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GE Fanuc
Intelligent Platforms

Hardware Reference

PMC676RC & RM676RC
PMC677RC & RM677RC*
Dual/Quad Port GbE
Second Edition

*THE PMC676/RM676 AND THE PMC677/RM677 ARE DESIGNED TO MEET THE EUROPEAN UNION (EU) RESTRICTION OF HAZARDOUS SUBSTANCE (ROHS) DIRECTIVE (2002/95/EC) CURRENT REVISION.

Part No: RX-URMH 139 Rev. B

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Document History

Hardware Reference Manual Document Number: RX-URMH 139 Rev B.

March 5, 2008

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Overview

Introduction

The PMC676RC and PMC677RC products provide dual/quad independent Gigabit Ethernet ports in a PMC form factor. The RM676RC and RM677RC are PCI edge card solutions for dual/quad Gigabit Ethernet ports. Each has both a fiber and copper media variant. The copper media versions operate at 10/100/1000Mb/s. Fiber can be ordered with either -SX or -LX options, depending on the model as specified in **Table 1** on page 7.

Aside from the media type (which in copper allows for multiple transport speeds), each card type has identical features. Except as specifically indicated, information in the following sections applies to all versions.

The Ethernet/Peripheral Component Interconnect (PCI) interface includes a powerful Direct Memory Access (DMA) engine for each port with very deep First-in/First-out (FIFO) buffers (64 KB). This assures continuous, full bandwidth operation with minimum PCI overhead.

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The following table indicates available variants for each product family. Transceiver and form factor must be specified at order time.

Table 1 PMC676RC/RM676RC and PMC677RC/RM677RC Family Models

Model	Media	Port Configuration	Form Factor
PMC676RCLC	Fiber, 1000Base-SX	2	PMC
PMC676RCSC	Fiber, 1000Base-SX	2	PMC
PMC676RCTX	Copper, 10/100/1000Base-T	2	PMC
PMC677RCLC	Fiber, 1000Base-SX	4	PMC
PMC677RCTX	Copper, 10/100/1000Base-T	4	PMC
RM676RCLC	Fiber, 1000Base-SX	2	PCI Edge Card
RM676RCSC	Fiber, 1000Base-SX	2	PCI Edge Card
RM676RCTX	Copper, 10/100/1000Base-T	2	PCI Edge Card
RM677RCLC	Fiber, 1000Base-SX	4	PCI Edge Card
RM677RCTX	Copper, 10/100/1000Base-T	4	PCI Edge Card

NOTE

-S and -P options are available for the PMC676 and RM676 cards, which must be specified when the card is ordered.

NOTE

Fiber boards with single mode 1000LX transceivers are also available.

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Features

- 64-bit 133 MHz PCI-X capable
- DMA engine
- Dual/quad 1000Mbit connections, depending on model
- 64 KB configurable Transmit and Receive FIFO buffers
- Jumbo Frame capable

Fiber Specific Options

- 1000Base-SX or 1000Base-LX
- Connector options SC, LC

Copper Specific Options

- 10/100/1000Base-TX Ethernet
- Auto-negotiation of operating speed/duplex
- MDI/MDIX switch over capability
- RJ45 connectors

Host Off-loading Features

- IEEE 802.1q VLAN support with VLAN tag insertion, stripping and packet filtering for up to 4096 VLAN tags
- Simple Network Management Protocol (SNMP) and Remote Monitoring (RMON) statistic counters
- Hardware Transmission Control Protocol (TCP) checksum off-loading
- Support for various address filtering modes
- 16 exact matches (unicast or multicast)
- 4096-bit hash filter for multicast frames
- Promiscuous unicast and promiscuous multicast transfer modes

Interconnect

All utilize industry standard connection methods. Controllers can be hooked "point-to-point" or into a switch. The copper versions support "MDIX" which auto detects how to configure transmit and receive lines, removing the need for "cross over" cables.

Software Support

GE Fanuc Intelligent Platforms has software drivers for all the popular operating systems (e.g., VxWorks®, LynxOS®, Windows NT®, Solaris™, etc.). These drivers have been carefully designed and implemented to fit within the Local Area Network (LAN) protocol stack of the host operating system.

