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PanelMate®
Texas Instruments Communication Driver Manual

Eaton Corporation
Cutler-Hammer Business Unit
811 Green Crest Drive
Columbus, OH 43081

EATON | Cutler-Hammer

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This center, located in Zurich, Switzerland, provides high-level quality support and product repair services for your PanelMate products. You will receive real-time technical and application support.

Table of Contents

Introduction

1

In this chapter, you will learn:

- *About driver installation*
- *How to download drivers to a PanelMate unit*
- *The supported memory types*

Introduction

The Operator Station can be used with the programmable controllers in the Texas Instruments (TI) 500 Series (520, 530, 560, and 565), 405 Series (425, 430, and 435), and 305 Series (315, 325, and 330) using the TI driver on the TIHL (Host Link) driver. The driver takes responsibility for communications to the programmable controller, generating the protocol necessary to request information from, and send information to, the PLC. The PLC simply responds to these requests and commands. Ladder logic is required in the PLC to support bit writes to the TI 405 and TI 305 PLCs.

Connection to PLCs using the TI or TIHL driver can be accomplished by a direct connection to the RS232 port, the Data Communication Module (DCM), or the Data Communications Unit (DCU). The RS232 connection can only be used Point-to-Point. RS422 has multi-drop capabilities.

Note: Check the Cutler-Hammer web site for current information on PanelMate PC connectivity to the Texas Instruments driver.

Installing Drivers

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.

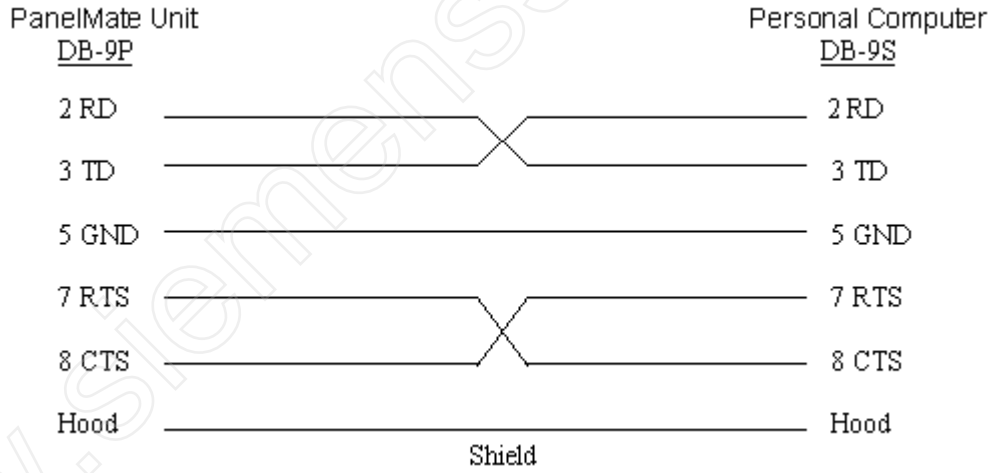
Downloading Drivers to a PanelMate Unit

- 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."

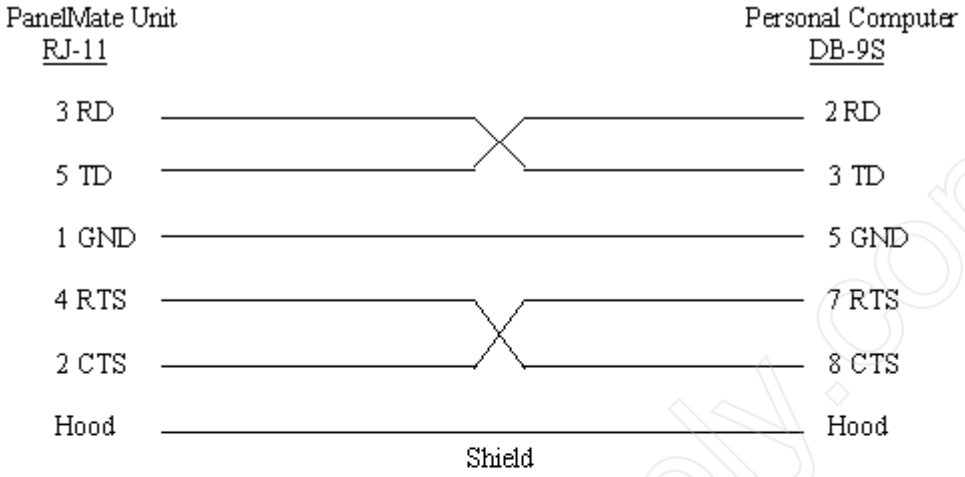
  Note: In order to download to a PanelMate for the first time or to clear the existence of another driver, the PanelMate must first be loaded with Executive Firmware.
- Choose the "Driver" tab.
- Select the appropriate driver to be downloaded to the PanelMate.
- Click the button labeled "Add to Operation 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

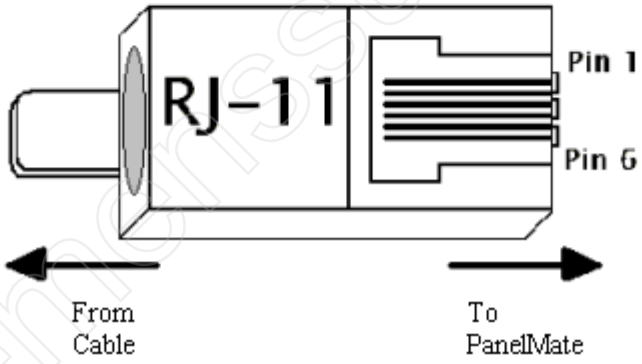
Cable P/N 0518



Cable P/N 0818
(PanelMate Power Series 1500 and PanelMate 500 only)



RJ-11 pin configuration



Memory

The 500 Series driver supports the following memory types.

Memory Type	Memory Address
16 Bit Word	
WX	WX Word Image Register
WY	WY Word Image Register
V	V Word Memory
DSP	Drum Step Preset
DSC	Drum Step Current Memory
DCP	Drum Count Preset Memory
DCC	Drum Count Current Memory (Read Only)
TCP	Timer/Counter Preset Memory
TCC	Timer/Counter Current Memory
LPV	Loop Process Variable
LMN	Output
LSP	Setpoint
LMX	Bias

Memory Type	Memory Address
Bit	
X	X Discrete Image Register
Y	Y Discrete Image Register
C	C Discrete Image Register

The 405 Series driver supports the following memory types.

Memory Type	Memory Address
16-Bit Word	
TMR	Timer
CNT	Count
V	User Data
V	System Parameter

Memory Type	Memory Address
Byte or Bit	
GX	Remote I/O
X	Input
Y	Output
C	Control Relays
S	Stages
T	Timer Relays (Read Only)
CT	Counter Relays (Read Only)
SP	Special Relays (Read Only)

The 305 Series driver supports the following memory types.

