td><td>Word Range Read (Binary Address)</td></tr>
<tr><td>102</td><td>Read-Modify-Write (Binary Address)</td></tr>
<tr><td>150</td><td>Word Range Write (ASCII Address)</td></tr>
<tr><td>151</td><td>Word Range Read (ASCII Address)</td></tr>
<tr><td>152</td><td>Read-Modify-Write (ASCII Address)</td></tr>
</table>
SLC Command Set (0x0F)
<table>
<tr><td>501</td><td>Prot Typed Read with 2 addr fields</td></tr>
<tr><td>502</td><td>Prot Typed Read with 3 addr fields</td></tr>
<tr><td>509</td><td>Prot Typed Write with 2 addr fields</td></tr>
<tr><td>510</td><td>Prot Typed Write with 3 addr fields</td></tr>
<tr><td>511</td><td>Prot Type Write with Mask 3 addr field</td></tr>
</table></td></tr>
<tr><td>Function Parameters</td><td>See Command Function Codes (page 35, page 117)</td><td>The number of auxiliary parameters required is dependent on the function code selected for the command.</td></tr>
</table>

2.5.9 [DF1 Pass-Through Port]

This section describes the use and configuration of the pass-through mode on the Serial Ports of DFCM-based modules.



Port 0 can operate either as:

- Pass-Through from the Debug to Port 0
- Standard Debug/Configuration operation on the Debug Port.

Enabled

This parameter specifies if the port will be used. If the parameter is set to No, the port is disabled. If the parameter is set to Yes, the port is enabled.

Request Timeout

0 to 10000 milliseconds

This parameter specifies the number of milliseconds to wait for a complete request message. The timer is started after the DLE-STX character sequence is received for the full-duplex protocol or the DLE-SOH sequence for the half-duplex protocol. If the timer expires, the current request message will be aborted.

Busy Timeout

0 to 65535

This parameter specifies the number of milliseconds to wait for the DF1 master port to become available. If the DF1 master port is processing a command list request, the busy flag will be set. The flag will remain busy until the communication transaction is complete. If the port does not become available before the busy timeout expires, the message will be aborted. If the master port becomes available before this timeout expires, the request will be routed to the master port.

ACK Timeout

0 to 65535

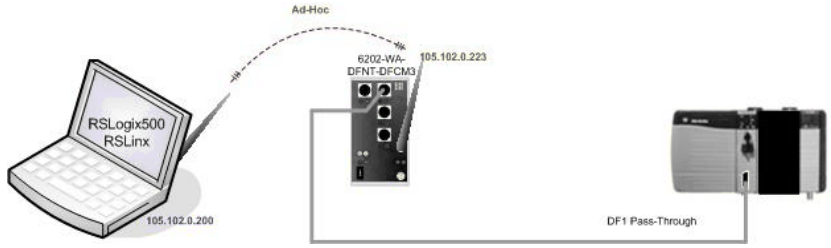
This parameter specifies the number of milliseconds to wait for a DLE-ACK character sequence after a response is issued.

Sample Parameters

To enable pass-through mode, configure Port 1 on the module as a DF1 master port using the DF1 full-duplex protocol. At least one command must be enabled in the DF1 Port 0 Commands section. It is recommended to have one or more seconds set for the Polling Rate.

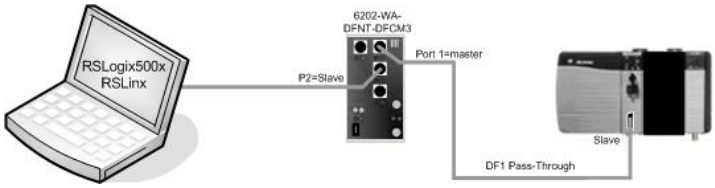
The following illustrations show the use of the pass-through port functionality:

Wireless DF1 Pass-Through in Ad-Hoc mode



Wireless DF1 Pass-Through in Infrastructure mode

Wired DF1 Pass-Through in Infrastructure mode



[Radio DF1 Pass-Through Server]

```
Enabled             :    Yes # Y=Use server, N=Do not use server
Service Port Number :  15000 # TCP service port for this server
Busy Timeout        :    500 # Time to wait for not Busy (100-65535 mSec)
```

Note: This section of the configuration file is applicable to third party port re-routing software that can RSLinx serial port driver to an IP address port. When such software is not necessary then this section is ignored by the module.

[DF1 Pass-Through Port]

```
Enabled             :    Yes # Y=Use port, N=Do not use port
Request Timeout     :   1000 # Request messgage timeout (0-65535 mSec)
Busy Timeou t       :    500 # Port Busy timeout (0-65535 mSec)
ACK Timeout         :    100 # DLE-ACK timeout (0-65535 mSec)
```

[DF1 Port 1]

```
Enabled             :    Yes # Y=Use port, N=Do not use port
RS Interface        : RS-232 # 0=RS-232, 1=RS-485, 2=RS-422
Type                : Master # M=Master, S=Slave
Local Station ID    :      0 # DF1 node address
Protocol            : Full-Duplex  # F=Full-Duplex, H=Half-Duplex
Termination Type    :    CRC # B=BCC, C=CRC
Baud Rate           :  38400 # Baud rate for Port 210-38400
Parity              : None   # N=None,O=Odd,E=Even,M=Mark,S=Space
Data Bits           :      8 # 5, 6, 7 or 8
Stop Bits           :      1 # 1 or 2
Min Response Delay  :      0 # 0-65535 mSec before sending response msg
RTS On              :      0 # 0-65536 mSec before message
RTS Off             :      1 # 0-65536 mSec after message
Use CTS Line        :     No # Use CTS modem control line (Y/N)
Response Timeout    :   1000 # Response messgage timeout (0-65535 mSec)
Retry Count         :      3 # Response failure retry count
ENQ Delay           :     10 # 0-65535 mSec before DLE-ENQ sent
Minimum Command Delay:    10 # Minimum number of msec's between commands
Error Delay Counter :    100 # 0-65535 Command cycle count if error
Command Control Reg :     -1 # Cmd control start DB Reg (-1=ignore)
First File          :      7 # First file number for SLC simulation
File Size           :    200 # Number of elements in each file
File Offset         :      0 # Database offset for first file element
```

[DF1 Port 1 Command]

```
START
# DF1 Port 1 Commands SLC500 2 Address Fields
# Enable  Int   Poll  Reg    Swap  Node  Func  File  File  Elem Comment
          Addr  Intr  Count  Code  Addr  Code  Type  Num   Num
1 1     50   1    50   0    1    509  N    7   50  # Write to cLX
END
```

2.5.10 [DF1 Port x]

The following shows a sample DF1 Port x section of the configuration file.

```
[DF1 Port x]
Enabled               : Yes    # Y=Use port, N=Do not use port
RS Interface          : 0      # 0=RS-232, 1=RS-485, 2=RS-422
Type                  : Master # M=Master, S=Slave
Local Station ID      : 0      # DF1 node address
Protocol              : F      # F=Full-Duplex, H=Half-Duplex
Termination Type      : CRC    # B=BCC, C=CRC
Baud Rate             : 19200  # Baud rate for Port 110-38400
Parity                : None   # N=None,O=Odd,E=Even,M=Mark,S=Space
Data Bits             : 8      # 5, 6, 7 or 8
Stop Bits             : 1      # 1 or 2
Min Response Delay    : 0      # 0-65535 mSec before sending response msg
RTS On                : 0      # 0-65536 mSec before message
RTS Off               : 1      # 0-65536 mSec after message
Use CTS Line          : No     # Use CTS modem control line (Y/N)
Response Timeout      : 1000   # Response message timeout (0-65535 mSec)
Retry Count           : 3      # Response failure retry count
ENQ Delay             : 10     # 0-65535 mSec before DLE-ENQ sent
Minimum Command Delay : 10     # Minimum number of msec's between commands
Error Delay Counter   : 100    # 0-65535 Command cycle count if error
Command Control Reg   : -1     # Cmd control start DB Reg (-1=ignore)
First File            : 7      # First file number for SLC simulation
File Size             : 200    # Number of elements in each file
File Offset           : 0      # Database offset for first file element
```

Modify each of the parameters as follows based on the needs of your application:

Enabled

This parameter specifies if the port will be used. If the parameter is set to No, the port is disabled. If the parameter is set to Yes, the port is enabled.

RS Interface

1 = RS-232

2 = RS-422

3 = RS-485

This parameter is used when Ports 1, 2, 3 are present to configure the electrical interface for the individual ports.

Port 1 must be jumper selected on the back of the unit.

Type

Master or Slave

This parameter defines if the port will emulate a master or slave device. Enter a value of Master for a master and Slave for a slave.

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.

Protocol

Full or Half

This parameter specifies the DF1 protocol to be used on the port. Enter Full Duplex or Half-Duplex.

Termination Type

BCC or CRC

This parameter specifies the error checking for all DF1 messages. Enter BCC or CRC.

Baud Rate

Baud Rate Value

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. Valid entries for this field include: 110, 150, 300, 600, 1200, 2400, 4800, 9600, 19200, 28800, 38400, 57600 and 115.

Parity

None, Odd, Even, Mark, Space

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

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

Data Bits

7 or 8

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

Stop Bits

1 or 2

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

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

Minimum Response Delay

0 to 65535

This parameter sets the number of milliseconds to wait to respond to a request on the port. This is required for slow reacting devices.

RTS On

0 to 65535 milliseconds

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

RTS Off

0 to 65535 milliseconds

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

Use CTS Line

Yes or No

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

Response Timeout

Number of milliseconds to wait for response to command. The value is set depending upon the communication network used and the expected response time of the slowest device on the network. Valid values are 0 to 5000 milliseconds.

Retry Count

0 to 10

This parameter specifies the number of times a command will be retried if it fails.

ENQ Delay

0 to 65535

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.

Minimum Command Delay

This parameter specifies the number of milliseconds to wait between issuing each command. This delay value is not applied to retries.

Error Delay Counter

0 to 65535

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.

Command Control Reg

0 to 3900

This parameter controls the execution of commands in the user list by setting a value of 0, 1, or 2. If a user defines the list with a type code of zero for all commands, no commands will execute. If the value in the first control register is changed to one, command zero will execute continuously. The feature can be disabled by setting the parameter value to -1 or by omitting the item name from the configuration file. This feature requires 100 registers of the module's database.

First File

0 to 100

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.

File Size

Range 1 to 1000

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.

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.

2.5.11 [DF1 PORT x COMMANDS]

The [DF1 PORT 1 COMMANDS], [DF1 PORT 2 COMMANDS], and [DF1 PORT 3 COMMANDS] sections of the CFG file set the serial master port command lists. These lists poll slave devices attached to the master ports. The module supports numerous commands.

The command list is formatted differently than the other sections of the configuration file. Commands are present in a block between the labels **START** and **END**. These labels inform the program where the list resides. The module's program will parse all commands after the **START** label until it reaches the **END** label.

Command List Overview

In order to interface the ProLinx module with slave devices, you must construct a command list. The commands in the list specify the slave device to be addressed, the function to be performed (read or write), the data area in the device to interface with and the registers in the internal database to be associated with the device data. There is a separate command list for each master port, with up to 100 commands allowed per master port. The command list is processed from top (command #0) to bottom. A poll interval parameter is associated with each command to specify a minimum delay time in seconds between the issuance of a command. If the user specifies a value of 10 for the parameter, the command will be executed no more frequently than every 10 seconds.

Write commands have a special feature, as they can be set to execute only if the data in the write command changes. If the register data values in the command have not changed since the command was last issued, the command will not be executed. If the data in the command has changed since the command was last issued, the command will be executed. Use of this feature can lighten the load on the DF1 network. In order to implement this feature; set the enable code for the command to a value of 2.

If the module is configured for the DF1 half-duplex protocol, the module can act as a master device routing messages between attached slave devices. This peer-to-peer communication is defined in the DF1 protocol specification. The master polls each DF1 slave device until no more data is available from the device. Response messages from the slaves that have a destination address that do not match the module are routed with a request message header back out onto the network. This facility offers communication between the slave devices for control and data monitoring. This feature is not available if the module is configured for DF1 full-duplex mode (point-to-point).

The module supports numerous commands. This permits the module to interface with a wide variety of DF1 protocol devices. This includes PLC2, PLC5, SLC-500 series, MicroLogix and ControlLogix processors. Additionally, other devices supplied by that use the DF1 protocol are supported.

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
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.

Command Entry Formats

Note: The format of each command in the list is dependent on the function being executed. Refer to the Reference chapter for a complete discussion of the DF1 commands supported by the module and of the structure and content of each command.

The following table shows the structure of the configuration data necessary for each of the supported commands.

Module Information Data ← → Device Information Data

DF1 COMMAND STRUCTURE

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**			
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 150	Code	Register	Seconds	Count	Code	Node	150	File String			
FC 151	Code	Register	Seconds	Count	Code	Node	151	File String			
FC 152	Code	Register	Seconds	Count	0	Node	152	File String			
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

The first part of the record is the Module Information, which relates to the ProLinx module and the second part contains information required to interface to the slave device. Refer to the slave device documentation for a full discussion of each function.

Command list example:

```
[DF1 Port 1 Commands]
# The file contains examples for a SLC 5/03 processor.
#
START
#      1       2       3      4    5        6    7    8    9   10   11
#        Internal     Poll       Swap     Node Func File File  Elm  Sub
# Enable  Address Interval Count Code  Address Code Type    #    #  Elm
       1     1510        0     5    0        3  501    N   10   10
       0     1515        0     2    0        3  509    N   10    0
       1     1500        0    10    0        3  502    N   10    0    0
END
```

<table>
<tr><th>Parameter</th><th>Range</th><th>Description</th></tr>
<tr><td>Enable</td><td>0, 1, 2, 999</td><td>This field defines whether or not the command is to be executed and under what conditions.
<table>
<tr><td>Value</td><td>Description</td></tr>
<tr><td>0</td><td>The command is disabled and will not be executed in the normal polling sequence.</td></tr>
<tr><td>1</td><td>The command is executed each scan of the command list if the Poll Interval Time is set to zero. If the Poll Interval time is set, the command will be executed, when the interval timer expires.</td></tr>
<tr><td>2</td><td>The command will execute only if the internal data associated with the command changes. This value is valid only for write commands.</td></tr>
<tr><td>999</td><td>Issues a poll request to indicated slaves. This command can be used to implement a slave-to-slave network or an RBE based network</td></tr>
</table></td></tr>
<tr><td>Internal Address</td><td>0 to 3999</td><td>This field specifies the internal database register to be associated with the command.
For Read functions, the data read from the slave device will be placed starting at the register value entered in this field.
For write functions, the data written to the slave device will be sourced from the address specified.</td></tr>
<tr><td>Poll Interval</td><td>0 to 65535</td><td>This parameter specifies the minimum interval to execute continuous commands (Enable code of 1). The parameter is entered in units of seconds. Therefore, if a value of 10 is entered for a command, the command will execute no more frequently than every 10 seconds.</td></tr>
<tr><td>Count</td><td>Message dependent</td><td>This parameter specifies the number of registers or digital points to be associated with the command. Functions 5 and 6 ignore this field as they only apply to a single data point.
For Binary data functions, this parameter sets the number of digital points (inputs or coils) to be associated with the command.
For word or register functions, this parameter sets the number of registers to be associated with the command.</td></tr>
<tr><td>Swap Code</td><td>0,1,2,3</td><td>This parameter defines if the data received from the slave is to be ordered differently than received from the slave device. This parameter is helpful when dealing with floating-point or other multi-register values, as there is no standard method of storage of these data types in slave devices. This parameter can be set to order the register data received in an order useful by other applications. The following table defines the values and their associated operations:
<table>
<tr><th>Swap Code</th><th>Description</th></tr>
<tr><td>0</td><td>None: No Change is made in the byte ordering (1234 = 1234)</td></tr>
<tr><td>1</td><td>Words: The words are swapped (1234=3412)</td></tr>
<tr><td>2</td><td>Words & Bytes - The words are swapped then the bytes in each word are swapped (1234=4321)</td></tr>
<tr><td>3</td><td>Bytes: The bytes in each word are swapped (1234=2143)</td></tr>
</table></td></tr>
</table>

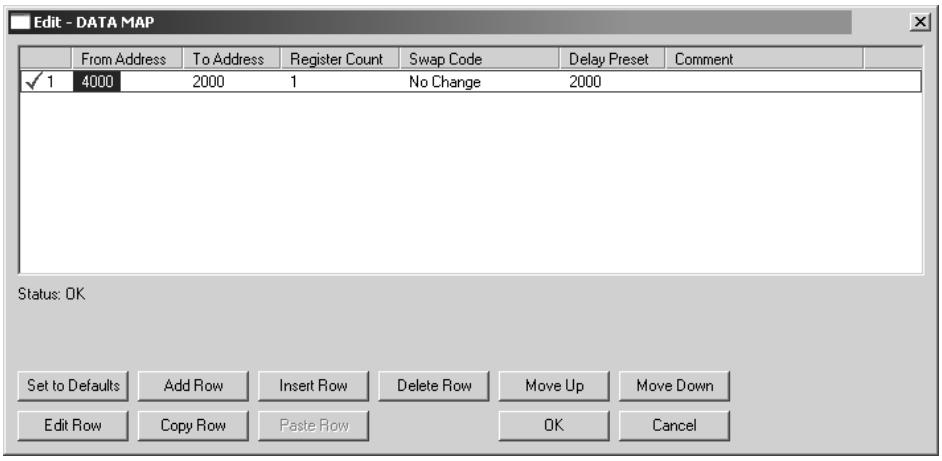
Parameter	Range	Description
Node Address	1 to 255 (255 = broadcast)	This parameter specifies the slave node address on the network to be considered. Values of 1 to 255 are permitted. If the value is set to 255, the command will be a broadcast message on the network. The DF1 protocol permits broadcast commands for write operations. Do not use this node address for read operations.
Function Code File Type File Number Elem # Sub Elem #	See Reference section	These parameters specify the function to be executed by the command. The Reference chapter in this Manual describes the meaning of these values for each of the available supported commands. Following is a complete list of the command supported by the Master driver. **ProLinx Function Code Listing** **Basic Command Set** Protected Write Unprotected Read Protected Bit Write Unprotected Bit Write Unprotected Write **PLC-5 Command Set** Word Range Write (Binary Address) Word Range Read (Binary Address) Read-Modify-Write (Binary Address) Word Range Write (ASCII Address) Word Range Read (ASCII Address) Read-Modify-Write (ASCII Address) **SLC Command Set** Prot Typed Read with 2 addr fields Prot Typed Read with 3 addr fields Prot Typed Write with 2 addr fields Prot Typed Write with 3 addr fields Prot Typed Write with Mask 3 addr fields

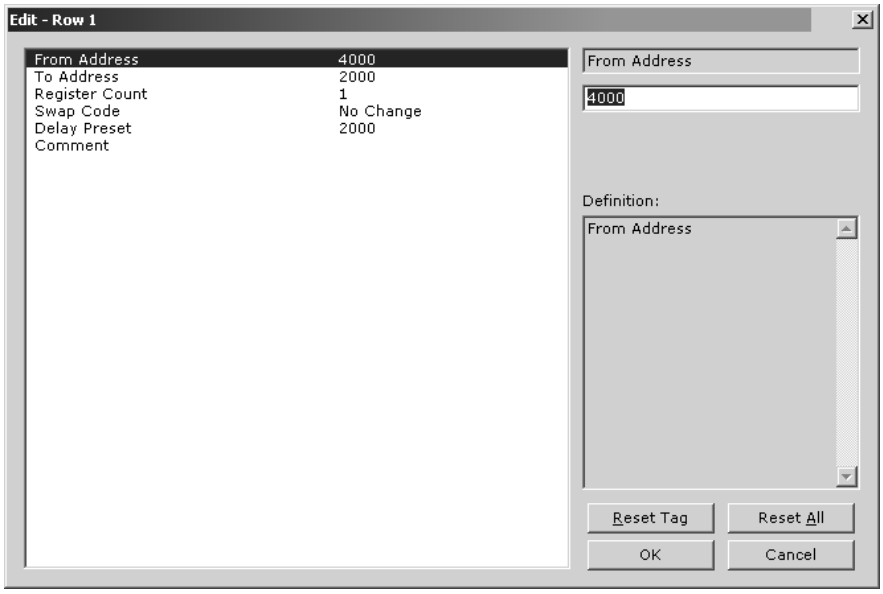
2.5.12 [Data Map]

The [Data Map] section of the CFG file allows you to selectively copy data registers, one register up to 100 registers at a time, from one internal database area to another. Up to 200 entries can be made in the [Data Map] section, providing a wide and powerful range of functionality.

You can use the Data Map section of the configuration file to copy data from the device error or status table to the internal database register, or to copy data from one area to another. The bytes and/or words copied can be altered to preset the data (for example, floating-point data) in the correct format for a specific protocol.

You can also use the Data Map to build a specific block of data to be used by any of the protocol drivers. For example, you can use the data map to build the input and output data area for the PROFIBUS Slave driver.





Moving Data

The following is an example of the Data Map section of the configuration file. This section allows a user to move data to different addresses within the database in order to create simpler data requests and control.

```
# This section moves data within the database to concentrate
# information for simpler data requests and control. The Form Address
# specifies the start
# database location to copy the number of registers set by Register Count # to
the specified To Address (destination of data). When the data is
# copied, the order # of the bytes can be altered using the Swap Code
# field as follows:
```

```
#
# SWAP CODE      DEFINITION
0 Bytes left in original order   (1234 -> 1234)
1 Words are swapped              (1234 -> 3412)
2 Words and bytes are swapped    (1234 -> 4321)
3 Bytes in each word are swapped (1234 -> 2143)
[DATA MAP]
#    From       To  Register  Swap  Delay
# Address  Address     Count  Code  Preset
START
     4000     1000         9     0    1000
     4170     1010         2     0    1001
     4370     1020        30     0    1002
     6300     1100        20     0    1003
END
```

From Address

0 to highest Status Data address

This field specifies the internal database register to copy from. This address can range from the Data area as well as the Status Data Area of the product

To Address

0 to 3999

The destination for the copy is always within the Register Data area.

Register Count

1 to 100

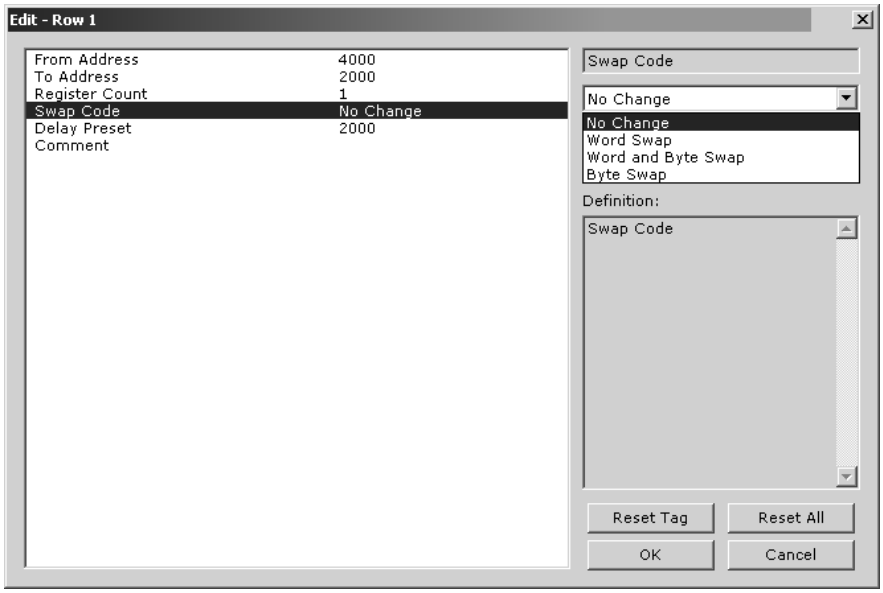
This parameter specifies the number of registers to copy.

Swap Code

0,1,2,3

You may need to swap the order of the bytes in the registers during the copy process in order to change from alignment of bytes between dissimilar protocols. This parameter is helpful when dealing with floating-point or other multi-register values, as there is no standard method of storage of these data types in slave devices.

The following table defines the values and their associated operations:



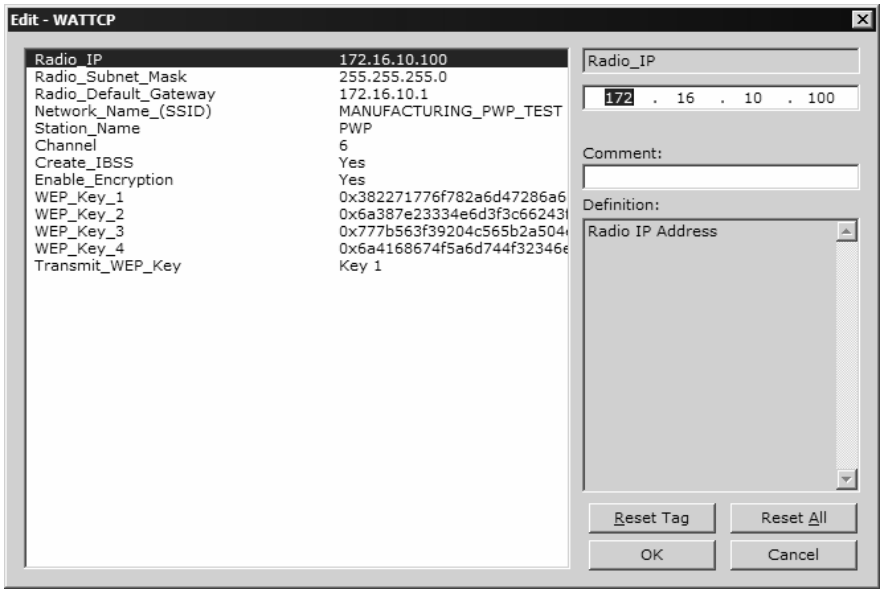
Swap Code	Description
0	None: No Change is made in the byte ordering (1234 = 1234)
1	Words: The words are swapped (1234=3412)
2	Words & Bytes: The words are swapped then the bytes in each word are swapped (1234=4321)
3	Bytes: The bytes in each word are swapped (1234=2143)

Delay Preset

Copies one portion of the database or virtual database to a user specified location in the database. The Delay Preset represents the scan count of the program between each copy operation. The copy operations should not all happen at the same time, otherwise the process could delay the scan. For example, you should not set all values to a delay preset of 1001. Instead, use values such as 1000, 1001 and 1002, or you can use the preset values. This will keep the copies from happening concurrently.

2.5.13 Radio Ethernet Configuration (WATTCP)

The Radio Ethernet Configuration is used to configure ethernet and wireless communication information.



Radio_IP

Default: 192.168.0.100

The IP address of the module to be used in wireless communication.

Radio_Subnet_Mask

Default: 255.255.255.0

The subnet mask to be used in wireless communication.

Radio_Default_Gateway

Default: 172.16.10.1

The default gateway to be used in wireless communication.

