ProSoft TECHNOLOGY

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inRAx®

MVI69-DNPSNET

CompactLogix or MicroLogix Platform

Distributed Network Protocol Interface Module

7/7/2021

USER MANUAL

Please Read This Notice

Successful application of this module requires a reasonable working knowledge of the Rockwell Automation CompactLogix or MicroLogix hardware, the MVI69-DNPSNET Module and the application in which the combination is to be used. For this reason, it is important that those responsible for implementation satisfy themselves that the combination will meet the needs of the application without exposing personnel or equipment to unsafe or inappropriate working conditions.

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

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

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

Battery Life Advisory

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

Note: The battery is not user replaceable.

Your Feedback Please

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

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ProSoft® Product Documentation

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

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Guide to the MVI69-DNPSNET User Manual

Function		Section to Read	Details
Introduction (Must Do)	→	Start Here (page 9)	This Section introduces the customer to the module. Included are: package contents, system requirements, hardware installation, and basic configuration.
Verify Communication, Diagnostic and Troubleshooting	→	Verifying Communication (page 58) Diagnostics and Troubleshooting (page 47)	This section describes how to verify communications with the network. Diagnostic and Troubleshooting procedures.
Reference Product Specifications Functional Overview Glossary	→	Reference (page 63) Functional Overview (page 65) Product Specifications (page 63)	These sections contain general references associated with this product, Specifications, and the Functional Overview.
Support, Service, and Warranty Index	→	Support, Service and Warranty (page 109)	This section contains Support, Service and Warranty information. Index of chapters.

1 Start Here

In This Chapter

Installing the MVI69-DNPSNET module requires a reasonable working knowledge of the Rockwell Automation hardware, the MVI69-DNPSNET Module and the application in which they will be used.

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

1.1 System Requirements

The MVI69-DNPSNET module requires the following minimum hardware and software components:

- Rockwell Automation CompactLogix or MicroLogix processor, with compatible power supply and one free slot in the rack, for the MVI69-DNPSNET module. The module requires 800mA of available power.

Important: The MVI69-DNPSNET module has a power supply distance rating of 2 (L43 and L45 installations on first 2 slots of 1769 bus).
Important: For 1769-L23x processors, please make note of the following limitations.

- 1769-L23-QBFC1B = 800mA at 5Vdc (1 MVI69-DNPSNET will use all 800mA of available power. No other modules can be used with an MVI69 module connected to this processor).
- 1769-L23E-QB1B = 1000mA at 5Vdc (1 MVI69-DNPSNET will use 800mA of available power. One other module can be used on this rack provided it consumes less than 200mA at 5Vdc.
- 1769-L23E-QBFC1B = 450mA at 5Vdc (no MVI69 module can be used with this processor)

- Rockwell Automation RSLogix 5000 (CompactLogix) or RSLogix 500 (MicroLogix) programming software
- Rockwell Automation RSLinx communication software

- Pentium® II 450 MHz minimum. Pentium III 733 MHz (or better) recommended
- Supported operating systems:
  - Microsoft Windows XP Professional with Service Pack 1 or 2
  - Microsoft Windows 2000 Professional with Service Pack 1, 2, or 3
  - Microsoft Windows Server 2003
- 128 Mbytes of RAM minimum, 256 Mbytes of RAM recommended
- 100 Mbytes of free hard disk space (or more based on application requirements)
- 256-color VGA graphics adapter, 800 x 600 minimum resolution (True Color 1024 × 768 recommended)
- HyperTerminal or other terminal emulator program capable of file transfers using Ymodem protocol.

1.2 Package Contents

The following components are included with your MVI69-DNPSNET module, and are all required for installation and configuration.

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

Qty.	Part Name	Part Number	Part Description
1	MVI69-DNPSNET Module	MVI69-DNPSNET	Distributed Network Protocol Interface Module
1	Cable	Cable #15, RS232 Null Modem	For RS232 Connection to the CFG Port
1	Cable	RJ45 to DB9 Male Adapter	For DB9 Connection to Module's Port

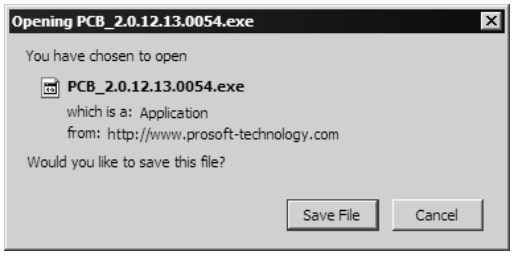
If any of these components are missing, please contact ProSoft Technology Support for replacement parts.

1.3 Install ProSoft Configuration Builder Software

You must install the ProSoft Configuration Builder (PCB) software in order to configure the MVI69-DNPSNET module. You can always get the newest version of ProSoft Configuration Builder from the ProSoft Technology web site.

To install ProSoft Configuration Builder from the ProSoft Web Site

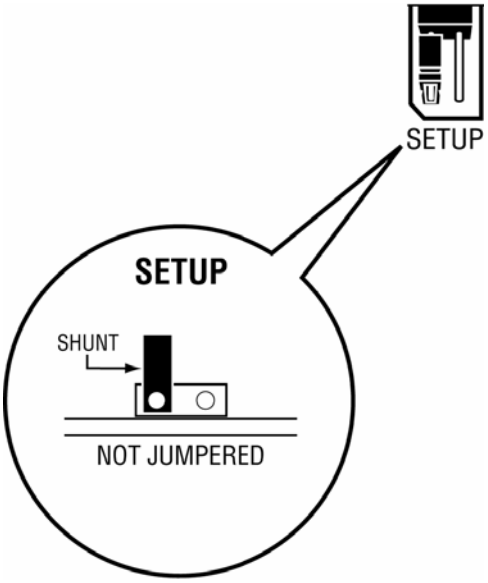
1. Open your web browser and navigate to http://www.prosoft-technology.com/pcb
2. Click the **Download Here** link to download the latest version of ProSoft Configuration Builder.
3. Choose "Save" or "Save File" when prompted. The following illustrations show the file download prompt for two of the most common web browsers.



4. Make a note of the location where you saved the file, for example "Desktop", or "My Documents", so you can start the installation program.
5. When the download is complete, locate and open the file, and then follow the instructions on your screen to install the program.

1.4 Setting Jumpers

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



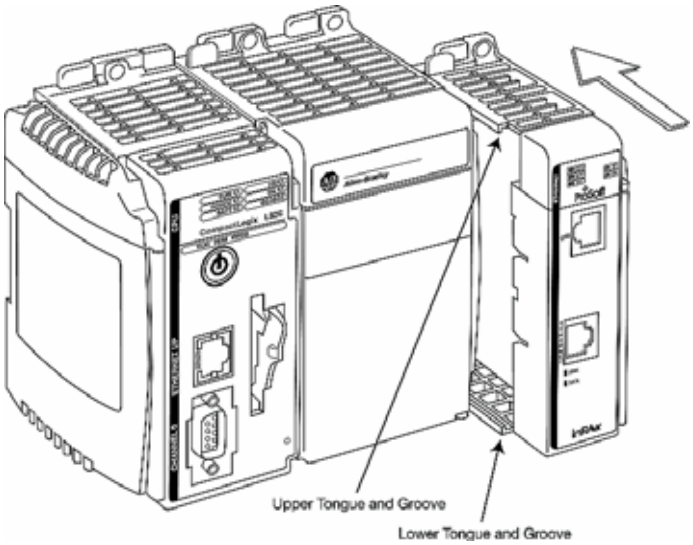
1.5 Install the Module in the Rack

This section describes how to install the module into a CompactLogix or MicroLogix rack

Before you attempt to install the module, make sure that the bus lever of the adjacent module is in the unlocked (fully right) position.

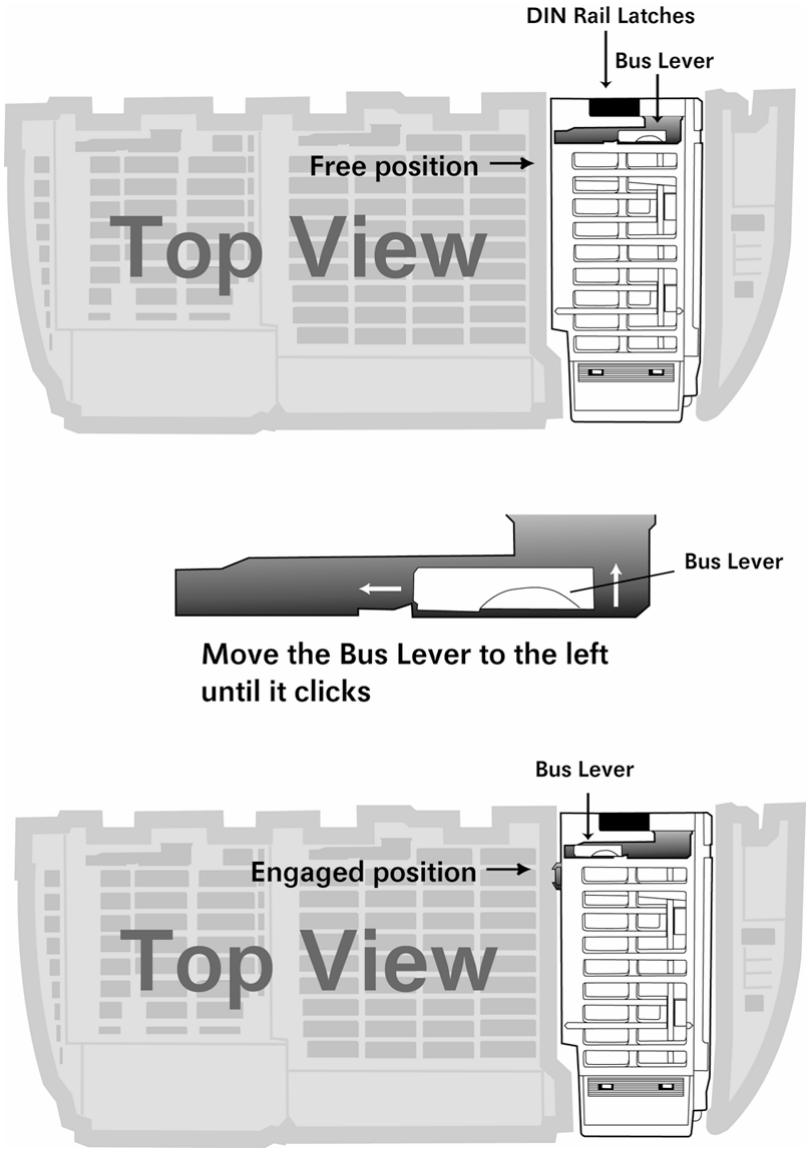
Warning: This module is not hot-swappable! Always remove power from the rack before inserting or removing this module, or damage may result to the module, the processor, or other connected devices.

1. Align the module using the upper and lower tongue-and-groove slots with the adjacent module and slide forward in the direction of the arrow.



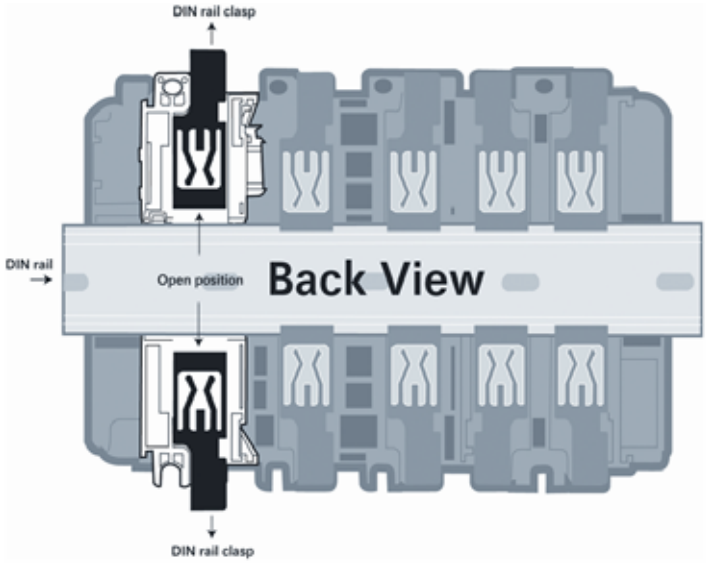
2. Move the module back along the tongue-and-groove slots until the bus connectors on the MVI69 module and the adjacent module line up with each other.

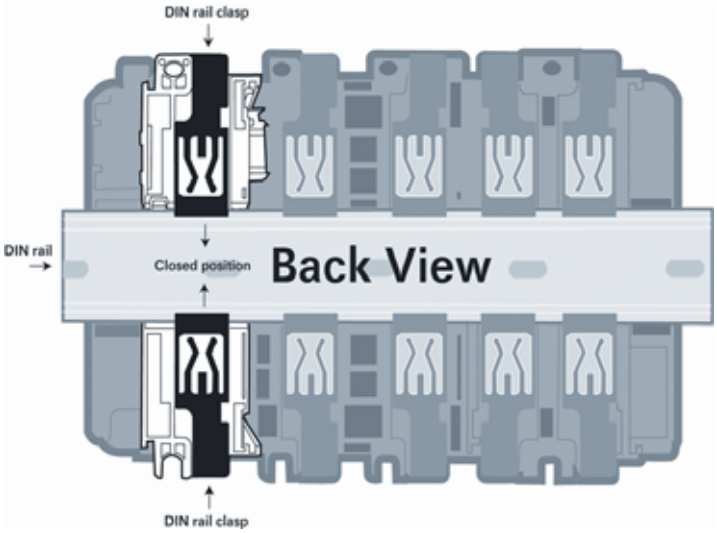
3 Push the module's bus lever back slightly to clear the positioning tab and move it firmly to the left until it clicks. Ensure that it is locked firmly in place.



4 Close all DIN rail latches.

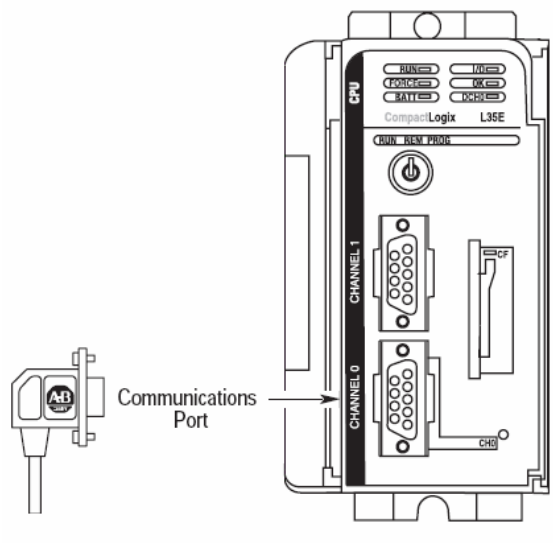
5 Press the DIN rail mounting area of the controller against the DIN rail. The latches will momentarily open and lock into place.



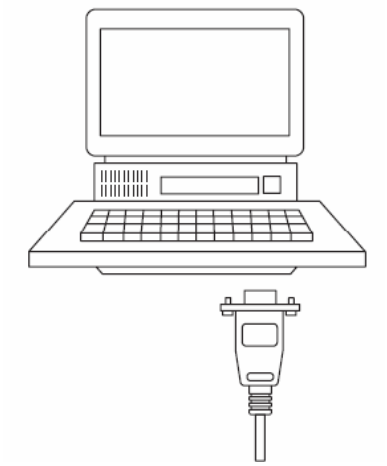


1.6 Connect your PC to the Processor

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



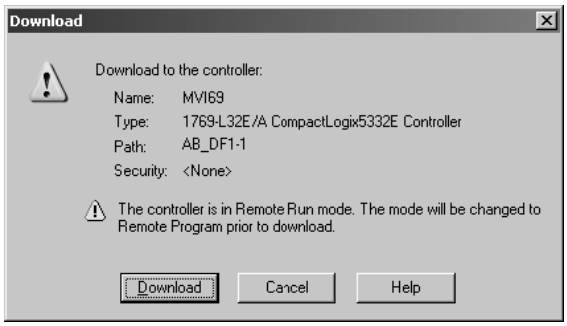
2 Connect the straight connector end of the cable to the serial port on your computer.



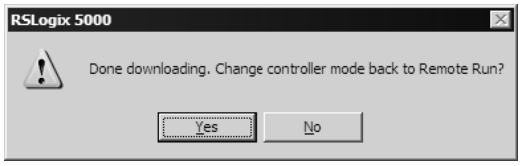
1.7 Download the Sample Program to the Processor

Important: For most applications, the sample program will work without modification.
Note: The key switch on the front of the CompactLogix processor must be in the REM position.

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



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

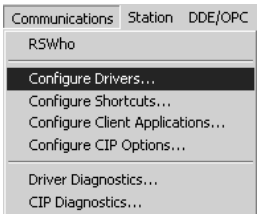


Note: If you receive an error message during these steps, refer to your RSLogix documentation to interpret and correct the error.

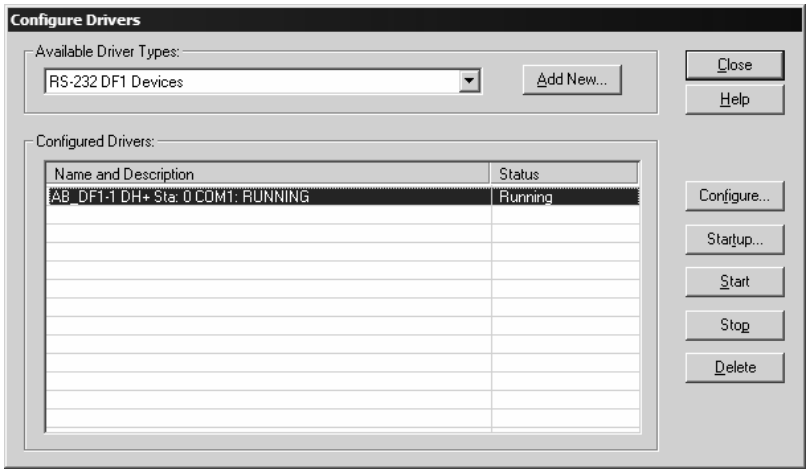
1.7.1 Configuring RSLinx

If RSLogix is unable to establish communication with the processor, follow these steps:

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

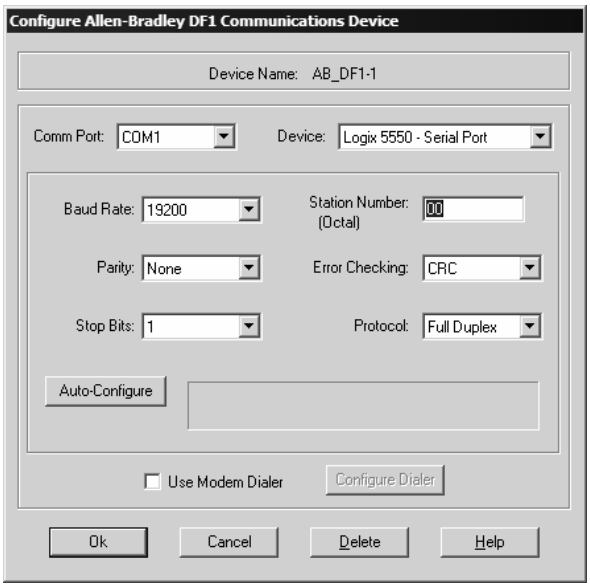


This action opens the Configure Drivers dialog box.



