



DIAMOND SYSTEMS CORPORATION

MERCATOR

*PC/104-Plus I/O Module with 1 or 2 10/100Mbps Ethernet Ports
+ 24 Lines Digital I/O*

User Manual V2.00

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MERCATOR

PC/104+ Module with 1 or 2 High Speed Ethernet Controllers + 24 lines of Digital I/O

Models: **MRC-100-XT** 1 Ethernet controller
 MRC-224-XT 2 Ethernet controllers + 24 digital I/O

1. DESCRIPTION

The Mercator provides one or two auto-negotiating PC/104+ Ethernet adapters with 24 optional lines of digital I/O. The digital I/O on the MRC-224 model is provided by a standard 82C55 chip with 3 8-bit ports and programmable direction. It is supported by Diamond Systems' Universal Driver software for DOS, Linux, QNX, and Windows.

The Mercator uses the National Semiconductor DP83815 Ethernet controller which incorporates both the physical layer (PHY) and Media Access Controller (MAC) on one chip. The DP83815 is a bus mastering controller, incorporating 4K of buffer memory. Up to 200Mbps of throughput is available in full duplex operation on fast Ethernet segments.

Driver support for the DP83815 is available for most operating systems, including: Windows 95/98/ME/NT/2K/XP, Linux, QNX and DOS.

2. FEATURES

Ethernet Controllers

- ◆ IEEE 802.3 10Base-T and 100Base-TX compatible
- ◆ 10/100 auto-negotiation provides support for Ethernet and Fast Ethernet networks.
- ◆ PC/104+ 5V and 3.3V compatible
- ◆ Driver support for Windows 95/98/NT/2K/XP, Linux, QNX, and DOS
- ◆ Full duplex allows for up to 200Mbps for two-way transmission between nodes on Fast Ethernet segments.
- ◆ Both RJ-45 and straight headers provided for Ethernet cable attachment
- ◆ PCI slot selection for slots 0, 1, and 2

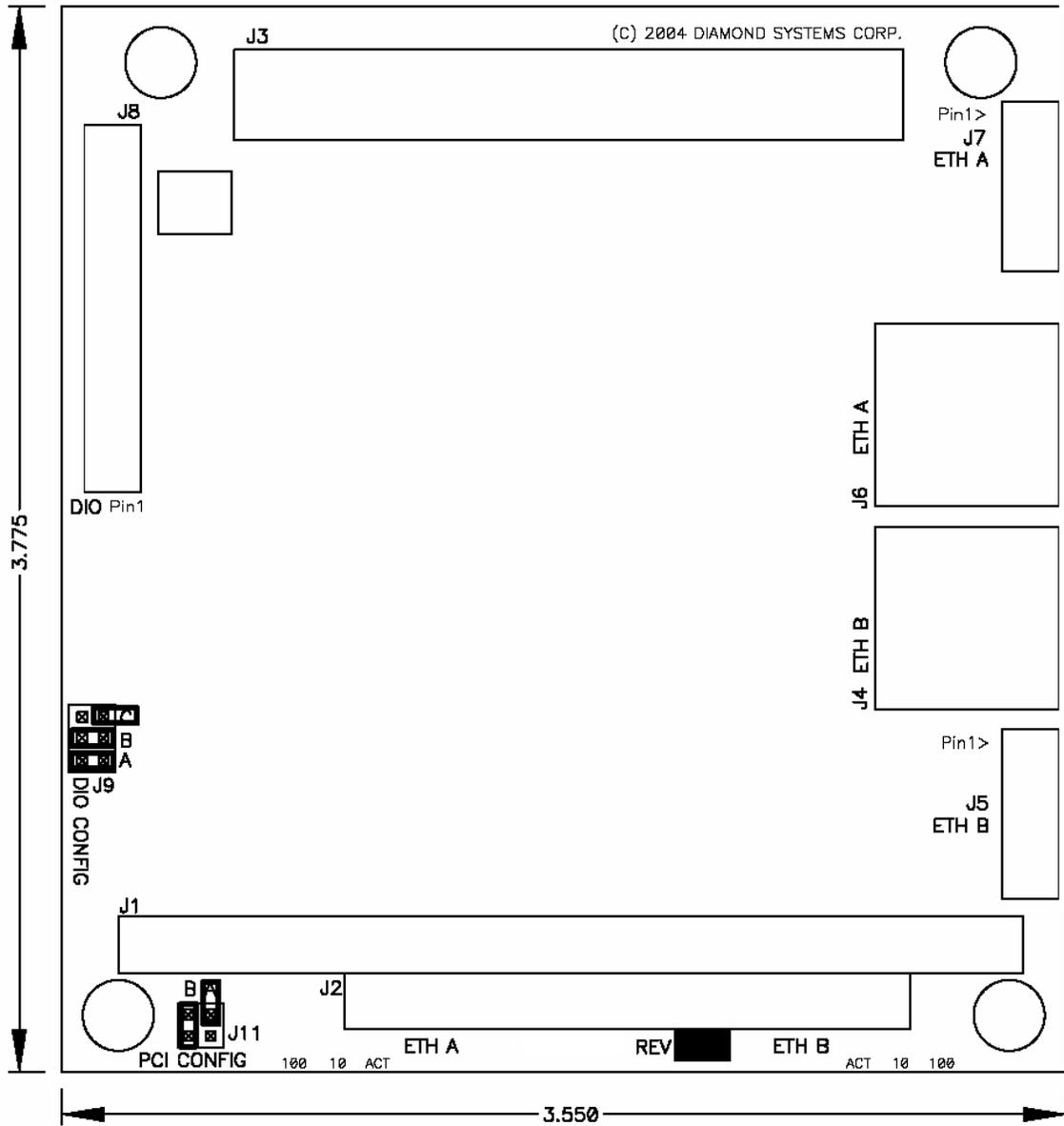
Digital I/O (MRC-224 only)

