ProSoft® TECHNOLOGY

Where Automation Connects.

ProLinx®

ProLinx DNPS

ProLinx Gateway

DNP 3.0 Slave

December 01, 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
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

UL/cUL	ISA 12.12.01 Class I, Div 2 Groups A, B, C, D
cUL	C22.2 No. 213-M1987

243333 183151

CL I Div 2 GPs A, B, C, D

Temp Code T5

II 3 G

Ex nA nL IIC T5 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 Gateways with Ethernet Ports

Series C ProLinx™ Gateways 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 ProLinx Plus gateway 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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ProSoft Technology® 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-ROM, and are available at no charge from our web site: www.prosoft-technology.com

Printed documentation is available for purchase. Contact ProSoft Technology for pricing and availability.

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Guide to the ProLinx DNPS User Manual

Function		Section to Read	Details
Introduction (Must Do)	→	Start Here (page 9)	This Section introduces the customer to the gateway. Included are: package contents, system requirements, hardware installation, and basic configuration.
Diagnostic and Troubleshooting	→	Diagnostics and Troubleshooting (page 31)	This section describes Diagnostic and Troubleshooting procedures.
Reference Product Specifications Functional Overview	→	Reference (page 41) Functional Overview (page 50) Product Specifications (page 41)	These sections contain general references associated with this product, Specifications, and the Functional Overview.
Support, Service, and Warranty Index	→	Support, Service and Warranty (page 79)	This section contains Support, Service and Warranty information. Index of chapters.

1 Start Here

In This Chapter

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 ProLinx Reference Guide

The *ProLinx Reference Guide* on the ProSoft Solutions CD-ROM provides detailed information on the entire range of ProLinx modules. If you have any questions that are not answered in the DNPS User Manual, please refer to the *ProLinx Reference Guide*.

1.2 Install ProSoft Configuration Builder Software

You must install the ProSoft Configuration Builder (PCB) software to configure the gateway. 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.
4 Save the file to your Windows 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 gateway.

To install ProSoft Configuration Builder from the Product CD-ROM

1. Insert the ProSoft Solutions Product CD-ROM into the CD-ROM drive of your PC. Wait for the startup screen to appear.
2. On the startup screen, click **PRODUCT DOCUMENTATION**. This action opens a Windows Explorer file tree 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 gateway.
4. Double-click the **SETUPCONFIGURATIONTOOL** folder, double-click the **"PCB_*.EXE"** file and follow the instructions on your screen to install the software on your PC. The information represented by the "*****" character in the file name is the PCB version number and, therefore, subject to change as new versions of PCB are released.

> **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.

1.2.1 Using the Online Help

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.

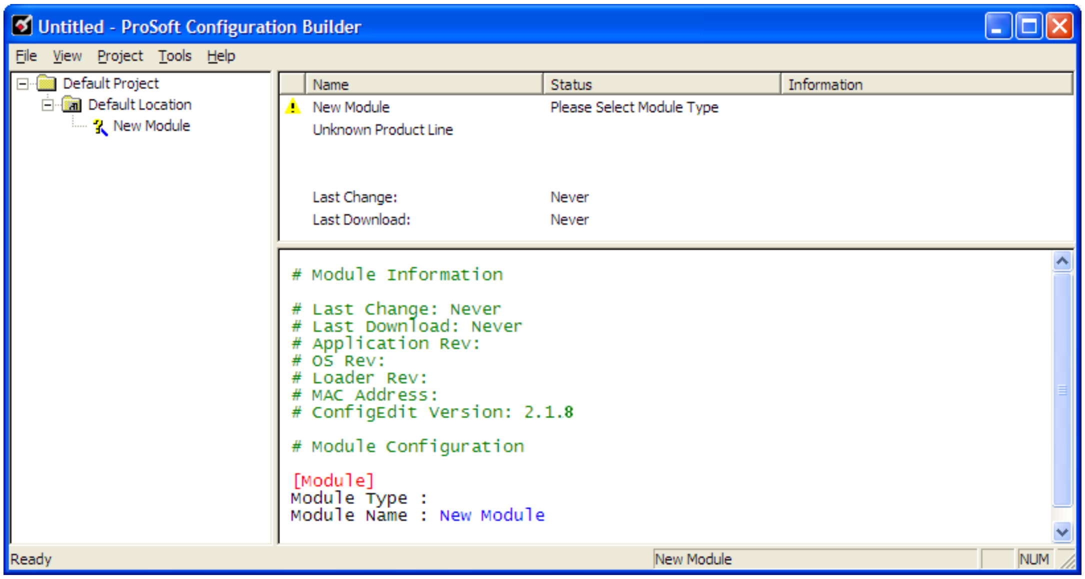
To view the help pages, start ProSoft Configuration Builder, open the **HELP** menu, and then choose **CONTENTS.**

1.3 Using ProSoft Configuration Builder

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

1.3.1 Set Up the Project

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



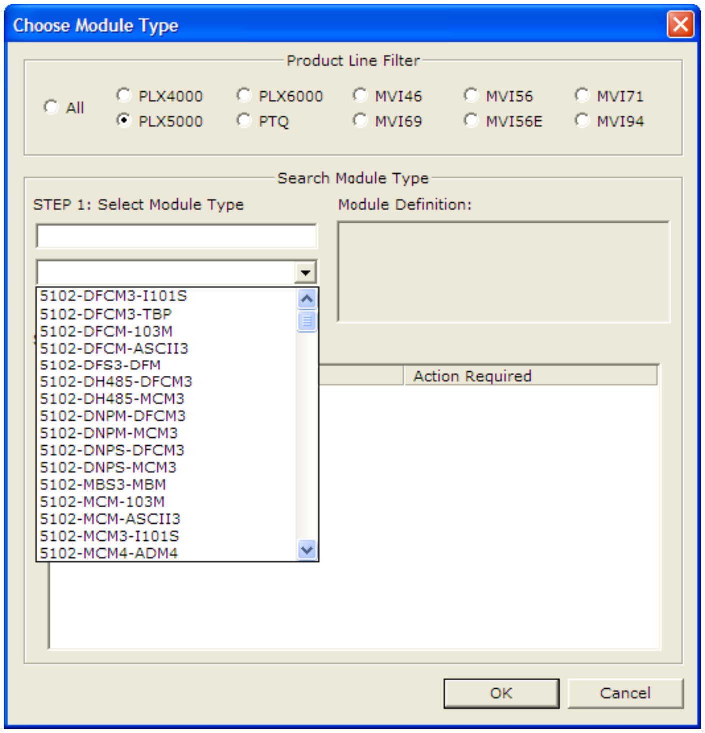
Name	Status	Information
New Module	Please Select Module Type	
Unknown Product Line		
Last Change:	Never	
Last Download:	Never	

```
# Module Information

# Last Change: Never
# Last Download: Never
# Application Rev:
# OS Rev:
# Loader Rev:
# MAC Address:
# ConfigEdit Version: 2.1.8

# Module Configuration

[Module]
Module Type :
Module Name : New Module
```

Your first task is to add the ProLinx DNPS 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.

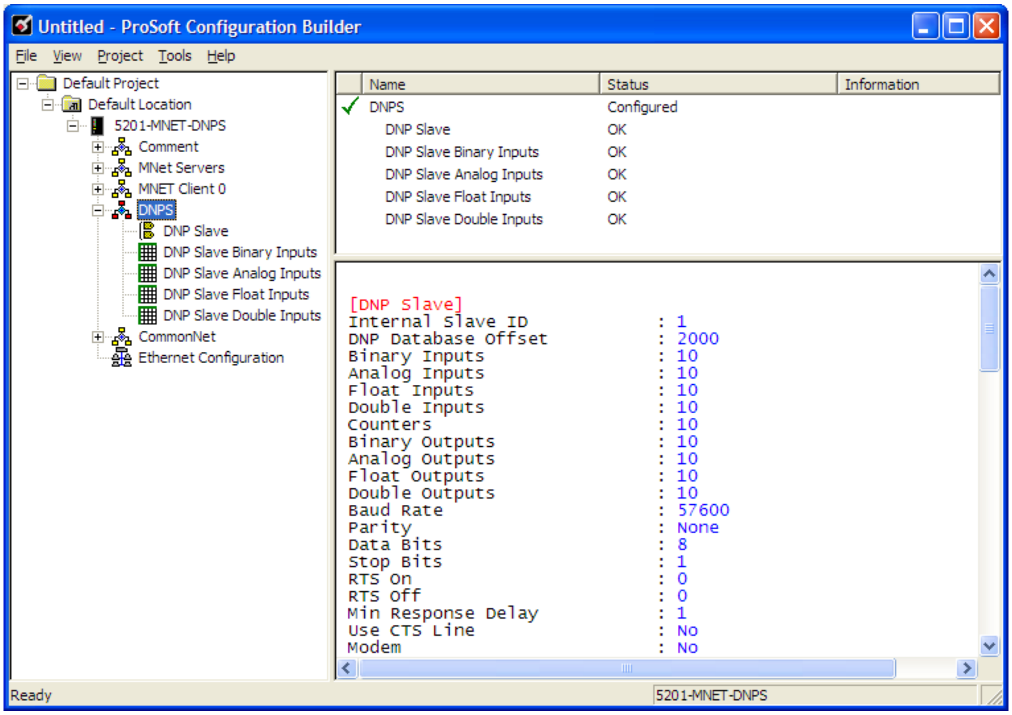


3 In the **PRODUCT LINE FILTER** area of the dialog box, select **PROLINX GATEWAY.** In the **SELECT MODULE TYPE** dropdown list, select **PROLINX DNPS**, and then click **OK** to save your settings and return to the **PROSOFT CONFIGURATION BUILDER** window.

The next task is to set the module parameters.

1.3.2 Set Module Parameters

Notice that the contents of the information pane and the configuration pane changed when you added the ProLinx DNPS module to the project.



Name	Status	Information
✓ DNPS	Configured	
DNP Slave	OK	
DNP Slave Binary Inputs	OK	
DNP Slave Analog Inputs	OK	
DNP Slave Float Inputs	OK	
DNP Slave Double Inputs	OK	

```
[DNP Slave]
Internal Slave ID              : 1
DNP Database Offset            : 2000
Binary Inputs                  : 10
Analog Inputs                  : 10
Float Inputs                   : 10
Double Inputs                  : 10
Counters                       : 10
Binary Outputs                 : 10
Analog Outputs                 : 10
Float Outputs                  : 10
Double Outputs                 : 10
Baud Rate                      : 57600
Parity                         : None
Data Bits                      : 8
Stop Bits                      : 1
RTS On                         : 0
RTS Off                        : 0
Min Response Delay             : 1
Use CTS Line                   : No
Modem                          : No
```

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.

To Configure Module Parameters

1 Click on the plus sign next to the icon to expand gateway information.
2 Double-click the 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.

Printing a Configuration File

1 Select the **MODULE** icon, and then click the right mouse button to open a shortcut menu.
2 On the shortcut menu, choose **VIEW CONFIGURATION.** This action opens the **VIEW CONFIGURATION** window.
3 On the **VIEW CONFIGURATION** window, open the **FILE** menu, and choose **PRINT.** This action opens the **PRINT** dialog box.
4 On the **PRINT** dialog box, choose the printer to use from the dropdown list, select printing options, and then click **OK.**

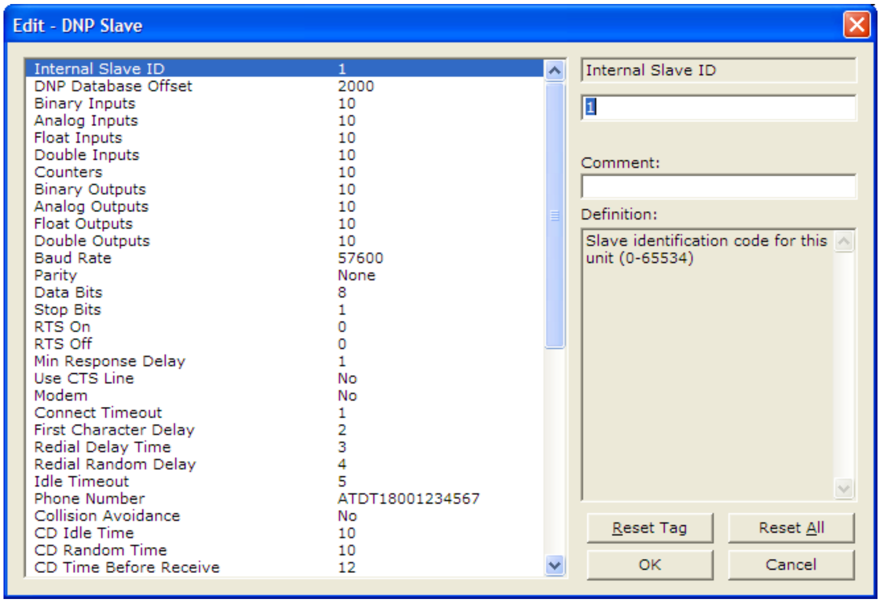
1.4 DNPS Protocol Configuration

1.4.1 [DNP Slave]

This section provides information required to configure a slave application with the module. Most entries contained within this section are self explanatory.

> Note: A limitation of the DNP slave driver is that all points defined in the module slave database must fit within one Class 0 poll. The maximum packet size for a Class 0 poll is 2048 bytes. A DNP Message Size Calculator is available on the ProSoft Technology web site. This calculator will help you ensure that the packet size fits within this requirement.

The following example shows a sample [DNP Slave] section:



Internal Slave ID	1
DNP Database Offset	2000
Binary Inputs	10
Analog Inputs	10
Float Inputs	10
Double Inputs	10
Counters	10
Binary Outputs	10
Analog Outputs	10
Float Outputs	10
Double Outputs	10
Baud Rate	57600
Parity	None
Data Bits	8
Stop Bits	1
RTS On	0
RTS Off	0
Min Response Delay	1
Use CTS Line	No
Modem	No
Connect Timeout	1
First Character Delay	2
Redial Delay Time	3
Redial Random Delay	4
Idle Timeout	5
Phone Number	ATDT18001234567
Collision Avoidance	No
CD Idle Time	10
CD Random Time	10
CD Time Before Receive	12

Internal Slave ID

1

Comment:

Definition:

Slave identification code for this unit (0-65534)

Internal Slave ID

0 to 65534

This is the DNP address for the module. All messages with this address from the master will be processed by the module.

DNP Database Offset

0 to 3999

Offset in which to place DNP data.

Binary Inputs

0 to 500

Number of words for digital input points to configure in the DNP slave device. Each word contains 16 binary input points.

Analog Inputs

0 to 500

Number of analog input points to configure in the DNP slave device. Each point will occupy a one-word area in the module memory.

Float Inputs

0 to 250 points

Number of floating point input points to configure in the DNP slave device. Each point will occupy a two-word area in the module's memory.

Double Inputs

0 to 125 points

Number of double floating point input points to configure in the DNP slave device. Each point will occupy a four word area in the module's memory.

Counters

0 to 250

Number of counter points to configure in the DNP slave device. Each point will occupy a two-word area in the module memory. This number corresponds to the number of frozen counters. The application maps the counters to the frozen counters directly.

Binary Outputs

0 to 500

Number of words for digital output points to configure in the DNP slave device. Each word contains 16 binary output points.

Analog Outputs

0 to 500

Number of analog output points to configure in the DNP slave device. Each point will occupy a one-word area in the module memory.

Float Outputs

0 to 250 points

Number of floating point output points to configure in the DNP slave device. Each point will occupy a two-word area in the module's memory.

Double Outputs

0 to 125 points

Number of double floating point output points to configure in the DNP slave device. Each point will occupy a four-word area in the module's memory.

Baud Rate

This is the baud rate to be used on the port. Enter the baud rate as a value. For example, to select 19K baud, enter 19200.

Baud Rate	**Parameter Value**
110	110
150	150
300	300
600	600
1200	12 or 1200
2400	24 or 2400
4800	48 or 4800
9600	96 or 9600
19,200	19, 192 or 19200
28,800	28, 288 or 28800
57,600	57 or 576
115,200	115 or 1152

Parity

None, Odd, Even

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

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

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 re-synchronize, use two stop bits.

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

RTS On

0 to 65535 milliseconds

This parameter sets the number of milliseconds to delay after Ready To Send (RTS) is asserted before 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.

Min Response Delay

0 to 65535 milliseconds

Minimum time between receiving a request and transmitting a response. Allows master time to disable transmitter on an RS-485 network.

Use CTS Line

YES or **NO**

This parameter specifies if the Clear To Send (CTS) modem control line is to be used or not. 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 gateway will send data. Normally, this parameter is required when half-duplex modems are used for communication (2-wire). This procedure is commonly referred to as *hardware handshaking*.

