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Hardware Reference Manual

PMC-GBIT-DT2BP* PMC-GBIT-DT2CC* PMC with Two Rear Panel 10BASE-T/100BASE-TX/ 1000BASE-T Gigabit Ethernet Interfaces and PIM-GBIT-DT* Rear Panel Interface Module

THE PMC-GBIT-DT2BP AND PMC-GBIT-DT2CC ARE DESIGNED TO MEET THE EUROPEAN UNION (EU) RESTRICTIONS OF HAZARDOUS SUBSTANCE (RoHS) DIRECTIVE (2002/95/EC) CURRENT REVISION.

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abaco SYSTEMS

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Document History

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D.0	October 2016	Reformatted

Waste Electrical and Electronic Equipment (WEEE) Returns



Abaco Systems is registered with an approved Producer Compliance Scheme (PCS) and, subject to suitable contractual arrangements being in place, will ensure WEEE is processed in accordance with the requirements of the WEEE Directive.

Abaco Systems will evaluate requests to take back products purchased by our customers before August 13, 2005 on a case-by-case basis. A WEEE management fee may apply.

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About This Manual

Conventions

Notices

This manual may use the following types of notice:


WARNING
Warnings alert you to the risk of severe personal injury.


CAUTION
Cautions alert you to system danger or loss of data.


NOTE
Notes call attention to important features or instructions.


TIP
Tips give guidance on procedures that may be tackled in a number of ways.


LINK
Links take you to other documents or websites.

Numbers

All numbers are expressed in decimal, except addresses and memory or register data, which are expressed in hexadecimal. Where confusion may occur, decimal numbers have a “D” subscript and binary numbers have a “b” subscript. The prefix “0x” shows a hexadecimal number, following the ‘C’ programming language convention. Thus:

One dozen = 12_D = 0x0C = 1100_b

The multipliers “k”, “M” and “G” have their conventional scientific and engineering meanings of $x10^3$, $x10^6$ and $x10^9$ respectively. The only exception to this is in the description of the size of memory areas, when “k”, “M” and “G” mean $x2^{10}$, $x2^{20}$ and $x2^{30}$ respectively.


NOTE
When describing transfer rates, “k”, “M” and “G” mean $x10^3$, $x10^6$ and $x10^9$ *not* $x2^{10}$, $x2^{20}$ and $x2^{30}$.

In PowerPC terminology, multiple bit fields are numbered from 0 to n where 0 is the MSB and n is the LSB. PCI terminology follows the more familiar convention that bit 0 is the LSB and n is the MSB.

Text

Signal names ending with a tilde (“~”) denote active low signals; all other signals are active high. “N” and “P” denote the low and high components of a differential signal respectively.

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Further Information

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Abaco Documents

This document is distributed via the Abaco website. You may register for access to manuals via the website.


LINK
www.abaco.com/products/pmc-gbit-dt2bp/p687


LINK
www.abaco.com/products/pmc-gbit-dt2cc-network-interface-card

Technical Support Contact Information

You can find technical assistance contact details on the website Embedded Support page.


LINK
www.abaco.com/embedded-support

Abaco will log your query in the Technical Support database and allocate it a unique Case number for use in any future correspondence.

Alternatively, you may also contact Abaco's Technical Support via:


LINK
support@abaco.com

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If you need to return a product, there is a Return Materials Authorization (RMA) form available via the website Embedded Support page.


LINK
www.abaco.com/embedded-support

Do not return products without first contacting the Abaco Repairs facility.

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Additional Notes

This manual covers both PMC-GBIT-DT2CC* and PMC-GBIT-DT2BP*. PMC-GBIT-DT2xx is the common name for both products. If information refers to just one of the models, the model will be identified.

The PMC-GBIT-DT2xx provides two high performance Gigabit Ethernet (GbE) interface controller ports on a single- wide PCI Mezzanine Care (PMC). The Ethernet network interface complies with the IEEE 802.3 specification for 10BASE-T, 100BASE-TX, and 1000BASE-T over category 5 twisted pair cable. Full and half duplex modes are supported (only full duplex supported at 1000BASE-T).

The PMC-GBIT-DT2xx uses the Intel® 82546GB which includes 64 KByte FIFO buffer memory, allowing back-to-back transmissions with minimum interface latency. It also features, a 10BASE-T, 100BASE-TX and 1000BASE-T auto-detection CSMA/CD interface controller.