- ◆ 24 digital I/O lines
- ◆ Programmable direction

System Features

- ◆ Extended temperature operation (-40 to +85°C)
- ◆ Locations for Zero-ohm resistors to replace jumpers for hard-wired configuration

3. MERCATOR BOARD DRAWING



Feature descriptions

- J1 PC/104 8-bit bus connector
- J2 PC/104 16-bit bus connector
- J3 PC/104+ PCI connector
- J4 Ethernet Controller B RJ-45 socket
- J5 Ethernet Controller B locking header
- J6 Ethernet Controller A RJ-45 socket
- J7 Ethernet Controller A locking header
- J8 Digital I/O header
- J9 Digital I/O configuration jumper block
- J11 PCI configuration jumper block

4. I/O HEADER PINOUT AND PIN DESCRIPTION

4.1 Ethernet Connectors – J4, J5, J6, J7

Each Ethernet port is brought out to two connectors. One is a standard RJ-45 female socket and the other is a 6-pin male right-angle locking header.

Ethernet Controller 1

J6 RJ-45 socket

J7 Straight header

Ethernet Controller 2 (model MRC-224-XT only)

J4 RJ-45 socket

J5 Straight header

The two different connection types are provided for cabling flexibility only. You must NOT use both connections of one controller simultaneously.

J5, J7: Ethernet controller locking headers

1	N/A
2	RX-
3	N/A
4	RX+
5	TX-
6	TX+

These connectors are Amp part no. 640457-6. Mating connector housing is Amp 770602-6 or compatible, and crimp terminals are Amp 770666-1 (tin plated) or 770666-2 (gold plated) or compatible.

J4, J6: Ethernet controller RJ-45 jacks

1	TX+
2	TX-
3	RX+
4	N/A
5	N/A
6	RX-
7	N/A
8	N/A

These jacks accept standard Ethernet CAT-5 cabling with RJ-45 plugs and standard pinout.

