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Installation Guide

DigiBoard PC/Xe and MC/Xe
Intelligent Asynchronous
Serial Communications Boards

90028800B

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Digi International Inc.,
d. b. a. DigiBoard
6400 Flying **Cloud** Drive
Eden Prairie, **MN 55344**

Phone **(800) 344-4273**
(6 12) 943-9020

FAX (612) 943-5398

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Table of Contents

Electronic Emission Notices iv
Federal Communications Commission (FCC) Statement.. iv
Industry Canada Compliance Statement.. v
German Notice v

Introduction 1
Components 1
About the Boards 2

Installation Tips 3
Memory Map Utility 5
User Diagnostics 6

Installing PC/Xe Boards.. 7
Before you plug in the board. 7
Plugging in the Board 9
Software Installation ..... IO
I/O Port Address.. ..... IO
Memory Window Size and Starting Address 12
Interrupt Request Line (IRQ) 14

Installing MC/Xe Boards.. 15
Before you plug in the board. 15
Plugging in the Board.. 17
Configuring the Board 18
Software Installation 20
I/O Port Address 20
Memory Window Size and Starting Address.. 20
Interrupt Vector (JRQ) 22

Connecting Peripherals 23
Connecting to a Modem 23
DB-9 Equipped Boards 23
DB-25 Equipped Boards 24
RJ-45 Equipped Boards.. 25
ALTPIN Modem Wiring (RJ-45 Versions). 26

Connecting the PC/Xe or MC/Xe Board to a DTE Device 27
DB-9 Equipped Boards 27
DB-25 Equipped Boards 29
Software Handshaking (XON/XOFF) 29
Hardware Handshaking (Ready/Busy). 30
RJ-45 Equipped Boards 31
Software Handshaking (XON/XOFF) 31
Hardware Handshaking (Ready/Busy). 32

RS-232 Cables and Connector Options.. 33
Cables 33
Grounding 33
Environment 33
Capacitance vs. Length of Run 33
Connector Options.. 34
DB-25 Connectors 34
DB-25 Connector Options 35
Quad and Octa Cable Option (DTE or DCE). 35
Quad and Octa Connector Boxes (DTE or DCE). 36
DB-9 Connectors. 37
RJ-45 Connectors 38
RJ-45 to DB-25 Conversion 40

Specifications 42
PC/2e 42
MC/2e 43
PC/4e 44
MC/4e 45
PC/8e 46
MC/8e 47

Index 48

List of Figures

Figure 1 PC/Xe, MC/Xe Installation Flow Chart.. 4
Figure 2 PC/2e Board Layout.. 8
Figure 3 PC/4e and PC/8e Board Layout 8
Figure 4 Switch Settings for I/O Port Addresses.. 11
Figure 5 MC/2e Board Layout 16
Figure 6 MC/4e and MC/8e Board Layout.. 16
Figure 7 DB-9 to DB-25 Modem Cable 23
Figure 8 DB-25 to DB-25 Modem Cable.. 24
Figure 9 RJ-45 to DB-25 Modem Cable.. 25
Figure 10 8-Wire Modem Cable for use with ALTPIN Configuration 26
Figure 11 9-Pin to 25-Pin Null Modem Cable.. 27
Figure 12 9-Pin Null Modem Cable.. 28
Figure 13 Simple Terminal/Printer Cable (DB-25) 29
Figure 14 Terminal/Printer Cable with DTR Handshaking (DB-25) 30
Figure 15 Simple Terminal/Printer Cable (RJ-45). 31
Figure 16 Terminal/Printer Cable with DTR Handshaking (RJ-45). 32
Figure 17 Octa Cable Assembly.. 35
Figure 18 Eight Port DB-25 Connector Box 36
Figure 19 RJ-45 Connector Box 38
Figure 20 RJ-45 to DB-25 "Cable Leg" 40

List of Tables

Table 1 Memory Start Addresses for PC/Xe.. 13
Table 2 Memory Addresses Typically Used by Other Devices 13
Table 3 Memory Start Addresses for MC/Xe 21
Table 4 DB-25 Connector Pin Assignments 34
Table 5 DB-25 Cable Options and Part Numbers 35
Table 6 Connector Box Options and Part Numbers 36
Table 7 DB-9 Quad and Octa Cable Options and Part Numbers 37
Table 8 DB-9 Connector Pin Assignments 37
Table 9 RJ-45 Connector Box Options and Part Numbers.. 38
Table 10 Cable Leg Options and Part Numbers.. 40