The Intel 82546GB provides dual integrated low-powered MAC/PHY functionality. The 82546GB appears on the PCI bus as a multifunction device, eliminating one PCI to PCI bridge, thus significantly improving bus performance. It supports a number of sophisticated features, including auto negotiation, collision detection, link detection, 4B/5B encoding/decoding (100BASE-TX), flow control, half duplex/full duplex. Standard network connection is accomplished through a rear panel I/O connector and rear panel interface module for Ethernet, PIM-GBIT-DT*.



NOTE

Previous versions of the SBCxyz product used non-RoHS Intel 82546EB with PCI device ID 1010.

PIM-GBIT-DT provides rear panel access for PMC-GBIT-DT2xx. The module has two RJ45 connectors and LED indicators for link, speed and activity.



NOTE

To assure error-free operation using full-length cable as specified in IEEE 802.3, physical link traces for GbE signals on all interconnects between the PMC and cable must be routed differentially with 100-ohm differential impedance. Abaco's CP-630 and PP-600 have matching differential pairs and are recommended to be used with PMC-GBIT-DT2CC/PMC-GBIT-DT2BP and PIM-GBIT-DT.

The module is compliant with standard single-wide PMC IEEE P1386.1, PCI 2.2, and PCI-X 1.0 specifications.

Features

- Dual 10BASE-T/100BASE-TX/1000BASE-T Rear Panel Network Interface Card
- Single-wide 32/64-bit, 33/66 MHz PCI, 66/133 MHz PCI-X PMC
- LED indicators for link, speed and activity
- Auto-negotiating protocol selection
- Transmit and receive FIFOs
- Supports jumbo frames
- Conduction cooled (PMC-GBIT-DT2CC only)
- Conformal coated (PMC-GBIT-DT2CC only)
- Rear panel access and LED indicators for link, speed and activity provided via PIM-GBIT-DT
- Software drivers are available for VxWorks®, Linux®, and Windows®.

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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.

Abaco 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 Abaco for service and repair to ensure that safety features are maintained.

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1 • Handling and Installation

1.1 Handling Precautions

CAUTION

Handle the board by the edges or front panel only.



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. Unused boards should be stored in the same protective boxes in which they were shipped.

1.2 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 Abaco Systems Technical Support.

Remove the PMC-GBIT-DT2xx card from the shipping box and anti-static packaging. Verify that it is not damaged and that all items are present by referring to the packing list.

1.3 Installation

The PMC-GBIT-DT2xx requires a single PMC Slot.

NOTE

There are no onboard user-configured jumpers for this product.

1. Remove power from the chassis.
2. Observe proper anti-static procedures.
3. Install the PMC-GBIT-DT2xx onto the PMC site.

   NOTE

   How washers are used on the backside of the card is very important when installing the PMC-GBIT-DT2CC. If possible, do not use washers. If washers must be used, make sure that they do not short traces on the backside of the card (using small outer diameter washers is recommended).

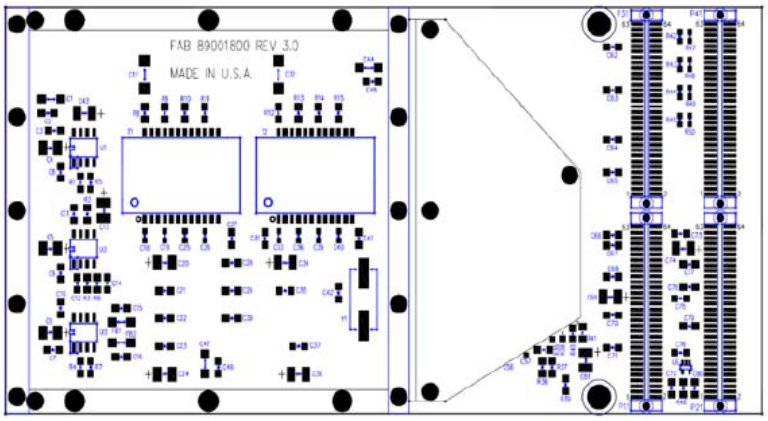
4. Power up the chassis.

