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FANUC

Series Six Programmable Controller

GFK-0238A
November 1988

Communications Control Module Type 2 and Type 3

IC600CB536
IC600CB537

General Description

The Communications Control Module Type 2 (CCM2) and Type 3 (CCM3) are modules for the Series Six PLC containing two communications ports, two switches, and four indicator Light Emitting Diodes (LEDs) for connection, control, and status of the module.

The primary purpose of these modules is to provide a serial interface between the Series Six Central Processing Unit (CPU) and any intelligent device which can initiate communications based on CCM2 and/or CCM3 supported protocols and electrical interface requirements. Examples of intelligent devices which can be interfaced are:

CCM2, CCM3, or I/O CCM Series Six modules

- Host computer or microprocessor based device

Process control system

- Color-graphics terminal

The Series Six Plus PLC with expanded microcode increases the number of user addressable I/O points.

This feature allows addressing of channeled I/O points with the Series Six expanded instruction set. The I/O points can be accessed by both the CCM and the Remote Terminal Unit (RTU) protocol for CCM3, and the CCM protocol only for CCM2. CCM also supports addressing of the Auxiliary I/O Override table.

Expanded user memory reference allows memory addressing up to 64k of the user logic memory. The expanded user logic memory is supported by both the CCM and the RTU protocol.

Table 1. FEATURES AND BENEFITS

FEATURES	BENEFITS
Contains two programmable communications interfaces.	Permits a data link between Series Six and host computer, programmable terminals, and other intelligent devices.
Accepts requests for Serial Communications from CPU user program. (If peer or master mode is selected.)	Allow CPU logic to initiate and control the communication and data flow.
On-board diagnostics and board fault indicator lights.	Simplifies troubleshooting arid indicates correct data transfer.
Direct interface with Operator Interface Unit (OIU).	Allows for simplified operator inputs into process under control.
QAB (Quick Access 1024 byte general purpose Buffer)	Buffer data to minimize access time from an external device.
Expanded memory	Permits addressing of channeled I/O points, up to 64K user logic memory.

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CCM2/CCM3 System Configurations

The CCM2/CCM3 supports two types of system configurations, point-to-point and multidrop.

In the point-to-point configuration only two devices can be connected to the same communication line. The communication line can be directly connected using RS-232 (50 feet, 15 meters maximum) or RS-422 (4000 feet, 1200 meters maximum). Modems can be used for longer distances.

In the multidrop configuration more than two devices can be connected to the same communication line. One CCM2 or host device is configured as the master and one or more CCM2s/CCM3s are configured as slaves. A master is capable of initiating communications; a slave is not. There are three ways to connect CCM2s/CCM3s in the multidrop configuration: RS-422 direct, RS-232 using modems, and RS-232 using modems and microwave or radio transmitters.

RS-422 Direct: This method can be used when the maximum distance between the master and the last **slave** does **not** exceed 4000 feet (1200 meters). This distance assumes good quality cables and a moderately "noisy" environment. A maximum of eight slaves can be connected using RS-422 in a daisy chain or multidrop configuration. The RS-422 line may be of the 2-wire or 4-wire type.

RS-232 Using Modems: This configuration is used for long distance communications, primarily over telephone lines. The number of slaves possible is determined by the modem capabilities.

RS-232 Using Modems and Microwave or Radio Transmitters: This configuration **is** used where cables cannot be used between modems. The FCC normally requires the use of single frequency transmitters with short transmitter-on times. Therefore, a warm-up delay for the radio transmitter must be added before each transmission. The CCM2/CCM3 keys the radio transmitter to warm-up and wait a short time before actually transmitting the data. The various time-out values for the communication protocol are increased to include the added delay.

Table 2. RS232C/RS-422 CABLE SPECIFICATIONS

Length, Maximum - 50 feet (15 meters) for RS-232C; 4000 ft. (1.2Km) for RS-422
Overall Shield
24 AWG, Minimum
Connector to CCM Port J 1 - D-Subminiature Type, Cannon DB25P (solder pot) with DB 110963-3 Hood or Equivalent (Standard RS-232C Connector)
Connector to CCM Port J2 - D-Subminiature Type, Cannon DE9P (solder pot) with DE110963-1 Hood or Equivalent
Connector to Intelligent Device (Determined by intelligent device)
RS-422 Cable Selection
The following cables provide acceptable operation at data rates up to I9.2K BPS and distances up to 4000 feet.
Belden -9184
Belden -9302
NEC -222PISLCBT
At shorter distances, almost any twisted pair or shielded twisted pair cable will work. It should be noted that RS-422 requires that the transmitter and receiver ground be within a few volts of each other or damage to the transmitter and receiver may result.
It is also noted that the twisted pairs should be matched so that both transmit signals make up one twisted pair and both receive signals make up the other twisted pair, If this is ignored, then cross-talk can result from the mis-matching which will affect the performance of the communication system.

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Module Function Options

The options listed below for the CCM2/CCM3 are hardware selectable using switches and jumpers, or software selectable using configuration registers.

Data Rate (bits per second)	300, 600, 1200,2400,4800, 9600, 19.2K 38.4K
Protocol	Peer-to-peer Master, slave RTU slave (CCM3 only)
Line Interface	RS-232C RS-422 RS-422 with clocks (CCM2 only)
Turn-Around Delay	Oms, lOms, 5OOms, 5OOms with time-outs disabled
Character Format	8 data bits 1 stop bit Optional parity bit
Parity	Odd **None** Even CCM3 RTU mode, (Port 32 only)
Operator Interface Unit (OIU)	Enable Disable Connect, disconnect power to OIU from CCM
• Terminating Resistors (RS-422)	Resistors IN receiver circuit if module is at the end of an RS-422 multidrop or point-to-point link. Removed from receiver circuit if module is in an intermediate drop in a multidrop link.