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Organization

This manual is composed of the following chapters:

Overview provides a general description of the PMC676RC, RM676RC and PMC677RC, RM677RC products and General Safety terms and symbols.

Chapter 1 Handling and Installation describes unpacking and installation of the hardware.

Chapter 2 Theory of Operation describes the unit's features and functionality.

Chapter 3 LAN Boot describes Solaris and PXE boot versions.

Maintenance provides GE Fanuc Intelligent Platforms' contact information relative to the care and maintenance of the unit.

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Safety Summary

The following general safety precautions must be observed during all phases of the operation, service and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of this product.

GE Fanuc Intelligent Platforms assumes no liability for the customer's failure to comply with these requirements.

Ground the System

To minimize shock hazard, the chassis and system cabinet must be connected to an electrical ground. A three-conductor AC power cable should be used. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet.

Do Not Operate in an Explosive Atmosphere

Do not operate the system in the presence of flammable gases or fumes. Operation of any electrical system in such an environment constitutes a definite safety hazard.

Keep Away from Live Circuits

Operating personnel must not remove product covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

Do Not Service or Adjust Alone

Do not attempt internal service or adjustment unless another person capable of rendering first aid and resuscitation is present.

Do Not Substitute Parts or Modify System

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to GE Fanuc Intelligent Platforms for service and repair to ensure that safety features are maintained.

Dangerous Procedure Warnings

Warnings, such as the example below, precede only potentially dangerous procedures throughout this manual. Instructions contained in the warnings must be followed.

WARNING

Dangerous voltages, capable of causing death, are present in this system.
Use extreme caution when handling, testing and adjusting.

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Warnings, Cautions and Notes



WARNING

WARNING denotes a hazard. It calls attention to a procedure, practice, or condition, which, if not correctly performed or adhered to, could result in injury or death to personnel.



CAUTION

CAUTION denotes a hazard. It calls attention to an operating procedure, practice, or condition, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the system.



NOTE

NOTE denotes important information. It calls attention to a procedure, practice, or condition which is essential to highlight.



TIP

Tip denotes a bit of expert information.



LINK

This is link text.

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1 • Handling and Installation

This chapter describes the unpacking and installation of the PMC676RC, RM676RC and PMC677RC, RM677RC products and displays their front panel connectors and indicators.

1.1 Unpacking Procedures

Any precautions found in the shipping container should be observed. All items should be carefully unpacked and thoroughly inspected for damage that might have occurred during shipment. The board(s) should be checked for broken components, damaged printed circuit board(s), heat damage and other visible contamination. All claims arising from shipping damage should be filed with the carrier and a complete report sent to GE Fanuc Intelligent Platforms Customer Care.

1.2 Handling Precautions

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 boards.

1. Please observe the precautions for electrostatic sensitive modules. Electronic assemblies use devices that are sensitive to static discharge.
2. If the product contains batteries, please do not place the board on conductive surfaces or anti-static plastic or sponge, which can cause shorts and lead to battery or board trace damage.
3. Please do not exceed the specified operational temperatures. Please note that batteries might have temperature restrictions.
4. Keep all original packaging material for future storage or warranty shipments of the board.

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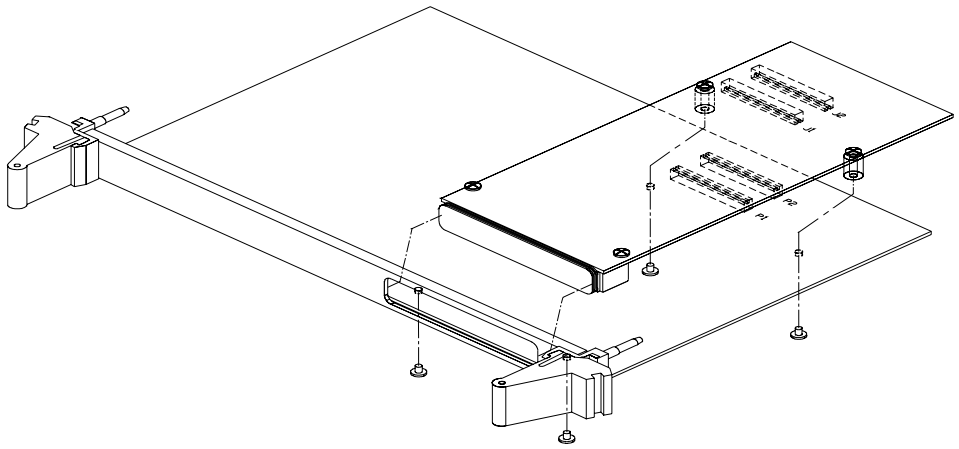
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1.3 Hardware Installation of PMC Module

