U S E R

1560

M A N U A L

ProSoft
TECHNOLOGY, INC

ProSoft Technology, Inc

1560-MBP Modbus Plus SCANport Gateway

Catalog Numbers:

1560-MBP-1	Modbus Plus SCANport Gateway - 115 VAC
1560-MBP-2	Modbus Plus SCANport Gateway - 24 VDC

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Please Read This Notice

Successful application of the 1560-MBP card requires a reasonable working knowledge of the Allen-Bradley hardware to be interfaced with, and the application in which the combination is to be used. For this reason, it is important that those responsible for implementing the 1560-MBP satisfy themselves that the 1560-MBP and Allen-Bradly hardware 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 assure that the information provided is accurate and a true reflection of the product's installation requirements. In order to assure a complete understanding of the operation of the 1560-MBP, the user should read all applicable documentation on the operation of the Allen-Bradley hardware.

Under no conditions will ProSoft Technology, Inc. be responsible or liable for indirect or consequential damages resulting form the use or application of the 1560-MBP product.

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WARNING

The 1560-MBP card will allow remote access to commands in the Allen-Bradley drives and other Scanport compatible devices. The User is responsible for assuring that any applicable regulations concerning the remote operation of equipment are adhered to.

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Quick Start Guide

In this section we have assembled a simple step-by-step procedure for installing and making the 1560-MBP unit operational. This discussion presumes that the application decisions such as Modbus Plus addressing and hierarchy, SCANport cable length, etc. have been addressed prior to this point.

Step-by-Step

The following steps will allow the 1560-MBP to be setup in the shortest period of time (the following steps refer to the Allen-Bradley drive implementation. Similar steps are followed when interfacing to other A-B Power Division products):

1. Set the dip switches
   The 1560-MBP dip switch positions are detailed in Section 3

2. Mount the 1560-MBP on the DIN rail
   See Appendix D for mounting instructions.

3. Connect power to the 1560-MBP
   Refer to Section 3

4. Setup the Drive hardware
   Refer to the appropriate drive manual to connect control and power to the drive. This aspect of the drive installation is out of the scope of this manual.

5. Setup the Drive parameters
   See Appendix B of the manual to setup the drive parameters

6. Install the SCANport cable between the drive and the 1560-MBP.

7. Connect the Modbus Plus communication cable between the host system and the 1560-MBP. The procedure follows standard Modbus Plus cabling practices.

Revisions

3/15/97	Rev 1.0 Initial Release
5/5/97	Rev 1.1 Modify product to allow slave addresses within any group of 16 slave addresses on one PLC Host when using Global Data. Also protect Control and Reference words from overwrite if Global Control Enabled.
1/98	Upgrade User Manual

1 Product Specifications

The ProSoft Technology, Inc. 1560-MBP card is a hardware product designed to be a communications front end for Allen-Bradley SCANport compatible products (1336 Plus/Force/ Vector, 1305, SMC Dialogue Plus, SMP3, etc.).

The product includes the following functionality:

1.1 Modbus Plus Specifications

- Protocol modes:
  Modbus Plus using licensed Schneider Automation technology
- Supported Modbus Plus Operations:
  MSTR Type 1 - Write Data
  MSTR Type 2 - Read Data
  MSTR Type 5 - Write Global Data
  MSTR Type 6 - Read Global Data
- Supports Global Database Control from Host PLC
  In this mode, the 1560-MBP will look for Control Word and Reference in the selected Host Global Database
- Pre-assigned Modbus memory map
  Read/Write
  Command Control/Frequency
  Datalinks Out : A to D
  Up to 2000 drive parameter values
  Read Only
  Status/Feedback
  Datalinks In : A to D

1.2 General Specifications

- Configuration via dip switches
  Slave Address : 1 to 64
  Host Address : 1 to 64
  Global Database Control Enable
  Fault on Loss of Modbus Plus Enable
  SCANport Messaging Options
  No Datalinks
  Datalinks A only
  Datalinks A and B only
  Datalinks A, B, C, D
- Available packages:
  Enclosed Power supplied externally (120 VAC)
  Enclosed Power supplied externally (24 VDC)

- Mounting :
  DIN Rail mounting
- Dimensions :
  44 mm (width) x 76 mm (height) x 123 mm (depth)
- Communication port connections:
  Modbus Plus - Female 9-pin D shell connector
  SCANport - Standard SCANport connector
- Status LED
  SCANport Status (bi-color Red/Green)
  Modbus Plus Status (green)
- Current Consumption: 65 ma at 24 VDC
- Input Voltage
  85 to 264 VAC, 1 Phase, 45 to 63 Hz
  24 VDC
- Operating Temp 0 to 50° C
- Storage Temp -40 to 85° C

2 Modbus Plus Port Functionality

2.1 Modbus Plus Communications

The 1560-MBP Modbus Plus card supports the Modbus Plus protocol using proprietary technology licensed from Schneider Automation. With the Modbus Plus capability, the module is able to communicate data from Allen-Bradley SCANport compatible devices to a Modbus Plus host PLC, and vice-versa.

The following discusses the functional capabilities of the 1560-MBP card.

2.1.1 Supported MSTR Programming Commands

The 1560-MBP uses several of the available MSTR ladder logic commands to transfer data when using a Modicon PLC. These are overviewed below:

Read Data: The following types of data read commands are supported:

MSTR Type 2 Read Data

This command reads data from any place within the Modbus Register map. This command allows a Modbus host to selectively read data from the 1560-MBP as required for the application.

MSTR Type 6 Read Global Data

This command gets data from the Global Data being sent from the 1560-MBP. The 1560-MBP returns 2 to 10 words of Global data. This is the fastest method of reading values from the MBP.

Write Data: The following data write commands are supported:

MSTR Type 1 Write Data

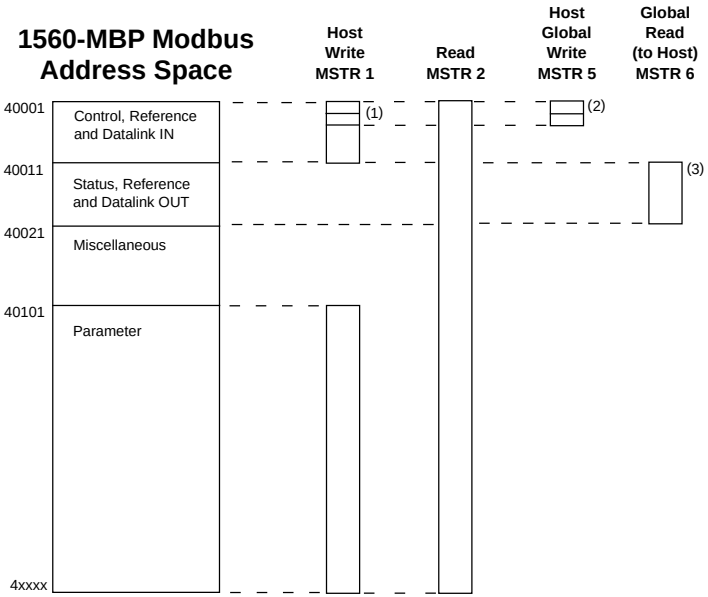
This command writes data to any place within the 1560-MBP Modbus Register map. This command can be used to selectively write configuration values to the SCANport device. In addition, if the Global Data Command Enable dip switch is disabled, this command can be used to write to the SCANport Control and Reference words (Modbus addresses 40001 to 40010).

MSTR Type 5 Write Global Data
This command is used in a host processor to 'publish' Global Data which all slaves on the Modbus Plus highway may access. The 1560-MBP units can be configured to read the Control and Reference values from this Global Data table.

