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MBP

ProLinx Gateway
Modbus Plus

DRIVER MANUAL

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MBP Driver Manual

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Important Installation Instructions

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

WARNING - EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIV. 2;

WARNING - EXPLOSION HAZARD - WHEN IN HAZARDOUS LOCATIONS, TURN OFF POWER BEFORE REPLACING OR WIRING MODULES

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

Class 2 Power

Product Warning

WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

AVERTISSEMENT – RISQUE D'EXPLOSION – AVANT DE DÉCONNECTER L'EQUIPMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DÉSIGNÉ NON DANGEREUX.

Stand-alone Gateways with Ethernet Ports

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

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

To order a 'Plus' gateway with the -WEB option

Add **-WEB** to the standard ProSoft stand-alone gateway part number. For example, **5201-MNET-MCM-WEB**.

To upgrade a previously purchased Series C model

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

Markings

Label Markings

<cULus>
E183151
Class I Div 2
Groups A,B,C,D T6
-30°C <= Ta <= 60°C
<Ex>
II 3 G
Ex nA IIC T4
-20°C <= Ta <= 50°C

II – Equipment intended for above ground use (not for use in mines).

3 – Category 3 equipment, investigated for normal operation only.

G – Equipment protected against explosive gasses.

Contents

1   Functional Overview

In This Chapter

1.1   Modbus Plus Port

The ProLinx module supports the Modbus Plus protocol on the DB-9 Male Modbus Plus port. The Modbus port is configurable.
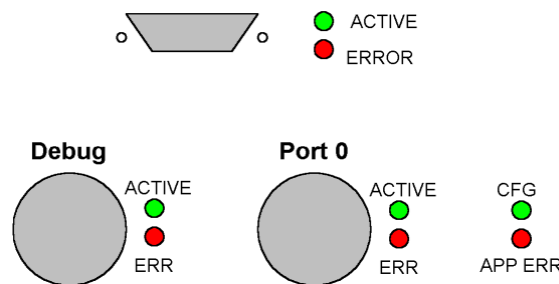
The Modbus Plus port can be used to continuously interface with Modbus Plus devices over a network. The port supports 200 user-defined commands that determine the Modbus Plus messages issued to each individual unit attached to the network.

1.2   Module Internal Database

The internal database is central to the functionality of the module. This database is shared between all the ports on the module and is used as a conduit to pass information from one device on one network to one or more devices on another network. This permits data from devices on one communication port to be viewed and controlled by devices on another port.

In addition to data from the Modbus Plus port, status and error information generated by the module can also be mapped into the internal database.
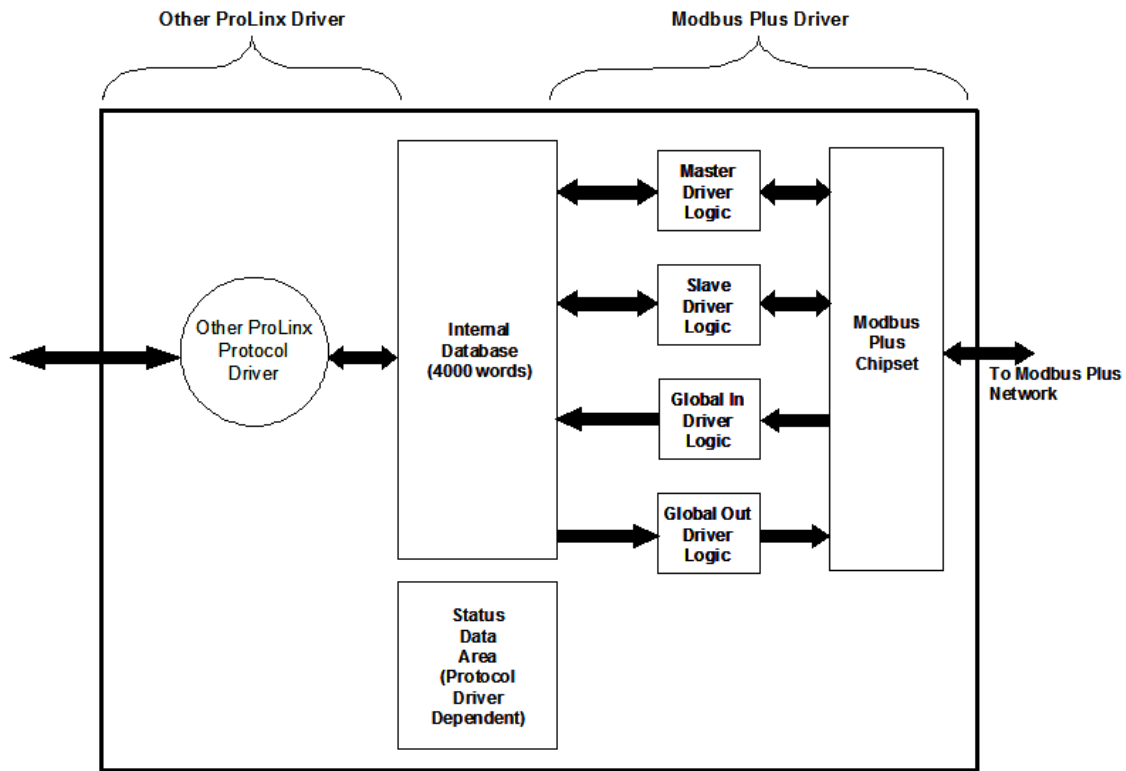
1.2.1 Modbus Plus Port Access to Database

The Modbus Plus driver uses the database in two ways:

1 A read command issued to a Modbus Plus device by the driver will return the foreign device data into the internal database.
2 A write command issued to a Modbus Plus device by the driver will use the data in the internal database to write to the foreign device.