Memory Type	Memory Area
16-Bit Word	
AC	Timer/Counter Accumulator (Read Only - Model 315)
R	Data Registers (Not Supported - Model 315)

Memory Type	Memory Area
Byte	
R	Data Registers (Not Supported – Model 315) (Read Only – Models 325 and 330)

Memory Type	Memory Area
Bit	
IO	Input/Output, Internal Relay, Shift Register (IO373-IO377 is Read Only - Model 315) (IO374-IO377 is Read Only - Models 325 and 330)
T	Timer Element (Read Only - all models)
C	Counter Element (Read Only - all models)
TC	Timer/Counter Element (Read Only - all models)
SG	Stage Element

Memory addresses are in octal.

Memory Ranges for the 500 Series Driver

The 500 Series driver supports the following memory types and ranges.

Memory Type	PLC Type			
16-Bit word	**520**	**530**	**560**	**565**
WX	1-1023	1-1023	1-8192	1-8192
WY	1-1023	1-1023	1-8192	1-8192
V	1-1024	1-5120	1-228352	1-228352
DSP	1-30	1-30	1-1152	1-1152
DSC	1-30	1-30	1-1152	1-1152
DCC	1-30	1-30	1-1152	1-1152
TCP	1-128	1-400	1-10240	1-10240
TCC	1-128	1-400	1-10240	1-10240
DCP	1-30	1-30	1-1152	1-1152
LPV	--	--	--	1-64
LMN	--	--	--	1-64
LSP	--	--	--	1-64
LMX	--	--	--	1-64

Memory Type	PLC Type			
Bit	**520**	**530**	**560**	**565**
X	1-1023	1-1023	1-8192	1-8192
Y	1-1023	1-1023	1-8192	1-8192
C	1-511	1-1023	1-8192	1-8192

Note: For the Drum memory type (DSP, DSC, DCP and DCC), the range represents the drum number. For DCP memory, the range of step values is 1-16. DCP values are entered using the format [DCPxx yy] where xx = drum number, yy = the step value.

Memory Ranges for the 405 Series Driver

The 405 Series driver supports the following memory types and ranges.

Memory Type	Memory Address	V Memory Addresses
16-Bit Word		
Timer	TMR0-TMR177	V00000-V00177
Counter	CNT0-CNT177	V01000-V01177
User Data	V01400-V07377	V01400-V07377
System Param	V07400-V07777	V07400-V07777

Memory Type	Memory Address	V Memory Addresses
Byte or Bit		
Remote I/O	GX0-GX777	V40000-V40037
Inputs	X0-X477	V40400-V40423
Outputs	Y0-Y477	V40500-V40523
Control Relays	C0-C737	V40600-V40635
Stages	S0-S577	V41000-V41027
Timer Relays	T0-T177 (Read Only)	V41100-V41107 (Read Only)
Counter Relays	CT0-CT177 (Read Only)	V41140-V41147 (Read Only)
Special Relays	SP0-SP137 (Read Only)	V41200-V41205 (Read Only)
Special Relays	SP320-SP617 (Read Only)	V41215-V41230 (Read Only)

Memory Ranges for the 305 Series Driver

The 305 Series driver supports the following memory types and ranges.

Memory Type	PLC Type		
16-Bit Word	**315**	**325**	**330**
Timer/Counter Acc	AC600-AC624*	AC600-AC677	AC600-AC677
Data Registers	Not Supported	R400-R577	R400-R577

Memory Type	PLC Type		
Byte or Bit	**315**	**325**	**330**
Timer*	T600-T624**	T600-T677	T600-T677
Timer/Counter*	TC600-TC624	TC600-TC677	TC600-TC677
Counter*	C600-C624**	C600-C677	C600-C677
Input/Output	IO000-IO017* IO20-IO357 IO360-IO377**	IO000-IO373 IO374-IO377* IO400-IO577 IO700-IO777	IO000-IO373 IO374-IO377* IO400-IO577 IO700-IO777
Stage	SG000-SG137	SG000-SG173 SG174-SG177*	SG000-SG173 SG174-SG177*
Data Registers*	Not Supported	R400-R577	R400-R577

* Read Only

** Not Available

Note: When using the 315 model, updates may take up to two minutes. The slow update times are due to limitations within the 315 model not the Operator Station.

Note: For models 325 and 330, byte IO370 and SG170 are read only.

Possible Configurations

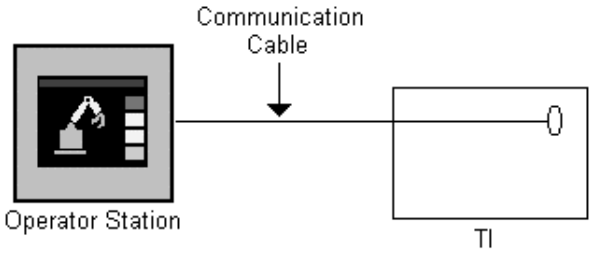
2

In this chapter, you will learn:

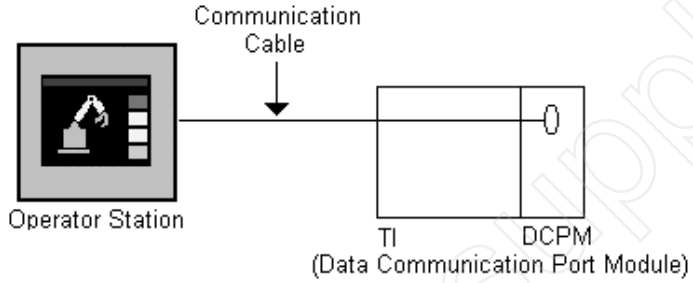
- *How to connect an operator station to Texas Instruments PLCs*

Direct Connection

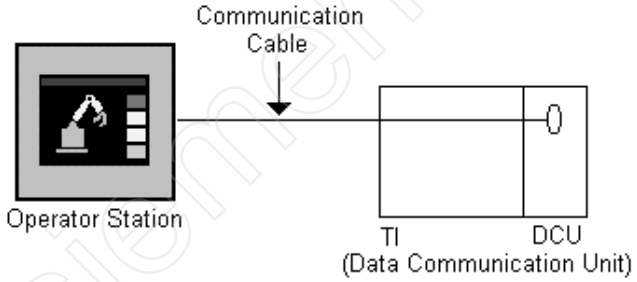
See the TI manual for your PLC to set the baud rate for the port on the CPU.



Connection to a DCPM



Connection to a DCU



Cabling

3

In this chapter, you will learn:

- *The cabling requirements for Texas Instruments PLCs*

Communication between the Operator Station and the TI PLCs

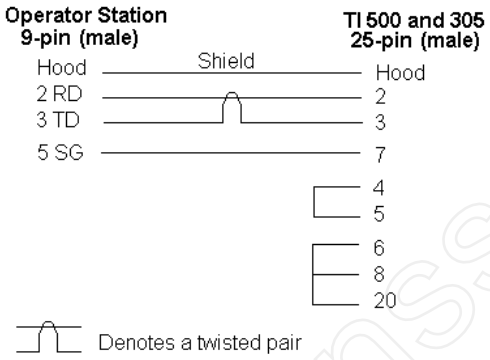
Communications between the Operator Station and TI 500 PLCs is achieved via RS232. Communications between the 405 and 305 PLCs can be achieved via RS232 or RS422. The maximum cable length when using RS232 is 50 feet, while the maximum cable length for RS422 is 4000 feet. RS422 cable must be a twisted double-wire shielded cable.