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1.4 Connectors and Indicators

1.4.1 PMC-GBIT-DT2CC

Figure 1-1 PMC-GBIT-DT2CC Placement Diagram



1.4.2 PMC-GBIT-DT2BP

Figure 1-2 PMC-GBIT-DT2BP Placement Diagram

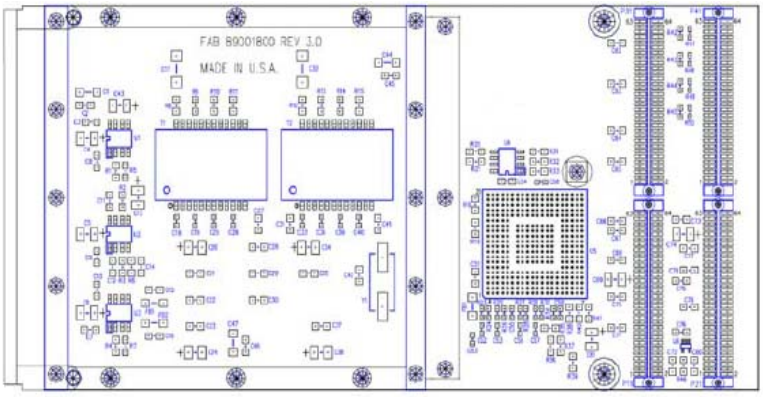


Figure 1-3 PMC-GBIT-DT2BP Front Panel

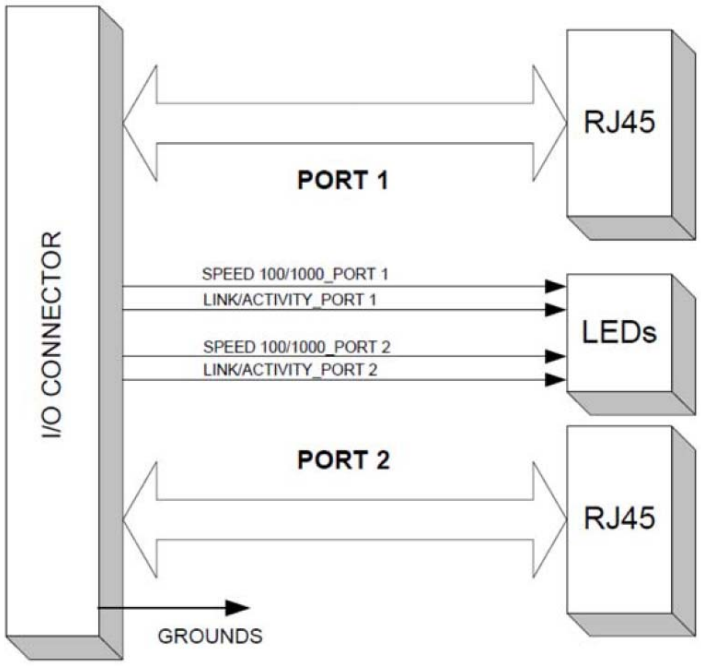


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1.4.3 PIM-GBIT-DT

The PIM-GBIT-DT provides physical interface for two 10/100/1000BASE-T Ethernet ports. PIM-GBIT-DT is used for rear panel access along with the rear panel transition module. This module has two RJ45 connectors and LED indicators for link, speed, and activity.

Figure 1-4 PIM-GBIT-DT Block Diagram



Front Panel RJ45 Pin Assignment

There are two RJ45 connectors, one for each port. The RJ45 connector pin assignments are shown below. Note that the 1000BASE-T uses all four pairs at the same time and that each pair can send and receive signals simultaneously. Additionally, if necessary, the controller chip automatically swaps the pairs.

Table 1-1 PIM-GBIT-DT Front Panel I/O Pin Assignment

RJ45 Pin #	Signal
1	TX0/RX0+
2	TX0/RX0-
3	TX1/RX1+
4	TX2/RX2+
5	TX2/RX2-
6	TX1/RX1-
7	TX3/RX3+
8	TX3/RX3-

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Front Panel LED Indicators

Each Ethernet port provides two LED status indicators. The LED functions are shown in the table below.

