
**PanelMate®
Modicon
Communication Driver Manual**

Preface

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Printed in the United States of America.

P/N 01-00454-03

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Introduction

1

This chapter describes Modicon drivers, specifically:

- *About driver installation*
- *How to download drivers to a PanelMate*

Installing Drivers

Note: PanelMate PC does not support connectivity to Modbus RTU. Check the Cutler-Hammer web site for current information on PanelMate PC connectivity to Modicon Modbus Plus. If you need to use a connectivity option not contained in this section, contact the Cutler-Hammer Support Services for recommendations.

PanelMate Configuration Editor software is installed using a CD-ROM. To install the drivers from the CD-ROM, select the **Install Software** option and then **Install Drivers**. From the dialog box, select the driver you wish to install.

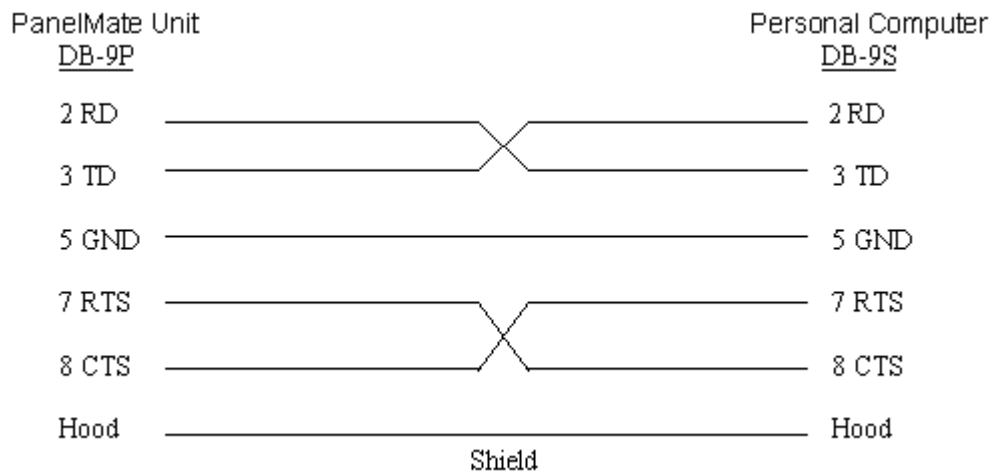
Downloading Drivers to a PanelMate Unit

- In the VCP Transfer Utility, choose the “Executive” tab and select the proper Executive Firmware to download to the PanelMate unit.
- Click the button labeled “Add to Operation List.”

Note: In order to download to a PanelMate for the first time or to clear the existence of another driver, the PanelMate must first be loaded with Executive Firmware.
- Choose the “Driver” tab.
- Select the appropriate driver to be downloaded to the PanelMate.
- Click the button labeled “Add to Operation List.”
- Place the PanelMate unit in Serial Transfer Mode.
- Connect a serial transfer cable from the correct port on the PC to port 1 on the PanelMate. (See cabling below.)
- Click “Start” at the bottom of the VCP Transfer Utility window.
- **Note:** For a more detailed description of downloading procedures and troubleshooting see *PanelMate Power Series, PowerPro, Pro LT Transfer Utility User’s Guide*.

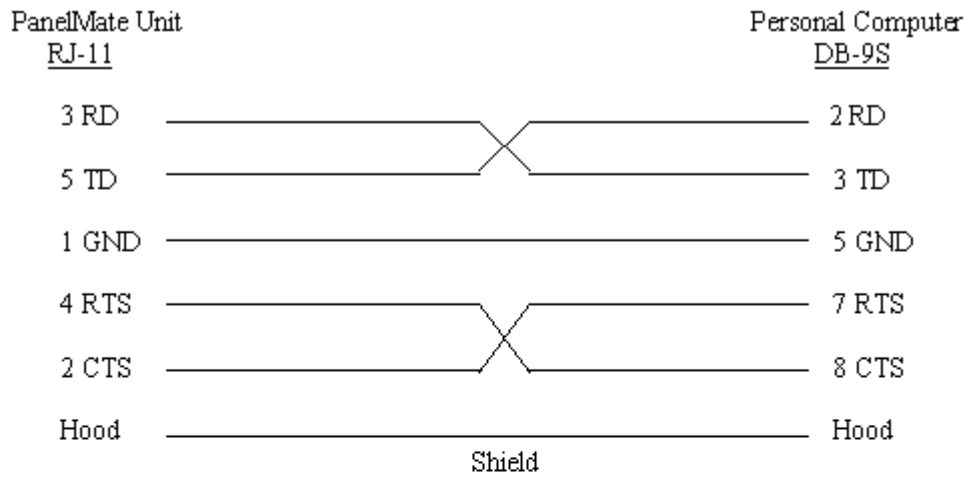
Serial Transfer Cables

Cable P/N 0518

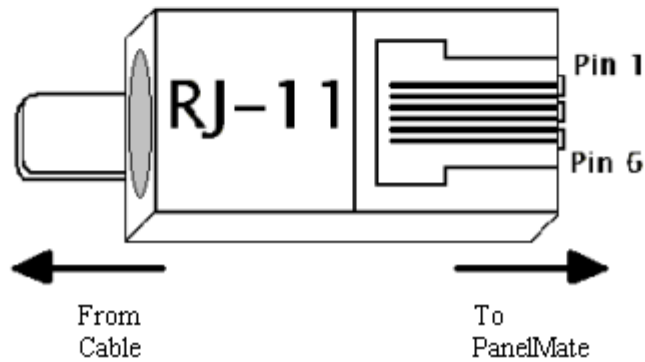


Cable P/N 0818

(PanelMate Power Series 1500 and PanelMate 500 only)



RJ-11 pin configuration



Modicon PLCs Using Modbus

2

This chapter explains how to use your PanelMate operator station with Modicon PLCs in Modbus ASCII or RTU mode. Specifically, this chapter includes:

- *Introduction*
- *Memory*
- *Possible Configurations*
- *PLC & communications module setup*
- *Cable diagrams*
- *Communications parameters*
- *Modicon word and bit references*
- *Maintenance access*
- *PLC cabling cross reference list*

Introduction

The Operator Station can be used with any of the Modicon PLCs that have Modbus capability. You may use the Modbus ASCII mode driver or the Modbus RTU mode driver to communicate Modbus to Modicon PLCs. The driver takes responsibility for communications to this programmable controller, generating the protocol necessary to request information from and send information to the PLC. The PLCs simply respond to these requests and commands. No ladder logic is required in the PLC to support the interface to the Operator Station. The information in this manual is for the Modbus ASCII and Modbus RTU mode drivers only. Depending on the driver selected in the PLC Name and Port Table, you must select either ASCII or RTU mode to communicate to an Operator Station.

Memory

The following memory types are supported by the Modbus ASCII and Modbus RTU (Micro 84, 184, 384, 484, 584, 884, and 984) mode drivers.

0XXX Coils/discrete outputs
0XXXX
0XXXXX
1XXX Discrete inputs (read only)
1XXXX
1XXXXX
3XXX Input registers (read only)
3XXXX
3XXXXX
4XXX Holding/output registers
4XXXX
4XXXXX

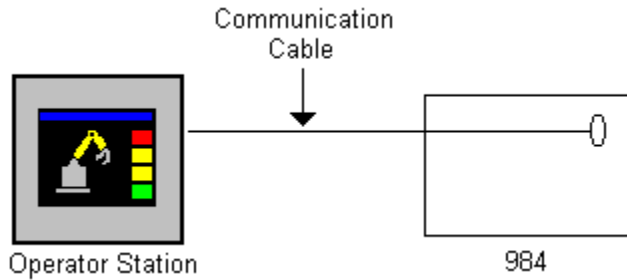
Note: For Modicon PLCs, “F”: must precede all holding registers to designate a floating point number.