2.1.2 Modbus Register Map

A pre-defined register map has been provided in the 1560-MBP unit. This map is detailed in Appendix A, and shown below. The full memory map is dependent on the A-B device which is connected to the 1560-MBP unit.

On power-up, the 1560-MBP unit polls the remote device and determines the maximum number of parameters that exist in the SCANport device. If the number is greater than 2000 the parameter list is limited to 2000.



(1) *Note that 40001 and 40002 are only accessible with MSTR Type 1 if 'Global Control' is disabled in the 1560-MBP.*

(2) *Represents Control and Reference Words which are controlled by host when 'Global Control' is enabled.*

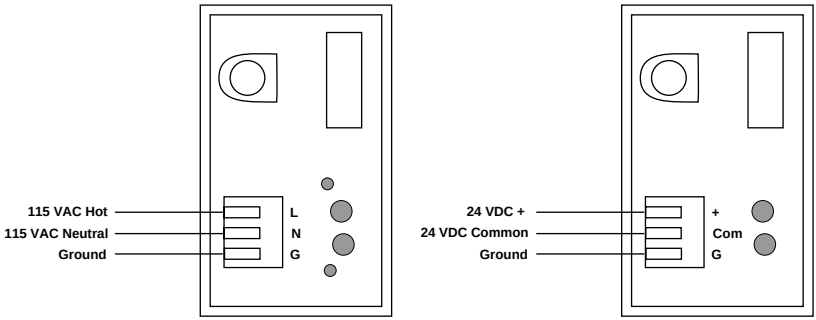
(3) *Words 40011 up to 40020 are 'Published' by 1560-MBP in the mode Global Data space. A host can access these values using a MSTR Type 6 instruction or Peer Cop (see Appendix C), or an MSTR Type 2 data read.*

3 Hardware Setup

3.1 1560-MBP Card Setup

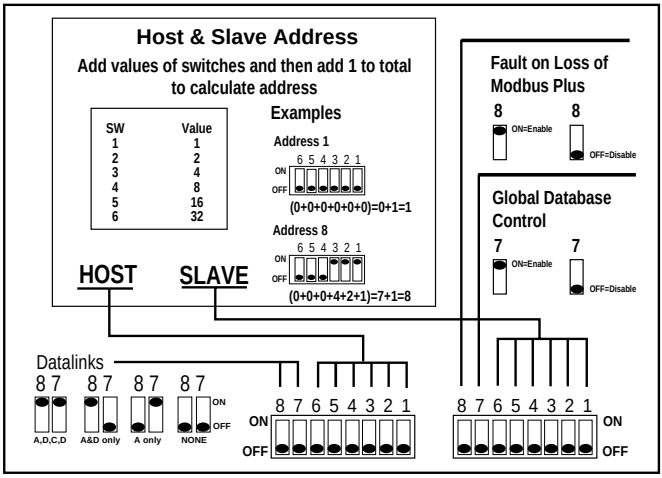
3.1.1 Connecting Power to the 1560-MBP Card

Connecting power requires a simple termination of the 120 VAC or 24 VDC cable to the front of the module. The connections are shown in the following diagram:



3.1.2 Dip Switch Configuration

Configuration of the 1560-MBP consists of setting up some dip switches. The dip switches are as follows:



Please note that dip switch configuration is read by the 1560-MBP during the power up process. Power must be cycled if dip switches are changed under power.

Switch SW 1

Function	Description	Details
Datalink		**SW1-7 and 8**
Options	Allows the User to select the level of Datalink support the 1560-MBP unit will have when talking to the SCANport device. Some devices do not support Datalinks, in which case the 'No Datalinks' option must be selected.	8 7 off off No Datalinks off on Datalink A only on off Datalink A&B only on on Datalink A,B,C,D
Host PLC Address (when Global Data Control Enabled)	If the Global Data Control is Enabled (SW2-7 is set to 1) then the 1560-MBP must be told which Host PLC Global Database to get the control values from. To select the appropriate Host, determine the Host's Modbus Plus address and select that address using the dip switches SW1- 1 to 6.	**SW1-1 to 6** 1 Address Bit 0 Value = 1 2 Address Bit 1 Value = 2 3 Address Bit 2 Value = 4 4 Address Bit 3 Value = 8 5 Address Bit 4 Value = 16 6 Address Bit 5 Value = 32 Example Addresses = 1 to 64 6 5 4 3 2 1 Address off off off off off off 1 off off off off off on 2 off off off off on off 3 off off off off on on 4 off off off on off off 5 off off off on off on 6 off off off on on off 7 off off off on on on 8 off off on off off off 9 off off on off off on 10 off off on off on off 11 off off on off on on 12 off off on on off off 13 off off on on off on 14 off off on on on off 15 off off on on on on 16 off on off off off off 17 off on off off off on 18 off on off off on off 19 off on off off on on 20 off on off on off off 21 off on off on off on 22 off on off on on off 23 off on off on on on 24 off on on off off off 25 off on on off off on 26 off on on off on off 27

		off	on	on	off	on	on	28
		off	on	on	on	off	off	29
		off	off	on	on	off	on	30
		off	on	on	on	on	off	31
		off	on	on	on	on	on	32
		on	off	off	off	off	off	33
		on	off	off	off	off	on	34
		on	off	off	off	on	off	35
		on	off	off	off	on	on	36
		on	off	off	on	off	off	37
		on	off	off	on	off	on	38
		on	off	off	on	on	off	39
		on	off	off	on	on	on	40
		on	off	on	off	off	off	41
		on	off	on	off	off	on	42
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		on	off	on	off	on	on	44
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		on	off	on	on	on	off	47
		on	off	on	on	on	on	48
		on	on	off	off	off	off	49
		on	on	off	off	off	on	50
		on	on	off	off	on	off	51
		on	on	off	off	on	on	52
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		on	on	off	on	on	off	55
		on	on	off	on	on	on	56
		on	on	on	off	off	off	57
		on	on	on	off	off	on	58
		on	on	on	off	on	off	59
		on	on	on	off	on	on	60
		on	on	on	on	off	off	61
		on	off	on	on	off	on	62
		on	on	on	on	on	off	63
		on	on	on	on	on	on	64

Switch SW 2

Function	Description	Details
Fault on Loss of Modbus Plus	When enabled, the 1560-MBP will fault the connected SCANport device if the Control Word is not updated within 10 seconds. Note that the fault is not enabled until after Modbus Plus communications have been initially established.	SW2-8 Off = Disable fault on loss of Modbus Plus On = Enable fault on loss of Modbus Plus

Switch SW 2 (cont'd.)

<table>
<tr><th>Function</th><th>Description</th><th>Details</th></tr>
<tr><td>Global Data Base Control</td><td>Enables the 1560-MBP to automatically gather the Control Word and Speed Reference values from the selected Host Global Database.

When enabled, the 1560 will use two words from the global database based on the selected Modbus Plus address (SW1-1 to 6).

When disabled, the Host must write into 1560 unit's Modbus register table at addresses 40001/2 to write the Control word and speed reference values</td><td><u>SW2-7</u>
Off = Disable Global Data Base Control
On = Enable Global Data Base Control

<u>Important</u>
A maximum of 16 1560-MBP units can be enabled in the Global Control Mode on one PLC network. These 16 units <u>must</u> be addressed within one of the following ranges:
1 to 16
17 to 32
33 to 48
49 to 64</td></tr>
<tr><td>Modbus Plus Address (1560-MBP unit address)</td><td>Selects the Modbus Plus Address for the 1560-MBP unit. Each node must have a unique address. Note that the addresses will be one higher than the binary value selected by the dip switches.

