

OPERATIONS MANUAL PPM-GIGABIT

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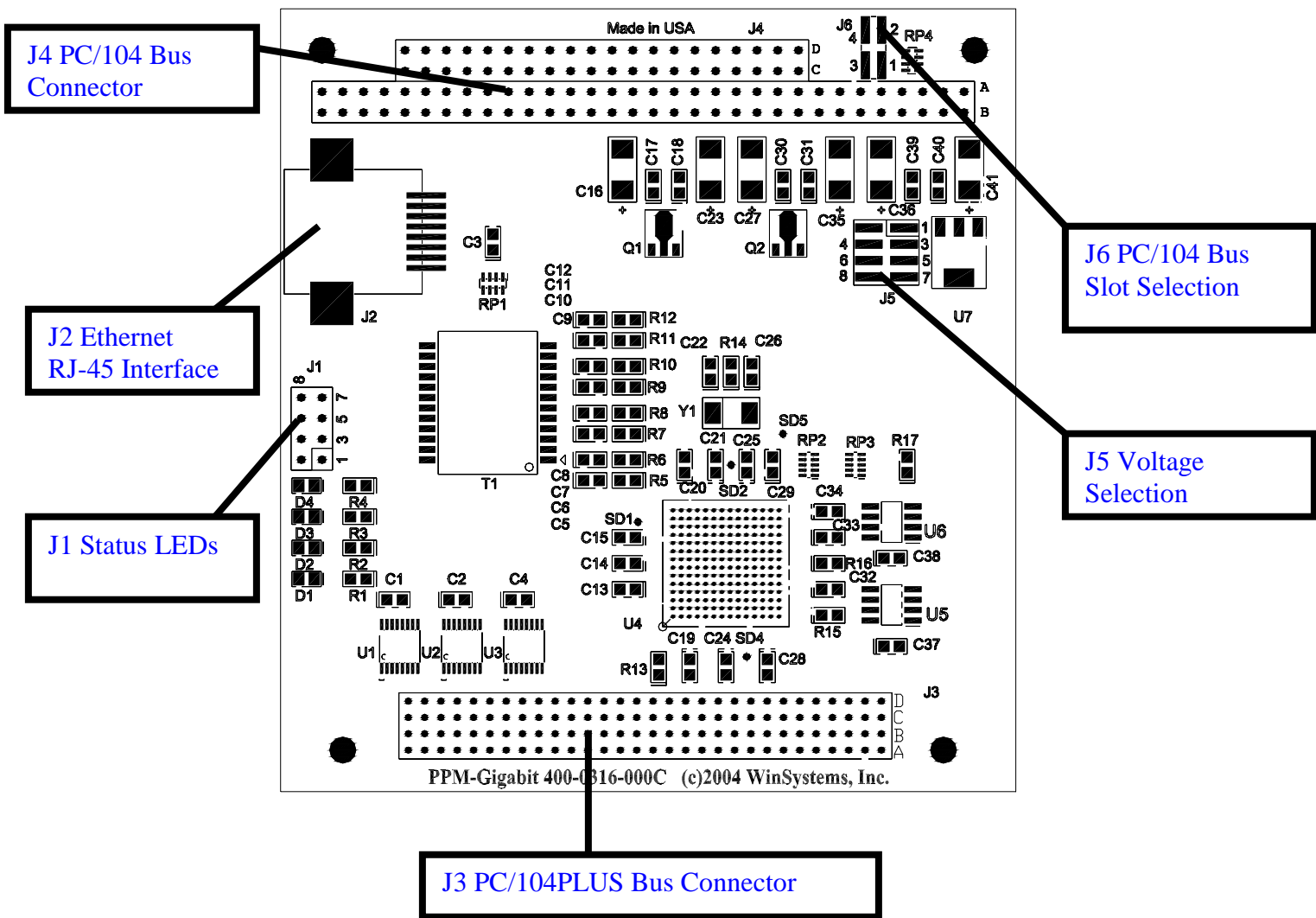
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Visual Index – Quick Reference

For the convenience of the user, a copy of the Visual Index has been provided with direct links to connector and jumper configuration data.