Table 3. SPECIFICATION AND SERIAL DATA FORMAT

Serial Data Format										
BIT0	BIT 1	BIT2	BIT3	BIT4	Em5	BIT6	BIT 7	BIT 8	BIT 9	BIT10
	LSB							MSB	*	
START				ACTIVE	DATA	BITS			PARITY	STOP
0				1	or	0				1

* Parity can be disabled on either port.

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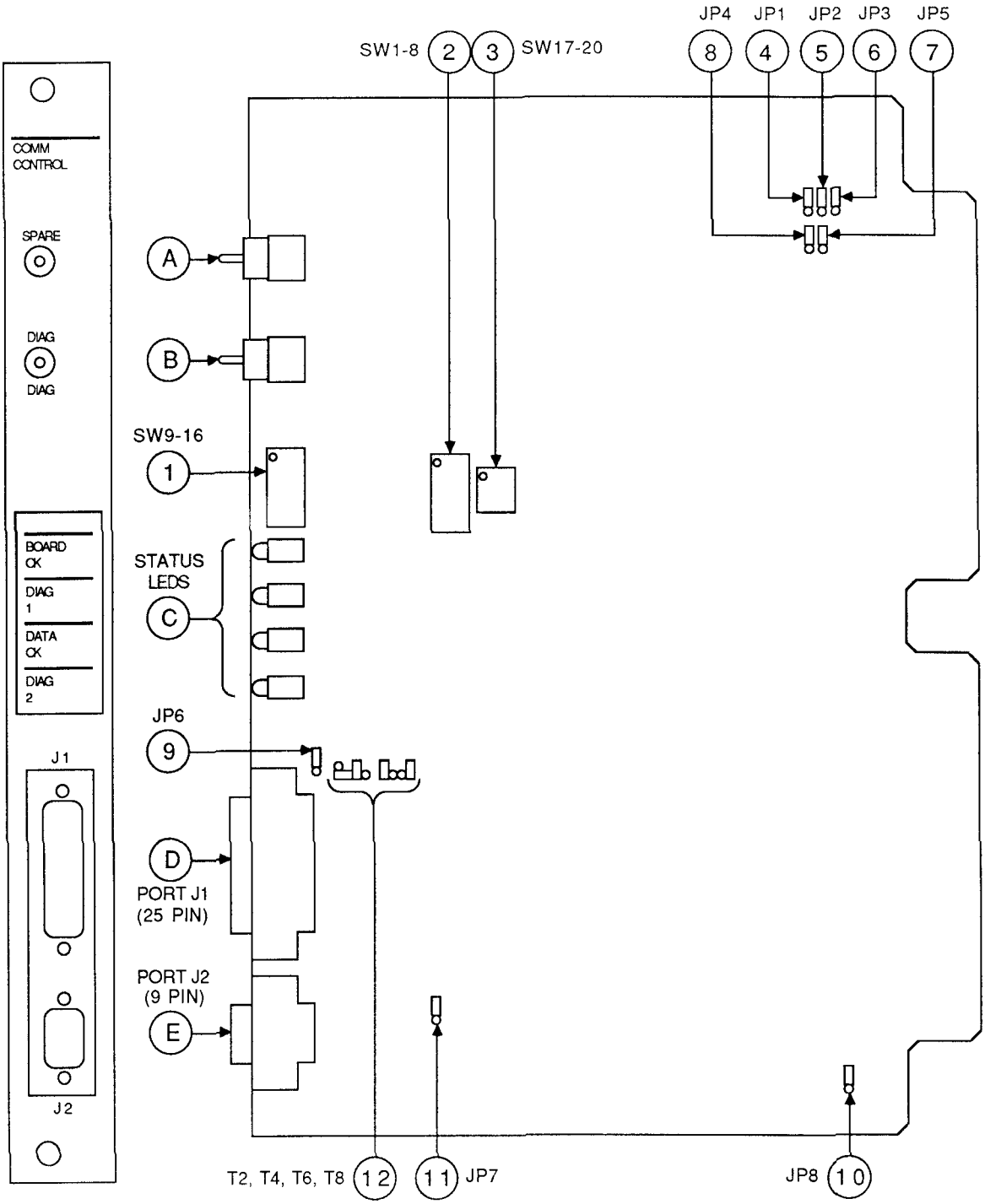


Figure 1. USER ITEMS

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Description of User Items

A Single Pole/Double Throw/Center Off switch (momentary contact)

B Single Pole/Double Throw/Center Off switch (momentary contact)

Both switches (A and B) perform the same function in either the Up or DOWN position.

Switches A and B are used for CCM error diagnostics.

C LED Indicators 1 **to 4 (see** below).

D Jl Connector: 25pin "D" type female connector for RS-232 and RS-422.

E J2 Connector: 9-pin "D" type female connector for RS-422 and RS-232.

1 DIP Switches 9 to 16: Configuration selection for port Jl (see Table 5).

2 DIP Switches 1 to 8: Configuration selection for port J2 (see Table 6).

3 DIP Switches 18 to 20: Miscellaneous selection for **both** ports (see Table 5).

4 Jumper JPI: Always set in 1-2 position,

5 Jumper JP2: Always set in l-2 position.

6 Jumper JP3: Always set in 1-2 **position.**

7 Jumper JP5: Always set in l-2 position.

8 Jumper JP4: 1-2 position, OIU DISABLE.

Jumper JP4: 2-3 position, OIU ENABLE.

9 Jumper JP6: 1-2 position disconnects **+5V** from pin 20 of Port Jl.

2-3 position, connects **+5V** to pin 20 of port Jl.