A 15-foot PLC cable can be purchased from Cutler-Hammer. Contact the Customer Support Group (see the Customer Support section in the Preface,) or your local distributor for more information. Refer to the PLC Cabling Cross-Reference List section for cabling catalog numbers.

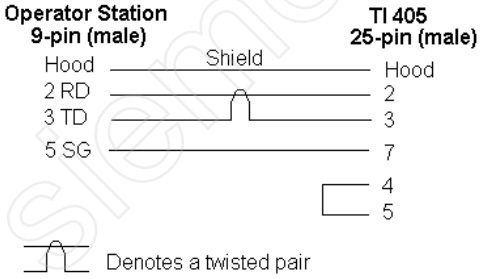
RS232C Cabling for TI PLCs

Cable Catalog Number: TI21

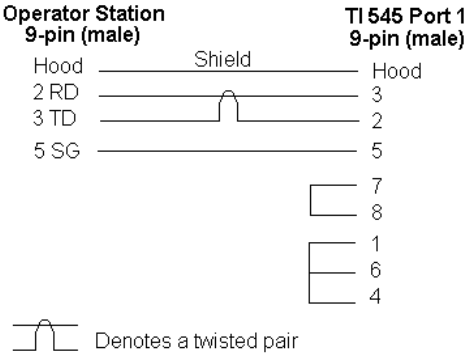
The Operator Stations that have 9-pin female connectors (DP-9S) must have cables configured male connectors (DB-9P).



Cable Catalog Number: TI22

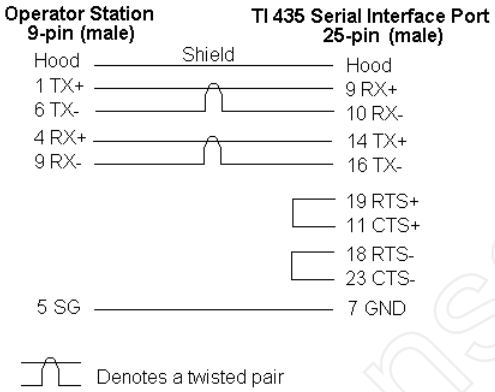


Cable Catalog Number: TI23

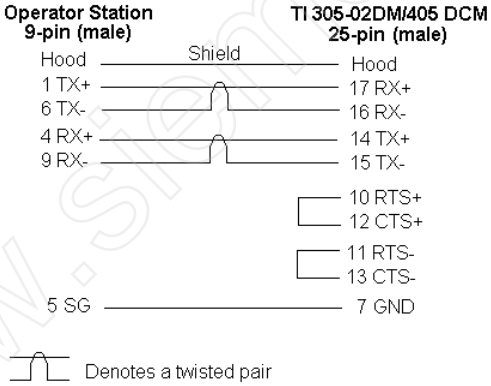


RS422 Cabling for TI 305, 405, 435, 505, 545, and 555 PLCs

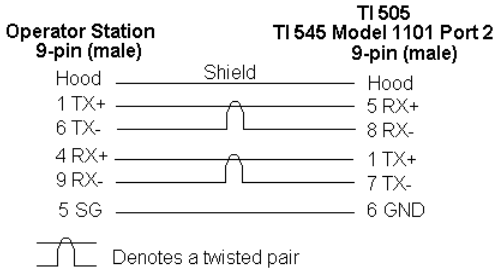
Cable Catalog Number: TI24A



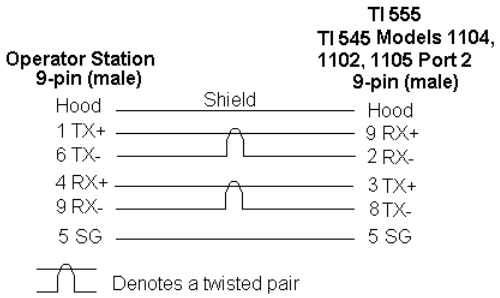
Cable Catalog Number: TI25A



Cable Catalog Number: TI26A

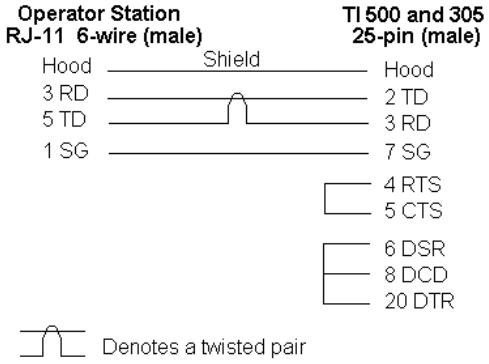


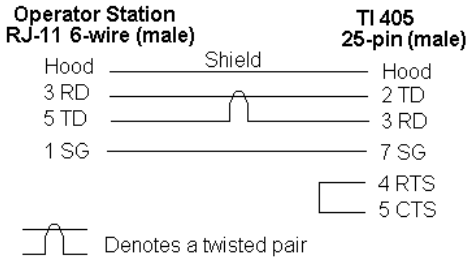
Cable Catalog Number: TI27A

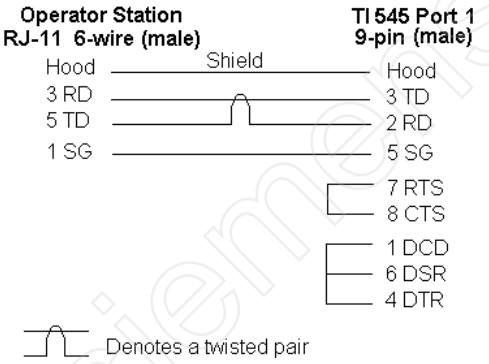


RS232C Cabling for TI PLCs

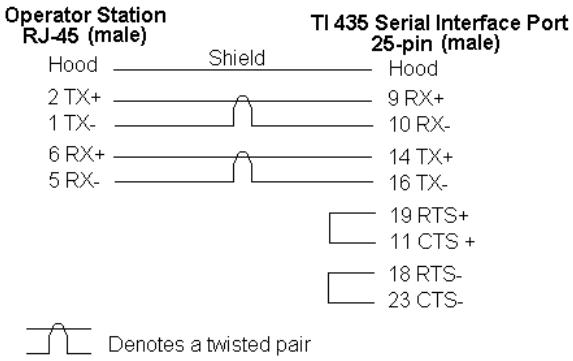
The Operator Stations that have RJ-11 6-wire and RJ-45 modular jacks must have cables configured with modular connections.