The PMC module is now ready for installation. Installation is done generically as with the commercial versions of the card. Follow any specific procedures recommended by the manufacturer of the chassis used. Perform the following steps:

1. Turn all system power OFF.
2. Remove the host board from the chassis (if currently installed).
3. Locate the PMC connectors on the host board.
4. Remove the four screws from the bottom of the stand-offs of the PMC.
5. Line up the J1 and J2 connectors on the host CMC to the J1 and J2 connectors on the PMC card.
6. Ensure all connectors are properly aligned before pushing the connectors together.
7. Carefully plug the PMC module into the mating connectors on the host's printed circuit board.
8. Use the four screws to connect the PMC stand-offs to the host CMC.
9. Reinsert the host CMC into the chassis.
10. The chassis may now be powered up.

Figure 1-1 Installation of PMC Module



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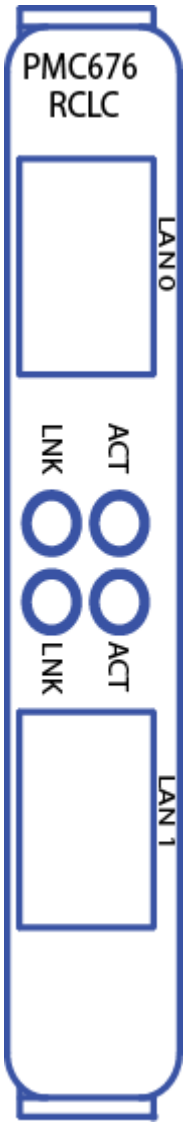
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1.4 Front Panel

The front panel, connectors and indicators are illustrated in the following pages.

1.5 PMC676RCLC

Figure 1-2 PMC676RCLC Connector



PMC676RCLC

LC Connector

There are four LEDs, two per port.

LNK illuminates when a valid signal is detected by the receiver.

ACT illuminates on activity (either receive or transmit).

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1.6 PMC676RCSC

Figure 1-3 PMC676RCSC Connector



PMC676RCSC

SC Connector

There are four LEDs, two per port.

LNK illuminates when a valid signal is detected by the receiver.

ACT illuminates on activity (either receive or transmit).

NOTE: The layout of the LEDs is the same as the LC panel shown in Figure 1-2. However, due to space constraints, the front panel is not marked.

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1.7 PMC676RCTX

Figure 1-4 PMC676RCTX Connector



PMC676RCTX

RJ45 Connector

There are four LEDS for each port.

LNK illuminates when a valid link signal is detected by the receiver.

1000 illuminates if the base speed is gigabit.

100 illuminates if the base speed is 100Mb.

(Thus **LNK** ON and both 1000 and 100 OFF indicate 10Mb operation.)

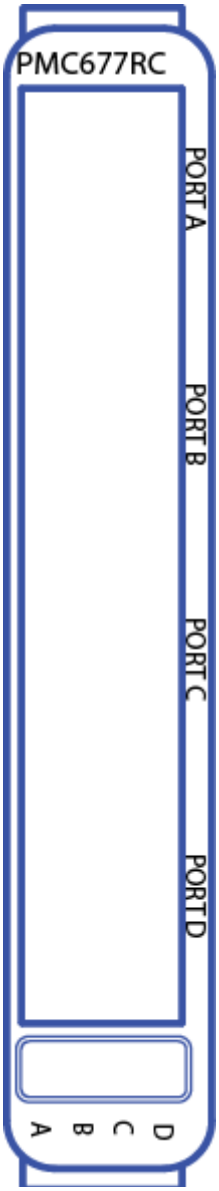
ACT illuminates on any network activity.