10 Jumper JP8: Always set in 1-2 position.

11 Jumper JP7: Always set in l-2 **position.**

12 See installation of RS-422 interfaces for terminating resistor configuration.

Jumper T2: J2, RS-422 receiver circuit

Jumper T4: RS-422 clock input

Jumper T6: Jl, RS-422 receiver circuit

Jumper T8: Always set in storage position

Table 4. LED INDICATORS POWERUP ERROR CODES

	CAUSE OF ERROR (° Light on, ⁄⁄ Light off)				
	LIGHT	CCM POWER-UP RAM TEST FAILED	CCM USART FAILED TO INITIALIZE	CCM PROM TEST FAILED	CPU/CCM COMMUNICA-TIONS FAILED
1	BOARD OK	a	0	•	0
2	DIAG 1	0	a	•	0
3	DATA OK	0	0	0	⁄
4	DIAG 2	0	0	O	0

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LED Descriptions

BOARD OK (Module Status)

STATUS	DESCRIPTION
ON:	Board has passed the self-check test and is operating properly.
FLASHING:	Invalid configuration or invalid CPU number, 0 or greater than 90 for CCM slave mode, 0 or greater than 247 for RTU mode (CCM3 only). The configuration or the CPU ID must be changed and the module powered up again to recover.
OFF:	Board has failed power-up test indicating a hardware failure or the CCM failed to communicate with the Series Six CPU. If the BOARD OK LED goes off as a result of a major CCM error, further information about the specific cause of the error can be obtained by toggling the front panel switch. When this is done, the 4 indicator lights will create **one** of the patterns shown in Table 3. - If it is a hardware failure **then** the CCM is inoperable and the LED will turn on again only after successful completion of the power-up test. § If at some time after a successful power-up there is a CCM/CPU communications failure, both the BOARD OK and the DATA OK LED will turn off. In this case additional information from the front panel LEDs cannot be obtained. Both LEDs will turn on again upon successful communications with the CPU.

DIAG 1

STATUS	DESCRIPTION
ON:	Passed powerup diagnostics. ON during normal operation. Cycles on and off during powerup then remains on.
OFF:	May change states when toggling Switch A or B.

DATA OK (Serial Data Transmission Link)

STATUS	DESCRIPTION
ON:	Data transmission normal.
FLASHING:	The LED will flash as serial data is actually transmitted.
OFF:	Data transmission is incorrect for one or more of the following reasons. - Parity, overrun or framing errors. - Invalid header, data block, control character, or checksum. In these cases the LED will turn on again after a successful session has been completed between the Series Six and the external device, or if the module power is cycled. A CCM./CPU communications failure will cause this LED and the BOARD OK LED to turn OFF.

DIAG 2

STATUS	DESCRIPTION
ON:	Passed powerup diagnostics. ON during normal operation. Cycles on and off during powerup then remains on.
OFF:	May change states when toggling Switch A or B.

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Installation

General

Before installing the CCM2/CCM3 in a CPU rack verify the position of the factory set jumpers (see Figures 1 and 2). Select the appropriate module function options by setting the on-board DIP switches (as required) per the coding shown in Tables 5, 6, 7 and 8.

The CCM2/CCM3 module can be installed in a model Six Plus, 60, 600, or 6000 PLC.

- ***In the Series Six 60,600, or 6000*** PLC the second slot to the left of the CPU power supply is reserved for this module, and is the only position where the CCM2/CCM3 can be installed.
- In the Series Six Plus PLC, slot 5 or 6 is reserved for the CCM2/CCM3 module. When slot 6 is used, set the backplane DIP switch package to all positions OPEN.

NOTE

The normal powerup operation with all backplane DIP switch positions set to OPEN is: All four LEDS powerup ON, next a BLINKING sequence, then all LEDS remain ON.

An unpredictable LED powerup sequence results when the backplane DIP switch package is set otherwise. The ALU Module LEDS remain OFF. And, if a Workmasteris connected, a message "No communications with the Series Six" is displayed.

Use the extraction/insertion tool furnished with the Series Six CPU to install or remove the circuit board. With the circuit board in place in the rack, guide the faceplate over the circuit board so that proper contact is made; then secure the faceplate to the rack using the thumbscrews at the top and bottom.

The CCM2/CCM3 module obtains its ID Number from the Series Six PLC. Use the Logicmaster software to set the correct ID Number in the Series Six CPU scratchpad.

Since there are many combinations of devices this module can interface with and many ways to wire up these combinations only a few of the more common wiring connections are shown as follows:

- The pinout definitions for ports JI and J2 are shown in Figure 3.
- Direct connect from one CCM2 module to another CCM2 is shown in Figures 4 and 6.
- Direct connect from a CCM2/CCM3 module to a computer or process control system is shown in Figure 5.
- Wiring from a CCM2/CCM3 to a GEnet Factory LAN BIU is shown in Figures 8 and 9.
- Wiring for CCM 4-wire multidrop network is shown in Figure 10.
- Wiring for a CCM 2-wire multidrop network is shown in Figure 1 I.
- Wiring from a CCM2/CCM3 to an Operator Interface Unit (OIU) is shown in Figure 7.

Troubleshooting Checklist:

- Verify CPU Id Number
- Verify CCM configuration setup
- Verify wiring
- Verify SCREQ commands (if used)

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HARDWARE JUMPERS						
	PINS JUMPERED	JUMPER	TERMINATING RESISTORS RS422	JUMPER POSITION RESISTOR IN	JUMPER POSITION RESISTOR OUT	JUMPER
REQUIRED SETTINGS	1 - 2	JP1	J2 RS422 RECEIVER			T2
	1 - 2	JP2				
	1 - 2	JP3	J1 RS422 CLOCK INPUT			T4
	1 - 2	JP5				
	1 - 2	JP7				
	1 - 2	JP8				
OIU ENABLED	2 - 3	JP4	J1 RS422 RECEIVER			T6
OIU DISABLED	1 - 2	JP4				
OIU POWER ON PIN 5 J1	2 - 3	JP6				
OIU POWER DISCONNECTED	1 - 2	JP6	REQUIRED SETTING			T8