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

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



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

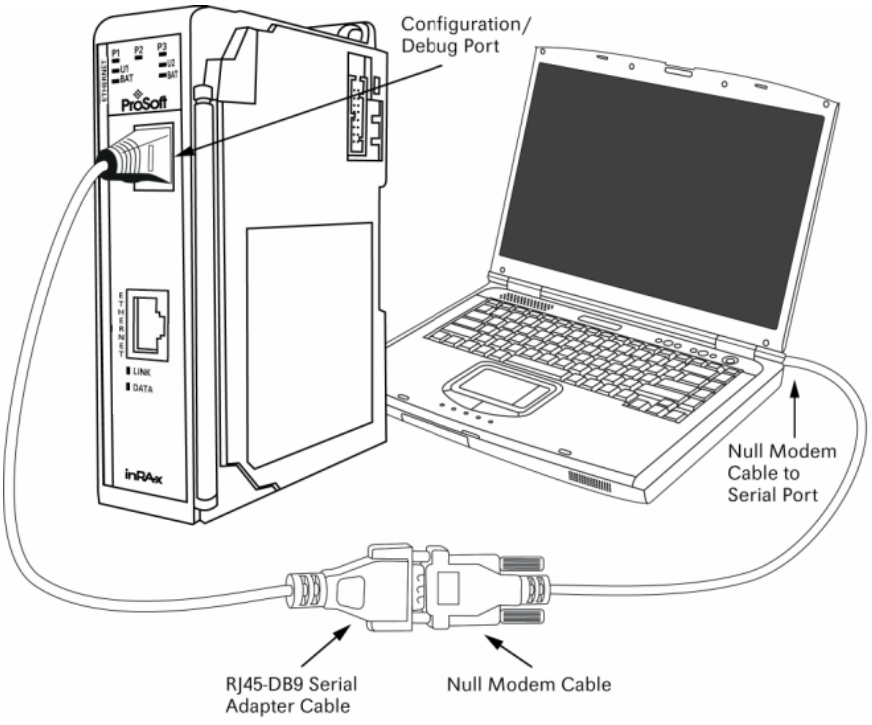
5 When you see the message "Auto Configuration Successful", click the OK button to dismiss the dialog box.

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

1.8 Connect your PC to the Module

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

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



2 Configuring the MVI69-DNPSNET Module

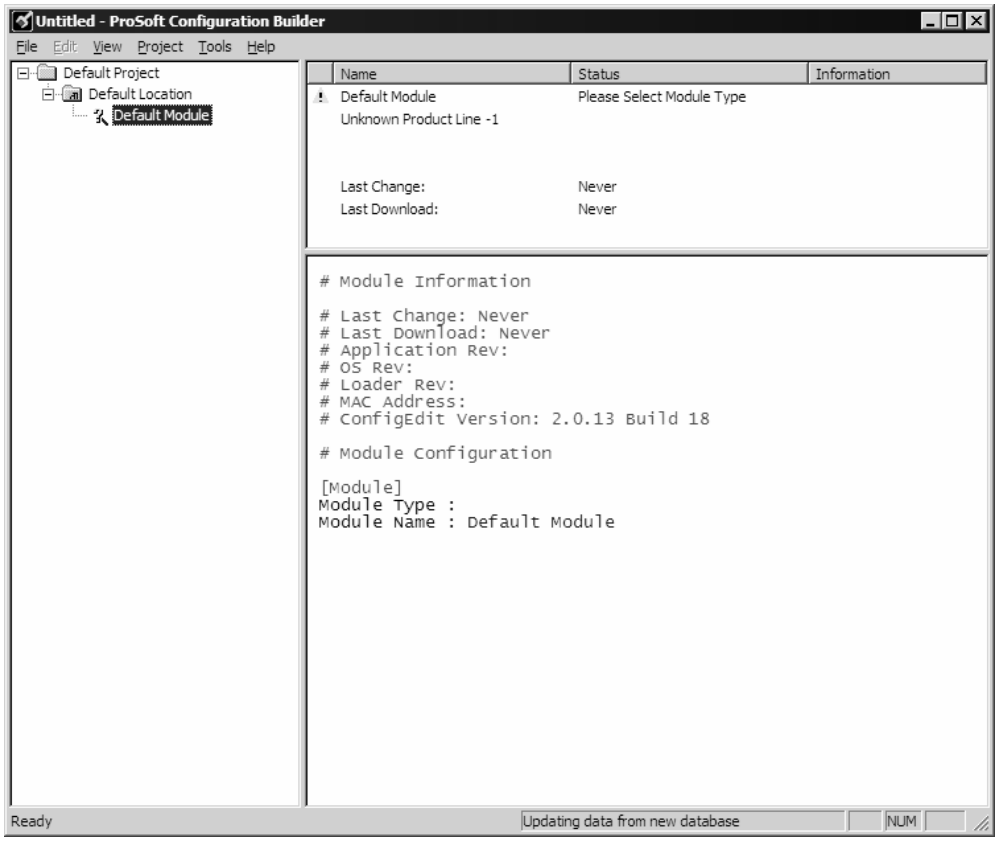
In This Chapter

2.1 ProSoft Configuration Builder

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

2.1.1 Set Up the Project

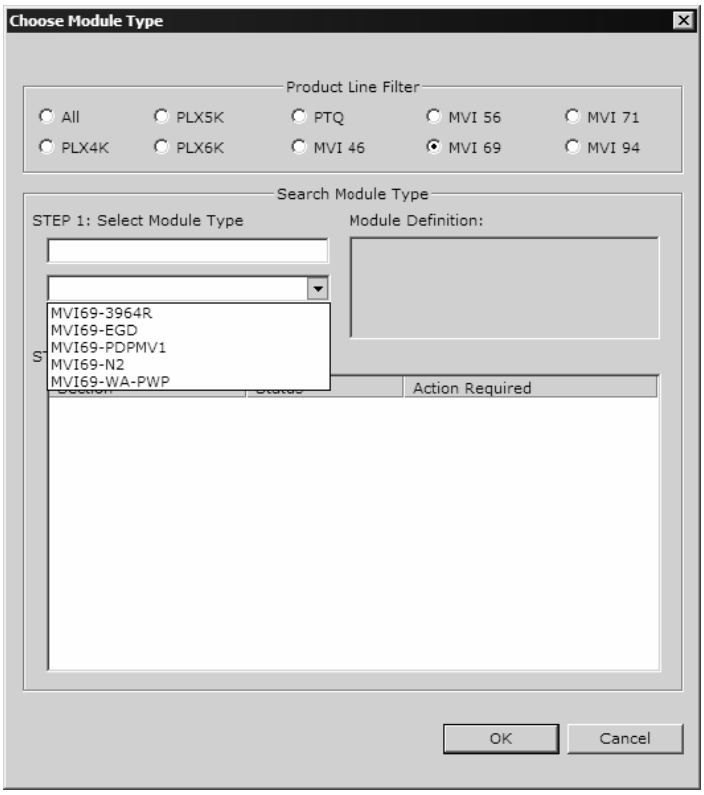
To begin, start ProSoft Configuration Builder. If you have used other Windows configuration tools before, you will find the screen layout familiar. ProSoft Configuration Builder's window consists of a tree view on the left, an information pane and a configuration pane on the right side of the window.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



Your first task is to add the MVI69-DNPSNET 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 MVI69. In the Select Module Type dropdown list, select MVI69-DNPSNET, and then click OK to save your settings and return to the ProSoft Configuration Builder window.

Adding a Project

To add a project to an existing project file:

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

Adding a Module

To add a module to your project:

1 Double-click the Default Module icon to open the Choose Module Type dialog box.
2 On the Choose Module Type dialog box, select the module type.

Or

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

To add a module to a different location:

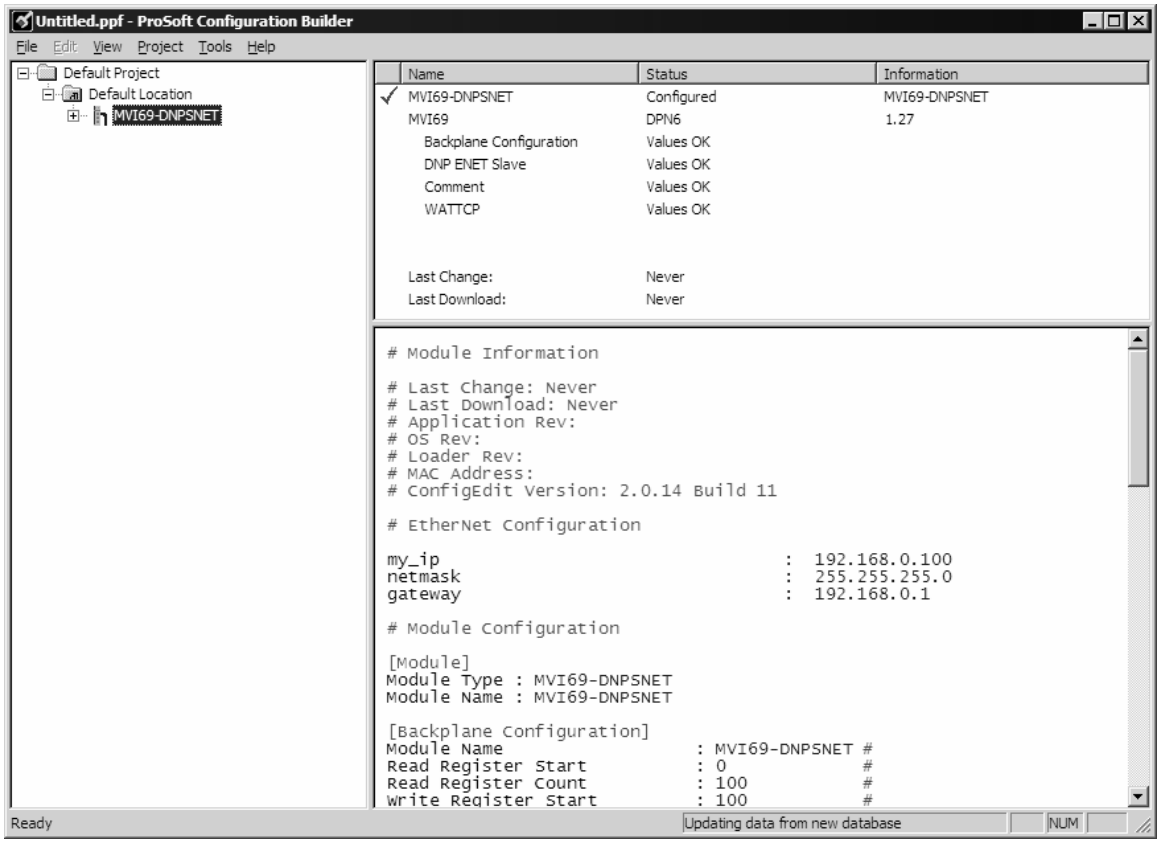
1 Right-click the Location folder and choose Add Module. A new module icon appears.

Or

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

2.1.2 Set Module Parameters

Notice that the contents of the information pane and the configuration pane changed when you added the MVI69-DNPSNET module to the project.



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

To rename an object:

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

Module Entries

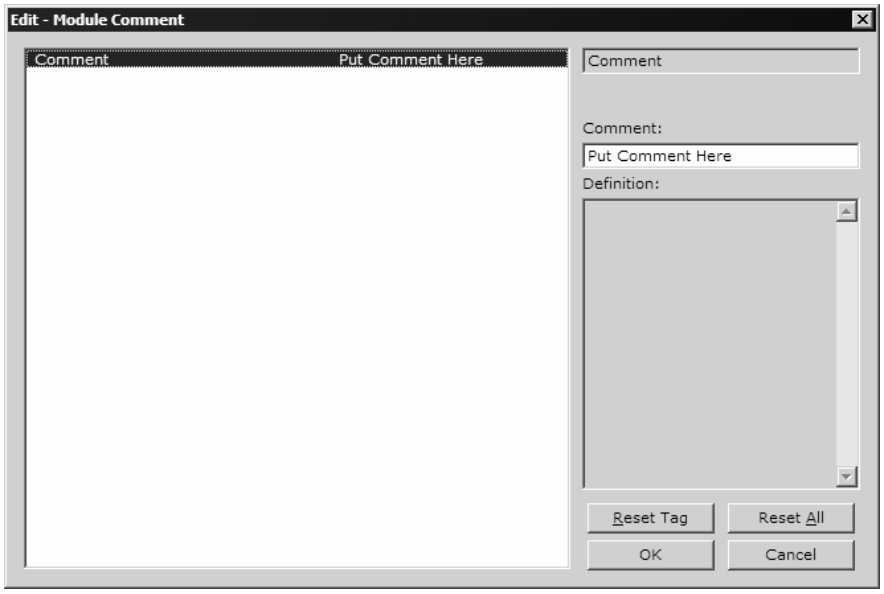
To configure module parameters

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

Comment Entries

To add comments to your configuration file:

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



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

Printing a Configuration File

To print a configuration file:

1. Select the Module icon, and then click the right mouse button to open a shortcut menu.
2. On the shortcut menu, choose View Configuration. This action opens the View Configuration window.
3. On the View Configuration window, open the File menu, and choose Print. This action opens the Print dialog box.
4. On the Print dialog box, choose the printer to use from the dropdown list, select printing options, and then click OK.

2.2 [Backplane Configuration]

This section of the file describes the database setup and module level parameters.

2.2.1 Module Name

0 to 80 characters

This parameter assigns a name to the module that can be viewed using the configuration/debug port. Use this parameter to identify the module and the configuration file.

2.2.2 Read Register Start

0 to 8899

This parameter specifies the starting register in the module where data will be transferred from the module to the processor. Valid range for this parameter is 0 to 8899.

2.2.3 Read Register Count

0 to 8900

This parameter specifies the number of registers to be transferred from the module to the processor. Valid entry for this parameter is 0 to 8900.

2.2.4 Write Register Start

0 to 8899

This parameter specifies the starting register in the module where the data will be transferred from the processor to the module. Valid range for this parameter is 0 to 8899.

2.2.5 Write Register Count

0 to 8900

This parameter specifies the number of registers to transfer from the processor to the module. Valid entry for this parameter is 0 to 8900.

2.2.6 Block Transfer Size

60, 120 or 240

This read-only parameter specifies the number of words in each block transferred between the module and processor. Valid values for this parameter are 60, 120 and 240.

2.2.7 Failure Flag Count

0 to 65535

This parameter specifies the number of successive transfer errors that must occur before the communication ports are shut down. If the parameter is set to 0, the communication ports will continue to operate under all conditions. The value range should be between 0 and 6900.

2.2.8 Error Offset

0 to 8899

This parameter specifies the register location in the module's database where module status data will be stored. If a value less than 0 is entered, the data will not be stored in the database. If the value specified is in the range of 0 to 8966, the data will be placed in the modules database.

2.2.9 Initialize Output Data

Yes or No

This parameter determines if the output data for the module should be initialized with values from the processor. If the value is set to N, the output data will be initialized to 0. If the value is set to Y, the data will be initialized with data from the processor.

2.3 [DNP ENET Slave]

This section provides information required to configure a slave application with the module. Most entries contained within this section are self explanatory with the possible exception of the Use IP List directive. This directive instructs the module to verify the address of the received message and ignore the message if it is not on our list of acceptable clients.

2.3.1 Internal Slave ID

0 to 65534

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

2.3.2 Use IP List

Y or N

This parameter specifies if the IP address of the host connected to the system will be validated. If the parameter is set to N, any host may connect to the unit. If the parameter is set to Y, only hosts in the IP list will be permitted to connect to the module. All other IP addresses will be ignored by the module and the module will issue a RST to the TCP/IP connection.

DNP Database Definition Note: The databases are in the memory of the module in this sequence and are placed directly adjacent to each other. In other words when you change the size of a database you must adjust the transfer commands to accommodate the new location.

2.3.3 Binary Inputs

0 to 500 words

This parameter specifies the number of digital input points to configure in the DNP slave device based on a word count. The valid range is 0 to 500 words.

2.3.4 Analog Inputs

0 to 500 points

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

2.3.5 Float Inputs

0 to 150

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

2.3.6 Counters

0 to 250 points

This parameter sets the 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. Valid values are 0 to 250 points.

2.3.7 Binary Outputs

0 to 500 words

Number of digital output points to configure in the DNP slave device based on a word count. Each word stores 16 points. Therefore, if the parameter is set to 2, 32 binary outputs will be defined for the application.

2.3.8 Analog Outputs

0 to 500 points

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

2.3.9 Float Outputs

0 to 150 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 memory.

2.3.10 BI Class

0=disable, else 1 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.

2.3.11 AI Class

0=disable, else 1 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.

2.3.12 Float Class

0=disable, else 1 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.

2.3.13 AI Deadband

0 to 32767 data units

This value sets the global deadband for all analog input points. When the current value for an analog input point is not within the deadband limit set based on the last event for the point, an event will be generated.

2.3.14 Float Deadband

0 to 32767 data units

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.

2.3.15 Select/Operate Arm Time

1 to 65535 milliseconds

This parameter sets the time period after select command received in which operate command will be performed. After the select command is received, the operate command will only be honored if it arrives within this period of time. Valid arm timeout values are 1 to 65535 milliseconds. This example shows the value set to 2000 milliseconds.

2.3.16 Write Time Interval

0 to 1440 minutes

This parameter sets the 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.

2.3.17 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.

2.3.18 Unsolicited Response

Yes or No

This parameter is 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.

2.3.19 Class 1 Unsol Resp Min

1 to 255 events

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

2.3.20 Class 2 Unsol Resp Min

1 to 255 events

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

2.3.21 Class 3 Unsol Resp Min

1 to 255 events

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

2.3.22 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.

2.3.23 Uresp Master Address

0 to 65534

DNP destination address where unsolicited response messages are sent.

2.3.24 BI with Flag

Yes or No

This parameter determines which variation will be returned for object 1 when the master requests variation 0. If the parameter is set to N, variation 1 will be returned. If the parameter is set to Y, variation 2 will be returned.

Note: Flag will always be set for Online and cannot be changed through by the PLC or user program. Only the default variation returned by the module will be affected by changing this parameter.

2.3.25 BI Events Without Time

Yes or No

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

2.3.26 AI with Flag

Yes or No

This parameter determines which variation will be returned for object 30 when the master requests variation 0. If the parameter is set to N, variation 4 will be returned. If the parameter is set to Y, variation 2 will be returned.

Note: Flag will always be set for Online and cannot be changed through by the PLC or user program. Only the default variation returned by the module will be affected by changing this parameter.

2.3.27 AI Events with Time

Yes or No

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.