Modem

Yes or No

This parameter defines if a dial-up modem is used on the DNP slave port. If the value is set to No, no modem is used. If the parameter is set to Yes, a modem is used.

Connect Timeout

0 to 65535

Defines the number of milliseconds to wait for the CD signal to be set high. The CD signal indicates a connection is made using a dial-up modem.

First Character Delay

0 to 65535

Defines the number of milliseconds to wait before sending the first message after the connection is first made. This delay only applies to the first packet sent to the modem.

Redial Delay Time

0 to 32000

Defines the minimum number of milliseconds to wait before a redial attempt is made by the slave.

Redial Random Delay

0 to 32000

Defines a random millisecond time range to be added to the redial delay time before the modem is accessed.

Idle Timeout

0 to 65535

Defines the number of milliseconds the modem is inactive before it will disconnect.

Phone Number

ASCII String Data

This field contains a null-terminated, ASCII character string used by the dial-up modem. The string must contain all characters required by the modem. An example string is ATDT1800222333. Maximum length is 34 bytes including the terminating 0.

Collision Avoidance

Yes or No

This parameter defines if the collision avoidance functionality is to be applied to the port. If the parameter is set to No, collision avoidance is not used. It will be used if set to Yes. If collision avoidance is used, it requires a special cable.

CD Idle Time

0 to 32000

Defines the minimum number of milliseconds to wait before transmitting a message after the CD signal is recognized as low.

CD Random Time

0 to 32000

Defines the range of random time to be added to the CD Idle Time before a message will be transmitted from the slave.

CD Time Before Receive

0 to 65535

Defines the number of milliseconds to wait before receiving characters after the CD signal is recognized as high.

BI Class

0 to 3

This parameter specifies the default class to be utilized for all the binary input points in the DNP database that are not defined in the override list section.

AI Class

0 to 3

This parameter specifies the default class to be utilized for all the analog input points in the DNP database that are not defined in the override list section.

Float Class

0 to 3

This parameter specifies the default class to be utilized for all the floating-point input points in the DNP database that are not defined in the override list section.

Double Class

0 to 3

Default class for double input events.

AO DB Trigger

Yes or No

Causes the last values to not match the database values when the DNP master sends an AO command to the module. This can be used to cause the module to issue a conditional write command on the other protocol interface, even if the value received is the same as received previously.

BO DB Trigger

Yes or No

Causes the last values to not match the database values when the DNP master sends a BO command to the module. This can be used to cause the module to issue a conditional write command on the other protocol interface, even if the value received is the same as received previously.

AI Deadband

0 to 32767

This parameter specifies the default deadband value assigned to all points not defined in the override list for the analog input point type in the DNP database.

Float Deadband

0 to maximum float value

This parameter specifies the default deadband value assigned to all points not defined in the override list for the floating-point input point type in the DNP database.

Double Deadband

0 to 100000

This parameter specifies the default deadband value assigned to all points not defined in the override list for the double float input point type in the DNP database.

Select/Operate Arm Time

1 to 65535 milliseconds

Time period after select command received in which operate command will be performed. Once the select command is received, the operate command will only be honored if it arrives within this period of time.

Write Time Interval

0 to 1440 minutes

Time interval to set the need time IIN bit (0=never), which will cause the master to write the time. Stored in milliseconds in the module memory.

Data Link Confirm Mode

Coded Value (N=Never, S=Sometimes, A=Always)

IED can request acknowledgement from master station when sending data. The codes are as follows: 0=Never, 1=Sometimes, 2=Always

Data Link Confirm Tout

1 to 65535 milliseconds

Time period to wait for Master Data Link confirmation of last frame sent. This time is in milliseconds. This parameter is only used if the frame is sent with confirmation requested.

Data Link Max Retry

0 to 255 retries

Maximum number of retries at the Data Link level to obtain a confirmation. If this value is set to 0, retries are disabled at the data link level of the protocol. This parameter is only used if the frame is sent with confirmation requested.

App Layer Confirm Tout

1 to 65535 milliseconds

Event data contained in the last response may be sent again if not confirmed within the millisecond time period set. If application layer confirms are used with data link confirms, ensure that the application layer confirm timeout is set long enough.

Unsolicited Response

Y or N

Set if the slave unit will send unsolicited response messages. If set to N, the slave will not send unsolicited responses. If set to Y, the slave will send unsolicited responses.

Class 1 Unsol Resp Min

1 to 255 events

Minimum number of events in Class 1 required before an unsolicited response will be generated.

Class 2 Unsol Resp Min

1 to 255 events

Minimum number of events in Class 2 required before an unsolicited response will be generated.

Class 3 Unsol Resp Min

1 to 255 events

Minimum number of events in Class 3 required before an unsolicited response will be generated.

Unsol Resp Delay

0 to 65535 milliseconds

Maximum number of 1 millisecond intervals to wait after an event occurs before sending an unsolicited response message. If set to 0, only use minimum number of events.

Uresp Master Address

0 to 65534

DNP destination address where unsolicited response messages are sent.

AI Events with time

Y or N

This parameter determines if the analog input events generated by the module will include the date and time of the event. If the parameter is set to N, the default is set to no time data. If the parameter is set to Y, the default object will include the time of the event.

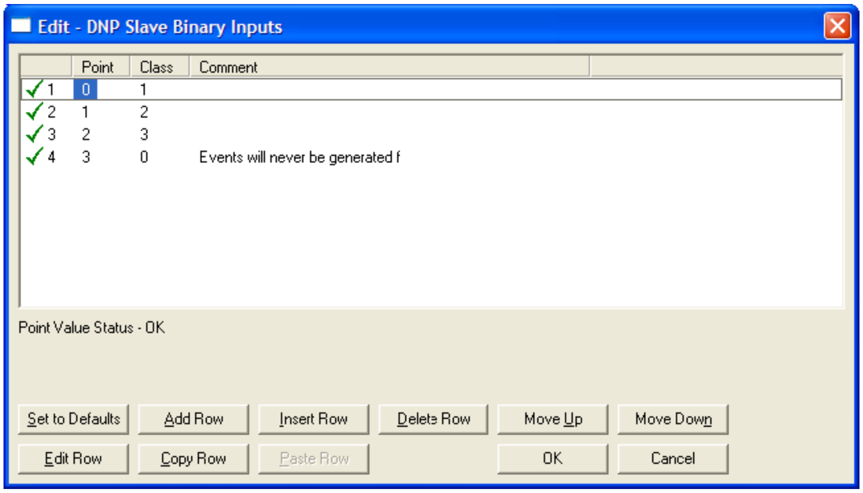
Time Sync Before Events

Y or N

This parameter determines if events are to be generated by the module before the time synchronization from the master unit. If the parameter is set to N, no events will be generated until the module's time has been synchronized. If the parameter is set to Y, events will always be generated.

1.4.2 [DNP Slave Binary Inputs]

This area is to override the class (2) binary input database points.



Edit - DNP Slave Binary Inputs

	Point	Class	Comment
✓ 1	0	1	
✓ 2	1	2	
✓ 3	2	3	
✓ 4	3	0	Events will never be generated f

Point Value Status - OK

Point #

This is the information object address of the point.

Class

Class 1 - Highest priority

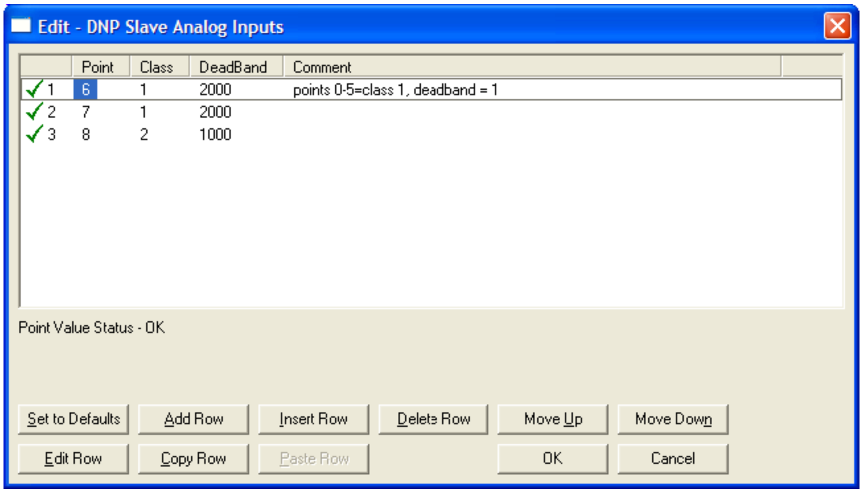
Class 2 - Middle priority

Class 3 - Lowest priority

0 - Disable.

1.4.3 [DNP Slave Analog Inputs]

This area is to override the class (3) and deadband for the integer analog input database. The point # is the offset from the start of the analog input database.



	Point	Class	DeadBand	Comment
✓ 1	6	1	2000	points 0-5=class 1, deadband = 1
✓ 2	7	1	2000	
✓ 3	8	2	1000	

Point Value Status - OK

Point #

This is the information object address of the point.

Class

Class 1 - Highest priority

Class 2 - Middle priority

Class 3 - Lowest priority

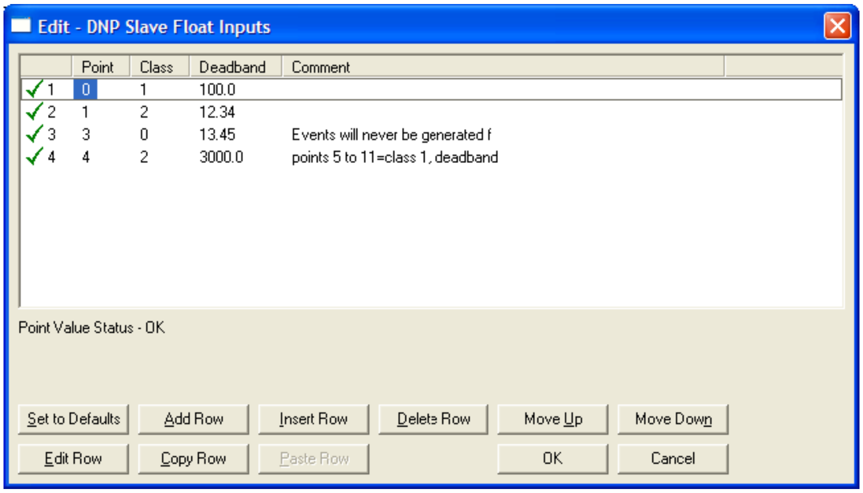
0 - Disable.

Deadband

A range of values within which the module will avoid generating events.

1.4.4 [DNP Slave Float Inputs]

This area is to override the class (3) and debased for the single float database. The point # is not the address in the analog database, but is the offset from the start of the single floating-point database.



	Point	Class	Deadband	Comment
✓ 1	0	1	100.0	
✓ 2	1	2	12.34	
✓ 3	3	0	13.45	Events will never be generated f
✓ 4	4	2	3000.0	points 5 to 11=class 1, deadband

Point Value Status - OK

Point #

This is the information object address of the point.

Class

Class 1 - Highest priority

Class 2 - Middle priority

Class 3 - Lowest priority

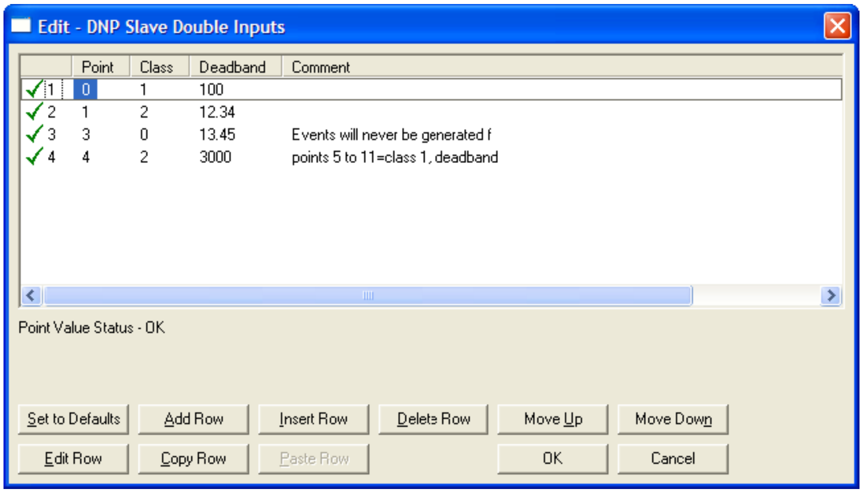
0 - Disable.

Deadband

A range of values within which the module will avoid generating events.

1.4.5 [DNP Slave Double Inputs]

This area is to override the class (3) and deadband for the double float database. The point # is not the address in the analog database, but is the offset from the start of the double floating-point database.



	Point	Class	Deadband	Comment
✓ 1	0	1	100	
✓ 2	1	2	12.34	
✓ 3	3	0	13.45	Events will never be generated f
✓ 4	4	2	3000	points 5 to 11=class 1, deadband

Point Value Status - OK

<u>Point #</u>

This is the information object address of the point.

<u>Class</u>

Class 1 - Highest priority

Class 2 - Middle priority

Class 3 - Lowest priority

0 - Disable.

<u>Deadband</u>

A range of values within which the module will avoid generating events.

1.4.6 Common Configuration

<u>Data Map</u>

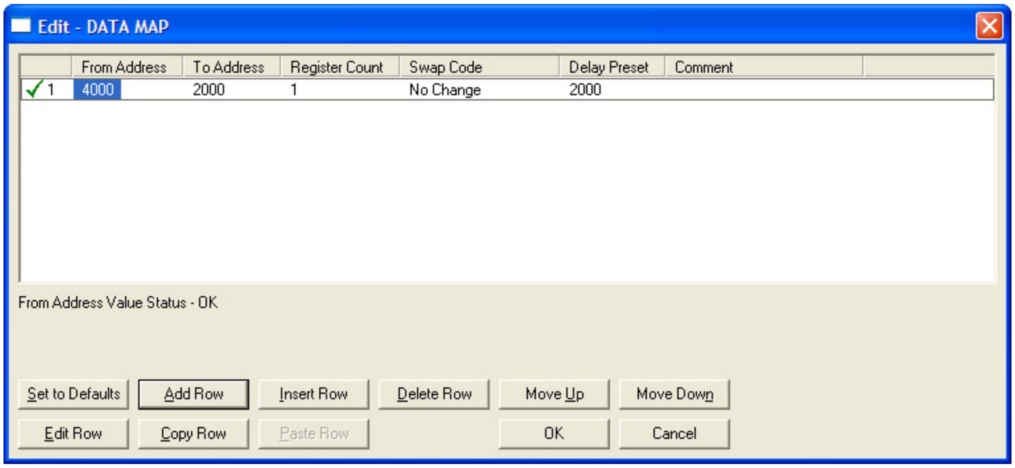
The **[DATA MAP]** section allows you to copy data between areas in the gateway's internal database.

You can copy to 100 registers at a time, and you can configure up to 200 separate copy commands.

For example, you can copy data from the error or status tables in upper memory to internal database registers in the User Data memory area.

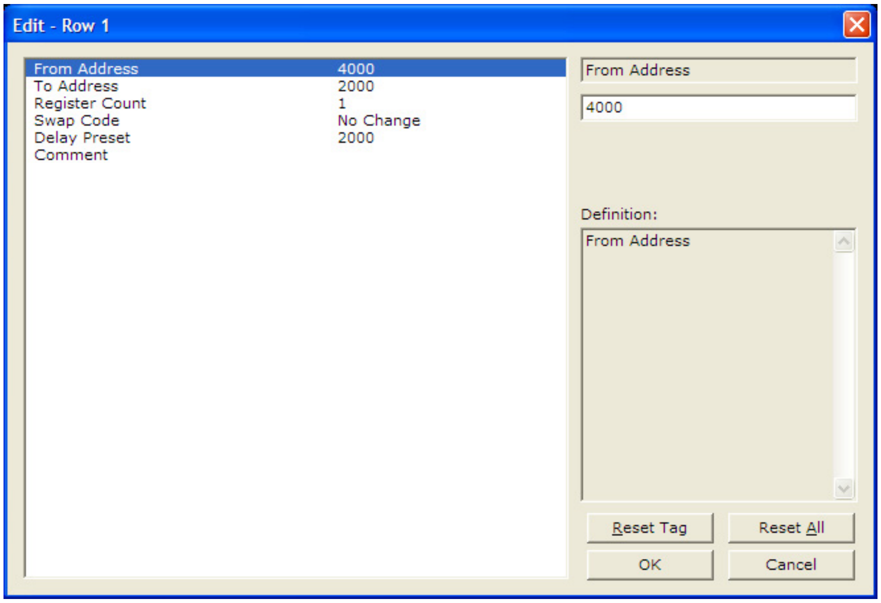
You can also rearrange the byte and/or word order during the copy process, for example, to convert floating-point values to the correct format for a different protocol.