Figure 2. CCM2/CCM3 CONFIGURATION JUMPERS

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Table 5. CCM PROTOCOL HARDWARE CONFIGURATION TABLE - PORT J1

FUNCTION PORT J1	O-Open C-CLOSED X-Don't Care	SWITCHES *										
		9 (1)	10 (2)	11 (3)	12 (4)	13 (5)	14 (6)	15 (7)	16 (8)	18 (2)	19 (3)	20 (4)
										X	X	O
Data Rate	300	O	O	O								
	600	C	O	O								
	1200	O	C	O								
	2400	C	C	O								
	4800	O	O	C								
	9600	C	O	C								
	19.2K	O	C	C								
	38.4K	C	C	C								
Protocol	Master RS-232				O	O	O					
	Master RS-422				C	O	O					
	Slave RS-232				O	C	O					
	Slave RS-422				C	C	O					
	Peer RS-232				O	O	C					
	Peer RS-422				C	O	C					
	Peer RS-422 With CLK (CCM2 Only)				O	C	C					
	Software Configuration **				C	C	C					
Turn Around Delay	0 ms full duplex							O	O			
	10 ms half duplex							C	O			
	500 ms half duplex							O	C			
	500 ms with time-outs disabled							C	C			
Parity Selection	(Always odd when using hardware configuration. To select no parity for port J1, see CCM2 Software Configuration.)											

* The numbers without parentheses are the actual switch numbers as indicated by the board silk screen. The numbers in parentheses are located on the dip switch package itself and are included as an aid in configuring the module.

X Don't Care

** Switch 17 must be CLOSED (C) for software configuration.

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Table 6. CCM PROTOCOL HARDWARE CONFIGURATION TABLE - PORT J2

FUNCTION PORT J2	O-Open C-Closed	SWITCHES * 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	17 (1)
Data Rate	300	O	O	O						
	600	C	O	O						
	1200	O	C	O						
	2400	C	C	O						
	4800	O	O	C						
	9600	C	O	C						
	19.2K	O	C	C						
	38.4K	C	C	C						
Protocol	Master RS-232				O	O	O			
	Master RS-422				C	O	O			
	Slave RS-232				O	C	O			
	Slave RS-422				C	C	O			
	Peer RS-232				O	O	C			
	Peer RS-422				C	O	C			
	Test 1(CCM2 only)				O	C	C			
Turn Around Delay	0 ms full duplex							O	O	
	10 ms half duplex							C	O	
	500 ms half duplex							O	C	
	500 ms with time-outs disabled							C	C	
Parity Selection	Odd									C
	None									O

* The numbers without parentheses are the actual switch numbers as indicated by the board silk screen. The numbers in parentheses are located on the dip switch package itself and are included as an aid in configuring the module.

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Table 7. RTU PROTOCOL (CCM3) HARDWARE CONFIGURATION TABLE - PORT J1

FUNCTION PORT J1	O-Open C-Closed	SWITCHES * 9 (1)	10 (2)	11 (3)	12 (4)	13 (5)	14 (6)	15 (7)	16 (8)
Data Rate	300	O	O	O					
	600	C	O	O					
	1200	O	C	O					
	2400	C	C	O					
	4800	O	O	C					
	9600	C	O	C					
	19.2K	O	C	C					
	38.4K	C	C	C					
Protocol	RTU(CCM3 Only)				O	C	C		
	Software Configuration				C	C	C	NOTE: Switch 17 must be C for Software Configuration	
Line Interface	RS-232							O	
	RS-422							C	
Parity Selection	Odd								O
	None								C

Table 8. RTU PROTOCOL (CCM3) HARDWARE CONFIGURATION TABLE - PORT J2

FUNCTION PORT J2	O-Open C-Closed	SWITCHES * 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	17 (1)
Data Rate	300	O	O	O						
	600	C	O	O						
	1200	O	C	O						
	2400	C	C	O						
	4800	0	O	C						
	9600	C	O	C						
	19.2K	O	C	C						
	38.4K	C	C	C						
Protocol	CCM3(RTU)				O	C	C			
Line Interface	RS-232							O		
	RS-422							C		
Parity Selection	Odd								O	C
	Even								C	C
	None								O	O
	None								C	O

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Faceplate Connections

The pinouts for the 25 pin (Jl) and **9** pin (52) ports (both female connectors) are shown below.

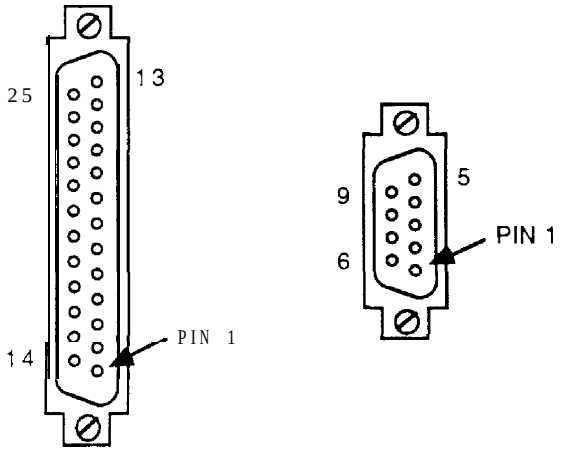


Figure 3. PORT CHARACTERISTICS (J1, J2)

Table 9. PORTS (Jl, J2) PIN-OUT DEFINITIONS

Jl Port				J2 Port	
Pin No.	**Description**	**Pin No.**	**Description**	**Pin No.**	**Description**
1	*	**14**	RS-422	1	RS-422 data out (+)
2	RS-232 data out	15	*	2	RS-232 data out
3	RS-232 data in	16	*	3	RS-232 data in
4	RS-232 request to send	17	RS-422 data out (-)	4	RS-232 request to send
5	RS-232 clear to send	18	RS-422 data out (+)	5	RS-232 clear to send
6	*	19	OIU ground	6	RS-422 data out (-)
7	signal ground	20	OIU +5 volts (fused at 5 A)	7	signal ground
8	*	21	RS-422 clock in (+)	8	RS-422 data in (+)
9	*	22	-12 volts resistive	9	RS-422 data in (-)
10	*	23	RS-422 clock in (-)		
II	keyout I/O	24	RS-422 clock out (+)		
12	+12 volts	25	RS-422 clock out f-)		
13	RS-422 data in (+)				