4.2 Digital I/O – J8 (MRC-224-XT only)

The digital I/O is provided on a 26-pin (2x13) header with 0.1" contact spacing. This connector may be used with Diamond Systems' cable no. C-26-18, which provides a 26-pin female connector at each end.

C7	1	2	C6
C5	3	4	C4
C3	5	6	C2
C1	7	8	C0
B7	9	10	B6
B5	11	12	B4
B3	13	14	B2
B1	15	16	B0
A7	17	18	A6
A5	19	20	A4
A3	21	22	A2
A1	23	24	A0
+5V	25	26	GND

5. BOARD CONFIGURATION

Refer to the Mechanical Drawing on page 4 for locations of the configuration items mentioned here. All configuration jumpers are dual-row 2mm size. Provision is made on the board for zero-ohm resistors to replace jumpers to enable a hard-wired configuration.

5.1 Digital I/O Base Address – J9 (MRC-224-XT only)

Each I/O board in your system must have a unique I/O address range. The first address in this range is called the base address. The digital I/O of the MRC-224 uses an I/O range of 4 bytes. The base address of this range is set with a portion of jumper block J9, located along the lower left portion of the board near the PC/104 bus connectors. Although any of the following addresses are selectable, certain locations are reserved or may cause conflicts with other system resources. The default setting is 300 Hex.

J9: Digital I/O Base Address

ISA Base Address		Jumper Position		
Hex	Decimal	A	B	C
200	512	In	In	In
240	576	Out	In	In
280	640	In	Out	In
2C0	706	Out	Out	In
300	768 (Default)	In	In	Out
340	832	Out	In	Out
380	896	In	Out	Out
3C0	960	Out	Out	Out

5.2 PC/104+ Slot Selection – J11

Each PCI device that exists on the PC/104+ expansion bus must occupy one unique slot number, 0-3. Slots 0-2 are bus master slots, while slot 3 is for targets only. Each active Ethernet controller on the Mercator requires a bus master slot. J11 controls which slot numbers the onboard Ethernet controllers occupy. For model MRC-100-XT, only Ethernet A is present and configurable. Note that for the dual-port board it is possible to disable one port.

J11: Ethernet PCI Slot Selection

B	A	Ethernet A (both models)	Ethernet B (MRC-224-XT)
In	In	Disabled	Slot 0
In	Out	Slot 0	Slot 1
Out	In	Slot 1	Slot 2
Out	Out	Slot 2	Disabled

6. I/O MAP

This section details the I/O register map for the digital I/O features of the MRC-224-XT.

6.1 Overview

The digital I/O circuit on model MRC-224-XT occupies 4 bytes in ISA I/O memory space. A functional list of these registers is provided below, and detailed register bit definitions are provided on the next page. The information in this chapters is provided to assist in understanding the board's operation and for use by programmers writing their own driver software. Diamond Systems' Universal Driver software provides high-level control of the board's functionality and will isolate these underlying hardware details for most programmers.

Base +	Function
0	DIO port A
1	DIO port B
2	DIO port C
3	DIO Configuration Register

6.2 Register Definitions

Base + 0: Digital I/O Register A

Bit	7	6	5	4	3	2	1	0
Name	A7	A6	A5	A4	A3	A2	A1	A0

A7-A0 Digital I/O port A

Base + 1: Digital I/O Register B

Bit	7	6	5	4	3	2	1	0
Name	B7	B6	B5	B4	B3	B2	B1	B0

B7-B0 Digital I/O port B

Base + 2: Digital I/O Register C

Bit	7	6	5	4	3	2	1	0
Name	C7	C6	C5	C4	C3	C2	C1	C0

C7-C0 Digital I/O port C

Base + 3: Digital I/O Configuration Register

This control register determines the direction and mode of the 82C55 digital I/O lines.