Ethernet Settings

Important: The settings for my_ip, netmask, gateway and Local_Domain_Name are only applicable for modules equipped with an Ethernet port. If you are configuring a module without an Ethernet port, you may disregard these settings as they are not used.

my_ip

Default: 192.168.0.100

The IP address for the module. Each word contains one of the four values that comprise the IP address.

netmask

Default: 255.255.255.0

Network mask. Each word contains one of the values for the network mask.

gateway

Default: 192.168.0.1

This is the IP address of the gateway for your network. If you do not supply this, the default is used. So for example if using an IP address of 192.168.0.100 your gateway statement would default to:

gateway=192.168.0.1,192.168.0.0,255.255.255.0

or

gateway=default gateway, default network, default mask

Note: The subnet must be specified for class B subnets

Local_Domain_Name

The local domain name for the module on the wired LAN.

Network_Name_(SSID)

Valid Values: any character in the range of "A to Z", "a to z" and "0 to 9" where:

- The value "ANY" enables your station to connect to any IEEE 802.11 compliant network.
- A "user-defined name" allows your station to connect to a specific network only. This value should match the value as set for the Access Point in your wireless network.

The SSID used when connecting to a wireless network used by an Access Point or Ad hoc station. Value can be alphanumeric string with a maximum of 32 ASCII characters that identifies the network to which you would like to connect your wireless station.

You should configure all modules that will be exchanging data to use the same SSID.

Create_IBSS

The following options are applicable during the module's power-up initialization in its attempt to connect to available devices.

Yes

a Connect Infrastructure (ESS) when Access Point IS available.
b Connect Ad-hoc (IBSS) when Access Point NOT available.

No

a Connect Infrastructure (ESS) when Access Point IS available.
b Will NOT connect Ad-hoc (IBSS) when Access Point NOT available.

Station_Name

An alphanumeric string with a maximum of 32 ASCII characters that will identify your station on the wireless network.

Valid Values: any character in the range of "A to Z", "a to z" and "0 to 9".

Channel

0 to 14 (Default 10)

Channel this module will use on the wireless network. Used for creating Ad hoc link. Channels 1 to 14 are available. FCC allows for channels 1 to 11, ETSI (Europe) channels 1 to 13, France channels 1 to 9, Japan channels 1 to 14. Contact ProSoft Technology for country approval list.

All modules for the same network should use the same channel number.

Enable_Encryption

Y = Yes. Enable WEP encryption

N = No. Do not enable WEP encryption

(Default = N)

Enables or Disables WEP encryption.

When this parameter is enabled, you can:

- Select up to four key for decrypting data received via the wireless interface.
- Select one Transmit key for encrypting data that will be transmitted via the wireless interface.

If you decide to enable encryption, please note that all stations will be configured with identical WEP key values.

WEP_Key_1 to WEP_Key_4

5-character ASCII key or 10-digit hexadecimal key for 64-bit encryption.

13-character ASCII key or 26-digit hexadecimal key for 128-bit encryption.

Identifies one of the four keys your station device can use to decrypt data received via its wireless interface. 64-bit or 128-bit encryption is selected by the number of characters.

The key value is case-sensitive. Hexadecimal values must be preceded by "0x". All wireless clients and access points should be configured with identical key values.

Note: Use only WEP Key 1 when communicating with an RLX-IH access point/repeater.

Transmit_WEP_Key

Selects which WEP key to use for encryption.

Note: If the WEP Key Rollover parameter is enabled, then the module will use a random WEP key out of the four provided, overriding any value specified in this parameter.

2.6 Downloading a File from PC to the Module

To download a file from the Configuration Builder to the module:

1. Verify that your PC is connected to the module with a null-modem serial cable connected to the serial port on your PC and the serial port on the module
2. Open the Project Menu, and then choose Module.
3. On the Module menu, choose Download. Wait while ProSoft Configuration scans for communication ports on your PC. When the scan is complete, the Download dialog box opens.

4. Select the port to use for the download.
5. Click the **Download** button.

3 Diagnostics and Troubleshooting

In This Chapter

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

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

3.1 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 diagnostic window in ProSoft Configuration Builder (PCB). The module does not respond to mouse movements or clicks. The command executes as soon as you press the command letter — you do not need to press **[Enter]**. When you type a command letter, a new screen will be displayed in your terminal application.

3.1.1 Required Hardware

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

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

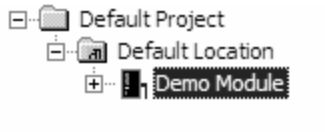
- 80486 based processor (Pentium preferred)
- 1 megabyte of memory

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

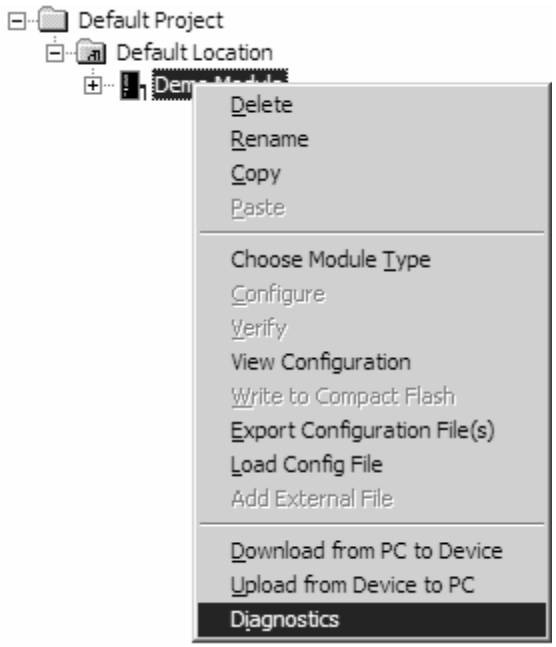
3.1.2 Using the Diagnostic Window in ProSoft Configuration Builder

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

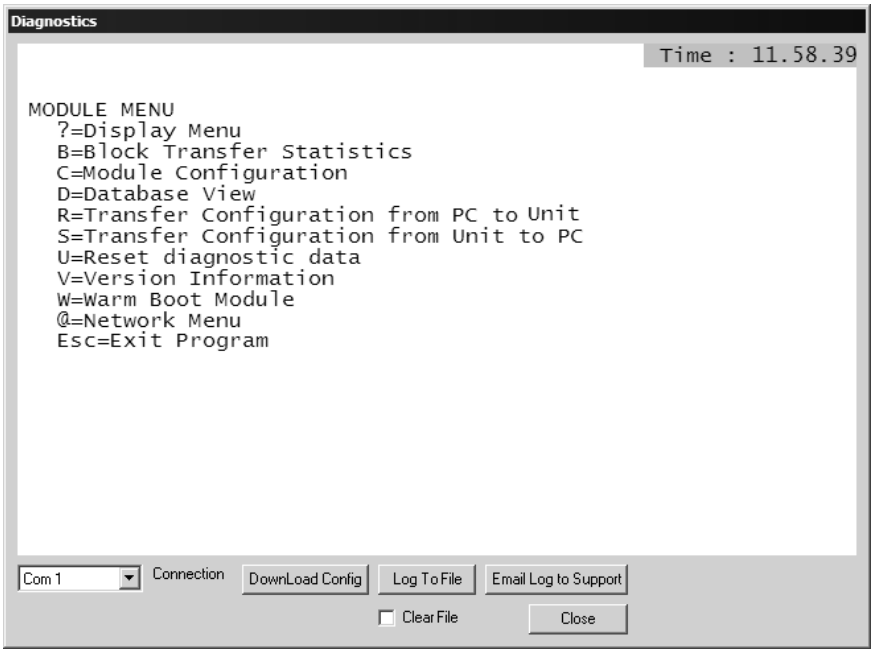
1 Start PCB program with the application file to be tested. Right click over the module icon.



2 On the shortcut menu, choose Diagnostics.



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



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

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

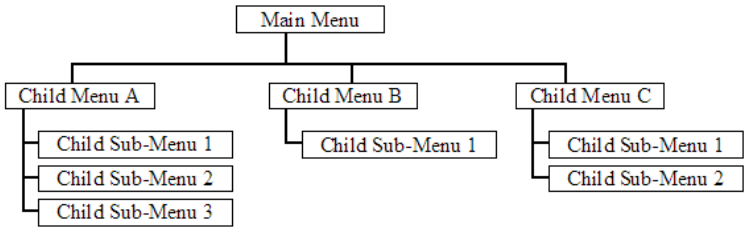
1 Verify that the null modem cable is connected properly between your computer's serial port and the module. A regular serial cable will not work.
2 On computers with more than one serial port, verify that your communication program is connected to the same port that is connected to the module.

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

3.1.3 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.

3.1.4 Main Menu

Features available through the use of the configuration/debug port on the 6202-WA-DFNT-DFCM3 module are all reached using single keystrokes on your computer. There is a single main menu and several sub-menus presented on the port. To view the current selections available, press **[?]**.

All facilities offered by the configuration/debugger are shown on the main menu. You make selections from this menu based on the type of information you want to view.

```
WA-DFNT/DFCM3 COMMUNICATION MODULE 6202-WA-DFNT-DFCM3 MENU
  ?=Display Menu
  A=Data Analyzer
  B=Client Configuration
  C=Module Configuration
  D=Database View
  DF1 Command Errs:  E=Port 1   F=Port 2   G=Port 3
  DF1 Command List:  I=Port 1   J=Port 2   K=Port 3
  Slave Status List: N=Port 1   O=Port 2   P=Port 3
  R=Radio Menu       Y=Exchange Menu       Z=NTP
  S=Transfer Configuration from 4100 Unit to PC
  U=Reset diagnostic data
  V=Version Information
  W=Warm Boot Module
  DFNT Command Errs:  X=Client 0
  DFNT Command List:  ,=Client 0
  0=Network Status
  Communication Status: 1=Port 1   2=Port 2   3=Port 3
  Port Configuration:   6=Port 1   7=Port 2   8=Port 3
  5=Pass-Through Port Cfg   ^=ENI Port
  @=Network Menu            (=DFNT Servers Status     $=DF1 Server Status
  %=Map Data Menu           Esc=Exit Program
```

Redisplaying the Menu

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

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 Client Configuration

Press **[B]** to display the configuration information for the client.

Viewing Module Configuration

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

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

Opening the Database Menu

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

Opening the Command Error List Menu

Press **[E], [F]** or **[G]** to open the Command Error List for ports 0, 1 and 2 respectively. This list consists of multiple pages of command list error/status data. Press **[?]** to view a list of commands available on this menu.

Opening the Command List Menu

Press **[I], [J]** or **[K]** to open the Command List menu for ports 0, 1 and 2 respectively. Use this command to view the configured command list for the module.

Viewing the Slave Status List

Press **[N], [O]** or **[P]** to view DF1 Slave Status for ports 0, 1 and 2 respectively.

Opening the Radio Menu

Press **[R]** to open the Radio menu. Use this command to view configuration and status for the module's onboard radio.

Opening the PWP Menu

Press **[Y]** to open the PWP Menu. Use this command to view configuration and status for the PWP protocol.

Viewing SNTP Status

Press **[Z]** to view configuration information about the SNTP client.

```
SNTP CLIENT CONFIGURATION:
  NTP SERVER IP : 0.0.0.0
  DB REGISTER   : 3000
  TIME ZONE     : 8         USE DST       : No
  TIME VALID    : No
  REQUESTS      : 0         RESPONSES     : 0
  COMPUTATIONS  : 0         TIME SET CNT  : 0
  TIMEOUT ERRS  : 0

SNTP Local time is: Fri Dec 14 08:22:38 2007
SNTP GMT is:        Fri Dec 14 16:22:38 2007
```

Refer to SNTP Support (page 108) for more information on configuring and using this function.

Transferring the Configuration File from ProLinx module to PC

Press **[S]** to receive (download) the configuration file from the module to your PC.

Press **[Y]** to confirm the file transfer, and then follow the instructions on the terminal screen to complete the file transfer process.

After the file has been successfully downloaded, you can open and edit the file to change the module's configuration.

Resetting diagnostic data

Press **[U]** to reset the status counters for the client and/or servers in the module.

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.

Opening the DFNT Command Errors List Menu

Press **[X]** from the main menu to view commands 0 to 19.

Opening the DFNT Command List Menu

Press **[,]** then **[S]** to view a list of DF1 commands.

Viewing Network Status

Press **[0]** to view detailed client network status information.

Viewing Port Communication Status

Press **[1], [2],** or **[3]** from the Main Menu to view the port communication status for Ports 0, 1, and 2, respectively.

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

Viewing Port Configuration

Press **[6]**, **[7]**, or **[8]** from the Main Menu to view configuration information for ports 0, 1 and 2, respectively.

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

Pass Through Mode

Press **[*]** to place the config/debug port in pass-through mode. Pass-through mode is only available if the Pass-through port is enabled in the module configuration (page 38).

Viewing Pass-Through Port Configuration

Press **[5]** to view detailed pass-through port configuration information for the selected port.

EtherNet/IP Interface Port

Press **[^]** to view detailed ENI pass-through server information for the selected port.

Opening the Network Menu

Press **[@]** to open the network menu. The network menu allows you to send, receive, and view the WATTCP.CFG file that contains IP, gateway, and other network specification information. You can find more information about the commands on this menu in the *Network Menu* section of this book.

Viewing DFNT Servers Status

Press **[(]** to view the file size for emulated files in all five servers.

Viewing DF1 Server Status

Press **[$]** to view the status and details of the DF1 server.

Opening the Map Data Menu

Press **[%]** to open the Map Data menu. Use this command to view settings and status of the database map.

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.

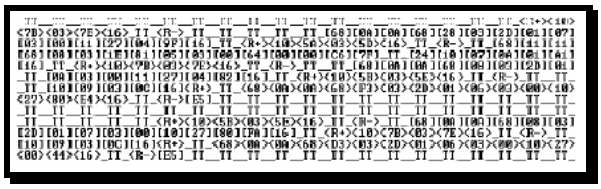
3.1.5 Data Analyzer

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

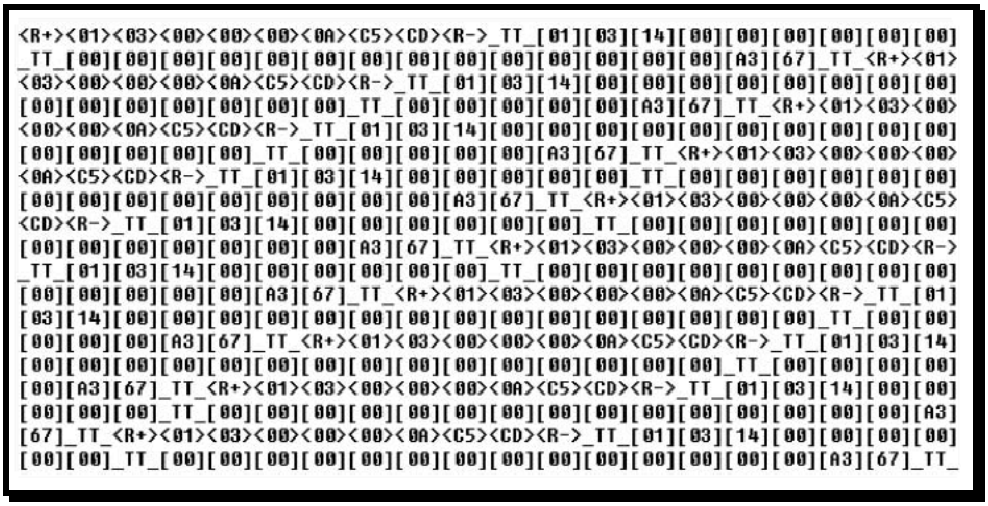
Press **[H]** to display the data on the current page in hexadecimal format.

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. The following illustration shows an example.



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.

3.1.6 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
```

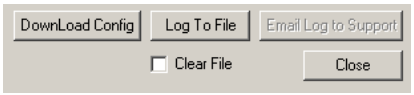
After the "Data Analyzer" mode has been selected, press **[?]** to view the Data Analyzer menu. From this menu, you can select the "Port", the "format", and the "ticks" that you can display the data in.

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.

To save a capture file of your Diagnostics session

1 After you have selected the Port, Format, and Tick, we are now ready to start a capture of this data. Click the Log to File button at the bottom of the Diagnostics window.



2 When you have captured the data you want to save, click the Stop Logging button.

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.

Now you have everything that shows up on the HyperTerminal screen being logged to a file called ProLinxLog.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.

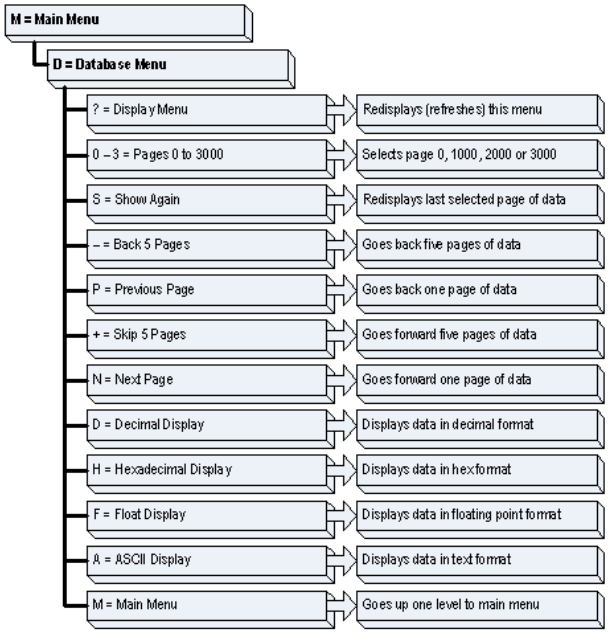
The <R-> shows when the module is done transmitting data, and is now ready to receive information back.

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.

3.1.7 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

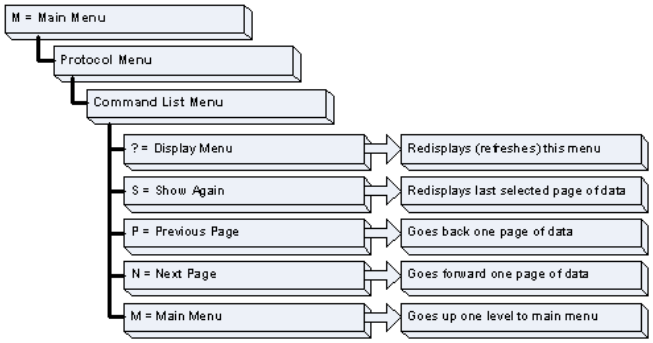
Press **[A]** to display the data on the current page in ASCII format. This is useful for regions of the database that contain ASCII data.

Returning to the Main Menu

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

3.1.8 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

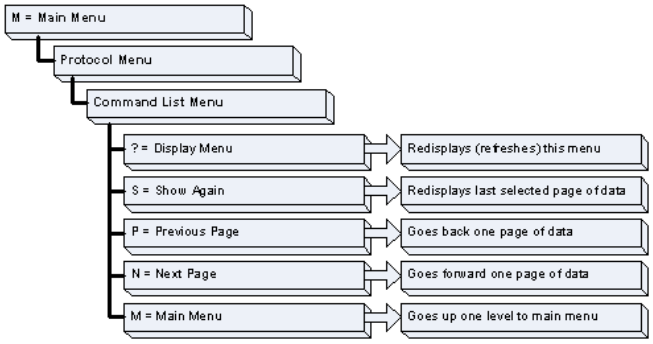
Press **[N]** to display the next page of commands.

Returning to the Main Menu

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

3.1.9 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

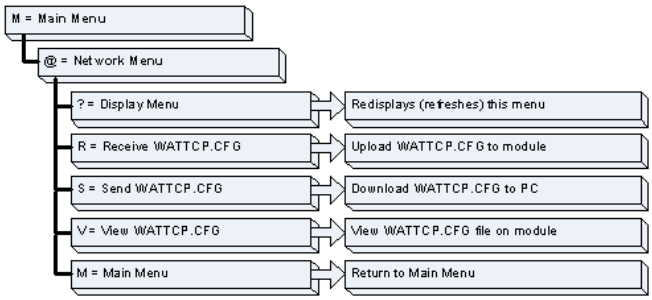
Press **[N]** to display the next page of commands.

Returning to the Main Menu

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

3.1.10 Network Menu

The network menu allows you to send, receive and view the WATTCP.CFG file that contains the IP and gateway addresses, and other network specification information.



Transferring WATTCP.CFG to the module

Press **[R]** to transfer a new WATTCP.CFG file from the PC to the module. Use this command to change the network configuration for the module (for example, the module's IP address).

Press **[Y]** to confirm the file transfer, and then follow the instructions on the terminal screen to complete the file transfer process.

Transferring WATTCP.CFG to the PC

Press **[S]** to transfer the WATTCP.CFG file from the module to your PC.

Press **[Y]** to confirm the file transfer, and then follow the instructions on the terminal screen to complete the file transfer process.

After the file has been successfully transferred, you can open and edit the file to change the module's network configuration.

Viewing the WATTCP.CFG file on the module

Press **[V]** to view the module's WATTCP.CFG file. Use this command to confirm the module's current network settings.

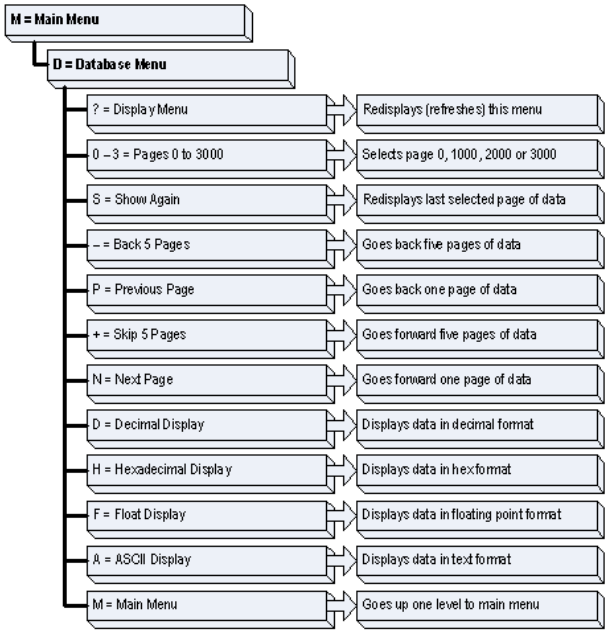
```
Network Menu Selected

WATTCP.CFG FILE:
# ProLinx Communication Gateways, Inc.
#
# Default private class 3 address
my_ip=192.168.0.135
#
# Default class 3 network mask
netmask=255.255.255.0
#
# The gateway I wish to use
gateway=192.168.0.1
#
#Parameters used by the ProLinx Communication Gateways, Inc. module
#Local_Domain_Name=mycompany.com
Password=PASSWORD
```

Returning to the Main Menu

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

3.1.11 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

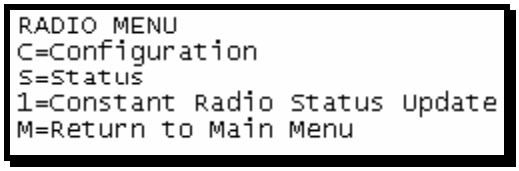
Press **[A]** to display the data on the current page in ASCII format. This is useful for regions of the database that contain ASCII data.

Returning to the Main Menu

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

3.1.12 Radio Menu

Press **[R]** to open the Radio menu. Use this command to view configuration and status for the module's onboard radio.



Viewing Radio Configuration

Press **[C]** to view radio configuration. Use this command to view the port type, channel, data length and other radio configuration settings.

```
RADIO STATIC CONFIGURATION:
Port Type    : 1        Own MAC Address: 00:10:C6:47:79:68
Own Channel  : 10       Own SSID:
Max Data Len : 1508     Own Name: New
Encryption   : 0        Authentication  : 1
TX Rate Ctrl : 3        WEP Key Rollover: No
LED Levels   : 20 - 25 - 30 - 35
```

Viewing Radio Status

Press **[S]** to view the current operational status of the radio. Use this command to view connection and signal status, packets and bytes transferred, signal quality and errors.

```
RADIO DRIVER STATUS:
Port Status = Connected IBSS  SSID = NetworkWA
Transmit Rate  = 11     MB    Signal Quality = 83     dB
Signal Level   = -19    dBm   Noise Level    = -102   dBm
PacketsIn      = 12082        PacketsOut     = 23737
BytesIn        = 1932496      BytesOut       = 3796798
ErrorsIn       = 1            ErrorsOut      = 559
PacketsDropped = 0            Channel #      = 10
```

Continuously Monitoring Radio Status

Press **[1]** to monitor radio status continuously. Use this command to view the signal strength and noise level for the radio in real time.

```
Radio Monitor Enabled.  Press any key to exit.
Q=   48 dB   SL=  -46 dBm   NL=  -94 dBm
Q=   48 dB   SL=  -46 dBm   NL=  -94 dBm
Q=   49 dB   SL=  -46 dBm   NL=  -95 dBm
Q=   50 dB   SL=  -45 dBm   NL=  -95 dBm
Q=   50 dB   SL=  -45 dBm   NL=  -95 dBm
Q=   49 dB   SL=  -46 dBm   NL=  -95 dBm
Q=   49 dB   SL=  -46 dBm   NL=  -95 dBm
Q=   49 dB   SL=  -46 dBm   NL=  -95 dBm
```

Important: When in continuous radio monitor mode, program execution will slow down. Only use this tool during a trouble-shooting session. Before disconnecting from the Config/Debug port, please be sure to press a key to disable the radio status monitor. This action will allow the module to resume its normal operating mode.

Returning to the Main Menu

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

3.1.13 PWP Menu

Press **[Y]** to open the PWP Menu. Use this command to view configuration and status for the PWP protocol.

```
RADIO PWP MENU
  C=Producer/Consumer List Menu
  G=Multicast Group List
  S=Status Data Menu
  ?=Display Menu
  M=Exit Menu
```

Opening the Producer/Consumer List Menu

Press **[C]** to open the Producer/Consumer List menu. Use this command to view the status of producers and consumers currently communicating on the network.

```
RADIO PWP PRODUCER/CONSUMER LIST 0 TO 9
P/C U/B  ADDR REG_CNT SWP PROD_TIME IP ADDRESS      EX_ID CFG_VER
 P   M    200      32   0       100 224.0.7.1         10   0.0
 C   M      0      32   0       100 224.0.7.1         11   0.0
 P   M    200      32   0       100 224.0.7.2         30   0.0
 C   M     32      32   0       100 224.0.7.2         31   0.0
```

Viewing the Multicast Group List

Press **[G]** to view the Multicast Group List. Use this command to see a list of IP addresses in the radio's configured multicast group.

```
RADIO MULTICAST GROUP LIST (Count=2):
E0000701 224.0.7.1
E0000702 224.0.7.2
```

Opening the Status Data Menu

Press **[S]** to open the Radio PWP Producer/Consumer Status List menu. Use this command to view communication status for each of the configured producers and consumers.