Possible Configurations

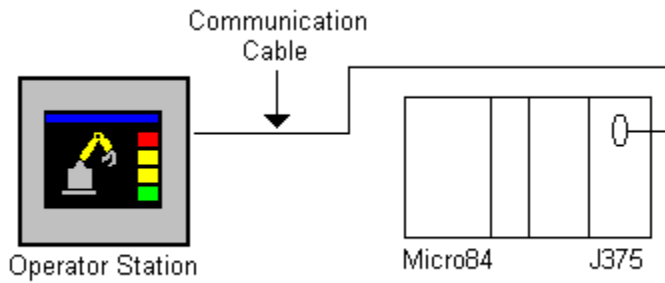
Examples of possible connections are described and shown in the following pages.

Direct

A direct connection to a Modicon PLC with built-in Modbus, without the need for any additional modules.

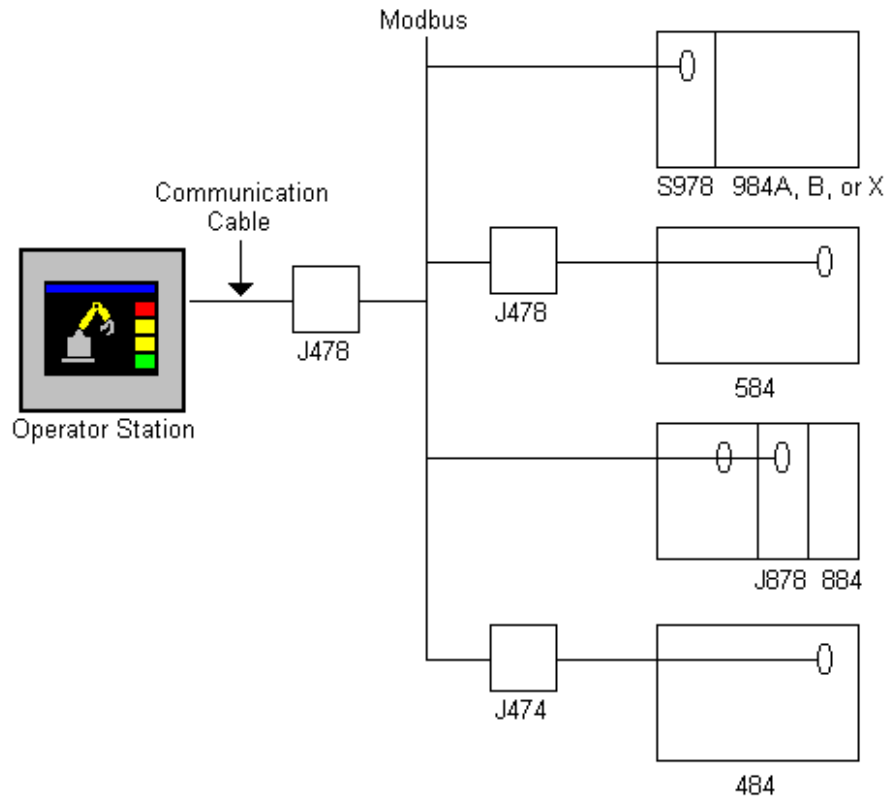


Models without built-in Modbus require a Modbus adapter.



Multiple PLCs on a Single Modbus

If the Operator Station is to communicate with multiple PLCs on a single Modbus network, it requires its own Modbus modem to provide the necessary interface.



Adapters and Cable Connectors for Modicon PLCs

The following table shows the Modicon PLCs, adapters, and cable connectors. Consult the proper Modicon manual for any information not contained in this manual.

Model	Modbus Ports Built-In	Modbus Adapter	Modbus Modem	Cable Connector	Port(s)
	3	N/A	S978	DB-25P	1,2,3
984-X	2	N/A	S978	DB-25P	1,2
984-381 -480/680 780	2	N/A	J878	DE-9P	1,2
984-380	1	N/A	J878	DB-9P	1
984-1XX	1	N/A	J478	DB-9P	1
884	2	N/A	J478	DB-25P	1,2
584	2	N/A	J478	Military	1,2
484	None	J474	J474/475	30-pin	1,2
μ84	None	J375	J378	DB-25P	1
Micro	1	N/A	JXXX	RJ45	1

* 984-120, 984-130, 984-145

** Models 984-385/485/685/785 have one Modbus port and one Modbus Plus port

Cable Diagrams

Communications between the Operator Station and Modbus is RS232C. The recommended maximum cable length is 50 cable feet. You should construct a communications cable of the desired length for each connection to be made. Note that the cable configuration is similar for the various Modicon PLCs and modems.

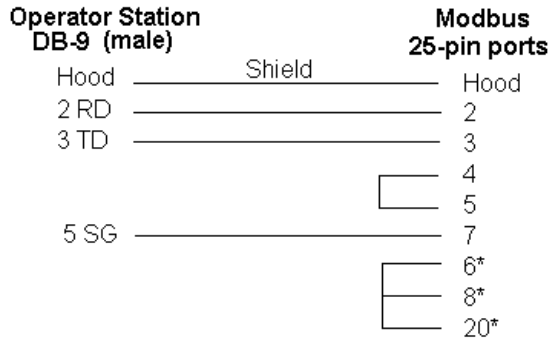
(You may also use a standard Modicon W190 cable instead of constructing your own.)

A 15-foot PLC cable can be purchased from Cutler-Hammer. Contact the Customer Support Center at (614) 883-3282 or your local distributor for more information. Refer to the PLC Cabling Cross-Reference List section for cabling catalog numbers.

The Operator Stations that have 9-pin female connectors (DB-9S) must have cables configured with male connectors (DB-9P).

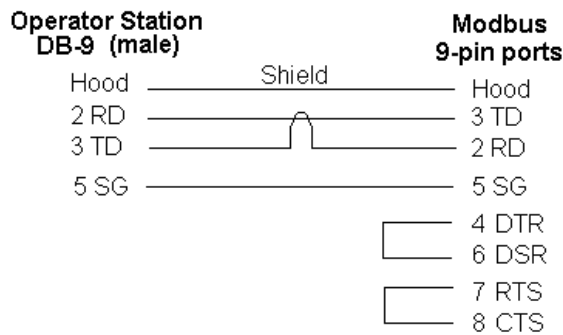
Note: For PanelMate PC applications, a female 9-pin connector is required for connecting to a male 9-pin port. To quickly convert a Cutler-Hammer cable for PC use, simply attach the 9-pin Gender Changer found in the PanelMate PC Runtime Kit.