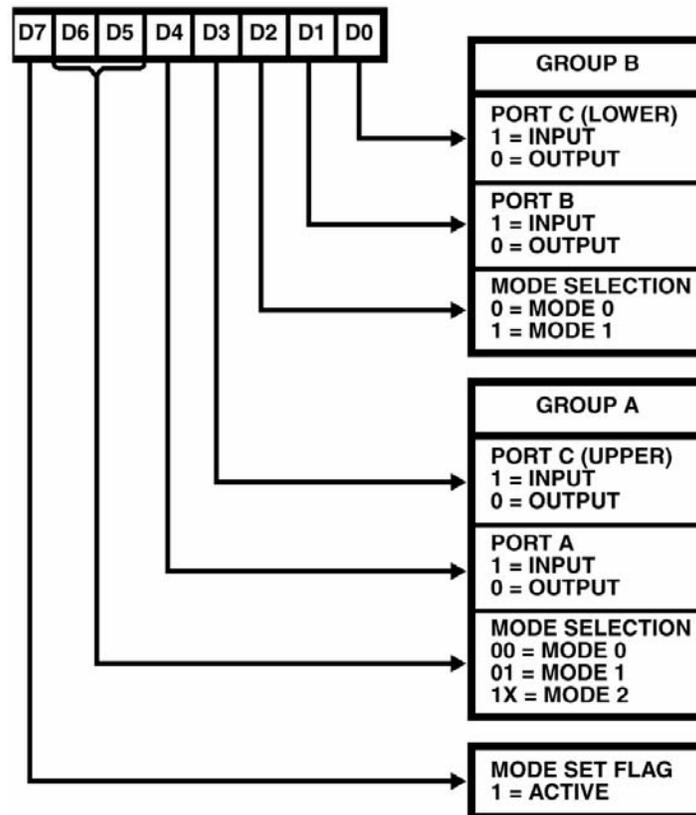
Most applications use the simple I/O configuration, in which bit 7 is set to 1 and the Mode is set to 0 for all ports. Only the three port direction bits need to be set. Note that the directions for Ports A and B are set for all 8 bits at once, while the direction for each half of port C can be set independently. (Upper means bits C7-C4, and Lower means bits C3-C0.)

For more complex operations with handshaking, consult the 82C55 datasheet attached at the end of this manual.

Here is a list of common configuration register control bytes:

Digital I/O Configuration Byte (Base + 3)

Hex	Decimal	Port A	Port B	Port C (both halves)
9B	155	Input	Input	Input
92	146	Input	Input	Output
99	153	Input	Output	Input
90	144	Input	Output	Output
8B	139	Output	Input	Input
82	130	Output	Input	Output
89	137	Output	Output	Input
80	128	Output	Output	Output



7. SPECIFICATIONS

Ethernet

No. of Ethernet controllers:	1 (MRC-100) or 2 (MRC-224)
Protocol:	IEEE 802.3 10Base-T and 100Base-TX compatible
Maximum baud rate:	100Mbps

Digital I/O

No. of I/O lines:	24
Direction:	Programmable: Ports A and B individually programmable for all input or all output. Port C programmable in 4-bit groups for input or output.
Input voltage:	Low -0.5V min, 0.8V max High 2.0V min, 5.5V max
Output voltage:	Low 0.0V min, 0.4V max High 3.0V min, Vcc - 0.4V max
Output current:	±2.5mA max, each line
Pull-up resistors:	10KΩ all lines, selectable with jumper

General

I/O headers:	Ethernet ports RJ-45 female sockets and 6-pin straight male headers Digital I/O 26-pin (2x13) .025" square pin header on .1" centers
Mating cables:	Ethernet ports RJ-45 sockets: Standard CAT5 cable Pin headers: Diamond Systems cable no. C-PRZ-02 Digital I/O Diamond Systems cable no. C-26-18
Dimensions:	3.55" x 3.775" (PC/104 standard)
Power supply:	+5VDC ±10%
Current consumption:	
Operating temperature:	-40 to +85°C
Operating humidity:	5% to 95% noncondensing
PC/104 bus:	Both PC/104 and PC/104+ stackthrough headers installed.

8. 82C55 DIGITAL I/O IC DATASHEET