1 General Information

1.1 Features

- IEEE 802.3 support for 1000BASE-T and 100BASE_TX and 10BASE-T applications
- Automatic switching from 1Gbps to 100 or 10 Mbps
- Intel 82541ER Gigabit Ethernet PCI Controller
- 10/100/1000 Mbps full- and half-duplex operation
- IEEE 802.3ab Auto-Negotiation support
- IEEE 802.3x-compliant flow control support
- Supports jumbo frames
- Adaptive equalization supported
- 64Kbyte Rx and Tx packet FIFO
- PHY supports 2-pair and 3-pair cable downshift
- RJ-45 Ethernet interface connector on board
- EEPROM for configuration data storage
- Flash memory for boot program
- Support for Windows® CE,XP Embedded and Linux
- PC/104-Plus compliant board
- Link Status, Activity and Speed LEDs
- Supports 5V or 3.3V PC/104-Plus Bus
- Low power
- Single +5V supply
- Operates from -40°C to +85°C

The PPM-GIGABIT is a high-performance, PC/104-Plus compliant Gigabit Ethernet module. This add-in module allows connection to 10, 100, and 1000 Mbps networks using standard CAT5 twisted pair copper cables. It is based upon the popular Intel 82541ER controller that is supported by a wide range of operating systems including Windows, Linux, and other x86-compatible operating systems.

1.2 Functional Capability

Ethernet Controller - The PPM-Gigabit module uses the Intel 82541ER integrated controller. It combines Intel's fifth-generation Gigabit MAC design with fully integrated state-of-the-art PHY technology that meets or exceeds IEEE 802.3ab specifications for Bit Error Rate performance. The controller provides a direct Peripheral Component Interconnect (PCI) to the PC/104-Plus bus.

The 82541ER architecture is optimized to deliver both high-performance and PCI bus efficiency with the lowest power and smallest size. It has a pipelined DMA unit and 128-bit wide buses for the fastest performance. The controller handles the gigabit traffic with low network latency and minimal internal processing overhead. The 82541ER uses efficient ring buffer descriptor data structures, with up to 64 packet descriptors cached on chip. A large 64-Kbyte on chip packet buffer maintains superior performance as available PCI bandwidth changes. In addition, using hardware acceleration, the controller offloads tasks from the host controller, such as TCP/UDP/IP checksum calculations and TCP segmentation. The controller is designed to have independent transmit and receive queues to limit PCI bus traffic, and a PCI interface that maximizes the use of bursts for efficient bus usage.

Flow Control - Low-latency transmit and receive queues handle network packets without waiting for buffer overflow. The controller supports the IEEE 802.3.x flow control with software programmable pause times and threshold times. This is to reduce/prevent frame loss from receive overruns.

MAC Features - The MAC has optimized descriptor fetching and write-back mechanisms for efficient system memory use and use of PCI bandwidth. It also caches up to 64-packet descriptors in a single burst. Programmable memory buffers (256 bytes to 16Kbytes) and cache line size (16 bytes to 256 bytes) promotes efficient PCI bandwidth as well. Support for transmission and reception of packets up to 16Kbytes enables jumbo frames.

Integrated PHY - The PHY supports 10/100/1000 Mbps full- and half-duplex operation. IEEE 802.3ab Auto-Negotiation support provides automatic link configuration of speed, duplex and flow control.

The controller incorporates the latest technology DSP architecture that implements digital adaptive equalization, echo cancellation, and crosstalk cancellation to improve performance in noisy environments. It also supports two-pair and three-pair cable downshift.

EEPROM - The configuration information describing the device's architecture, address, interrupt, etc. can either be loaded from jumpers or from an EEPROM. The module is shipped with the EEPROM programmed.

Ethernet Network Connection - The PPM-Gigabit is hooked to the network through an onboard RJ-45 connector.

Monitor LEDs - Light emitting diodes (LEDs) are on the PPM-Gigabit to provide a visual indication of the link status, network activity and network speed. The yellow Link Integrity LED is lit when there is a valid connection detected. The green Activity LED blinks on and off when activity is detected on the wire. The red LEDs indicate if the link is 10, 100, or 1000 Mbps.