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1.8 PMC677RCLC

Figure 1-5 PMC677RCLC Connector



PMC677RCLC

LC Connector

There are four LEDs, one per port.

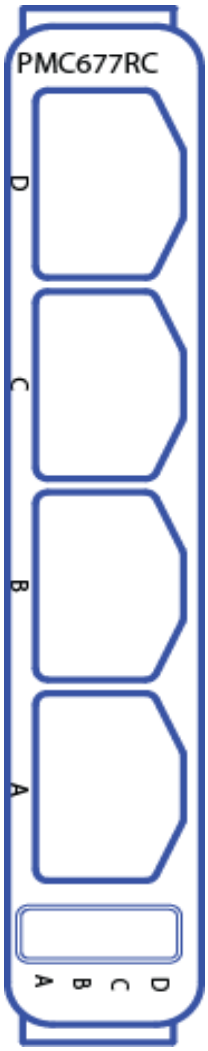
LNK illuminates when a valid signal is detected by the receiver.

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1.9 PMC677RCTX

Figure 1-6 PMC677RCTX Connector



PMC677RCTX

RJ45 Connector

There are four LEDs, one per port.

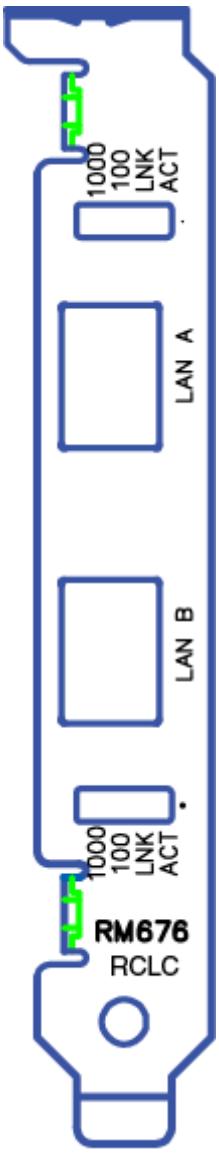
LNK illuminates when a valid link signal is detected by the receiver.

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1.10 RM676RCLC

Figure 1-7 RM676RCLC Connector



RM676RCLC

LC Connector

There are four LEDs per port.

LNK illuminates when a valid link signal is detected by the receiver.

1000 illuminates if the base speed is gigabit.

100 illuminates if the base speed is 100Mb.

(Thus **LNK** ON and both 1000 and 100 OFF indicate 10Mb operation.)

ACT illuminates on any network activity.

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1.11 RM676RCSC

Figure 1-8 RM676RCSC Connector



RM676RCSC

SC Connector

There are four LEDs per port.

LNK illuminates when a valid link signal is detected by the receiver.

1000 illuminates if the base speed is gigabit.

100 illuminates if the base speed is 100Mb.

(Thus **LNK** ON and both 1000 and 100 OFF indicate 10Mb operation.)

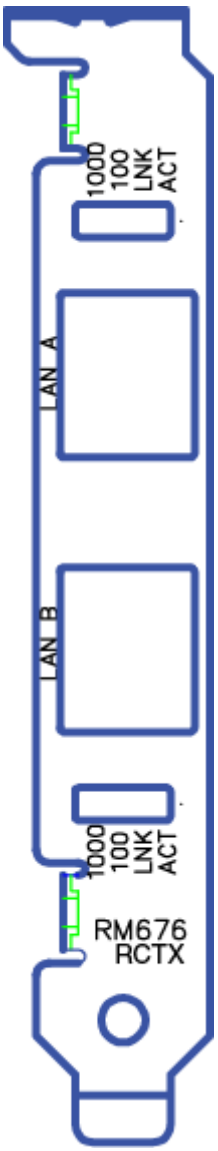
ACT illuminates on any network activity.

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1.12 RM676RCTX

Figure 1-9 RM676RCTX Connector



RM676RCTX

RJ45 Connector

There are four LEDs per port.

LNK illuminates when a valid link signal is detected by the receiver.

1000 illuminates if the base speed is gigabit.