Electronic Emission Notices

Federal Communications Commission (FCC) Statement

Radio Frequency Interference (RFI) (FCC 15.105)

This equipment has been tested and found to comply with the limits for Class B digital devices pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential cnvironmcnt. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference lo radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Labeling Requirements (FCC 15.19)

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: (I) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Modifications (FCC 15.21)

Changes or modifications to this equipment not expressly approved by DigiBoard may void the user's authority to operate this equipment.

Cables (FCC 15.27)

Shielded cables *must* be used to remain within the Class B limitations.

Industry Canada Compliance Statement

This digital apparatus does not exceed the Class B limits for radio noise for digital nppnratus set out in the interference-causing equipment standnrd entitled: "Digital Apparatus", ICES-003 of Industry Canada.

Cet appareil numdrique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Clnsse B prescrites dnns la norme sur le matériel brouillcur: "Appareils numériques", NMB-003 édictée par Industrie Canada.

German Notice

Hiermit wird bescheinigt, daß die DigiBoard PC/2e, PC/4e, PC/8e, MC/2e, MC/4e und MC/8e boards in Übereinstimmung mil den Bestimmungen der Vfg. 243/1991 und 46/1992 funkenstört sind.

Dcr Dcutschen Bundespost wurde das Inverkehrbringen dieser Geräte angezeigt und die Berechtigung zur Überprüfung der Seric auf Einhnltung der Bestimmungen eingeräumt.

We hereby certify that the DigiBoard PC/2e, PC/4e, PC/8e, MC/2e, MC/4e nnd MC/8e boards comply with the RFI Suppression Requirements of Vfg. 243/1991 and Vfg. 46/1992.

The German Postal Service was notified that the equipment is being marketed. The German Postal Service has the right to re-test the equipment and to verify that it complies.

Notes

Introduction

This Installation Guide covers the installation and configuration of the PC/Xe and MC/Xe intelligent serial communications boards for ISA and Micro Channel personal computers ("ISA" stands for Industry Standard Architecture, and includes IBM AT and compatible computers, and most 80286, 80386, 80486 and Pentium based computers; Micro Channel computers include most IBM PS/2 and compatible computers).

In addition to the board itself (hardware), you will also need to install device driver software for your operating system, so that programs can communicate with the board. Device driver installation instructions are in separate manuals, included with the software diskette(s).

Note: The PC/2e, PC/4e and PC/8e boards for ISA computers are collectively known as PC/Xe boards; the MC/2e, MC/4e and MC/8e boards for Micro Channel computers are collectively known as MC/Xe boards.

Components

The carton in which your PC/Xe or MC/Xc board was shipped should contain the following items:

- PC/Xc 8K or MC/Xe SK board
- *Installation Guide* (this book)
- One or more software packets containing device driver diskettes and manuals
- Diskette containing ADF files (Adapter Description Files-Micro Channel versions only)
- Connector assembly (four and eight port models only)

About the Boards

(Technical information ***for those who are interested)***

The PC/Xc and MC/Xe boards are multi channel intelligent serial communications boards for ISA and Micro Channel computers.

The heart of the PC/Xe and MC/Xe boards is an 80186 microprocessor and 64K bytes of dual ported RAM, which relieves your computer of the burden of managing the serial ports. The computer can transfer large blocks of data directly to the memory on the board, then move on to other tasks while the board sends the data out the serial port one character at a time. Similarly, the board receives input data and stores it in buffers in its dual ported RAM, so the computer only needs to check periodically to see if data is available.

The dual ported RAM is memory which is accessible for read and write operations by both the board and the computer. To the computer, the dual ported RAM looks exactly like its own memory, and can be accessed by the same high speed memory referencing commands it uses for its internal memory. This means that a block of data that may take a number of seconds for the PC/Xe or MC/Xe board to receive or transmit to the outside world can be transferred between the board and the computer in mere microseconds.