It is recommended that address 1 not be used to avoid possible confusion when using a local default address of 1 at a controller node programming panel.</td><td><u>SW2-1 to 6</u>
1 Address Bit 0 Value = 1
2 Address Bit 1 Value = 2
3 Address Bit 2 Value = 4
4 Address Bit 3 Value = 8
5 Address Bit 4 Value = 16
6 Address Bit 5 Value = 32

<table>
<tr><th>6</th><th>5</th><th>4</th><th>3</th><th>2</th><th>1</th><th>Address</th></tr>
<tr><td>off</td><td>off</td><td>off</td><td>off</td><td>off</td><td>off</td><td>1</td></tr>
<tr><td>off</td><td>off</td><td>off</td><td>off</td><td>off</td><td>on</td><td>2</td></tr>
<tr><td>off</td><td>off</td><td>off</td><td>off</td><td>on</td><td>off</td><td>3</td></tr>
<tr><td>off</td><td>off</td><td>off</td><td>off</td><td>on</td><td>on</td><td>4</td></tr>
<tr><td>off</td><td>off</td><td>off</td><td>on</td><td>off</td><td>off</td><td>5</td></tr>
<tr><td>off</td><td>off</td><td>off</td><td>on</td><td>off</td><td>on</td><td>6</td></tr>
<tr><td>off</td><td>off</td><td>off</td><td>on</td><td>on</td><td>off</td><td>7</td></tr>
<tr><td>off</td><td>off</td><td>off</td><td>on</td><td>on</td><td>on</td><td>8</td></tr>
<tr><td>off</td><td>off</td><td>on</td><td>off</td><td>off</td><td>off</td><td>9</td></tr>
<tr><td>off</td><td>off</td><td>on</td><td>off</td><td>off</td><td>on</td><td>10</td></tr>
<tr><td>off</td><td>off</td><td>on</td><td>off</td><td>on</td><td>off</td><td>11</td></tr>
<tr><td>off</td><td>off</td><td>on</td><td>off</td><td>on</td><td>on</td><td>12</td></tr>
<tr><td>off</td><td>off</td><td>on</td><td>on</td><td>off</td><td>off</td><td>13</td></tr>
<tr><td>off</td><td>off</td><td>on</td><td>on</td><td>off</td><td>on</td><td>14</td></tr>
<tr><td>off</td><td>off</td><td>on</td><td>on</td><td>on</td><td>off</td><td>15</td></tr>
<tr><td>off</td><td>off</td><td>on</td><td>on</td><td>on</td><td>on</td><td>16</td></tr>
<tr><td>off</td><td>on</td><td>off</td><td>off</td><td>off</td><td>off</td><td>17</td></tr>
<tr><td>off</td><td>on</td><td>off</td><td>off</td><td>off</td><td>on</td><td>18</td></tr>
</table>
</td></tr>
</table>

		off	on	off	off	on	off	19
		off	on	off	off	on	on	20
		off	on	off	on	off	off	21
		off	on	off	on	off	on	22
		off	on	off	on	on	off	23
		off	on	off	on	on	on	24
		off	on	on	off	off	off	25
		off	on	on	off	off	on	26
		off	on	on	off	on	on	27
		off	on	on	off	on	on	28
		off	on	on	on	off	off	29
		off	off	on	on	off	on	30
		off	on	on	on	on	off	31
		off	on	on	on	on	on	32
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		on	on	on	off	on	off	59
		on	on	on	off	on	on	60
		on	on	on	on	off	off	61
		on	off	on	on	off	on	62
		on	on	on	on	on	off	63
		on	on	on	on	on	on	64

4 Programming Considerations

Transferring data to/from the 1560-MBP is performed either using the standard MSTR instruction, or using the Peer Cop functionality available in some Schneider processors. (Note that Peer Cop functionality is somewhat limited. See Appendix C.) Specifically, the following functionality is supported:

MSTR Type 1 - Write data
MSTR Type 2 - Read data
MSTR Type 5 - Write Global Data
MSTR Type 6 - Get Global Data

The following sections will detail the programming requirements for each of these commands, as well as discuss speed trade-offs between the different commands. An application note detailing the configuration of a Peer Cop solution is also available in Appendix C.

4.1 Writing to the 1560-MBP

4.1.1 Global Data Enabled - MSTR Type 5

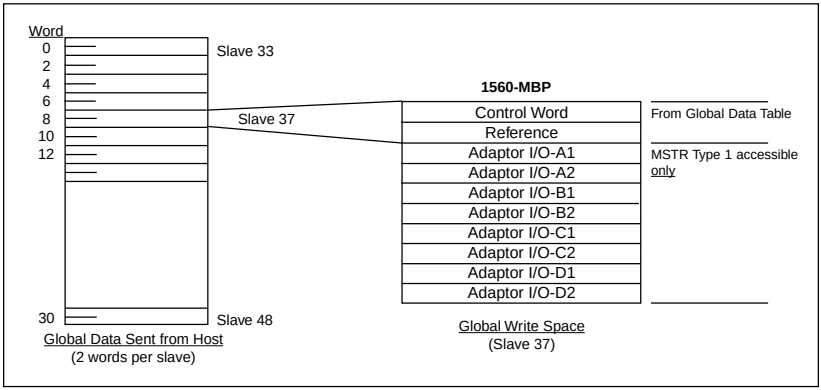
If Global Data Control Mode is enabled, the 1560-MBP will look to the Host's Global Data space for the Control and Reference values. All other values must be written by the host using the MSTR Type 1 instruction in the PLC.

The location of the Control and Reference values in the Global Data is determined by the 1560-MBP Modbus Plus address. The 1560-MBP uses the following algorithm to obtain the values:

If Modbus Plus Address < 17
Global Table Index = (Modbus Plus Address - 1) * 2
else if Modbus Plus Address < 33
Global Table Index = (Modbus Plus Address - 17) * 2
else if Modbus Plus Address < 49
Global Table Index = (Modbus Plus Address - 33) * 2
else if Modbus Plus Address < 65
Global Table Index = (Modbus Plus Address - 49) * 2

Note

The Global Data Table has a limit of 32 words, therefore there can only be 16 1560-MBP units with Global Control Enabled on one Host processor. Care must be exercised that all 16 Global Control Enabled 1560-MBP devices are in the same block of addresses.



Relationship between Global Data from Host and 1560-MBP Control & Reference Words: The diagram shows an example if Slave 37 was configured for Global Data Control and where the Control/Reference words would come from in the Global Data from a Host.

The following table details the relationship between the Modbus Plus addresses and the Global Data Table:

1560-MBP Modbus Plus Address	Global Data Table Index	Description
1,17,33,49	0 1	Control Word Reference Word
2,18,34,50	2 3	Control Word Reference Word
3,19,35,51	4 5	Control Word Reference Word
4,20,36,52	6 7	Control Word Reference Word
5,21,37,53	8 9	Control Word Reference Word
6,22,38,54	10 11	Control Word Reference Word
7,23,39,55	12 13	Control Word Reference Word
8,24,40,56	14 15	Control Word Reference Word
9,25,41,57	16 17	Control Word Reference Word
10,26,42,58	18 19	Control Word Reference Word
11,27,43,59	20 21	Control Word Reference Word
12,28,44,60	22 23	Control Word Reference Word

1560-MBP Modbus Plus Address	Global Data Table Index	Description
13,29,45,61	24 25	Control Word Reference Word
14,30,46,62	26 27	Control Word Reference Word
15,31,47,63	28 29	Control Word Reference Word
16,32,48,64	30 31	Control Word Reference Word

Modicon Programming Example - MSTR 5

enable -	40400	- active	**Contents of registers in control block** 40400 = 5 Global write data instruction 40401 = 0 Error code 40402 = 32 Global Data block length (Max 32 words) 40403 = 0 N/A 40404 = 0 N/A 40410 = Source of the Global Out Data
abort -	40410	- error	
	MSTR 00032	- success	