100 illuminates if the base speed is 100Mb.

(Thus **LNK** ON and both 1000 and 100 OFF indicate 10Mb operation.)

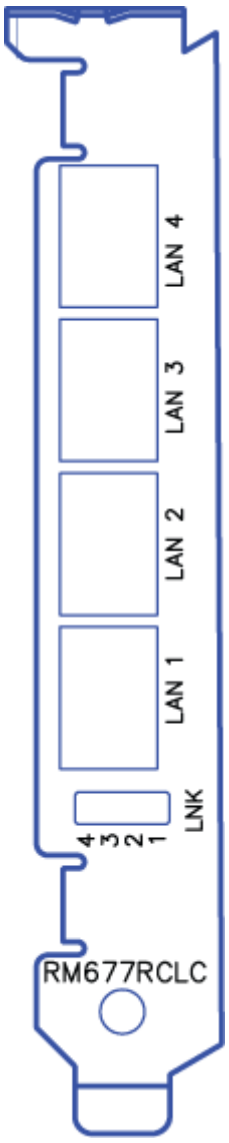
ACT illuminates on any network activity.

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1.13 RM677RCLC

Figure 1-10 RM677RCLC Connector



RM677RCLC

LC Connector

There are four LEDs, one per port.

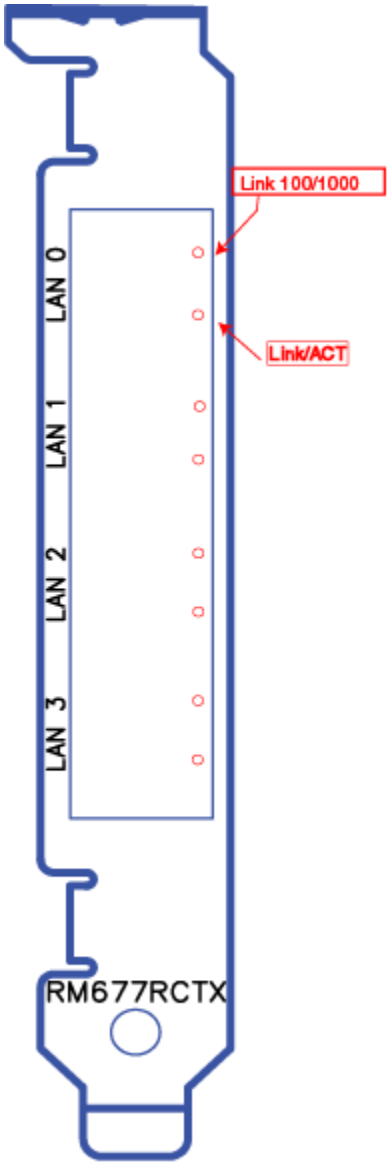
LNK illuminates when a valid link signal is detected by the receiver.

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1.14 RM677RCTX

Figure 1-11 RM677RCTX Connector



RM677RCTX

RJ45 Connector

There are two LEDs for each port.

NOTE: LEDs are built into RJ45 connectors:

Top LED is Link 100/1000
Lower LED is Link/ACT

Link100/1000
Illuminates yellow if the base speed is 100Mb/s.

Illuminates green if the base speed is 1000Mb/s.

Link/ACT
Illuminates green when a valid signal is detected by the receiver.

Yellow blink, simultaneous with Green steady illuminations, indicate that network activity is detected.

