PanelMate®
GE Fanuc Communication
Driver Manual

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

Preface

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Support Services

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The latest Cutler-Hammer product information, specifications, technical notes and company news are available to you via fax through this direct document request service. Using a touch-tone phone, you can select any of the info faxes from our automated product literature and technical document library, enter a fax number and receive the information immediately.

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If you have questions regarding the repair or upgrade of an OI/IPC, contact your local distributor. Additional support is also available from our well-equipped Repair and Upgrade Service department.

European PanelMate Support Center

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EMAIL: CHSupport@bfa.ch

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 GE Fanuc Driver supports the Series Five, Series Six, Series Six Plus, and the Series 90 models.

All models support the master/slave protocol that allows only one node to be the master (Operator Station). The master is the only device which can initiate communications. The Series Six and Series Six Plus models also support the peer/peer protocol that allows either device to initiate communications. The port use selections available in the PLC Name and Port Table are GE M/S (for models S5, S6, S6+, S6+WBit), GE P/P (for models S6, S6+, S6+WBit), and GE S-90 (for models 311, 331, 731, 732, 771, 772, 781, and 782). Note that there are two GE S-90 drivers. The GE-90P driver is used for point-to-point communication and the GE-90N is used for network communication.

The Series Six Plus with bit write model selection (S6+WBit) in the PLC Name and Port Table supports both the Series Six and the Series Six Plus PLCs that have a CCM2 or CCM3 card with bit write capability. In all other cases, use the driver for your specific PLC. For example, always use the S5 model selection with Series Five PLCs and the 771 model selection with the Series 90-70 model 771 PLC.

Installing Drivers

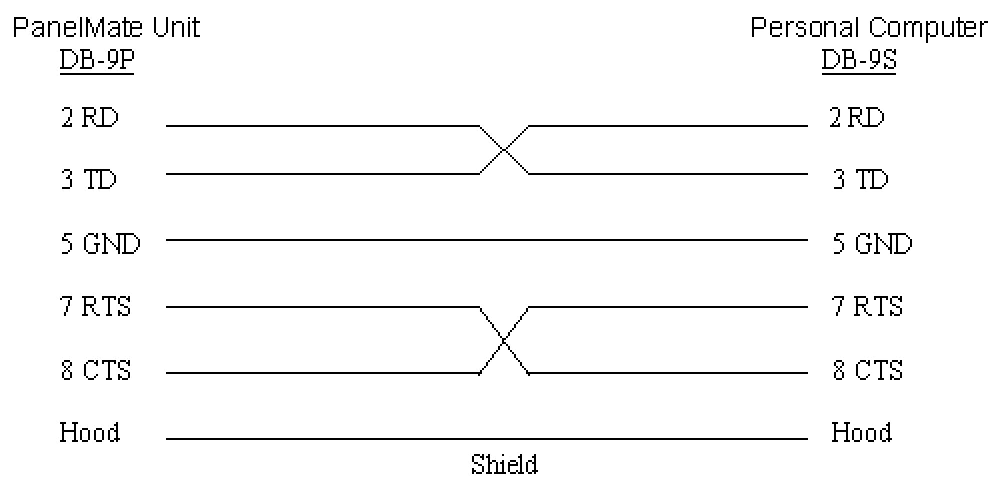
PanelMate Configuration Editor software is installed using a CD-ROM. To install the drivers from the CD-ROM, select the **Install Software** option and then **Install Drivers**. From the dialog box, select the driver you wish to install.

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.*

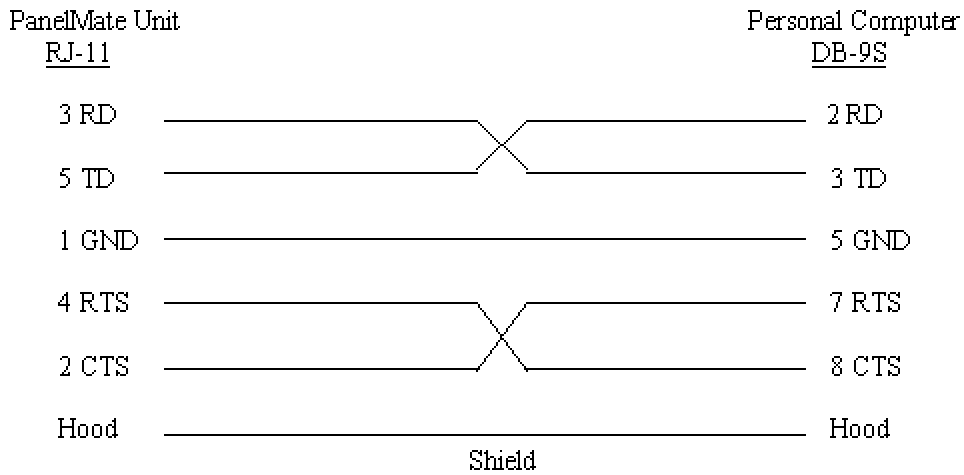
Serial Transfer Cables



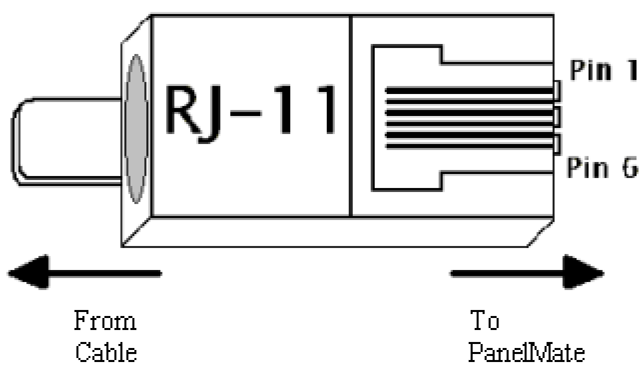
Cable P/N 0518

Cable P/N 0818

(PanelMate Power Series 1500 and PanelMate 500 only)



RJ-11 pin configuration



Memory

The GE Series 5, 6 and 6+ driver supports the following memory types:

Memory Type	Memory Address
16-Bit Word	
R	Register
Bit	
AI	Auxiliary input
AO	Auxiliary output
I	Input
O	Output
Ix+yyyy	Expanded input channels
Ix-yyyy	Expanded input channels
Ox+yyyy	Expanded output channels
Ox-yyyy	Expanded output channels

Where:
x = channel numbers 1-7 and 9-F (0 and 8 are not available for Ix+yyyy and Ox+yyyy)
yyyy = bit number 1-1024

The GE Fanuc Series 90 driver supports the following memory types:

Memory Type	Memory Address
16-Bit Word	
%AI	Analog inputs
%AQ	Analog outputs
%R	Data registers

Memory Type	Memory Address
Byte or Bit	
%I	Discrete machine inputs
%Q	Discrete machine outputs
%M	Discrete internal coils
%T	Discrete temporary internal coils
%G	Genius global data
%S	System memory - Read Only
%SA	System memory
%SB	System memory
%SC	System memory

The following table shows the relationship between the I/O references and registers.

Real I/O Points		
Register	**I/O Reference**	
R0001	AO0001- AO1024	AUX
R0065	AI0001- A11024	AUX
R0129	O1+00001- O1+1024	M
R0193	I1+0001- I1+1024	A
R0257	O2+0001- O2+1024	I
R0321	I2 + 0001- I2 +1024	N
R0385	O3 + 0001- O3+1024	
R0449	I3 + 0001- I3 +1024	I
R0513	O4 + 0001- O4 + 1024	O
R0577	I4 + 0001- I4 +1024	
R0641	O5+0001- O5+1024	C
R0705	I5 + 0001- I5 +1024	H
R0769	O6+0001- O6+1024	A
R0833	I6 + 0001- I6 +1024	I
R0897	O7+ 0001- O7+1024	N
R0961	I7 + 0001- I7 +1024	
R1025	User Register	
R1089	User Register	
R1153	O9+0001- O9+1024	A
R1217	I9 +0001- I9 +1024	U
R1281	OA+0001- OA+1024	X
R1345	IA +0001- IA +1024	
R1409	OB+0001- OB+1024	I
R1473	IB + 0001- IB +1024	O
R1537	OC+ 0001- OC+1024	
R1601	IC +0001- IC +1024	C
R1665	OD+0001- OD+024	H
R1729	ID +0001- ID +1024	A
R1793	OE+0001- OE+024	I
R1857	IE +0001- IE +1024	N
R1921	OF+0001- OF+024	
R1985	IF +0001- IF +1024	

Internal Discreet References	
Register	**I/O Reference**
R2049	O0-0001- O0-1024
R2113	I0-0001- I0-1024
R2177	O1-0001- O1-1024
R2241	I1-0001- I1-1024
R2305	O2-0001- O2-1024
R2369	I2-0001- I2-1024
R2433	O3-0001- O3-1024
R2497	I3-0001- I3-1024
R2561	O4-0001- O4-1024
R2625	I4-0001- I4-1024
R2689	O5-0001- O5-1024
R2753	I5-0001- I5-1024
R2817	O6-0001- O6-1024
R2881	I6-0001- I6-1024
R2945	O7-0001- O7-1024
R3009	I7-0001- I7-1024
R3073	O8-0001- O8-1024
R3137	I8-0001- I8-1024
R3201	O9-0001- O9-1024
R3265	I9-0001- I9-1024
R3329	OA-0001- OA-1024
R3393	IA-0001- IA-1024
R3457	OB-0001- OB-1024
R3521	IB-0001- IB-1024
R3585	OC-0001- OC-1024
R3649	IC-0001- IC-1024
R3713	OD-0001- OD-1024
R3777	ID-0001- ID-1024
R3841	OE-0001- OE-1024
R3905	IE-0001- IE-1024
R3969	OF-0001- OF-1024
R4033	IF-0001- IF-1024

Possible Configurations

2

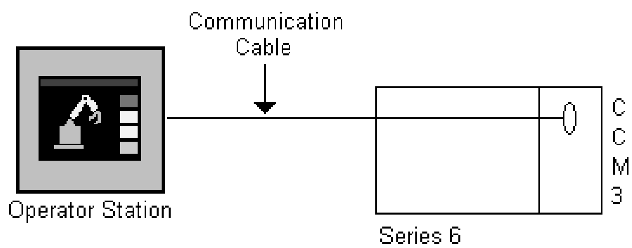
In this chapter, you will learn:

- *How to connect an operator station to GE Fanuc PLCs*

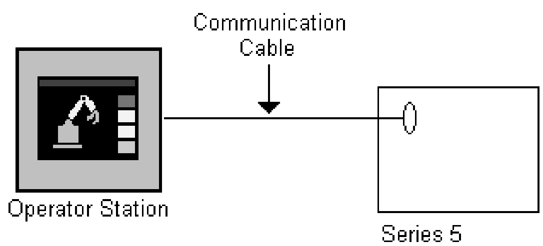
Direct Connection to One GE Fanuc PLC

Direct connection between one Operator Station and one GE Fanuc PLC. Either master/slave or peer-to-peer protocol may be used. **Note** that there are two GE Fanuc S-90 drivers. For point-to-point communication, use the GE-90P driver. When communicating on a network, use the GE-90N driver.

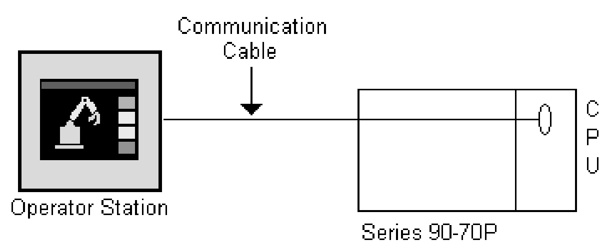
Direct Connection to the Series 6



Direct Connection to the Series 5

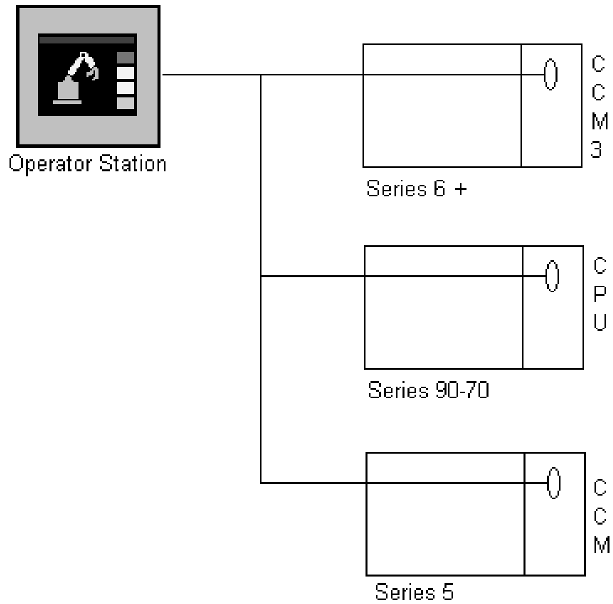


Direct Connection to the Series 90-70P



Multidrop Connection to GE Fanuc PLCs

The master/slave protocol must be used for multidrop communication. The Operator Station is always the master and the GE Fanuc PLCs are the slaves.



Cabling

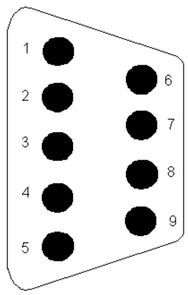
3

In this chapter, you will learn:

- *The cabling requirements for General Electric PLCs*

Communication between the Operator Station and the GE PLCs

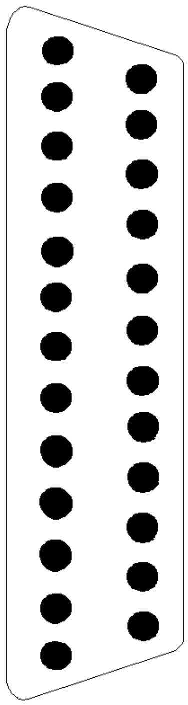
Communication can be achieved between the Operator Station and the General Electric PLCs with either RS232C or RS422 (except for the Series 90 that is RS422 only). The maximum cable length when using RS232C is 50 feet, while the maximum cable length for RS422 is 4000 feet.



Pin	Signal
1	RS-422 Transmit Data (+) (Output)
2	RS-232 Receive Data (Input)
3	RS-232 Transmit Data (Output)
4	RS-422 Receive Data (+) (Input)
5	Signal Ground
6	RS-422 Transmit Data (-) (Output)
7	RS-232 Request to Send (Output)
8	RS-232 Clear to Send (Input)
9	RS-422 Receive Data (-) (Input)

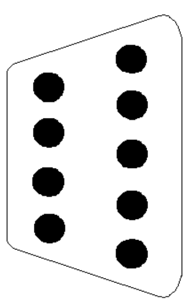
CCM2

The CCM2 card has two ports. One port (J1) uses a 25-pin connector, while the second port (J2) uses a 9-pin connector. The following figures show the pinouts and signals for each port.