External Modbus Plus devices can monitor and control data in this database through the Modbus Plus Port. Setup of the port only requires appropriate values in the CFG file.

1.2.2 Modbus Plus Master Access to Database

The Master functionality exchanges data between MBP module's internal database and data tables established in one or more Modicon processors or other Modbus Plus slave devices. The command list, defined in the user configuration, defines what data to transfer between the module and each of the slaves on the network. No ladder logic is required in the processor for master functionality, except to assure that sufficient data memory exists.

The following illustration describes the flow of data between the Modbus Plus devices and the internal database.
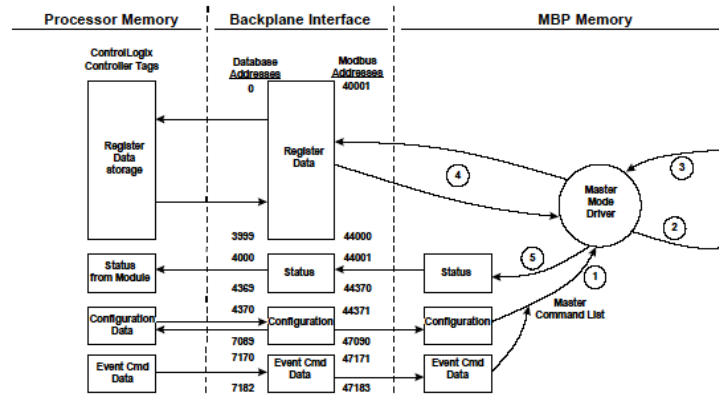
1.2.3 Modbus Plus Slave Access to Database

The MBP module supports slave functionality using the Modbus Plus protocol. Services supported in the module permit Modbus Plus master applications (that is, HMI software applications, Modicon processors, and so on) to read from and write to the module's database. This section discusses the requirements for attaching to the module using several Modbus Plus master applications.
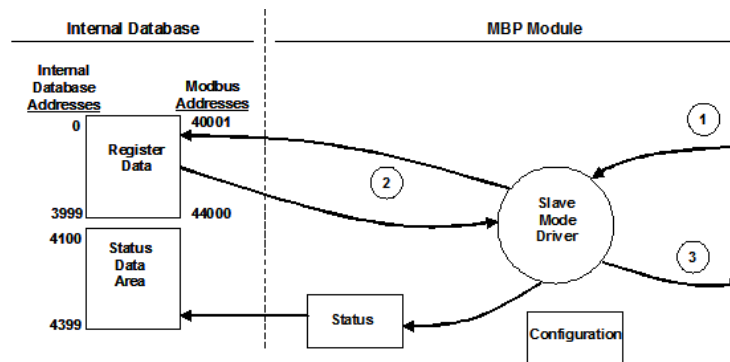
There is no configuration of the MBP module required to implement Slave functionality other than setting up the network and database parameters in the user configuration file.

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

Database Address	Modbus Address
0	40001
1000	41001
2000	42001
3000	43001
3999	44000

Before attempting to use the module on a network, verify that the MBP module is correctly configured and connected to the network. Use ProSoft Configuration Builder to confirm proper configuration of the module, and to transfer the configuration files to and from the module.

1.2.4 Modbus Plus Global In Access to Database

The MBP module actively exchanges global in (32 words max. per node) and global out (32 words max.) data on the Modbus Plus network. Priority is given to these data types to provide a high speed mechanism for the transfer of control data.
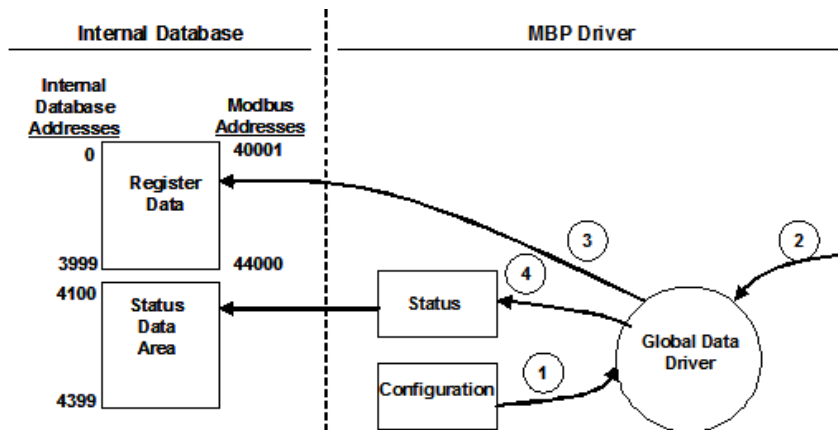
1 The Global In driver reads configuration data from the configuration file. This data includes the Device Definition File that includes the node address data, the number of Global In words and where to put this data in the module's internal database.

2 During the configuration process, the Input File Map is updated out of the configuration file. The Input File Map informs the module which data registers in the internal database to feed into the module's input image. This operational mode is independent of the Global In mode but is commonly used to transfer global input data from other nodes directly to the processor.

3   The Global In Driver monitors Global In data from other nodes on the network. If the data matches one of the node addresses in the Device Definition File and is qualified in terms of length, and so on. the data is accepted.

4   After the data is accepted, the data is transferred into the module's internal database. The user via configuration in the Device Definition File determines the location of the data.

5   As data is read from the other nodes on the network into the module, an asynchronous process moves the data from the database into the module's input image. The values to be moved are user determined via configuration of the Input File Map. Up to 32 words of data can be transferred in this fashion.

6   Status is monitored for each device in the Device Definition File that is expected to return Global In data to the module. This status is updated on an on-going basis and is transferred to the Modbus Plus network for processing. This data includes the node status value and a counter incremented each time global input data is received.