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2 • Theory of Operation

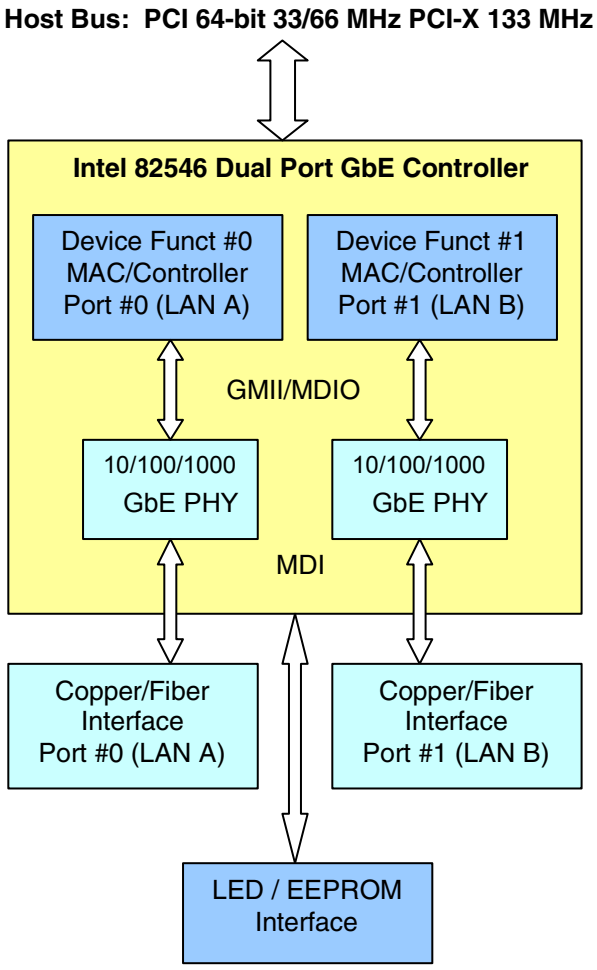
This chapter describes the hardware architecture of the PMC676RC and RM676RC and the PMC677RC and RM677RC products.

2.1 Architecture

2.1.1 PMC676RC/RM676RC Subsystems

The PMC676RC and RM676RC use a single component dual port GbE controller.

Figure 2-1 PMC676RC/RM676RC Subsystems



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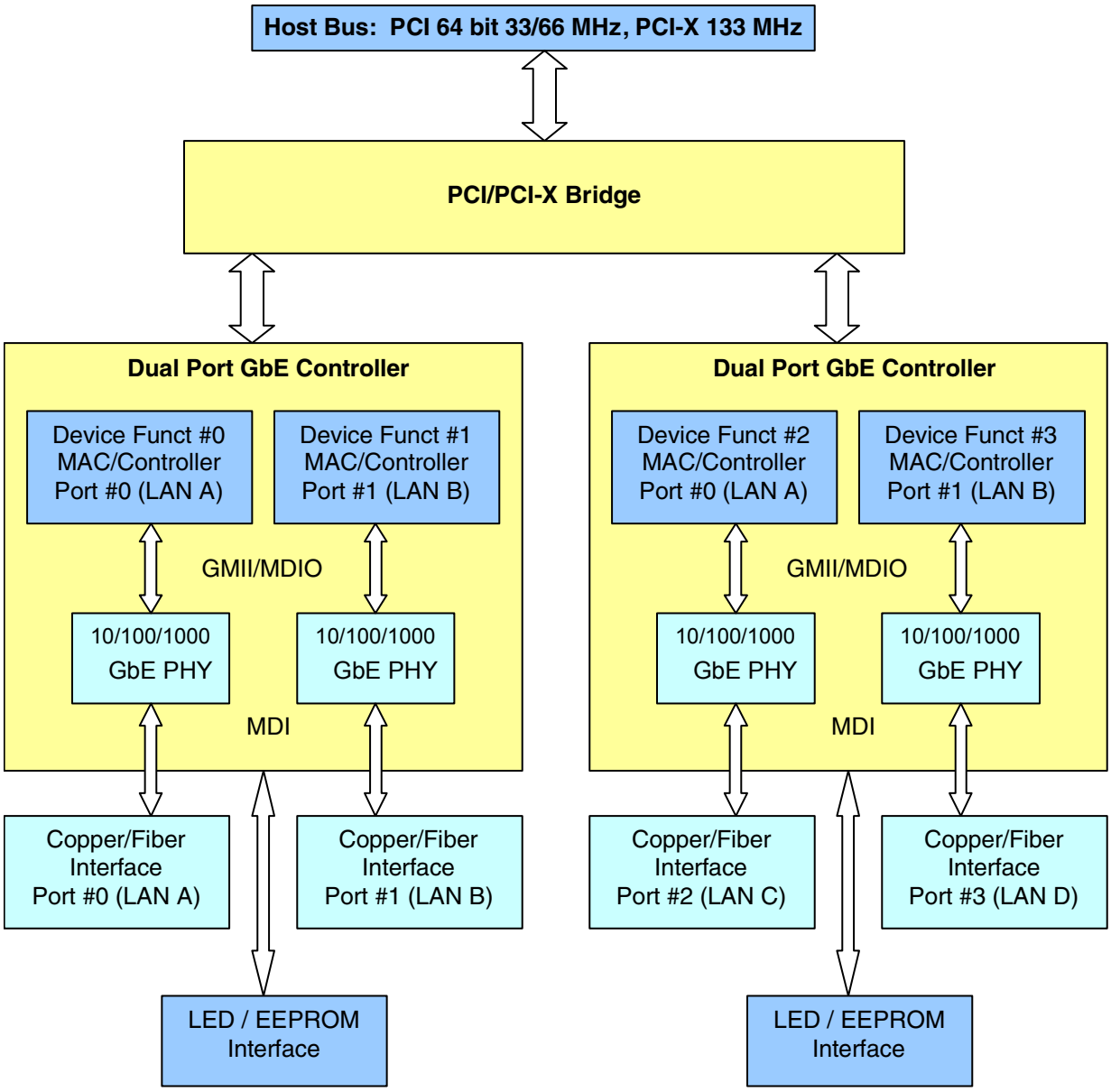
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2.1.2 PMC677RC/RM677RC Subsystems