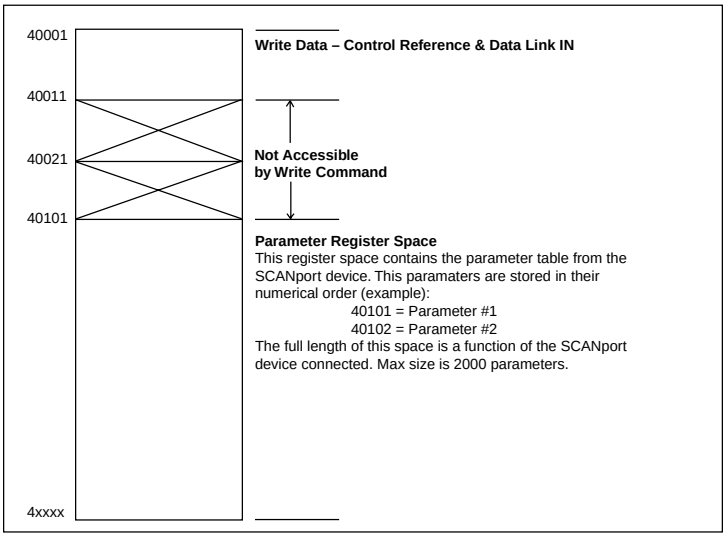
This instruction “publishes” Global Data on the Modbus Plus network from the Host PLC. Up to 32 words can be transmitted from the Host, allowing up to 16 1560-MBP units to be controlled. When the 1560-MBP reads the Global Data it first examines the source node address to assure it matches the dip switch configured Host Node Address, and then retrieves the two words that relate to its node from the packet.

Controller Address	Node	Description
40410 40411	33	Control Word Reference Word
40412 40413	34	Control Word Reference Word
• •	• •	• •
40420 40421	37	Control Word Reference Word
• •	• •	• •
40440 40441	48	Control Word Reference Word

In the example (at the bottom of the previous page) the 1560-MBP responding at Node 37 would retrieve its control and reference values from the 8th and 9th words of the Global Data block. In the Host PLC we have placed this data in registers 40418 and 40419, as this corresponds to the 8th and 9th position in the Global Data packet.

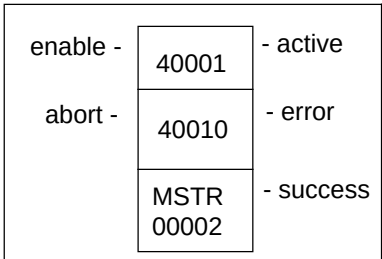
4.1.2 Host Issued Write Commands - MSTR Type 1

If the Global Data Control Mode is not enabled, the 1560-MBP will not look to the Global Data Table to obtain the Control and Reference values. In this mode, the Host PLC must execute a write command (MSTR Type 1) to the 1560-MBP to register addresses 40001 and 40002, per the following drawing, to control the drive.



MSTR Type 1 Accessible Data Registers: The memory map for the registers which a PLC programmer can access from the 1560-MBP using the MSTR Type 1 command. Note that a write to the Read Only space between 40011 and 40100 will place an Error Code in the MBP Status register.

Modicon Programming Example - MSTR Type 1



Contents of registers in control block

40001 = 1 Write instruction
40002 = 0 Error code
40003 = 1 Length of the write
40004 = 119 slave register to Write (40119)
40005 = 37 MBP Node address to write to
40006 = 1 Slave Input Path for routing

40010 = Source of the data to the device attached to the 1560-MBP

This instruction would write one value into parameter 19 of the device attached to 1560-MBP node address 37. In the 1560-MBP register map this would be register 40119.

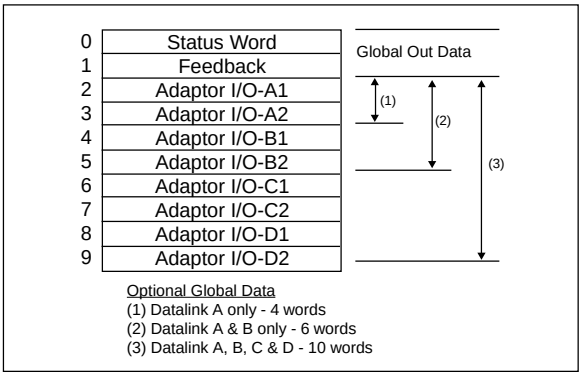
Note that the Slave Input Path value must be entered in order for the command to execute successfully. Valid values are from 1 to 8. Any other values will cause the command to fail.

4.2 Reading from the 1560-MBP

Reading data from the 1560-MBP is independent of the Global Data Control mode selection. There are two methods for obtaining data from the 1560-MBP units as outlined in the following section.

4.2.1 Global Data - MSTR Type 6

The 1560-MBP publishes Global Out Data which can be accepted by any other node on the Modbus Plus port. The structure of the Global Data sent out in is as follows:



Global Data from each 1560-MBP unit: Note the minimum length of 2 words can be increased up to 10 words by selectively enabling Datalinks using the dip switches

Please note that not all A-B Scanport devices support Datalinks. In particular, the SMC Dialogue Plus does not. To operate with the SMC Dialogue Plus do not enable Datalink Messaging.

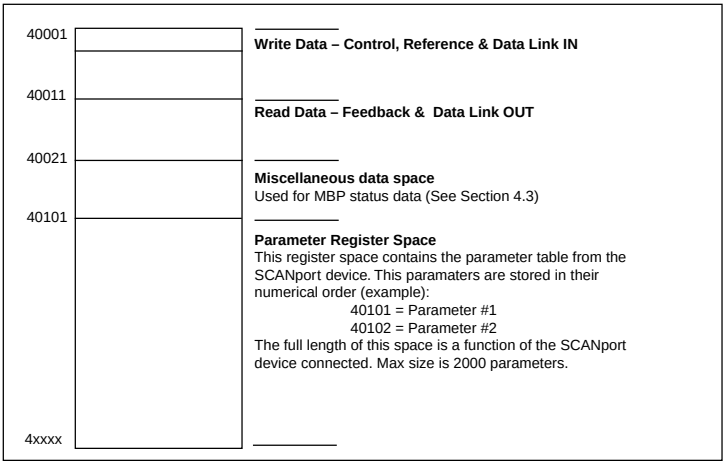
Modicon Programming Example - MSTR Type 6

enable -	40500	- active	**Contents of registers in control block**
abort -	40510	- error	40500 = 6 global read data instruction 40501 = 0 Error code 40502 = 10 length of the global data 40503 = 0 number of words available
	MSTR 00010	- success	40504 = 37 slave address to retrieve data from 40510 = Destination address for global data from slave 37

In the example we configured the Allen-Bradley device to use Datalink output words. The MSTR 6 instruction (Read Global Data), when programmed in a Host PLC, will retrieve the Global Data from the 1560-MBP and place it in the Host PLC register space beginning at address 40510.

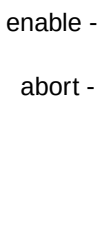
4.2.2 Host Issued Read Commands - MSTR Type 2

If the PLC Programmer does not want to use Global Data or if there is a desire to read more data out of the 1560-MBP, the MSTR Type 2 Read Command can be used. The MSTR Type 2 Read command has access to all available parameter values (40101 to 40xxx), in addition to the Control and Status registers (40001 to 40100).



MSTR Type 2 Accessible Data Registers: The memory map for the registers which a PLC programmer can access from the 1560-MBP using the MSTR Type 2 command.