Modbus 25-Pin Ports



* 884 25-pin only

Modbus 9-pin Ports



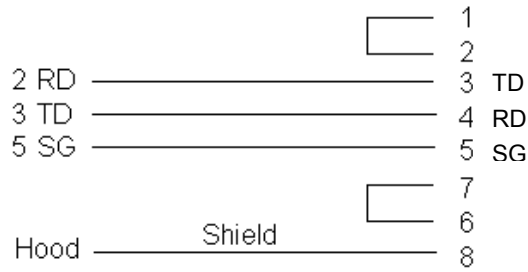
 Denotes a twisted pair

Micro RJ45 Connector

MB22

**Operator Station
DB-9 (male)**

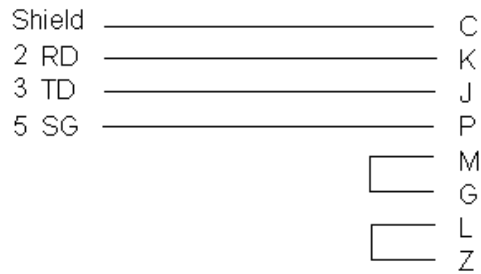
**Micro RJ-45
connector (male)**



584 Military Connector

**Operator Station
DB-9 (male)**

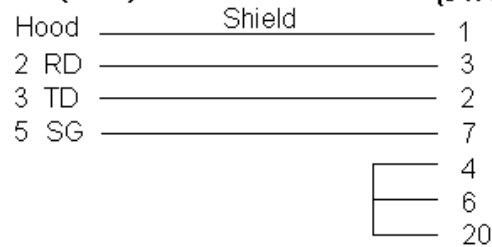
**584 Military
Connector**



25-Pin Modems (J478)

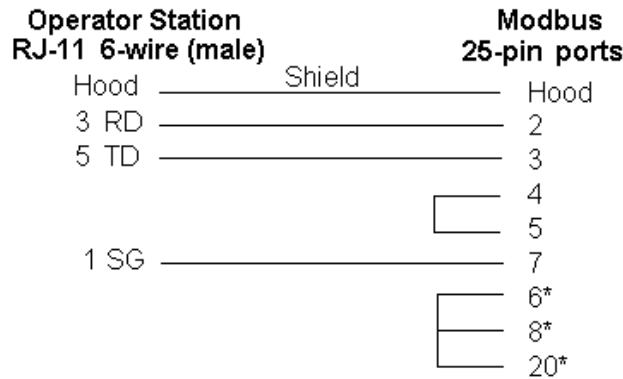
**Operator Station
DB-9 (male)**

**25-pin Modems
(J478)**



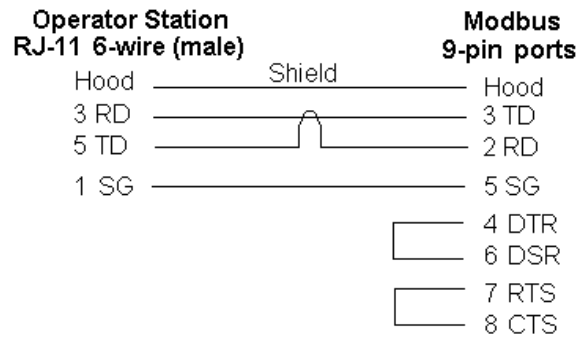
The Operator Stations that have RJ-11 6-wire modular jacks must have cables configured with male modular connectors.


Modbus 25-Pin Ports



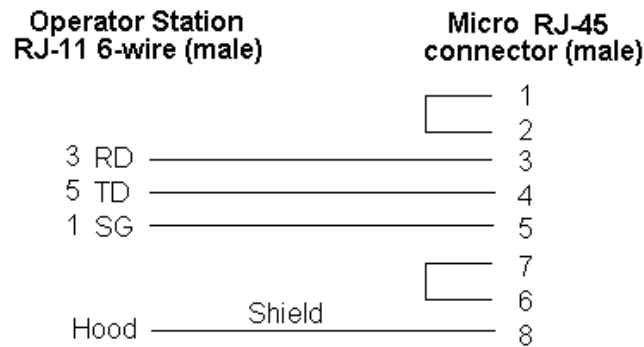
* 884 25-pin only

Modbus 9-Pin Ports

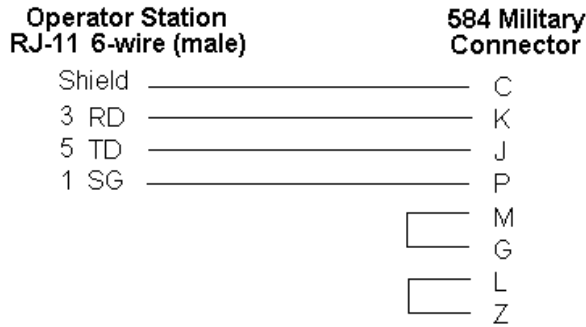


 Denotes a twisted pair

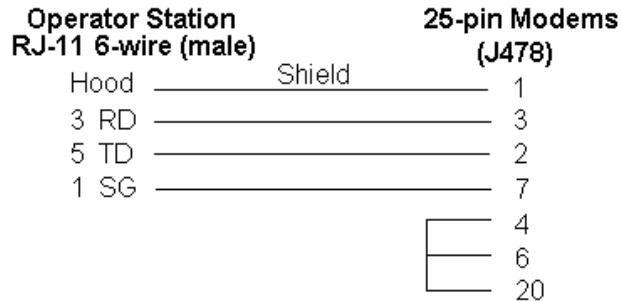
Micro RJ45 Connector



584 Military Connector



25-Pin Modems (J478)



For applications requiring additional Modbus ports, it is recommended that Modbus expanders be used. Modbus Port Expanders from Modicon may be used to connect multiple Operator Stations to a single PLC. The Operator Station communications cable previously described may be used to connect the Operator Station and the PLCs to a Modbus Port Expander.

Communications Parameters

For each Modicon port used, certain parameters must be set in order to establish communications with the Operator Station. This is accomplished either through dipswitch settings on the individual module or programming selections using the Modicon P230 Programmer.

Standard communication parameters for communicating with Modicon PLCs using Modbus are:

- 7 data bits for ASCII mode and 8 data bits for RTU mode
- 1 stop bit*
- 9600 baud rate
- ASCII or RTU mode**
- No parity

*2 stop bits for 984-38X, 984-48X, 984-68X

**Depending on the driver selected in the PLC Name and Port Table, you must select either ASCII or RTU mode to communicate to an Operator Station. All other parameters should be configured as listed above.

Note: The following is a summary of the information available at the time of this manual's printing, describing the necessary settings for each PLC model. Be sure to check with Modicon for any possible updates or changes if you encounter any difficulty.

984 and 584 Modbus Ports

The Modicon P230 Programmer is used to set the communications parameters of the 984 and 584 Modbus ports.

For the PLC address, use the number that coincides with the PLC ID# you have established for this unit in the PLC Name and Port Table.

Depending on the driver selected in the PLC Name and Port Table, select ASCII or RTU mode.

Be sure to match the baud rate, parity, data bits, and stop bits with the entries made in the PLC Name and Port Table.

984-38X, -48X, -68X, and -78X

The 984-38X, -48X, -68X, and -78X models contain a switch to determine whether port parameters will be set up using the dipswitches or configured with the P230 programmer. See the Modicon manual for your specific PLC for information on the dipswitch settings. A switch is used to determine if the memory or the dipswitch is actually controlling the port parameters. Modicon recommends that the dipswitch setting remain in RTU mode so that a maintenance person can plug in a local Data Access Panel by selecting the dipswitches.

884 Modbus Ports

Modbus port 1 parameters may only be configured using the Modicon P230 Programming Panel. Port 2 parameters may be set either by the Programming Panel or by dipswitches.

Port 1 is factory-set to the following parameters:

- Data Bits - 7 (fixed)
- Mode - RTU
- Parity - Even
- Stop Bits - 1
- Baud Rate - 9600

Be aware that 884 models with 4-digit serial numbers have no capability for ASCII mode communications, therefore RTU mode must be used for these models.

Port 2 parameters may be selected using the dipswitches located at the rear of the 884. The top set of switches is used to set the address of the PLC. This number corresponds to the PLC ID# entered in the PLC Name and Port Table.

The address is set as a binary number, where switch 8 is of lowest significance, and switch 1 is of the highest significance.

	Most Sig. Bit				Least Sig. Bit			
Dip Switch #	1	2	3	4	5	6	7	8
Example: PLC address = 11	0	0	0	0	1	0	1	1

Switch up for a binary 1 (ON): switch down for a binary 0 (OFF)

Table 1 - Port 2 Dipswitch Settings

The bottom set of switches is used to set communication parameters. Be sure the parameters of both the 884 and the Operator Station match.