```
Status Data Menu Selected
RADIO PWP PRODUCER/CONSUMER STATUS 0 TO 9
S P MSG_COUNT MISS_COUNT REF_COUNT INVALID TM_SYNC SHORT  LONG PROTO
1 2     14604          0         0       0       0     0     0     0
2 0         0          0    172126       0       0     0     0     0
1 2     14604          0         0       0       0     0     0     0
2 0         0          0    172126       0       0     0     0     0
```

Redisplaying the Menu

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

Returning to the Main Menu

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

3.1.14 Radio PWP Producer/Consumer List Menu

Press **[S]** to open the Radio PWP Producer/Consumer Status List menu. Use this command to view communication status for each of the configured producers and consumers.

```
RADIO PWP PRODUCER/CONSUMER STATUS MENU
 ?=Display Menu
 S=Show Again
 -=Back 2 Pages
 P-Previous Page
 +=Skip 2 Pages
 N=Next Page
 ?=Display Menu
 M=Return to RADIO PWP Main Menu
```

Redisplaying the Menu

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

Redisplaying the Current Page

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

Going Back Two Pages of Data

Press **[-]** from the Database View menu to skip back to the previous 200 registers of data.

Viewing the Previous Page of Data

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

Going Ahead Two Pages of Data

Hold down **[Shift]** and press **[=]** to skip forward to the next 200 registers of data.

Viewing the Next Page of Data

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

Returning to the Previous Menu

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

3.1.15 Map Data Menu

Press **[%]** to view the module's error/status data. Refer to PWP Error/Status Data (page 103) for more information on the contents of this screen.

3.2 LED Indicators

Troubleshooting the operation of the DFNT ports can be performed using several methods.

The first and quickest is to scan the LEDs on the module to determine the existence and possibly the cause of a problem. This section provides insight into the operation of the Serial Port status LEDs. Information on other LEDs can be found in the *ProLinx Reference Guide* or in the product User Manual.

3.2.1 Ethernet LED Indicators

LED	State	Description
Data	Off	No activity on the port.
	Green Flash	The port is either actively transmitting or receiving data.
Link	Off	No connection to hub or network is detected.
	Green Solid	Connected to hub or network correctly. This is the normal operating state.

3.2.2 LEDs for the PWP Port

The following table lists LED status descriptions of the ProSoft Wireless Protocol module.

LED	Status	Indication
ACT (Green)	6 flashes per second.	The PWP is working normally in that it is successfully sending and receiving data. All nodes on the link should be flashing in this pattern.
RF Signal	Blinking in 8 / 2 second intervals	RF signal lost after successful connection.
	One or more LEDs illuminated	RF signal present, number of LEDs illuminated corresponds to signal strength LED values in module configuration file.
	Off	No RF signal detected after power up.
RF LINK	Blinking in 1 second intervals	Not connected.
	Flashing Green	The port is either actively transmitting or receiving data.
	Blinking in 8 / 2 second intervals	RF signal lost after successful connection.
RF DATA	Blinking in 5 second intervals	Not connected.
	Flashing Green	The port is either actively transmitting or receiving data.
	Blinking in 8 / 2 second intervals	RF signal lost after successful connection.

3.3 Client Error/Status Data

The second and most thorough troubleshooting method for debugging the operation of the DFNT driver (and the module in general) is the powerful Debug port on the module which provides much more complete access to the internal operation and status of the module. Accessing the Debug capabilities of the module is accomplished easily by connecting a PC to the Debug port and loading a terminal program such as ProSoft Configuration Builder or Hyperterminal.

The Client connection Error and Status Data areas are discussed in this section

The error/status data table is located in virtual address assigned by ProLinx. If the address is set to -1, the data will not be placed in the database. It will only be available through the Configuration/Debug Port. If a valid address value is assigned, the module will update the data area.

The data area is initialized with zeros whenever the module is initialized. This occurs during a cold-start (power-on), reset (reset push-button pressed) or a warm-boot operation (commanded or loading of new configuration).

Note: The *ProLinx Reference Guide* contains detailed information on accessing the contents of the following registers.

3.3.1 DFNT Client 0 Status

Internal Database Address	Offset	Description
7900	0	Number of Command Requests
7901	1	Number of Command Responses
7902	2	Number of Command Errors
7903	3	Number of Requests
7904	4	Number of Responses
7905	5	Number of Errors Received
7906	6	Number of Errors Sent
7907	7	Configuration Error Code
7908	8	Current Error Code
7909	9	Last Error Code

3.3.2 Unconnected Msg DFNT Client 0 Status

Status Register	Description
12800	Command Request Count
12801	Command Response Count
12802	Command Error Count
12803	Number of Request Packets
12804	Number of Response Packets
12805	Errors Sent
12806	Errors Received
12807	Configuration Error Word
12808	Current Error

Status Register	Description
12809	Last Error
12810 to 12909	Command List Errors
12910 to 12999	No Valid Data

3.3.3 DFNT Client 1 through 4 Status

DFNT Clients 1 through 4 have the same description and order as shown in the DFNT Client 0 Status Table. The following table shows the internal database addresses for clients 1 through 4:

DFNT Client	Address Range
1	8100 through 8109
2	8300 through 8309
3	8500 through 8509
4	8700 through 8709

3.3.4 DFNT Server 0

Internal Database Address	Description
8900	Socket Size
8901	Connection State
8902	Socket Open Count
8903	Socket Established Count
8904	Socket Close Count
8905	Socket Read Count
8906	Processed Message Count
8907	Socket Write Count
8908	Socket Timeout Count
8909	Host s_type
8910	Host Port
8911	Host IP
8912	Host IP
8913	Reserved
8914	Reserved
8915	Reserved

3.3.5 DFNT Servers 1 Through 4

DFNT Servers 1 through 4 have the same description and order as shown in the DFNT Server 0 Status Table. The following table shows the internal database addresses for servers 1 through 4:

DFNT Server	Address Range
1	8916 through 8931
2	8932 through 8947
3	8948 through 8963
4	8964 through 8981

3.3.6 DF1 Pass-Through Server

Internal Database Address	Description
8982	Socket Size
8983	Connection State
8984	Socket Open Count
8985	Socket Established Count
8986	Socket Close Count
8987	Socket Read Count
8988	Processed Message Count
8989	Socket Write Count
8990	Socket Timeout Count
8991	Host s_type
8992	Host Port
8993	Host IP
8994	Host IP
8995	Reserved
8996	Reserved
8997	Reserved
8998	No Valid Data
8999	No Valid Data

Refer to Error Codes to interpret the status/error codes present in the data area.

3.4 EtherNet/IP Client Command List Error Data

Each command in the command list for each EtherNet/IP client has a reserved word value for a status/error code. This error data list can be read using the Debug/Config Port and can be placed in the module's internal database. Each network client has its own register location parameter.

The first word in the register location defined contains the status/error code for the first command in the client's command list. Each successive word in the command error list is associated with the next command in the list. Therefore, the size of the data area is dependent upon the number of commands defined. The structure of the data area is displayed in the following tables:

3.4.1 DFNT Client 0 (Command List Error Data)

Internal Database Address	Offset	Description
7910	0	Command #0 Error Status
7911	1	Command #1 Error Status
7912	2	Command #2 Error Status
7913	3	Command #3 Error Status
7914	4	Command #4 Error Status

Internal Database Address	Offset	Description
	.	.
	.	.
	.	.
8007	97	Command #97 Error Status
8008	98	Command #98 Error Status
8009	99	Command #99 Error Status

3.4.2 DFNT Client 1 Through 4 Command List Error Addresses

DFNT clients 1 through 4 have the same description and order as shown in the DFNT Client 0 Status Table. The following table shows the internal database addresses for clients 1 through 4:

DFNT Client	Address Range
1	8100 through 8209
2	8310 through 8409
3	8510 through 8609
4	8710 through 8809

Note that the values in the Command List Error Status tables are initialized to zero(0) at power-up, cold boot and during warm boot. Refer to the following topic containing Error Codes to interpret the status/error codes present in the data area.

3.5 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:

3.5.1 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

3.5.2 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)

3.5.3 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

Code (Int)	Code (Hex)	Description
-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
-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

3.5.4 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

3.6 TCP/IP Interface Errors

3.6.1 Timeout Errors

Error (Int)	Error (Hex)	Description
-33	0xFFDF	Failed to connect to target
-34	0xFFDE	Failed to register session with target (timeout)
-35	0xFFDD	Failed forward open response timeout
-36	0xFFDC	PCCC command response timeout
-37	0xFFDB	No TCP/IP connection error

3.6.2 Register Session Response Errors

Error (Int)	Error (Hex)	Description
-49	0xFFCF	Invalid response length
-50	0xFFCE	Command field invalid
-51	0xFFCD	Invalid length field parameter
-52	0xFFCC	Status error reported
-53	0xFFCB	Context field not matched
-54	0xFFCA	Invalid version

3.6.3 Forward Open Response Errors

Error (Int)	Error (Hex)	Description
-65	0xFFBF	Message Length received not valid
-66	0xFFBE	Command code returned not valid
-67	0xFFBD	Session handle field invalid
-68	0xFFBC	Status error reported
-69	0xFFBB	Context field not matched
-70	0xFFBA	CPF item count not correct
-71	0xFFB9	CPF address field error
-72	0xFFB8	CPF packet tag invalid
-73	0xFFB7	CPF bad command code
-74	0xFFB6	CPF invalid IOI
-75	0xFFB5	CPF status error reported

3.6.4 PCCC Response Errors

Error (Int)	Error (Hex)	Description
-81	0xFFAF	Message Length received not valid
-82	0xFFAE	Command code returned not valid
-83	0xFFAD	Session handle field invalid
-84	0xFFAC	Status error reported
-85	0xFFAB	Context field not matched
-86	0xFFAA	CPF item count not correct

Error (Int)	Error (Hex)	Description
-87	0xFFA9	CPF address field error
-88	0xFFA8	CPF packet tag invalid
-89	0xFFA7	CPF bad command code
-90	0xFFA6	CPF invalid IOI
-91	0xFFA5	CPF status error reported
-92	0xFFA4	
-93	0xFFA3	TSN in PCCC message not matched
-94	0xFFA2	CPF not correct message number
-95	0xFFA1	CPF incorrect connection ID value returned
-96	0xFFA0	Incorrect session handle returned

4 Functional Overview

In This Chapter

4.1 DF1 Functional Overview

The DF1 Master/Slave Protocol driver can exist in a single port (DFCM) or a multiple port (DFCM3) implementation. In either case, the driver can be configured on an individual port basis to operate as either a DF1 Master or a Slave. Each port is independently configured for communication on a DF1 network and interfaces with the internal database in the module.

4.1.1 Master/Slave Serial Port(s)

The ProLinx module supports the DF1 protocol as a Master or Slave on up to four ports. Each of the ports is individually configurable.

The relationship between the port labeling on the front of the ProLinx module and the application is as follows:

Port Label	Function
Debug	Debug/Configuration
Following ports only exist on multiple port units	
Port 1	DF1 Port 1
Port 2	DF1 Port 2
Port 3	DF1 Port 3

One or more DF1 protocol master ports can be configured on the module to continuously interface with DF1 slave devices over a serial communication interface (RS-232, RS-422 or RS-485). Each port is configured independently. Support for half-duplex (master-slave) and full-duplex (point-to-point) DF1 links are provided on the ports. User defined commands determine the commands to be issued on each port. Up to 100 commands can be defined for each port. Data read from the devices are placed in the virtual database. Any write requests for the DF1 slave devices are sourced with data from the virtual database.

The module can be configured to place slave devices that are not responding to commands from the master ports at a lower priority. If the module recognizes that a slave device has failed to respond to a message after the user defined retry count, it will mark the slave as "in communication failure" and set the error delay counter to the specified value. Each time the module encounters this slave in the command list, the counter will be decremented. When the value reaches zero, the slave will be placed in an active status. This facility can improve communication throughput on the network.

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.

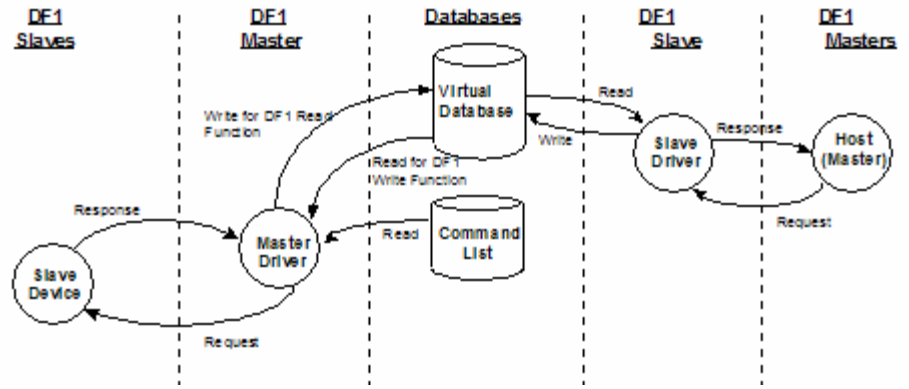
DF1 slave devices can be emulated on the module to interface with remote DF1 master devices. Each port is configured independently. Support for half-duplex (master-slave) and full-duplex (point-to-point) DF1 links are provided on the ports. Simulation of a selected set of functions from the basic, PLC5 and SLC command sets are supported. Virtual files are mapped to the internal database in the module to provide support of the PLC5 and SLC command sets.

4.1.2 Module Internal Database

Central to the functionality of the module is the internal database. This database is shared between all the ports on the module and is used as a conduit to pass information from one device on one network to one or more devices on another network. This permits data from devices on one communication port to be viewed and controlled by devices on another port. In addition to data from the slave and master ports, status and error information generated by the module can also be mapped into the internal database.

DF1 Serial Port Driver Access to Database

The following diagram describes the flow of data between the serial port drivers and the internal database.



The Master driver uses the database in two ways:

1. A read command issued to a slave device by the master driver will return the slave data into the internal database
2. A write command issued to a slave device by the master driver uses the data in the internal database to write to the slave device

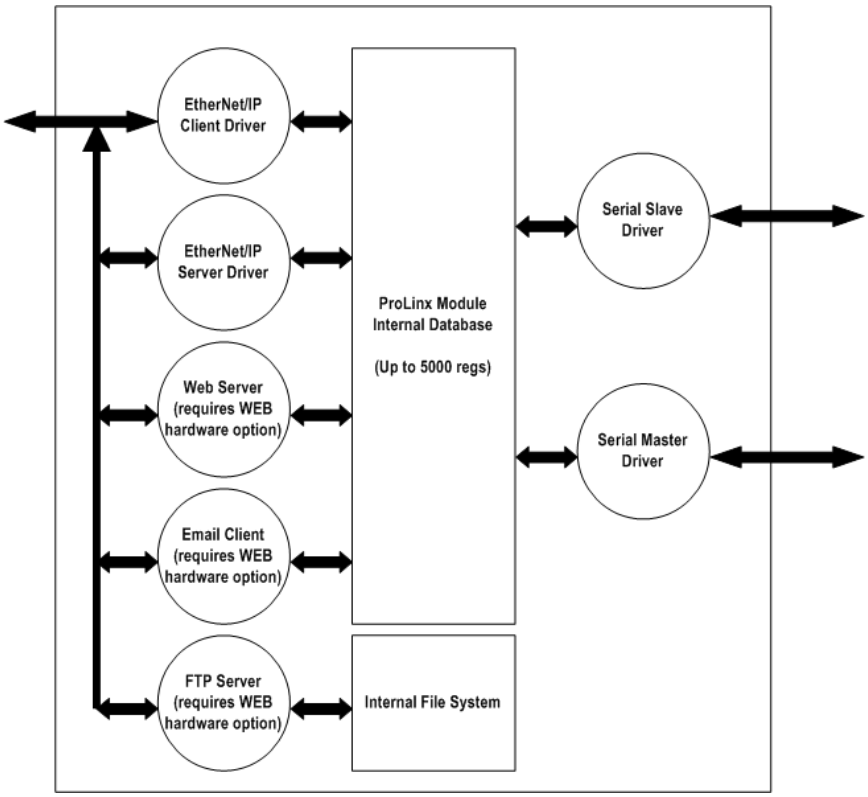
The slave driver accesses data from the internal database. External DF1 master devices can monitor and control data in this database through these slave port(s). Setup of the slave ports only requires the CFG file.

4.2 EtherNet/IP Functional Overview

The ProLinx EtherNet/IP (DFNT) driver can be used to interface many different protocols into the family of processors as well as other software-based solutions. The DFNT driver supports Client connections as well as Server connections. With the addition of the WEB hardware option, the module also provides HTTP, FTP and Email capability.

The Ethernet driver interfaces with a common internal database in the module. This permits the sharing of data across many different networks. processors supported on the TCP/IP network include ControlLogix, PLC5 Ethernet and SLC 5/05.

The following illustration shows the functionality of the DFNT driver.



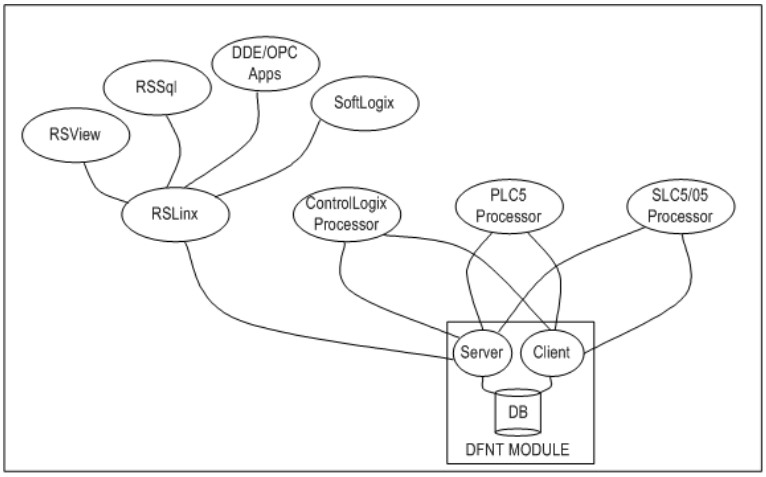
4.2.1 EtherNet/IP (Explicit Messaging) Compatible Devices

List of Rockwell Automation material that support EPIC:

- PLC5/E rev C/N, D/E, E/D
- SLC5/05 series A, OS503 frn4
- 1785-ENET Series A, rev D
- Interchange V6.2
- RSLinx Gateway V1.7
- ControlLogix 1756-ENET

4.2.2 WA-DFNT Server Access to Database

The following illustration shows the relationship of the DFNT module's functionality to devices on an Ethernet network:



Server functionality places all data transfer operations outside the module. There is no configuration required in the module other than setting up the network and database parameters in the configuration file. Ladder logic in attached processors use MSG instructions to perform read and write operations on the module's internal database.

When RSLinx links a user application to the module, the module's server functionality must be used. RSLinx exists on an Ethernet network only as a client application. It cannot act as a server. User applications can use the DDE/OPC capabilities built into RSLinx to interface with the data in the DFNT module. RSView can link directly to the module using drivers supplied by RSLinx.

The internal database of the DFNT module is used as the source (read requests) and destination (write requests) for requests from remote clients. Access to the database is dependent on the MSG command type executed to interface with the database. The following table defines the relationship of the module's internal database to the addresses required in the MSG instructions:

MSG Instruction Type

Database Address	PLC2	PLC5 or SLC	ControlLogix	