The dual ported RAM is "mapped" into au unused area in the host computer's memory address space (typically somewhere between 0C0000h and OEFFFFh-the area traditionally reserved for expansion board BIOS ROMs and dual ported memory). The PC/Xe or MC/Xe board can be set via software so that the entire 64K is mapped into the computer's memory, or just an 8K "window". Using the 8K window allows you to fit the board into a smaller space when it has to coexist with a number of other expansion boards, many of which also need memory address space in the 0C0000h-0EFFFFh area (the entire 64K is still used; it's just divided into eight 8K segments which can be accessed by moving the window around).

Installation Tips

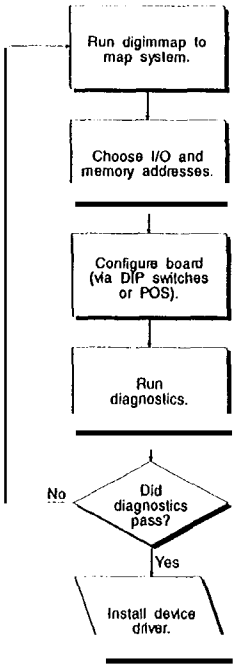
This section provides information about the DigiBoard memory mapping and diagnostic utilities.

Installing your PC/Xe or MC/Xe board is easy; however, since the boards require unique I/O and memory addresses, you may experience conflicts with other devices in your system. To minitnize installation difficulties, two utilities have been provided: **DIGIMMAP.EXE,** a program which will help you find a block of available memory address space in your computer (needed for the board's dual ported memory), and **UD-CISC. EXE,** a diagnostic program which will verify that the board is functioning correctly, and help you to identify any hardware problems with the board. Both of these utilities are in the **\DIAGS** directory of the DOS, AIO, OS/2 and Windows diskette which is included with your board.

The flow chart on the following page shows a good sequence to follow when installing your board. Following this procedure will minimize installation difficulties and minimize **the need for calls to Technical Support.**

Important! **Please run the memory map utility and diagnostics before calling Technical Support** for assistance.

Figure 1 **PC/Xe, MC/Xe Installation Flow Chart**



Memory Map Utility

The memory map utility, **DIGIMMAP.EXE**, is an MS-DOS based executable program that is designed to aid in the installation of DigiBoard hardware by detailing locations in memory that are available for the DigiBoard product.

To run **DIGIMMAP . EXE,** follow this procedure:

1. Boot your system normally. This should cause any adapters in your system to be initialized.
2. Place a bootable DOS formatted diskette in drive A (or your boot drive, if different from drive A). This diskette must have no TSRs or memory managers present, or **DIGIMMAP** may give erroneous results (hint: rename **CONFIG.SYS** and **AUTOEXEC. BAT,** if present, so they are not executed during bootup).
3. Press the <Ctrl>,<Alt> and <Delete> keys simultaneously to reboot your machine. DO NOT press the RESET button or cycle power to reboot; resetting the machine may turn off any adapters that were activated in Step I.
4. Now place the DOS, AIO, OS12 and Windows diskette in the diskette drive and enter: **A: \DIAGS\DIGIMMAP** (assuming that you put the diskette in drive A).
5. After reading the initial screen, press **<E>** to execute the utility.
6. The left hand column will contain a list of 8K starting addresses which appear to be available. Write down several of these addresses (some devices can fool the memory mapper by turning their memory off, making the area appear to be available). A good order **for trying addresses is:**
   1. **Addresses beginning with "D"** (D0000h-DE000h)
   2. Addresses **beginning with "C"** (C0000h-CE000h)
   3. **Addresses beginning with "E"** (E0000h-EE000h)

User Diagnostics

The **\DIAGS** directory on the DOS, AIO, OS/2 and Windows diskette contains a user diagnostic program called **UD-CISC. EXE.**

1. Place the DOS, AIO, OS/2 and Windows diskette in the diskette drive and enter **A: \DIAGS\UD-CISC** (assuming that you put the diskette in drive A).
2. When asked for a board family, press **<A>**.
3. Now you need to enter at least two parameters: the board's I/O address (as set on the DIP switches; see page 11) and the Host Base Address (the starting address of the board's dual ported memory-use the memory map utility **DIGIMMAP . EXE to find** a good address to use).