1.2.5 *Modbus Plus Global Out Access to Database*

When the MBP module's Global Output capability is enabled, up to 32 words of data can be transferred onto the Modbus Plus network by the module. This data, typically reserved for high-speed data such as for application control data, is transmitted each time the module receives the network token.

The number of words transferred to the Modbus Plus network is user determined through the Module Configuration Block. The following flow chart and associated table describe the flow of data into and out of the module.
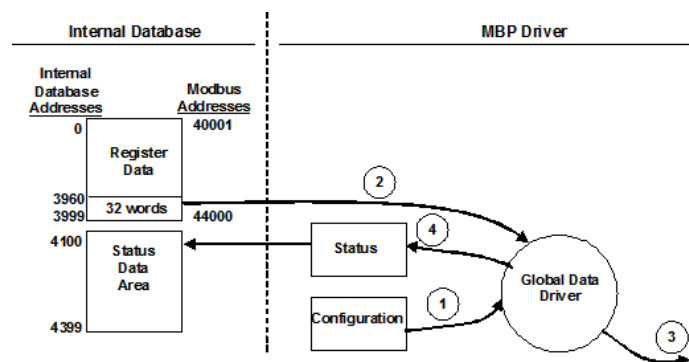
1   The Global Output driver reads configuration data from the configuration file. This data consists of the number of words to be transmitted by the module each time the module has the token. In addition, timing data on the update rate for the Global Out transmission is also obtained from the configuration data.

2   The Global Out data image is updated through the module's output image. Based on the update rate configured by the user, the Global Out image in the Modbus Plus chipset will also be updated.

3 The Global Output driver in the Modbus Plus chipset will transmit the Global Out data each time the token is received by the module.

4 The Global Output driver status is updated in the module's database.

To enable the Global Output Mode, set the Global Output Length parameter to a value between 1 and 32. To disable this feature, set the parameter to a value of zero.

1.3 Single Port With Dual Media-Redundant Connector Operation

Some Modbus Plus modules are equipped with a second, redundant Modbus Plus Connector. A Dual Connector Modbus Plus network is implemented in the following way:

- The primary network connects to Connector 1 on all modules.
- The secondary (backup) network connects to Connector 2 on all modules.

If the primary network connected through Connector 1 fails (for example, if a cable is cut or disconnected), the network connected through Connector 2 will become active, maintaining the connection between devices.

Important: All Modbus Plus nodes on a network must be equipped with dual connectors in order to implement redundant connector operation.

Refer to the following illustration for an example of redundant connector operation on a Modbus Plus network.

MODBUS Plus communications redundancy using Dual ports.
(if **one network** is damaged the **remaining network** automatically takes over the communications)

The wire routing of the two networks is separate and preferably wide apart enough to minimize accidental damage to to both networks at the same time.
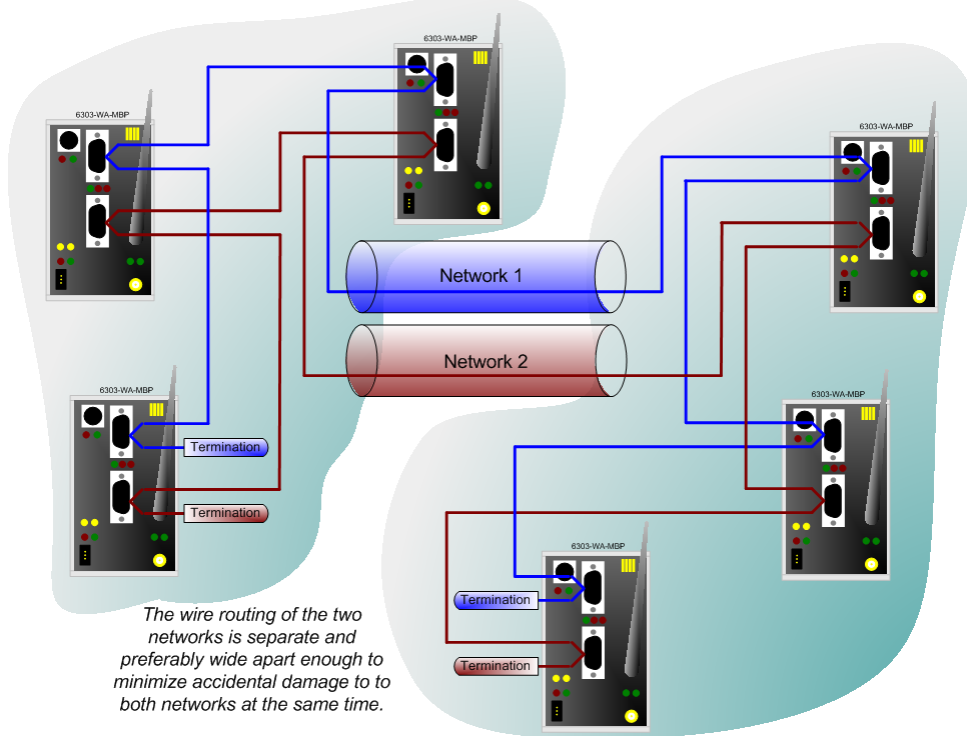
1.4   Command Routing