Software - The board emulates the popular Intel Pro/1000 PCI board. Intel has driver support for the most popular operating systems and real time operating systems for its 82541ER controller. Therefore most PCI-compatible drivers, utilities and 10/100/1000 Ethernet supported operating systems will work directly with this module.

Power Supplies - There are 3 independent power supplies on this module for use by the 82541ER controller. They are 3.3V, 1.8V, and 1.2V. The PPM-Gigabit requires only a single +5 volt input. The +5V input power and ground for the board is supplied from both the PC/104 and PC/104-Plus connectors.

PC/104-Plus Interface - The PPM-Gigabit module is designed to offer flexible, high-performance Ethernet networking capability. It provides 32-bits of addressing and data, as well as the complete control interface to operate on the PC/104-Plus bus. The chip has a PCI bus master interface and is compliant with the PCI Bus Specification Revision 2.2.

The PPM-Gigabit is designed to support either 5V or 3.3V PC/104-Plus signaling. A jumper block selects the voltage range. Multiple PPM-Gigabit boards can be installed and supported on a single PC/104-Plus stack. There is a jumper block on board to select the module slot position.

Also, there is a PC/104 connector on the board; however, no control or data signals are wired to it. It simply feeds the signals through the connector to the next module in

Related Information - Intel 82451ER Drivers/Utilities for supported operating systems like Windows can be found on the WinSystems web site at www.winsystems.com. The appropriate link is located on the datasheet for this board under the heading *Software Drivers and Examples*.

1.3 Specifications

Electrical

Data rate: 10/100/1000 megabits per second

Power Requirements: $V_{cc} = +5V \pm 5\%$ @ tbd mA typical

Mechanical

Dimensions: 3.6" x 3.8" (90mm x 96mm)

Weight: 3.0 oz. (84g)

Connectors:

Ethernet: RJ-45

PC/104-Plus: 120-pin (4 x 30; 2mm) stack-through with shrouded header

PC/104: 16-bit stack-through (feed through only)

Environmental

Operating Temperature: -40° to +85° Celsius

Non condensing humidity: 5% to 95%

MTBF: 42.7 years

2 PPM-GIGABIT Technical Reference

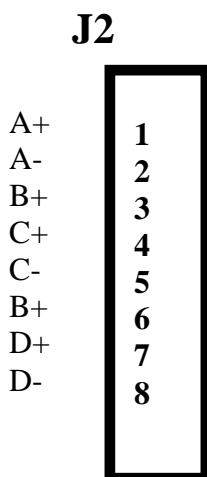
2.1 Introduction

This section of the manual is intended to provide the necessary information regarding configuration and usage of the PPM-GIGABIT board. WinSystems maintains a Technical Support Group to help answer questions regarding usage, or programming of the board. For answers to questions not adequately addressed in this manual, contact Technical Support at (817) 274-7553 between 8AM and 5PM Central Time.

2.2 Ethernet RJ-45 Interface

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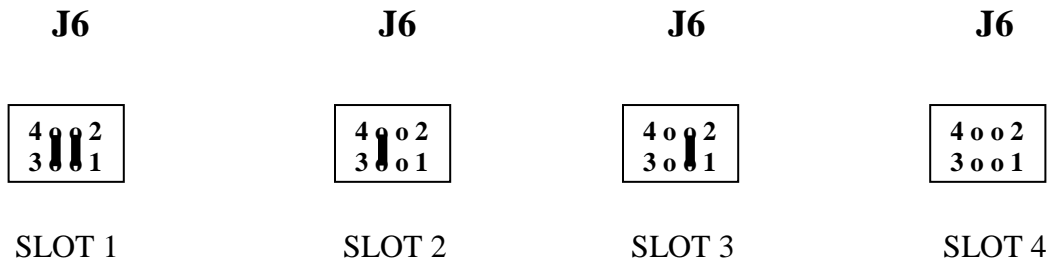
RJ-45 connector is located at J2. Pin descriptions are detailed below.