Table 1-2 PIM-GBIT-DT LED Status Definitions

Name	LED State	Description
ACT/LNK	Solid Green	Indicates Link without Activity
	Blinking Green	Indicates Link with Activity
SPEED	Off	Indicates 10BASE-T Speed when LNK/ACT LED is on or blinking
	Solid Yellow	Indicates 100BASE-TX Speed
	Solid Green	Indicates 1000BASE-T Speed

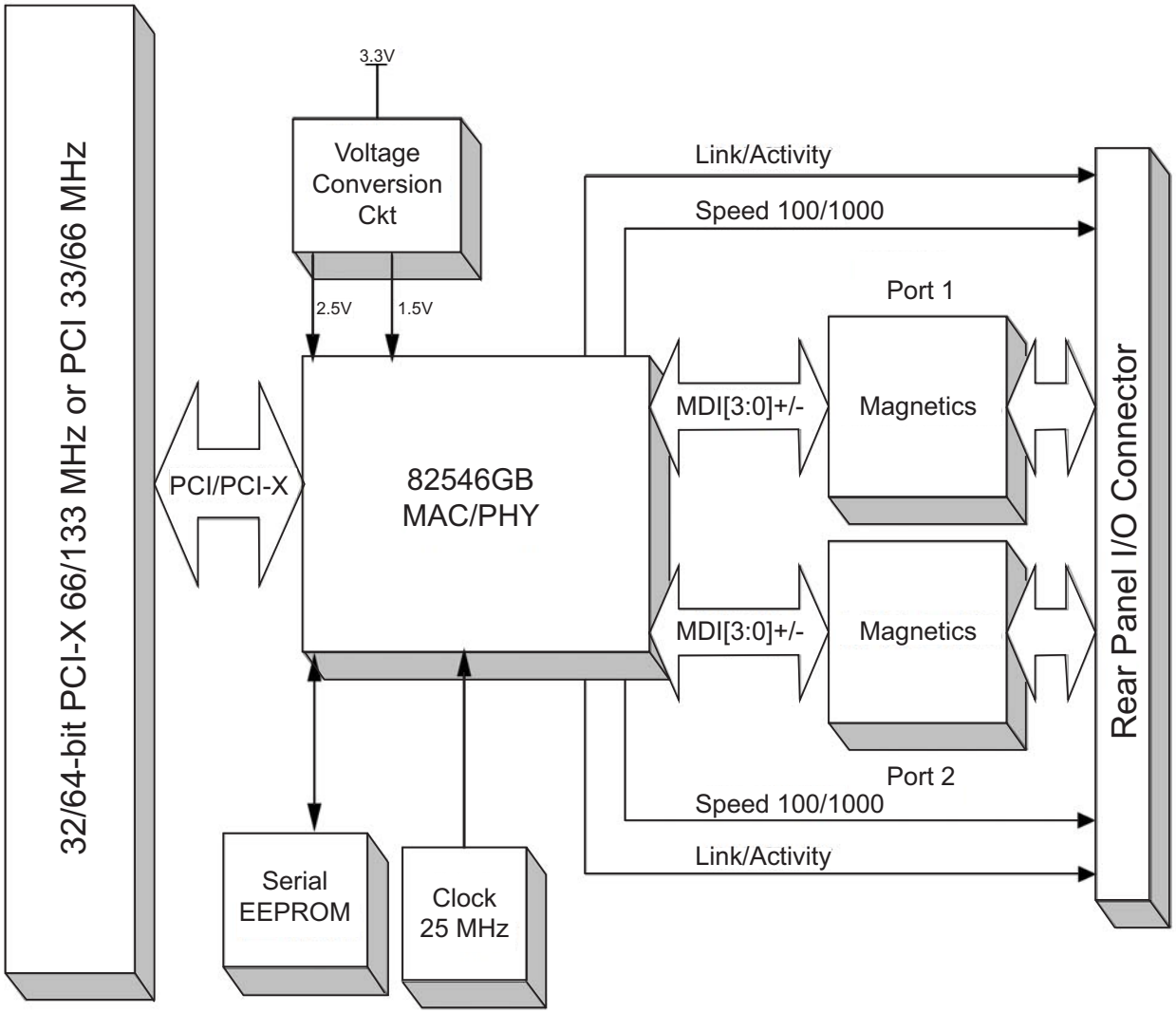
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2 • Theory of Operation

The following block diagram illustrates the PMC-GBIT-DT2xx.

2.1 Block Diagram

Figure 2-1 PMC-GBIT-DT2xx Block Diagram



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2.2 Programming

2.2.1 PMC/PCI(-X) Interface

The PMC-GBIT-DT2xx is accessed by the host system via the 32/64-bit PMC interface running 33/66 MHz PCI bus or 66/133MHz PCI-X bus. The card is compliant with PCI 2.2 and PCI-X 1.0a specifications. It is a multifunction device, with two Ethernet ports appearing as two separate functions to the host. Each function has its own register sets.