Modicon Programming Example - MSTR Type 2



Contents of registers in the control block

40050 = 2 Read Instruction
40051 = 0 Error Code
40052 = 13 Length of the read
40053 = 21 slave register to read (40021)
40054 = 37 Node address to retrieve data from
40055 = 1 Slave Input Path for routing
40060-40092 = data returned from the 1560-MBP

The MSTR instruction shown above reads the status registers (40021- 40033) from the 1560-MBP at Node Address 6, and stores the values in the processor starting at register 40060. Note that the instruction reserves 20 words for the data block, but we have chosen to only fill 13 when configuring the command.

Note that the Slave Input Path value must be entered in order for the command to execute successfully. Valid values are from 1 to 8. Any other values will cause the command to fail

4.3 The MBP Status Registers (40021 to 40100)

The register space between 40021 and 40100 has been set aside for miscellaneous status data. This data is intended to be used for assisting in troubleshooting. The following table details the Status values which are available:

Modbus Address	Name	Values	Description
40021	SCANport Status	0 = Offline 1 = Online	Indicates if 1560-MBP is logged into the drive. If Drive is powered down or if SCANport cable becomes disconnected, the value will go to offline
40022	Control/Status Update Counter	0 to 0xFFFF	This is a rollover counter which increments each time the 1560-MBP received a Status word update from the SCANport device
40023	Datalink A Update Counter	0 to 0xFFFF	This is a rollover counter which increments each time the Datalink A update is received from the SCANport device
40024	Datalink B Update Counter	0 to 0xFFFF	This is a rollover counter which increments each time the Datalink B update is received from the SCANport device
40025	Datalink C Update Counter	0 to 0xFFFF	This is a rollover counter which increments each time the Datalink C update is received from the SCANport device
40026	Datalink D Update Counter	0 to 0xFFFF	This is a rollover counter which increments each time the Datalink D update is received from the SCANport device
40027	Parameter Read Update Counter	0 to 0xFFFF	This is a rollover counter which increments each time a Read Parameter command (used to update 40101 to 40xxx) is received from the SCANport device.

Modbus Address	Name	Values	Description
40028	Parameter Write Update Counter	0 to 0xFFFF	This is a rollover counter which increments each time a Write Parameter command (used to transfer MSTR Type 1 write data to the SCANport device) is executed.
40029	Not Defined at this time		Reserved for future use
40030	Not Defined at this time		Reserved for future use
40031	Product Revision - Firmware Release		Provides the firmware revision level. The data should be viewed in hex mode as follows: Revision 1.0 0x0010 = 1.0
40032	Product Batch Number		Provides an independent firmware batch number used for internal tracking purposes. This value should be viewed in hex as follows: Batch 0x0001 = 1

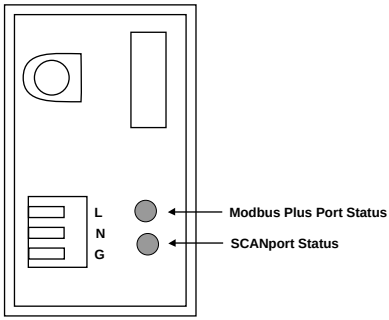
Modbus Address	Name	Values	Description
40033	MBP Status	0 to 3	This register is used to communicate the last Invalid MBP Status value. Possible values are as follows: 0 No error since power cycle 1 Invalid Global Cmd Request Most likely the slave address for the MBP is > 16 and is configured for Global Cmd 2 Invalid Global Length The host is not configured to send enough Global Data to support this node's Modbus Plus address 3 Invalid Write Range An MSTR Type 1 write cmd was received attemtpting to write into the 40011 to 40100 address range. The cmd was disregarded by the MBP with a successful response returned to the host. Note that this register is only cleared on power up, and will only be updated when a new error condition arises. Therefore be aware that a non-zero value will stay in the register after an initial error condition until the next power cycle.
40034 to 40100	Not Defined at this time		Reserved for future use

5 Troubleshooting

Several hardware diagnostics capabilities have been implemented using the LED indicator lights on the front of the 1560-MBP card.

5.1 LED Locations

The location of the LEDs on the units are shown in the following diagrams:



LED Locations

5.1.1 LED Troubleshooting Table

The following table details the meaning of the LEDs in the 1560-MBP unit.

NAME	Color	Status	Indication
Modbus Plus Port Status	Green	Six flashes per second	The 1560-MBP is working normally in that it is successfully receiving and passing the token. All nodes on the link should be flashing this pattern.
		One 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 five seconds, then attempts to go to its normal operating state.

NAME	Color	Status	Indication
		Two Flashes then OFF for two 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.
		Three 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 which to pass it. Check the network for an open circuit or defective termination.
		Four 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 five seconds, the node then changes to the pattern of one flash every second.
SCANport Status	Green	Steady	SCANport connection if OK
		Blinking	Check cable connections. Indicates that the 1560-MBP unit is not able to link up with the drive's SCANport. Make sure that the A-B device supports Datalinks if the 1560-MBP Datalinks are enabled.
	Red	Steady	The SCANport connection has faulted. Check configuration switch settings, SCANport cable connections, cycle power. Contact ProSoft factory support if problem persists.

5.2 MBPSTAT Diagnostics

This troubleshooting section applies to Users that have access to a utility from Modicon called MBPSTAT. This utility is shipped with the SA-85 Modbus Plus Communications Card, and allows easy access to Modbus Plus Network status and statistics.

The data that is available with the utility includes:

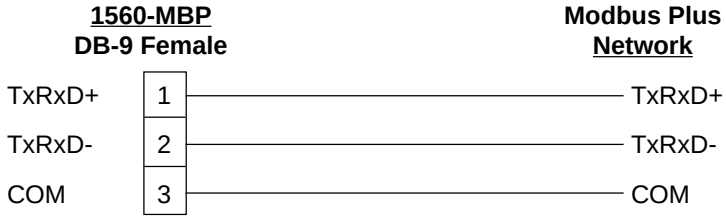
Active Node List: If there is doubt as to whether or not the MBP node is seen on the network, this list will show all active nodes

Global Data: The utility will read the Global Out Data being transmitted from each node, allowing a user to see the actual values coming out of any node

Node Statistics: This screen will show you the communication status and error counters within each node. This data is useful if unusual communication problems are occurring

6 Cable Diagram

The communication connection to the 1560-MBP card is made via a DB-9 pin female connection on the front of the card. The physical terminations are shown in the following diagram:



Refer to the *Modicon Modbus Plus Network Planning & Installation Guide* (publication No. GM-MBL-001) for additional information.

7 Technical Support

7.1 Technical Support Contacts

ProSoft Technology survives on its ability to provide meaningful support to its customers. Should any questions or problems arise, please feel free to contact us at:

ProSoft Technology, Inc.
9801 Camino Media
Suite 105
Bakersfield, CA 93311
(661) 664-7208
(661) 664-7233 Fax
e-mail : prosoft@prosoft-technology.com
http://www.prosoft-technology.com

Before calling for support, please prepare yourself for the call. In order to provide the best and quickest support possible, we will most likely ask for the following information (you may wish to fax it to us prior to calling):