Three Bus Modbus Plus Network Example for Command Routing
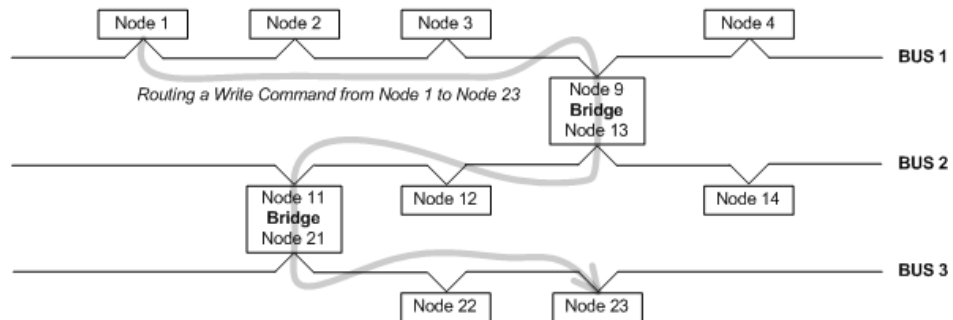
```
Route   Route   Route   Route   Route   Global       Global
  1       2       3       4       5     In Length    In Address
----------------------------------------------------------------
  9      11      23       0       0        32          2500
```

2 Port Physical and Protocol Specifications

2.1 Functional Specifications - Modbus Plus

The Modbus Plus (MBP) protocol driver operates as a single, peer-to-peer Modbus Plus port with dual media-redundant connectors. The two connectors cannot be configured as separate MBP ports. They are for physical cabling redundancy only.

General Parameters	
Modbus Function Codes	3: Read Multiple Data Registers (MSTR 2) 16: Write Multiple Data Register (MSTR 1) Global data read (32 words per node max.) Global data write (32 words per node max.)
Address Scope	1 to 64
Modbus Plus Functioning as a Master	
Command List	Up to 200 commands on the master port, fully configurable for function, slave address, register to/from addressing and word count
Polling of command list	Configurable polling of command list, including continuous read or write commands and write on change of data (Function Code 16 Write command only)"
Modbus Plus Functioning as a Slave	
Node address	1 to 64 (software selectable)

2.2 General Specifications

ProLinx® Communication Gateways provide connectivity for two or more dissimilar network types. The gateways, encased in sturdy extruded aluminum, are stand-alone, DIN-rail-mounted solutions that provide data transfer between many of today's most widely used industrial automation protocols.

2.3   Hardware Specifications

Specification	Description
Power Supply	24 Vdc nominal 18 Vdc to 32 Vdc allowed Positive, Negative, GND Terminals 2.5 mm screwdriver blade
Current Load	500 mA maximum @ 32 Vdc maximum
Operating Temperature	-4°F to 122°F (-20°C to 50°C)
Storage Temperature	-40°F to 185°F (-40°C to 85°C)
Relative Humidity	5% to 95% RH with no condensation
Shock	IEC 60068-2-6; 5G @ 10-150HZ
Vibration	IEC 60068-2-27; 20G @ 11ms, 3-Axis (Operational)
Dimensions (Height x Width x Depth)	Standard: 5.20 in x 2.07 in x 4.52 in (13.2 cm x 5.25 cm x 11.48 cm) Extended: 5.20 in x 2.73 in x 4.52 in (13.2 cm x 6.934 cm x 11.48 cm)
LED Indicators (On all modules)	Power and Hardware Fault Configuration and Application Communication Status Serial Configuration Port Activity and Error
Configuration Serial Port	DB-9M RS-232 only No hardware handshaking
Ethernet Port (Ethernet protocol modules only)	10 Base-T half-duplex RJ45 Connector Link LED and Activity LED indicators Electrical Isolation 1500 Vrms at 50 Hz to 60 Hz for 60 seconds, 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
Serial Port Isolation	2500 Vrms port signal isolation per UL 1577 3000 Vdc min. isolation port to ground and port to logic
Shipped with Each Unit	Mini-DIN to DB-9M serial cables 4-foot RS-232 configuration cable 2.5 mm screwdriver RS-422/485 DB-9 to Screw Terminal Adapter for each serial application port (serial protocols only)

3   MBP Protocol Configuration

In This Chapter

The following illustration shows typical examples of the Modbus Plus
Configuration, Modbus Plus Device Definition, and Modbus Plus Commands
sections for the MBP protocol.
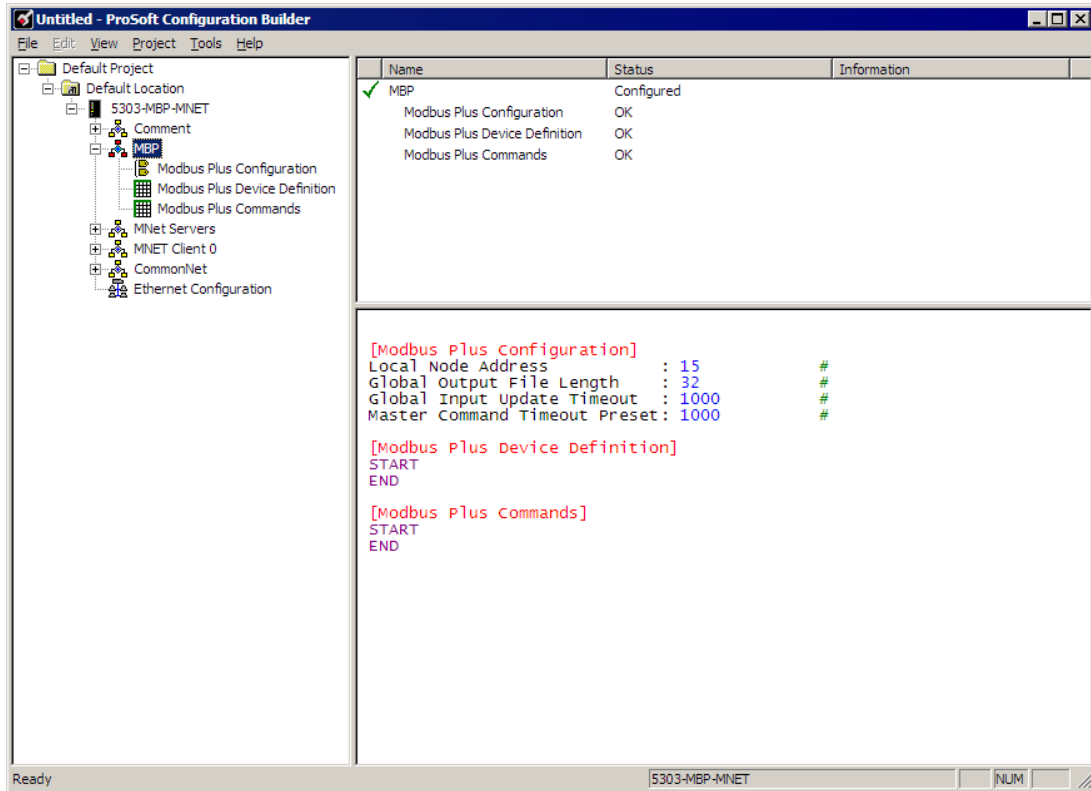
3.1   [Modbus Plus Configuration]