Pin	Signal
1	Do not connect
2	RS232 TxD
3	RS232 RxD
4	RS232 RTS
5	RS232 CTS
6	Do not connect
7	Signal GND
8	Do not connect
9	Do not connect
10	Do not connect
11	Keyout I/O
12	+12 V
13	RS422 RxD(+)
14	RS422 RxD (-)
15	Do not connect
16	Do not connect
17	RS422 TxD (-)
18	RS422 TxD(+)
19	OIU GND
20	OIU +5 V (5A)
21	RS422 CLK in(+)
22	-12 V
23	RS422 CLK in (-)
24	RS422 CLK out(+)
25	RS422 CLK out (-)

Port J2

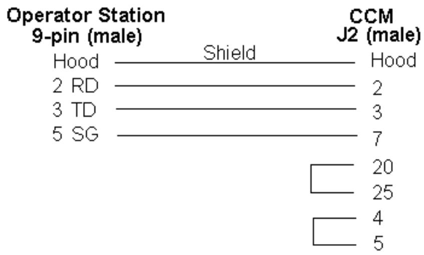


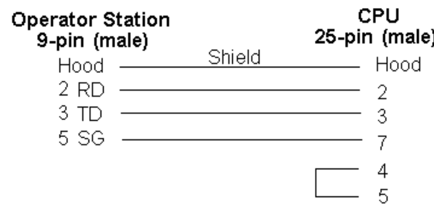
Pin	Signal
1	RS422 TxD(+)
2	RS232 TxD
3	RS232 RxD
4	RS232 RTS
5	RS232 CTS
6	RS422 TxD (-)
7	Signal GND
8	RS422 RxD(+)
9	RS422 RxD (-)

Series Five

The following figures show RS232 cabling for Series Five PLCs.

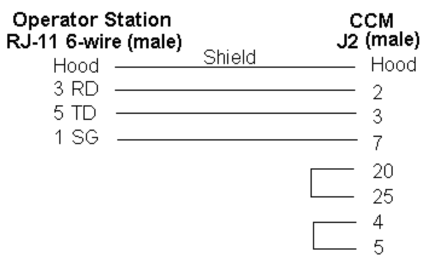
The Operator Stations that have 9-pin female connectors (DB-9S) must have cables configured with male connectors (DB-9P).

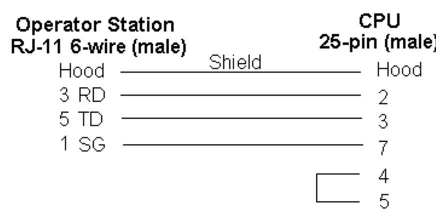




Note: For PanelMate PC applications, a female 9-pin connector is required for connecting to a male 9-pin port. To quickly convert a Cutler-Hammer cable for PC use, simply attach the 9-pin Gender Changer found in the PanelMate PC Runtime Kit.

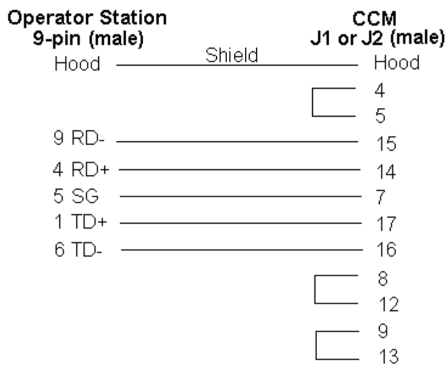
The Operator Stations that have RJ-11 6-wire modular jacks must have cables configured with male modular connectors

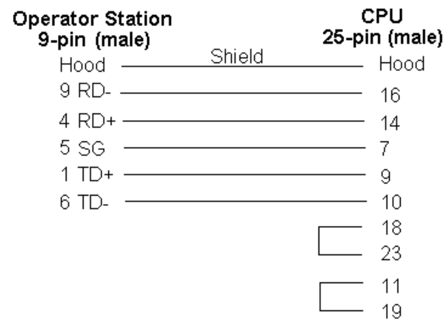




The following figures show RS422 cabling for Series Five PLCs.

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

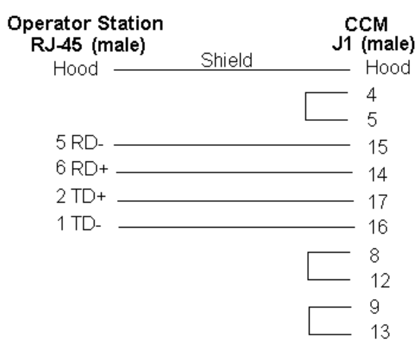


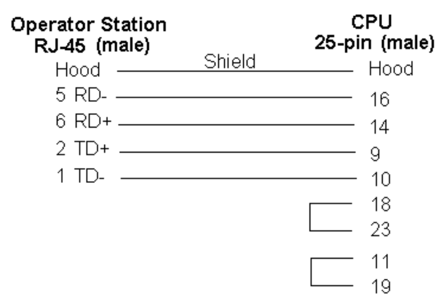


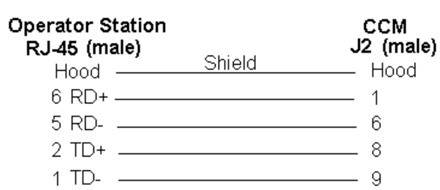
Note: For PanelMate PC applications that require data exchanges between RS232 and RS422/485 ports, a RS232 to RS422/485 converter is required to enable communication.

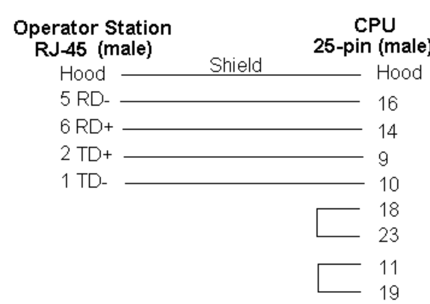
The following figures show RS422 cabling for Series Five PLCs.

The Operator Stations that have RJ-45 modular jacks must have cables configured with male modular connectors.







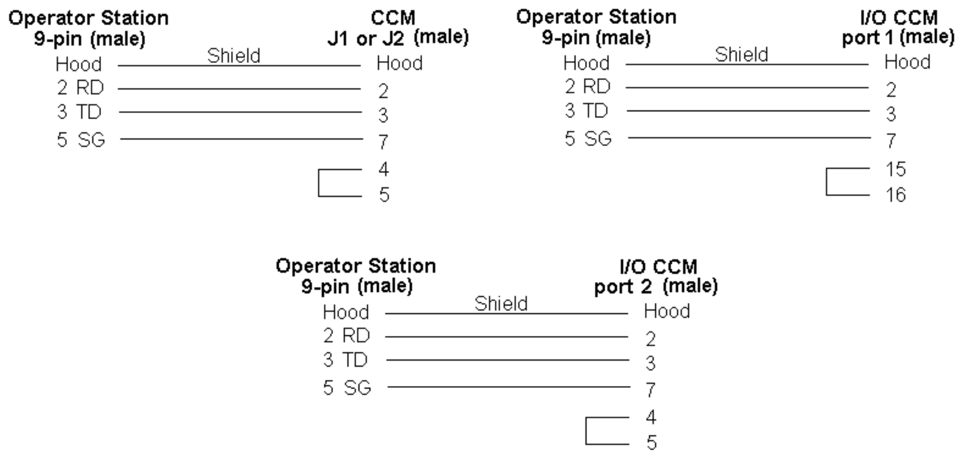


Series Six and Six Plus

The following figures show RS232 cabling for Series Six and Series Six Plus PLCs.

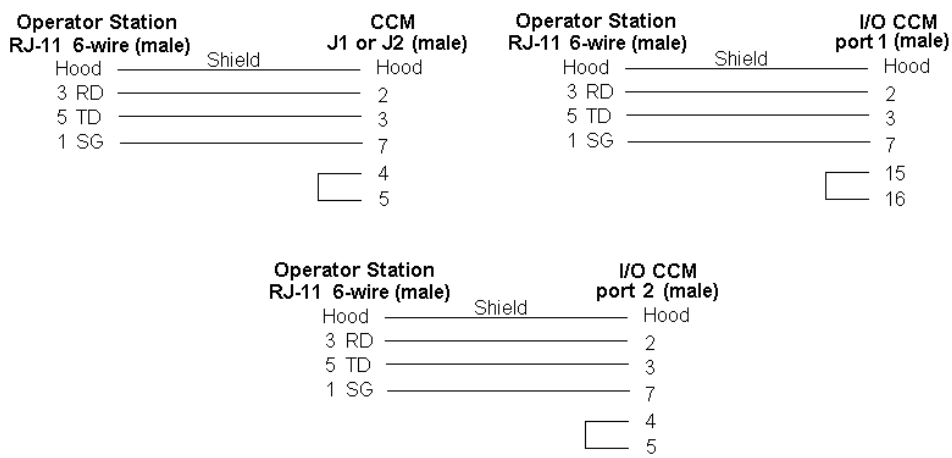
The Operator Stations that have 9-pin female connectors (DB-9S) must have cables configured with male connectors (DB-9P).

GE 25



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.

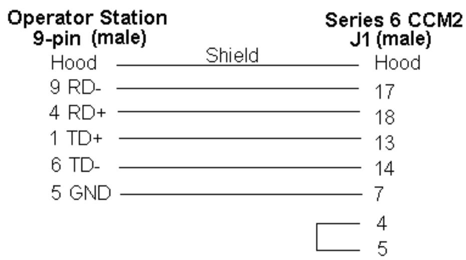
The Operator Stations that have RJ-11 6-wire modular jacks must have cables configured as shown below.

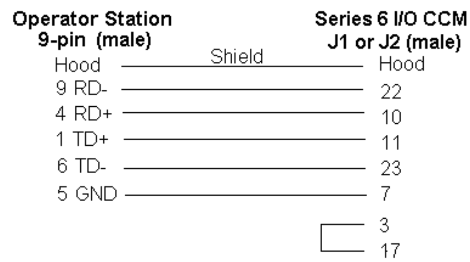


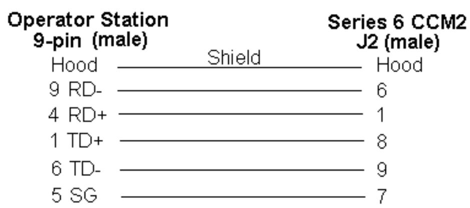
The following figures show RS422 cabling for Series Six and Series Six Plus PLCs.

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

GE 24

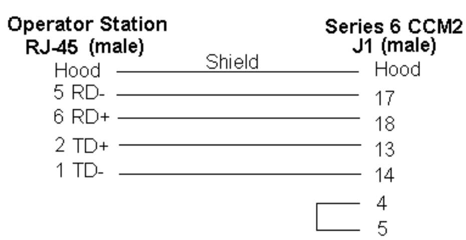


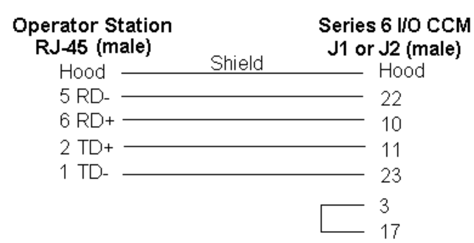




Note: For PanelMate PC applications that require data exchanges between RS232 and RS422/485 ports, a RS232 to RS422/485 converter is required to enable communication.

The Operator Stations that have RJ-45 modular jacks must have cables configured with male modular connectors.





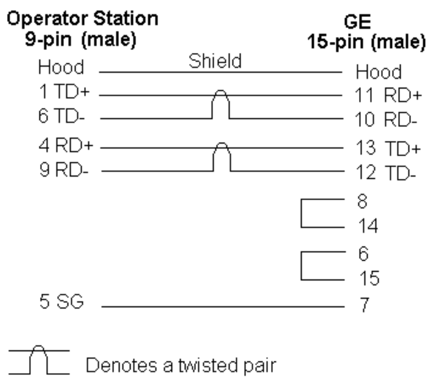
Series 90

Connection to the Series 90 PLC is through the serial port located on the front of the power supply of the 90-30 PLC and on the CPU of the 90-70 PLC.

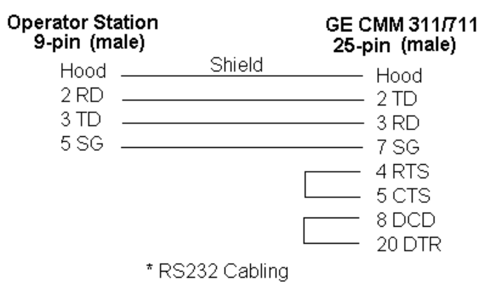
A 15-foot PLC cable can be purchased from Cutler-Hammer. Contact the Customer Support Group at (614) 882-3282 or your local distributor for more information. Refer to Appendix A, the PLC Cabling Cross-Reference List, for cabling catalog numbers.

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

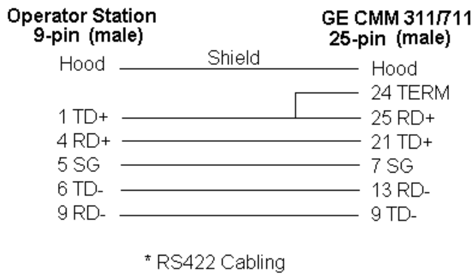
GE 21A



GE 23



GE 22



Note: The CMM 311 module has only one port. A Y-cable can be used to split the port into two separate ports. One port will have both RS422 and RS232 communication capabilities while the other port will only have RS232 communication capabilities.

Note: When RS422 communication is used with a CMM 311 or CMM 711 communication module, the flow control is normally set to NONE. If the flow control is used, the following jumpers are needed on the CMM module side:

10 RTS(A) to 11 CTS(A)

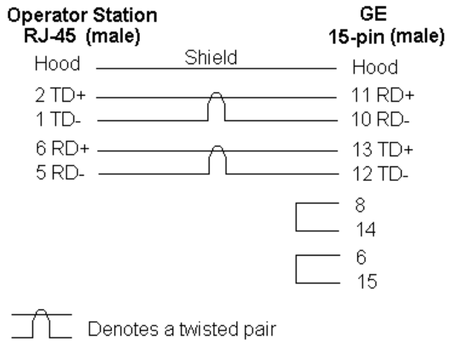
22 RTS(B) to 23 CTS(B)

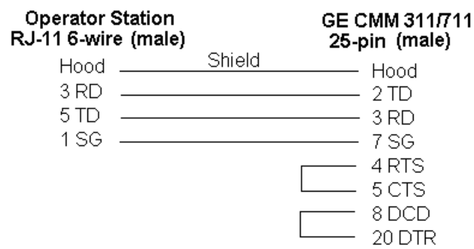
Flow control jumpers may cause problems when flow control is set to NONE.