   Note-for MC/Xc boards, you will only be asked for a slot number; the I/O and memory addresses will be read from the POS.

   Depending on the version of the diagnostic program, the other parameters may already be filled in with default values; if they are not, enter the following values:

Window Size:	**8K**
IRQ:	Disabled
Machine Environment:	ISA
Port:	1
RS232/422:	232
Loopback:	No
Continuous Test:	Yes
Stop on first:	Yes

4. Now press **<E> to** start the tests. The tests will be run consecutively, and pass/fail status will be indicated on the right hand side of your **screen.**
5. **If all the tests pass, the board is functioning correctly and you are ready to install** the device driver software. Make a note of the Hosl Base Address and I/O address before exiting the diagnostic program (you will **need to specify these when you install the device driver software).**
6. **If failures occur, the most likely cause is a memory conflict.** Try a different Host Base Address and execute the diagnostics again. If you get a Hardware Reset Error, try a different I/O address (be sure to set the DIP switches **for the new address).**

Installing PC/Xe Boards

This section provides instructions for installing and configuring PC/Xe boards in ISA computers. These include IBM AT and compatible computers, and 80386/80486/Pentium based computers that employ the ISA (Industry Standard Architecture) bus.

Instructions for installing the MC/Xe board (in Micro Channel computers) begin on page 15.

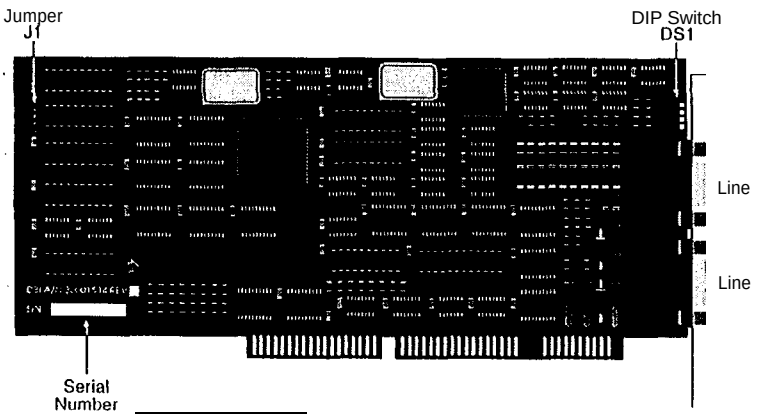
Before you plug in the board. ..

Write down the serial number of the board in the space provided. You will need it if you have to contact DigiBoard regarding the board.

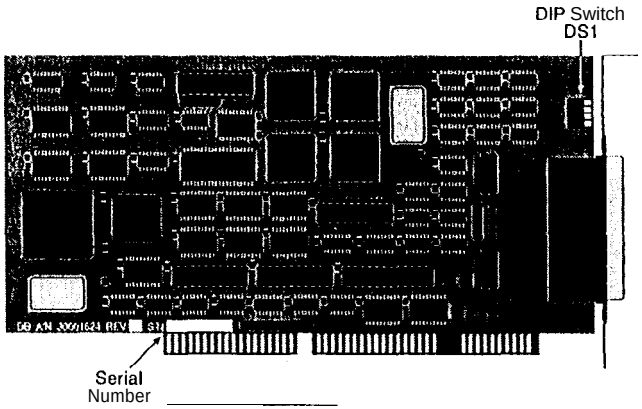
There is one jumper, J 1, on the PC/2e board. Make sure it hasn't been changed from the factory-set position (the top and middle pins connected). There are no jumpers on the PC/4e and PC/8e boards.

We recommend that you initially set all four DIP switches to the ON position (towards the circuit board). If necessary, you can change them later without removing the board.

Finure 2 **PC/2e Board Lavou**



Fiaure 3 **PC/4e and PC/8e Board Lavou**



Important! PC/Xe **boards contain static-sensitive components. Always touch a grounded surface to discharge static electricity before handling the circuit board.**

Plugging in the Board

Now you are ready to install the PC/Xe board in your computer. Follow these steps:

1. Turn off your computer's power and remove the cover (refer to your computer's manual for instructions on cover removal and option board installation and cautions).
2. Locate an available 16-bit slot in your computer and remove the slot plate.
3. Plug the PC/Xe board into the slot and screw the endplate to the computer chassis (use the screw you removed from the slot plate). The endplate must to be screwed in to the computer chassis to remain in compliance with Part 15 of the FCC rules.
4. Replace your computer's cover.