You can also use the Data Map to condense widely dispersed data into one contiguous data block, making it easier to access.


Edit - DATA MAP

	From Address	To Address	Register Count	Swap Code	Delay Preset	Comment
✓ 1	4000	2000	1	No Change	2000	

From Address Value Status - OK


Edit - Row 1

From Address	4000
To Address	2000
Register Count	1
Swap Code	No Change
Delay Preset	2000
Comment	

From Address

4000

Definition:

From Address

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 highest User Data Register Address

The destination for the copy is always within the User Data registers area. Take care to specify a destination address that will not overwrite data that may be required for other purposes.

Register Count

1 to 100

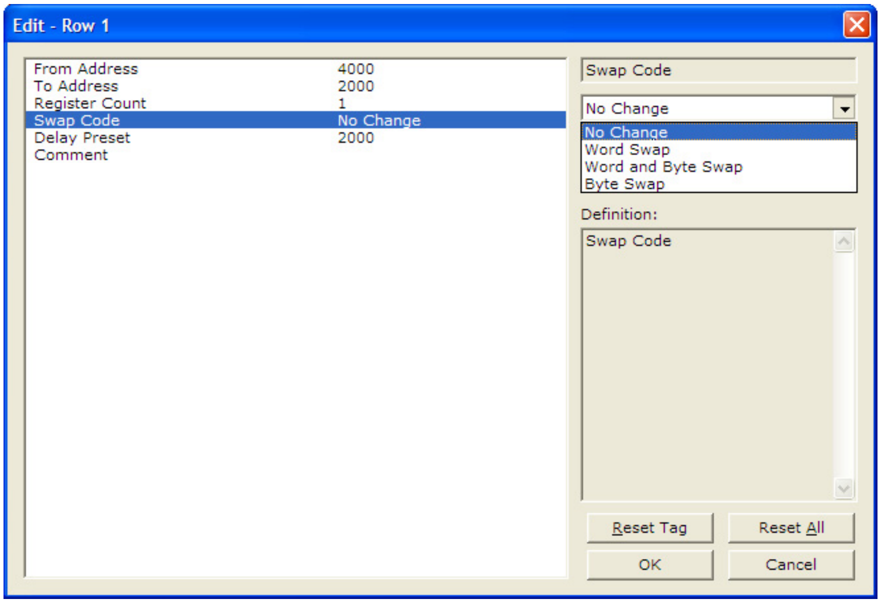
This parameter specifies the number of registers to copy.

Swap Code

No Change, Word Swap, Word and Byte Swap, Byte Swap

You may need to swap the order of the bytes in the registers during the copy process in order to change the 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:



Edit - Row 1

From Address	4000
To Address	2000
Register Count	1
Swap Code	No Change
Delay Preset	2000
Comment	

Swap Code

No Change

No Change
Word Swap
Word and Byte Swap
Byte Swap

Definition:

Swap Code

Swap Code	Description
No Swap	No Change is made in the byte ordering (1234 = 1234)
Word Swap	The words are swapped (1234=3412)
Word and Byte Swap	The words are swapped then the bytes in each word are swapped (1234=4321)
Bytes	The bytes in each word are swapped (1234=2143)

Delay Preset

This parameter sets an interval for each [Data Map] copy operation. The value you put for the Delay Preset is not a fixed amount of time. It is the number of firmware scans that must transpire between copy operations.

The firmware scan cycle can take a variable amount of time, depending on the level of activity of the protocol drivers running on the ProLinx gateway and the level of activity on the gateway's communications ports. Each firmware scan can take from 1 to several milliseconds to complete. Therefore, [Data Map] copy operations cannot be expected to happen at regular intervals.

If multiple copy operations (several rows in the [Data map] section) happen too frequently or all happen in the same update interval, they could delay the process scan of the gateway protocols, which could result in slow data updates or missed data on communications ports. To avoid these potential problems, you should set the Delay Preset to different values for each row in the [Data Map] section and set them to higher, rather than lower, numbers.

For example, Delay Preset values below 1000 could begin to cause a noticeable delay in data updates through the communications ports. And you should not set all Delay Presets to the same value. Instead, use different values for each row in the [Data Map] such as 1000, 1001, and 1002 or any other different Delay Preset values you like. This will prevent the copies from happening concurrently and prevent possible process scan delays.

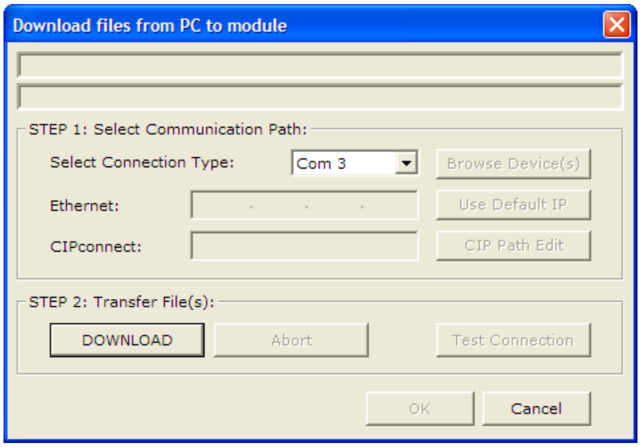
1.5 Download the Project to the Module

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

To Download the Project File

1 In the tree view in ProSoft Configuration Builder, click once to select the ProLinx DNPS module.

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



Download files from PC to module

STEP 1: Select Communication Path:

Select Connection Type: Com 3

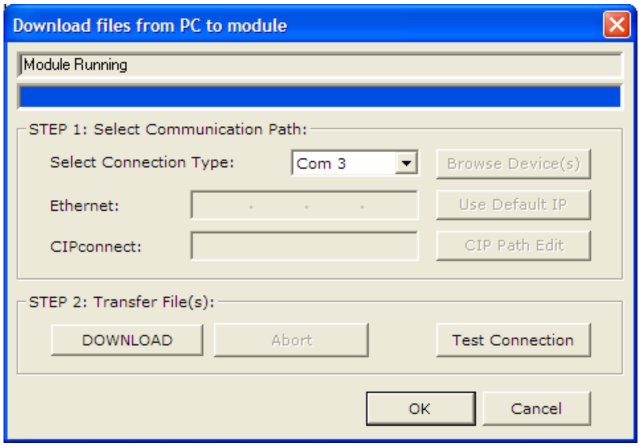
Ethernet:

CIPconnect:

STEP 2: Transfer File(s):

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

The module will perform a platform check to read and load its new settings. When the platform check is complete, the status bar in the **DOWNLOAD** dialog box with the message *"Module Running*".



Download files from PC to module

Module Running

STEP 1: Select Communication Path:

Select Connection Type: Com 3

Ethernet:

CIPconnect:

STEP 2: Transfer File(s):

2 Diagnostics and Troubleshooting

In This Chapter

There are two ways to troubleshoot ProLinx gateways: LEDs located on the front of the gateway, and a Debug port that provides a view into the gateway's internal database.

2.1 Requirements

In order to use the Debug capabilities of any ProLinx Module, you will need the following:

- A PC running ProSoft Configuration Builder or HyperTerminal software
- A Null Modem cable
- A Mini-DIN to DB-9M connector
- Configuration and executable files described earlier

2.1.1 The Configuration/Debug Menu

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

Because this is a text-based menu system, you enter commands by typing the command letter from your computer keyboard in the 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.

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:

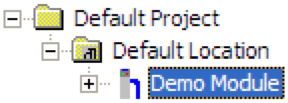
- 80486 based processor (Pentium preferred)

- 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.

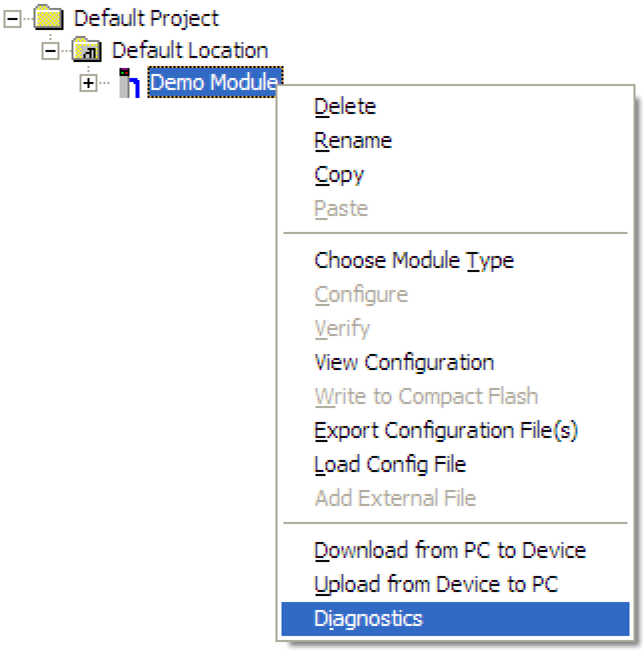
Using the Diagnostic Window in ProSoft Configuration Builder

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

1 Start PCB, and then select the module to test. Click the right mouse button to open a shortcut menu.

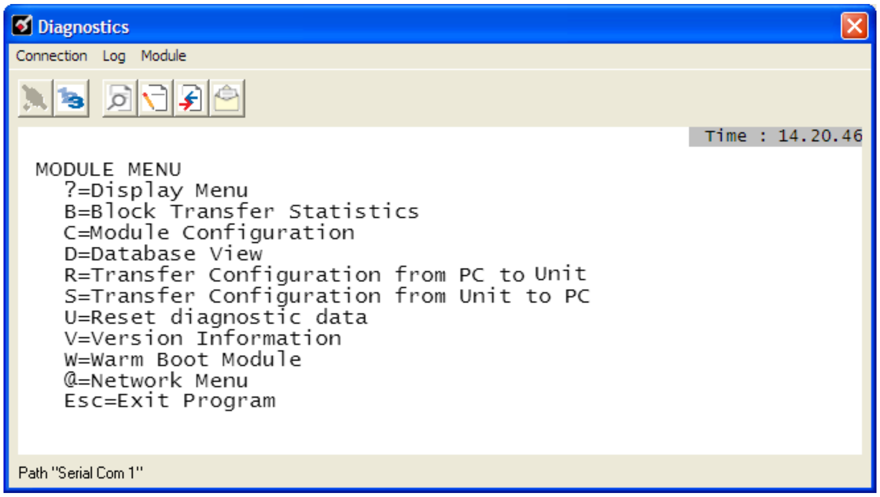


2 On the shortcut menu, choose **DIAGNOSTICS.**



This action opens the **DIAGNOSTICS** dialog box.

3 Press **[?]** to open the Main Menu.

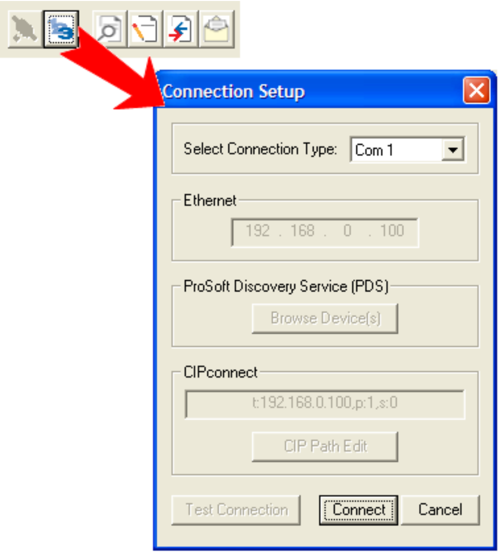


```
MODULE MENU
  ?=Display Menu
  B=Block Transfer Statistics
  C=Module Configuration
  D=Database View
  R=Transfer Configuration from PC to Unit
  S=Transfer Configuration from Unit to PC
  U=Reset diagnostic data
  V=Version Information
  W=Warm Boot Module
  @=Network Menu
  Esc=Exit Program
```

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

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

1 Click to configure the connection. On the Connection Setup dialog box, select a valid com port or other connection type supported by the gateway.



Select Connection Type: Com 1

192 . 168 . 0 . 100

t:192.168.0.100,p:1,s:0

2 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.

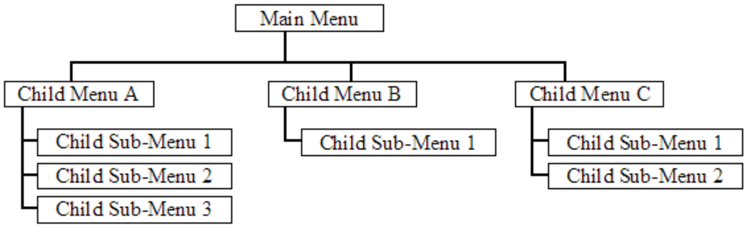
3 On computers with more than one serial port, verify that your communication program is connected to the same port that is connected to the module.

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

Navigation

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

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



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

Keystrokes

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

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

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

2.2 LED Indicators

Troubleshooting the operation of the DNP Slave port 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 the module's other LEDs can be found in the *ProLinx Reference Guide*.

2.2.1 Base Module LEDs

LED	State	Description
Power	Off	Power is not connected to the power terminals or source is insufficient to properly power the gateway (800mA at 24vdc minimum required)
	Green Solid	Power is connected to the power terminals.
Fault	Off	Normal operation.
	Red Solid	A critical error has occurred. Program executable has failed or has been user-terminated and is no longer running. Press Reset p/b or cycle power to clear error. If not, use the Debug procedures described later in this manual.
Cfg	Off	Normal operation.
	Amber Solid	The unit is in configuration mode. The configuration file is currently being downloaded or, after power-up, is being read, the unit is implementing the configuration values, and initializing the hardware. This will occur during power cycle, or after pressing the reset button. It also occurs after a cold/warm boot command is received.
Err	Off	Normal operation.
	Flashing	An error condition has been detected and is occurring on one of the application ports. Check configuration and troubleshoot for communication errors.
	Solid Red	This error flag is cleared at the start of each command attempt (master/client) or on each receipt of data (slave/adapter/server); so, if this condition exists, it indicates a large number of errors are occurring in the application (due to bad configuration) or on one or more ports (network communication failures).

2.2.2 LEDs for Port 0 Serial Port

Some ProLinx modules have three extra serial ports. Each of these serial ports has two LEDs indicating status.

LED	Color	Description
Port 0 - ACT	Off	No activity on the port.
	Green Flash	The port is either actively transmitting or receiving data
Port 0 - ERR	Off	Normal state. When off and Port Active led is indicating activity, there are no communication errors
	Red On or Flashing	Activity on this led indicates some communication error was detected, either during transmit or receive

2.2.3 4101 Series LEDs

LED	State	Description
Power	Off	Power is not connected to the power terminals.
	Green Solid	Power is connected to the power terminals. Verify that the other LEDs for operational and functional status light.
Fault	Off	Normal operation.
	Red Solid	The Debug/Configuration mode is active (applies to gateways that support pass-through on Debug port - such as DFCM units). If CFG LED is not on, a critical error has occurred. Program executable has failed or has been user-terminated and is no longer running. Press Reset p/b or cycle power to clear error. If not, use the Debug procedures described later in this manual.
CFG	Off	Normal operation.
	Amber Solid	If Fault LED is on, the Debug/Configuration Mode is active (if the gateway supports pass-through on the Debug port - such as DFCM units). If the Fault LED is off, the unit is in the configuration mode. The configuration file is being read and the unit is implementing the configuration values and initializing the hardware. This will occur during power cycle, or after pressing reset button. It also occurs after a cold/warm boot command is received.
ERR	Off	Normal operation.
	Flashing	An error condition has been detected and is occurring. Check configuration.
	Solid Red	This condition is indicative of a large number of errors in the application interface communications. The gateway's error flag is cleared at the start of each command (master/client) or receipt of data (slave/adapter/server).

2.3 Serial Port DNPS Error and Status Data

The second and most thorough troubleshooting method for debugging the operation of the DNPS 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.

Note: 4101 series modules that use both serial ports (Debug and Port x) as application ports (for example, 4101-MCM-DFCM) must be reset or power-cycled in order to enable the selected port as a Debug port. To enable the debug port, connect to the port using a null-modem serial cable, and then press and hold the [A] key on the keyboard while resetting or power cycling the card. Do not release the key until HyperTerminal shows the debug port menu. Debug mode can be enabled on either port. The upload/download command is only available when connected to the Debug port.

2.3.1 Viewing Error and Status Data

The following topics list the register addresses that will contain error and status data. You use the Database View option to view the contents of these registers. Refer to the *ProLinx Reference Guide* for detailed information on viewing error and status registers.

2.3.2 General Module Status Data

The following table describes the general module status data address registers.