2.3 PC/104 Bus Slot Selection

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J6 is used to select the “slot” number of the PCI connection for the board. Each PC/104-*Plus* board installed in a system must have a unique “slot” assignment and must not conflict with any PCI “slot” assignments on the CPU card. The jumper settings for J6 are shown here:



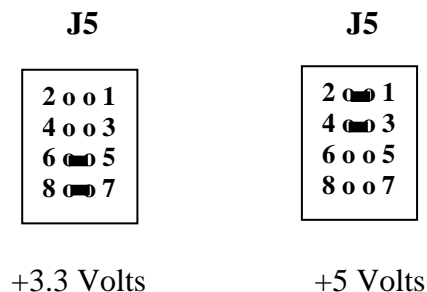
2.4 +3.3 Volt/+5 Volt Selection

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Note: Incorrectly configuring externally supplied voltage sources may cause damage to components and/or printed circuits. Please verify jumper selections before applying power.

J5 routes the voltage sources supplied from the PC/104-*Plus* bus to the on-board Vcc circuit. Refer to the jumpering options shown below to route the appropriate voltage.

Notice: At the time of this writing, ALL WinSystems’ PC/104PLUS CPU products supply +5V ONLY, and J5 must be jumpered 1-2 & 3-4.



2.5 Status LEDs

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J1 provides the user with connection to four status LEDs. This feature may be used for remote, “off-board” monitoring of the Link, Activity, Speed 100 & Speed 1000 status signals of the PPM-GIGABIT. J1 pinout and signal names are depicted below.

J1 Status LEDs

VCC 3.3
VCC 3.3
VCC 3.3
VCC 3.3

8 0 0 7
6 0 0 5
4 0 0 3
2 0 0 1

SPEED 1000
SPEED 100
ACTIVITY
LINK

D4 – RED – SPEED 1000
D3 – RED – SPEED 100
D2 – GREEN – ACTIVITY
D1 – YELLOW – LINK

2.6 PC/104 Bus Interface

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The PPM-GIGABIT connects to the processor through the PC/104 bus connector at J4. The pin definitions for the 8-bit and 16-bit portions are shown here.

J4 PC/104 BUS CONNECTOR

GND	B1 ○ ○ A1	IOCHK#	GND	C0 ○ ○ D0	GND
RESET	B2 ○ ○ A2	SD7	SBHE#	C1 ○ ○ D1	MEMCS16#
+5V	B3 ○ ○ A3	SD6	LA23	C2 ○ ○ D2	IOCS16#
IRQ9	B4 ○ ○ A4	SD5	LA22	C3 ○ ○ D3	IRQ10
-5V	B5 ○ ○ A5	SD4	LA21	C4 ○ ○ D4	IRQ11
DRQ2	B6 ○ ○ A6	SD3	LA20	C5 ○ ○ D5	IRQ12
-12V	B7 ○ ○ A7	SD2	LA19	C6 ○ ○ D6	IRQ15
SRDY#	B8 ○ ○ A8	SD1	LA18	C7 ○ ○ D7	IRQ14
+12V	B9 ○ ○ A9	SD0	LA17	C8 ○ ○ D8	DACK0#
GND	B10 ○ ○ A10	IOCHRDY	MEMR#	C9 ○ ○ D9	DRQ0
MEMW#	B11 ○ ○ A11	AEN	MEMW#	C10 ○ ○ D10	DACK5#
MEMR#	B12 ○ ○ A12	SA19	SD8	C11 ○ ○ D11	DRQ5
IOW#	B13 ○ ○ A13	SA18	SD9	C12 ○ ○ D12	DACK6#
IOR#	B14 ○ ○ A14	SA17	SD10	C13 ○ ○ D13	DRQ6
DACK3#	B15 ○ ○ A15	SA16	SD11	C14 ○ ○ D14	DACK7#
DRQ3	B16 ○ ○ A16	SA15	SD12	C15 ○ ○ D15	DRQ7
DACK1#	B17 ○ ○ A17	SA14	SD13	C16 ○ ○ D16	+5V
DRQ1	B18 ○ ○ A18	SA13	SD14	C17 ○ ○ D17	MASTER#
REFRESH#	B19 ○ ○ A19	SA12	SD15	C18 ○ ○ D18	GND
SYSCLK	B20 ○ ○ A20	SA11	KEY	C19 ○ ○ D19	GND
IRQ7	B21 ○ ○ A21	SA10			
IRQ6	B22 ○ ○ A22	SA9			
IRQ5	B23 ○ ○ A23	SA8			
IRQ4	B24 ○ ○ A24	SA7			
IRQ3	B25 ○ ○ A25	SA6			
DACK2#	B26 ○ ○ A26	SA5			
TC	B27 ○ ○ A27	SA4			
BALE	B28 ○ ○ A28	SA3			
+5V	B29 ○ ○ A29	SA2			
OSC	B30 ○ ○ A30	SA1			
GND	B31 ○ ○ A31	SA0			
GND	B32 ○ ○ A32	GND			

