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GE Fanuc Automation

CP237

Multipurpose PMC Expansion Card for CompactPCI

HARDWARE REFERENCE MANUAL

Document Number: Rx-URMH 005 Rev C

Embedded Systems

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1 Introduction

The CP237 is identified as a “System Expansion Card” due to the number of features and functions it supports. Combining multiple on-card functions (e.g., 10/100 Ethernet, RS232 console, EIDE disk) with PMC expansion slots, provides maximum flexibility and economy for the most effective utilization of each cPCI slot.

As the PCI specification includes automatic location, and configuration of all devices on the bus, supporting multiple capabilities imposes no tedious setup overhead. Options not appropriate, or for future use, will not consume system resources.

1.1 Features

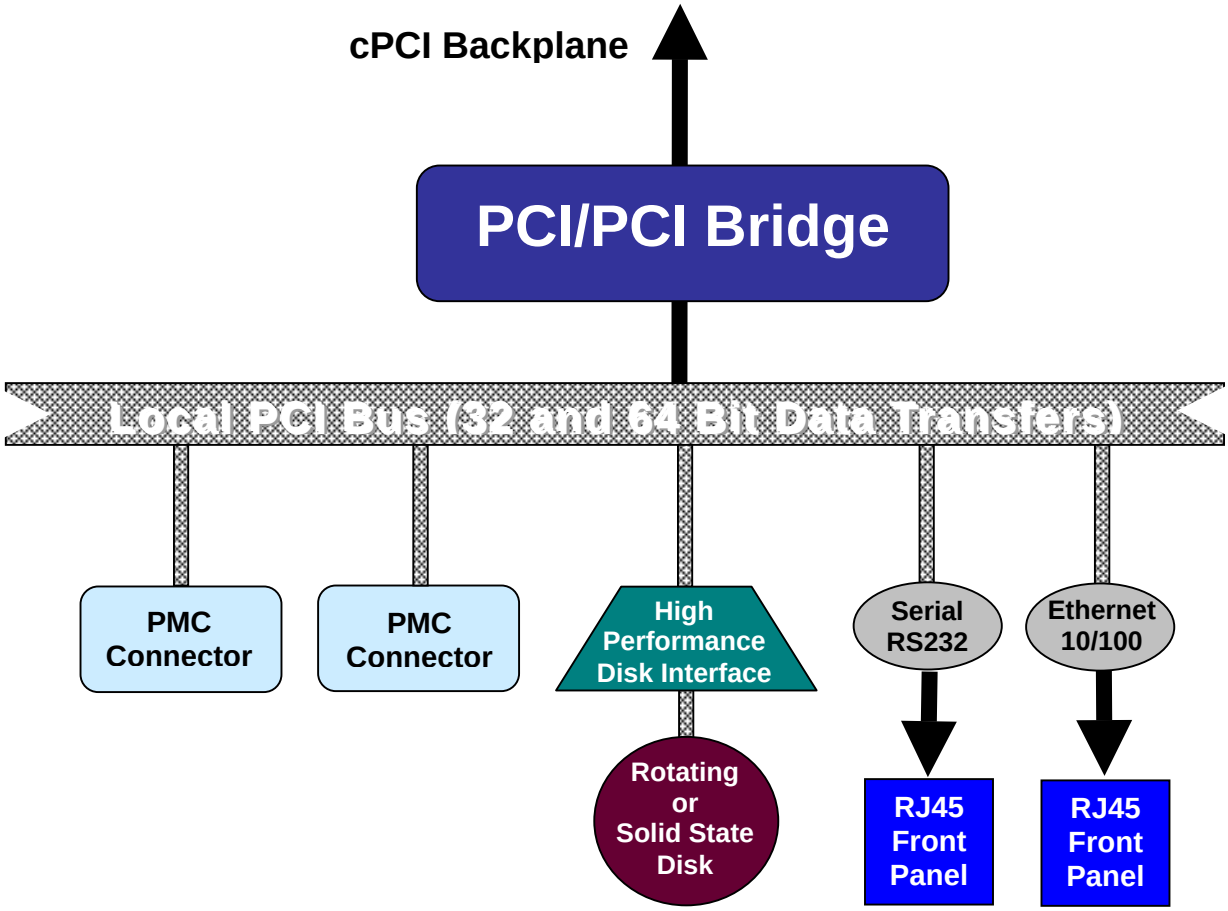
The CP237 has commonly required system options (e.g., Ethernet) on-card, to provide maximum expansion capability from the two PMC slots.