Internal Database Address	**Variable Name**	**Description**
1000	Program Cycle Counter	
1001 to 1002	Product Name (ASCII)	These two words contain the product name of the module in ASCII format.
1003 to 1004	Revision (ASCII)	These two words contain the product revision level of the firmware in ASCII format.
1005 to 1006	Operating System Revision (ASCII)	These two words contain the module's internal operating system revision level in ASCII format.
1007 to 1008	Production Run Number (ASCII)	These two words contain the production "batch" number for the particular chip in the module in ASCII format.
1009 to 1019	No Valid Data	

2.3.3 DNPS Port - Error and Status

The serial port (DNP 3.0 Slave) Error and Status Data areas are discussed in this section.

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).

Internal Database Address	**Variable Name**	**Description**
1010	DNP Slave Port total number of message frames received by slave	This value represents the total number of message frames that have matched this slave's address on this port. This count includes message frames that the slave may or may not be able to parse and respond.
1011	DNP Slave Port total number of response message frames sent from slave	This value represents the number of good (non-error) responses that the slave has sent to the master on this port. The presumption is that if the slave is responding, the message was good. Note: This is a frame count.
1012	DNP Slave Port total number of message frames seen by slave	This value represents the total number of message frames received by the slave, regardless of the slave address.

Internal Database Address	Variable Name	Description
1013	DNP Slave Binary Input Event count	This value contains the total number of binary input events that have occurred.
1014	DNP Slave Analog Input Event count	This value contains the total number of analog input events that have occurred.
1015	DNP Slave Float Input Event Count	This value contains the total number of float events that have occurred.
1016	DNP Slave Double Input Event Count	This value contains the total number of double events that have occurred.
1017	DNP Slave bad function code error (Application Layer Error)	This value counts the number of times a bad function code for a selected object/variation is received by the slave device.
1018	DNP Slave object unknown error (Application Layer Error)	This value counts the number of times a request for an unsupported object is received by the slave device.
1019	DNP Slave out of range error (Application Layer Error)	This value counts the number of times a parameter in the qualifier, range or data field is not valid or out of range.
1020	DNP Slave message overflow error (Application Layer Error)	This value counts the number of times an application response message from the slave is too long to transmit.
1021	DNP Slave multi-frame message from DNP Master error (Application Layer Error)	This value counts the number of times the slave receives a multi-frame message from the master. The application does not support multi-frame master messages.
1022	Unsolicited Message Errors	This value counts the number of unsuccessful unsolicited messages transmitted by the slave unit.
1023	Cycle Count	This value is incremented each program scan.
1024	DNP Slave synchronization error count (Physical Layer Error)	This value counts the number of times a sync error occurs. The error occurs when extra bytes are received before the start bytes (0x05 and 0x64) are received.
1025	DNP Slave overrun error count (Physical Layer Error)	This value counts the number of times the overrun error occurs. This error occurs when the mainline Data Link Layer routine cannot read the data received on the communication port before it is overwritten.
1026	DNP Slave length error count (Physical Layer Error)	This value counts the number of times an invalid length byte is received. If the length of the message does not match the length value in the message, this error occurs.
1027	DNP Slave bad CRC error (Data Link Layer Error)	This value counts the number of times a bad CRC value is received in a message.

Internal Database Address	Variable Name	Description
1028	DNP Slave user data overflow error (Transport Layer Error)	This value counts the number of times the application layer receives a message fragment buffer which is too small.
1029	DNP Slave sequence error (Transport Layer Error)	This value counts the number of times the sequence numbers of multi-frame request fragments do not increment correctly.
1030	DNP Slave address error (Transport Layer Error)	This value counts the number of times the source addresses contained in a multi-frame request fragments do not match.

3 Reference

In This Chapter

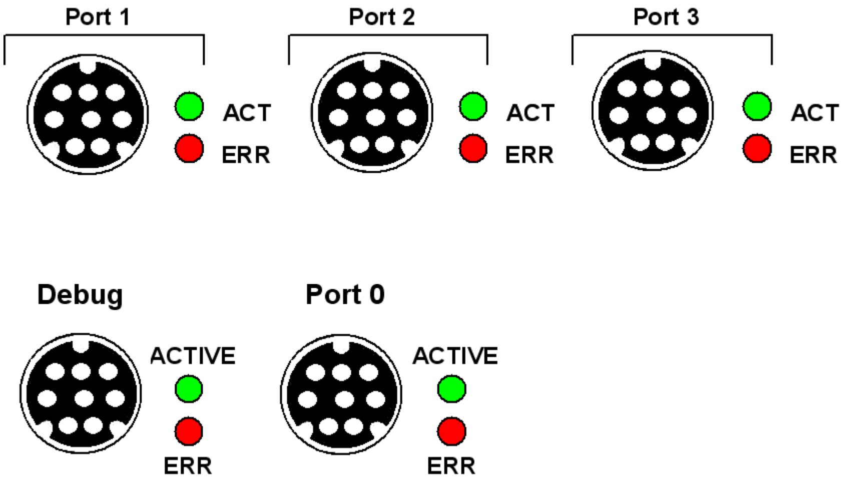
3.1 Product Specifications

3.1.1 DNP 3.0 Slave Port Specifications

Type	Specifications
General Parameters	
Internal Database	Binary Inputs: 0 to 100 word count Analog Inputs: 0 to 100 points of analog input data Float Inputs: 250 points Double Inputs: 125 points Counters: 0 to 50 points of counter data Binary Outputs: 0 to 100 word count Analog Outputs: 0 to 100 points of analog output Float Outputs: 250 points Double Outputs: 125 points Binary Input Events: 0 to 100 binary input event buffer Analog Input Events: 0 to 100 analog input event buffer
Communication parameters	Port 0: Baud Rate: 110 to 38.4K baud Stop Bits: 1 Data Size: 8 bits Parity: None RTS Timing delays: 0 to 65535 milliseconds
DNP Mode	DNP 3.0 Slave - Level 2
DNP Object Support	See Reference chapter for full Object Definition document

Type	Specifications
DNP Slave	
Node address	0 to 65534 (software selectable)
Status Data	Error codes, counters and port status available per configured slave port

3.1.2 Serial Port Specifications



Type	Specifications
Serial Ports	
Serial Port Adapter Cables	One Mini DIN to DB-9M adapter cable included for each configurable serial port
Config Port Connector/ Pinout	DB-9F connector / DTE pinout
Serial Port Isolation	2500V RMS port-to-port isolation per UL 1577. 3000V DC min. port to ground and port to logic power isolation.
Serial Port Protection	RS-485/422 port interface lines TVS diode protected at +/- 27V standoff voltage. RS-232 port interface lines fault protected to +/- 36V power on, +/- 40V power off.

Note: On all ProLinx gateways, data from the application port on the main board, serial Port 0, is not buffered. Packets go directly to and from the serial chipset to the processor. This has the potential to cause the serial communications to become erratic at baud rates above 38,400 baud. ProLinx gateways with 4 serial ports have a separate serial interface board for serial Ports 1, 2, and 3. These serial ports are buffered and can handle communications up to 115,200 baud.

3.1.3 Functional Specifications - DNP 3.0 Slave

The DNP 3.0 Slave driver provides extensive support for Slave implementations of the protocol. The serial port on the gateway is user-configurable to support the DNP 3.0 protocol (Slave, Error Checking, Baud rate, and so on).

General Parameters	
Internal Database	Binary Inputs: 0 to 500 word count Analog Inputs: 0 to 500 points Counters: 0 to 250 points Binary Outputs: 0 to 200 word count Analog Outputs: 0 to 500 points Binary Input Events: 0 to 100 event buffer Analog Input Events: 0 to 100 event buffer
Communication parameters	Baud Rate: 110 to 115K baud Stop Bits: 1 Data Size: 8 bits Parity: None RTS Timing delays: 0 to 65535 milliseconds
DNP Mode	DNP 3.0 Slave - Level 2
DNP Slave	
Node address	0 to 65534 (software selectable)

3.1.4 Hardware Specifications

Specification	Description
Power Supply	24 VDC nominal 18 to 32 VDC allowed Positive, Negative, GND Terminals 2.5 mm screwdriver blade
Current Load	500 mA max@ 32 VDC max
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: 5.20 H x 2.07 W x 4.52 D inches (13.2 cm H x 5.25 cm W x 11.48cm D) Extended: 5.20 H x 2.73 W x 4.52 D inches (13.2 cm H x 6.934 cm W x 11.48cm D)
LED Indicators	Power and Module Status Application Status Serial Port Activity LED Serial Activity and Error LED Status
Configuration Serial Port	DB-9M RS-232 only No hardware handshaking

Specification	Description
Ethernet Port (Ethernet protocol gateways only)	10Base-T half duplex RJ45 Connector Link and Activity LED indicators Electrical Isolation 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in section 5.3.2 of IEC 60950: 1991 Ethernet Broadcast Storm Resiliency = less than or equal to 5000 [ARP] frames-per-second and less than or equal to 5 minutes duration
Application Serial Port(s) (Serial protocol gateways only)	RS-232/422/485 RS-232 handshaking configurable RS-422/485 DB-9 to Screw Terminal Adaptor **Note:** The number of serial application ports depends on the module type, and the combination of protocols.
Serial Port Isolation	2500V RMS port signal isolation per UL 1577 3000V DC min. isolation port to ground and port to logic
Shipped with Each Unit	Mini-DIN to DB-9M serial cables 4 ft RS-232 configuration cable 2.5mm screwdriver CD (docs and Configuration utility) RS-422/485 DB-9 to Screw Terminal Adaptor for each serial application port (serial protocols only)

3.2 Communication Port Cables

This section contains information on the cable and pin assignments for the ProLinx gateway's serial ports (RS-232/422/485). The ProLinx gateway will come with one to five serial ports, depending on the configuration purchased. In all cases, the protocol serial ports will have the same pinouts.

Example: The 5202-MNET-MCM4 gateway contains five serial communication ports; four configurable protocol application ports and one Configuration/ Debug port.
The 5201-MNET-MCM gateway contains two serial communication ports; one configurable protocol application port and one Configuration/Debug port.

Each physical serial port has an eight-pin Mini-DIN jack connector. A six-inch Mini-DIN-8Male to DB-9Male adapter cable is provided for each serial port. The DB-9M provides connections for RS-232, wired as Data Terminal Equipment (DTE), RS-422 and RS-485. The diagrams in the following topics detail the pin assignments for several possible electrical interface connections.

3.2.1 Serial Port Cable Connections: Config/Debug and Port 0

This section contains information on the cable and pin assignments for the ProLinx Communication Gateway module application serial ports (RS-232/422/485).

The module will come with one to five serial ports, depending on the configuration purchased. In all cases, the protocol serial ports will have the same pin-outs.

Each serial port is a Mini-DIN physical connection. A 6-inch 'Mini-DIN to DB-9M' cable is provided for each active protocol port. The DB-9M provides connections for RS-232, RS-422 and RS-485, as well as for the Debug port. The diagrams in the following topics detail the pin assignments for several possible physical connections.

The following table describes the relationship between the port labeling on the front of the ProLinx module and the application.

Port Label	Function
Debug	Debug/Configuration
Port 0	Application Port 0

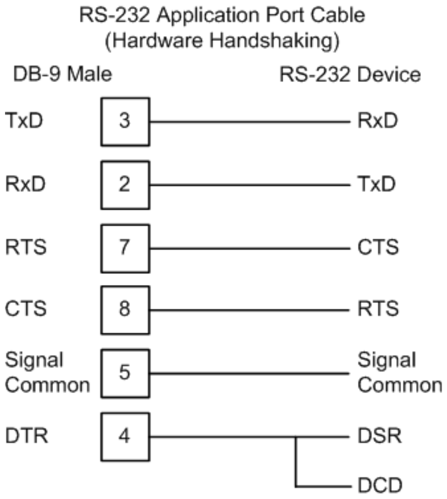
3.2.2 Serial Port Cable Connections: Multiple Port Units

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

The following ports only exist on multiple port units	
Port 1	Application Port 1
Port 2	Application Port 2
Port 3	Application Port 3

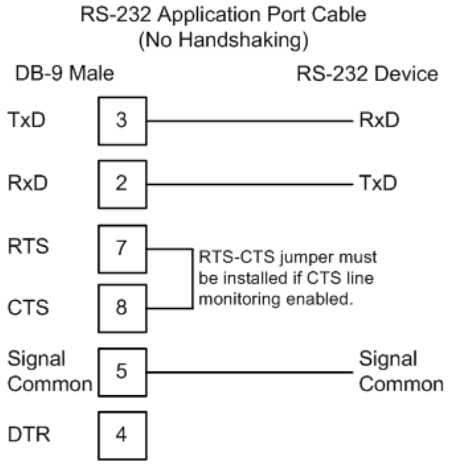
Port 0, 1, 2, 3: RS-232 - Null Modem (DTE with Hardware Handshaking)

This type of connection is used when the device connected to the gateway requires hardware handshaking (control and monitoring of modem signal lines; *Use CTS* (page 17) parameter set to **YES**).



Port 0, 1, 2, 3: RS-232 - Null Modem (DTE without Hardware Handshaking)

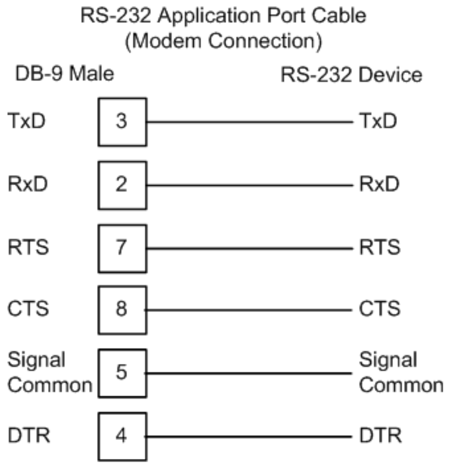
This type of connection can be used to connect the gateway to a computer or field device communication port.


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

Note: If the port is configured with the *Use CTS* (page 17) set to YES, then a jumper is required between the RTS and the CTS line on the gateway connection.

Port 0, 1, 2, 3: RS-232 - DTE to DCE Modem Connection

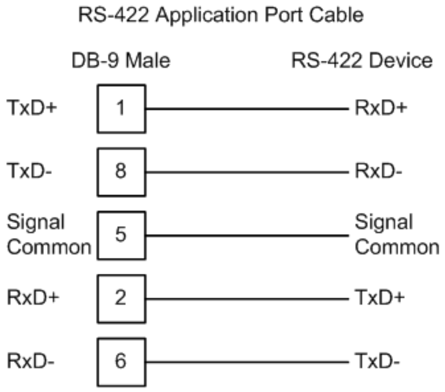
This type of connection is required between the gateway and a modem or other communication device.



The *Use CTS Line* (page 17) parameter for the port configuration should be set to **YES** for most modem applications.

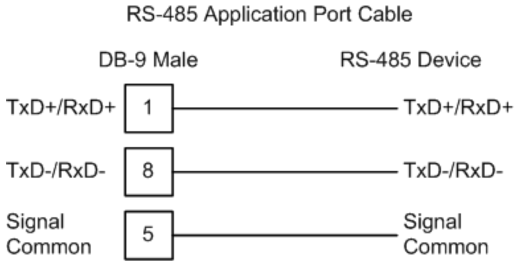
Port 0, 1, 2, 3: RS-422 Interface Connections

The following illustration applies when the RS-422 interface is selected.



Port 0, 1, 2, 3: RS-485 Interface Connections

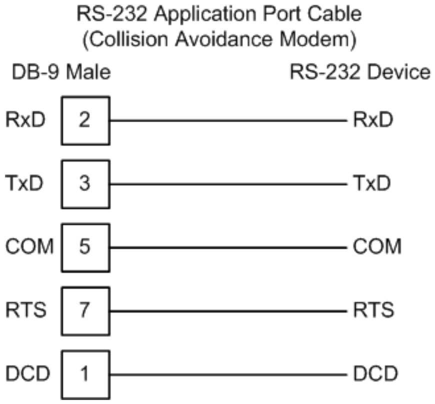
The following illustration applies when the RS-485 interface is selected.



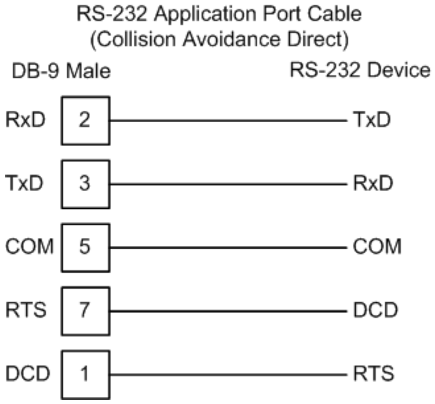
NOTE: This type of connection is commonly called a *RS-485 half-duplex, 2-wire* connection. If you have RS-485 4-wire, full-duplex devices, they can be connected to the gateway's serial ports by wiring together the TxD+ and RxD+ from the two pins of the full-duplex device to Pin 1 on the gateway and wiring together the TxD- and RxD- from the two pins of the full-duplex device to Pin 8 on the gateway. As an alternative, you could try setting the gateway to use the RS-422 interface and connect the full-duplex device according to the RS-422 wiring diagram (page 47). For additional assistance, please contact ProSoft Technical Support.