The PMC-GBIT-DT2xx is mapped into PCI memory space. In addition to PCI Configuration Registers, it implements configuration registers that are specific to PCI-X. The PCI configuration registers for the 82546GB Ethernet chip on the PMC-GBIT-DT2xx are listed in the figure below.

Table 2-1 PCI Configuration Registers for Function 0 of 82546GB

31 16	15 00	Register Address
Device ID = 1079h	Vendor ID = 8086h	00h
Status	Command	04h
Class Code = 020000h	Revision ID	08h
BIST / Header Type = 80h	Latency Timer / Cache Line Size	0Ch
Memory-Mapped Base Address Register, 128kbyte in size		10h
Reserved Base Address Register		14h
Reserved Base Address Register		18h
Reserved Base Address Register		1Ch
Reserved Base Address Register		20h
Reserved Base Address Register		24h
Reserved		28h
Subsystem ID = 1005h	Subsystem Vendor ID = 124Bh	2Ch
Expansion ROM Base Address Register		30h
Reserved	Cap_Ptr	34h
Reserved		38h
Max_Lat = 00h / Min_Gnt = FFh	Interrupt Pin = 01h / Interrupt Line	3Ch
Power Management Capabilities	Next Item Pointer / Capability ID	DCh
Data / PMCSR Bridge Support Extension	Power Management Control Status Register	E0h
PCI-X Command	Next Capability / PCI-X Capability ID	E4h
PCI-X Status		E8h

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Table 2-2 PCI Configuration Registers for Function 1 of 82546GB

31 16	15 00	Register Address
Device ID = 1079h	Vendor ID = 8086h	00h
Status	Command	04h
Class Code = 020000h	Revision ID	08h
BIST / Header Type = 80h	Latency Timer / Cache Line Size	0Ch
Memory-Mapped Base Address Register, 128kbyte in size		10h
Reserved Base Address Register		14h
Reserved Base Address Register		18h
Reserved Base Address Register		1Ch
Reserved Base Address Register		20h
Reserved Base Address Register		24h
Reserved		28h
Subsystem ID = 1005h	Subsystem Vendor ID = 124Bh	2Ch
Expansion ROM Base Address Register		30h
Reserved	Cap_Ptr	34h
Reserved		38h
Max_Lat = 00h / Min_Gnt = FFh	Interrupt Pin = 02h / Interrupt Line	3Ch
Power Management Capabilities	Next Item Pointer / Capability ID	DCh
Data / PMCSR Bridge Support Extension	Power Management Control Status Register	E0h
PCI-X Command	Next Capability / PCI-X Capability ID	E4h
PCI-X Status		E8h

The revision ID is a sequential stepping number starting with 0x00 for the first revision of the Gigabit Ethernet Controller. Consult the 82546GB Gigabit Ethernet Controller Specification Update for the latest stepping information.

In a PCI-X system, the PMC-GBIT-DT2xx can be configured in different PCI(-X) modes depending on the resistor value of R71 that connects to PMC P1 connector pin 39:

Table 2-3 PCI(-X) Mode Depending on Resistor Value of R71

R71 Value	PCI(-X) Mode
0Ohm	PCI 33/66MHz
10kOhm	PCI-X 66MHz
Open	PCI-X 133MHz

2.2.2 MAC Addresses

A unique Ethernet address is assigned at the factory to the Ethernet port. For convenience, the address is shown on the human- and machine-readable label affixed to the back side of the board.

2.2.3 MII Management Interface

83546GB provides software access to the MII management resistors in the PHY via MDIC registers. There are two MDIC registers, one for each port.