* Do not connect

Grounding

Both RS-232 and RS-422 require that the transmitter and receiver circuits be at the same ground potential (within a few hundred millivolts). On the CCM2 or CCM3, none of the circuits are isolated from the Series Six chassis ground, which is also the "local" power company ground. In many cases this is not a problem. However, the user should insure that the ground voltages are within a few hundred millivolts of each other before connecting the devices together. A problem will exist only if the local power ground is exceptionally noisy, or if the Series Six PLC rack or other device is floating with respect to this ground (which indicates an incorrect or very unusual configuration). If the user's configuration is such that the grounds do not meet the above condition, then isolating modems will be required instead of a direct twisted pair hookup.

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Installation of RS-422 Interfaces

- The maximum number of slaves on a multidrop line may be between 4 and 8, depending on the local electrical noise, the type of cable, distance between devices on the line, and the overall length of the cable.
- The maximum distance between the farthest 2 points in a multidrop system with 8 slave units on the line that has been tested is 10,000 feet. However, this may not represent a worst case in terms of noisy environments.
  - 4000 feet seems to be a good rule of thumb for maximum cable length. This assumes a twisted pair cable of AWG 24 copper with a shunt capacitance of 16 pf/foot. (Refer to the RS-422 specification).
  - In general, distance may be increased by using cables which have less resistance and capacitance per foot, than the 24 AWG cable illustrated above.
  - For example: If a cable with half the resistance per foot and only 8 pf/foot were used, operation at 8000 feet is probably attainable.
- **Terminating resistors:** The CCM2/CCM3 is supplied with 150 ohm terminating resistors in each RS-422 receiver circuit. (These resistors have no effect on RS-232 operation.)
  - These resistors should be left in the circuit if the CCM is at either end of a multidrop or point-to-point link.
  - If the module is used as an intermediate device in a multidrop network, the resistor should be removed by placing Jumper T6 for the J1 port and T2 for the J2 port in the storage position as shown in Table 2.
  - Jumper T8 must be in the storage position.

Physical layout: The following rules should be followed:

- All connections on the multidrop bus should be made inside the CCM serial port connectors. No intervening terminal strips, splices, or other devices should be used. Although it is difficult to get more than one (1) wire on the D connectors, this is the only way to insure that the network will function properly.
- For a multidrop network, the layout of the cable between devices should be as a daisy chain bus; NOT AS A STAR. Even if the physical proximity of the communicating devices **is** such that a radial star would be nice, it will not work.
- Pairing of twisted pairs within the cable: It is critical that the two transmit signals remain physically paired, and the two receive signals remain physically paired in the twisted pair cable.
  - It is not enough that electrically there is continuity between the correct points. If a transmit wire gets paired with a receive wire (twisted together) there may be crosstalk which will limit the maximum dependable distance to about 3 feet instead of 4000.
  - In the case of a 2-wire network where the transmit and receive signals are connected together; this is not a problem.

Cable Configuration

The CCM2/CCM3 module can interface many devices and there are many ways to wire these combinations. A few of the more common applications are shown in the following figures.

General guidelines for cable construction is provided below:

- At short distances (under 1000 feet) almost any twisted shielded pair will work. The specified cables will provide reliable operation at data rates up to 19.2 Kbps and distances up to 4000 feet. Good wiring practices must **be** observed. Twisted pairs must be matched.
- When routing communication cables outdoors, transient suppression devices should be used to reduce the possibility of damage due to lightning or static discharge. Best results have been obtained with General Semiconductor Industries Transzorb SA series wired from each signal line to earth ground at both ends of the cable.

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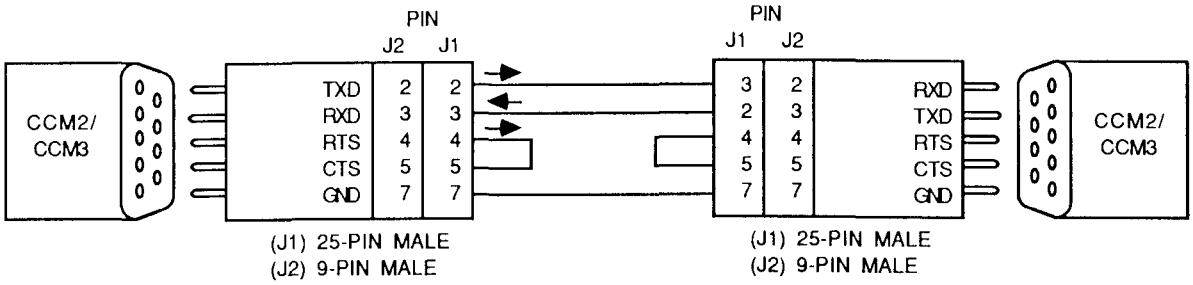


Figure 4. RS-232 TO ANOTHER SERIES SIX PLC CONNECTION

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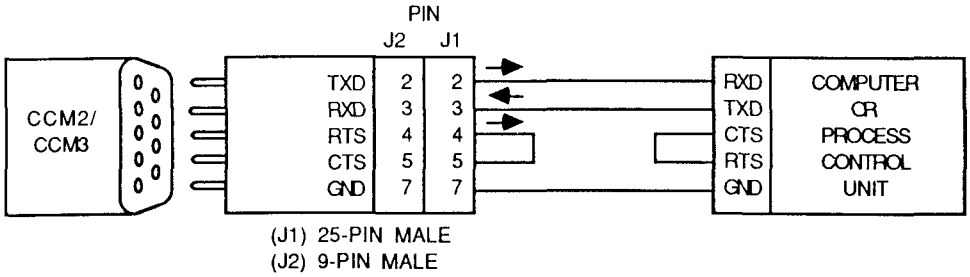