Micro 84/J375 Modbus Adapter

The J375 Modbus Adapter is a communications interface module for the Micro 84 PLC. The J375 provides one RS232C port connection for use with intelligent RS232 devices. Also, port connections are provided for the Micro 84 controller and a P370 Micro 84 Programmer.

The Modbus Adapter provides dipswitches at the rear of its case for address and system parameter selection. The user may select the number of stop bits, parity, and baud rate. Data bits are fixed at 7.

Switch set one (S1) on the J375 determines the station address for the Micro 84. Station addresses are entered as binary numbers, where switch 1 is of lowest significance and switch 8 is of highest significance.

	Most Sig. Bit				Least Sig. Bit			
Dip Switch #	8	7	6	5	4	3	2	1
Example: PLC address = 11	0	0	0	0	1	0	1	1

Switch up for a binary 1 (ON); switch down for a binary 0 (OFF)

Table 2 - Port 2 Dipswitch Settings

Switches 1, 2, 3 and 4 of switch set two (S2) are used to configure the baud rate for the J375. Switches 5 and 6 are used to configure the parity for the J375.

Note: When communicating with the Operator Station using ASCII Modbus, the parity selected must be ODD or EVEN.

Switch 7 of switch set two (S2) is used to select the number of stop bits for the J375. With switch 7 set ON, two stop bits are selected. With switch 7 set OFF, one stop bit is selected.

Switch 8 of switch set two (S2) selects ASCII mode when it is OFF, or RTU mode when it is ON.

Switch Set 2 Dipswitch Settings

Switch up for a binary 1 (ON); switch down for a binary 0 (OFF)

	1	2	3	4	5	6	7	8
switch:	1	2	3	4	Baud Rates			
	0	0	0	0	50	0 = 8 data bits, RTU 1 = 7 data bits, ASCII		
	0	0	0	1	75	0 = 2 stop bits 1 = 1 stop bit		
	0	0	1	0	110	0 = odd parity 1 = even parity		
	0	0	1	1	134.5	0 = no parity 1 = parity selected		
	0	1	0	0	150			
	0	1	0	1	300			
	0	1	1	0	600			
	0	1	1	1	1200			
	1	0	0	0	1800			
	1	0	0	1	7000			
	1	0	1	0	2400			
	1	0	1	1	3600			
	1	1	0	0	4800			
	1	1	0	1	7200			
	1	1	1	0	9600			
	1	1	1	1	19200			

484 PLC/J474 Modbus Communication Interface

The J474 Communication Interface allows for a computer or other intelligent devices to communicate to a 484 PLC. The J474 may be connected to the Modbus or an RS232 device via a single 30-pin connector. All user options such as baud rate, parity, and stop bits are selected by the wiring of this connector.

The following tables include pin descriptions and selection options, for the J474 Modbus Communication Interface.

Pin	Function	Pin	Function
1	Protective Ground	16	Binary Address 16
2	Data Transmit	17	Stop Bit Option
3	Data Receive	18	Binary Address 32
4	Ready to Send	19	Parity Type Option
5	Clear to Send	20	Data Terminal Ready
6	Data Set Ready	21	Parity Enable
7	Signal Ground	22	Binary Address 64
8	Binary Address 1	23	Modbus Full Duplex In
9	Baud Rate 1	24	Binary Address 128
10	Binary Address 2	25	Modbus Full Duplex Out
11	Baud Rate 2	26	Signal Ground
12	Binary Address 4	27	Modbus Data In
13	Baud Rate 4	28	Mode Select 1
14	Binary Address 8	29	Modbus Data Out
15	Baud Rate 8	30	Mode Select 2

Pins 1 through 7 and 20 conform to EIA RS232C specifications.

Table 3 - Port Pinouts for the J474 Interface

Baud rate is selected by connecting pins 9, 11, 13 and 15 to signal ground at pin 7. The following chart summarizes selection options, where YES = connect to pin 7 and NO = leave unconnected.

Baud Rate	Pin 9	Pin 11	Pin 13	Pin 15
50	YES	YES	YES	YES
75	NO	YES	YES	YES
110	YES	NO	YES	YES
134.5	NO	NO	YES	YES
150	YES	YES	NO	YES
300	NO	YES	NO	YES
600	YES	NO	NO	YES
1200	NO	NO	NO	YES
1800	YES	YES	YES	NO
2000	NO	YES	YES	NO
2400	YES	NO	YES	NO
3600	NO	NO	YES	NO
4800	YES	YES	NO	NO
7200	NO	YES	NO	NO
9600	YES	NO	NO	NO
19200	NO	NO	NO	NO

Table 4 - Baud Rate Selection for the J474 Interface

The slave address (PLC ID#) is selected by connecting pins 24, 22, 18, 16, 14, 12, 10 and 8 to signal ground at pin 26. A binary pattern is used, where zero bit = connect to pin 26 and a one bit = leave unconnected. For example, the address 11 in binary is 00001011, which requires connection of pins 24, 22, 18, 16, and 12 to pin 26, as shown below.

Pin Number	Most Sig. Bit						Least Sig. Bit	
	24	22	18	16	14	12	10	8
Example: PLC address = 11	0	0	0	0	1	0	1	1

Switch up for a binary 1 (ON): switch down for a binary 0 (OFF)

Table 5 - Example for a Slave Address of 11

Specific modes of operation are selected by connecting pins 28 and 30 to signal ground at pin 26. The following chart summarizes selection options where YES = connect to pin 26 and NO = leave unconnected.

Model	Pin 28	Pin 30
ASCII	YES	YES
RTU	YES	NO
Not Valid	NO	YES
Test	NO	NO

Table 6 - Mode Selection

The number of stop bits and parity are selected by connecting pins 17, 19, and 21 to signal ground at pin 7. The following chart summarizes selection options where YES = connect to pin 7 and NO = leave unconnected.

Option	Pin 17	Pin 19	Pin 21
Two stop bits, no parity	YES	YES	YES
One stop bit, no parity	NO	YES	YES
Two stop bits, no parity	YES	NO	YES
One stop bit, no parity	NO	NO	YES
Two stop bits, odd parity	YES	YES	NO
One stop bit, odd parity	NO	YES	NO
Two stop bits, even parity	YES	NO	NO
One stop bit, even parity	NO	NO	NO

Table 8 - Stop Bit and Parity Selection

Modicon Word and Bit References

The following section describes the use of Modicon word and bit references in your configuration. The general word referencing method is:

[plcname,word#format]

The “plcname” is the name of the designated PLC as listed in the PLC Name and Port Table. The “word” is the reference number (address) of the word or register to be read or written. The “#format” is a code which specifies the format of the data being read or written. The “plcname” and “#format” are optional.

The general bit referencing method is:

[plcname,bit]

The “plcname” is the designated PLC as listed in the PLC Name and Port Table. The “bit” is the reference number (address) of the bit, coil, or input to be written or read.

See the “Word and Bit References” topic in the Configuration Software Online Help for a more detailed explanation of word and bit references, including format descriptions.

Modicon Micro 84, 184, 384, and 484

The Modicon PLCs listed above use decimal addresses. The Operator Station format default is BIN3. The following list contains the supported memory types.

- 0XXX Coils/discrete outputs
- 1XXX Discrete inputs (read only)
- 3XXX Input registers (read only)
- 4XXX Holding/output registers

The following is the format for a register reference.

[rr]

rr PLC reference number of the register.

The following is the format for an input reference.

[ii]

ii PLC reference number for an input.

The following is the format for a coil reference.

[cc]

cc PLC reference number for a coil.

The Operator Station cannot write to inputs or input registers. Therefore, all control button PLC bit references in the Operator Station’s editors refer to Modicon coils.