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.

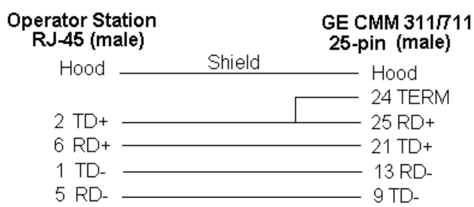
Note: For PanelMate PC applications that require data exchanges between RS232 and RS422/485 ports, a RS232 to RS422/485 converter is required to enable communication.

The Operator Stations that have RJ-11 6-wire or RJ-45 modular jacks must have cables configured with male modular connectors.





* RS232 Cabling



* RS422 Cabling

Note: The CMM 311 module has only one port. A Y-cable can be used to split the port into two separate ports. One port will have both RS422 and RS232 communication capabilities while the other port will only have RS232 communication capabilities.

Note: When RS422 communication is used with a CMM 311 or CMM 711 communication module, the flow control is normally set to NONE. If the flow control is used, the following jumpers are needed on the CMM module side:

10 RTS(A) to 11 CTS(A)

22 RTS(B) to 23 CTS(B)

Flow control jumpers may cause problems when flow control is set to NONE.

Note: For PanelMate PC applications that require data exchanges between RS232 and RS422/485 ports, a RS232 to RS422/485 converter is required to enable communication.

Communication Parameters

4

In this chapter, you will learn:

- *The different switch settings*

Series 90

Standard communication parameters for communicating with the Series 90 are described below. These parameters are given only as a starting point and may be changed to meet the demands of your application. The communication parameters are set via programming software for the Series 90 PLCs. In the PLC Name and Port Table, set the Operator Station's communication parameters to match the settings of your PLC.

8 Data bits

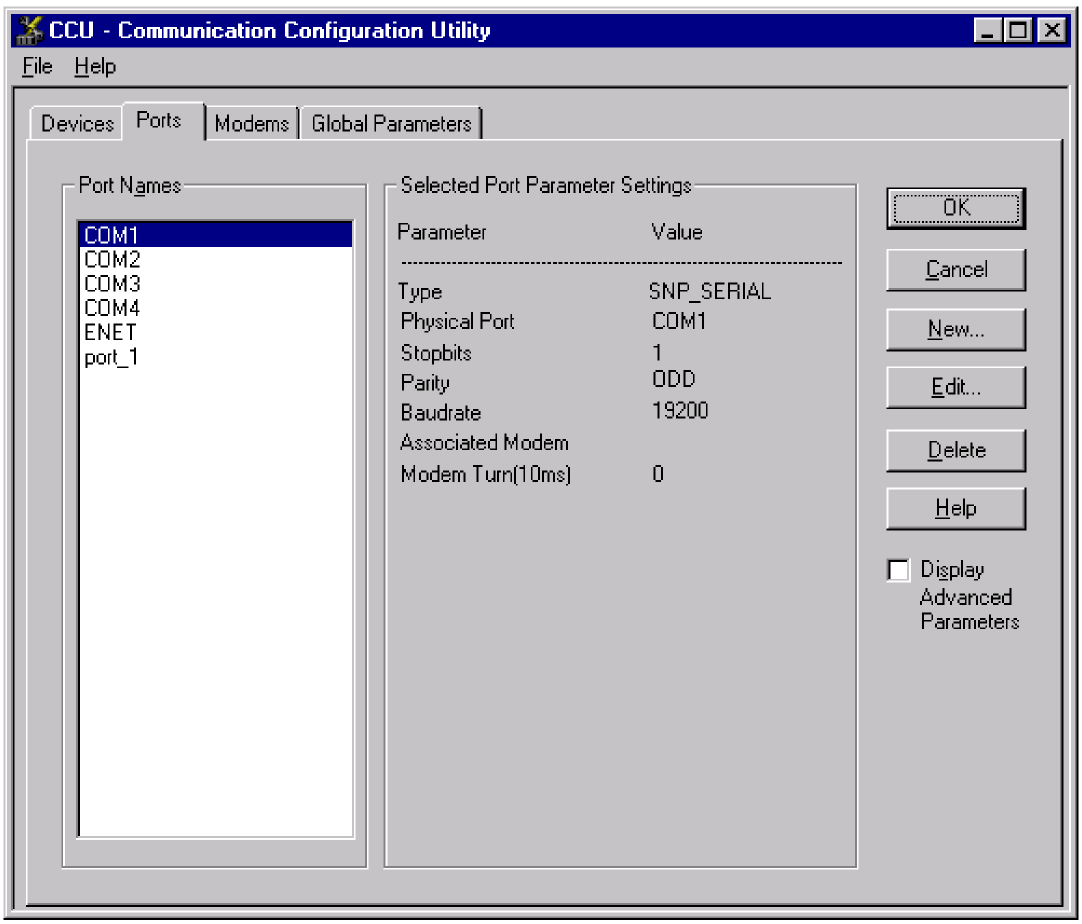
1 Stop bit

Odd Parity

19.2K Baud

Note: The minimum baud rate setting for network communication to the GE Fanuc Series 90 PLC is 4800. The minimum baud rate setting for point-to-point communication to the GE Fanuc Series 90 PLC is 1200.

Once all programming has been completed, power must be cycled to the GE Fanuc PLC to enable communication with the operator station.



PLC ID

The valid PLC ID ranges for each GE Fanuc PLC model are listed below. The PLC ID should match the PLC ID assigned in the PLC Name and Port Table.

PLC Model	PLC ID Range
Series Five	0 - 90
Series Six (Master/Slave)	
Series Six Plus (Master/Slave)	
Series Six (Peer/Peer)	0 - 255
Series Six Plus (Peer/Peer)	
Series 90-30	Up to 6 characters: 0-9, A-F (upper case) (e.g., 123456, ABCDEF, 1A)
Series 90-70	Up to 7 characters: ASCII character with decimal values 32-127 (e.g., 1234567, TUvwxYZ, 123#)

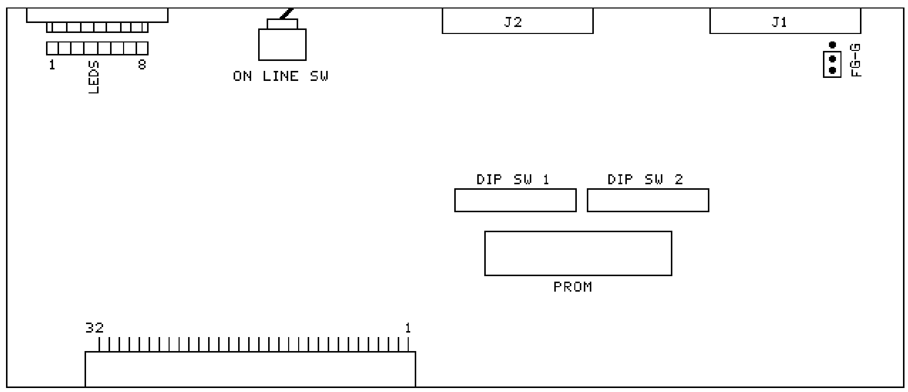
Note: The PLC ID in the port parameter table must match the ID in the PLC. A case discrepancy will prevent successful communications.

Switch Settings

The Operator Station can use the CCM2, CCM3, or I/O CCM card for communications with a Series Six and Series Six Plus PLCs. The CCM module is needed for communications with Series Five PLCs. Each of these cards are discussed in the following sections.

CCM

The following figure shows the port and DIP switch positions on the CCM card. This card is used with Series Five PLCs only.



The CCM card has two DIP switch banks, labeled DIP SW1 and DIP SW2. DIP SW1, switch 1 through switch 7, are used to set the slave station address. Switch 1 is the least significant bit. Switch 9 is used to select either master or slave.

Switch 8
Off*

Master/Slave	Switch 9
Master Slave*	On Off

* Default

The second DIP switch bank is used to configure the response delay time, turnaround delay, diagnostic mode, parity, and baud rate. The following tables show the possible settings for each DIP switch bank.

Baud Rate	Switch 1	Switch 2	Switch 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
19.2K	On	On	On

Parity	Switch 4
Odd	On
None*	Off

Self Diagnostics	Switch 5
Diags On	On
Diags Off	Off

Turnaround Delay	Switch 6
10 msec.	On
No Delay*	Off

* Default

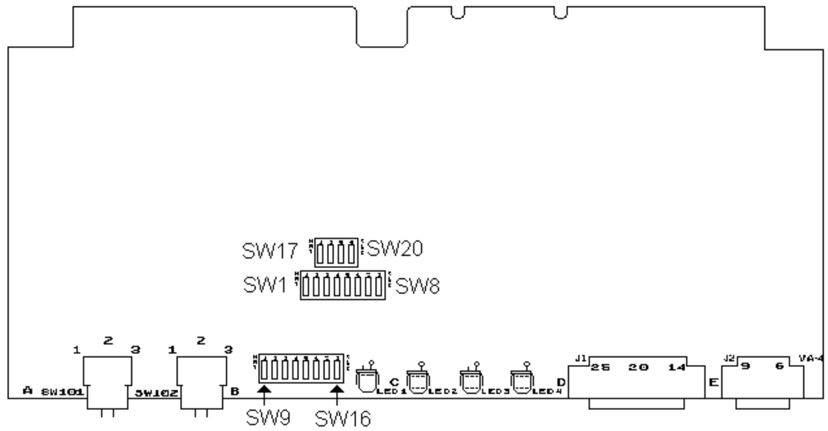
Delay Time	Switch 7	Switch 8
0*	Off	Off
20	On	Off
100	Off	On
500	On	On

Switch 9
Off*

* Default

CCM2

The following figure shows the port and DIP switch positions on the CCM2 card.



The CCM2 card has 17 DIP switches that are used for configuration of baud rate, turnaround time, protocol, and parity of the two ports, labeled "J1" and "J2". The 17 switches are divided between three switch banks and are positioned on the card as shown in the above figure. The switch numbers are silk-screened on the circuit board. The switch numbers given in the following tables reference the silk-screened numbers and not the switch numbers marked on each individual package.

These tables show the switch settings for Port J1.

Baud Rate	Switch 9	Switch 10	Switch 11
300	Open	Open	Open
600	Close	Open	Open
1200	Open	Close	Open
2400	Close	Close	Open
4800	Open	Open	Close
9600	Close	Open	Close
19.2K	Open	Close	Close

Protocol	Switch 12	Switch 13	Switch 14
Master RS232	Open	Open	Open
Master RS422	Close	Open	Open
Slave RS232	Open	Close	Open
Slave RS422	Close	Close	Open
Peer RS232	Open	Open	Close
Peer RS422 w/o clk	Close	Open	Close
Peer RS422 with clk	Open	Close	Close
Test 3	Close	Close	Close

Turn Around Delay	Switch 15	Switch 16
0 ms	Open	Open
10 ms	Close	Open
500 ms	Open	Close
500 ms	Close	Close

Parity	Switch 17
Enabled (odd)	Close
Disabled	Open

These tables show the switch settings for Port J2.

Baud Rate	Switch 1	Switch 2	Switch 3
300	Open	Open	Open
600	Close	Open	Open
1200	Open	Close	Open
2400	Close	Close	Open
4800	Open	Open	Close
9600	Close	Open	Close
19.2K	Open	Close	Close

Protocol	Switch 4	Switch 5	Switch 6
Master RS232	Open	Open	Open
Master RS422	Close	Open	Open
Slave RS232	Open	Close	Open
Slave RS422	Close	Close	Open
Peer RS232	Open	Open	Close
Peer RS422	Close	Open	Close
Test 1	Open	Close	Close
Test 2	Close	Close	Close

Turn Around Delay	Switch 7	Switch 8
0 ms	Open	Open
10 ms	Close	Open
500 ms	Open	Close
500 ms	Close	Close

Parity	Switch 17
Enabled (odd)	Close
Disabled	Open

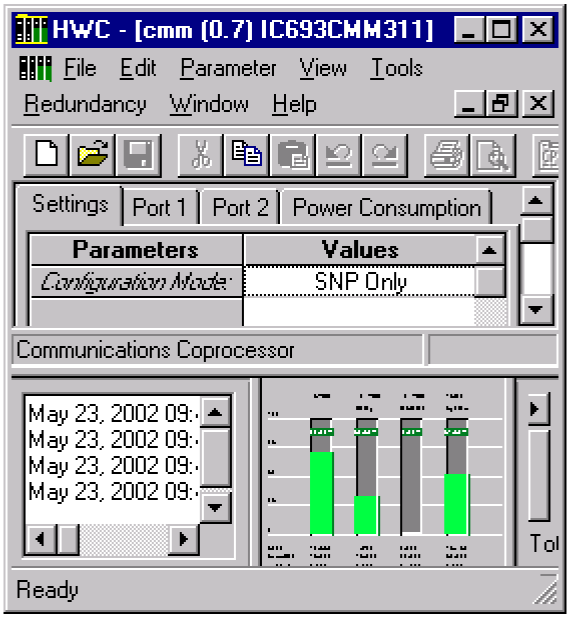
Miscellaneous Switch Settings	
Switch 18	Don't Care
Switch 19	Don't Care
Switch 20	Always Open

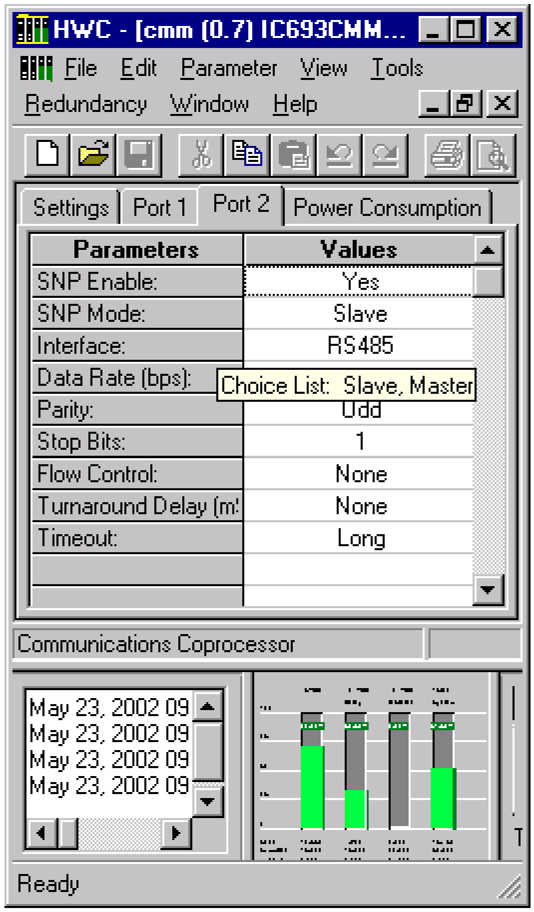
CCM3

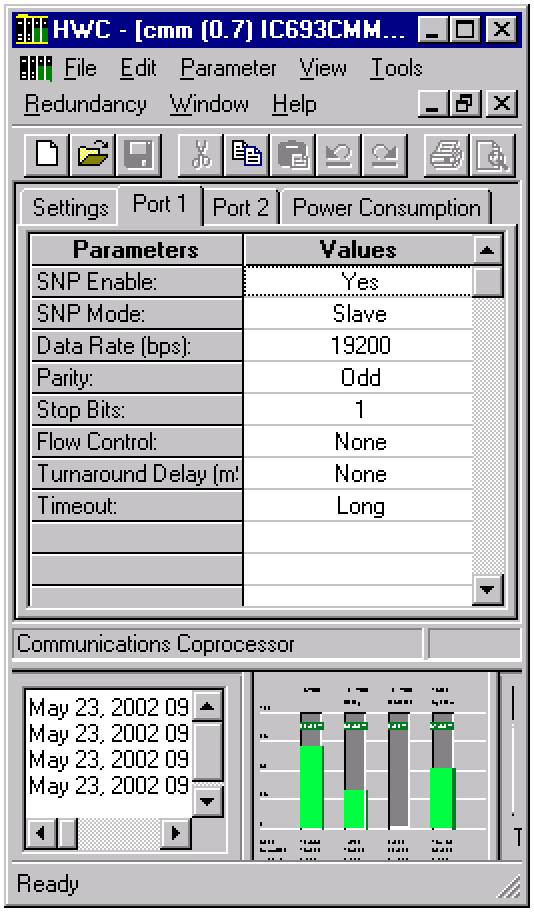
The CCM3 card DIP switches should be configured the same as the CCM2 card described in the previous section. The placement and numbering of the DIP switches are exactly the same as the CCM2 card.