- Hot Insertion support
- Second Generation PCI/PCI bridge isolates local devices from cPCI backplane
- Full support for 32 & 64 bit PCI transactions
- Support for split 66Mhz host 33Mhz local PCI operation
- High Performance Disk Controller
- Disk controller has (optional) PROM interface for boot drivers (e.g., NT)
- On card Rotating or SS (Solid State) Disk
- 10/100 Mbit Ethernet Controller (Auto negotiation & Full Duplex support)
- RS232 interface
- Connectors for Two PMC add-on modules
- Each PMC location supports “J4” module specific I/O routed to the backplane
- Full Compliance with PCI Specifications

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2 Theory of Operation

The architecture of the CP237 is illustrated in the block diagram below:



Devices on the CP237 (both built-in, and added via PMC) are connected on a local PCI that appears as a bus segment from the Compact PCI backplane. The following sections provide information on each of the local device connections, the bridge to the cPCI backplane, and general system functions.

2.1 PCI to PCI Bridge

The PCI specification defines the maximum number of devices that may be connected to a single bus segment. Only a single load may be presented on any add-in card. The PCI to PCI bridge resolves this, as well as providing a set of significant additional performance features.

Setup and operation of the bridge is fully defined in the PCI Specification. It can be fully initialized using standard BIOS or other console firmware. Once configured, the local bus has a subset of the full address space of the cPCI backplane. Transfers directed to addresses in this range will be captured by the bridge and forwarded to the local side. On the local side, addresses not in the local bus range will be forwarded to the cPCI backplane.

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Note: This does allow for communication between devices on the CP237, and this transfer will occur without any affect to the cPCI, thus, essentially, increasing total system bus capacity.

2.2 Support for 64 bit systems and devices

The bridge can support 64-bit operation on both the primary and secondary bus. When inserted into a system that is 64-bit capable, the bridge will attempt a 64-bit transfer whenever possible. The PCI specification provides a per-transaction protocol to identify 64-bit capable targets so mixed capability systems do not force all operation to 32 bits. Even though transactions are across the bridge, each side is independent in determining the transfer width. Thus, a host that is 64-bit capable can achieve full potential bus bandwidth (i.e., 64-bit transfers) even to a target that is only 32 bits wide. This promotes effective use of the cPCI backplane bandwidth.

2.3 Support for 66Mhz cPCI systems

The bridge may be configured for 66Mhz operation on the cPCI side with 33Mhz on the local PCI. This allows connection of common components (most PMC modules are only 33Mhz operation) into high performance systems.

2.4 10/100 Mbit Ethernet Interface

The on-card 10/100 Mbit Ethernet controller is optimized for use in PCI systems. On-controller DMA engines and deep FIFO buffers decouple the demands of meeting exact wire timing from PCI latencies. This encourages use of PCI burst transfers and minimizes data under/over run situations.

The interface supports standard (802.3u) auto-negotiation to determine maximum signaling opportunity. Both speed (10/100) and duplex (full/half) operation are negotiated. Software may force configuration to a specific profile.

2.5 Serial Console

The on-card serial port offers RS232 connection for console or secondary communication port. Interface conforms to industry standard (16550) register definitions. Programmable Baud rate. Modem signals are not supported (“three wire” operation only).

2.6 Disk Controller and on-Card Disk Option

The disk controller utilized on the CP237 is designed for high performance PCI systems. It supports full burst PCI transfers with local buffers to mediate between bus and disk speeds. The controller includes a FLASH storage option for loading system-specific software drivers during the boot process (e.g., Windows NT). This facilitates use of this disk as a system boot device.

Two types of disk technology are available: Rotating Magnetic Media and Solid State (FLASH).