The PMC677RC and RM677RC use two dual port GbE controllers and a PCI/PCI-X bridge.

The bridge has two PCI/PCI-X interfaces. Each interface handles the PCI/PCI-X protocol independently for its respective bus.

Figure 2-2 PMC677RC/RM677RC Subsystems



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3 • LAN Boot

This chapter describes the -S (Solaris boot) and -P (PXE boot) versions.

3.1 Cards with OBP firmware

Cards designated **-S** have Solaris OBP firmware to allow booting Solaris over the network.

Use the "**show-devs**" command to list devices in your system. The network interface displays as follows:

```
ok show-devs
[...output truncated for relevance...]
/pci@1f,0/pci@1,1
/pci@1f,0/pci@1/ethernet@4,1
/pci@1f,0/pci@1/ethernet@4      [<--- Bootable ethernet interface]
/pci@1f,0/pci@1/scsi@1,1
/pci@1f,0/pci@1/scsi@1
[...]
```

The card can be used to boot just like any other device:

```
ok boot <device>
```

e.g.

```
ok boot /pci@1f,0/pci@1/ethernet@4
Boot device: /pci@1f,0/pci@1/ethernet@4  File and args: kernel/
sparcv9/unix
Copyright 2002-2003 (c) CodeGen, Inc.  All rights reserved.
Copyright 2001-2002 (c) Intel Corporation.  All rights reserved.
Intel Gigabit Ethernet Fcode Driver
RAMIX PMC676TX version 2.3.0 -- Nov 20 2006 19:07:04
[...]
```

3.2 Cards with PXE firmware

Cards designated **-P** have PXE firmware to allow booting an operating system over the network.

The BIOS in your system determines how this is enabled. Typically, there will be a "Boot order" menu option in the BIOS, which will allow you to select "LAN boot" or a similar option.

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Maintenance

If a GE Fanuc Intelligent Platforms product malfunctions, please verify the following:

1. Software version resident on the product
2. System configuration
3. Electrical connections
4. Jumper or configuration options
5. Boards are fully inserted into their proper connector location
6. Connector pins are clean and free from contamination
7. No components or adjacent boards were disturbed when inserting or removing the board from the chassis
8. Quality of cables and I/O connections

If products must be returned, contact GE Fanuc Intelligent Platforms for a Return Material Authorization (RMA) Number. **This RMA Number must be obtained prior to any return.** The RMA is available at rma@gefanuc.com.

GE Fanuc Intelligent Platforms Customer Care is available at: 1-800-GEFANUC (or 1-800-433-2682), 1-780-401-7700.
Or email us at support.embeddedsystems@gefanuc.com.

Maintenance Prints

User level repairs are not recommended. The drawings and diagrams in this manual are for reference purposes only.

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