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A • Connectors and Pinouts

A.1 PIM-GBIT-DT P41 I/O Connector

Table A-1 PIM-GBIT-DT P41 I/O Connector Pinouts

Pin Number	Signal Name	Signal Name	Pin Number
1	N/C	N/C	2
3	GND	D0+_1	4
5	D0-_1	N/C	6
7	GND	GND	8
9	D1+_1	D1-_1	10
11	N/C	GND	12
13	GND	D2+_1	14
15	D2-_1	N/C	16
17	GND	GND	18
19	D3+_1	D3-_1	20
21	N/C	GND	22
23	GND	D0+_2	24
25	D0-_2	N/C	26
27	GND	GND	28
29	D1+_2	D1-_2	30
31	LED_LINK_1_1000#	LED_LINK_1_100#	32
33	GND	D2+_2	34
35	D2-_2	LED_LINK_1#	36
37	LED_ACT_1#	GND	38
39	D3+_2	D3-_2	40
41	N/C	N/C	42
43	GND	GND	44
45	GND	N/C	46
47	N/C	GND	48
49	N/C	N/C	50
51	LED_LINK_2_1000#	LED_LINK_2_100#	52
53	GND	GND	54
55	N/C	LED_LINK_2	56
57	LED_ACT_2#	GND	58
59	GND	N/C	60
61	N/C	N/C	62
63	GND	N/C	64
N/C = Not Connected			

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A.2 PMC P1 Connector

Table A-2 PMC P1 Connector PCI Pinouts

Pin Number	Signal Name	Signal Name	Pin Number
1	TCK	-12V	2 (BP)
3	GND	INTA#	4
5	INTB#	INTC#	6 (N/C)
7	BUSMODE1#	+5V	8 (BP)
9 (N/C)	INTD#	PCI-RSVD	10 (N/C)
11	GND	PCI-RSVD	12 (N/C)
13	CLK	GND	14
15	GND	GNT#	16
17	REQ#	+5V	18 (BP)
19	V (I/O)	AD[31]	20
21	AD[28]	AD[27]	22
23	AD[25]	GND	24
25	GND	C/BE[3]#	26
27	AD[22]	AD[21]	28
29	AD[19]	+5V	30 (BP)
31	V (I/O)	AD[17]	32
33	FRAME#	GND	34
35	GND	IRDY#	36
37	DEVSEL#	+5V	38 (BP)
39	PCIXCAP	LOCK#	40
41 (N/C)	SDONE#	SBO#	42 (N/C)
43	PAR	GND	44
45	V (I/O)	AD[15]	46
47	AD[12]	AD[11]	48
49	AD[09]	+5V	50 (BP)
51	GND	C/BE[0]#	52
53	AD[06]	AD[05]	54
55	AD[04]	GND	56
57	V (I/O)	AD[03]	58
59	AD[02]	AD[01]	60
61	AD[00]	+5V	62 (BP)
63	GND	REQ64#	64
N/C = Not Connected, BP = Bypass only			

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A.3 PMC P2 Connector

Table A-3 PMC P2 Connector PCI Pinouts

Pin Number	Signal Name	Signal Name	Pin Number
1	+12V	TRST#	2
3	TMS	TDO	4
5	TDI	GND	6
7	GND	PCI-RSVD	8 (N/C)
9 (N/C)	PCI-RSVD	PCI-RSVD	10 (N/C)
11 (N/C)	BUSMODE2#	+3.3V	12
13	RST#	BUSMODE3#	14
15	3.3V	BUSMODE4#	16
17	PME#	GND	18
19	AD[30]	AD[29]	20
21	GND	AD[26]	22
23	AD[24]	+3.3V	24
25	IDSEL	AD[23]	26
27	+3.3V	AD[20]	28
29	AD[18]	GND	30
31	AD[16]	C/BE[2]#	32
33	GND	PMC-RSVD	34 (N/C)
35	TRDY#	+3.3V	36
37	GND	STOP#	38
39	PERR#	GND	40
41	+3.3V	SERR#	42
43	C/BE[1]#	GND	44
45	AD[14]	AD[13]	46
47	M_66EN	AD[10]	48
49	AD[08]	+3.3V	50
51	AD[07]	PMC-RSVD	52 (N/C)
53	+3.3V	PMC-RSVD	54 (N/C)
55 (N/C)	PMC-RSVD	GND	56
57 (N/C)	PMC-RSVD	PMC-RSVD	58 (N/C)
59	GND	PMC-RSVD	60 (N/C)
61	ACK64#	+3.3V	62
63	GND	PMC-RSVD	64 (N/C)
N/C = Not Connected, BP = Bypass only			