1. Product Serial and Version Number
2. 1560-MBP Configuration Information
   - Dip Switches
   - Communication cabling

Appendix A

1560-MBP Modbus Register Map

Type	1560-MBP Modbus Addr	Description	
R/W	40001	Command Control Word	Global Data Write if Enabled
R/W	40002	Reference Control Word	Global Data Write if Enabled
R/W	40003	Adaptor I/O - In A1	Datalink A
R/W	40004	Adaptor I/O - In A2	Datalink A
R/W	40005	Adaptor I/O - In B1	Datalink B
R/W	40006	Adaptor I/O - In B2	Datalink B
R/W	40007	Adaptor I/O - In C1	Datalink C
R/W	40008	Adaptor I/O - In C2	Datalink C
R/W	40009	Adaptor I/O - In D1	Datalink D
R/W	40010	Adaptor I/O - In D2	Datalink D
R	40011	Status Word	
R	40012	Feedback Word	
R	40013	Adaptor I/O - Out A1	Datalink A
R	40014	Adaptor I/O - Out A2	Datalink A
R	40015	Adaptor I/O - Out B1	Datalink B
R	40016	Adaptor I/O - Out B2	Datalink B
R	40017	Adaptor I/O - Out C1	Datalink C
R	40018	Adaptor I/O - Out C2	Datalink C
R	40019	Adaptor I/O - Out D1	Datalink D
R	40020	Adaptor I/O - Out D2	Datalink D
	40021	MBP Status Registers	
	–	See Section 4.3 for details	
	40100		

Device Parameter List

R/W	40101	1
R/W	40102	2
R/W	40103	3
R/W	40104	4
R/W	40105	5
R/W		–
R/W	Modbus Address = Parameter Number + 40100	
R/W		–
R/W		Up to
R/W	40xxx	Max Parameter in Device
		(Up to 2000 max)

Sequential listing of parameter table in the drive. See A-B Device documentation for complete listing

All register values in the 1560-MBP are presented in unscaled units. Please refer to the drive User manual for any necessary scaling information

Appendix B

Device Specific Hints

SMC Dialogue Plus

The SMC Dialogue Plus does not support Datalinks, therefore the configuration of SW1-7 and 8 should not include any of the Datalinks Enabled. If a Datalink is enabled, the SCANport Status LED will toggle, indicating an error in the SCANport communications.

The version of SMC which was tested (Rev 1.05) had 88 parameters. Each parameter was accessible in the Modbus register listing shown in Appendix A. Note that if one of the 88 parameters is to be changed from a host that the host must enable the EEPROM Storage function by writing a 2 into the Parameter Management parameter (Parameter 17 - Modbus address 40117).

SMP 3

The SMP3 does not support Datalinks, therefore the configuration of Datalinks should not include any of the Datalinks Enabled. If a Datalink is enabled, the SCANport Status LED will toggle, indicating an error in the SCANport communications.

The 1560-MBP is able to read all of the parameters out of the SMP3 unit.

Variable Speed Drives

In order to enable Frequency control from the 1560-MBP, the drive parameter FREQUENCY SELECT 2 must be configured for the appropriate Adapter ID representing the 1560-MBP module. This will normally be Adaptor #2, unless a SCANport expander is being used (in which case this Adaptor number will be based on the port the 1560-MBP is plugged into).

Setting up the Adaptor I/O - Datalinks Out

Selects the parameter values which will be made available from the 1560-MBP via Global Data Out. Placement of the values in the 1560-MBP is referenced in Appendix A.

Data Out Image	Suggested Parameter	Description
A1	54	Output Current
A2	1	Output Volts
B1	23	Output Power
B2	53	DC Bus Voltage

C1 C2		
D1 D2	19 4	Maximum Frequency Last fault

Setting up the Adaptor I/O - Data In

Selects the parameters which will be made accessible for configuration/ writing from the 1560-MBP. As with the Data Out parameters, there are eight possible selections. These may be chosen by the programmer to meet the needs of the application.

Logic Control Word

Since the most common implementation of the 1560-MBP is with the variable speed drives, we have included the following table for the more commonly used control bits. This word should be verified in the A-B User Manual for the particular device being controlled.

Bit	Function	Description
0	Stop	1 = Stop, 0 = Not Stop
1	Start	1 = Start, 0 = Not Start
2	Jog	1 = Jog, 0 = Not Jog
3	Clear Faults	1 = Clear, 0 = Not Clear
4, 5	Direction	00 = No Command 01 = Forward 10 = Reverse 11 = Hold Direction

Drive Status Word

Since the most common implementation of the 1560-MBP is with the variable speed drives, we have included the following table for the more commonly used Status bits. This word should be verified in the A-B User Manual for the particular device being monitored.

Bit	Function	Description
0	Enabled	1 = Enabled
1	Running	1 = Running
2	Cmd Direction	1 = Forward, 0 = Reverse
3	Actual Direction	1 = Forward, 0 = Reverse
4	Accel	1 = Accelerating
5	Decel	1 = Decellerating
6	Alarm	1 = Alarm Active
7	Fault	1 = Fault Active
8	At Speed	1 = At Speed

Appendix C

Single Drive Peer Cop Application Example

Overview

This example shows how to configure a PLC to control and monitor a single drive using Peer Cop. Note that this example may easily be extended to 16 drives on one network. Additional sets of 16 drives may be controlled by adding Modbus Plus Network Option Modules to the PLC.

In this example, a 984-785E is connected to a 1560-MBP controlling a 1336Plus drive. It is strongly suggested that the user initially follow this application closely and then modify the application to suit his requirements. This should minimize the effort required to get your implementation up and running.

Hardware Configuration

In this application, we have made the following assumptions:

984 Processor Node Address	7
1560-MBP Configuration	
Node Address	6
Data Links Enabled	A, B, C, D
Global Control	Enabled
Comm Loss Fault	Disabled

The 1560-MBP Dip Switch 1 Configuration is as follows:

Switch	Position	Description
1	Off	Set the Global Data Host PLC to Node 7
2	On	This tells the 1560-MBP which PLC is
3	On	controlling the drive
4	Off	
5	Off	
6	Off	
7	On	Enable Datalinks A, B,C,D
8	On	

The 1560 MBP-1560 Dip Switch 2 Configuration is as follows:

Switch	Position	Description
1	On	Set the 1560-MBP Node Address 6
2	Off	
3	On	
4	Off	
5	Off	
6	Off	
7	On	Enable Global Data Control from a host. Allows the Control and Reference words to be obtained from the Host PLC Global Data Block
8	On	Enables Drive fault on loss of Mobus Plus communication

The Host PLC (984) must also have its dip switches set to Node Address 7 and a proper Modbus Plus cable connected between the PLC and the 1560-MBP.

Configuration Extension Blocks

This section is a PLC printout (using Modsoft) that shows how the PLC's Peer Cop is configured.

```
PEER COP
   Timeout  : 500 ms   Total Links:1  Link Id:1 - Internal
    On Error :  CLEAR          USED    20 OF   512 WORDS
                 Access to Node :   6
   ____________________________________________________
        MODE          REFERENCE        LEN    TYPE    INDEX

     SPECIFIC INPUT          -
     SPECIFIC OUTPUT         -

     GLOBAL INPUT    100001-100016    1                1
     GLOBAL INPUT    400200-400208    9      BIN       2
     GLOBAL INPUT            -
     GLOBAL INPUT            -
     GLOBAL INPUT            -
     GLOBAL INPUT            -
     GLOBAL INPUT            -
     GLOBAL INPUT            -
   ____________________________________________________
TO ALL NODES ON LINK
GLOBAL OUTPUT   400100-400131   32  BIN
```

This configuration indicates that PLC words 40100 through 40131 will be sent in Node 7 (this PLC) Global Data. Since the 1560-MBP is configured to look at Node 7 as the Host, words 40110 will be the Drive Control word, and 40111 will be the Reference to the drive (The remaining registers are for 1560-MBP units located at nodes 1-5 (words 40100-40109), and 7-16 (words 40112-40131). Note that the user could have configured a length of only 12, and only words 40100-40111 would have been sent.

The above configuration also has the first Global Input word from Node 6, offset 0, assigned to PLC reference 100001, with the remaining values (Feedback and Datalinks) stored beginning at 400200.