Rotating media solutions offer the highest transfer rates (up to 33Mbyte/second), the highest capacity (up to 25Gbyte) and the lowest cost per bit pricing. Built for the laptop environment, these devices are much more environmentally rugged than devices intended for server applications.

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For maximum environmental robustness, a Solid State disk can be utilized. Based upon FLASH technology, this solution has no moving parts and can operate over a wider temperature range. Up to 440 Mbyte SSD drives may be configured.

Device drivers can automatically detect drive capacity and capability. A single driver instance is sufficient for any drive type.

Utilizing disk drives developed for high-end laptops provides two benefits:

- Access to rapidly evolving capabilities in both capacity, and transfer performance
- Integration with environmental requirements that are more stringent than general purpose processor environments

2.7 PMC Module Connection

The CP237 supports configuration of up to two PMC modules. In both locations, there are connectors for support of all PMC types:

- 32/64-bit PMC devices
- “J4” rear access signaling

The J4 connector is an option specified in the PMC specification to provide for instances where I/O signaling needs to be from the connection on the back of the chassis. The signals from the J4 connector are routed to uncommitted pins on the cPCI backplane.

PMC modules that have front I/O connections will mate exactly within the cut-outs in the CP237 front panel.

2.8 Hot Insertion Support

The CP237 is capable of the “hot swap” per PICMG specification.

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3 Installation

This chapter provides unpacking, hardware preparation, and installation procedures for the CP237.

3.1 Unpacking Instructions

3.1.1 Handling

Electronic assemblies use devices that are sensitive to static discharge: observe anti-static procedures when handling these boards. All products should be in an anti-static plastic bag or conductive foam for storage or shipment.

Work at an approved anti-static workstation when unpacking the board.

> ***Note***: GE Fanuc products are shipped in an individual, reusable shipping box. When the shipping container is received, inspect it for any evidence of physical damage. If the container is damaged, request that the carrier's agent be present during unpacking and inspection of the unit.

Unpack the Ethernet Switch from the shipping carton. Check and verify that all items are present by referring to the packing list.

3.1.2 Included Items

Each CP237 is shipped with the following items:

- 6U Assembly
- Disk Drive specified on order

3.2 Installation

The CP237 consumes a single slot in the chassis.

Configure the bus operation options on SW2 (as shipped, the CP237 is ready for 33Mhz operation).

Locate the slot in the chassis into which the CP237 will be installed. Check that no unknown transition modules or other cabling is attached to the rear side of the backplane in the chosen slot.

Remove power from the chassis.

Observing proper anti-static procedures, insert the Switch Assembly into the chassis. Use the ejector handles to ensure the card is fully seated into the backplane.

The chassis may now be powered up.

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3.3 Front Panel Connections & Indicators

The front panel of the CP237 is illustrated in the drawing below. There are two LED indicators and RJ45 for the Ethernet; one RJ45 for the Serial port, and two openings for PMC devices.

3.4 Network Connection and Indicators

The bottom RJ45 connector conforms to 10/100 BaseT standards. It can be directly connected to a switch or hub using standard twisted pair cabling. A point-to-point connection directly to a peer Ethernet controller can be achieved with a simple “crossover” or “null modem” adapter or cable.

There are two indicators associated with the Ethernet:

- LINK is illuminated when the presence of a valid connection is detected by the local Ethernet receiver.
- Activity illuminates when any network traffic (Receive or Transmit) is present at the port.

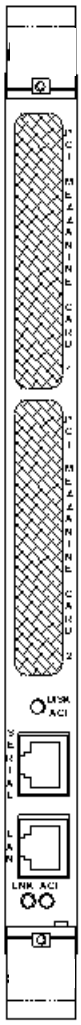
3.5 Serial Port Connection

The serial port Tx and Rx (transmit/receive) signals are available on the connector labeled “serial”. See the Specifications section of specific pinout assignments. (The assignments conform to industry standard usage).

3.6 PMC Module Connectors

PMC modules may be installed in one, or both locations. When shipped, an EMI faceplate is installed in each cut-out to maintain emission standards when no PMC is installed. Simply remove (gentle finger pressure) prior to installation of a PMC device. The CP237 routes the rear I/O connectors of the PMC to the J3 and J4 connectors on CompactPCI per PCIMG specification.