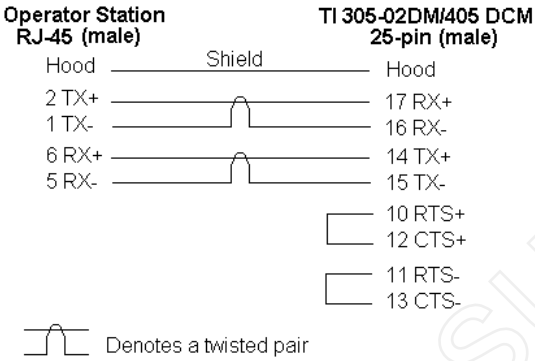


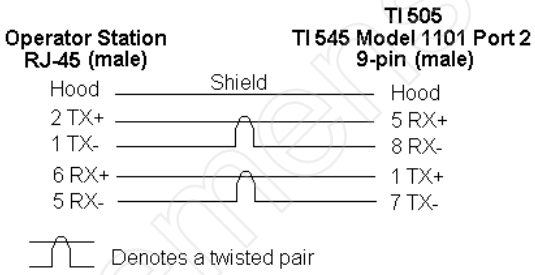


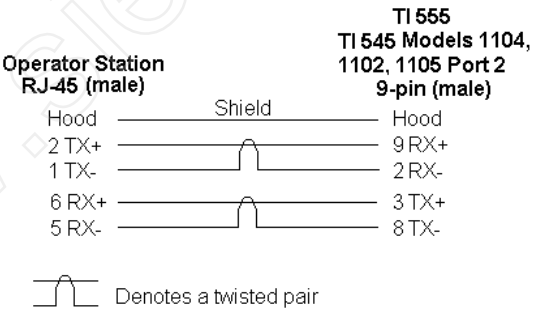


RS422 Cabling for TI 405, 305, and 545 PLCs









Communication Parameters

4

In this chapter, you will learn:

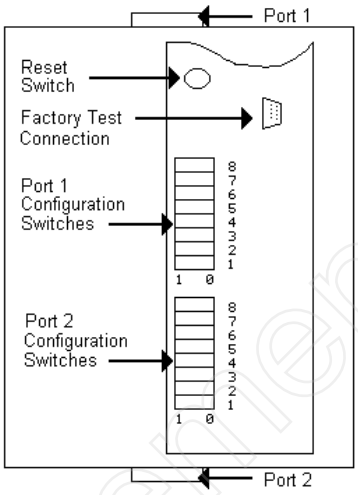
- *The different switch settings*

Dual Communication Port Module TI 500 Series

The Dual Communication Port Module (DCPM) has two RS232/423 ports that work independently and permit simultaneous communication. The Operator Station does not support RS423. RS232 must be used for communications. The two ports are identical to the programming port on the PLC. All communication is serial with one stop bit at all baud rates, except at 110 baud, which has two stop bits. The ports may be configured for a baud rate ranging from 110 to 19.2K, and also for DTE or DCE mode. Standard communication parameters for communicating with TI PLCs are shown below. These parameters are given only as a starting point and may be changed to meet the demands of your application.

7 Data Bits
1 Stop Bit
Odd Parity
9600 Baud

Under the front access cover are two dipswitch banks. The upper dipswitch bank is for configuring port 1, while the lower dipswitch bank is for configuring port 2. The configuration switches are shown in the following figure.



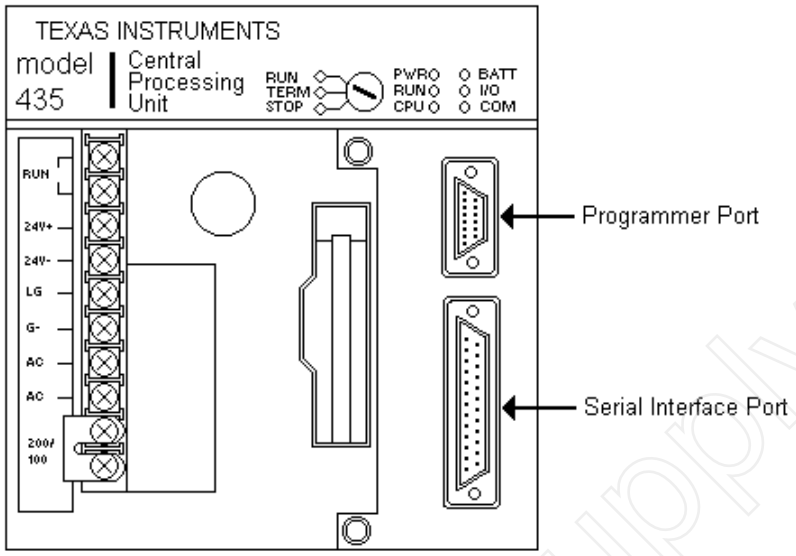
Dipswitch Bank Locations

Set switch 4 to the 1 position to select DTE mode or into the 0 position to select DCE mode. Switches 5 through 8 are not used. The Baud Rate Selection table is shown below.

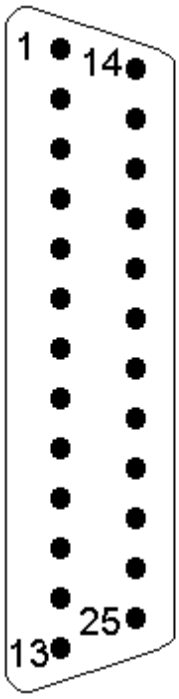
Baud Rate	110	300	600	1200	2400	4800	9600	19.2K
Switch 1	0	1	0	1	0	1	0	1
Switch 2	0	0	1	1	0	0	1	1
Switch 3	0	0	0	0	1	1	1	1

Serial Interface Port TI 435 PLC

The Serial Interface Port enables the TI 435 PLC to interface directly to the Operator Station. The figure below shows the TI 435 Serial Interface Port.



The table below shows the pinouts for the Serial Interface Port.



Pin	Name	Pin	Name
1	Not Used	14	TXD+
2	TXD	15	Not Used
3	RXD	16	TXD-
4	RTS	17	Not Used
5	CTS	18	RTS-
6	Not Used	19	RTS+
7	SG	20	Not Used
8	Not Used	21	Not Used
9	RXD+	22	Not Used
10	RXD-	23	CTS-
11	CTS+	24	Not Used
12	Not Used	25	Not Used

Communication to the TI 435 is through the Host Link Protocol in Master/Slave mode. The Operator Station uses hexadecimal data protocol, not ASCII. Note that the data protocol and parity are set with the TI programming software in the Auxiliary Function 26, Set Secondary Address. Standard communication parameters for communicating directly with the TI 435 Serial Interface Port are shown below.

8 Data Bits
1 Stop Bit
Odd Parity
300 to 19200 Baud Rate*

* The baud rate is dipswitch selectable.

Dipswitch Settings

The dipswitch block is located at the rear of the CPU. The table below summarizes the dipswitch settings for the CPU dipswitch.