Collision Avoidance (DNP modules only)

The RTS line is controlled by the RTS on and off parameters set for the port. If the CTS line is used (usually only required for half-duplex modems and not defined for use in the DNPS specification), the RTS and CTS lines must either be connected together or connected to the modem. The following illustration shows the cable required when connecting the port to a modem.

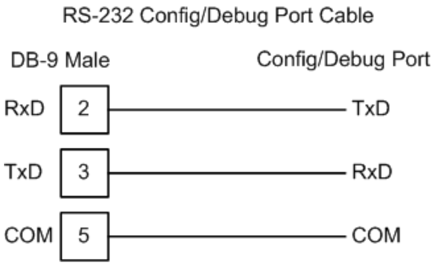


If collision avoidance is used in a point-to-point connection on the RS-232 interface, the following cable should be used.

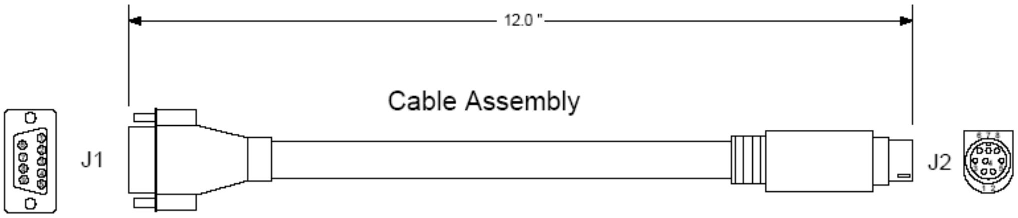


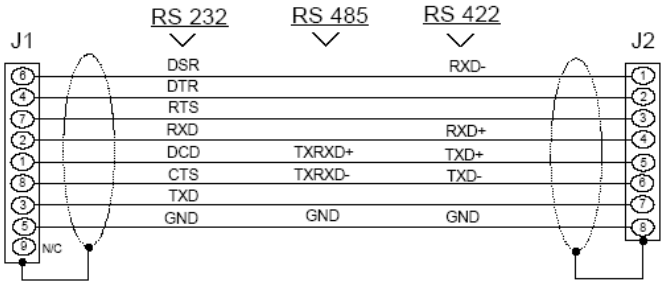
3.2.3 Configuration/Debug Port

This port is physically an 8-pin Mini-DIN connector. A Mini-DIN to DB-9Male adapter cable is included with the module. This port permits a PC based terminal emulation program to view configuration and status data in the module and to control the module. The cable pin-out for communications on this port is shown the diagram.



3.2.4 DB9 to Mini-DIN Adaptor (Cable 09)





Wiring Diagram

3.3 Functional Overview

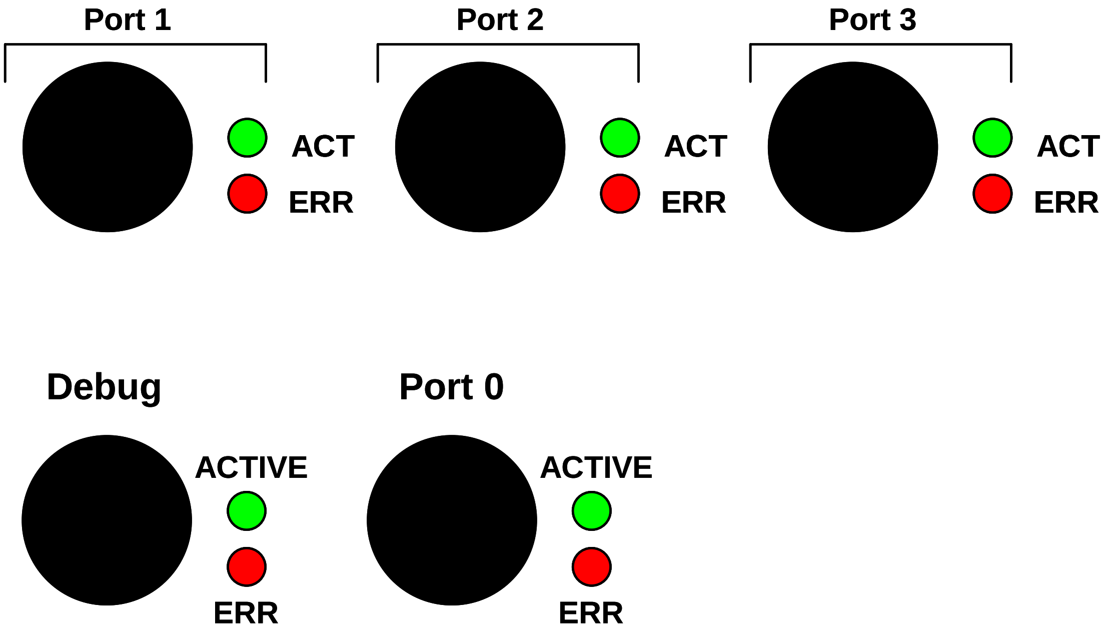
The DNP 3.0 Slave protocol driver exists in a single port (DNPS) implementation only. The DNPS port operates in a slave mode only, supporting the DNP 3.0 protocol in a Level 2 implementation.

The DNP slave driver is implemented in ProLinx modules to interface DNP master units with a variety of communication protocols and interfaces. This driver supports DNP version 3.0, subset level 2. The Reference chapter of this documentation contains the Device Profile for the driver. The Reference chapter contains the subset definition for the driver. This document serves as the base for understanding the DNP slave driver functionality and configuration. The discussion is general in nature deferring specifics to the individual product documents.

Before attempting to use this or any other DNP protocol device, verify that you have a copy of the DNP Basic 4 document and other information available through the DNP User Group. It is very important that these documents be understood for successful application of the protocol in a user's solution. If you are a member of the user group, you can download these documents from the http://www.dnp.org (http://www.dnp.org) Web site.

The DNP slave driver will respond to requests from a remote DNP master device. All data in the module's database configured as DNP data points is available to the remote master device for read and write requests.

3.3.1 DNP 3.0 Slave Port



The ProLinx module supports the DNP 3.0 protocol as a Slave on one port. This port is fully configurable.

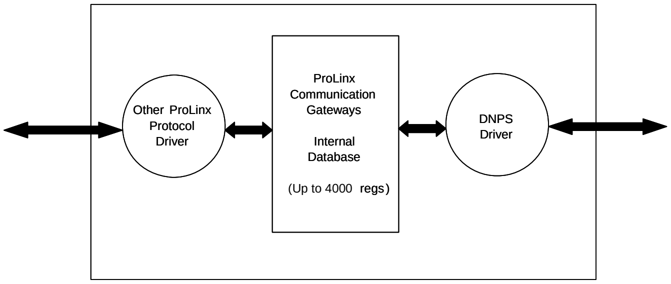
The relationship between the port labeling on the front of the ProLinx module and the application is as follows:

Port Label	Function
Debug	Debug/Configuration
Port 0	DNP Slave Port
Following ports only exist on multiple port units	
Port 1	Not available to DNP Driver
Port 2	Not available to DNP Driver
Port 3	Not available to DNP Driver

The DNP Slave port can be used to continuously interface with a DNP Host device over a serial communication interface (RS-232, RS-422 or RS-485).

3.3.2 Module Internal Database

The internal database is central to the functionality of the module. 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/network to be viewed and controlled by devices on another port/network.



In addition to data from the slave port, status and error information generated by the module can also be mapped into the internal database.

3.3.3 DNP Slave Database Layout

Central to the functionality of the DNP driver is the database. This database is used as the interface between remote DNP devices and the other protocol implemented on a module. The content and structure of the user data area of the database is completely user defined. The following illustration shows the general format of the module's database:

Data	Area	Data Size
DNP Data	Binary Inputs	1 word per 16 points
	Analog Inputs	1 word per point
	Float Input	2 words per point
	Double Input	4 words per point
	Counter Data	2 words per point

Data	Area	Data Size
	Binary Outputs	1 word per 16 points
	Analog Outputs	1 word per point
	Float Output	2 words per point
	Double Output	4 words per point
	Frozen Data Counter	2 words per point
	Binary Input Events	11 bytes per point
	Analog Input Events	13 bytes per point
User Data	Remaining Data Area	

The first word of the module's database contains the first 16 points of binary input data (if defined). It is important to understand how the data is mapped to the database so that it can be accessed by the other protocol. Each DNP data type has a fixed size. This size is used in conjunction with the number of points configured for the type to determine the size and location in the database. Below is an example of a user database with a defined set of point counts:

Data	Area	Registers	CFG Values
DNP Data	Binary Inputs	0 to 4	5
	Analog Inputs	5 to 25	21
	Float Input	26 to 45	10
	Double Input	46 to 65	5
	Counter Data	66 to 75	5
	Binary Outputs	76 to 77	2
	Analog Outputs	78 to 87	10
	Float Output	88 to 107	10
	Double Output	108 to 127	5
	Frozen Data Counter	128 to 137	5
	Binary Input Events	138 to 687	100
	Analog Input Events	688 to 1337	100
User Data	Remaining Data Area	1338 to 9999	[redacted]

Note that the order of the data types is fixed by the driver (for some interfaces this order may be altered (that is, PROFIBUS Slave)). In order to access the binary input data, registers 0 to 4 are used. To read analog output data passed to the driver from a remote master, registers 38 to 47 are used. Register 38 contains the value for analog output point 0, and register 47 contains the value for analog output point 9.

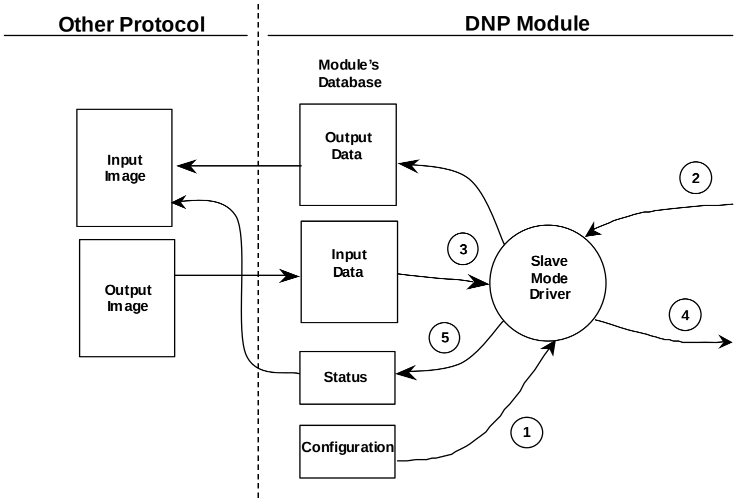
Data in the frozen counter, binary input event and analog input event areas should not be altered by the other protocol in the module. The DNP slave driver should only use this data area. The other protocol on the ProLinx module should place data in the binary input, analog input and counter data areas. The remote DNP master reads this data. The remote DNP master will write values to the binary and analog output data areas. This data should be used by the other protocol for control.

The float and double point numbers are offset based on the analog count number since the float and double point are in fact analog variations. The following table shows how the points are generated based on an example configuration.

Data Area	Point Count Configuration Value	First Point Number
Analog Inputs	5	0
Float Inputs	15	5
Double Inputs	10	20
Analog Outputs	25	0
Float Outputs	7	25
Double Outputs	10	32

3.3.4 DNP Slave Driver Data Flow

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



Step	Description
1	The DNP slave driver receives the configuration information from the Flash Disk in the module. This information configures the serial port and defines the slave node characteristics.
2	A Host device issues read or write commands to the module's node address. The port driver qualifies the message before accepting it into the module.
3	After the module accepts the command, the data is immediately transferred to or from the internal database in the module. If the command is a read command (binary input, analog input, counter, event, and so on), the data is read out of the database and a response message is built. If the command is a write command (binary output or analog output), the data is written directly into the database and a response message is built.
4	After the data processing has been completed in Step 3, the response is issued to the originating master node.
5	Error/Status data are available in a Status Block that can be placed anywhere in the module's database. This area can be accessed by the other protocol on the module using the correct database offset.

3.3.5 Module DNP Protocol Operation

Unsolicited Messaging

If the module is configured for unsolicited messaging, the module immediately sends an unsolicited response out Port 1 (Primary DNP port) informing the master of a module restart. The module will not log events or process any data read operations from the master until the master clears the restart IIN data bit. The master must also synchronize the time with the module before events are generated if the module is so configured. The master is also responsible for enabling the unsolicited message facility in the module by sending the Enable Unsolicited Messaging command to the module.

Solicited Messaging

If the module is not configured for unsolicited messaging, the program listens on Port 1 for DNP messages from a DNP master and sends responses to requests after initialization. The DNP master must clear the restart IIN bit before the module starts logging events. The master must also synchronize the time with the module before events are generated if the module is so configured.

If the DNP master port is used, the port starts processing the command list. It sends commands and requests out the port to slave units. Data acquired is placed in the correct database in the module. Event messages received from the IED units are placed directly in the event buffer or the values are placed in the database. The communication statistics for each slave unit is tracked by the module and is available for the other protocol to request.

While the program is running, a status/error table is maintained. This data is automatically passed to the other protocol at a frequency set in the configuration. Refer to the following section on the contents of the table.

If an error is encountered in the module's program, it is logged to the error list maintained by the system. The program maintains a list of the last 60 errors. This data is automatically passed to the other protocol at a frequency set in the configuration. Refer to the following section on the error codes contained in the list.

If the module is configured to use the secondary slave DNP port (Port 2), the module may automatically switch communications to that port under the following conditions:

- If the module receives a request on the port from the master
- If unsolicited messages are enabled and the module is configured to switch to the port if application confirm messages are not received while using the primary port (user sets the number of reties in the configuration)

Communications will switch back to the primary DNP port when the module receives a message on that port. If the module restarts, communications will always be attempted on the primary DNP port first.

3.3.6 Designing the system

System design defines the data requirements of the system, communication parameters, and module functionality. The application developer should refer to the person responsible for the DNP master and slave device configurations to verify that the functionality and data types required for the whole system are consistent. Review the DNP Device Profile and DNP Subset documentation for a definition of the level of DNP support offered by the module.

The following topics describe each element of system design.

DNP Functionality Review

This phase of design defines the features of the DNP Level 2 Subset supported by the module and to be utilized in the specific application. For example, will the unit use unsolicited messaging? Coordination with the DNP master developer is required to verify that the host will support the functionality you select. If a DNP master port is to be used, the parameters required to communicate with the slave devices must be known and considered in installing and configuring the module.

The features that must be defined in this design step are as follows:

DNP Feature	Discussion
Is collision avoidance required for the primary DNP port?	Collision avoidance is required when unsolicited messaging is used. Any node on the network (master or slave) can transmit a message when data is ready. Collision avoidance prevents two or more units from transmitting data at the same time. This feature requires special cabling and timing considerations. It will only operate in RS-232 mode, and is not supported in RS-485 or RS-422 modes.
Will the module use events and the Report by Exception feature?	If the DNP Slave driver will generate event messages, they must be retrieved from the module using class polls or polls for the specific event objects. Refer to Event Size Computation (page 67) for computing event size for digital and analog inputs.
Will analog events be returned with or without a time value?	The default for analog events is to return them without time. This is as specified in the DNP Subset document. The module supports analog event reporting with time. This is selected setting bit 5 in the configuration word (offset 21) for the module.
Will events be logged before time synchronization has occurred?	This feature will avoid logging events without the proper date and time stamping. When the DNP slave driver is initialized, it will have the IIN bit set to request time synchronization from the remote master unit. The master must synchronize the time before the module will generate events. This feature is selected using bit 8 in the module's configuration word.
Will unsolicited messages be used? If so, how may for each class before triggering and what is the delay time?	Unsolicited messaging provides the means for a slave unit to send event data asynchronously to the master unit without a request from the master. This requires the use of collision avoidance to prevent two or more units from transmitting data on the network at one time.
What will be the memory mapping for the DNP and IED memory areas?	There are many databases maintained within the module for all the specific DNP data types and for the virtual slave unit simulated in the module. For successful application of the module, an understanding of the databases is required to carefully design them.