Bit references in expressions refer to Modicon inputs or outputs.

All references to words refer to Modicon registers.

Modicon PLC model Micro84 can read up to 16 words per read cycle. Models 184 and 484 will allow a maximum of 25 contiguous words per read. The maximum number of unused words for the three above mentioned PLCs is 10. The Operator Station generates another read when more than 10 unused PLC words are encountered.

Modicon 584, 884, and 984 Register, Input and Coil References

The Modicon PLCs listed above use decimal word addresses. The Operator Station format default is BIN4. The following list contains the supported memory types.

0XXXX	Coils/discrete outputs
0XXXXX	
1XXXX	Discrete inputs (read only)
1XXXXX	
3XXXX	Input registers (read only)
3XXXXX	
4XXXX	Holding/output registers
4XXXXX	

Note: The Modicon PLC model 984-785 allows six-digit addressing and holding/output register bit writes.

Note: Individual bit writes to the holding/output register are not allowed (except for the 984-785 PLC).

The following is the format for a register reference.

[rr]

rr PLC reference number of the register.

The following is the format for an input reference.

[ii]

ii PLC reference number for an input.

The following is the format for a coil reference.

[cc]

cc PLC reference number for a coil.

The following is the format for a register bit reference.

[rr bb]

rr PLC reference number of the register.

bb PLC reference number of the bit position. The bit positions are numbered from 1 to 16, least significant to most significant, respectively. Note that leading 0's are not required.

Note: The register number must be followed by a space.

The Operator Station cannot write to inputs or input registers. Therefore, all control button PLC bit references in the Operator Station editors refer to Modicon coils (or holding/output registers for the 984-785 PLC).

Bit references in expressions refer to Modicon inputs or outputs.

All references to words refer to Modicon registers.

The Modicon PLC models 584, 884 and 984 up to 25 contiguous words per single read. The maximum number of unused words is 10. The Operator Station generates another read when more than 10 unused PLC words are encountered.

Examples

The following are examples of valid PLC references which may be assigned in the Operator Station expression fields.

Word References

<u>Reference</u>	<u>Description</u>
------------------	--------------------

[40010]	Output register 40010
---------	-----------------------

[30001]	Input register 30001
---------	----------------------

[401000]	Output register 401000
----------	------------------------

Bit References

<u>Reference</u>	<u>Description</u>
------------------	--------------------

[25]	Coil 25
------	---------

[10009]	Discrete input 10009
---------	----------------------

[40098 16]	Bit 16 of output register 40098
------------	---------------------------------

Note: Bit writes to 40000 registers cannot be performed.

Maintenance Access

The Maintenance Template will access all memory locations supported by the PLC driver as defined in this manual. When running online, you may change the PLC reference. You must enter the correct mnemonics and numeric values and create a legal reference to change a PLC reference.

Note: A double word reference (ID, QD, MD, or SMD) should not be entered as the default reference in the Maintenance Template.

Note: When a new reference is entered on an Operator Station, the Maintenance Template will remain in a paused state until the **Start Monitor** control button or the **Chng** soft function key is pressed. When the **Start Monitor** control button or the **Chng** soft function is pressed, the Operator Station will parse the reference. (Parsing means checking the syntax and range of the reference to ensure that is supported by the driver.)

Note: A Maintenance Template cannot be used to monitor unsolicited references.

Modicon PLCs Using Modbus Plus

3

This chapter explains how to use your PanelMate Power Series operator stations on the Modbus Plus network. Specifically, this chapter includes:

- *Introduction*
- *Memory*
- *Possible Configurations*
- *Cabling*
- *Communications parameters*
- *Configuration entries*
- *Switch settings*
- *Modicon word and bit references*
- *Unsolicited Writes to the operator station*
- *Maintenance access*

Introduction

An Operator Station, with an optional Modbus Plus interface board, can communicate with Modicon controllers that have Modbus Plus compatibility. The Operator Station appears as a node on the Modbus Plus network (similar to an SA85 network adapter). The interface board has responsibility for establishing and maintaining communications across the network. No ladder logic is required to support the interface.

Memory

The following memory types are supported by the Modbus Plus interface board:

XXXX Coils/discrete outputs

XXXX Discrete inputs (read only)

3XXXX Input Registers (read only)

4XXXX Holding/output registers

900XX Global data (read only; range 1-32)

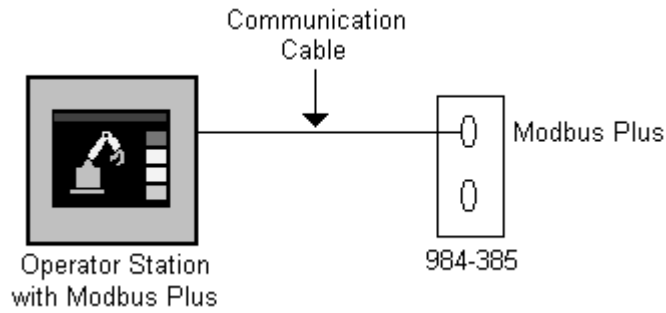
G00XX Global data (Operator Station's node range; 1-32)

Note: G00XX requires the use of the GLBL prefix.

Possible Configurations

Direct

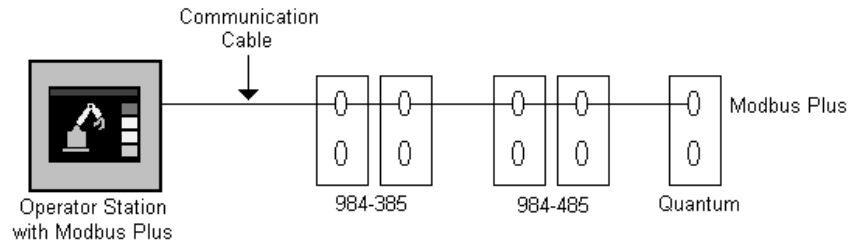
The Operator Station may be connected directly to a Modicon controller having Modbus Plus capability. The Operator Station must have a different network node address than the Modicon controller (see Switch Settings for more information on setting node addresses).



Multiple Controllers on a Single Modbus Plus Network

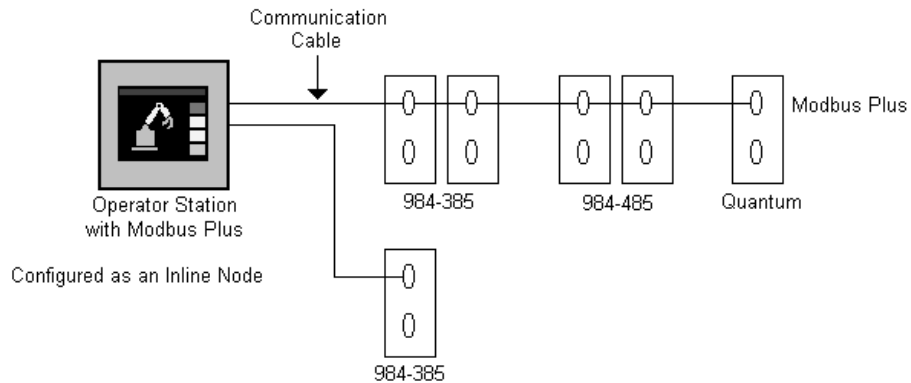
In this configuration, the Operator Station acts like a node on the immediate Modbus Plus network. Each node on the network must have a separate node address as in the following example (see the Switch Settings section for more information on setting node addresses).