Switch	ON	OFF
SW1	CPU Battery	CPU battery enabled
SW2	Station Address is 1	Station address is set via MIU (Machine Interface Unit) or programming software
SW3	Baud rate selection for Serial Interface Port	
SW4	Baud rate selection for Serial Interface Port	

Dipswitch Settings for Baud Rate

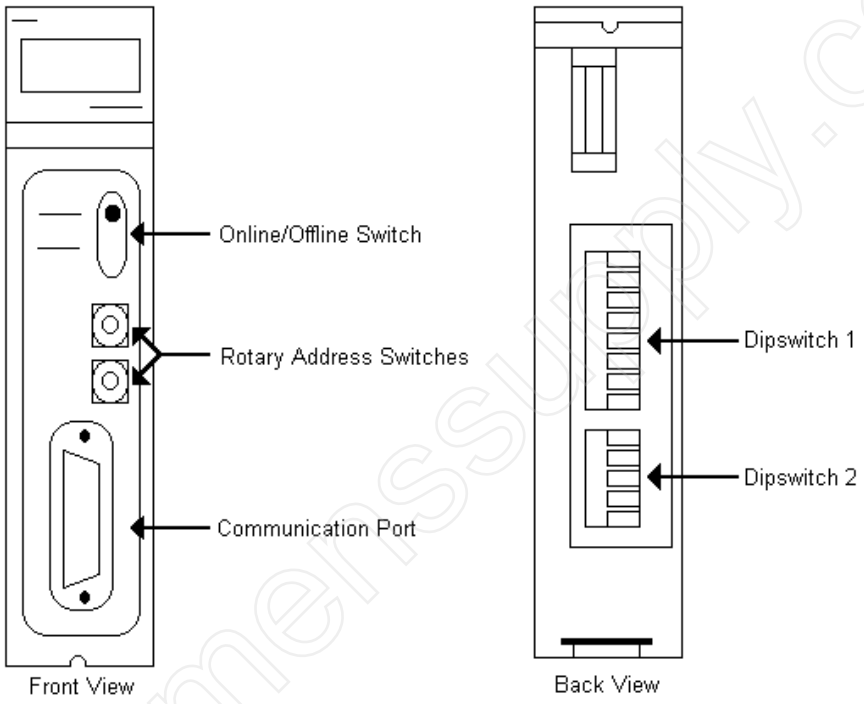
SW3 and SW4 on the dipswitch control the baud rate at which the Serial Interface Port will operate. Refer to the table below for the baud rates corresponding to the settings of SW3 and SW4.

Baud	SW3	SW4
300	Off	Off
1200	Off	On
9600	On	Off
19200	On	On

Data Communication Module (DCM) TI 405 Series

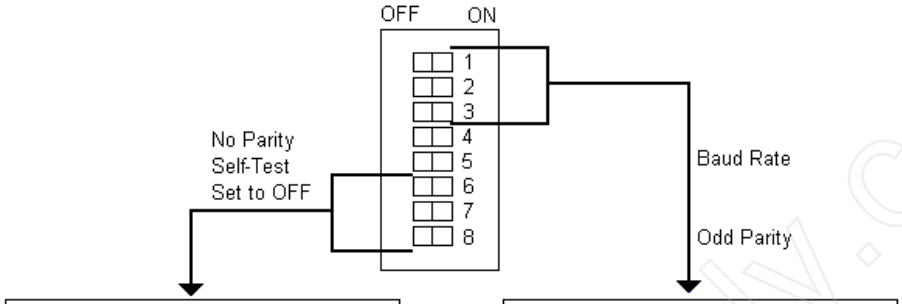
The Data Communication Module (DCM) enables the TI Series 405 PLCs to interface with the Operator Station. The DCM supports the Hostlink protocol either Master/Slave or Peer-to-Peer. In the Master/Slave configuration, the Operator Station will be the Master device and the DCM will be the slave device in both the Point-to-Point and the Multidrop configurations. The DCM has a serial connection that will connect to the multi-drop network or directly point-to-point to the Operator Station.

Switch Locations



There are two rotary switches on the DCM that select the network address of the PLC. This address must match the assigned PLC ID in the PLC Name and Port Table. There are two dipswitches located on the DCM. Dipswitch 1 sets the communication parameters. Switches 1, 2, and 3 of dipswitch 1 select the baud rate. Switch 4 sets the parity. Switch 5 must be set to OFF. Switches 6 through 8 set the Response Time Delay. This should be set to 0ms.

Dipswitch 1



SWITCH POSITION			
TIME	6	7	8
0	OFF	OFF	OFF
2	ON	OFF	OFF
5	OFF	ON	OFF
10	ON	ON	OFF
20	OFF	OFF	ON
50	ON	OFF	ON
100	OFF	ON	ON
500	ON	ON	OFF

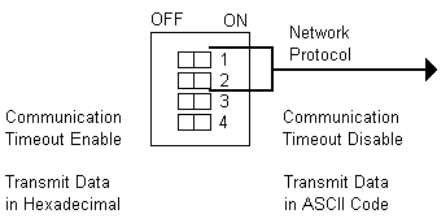
SWITCH POSITION			
BAUD	1	2	3
300	ON	OFF	OFF
600	OFF	ON	OFF
1200	ON	ON	OFF
2400	OFF	OFF	ON
4800	ON	OFF	ON
9600	OFF	ON	ON
19200	ON	ON	ON
38400	OFF	OFF	OFF

Dipswitch 2 sets the communication protocol and communication functions. Switch 1 and 2 select the protocol to be used. The following table shows the valid switch setting for the Operator Station Interface.

Operator Station Port	Protocol	Switch 1	Switch 2
TI-HL/M	Hostlink Slave	OFF	OFF
TI-HL/P	Hostlink P/P	ON	OFF

Switch 3 and 4 of dipswitch 2 should be set to OFF to enable communication timeout and to allow data to be transmitted in hexadecimal.

Dipswitch 2



	SWITCH POSITION	
PROTOCOL	1	2
HOSTLINK SLAVE	OFF	OFF
HOSTLINK MASTER	OFF	ON
HOSTLINK PEER-TO-PEER	ON	OFF
MODBUS RTU	ON	ON