Figure 5. RS-232 TO A HOST COMPUTER CONNECTION

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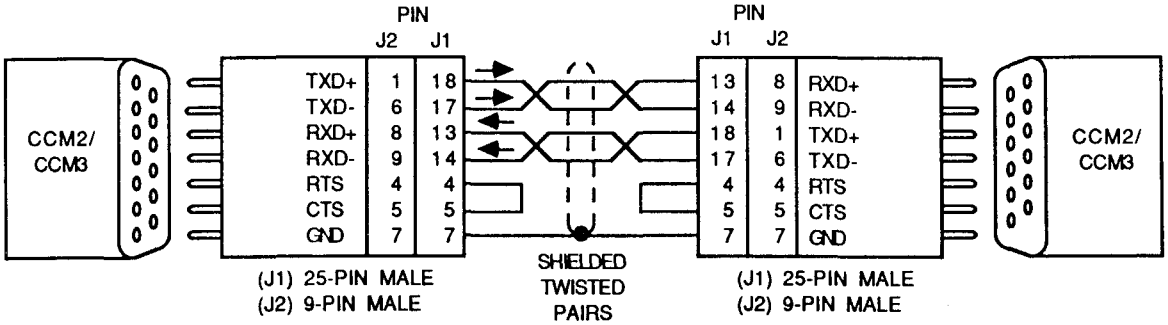


Figure 6. RS-422 TO ANOTHER SERIES SIX PLC CONNECTION

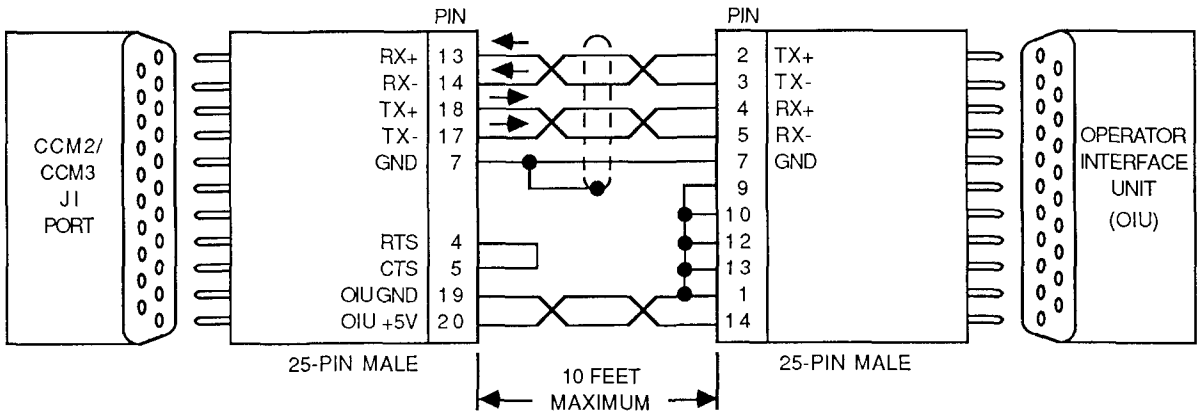
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Operator Interface Unit (OIU) Connections

The Operator Interface Unit (OIU) connects to the J1 port of the CCM2/CCM3 module. The CCM communicates to the OIU via RS-422 receive and transmit signals at a data rate of 19.2K BPS. The J1 port also provides power to the OIU.

The CCM needs to be configured properly in order to interface to the OIU. The CCM should be set up for RS-422, 19.2 Kbps, OIU ENABLED, and OIU operating power connected. The connection between the CCM and the OIU is shown in Figure 7.

a41528



TEN FEET MAXIMUM APPLIES ONLY WHEN OBTAINING POWER FROM THE CCM. IF POWER IS SUPPLIED LOCALLY TO THE OIU, THIS CABLE (MINUS THE 19, 20 CONNECTIONS), CAN BE UP TO FOUR THOUSAND FEET LONG.

Figure 7. DIRECT CCM TO OIU CONNECTION DIAGRAM

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GEnet™ Factory LAN BIU Connections

The Series Six PLC may communicate with many other devices by connection to the GEnet LAN network via the Bus Interface Unit (BIU). The connection can be made on J1 or J2 by using the appropriate 9-pin or 25-pin connectors. Figure 8 shows the pin assignments for an RS-232 connection between the CCM2 and the GEnet BIU.