Operator Station/Modbus Plus - Termination Node



Configured as a Termination Node

Operator Station/Modbus Plus - Inline Node



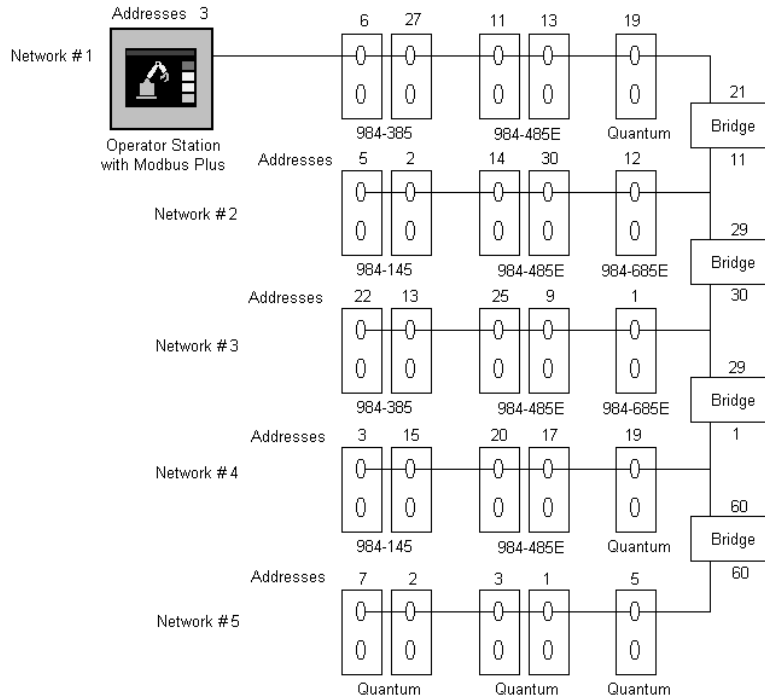
Configured as an Inline Node

Multiple Controllers on Multiple Modbus Plus Networks

An Operator Station can communicate with up to 32 controllers at once. An Operator Station communicates with a controller through a maximum of four bridges. An Operator Station communicates with another Operator Station through a maximum of three bridges.

Note: The address of the system on the 5th byte of the routing address must be a number less than 8.

Sample Operator Station/Modbus Plus Network

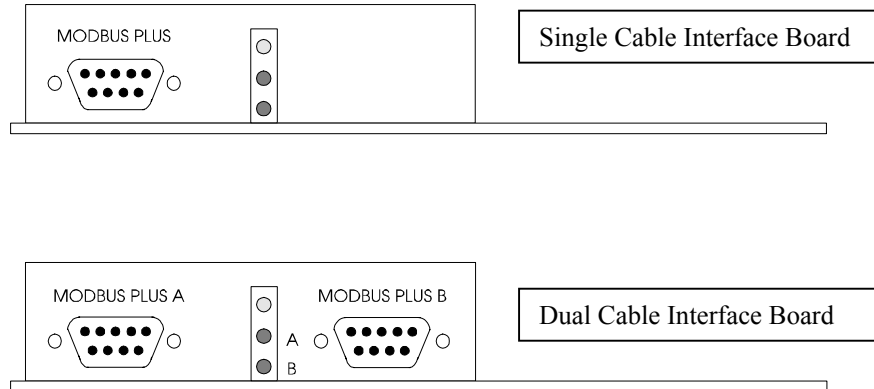


Cabling Diagrams

Communications between the Operator Station and Modbus Plus follows the Modicon standard. See the PanelMate Power Series Modbus Plus Interface Instructions IL (01-50463) for additional information. The Operator Station should be wired like a node on the Modbus Plus Network. The Modicon Part number for the connector required is: AS-MBKT-085 (if the Operator Station is at an inline node) or AS-MBKT-185 (if the Operator Station is at an extreme end of the network).

The figures below shows a single and dual cabled Modbus Plus interface board.

Note: The Dual Channel Modbus Plus interface board is no longer available.



LEDs

The green LED is used to help determine the current status of the Modbus Plus interface board. The following is a list of possible indications:

Note: The two red LEDs, labeled A and B, on the dual cabled Modbus Plus interface board indicate communication errors in either the Modbus Plus A port or the Modbus Plus B port. If an error occurs, the corresponding red error LED will turn on while the communication error exists.

Network Communication Status

Modbus Plus status is shown by flashing a repetitive pattern on the green indicator. The patterns are:

Six flashes per second

The Modbus Plus interface board's normal operating state. The indicator flashes each time the board transmits at its Modbus Plus port. All nodes on the network should be flashing this pattern. If a port indicator is OFF continuously, the board is not transmitting at its port.

One flash per second

The Operator Station node is offline after just being powered up, or after hearing a message from another node with the same network address (duplicate addresses are not allowed). 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.

Two flashes, then OFF for two seconds

The Operator Station node is hearing the token being passed among other nodes, but is never receiving the token. Check the network link for an open or short circuit or defective termination.

Three flashes, then OFF for 1.7 seconds

The Operator Station node is not hearing any other nodes. It is periodically claiming the token, but finding no other node to pass it. Check the network link for an open or short circuit or defective termination.

Four flashes, then OFF for 1.4 seconds

The Operator Station node has heard a valid message from another node that is using the same address as this node. The node remains offline 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.

Communication Parameters

When using the Modbus Plus interface board, the only communication parameter that needs to be set is the I/O port. In the PLC Name and Port Table, configure the Use field for the I/O port to MODBUS+.

Configuration Entries

A sample PLC Name and Port Table is shown below.

PLC Name and Port Table

Port Parameters

Port	Device Use	Local ID
1	(No Usage)	
2	(No Usage)	
I/O	Modicon Modbus Plus	

Device Use: [No Usage] Local ID: 0

PLC Name Parameters

Item	Name	Port	Model	Remote ID
1:	plc1	I/O	984 MB+	6
2:	plc2	I/O	984 MB+	13
3:	plc3	I/O	984 MB+	21, 2
4:	plc4	I/O	984 MB+	21, 12
5:	plc5	I/O	984 MB+	21, 29, 22
6:	plc6	I/O	984 MB+	21, 29, 1
7:	plc7	I/O	984 MB+	21, 29, 29, 15
8:	plc8	I/O	984 MB+	21, 29, 29, 19
9:	plc9	I/O	984 MB+	21, 29, 29, 60
10:	plc10	I/O	984 MB+	21, 29, 29, 60, 2

Name: plc1 Model: 984 MB+ Port: I/O Remote ID: 6 Default PLC Name: plc1

Buttons: Add, Change, Copy, Paste, Delete, Port Settings..., Unsolicited Device..., OK, Cancel, Help

In the PLC Name Table, under the ID# field, the routing address(es) must be specified. The Operator Station can communicate through a maximum of four bridges. When entering routing information, each bridge address is followed by a command. The last routing address represents the ID# of the controller the Operator Station will be communicating with.

Sample Addressing for Configuration

- [PLC8,40055] Register 40055 of Controller 19 Network #4
- [PLC4, 30125] Register 30125 of Controller 12 Network #2
- [GLBL, G0030] Operator Station Global Register 30
- [90030.01] Coil 16 of Global Register 30 of Controller 6 Network #1
- [PLC7,00055] Coil 00055 of Controller 15 Network #4
- [10077] Contact 10077 of Controller 6 Network #1

Switch Settings

The following is a summary of the necessary settings for each of the modules. Be sure to check with Cutler-Hammer Support Services for any possible updates or changes if you encounter any difficulty.

Operator Station

The Operator Station has one switch setting that is used to set the network node address. The dipswitch is located on the right side of the unit, above the 9-pin Modbus Plus port. The Operator Station node address must not be the same as any other node address on the immediate network

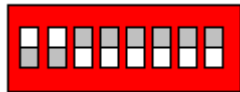
Note: The dipswitch on the dual cabled Modbus Plus Interface board is located at the rear of the board.