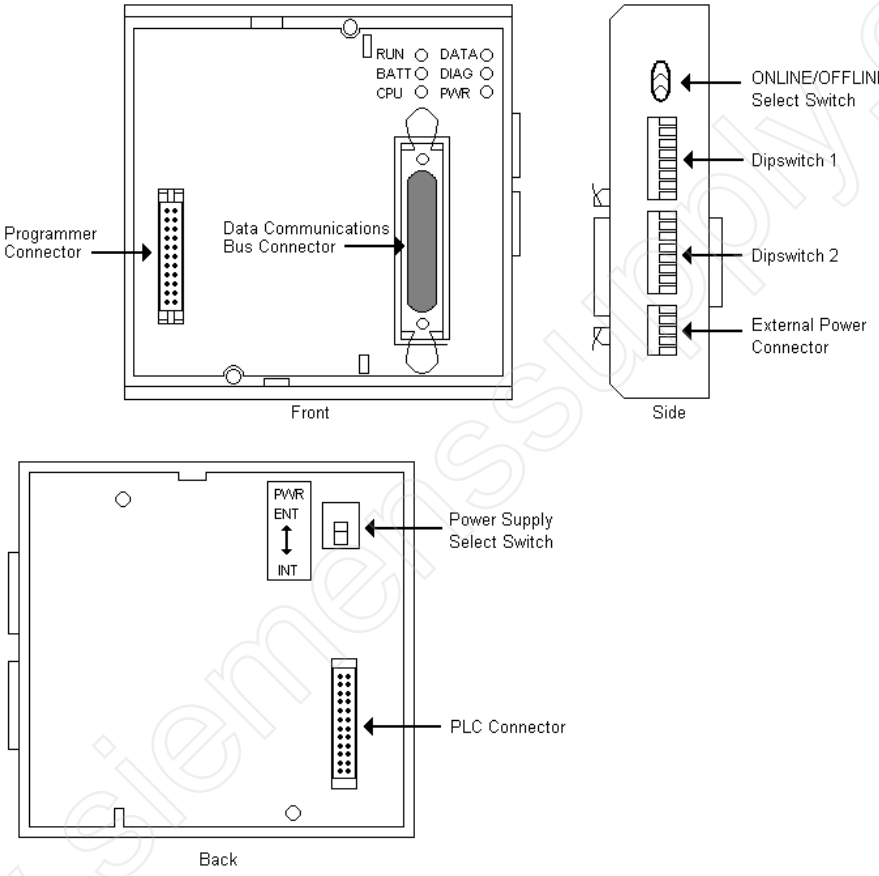
The following parameters are the default port characteristics of the DCM.

RS422
8 Data Bits
1 Stop Bit
Odd Parity
Baud Rate 9600
Master-Slave

Data Communication Unit (DCU) TI 305 Series

The Data Communication Unit (DCU) enables the TI Series 305 PLCs to interface with external devices. The DCU only supports the master/slave protocol. The Operator Station will be the master device and the DCU will be the slave. When selecting a port use in the PLC Name and Port Parameters Table, use TI-HL/M (Texas Instruments Hostlink master/slave). The two DCU models are 305-02DM and 305-03DM. The 305-02DM has one RS422 port and can be multi-dropped from a network with up to 90 (405 or 305) controllers. This model also supports a point-to-point connection. The 305-03DM has one RS232 port and must use a point-to-point connection.

Data Communications Unit



There are two dipswitches located on the DCU. Dipswitch 1 selects the baud rate and internal functions. Switches 1 and 2 of dipswitch 1 select the baud rate. Switches 3 through 8 select the internal functions of dipswitch 1. See the following tables for the recommended settings.

Baud Rate Settings for Dipswitch 1

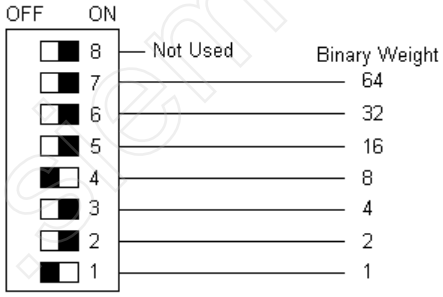
Baud Rate	Switch 1	Switch 2
300	Off	Off
1200	On	Off
9600	Off	On
19200	On	On

Internal Function Settings for Dipswitch 1

Switch	Function	Setting
3	Parity	Odd or None
4	Self-Diagnostic	Operate
5	Turn-Around Delay	No Delay
6	Mode at Power Up	PGM or Run
7	Not Used	
8	Transmission Mode	HEX

Dipswitch 2 sets the slave address of the PLC. This must match the PLC ID in the PLC Name and Port Parameters Table. The station number can be any number from 1 to 90. The switches are set in binary with switch 1 representing the least significant bit. See the figure below for an example of dipswitch 2 with the station number set to 9.

Dipswitch 2



Bit Writes with Ladder Logic – 405 Series

The Texas Instruments Hostlink Protocol does not permit an external intelligent device to directly alter the state of a single bit without over-writing the entire byte in which that bit exists. As a result, the Operator Station will write values to designated registers in the PLC, specifying which bit should be set or cleared. It is necessary to write a section of Ladder Logic/Stage Programming to interpret this value in order to change the appropriate bit. The Operator Station will write to four V memory registers to set or reset a bit. The four registers will be consecutive starting with the Bit Write register entered in the PLC ID field. If a Bit Write register is not entered, the register will default to V7374. When the default register is used, V7374, V7375, V7376 and V7377 will be used to accomplish the Bit Writes.

Register 1 This register contains a 16-bit mask in which the bit position to be set will be set to 1 and all other bits will be set to 0.

Register 2 Each memory type has a corresponding V memory address. Register 2 contains the V memory address in which the bit to be set is located.

Register 3 This register contains a 16-bit mask in which the bit position to be reset will be set to 0 and all other bits will be set to 1.

Register 4 This register contains the V memory address in which the bit to be reset is located.

PLC ID

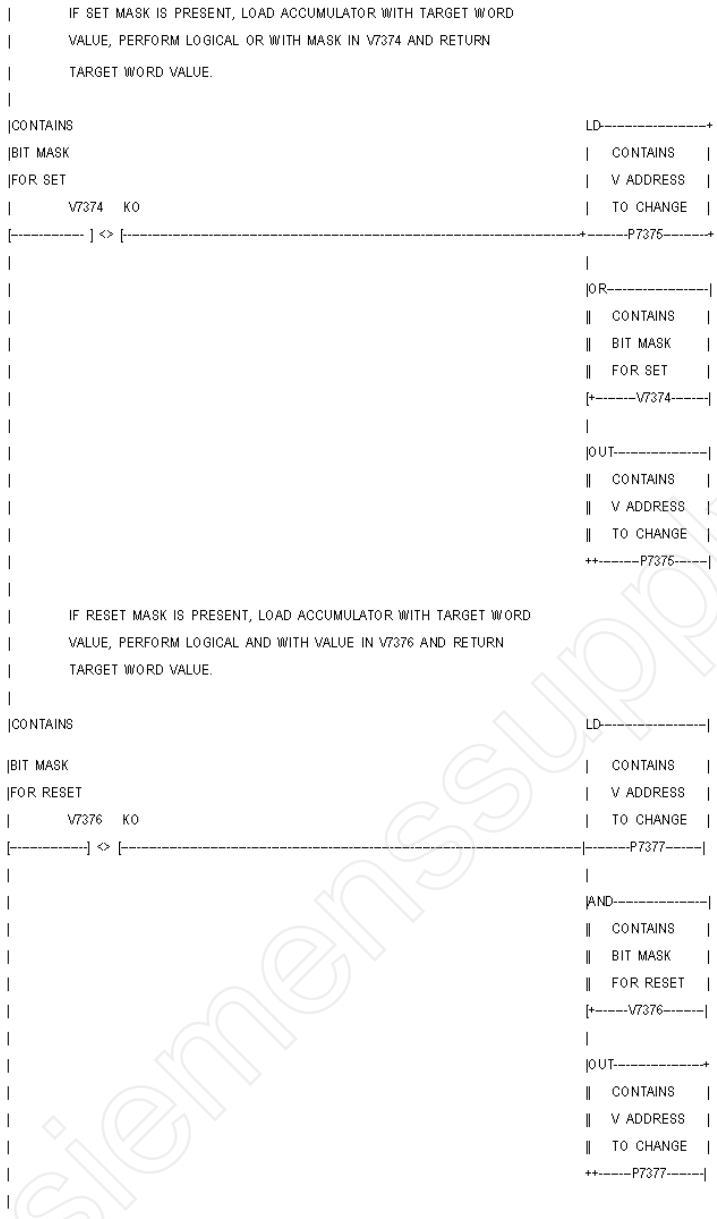
The format for the PLC ID for TI 405 will include both the PLC ID and a memory register used for the four Bit Write registers. The format will be the PLC ID followed by the memory address.