CMM 311 and CMM 711

The following figure shows the CMM Setup screen for the CMM 311 and CMM 711 communication modules.




HWC - [cmm (0.7) IC693CMM...
File Edit Parameter View Tools
Redundancy Window Help
Settings
Port 1
Port 2
Power Consumption
Parameters
Values
SNP Enable:
Yes
SNP Mode:
Slave
Interface:
RS485
Data Rate (bps):
Choice List: Slave, Master
Parity:
Odd
Stop Bits:
1
Flow Control:
None
Turnaround Delay (m
None
Timeout:
Long
Communications Coprocessor
May 23, 2002 09
May 23, 2002 09
May 23, 2002 09
May 23, 2002 09
Ready



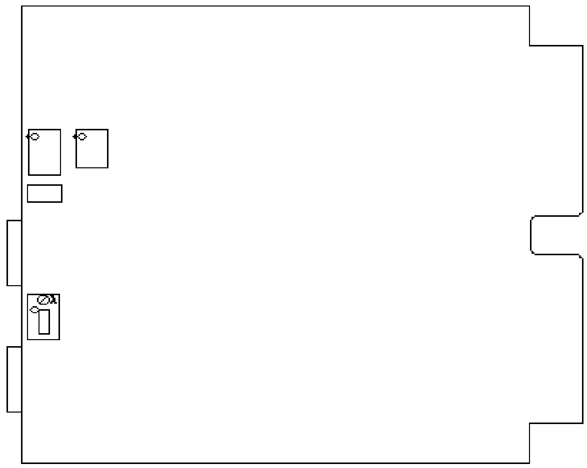
Note: The CMM 311 Port 1 does not have an Interface selection. Port 1 on the CMM 311 is defaulted to RS232.

Note: If connecting an Operator Station to both ports of a CMM module, it is recommended to lower the baud rate to 9600 on both ports and the Operator Station.

Note: RS485 communication on the CMM corresponds to RS422 communication on the Operator Station.

I/O CCM

The following figure shows the port and DIP switch positions on the I/O CCM card.



The I/O CCM card has three banks of DIP switches. Bank A is used to configure port one. Bank B is used to configure port two. Bank C is used to configure pins 15 and 16 for RS232D operation. The first switch position in bank C should be left in the closed state.

The following tables show the possible DIP switch settings for the I/O CCM card. The switch numbers correspond to the number on the DIP bank.

These tables show DIP switch settings for Bank A.

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

Protocol	Switch 4	Switch 5	Switch 6
CCM Master RS232/RS422	Open	Open	Open
CCM Master Current Loop	Close	Open	Open
CCM Slave RS232/RS422	Open	Close	Open
CCM Slave Current Loop	Close	Close	Open
CCM Peer RS232/RS422	Open	Open	Close
CCM Peer Current Loop	Close	Open	Close
RTU Slave RS232/RS422	Open	Close	Close
RTU Slave Current Loop	Close	Close	Close

Parity	Switch 7	Switch 8
No Parity	Open	Open
No Parity	Close	Open
Odd Parity	Open	Close
Even Parity	Close	Close

These tables show DIP switch settings for Bank B.

Baud Rate	Switch 1	Switch 2
300	Open	Open
1200	Close	Open
9600	Open	Close
19.2K	Close	Close

Protocol	Switch 3	Switch 4	Switch 5
CCM Master RS232	Open	Open	Open
CCM Master RS422	Close	Open	Open
CCM Slave RS232	Open	Close	Open
CCM Slave RS422	Close	Close	Open
CCM Peer RS232	Open	Open	Close
CCM Peer RS422	Close	Open	Close
RTU Slave RS232	Open	Close	Close
RTU Slave RS422	Close	Close	Close

Turn Around Delay	Switch 6
0 ms	Open
500 ms	Close

Parity	Switch 7
No Parity	Open
Odd Parity	Close

Module Operation	Switch 8
Operational	Open
Test	Close

Reset Switch	Switch 9
Enabled	Open
Reset	Close

These tables show DIP switch settings for Bank C

Function	Switch
RS232 Operation	1
Disconnects pins 15, 16 for Port1 RS232D Connects Pins 15, 16 for Port 1 RS232D operation (use external jumper if desired across pins 15-16)	Open Close*

*Factory-set default position

Series Five CPU

The Series Five CPU has one four-position DIP switch bank. This DIP switch bank is used to configure the 25-pin port on the CPU and to configure the CCM address and protocol.

The following table shows the possible settings for this DIP switch:

CCM Port Communications	Switch 1
RS232*	On
RS422	Off

CCM Port Address	Switch 2
1 (No Parity)	On
Scratch Pad	Off

Baud Rate	Switch 3	Switch 4
300	Off	Off
1200	Off	On
9600	On	Off
19.2K	On	On

* Default

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.

Series Five PLC Word and Bit References

Series Five PLCs use decimal word addresses. The Operator Station format default is U16. Inputs and outputs use bit references.

The following list contains the memory types and ranges supported by the Series Five driver:

I0001	to	I1024
O0001	to	O1024
I1+0001	to	I1+1024
O1+0001	to	O1+1024
O1-0001	to	O1-1024
O2-0001	to	O2-1024
I1-0001	to	I1-512
I2+0001	to	I2+1024
O2+0001	to	O2+1024
R00001	to	R16384

All of the references in the table above are bit references, except for registers R00001 through R16384, which are word references.
The following is the format for a register reference:

[rr]

rr PLC reference number of the register.

The following is the format for a bit reference:

[xi]

x PLC memory type (O or I).

I PLC reference number of the input or output.

The following is the format for a register bit reference (Read Only):

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

The Operator Station can reference more than one PLC word with a single read. The Series Five PLC can read a maximum of forty words per read. The maximum number of unused PLC words per read is ten. Once ten-unused PLC words are encountered, the Operator Station will generate another read.

Note: Bit writes to the following are not permitted. They are generally used by the CPU:

Internal status bits I1-XXX

Output status bits O2-1000 through O2-1024

Series Six PLC Word and Bit References

GE Series Six PLCs use decimal word addresses. The Operator Station format default is U16.

The following list contains the memory types supported by the Series Six driver:

AI	Auxiliary Input (Bit Reference)
AO	Auxiliary Output (Bit Reference)
I	Input (Bit Reference)
O	Output (Bit Reference)
R	Register (Word Reference)

The following is the format for a register reference.

[rr]

rr PLC reference number of the register.

The following is the format for a bit reference:

[xi]

x PLC memory type (O or I).

i PLC reference number of the input or output.

The following is the format for a register bit reference (Read Only):

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

Note that General Electric Series Six Family PLCs store double precision numbers with the first (low) register holding the least significant word and the next consecutive (high) register holding the most significant word. The Operator Station, however, interprets the first register as the most significant word and the next consecutive register as the least significant word. For example, if the value 1 is stored in register 624 and the value 0 is stored in register 625, General Electric would interpret the stored value as 1, while the Operator Station would display the value as 65536. To read a double precision number correctly, multiply the low byte by 65536 and add this value to the high byte.

Bit Writes without Ladder Logic

The GE Fanuc communication protocol for Series Six, for the latest CCM2 and CCM3 cards, will allow the Operator Station to directly alter the state of a single bit without the use of ladder logic. The part numbers for the cards that allow single bit writes are listed below.

CCM2 IC600CB536K
CCM3 IC600CB537K

Note: Cards with part numbers that have revisions later than K will also support single bit writes.

The part number should be labeled in the lower left-hand corner of the board. If either of these cards are installed, then select "S6+WBit", even for Series Six PLCs, for the model name in the PLC Name and Port Editor; otherwise, select "S6". If the board number is IC600CB516 or IC600CB517, an upgrade kit is available from General Electric to allow single bit writes without using ladder logic.

Bit Writes with Ladder Logic

CCM cards, other than those mentioned in the previous section, will not permit an external intelligent device to directly alter the state of a single bit (input, output, etc.) without overwriting the entire word in which that bit exists. As a result, the Operator Station will write a value to a designated word in the GE PLCs specifying which bit should be set or cleared. A section of each PLC program is necessary to interpret this value in order to change the appropriate bit.

Within the PLC Name Table, the PLC ID# is defined using the following format:

ID#-	Rreg# (8 characters maximum)
ID#	PLC ID#
R	optional "R"
reg#	Register value used to receive bit set/clear information

Note: If no register value is entered, the default is 255.

The value that the Operator Station writes to the PLC in order to specify what bits to write, always contains the number (address) of the bit to be changed. This value is represented as a positive or negative number, depending on whether the bit is to be set or cleared, respectively. The value sent to the PLC is sent using the normal Series Six word/block write instruction. The value is described below:

15000 < value	=	AIx where x = value - 15000
10000 < value <= 15000	=	Ix where x = value - 10000
5000 < value <= 10000	=	AOx where x = value - 5000
0 < value <= 5000	=	Ox where x = value

The following ladder logic rungs may be added to a GE PLC program for the purpose of setting and clearing individual bits as dictated by the instructions the Operator Station writes to the unit's instruction word (word 255) in GE PLCs.

```
GE Series 6:  Program to Interpret Bit Controls
If Bit Address in Reg 255
CONST               R0256     R0255     R0256                                O1023
+[ A      MOVE      B  ]+[    A  :      B          ]+------+------+------+------+--(   )--+
|+00000
|
+
|Then set or clear bit
|O1023    CONST               R0256               CONST     R0256
+--]/[--+[ A MOVE    B   ]+DO [SUB       N          REPS]+               (   )
|         +00001                                  001
|
+
|Reset Reg 255
|O1023    CONST               R0255
+--]/[--+[ A MOVE    B  ]+                                                (   )
\         +00000
|
+ELSE continue with other processing
|
+[ENDSW]+
|
|R0255              R0254
+[ A      MOVE      B  ]+                                                 (   )
|
```

```
|Get absolute value of address
+
|If address < 0 then:
|            CONST   R0254     CONST                                          01024
+[SHIFT LEFT N       MATRIX    LEN]+------+------+------+------+------+------+------+------+-(    )-+
-+|          00001             001
|
+Set flag
|
|O1024       R0255             R0254     R0254     R0254     CONST
+--] [--+[ A MOVE    B  ]+[    A   INV   B         LEN]+                 (   )
|                                                  001
||Address| = absolute value
+
|
|O1024       R0254   CONST     R0255
+--] [--+[ A  ADDX   B   =     C ]+                                           (   )
|                  +00001
|Auxiliary inputs
+If |address|>15000 then:
|
|CONST               R0255     R0254                                          O1022
+[ A  SUBXB     =    C   ]+------+------+------+------+-------+------+-----+-------+-(    )-+
|+15000
|
O1022        R0255   CONST     R0254
+--] [--+[ A  SUBX  B = C ]+                                         (   )
|                    +15000
|
```

```
+If address > 0 then set bit
|
|O1022    O1024    R0254              AI0001    CONST
+--]  [--+--] / [--+ [    BIT    SET    MATRIX    LEN]+                    (  )
|                                               064
|Else clear bit
+
|
|O1022    O1024    R0254              AI0001    CONST
+--] [--+--] [--+[ BIT    CLEAR    MATRIX    LEN]+                         (  )
|                                                64
|Inputs
+Else if |address| > 10000 then
|
|O1022    CONST    R0255    R0254                                          O1021
+--]/[--+[ A  SUBX  B = C ]+------+------+------+------+------+------+-----+-----+-(  )-+
|        +10000
|
+
|
|O1021    R0255    CONST    R0254
+--] [--+[  A  SUBX  B        = C ]+                                       (  )
|                  +10000
|
+If address > 0 then set bit
```

```
|
|O1021     O1024    R0254                I0001     CONST
+--] [--+--]/[--+   [      BIT       SET       MATRIX    LEN]+                          (   )
|                                              064
+Else clear bit
|
|O1021     O1024    R0254                I0001     CONST
+--] [--+--] [--+[         BIT       CLEAR     MATRIX    LEN]+                          (   )
|                                              064
|Auxiliary Outputs
+Else if |address|> 5000 then
|
|O1022     O1021    CONST     R0255      R0254                                          O1020
+--] / [--+--] / [--+ [       A    SUBX  B      =C  ]-----+-----+-----+-----+-----+-----+-----+-(    )-+
                   +05000
|
|O1020     R0255    CONST     R0254
+--] [--+[   A     SUBX  B        = C ]+                                                (   )
|                   +05000
|If address>0 then set bit
|O1020     O1024    R0254                AO0001    CONST
+--] [--+--]/[--+[         BIT       SET       MATRIX    LEN]+                          (   )
|                                              064
|Else clear bit
|
|O1020     O1024    R0254                AO0001    CONST
+--] [--+] [--+[           BIT       CLEAR     MATRIX    LEN]+                          (   )
|                                    064
|Outputs
+
```

```
|O1022      O1021   O1020   R0255                              R00253
+--] / [----] / [----] / [---[          A         Move       B]-
|
|Else if address>0 then set bit
|
|O1022      O1021   O1020   O1024   R0253          O0001      CONST
+--] / [--+--] / [--+--] / [--+--] / [--+[    BIT      SET      MATRIX     LEN]+            (   )
|                                                             064
|Else clear bit
+
|
|O1022      O1021   I1020   I1024  R0253           O0001      CONST
+--] / [--+--] / [--+--] / [--+--]  [--+[    BIT      CLEAR    MATRIX     LEN]+            (   )
|                                                             064
+
|
+[   RETURN   ]+
+
|
+[ENDSW]+ Note:     Bit reference is sent to register 255.  If bit reference
|                          is negative then bit is to be cleared, otherwise bit is
|                          to be set
+
|
|                  Registers - 253, 254, 255, and 256 are used by the program.
+[ENDSW]+
                   Output points 1020, 1021, 1022, 1023, and 1024 are used by the program.
|
```

Series Six Plus PLC Word and Bit References

GE Series Six Plus PLCs use decimal word addresses. The Operator Station format default is U16.