The Drive Status word will be returned in inputs 100001-100016, as noted below:

PLC REF	DRIVE STATUS
100001	Bit 15
100002	Bit 14
100003	Bit 13
100004	Bit 12
100005	Bit 11
100006	Bit 10
100007	Bit 9
100008	Bit 8
100009	Bit 7
100010	Bit 6
100011	Bit 5
100012	Bit 4
100013	Bit 3
100014	Bit 2
100015	Bit 1
100016	Bit 0

The Global Input Data from Node 6, starting with offset 1 for a length of 9 words, will be assigned to PLC registers 40200 through 40209. These are mapped as follows:

PLC	RefOffset	Description
40200	Offset 1	Drive Feedback
40201	Offset 2	Datalink Input Word A1 (Configurable in Drive)
40202	Offset 3	Datalink Input Word A2 (Configurable in Drive)
40203	Offset 4	Datalink Input Word B1 (Configurable in Drive)
40204	Offset 5	Datalink Input Word B2 (Configurable in Drive)
40205	Offset 6	Datalink Input Word C1 (Configurable in Drive)
40206	Offset 7	Datalink Input Word C2 (Configurable in Drive)
40207	Offset 8	Datalink Input Word D1 (Configurable in Drive)
40208	Offset 9	Datalink Input Word D2 (Configurable in Drive)

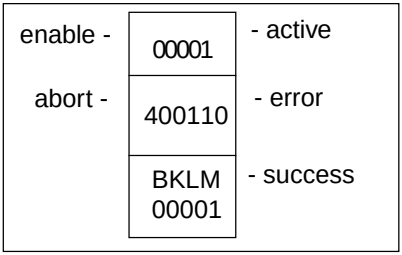
Ladder Logic Programming

Finally, a small amount of programming is added to simplify drive control. A group of 16 coils, 00001-00016, are block moved into the word that is mapped to the Drive Control word, 40100.

In our example, coils 00001-00016 are assigned the specific name and function as shown below:

PLC Ref	PLC Name	Description
000001	MOP DECREMENT	1 = Decrement, 0=Not
000002	REF SEL1	Binary Reference Source Selection 2^0
000003	REF SEL2	Binary Reference Source Selection 2^1
000004	REF SEL3	Binary Reference Source Selection 2^2
000005	DEC SEL1	Decellaration Rate Selection
000006	DEC SEL2	Decellaration Rate Selection
000007	ACC SEL1	Accelaration Rate Selection
000008	ACC SEL2	Accelaration Rate Selection
000009	MOP INCREMENT	1 = Increment, 0=NOT
000010	LOCAL LOCKOUT	1 = Local Lockout, 0 = Not Local
000011	DIR SEL1	Direction Selection
000012	DIR SEL2	Direction Selection
000013	DRV RESET	1 = Clear Faults, 0 = Not Clear Faults
000014	DRV JOG	1 = Jog, 0 = Not Jog
000015	DRV START	1 = Start, 0 = Not Start
000016	DRV STOP	1 = Stop, 0 = Not Stop

This allows a coil to control a specific function in the drive. You could use bit manipulation instructions operating on word 40100 (such as MBIT), but it is far simpler to just assign coils to specific functions, and then move these coils into the Control Word. These coils are then moved into word 40100 using the simple instruction shown below:



Now the user may control specific functions by turning on and off these coils. For example, to start the drive, the user would turn on coil 15, which is block moved to word 40100, setting Modicon bit 15 on. Register 40100 is then transmitted over Modbus Plus via the Peer Cop to the 1560-MBP, which then turns on bit 1 in the drive control word, starting the drive. Inputs 100001-100016 may then be examined to observe feedback, such as run acknowledgment.

Note that by using this approach, the complexity is minimized by setting up a control structure (peercop) up front once, which may now be easily copied and duplicated. Also, additional drives may be very easily controlled by simply adding a few entries to the peercop tables and a block move to transfer bit states to the drive.

Special Precautions and hints

Timing

Because all parameters to and from the drive must pass through the SCANport, be careful about adding additional devices, such as the HIM module, when critical drive communication timing is required. While it does not affect the transfer of parameters, it does affect the throughput, which may cause unexpected problems in speed critical applications. Other devices placed on the network will affect the speed of the Modbus Plus network. Programming panels and operator interfaces can add significant network load. Nodes going online or off-line momentarily disrupt the token passing pattern. For critical drive control, a separate dedicated Modbus Plus network is recommended.

Addressing

Pay careful attention to the dip switch address configuration. **EACH** 1560-MBP on the network must have it own unique address. This **MUST** also be different from the PLC address. **ALL** drives should in general have their Host address set to the PLC ís address.

Hints

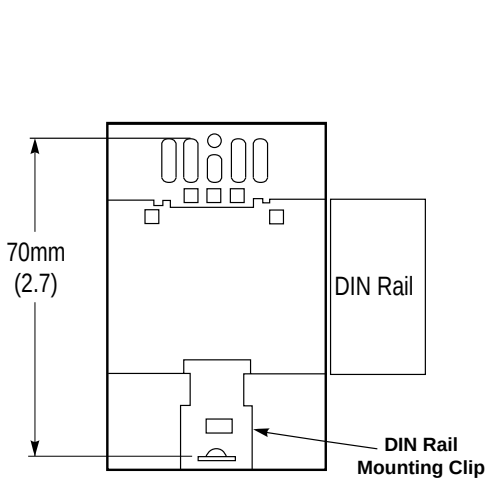
Note that the Stop bit is set to 1 to stop drive. If communication is lost, the PLC is unable to remotely stop the drive. In general, when controlling drive functions, SW2-8 should be set ON so that the drive will fault on loss of Modbus Plus communications. In addition, when drives are controlling hazardous operations, a hard wired interlock to the drive should be provided.Other devices may be used on the same Modbus Plus network, but the user must pay close attention to any use of Global Data to insure compatibility.

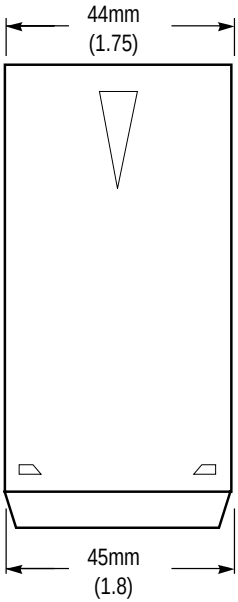
Appendix D

Mounting and SCANport Cabling Instructions

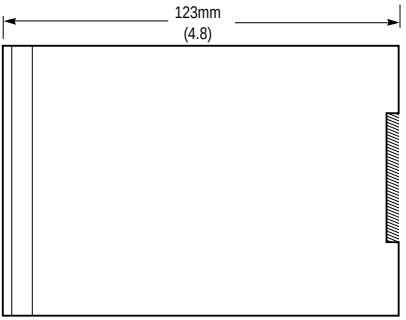
Mounting Instructions

Following are the mounting dimensions and layout drawings for the enclosed style communication module, such as the 1560-MBP. The following drawings are excerpted from A-B document 1203-5.5.