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A.4 PMC P3 Connector

Table A-4 PMC P3 Connector PCI Pinouts

Pin Number	Signal Name	Signal Name	Pin Number
1 (N/C)	PMC-RSVD	GND	2
3	GND	C/BE[7]#	4
5	C/BE[6]#	C/BE[5]#	6
7	C/BE[4]#	GND	8
9	V (I/O)	PAR 64	10
11	AD[63]	AD[62]	12
13	AD[61]	GND	14
15	GND	AD[60]	16
17	AD[59]	AD[58]	18
19	AD[57]	GND	20
21	V (I/O)	AD[56]	22
23	AD[55]	AD[54]	24
25	AD[53]	GND	26
27	GND	AD[52]	28
29	AD[51]	AD[50]	30
31	AD[49]	GND	32
33	GND	AD[48]	34
35	AD[47]	AD[46]	36
37	AD[45]	GND	38
39	V (I/O)	AD[44]	40
41	AD[43]	AD[42]	42
43	AD[41]	GND	44
45	GND	AD[40]	46
47	AD[39]	AD[38]	48
49	AD[37]	GND	50
51	GND	AD[36]	52
53	AD[35]	AD[34]	54
55	AD[33]	GND	56
57	V (I/O)	AD[32]	58
59 (N/C)	PMC-RSVD	PMC-RSVD	60 (N/C)
61 (N/C)	PMC-RSVD	GND	62
63	GND	PMC-RSVD	64 (N/C)
N/C = Not Connected, BP = Bypass only			

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A.5 PMC P4 Connector

Table A-5 PMC P4 Connector PCI Pinouts

Pin Number	Signal Name	Signal Name	Pin Number
1	N/C	N/C	2
3	GND	D0+_1	4
5	D0-_1	N/C	6
7	GND	GND	8
9	D1+_1	D1-_1	10
11	N/C	GND	12
13	GND	D2+_1	14
15	D2-_1	N/C	16
17	GND	GND	18
19	D3+_1	D3-_1	20
21	N/C	GND	22
23	GND	D0+_2	24
25	D0-_2	N/C	26
27	GND	GND	28
29	D1+_2	D1-_2	30
31	LED_LINK_1_1000#	LED_LINK_1_100#	32
33	GND	D2+_2	34
35	D2-_2	LED_LINK_1#	36
37	LED_ACT_1#	GND	38
39	D3+_2	D3-_2	40
41	N/C	N/C	42
43	GND	GND	44
45	GND	N/C	46
47	N/C	GND	48
49	N/C	N/C	50
51	LED_LINK_2_1000#	LED_LINK_2_100#	52
53	GND	GND	54
55	N/C	LED_LINK_2	56
57	LED_ACT_2#	GND	58
59	GND	N/C	60
61	N/C	N/C	62
63	GND	N/C	64
N/C = Not Connected, BP = Bypass only			

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B • Specifications

General specifications are listed below.

B.1 Functional Specifications

Table B-1 Functional Specifications

I/O Connections	Two RJ45 connectors, one for each port
Compatibility	PCI REV. 2.2; PCI-X 1.0 specification 33/66 MHz, 32/64-bit, master and slave, 3.3 V/5V signaling 66/133MHz PCI-X bus IEEE P1386.1 (64-bit PMC) IEEE 802.3 ANSI 8802-3 1000BASE-T/100BASE-TX/10BASE-T
PCI Controller / Ethernet MAC	Intel 82546GB
Receive/Transmit FIFOs	64kbyte total
Front Panel I/O	None
Rear Panel I/O (P4)	Yes
Rear Panel Access	Via PIM-GBIT-DT

B.2 Electrical/Mechanical PMC-GBIT-DT2xx

Table B-2 Electrical/Mechanical PMC-GBIT-DT2xx Specifications

Power Requirements	
@3.3V	1.6A (typical)
Form Factor	
PMC	Single Slot (74.0mm x 143.75 mm)
	2 ports routed to the P4 connector
Connectors	P1, P2, P3 and P4 (P41 on PIM-GBIT-DT)
Weight	0.07 kg (0.16 lb.) for PMC-GBIT-DT2BP 0.11 kg (0.24 lb.) for PMC-GBIT-DT2CC
Temperature	
Operating Temperature	0°C to +55°C for PMC-GBIT-DT2BP -40°C to +85°C (when temperature screened) for PMC-GBIT-DT2CC
Storage	-40°C to +125°C for PMC-GBIT-DT2BP -40°C to +125°C for PMC-GBIT-DT2CC
Humidity	
Operating	5% to 95% Non-Condensing
Storage	5% to 95% Non-Condensing
Shock and Vibration	PMC-GBIT-DT2CC is designed to withstand 18GRMS as specified in MIL-STD-810F

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