The [Modbus Plus Configuration] section of the **CFG** file sets general characteristics of the Modbus Plus port.

Example
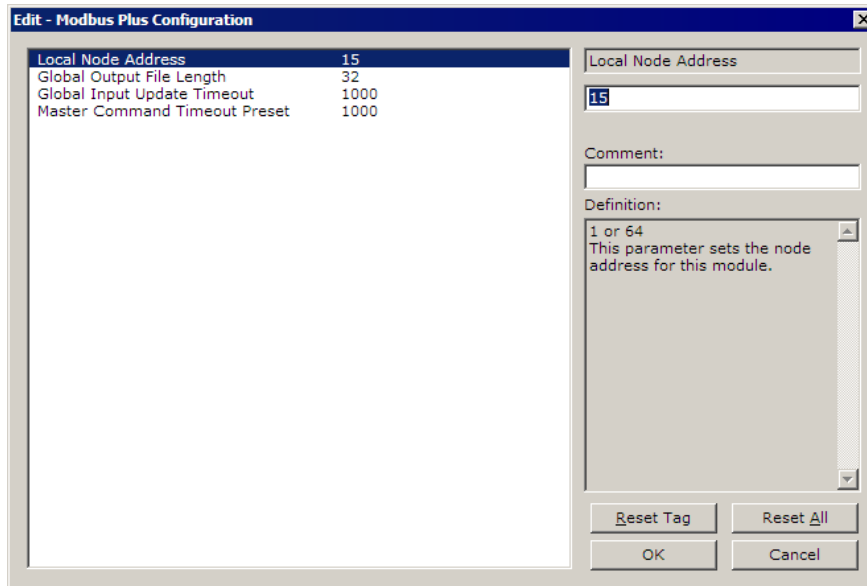
Parameter Description

The following section lists the parameters.

3.1.1   Local Node Address

1 to 64

This value defines the Modbus Plus Node Address for the module. A valid node address must be entered for the module to operate, and the address must be unique on the network. Valid values are between 1 and 64, inclusive.

3.1.2   Global Output File Length

0 to 32

This value defines the number of Global Output words to be placed on the Modbus Plus network. If the value is set to 0, no global output data will be placed on the network. Values of 1 to 32 represent the number of words to be used by the module. This data must be transferred from the processor to the module.

Important: ProLinx Modbus Plus modules use memory addresses 3960 to 3991. If you plan to use Global Output Data, you must not use this memory area for normal data transfer, otherwise data may be overwritten and unpredictable results may occur.

3.1.3 Global Input Update Timeout

0 to 65535

This value defines the timeout period (0 to 65535 milliseconds) for receiving Global Input Data from other nodes on the network. After the timeout period has been exceeded, the Timeout Error will be returned in the Global In Update Status data set. A value of 0 will result in the default value of 1000 milliseconds (1 second).

3.1.4 Master Command Timeout Preset

0 to 65535

This parameter defines the number of milliseconds (0 to 65535) to wait for a response to a master command issued by the module on the network. If a timeout condition exists for a command, it will be reflected in the Master Command List Status data area. A value of 0 will result in a value of 1000 (1 second) for the parameter.

3.2   [Modbus Plus Device Definition]

The Modbus Plus Device Definition portion of the file represents the roadmap to get data from one destination to the next. If the Modbus Plus is going to be configured to operate in the Global In and/or Master Command modes, the Modbus Plus Device Definition file must be set up. This file allows the user to configure specific operating parameters for each device on the Modbus Plus network.

Each Modbus Plus device on the network must be defined in the [Modbus Plus Device Definition] section of the configuration file. The table starts after the START label and continues until the END label.

Example
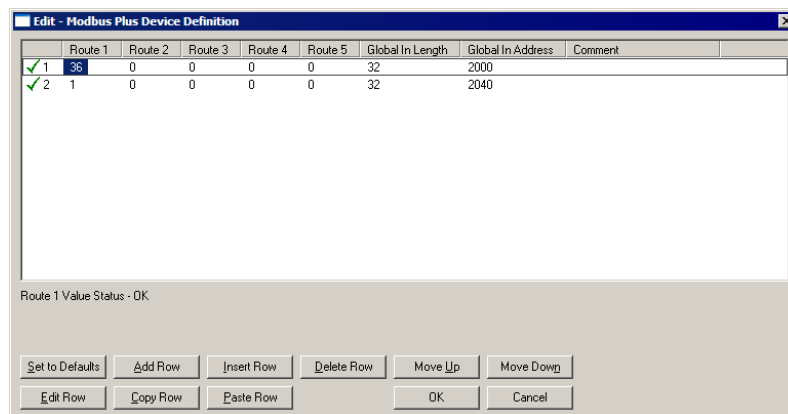
Parameter Description

The following section lists the parameters.