For Series Six Plus PLCs, the Operator Station permits access to all memory addresses, up through the largest 5-digit address available (the Operator Station can actually read addresses up through a maximum of 99999). All registers in the Series Six Plus may be accessed by the Operator Station directly. Series Six Plus units feature extended I/O channels with addresses grouped in blocks of 1024, using prefixes such as I2+.

The following list contains the memory types supported by the Series Six Plus driver.

AI	Auxiliary Input (Bit Reference)
AO	Auxiliary Output (Bit Reference)
I	Input (Bit Reference)
O	Output (Bit Reference)
R	Register (Word Reference)
Ix + yyyy	Expanded Input Channels
Ox + yyyy	Expanded Output Channels

where x = channel numbers 1 - 7 and 9 - F (0 and 8 not available)

yyyy = bit number 1 – 1024

Bit Writes without Ladder Logic

The GE Fanuc communication protocol for Series Six Plus for the latest CCM2 and CCM3 cards will allow the Operator Station to directly alter the state of a single bit without the use of ladder logic. The part numbers for the cards that allow single bit writes are listed below:

CCM2 IC600CB536K

CCM3 IC600CB537K

Note: Cards with part numbers that have revisions later than K will also support single bit writes.

The part number should be labeled in the lower left-hand corner of the board. If either of these cards are installed, then select "S6+WBit" for the model name in the PLC Name and Port Editor; otherwise, select "S6+". If the board number is IC600CB516 or IC600CB517, an upgrade kit is available from General Electric to allow single bit writes without using ladder logic.

Bit Writes with Ladder Logic

CCM cards, other than those mentioned in the previous section, will not permit an external intelligent device to directly alter the state of a single bit (input, output, etc.) without overwriting the entire word in which that bit exists. As a result, the Operator Station will write a value to a designated word in the GE PLCs, specifying which bit should be set or cleared. A section of each PLC program is necessary to interpret this value in order to change the appropriate bit.

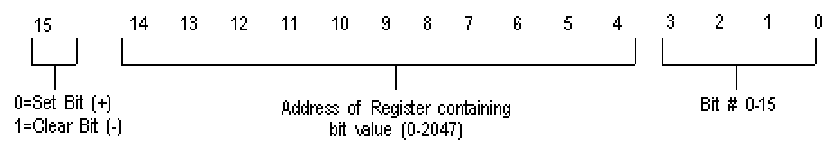
Within the PLC Name Table, the PLC ID# is defined using the following format:

ID#-	Rreg# (8 characters maximum)
ID#	PLC ID#
R	optional "R"
reg#	Register value used to receive bit set/clear information

Note: If no register value is entered, the default is 255.

The value that the Operator Station writes to the PLC in order to specify which bits to write, contains the register and number of the bit to be changed. This value is represented as a positive or negative number, depending on whether the bit is to be set or cleared, respectively. The PLC word containing the value is controlled by the Operator Station using normal Series Six Plus word/block write instructions.

The two byte value sent by the Operator Station is represented as shown in the following figure:



Note: It is not possible to write to references Ix-yyyy or Ox-yyyy.

Note that GE register values range from 1 - 2048, and bits are numbered 1-16 per register. The Operator Station sends a register value from 0 - 2047, and a bit value from 0 - 15. When the Operator Station sends a bit value of 0, it is interpreted as the sixteenth bit of the designated register value, and when it is 1-15, it is the specified bit of the designated register value +1.

Examples

Operator Station Reference = OF + 0001
Value sent to GE = 0111100000000001 (reg. = 1920, bit = 1)
Interpretation = Set bit 1 of register 1921

Operator Station Reference OE + 1024
Value sent to GE = 0111100000000000 (reg. = 1920, bit = 0)
Interpretation = Set bit 16 of register 1920

Operator Station Reference = O1
Value sent to GE = 0100000000000001 (reg. = 1024, bit = 1)
Interpretation = Set Output value bit 1

Operator Station Reference AO1
Value sent to GE = 0000000000000011 (reg. = 0, bit = 3)
Interpretation = Set Auxiliary Output value 3 (bit 3 of register 1)

Operator Station Reference = AO1
Value sent to GE = 1111111111111101 (reg. = 0, bit 3)
Interpretation = Clear Auxiliary Output value 3 (bit 3 of register 1)

In the last example, the value is negative so the twos complement is calculated before interpreting a register and bit value. I/O bit values (Ixxxx, Oxxxx) are designated as being in registers 1024 - 1151, but the values in the registers are not affected since the I/O bit values are stored in a separate location. I/O values I1024 and O1024 are not available for setting and clearing unless logic is added to the PLC program to check the bit value, in addition to the register range. In the PLC program supplied, Output register values are 1024 - 1087, and Input register values are 1088 - 1151. Output 1024 would be designated as register 1088, bit 0, and Input 1024 would be designated as register 1152, bit 0.

The following ladder logic rungs may be added to a Series Six Plus PLC program for the purpose of setting and clearing individual bits as dictated by the instructions the Operator Station writes to the bit write register (default word 255) in GE PLCs.

```
************************************************************************************************
|
|
|
|
|
|
+[NO OP]-                                                  (   )
|
|
|  <<RUNG 390>>
|
|
|************************************************************************************************
|
|GE Series Six Plus:
```

Program section to implement bit set and clear operations for the Operator Station's pushbuttons when the Operator Station is used with the Series Six Plus advanced I/O.
The registers used are R0620 through R0632, and the outputs used are AO0977 through AO0985. Any other data space could be used by modifying this section of program.

The Operator Station instructs the GE PLCs to set and clear bits by writing coded values to a register called the "Bit Write Register" (BWR). The BWR is user-selectable during development using the PLC Name and Port Editor of the Operator Station. A register number may be entered following a PLC ID# and a "-" character in the Logical Device Unit, PLC ID# field. If no register number is explicitly designated by the user, the BWR used defaults to R0255 (default setting).

In the following program, the BWR is R0621. Whenever R0621 is nonzero, The Operator Station has written a "Bit Write Code" (BWC) to the BWR, indicating a bit to set or clear. AO0977 becomes energized otherwise.

```
|                   Bit      Bit      Bit                        Do not
|                   Write    Write    Write                      Set or
|                   Memory   Registr  Memory                     Clear
|Const               R0622   R0621    R0622                      AO0977
+[A    MOVE  B ]-[      A      B ]----------------------------------------(   )
|+00000
|
```

```
|  <<RUNG 391>>
****************************************************************************************************
|
|If there is a BWC in BWR, call the subroutine to set/clear bits.
|
|
|Do not
|Set or
|Clear
|
|AO0977    Const              R0620              Const     R0620
+--]/[--[      A      MOVE       B ]-[ DO SUB         N      REPS ]-                ( )
|  390   +00001                                   001
|
|  <<RUNG 392>>
|
|
****************************************************************************************************
|
|Clear the BWR, if there is a BWC (Note - for purposes of debugging, it is most convenient to temporarily remove this rung.)
|
|
|Debug       Do not                  Bit
Rung         Set or                  Write
Remover      Clear                   Register
|
|AO0985  AO0977   Const              R0621
+--]  [-----]/[----[     A      MOVE      B ]-                                   ( )
|             390    +00000
|
|  <<RUNG 393>>
|
****************************************************************************************************
|
|Else continue with other processing
```

```
+[ENDSW]-

|  <<RUNG 394>>
*****************************************************************************************************

|

|Subroutine to set/clear bits.  Copy BWC (R0621) to R0622

|

|Bit                  Bit

|Write                Write

|Register             Memory

|

|R0621                R0622

+[ A        MOVE        B ]-                                                    (   )

|

|

|  <<RUNG 395>>

|
*****************************************************************************************************

|

|Test BWC to see if it is a negative number and energize AO0978 if it is
|(high bit set).  Note that whenever the BWC is positive, a bit is to be
|set, however, if the BWC is negative, a bit is cleared.

|
|

|                              Bit

|                              Write

|                              Memory

|

|                   Const      R0622      Const                                AO0978
+[SHIFT LEFT          N        MATRIX     LEN ]-------------------------------------(

|                   000001                001

|

|  <<RUNG 396>>

|
```

```
****************************************************************************************************
|
|Copy BWC (R0621) to R0622 again
|
|           Bit                 Bit
|           Write               Write
|           Register            Memory
|
|           R0621               R0622
+[          A        MOVE         B ]-                                         (   )
|
|  <<RUNG 397>>
|
****************************************************************************************************
|
|Derive the absolute value of the BWC in R0622.  If the BWC is negative,
|take the twos complement of the value.  (Invert all bits and add one.)
|
|           Bit       Bit
|           Write     Write
|           Memory    Memory
|
|AO0978     R0622     R0622      Const
+--] [---[    A   INV    B         LEN]-                                       (   )
|   395                             001
|
|  <<RUNG 398>>
|           Bit                 Bit
|           Write               Write
|           Memory              Memory
|
+AO0978     R0622     Const      R0622
|----] [--[    A   ADDX          B   =      C ]-                                     (
```

```
|      395                   +00001
|
|  <<RUNG  399>>
|
****************************************************************************************************
|
|Clear  R0623
|
|                          # of Bit
|                          to be
|                          set
|
|Const                     R0623
+[  A          MOVE        B  ]-                                                        (    )
|+00000
|
|  <<RUNG  400>>
|
****************************************************************************************************
|
|The  upper  12  bits  of the  BWC  contain  the  address  of the  register
|containing  the  bit  to  be  set  or  cleared.   Shift  these  bits  from
|R0622  to  R0623,  and  then  save  them  in  R0624.
|
|                                         Bit
|                                         Write
|                                         Memory
|
|                          Const          R00622       Const
+[   SHIFT   LEFT            N            MATRIX        LEN  ]-                         (    )
|                          00012                        002
|
|  <<RUNG  401>>
|
```

```
*****************************************************************************************************
|
|Move the Register Address to R0624
|
|# of Bit      Registr
|to be                  Address
|set                    of Bit
|
|R0623                  R0624
+[ A         MOVE         B ]-                                              (   )
|
|
|  <<RUNG 402>>
|
*****************************************************************************************************
|Clear R0623
|
|                       # of Bit
|                       to be
|                       Set
|
| Const                 R0623
+[  A        MOVE         B ]-                                              (   )
| +00000
|
|  <<RUNG 403>>
|
*****************************************************************************************************
|
|The lower 4 bits of the BWC (still in R0622) contain the number of the
|bit to be set or cleared.  Shift these bits from R0622 to R0623, and
|allow them to remain in R0623.
|
```

```
|                       Bit
|                       Write
|                       Memory
|
|                Const  R0622   Const
+[ SHIFT LEFT      N    MATRIX   LEN ] -                    (   )
|                00004            002
|
|  <<RUNG 404>>
|
| Const          R0631
+[   A      MOVE    B ]-                                    (   )
| +00000
|
|  <<RUNG 405>>
|
| Const          R0632
+[   A      MOVE    B ]-                                    (   )
| +00000
|
|  <<RUNG 406>>
|
|
|# of Bit
|to be
|set
|
|R0623           R0632
+[ A        MOVE    B ]-                                    (   )
```

```
|
| <<RUNG 407>>
|
*****************************************************************************************
|
|The following checks register R0623 for zero.  If the 4 bits of the BWC
|(in R0623) is zero, this indicates that the 16th bit needs to be cleared,
|therefore 16 must be added to R0623.  The following rungs will accomplish
|this function.
|
|R0632    R0631                                                                AO0982
+[  A :      B ]-------------------------------------------------------------------------( )
|
|
| <<RUNG 408>>
|
*****************************************************************************************
|
|                          # of Bit
|                          to be
|                          set
|
|AO0982   Const            R0623                                               AO0981
+--] [---[   A       MOVE       B ]-------------------------------------------------( )
|   407  +00016
|
| <<RUNG 409>>
|
*****************************************************************************************
|
|If the register address in R0624 is <= 1087 and R0624 > = 1024, then the
|bit to be set or cleared is a real output.  AO0979 becomes energized and
|R0625 and R0626 are ignored.  Note that the register address is actually
|register address -1.
|
```

```
|Register                          Register  NotReal              Bit is
|Address                           Address   Address              Real
|of Bit                            of Bit    Memory               Output
|
|R0624   Const   R0625   Const     R0624     R0626                AO0979
+[ A SUBX B  =    C ]-[    A SUBX   B  =    C ]-------------------------------------(  )
|        +01087          +01024
|
|  <<RUNG 410>>
|
*********************************************************************************************************
|
|If BWC is for a real output, subtract 1024 from the register address,
|multiply by 16, and add the bit number to get the address of the output
|to set or clear (00001 through 01024)
|
|
|Bit is    Register
|Real      Address
|Output    of Bit
|
|AO0979    R0624          R0627    R0627     Const     R0628
+---] [---[  A     MOVE     B ]-[    A SUBX   B  =    C ]-                   (  )
|   409                                      +01024
|
|  <<RUNG 411>>
|
|
|Bit is
|Real
|Output
|
```

```
|AO0979    R0628    Const       R0629
+--] [---[      A MPY   B   =       C      ]-                                     ( )
|  409              +00016
|
|  <<RUNG 412>>
|
|Bit is                                                  # of Bit    Not Real
|Real                                                    to be       I/O Reg
|Output                                                  Set         Address
|AO0979             R0629                                R0623       R0630
|---] [---              A                ADDX               B   =    C ] -
|   409
|  <<RUNG 413>>
|
*******************************************************************************************************
|
|Set the output when the BWC is positive
|
|Bit is              Not Real
|Real                I/O Reg
|Output              Address
|
|AO0979  AO0978     R0630              O0001      Const
+---] [-------]/[-----[  BIT      SET    MATRIX         LEN]-                     ( )
|   409       395                       315         064
|
|  <<RUNG 414>>
|
*******************************************************************************************************
|
```

```
|Clear the output when the BWC is negative.
|
|Bit is                  Not Real
|Real                    I/O Reg
|Output                  Address
|
|AO0979   AO0978     R0630                  O0001       Const
+---] [--------] [-----[   BIT        CLEAR   MATRIX         LEN]-                        (  )
|     409        395                           315          064
|
|
|  <<RUNG 415>>
|
*************************************************************************************************
|
|If the register address in R0624 is <= 1151 and R0624 >= 1088, then the bit to be set or cleared is a real input.
|AO0980 becomes energized and R0625 and R0626 are ignored.
|
|Register                                  Register    Not Real                      Bit is
|Address                                   Address     Address                       Real
|of Bit                                    of Bit      Memory                        Input
|
|R0624      Const      R0625      Const      R0624      R0626                         AO0980
+[ A  SUBX  B           C  ]-[       A SUBX     B    =      C ]------------------------------------(    )
|           +01151                +01088
|  <<RUNG 416>>
|
|If the BWC is for a real input, subtract 1088 from the register address,
|multiply by 16, and add the bit number to get the address of the input
|to set or clear.  (I0001 through I1024)
|
```

```
|Bit is         Register
|Real           Address
|Input          of Bit
|
|AO0980   R0624              R0627    R0627    Const     R0628
+--] [----[  A       MOVE      B  ]-[   A  SUBX   B   =    C ]-              (  )
|    415                                     +01088
|
|  <<RUNG 417>>
|
|
|Bit is
|Real
|Input
|
|AO0980   R0628   Const     R0629
+--] [----[  A MPY    B   =     C    ]-                                      (  )
|    415            +00016
|
|  <<RUNG 418>>
|
|Bit is                        # of Bit   Not Real
|Real                          to be      I/O Reg
|Input                         set        Address
|
|AO0980   R0629   R0623     R0630
+--] [----[  A  ADDX   B   =    C ]-                                         (  )
|    415
|
|  <<RUNG 419>>
|
|
*******************************************************************************************************
```

```
|
|Set the input when the BWC is positive
|
|Bit is                 Not Real
|Real                   I/O Reg
|Input                  Address
|
|AO0980   AO0978   R0630            I0001      Const
+---] [---------] / [-----[  BIT     SET    MATRIX        LEN]-                       (  )
|   415        395                               064
|
|  <<RUNG 420>>
|
*****************************************************************************************************
|
|
|Clear the input when the BWC is negative
|
|Bit is                 Not Real
|Real                   I/O Reg
|Input                  Address
|
|AO0980   AO0978   R0630            I0001      Const
+--] [-------] [--------[  BIT   CLEAR   MATRIX        LEN]-                          (  )
|   415       395                                064
|
|  <<RUNG 421>>
|
```

```
|Bit is      Bit is            Register          Not Real
|Real        Real              Address           I/O Reg
|Output      Input             of Bit            Address
|
|AO0979      AO0980   AO0981   R0624             Const      R0630
+---] / [--------] / [-----------] / [------[   A   ADDX        B    =    C ]-                    (   )
|    409         415      408                    +00001
|
|  <<RUNG 422>>
|
*****************************************************************************************************
|
|If the BWC is not a real input, output or if the "Adding 16 to Register"
|(See Rung 407 - 408) function was not implemented, add one to the
|register address to get a register range of R00001 through R02048 and
|store in register R00630.
|
|If the "Adding 16 to Register" function was implemented, then do not add
|1 (one) to the register, instead, store the register address in R0630.
|
|Bit is      Bit is                        Not Real   Registr              Not Real
|Real        Real                          I/O Reg    Address              I/O Reg
|Output      Input                         Address    of Bit               Address
|
|AO0979      AO0980   AO0981    Const      R0630      R0624      R0630
+--] / [------] / [------] [---[           A   MOVE    B   ]-[     A    MOVE   B ]-              (   )
|    409         415      408      +00000
|
|  <<RUNG 423>>
|
```

```
|
*****************************************************************************************************
|
|Store the value in the register designated by the address in R0630 in
|R0626
|
|Bit is      Bit is                          Not Real
|Real        Real                            Address
|Output      Input                           Memory
|
|AO0979    AO0980   IR0630                   R0626     Const
+--] / [--------] / [-----[  A    MOVE  TBL  EXT  B      LEN ]-                         (  )
|   409        415                                         001
|
|  RUNG 424>>
|
*****************************************************************************************************
|
|When the BWC is positive, set the bit in the value copied in R0626.
|
|
|Bit is      Bit is               # of Bit               Not Real
|Real        Real                 to be                  Address
|Output      Input                set                    Memory
|
|AO0979    AO0980   AO0978     R0623                  R0626     Const
+--] / [--------] / [----------] / [------[   BIT      SET    MATRIX          LEN]-        (  )
|   409        415       395                                        001
|
|  <<RUNG 425>>
|
|
*****************************************************************************************************
```

```
|
|When the BWC is negative, clear the bit in the value copied in R0626.
|
|
|Bit is     Bit is            # of Bit            Not Real
|Real       Real              to be               Address
|Output     Input             set                 Memory
|
|AO0979     AO0980   AO0978   R0623               R0626     Const
+---]/[-------]/[-----------] [------[   BIT     CLEAR   MATRIX       LEN]-              (   )
|    409       415      395                                 001
|
|  <<RUNG 426>>
|
|
*****************************************************************************************************
|
|Move the modified value in R0626 back to the register designated by
|the address in R0630.
|
|Bit is     Bit is    Not Real
|Real       Real      Address
|Output     Input     Memory
|
|AO0979     AO0980    R0626              IR0630    Const
+--]/[--------]/[-----[   A    MOVE   TBL    EXT B     LEN ]-                              (   )
|    409       415                                 001
|
|  <<RUNG 427>>
|
|
+[Return   ]-
.
```

```
|
|
|  <<RUNG 428>>
|
|
+[ENDSW]-
|
|
|  <<RUNG 429>>
|
|
|+[ENDSW]-
|
```