			PCCC	CIP Integer
0	0	N10:0	N10:0	Int_data[0]
999	999	N19:99	N19:99	Int_data[999]
1000	1000	N20:0	N20:0	Int_data[1000]
1999	1999	N29:99	N29:99	Int_data[1999]
2000	2000	N30:0	N30:0	Int_data[2000]
2999	2999	N39:99	N39:99	Int_data[2999]
3000	3000	N40:0	N40:0	Int_data[3000]
3999	4000	N49:99	N49:99	Int_data[3999]

MSG Instruction Type

Database Address	CIP Boolean	ControlLogix			
		CIP Bit Array	CIP Byte	CIP Double Int	CIP Real
0	BoolData[0]	BitAData[0]	SIntData[0]	DIntData[0]	RealData[0]
999	BoolData[15984]		SIntData[1998]		
1000	BoolData[16000]	BitAData[500]	SIntData[2000]	DIntData[500]	RealData[500]
1999	BoolData[31984]		SIntData[3998]		
2000	BoolData[32000]	BitAData[1000]	SIntData[4000]	DIntData[1000]	RealData[1000]
2999	BoolData[47984]		SIntData[5998]		
3000	BoolData[48000]	BitAData[1500]	SIntData[6000]	DIntData[1500]	RealData[1500]
3999	BoolData[63999]		SIntData[9998]		

When using PLC5 or SLC commands, access to the database is through simulated 'N' files. For example, to access database element 3012, use the file address of N40:12. When using CIP Data Table Read or Write commands, use the various data[ ] tag arrays described in the following table. For example, use int_data[3012] to access database register 3012 as an integer value.

Data Type	Tag Name	Length of Each Element in CIP message	Array Range for 4000 Element Database
BOOL	BOOLData[ ]	1	0 to 63999
Bit Array	BITAData[ ]	4	0 to 1999
SINT	SINTData[ ]	1	0 to 7999
INT	INT_Data[ ]	2	0 to 3999
DINT	DINTData[ ]	4	0 to 1999
REAL	REALData[ ]	4	0 to 1999

Before attempting to use the module on a network, verify that the DFNT module is correctly configured and connected to the network. A network program such as PING can be utilized to make certain the module can be seen on the network. Use ProSoft Configuration Builder to verify correct operation, and to transfer configuration files to and from the module.

EtherNet/IP Explicit Messaging Server Command Support

The current version of the module will respond to the following list of commands. Future releases may support more functions as required by user applications.

Basic Command Set Functions

Command	Function	Definition	Supported in Slave
0x00	N/A	Protected Write	X
0x01	N/A	Unprotected Read	X
0x02	N/A	Protected Bit Write	X
0x05	N/A	Unprotected Bit Write	X
0x08	N/A	Unprotected Write	X

PLC-5 Command Set Functions

Command	Function	Definition	Supported in Slave
0x0F	0x00	Word Range Write (Binary Address)	X
0x0F	0x01	Word Range Read (Binary Address)	X
0x0F		Typed Range Read (Binary Address)	X
0x0F		Typed Range Write (Binary Address)	X
0x0F	0x26	Read-Modify-Write (Binary Address)	
0x0F	0x00	Word Range Write (ASCII Address)	X
0x0F	0x01	Word Range Read (ASCII Address)	X
0x0F	0x26	Read-Modify-Write (ASCII Address)	

4.3 ProSoft Wireless Protocol Functional Overview

The ProSoft Wireless Protocol (PWP) driver can be used to interface many different protocols with PWP devices. PWP allows one controller to produce or send an area of its memory onto a network at a specified rate. It also allows another controller to consume or receive this data. Each data message contains a data sample, or snapshot, of a specific portion of the producing node's memory. Data messages are uniquely identified so that consuming nodes can relate the incoming data with a specific configuration (known as an exchange) which describes key characteristics of the data sample. A node can contain a number of these exchanges, so that it may be both a consumer of some exchanges and a producer of others at the same time.

Periodic Data Services provide an efficient mechanism which allows the repeated transmission of a set of variables from a controller which *produces* data, to one or more controllers which *consume* the data. Significant features of the Periodic Data Service include:

- A single request for data from a consumer controller can cause data packets to be sent repetitively from the producer.
- The set of data variables to be sent periodically can be pre-defined so that the controller starts sending the data as soon as it is initialized.
- Data can be sent to the specific node that requested it, or simultaneously to a group of nodes.

Periodic Data Services utilize a low level protocol (UDP/IP) which requires less overhead than fully acknowledged stream oriented protocols.

4.3.1 Underlying Protocol Requirements and Constraints

PWP protocol messages are classified as data messages. PWP operates on a message based, connectionless network transport layer, such as the internet UDP/IP protocol. Each protocol message is sent to a specific network access point (UDP port) on one or more destination nodes. Data messages are individually configured to send a sample of data at a fixed periodic rate. Each data message that a node sends or receives is associated with a specific identifier, which uniquely defines the configuration of the data sample. This configuration is called an exchange. PWP allows the configuration of exchanges which are sent to:

- A single destination address (IP Unicast addressing)
- A group of addresses (IP Multicast addressing)
- All PWP nodes (IP Broadcast addressing).

An assigned set of 32 IP Multicast addresses has been defined for use by applications requiring the transmission of data exchanges to a group of nodes. The following tables show the defined network parameters for PWP.

Assigned UDP Network Ports

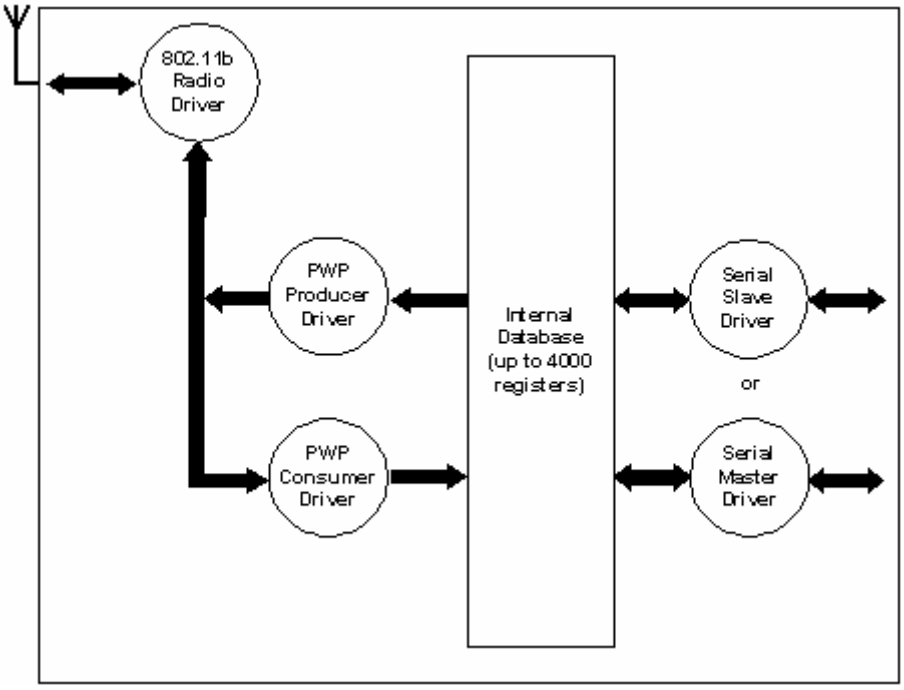
Parameter	UDP Port
Command Port	7937. (1F01H)
Data Port	18246. (4746H)

Multicast Address Assignments

Parameter	IP Address
Group 1	224.0.7.1
Group 2	224.0.7.2
…	…
Group 32	224.0.7.32

The user defines the data to be produced and consumed in a configuration file downloaded to the module. The driver interfaces with a common internal database in the module. This permits the sharing of data across many different types of networks.

The following illustration shows the functionality of the PWP driver when interfaced with serial communication based and 802.11b wireless networks:



In order to use these functions, an exchange must first exist in the module's exchange list defining the database and register count. If the production/consumption time is set to zero, the exchange will never be produced or consumed and will only be valid for command processing. These functions should be used for data that is not time critical and does not require periodic updating. The maximum length of the message is limited to 1400 bytes.

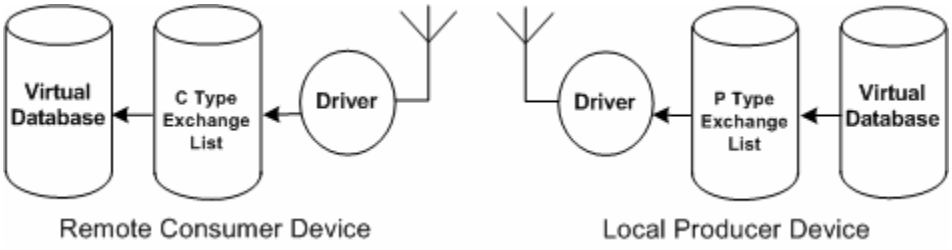
4.3.2 Module Internal Database

Central to the functionality of the module is the internal database. This database is shared between all the drivers in the module and is used as a conduit to pass information from one device on one network to one or more devices on another network. This permits data from devices on one communication port to be viewed and controlled by devices on another port. The following topics discuss the relationship of the internal database to the PWP Producer and the PWP Consumer.

PWP Producer

The PWP driver will generate produced data as defined in the user configuration exchange list. This data is derived from the module's internal database and is produced at the set frequency defined in the exchange list. This data can be broadcast to all nodes, sent to a specific multicast group or sent to a specific node on the network. Up to 680 database registers can be transferred in a single produced message. Therefore, to transfer the whole database would only require 6 messages (4000 word registers in the module's database).

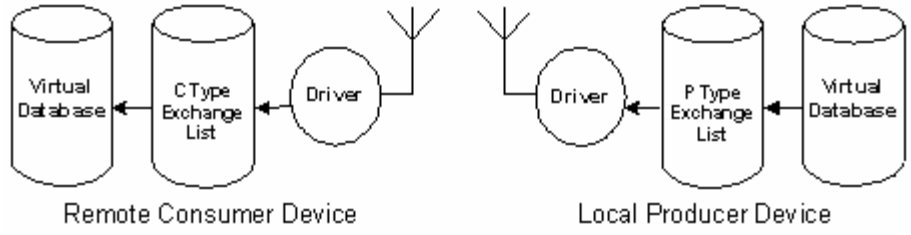
The producer functionality provided in the PWP driver is used to transfer portions of the module's database to other PWP nodes on the network. The following diagram describes the flow of data between the Producer, the internal database and the remote Consumer device:



PWP Consumer

The PWP driver will consume data as defined in the user configuration exchange list. This data is derived from other nodes on the network and is placed in the module's internal database. If a consumer exchange is not received at the specified timeout, the driver will update the status of the exchange. When the driver again receives the exchange, the status will be updated. Exchanges received by the consumer driver that are not defined in the exchange list will be discarded. Up to 680 words of data can be consumed in a single message. Therefore, to fill the whole database with values would only require 6 exchanges (4000 word registers in the module's database).

The consumer functionality provided in the PWP driver is used to transfer data from other nodes on the network into the module's database. The following diagram describes the flow of data between the Consumer, the internal database and the remote Producer device:



5 Reference

In This Chapter

5.1 Product Specifications

In Server mode, the module accepts commands from one or more clients to read/write data stored in the module's internal registers.

Supported PLC Types	PLC2, PLC5, SLC and ControLogix file types supported
Internal Database	Data Table File Size: 100 or 1000 words Data Table File Start: N10 to N109 (based on file size set to 100) or N10 to N19 (based on file set to 1000)
CIP Services Supported	0x4C - CIP Data Table Read 0x4D - CIP Data Table Write

EtherNet/IP Client

In Client mode, the module controls the read/write data transfer between the gateway and other EtherNet/IP devices. Data transfer can be initiated and executed without any ladder programming being required in the Rockwell Automation hardware.

Command List	Support for 100 commands per client, each configurable for command, IP address, register to/from addressing and word/bit count.
Polling of command list	User configurable polling of commands, including disabled, continuous and on change of data (write only).
Configurable Parameters	Number of commands (Up to 100 per client) Min Command Delay Response Timeout Retry Count Command Error Pointer

Functional Specifications - DF1 Master/Slave

The DF1 Master/Slave Protocol driver provides extensive support for both Master and Slave implementations of the protocol. The serial port on the gateway is user-configurable to support the DF1 protocol (Master or Slave, Error Checking, Baud rate, etc).

DF1 General Specifications

Internal Database	10000 registers (words) available
Communication parameters	Local Station ID: 0 to 254 Ports 1 to 3 Baud Rate: 110 to 115K baud Stop Bits: 1 Data Bits: 8 Parity: None, Even, Odd RTS Timing delays: 0 to 65535 milliseconds
Error Checking	BCC and CRC
Miscellaneous	Full hardware handshaking control, providing radio, smart modem and multi-drop support Floating point data supported

DF1 Master

The ports on the 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.

DF1 Modes	Full-Duplex - Master (Module generates commands) Half-Duplex - Polling
Command List	Up to 100 commands per Master port, each fully-configurable for function, slave address, register to/from addressing and word/bit count
Polling of Command List	User-configurable polling of commands, including disabled, continuous, and on change of data (write only)
Configurable Parameters per Master port	Min Command Delay Number of Commands Response Timeout Retry Count Slave List Error Pointer

DF1 Slave

The ports on the module can be individually configured to support the Slave mode of the DF1 protocol. When in slave mode, the module can accept DF1 commands from a master to read/write data stored in the module's internal registers.

DF1 Modes	Full Duplex - Slave (not peer mode) Half Duplex - Polled
Configurable parameters per slave port	Data Table File Start (File N[x] 0 to 999) Data Table File Size (1 to 1000 words) Data Table location in database (0 to 3999)

Functional Specifications - ProSoft Wireless Protocol

ProSoft Wireless Protocol (PWP) offers versatility where a mix of control devices requires cooperation with each other. This involves sharing of information across the applications regardless of device or network type, often at high speed, and with high reliability. Wireless bandwidth utilization is optimized by using efficient communication methods. The protocol supports Unicast, Broadcast and Multicast group messaging. Efficiency is based on the fact each device on the "wireless" network can produce these types of messages and each device determines which of these messages to consume.

General Specifications - Radio Modules

These modules utilize a full function wireless network card, supporting RF data rates up to 11 Mbps. The modules function as a client, providing an ultra-fast wireless solution for the most demanding industrial applications.

These modules allow you to connect various field devices using different networks or protocols and share data between these devices "over-the-air." This is accomplished by exchanging shared common database information over-the-air with ProSoft Technology's efficient but powerful wireless protocol.

Specification	Description
Frequency	2.4 GHz band (2400 to 2483.5 MHz)*
Wireless medium	DSSS: Direct Sequence Spread Spectrum (802.11b)
Output power	32 mW (15 dBm)
Channel data rates	11, 5.5, 2, 1 Mbps
Channels: user selectable	1 through 11* **
Security	PWP + WEP 64/128 Encryption with WEP key rollover management
Antenna Ports	Two RP-SMA connectors, automatic antenna diversity
Bit Error Rate (BER)	Better than 10-5

* Varies with country regulation
** Some European countries such as France allow fewer channels

5.1.1 Hardware Specifications

Specification	Description
Power Supply	24 VDC nominal, 18 to 32 VDC allowed. Positive, Negative, GND Terminals.
Current Load	500 mA max@ 24 VDC
Operating Temperature	-20 to 50°C (-4 to 122°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Relative Humidity	5% to 95% (non-condensing)
Dimensions	**Standard:** 5.20H x 2.07W x 4.52D inches (13.2cmH x 5.25cmW x 11.48cmD) **Extended:** 5.20H x 2.73W x 4.52D inches (13.2cmH x 6.934cmW x 11.48cmD)
LED Indicators	Power and Module Status, Application Status, Serial Port Activity LED, Serial Activity and Error LED Status, RF Link Status, RF Data Status
Configuration Serial Port	Mini-DIN, RS-232 only No hardware handshaking
Application Serial Ports	Mini-DIN, RS-232/422/485 RS232 handshaking configurable RS422/485 screw termination included
Antenna ports	Two RP-SMA connectors, with automatic antenna diversity.
Shipped with each unit	Mini-DIN to DB-9M cables per serial port, 4 ft RS-232 configuration cable, 2.5mm screwdriver, CD (docs and Configuration utility), RS-422/485 DB9 to Screw Terminal Adaptor (1 to 4, depending on ports)

5.2 Exchange Configuration Form

Use this form to design the exchange list for an application.

1	2	3	4	5	6	7	8	9	10
Exchange Type (C/P)	Cast Type (B/M/U)	Database Address	Register Count	Swap Code	Prod/Cons Time	IP Address	Exchange ID	CFG Signature Version	
								Major	Minor

5.3 Radio Status Data

The module's data mapping feature can be used to move Radio Status data into the module's database area. This way the data can be made available to all drivers on the module for use on any of the connected networks.

There is a 14-word register data area for each exchange. The data area is initialized with zeros whenever the module is initialized. This occurs during a cold-start (power-on), reset (reset push-button pressed) or warm-boot operation (commanded or loading of new configuration).

The following table describes each value stored for Radio Status:

Status Register	Status Value	Description
12500 to 12501	Packets in	The total number of MSDUs, with a unicast MAC address as the Destination Address, received successfully. +Plus+ The total number of MSDUs, with a multicast MAC address (including the broadcast MAC address) as the Destination Address, received successfully.
12502 to 12503	Packets out	The total number of MSDUs, of which the Destination Address is a unicast MAC address, transmitted successfully. This implies having received an acknowledgment to all associated MPDUs. +Plus+ The total number of MSDUs, of which the Destination Address is a multicast MAC address (including the broadcast MAC address), transmitted successfully. When operating as a STA in an ESS, and these frames are directed to the AP, this implies having received an acknowledgment to all associated MPG.
12504 to 12505	Bytes in	The total number of octets received successfully as part of unicast MSDUs (PacketsIn). These octets include MAC Header and Frame Body of all associated fragments. +Plus+ The total number of octets received successfully as part of multicast (incl. broadcast) MSDUs (PacketsIn). These octets include MAC Header and Frame Body of all associated fragments.
12506 to 12507	Bytes out	The total number of octets transmitted successfully as part of successfully transmitted unicast MSDUs (PacketsOut). These octets include MAC Header and Frame Body of all associated fragments. +Plus+ The total number of octets transmitted successfully as part of successfully transmitted multicast (incl. broadcast) MSDUs (PacketsOut). These octets include MAC Header and Frame Body of all associated fragments.

Status Register	Status Value	Description