Data Requirements

This phase of design defines what data elements are to be interfaced between the other ProLinx protocol and the DNP master. The module provides the following data types:

- Digital Input
- Digital Output
- Counter
- Floating Point
- Analog Input
- Analog Output

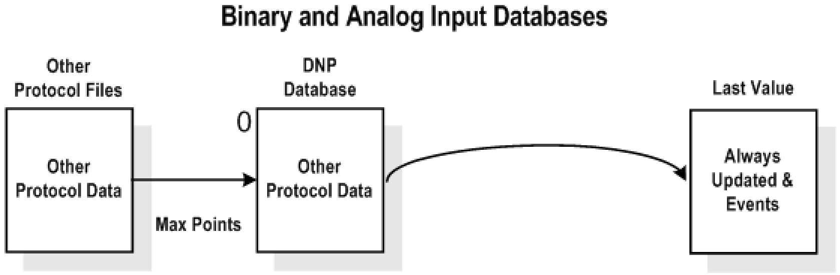
All communications between the DNP master and the other protocol is through these data types. Therefore, all data to be used by the system must be contained and configured in one of these data types.

The following illustration shows the databases maintained by the module for the DNP data.

DATA AREA	
DNP DATA	BINARY INPUTS
	ANALOG INPUTS
	COUNTER DATA
	BINARY OUTPUTS
	ANALOG OUTPUTS
	FROZEN COUNTER DATA
	BINARY INPUT EVENTS
	ANALOG INPUT EVENTS

The module is responsible for maintaining the databases using data acquired from the other protocol and DNP master attached network port.

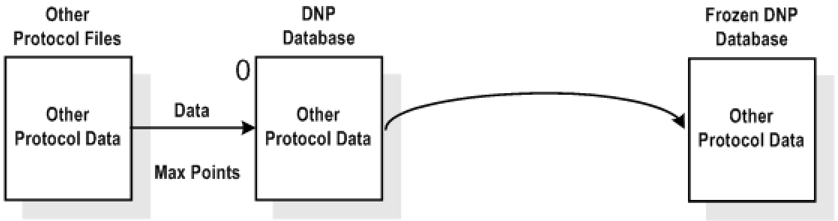
The following illustration shows the interaction of the binary and analog input points with the databases.



All data for these data types is derived from the processor and is passed to the module over the backplane. The module will constantly monitor for changes in this data and generate event messages when point values change. For binary input points, events will be generated on any state change. For analog input points, events will be generated for points that have a current value outside of the user-set deadband based on the last value used for an event.

The following illustration shows the interaction of the counter points with the databases.

Counter Databases

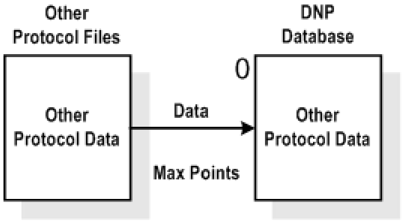


This data is constantly sourced from the processor and placed in the module's internal database. This information is available to the remote master for monitoring. When the module receives a freeze command from the master unit, it will copy the current counter values into the frozen counter database area. The remote master can then monitor this information. If the module receives a counter freeze with reset command, the current counter values will be passed to the frozen counter database and only the module's values will be set to 0.

Note: This data is not sent to the other protocol and the zero data can be overwritten by the counter data contained in the controller. Therefore, the freeze with reset should not be used with this module. The results will not be as expected. There is no way to guarantee that counts will not be lost during the reset step in the module and controller. As a result, this feature was not implemented in the module.

The following illustration shows the interaction of the binary and analog output points with the databases.

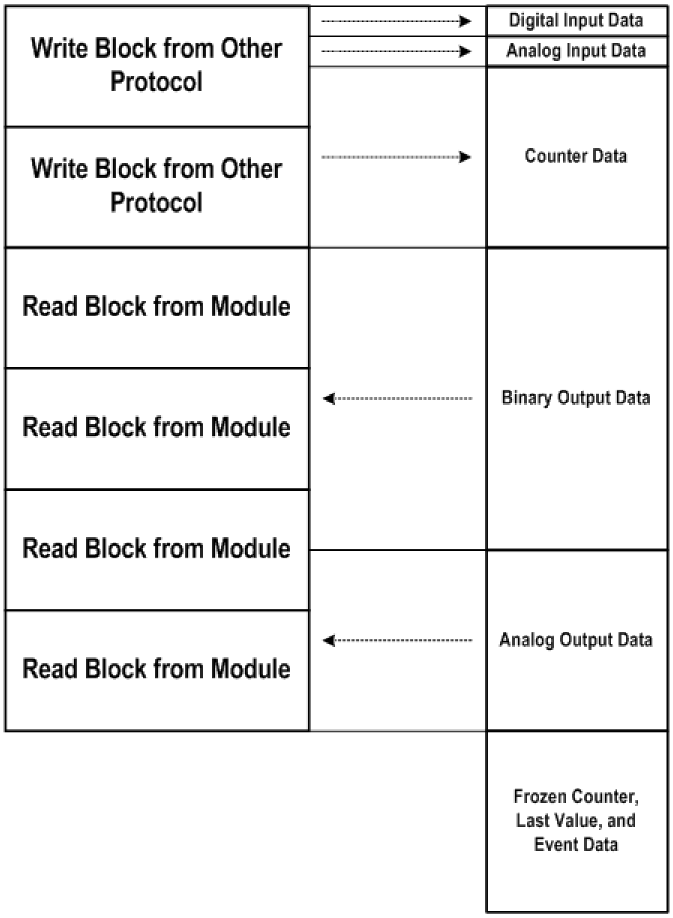
Binary and Analog Output Databases



Output data is sourced from the controlling master station and passed to the processor over backplane from the module. These data are used in the ladder logic to control operations and I/O in the processor.

Data Transfer Interface

The following figure displays the direction of movement of the DNP database data between the module and the processor.



It is important to understand the relationship of the block identifications and the data in the module.

The Reference chapter contains forms to aid in designing your system. They can be used to document the relationship between the point assignments, block identification numbers and the other protocol file and offset values and to define the program configuration. Use these forms during your design phase.

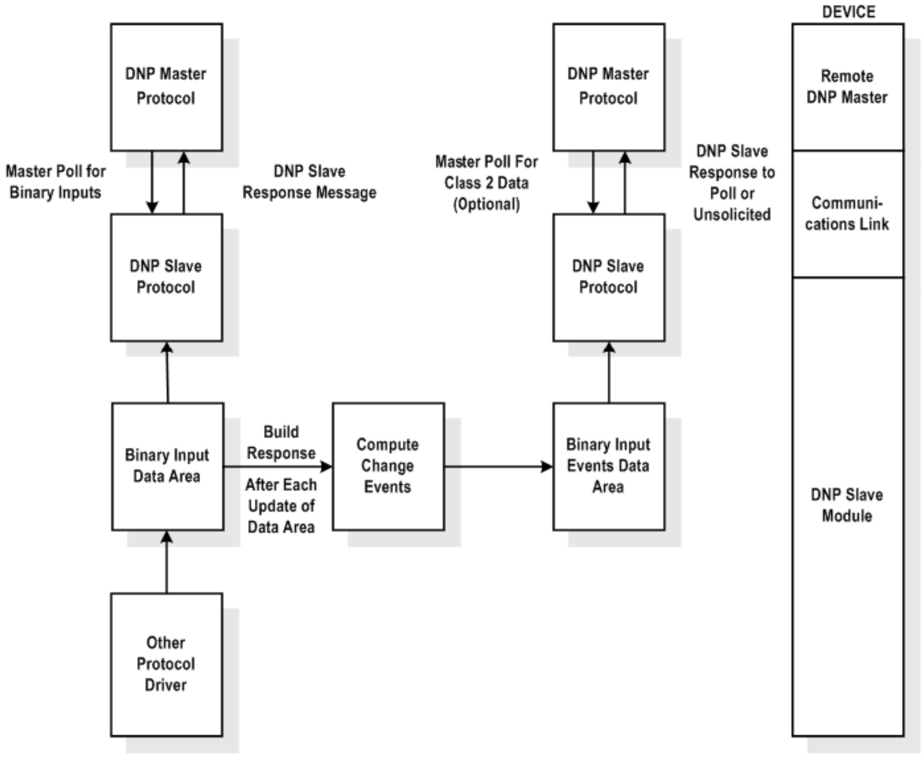
DNP Digital Input Data

This data type stores the binary value of 1 or 0. The size of this data area is determined from the configuration parameter Binary Inputs (number of words, each containing 1 binary input point). These data are transferred to the module from the other protocol using the read operation. Therefore, these data are read-only for the module and the DNP master unit communicating with the module. When the module receives a new block of this data from the other protocol, it compares the new values to those currently in the database. If there is a change in any of the data, the module will generate an event message for the points that change.

The remote DNP master unit can read the current status data and the event data from the module. Event messages generated by the module can be retrieved using a poll for Class 2 data, as all digital input events are considered a Class 2 data type. If unsolicited message generation is enabled in the application, the events will automatically be sent by the module to the DNP master unit when the maximum event count for Class 2 data is reached or when the timeout for unsolicited messages is exceeded.

The following illustration describes data flow for the digital input data.

Binary Input Data Flow Diagram

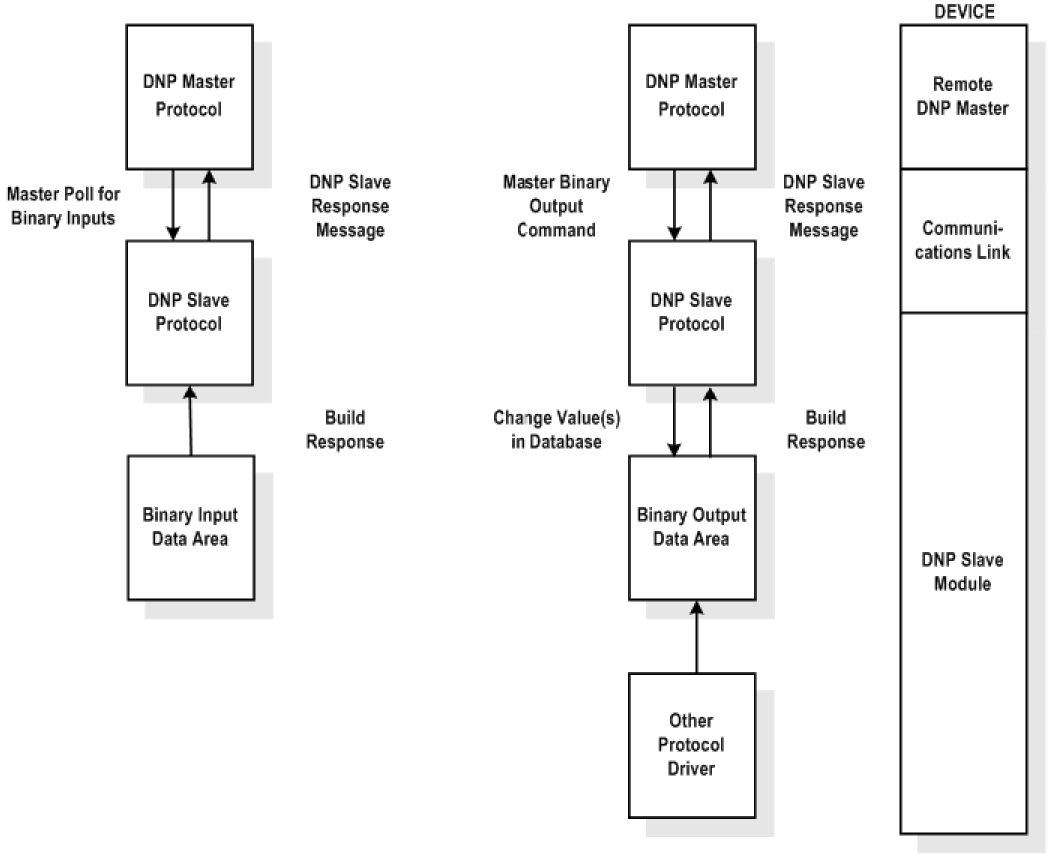


DNP Digital Output Data

This data type stores digital control and command state data received from the DNP master unit with a value of 1 or 0. The size of this data area is determined from the configuration parameter Binary Outputs (defines number of words, each containing 1 binary output point). These data are transferred from the module to the other protocol using the write operation. Therefore, these data are read-only for the other protocol, as the other protocol cannot directly alter these values in module. It is the responsibility of the DNP master unit to maintain this data. For example, if the DNP master sets a digital point on, it will remain on until the master resets the point.

The following illustration describes data flow for the digital output data.

Binary Output Data Flow Diagram



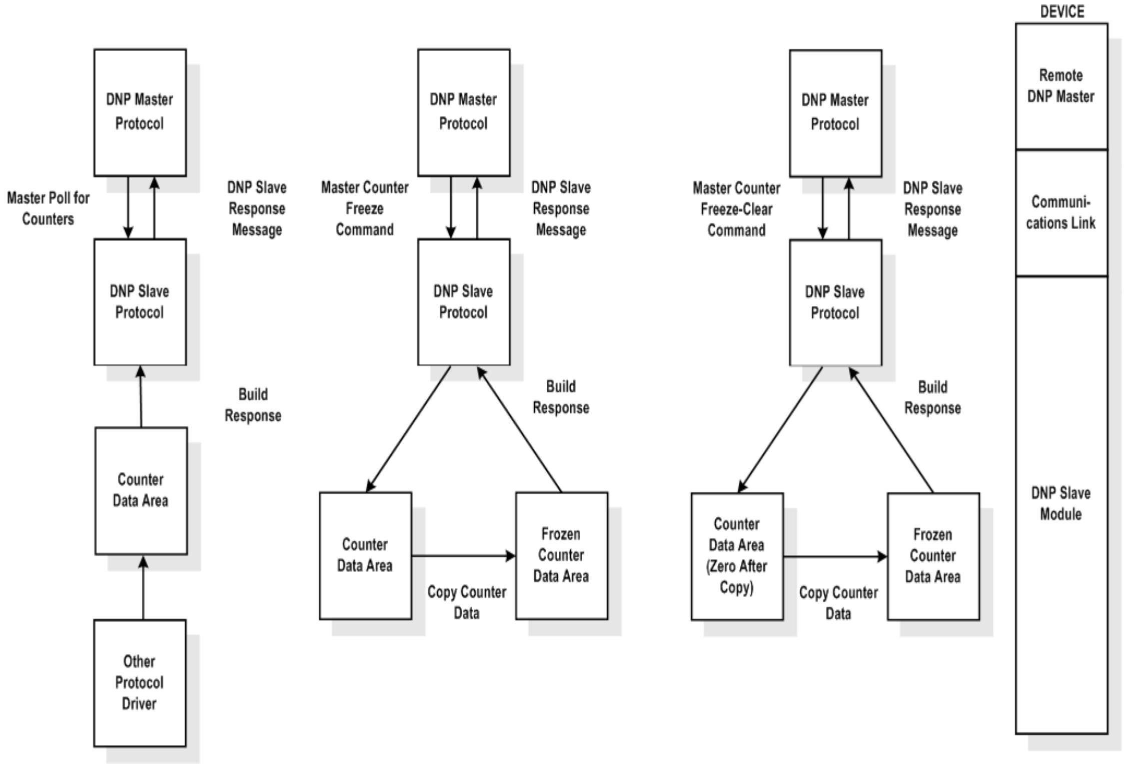
DNP Counter Data

This data type stores accumulated count data. These data are stored in the module in a double word value and have a data range of 0 to 4,294,967,296. The size of this data area is determined from the configuration parameter Counters. The other protocol transfers data of this type to the module using the read operation. The module maintains two values for each counter point: a current running value and a frozen value. The DNP master must send the freeze command to the module in order to transfer the current running values to the frozen area.

Note: The freeze-reset command is not supported in the data transfer operation. There is no way to guarantee counts will not be lost using the freeze-reset operation, therefore, this feature is not implemented.

The following illustration describes data flow for the counter data.