2.3.28 BO Without Flag

Yes or No

This parameter determines which variation will be returned for object 10 when the master requests variation 0. If the parameter is set to N, variation 2 will be returned. If the parameter is set to Y, variation 1 will be returned.

2.3.29 Counter with Flag

Yes or No

This parameter determines which variation will be returned for object 20 when the master requests variation 0. If the parameter is set to N, variation 5 will be returned. If the parameter is set to Y, variation 1 will be returned.

Note: Flag will always be set for Online and cannot be changed through by the PLC or user program. Only the default variation returned by the module will be affected by changing this parameter.

2.3.30 Frozen Counter with Flag

Yes or No

This parameter determines which variation will be returned for object 21 when the master requests variation 0. If the parameter is set to N, variation 9 will be returned. If the parameter is set to Y, variation 1 will be returned.

Note: Flag will always be set for Online and cannot be changed through by the PLC or user program. Only the default variation returned by the module will be affected by changing this parameter.

2.3.31 Time Sync Before Events

Yes or No

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, events will be generated irrespective of the module's time sync status. If the parameter is set to Y, events will be generated only if the module's time is synchronized.

2.3.32 Use Trip/Close Single Point

Yes or No

If you set this parameter to Yes, Trip/Close events will function like Pulse On operations. Only one bit will be reserved in the DNP BO database.

If you set this parameter to No, the dual-point relay control database (Trip/Close) is overlaid on the DNP Binary Output database of the module. Each DNP point index sent will have an offset of point index times 2 into the database. The first bit of the dual-point relay control database will correspond to the close relay and the second will correspond to the trip relay.

The bit definitions from control byte of CROB are as follows:

- 00 - Null (single bit control or select of Trip/Close
- 01 - Close relay
- 10 - Trip relay
- 11 - Invalid

If the operate command is used with the Null relay (00), the module will operate on the point as single point control. The following table describes the module's behavior:

Point Index in Command	Point in Database Controlled
0	Bit 0 in BO database
10	Bit 10 in BO database
15	Bit 15 in BO database

If the operate command is used with the close relay selected, the module will operate on the first bit of the two database bits associated with the point. The following table describes the module's behavior when the close relay is selected:

Point Index in Command	Point in Database Controlled
0	Bit 0 in BO database
1	Bit 2 in BO database
10	Bit 20 in BO database
15	Bit 30 in BO database

If the operate command is used with the trip relay selected, the module will operate on the second bit of the two database bits associated with the point. The following table describes the module's behavior when the trip relay is selected:

Point Index in Command	Point in Database Controlled
0	Bit 1 in BO database
1	Bit 3 in BO database
10	Bit 21 in BO database
15	Bit 31 in BO database

It is important to note that the trip and close relays are linked in the module. If a latch-on command is sent to the close relay its bit will be set and the associated trip relay bit will be cleared.

Because the single-point and dual-point control database share the same memory area, caution should be exercised to prevent control of one area by another. This can be accomplished by careful design of the system. The dual-point database could be isolated from the single-point database. For example, DNP point index 0 to 9 could be used for the dual-point database and correspond to bits 0 to 19. The single-point control points would then start at DNP point index 20 which corresponds to bit 20 of the database.

Using this technique, the MVI69-DNPSNET module will not require any configuration for the new dual-point control, and the module will be backward compatible for current customer applications.

2.4 [DNP Slave Binary Inputs]

This section of the configuration file overrides the Class 2 binary database points.

2.4.1 Point #

This is the information object address of the point.

2.4.2 Class

Class 1 - Highest priority

Class 2 - Middle priority

Class 3 - Lowest priority

0 - Disable.

2.5 [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.

2.5.1 Point

This is the information object address of the point.

2.5.2 Class

Class 1 - Highest priority

Class 2 - Middle priority

Class 3 - Lowest priority

0 - Disable.

2.5.3 Deadband

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

2.6 [DNP Slave Float Inputs]

This area is to override the class (3) and deadband 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.

2.6.1 Point

This is the information object address of the point.

2.6.2 Class

Class 1 - Highest priority

Class 2 - Middle priority

Class 3 - Lowest priority

0 - Disable.

2.6.3 Deadband

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

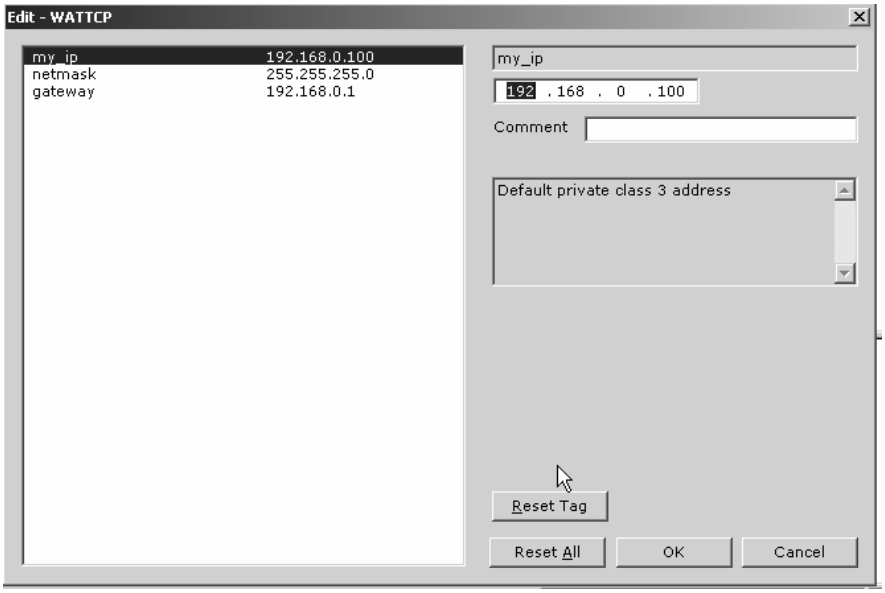
2.7 [DNP ENET IP ADDRESSES]

This section of the configuration file only applies if the directive labeled **Use IP List** is set to Yes or Y. If **Use IP List** is enabled, the module will refuse to answer a request unless the IP address of the client is listed in this section. This section may contain no more then 10 addresses.

2.8 Ethernet Configuration

Use this procedure to configure the Ethernet settings for your module. You must assign an IP address, subnet mask and gateway address. After you complete this step, you can connect to the module with an Ethernet cable.

1. Determine the network settings for your module, with the help of your network administrator if necessary. You will need the following information:
   - IP address (fixed IP required) _____ . _____ . _____ . _____
   - Subnet mask _____ . _____ . _____ . _____
2. Gateway address _____ . _____ . _____ . _____Click [+] to expand the tree for the MVI69-DNPSNET module.
3. Double-click the Ethernet Configuration object. This action opens the Edit dialog box.



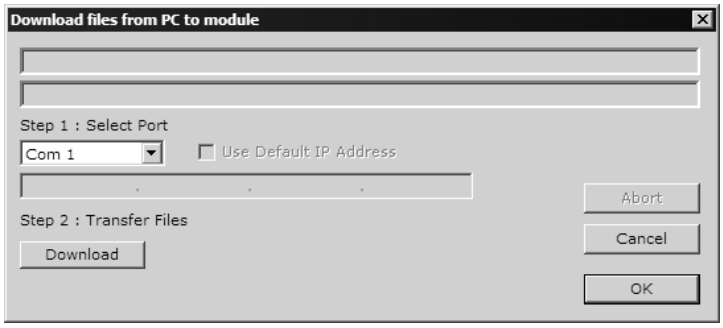
4. Edit the values for my_ip, netmask (subnet mask) and gateway (default gateway).
5. When you are finished editing, click OK to save your changes and return to the ProSoft Configuration Builder window.

2.9 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.

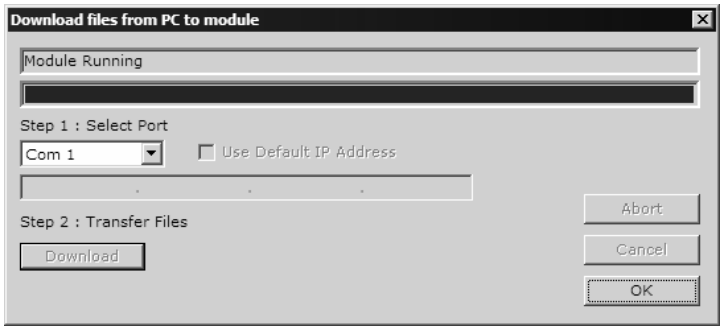
To Download the Project File

1. In the tree view in ProSoft Configuration Builder, click once to select the MVI69-DNPSNET module.
2. Open the **Project menu,** and then choose **Module / Download**. The program will scan your PC for a valid com port (this may take a few seconds). When PCB has found a valid com port, the following dialog box will open.



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

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



3 Ladder Logic

In This Chapter

Ladder logic is required for application of the MVI69-DNPSNET module. Tasks that must be handled by the ladder logic are module data transfer, special block handling and status data receipt. Additionally, a power-up handler may be needed to handle the initialization of the module's data and to clear any processor fault conditions.

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

3.1 Module Data Objects

All data related to the MVI69-DNPSNET is stored in one user defined data type, containing data transfer and status data, and the DNP datasets. Any time an array's size is altered in the RSLogix 5000 software, all the data in the object can be set to zero. Because the array sizes may need to be adjusted for the data types in an application, the user defined data should be adjusted prior to the module being placed in service (if the default configuration does not contain enough data points for the application).

An instance of each data type is required before the module can be used. This is accomplished by declaring variables of the data types in the Controller Tags Edit Tags dialog box. Each object is discussed in the following topics.

3.1.1 DNPModuleDef Object

The DNPModuleDef object contains all the MVI69-DNPSNET module status data and data transfer variables. The object has the following structure.

Name	Data Type	Description
Status	DNPSlvStat	
Data	DNPData	
CMDcontrolbits	DNPCMDBits	
ReadClock	DNPClock	
WriteClock	DNPClock	
BI_Events	DNPBIEvntBlk	
AI_Events	DNPAIEvntBLK	
BP	DNPBackplane	

Each of these object types are discussed in the following topics:

DNPSlvStat

This object holds the module status information transferred with each read data block transferred from the module. The structure of the object is shown in the following example:

Name	Data Type	Description
Scan_Cnt	INT	Program Scan Counter
Product_Name	SINT[4]	Product Code
Rev_Level	SINT[4]	Revision
Op_Sys	SINT[4]	Operating system revision
Run_Number	SINT[4]	Run number
Blk_Rd_Count	INT	Number of block read transfers
Blk_Wr_Count	INT	Number of block write transfers
Blk_Parse_Cnt	INT	Number of blocks parsed by module
Blk_Err	INT	Number of block errors
Rx_Frames	INT	Number of frames received for this unit
Tx_Frames	INT	Number of frames transmitted for this unit
Rx_Total	INT	Number of frames received
Sync_err	INT	Sync error count
Overrun_err	INT	Overrun error count
len_err	INT	Length error count
CRC_err	INT	CRC error count
Overflow_err	INT	Overflow error count
Seq_err	INT	Sequence error count
Addrs_err	INT	Address error count
BI_Events	INT	Number of binary events generated
BI_Queue	INT	Number of binary events in queue
AI_Events	INT	Number of analog input events
AI_Queue	INT	Number of analog input events in queue
FL_Queue	INT	Float Input Event Count in Buffer
Reserved	INT	Reserved
Bad_func_err	INT	Number of bad function code error count
Ukn_Obj_err	INT	Unknown Object error count
Range_err	INT	Range error count
App_Overflow	INT	Number of application level overflow errors
Multi_Frame_err	INT	Multi-frame error count
UDP_Rx_Count	INT	UDP Recieve Count
UDP_Tx_Count	INT	UDP transmit Count
Unsol_error	INT	Unsolicited Error Count
State_Value	INT	State Value
TCP_ST_value	INT	TCP Socket State Value

Name	Data Type	Description
UDP_ST_Value	INT	UDP Socket State Value
Busywithmsg	INT	DNP Busy with Message State
App_Fragm	INT	Application fragment
Tx_frame_ST	INT	Transmit frame State
TCP_msg_len	INT	TCP message length
UDP_msg_len	INT	UDP message length
Port_Tx_St	INT	Port Transmit state
Free_Mem	DINT	Free Memory

This information is important as it can be used to view the "health" of the module. If the module is not communicating, examine the object to help find the problem. Additionally, you should use the configuration/debug port on the module to confirm that the desired configuration of the module is implemented.

DNPBackplane Object

The DNPBackplane Object stores the variables required for backplane data transfer between the module and the processor. The structure of the object is displayed in the following example:

Name	Data Type	Description
BlockTransferSize	INT	
LastRead	INT	Index of last read block
LastWrite	INT	Index of last write block
BlockIndex	INT	Computed block offset for data table
ReadData	INT[240]	Buffer File for data Read from Module
WriteData	INT[240]	Buffer File for data Write from Module.

3.1.2 DNPData Object

The DNPData object stores all the data for an MVI69-DNPSNET module. Contained within the object is an array for each data type. The array sizes are set to match the configuration set for the module. If multiple MVI69-DNPSNET modules are used within a rack, a copy of this structure may have to be made to permit each module to have its own database sizes. Ladder logic is required to transfer the data in this structure between the module and the processor. The structure of the object is shown in the following example:

Name	Data Type	Description
DNP_BI	INT[20]	Number of DNP BI data words
DNP_AI	INT[40]	Number of DNP AI data words
DNP_FLTI	REAL[20]	Number of DNP Float Input Points
DNP_Cntr	DINT[10]	Number of DNP counter double-words
DNP_BO	INT[40]	Number of DNP BO data words
DNP_AO	INT[40]	Number of DNP AO data words
DNP_FLTO	REAL[20]	Number of DNP Float Output points

3.1.3 Special Objects

These objects utilize some of the advanced features the module provides. If your application does not require the object, then you need not declare an instance of the object. Each of the objects and associated function are discussed in the following topics.

DNP_BI_Event Object

The DNP_BI_Event object stores the information for eleven binary input events to be sent from the processor to the module in a command block 9958. The structure shown in the following example contains all the parameters required for binary input events.

Name	Data Type	Description
EventCount	INT	Event Count
SeqCounter	INT	Sequence Counter
EventData	DNPBIEvntData[11]	
DataPoint	INT	DNP Binary Input Data Point
Day	SINT	Day
MonthState	SINT	Month and State Bit (state is MSB)
Minutes	SINT	Minutes
Hour	SINT	Hours
SecMsecond	INT	Formatted: Bits 0-9 = Milliseconds, bits 10 to 15 = Seconds
Year	INT	Year

3.1.4 DNP_AI_Event Object

The DNP_AI_Event object stores the information for nine analog input events to be sent from the processor to the module in a command block 9959. The structure shown in the following example contains all the parameters required for analog input events.

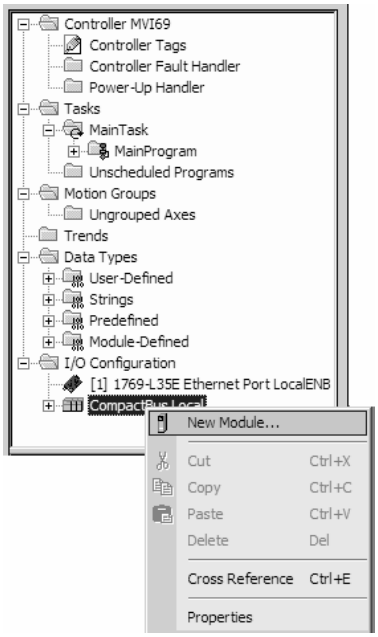
Name	Data Type	Description
EventCount	INT	Event Count
SeqCounter	INT	Sequence Counter
EventData	DNPAIEvntData[9]	Event Data Points
AIDataPoint	INT	DNP Analog Input Data Point
AIvalue	INT	DNP Analog Input Value
Day	SINT	Day
Month	SINT	Month
Minutes	SINT	Minutes
Hour	SINT	Hour
SecMsec	INT	Formatted, bits 0 to 9 = Milliseconds, bits 10-15 = seconds
Year	INT	Year

3.2 Adding the Module to an Existing CompactLogix Project

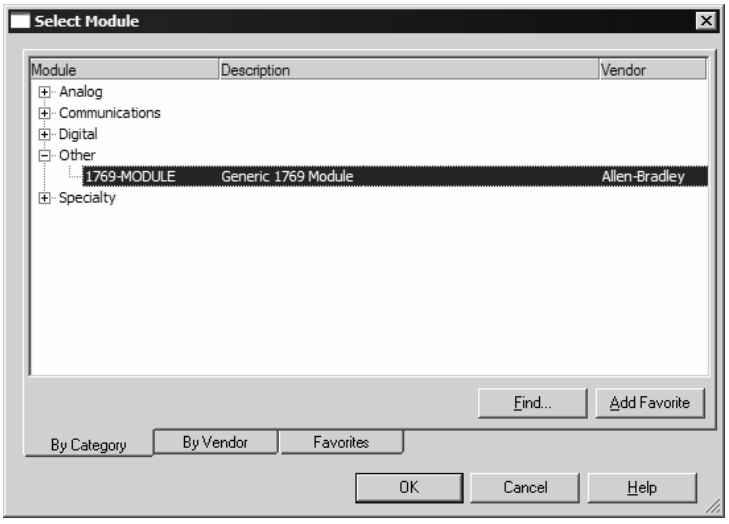
Important: The MVI69-DNPSNET module has a power supply distance rating of 2 (L43 and L45 installations on first 2 slots of 1769 bus)

If you are installing and configuring the module with a CompactLogix processor, follow these steps. If you are using a MicroLogix processor, refer to the next section.

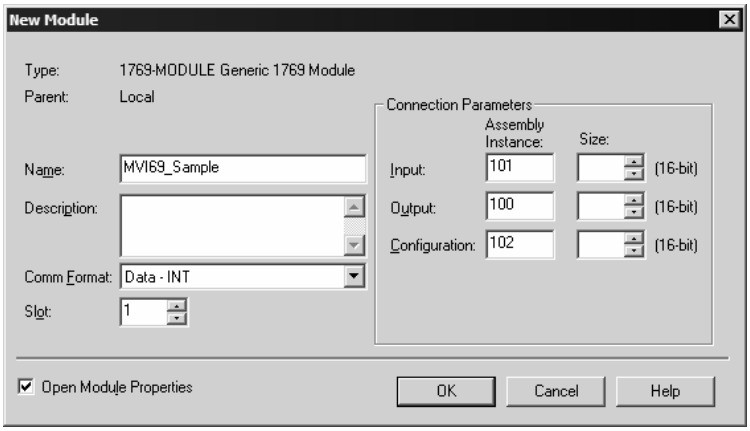
1 **Add the** MVI69-DNPSNET **module to the project.** Right-click the mouse button on the I/O Configuration option in the Controller Organization window to display a pop-up menu. Select the New Module option from the I/O Configuration menu.



This action opens the following dialog box:



2 Select the 1769-Module (Generic 1769 Module) from the list and click OK.



3 Enter the Name, Description and Slot options for your application, using the values in the illustration above. You must select the **Comm Format** as **Data - INT** in the dialog box, otherwise the module will not communicate over the backplane of the CompactLogix rack.