Series 90 PLC Word and Bit References

The Series 90 PLCs use decimal word addresses. The Operator Station format default is S16, where the values can range from -32768 to 32767. Thirty-two-bit formats are not allowed for the byte memory type (i.e., S32, U32, BCD6, BCD8, BIN6, or BIN8). See the "Word and Bit References" topic in online help for valid word formats.

The following are the memory ranges for the Series 90-30 and 90-70 models.

	311	331	731 732	771 772	781 782
%AI (Read/Write)	1-64	1-128	1-8192	1-8192	1-8192
%AQ (Read/Write)	1-32	1-64	1-8192	1-8192	1-8192
%R (Read/Write)	1-512	1-2048	1-16384	1-16384	1-16384
%I (Read/Write)	1-512	1-512	1-512	1-2048	1-12288
%Q (Read/Write)	1-512	1-512	1-512	1-2048	1-12288
%M (Read/Write)	1-1024	1-1024	1-2048	1-4096	1-12288
%T (Read/Write)	1-256	1-256	1-256	1-256	1-256
%G (Read/Write)	1-1280	1-1280	1-1280	1-7680	1-7680
%S (Read Only)	1-32	1-32	1-128	1-128	1-128
%SA (Read/Write)	1-32	1-32	1-128	1-128	1-128
%SB (Read/Write)	1-32	1-32	1-128	1-128	1-128
%SC (Read/Write)	1-32	1-32	1-128	1-128	1-128

The first three memory types in the above table are 16-bit word references (%AI, %AQ, %R) and the remaining memory types are bit references.

The following is the format for a word reference:

[%XXrrrrr]

% Beginning symbol

XX PLC word memory type (AI, AQ, R). This may be upper or lower case.

rrrrr PLC word reference number. Leading zeroes are allowed but not required.

The following is the format for a word bit reference (Read Only):

[%XXrrrrr/bb]

% Beginning symbol

XX PLC word memory type (AI, AQ, R). This may be upper or lower case.

rrrrr PLC word reference number. Leading zeroes are allowed but not required.

/ Character used as a delimiter between word address and bit number

bb PLC reference number of the bit position. The bit positions are numbered from 0 to 15 with 0 being the least significant bit.

The following is the format for a byte (8-bit) reference:

[B:%XXbbbbb]

B Character designating byte reference

: Byte designator/memory type separator

% Beginning symbol

XX PLC memory type (I, Q, T, M, G, S, SA, SB, SC). This may be upper or lower case.

bbbbb PLC byte reference number. This address must be a multiple of 8 + 1. Leading zeroes are allowed but not required.

The following is the format for a bit reference:

[%XXbbbbb]

% Beginning symbol

XX PLC memory type (I, Q, T, M, G, S, SA, SB, SC). This may be upper or lower case.

bbbbb PLC reference number of the bit position. Leading zeroes are allowed but not required.

Note that GE Fanuc Series 90 Family PLCs store double precision numbers with the first (low) register holding the least significant word and the next consecutive (high) register holding the most significant word. The Operator Station, however, interprets the first register as the most significant word and the next consecutive register as the least significant word. For example, if the value 1 is stored in register 624 and the value 0 is stored in register 625, GE Fanuc would interpret the stored value as 1, while the Operator Station would display the value as 65536. To read a double precision number correctly, multiply the low byte by 65536 and add this value to the high byte.

Examples

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

Series 5, 6, and 6+

Word References	
Reference	**Description**
[R1024]	Register 1024
[R701]	Register 701

Bit References	
Reference	**Description**
[AI233]	Auxiliary input 233
[AO466]	Auxiliary output 466
[I18]	Input 18
[O42]	Output 42
[IF+999]	Input 999 of expanded channel IF+
[I7-766]	Input 766 of expanded channel I7-
[OA+643]	Output 643 of expanded channel OA+
[O6-1019]	Output 1019 of expanded channel O6-

Series 90/30 and 90/70

Word References	
Reference	**Description**
[%AI32]	Analog input 32
[%R1234]	Data register 1234

Byte References	
Reference	**Description**
[B:%M65]	Discrete internal coil 65
[B:%Q9]	Discrete machine output 9

Bit References	
Reference	**Description**
[%SA32]	Bit 32 of system memory
[%T198]	Discrete temporary coil 198
[%AQ705/0]	Bit 0 of analog output 705
[%R150/15]	Bit 15 of data register 150

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.

"%AI", "%AQ", "%R", "%I", "%Q", "%M", "%T", "%G", "%S", "%SA", "%SB", "%SC", "B:", and "/"

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.

Genius I/O Driver

7

In this chapter, you will learn:

- *About the Genius I/O Communications PLC Network*

Driver Installation

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.

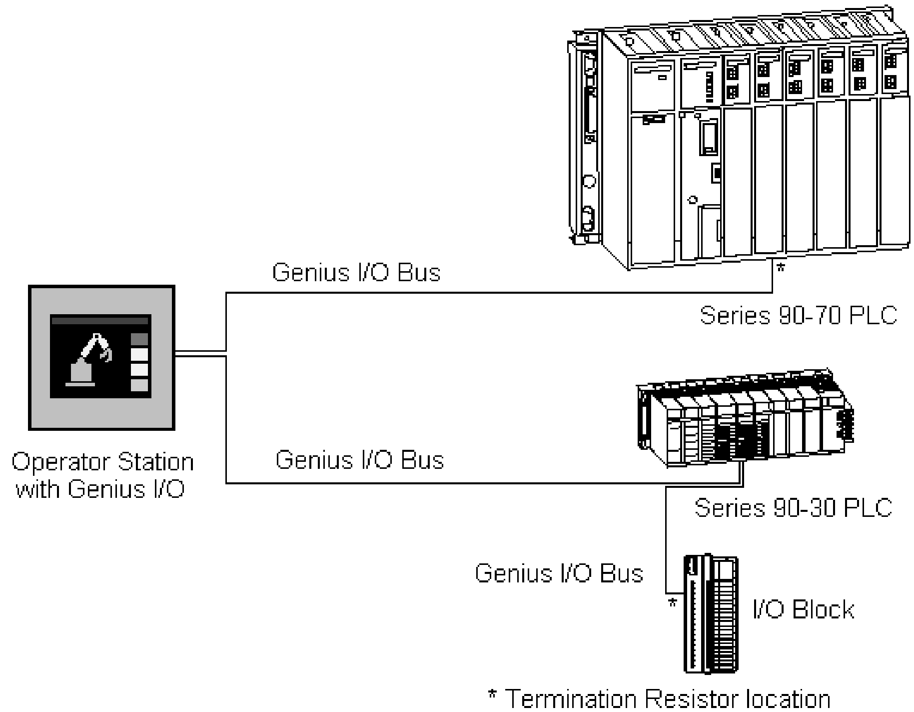
Memory

Genius I/O supports all of the GE Fanuc Series 90 memory addressing types. Consult the GE Fanuc Driver Manual for Series 90 Memory addressing formats. The use of Series 90 memory addressing results in the creation of a Genius I/O Datagram.

Note: The uses of Global Data, results in increased Genius I/O network traffic and can result in a higher Bus Scan rate. Consult the GE Fanuc Genius I/O documentation to determine when the use of Global Data is appropriate.

Possible Configurations

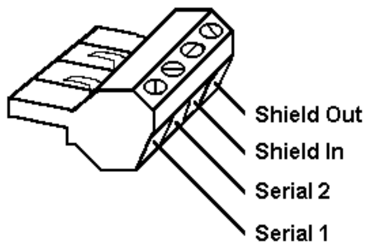
Operator Station to Genius I/O Bus



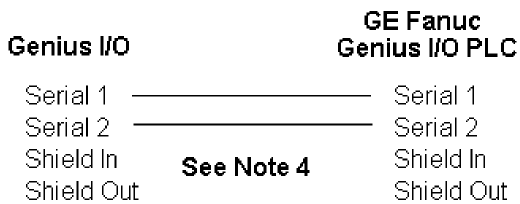
Cabling

The Genius I/O driver comes with a male, four pin Phoenix connector. The connector is keyed.

Wiring for the Phoenix connector is as follows:



Operator Station Genius I/O Card to Genius I/O Network



Note 1: The Genius bus is a shielded twisted-pair wire, daisy-chained from block to block and terminated at both ends. Proper cable selection is critical to successful operation of the system.

Note 2: The connection to the Genius I/O board is made with a four pin Phoenix connector supplied with the Genius I/O option.

Note 3: A termination resister is attached at each end of the Genius I/O bus cable. Consult GE Fanuc documentation shipped with your PLC for information regarding correct termination of the Genius I/O bus. A 75 or 150-ohm resistor is required if the Genius I/O interface is the end node on a network. If the interface is not the end node on the network, a resistor is not used. See Genius I/O System and Communications User's Manual for additional information on cable termination.

Note 4: Shield In of each block must be connected to Shield Out of the preceding device. See Genius I/O System and Communications User's Manual for additional information on Shield connections.