Software Installation

Important! Before installing device drivers, be sure to run the memory map utility to find available memory addresses, and run the user diagnostics to verify that the board is functioning correctly. See Installation Tips, beginning on page 3, for instructions.

The actual procedures for installing the device driver software for the PC/Xe board are covered in a separate manual, included with the software diskette. There are, however, a couple of points that should be made here to make the software installation go more smoothly.

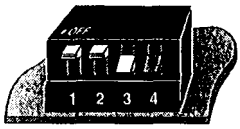
I/O Port Address

When configuring the device driver software, one of the first things you will be asked for is the I/O address of the PC/Xe board.

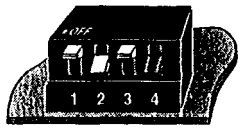
The PC/Xe board has four 8-bit I/O registers which the computer uses to configure the board (for example, this is how the computer sets the starting address and size of the board's dual ported memory window). The four registers occupy consecutive I/O addresses, the first of which is defined by setting switches 1-3 on DIP switch DS1. In the initial setup, on page 7, we had you set the switches to the ON position. This sets the first I/O address of the board to 320h (320h-323h will bc used), which is a good address to try first if this is the only DigiBoard intelligent serial board in your computer.

If you are installing multiple PC/Xe boards, each board must have its own I/O addresses. The PC/Xe board can be set to seven different I/O address ranges, so it should be easy to find addresses that aren't already in use. The switch settiugs for the different I/O address ranges arc shown in Figure 4 on the next page.

Figure 4 **DIP Switch Settings for I/O Port Addresses**



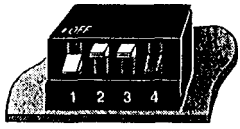
OFF-OFF-ON
100h-103h



OFF-ON-OFF
110h-113h



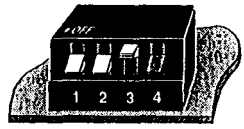
OFF-ON-ON
120h-123h



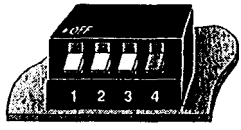
ON-OFF-OFF
200h-203h



ON-OFF-ON
220h-223h



ON-ON-OFF
300h-303h



ON-ON-ON
320h-323h

Important! **The fourth switch should always be in the ON position (towards the circuit board).**

Memory Window Size and Starting Address

The memory window size and starting address are programmed into the board by the device driver. No switches or jumpers are required to change these parameters.

The PC/Xe board requires at least 8K bytes of unused memory address space in your computer. This is typically allocated from the area between OCOOOOh and OEFFFFh in your computer's memory map (it can, however, be mapped into any free region in the first sixteen megabytes of address space, depending on your operating system).

When deciding on a memory start address, keep in mind that the PC/Xe board may have to coexist with a number of other devices which also require memory address space. You may have to try a number of different starting addresses before you find a free area. The starting addresses for 8K windows between OCOOOOh and OEFFFFh are listed in Table 1.

NOTE-If you are installing two **or more PC/Xe boards, they may all share the same starting address.**

As **an additional aid, the device driver diskette that comes with the PC/Xe board has a program, `DIGIMMAP.EXE`, in the `\DIAGS` directory, which can help you find an open memory address range.**

If you don't know what areas in this region are free, you'll have to use trial and error to find an available 8K window. A good sequence to try is 0D0000h first, then 0D8000h, 0D4000h, 0C8000h and 0CC000h. If these don't work, try some of the addresses in the 0E0000h column (if your computer has Extended BIOS functions, this area may not be available). If your system has monochrome graphics (e.g. Hercules), you may be able to use addresses in the 0A0000h-0AFFFFh range. If your system has 512K of base memory (memory below 1 megabyte), instead of the usual 640K, you may be able to use addresses between 080000h and 09FFFFh.