= Active Low Signal

2.7 PC/104-Plus Bus Interface

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J3 PC/104-Plus BUS CONNECTOR

Pin	A	B	C	D
1	GND	RESERVED	+5V	AD00
2	VI/O	AD02	AD01	+5V
3	AD05	GND	AD04	AD03
4	C/BE0#	AD07	GND	AD06
5	GND	AD09	AD08	GND
6	AD11	VI/O	AD10	M66EN
7	AD14	AD13	GND	AD12
8	+3.3V	C/BE1#	AD15	+3.3V
9	SERR#	GND	RESERVED	PAR
10	GND	PERR#	+3.3V	RESERVED
11	STOP#	+3.3V	LOCK#	GND
12	+3.3V	TRDY#	GND	DEVSEL#
13	FRAME#	GND	IRDY#	+3.3V
14	GND	AD16	+3.3.V	C/BE2#
15	AD18	+3.3V	AD17	GND
16	AD21	AD20	GND	AD19
17	+3.3V	AD23	AD22	+3.3V
18	IDSEL0	GND	IDSEL1	IDSEL2
19	AD24	C/BE3#	VI/O	IDSEL3
20	GND	AD26	AD25	GND
21	AD29	+5V	AD28	AD27
22	+5V	AD30	GND	AD31
23	REQ0#	GND	REQ1#	VI/O
24	GND	REQ2#	+5V	GNT0#
25	GNT1#	VI/O	GNT2#	GND
26	+5V	CLK0	GND	CLK1
27	CLK2	+5V	CLK3	GND
28	GND	INTD#	+5V	RST#
29	+12V	INTA#	INTB#	INTC#
30	-12V	REQ3#	GNT3#	GND/3.3V KEY

= Active Low Signal

Software Drivers and Examples (from Intel.com)

Windows* 2000 and XP Network Adapter Base Drivers	e1000win.exe
Windows XP embedded driver	e1000exp.exe
Windows CE.Net driver	e1000ce.exe
Windows NT* 4.0 Network Adapter Driver Set.	e1000ndis4.exe
Linux* 2.4 10/100 Adapter Base Driver (Readme) (Release Notes)	e1000-5.6.10.1.tar.gz



Telephone: 817-274-7553 . . Fax: 817-548-1358
<http://www.winsystems.com> . . E-mail: info@winsystems.com

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1. Description and quantity of the product(s) to be returned including its serial number.
2. Reason for the return.
3. Invoice number and date of purchase (if available), and original purchase order number.
4. Name, address, telephone and FAX number of the person making the request.
5. Do not debit WinSystems for the repair. WinSystems does not authorize debits.

After the RMA number is issued, please return the products promptly. Make sure the RMA number is visible on the outside of the shipping package.

The customer must send the product freight prepaid and insured. The product must be enclosed in an anti-static bag to protect it from damage caused by static electricity. Each bag must be completely sealed. Packing material must separate each unit returned and placed as a cushion between the unit(s) and the sides and top of the shipping container. WinSystems is not responsible for any damage to the product due to inadequate packaging or static electricity.