Operator Station Setup

Operator Station Connection to Genius I/O Bus

Configure the following setup in the PLC Name and Port Table Editor:

Field	Selection	Comments	Notes:
Port#	I/O	Selects the Genius I/O card as the communication interface.	
Use	GENIUS		
Local ID#	*	Can be set to any number between 0 and 31, the default is 0.	See Note 1.
Data Bits	N/A		This field is not used by Genius I/O.
Stop Bits	N/A		This field is not used by Genius I/O.
Parity	N/A		This field is not used by Genius I/O.
Baud Rate	*	Set to match the PLC network baud rate (valid rates are: 38,4 Kbaud, 76.8 Kbaud, 153.6 Kbaud and 153.6X Kbaud extended).	
Name	*	Use any six-character name.	
Remote ID#	*	Can be set to any number between 0 and 31, the default is 0.	See Note 2.
Port	I/O	Denotes connection to the Genius I/O card.	
Model	*	Set to match the processor model type.	

Note 1: Operator Station ID# must be unique to the network. Genius I/O reserves address 31 for the bus controller and address 0 for the Hand-held monitor.

Note 2: Processor ID# on the bus. Genius I/O reserves address 31 for the bus controller and address 0 for the Hand-held monitor. The Remote ID# must be unique to the bus

Global Data Length

The Global Data Length setting is accessed via the Genius I/O selection in the PLC Name and Port Table. The Global Data Length specifies the number of bytes of Global Data the Operator Station will transmit each bus scan onto the Genius I/O bus. The valid range for Global Data Length is 0 to 128 bytes (0 to 64 words).

PLC and Communication Module Setup

PLC Connection to Genius I/O

Refer to your GE Fanuc documentation shipped with your PLC for information on configuring the Genius I/O.Datagrams

Word and Bit References

The following section describes the use of GE Fanuc 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.

Note: Refer to the GE Fanuc Series Six PLC Word and Bit References, GE Fanuc Series Six Plus PLC Word and Bit References, or GE Fanuc Series 90 Word and Bit References section for more specific referencing information

Datagrams

The Operator Station will allow the GE Fanuc Genius I/O models a maximum of 64 contiguous words for each block read. The maximum number of unused words before another read is generated is 62. This directly corresponds to the number of Datagrams that would be generated by the Operator Station.

Global Data Format

The GE Fanuc Genius I/O supports Global Data access in both byte and word format. The following uses a decimal index. The Operator Station default format is S16. Each byte is stored as a S16 word; the upper 8 bits of each word are not used. Byte reference is the default. The following word and bit addressing descriptions apply to the Genius I/O Command Set.

Byte Format

[nodename,Mxxx]

nodename	plcname or GLBL, where GLBL signifies the Operator Station's local Global Data or plcname signifies the remote PLC name found in the PLC Name Table. If left blank, the default PLC name is used.
M	GL or GR, where GL signifies Global Data on the Operator Station's Local node or GR signifies Global Data on any Remote node.
xxx	Byte index. Range is from 1 to 128.

Bit (Byte) Format

[nodename,Mxxx/bb]

nodename	plcname or GLBL, where GLBL signifies the Operator Station's local Global Data or plcname signifies the remote PLC name found in the PLC Name Table. If left blank, the default PLC name is used.
M	GL or GR, where GL signifies Global Data on the Operator Station's Local node or GR signifies Global Data on any Remote node.
xxx	Byte index. Range is from 1 to 128.
/	Bit delimiter
bb	Bit number. Range is from 1 to 8.

Word Format

[nodename,W:Mxxx]

nodename	plcname or GLBL, where GLBL signifies the Operator Station's local Global Data or plcname signifies the remote PLC name found in the PLC Name Table. If left blank, the default PLC name is used.
W	Word reference identifier.
:	Word delimiter.
M	GL or GR, where GL signifies Global Data on the Operator Station's Local node or GR signifies Global Data on any Remote node.
xxx	Word index. Range is from 1 to 64.

I/O Format

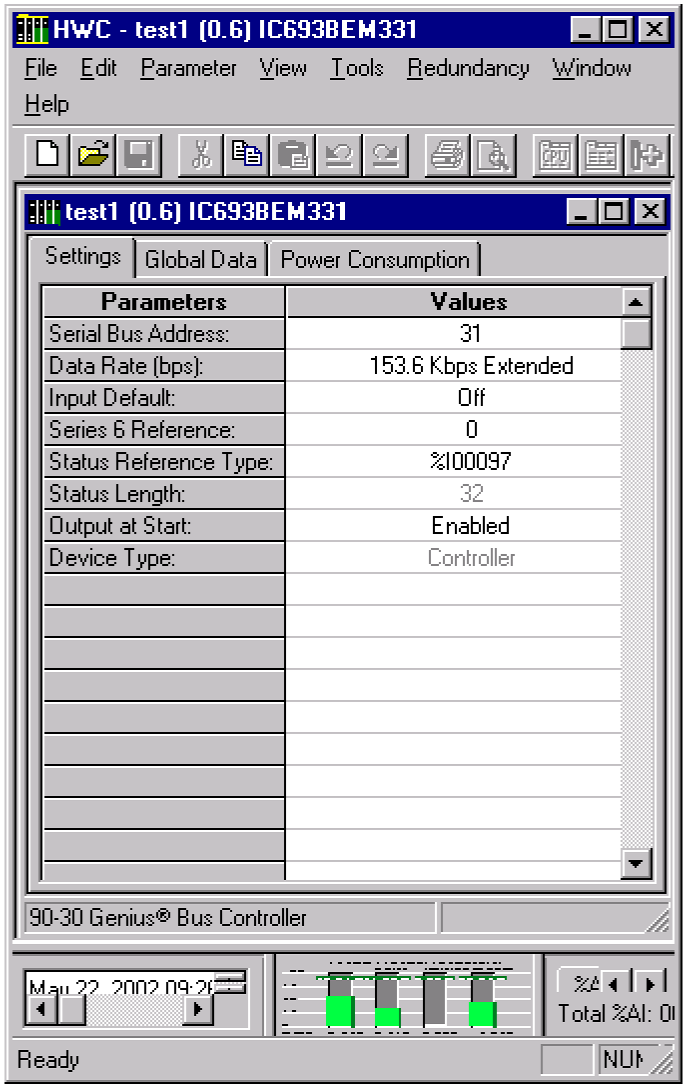
GE Fanuc Genius I/O supports I/O Block access via Global Data. I/O Block data is broadcast on the network via Global Data packets from each I/O block on the network. Access is via the formats discussed under Global Data Format.

Remote Errors

For a list of online, remote errors not documented below see the Online Operations Users Guide.

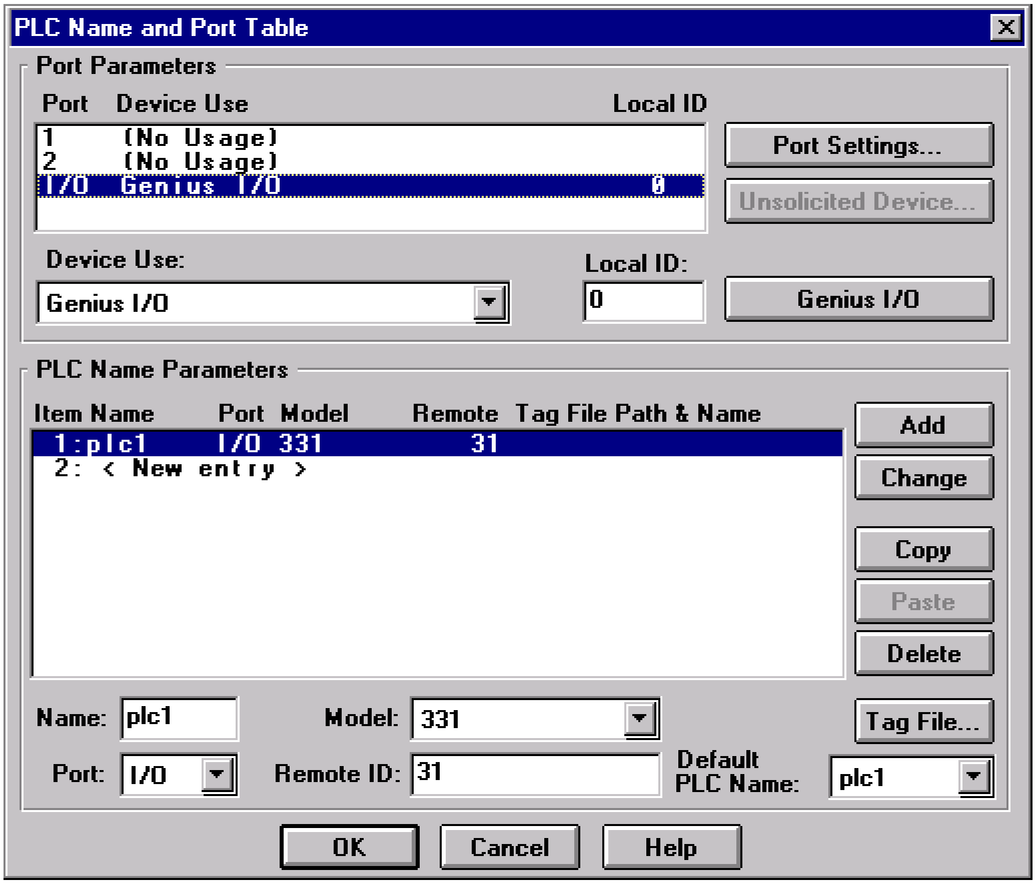
Local or System Error 1161 Description Global Data Write Reference Out of Range	
Local or System Error 1162 Description Local Node Address Out Of Range, if local node is configured less than 0 or greater than 31	
Local or System Error 1165 Description Remote device not on the network	Probable Cause Check network cabling
Local or System Error 1751 Description The reference is read only	

To set up the PanelMate to communicate with Genius IO using Global data, it is important to make sure that the PanelMate setup matches the GE. In the following example the GE and the PanelMate are both set up to transmit and receive 2 words and 16 bits of data.



In the diagram above the important information to note is the Serial Bus Address (31), and the Data Rate (153.6kps Extended). Based on this information we can start to set up the PLC Name and Port Table in the PanelMate Configuration software.

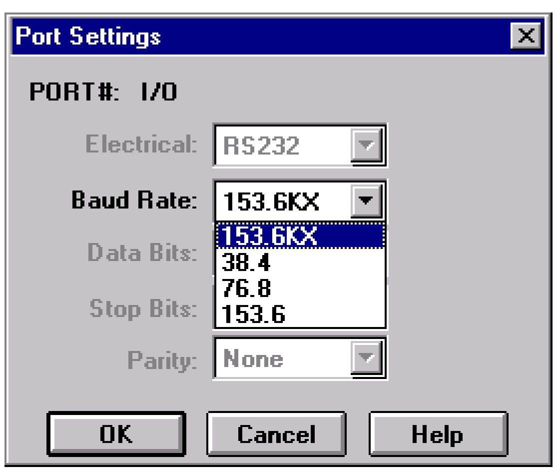
In the PanelMate software we are going to take the Values used in the Hardware configuration of the VersaPro software and use them to correctly configure the PLC Name and Port Table.



After installing the Genius I/O driver >= version 4.97, The option of setting the IO port to Genius I/O will be an option in the Port Parameters. In this example the Genius has been selected and the local ID is set to 0. This means that the PanelMate's Node address on the network is now set to 0.It is important to make sure that no other device on the network has the same address as the PanelMate.

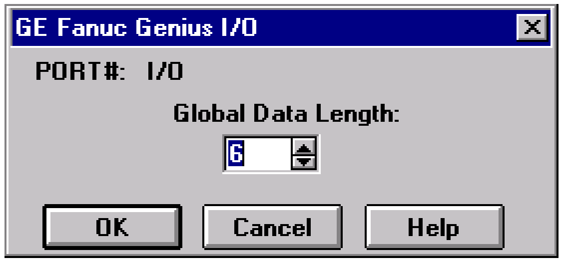
In the PLC Name Parameters it is important to note the Remote ID is set to 31. 31 is the Node address of the PLC that the PanelMate is communicating with. This node address is the same address that is set up in the GE's Serial Bus Address. Both the Remote ID and the Serial Bus Address must match

Next are the Port Settings. Again it is very important that the PanelMate setting for the baud rate match the baud rate in the Hardware configuration of the GE software.



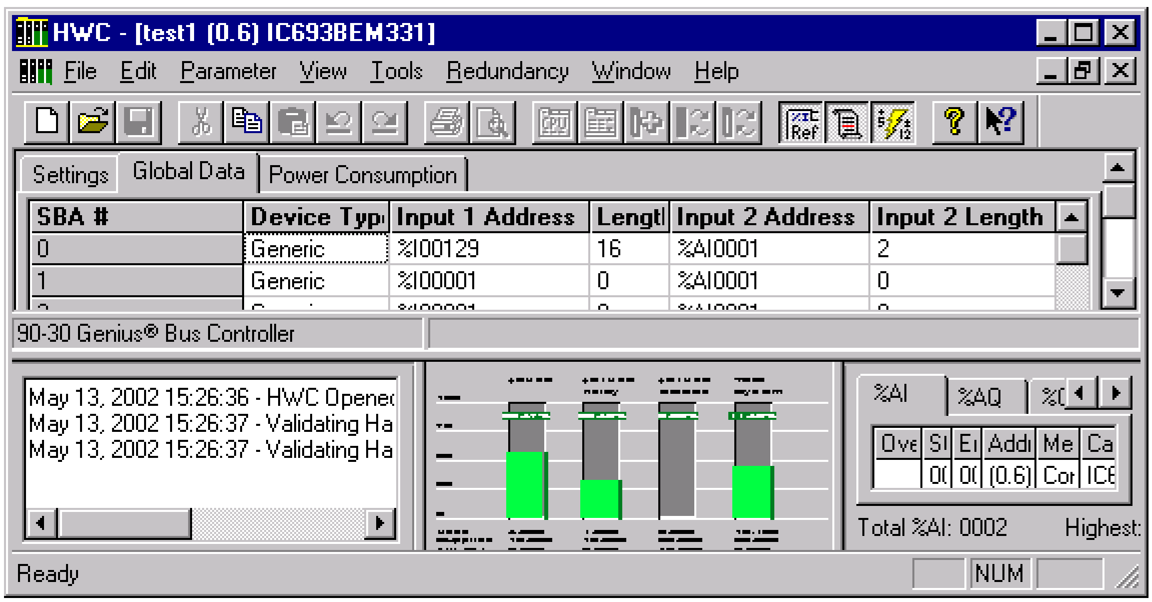
Notice 153.6KX reefers to the extended option in the GE Hardware config.