12508 to 12509	Errors in	Number of MPDUs, considered to be destined for this station (Address1 matches), received with an FCS error. Note: This does not include things received with an incorrect CRC in the PLCP header. These are not considered MPDUs. +Plus+ The number of received MPDUs, with the WEP subfield in the Frame Control field set to one, that were discarded because it should not have been encrypted or due to the receiving station not implementing the privacy option.
12510 to 12511	Errors out	Number of times a MSDU is not transmitted successfully because the retry limit (either the ShortRetryLimit or the LongRetryLimit) is reached, due to no acknowledgment or CTS received. +Plus+ The number of transmit requests that were discarded to free up buffer space on the NIC. Transmit queued too long on one of the transmit queues, due to many retries and defers, or otherwise not being able to transmit (e.g. scanning). Transmit queued too long on the Power-Save queue (STA in IBSS: destination STA does not respond to ATIM; AP: STA does not Poll or wake up in time). +Plus+ The number of transmit requests that were discarded because of wrong Source Address (Source Address OwnMACAddress). This only applies to a STA with a BSS Port.
12512 to 12513	Packets dropped	The number of received Message Protocol Data Units that were discarded because of lack of buffer space on the NIC.
12514	Port status	*Connected IBSS* (ad-hoc) or *Connected ESS* (Infrastructure)
12515(1)	LED output	RF Link and Data Values combined (in *MSB)
12515(2)	Signal LED	Value for Signal level LEDs (in MSB)
12516(1)	Link LED	Radio Frequency Link LED indicator. 1 or 0 (in *LSB)
12516(2)	Data LED	Radio Frequency Data LED indicator. 1 or 0 (in MSB)
12517	Length of SSID data (byte count 0 to 32)	Character length of Service Set IDentifier Name.
12518 to 12533	SSID name (32 bytes)	Service Set IDentifier Name.
12534	Tx rate (rounded)	Data Tx rate integer. 11, 6, 2 or 1.
12535	Communication quality	The value of the last recorded quality signal.
12536	Signal level	Received Signal level quality.
12537	Noise level	Received Noise level.
12538	Channel number	Communications Channel.

Status Register	Status Value	Description
12539	Signal LED 1 level	The value from the module configuration file for the signal strength level at which the LED will illuminate.
12540	Signal LED 2 level	The value from the module configuration file for the signal strength level at which the LED will illuminate.
12541	Signal LED 3 level	The value from the module configuration file for the signal strength level at which the LED will illuminate.
12542	Signal LED 4 level	The value from the module configuration file for the signal strength level at which the LED will illuminate.

* MSDU = MAC Service Data Units,
* MPDU = MAC Protocol Data Unit
* LSB = Least Significant Byte
* MSB = Most Significant Byte

5.3.1 PWP Exchange Status Data

Status Register	Description
18000	Exchange message 0 Configuration State
18001	Exchange message 0 Status
18002 to 18003	Exchange message 0 Message count
18004 to 18005	Exchange message 0 Number of times missed
18006 to 18007	Exchange message 0 Number of refresh errors
18008	Exchange message 0 Invalid bit set by producer count
18009	Exchange message 0 Time sync bit set by producer count
18010	Exchange message 0 Short message count
18011	Exchange message 0 Long message count
18012	Exchange message 0 Protocol version number error count
18013	Exchange message 0 Configuration signature error count
18014 to 18027	Exchange message 1 in same format as above for 14 registers
18028 to 18042	Exchange message 2 in same format as above for 14 registers
…	…
19386 to 19399	Exchange message 99 in same format as above for 14 registers

5.4 Radio Networks and Security

802.11 wireless networks operate in one of two modes ad-hoc or infrastructure mode. The IEEE standard defines the ad-hoc mode as Independent Basic Service Set (IBSS), and the infrastructure mode as Basic Service Set (BSS).

In ad hoc mode, each client communicates directly with the other clients within the network, see figure 2. Ad hoc mode is designed so only the clients within transmission range (within the same cell) of each other can communicate. If a client in an ad hoc network wishes to communicate outside of the cell, a member of the cell must perform routing capabilities.

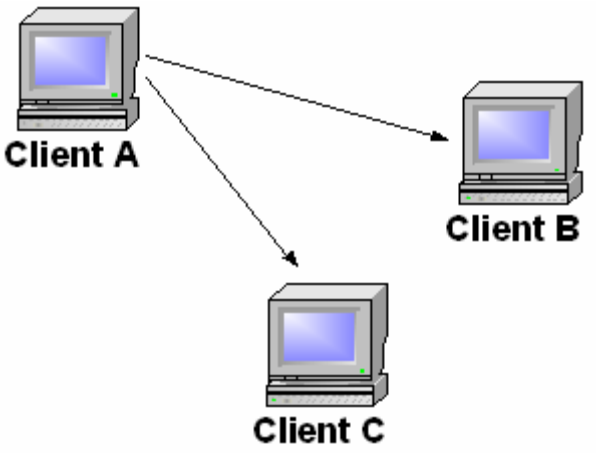


Figure 2: Example ad-hoc network

In infrastructure mode, each client sends all of it's communications to an access point (AP). The access point acts as an Ethernet bridge and forwards the communications onto the appropriate network- either the wired network, or the wireless network, see figure 3.

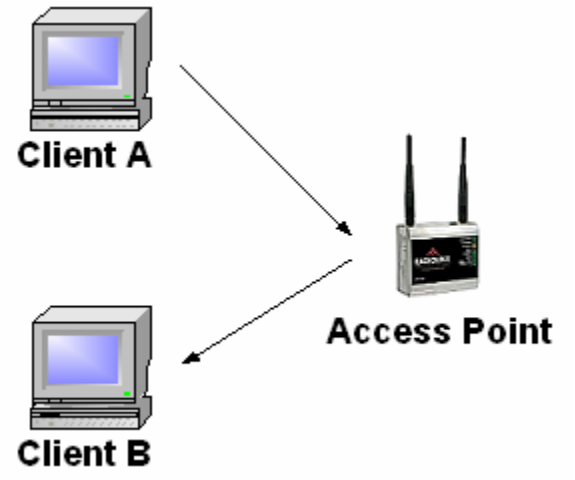


Figure 3: Example infrastructure network

Prior to communicating data, wireless clients and access points must establish a relationship, or an association. Only after an association is established can the two wireless stations exchange data. In infrastructure mode, the clients associate with an access point. The association process is a two step process involving three states:

1. Unauthenticated and unassociated,
2. Authenticated and unassociated, and
3. Authenticated and associated.

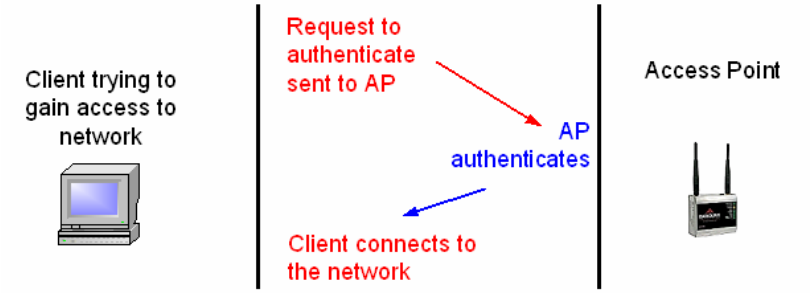
To transition between the states, the communicating parties exchange messages called management frames.

We will walk through the process of a wireless client finding and associating with an access point.

1. All access points transmit a beacon management frame at fixed interval. To associate with an access point and join a BSS, a client listens for beacon messages to identify the access points within range. The client then selects the BSS to join in a vendor independent manner.
2. All of the network names (or service set identifiers (SSID)) which are usually contained in the beacon frame are presented to the user so that they may select the network to join.
3. A client may also send a probe request management frame to find an access point affiliated with a desired SSID.
4. After identifying an access point, the client and the access point perform a mutual authentication by exchanging several management frames as part of the process. The two standardized authentication mechanisms are described below.
5. After successful authentication, the client moves into the second state, authenticated and unassociated.
6. Moving from the second state to the third and final state, authenticated and associated, involves the client sending an association request frame, and the access point responding with an association response frame. After following these steps the client becomes a peer on the wireless network, and can transmit data frames on the network.

Open System Authentication

Open system authentication is the default authentication protocol for 802.11. As the name implies, open system authentication authenticates anyone who requests authentication. Essentially, it provides a NULL authentication process. Experimentation has shown that stations do perform a mutual authentication using this method when joining a network, and our experiments show that the authentication management frames are sent in the clear even when WEP is enabled.



Reference: Your 802.11 Wireless Network has No Clothes - William A. Arbaugh, Narendar Shankar, Y.C. Justin Wan, Department of Computer Science, University of Maryland, College Park, Maryland, 20742, March 30, 2001

5.5 SNTP Support

SNTP is used for time synchronization of produced and consumed commands. When an exchange occurs the driver compares time stamps from the previous exchange. When the new exchange time is less than the previous exchange, the exchange is ignored. This can occur when the Ethernet packets are routed and delayed. Time synchronization provides for data integrity. The following table lists the parameters defined in this section:

The SNTP driver will compute a new clock value every 5 minutes using the average value of 10 samples each collected over an approximate 6-second period. This new value will be used to adjust the clock maintained by the SNTP driver and used by the application. If a valid database register is specified, the driver will place the time value into the module's database. The first two registers will contain the number of seconds and the next two registers will contain the number of microseconds since January 1, 1970.

A list of some of the common NTP servers can be obtained at http://www.ntp.org/ (http://www.ntp.org/), http://www.eecis.udel.edu/~mills/ntp/servers.html (http://www.eecis.udel.edu/~mills/ntp/servers.html), along with the appropriate IP address. Other server lists can be found on the Internet by searching on "NTP Servers" with your browser.

5.5.1 SNTP Status Data

The status data for the SNTP driver is located at the virtual database addresses shown in the following table. The data area is initialized with zeros whenever the module is initialized. This occurs during a cold-start (power-on), reset (reset push-button pressed) or warm-boot operation (commanded or loading of new configuration).

SNTP Client Status	
4030	Time is valid
4031	Request count
4032	Response count
4033	Computation count
4034	Clock set count
4035	Timeout error count

The module's data mapping feature can be utilized to move this data into the module's database area. This way the data can be made available to all drivers on the module for use on any of the connected networks. If it is not mapped into the module's database, the data will only be available through the Configuration/Debug Port.

The Time is valid status register will be set to 1 if the SNTP time is valid. If the time is not valid, the register will be set to 0. All the other registers are counters used to determine the functionality of the driver.

This version of the driver supports SNTP Revision 3 and stratum between 1 and 14.

5.6 Radio DF1 Pass-Through Server

This section can be configured in two ways:

- Connecting through a wireless laptop or PC

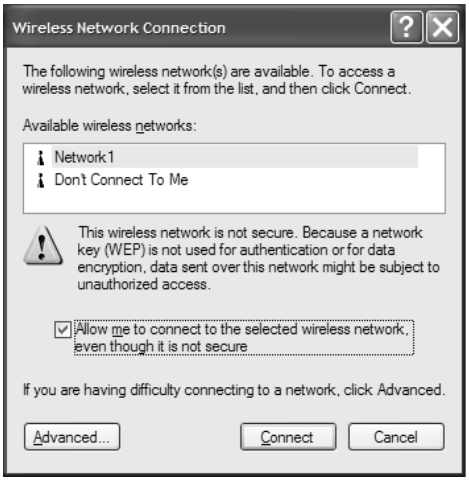
OR

- Connecting thru laptop or PC connected to an Ethernet network using Wireless Access Point

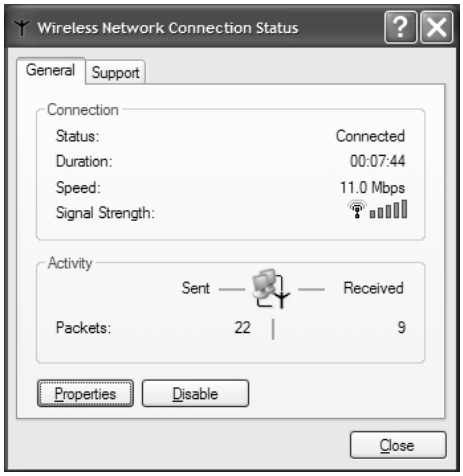
5.6.1 Connecting through Wireless Laptop or PC

1 Locate the Wireless Network.

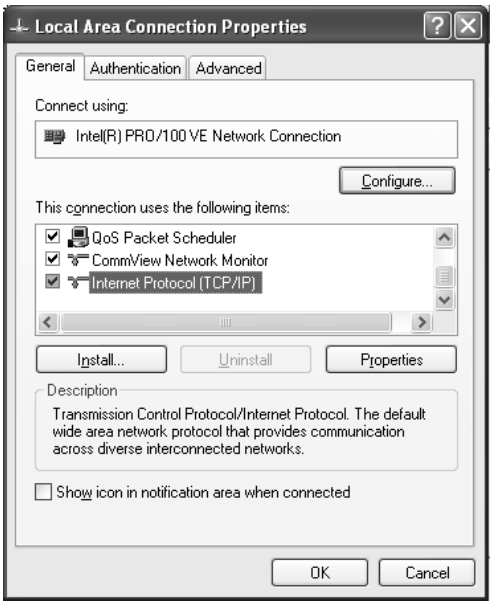
2 Connect to the Wireless Network.



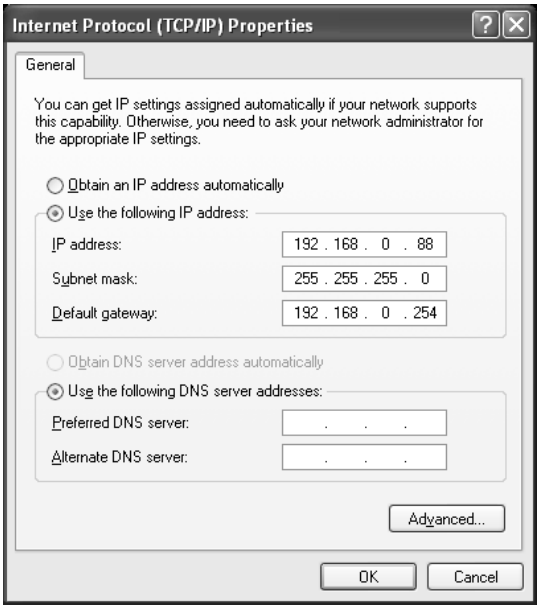
3 You can check the status of the wireless network.

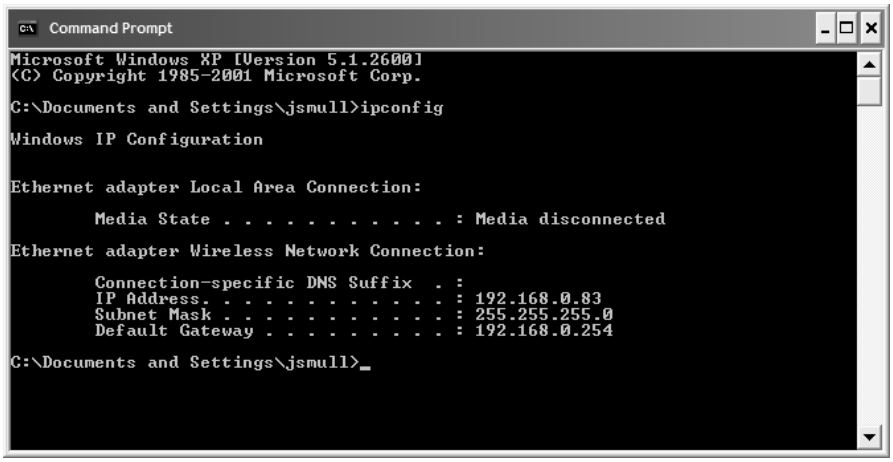


4 Configure the IP Address (Control Panel->Network Connections->Local Area Connection (right click)-> Properties).

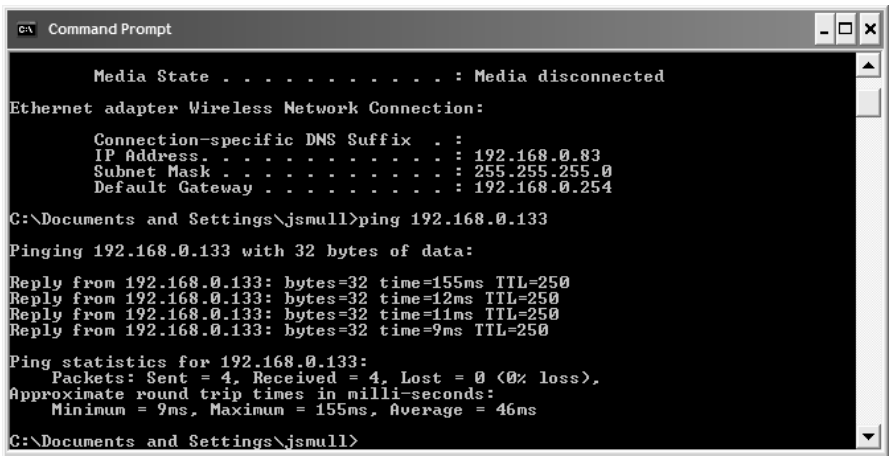


5 Select Internet Protocol and click on Properties.



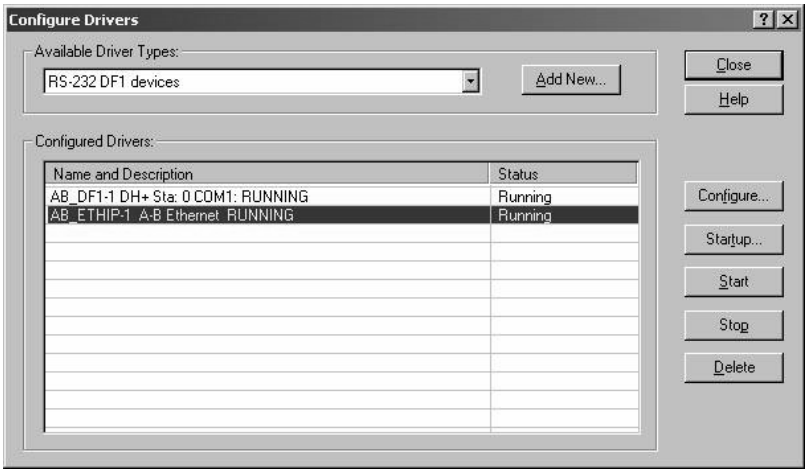


6 Ping the Radio-IP address.

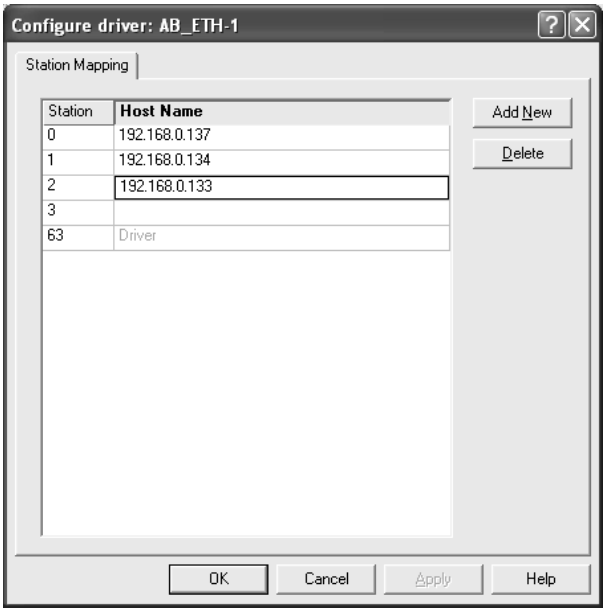


NOTE: If the Wireless Laptop or PC also connects thru an Ethernet cable you may experience some difficulties pinging the required IP address; in this case you should first try to disconnect the Ethernet cable and try to ping again.

7 Create an AB_ETHIP-1 Ethernet/IP Driver with RSLinx.

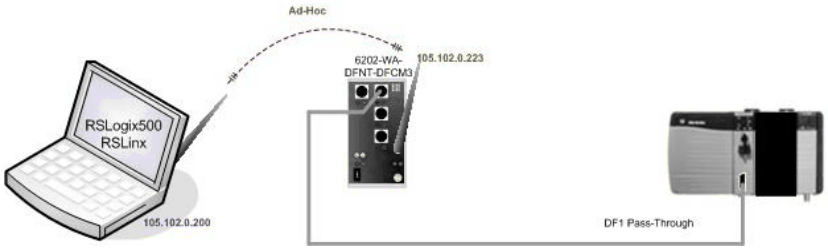


8 Enter the Radio-IP address.

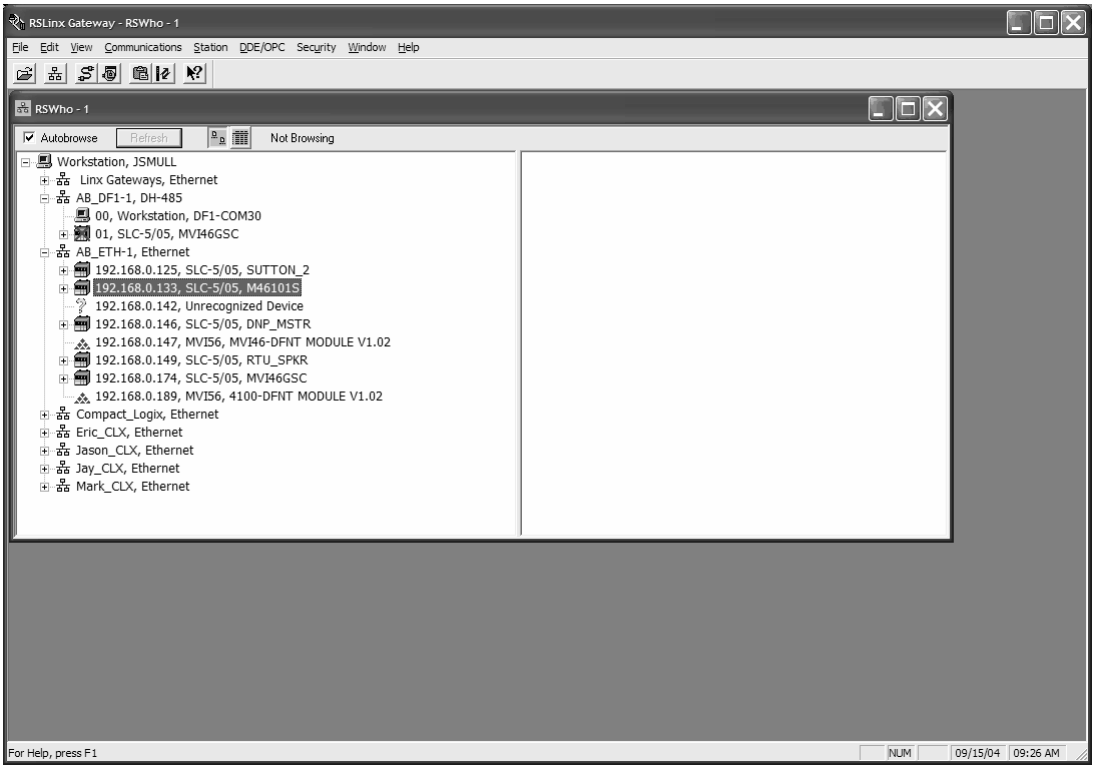


9 Configure the DF1 port 1 as Master and Pass-Through enabled, and configure with at least one command. Use PCB to configure the Slave Device configurations, which must match the Master configurations.

The following figure shows the wireless DF1 pass-through in Infrastructure mode. For details, see and [DF1 Pass-Through Port] (page 38).

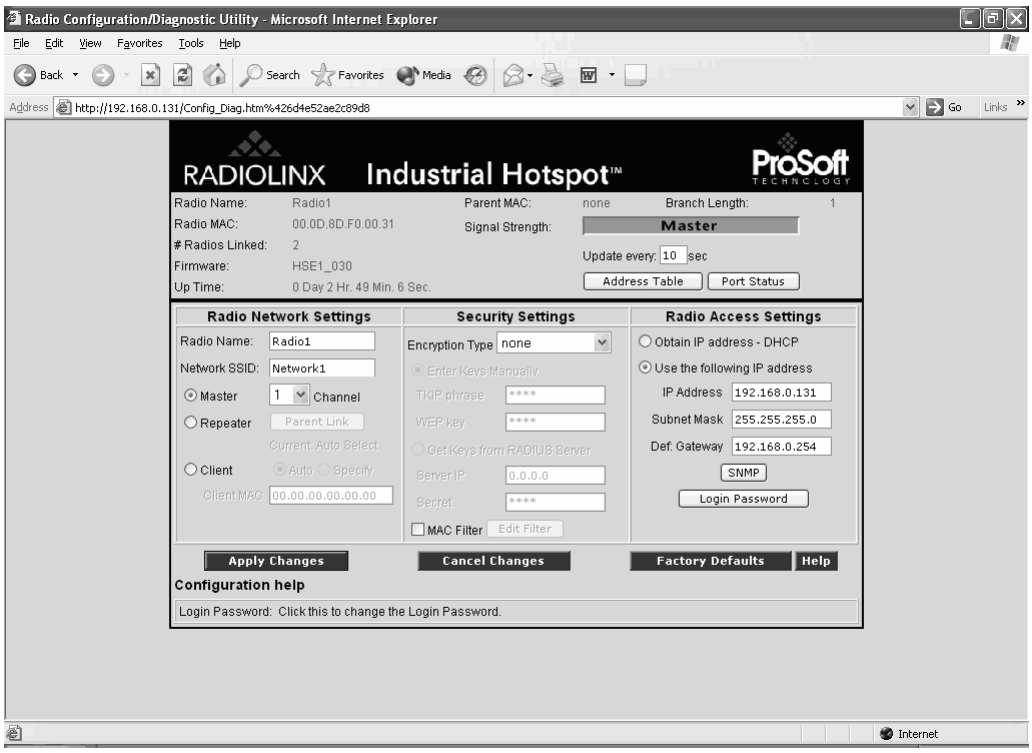


10 Now you can access the AB device (for example, SLC) through radio.

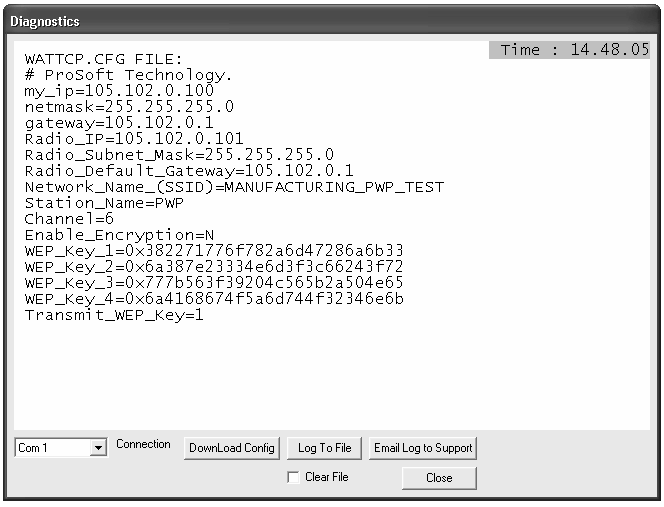


5.6.2 Connecting through Laptop or PC connected to Ethernet Network Using Wireless Access Point

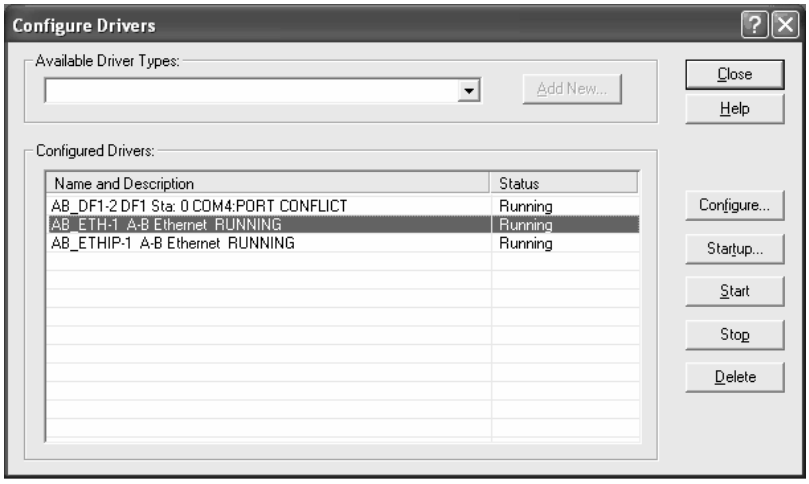
1 The first three octets used for the RadioLinx IH IP address must be identical to the first three octets used in the module.



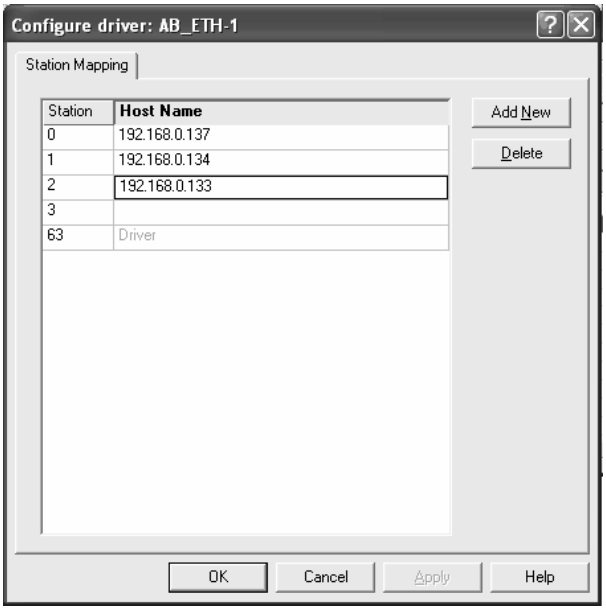
2 Match the Network Name (Network SSID in RadioLinx with Wireless_Network_Name_(SSID) parameter in WATTCP file.



3 Create an AB_ETH-1 Ethernet Driver with RSLinx.

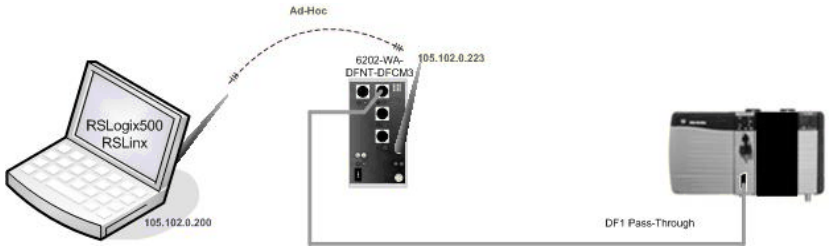


4 Enter the Radio-IP address.

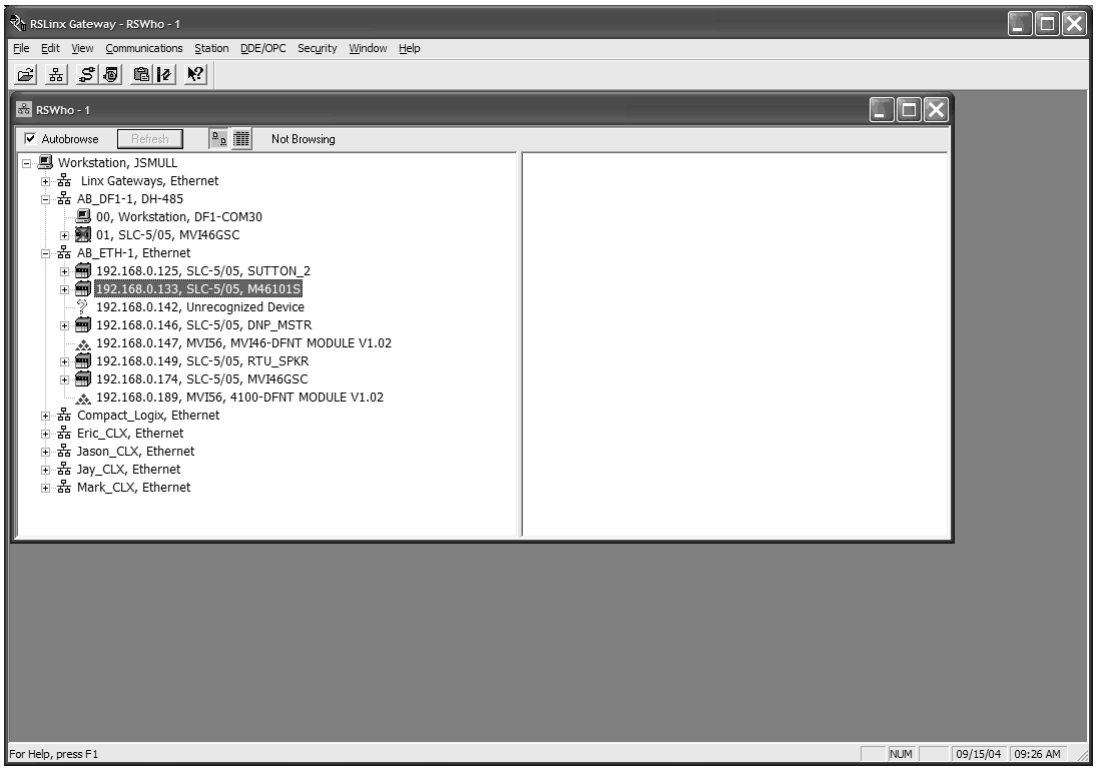


5 Configure the DF1 port 1 as Master and Pass-Through enabled, and configure with at least one command. Use PCB to configure the Slave Device configurations, which must match the Master configurations.

The following figure shows the wireless DF1 pass-through in Infrastructure mode. For details, see and [DF1 Pass-Through Port] (page 38).



6 Now you can access the AB device (for example, SLC) through radio.



5.7 DFNT Reference

5.7.1 Command Function Codes

In the following discussion, the Column values are described for the serial DFCM Command list (See Node Address parameter #6). In the DFNT module, the Node address has been replaced with two parameters; the IP Address and the Slot Number, causing the Function Code and Function Parameters to occupy positions 8 to 12 instead of 7 to 11. Aside from this difference, all other information is correct.

DFNT Configuration Form

Module Information Data						Device Information Data					
1	2	3	4	5	6	7	8	9	10	11	12
Enable Code	Internal Address	Poll Interval Time	Count	Swap Code	IP Address	Slot Number	Function Code	Function Parameters			

DFNT Command Structure

Module Information Data							Device Information Data					
Column #	1	2	3	4	5	6	7	8	9	10	11	12
Function Code	Enable Code	Internal Address	Poll Interval Time	Count	Swap Code	IP Address	Slot Number	Function Code	Function Parameters			

5.7.2 General Command Structure

	DF1 Master Port Command Structure (File for each Master Port)	Description
Communication Module Information	Enable/Type Word	0=Disabled, 1=Continuous, 2=Conditional and 999=Poll. The conditional type only applies to the write functions.
	Virtual Database Address	This parameter defines the virtual database register to be associated with the command.
	Poll Interval	Minimum time in tenths of a second to wait before polling with this command.
	Count	Number of data values or registers to be considered by the function.
	Swap Type Code	Swap type code for command: 0=None, 1=Swap words, 2=Swap words & bytes and 3=swap bytes in each word.
Device Information	Node Address	Node address of unit to be reached on the data highway.
	Function Code	This parameter defines the module function code to be associated with the command. Each function code requires a set of parameters to construct the DF1 message.
	Parameters	Up to four parameter fields can follow the function code field to define the element or data register to be considered by the function.

Note that the Node Address field of the serial implementation has been expanded to two fields: IP Address and Slot Number. This is required for network support. The IP Address specifies the IP address of the device to reach on the network. The Slot Number has specific meaning determined by the processor. For ControlLogix processors, the Slot Number is the location in the ControlLogix rack of the processor. For a four-slot rack, this parameter would have a valid range of 0 to 3. For the PLC5 and SLC family of processors, the Slot Number parameter is always set to -1. These processors do not have a slot number in the path field as the Ethernet interface is resident on the processor.

The following tables define the parameters required for each function.

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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 1	Protected Write Function	
9	Word Address	Word address where to start the write operation.	P1
10 to 12	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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 2	Unprotected Read Function	
9	Word Address	Word address where to start the read operation.	P1
10 to 12	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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 3	Protected Bit Write Function	
9	Word Address	Word address where to start the write operation.	P1
10 to 12	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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 4	Unprotected Bit Write Function	
9	Word Address	Word address where to start the write operation.	P1
10 to 12	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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 5	Unprotected Write Function	
9	Word Address	Word address where to start the write operation.	P1
10 to 12	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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 100	Word Range Write Command.	
9	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
10	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
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. If the value is set to -1, the default sub-element number will be used.	P3
12	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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 101	Word Range Write Command.	
9	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
10	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
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. If the value is set to -1, the default sub-element number will be used.	P3