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CP237

Front Panel of PMC Slot 1

Front Panel of PMC Slot 2

Illuminates on Activity of
(Optional) disk RS232 Console

10/100 Mbit Ethernet
Illuminates for 10/100 Mbit

As described in the *Theory of Operation* (refer to the block diagram), there are several bus performance options that may be configured.

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4 Setting Optional Characteristics

The switch settings should not be changed from the factory default.

> ***Note***: Switches can be labeled On/Off or Close/Open. GE Fanuc Embedded Systems uses "Open" and "Closed."

The active switches at this location are:

SW1	Factory Default
1	Open
2	Close
3	Open
4	Close

SW2	Factory Default
1	Open
2,3	2 Open 3 Close
4	Open

The SW1 is only valid if the CP237 has been purchased with the disk option. The SW1 setting is only for the factory setting and should not be changed.

The SW2 configures the PCI bus speed. The SW2 position one configures if the bridge can run at 66Mhz or 33Mhz on its primary side. If the SW2 position one is closed, the PCI bridge runs at 33Mhz.

If the primary bus of the CP237 is running at 66Mhz, the secondary bus can be configured to run at either 33Mhz or 66Mhz. If CP237 is purchased with the Ethernet/Serial or the Disk option, the secondary PCI bus must run at 33Mhz since the on board I/O chip set supports 33Mhz only. The SW2 Pin 2 and 3 configure the secondary PCI bus speed. If position two is closed, the secondary bus will run at 66Mhz if the Primary bus runs at 66Mhz. Further the PMC slots must also support the 66Mhz speed otherwise the CP237 will force the 33Mhz on the secondary bus. If the position three is closed, the secondary PCI bus is forced to run at 33Mhz regardless of the Primary bus speed. Only the position two or three of the SW2 must be closed but not both (having both the positions open is not valid either).

The SW2 position four should be open.

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5 I/O Pin Assignments

5.1 RS232

	Tx	Rx	Gnd
Pin	5	4	2,6

5.2 Ethernet

	Tx +	Tx –	Rx +	Rx –	Shield	CT0	CT1
Pin	1	2	3	6	9	7&8	4&5

Standard cabling uses pairs 1 & 2 and 3 & 6 only.

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5.3 PMC User Defined I/O

5.3.1 P4 Mezzaine Card

SIGNAL	PMC "P4"	CPCI		SIGNAL	PMC "P4"	CPCI
I/OA1	1	J4-E8		I/OA33	33	J4-C2
I/OA2	2	J4-D8		I/OA34	34	J4-B2
I/OA3	3	J4-C8		I/OA35	35	J4-A2
I/OA4	4	J4-B8		I/OA36	36	J4-E1
I/OA5	5	J4-A8		I/OA37	37	J4-D1
I/OA6	6	J4-E7		I/OA38	38	J4-C1
I/OA7	7	J4-D7		I/OA39	39	J4-B1
I/OA8	8	J4-C7		I/OA40	40	J4-A1
I/OA9	9	J4-B7		I/OA41	41	J3-E19
I/OA10	10	J4-A7		I/OA42	42	J3-D19
I/OA11	11	J4-E6		I/OA43	43	J3-C19
I/OA12	12	J4-D6		I/OA44	44	J3-B19
I/OA13	13	J4-C6		I/OA45	45	J3-A19
I/OA14	14	J4-B6		I/OA46	46	J3-E18
I/OA15	15	J4-A6		I/OA47	47	J3-D18
I/OA16	16	J4-E5		I/OA48	48	J3-C18
I/OA17	17	J4-D5		I/OA49	49	J3-B18
I/OA18	18	J4-C5		I/OA50	50	J3-A18
I/OA19	19	J4-B5		I/OA51	51	J3-E17
I/OA20	20	J4-A5		I/OA52	52	J3-D17
I/OA21	21	J4-E4		I/OA53	53	J3-C17
I/OA22	22	J4-D4		I/OA54	54	J3-B17
I/OA23	23	J4-C4		I/OA55	55	J3-A17
I/OA24	24	J4-B4		I/OA56	56	J3-E16
I/OA25	25	J4-A4		I/OA57	57	J3-D16
I/OA26	26	J4-E3		I/OA58	58	J3-C16
I/OA27	27	J4-D3		I/OA59	59	J3-B16
I/OA28	28	J4-C3		I/OA60	60	J3-A16
I/OA29	29	J4-B3		I/OA61	61	J3-E15
I/OA30	30	J4-A3		I/OA62	62	J3-D15
I/OA31	31	J4-E2		I/OA63	63	J3-C15
I/OA32	32	J4-D2		I/OA64	64	J3-B15