984-385, 984-484, 984-685, 984-785, Compact 984-145, 984-385E, 984-485E, 984-685E, 984-785E, and Quantum

The 984-385,-485,-685,-785, and Compact 984-145 models have a switch setting for configuring the node address. .

In the example below, switch 1 and 2 are up making the address 4. It's in binary format starting at 1. Meaning, you must always add 1 to the binary number. (3+1=4)

Modbus+ Card dip switch



1 2 3 4 5 6 7 8

In the example above up=on, down=off, and white represents the switch head.

Standard Binary Table

Address	Switch Position						Address	Switch Position					
	1	2	3	4	5	6		1	2	3	4	5	6
0	0	0	0	0	0	0	32	0	0	0	0	0	1
1	1	0	0	0	0	0	33	1	0	0	0	0	1
2	0	1	0	0	0	0	34	0	1	0	0	0	1
3	1	1	0	0	0	0	35	1	1	0	0	0	1
4	0	0	1	0	0	0	36	0	0	1	0	0	1
5	1	0	1	0	0	0	37	1	0	1	0	0	1
6	0	1	1	0	0	0	38	0	1	1	0	0	1
7	1	1	1	0	0	0	39	1	1	1	0	0	1
8	0	0	0	1	0	0	40	0	0	0	1	0	1
9	1	0	0	1	0	0	41	1	0	0	1	0	1
10	0	1	0	1	0	0	42	0	1	0	1	0	1
11	1	1	0	1	0	0	43	1	1	0	1	0	1
12	0	0	1	1	0	0	44	0	0	1	1	0	1
13	1	0	1	1	0	0	45	1	0	1	1	0	1
14	0	1	1	1	0	0	46	0	1	1	1	0	1
15	1	1	1	1	0	0	47	1	1	1	1	0	1
16	0	0	0	0	1	0	48	0	0	0	0	1	1
17	1	0	0	0	1	0	49	1	0	0	0	1	1
18	0	1	0	0	1	0	50	0	1	0	0	1	1
19	1	1	0	0	1	0	51	1	1	0	0	1	1
20	0	0	1	0	1	0	52	0	0	1	0	1	1
21	1	0	1	0	1	0	53	1	0	1	0	1	1
22	0	1	1	0	1	0	54	0	1	1	0	1	1
23	1	1	1	0	1	0	55	1	1	1	0	1	1
24	0	0	0	0	1	0	56	0	0	0	1	1	1
25	1	0	0	0	1	0	57	1	0	0	1	1	1
26	0	1	0	1	1	0	58	0	1	0	1	1	1
27	1	1	0	1	1	0	59	1	1	0	1	1	1
28	0	0	1	1	1	0	60	0	0	1	1	1	1
29	1	0	1	1	1	0	61	1	0	1	1	1	1
30	0	1	1	1	1	0	62	0	1	1	1	1	1
31	1	1	1	1	1	0	63	1	1	1	1	1	1

Note: Modicon uses binary format starting at 1. This means that you must always add 1 to the binary number in the above table.

Modbus Plus Word and Bit References

The following section describes the use of Modbus Plus word and bit references in your configuration. The general word referencing method is:

[plcname,word#format]

The “plcname” is the name of the designated PLC as listed in the PLC Name and Port Table. The “word” is the reference number (address) of the word or register to be read or written. The “#format” is a code that specifies the format of the data being read or written. The “plcname” and “#format” are optional.

The general bit referencing method is:

[plcname,bit]

The “plcname” is the designated PLC as listed in the PLC Name and Port Table. The “bit” is the reference number (address) of the bit, coil, or input to be written or read.

984-385, 984-485, 984-685, 984-785, Compact 984-145, 984-385E, 984-485E, 984-685E, 984-785E, and Quantum

The Modicon controllers listed above use decimal word addresses. The Operator Station format default is BIN4. The following list contains the memory types supported by the Operator Station.

0XXXX	Coils/discrete outputs
1XXXX	Discrete inputs (read only)
3XXXX	Input registers (read only)
4XXXX	Holding/output registers
900XX	Global data (Modicon Controllers; read only)
G00XX	Global data (Operator Station node)

An Operator Station with a Modbus Plus interface board cannot write to inputs, input registers, or “900XX” global registers; therefore, control button bit references in the Operators Station editors refer to Modicon coils (or holding/output registers for the 984-785 PLC).

Bit references in expressions refer to Modicon inputs or outputs.

All references to Controller words refer to Modicon registers.

Leading 0’s are not required unless specified.

The Modicon 984-X85 and Quantum controllers allow up to 100 contiguous words per single block read. The maximum number of unused words is 98. If the Operator Station encounters 98 or more unused words, then another block read is generated.

The following is the format for a register reference:

[3rrr] or [4rrr]

rrr Controller reference number of the register.

The following is the format for a discrete input reference:

[1iiii]

iiii Controller reference number for an input reference.

The following is the format for a coil reference:

[0cccc]

cccc Controller reference number for a coil reference.

The following is the format for a register bit reference:

[3rrrr bb], [4rrrr bb], [3rrrr,bb], or [4rrrr.bb]

rrrr Controller reference number of the register.

bb Controller reference number of the bit position.

The bit positions are numbered 1 to 16, least significant to most significant.

Note: The register number must be followed by a space or a period. Input register bit writes are not allowed. Output register bit writes are not allowed (except for the 984-785 PLC).

The following is the format for a global data word read from a Modicon Controller:

[900rr]

rr Controller reference number of the register.

The following is the format for a global data bit read from a Modicon Controller:

[900rr bb] or [900rr.bb]

rr Controller reference number of the register.

bb Controller reference number of the bit position.

The bit positions are numbered from 1 to 16, least significant to most significant.

An Operator Station has 32 global words, numbered 1 to 32. The global data area on the Operator Station can be written to and read from.

The following is the format for a global data word read from a Operator Station:

[GLBL,G00rr]

rr Operator Station reference number of the register.

The following is the format for a global data bit read from a Operator Station:

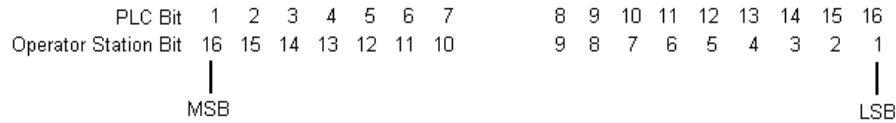
[GLBL,G00rr bb] or [GLBL, G00rr.bb]

rr Operator Station reference number of the register.

bb Operator Station reference number of the bit position. The bit positions are numbered from 1 to 16, least significant to most significant.

Note: An Operator Station cannot directly read or write to another Operator Station.

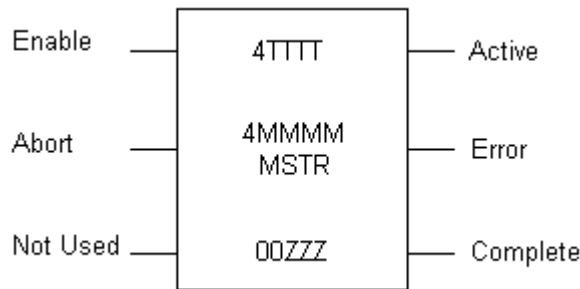
Note: An Operator Station’s most significant bit (MSB) is bit 16 and the Modicon PLC’s most significant bit (MSB) is 1. Refer to the figure below.



Unsolicited Writes to the Operator Station with Modbus Plus

An Operator Station can receive unsolicited writes from a Modicon controller provided the Operator Station and the specified address is referenced in the Operator Station. The Modicon controller performs unsolicited writes through the use of the MSTR function block.

The Master Function Block consists of 4 main components: the control block, data start, data size, and the enable input.