3.2.1 Route Values

1 to 64

The Routing Path is required by the Modbus Plus module and the Modbus Plus chipset to address specific nodes on the network. The routing path allows the module to support the addressing of nodes separated by Bridge Multiplexers, and to define Data Slave input paths for devices requiring path specifications (that is, other ModConnect Program devices). Up to 64 devices may be defined in this section.

Note the following when entering addresses:

Programmable Controllers: When addressing these devices, the last non-zero byte in the routing specifies the network node address.

Example: 6 0 0 0 0

Addresses a PLC at Node Address 6.

ModConnect Type Devices: When addressing these devices, including other MBP modules, the next-to-last non-zero value specifies the Slave Data Path to use (1 to 64). An incorrect value in the Slave Data Path will cause communications to fail.

Example: 6 1 0 0 0

Addresses Node Address 6 through Slave Data Path 1.

3.2.2 Global In Length

0 to 32

The Global Input Length defines how many words of Global Input Data the module will be expecting from each of the network nodes. If less data is returned, an error code is returned to the module status table and the data is rejected.

Conversely, if more data is returned, it is accepted and no error is flagged.

Valid values range from 0 to 32. Note that a value of 0 tells the MBP module not to request Global Data from a node.

3.2.3 Global In Address

0 to 3999

The Global Input Address tells the module where to place the Global Input Data received from the network nodes into the module's database. Valid locations are from 0 to 3999.

3.3   [Modbus Plus Commands]

The [Modbus Plus Commands] sections defines the commands to issue from the module to other devices on the Modbus Plus network. Commands are entered in the columns between the START and END labels. This section may contain up to 200 commands.

Example
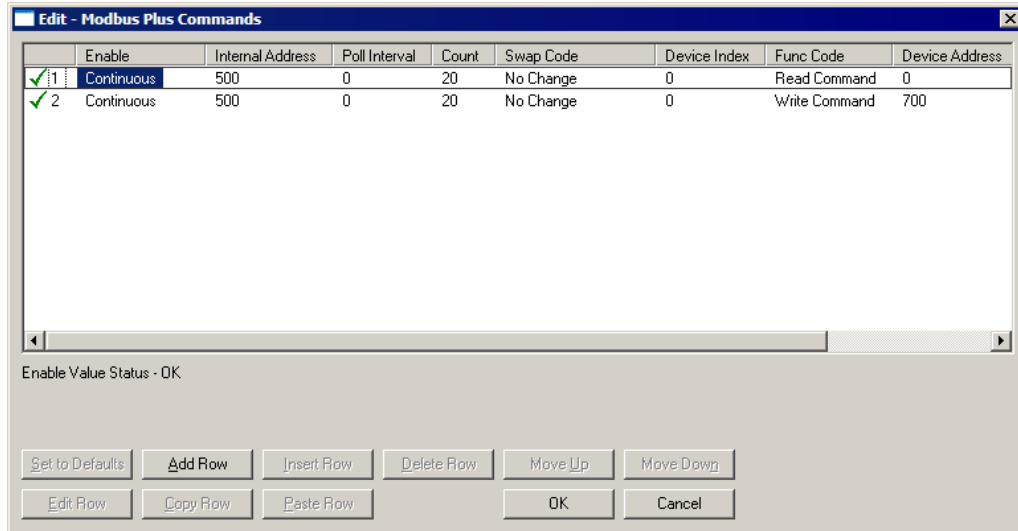
Parameter Description

The following section lists the parameters.

3.3.1   Enable

This field defines how to execute the command:

- Disable (0): disables the command. The command will not execute during the normal polling sequence.
- Continuous (1): executes the command during each scan of the command list if the Poll Interval Time is set to zero (0). If the Poll Interval Time is set, the command will be executed when the interval timer expires.
- Event Command (2): The command executes only if the internal data associated with the command changes. This value is only valid for WRITE commands.

3.3.2 Internal Address

0 to 3999

This field specifies the internal database register to be associated with the command.

- If the command is a read function, the data read from the slave device will be placed starting at the register value entered in this field.
- If the command is a write function, the data written to the slave device will be sourced from the address specified.

3.3.3 Poll Interval

0 to 65535

This parameter specifies the minimum interval to execute continuous commands (Enable code of 1). The parameter is entered in units of seconds. Therefore, if a value of 10 is entered for a command, the command will execute no more frequently than every 10 seconds.

3.3.4 Count

1 to 125

This parameter specifies the number of registers to associate with the command. Functions 5 and 6 ignore this field as they only apply to a single data point.

For functions 3 and 16, this parameter sets the number of registers to be associated with the command.

3.3.5 Swap Code

NONE

SWAP WORDS

SWAP WORDS & BYTES

SWAP BYTES

This parameter defines if and how the order of bytes in data received or sent is to be rearranged. This option exists to allow for the fact that different manufacturers store and transmit multi-byte data in different combinations. This parameter is helpful when dealing with floating-point or other multi-byte values, as there is no one standard method of storing these data types. The parameter can be set to rearrange the byte order of data received or sent into an order more useful or convenient for other applications. The following table defines the valid *Swap Code* values and the effect they have on the byte-order of the data.

Swap Code	Description
NONE	No change is made in the byte ordering (1234 = 1234)
SWAP WORDS	The words are swapped (1234=3412)
SWAP WORDS & BYTES	The words are swapped, then the bytes in each word are swapped (1234=4321)
SWAP BYTES	The bytes in each word are swapped (1234=2143)

These swap operations affect 4-byte (or 2-word) groups of data. Therefore, data swapping using these *Swap Codes* should be done only when using an even number of words, such as when 32-bit integer or floating-point data is involved.

3.3.6 Device Index

The Master Driver uses this value to reference the Device Definition File. The Master Driver obtains the Route Path data from the [Modbus Plus Device Definition] section. A value of 0 corresponds to the first device defined in the Device Definition Table.