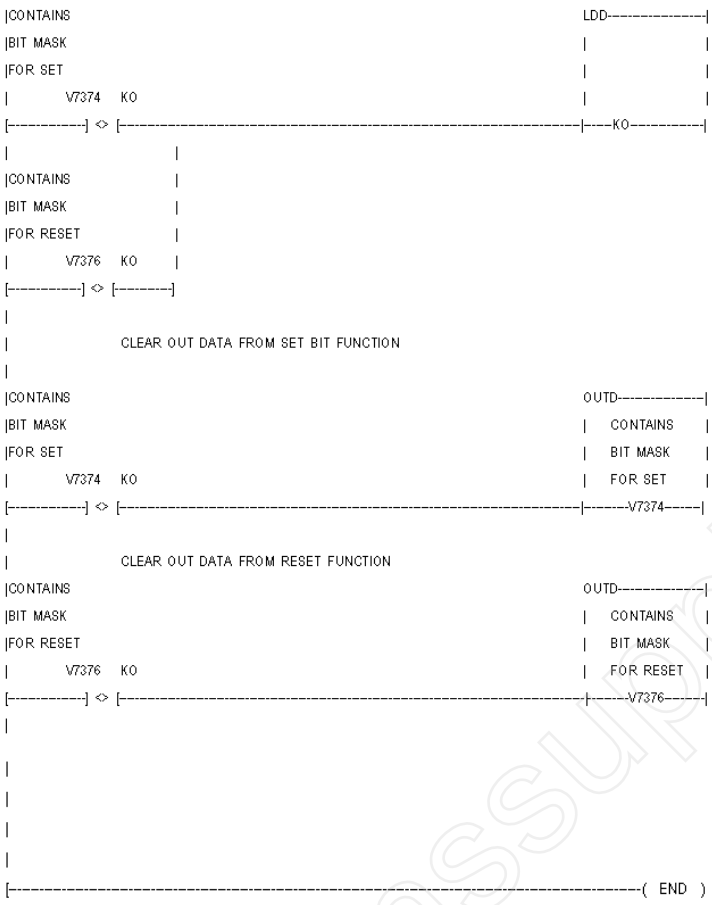
XX-VYYYYY or XX-YYYYY or XX

Where

XX	PLC ID in range 1 - 90
-	PLC ID/memory address separator
V	Optional memory type specifier
YYYYY	Optional starting with V memory address in range 1400 -7374

If a memory address is not entered, the Bit Write register will default to V7374. The following ladder logic rungs may be added to a TI 405 program for the purpose of setting and clearing individual bits.





Bit Writes with Ladder Logic – Model 315

The Texas Instruments Hostlink Protocol does not permit an external intelligent device to directly alter the state of a single bit without over-writing the entire byte in which the bit exists. As a result, the Operator Station will write values to designated registers in the PLC, specifying which bit should be set or cleared. A section of Ladder Logic/Stage Programming is necessary to interpret this value in order to change the appropriate bit. The Operator Station will write to two consecutive bit/byte memory registers to set or reset a bit. The starting register that the Operator Station will write to, is determined by the register entered in the PLC ID field. If a Bit Write register is not entered, the register will default to IO340. When the default register is entered, the register will default to IO340. When the default register is used, bytes IO340 and IO350 will be used to accomplish bit writes.

The following describes the values that will be written to the memory addresses:

Byte 1 This byte will be used to set bits 0-177. To set a particular bit, the actual bit number (octal) will be sent to this byte value. To reset the same bit, the bit number (octal) plus 200 (octal) will be sent to this byte value.

Byte 2 This byte will be used to set bits 200-373. To set a particular bit, the actual bit number (octal) minus 200 (octal) will be sent to this byte value. To reset the same bit, the bit number will be sent to this byte value.

Two rungs of ladder logic will be required for each bit write. Each rung will test the individual bits within the specified byte memory location for the bit pattern expected from the Operator Station. If the rung is true, the logic will set or reset a particular bit as required.

PLC ID

The format for the PLC ID for the model 315 will include both the PLC ID and a memory register used for the two Bit Write registers. The format will be the PLC ID followed by the memory address.

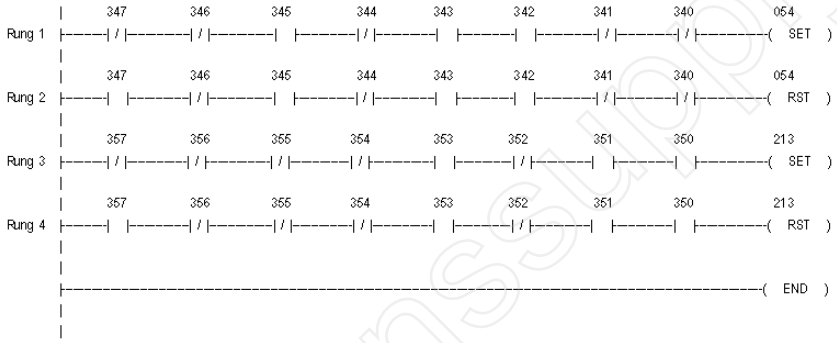
XX-IOYYY or XX-YYY or XX

Where

XX	PLC ID in range 1-90
-	PLC ID/memory address separator
IO	Optional memory type
YYY	Optional Starting IO byte memory address in range 0-340.

Note: In the PLC ID field, IO will default to a byte address.

The memory address must be on an 8-bit boundary. If an IO memory address is not entered, the Bit Write register will default to IO340. The following ladder logic rungs are an example of setting and clearing bits that may be added to a model 315 program for the purpose of setting and clearing individual bits.



Example 1:

With a bit write to IO054, the Operator Station will write 54 octal (44 decimal). Rung 1 tests for bit pattern 0010 1100 in byte IO340 and set IO054.

The Operator Station will also write 254 octal (172 decimal) to byte IO340. Rung 2 tests for bit pattern 1010 1100 in byte IO340 and resets IO054.

Example 2:

With a bit write to IO213, the Operator Station will write 13 octal (11 decimal). Rung 3 tests for bit pattern 0000 1011 in byte IO350 and sets IO213.

The Operator Station will also write 213 octal (139 decimal) to byte IO350. Rung 4 tests for bit pattern 1000 1011 in byte IO350 and re-sets IO213.