4 Configure the Connection Parameters to match to the Block Transfer Size parameter in the configuration file. Use the values in the table corresponding with the block transfer size you configured.

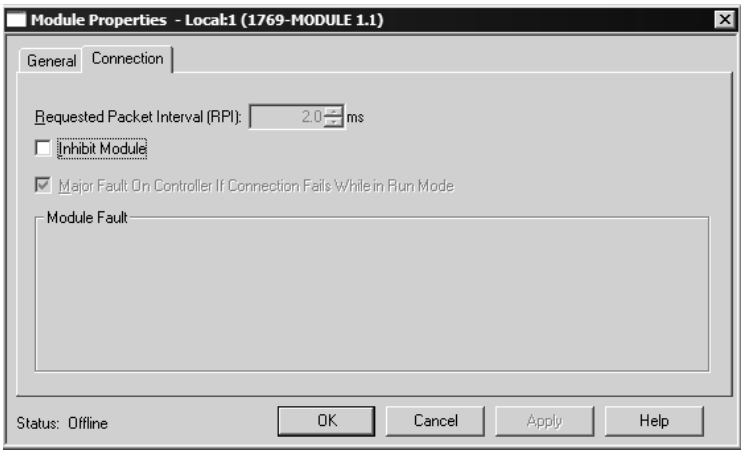
Block Transfer Size = 60	
Field	**Recommended Value**
Type	1769-MODULE Generic 1769 Module
Parent	Local
Name	MVI69
Description	MVI69 Application Module
Comm Format	Data - INT

Block Transfer Size = 60	
Field	**Recommended Value**
Slot	The slot number in the rack where the module is installed
Input Assembly Instance	101
Input Size	62
Output Assembly Instance	100
Output Size	61
Configuration Assembly Instance	102
Configuration Size	0

Block Transfer Size = 120	
Field	**Recommended Value**
Type	1769-MODULE Generic 1769 Module
Parent	Local
Name	MVI69
Description	MVI69 Application Module
Comm Format	Data - INT
Slot	The slot number in the rack where the module is installed
Input Assembly Instance	101
Input Size	122
Output Assembly Instance	100
Output Size	121
Configuration Assembly Instance	102
Configuration Size	0

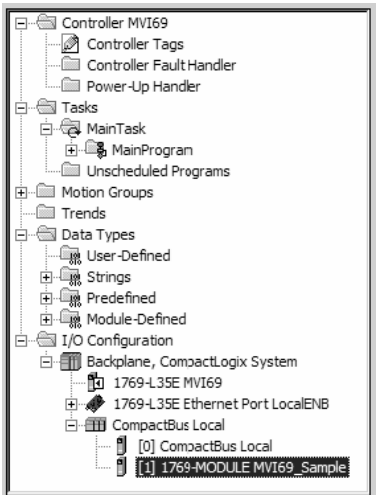
Block Transfer Size = 240	
Field	**Recommended Value**
Type	1769-MODULE Generic 1769 Module
Parent	Local
Name	MVI69
Description	MVI69 Application Module
Comm Format	Data - INT
Slot	The slot number in the rack where the module is installed
Input Assembly Instance	101
Input Size	242
Output Assembly Instance	100
Output Size	241
Configuration Assembly Instance	102
Configuration Size	0

5 Click **Next** to continue.



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

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



8 Copy the Controller Tags from the sample program.

9 Copy the User Defined Data Types from the sample program.

10 Copy the Ladder Rungs from the sample program.

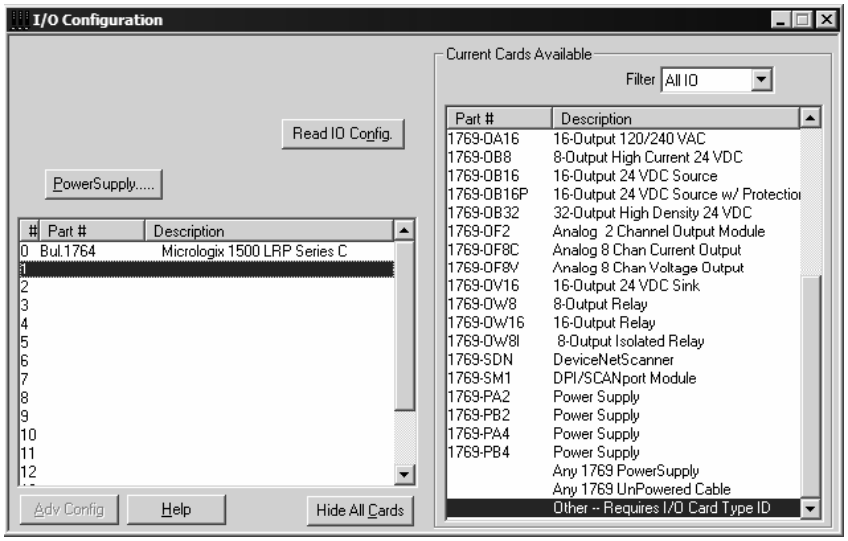
11 Save and Download the new application to the controller and place the processor in run mode.

3.3 Adding the Module to an Existing MicroLogix Project

If you are installing and configuring the module with a MicroLogix processor, follow these steps. If you are using a CompactLogix processor, refer to the previous section.

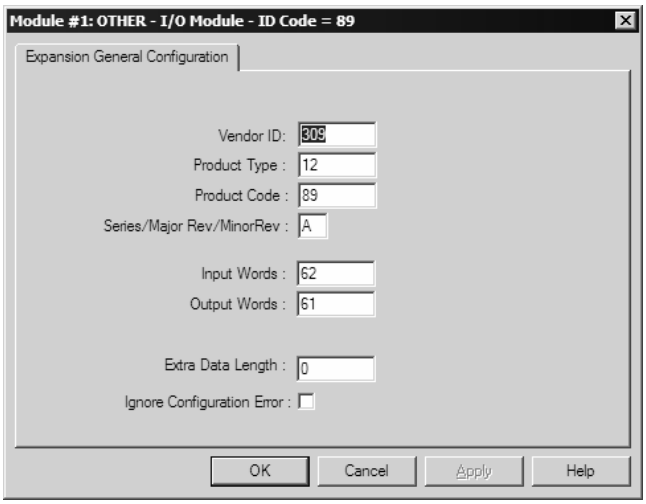
The first step in setting up the processor ladder file is to define the I/O type module to the system. Start RSLogix 500, and follow these steps:

1. In RSLogix, open your existing application, or start a new application, depending on your requirements.
2. Double-click the I/O Configuration icon located in the Controller folder in the project tree. This action opens the I/O Configuration dialog box.



3. On the I/O Configuration dialog box, select "Other - Requires I/O Card Type ID" at the bottom of the list in the right pane, and then double-click to open the Module dialog box.

4 Enter the values shown in the following illustration to define the module correctly for the MicroLogix processor, and then click OK to save your configuration.



The input words and output words parameter will depend on the Block Transfer Size parameter you specify in the configuration file. Use the values from the following table.

Block Transfer Size	Input Words	Output Words
60	62	61
120	122	121
240	242	241

5 Click **Next** to continue.

6 After completing the module setup, the I/O configuration dialog box will display the module's presence.

The last step is to add the ladder logic. If you are using the example ladder logic, adjust the ladder to fit your application. Refer to the example Ladder Logic section in this manual.

Download the new application to the controller and place the processor in run mode. If you encounter errors, refer to **Diagnostics and Troubleshooting** (page 47) for information on how to connect to the module's Config/Debug port to use its troubleshooting features.

4 Diagnostics and Troubleshooting

In This Chapter

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

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

4.1 Reading Status Data from the Module

The MVI69-DNPSNET module provides the status data in each read block. This data can also be located in the module's database. For a complete listing of the status data object, refer to the **Module Set Up** section.

4.1.1 Required Hardware

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

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

- 80486 based processor (Pentium preferred)
- 1 megabyte of memory
- At least one UART hardware-based serial communications port available. USB-based virtual UART systems (USB to serial port adapters) often do not function reliably, especially during binary file transfers, such as when uploading/downloading configuration files or module firmware upgrades.
- A null modem serial cable.

4.1.2 The Configuration/Debug Menu

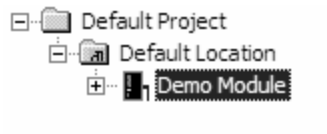
The Configuration and Debug menu for this module is arranged as a tree structure, with the Main Menu at the top of the tree, and one or more sub-menus for each menu command. The first menu you see when you connect to the module is the Main menu.

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

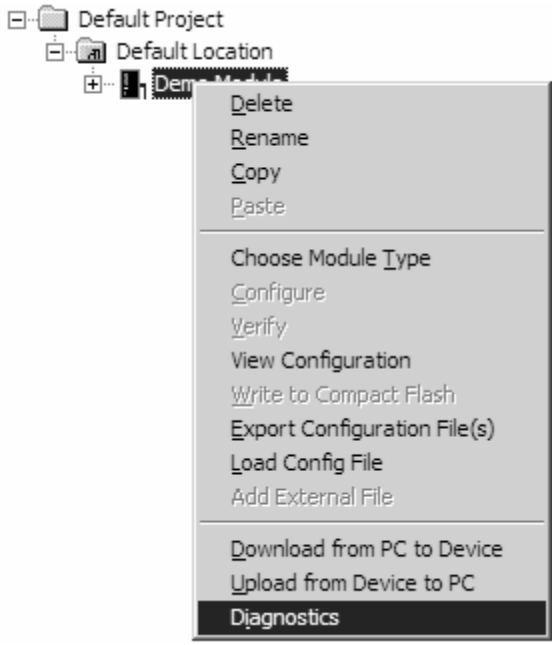
Using the Diagnostic Window in ProSoft Configuration Builder

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

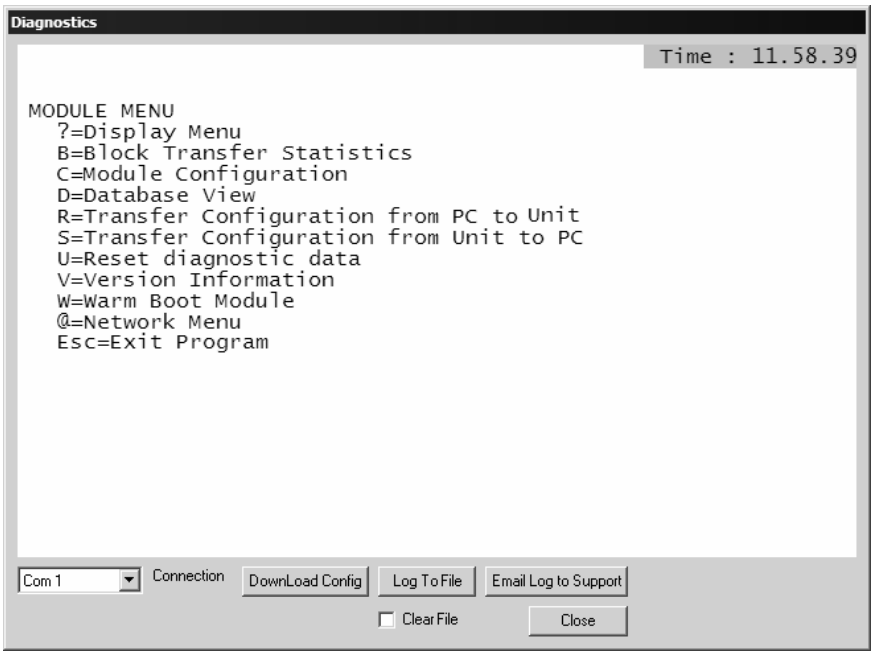
1 Start PCB program with the application file to be tested. Right click over the module icon.



2 On the shortcut menu, choose Diagnostics.



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



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

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

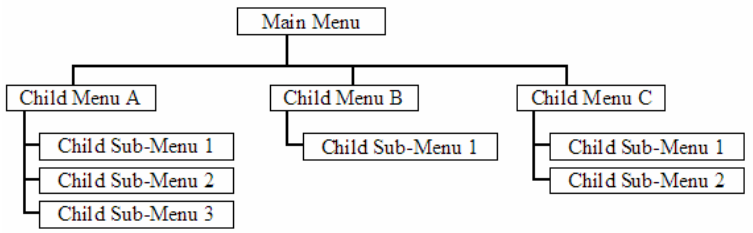
1 Verify that the null modem cable is connected properly between your computer's serial port and the module. A regular serial cable will not work.
2 On computers with more than one serial port, verify that your communication program is connected to the same port that is connected to the module.

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

Navigation

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

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



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

Keystrokes

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

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

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

4.1.3 Main Menu

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

```
DNP ETHERNET SERVER COMMUNICATION MODULE
  ?=Display Menu
  B=Block Transfer Statistics
  C=Module Configuration
  D=Database View
  I=DNP Menu
  R=Receive Configuration File
  S=Send Configuration File
  V=Version Information
  W=Warm Boot Module
  @=Network Menu
  Esc=Exit Program
```

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

Viewing Block Transfer Statistics

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

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

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

Viewing Module Configuration

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

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

Opening the Database Menu

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

Opening the DNP Menu

Press **[I]** from the Main Menu to open the DNP Menu. This menu allows you to view all data associated with the DNP Server driver. For more information about the commands on this menu, refer to DNP Menu (page 52).

Receiving the Configuration File

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

Sending the Configuration File

Press **[S]** to upload (send) an updated configuration file to the module. For more information on receiving and sending configuration files, please see Uploading and Downloading the Configuration File.

Viewing Version Information

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

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

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

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

Warm Booting the Module

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

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

Opening the Network Menu

Press **[@]** to open the network menu. The network menu allows you to send, receive and view the WATTCP.CFG file that contains the IP, gateway and other network specification information. You can find more information about the commands on this menu in the Network Menu (page 57) section.

Exiting the Program

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

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

4.1.4 DNP Menu

This opens the DNP menu. After the option is selected, press the '?' key to display the menu and the following is displayed:

```
DNP ETHERNET PROTOCOL MENU
  ?=Display Menu
  B=DNP Set Up & Pointers
  C=DNP Configuration
  D=DNP Database View
  I=List of valid hosts
  M=Return to Main Menu
  1=DNP Communication Status
  2=TCP Socket Status
  3=UDP Socket Status
```

Each option on the menu is discussed in the following topics.

Viewing DNP Set Up & Pointers

Press **[B]** to display the memory allocation and the database setup parameters.

Viewing DNP Configuration

Press **[C]** to displays the configuration information for the server. Use this command to confirm that the module is configured as desired. If any parameter is not set correctly, adjust the configuration file and download the altered file to the unit.

Opening the DNP Database View Menu

Press **[D]** to open the DNP Database View menu. Use this command to display the database associated with each data type.

Viewing a List of Valid Hosts

Press **[I]** to view the list of IP addresses from which the module will accept connections This list is only used if the module configuration parameter, Use IP List, is set to a value other than 0.

Returning to the Main Menu

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

Viewing DNP Communication Status

Press **[1]** to view DNP Communication Status. Use this command to view the communication status data for the DNP driver.

Viewing TCP Socket Status

Press **[2]** to view the status of the TCP socket in the module. After selecting the option, the following is displayed:

```
TCP SOCKET STATUS
Rx Count       : -20148
Tx Count       : -20146
Tx State       : 0
TCP State      : 1
Busy Flag      : 0
App Frame      : 0
Tx Frame       : 1
Packet Length  : 0
```

The parameters displayed have the following definitions:

Rx Count - Number of messages received on TCP socket

Tx Count - Number of messages transmitted on TCP socket

Tx State - 0=not transmitting, 1=transmitting

TCP State - Value used for TCP/IP socket state machine

Busy Flag - 0=not busy, 1=TCP has control of DNP server, 2=UDP has control of DNP server, 3=Unsolicited message being sent

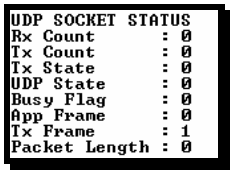
App Frame - 0=no application data frame data, 1=application data available

Tx Frame - 0=Data link level frame ready to send, 1=Data link level message not ready to send

Packet Length - Length of message left to process

Viewing UDP Socket Status

Press **[3]** to view the status of the UDP socket in the module. After selecting the option, the following is displayed:



The parameters displayed have the following definitions:

Rx Count - Number of messages received on UDP socket

Tx Count - Number of messages transmitted on UDP socket

Tx State - 0=not transmitting, 1=transmitting

TCP State - Value used for UDP/IP socket state machine

Busy Flag - 0=not busy, 1=TCP has control of DNP server, 2=UDP has control of DNP server, 3=Unsolicited message being sent

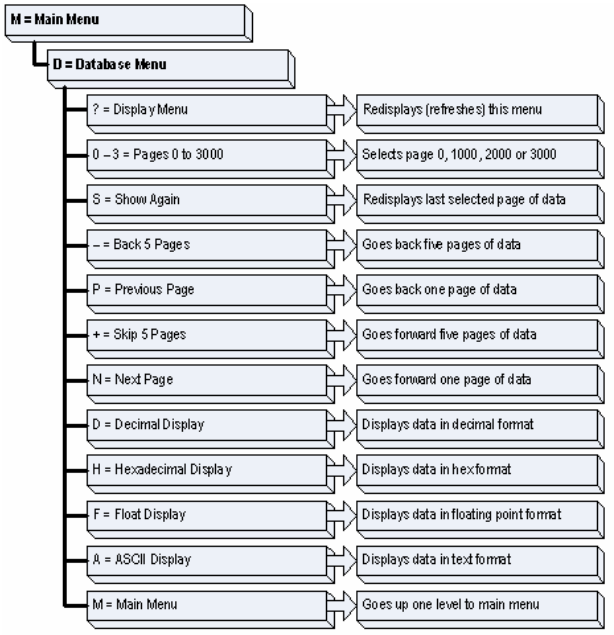
App Frame - 0=no application data frame data, 1=application data available

Tx Frame - 0=Data link level frame ready to send, 1=Data link level message not ready to send

Packet Length - Length of message left to process

4.1.5 Database View Menu

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



Viewing Register Pages

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

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

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

Displaying the Current Page of Registers Again

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

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

Moving Back Through 5 Pages of Registers

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

Viewing the Previous 100 Registers of Data

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

Skipping 500 Registers of Data

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

Viewing the Next 100 Registers of Data

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

Viewing Data in Decimal Format

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

Viewing Data in Hexadecimal Format

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

Viewing Data in Floating Point Format

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

Viewing Data in ASCII (Text) Format

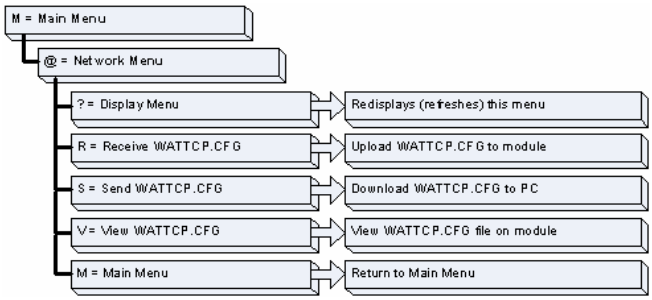
Press **[A]** to display the data on the current page in ASCII format. This is useful for regions of the database that contain ASCII data.