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5.3.2 P8 Mezzaine Card

SIGNAL	PMC "P8	CPCI		SIGNAL	PMC "P8	CPCI
I/OB1	1	J3-E13		I/OB33	33	J3-C7
I/OB2	2	J3-D13		I/OB34	34	J3-B7
I/OB3	3	J3-C13		I/OB35	35	J3-A7
I/OB4	4	J3-B13		I/OB36	36	J3-E6
I/OB5	5	J3-A13		I/OB37	37	J3-D6
I/OB6	6	J3-E12		I/OB38	38	J3-C6
I/OB7	7	J3-D12		I/OB39	39	J3-B6
I/OB8	8	J3-C12		I/OB40	40	J3-A6
I/OB9	9	J3-B12		I/OB41	41	J3-E5
I/OB10	10	J3-A12		I/OB42	42	J3-D5
I/OB11	11	J3-E11		I/OB43	43	J3-C5
I/OB12	12	J3-D11		I/OB44	44	J3-B5
I/OB13	13	J3-C11		I/OB45	45	J3-A5
I/OB14	14	J3-B11		I/OB46	46	J3-E4
I/OB15	15	J3-A11		I/OB47	47	J3-D4
I/OB16	16	J3-E10		I/OB48	48	J3-C4
I/OB17	17	J3-D10		I/OB49	49	J3-B4
I/OB18	18	J3-C10		I/OB50	50	J3-A4
I/OB19	19	J3-B10		I/OB51	51	J3-E3
I/OB20	20	J3-A10		I/OB52	52	J3-D3
I/OB21	21	J3-E9		I/OB53	53	J3-C3
I/OB22	22	J3-D9		I/OB54	54	J3-B3
I/OB23	23	J3-C9		I/OB55	55	J3-A3
I/OB24	24	J3-B9		I/OB56	56	J3-E2
I/OB25	25	J3-A9		I/OB57	57	J3-D2
I/OB26	26	J3-E8		I/OB58	58	J3-C2
I/OB27	27	J3-D8		I/OB59	59	J3-B2
I/OB28	28	J3-C8		I/OB60	60	J3-A2
I/OB29	29	J3-B8		I/OB61	61	J3-E1
I/OB30	30	J3-A8		I/OB62	62	J3-D1
I/OB31	31	J3-E7		I/OB63	63	J3-C1
I/OB32	32	J3-D7		I/OB64	64	J3-B1

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6 Functional Specifications

CP237 Multi-purpose PMC Expansion Card for CompactPCI

Power	**2 Total Watts**
@ 3.3 V	**0.4 Amps**
@ 5 V	**0.13 Amps**
Form Factor	
cPCI	**6U Single Slot**
MTBF	
MIL 217-F Nav Shel 25 Deg. C	**283000 Hours**
Temperature	
Operating	**0 to +60 ° C**
Storage	**-40 to +85 ° C**
Humidity	
Operating	**5% to 95% Non-Condensing**
Storage	**5% to 95% Non-Condensing**

Conformal Coating	**Yes, additional charge**

PCI Bus Characteristics	
Signaling	**5&3V**
Specification	**2.2**
Speed	**33/66Mhz**
Width	**32/64**

PCI Standards	
Hot Swap	**Yes**

Ethernet Characteristics	
Ports	
10/100 Base-TX	**1**
Port Routing	
Front	**(1) RJ45 10/100BaseTX**

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