Then chose the Genius tab. In my example I am writing 16 bits and 2words to the GE though Global data, this correlates to 6 bytes of information



The Genius setting is only for information being sent from the PanelMate to the PLC over Genius I/O using Global Data. There is no setting required for the PanelMate to receive data using Global Data, in the PLC Name and Port table.

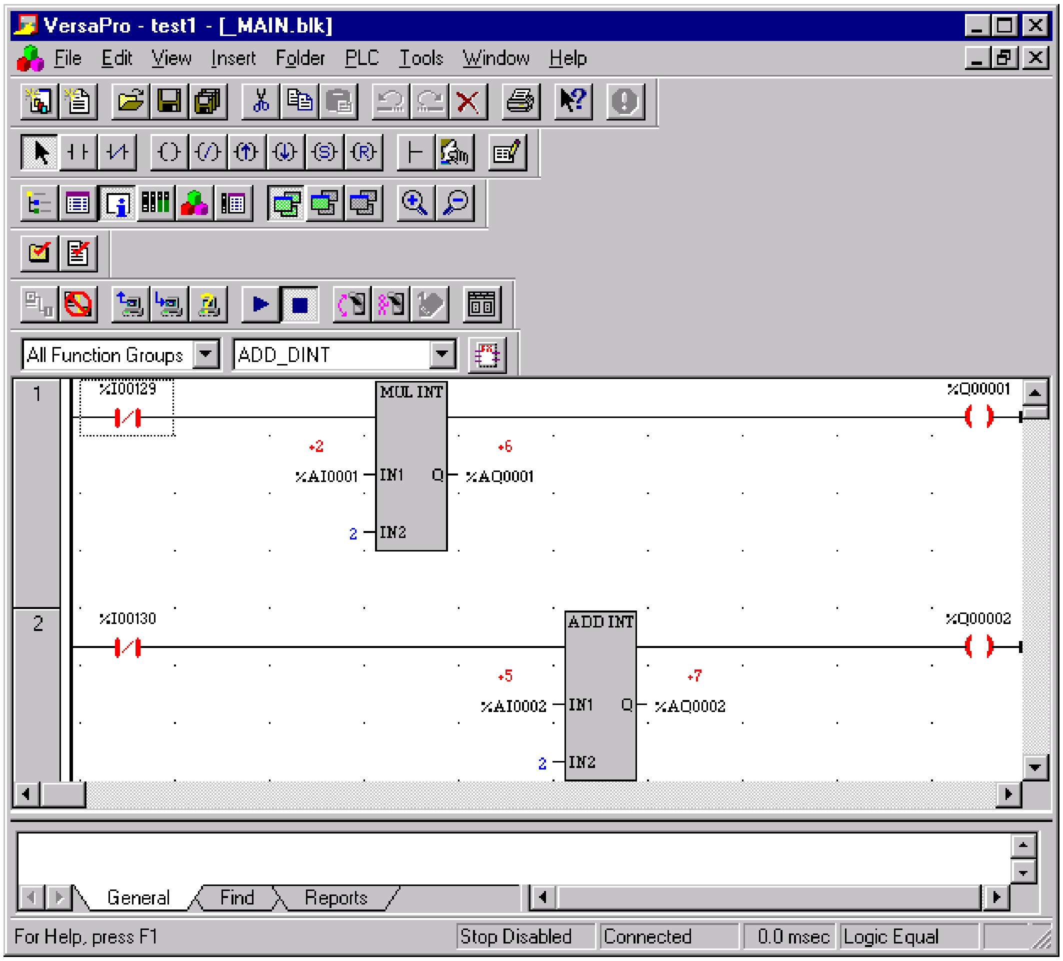
To set up the receive information on the GE the following must be set up under the Global Data section in the Hardware config.



Input 1Address of %I00129 is the first16 bits %I00129 - %I00144 that can be received from the PanelMate. Input 2 Address of %AI0001 is the first word and %AI0002 is the second word that is received from the PanelMate. It is very important that this is set up at SBA# 0 to match the PanelMate's local ID.

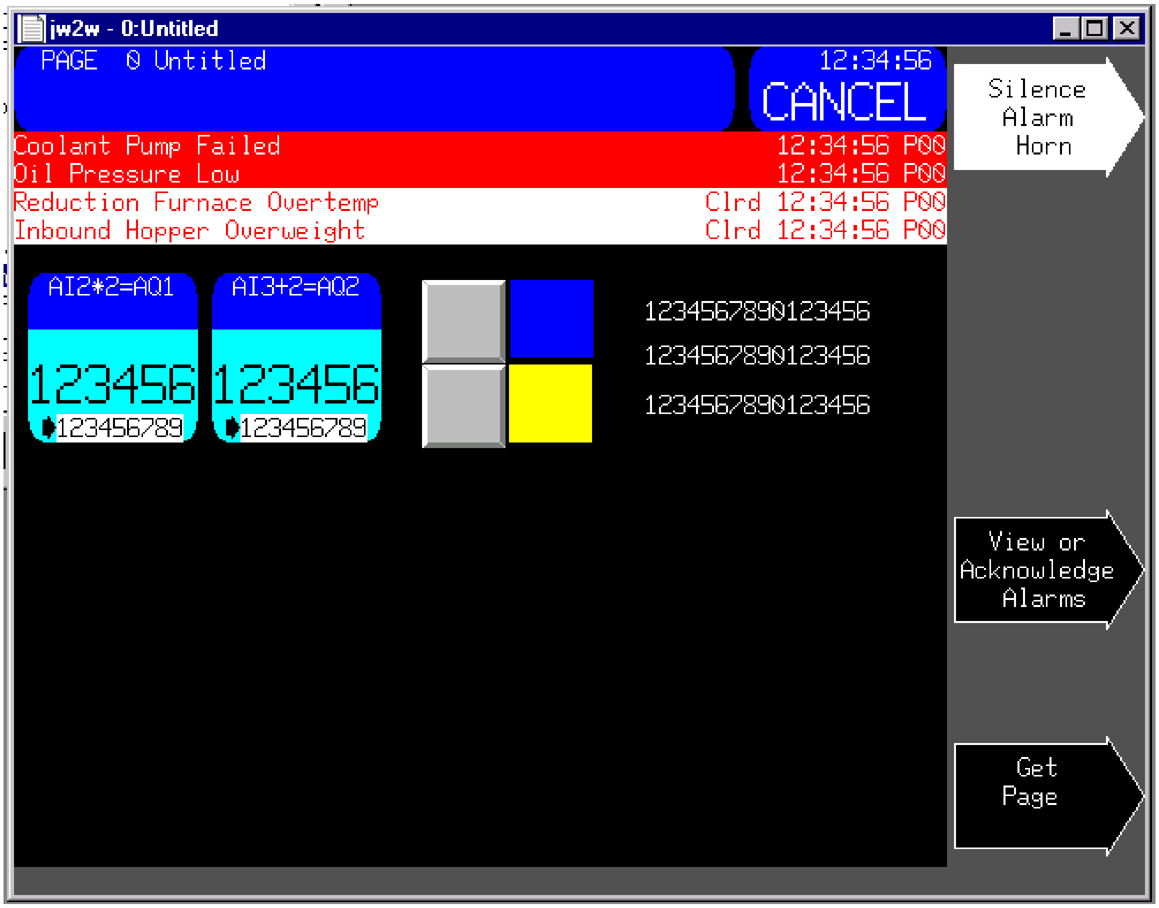
The output from the PLC to the PanelMate must be set up at address 31 This is the address of the Genius card in the rack (Serial Bus Address). Output 1Address of %Q00001 is the first of 16 bits %Q00001-%Q00016 that can be sent to the PanelMate. Output 2Address of %AQ0001 is the first word and %AQ0002 is the second word that is sent to the PanelMate.

The following program below was used to test communications.



All of the setup in the PLC is now complete.

The PanelMate screen below was used to get test the communications.



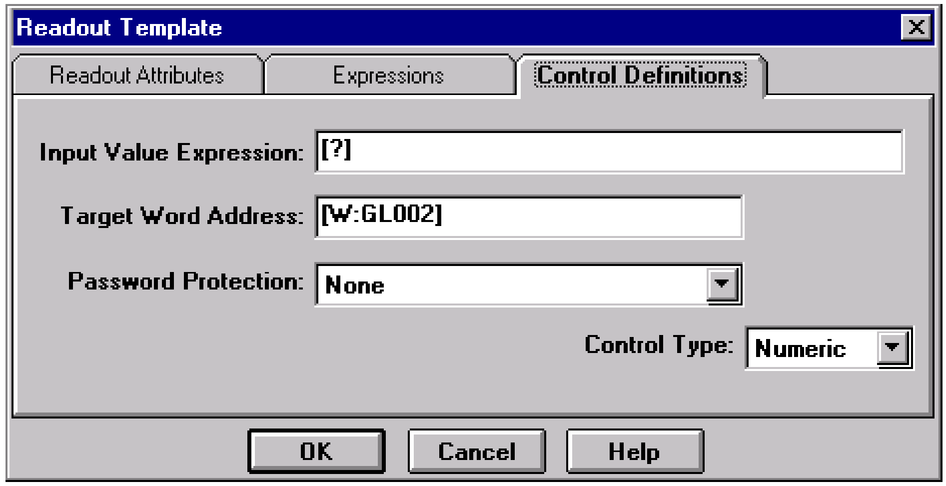
The addressing is as follows for this example.

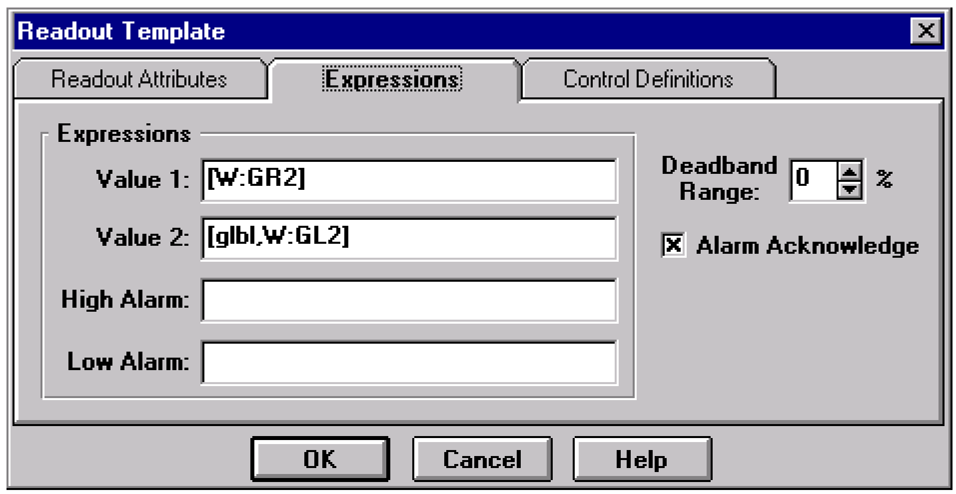
Addressing from PanelMate to GE Genius I/O Global Data					
To PLC		From PanelMate	Global I/O Settings		
	Address	Address	SBA#	Address	Length
Word 0	%I00129- %I00144	GL001/01-Gl001/16	Input 1	%I00129	16
Word 1	%AI0001	W:GL002 or GLBL,W:GL002	Input 2	%AI0001	2
Word 2	%AI0002	W:GL003 or GLBL,W:GL003			

Addressing to PanelMate from GE Genius I/O Global Data					
From PLC		To PanelMate	Global I/O Settings		
	Address	Address	SBA#	Address	Length
Word 0	%Q00001- %Q00016	GR001/01-GR001/16	Output 1	%Q00001	16
Word 1	%AQ0001	W:GR002	Output 2	%AQ0001	2
Word 2	%AQ0002	W:GR003			

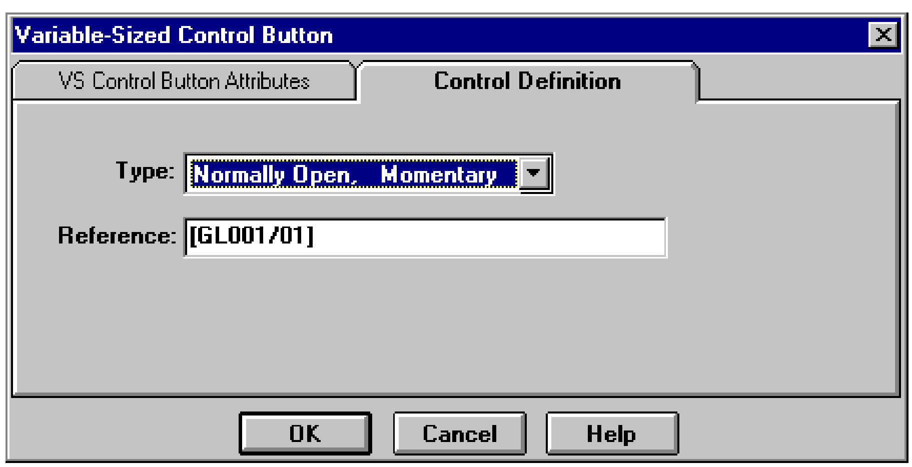
The address format on the previous page was used to create the following templates.

Read out template AI2*2=AQ1

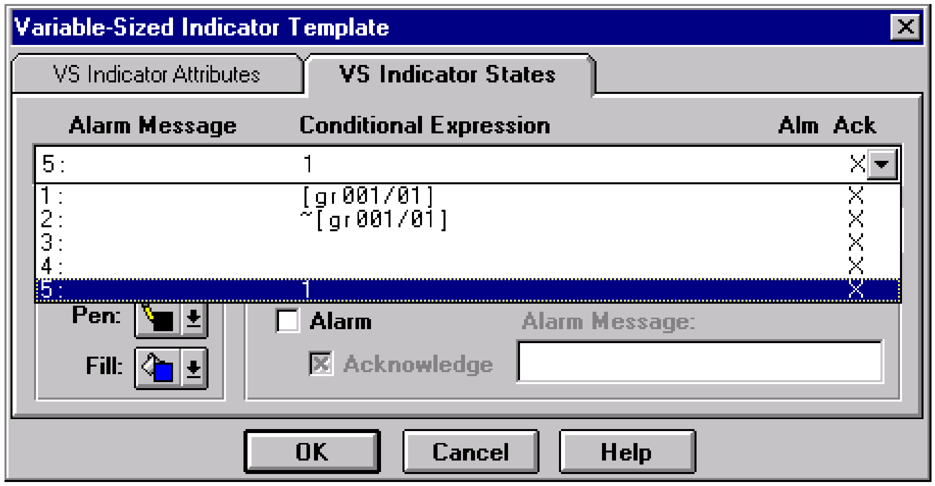




Variable sized control button



Variable Sized Indicator Template



This is just a sample setup. For further information refer to the GE driver manual under the Global IO section.

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