Counter Data Flow Diagram



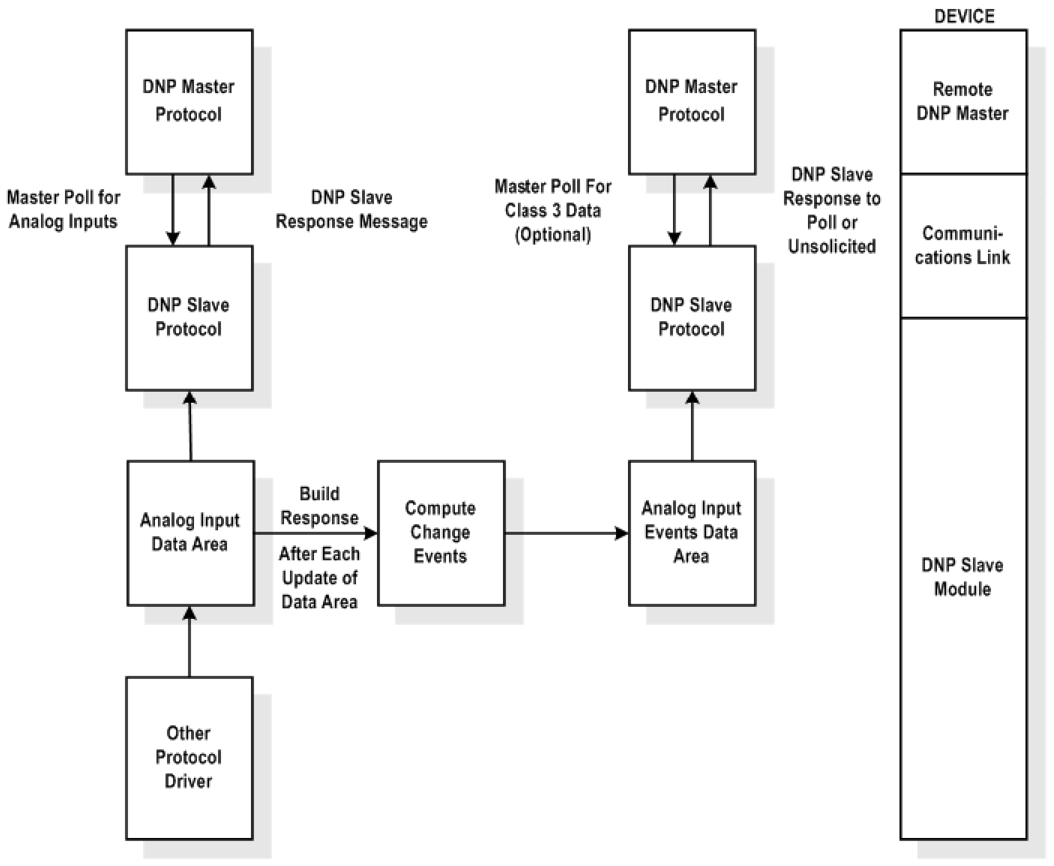
DNP Analog Input Data

This data type stores analog data with a data range of 0 to 65535 or -32768 to 32767. The size of this data area is determined from the configuration parameter Analog Inputs. These data are transferred to the module from the other protocol using the read operation. Therefore, these data are read-only for the module and the DNP master unit. When the module receives a new block of this data from the other protocol, it compares the new values to those currently in the database. If there is a change in any of the data, the module will generate an event message for the points that change. The dead-band parameter configured for the module determines the variance required for the event message.

The DNP master unit can read the current value data and the event data from the module. Event messages generated by the module can be retrieved using a poll for Class 3 data, as all analog input events are considered a Class 3 data type. If unsolicited message generation is enabled in the application, the events will automatically be sent by the module to the DNP master unit when the maximum event count for Class 3 data is reached or when the timeout for unsolicited messages is exceeded.

The following illustration describes data flow for the analog input data.

Analog Input Data Flow Diagram

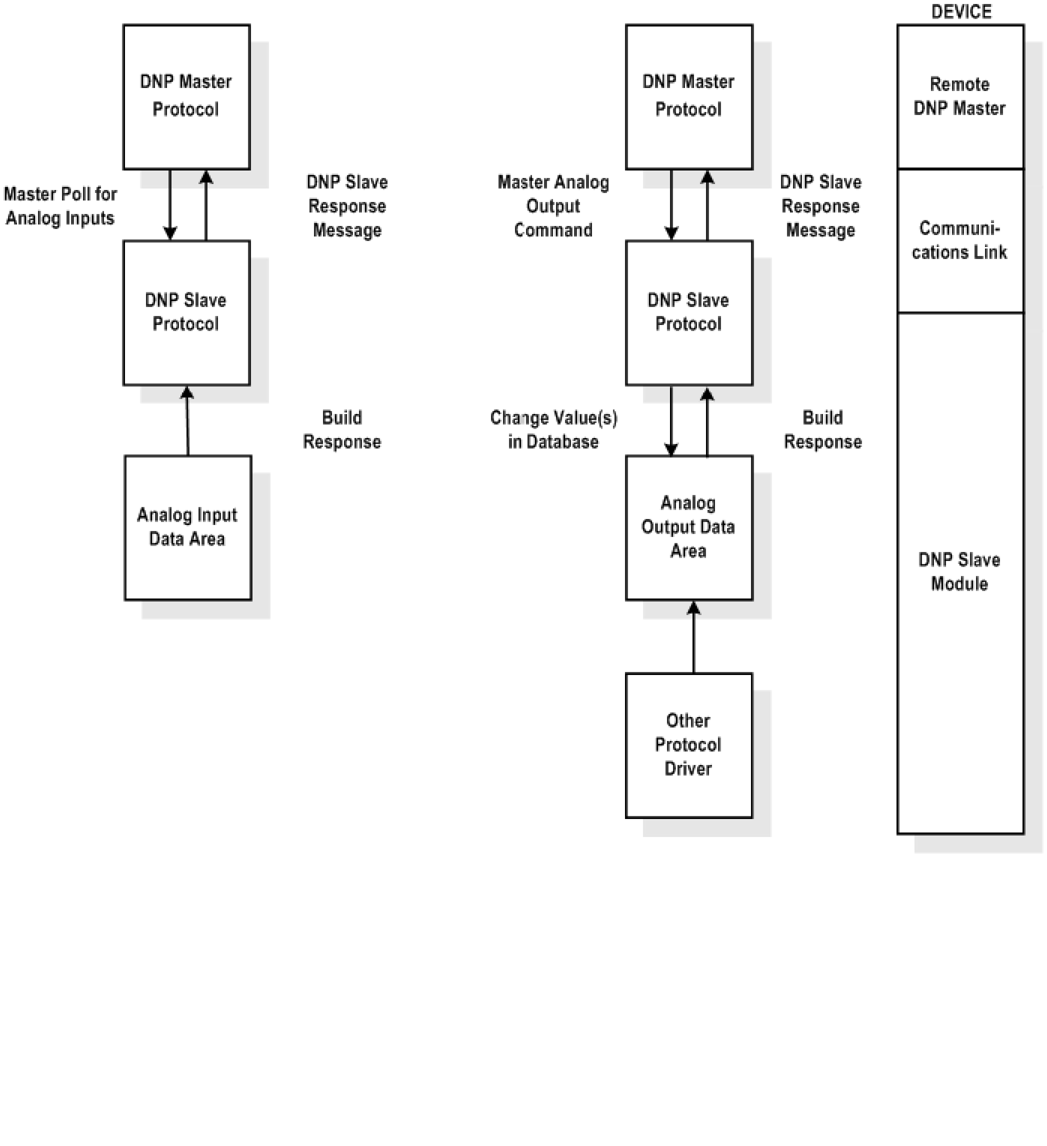


DNP Analog Output Data

This data type stores analog values sent from the DNP master unit to the module and the other protocol with a data range of 0 to 65535 or -32768 to 32767. The size of this data area is determined from the configuration parameter Analog Outputs. These data are transferred from the module to the other protocol using the write operation. Therefore, these data are read-only for the other protocol, as the other protocol cannot directly alter these values in the module. It is the responsibility of the DNP master unit to maintain this data. For example, if the DNP master sends a value of 3405 to the module for a specific point, the value will be stored in the module until changed by the master.

The following illustration describes data flow for the analog output data.

Analog Output Data Flow Diagram



3.4 DNP Collision Avoidance

3.4.1 When Required

Collision avoidance is required under to following network configurations:

1 A multi-point network is used (that is, master unit is communicating with several slave units on same physical link). This excludes a dial-up modem network where the master only communicates with one slave at a time in a point-to-point physical link. Will only operate on two-wire, half-duplex communication networks.

2 Unsolicited messaging is used where asynchronous, spontaneous messages may be generated by any node on the network.

3 Any network where the physical layer does not implement a collision avoidance scheme and permits several nodes to communicate at one time (that is, some radio networks).

3.4.2 Rules

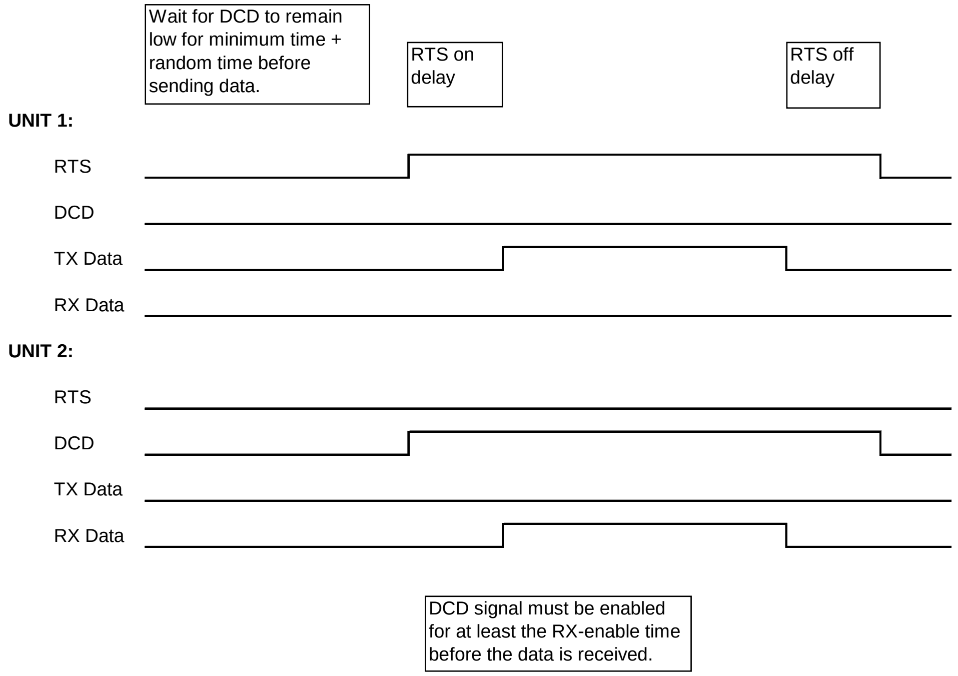
- RTS controls DCD line on all other units.
- No stations transmit while DCD line is high except the one that has the RTS line high.
- After DCD line drops low, slaves wait variable time before attempting to transmit.
- Master has smallest delay (can be set to 0)
- Slaves have higher delays (fixed delay (that is, slave#*20 milliseconds) + random delay (20 to 50 milliseconds))
- Only supported in 2-wire half-duplex mode. Not supported in 4-wire half-duplex mode.
- This option is set in the configuration of the module with the port type.

3.4.3 Timing Chart

Several timing parameters are required for each unit in order to implement the collision avoidance feature. The parameters are as follows:

Parameter	Description
Fixed DCD Idle Delay Time Before Transmit	This parameter specifies the minimum number of milliseconds to delay before transmitting a message after recognizing that the DCD line is low.
Random DCD Idle Delay Time Before Transmit	This parameter determines the random time to be added to the above fixed delay value above before attempting to transmit a message. The value specified for the parameter determines the range of random values (milliseconds) to be used. For example, if a value of 20 is specified, the random delay time will be from 0 to 20 each time the value is requested.
DCD Time Before Receive	This parameter specifies the number of milliseconds to delay after recognizing that DCD has been asserted before accepting data. The RTS on time of the sending unit must be set greater that the time specified here or else the first part of the data message will be ignored.
RTS On Time	This parameter specifies the number of milliseconds to delay after asserting the RTS modem control line before sending the data.
RTS Off Time	This parameter specifies the number of milliseconds to delay after the data has been transmitted before dropping the RTS modem control line.

The timing parameters defined above must be set correctly for successful use of the collision avoidance feature. A timing diagram displaying the data and modem control lines used with the collision avoidance scheme is shown below. This example displays the state of the signal lines in transmitting a message from Unit 1 to Unit 2.


Wait for DCD to remain low for minimum time + random time before sending data.
RTS on delay
RTS off delay
UNIT 1:
RTS
DCD
TX Data
RX Data
UNIT 2:
RTS
DCD
TX Data
RX Data
DCD signal must be enabled for at least the RX-enable time before the data is received.

3.5 IIN Response: Slave Port

The module defines the IIN data bits returned with a response message from the module to a DNP master unit. These bits should be interpreted and handled by the master. These bits report status and error information to the master DNP device.

The following is a description of the word:

3.5.1 First Byte

Bit	Description
0	All stations message received. Set when a request is received with the destination address set to 0xffff. Cleared after next response. Used to let master station know broadcast received.
1	Class 1 data available. Set when class 1 data is ready to be sent from the slave to the master. Master should request class 1 data when this bit is set.
2	Class 2 data available. Set when class 2 data is ready to be sent from the slave to the master. Master should request class 2 data when this bit is set.
3	Class 3 data available. Set when class 3 data is ready to be sent from the slave to the master. Master should request class 3 data when this bit is set.

Bit	Description
4	Time synchronization required from master. The master should write the date and time when this bit is set. After receiving the write command, the bit will be cleared. Events may not be generated until this bit is cleared after a restart if configured by the user.
5	Slave digital outputs are in local control. This bit is not used in this application.
6	Not used
7	Device restart. This bit is set when the slave either warm or cold boots. It is cleared after a master writes a 0 to the bit. Events will not be generated until this bit is cleared.

3.5.2 Second Byte

Bit	Description
0	Bad function code. The function code contained in the master request is not supported for the specified object/variation.
1	Requested object(s) unknown. Object requested by master is not supported by the application.
2	Parameters in the qualifier, range, or data fields are not valid or out of range for the slave.
3	Event buffer(s) or other application buffers have overflowed. This bit is also set if the slave receives a multi-frame message from the master.
4	Request understood but requested operation is already executing. The slave will never set this bit.
5	Bad configuration. The slave configuration is invalid and should be re-configured. If the configuration is invalid, the slave will set the invalid parameters to default values, and continue to run. Check error log using debug port.
6	Reserved, always 0.
7	Reserved, always 0.

3.6 IIN Bit Definitions

The internal indication bits are stored in a word that follows the function code in all response messages. These bits report status and error information to the master DNP device. Below is a description of the word:

3.6.1 First Byte

Bit	Description
0	All stations message received. Set when a request is received with the destination address set to 0xffff. Cleared after next response. Used to let master station know broadcast received.
1	Class 1 data available. Set when class 1 data is ready to be sent from the slave to the master. Master should request class 1 data when this bit is set.
2	Class 2 data available. Set when class 2 data is ready to be sent from the slave to the master. Master should request class 2 data when this bit is set.
3	Class 3 data available. Set when class 3 data is ready to be sent from the slave to the master. Master should request class 3 data when this bit is set.
4	Time synchronization required from master. The master should write the date and time when this bit is set. After receiving the write command the bit will be cleared.
5	Slave digital outputs are in local control. This bit is not used in this application.

Bit	Description
6	Device trouble. When this bit is set, the data reported by the module may not be that currently present in the other protocol because the block transfer operation is not successful.
7	Device restart. This bit is set when the slave either warm or cold boots. It is cleared after a master writes a 0 to the bit.

3.6.2 Second Byte

Bit	Description
0	Bad function code. The function code contained in the master request is not supported for the specified object/variation.
1	Requested object(s) unknown. Object requested by master is not supported by the application.
2	Parameters in the qualifier, range, or data fields are not valid or out of range for the slave.
3	Event buffer(s) or other application buffers have overflowed. This bit is also set if the slave receives a multi-frame message from the master.
4	Request understood but requested operation is already executing. The slave will never set this bit.
5	Bad configuration. The slave configuration is invalid and should be re-configured. If the configuration is invalid, the slave will set the invalid parameters to default values and continue to run. Check error log using debug port.
6	Reserved, always 0.
7	Reserved, always 0.

3.7 Event Size Computation

The minimum event buffer size required to avoid overflow can be computed as follows:

```
((number of static points)*(rate per second scan of change function)) /(rate
per second of master event data poll)
```

For example: 51 binary input points are scanned two times each second and polled by the master station about every five seconds. The minimum number of binary input events is:

(51 * 2)/.02 = 510 events

This computation assumes the unlikely event that all data points will change in consecutive calls to the scan of change function. If an event buffer overflow condition occurs, the internal indication bit, BUFFER OVERFLOW, will be set. If the system you are working with is fairly stable, the following equation can be used to compute the event buffer size:

```
(number of points that change per change function * rate per second of scan of
change function)*(number of seconds between master event data poll)
```

For example: 1000 binary input points are scanned two times each second and polled by the master station about every five seconds. Only about five points change state every scan of the change function call.

(5 * 2) * 5 = 50 events required

The number of events that can be defined in the system is limited to 400. The event buffer will overflow in systems which are very dynamic unless one of the following conditions exist:

- The master frequently polls the slave device for events to keep the buffer empty.