Returning to the Main Menu

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

4.1.6 Network Menu

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



Transferring WATTCP.CFG to the module

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

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

Transferring WATTCP.CFG to the PC

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

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

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

Viewing the WATTCP.CFG file on the module

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

```
Network Menu Selected

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

Returning to the Main Menu

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

4.2 LED Status Indicators

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

Module	Color	Status	Indication
CFG	Green	On	Data is being transferred between the module and a remote terminal using the Configuration/Debug port.
		Off	No data is being transferred on the Configuration/Debug port.
EP	Not Used		
APP	Amber	Off	The MVI69-DNPSNET is working normally.
		On	The MVI69-DNPSNET module program has recognized a communication error on one of its DNP ports.
BP ACT	Amber	On	The LED is on when the module is performing a write operation on the backplane.
		Off	The LED is off when the module is performing a read operation on the backplane. Under normal operation, the LED should blink rapidly on and off.
OK	Red/ Green	Off	The card is not receiving any power and is not securely plugged into the rack.
		Green	The module is operating normally.
		Red	The program has detected an error or is being configured. If the LED remains red for over 10 seconds, the program has probably halted. Remove the card from the rack and re-insert the card to restart the module's program.
BAT	Red	Off	The battery voltage is OK and functioning.
		On	The battery voltage is low or battery is not present. Allow battery to charge by keeping module plugged into rack for 24 hours. If BAT LED still does not go off, contact ProSoft Technology, as this is not a user serviceable item.

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

4.2.1 Ethernet LED Indicators

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

4.2.2 Clearing a Fault Condition

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

To clear the condition, follow these steps:

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

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

4.2.3 Troubleshooting

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

Processor Errors

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

Module Errors

Problem Description	Steps to take
BP ACT LED remains off or blinks slowly	This indicates that backplane transfer operations are failing. Connect to the module's Configuration/Debug port to check this. To establish backplane communications, verify the following items: ▪ The processor is in Run mode. ▪ The backplane driver is loaded in the module. ▪ The module is configured for read and write block data transfer. ▪ The ladder logic handles all read and write block situations. ▪ The module is configured in the processor.
OK LED remains red	The program has halted or a critical error has occurred. Connect to the Configuration/Debug port to see if the module is running. If the program has halted, turn off power to the rack, remove the card from the rack and re-insert the card in the rack, and then restore power to the rack.

4.2.4 Error Status Table

The program maintains an error/status table that is transferred to the processor in each read block. Ladder logic should be programmed to accept this block of data and place it in the module's controller tag. You can use the error/status data to determine the "health" of the module.

The data in the block is structured as shown in the following table.

Word	Variable Name	Description
0	Scan Counter	Program scan counter incremented each time the program loop is executed.
1 to 2	Product Name (ASCII)	These two words contain the product name of the module in ASCII format.
3 to 4	Revision (ASCII)	These two words contain the product revision level of the firmware in ASCII format.
5 to 6	Operating System Revision (ASCII)	These two words contain the module's internal operating system revision level in ASCII format.
7 to 8	Production Run Number (ASCII)	These two words contain the production 'batch' number for the particular chip in the module in ASCII format.
9	Read Block Count	Total number of blocks transferred from the module to the processor.
10	Write Block Count	Total number of blocks transferred from the processor to the module.
11	Parse Block Count	Total number of blocks parsed by the module that were received from the processor.
12	Block number error	Number of BTW requests that resulted in an incorrect BTW identification code.
13	DNP Slave Port total number of message frames received by slave	This value represents the total number of message frames that have matched this slaves address on this port. This count includes message frames which the slave may or may not be able to parse and respond.
14	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.
15	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.
16	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.
17	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.
18	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.
19	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.

Word	Variable Name	Description
20	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.
21	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.
22	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.
23	DNP Slave Binary Input Event count	This value contains the total number of binary input events which have occurred.
24	DNP Slave Binary Input Event count in buffer	This value represents the number of binary input events which are waiting to be sent to the master.
25	DNP Slave Analog Input Event count	This value contains the total number of analog input events which have occurred.
26	DNP Slave Analog Input Event count in buffer	This value represents the number of analog input events which are waiting to be sent to the master.
27	DNP Slave Float Input Event count in buffer	This value represents the number of float input events which are waiting to be sent to the master.
28	Reserved	Future Use
29	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.
30	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.
31	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.
32	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.
33	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.
34	UDP Receive Count	Number of UDP messages received
35	UDP Transmit Count	Number of UDP messages transmitted
36	Unsolicited Error Count	Number of failures when trying to send unsolicited event data
37	State Value	This variable has a value of 0 if there is not a message being sent and 1 if a message is being sent.
38	TCP Socket State Value	State machine value for the TCP socket
39	UDP Socket State Value	State machine value for the UDP socket
40	DNP Busy With Message State	Socket busy state -1=TCP socket not connected, 0=TCP or UDP not processing message, 1 or 3 = TCP processing message, and 2=UDP socket processing message.
41	Application Fragment	Application fragmentation flag/counter

Word	Variable Name	Description
42	Transmit Frame State	Transmit Frame State
43	TCP Message Length	Bytes Received on the TCP port for the current message.
44	UDP Message Length	Bytes received on the UDP port for the current message.
45	Port TX State	This variable has a value of 0 if there is not a message being sent and 1 if a message is being sent.
46	Free Memory LSB	Free memory in module
47	Free Memory MSB	

5 Reference

In This Chapter

5.1 Product Specifications

The MVI69 DNP 3.0 Server over Ethernet Communications Module supports the implementation of the DNP 3.0 (Distributed Network Protocol) over Ethernet, allowing CompactLogix processors to easily communicate with host systems supporting the protocol. The module supports DNP Subset Level 2 features and some Level 3 features.

The module supports DNP subset level 2 features and some Level 3 features. The MVI69-DNPSNET module acts as an input/output module between the DNP Ethernet network and the CompactLogix backplane. The data transfer from the CompactLogix processor is asynchronous from the actions on the DNP network. Databases are defined in the module to house the data required by the protocol.

5.1.1 General Specifications

- Single Slot - 1769 backplane compatible
- The module is recognized as an Input/Output module and has access to processor memory for data transfer between processor and module
- Ladder Logic is used for data transfer between module and processor. Sample ladder file included.
- Configuration data obtained from configuration text file downloaded to module. Sample configuration file included.
- Supports all CompactLogix processors: L20/L23/L30/L31/L32/L35, L43 and L45 (L43 and L45 supported with RSLogix 5000 v16.03 or later)
- Also supports MicroLogix 1500 LRP

5.1.2 Hardware Specifications

Specification	Description
Dimensions	Standard 1769 Single-slot module
Current Load	800 mA max@ 5 VDC Power supply distance rating of 2 (L43 and L45 installations on first 2 slots of 1769 bus)
Operating Temp.	0 to 60°C (32 to 140°F)
Storage Temp.	-40 to 85°C (-40 to 185°F)
Relative Humidity	5 to 95% (non-condensing)
LED Indicators	Power and Module Status Application Status CFG Port Activity Ethernet Port Activity Error Status
CFG Port (CFG)	RJ45 (DB-9M with supplied cable) RS-232 only No hardware handshaking
App Port (Ethernet modules)	10/100 Base-T Ethernet compatible interface 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
Shipped with Unit	RJ45 to DB-9M cables for each port 6-foot RS-232 configuration Cable

5.1.3 Functional Specifications

The MVI69-DNPSNET module accepts DNP commands to control and monitor the data stored in the DNP databases. This data is passed between the module and the CompactLogix processor over the backplane for use in user applications.

- DNP databases to house data for the slave port supporting the following maximum point counts
  - Binary input: 8000 points (500 words)
  - Binary output: 8000 points (500 words)
  - Counter: 250 (500 words)
  - Analog input: 500 words
  - Analog output: 500 words
  - Float input: 150 points (300 words)
  - Float output: 150 points (300 words)
- User-definable module memory usage up to maximum point counts
- Data movement between module using Input/Output image
- Ethernet port supporting both TCP and UDP over Ethernet
- Supports DNP 3.0 in a level 2 implementation
- Supports sending of input event data from the ladder to the module
- Supports time synchronization from/to processor
- Configurable via text file
- Status and error information
- All data in the DNP slave is contained in user-defined files

5.2 Functional Overview

This section provides an overview of how the MVI69-DNPSNET module transfers data using the DNPSNET protocol. You should understand the important concepts in this chapter before you begin installing and configuring the module.

The DNPSNET protocol driver exists as a single service port (DNPSNET port 20000) implementation that supports a single TCP port connection and multiple UDP ports on a TCP/IP Ethernet network. The DNPSNET port operates as a server, supporting the DNP 3.0 protocol in a Level 2 implementation using the DNP User Group recommended extension for use on LAN/WAN. This is published in "Transporting DNP V3.00 over Local and Wide Area Networks", December 15, 1998 by the DNP Users Group and is available on the Internet at http://www.dnp.org.

5.2.1 General Concepts

The following discussion explains several concepts that are important for understanding the operation of the MVI69-DNPSNET module.

Module Power Up

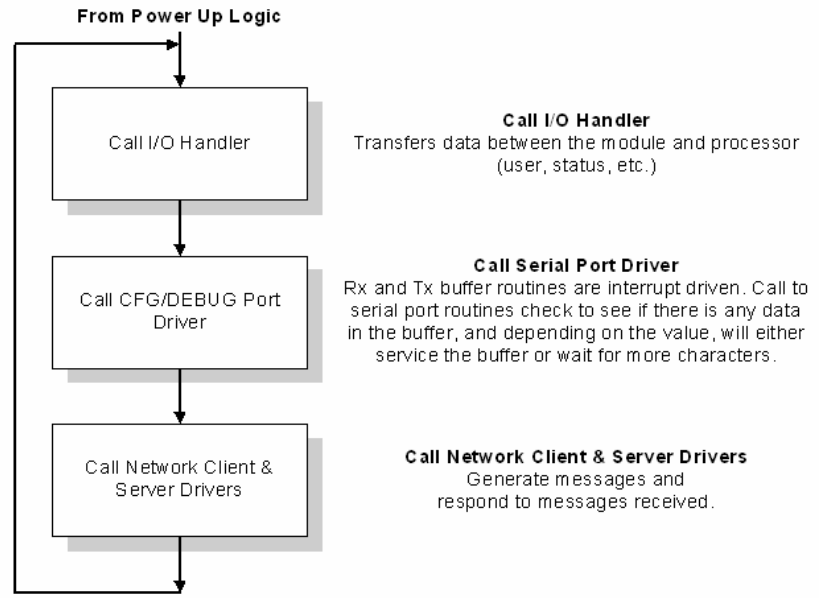
On power up the module begins performing the following logical functions:

1. Initialize hardware components
2. Install packet driver for Ethernet network interface and TCP/IP stack
   - Initialize CompactLogix or MicroLogix backplane driver
   - Test and clear all RAM
   - Initialize the serial communication ports
3. Read configuration file from Compact Flash Disk
4. Enable Slave Driver

After the module has received the configuration, the module will begin communicating with other nodes on the network, depending on the configuration.

Main Logic Loop

Upon completing the power up configuration process, the module enters an infinite loop that performs the functions shown in the following diagram.



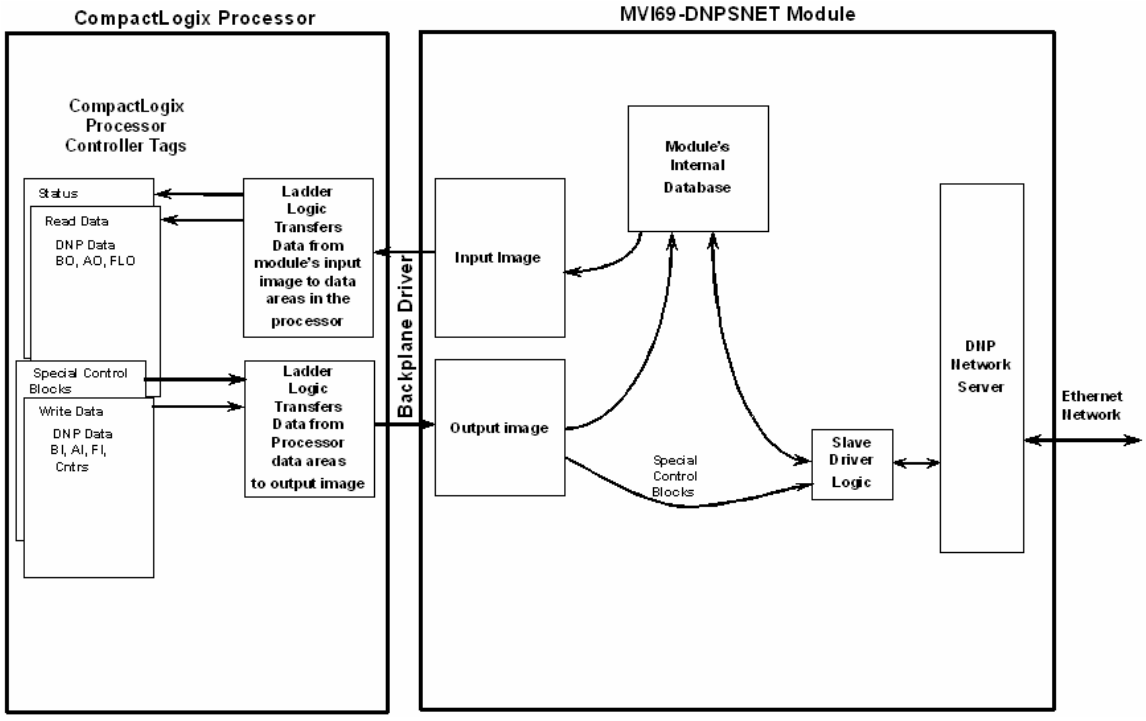
Backplane Data Transfer

The MVI69-DNPSNET module communicates directly over the CompactLogix or MicroLogix backplane. Data is paged between the module and the CompactLogix or MicroLogix processor across the backplane using the module's input and output images. The update frequency of the images is determined by the scheduled scan rate defined by the user for the module and the communication load on the module. Typical updates are in the range of 1 to 10 milliseconds.

This bi-directional transference of data is accomplished by the module filling in data in the module's input image to send to the processor. Data in the input image is placed in the Controller Tags in the processor by the ladder logic. The input image for the module can be set to 62, 122 or 242 words. This large data area permits fast throughput of data between the module and the processor.

The processor inserts data to the module's output image to transfer to the module. The module's program extracts the data and places it in the module's internal database. The output image for the module can be set to 61, 121 or 241 words. This large data area permits fast throughput of data from the processor to the module.

The following illustration shows the data transfer method used to move data between the CompactLogix or MicroLogix processor, the MVI69-DNPSNET module and the DNP Network.



All data transferred between the module and the processor over the backplane is through the input and output images. Ladder logic must be written in the CompactLogix or MicroLogix processor to interface the input and output image data with data defined in the Controller Tags. All data used by the module is stored in its internal databases. These databases are defined as a virtual DNP data tables with addresses from 0 to the maximum number of points for each data type. The following illustration shows the layout of the databases:

DATA AREA	
DNP DATA	BINARY INPUTS
	ANALOG INPUTS
	FLOAT INPUTS
	COUNTER DATA
	BINARY OUTPUTS
	ANALOG OUTPUTS
	FLOAT OUTPUTS
FROZEN DATA	FROZEN COUNTER DATA
LAST VALUE DATA	BINARY INPUTS
	ANALOG INPUTS
	FLOAT INPUTS
EVENT DATA	BINARY INPUT EVENTS
	ANALOG INPUT EVENTS
	FLOAT INPUT EVENTS

Data contained in this database is paged through the input and output images by coordination of the CompactLogix or MicroLogix ladder logic and the MVI69-DNPSNET module's program. Up to 248 words of data can be transferred from the module to the processor at a time. Up to 247 words of data can be transferred from the processor to the module.

Each block transferred from the module to the processor or from the processor to the module contains a block identification code that describes the content of the block.

The following table defines the blocks used by this module:

Block Number	Function/Description
0 or -1	Dummy Blocks: Used by module when no data is to be transferred
1 to 150	DNP Data blocks
1000 to 1149	Output initialization blocks
9250	Status Data Block
9958	PLC Binary Input Event data
9959	PLC Analog Input Event Data
9970	Set PLC time using module's DNP time
9971	Set module's time using PLC time
9998	Warm Boot Request from PLC (Block contains no data)
9999	Cold Boot Request from PLC (Block contains no data)

Blocks 1 to 150 transfer data between the module and the processor. Blocks 1000 to 1149 are utilized to transfer the initial output databases (binary and analog output data) from the processor to the module at startup. Blocks 9958 to 9999 are used for command control of the module. Each group of blocks are discussed in the following topics.

Normal Data Transfer

Normal data transfer includes the paging of the user data found in the module's internal databases between the module and the controller. These data are transferred through read (input image) and write (output image) blocks. Refer to the **Module Set Up** section for a description of the data objects used with the blocks and the ladder logic required. Each data block transferred between the module and the processor has a specific block identification code that defines the data set contained in the block. The following illustration shows the direction of movement of the DNP data types between the module and the processor:

		DNP MEMORY		
WRITE BLOCK FROM PROCESSOR	→		→	DIGITAL INPUT DATA
	→		→	ANALOG INPUT DATA
	→		→	FLOAT INPUT DATA
WRITE BLOCK FROM PROCESSOR	→		→	COUNTER DATA
READ BLOCK FROM MODULE	←		←	BINARY OUTPUT DATA
	←		←	ANALOG OUTPUT DATA
	←		←	FLOAT OUTPUT DATA
READ BLOCK FROM MODULE	←		←	FROZEN COUNTER, LAST VALUE AND EVENT DATA

The structure and function of each block is described in the following topics:

Read Block

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

Offset	Description
0	Read Block ID
1	Write Block ID
2 to *n*	Read Data

where
n = 60, 120, or 240 depending on the Block Transfer Size parameter (refer to the configuration file).

The Read Block ID is an index value used to determine the location of where the data will be placed in the CompactLogix or MicroLogix processor controller tag array of module read data. The number of data words per transfer depends on the configured Block Transfer Size parameter in the configuration file (possible values are 60, 120, or 240).

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

R1W1→R2W2→R3W1→R1W2→R2W1→R3W2→R1W1→

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

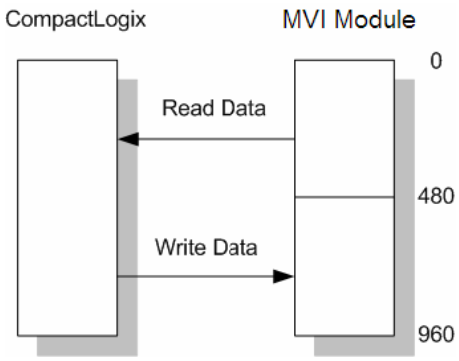
The following example shows a typical backplane communication application.

Note: This example for reference only

Assume that the backplane parameters are configured as follows:

```
Read Register Start:    0
Read Register Count:  480
Write Register Start: 480
Write Register Count: 480
```

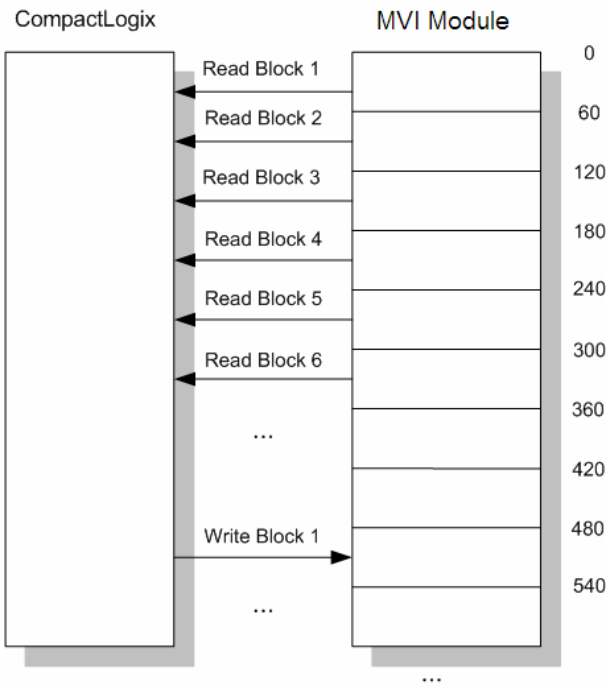
The backplane communication would be configured as follows:



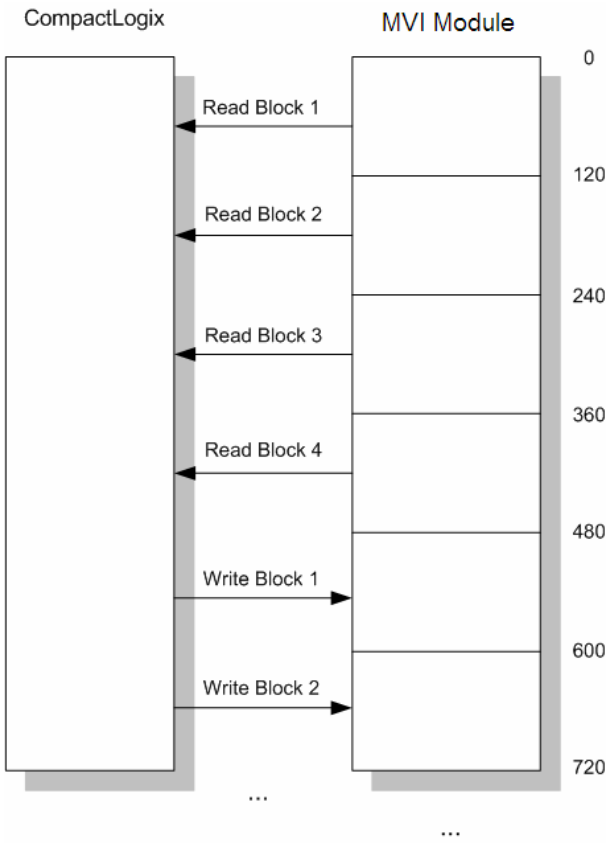
Database address 0 to 479 will be continuously transferred from the module to the processor. Database address 480 to 959 will continuously be transferred from the processor to the module.

The Block Transfer Size parameter basically configures how the Read Data and Write Data areas are broken down into data blocks (60, 120, or 240).

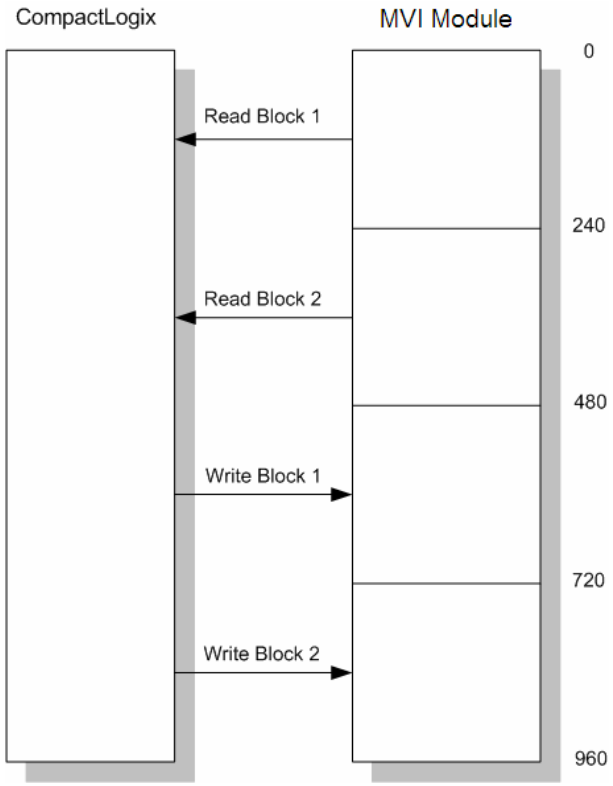
If Block Transfer Size = 60:



If Block Transfer Size = 120:



If Block Transfer Size = 240:



Write Block

These blocks of data transfer information from the CompactLogix or MicroLogix processor to the module and source the input (monitored) data to be used by the remote client. The structure of the output image used to transfer this data is shown in the following table.

Offset	Description	Length
0	Write Block ID	1
1 to n	Write Data	n

where n = 60, 120, or 240 depending on the Block Transfer Size parameter (refer to the configuration file).

The Write Block ID is an index value used to determine the location in the module's database where the data will be placed.

How Data is Transferred

In order to understand how the data is transferred between the processor and the module, you must understand the Read Data and Write Data area concept in the module's database. The module's database can be partially, or totally divided into Read Data Areas and Write Data Areas.

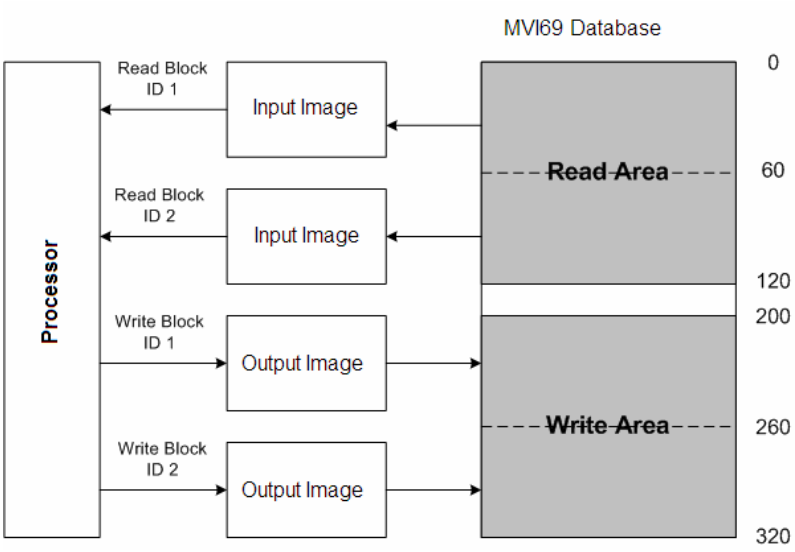
These areas are defined by the user when the configuration file is being edited. The following parameters define the Read and Write data areas:

```
Read Register Start    = 0
Read Register Count  = 120
Write Register Start = 200
Write Register Count = 120
```

Each area is broken down into blocks of 60 words. Therefore, the Read Register Count and Write Register Count parameters should be multiples of 60.

The Read Data Area will be transferred from the module to the CompactLogix or MicroLogix processor. The Write Data Area will be transferred from the CompactLogix or MicroLogix processor to the module.

The following example shows the resulting data flow:



Command Control Blocks

Command control blocks are special blocks used to control the module or request special data from the module. The current version of the software supports several command control blocks each of which is discussed in the following topics:

Block 9958 - Processor Binary Input Event

If the processor sends a block 9958, the module will place the binary input event data in the block into the event buffer and alter the data values for the points in the DNP binary input database. The format for the message is shown in the following table.

Block Format for Write

Word Offset in Block	Data Field(s)	Description
0	Block ID	This field contains the value of 9958 identifying the event block to the module.
1	Event Count	This field contains the number of events contained in the block. Valid values for this field are 1 to 11.
2	Sequence Counter	This field holds the sequence counter for each 9958 block transfer. This synchronizes and confirms receipt of the block by the module.
3	DNP Binary Input Data point	This is the data point in the DNP binary input database represented by the event.
4	Month/Day/State	Formatted: bits 0 to 4 = Day, bits 8 to 11 = Month, bit 15 = digital state for point. All other bits are ignored.
5	Hour/Minute	Formatted: bits 0 to 5 = Minutes, bits 8 to 12 = Hour. All other bits are ignored.
6	Sec/Millisecond	Formatted: bits 0 to 9 = Milliseconds, bits 10 to 15 = Seconds.
7	Year	This is the four digit year for the event.
8 to 12		Five words of data for Event #2.
13 to 17		Five words of data for Event #3.
18 to 22		Five words of data for Event #4.
23 to 27		Five words of data for Event #5.
28 to 32		Five words of data for Event #6.
33 to 37		Five words of data for Event #7.
38 to 42		Five words of data for Event #8.
43 to 47		Five words of data for Event #9.
48 to 52		Five words of data for Event #10.
53 to 57		Five words of data for Event #11.
58 to n	Spare	Not Used

To ensure the receipt of this block of information, the module returns a block 9958 with the sequence counter set to the value of the last successful block 9958 received.

Block Format for Read

Word Offset in Block	Data Field(s)	Description
0	Block ID	Identification code for block set to 9958.
1	Block ID	Block identification code for request from PLC by the module.
2	Event Count	This field contains the number of events processed by the module.
3	Sequence Counter	This field contains the sequence counter of the last successful block 9958 received.
4 to n	Spare	Not used

Block 9959 - Processor Analog Input Event

If the processor sends a block 9959, the module will place the analog input event data in the block into the event buffer and alter the data values for the points in the DNP analog input database. The format for the event message is shown in the following table.

Block Format for Write

Word Offset in Block	Data Field(s)	Description
0	Block ID	This field contains the value of 9959 identifying the event block to the module.
1	Event Count	This field contains the number of events contained in the block. Valid values for this field are 1 to 9.
2	Sequence Counter	This field holds the sequence counter for each 9959 block transfer. This synchronizes and confirms receipt of the block by the module.
3	DNP Analog Input Data point	This is the data point in the DNP analog input database represented by the event.
4	Analog Input Value	This is the new analog input value represented in the event.
5	Month/Day	Formatted: bits 0 to 4 = Day, bits 8 to 11 = Month. All other bits are ignored.
6	Hour/Minute	Formatted: bits 0 to 5 = Minutes, bits 8 to 12 = Hour. All other bits are ignored.
7	Sec/Millisecond	Formatted: bits 0 to 9 = Milliseconds, bits 10 to 15 = Seconds.
8	Year	Four digit year value for event.
9 to 14		Six words of data for Event #2.
15 to 20		Six words of data for Event #3.
21 to 26		Six words of data for Event #4.
27 to 32		Six words of data for Event #5.
33 to 38		Six words of data for Event #6.
39 to 44		Six words of data for Event #7.
45 to 50		Six words of data for Event #8.
51 to 56		Six words of data for Event #9.
57 to n	Spare	Not Used

To ensure the receipt of this block of information, the module returns a block 9959 with the sequence counter set to the value of the last successful block 9959 received.

Block Format for Read

Word Offset in Block	Data Field(s)	Description
0	Block ID	Identification code for block set to 9959.
1	Block ID	Block identification code for request from PLC by the module.
2	Event Count	This field contains the number of events processed by the module.

Word Offset in Block	Data Field(s)	Description
3	Sequence Counter	This field contains the sequence counter of the last successful block 9959 received.
4 to n	Spare	Not used

Block 9970 - Set Processor Time Using Module Time

This block transfers the module's time to the processor. Ladder logic must be used to set the processor's clock using the data received. The format of the block sent from the processor has the following format:

Block Format for Write

Word Offset in Block	Data Field(s)	Description
0	Block ID	This field contains the value of 9970 identifying the block type to the module.
1 to n	Not Used	Not Used

The module will respond to a valid block 9970 request with a block containing the requested date and time. The following example shows the format of this block.

Block Format for Read

Word Offset in Block	Data Field(s)	Description
0	Block Read ID	This field contains the block identification code of 9970 for the block.
1	Block Write ID	This is the next block requested by the module.
2	Year	This field contains the four-digit year to be used with the new time value.
3	Month	This field contains the month value for the new time. Valid entry for this field is in the range of 1 to 12.
4	Day	This field contains the day value for the new time. Valid entry for this field is in the range of 1 to 31.
5	Hour	This field contains the hour value for the new time. Valid entry for this field is in the range of 0 to 23.
6	Minute	This field contains the minute value for the new time. Valid entry for this field is in the range of 0 to 59.
7	Seconds	This field contains the second value for the new time. Valid entry for this field is in the range of 0 to 59.
8	Milliseconds	This field contains the millisecond value for the new time. Valid entry for this field is in the range of 0 to 999.
9	Remote Time Synchronization	This field informs the PLC if the date and time passed has been synchronized with a remote DNP master device on the module's slave port.
10 to n	Not Used	Not Used

Block 9971 - Set Module's Time Using the Processor's Time

This block sets the clock in the module to match the clock in the processor. If the processor sends a block 9971, the module will set its time using the data contained in the block. The format of the block is shown in the following table.

Block Format for Write

Word Offset in Block	Data Field(s)	Description
0	Block ID	This field contains the block identification code of 9971 for the block.
1	Year	This field contains the four-digit year to be used with the new time value.
2	Month	This field contains the month value for the new time. Valid entry for this field is in the range of 1 to 12.
3	Day	This field contains the day value for the new time. Valid entry for this field is in the range of 1 to 31.
4	Hour	This field contains the hour value for the new time. Valid entry for this field is in the range of 0 to 23.
5	Minute	This field contains the minute value for the new time. Valid entry for this field is in the range of 0 to 59.
6	Seconds	This field contains the second value for the new time. Valid entry for this field is in the range of 0 to 59.
7	Milliseconds	This field contains the millisecond value for the new time. Valid entry for this field is in the range of 0 to 999.
8 to n	Not Used	Not Used

Block Format for Read

The module will respond to a valid block 9971 request with

Word Offset in Block	Data Field(s)	Description
0	Block Read ID	This field contains the block identification code of 9971 for the block.
1	Block Write ID	This is the next block requested by the module.
2 to n	Spare	Not used

Warm Boot

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

Offset	Description	Length
0	9998	1
1 to n	Spare	n

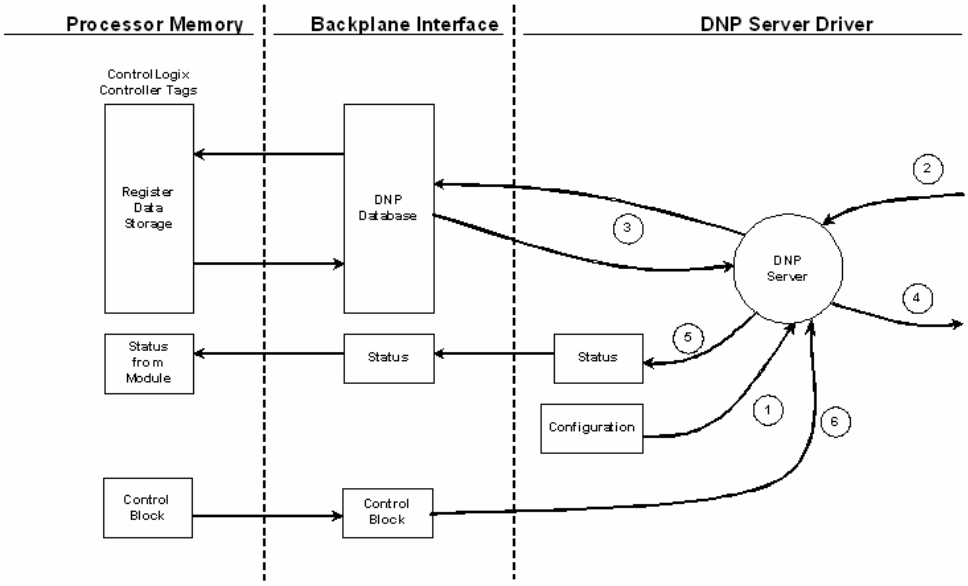
Cold Boot

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

Offset	Description	Length
0	9999	1
1 to n	Spare	n

Data Flow Between MVI69-DNPSNET Module and the CompactLogix or MicroLogix Processor

The following topics describe the flow of data between the two pieces of hardware (CompactLogix or MicroLogix processor and MVI69-DNPSNET module) and other nodes on the DNP network. The DNP Server Driver allows the MVI69-DNPSNET 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 configuration information for the module is retrieved from the DNPSNET.CFG file on the Compact Flash Disk. This information configures the module and define the Ethernet node characteristics.
2	A Host device (DNP Master unit) issues a read or write command to the module's node address. The 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 appropriate internal database in the module. If the command is a read command, the data is read out of the database and a response message is built. If the command is a write command, the data is written directly into the database and a response message is built.

Step	Description
4	After the data processing has been completed in Step 3, the response is issued to the originating master node.
5	Counters are available in the Status Block that permit the ladder logic program to determine the level of activity of the Slave Driver.
6	The module constantly monitors for command control blocks from the processor. If a valid block is received, the function is executed. Additionally, data is constantly being exchanged between the module and the processor.

Review the **Module Configuration** section for a complete list of the parameters that must be defined for a slave port.

5.3 MVI69-DNPSNET Application Design

This documentation describes the MVI69-DNPSNET module configuration and setup as it applies to application design. Before attempting to implement this module with a DNP network, verify that the whole design of the system is complete. This includes definition of all the data types and point counts required for each type, all communication parameters required for the network including media type and the use of advanced features such as unsolicited messaging. These must be defined for all master and slave devices on the network. Additionally, the DNP Device Profiles and DNP Subset Definition documents for each device must be reviewed to make sure all the devices will interact on the network as expected. Failure to fully understand these important documents for all devices on the network will usually lead to many problems when implementing the design.

It is important to fully understand the DNP specification as outlined in the Basic Four Documents. These are available to users of the DNP users group. It is recommended that all users of the module have access to these important documents as they define the DNP data types, functions and variations. It will be very difficult to implement the module without an understanding of the protocol and the rules that are defined in the specification. Additionally, potential users should review the DNP Subset and Conformance Test documents and the document that discusses DNP protocol support on Ethernet using the UDP and TCP protocols. These documents provide auxiliary information on the protocol. All of these documents are available to members of the DNP User Group at http://www.dnp.org (http://www.dnp.org). Please check this site for other important information regarding the DNP protocol.

In order to implement a solution using the module, the CompactLogix or MicroLogix processor must be set up using predefined user data structures. The data transfer interface requires ladder logic in order to interface data in the module with that in the processor. The program required for data transfer is developed in ladder and is discussed in the **Module Set Up** section. This program will interact with the module by sending and receiving data and issuing special control commands.

Data tags in the CompactLogix or MicroLogix processor contain the data to be used by the module and the configuration information is stored in the text file, DNPSNET.CFG, stored on the module's Compact Flash Disk. Before you generate the program or layout the data files, you must first design your system. Time spent doing system design at the outset of the project will greatly enhance the success and ease of development of the project.

5.3.1 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.

Data Requirements

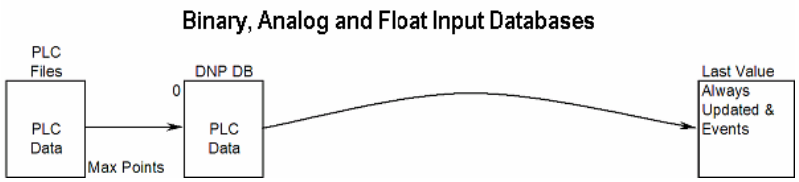
This phase of design defines what data elements are to be interfaced in the CompactLogix or MicroLogix processor with the DNP master. The module provides the following data types: digital input, digital output, counter, analog input, analog output, float input and float output. All communications between the DNP master and the PLC 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
	FLOAT INPUTS
	COUNTER DATA
	BINARY OUTPUTS
	ANALOG OUTPUTS
	FLOAT OUTPUTS
FROZEN DATA	FROZEN COUNTER DATA
LAST VALUE DATA	BINARY INPUTS
	ANALOG INPUTS
	FLOAT INPUTS
EVENT DATA	BINARY INPUT EVENTS
	ANALOG INPUT EVENTS
	FLOAT INPUT EVENTS

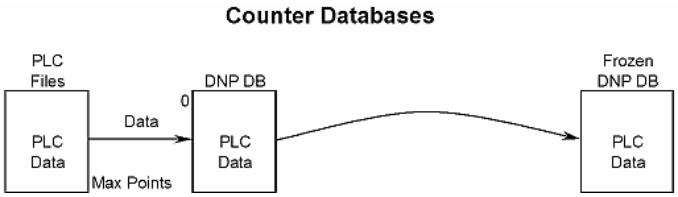
The module is responsible for maintaining the databases using data acquired from the PLC and DNP master attached network port.

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.

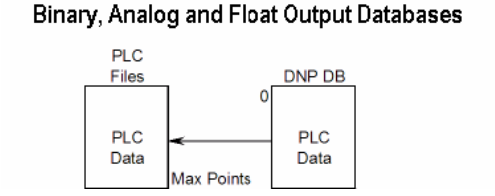
The following illustration shows the interaction of the counter points with the databases.



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 controller, and the zero data 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, analog and Float output points with the 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

Data is transferred between the CompactLogix or MicroLogix processor and the module using module's I/O images. Each block transfer operation transfers up to a maximum of 240 words of data if Block size of 240 is used. The other words in the block contain block header identification codes, or not used. The module defines the blocks to be transferred between the PLC and the module when the system is initialized. For the PLC read operations, word 0 of the module's input image identifies the data set contained in the image. Word 1 contains the block index the module is requesting the processor to write. The PLC constructs the write image to send to the module in the module's output image. The first word of the block identifies the data set contained in the block.

The module determines the block numbers required based on the module read and write register counts defined in the configuration file. The user is responsible for defining these parameters and the starting location of these data areas in the module's database correctly. These data must correspond to the DNP database definitions defined. The module stores the data in fixed order for the data types. The size of each data area for each type is determined by the user configuration. An example is given in the following table.

DATA AREA		Cfg	Points	Words	Offset
DNP DATA	BINARY INPUTS	2	32	2	0 to 1
	ANALOG INPUTS	48	48	48	2 to 49
	FLOAT INPUTS	10	10	20	50 to 69
	COUNTER DATA	25	25	50	70 to 119
	BINARY OUTPUTS	4	64	4	120 to 123
	ANALOG OUTPUTS	52	52	52	124 to 175
	FLOAT OUTPUTS	20	20	40	176 to 215

For the example above, 120 registers will be transferred from the processor (all the input data) and 96 registers will be transferred to the processor (all the output data). The data transfer parameters should be defined as follows:

Parameter	Value
Write Register Start:	120
Write Register Count:	96
Read Register Start:	0
Read Register Count:	120

The configuration above will require one block to read and one block to write all the DNP data between the module and the processor.

Note that in one block, one or more data types may be transferred. This is especially important when considering the counter and Float data. They require two registers to store their value. The value of a counter should never be passed in two separate blocks. To avoid this potential problem, always configure the module to have the counter data start on an even word number same rule applies to Float points.

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

		DNP MEMORY		
WRITE BLOCK FROM PROCESSOR	→		→	DIGITAL INPUT DATA
	→		→	ANALOG INPUT DATA
	→		→	FLOAT INPUT DATA
WRITE BLOCK FROM PROCESSOR	→		→	COUNTER DATA
READ BLOCK FROM MODULE	←		←	BINARY OUTPUT DATA
	←		←	ANALOG OUTPUT DATA
	←		←	FLOAT OUTPUT DATA
READ BLOCK FROM MODULE	←		←	FROZEN COUNTER, LAST VALUE AND EVENT DATA

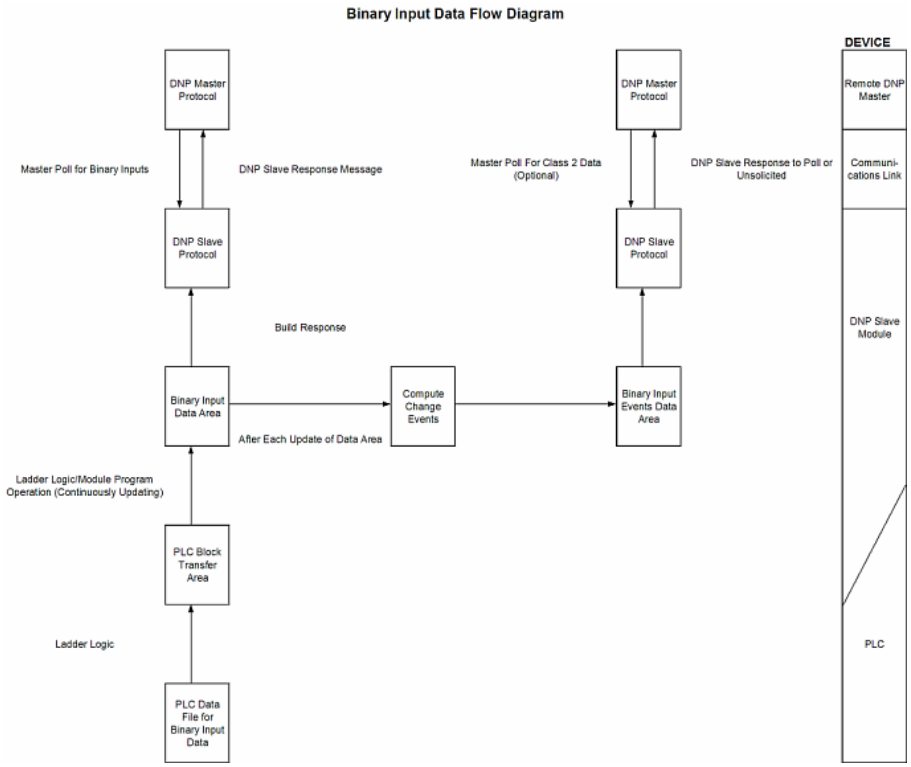
It is important to understand the relationship of the block identifications and the data in the module. Confident data handling in the module is only accomplished if the user defines a consistent set of parameters in the module configuration, handles the read and write operations for the blocks in the module in the PLC ladder logic and understands the requirements of the DNP master unit.

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 PLC file and offset values and to define the program configuration. Use these forms during your design phase.

DNP Digital Input Data

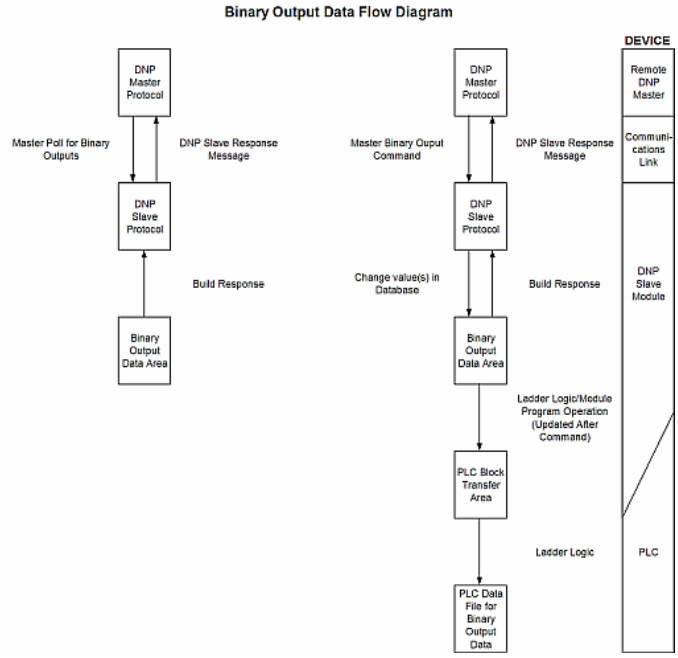
This data type stores the binary value of 1 or 0. The size of this data area is determined from the configuration parameter Binary Inputs (number of words, each containing 16 binary input points). These data are transferred to the module from the PLC using the read operation. Therefore, these data are 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 PLC, 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. A data flow diagram for the digital input data is shown in the following figure.



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 16 binary output points). These data are transferred from the module to the PLC using the write operation. Therefore, these data are read-only for the PLC, as the PLC 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. A data flow diagram for the digital output data is shown in the following figure.

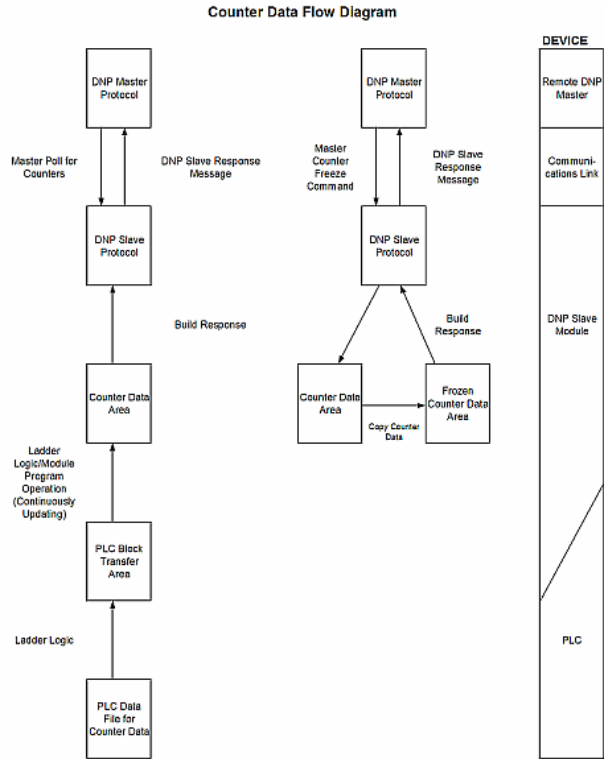


DNP Counter Data

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 PLC 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.

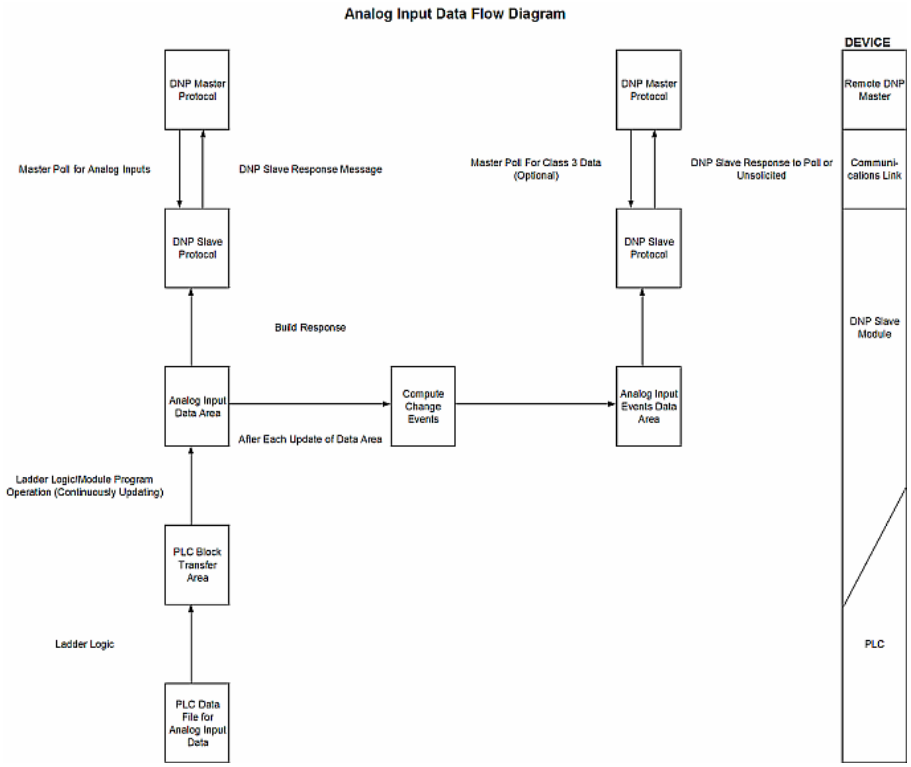
A data flow diagram for the counter data is shown in the following figure.



DNP Analog Input Data

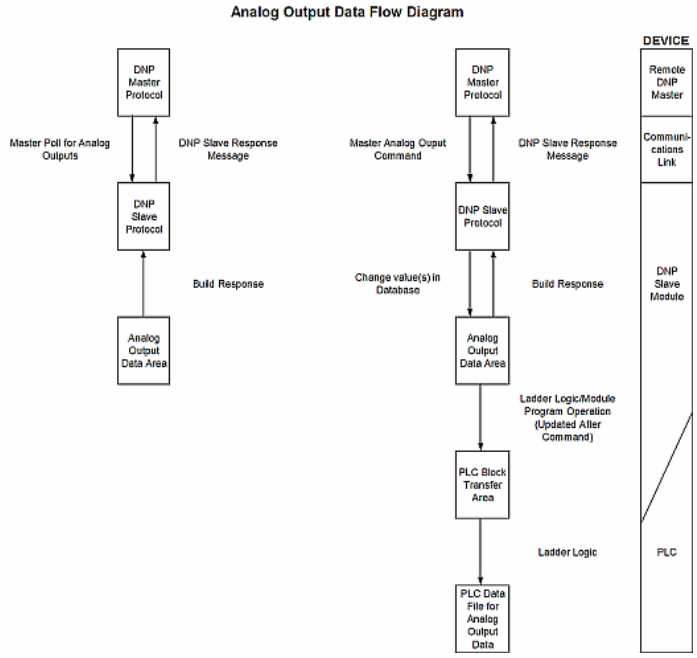
This data type stores analog data with a data range of 0 to 65535 or -32768 to 32767. The size of this data area is determined from the configuration parameter Analog Inputs. These data are transferred to the module from the PLC using the read operation. Therefore, these data are read-only for the module and the DNP master unit. When the module receives a new block of this data from the PLC, 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. A data flow diagram for the analog input data is shown in the following figure.



DNP Analog Output Data

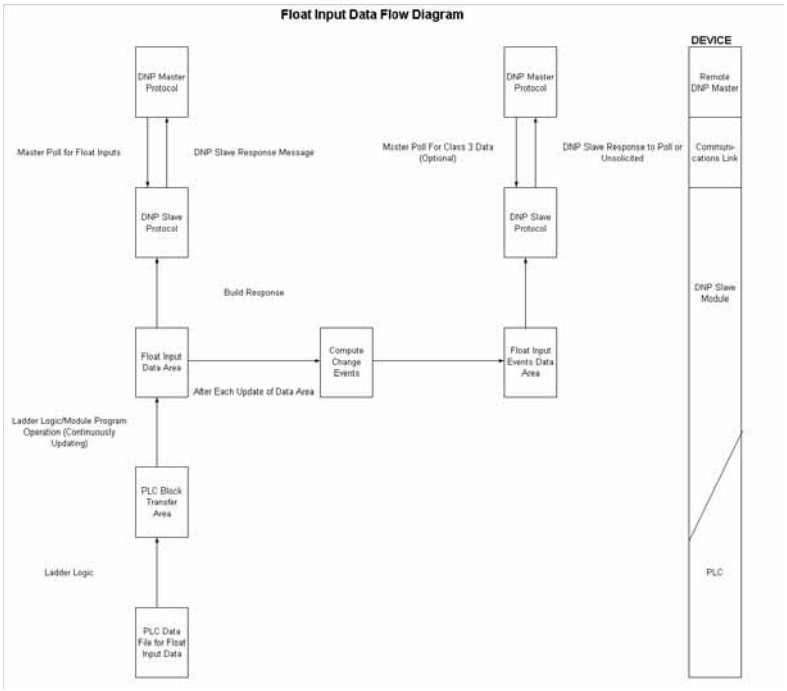
This data type stores analog values sent from the DNP master unit to the module and PLC with a data range of 0 to 65535 or -32768 to 32767. The size of this data area is determined from the configuration parameter Analog Outputs. These data are transferred from the module to the PLC using the write operation. Therefore, these data are read-only for the PLC, as the PLC 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. A data flow diagram for the analog output data is shown in the following figure.



DNP Float Input Data

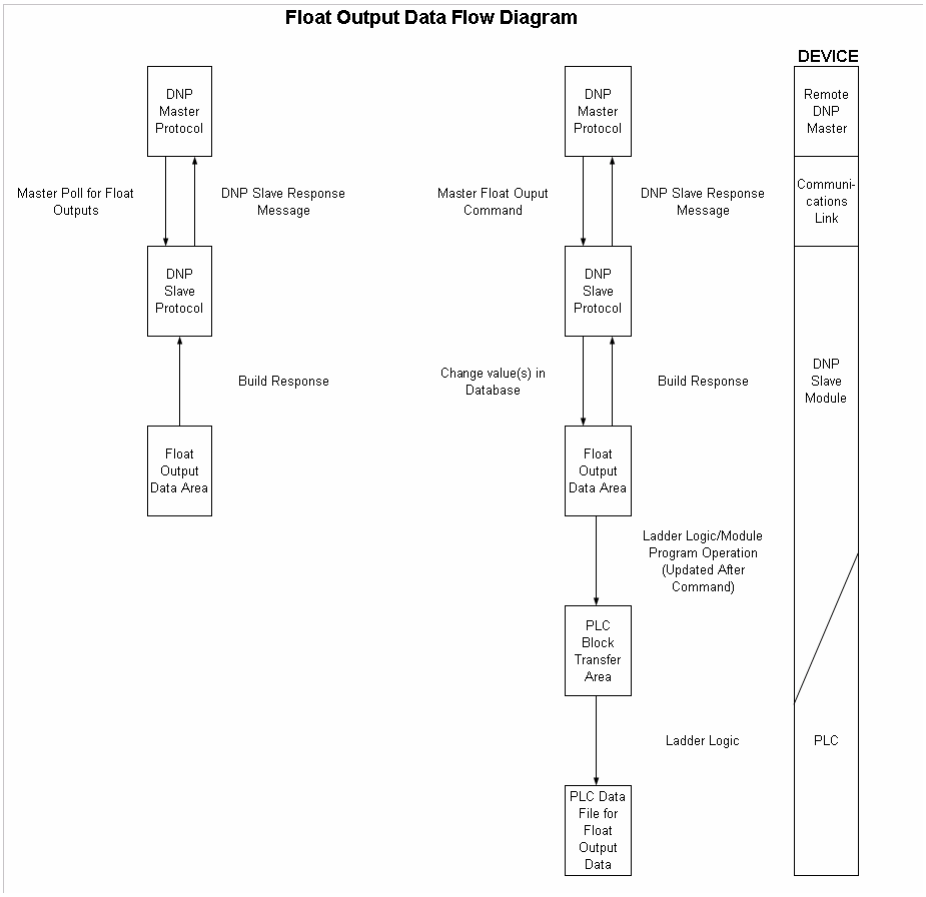
This data type stores float data. The size of this data area is determined from the configuration parameter float Inputs. These data are transferred to the module from the PLC using the read operation. Therefore, these data are read-only for the module and the DNP master unit. When the module receives a new block of this data from the PLC, 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 float 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. A data flow diagram for the float input data is shown in the following figure.



DNP Float Output Data

This data type stores Float values sent from the DNP master unit to the module and PLC. The size of this data area is determined from the configuration parameter Float Outputs. These data are transferred from the module to the PLC using the write operation. Therefore, these data are read-only for the PLC, as the PLC 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 3405.000 to the module for a specific point, the value will be stored in the module until changed by the master. A data flow diagram for the float output data is shown in the following figure.



5.3.2 Communication Parameters

This phase of design defines the communication parameters required for successful communications between the module and DNP master and slave units over the Ethernet network. Determine the IP address for the module and the list of IP addresses that can connect to the unit if this feature is enabled. Consult with the MIS person in charge of assigning these addresses and setting up the network configuration. The Reference chapter contains a form to aid in setting these parameters. Fill out this form before attempting to configure the module. You must also determine if the UDP or the TCP protocol or both will be used in your application. The module supports a single connection for the TCP protocol. The UDP server supports receipt of messages from multiple clients. Access to both servers can be limited by using the IP address list filtering.

5.3.3 Functionality

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

- Will analog events be returned with or without a time value?
- Will events be logged before time synchronization has occurred?
- Will the module start with database values initialized by the processor?

For a complete description of the module configuration, refer to the **Module Setup** section.

5.3.4 Data Transfer at Startup

The module can be configured to have the internal databases initialized with data contained in the processor. This feature requires ladder logic. Data to be initialized are as follows: Binary and Analog Output data. This feature can be used to bring the module to a known state (last state set in controller) when the module is first initialized. For example, in order to have the module startup using the last set of binary output values and setpoint values (analog outputs), enable this feature.

If this feature is implemented, the module will request the data from the processor. Ladder logic must handle the blocks requested by the module (1000 to 1149) based on the modules configuration values for the write block data. When the block is requested, the module must place the correct data in the block and return the block to the module. The module will receive the data and initialize the output values. Each block required by the module for initialization will be requested.

5.3.5 Module Operation

After the system has been designed and the system is set up, the module will be ready to operate. When the module is first initialized, it will read the configuration file (DNPSNET.CFG on the module's Compact Flash Disk). After the file is processed, the module will use the data to set up the data structures of the application. If any errors are encountered during the initialization process, the default value for the parameter will be assigned and used.

The module will next check if the output initialization feature is utilized. The option permits the PLC to set these read-only data at startup. There is no static memory available on the module to remember the last values for these data types. In order to prevent a "shock" to the system at boot time, this option can be used to set the module's database to the last transferred set of data. If this option is enabled, the module will request the binary and analog output from the PLC. This is done using blocks 1000 to 1149. Ladder logic must transfer the data for this feature to operate.

After the successful initialization of the module, the program will start the normal data transfer between the module and the CompactLogix or MicroLogix processor. The program will send a read block first and then wait for a write block to receive data from the PLC. This alternating sequence of read and write will continue as long as the program is running. The program will update the DNP memory areas in the module with the new data and generate events for digital and analog input status changes.

If the module is configured for unsolicited messaging, the module will immediately send an unsolicited response once the remote master connects to the module, 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 will be 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.

If the module is not configured for unsolicited messaging, the DNP master must clear the restart IIN bit before the module will start logging events. The master must also synchronize the time with the module before events will be generated if the module is so configured.

Additionally, the program will listen on Port 1 for requests. This is the debug port for the module and transfers module information to an attached terminal. Refer to the **Diagnostics and Troubleshooting** section for a complete discussion on the use of this important feature.

5.4 Cable Connections

The MVI69-DNPSNET module has the following communication connections on the module:

- One Ethernet port (RJ45 connector)
- One RS-232 Configuration/Debug port (RJ45 connector)

5.4.1 Ethernet Connection

The MVI69-DNPSNET module has an RJ45 port located on the front of the module labeled "Ethernet", for use with the TCP/IP network. The module is connected to the Ethernet network using an Ethernet cable between the module's Ethernet port and an Ethernet switch or hub.

Note: Depending on hardware configuration, you may see more than one RJ45 port on the module. The Ethernet port is labeled "Ethernet".
Warning: The MVI69-DNPSNET module is NOT compatible with Power Over Ethernet (IEEE802.3af / IEEE802.3at) networks. Do NOT connect the module to Ethernet devices, hubs, switches or networks that supply AC or DC power over the Ethernet cable. Failure to observe this precaution may result in damage to hardware, or injury to personnel.
Important: The module requires a static (fixed) IP address that is not shared with any other device on the Ethernet network. Obtain a list of suitable IP addresses from your network administrator BEFORE configuring the Ethernet port on this module.

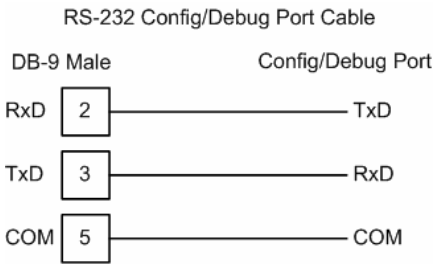
Ethernet Port Configuration - wattcp.cfg

The wattcp.cfg file must be set up properly in order to use a TCP/IP network connection. You can view the current network configuration using an ASCII terminal by selecting "@" (Network Menu) and "V" (View) options when connected to the Debug port.