12	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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 102	Read-Modify-Write Command.	
9	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
10	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
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. If the value is set to -1, the default sub-element number will be used.	P3
12	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.	

Column	Parameter	Description	Parameter
7	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 150	Word Range Write Command.	
9	File String	PLC-5 address as specified as an ASCII string. For example, N10:300.	P1
10 to 12	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.	
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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 151	Word Range Read Command.	
9	File String	PLC-5 address as specified as an ASCII string. For example, N10:300.	P1
10 to 12	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.	

Column	Parameter	Description	Parameter
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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 152	Read-Modify-Write Command.	
9	File String	PLC-5 address as specified as an ASCII string. For example, N10:300.	P1
10 to 12	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.	
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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 501	Logical Read Command	
9	File Type	SLC file type letter as used in file name string. Valid values for the system are N, S, F, A, ….	P1
10	File Number	SLC file number to be associated with the command.	P2
11	Element Number	The parameter defines the element in the file where write operation will start.	P3
12	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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 502	Logical Read Command	
9	File Type	SLC file type letter as used in file name string. Valid values for the system are N, S, F, A, ….	P1
10	File Number	SLC file number to be associated with the command.	P2
11	Element Number	The parameter defines the element in the file where write operation will start.	P3
12	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.	
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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 509	Logical Write Command	
9	File Type	SLC file type letter as used in file name string. Valid values for the system are N, S, F, A, ….	P1
10	File Number	SLC file number to be associated with the command.	P2
11	Element Number	The parameter defines the element in the file where write operation will start.	P3
12	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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 510	Logical Write Command	
9	File Type	SLC file type letter as used in file name string. Valid values for the system are N, S, F, A, ….	P1
10	File Number	SLC file number to be associated with the command.	P2
11	Element Number	The parameter defines the element in the file where write operation will start.	P3
12	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	Slot Number	Processor slot number in Control/CompactLogix rack. Use -1 for PLC5 & SLC processors.	
8	Function Code = 511	Logical Write with mask	
9	File Type	SLC file type letter as used in file name string. Valid values for the system are N, S, F, A, ….	P1
10	File Number	SLC file number to be associated with the command.	P2
11	Element Number	The parameter defines the element in the file where write operation will start.	P3
12	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.

5.7.3 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

5.7.4 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	Description
S	Status
B	Bit
T	Timer
C	Counter
R	Control
N	Integer
F	Floating-point
Z	String
A	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.

5.7.5 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	Description
S	Status
B	Bit
T	Timer
C	Counter
R	Control
N	Integer
F	Floating-point
Z	String
A	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.

ControlLogix Processor Specifics

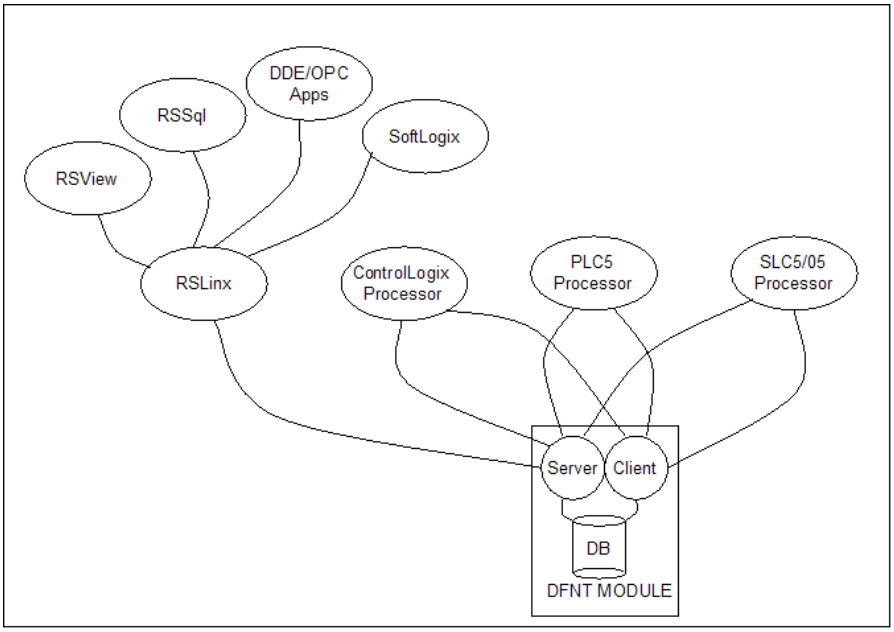
This section contains information specific to the ControlLogix processor when used with the DF1 command set. The current implementation of the DF1 command set does not use functions that can directly interface with the ControlLogix Tag Database. In order to interface with this database, the table-mapping 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.

5.7.6 Server Driver

The Server Driver allows the 6202-WA-DFNT-DFCM3 module to respond to data read and write commands issued by clients on the DFCM network using explicit messaging.

The DFNT module supports server functionality using the reserved ControlNet service port 0xAF12. Services supported in the module permit client applications (that is, RSView, processors, and RSLinx) to read from and write to the module's database. This section discusses the requirements for attaching to the module using several client applications.

The following illustration shows the relationship of the DFNT module's functionality to devices on an Ethernet network:



Server functionality places all data transfer operations outside the module. There is no configuration required in the module other than setting up the network and database parameters in the configuration file. Ladder logic in attached processors use MSG instructions to perform read and write operations on the module's internal database. When RSLinx links a user application to the module, the module's server functionality must be used. RSLinx exists on an Ethernet network only as a client application. It cannot act as a server. User applications can use the DDE/OPC capabilities built into RSLinx to interface with the data in the DFNT module. RSView can link directly to the module using drivers supplied by RSLinx.

The internal database of the DFNT module is used as the source (read requests) and destination (write requests) for requests from remote clients. Access to the database is dependent on the MSG command type executed to interface with the database. The following table defines the relationship of the module's internal database to the addresses required in the MSG instructions:

	Msg Instruction Type			
Database Address	**PLC2**	**PLC5 or SLC**	**ControlLogix**	
			PCCC	**CIP Integer**
0	0	N10:0	N10:0	Int_data[0]
999	999	N10:999	N10:999	Int_data[999]
1000	1000	N11:0	N11:0	Int_data[1000]
1999	1999	N11:999	N11:999	Int_data[1999]
2000	2000	N12:0	N12:0	Int_data[2000]
2999	2999	N12:999	N12:999	Int_data[2999]
3000	3000	N13:0	N13:0	Int_data[3000]
4000	4000	N14:0	N14:0	Int_data[4000]

When using PLC5 or SLC commands, access to the database is through simulated 'N' files. For example, to access database element 3012, use the file address of N13:12. The module simulates N-files in the internal database. The following table lists the relationship between the N-files and the module's internal database registers:

Internal	**Simulated**
Database	N-File
Register	
0	N10:0
1	N10:1

999	N10:999
1000	N11:0
1001	N11:1

1999	N11:999
2000	N12:0
2001	N12:1

2999	N12:999
3000	N13:0
3001	N13:1

3999	N13:999

Note: The way the data files are used will depend on the DFNT Server File Size value (100 or 1000). The previous example shows an example where this parameter is set with a value of 1000.The following table lists the PCCC functions supported by the module:

Additionally, the module supports CIP data table read and write functions. These functions use controller tags to access data in the module's database. This is the preferred data access method as it directly specifies the data type used with the command. The following table lists the data access methods:

Server Database Access

	MSG Instruction Type								
Database Address	PLC2	PLC5 or SLC	ControlLogix						
			PCCC	CIP Boolean	CIP Bit Array	CIP Byte	CIP Integer	CIP Double Int	CIP Real
0	0	N10:0	N10:0	BoolData[0]	BitAData[0]	SintData[0]	Int_Data[0]	DIntData[0]	RealData[0]
999	999	N10:999	N10:999	BoolData[15984]		SIntData[1998]	Int_Data[999]		
1000	1000	N11:0	N11:0	BoolData[16000]	BitAData[500]	SintData[2000]	Int_Data[1000]	DIntData[500]	RealData[500]
1999	1999	N11:999	N11:999	BoolData[31984]		SintData[3998]	Int_Data[1999]		
2000	2000	N12:0	N12:0	BoolData[32000]	BitAData[1000]	SintData[4000]	Int_Data[2000]	DIntData[1000]	RealData[1000]
2999	2999	N12:999	N12:999	BoolData[47984]		SintData[5998]	Int_Data[2999]		
3000	3000	N13:0	N13:0	BoolData[48000]	BitAData[1500]	SintData[6000]	Int_Data[3000]	DIntData[1500]	RealData[1500]
3998	3998	N13:998	N13:998	BoolData[63968]	BitAData[1999]	SintData[7996]	Int_Data[3998]	DIntData[1999]	RealData[1999]
3999	999	N13:009	N13:009	BoolData[63984]		SintData[7998]	Int_Data[3999]		

If the CIP data table read and write functions are utilized, the controller tag array names defined in the module must be used. The following table lists the controller tag names recognized by the module and the associated data types:

Tag Array	Data Type	Data Size
BoolData[ ]	Bit	1 bit
BitAData[ ]	Bit Array	32 bits
SintData[ ]	Byte	8 bits
Int_Data[ ]	Word	16 bits
DIntData[ ]	Double Word	32 bits
RealData[ ]	Floating-point	32 bits

The following table shows the supported commands when the module acts as a slave (server):

Basic Command Set Functions

Command	Function	Definition	Supported in Slave
0x00	N/A	Protected Write	X
0x01	N/A	Unprotected Read	X
0x02	N/A	Protected Bit Write	X
0x05	N/A	Unprotected Bit Write	X
0x08	N/A	Unprotected Write	X

PLC-5 Command Set Functions

Command	Function	Definition	Supported in Slave
0x0F	0x00	Word Range Write (Binary Address)	X
0x0F	0x01	Word Range Read (Binary Address)	X
0x0F		Typed Range Read (Binary Address)	X
0x0F		Typed Range Write (Binary Address)	X
0x0F	0x26	Read-Modify-Write (Binary Address)	
0x0F	0x00	Word Range Write (ASCII Address)	X
0x0F	0x01	Word Range Read (ASCII Address)	X
0x0F	0x26	Read-Modify-Write (ASCII Address)	

SLC-500 Command Set Functions

Command	Function	Definition	Supported in Slave
0x0F	0xA1	Protected Typed Logical Read With Two Address Fields	X
0x0F	0XA2	Protected Typed Logical Read With Three Address Fields	X
0x0F	0XA9	Protected Typed Logical Write With Two Address Fields	X
0x0F	0XAA	Protected Typed Logical Write With Three Address Fields	X
0x0F	0XAB	Protected Typed Logical Write With Mask (Three Address Fields)	

5.7.7 Client Driver

In the client driver, the 6202-WA-DFNT-DFCM3 module is responsible for issuing read or write commands to servers on the DFCM network using explicit, connected messaging. These commands are user configured in the module via the Client Command List received from the module's configuration file. Command status is returned to the processor for each individual command in the command list status block in the command control data area.

Client Command List

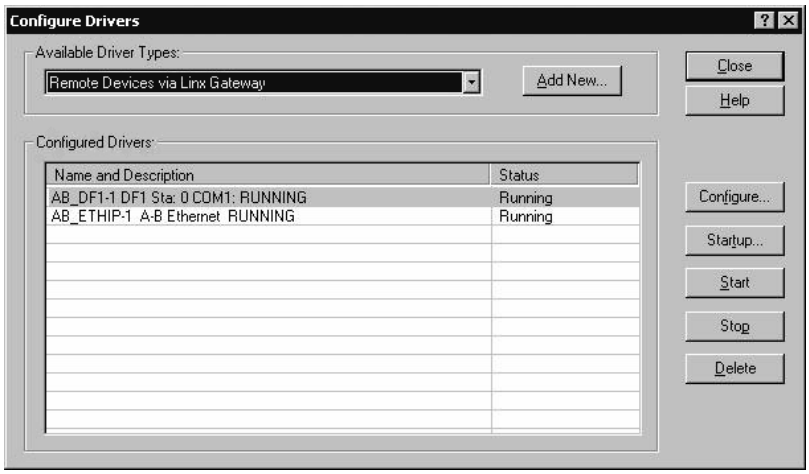
In order for the client to function, the module's Client Command List must be defined. This list contains up to 100 individual entries, with each entry containing the information required to construct a valid command. This includes the following:

- Command enable mode ((0) disabled, (1) continuous or (2) conditional)
- IP address of the remote server
- Slot number for processor when interfacing with a ControlLogix processor
- Command Type - Read or Write command
- Database Address - Determines where data will be placed and/or obtained
- Address information to access data in remote unit
- Count - Select the number of words to be transferred
- Poll Delay - (1/10th seconds)

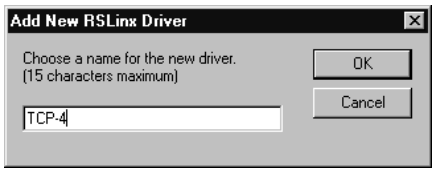
5.7.8 RSLinx Software

RSLinx is used by many personal computer-based applications to interface with products. For example, RSView requires the use of RSLinx for communication to remote nodes on a network.

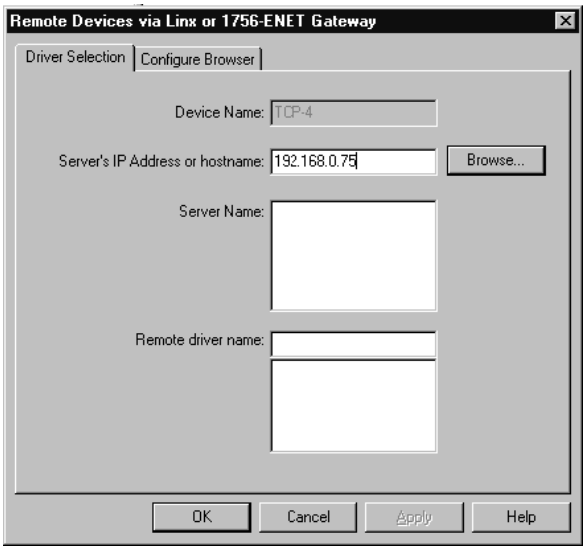
To set up a connection to a DFNT module, a driver must first be added to RSLinx. Select the **Configure Drivers…** command from the **Communications** menu. After selecting the option, the following dialog box appears.



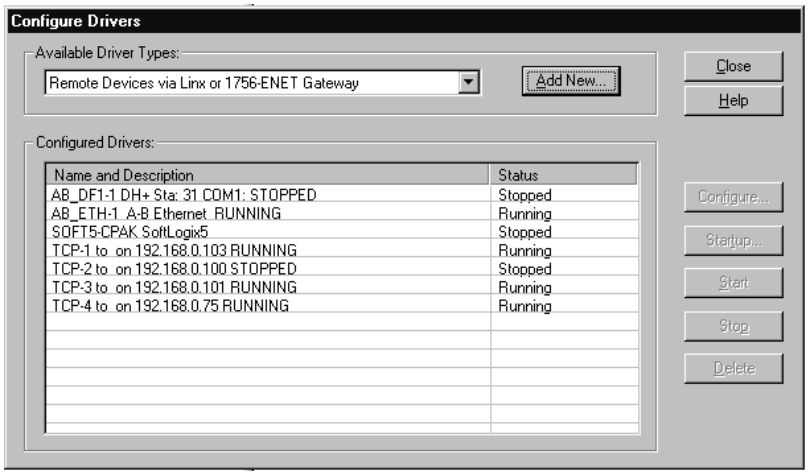
From the list of available drivers, select the **Remote Devices via Linx Gateway** option. Then, select the **Add New…** button. This action opens the following dialog box.



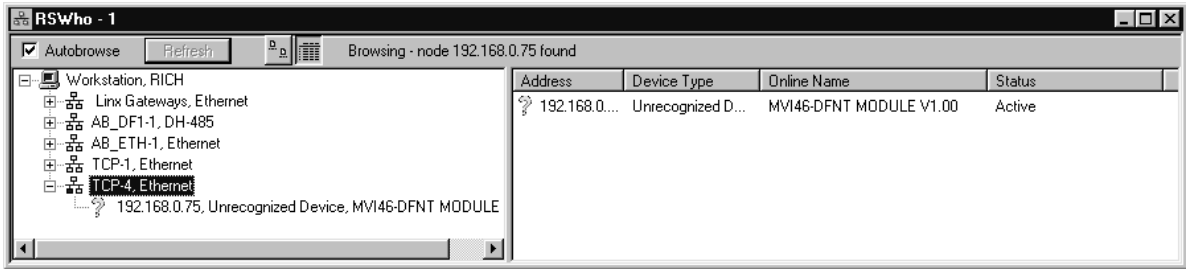
Enter the name for the driver or accept the default name provided, and then, click OK. The program displays the following dialog box:



Enter the IP address for the DFNT module in the Server's IP Address or hostname entry area. In the example shown, the module's IP address is 192.168.0.75. The value entered should match the value configured in the module's WATTCP.CFG file. Click OK and the new driver should appear in the list as shown in the following dialog box:



The driver and the IP address of the DFNT module should be presented in the **Configure Drivers** dialog box. If the driver is not running, select the **Start** button. Select the **Close** button to exit the dialog box. The new driver should be displayed in the main program window as shown:

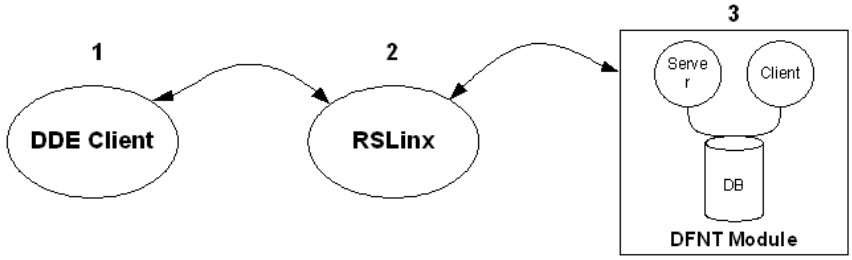


The module is now ready to use with any program requiring RSLinx for communication. This set of instructions can also be used to test if the DFNT module is functioning correctly without the use of processor or client application.

DDE Connection

This section discusses setting up a DDE connection to the module in order to transfer data between the module and a DDE compliant application.

Each DDE connection requires three basic elements: Application, Topic and Item. These three properties of a DDE link define the program providing the connection, the topic to connect to and the item in the topic that you wish to interface. All three are required for a connection. For this discussion, the Application will always be RSLinx. The Topic is defined in the RSLinx OEM release software and the Item is defined in the DDE client application where the data is required. The link between the DDE server and the DDE client can be established after these parameters are defined. The following illustration shows the relationship of these elements and the facilities used in the DDE link.



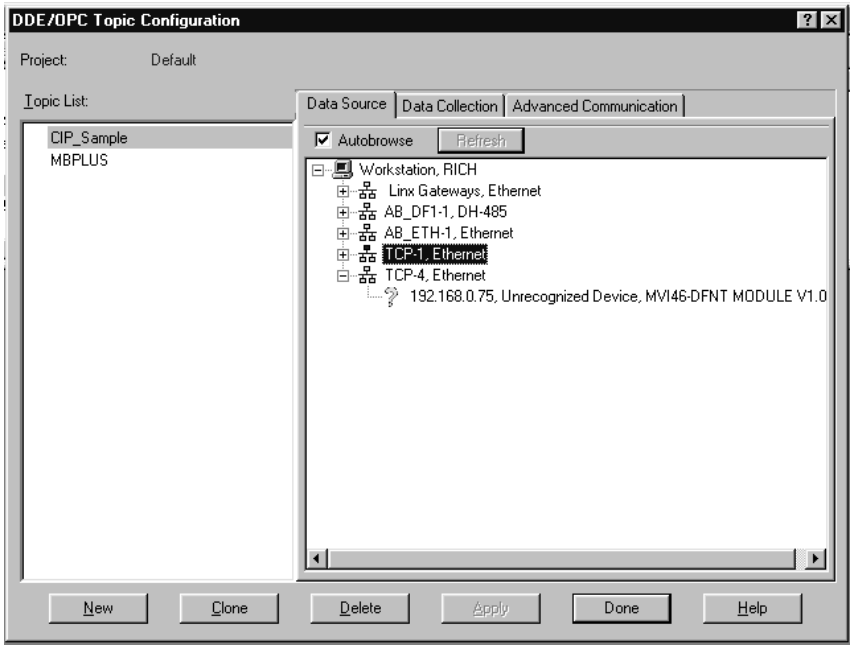
1 The DDE Client application specifies the DDE link by specifying the APPLICATION, TOPIC, and ITEM elements. For example, in Excel, enter =RSLINX|PROLINX1! 'ReadData[0]' into a cell.

2 RSLinx is the DDE Server: APPLICATION = RSLINX.

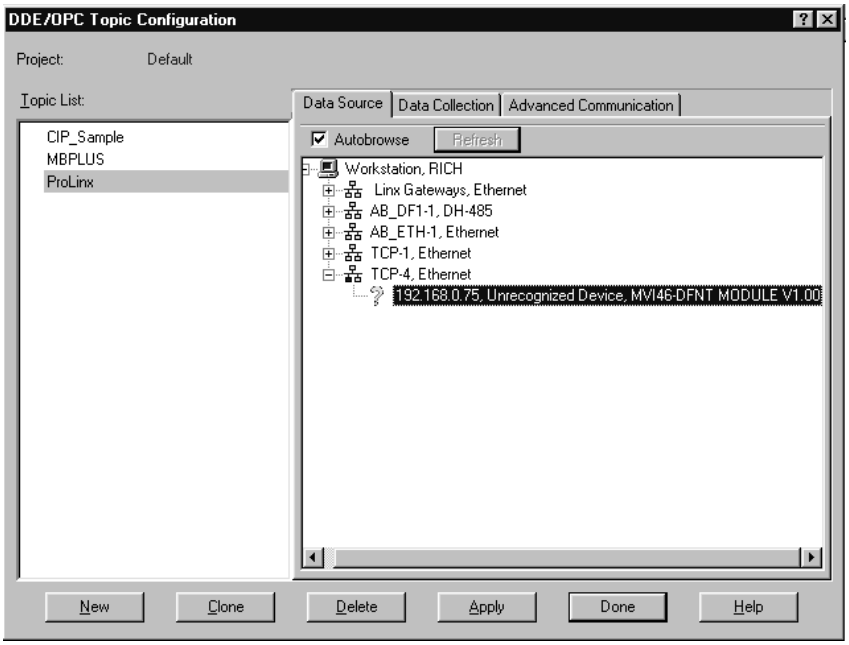
And
RSLinx is used to define the TOPIC.
This is the communication link to the DFNT Module. In this example, a DDE TOPIC is defined PROLINX1 for the communication link to the DFNT module.

3 The DFNT Module is used to serve data to RSLinx using the EtherNet/IP driver with explicit messaging. Database is accessed using tag names (e.g. ReadData[0]).

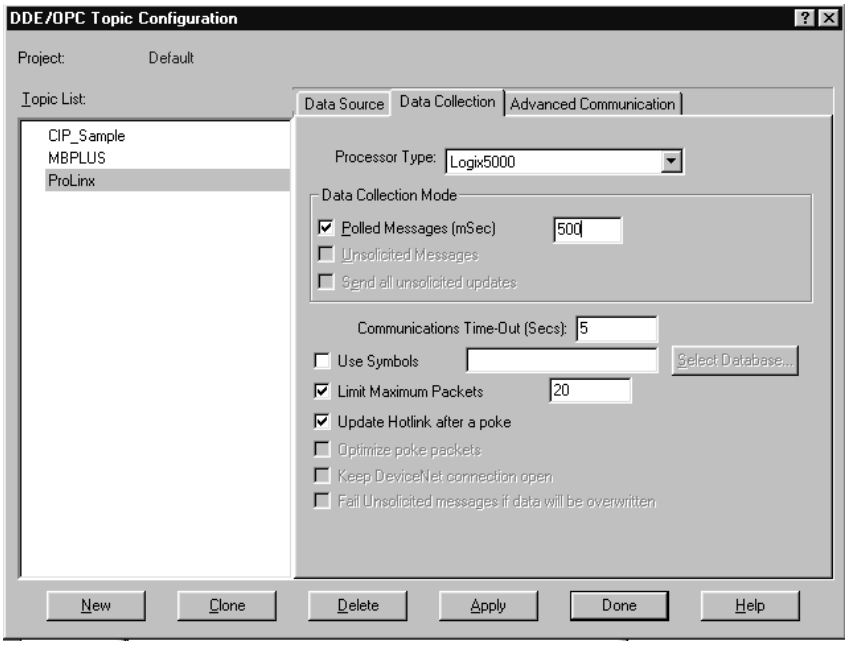
As discussed in the previous section, RSLinx must be used to define the Topic element for the DDE link definition. This is accomplished using the following procedure. It is assumed that the module can be seen in the RSLinx software. Refer to the RSLinx section of this manual to set up this connection. To define a new Topic, select the **Topic Configuration** option on the **DDE/OPC** menu from the RSLinx Main Menu. This causes the following dialog box to appear:



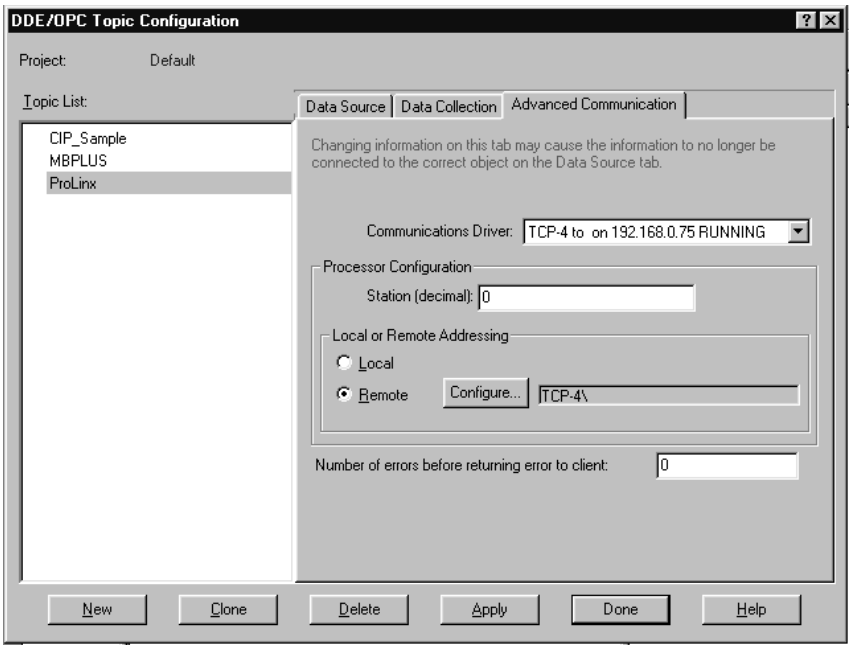
Click the **New** button to add a new Topic to the **Topic List**. This displays a default name. Edit the Topic name for the link to be formed. This name should reflect the unit or location to which the connection is being made. Do not press the Enter key. Instead, double-click the mouse on the DFNT device you want to connect to the entered Topic name. The dialog should now appear as follows:



Now select the **Data Collection** tab on the dialog. Fill in the form to define the characteristics of the DDE link. The following screen shows an example:



You must set the **Processor Type** to Logix5000. Refer to the RSLinx on-line help for a discussion of each of the parameters on the form. Next select the **Advanced Communication** tab on the dialog box. The following is displayed after selecting the tab.



The **Communication Driver** should be set to the TCP driver and display the IP address of the DFNT module. Make sure the **Remote** option is selected in the **Local or Remote Addressing** section of the dialog. You should not have to alter any data on this tab, as RSLinx knows the communication path. Now click the **Apply** button to implement the options and to establish the topic. You are now ready to use the DDE link in a DDE client application. Two examples follow: Excel Spreadsheet and Visual Basic program. Any other Windows DDE client application could be used including SoftLogix and RSSql.

Defining a DDE link in Excel

This is the simplest DDE link to define and should be used to make sure the Topic is defined correctly before using more advanced applications. Before attempting to make the link, verify that RSLinx is running and that the DFNT module is seen. To make a DDE link in Excel, enter the application, topic and item elements as a formula into a cell. The format for the formula is as follows:

```
=APPLICATION|TOPIC!ITEM
```

The '**|**' character (piping symbol) separates the application and topic fields and the '**!**' (exclamation symbol) separates the topic and item fields. For our example topic of ProLinx1, the entry into the cell is:

```
=RSLinx|ProLinx1!'RealData[500]'
```

This causes the current value at the database double-word offset 500 (starting at word address 1000) in the DFNT module to be displayed in the cell as a floating-point value. This value updates at the frequency defined in the Topic configuration in RSLinx. You can now place any database point in the DFNT module using the same procedure in your worksheet. Note that the tag array name is used for the item property and must be enclosed within the quote marks. This is because the tag array name item reference looks like an Excel worksheet reference. If you do not include the quotes, a formula error occurs. You can select any of the defined tag array names defined in the module on your spreadsheet.

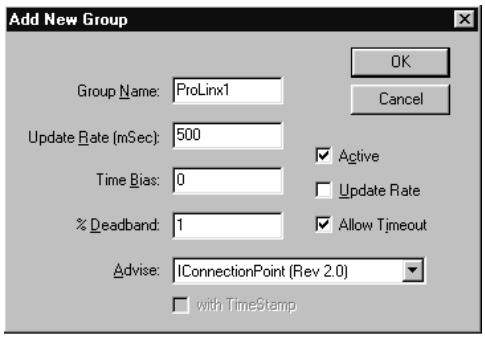
When the items are used for the topic, RSLinx displays the following after selecting the Active Topic/Items command on the DDE/OPC menu option:

Any DDE compliant program can be used in the same manner. For maximum utility Visual Basic applications can be used to interface with module's database using DDE connectivity.

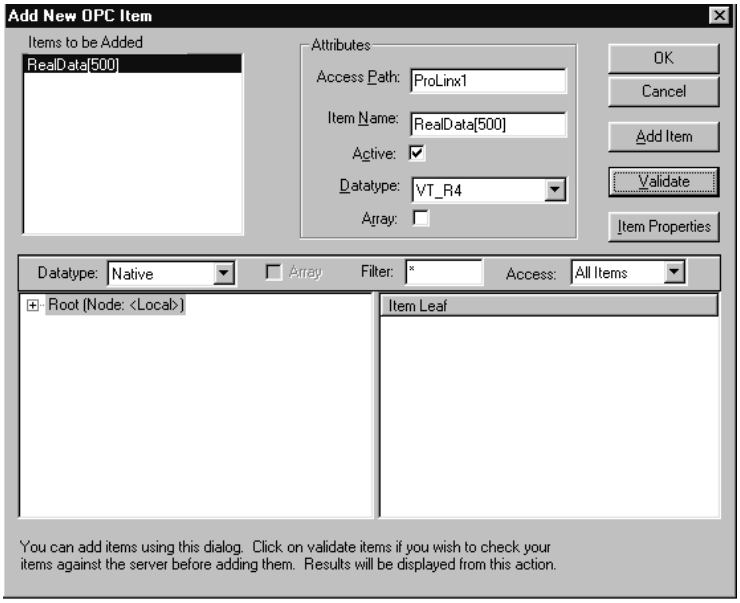
5.7.9 OPC Connection

This section discusses setting up an OPC connection to the module in order to transfer data between the module and an OPC compliant client. Follow the instructions for setting up the DDE connection outlined in the previous section. This will define the connection required by the OPC server. RSLinx will now be configured to interface with an OPC client application.

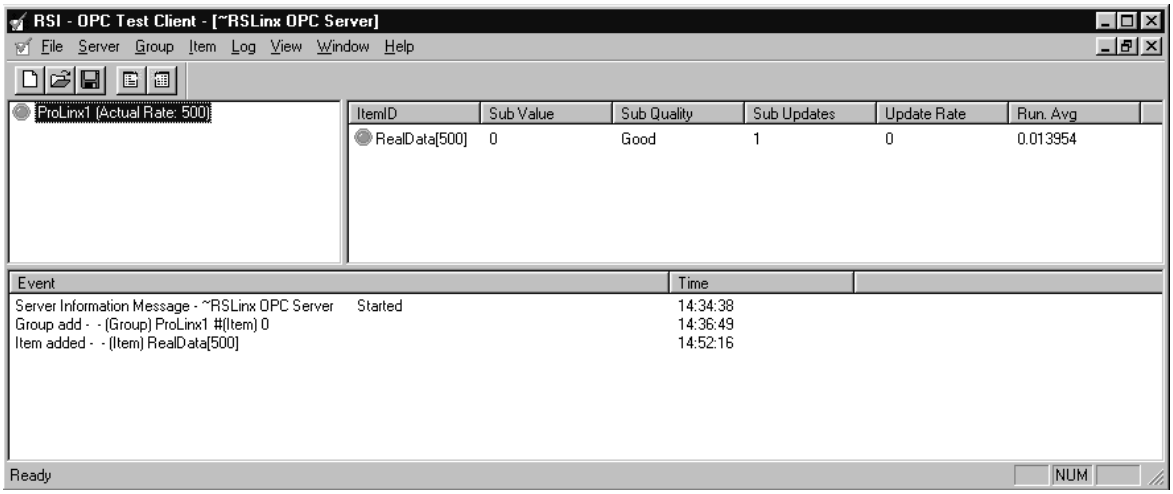
The example used in this section uses the OPC test client (opctest.exe) available from . First start the application and select the Connect… option from the Server Menu. In the dialog box shown, select the RSLinx OPC server. Next add a group using the Group menu option and fill in the Group Name using any name that is meaningful for the points to be monitored and controlled. The following dialog displays an example:



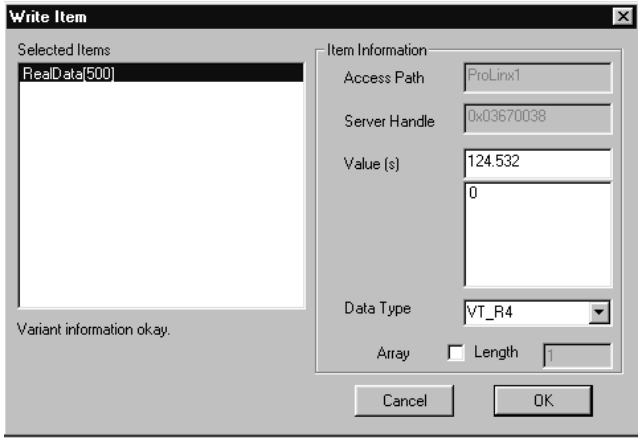
Next, add items to the client. The following shows an example dialog used to add a floating-point data item:



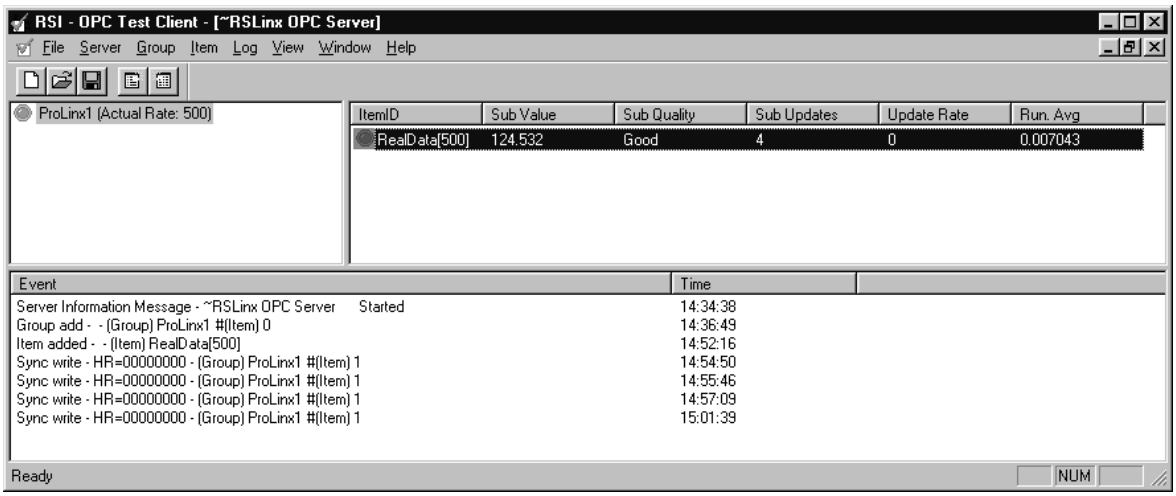
It is important to set the Access Path value to the Topic name assigned in RSLinx and to set the Item Name to a valid controller tag in the DFNT module. The Datatype parameter must be set to match that of the controller tag. In the example shown, the VT_R4 data type is selected for the floating-point tag. The Validate button can be used to verify that the point is valid in the OPC server. After configuring the new data item, click OK to add the point. The new item should be displayed in the item and event windows as shown in the following display:



You have now connected an OPC client to data in the DFNT module. In order to change the value for the item, select the Sync Write option from the Item menu and enter a new value as shown in the following dialog box:



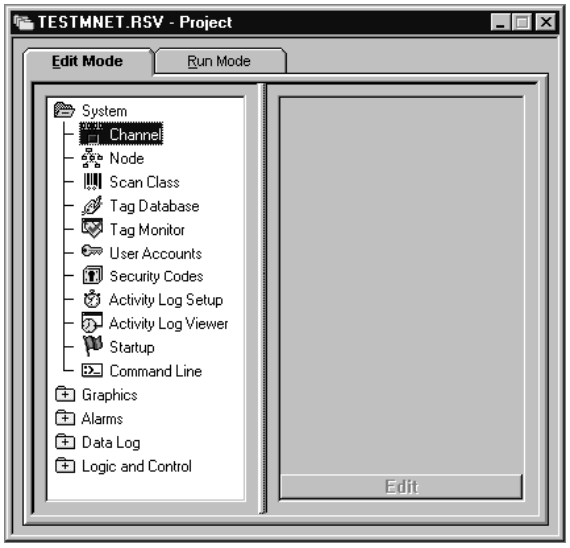
After selecting the Ok button, the new value is transferred to the module and updated in the item data window as shown in the following example:



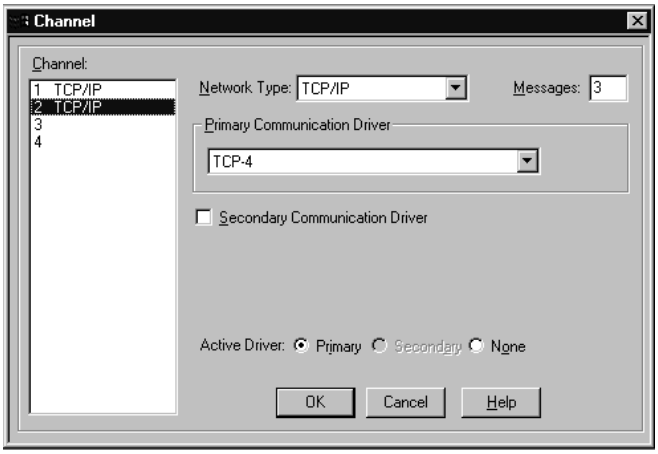
5.7.10 RSView Software

RSView is a client application for building user interfaces to control systems. This tool requires RSLinx to be loaded and operational (refer to the RSLinx section of this document). In order to interface RSView to a DFNT module, the following steps are required:

First select the **Channel** option from the **Edit Mode** tab as shown in the following window.

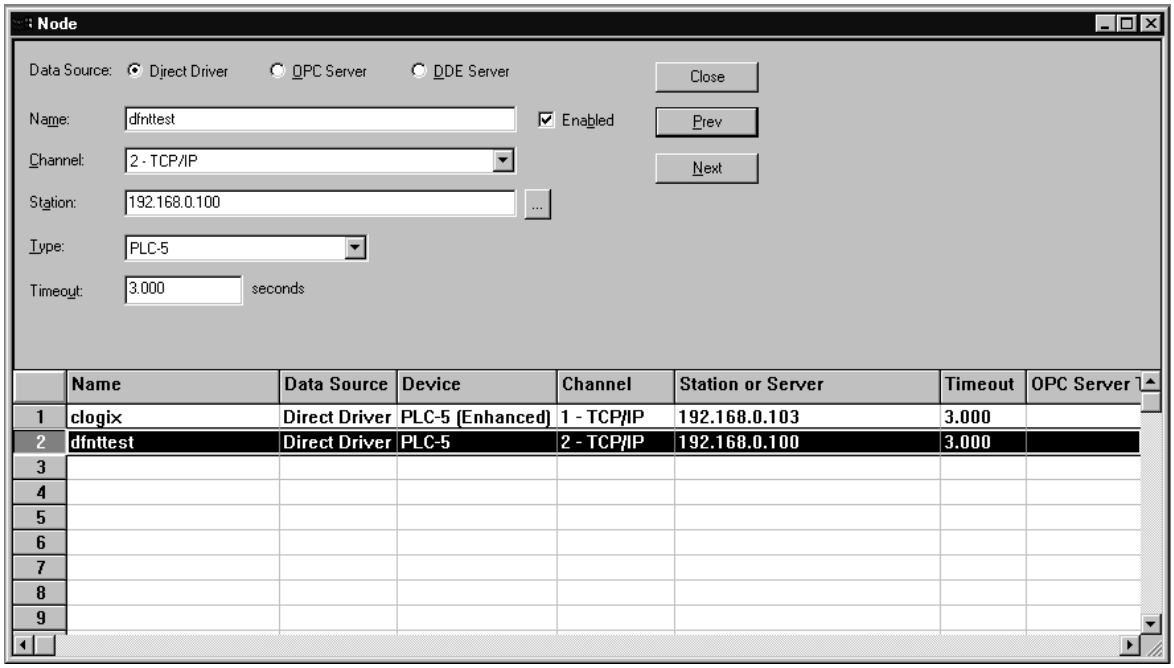


After selecting the option, the following dialog box is displayed:



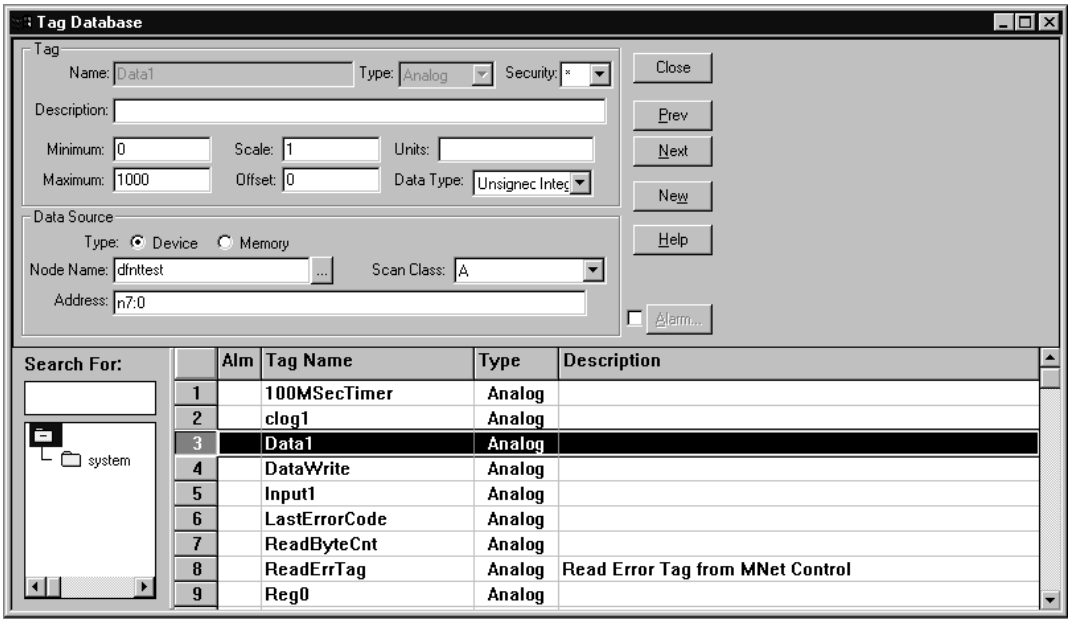
Select the **Network Type** and **Primary Communication Driver** for the channel to be associated with the DFNT module. The **Network Type** should be TCP/IP and the **Primary Communication Driver** name should match that set up in RSLinx. Click OK to save the information.

Next select the **Node** option from the **Edit Mode** tab. After selecting the option, the following dialog box is displayed:



Enter a record in the dialog box for the DFNT module to be addressed. The **Name** field identifies the module to the RSView system. The **Channel** parameter should be that defined in the channel set up defined above. The **Station** parameter should be set to the IP address of the DFNT module. Select the **Close** button after completing the node entry. If your version of the RSView supports ControlLogix controller tag read and write operations, select the device type consistent with the ControlLogix processor. This will permit direct access to the controller tags simulated in the module. Use of controller tags simplifies handling of the data in RSView as the data will be passing in the correct data format (that is, bit, word, float).

Next select the **Tag Database** option from the **Edit Mode** tab. After selecting the option, the following dialog box is displayed:



Set up tags for each element to be transferred between RSView and the DFNT module. In the example above, **Data1** is associated with the first element in the DFNT module's database (N7:0). A tag should be setup for each register in the module's database to be interfaced. If RSView is set in run mode, values for the tags should match those in the module's database. Use the module controller tag names if using CIP data table read and write operations.

Refer to the RSView documentation for a full discussion of database tags and reading and writing data between RSView and a processor.

5.7.11 ControlLogix (CLX) Processor

In order to exchange data between a ControlLogix processor and the module, the MSG instruction is used. There are two basic methods of data transfer supported by the module when using the MSG instruction: Encapsulated PCCC messages and CIP Data Table messages. Either method can be used, and the selection is left to the application developer.

Encapsulated PCCC Messages

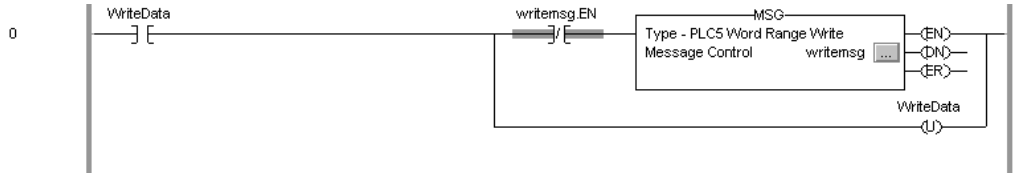
5 and SLC5/05 processors containing an Ethernet interface use the encapsulated PCCC message method. The module simulates these devices and accepts both read and write commands. The following topics describe the support for the read and write operations.

Encapsulated PCCC Write Commands

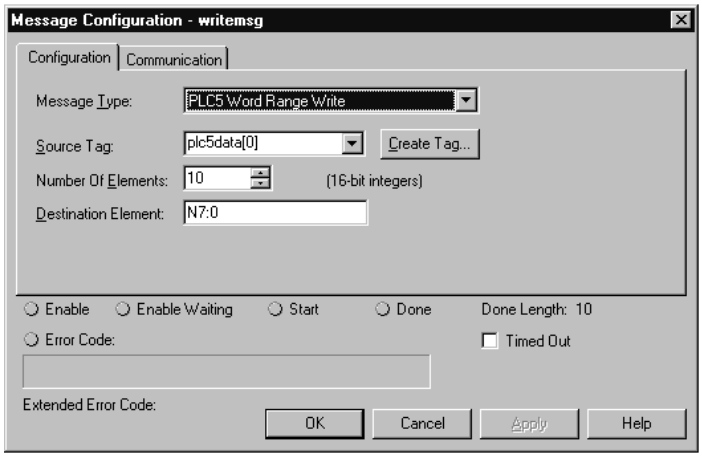
Write commands transfer data from the ControlLogix processor to the module. The following encapsulated PCCC commands are supported from a ControlLogix Processor:

- PLC2 Unprotected Write
- PLC5 Typed Write
- PLC5 Word Range Write
- PLC Typed Write

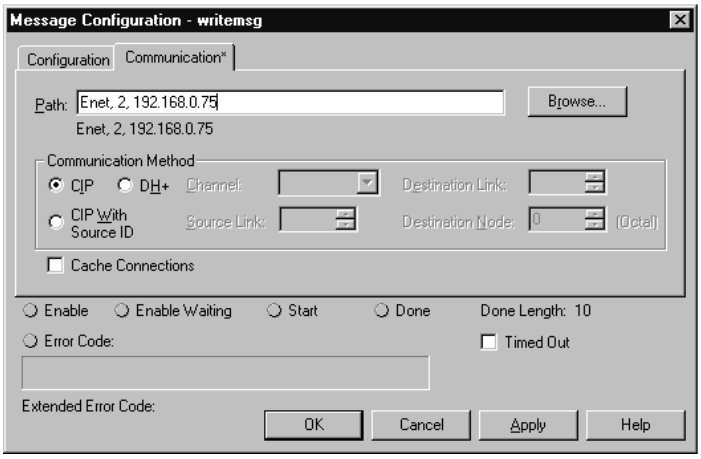
An example rung used to execute a write command is shown in the following diagram:



The **Message Configuration** dialog box must be completed to define the data set to be transferred from the processor to the module. An example of the dialog box follows:



Complete the dialog box for the data area to be transferred. For PLC5 and SLC messages, the **Destination Element** should be an element in a data file (that is, N7:0). For the PLC2 Unprotected Write message, the **Destination Element** is the address in the module's internal database and cannot be set to a value less than ten. This is not a limitation of the module but of the RSLogix software. For a PLC2 unprotected write or read function, the database address should be entered in octal format. Additionally, the **Communication** information must also be configured. The following is an example of the dialog box.



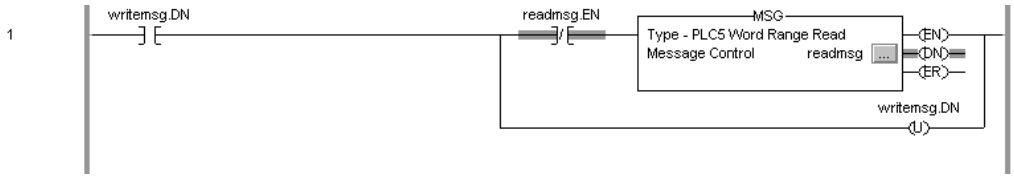
Verify that the **CIP** radio-button is selected as the **Communication Method**. The **Path** specifies the message path from the ControlLogix processor to the module. In the example shown, the path is from the processor to the Enet module (1756-ENET module in slot 2), the 2 represents the Ethernet port on the 1756-ENET module and the last portion of the path is the IP address of the DFNT module to reach (192.168.0.75). More complex paths are possible if routing to other networks using multiple 1756-ENET modules and racks. Refer to the Knowledge Document 10803, Control Logix Gateway: Ethernet Communications for a full discussion of Ethernet routing and path definition.

Encapsulated PCCC Read Commands

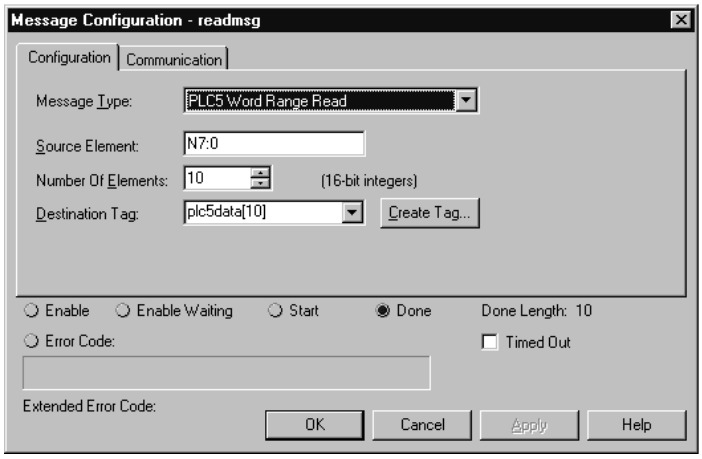
Read commands transfer data from the module to a ControlLogix processor. The following encapsulated PCCC commands are supported from a ControlLogix Processor:

- PLC2 Unprotected Read
- PLC5 Typed Read
- PLC5 Word Range Read
- PLC Typed Read

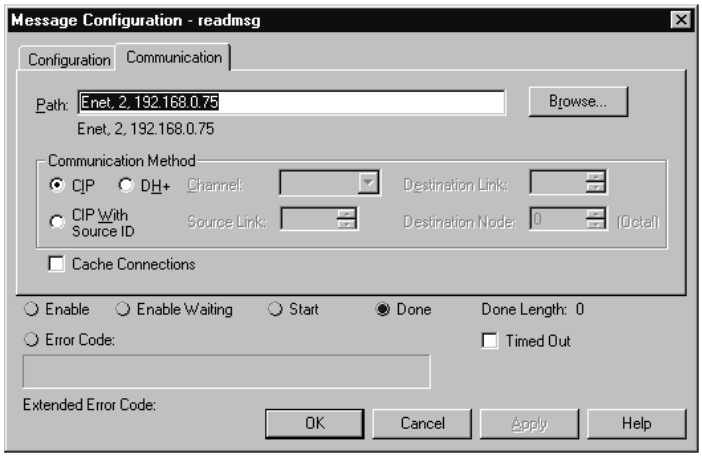
An example rung used to execute a read command is shown in the following diagram:



The **Message Configuration** dialog box must be completed to define the data set to transfer to the processor from the module. An example of the dialog box follows:



Complete the dialog box for the data area to be transferred. For PLC5 and SLC messages, the **Source Element** should be an element in a data file (that is, N7:0). For the PLC2 Unprotected Read message, the **Source Element** is the address in the module's internal database and cannot be set to a value less than ten. This is not a limitation of the module but of the RSLogix software. Additionally, the **Communication** information must also be configured. An example of the dialog box follows:



Verify that the **CIP** radio-button is selected as the **Communication Method**. The **Path** specifies the message path from the ControlLogix processor to the module. In the example above, the path is from the processor to the Enet module (1756-ENET module in slot 2), the 2 represents the Ethernet port on the 1756-ENET module and the last portion of the path is the IP address of the DFNT module to reach (192.168.0.75).

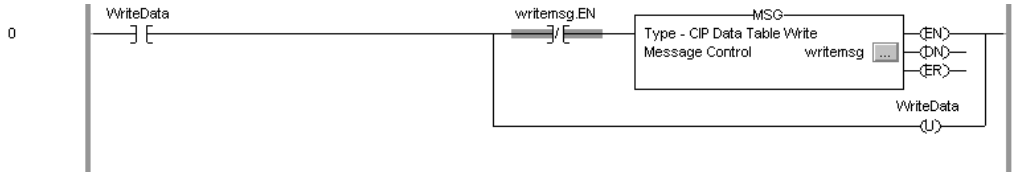
More complex paths are possible if routing to other networks using multiple 1756-ENET modules and racks. Refer to the Knowledge Document 10803, Control Logix Gateway: Ethernet Communications for a full discussion of Ethernet routing and path definition.

CIP Data Table Operations

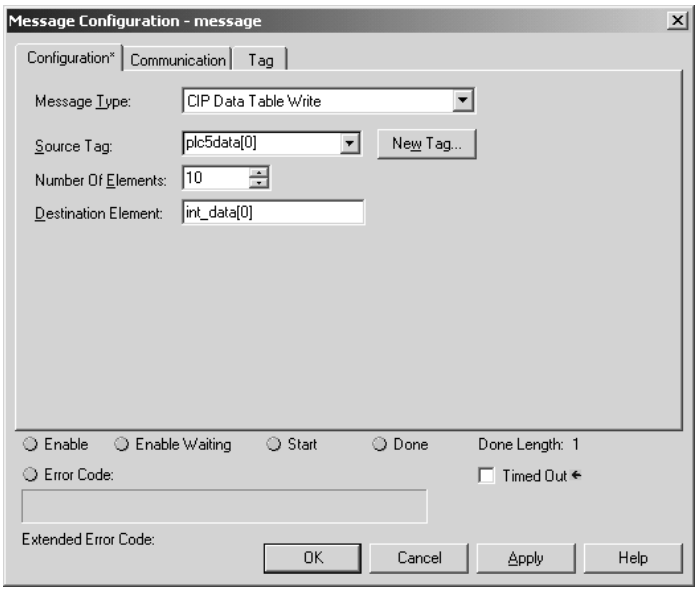
This method of data transfer uses CIP messages to transfer data between the ControlLogix processor and the module. Tag names define the elements to be transferred. The following topics describe the support for the read and write operations.

CIP Data Table Write

CIP data table write messages transfer data from the ControlLogix processor to the DFNT module. An example rung used to execute a write command is shown in the following diagram:



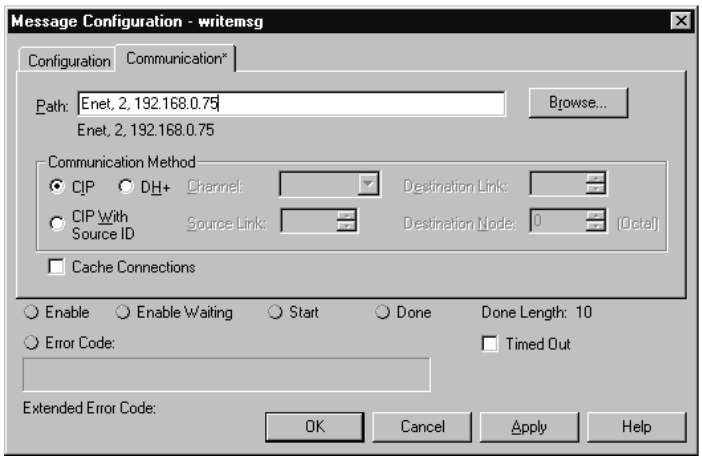
The **Message Configuration** dialog box must be completed to define the data set to be transferred from the processor to the module. An example of the dialog box follows:



Complete the dialog box for the data area to be transferred. CIP Data Table messages require a tag database element for both the source and destination. The **Source Tag** is a tag defined in the ControlLogix Tag database. The **Destination Element** is the tag element in the DFNT module.

The module simulates a tag database as an array of elements defined by the maximum register size for the module (user configuration parameter "Maximum Register" in the [Module] section) with the tag name **int_data**.

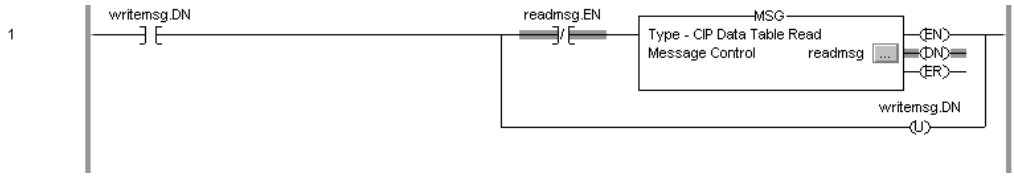
In the previous example, the first element in the database is the starting location for the write operation of ten elements. Additionally, the **Communication** information must also be configured. An example of the dialog box follows:



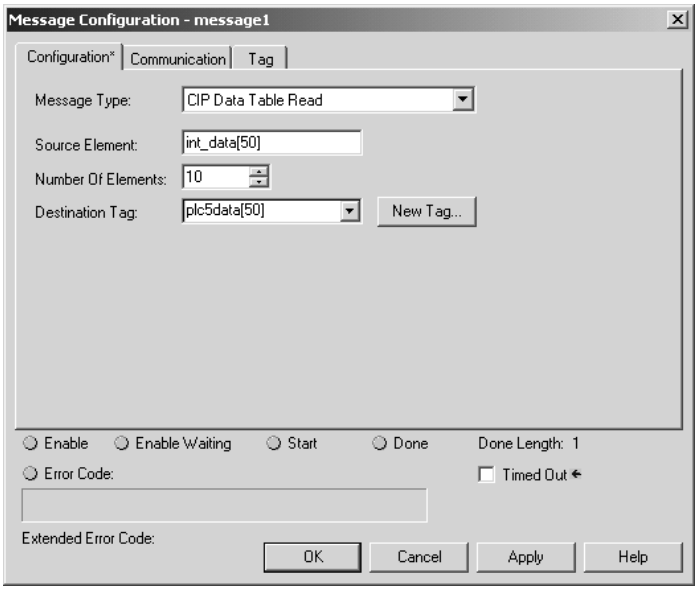
Verify that the **CIP** radio-button is selected as the **Communication Method**. The **Path** specifies the message path from the ControlLogix processor to the module. In the example above, the path is from the processor to the Enet module (1756-ENET module in slot 2), the 2 represents the Ethernet port on the 1756-ENET module and the last portion of the path is the IP address of the DFNT module to reach (192.168.0.75). More complex paths are possible if routing to other networks using multiple 1756-ENET modules and racks. Refer to the Knowledge Document 10803, Control Logix Gateway: Ethernet Communications for a full discussion of Ethernet routing and path definition.

CIP Data Table Read

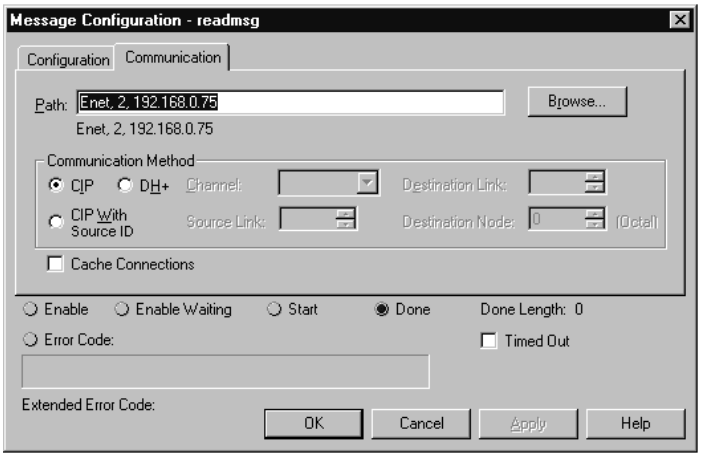
CIP data table read messages transfer data to the ControlLogix processor from the DFNT module. An example rung used to execute a read command is shown:



The **Message Configuration** dialog box must be completed to define the data set to transfer to the processor from the module. An example of the dialog box follows:



Complete the dialog box for the data area to be transferred. CIP Data Table messages require a tag database element for both the source and destination. The **Destination Tag** is a tag defined in the ControlLogix Tag database. The **Source Element** is the tag element in the DFNT module. The module simulates a tag database as an array of elements defined by the maximum register size for the module (user configuration parameter "Maximum Register" in the [Module] section) with the tag name **int_data**. In the example above, the first element in the database is the starting location for the read operation of ten elements. Additionally, the **Communication** information must also be configured. An example of the dialog box follows:



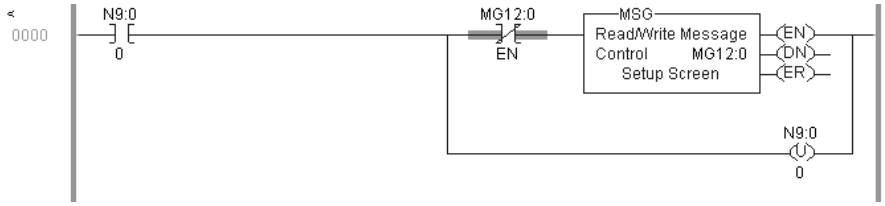
Verify that the **CIP** radio-button is selected as the **Communication Method**. The **Path** specifies the message path from the ControlLogix processor to the module. In the example above, the path is from the processor to the Enet module (1756-ENET module in slot 2), the 2 represents the Ethernet port on the 1756-ENET module and the last portion of the path is the IP address of the DFNT module to reach (192.168.0.75). More complex paths are possible if routing to other networks using multiple 1756-ENET modules and racks. Refer to the Knowledge Document 10803, Control Logix Gateway: Ethernet Communications for a full discussion of Ethernet routing and path definition.

5.7.12 PLC5 Processor

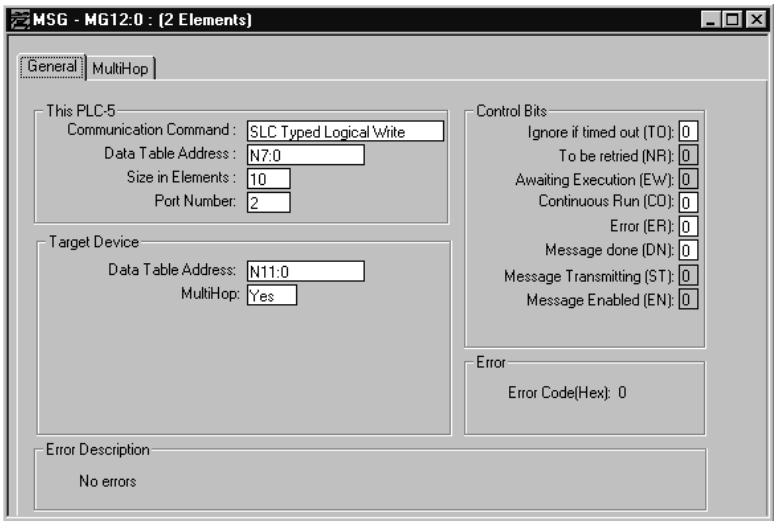
The module can be used to receive messages from a PLC5 containing an Ethernet interface. The module supports both read and write commands. A discussion of each operation is provided in the following topics:

PLC5 Write Commands

Write commands transfer data from the PLC5 processor to the DFNT module. An example rung used to execute a write command is shown in the following diagram:



In order to complete the configuration of the MSG instruction, select the **Setup Screen** area of the MSG object. This displays the following dialog box.

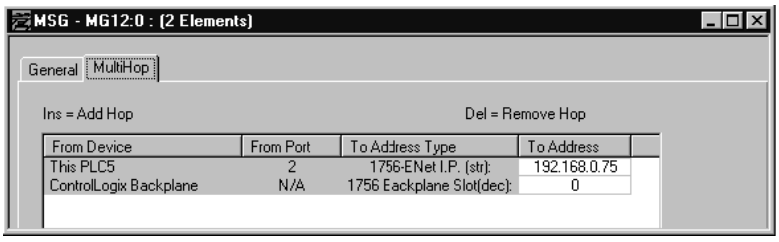


Select the **Communication Command** to execute from the following list of supported commands.