3.3.7 Function Code

3, 16

This parameter specifies the Modbus function to be executed by the command. A value of 3 = Read Command (Type 2). A value of 16 = Write Command (Type 1).

3.3.8 Device Address

This parameter specifies the starting Modbus register or digital point address to be considered by the command in the Modbus slave device. Refer to the documentation of each Modbus slave device on the network for their register address assignments.

4 Communication Port Cables

This section contains information on the cable and pin assignments for the ProLinx module's serial ports and the application port. The diagrams in the following sections detail the pin assignments.

4.1 Modbus Plus Connections

The MBP module has one physical Modbus Plus connector with a DB-9 Female plug located on the front of the module. Modicon provides two different Modbus Plus connectors to ease installation.

These connectors are as follows:

Modicon Part Number	Description
AS-MBKT-085	Inline Connector
AS-MBKT-185	Terminating Connector

The actual cable installation and the wiring of the cable to the connectors is fully documented in the Modicon publication *Modicon Modbus Plus Network Planning and Installation Guide - Pub No. GM-Modbus Plus L-001*.

If the Modicon connectors are not available during installation, the following pin out applies to the DB-9 Modbus Plus port connections:
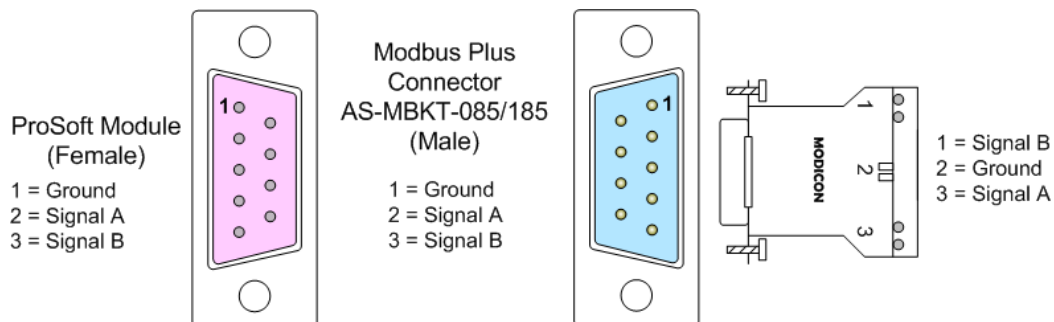
4.1.1 Port 0: RS-232 - Null Modem (without Hardware Handshaking)

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

RS-232 Application Port Cable
(No Handshaking)
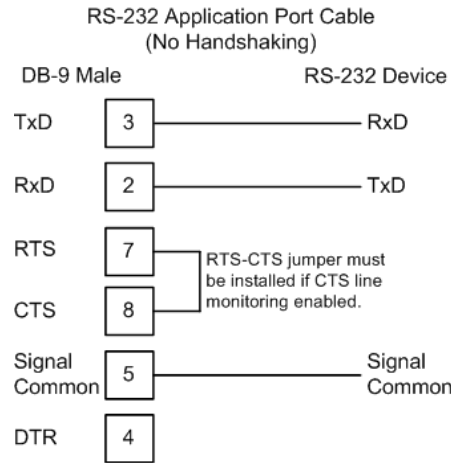
> **Note:** If the port is configured with the "Use CTS Line" set to 'Y', then a jumper is required between the RTS and the CTS line on the module connection. Refer to the *ProLinx Reference Guide* for more information.

5   LED Indicators

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

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

5.1   LEDs for the Modbus Plus Port

The following table lists LED status descriptions of the Modbus Plus module.

LED	Status	Indication
ACT (Green)	6 flashes per second.	The Modbus Plus is working normally in that it is successfully receiving and passing the token. All nodes on the link should be flashing in this pattern.
	1 flash per second	This node is off-line after just being powered up, or after exiting the four flashes per second mode. In this state, the node monitors the network and builds a table of active nodes and token-holding nodes. It remains in this state for 5 seconds, then attempts to go to its normal operating state.
	2 flashes, then OFF for 2 seconds	The node is hearing the token being passed among other nodes, but is never receiving the token. Check the network for an open circuit or defective termination.
	3 flashes, then off for 1.7 seconds	The node is not hearing any other nodes. It is periodically claiming the token but finding no other node to pass it to. Check the network for an open circuit or a defective termination.
	4 flashes, then OFF for 1.4 seconds	The node has heard a valid message from another node that is using the same address as this node. The node remains in this state as long as it continues to hear the duplicate address. If the duplicate address is not heard for 5 seconds, the node then changes to the pattern of one flash every second.
ERR (RED)	Off	Normal State: When the error LED is off and the port is actively transferring data, there are no communication errors.
	Blink	If the LED blinks momentarily, a message error has been detected on the cable path.
	On	If the LED is on steady, a hard fault has occurred either in the cable or in a node device connected to the cable. Also, the LED will be on steady if none of the commands in the Master Command list are successfully being completed.

6   Serial Port Modbus Error and Status Data

In This Chapter

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

6.1   Viewing Error and Status Data

The following topics list the register addresses that contain error and status data. Use the Database View Option from the ProLinx Main Menu to view the contents of each register.

Each driver maintains its error and status data in virtual database registers. In order for a protocol driver to use this data, it must be mapped into the module's internal database registers (0 to 3999). Data Map Facility describes this process.

The *ProLinx Reference Guide* provides complete information on viewing registers.

6.2 Global Input Update Status

The following table lists the status registers that contain global input status information for each MBP device. The global input update status register range is 4100 to 4169. Registers 4164 to 4169 are reserved as spares.