```
# WATTCP.CFG FILE:
# ProSoft Technology.
  my_ip=192.168.0.100
# Default class 3 network mask
  netmask=255.255.255.0
# The gateway I wish to use
  gateway=192.168.0.1
```

5.4.2 RS-232 Configuration/Debug Port

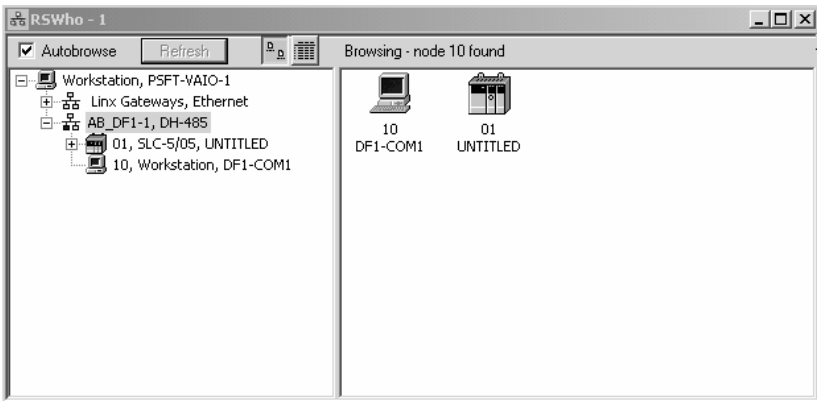
This port is physically an RJ45 connection. An RJ45 to DB-9 adapter cable is included with the module. This port permits a PC based terminal emulation program to view configuration and status data in the module and to control the module. The cable for communications on this port is shown in the following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



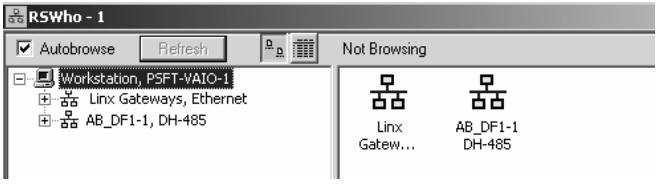
Disabling the RSLinx Driver for the Com Port on the PC

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

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



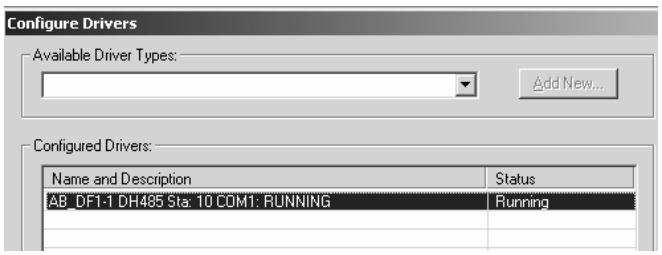
3. Notice how the DF1 driver is opened, and the driver is looking for a processor on node 1. If the network is being browsed, then you will not be able to stop this driver. To stop the driver your RSWho screen should look like this:



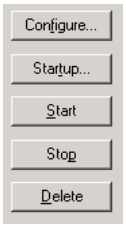
Branches are displayed or hidden by clicking on the ⊞ or the ⊟ icons.

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

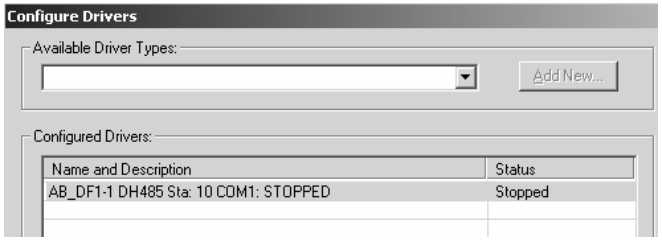
Communications>Configure Drivers
You may see something like this:



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



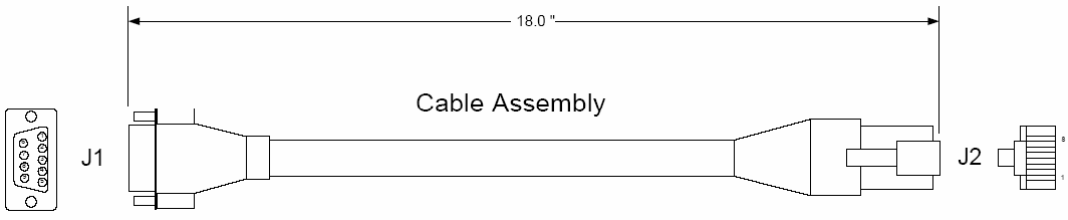
5 After you have stopped the driver you will see the following:

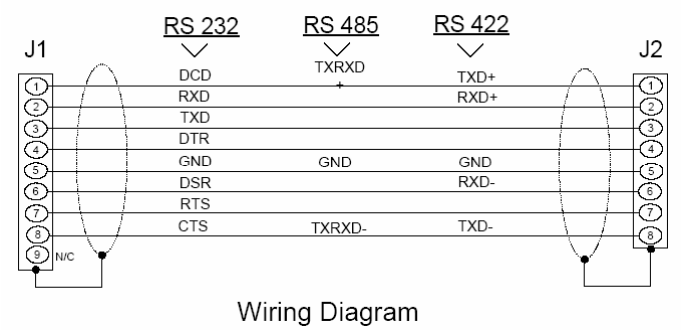


6 Upon seeing this, you may now use that com port to connect to the debug port of the module.

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

5.4.3 DB9 to RJ45 Adaptor (Cable 14)





Wiring Diagram

5.5 MVI69-DNPSNET Status Data

This section contains a listing of the MVI69-DNPSNET module's status data area.

Word	Variable Name	Description
0	Scan Counter	Program scan counter incremented each time the program loop is executed.
1-2	Product Name (ASCII)	These two words contain the product name of the module in ASCII format.
3-4	Revision (ASCII)	These two words contain the product revision level of the firmware in ASCII format.
5-6	Operating System Revision (ASCII)	These two words contain the module's internal operating system revision level in ASCII format.
7-8	Production Run Number (ASCII)	These two words contain the production 'batch' number for the particular chip in the module in ASCII format.
9	Read Block Count	Total number of blocks transferred from the module to the processor.
10	Write Block Count	Total number of blocks transferred from the processor to the module.
11	Parse Block Count	Total number of blocks parsed by the module that were received from the processor.
12	Block number error	Number of BTW requests that resulted in an incorrect BTW identification code.

Word	Variable Name	Description
13	DNP Slave Port total number of message frames received by slave	This value represents the total number of message frames that have matched this slaves address on this port. This count includes message frames which the slave may or may not be able to parse and respond.
14	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.
15	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.
16	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.
17	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.
18	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.
19	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.
20	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.
21	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.
22	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.
23	DNP Slave Binary Input Event count	This value contains the total number of binary input events which have occurred.
24	DNP Slave Binary Input Event count in buffer	This value represents the number of binary input events which are waiting to be sent to the master.
25	DNP Slave Analog Input Event count	This value contains the total number of analog input events which have occurred.
26	DNP Slave Analog Input Event count in buffer	This value represents the number of analog input events which are waiting to be sent to the master.

Word	Variable Name	Description
27	DNP Slave Float Input Event count in buffer	This value represents the number of float input events which are waiting to be sent to the master.
28	Reserved	Future Use
29	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.
30	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.
31	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.
32	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.
33	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.
34	UDP Receive Count	Number of UDP messages received
35	UDP Transmit Count	Number of UDP messages transmitted
36	Unsolicited Error Count	Number of failures when trying to send unsolicited event data
37	State Value	This variable has a value of 0 if there is not a message being sent and 1 if a message is being sent.
38	TCP Socket State Value	State machine value for the TCP socket
39	UDP Socket State Value	State machine value for the UDP socket
40	DNP Busy With Message State	Socket busy state -1=TCP socket not connected, 0=TCP or UDP not processing message, 1 or 3 = TCP processing message, and 2=UDP socket processing message.
41	Application Fragment	Application fragmentation flag/counter
42	Transmit Frame State	Transmit Frame State
43	TCP Message Length	Bytes Received on the TCP port for the current message.
44	UDP Message Length	Bytes received on the UDP port for the current message.
45	Port TX State	This variable has a value of 0 if there is not a message being sent and 1 if a message is being sent.
46	Free Memory LSB	Free memory in module
47	Free Memory MSB	

5.6 MVI69-DNPSNET Module

Internal Indication Bits (IIN Bits) for DNP Server

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. The following description describes the word.

5.6.1 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 the master station know that the broadcast was 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 the master. The master should write the date and time when the 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.
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.

5.6.2 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 the requested operation is already executing. The slave will never set this bit.
5	Not used.
6	Reserved. Always 0.
7	Reserved. Always 0.

5.7 Device Profile

DNP V3.00 DEVICE PROFILE DOCUMENT	
Vendor Name: ProSoft Technology, Inc.	
Device Name: MVI69-DNPSNET (VERSION 1.00)	
Highest DNP Level Supported : For Request: L2 For Responses: L2	Device Function: Slave (TCP/IP Server (Data Provider))
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: Supports both TCP and UDP protocols as specified in the recommendation document. Supports new function 24 and object 50 variation 3 for time synchronization. Supports list of valid IP addresses for clients to connect (may be disabled by user). Setting of IP list secure. Supports receipt of multiple messages in a single network packet. The following features are configurable on the module: Time sync before events are generated and default analog input events, Obj32V4 or O32V2, select option. Counter Freeze with reset will not zero values in the processor. Therefore, this function should not be utilized. Module will not generate events until Restart IIN bit is cleared by DNP master.	
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	Maximum Application Layer Re-tries: None
Requires Data Link Layer Confirmation: Always set to Never as defined in recommendation	
Requires Application Layer Confirmation: When reporting Event Data as a slave unit	
Time-outs while waiting for: Data Link Confirm : NA 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 65535) Pulse On : Always Pulse Off : Always Latch On : Always Latch Off : Always Queue : Never Clear Queue : Never	

DNP V3.00 DEVICE PROFILE DOCUMENT	
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	

5.8 DNP 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

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
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
	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
	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

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
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
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
	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
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 Input	1	06	129, 130	00, 01	40	Slave will return this variation
33	0	Frozen Analog Event: All Variations						Slave will return Unknown Object to this request
	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

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
	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
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
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
	3	Short Floating Point Analog Output Status	1	06	129, 130	00, 01	40	Slave will return this variation
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
	3	Time and Date - last recorded absolute time	2	07, With Quant=1			48	Slave will respond to this variation
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
	3	Date and Time at Last Recorded Time	2				48	Slave will process the data in this object for time synchronization.
60	0	Not Defined						Not Defined in DNP
	1	Class 0 Data	1	06				Slave will respond to this variation with all static data

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
	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
	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	
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

OBJECT			REQUEST		RESPONSE			
Obj	Var	Description	Func Codes	Qual Codes (hex)	Func Codes	Qual Codes (hex)	Data Size (bits)	NOTES
			20					Slave supports the Enable Unsolicited Function
			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
			24					Slave supports use of this new time synchronization function. Used with Obj 52, Var 3.

5.9 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 2 times each second and polled by the master station about every 5 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 2 times each second and polled by the master station about every 5 seconds. Only about 5 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 both the binary and analog input events in the configuration. This will cause the DNP slave port driver to never return any data on object 2 and 32 and class 2 and 3 master station requests.

6 Support, Service & Warranty

6.1 Contacting Technical Support

ProSoft Technology, Inc. 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 associated ladder files, if any
2. Module operation and any unusual behavior
3. Configuration/Debug status information
4. LED patterns
5. Details about the serial, Ethernet or Fieldbus devices interfaced to the module, if any.

Note: *For technical support calls within the United States, ProSoft's 24/7 after-hours phone support is available for urgent plant-down issues.*

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For additional ProSoft Technology contacts in your area, please visit:
https://www.prosoft-technology.com/About-Us/Contact-Us.

6.2 Warranty Information

For complete details regarding ProSoft Technology's TERMS & CONDITIONS OF SALE, WARRANTY, SUPPORT, SERVICE AND RETURN MATERIAL AUTHORIZATION INSTRUCTIONS please see the documents at:
www.prosoft-technology/legal