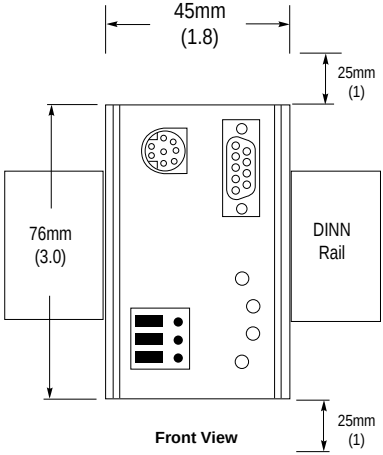




Top View



Side View



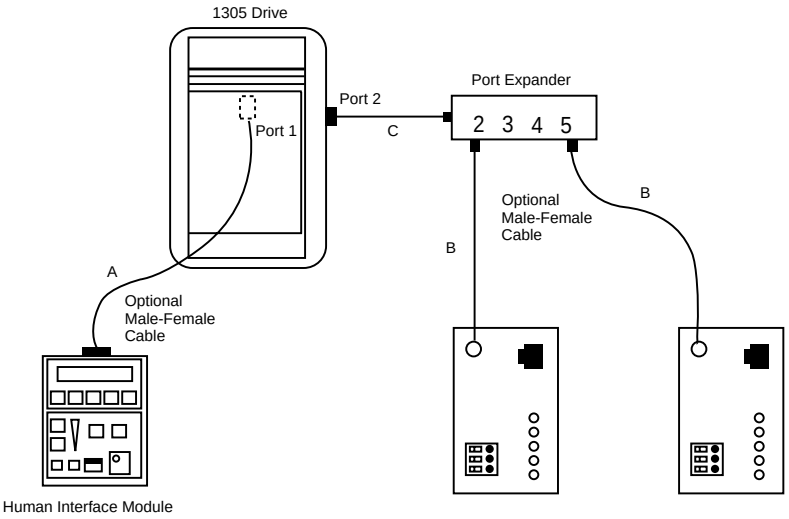
Front View

Cable Requirements

SCANport cables are available in either Male to Male or Male to Female configurations. Cables of up to 10 meters (33 feet) can be connected from the SCANport device to the 1560-MBP. If a Port Expander is used, the cable length from the master to the Port Expander must be subtraced from the cable length used to connect the device to the expander (B1 + C = max 10 meters).

> Generally when selecting a SCANport cable, the Male-Male configuration will be used. This is true in all cases when connecting to Ports 2 through 5. If connecting to the HIM port (Port 1) the Male-Female cable will be required.

Please verify with the Installation Manual for the A–B device the correct cable configuration. The following drawing, excerpted from A-B document 1203-5.2, is an example for a 1305 drive installation.



Appendix E

SCANport Datalink Operation

(Excerpted from A-B Publication 1203-5.2 - May 1995)

> In the following discussion, the term ‘Datalink’ is used extensively. When configuring some SCANport devices, the term ‘Adaptor I/O’ is used in place of Datalink.

A Datalink is a type of pointer used by some SCANport devices to transfer information between a SCANport communication interface (such as the 1560-MBP) and a SCANport device (such as a VFD, SMP3, etc.). Datalinks allow parameter values to be written when the Control Command and Reference are sent to the SCANport device. Datalinks also allow parameter values to be read whenever the Status and Feedback values are read from the SCANport device.

SCANport devices that support Datalinks have a group of parameters for Datalink configuration. These parameters are identified as ‘Datalink In’ and Datalink Out’ parameters. The Datalink functions are enabled by setting the appropriate dip switches on SW1 and by configuring the ‘Datalink In’ and Datalink Out’ adapter I/O parameters in the SCANport device.

Each Datalink consists of two 16-bit words of input and two 16-bit words of output. Each of the two input words can be configured to write to a different destination parameter inside the SCAnport device by setting the two ‘Datalink In’ parameters for that Datalink to the desired destination parameters. Similarly, each of the two output words is configured by setting the two ‘Datalink Out’ parameters for that Datalink.

If a Datalink is enabled the value of the parameters pointed to by the ‘Datalink Out’ parameters will be transferred to the 1560-MBP. Conversely, data values sent into the Datalink registers will be written to the parameter locations configured in the ‘Datalink In’ parameters. If a Datalink is not enabled, any data sent to the corresponding 1560-MBP data space will be ignored.

If no ‘Datalink In’ parameter is configured the SCANport device will ignore it. The same is true for a ‘Datalink Out’ parameter. A zero usually represents an un-configured Datalink.

Repair and Warranty

Service and Repair

The 1560-MBP card is an electronic product, designed and manufactured to function under somewhat adverse conditions. As with any product, through age, misapplication, or any one of many possible problems, the card may require repair.

The 1560-MBP product has a one year parts and labor warranty according to the limits specified in the warranty. Replacement and/or returns should be directed to the distributor from whom the product was purchased. If you need to return the card for repair, it is first necessary to obtain an RMA number from ProSoft Technology. Please call the factory for this number and display the number prominently on the outside of the shipping carton used to return the card.

General Warranty Policy

ProSoft Technology, Inc. (Hereinafter referred to as ProSoft) warrants that the Product shall conform to and perform in accordance with published technical specifications and the accompanying written materials, and shall be free of defects in materials and workmanship, for the period of time herein indicated, such warranty period commencing upon receipt of the Product.

This warranty is limited to the repair and/or replacement, at ProSoft's election, of defective or non-conforming Product, and ProSoft shall not be responsible for the failure of the Product to perform specified functions, or any other non-conformance caused by or attributable to: (a) any misapplication of misuse of the Product; (b) failure of Customer to adhere to any of ProSoft's specifications or instructions; (c) neglect of, abuse of, or accident to, the Product; or (d) any associated or complementary equipment or software not furnished by ProSoft.

Limited warranty service may be obtained by delivering the Product to ProSoft and providing proof of purchase or receipt date. Customer agrees to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to ProSoft, and to use the original shipping container or equivalent. Contact ProSoft Customer Service for further information.

Limitation of Liability

EXCEPT AS EXPRESSLY PROVIDED HEREIN, PROSOFT MAKES NO WARRANT OF ANY KIND, EXPRESSED OR IMPLIED, WITH RESPECT TO ANY EQUIPMENT, PARTS OR SERVICES PROVIDED PURSUANT TO THIS AGREEMENT, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANT ABILITY AND FITNESS FOR A PARTICULAR PURPOSE. NEITHER PROSOFT OR ITS DEALER SHALL BE LIABLE FOR ANY OTHER DAMAGES, INCLUDING BUT NOT LIMITED TO DIRECT, INDIRECT, INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES, WHETHER IN AN ACTION IN CONTRACT OR TORT (INCLUDING NEGLIGENCE AND STRICT LIABILITY), SUCH AS, BUT NOT LIMITED TO, LOSS OF ANTICIPATED PROFITS OR BENEFITS RESULTING FROM, OR ARISING OUT OF, OR IN CONNECTION WITH THE USE OR FURNISHING OF EQUIPMENT, PARTS OR SERVICES HEREUNDER OR THE PERFORMANCE, USE OR INABILITY TO USE THE SAME, EVEN IF PROSOFT OR ITS DEALER'S TOTAL LIABILITY EXCEED THE PRICE PAID FOR THE PRODUCT.

Where directed by State Law, some of the above exclusions or limitations may not be applicable in some states. This warranty provides specific legal rights; other rights that vary from state to state may also exist. This warranty shall not be applicable to the extent that any provisions of this warranty is prohibited by any Federal, State or Municipal Law that cannot be preempted.

Hardware Product Warranty Details

Warranty Period: ProSoft warranties hardware product for a period of one (1) year.

Warranty Procedure: Upon return of the hardware Product ProSoft will, at its option, repair or replace Product at no additional charge, freight prepaid, except as set forth below. Repair parts and replacement Product will be furnished on an exchange basis and will be either reconditioned or new. All replaced Product and parts become the property of ProSoft. If ProSoft determines that the Product is not under warranty, it will, at the Customer's option, repair the Product using current ProSoft standard rates for parts and labor, and return the Product freight collect.

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 and Section 18-152 for installation within Canada.

A. This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D or nonhazardous locations only.

B. Warning – Explosion hazard – Substitution of components may impair suitability for Class I, Division 2.

C. Warning – Explosion hazard – When in hazardous locations, turn off power before replacing or wiring modules.

D. Warning – Explosion hazard – Do not disconnect equipment unless power has been switched off or the area is known to be nonhazardous.

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