a41199

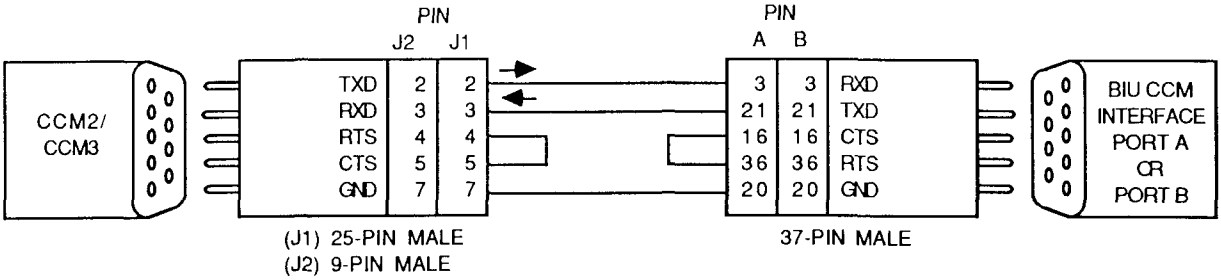


Figure 8. RS-232, CCM TO GEnet BIU, 2-WIRE CONNECTION

a41200

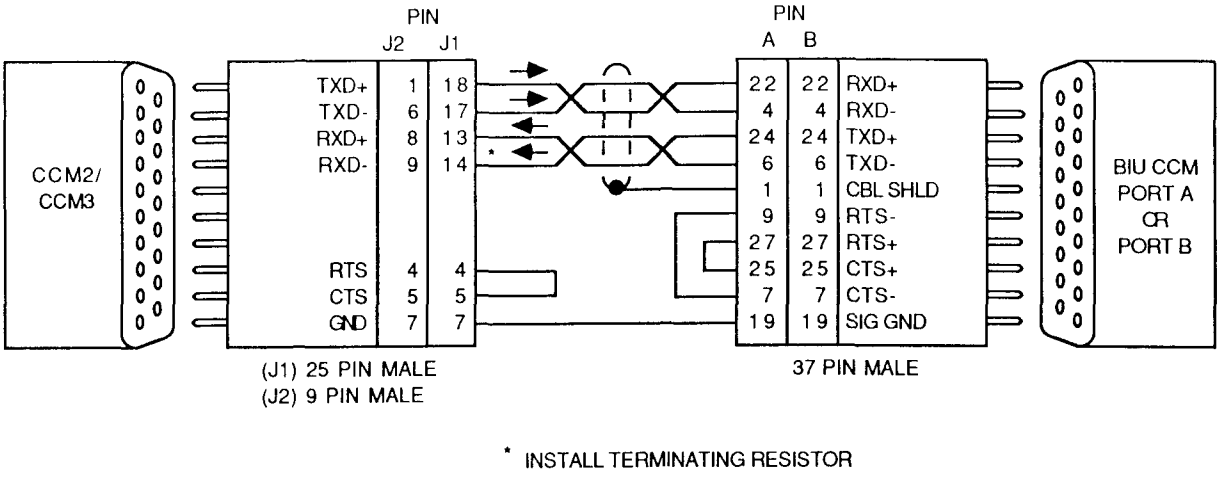


Figure 9. CCM TO GEnet BIU RS-422, 4-WIRE CONNECTION

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CCM Multidrop Connections

The diagrams shown as follows show generally how devices are connected in a multidrip configuration. Examples of the 4-wire and 2-wire, RS-422 multidrop connections for the CCM are included.

Master-slave protocol must be used for multidrop connections.

Modems may also be used to set up a multidrop configuration.

a41533

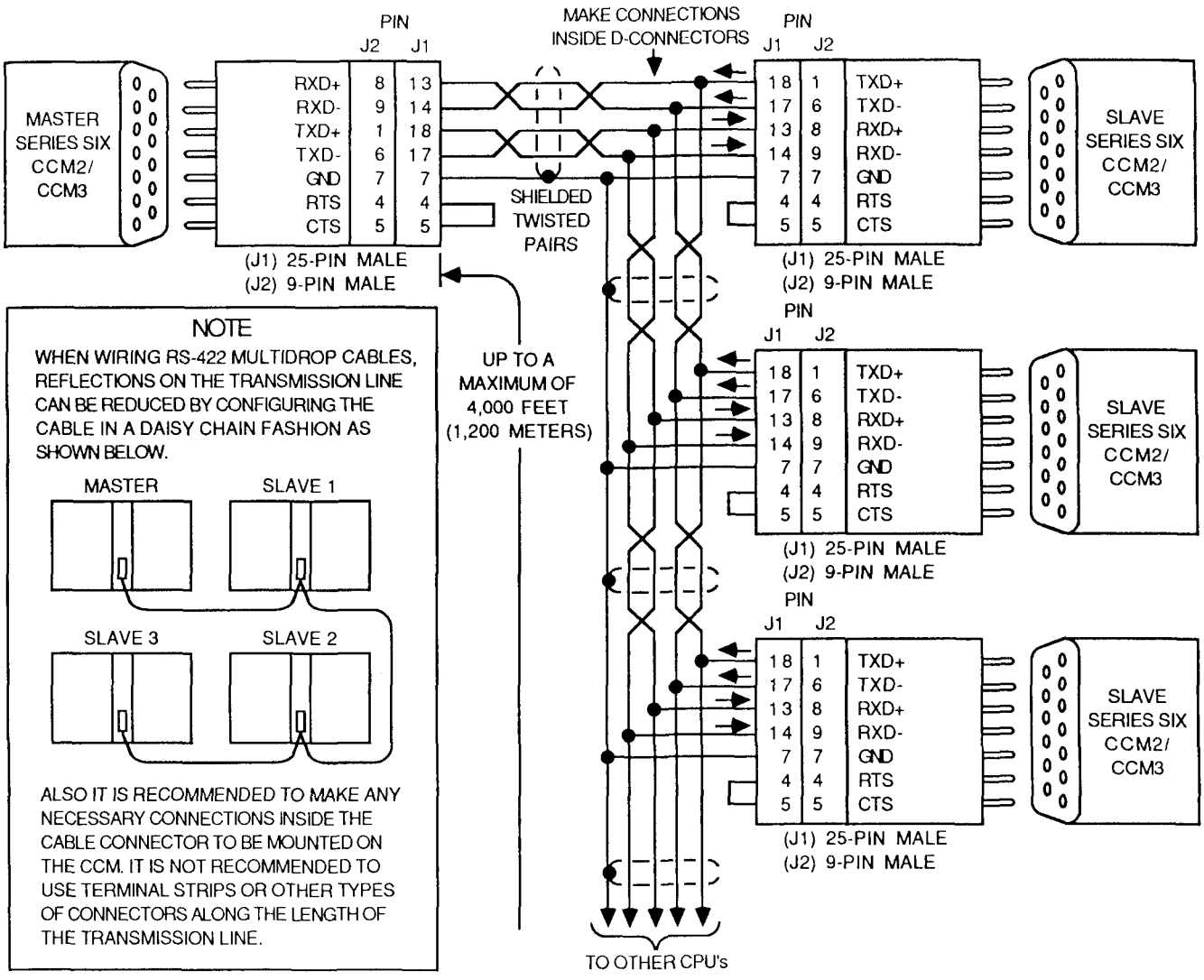


Figure 10. RS-422, 4-WIRE MULTIDROP CONNECTIONS

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CCM Multidrop Connections (continued)

A 2-wire RS-422 multidrop link can be implemented. To accomplish this, tie Rxd+ and Txd+ together and tie Rxd- and Txd- together at the CCM. This results in one signal path for a 2-wire RS-422 differential signal.