OR

- The slave is configured to send unsolicited messages to the master station. This method requires full-duplex operation of the network because the slave may be sending a message during a request from the master station.

In order to disable the report by exception feature in the module, set the number of events to 0 for the BI Class, AI Class, and Float Class parameters within the DNP.CFG files. This will cause the slave to never generate event data for classes 1, 2, or 3.

3.8 Device Profile

DNP V3.00 DEVICE PROFILE DOCUMENT	
Vendor Name: ProSoft Technology, Inc.	
Device Name: DNP SLAVE DRIVER FOR PROLINX COMMUNICATION MODULES (VERSION 1.00)	
Highest DNP Level Supported : For Request: L2 For Responses: L2	Device Function:
Notable objects, functions, and/or qualifiers supported in addition to the highest DNP level stated above (see attached table for complete list): Definition of selected IIN bits: Configuration Error - User specified point or event count is too high for application (can only correct by changing configuration in module). Slave port on the module may be attached to a dial-up modem. The following features are configurable on the module: Collision avoidance, time sync before events are generated and default analog input events, Obj32V4 or O32V2, select option. Slave module will not generate events until Restart IIN bit is cleared by remote DNP master. Counter reset function should not be used because there is no way to zero values from host device.	
Maximum Data Link Frame Size (octets): Transmitted : 292 Received : 292	Maximum Application Fragment Size (octets): Transmitted : 2048 Received : 2048
Maximum Data Link Re-tries: Configurable from 0 - 255	Maximum Application Layer Re-tries: None
Requires Data Link Layer Confirmation: Configurable at module start-up (never, sometimes, & always)	
Requires Application Layer Confirmation:	

DNP V3.00 DEVICE PROFILE DOCUMENT When reporting Event Data as a slave unit	
Time-outs while waiting for:	
Data Link Confirm	: Configurable at module start-up (1 to 65535 mSec)
Complete Application Fragment	: Configurable at module start-up
Application Confirm	: Configurable at module start-up (1 to 65535 mSec)
Complete Application Response	: None
Sends/Executes Control Operations:	
WRITE Binary Outputs	: Never
SELECT/OPERATE	: Always
DIRECT OPERATE	: Always
DIRECT OPERATE-NO ACK	: Always
Count > 1	: Always (1 to 255)
Pulse On	: Always
Pulse Off	: Always
Latch On	: Always
Latch Off	: Always
Queue	: Never
Clear Queue	: Never
Reports Binary Input Change Events when no specific variation requested: Only time-tagged	Reports time-tagged Binary Input Change Events when no specific variation requested: Binary Input Change with Time
Sends Unsolicited Responses: This is configurable at module start-up. If the number of events for the Binary or Analog Input Events is greater than 0, unsolicited responses are supported. Use the Enable/Disable Unsolicited function code from the DNP master for control.	Sends Static Data in Unsolicited Responses: Never
Default Counter Object/Variation: Object : 20 Variation : 5	Counters Roll Over at: 32 Bits
Sends Multi-Fragment Responses: Yes	

3.9 Subset Definition

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
1	0	Binary Input: All Variations	1	06			1	Slave will return variation 1 data
	1	Binary Input	1	06	129, 130	00, 01	1	Slave will return this variation
	2	Binary Input with Status			129, 130	00, 01	8	Slave will return Unknown Object to this request
2	0	Binary Input Change: All Variations	1	06, 07, 08			56	Slave will return variation 2 data
	1	Binary Input Change Without Time	1	06, 07, 08	129, 130	17, 28	8	Slave will return this variation
	2	Binary Input Change With Time	1	06, 07, 08	129, 130	17, 28	56	Slave will return this variation
	3	Binary Input Change With Relative Time	1	06, 07, 08	129, 130	17, 28	24	Slave will parse this message and return no data
10	0	Binary Output: All Variations	1	06			8	Slave will return variation 2 data
	1	Binary Output					1	Slave will return Unknown Object to this request
	2	Binary Output Status	1	06	129, 130	00, 01	8	Slave will return this variation
12	0	Control Block: All Variations					88	Slave will use variation 1 control
	1	Control Relay Output Block	3, 4, 5, 6	17, 28	129	Echo of request	88	Slave will respond correctly to this variation
	2	Pattern Control Block					88	Slave will return Unknown Object to this request
	3	Pattern Mask					16	Slave will return Unknown Object to this request
20	0	Binary Counter: All Variations	1, 7, 8, 9, 10	06			32	Slave will return variation 5 data
	1	32-Bit Binary Counter			129, 130	00, 01	40	Slave will return Unknown Object to this request
	2	16-Bit Binary Counter			129, 130	00, 01	24	Slave will return Unknown Object to this request
	3	32-Bit Delta Counter			129, 130	00, 01	40	Slave will return Unknown Object to this request
	4	16-Bit Delta Counter			129, 130	00, 01	24	Slave will return Unknown Object to this request

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
	5	32-Bit Binary Counter Without Flag	1, 7, 8, 9, 10	06	129, 130	00, 01	32	Slave will return this variation
	6	16-Bit Binary Counter Without Flag	1, 7, 8, 9, 10	06	129, 130	00, 01	16	Slave will return this variation (counter upper 16-bits removed)
	7	32-Bit Delta Counter Without Flag			129, 130	00, 01	32	Slave will return Unknown Object to this request
	8	16-Bit Delta Counter Without Flag			129, 130	00, 01	16	Slave will return Unknown Object to this request
21	0	Frozen Counter: All Variations	1	06			32	Slave will return variation 9 data
	1	32-Bit Frozen Counter			129, 130	00, 01	40	Slave will return Unknown Object to this request
	2	16-Bit Frozen Counter			129, 130	00, 01	24	Slave will return Unknown Object to this request
	3	32-Bit Frozen Delta Counter					40	Slave will return Unknown Object to this request
	4	16-Bit Frozen Delta Counter					24	Slave will return Unknown Object to this request
	5	32-Bit Frozen Counter With Time Of Freeze					88	Slave will return Unknown Object to this request
	6	16-Bit Frozen Counter With Time Of Freeze					72	Slave will return Unknown Object to this request
	7	32-Bit Frozen Delta Counter With Time Of Freeze					88	Slave will return Unknown Object to this request
	8	16-Bit Frozen Delta Counter With Time Of Freeze					72	Slave will return Unknown Object to this request
	9	32-Bit Frozen Counter Without Flag	1	06	129, 130	00, 01	32	Slave will return this variation
	10	16-Bit Frozen Counter Without Flag	1	06	129, 130	00, 01	16	Slave will return this variation (counter upper 16-bits removed)
	11	32-Bit Frozen Delta Counter Without Flag					32	Slave will return Unknown Object to this request

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
	12	16-Bit Frozen Delta Counter Without Flag					16	Slave will return Unknown Object to this request
22	0	Counter Change Event: All Variations	1	06, 07, 08				Slave will parse this request and return no data
	1	32-Bit Counter Change Event Without Time			129, 130	17, 28	40	Slave will return Unknown Object to this request
	2	16-Bit Counter Change Event Without Time			129, 130	17, 28	24	Slave will return Unknown Object to this request
	3	32-Bit Delta Counter Change Event Without Time					40	Slave will return Unknown Object to this request
	4	16-Bit Delta Counter Change Event Without Time					24	Slave will return Unknown Object to this request
	5	32-Bit Counter Change Event With Time					88	Slave will return Unknown Object to this request
	6	16-Bit Counter Change Event With Time					72	Slave will return Unknown Object to this request
	7	32-Bit Delta Counter Change Event With Time					88	Slave will return Unknown Object to this request
	8	16-Bit Delta Counter Change Event With Time					72	Slave will return Unknown Object to this request
23	0	Frozen Counter Event: All Variations						Slave will return Unknown Object to this request
	1	32-Bit Frozen Counter Event Without Time					40	Slave will return Unknown Object to this request
	2	16-Bit Frozen Counter Event Without Time					24	Slave will return Unknown Object to this request
	3	32-Bit Frozen Delta Counter Event Without Time					40	Slave will return Unknown Object to this request

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
	4	16-Bit Frozen Delta Counter Event Without Time					24	Slave will return Unknown Object to this request
	5	32-Bit Frozen Counter Event With Time					88	Slave will return Unknown Object to this request
	6	16-Bit Frozen Counter Event With Time					72	Slave will return Unknown Object to this request
	7	32-Bit Frozen Delta Counter Event With Time					88	Slave will return Unknown Object to this request
	8	16-Bit Frozen Delta Counter Event With Time					72	Slave will return Unknown Object to this request
30	0	Analog Input: All Variations	1	06			16	Slave will respond with variation 4 data
	1	32-Bit Analog Input	1	06	129, 130	00, 01	40	Slave will return this variation (Note: Data will only be 16-bit)
	2	16-Bit Analog Input	1	06	129, 130	00, 01	24	Slave will return this variation
	3	32-Bit Analog Input Without Flag	1	06	129, 130	00, 01	32	Slave will return this variation (Note: Data will only be 16-bit)
	4	16-Bit Analog Input Without Flag	1	06	129, 130	00, 01	16	Slave will return this variation
	5	Short Floating Point Analog Input	1	06	129, 130	00, 01	40	Slave will return this variation
	6	Long Floating Point Analog Input	1	06	129, 130	00, 01	72	Slave will return this variation
31	0	Frozen Analog Input: All Variations						Slave will return Unknown Object to this request
	1	32-Bit Frozen Analog Input					40	Slave will return Unknown Object to this request
	2	16-Bit Frozen Analog Input					24	Slave will return Unknown Object to this request
	3	32-Bit Frozen Analog Input With Time To Freeze					88	Slave will return Unknown Object to this request

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
	4	16-Bit Frozen Analog Input With Time To Freeze					72	Slave will return Unknown Object to this request
	5	32-Bit Frozen Analog Input Without Flag					32	Slave will return Unknown Object to this request
	6	16-Bit Frozen Analog Input Without Flag					16	Slave will return Unknown Object to this request
	7	Short Floating Point Frozen Analog Input					40	Slave will return Unknown Object to this request
	8	Long Floating Point Frozen Analog Input					72	Slave will return Unknown Object to this request
32	0	Analog Change Event: All Variations	1	06, 07, 08			24	Slave will return variation 2 data
	1	32-Bit Analog Change Event Without Time	1	06, 07, 08	129, 130	17, 28	40	Slave will return this variation (Note: Data only 16-bit)
	2	16-Bit Analog Change Event Without Time	1	06, 07, 08	129, 130	17, 28	24	Slave will return this variation
	3	32-Bit Analog Change Event With Time	1	06, 07, 08	129, 130	17, 28	88	Slave will return this variation (Note: Data only 16-bit)
	4	16-Bit Analog Change Event With Time	1	06, 07, 08	129, 130	17, 28	72	Slave will return this variation
	5	Short Floating Point Analog Change Event	1	06, 07, 08	129, 130	17, 28	40	Slave will return this variation
	6	Long Floating Point Analog Change Event	1	06, 07, 08	129, 130	17, 28	72	Slave will return this variation
	7	Short Floating Point Analog Change Event With Time	1	06, 07, 08	129, 130	17, 28	88	Slave will return this variation
	8	Long Floating Point Analog Change Event With Time	1	06, 07, 08	129, 130	17, 28	120	Slave will return this variation
33	0	Frozen Analog Event: All Variations						Slave will return Unknown Object to this request

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
	1	32-Bit Frozen Analog Event Without Time					40	Slave will return Unknown Object to this request
	2	16-Bit Frozen Analog Event Without Time					24	Slave will return Unknown Object to this request
	3	32-Bit Frozen Analog Event With Time					88	Slave will return Unknown Object to this request
	4	16-Bit Frozen Analog Event With Time					72	Slave will return Unknown Object to this request
	5	Short Floating Point Frozen Analog Event					40	Slave will return Unknown Object to this request
	6	Long Floating Point Frozen Analog Event					72	Slave will return Unknown Object to this request
	7	Short Floating Point Frozen Analog Event With Time					88	Slave will return Unknown Object to this request
	8	Long Floating Point Frozen Analog Event With Time					120	Slave will return Unknown Object to this request
40	0	Analog Output Status: All Variations	1	06			24	Slave will return variation 2 data
	1	32-Bit Analog Output Status	1	06	129,130	00,01	40	Slave will return this variation but data only 16-bit accuracy
	2	16-Bit Analog Output Status	1	06	129, 130	00, 01	24	Slave will return this variation
	3	Short Floating Point Analog Output Status	1	06	129, 130	00, 01	40	Slave will return this variation
	4	Long Floating Point Analog Output Status	1	06	129, 130	00, 01	72	Slave will return this variation
41	0	Analog Output Block: All Variations					24	Slave will respond to this request using variation 2 data
	1	32-Bit Analog Output Block	3, 4, 5, 6	17, 28	129,130	00,01	40	Slave will respond to this request but data only 16-bit
	2	16-Bit Analog Output Block	3, 4, 5, 6	17, 28	129	Echo of Request	24	Slave will respond to this request

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
	3	Short Floating Point Analog Output Block	3, 4, 5, 6	17, 28	129	Echo of Request	40	Slave will respond to this request
	4	Long Floating Point Analog Output Block	3, 4, 5, 6	17, 28	129	Echo of Request	72	Slave will respond to this request
50	0	Time and Date: All Variations	2	07, With Quant=1			48	Slave will use variation 1
	1	Time and Date	2	07, With Quant=1			48	Slave will respond to this variation
	2	Time and Date With Interval					80	Slave will return Unknown Object to this request
51	0	Time and Date CTO: All Variations						Slave will return Unknown Object to this request
	1	Time and Date CTO			129, 130	07, With Quant=1	48	Slave will return Unknown Object to this request
	2	Unsynchronized Time and Date CTO			129, 130	07, With Quant=1	48	Slave will return Unknown Object to this request
52	0	Time Delay: All Variations						
	1	Time Delay Coarse			129	07, With Quant=1	16	Slave will never return this variation
	2	Time Delay Fine			129	07, With Quant=1	16	Slave will return this variation to functions 0D, 0E, and 17
60	0	Not Defined						Not Defined in DNP
	1	Class 0 Data	1	06				Slave will respond to this variation with all static data
	2	Class 1 Data	1	06, 07, 08				Slave will respond to this variation (No class 1 data defined in application)
	3	Class 2 Data	1	06, 07, 08				Slave will respond to this variation with all class 2 data (binary input events)
	4	Class 3 Data	1	06, 07, 08				Slave will respond to this variation with all class 3 data (analog input events)
70	0	Not Defined						Not Defined in DNP
	1	File Identifier						Slave will return Unknown Object to this request
80	0	Not Defined						Not Defined in DNP
	1	Internal Indications	2	00, Index=7			24	Slave will respond to this variation
81	0	Not Defined						Not Defined in DNP

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
	1	Storage Object						
82	0	Not Defined						Not Defined in DNP
	1	Device Profile						
83	0	Not Defined						Not Defined in DNP
	1	Private Registration Object						
	2	Private Registration Objection Descriptor						
90	0	Not Defined						Not Defined in DNP
	1	Application Identifier						
100	0							
	1	Short Floating Point					48	
	2	Long Floating Point					80	
	3	Extended Floating Point					88	
101	0							
	1	Small Packed Binary-Coded Decimal					16	
	2	Medium Packed Binary-Coded Decimal					32	
	3	Large Packed Binary-Coded Decimal					64	
110	0	Not Defined						Not Defined as the variation determines the string length
	1 to 100	Octet String	1	00, 01, 06, 07, 08, 17, 28	129, 130	00, 01, 07, 08, 17, 28	8 * Var #	The module will return this variation for the points defined in the module. The variation determines the returned string length.
No Object			13					Slave supports the Cold Restart Function and will return Obj 52, Var 2, Qual 7, Cnt 1
			14					Slave supports the Warm Restart Function and will return Obj 52, Var 2, Qual 7, Cnt 1
			20					Slave supports the Enable Unsolicited Function

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
			21					Slave supports the Disable Unsolicited Function
			23					Slave supports the Delay Measurement & Time Synchronization Function and will return Obj 52, Var 2, Qual 7, Cnt 1

4 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.

4.1 How to Contact Us: Technical Support

Internet	Web Site: 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

4.2 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.

4.2.1 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 79). 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, and so on.

4.2.2 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.

4.2.3 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

4.3 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.

4.3.1 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.

4.3.2 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.

4.3.3 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.

4.3.4 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.

4.3.5 Disclaimer of all Other Warranties

The Warranty set forth in What Is Covered By This Warranty (page 81) 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.

4.3.6 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.

4.3.7 Time Limit for Bringing Suit

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

4.3.8 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.

4.3.9 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.

4.3.10 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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