Bit Writes with Ladder Logic – Models 325 and 330

The Texas Instrument Hostlink Protocol does not permit an external intelligent device to directly alter the state of a single bit without overwriting the entire byte in which that bit exists. As a result, the Operator Station will write to a designated register in the PLC, specifying which bit should be set or cleared. A section of Ladder Logic Programming is necessary to be written to interpret this value in order to change the appropriate bit. The starting register that Operator Station will write to is determined by the register entered in the PLC ID field. If a Bit Write register is not entered, the register will default to AC677.

To set a bit, the bit number will be sent to the Bit Write register. To reset a bit, the bit number (decimal) + 1000 (decimal) will be sent to the Bit Write register.

Two rungs of ladder logic will be required for each bit write. Each rung will test the specified register for the expected value from an Operator Station. If the rung is true, the logic will set or rest a particular bit as required.

PLC ID

The format for the PLC ID for models 325 and 330 will include both the PLC ID and a memory register sued for the Bit Write register. The format will be the PLC ID followed by the memory address.

XX-ACYYY or XX-YYY or XX

Where

XX	PLC ID in range 1-90
-	PLC ID/memory specifier
AC	Optional memory type
YYY	Optional starting AC memory address in range 600-677

If an AC memory address in not entered, the Bit Write register will default to AC677. The following ladder logic rungs are an example of setting or clearing bits that may be added to models 325 and 330 program for the purpose of setting and clearing individual bits

Word and Bit References

5

In this chapter, you will learn:

- *How to configure word and bit references*

Word Referencing Method

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.

TI 500 Series Word and Bit References

Texas Instruments 520, 530, 560, and 565 PLCs use decimal word addresses. The Operator Station format default is U16.

The following is the format for an output reference.

[YY]

YY Place reference number of the output.

TI 405 Series Word, Byte, and Bit References

Texas Instruments 405 PLCs use octal word addresses. The Operator Station format default is U16. The following is the format for a register reference.

[XY]

X	Memory type (TMR, CNT, and V)
Y	Word address (leading zeroes not required)

To reference a byte value, the memory address must be on an 8-bit boundary. The following is the format for an 8-bit (byte) reference.

[B:XY]

B	Designating byte reference
:	Byte designator/byte address separator
X	Memory type (GX, X, Y, C, S, T, CT, and SP)
Y	Byte address

The following is the format for a bit referenced within a word.

[XY/B]

X	Memory type (TMR, CNT, and V)
Y	Word address (leading zeroes not required)
B	Bit number in the range (0-17 in octal)

The following is the format for a single bit reference (device).

[XY]

X	Memory type (GX, S, Y, C, S, T, CT, and SP)
Y	Bit address (leading zeroes not required)

TI 305 Series Word and Bit References

Texas Instruments 305 PLCs use octal word addresses. The Operator Station format default is U16. The following is the format for a register reference.

[XY]

X	Memory type (AC and R - for 325 and 330 models)
Y	Word address (leading zeroes not required)

Note: The Data Register (R) is 8-bits with this format.

The following is the format for a 16-bit data register reference.

[W:RY]

W	Designating 16-bit word reference
:	16-bit designator/address separator
R	Data register specifier
Y	Word address

To reference a byte value, the memory address must be on an 8-bit boundary. The following is the format for an 8-bit (byte) reference

[B:XY]

B	Designating byte reference
:	Byte designator/byte address separator
X	Memory type (IO, T, TC, C, and SG)
Y	Byte address

Note: Write restrictions that apply to each bit memory type also apply to the byte references. Byte IO370 is read only.

The following is the format for a bit referenced within a word.

[XY/B]

X	Memory type (AC and R - for 325 and 330 models)
Y	Word address (leading zeroes not required)
/	Delimiter to separate bit number
B	Bit number in the range (0-17, 0-7 for Data Register)

or

[W:RY/B]

W	Designating word reference
:	Word designator/address separator
R	Memory type (R - for 325 and 330 models)
Y	Word address
/	Delimiter to separate bit number
B	Bit number in the range (0-17)

The following is the format for a single bit reference (device).

[XY]

X	Memory type (IO, T, TC C, and SG)
Y	Bit address (leading zeroes not required)

Examples

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

500 Series

Word References	
Reference	**Description**
[WX12]	Word image register 12
[WY18]	Word image register 18
[V22]	V Word memory 22
[DSP12]	Drum step preset 12
[DSC15]	Word 15 of drum step current memory
[DCC9]	Word 9 of drum count current memory
[TCP4]	Word 4 of timer/counter preset memory
[TCC19]	Word 19 of timer/counter current memory
[LPV34]	Word 34 of loop process variable
[LMN43]	Output word 43
[LSP44]	Setpoint word 44
[LMX61]	Bias word 61

Bit References	
Reference	**Description**
[X520]	Bit 520 of a discrete image register
[Y680]	Bit 680 of a discrete image register
[C7123]	Bit 7123 of a discrete image register
[DCP30 16]	Step 16 of drum 30 of drum count preset memory

405 Series

Word References	
Reference	**Description**
[TMR11]	Timer register 12
[CNT30]	Counter register 30
[V24]	User Data register 22

Byte References	
Reference	**Description**
[B:GX10]	Remote I/O register 10
[B:X20]	Input register 20
[B:Y100]	Output register 100
[B:C30]	Control relay register 30
[B:S40]	Stage register 40
[B:T50]	Timer relay register 50
[B:CT170]	Counter relay register 170
[B:SP0]	Special relay register 0

Bit References	
Reference	**Description**
[GX12]	Bit 12 of remote I/O memory
[X315]	Bit 315 of input memory
[CNT.50/10]	Bit 10 of counter word 150

305 Series

Word References	
Reference	**Description**
[AC614]	Timer/Counter register 614
[W:R502]	Data register 502 (325 or 330 models only)

Byte References	
Reference	**Description**
[R12]	Data register 12 (325 or 330 models only)
[B:T611]	Timer register 611
[B:SG20]	Stage register 20

Bit References	
Reference	**Description**
[IO12]	Input/Output register 12
[T617]	Timer element 617
[C622]	Counter element 622
[TC600]	Timer/Counter element 600
[SG43]	Stage element 43
[W:R510/11]	Bit 11 of data register 510 (325 or 330 models only)
[AC613/17]	Bit 17 of timer accumulator word 613

Maintenance Access

6

In this chapter, you will learn:

- *How to use the Maintenance Template*

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. The Maintenance Template is designed to assist you in specifying the PLC reference by scrolling through a list of mnemonics that are used to enter the PLC word reference. When online in the PLC reference change mode, the following list is available.

TI 305 "AC", "R", "IO", "T", "C", "TC", "SG", "W", "B:", and "/"

TI 405 "TMR", "CNT", "V", "GX", "X", "Y", "C", "S", "T", "CT","SP", "B:", and "/"

TI 500 "X", "Y", "WX", "WY", "C", "V", "DSP", "DSC", "DCP","DCC", "TCP", "TCC", "LPV", "LMN", "LSP", and "LMX"

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 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 key 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.)

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

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