When implementing a 2-wire RS-422 link with a host as a master, the host must have a tri-state transmitter which maintains idle lines in a high impedance state. Also, some host equipment may not allow tying Rxd and Txd together. In this case the user must use the 4-wire multidrop.

a41534

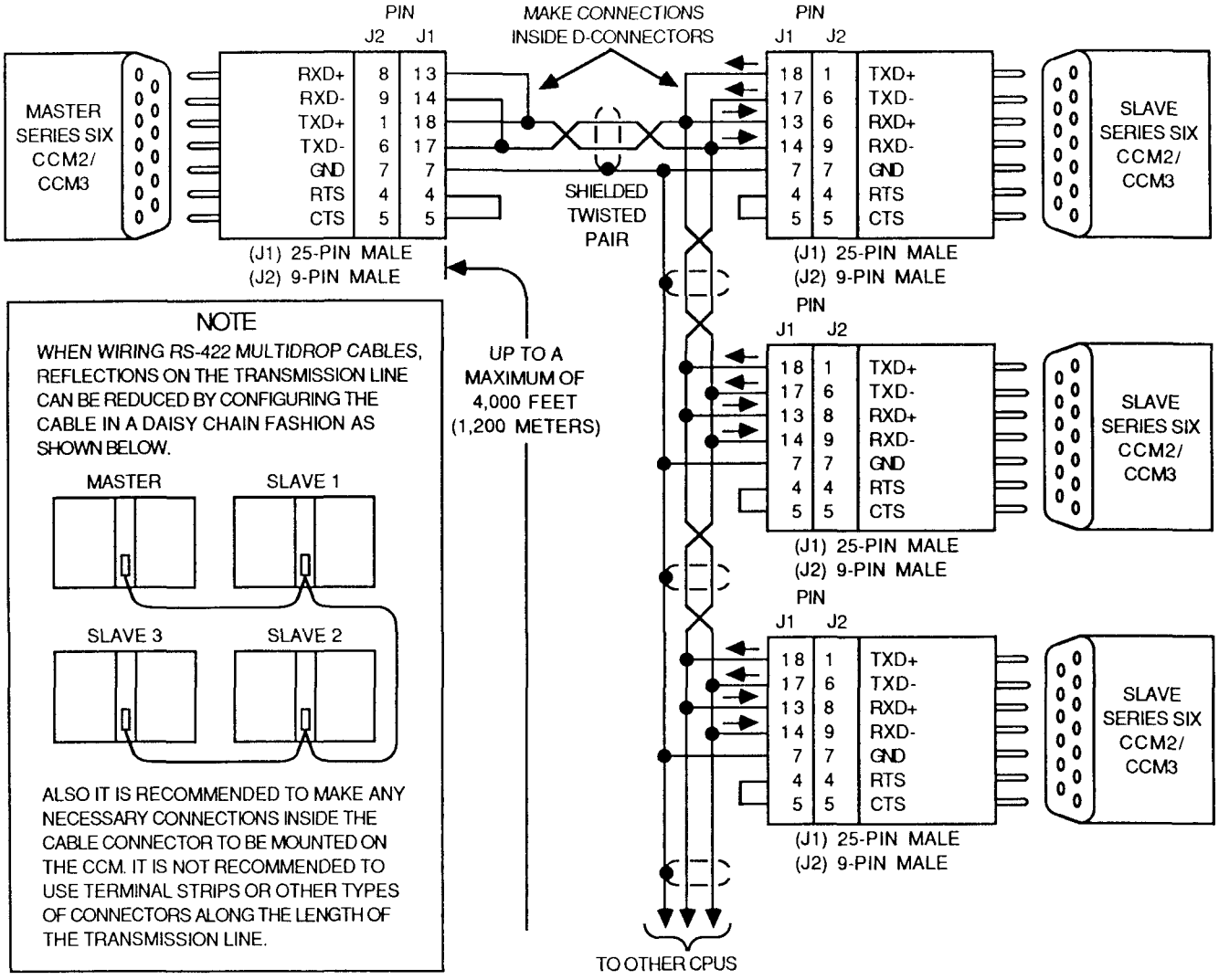


Figure 11. RS-422, 2-WIRE MULTIDROP CONNECTIONS

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Table 10. MODULE SPECIFICATIONS

Dimensions - Circuit Board:	8.15 x 11.0 (inches), 208 x 280 (mm)
Dimensions - Faceplate:	12.46 x 1.175 (inches), 317 x 30 (mm)
Power Requirements:	(Supplied by CPU Power Supply)
	+5 Vdc +12 Vdc -12 Vdc
Units of Load (CCM2)	17 4 4
Units of Load (CCM3)	17 4 4
Storage Temperature:	0 to 70 C
Operating Temperature:	0° to 60° C (outside of rack)
Humidity:	5% - 95% (non-condensing)

Table 11. ORDERING INFORMATION

DESCRIPTION	CATALOG NUMBER
Circuit Board & Faceplate (CCM2)	IC600CB536
Circuit Board & Faceplate (CCM3)	IC60OCB537
Faceplate (CCM2/CCM3)	IC6OOFP536

For further information, contact your local GE Fanuc - NA sales representative.

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