The Control Block - This block must be configured as follows:

- 4TTTT Operation Type (1 for write)
- 4TTTT+1 Error Status (reported by controller)
- 4TTTT+2 Length
- 4TTTT+3 Slave Device Data Area
- 4TTTT+4 Routing 1
- 4TTTT+5 Routing 2 Complete path to the Operator
- 4TTTT+6 Routing 3 Station from controller
- 4TTTT+7 Routing 4
- 4TTTT+8 Routing 5

Note: The routing address after the Operator Station address should be set to one. Any unused routing addresses should be set to zero.

Note: For a Operator Station to read data from another Operator Station, the routing address after the Operator Station address should be set to 1.

Data Block Size - This represents the length of the data block (must match the third word of the control block 4TTTT+2).

00ZZZ Length of the data block (1-100).

For more information concerning Modicon function blocks, consult Modicon's 984 Programmable Controller Systems Manual.

Maintenance Access

The Maintenance Template or Page will access all memory locations supported by the PLC driver as defined in this manual. When running online, you may change the PLC reference. You must enter the correct mnemonics and numeric values and create a legal reference to change a PLC reference.

Note: When a new reference is entered on a Operator Station, the Maintenance Template will remain in a paused state until the **Start Monitor** control button is pressed. When the **Start Monitor** control button is pressed, the Operator Station will parse the reference. (Parsing means checking the syntax and range of the reference to ensure that it is supported by the driver.)

Modicon 410 Servo Controller

4

This chapter explains how to use the PanelMate operator station to communicate with the Modicon 410 Intelligent Brushless Servo Controller. Specifically, this chapter includes:

- *Introduction*
- *Driver Installation*
- *Memory*
- *Possible Configurations*
- *Cabling*
- *Communication Parameters*
- *Modicon 410 Word and Bit References*
- *Maintenance Access*

Introduction

The PanelMate Operator Station can be used to communicate with the Modicon 410 Intelligent Brushless Servo Controller. The driver takes responsibility for communications to this controller, generating the protocol necessary to request information from and send information to the controller. The controller responds to these requests and commands. No ladder logic is required in the controller to support the interface to the PanelMate unit.

Driver Installation

The driver software contains an installation program named Setup. Setup is on the diskette labeled "PanelMate Plus Modicon Driver Disk."

To install the driver on your hard disk, insert the driver disk in your computer. Under Windows in the Program Manager, choose File Run. In the Run dialog box, type:

Drive:\Setup

In the Command Line entry field, where *drive* is the letter of the floppy drive that contains the driver disk, choose the <OK> button.

From the Setup program, select the directory for the driver files. (The default directory is C:\PMCONFIG\ONLINE\DRIVER.)

Once the installation is complete, you will find the following files on your computer:

<u>Filename</u>	<u>Description</u>
MOD410.DLL	Used by the Configuration Editor
MOD410.DVR	Downloadable driver

Memory

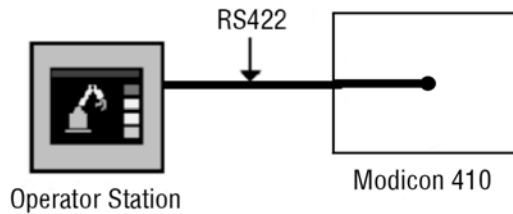
This interface supports reading and writing 32-bit signed user registers. Register addresses must be in a decimal format, in the range of 0 to 99.

Possible Configurations

Examples of possible configurations are described and shown below.

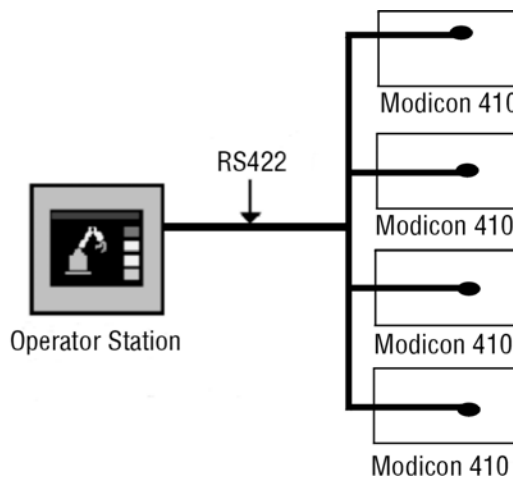
Direct

A direct connection to a Modicon 410 without the need for any additional modules uses RS232/RS422 communications.



Multiple Controllers

The following figure shows multiple controllers connected on a network using RS422 communications. The RS422 communications allow a maximum of 16 Modicon 410s to be connected on a network.



Cabling

A shielded cable must be used to connect the PanelMate unit to a Modicon 410. The following diagrams describe the pinouts needed for a cable using RS232 and RS422, respectively. Using RS422, you can daisy chain devices for a multidrop configuration. The first Modicon 410 and the PanelMate Plus unit must be wired as shown below. A multi-drop configuration can be wired using RS232 as long as it is used to connect the PanelMate unit to the first device only. All subsequent devices must be wired using RS422 in a daisy chain fashion.

Communications Cable for Modicon PLCs

<u>PanelMate Serial Ports</u>	<u>Modicon 410</u>
Shield	1 (SHLD)
2 (RD)	3 (RD)
3 (TD)	2 (TD)
5 (GND)	7 (GND)

Modicon 410 RS232 Cabling

Communications Cable for Modicon PLCs

<u>PanelMate Serial Ports</u>	<u>Modicon 410</u>
Shield	1 (SHLD)
1 (TD+)	22 (RD+)
4 (RD+)	25 (TD+)
5 (GND)	7 (GND) 23 (RS232)
6 (TD-)	21 (RD-)
9 (RD-)	24 (TD-)

Modicon 410 RS422 Cabling

Communication Parameters

For the Modicon 410, certain parameters must be set in order to establish communications with the PanelMate unit. This is accomplished through dip switch settings, used to select a Modicon 410 network address. The network address selected is the PLC ID in the PanelMate Plus unit, PLC Name and Port Tables.

0 indicates the switch should be in the down position, 1 indicates up.

Address	Switch Settings			
	1	2	3	4
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

Standard communication parameters for communicating with the Modicon 410 are:

- 8 data bits
- 2 stop bits
- 9600 baud rate
- no parity

Modicon 410 Word and Bit References

The following section describes the use of Modicon 410 word and bit references in your configuration. The general word referencing method is:

[plcname,word#format]

The “plcname” is the name of the designated PLC as listed in the PLC Name and Port table. The “word” is the reference number (address) of the word or register to be read or written. The “#format” is a code that specifies the format of the data being read or written. The “plcname” and #format” are optional.

The general bit referencing method is:

[plcname,bit]

The “plcname” is the designated PLC as listed in the PLC Name and Port table. The “bit” is the reference number (address) of the bit, coil or input to be written or read.

See chapter 10 for a more detailed explanation of word and bit references, including format descriptions.

This interface supports only reading and writing 32-bit signed user registers. Register addresses must be in a decimal format, in the range of 0 to 99.

The default PanelMate unit read/write format is signed 32 (S32). Only 32-bit data types are allowed (S32, U32, BCD6, BCD8, BIN6, BIN8).

The following is the format for a register reference:

[rr]

rr = PLC reference number of the register

(0 – 99 decimal, leading zeros not required)

Examples

The following are examples of valid PLC references that may be assigned in the PanelMate expression fields.

Word References:

<u>Reference</u>	<u>Description</u>
[1]	Register 1
[36]	Register 36
[48]	Register 48

Note The Modicon 410 will only perform single register reads and writes. Due to this fact, update times will be affected by the number of registers being polled by the PanelMate unit. The reason update times are slower is because a packet must be sent for each register that is read.

Maintenance Access

A Maintenance Template cannot be used to monitor Modicon 410 Servo Controller references.

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