Status Register	Description
4100	Global In Update Stat - Device #1
4101	Global In Update Stat - Device #2
4102	Global In Update Stat - Device #3
4103	Global In Update Stat - Device #4
4104	Global In Update Stat - Device #5
-	----
4162	Global In Update Stat - Device #63
4163	Global In Update Stat - Device #64
4164	Spare
4165	Spare
4166	Spare
4167	Spare
4168	Spare
4169	Spare

6.2.1 Global In Status Code Definitions

Any of the following status codes may be present in any of the Global In Update Stat registers listed in the previous table. The following table describes these codes:

Status Code	Description
0x01	Updating - All Normal
0x02	
0x04	
0x08	Global Update Timeout
0x10	Global Data Not Configured
0x20	
0x40	Invalid Global Data Length
0x80	

6.3 Master Command Status

The following table lists the registers that contain Master Command Status error codes for each device. The register address range is 4170 to 4369.

Status Register	Description
4170	Master Command Status: #1
4171	Master Command Status: #2
4172	Master Command Status: #3
4173	Master Command Status: #4
4174	Master Command Status: #5
-	----
4368	Master Command Status: #199
4369	Master Command Status: #200

6.3.1 Master Command Status Error Code Definitions

The following error codes may be present in the Master Command Status error code registers listed in the previous table. The following table lists each of the codes and associated definition.

High Byte	Low Byte	Description
0x00		Normal: Driver will reset when processing commands.
0x01		Command has completed successfully.
0x02		Routing Errors
	0x01	No response received: Is addressed unit online?
	0x02	Program access denied.
	0x04	Exception response received.
	0x08	Invalid node type in routing path.
	0x10	Slave rejected the Modbus command: Invalid input path?
	0x20	Initiated transaction forgotten by slave.
	0x40	Unexpected master output path received.
	0x80	Unexpected response received.
0x04		Configuration Errors
	0x01	Invalid configuration for command.
	0x02	Invalid command type: 1=Write, 2=Read, All other errors.
	0x04	
	0x08	
	0x10	
	0x20	
	0x40	
	0x80	

6.4 Miscellaneous Module Status

The following table lists the registers that contain miscellaneous module status error codes. Miscellaneous module status codes are contained in register addresses 4370 to 4399.

Status Register	Description
4370	Module Status - Software Reset Response
4371	Peer Status
4372	Token Pass Counter
4373	Token Rotation Time
4374-H	Communication Failed Error Counter
4374-L	Communication Retry Counter
4375-H	No Response Received Error Counter
4375-L	Good Received Packet Success Counter
4376-H	Unexpected Path Error Counter
4376-L	Exception Response Received Error Counter
4377	Data Master Output Path 1 & 2 Counter
4378	Data Master Output Path 3 & 4 Counter
4379	Data Master Output Path 5 & 6 Counter
4380	Data Master Output Path 7 & 8 Counter
4381	Data Slave Output Path 1 & 2 Counter
4382	Data Slave Output Path 3 & 4 Counter
4383	Data Slave Output Path 5 & 6 Counter
4384	Data Slave Output Path 7 & 8 Counter
4385	Global Out Update Status
4386	Global Out Update Counter
4387	Data Transfer Read Counter
4388	Data Transfer Write Counter
4389	Data Parse Counter
4390	Spare
4391	Spare
4392	Data Transfer Error Counter
4393	Product ID
4394	Product ID
4395	Revision Level
4396	Batch Number
4397	MBP Update Processing Time
4398	Global In Update Time
4399	Global Out Update Time

6.4.1 Module Status Values

The following table lists the module status values that may be found in register 4370:

Normal Operation Codes	Description
0x00	Interface is operational.
Interface Crash Codes	
0x01	2-second Interface Timeout
0x02	Bad Interface Opcode
0x03	Interface Data Error
0x04	Interface Test Error
0x05	Interface X-Fer Done Error
0x06	Bad Interface Path
0x07	Bad Interface State
0x08	Bad Interface Length
0x09	Global Data Length Error
0x0A	Global Data Address Error
0x0B	Global Data Not Present
Fatal Crash Codes	
0x81	PROM Checksum Error
0x82	Internal RAM Data Test Error
0x83	External RAM Data Test Error
0x84	External RAM Address Test Error
0x85	Bad Confidence Test Index
0x86	External Int 0 Event Error
0x87	External Int 1 Event Error
0x88	DMA Int 0 Event Error
0x89	Comm. Int Event Error
0x8A	XMIT-No Good Event Error
0x8B	No Response Timeout MAC State
0x8C	No Response Timeout MAC Idle
0x8D	Receive OK MAC State
0x8E	Transmit OK MAC State
0x8F	No Receive Buffer Free
0x90	Bad Input Transfer Length
0x91	Reserved Rev Buffer Error
0x92	Bad Trans Control State
0x93	Bad Word Request Bit
0x94	Node Queue Overflow
0x95	Bad Data Queue Error
0x96	Empty Data Path Error
0x97	Bad Path Search Index
0x98	Bad Data Slave Path

6.4.2 Peer Status Codes

The following status codes can appear in register 4371.

Status Code	Description
0	Updating: All Normal
32	Normal Link Operation
64	Never Getting Token
96	Sole Station
128	Duplicate Station

6.4.3 Global Out Update Status

The following status codes can appear in register 4385.

Status Code	Description
0x01	Updating All OK
0x02	Not Assigned
0x04	Not Assigned
0x08	Global Update Timeout (not transmitted in 500 milliseconds)
0x10	Global Data Not Configured (length set to zero)
0x20	Not Assigned
0x40	Invalid Global Data Length (Length > 32 words)
0x80	Not Assigned.

7   Support, Service & Warranty

7.1   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. Detailed contact information for all our worldwide locations is available on the following page.*

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7.2   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

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