- PLC5 Type Write
- PLC2 Unprotected Write
- PLC5 Typed Write to PLC
- PLC Typed Logical Write

The **Target Device Data Table Address** must be set to a valid file element (that is, N11:0) for SLC and PLC5 messages. For the PLC2 Unprotected Write message, set the address to the database index (that is, 1000) to consider with the command.

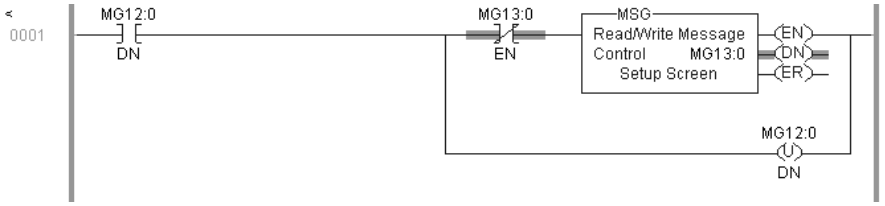
The **MultiHop** option must be set to **Yes**. The **MultiHop** tab portion of the dialog box must be completed as shown in the following window:



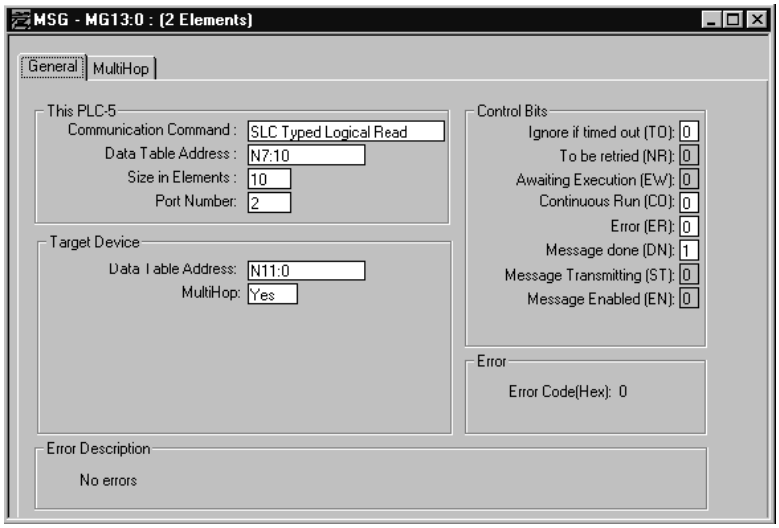
The IP address corresponds to that set in the module's WATTCP.CFG file. The slot number should be set to zero.

PLC5 Read Commands

Read commands transfer data to the PLC5 processor from the DFNT module. An example rung used to execute a read command is shown in the following diagram:



In order to complete the configuration of the MSG instruction, select the **Setup Screen** area of the MSG object. This displays the following dialog box.



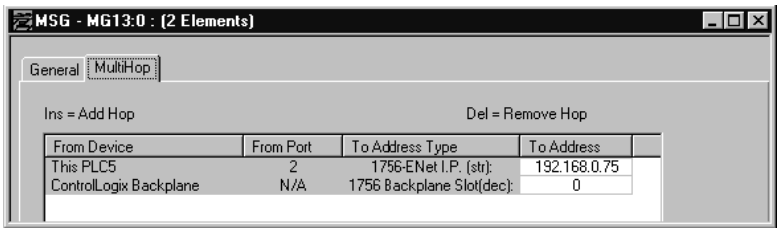
Select the **Communication Command** to execute from the following list of supported commands.

- PLC5 Type Read

- PLC2 Unprotected Read
- PLC5 Typed Read to PLC
- PLC Typed Logical Read

The **Target Device Data Table Address** must be set to a valid file element (that is, N11:0) for SLC and PLC5 messages. For the 2 Unprotected Read message, set the address to the database index (that is, 1000) to consider with the command.

The **MultiHop** option must be set to **Yes**. The **MultiHop** tab portion of the dialog box must be completed as shown in the following window:



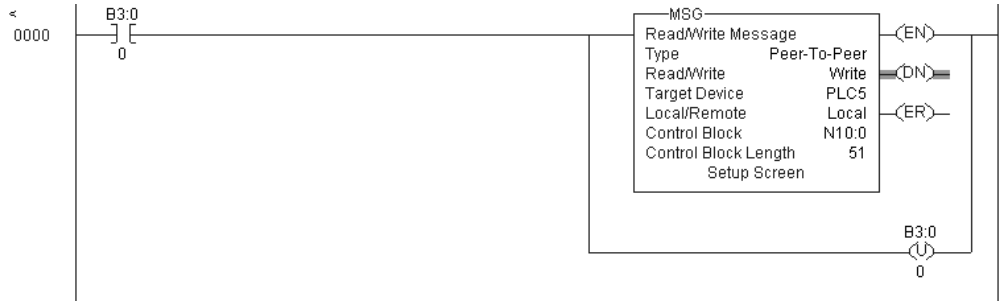
The IP address corresponds to that set in the module's WATTCP.CFG file. The slot number should be set to zero.

5.7.13 SLC 5/05 Processor

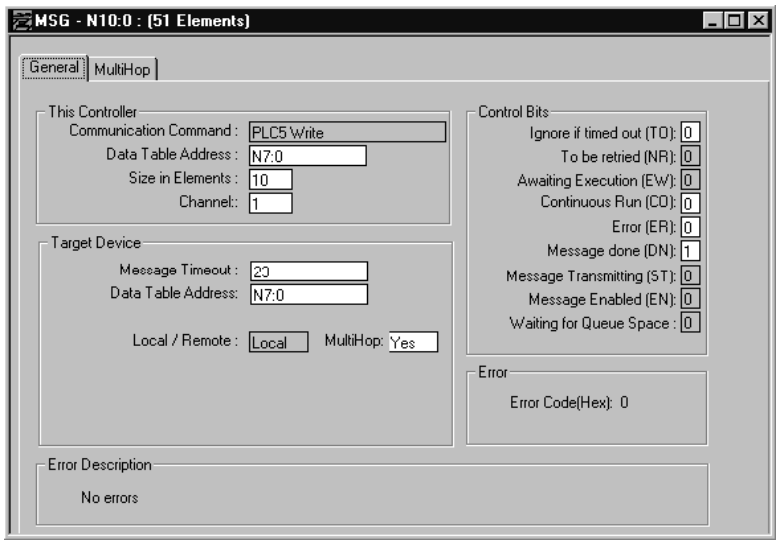
The module can be used to receive messages from a SLC 5/05 containing an Ethernet interface. The module supports both read and write commands. A discussion of each operation is provided in the following topics.

SLC5/05 Write Commands

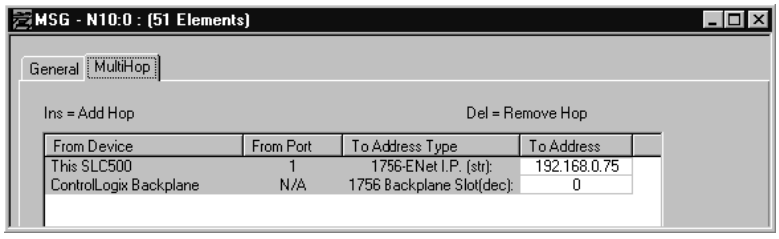
Write commands transfer data from the SLC processor to the DFNT module. An example rung used to execute a write command is shown in the following diagram:



Set the **Read/Write** parameter to **Write**. The module supports a **Target Device** parameter value of **500CPU** or **PLC5**. In order to complete the configuration of the MSG instruction, select the **Setup Screen** area of the MSG object. This displays the following dialog box.



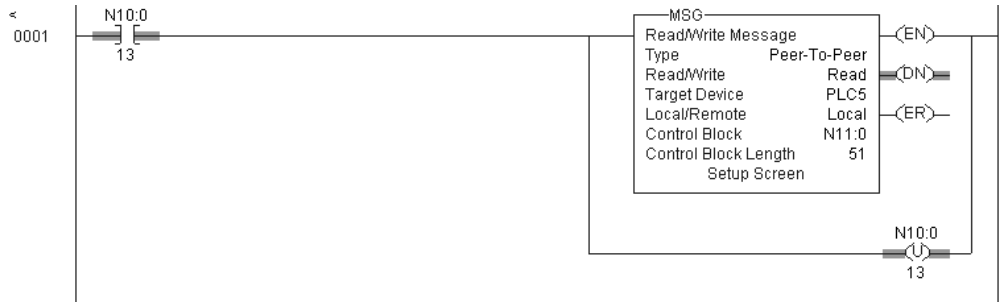
The **Target Device Data Table Address** must be set to a valid file element (that is, N11:0) for SLC and PLC5 messages. The **MultiHop** option must be set to **Yes**. The **MultiHop** tab portion of the dialog box must be completed as displayed in the following window:



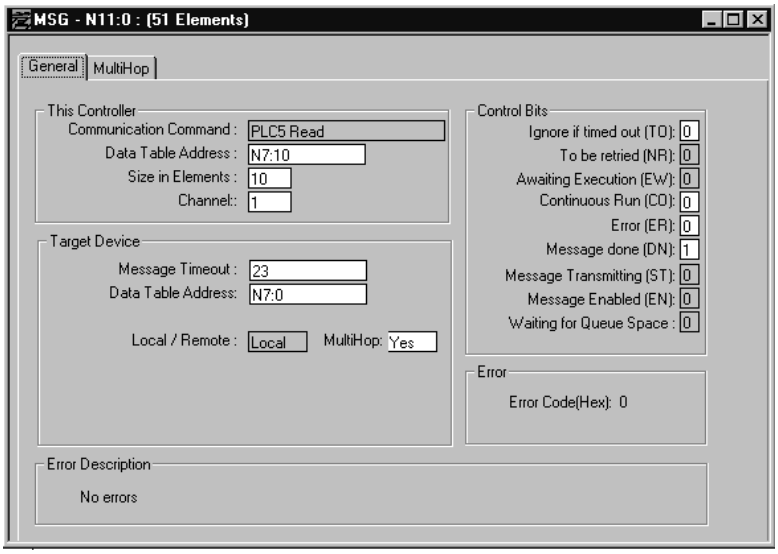
The IP address corresponds to that set in the module's WATTCP.CFG file. The slot number should be set to zero.

SLC5/05 Read Commands

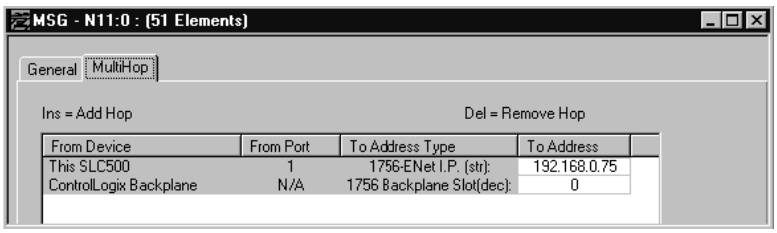
Read commands transfer data to the SLC processor from the DFNT module. An example rung used to execute a read command is shown in the following diagram:



Set the **Read/Write** parameter to **Read**. The module supports a **Target Device** parameter value of **500CPU** or **PLC5**. In order to complete the configuration of the MSG instruction, select the **Setup Screen** area of the MSG object. This displays the following dialog box.



The **Target Device Data Table Address** must be set to a valid file element (that is, N11:0) for SLC and SLC5 messages. The **MultiHop** option must be set to **Yes**. The **MultiHop** tab portion of the dialog box must be completed as displayed in the following window:



The IP address corresponds to that set in the module's WATTCP.CFG file. The slot number should be set to zero.

5.7.14 DFNT Command Entry Form

The following form can be used to design the application's command list:

Module Information Data						Device Information Data						
Column #	1	2	3	4	5	6	7	8	9	10	11	12
Function Code	Enable Code	Internal Address	Poll Interval Time	Count	Swap Code	IP Address	Slot Number	Function Code	Function Parameters			

Module Information Data						Device Information Data						
Column #	1	2	3	4	5	6	7	8	9	10	11	12
Function Code	Enable Code	Internal Address	Poll Interval Time	Count	Swap Code	IP Address	Slot Number	Function Code	Function Parameters			

IP Address = IP address of processor to reach
Slot Number = -1 for PLC5 & SLC, processor slot number of ControlLogix 5550

5.8 DFCM Reference

5.8.1 Serial Port Protocol Error/Status Data

The second and most thorough troubleshooting method for debugging the operation of the DFCM driver (and the module in general) is the powerful Debug port on the module which provides much more complete access to the internal operation and status of the module. Accessing the Debug capabilities of the module is accomplished easily by connecting a PC to the Debug port and loading a terminal program such as ProSoft Configuration Builder or Hyperterminal.

Viewing Error and Status Data

The following topics describe the register addresses that contain protocol error and status data. Viewing the contents of each register is accomplished using the Database View option. The use of this option and its associated features are described in detail in the ProLinx Reference Guide.

DF1 Error and Status Data Area Addresses

DF1 error and status data are stored in registers based on the DF1 port configuration. Starting register addresses are shown in the following table.

DF1 Port	Starting Address
0	6300
1	6700
2	7100
3	7500

Note: None of the addresses are available in the DF1 address range. In order to view them, the data must be moved using the Data Map section of the configuration file. Refer to Moving Data (page 50) for an example of how to move data to the DF1 address range.

DF1 Ports - Error/Status Data

The serial port (DF1 Master/Slave) Error and Status Data areas are discussed in this section. The Error Status Pointer value is configured in the CFG file within each of the individual [DF1 PORT X] sections.

The data area is initialized with zeros whenever the module is initialized. This occurs during a cold-start (power-on), reset (reset push-button pressed) or a warm-boot operation (commanded or loading of new configuration).

Example Internal Database Address	Offset	Description
6300	0	Number of Command Requests
6301	1	Number of Command Responses
6302	2	Number of Command Errors
6303	3	Number of Requests
6304	4	Number of Responses
6305	5	Number of Errors Sent
6306	6	Number of Errors Received
6307	7	Configuration Error Word
6308	8	Current Error Code
6309	9	Last Error Code

Refer to the following Error Codes section to interpret the status/error codes present in the data area.

Master Port: Command Errors

The individual command errors for each master port are returned to the address locations specified in the following table.

DF1 Port	Address Range
0	6310 to 6409
1	6710 to 6809
2	7110 to 7209
3	7510 to 7609

The first word in the register location defined contains the status/error code for the first command in the port's command list. Each successive word in the command error list is associated with the next command in the list.

Refer to Error Codes to interpret the status/error codes present in the data area.

Example DF1 Port 1 Command List Errors

Internal Database Address (Example)	Offset	Description
6310	0	Command #0 Error Status
6311	1	Command #1 Error Status
6312	2	Command #2 Error Status
6313	3	Command #3 Error Status
6314	4	Command #4 Error Status

Internal Database Address (Example)	Offset	Description
	.	.
	.	.
	.	.
6407	97	Command #97 Error Status
6408	98	Command #98 Error Status
6409	99	Command #99 Error Status

Note that the values in the Command List Error Status tables are initialized to zero (0) at power-up, cold boot and during warm boot.

Master Port: DF1 Slave List Status

Each slave polled in the command list on the DF1 master ports has a reserved word value for a status code. This status data list can be read using the Configuration/Debug Port and can be placed in the module's internal database. The first word in the register location defined contains the status code for the DF1 slave node address 0. Each successive word in the list is associated with the next node up to slave node 255.

Slaves attached to the master port can have one of the following states:

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

Slaves are defined to the system when the module initializes the master command list. Each slave defined will be set to a state value of 1 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 (**Error Delay Counter** value in the 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 1. This will enable polling of the slave.

The individual Slave List Status errors for each DF1 port are returned to the address locations specified in the following table.

DF1 Port	Address Range
0	6410 to 6665
1	6810 to 7065
2	7210 to 7465
3	7610 to 7865

Example DF1 Port 1 Slave List Status Example

Internal Database Address (Example)	Offset	Description
6410	0	Slave #0 Status
6411	1	Slave #1 Status
6412	2	Slave #2 Status
6413	3	Slave #3 Status
6414	4	Slave #4 Status
	.	.
	.	.
	.	.
6663	253	Slave #253 Status
6664	254	Slave #254 Status
6665	255	Slave #255 Status

The example addresses shown above assumes DF1 Port 1. Note that each master port will have one of these status data blocks available in the internal database, each individually located with a separate address.

Note that the values in the Slave List Status tables are initialized to zero (0) at power-up, cold boot and during warm boot.

5.8.2 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:

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

Code (Int)	Code (Hex)	Description
1536	0x0600	Duplicate node detected
1792	0x0700	Station is offline
2048	0x0800	Hardware fault

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)

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

Code (Int)	Code (Hex)	Description
-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
-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

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

5.8.3 DF1 Configuration Error Word

DF1 Configuration Error Word errors are stored in protocol-specific registers. The following table lists the Port/Register Address configuration.

DF1 Port	Configuration Error Word Register
0	6307
1	6707
2	7107
3	7507

A register containing a code indicates a problem with the configuration. The following table lists the codes, a description of the problem, and parameters to correct the error condition within the configuration file.

Bit	Code	Description
0	0x0001	Invalid Enabled parameter (Yes or No)
1	0x0002	Invalid RS-Interface parameter (0 to 2)
2	0x0004	Invalid Type (Master or Slave)
3	0x0008	Invalid Protocol (RTU or ASCII)
4	0x0010	Invalid Baud Rate
5	0x0020	Invalid Parity (None, Odd, Even)
6	0x0040	Invalid Data Bits (7 or 8 bits)
7	0x0080	Invalid Stop Bits (1 or 2)
8	0x0100	Invalid Use CTS Line (Yes or No)
9	0x0200	Retry Count Invalid (0 to 10)

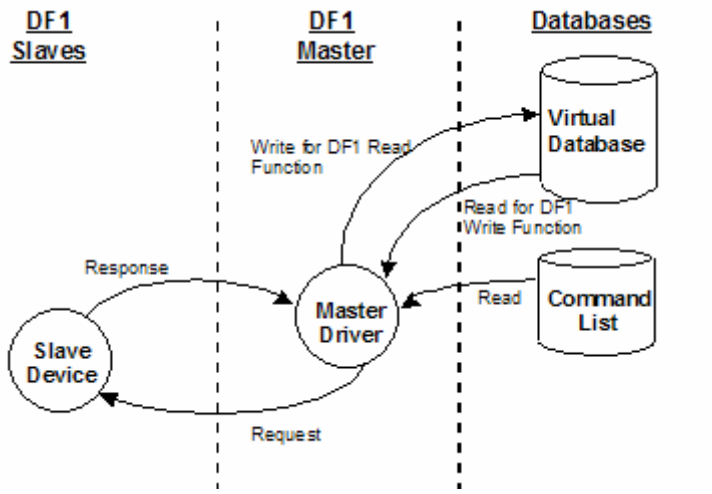
Bit	Code	Description
10	0x0400	Invalid Floating Point Data: Float Flag not Yes or No Float Start less than 0 or Float Offset is Invalid
11	0x0800	Invalid Internal Slave ID (1 to 255) (Slave Only)
12	0x1000	Invalid Entry for Register Offset Data (Slave Only)
13	0x2000	Reserved
14	0x4000	Reserved
15	0x8000	Reserved

5.8.4 DF1 Command Set For ProSoft Technology Communication Modules

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 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. 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.

Command Function Codes

This section describes DFNT 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
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

Column	Parameter	Description	Parameter
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.	
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.	

Column	Parameter	Description	Parameter
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.	
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.	

Column	Parameter	Description	Parameter
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.	
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.	

Column	Parameter	Description	Parameter
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).	

Column	Parameter	Description	Parameter
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.

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

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.

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.

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.

5.8.5 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

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

1 Product Version Number
2 System architecture
3 Network details

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

1 Module configuration and contents of file
   - Module Operation
   - Configuration/Debug status information
   - LED patterns

2 Information about the processor and user data files as viewed through and LED patterns on the processor.
3 Details about the serial devices interfaced, if any.

6.1 How to Contact Us: Technical Support

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

Asia Pacific

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

Europe (location in Toulouse, France)

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

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

+1.661.716.5100, support@prosoft-technology.com
Languages spoken include: English, Spanish
*For technical support calls within the United States, an after-*hours *answering system allows pager access to one of our qualified technical and/or application support engineers at any time to answer your questions.*

Brasil (location in Sao Paulo)

+55-11-5084-5178 , eduardo@prosoft-technology.com
Languages spoken include: Portuguese, English

6.2 Return Material Authorization (RMA) Policies and Conditions

The following RMA Policies and Conditions (collectively, "RMA Policies") apply to any returned Product. These RMA Policies are subject to change by ProSoft without notice. For warranty information, see "Limited Warranty". In the event of any inconsistency between the RMA Policies and the Warranty, the Warranty shall govern.

6.2.1 All Product Returns:

a) In order to return a Product for repair, exchange or otherwise, the Customer must obtain a Returned Material Authorization (RMA) number from ProSoft and comply with ProSoft shipping instructions.
b) In the event that the Customer experiences a problem with the Product for any reason, Customer should contact ProSoft Technical Support at one of the telephone numbers listed above (page 179). 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 181)". 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 182) 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.

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