Table 1 Memory Start Addresses for PC/Xe Boarc

0C0000h	**0D0000h**	**0E0000h**
0C2000h	0D2000h	0E2000h
0C4000h	0D4000h	0E4000h
0C6000h	0D6000h	0E6000h
0C8000h	0D8000h	0E8000h
0CA000h	0DA000h	0EA000h
0CC000h	0DC000h	0EC000h
0CE000h	0DE000h	0EE000h

Table 2 Memory Addresses Typically Used by Other Device

Device	Addresses
VGA	A0000-C7FFF
Shadow RAM	Possibly anywhere. Check system BIOS setup.
SCSI Controller	DC000-DA000. Check controller documentation.
Network Interface	Check network interface controller documentation.

Interrupt Request Line (IRQ)

Depending upon the operating system or environment, it may be necessary assign an IRQ (Interrupt Request) line to the board. The PC/Xe board can be s to use IRQs 3, 5, 7, 10, 11, 12 or 15, or IRQs can be disabled (some DigiBoa device drivers, such as the OS/2 driver, do not use IRQs). The IRQ selection programmed into the board by the device driver. No switches or jumpers a required to change the IRQ selection.

When run with an IRQ enabled (such as with Windows), the IRQ chosen fort board must be unique-that is, no other board or device can have the same IR assigned to it.

The most common sources of contention for IRQs are:

IRQ3: Used by standard serial ports COM2 and COM4, if prcscnt.
IRQ5: Used by secondary parallel printer port, if present.
IRQ7: Used by primary parallel printer port, if present.

Many different expansion boards use IRQs. Check the documentation for t boards installed in your computer to see which, if any, IRQs they may be usin

Installing MC/Xe Boards

This section provides instructions for installing and configuring MC/Xe boards in Micro Channel computers. The Micro Channel version is for use with IBM PS/2 and compatible computers which use Micro Channel bus architecture.

Instructions for installing PC/Xe boards (in ISA computers) begin on page 4.

Before you plug in the board. ..

Write down the serial number of the board in the space provided. You will need it if you have to contact DigiBoard regarding the board.

Make sure you have the following items at hand:

- ***Working*** copy of your IBM Reference Diskette (don't use the original-it should be write-protected and stored in a safe place)
- ADF (Adapter Description Files) diskette (supplied with the board)

Figure 5 **MC/2e Board Layout**

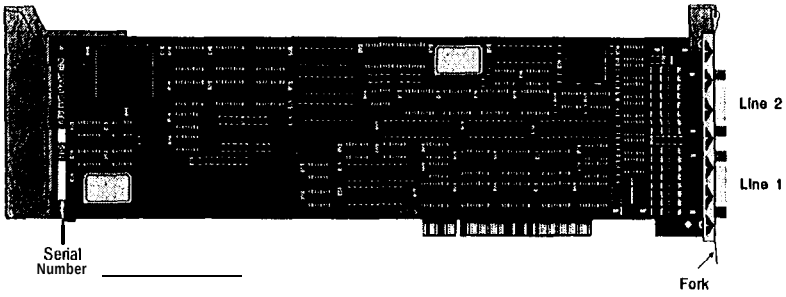
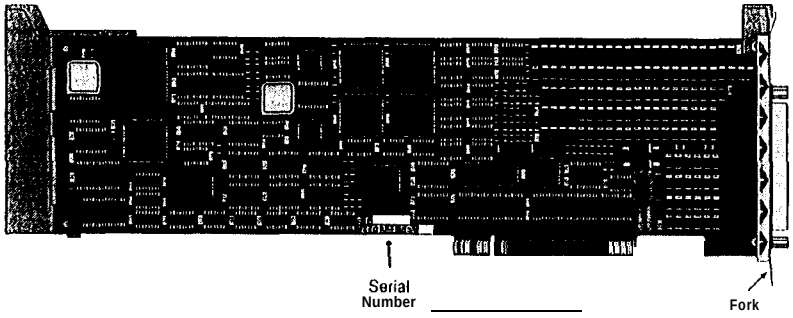


Figure 6 **MC/4e and MC/8e Board Layout**



Important! MC/Xe boards contain static-sensitive components. Always touch a grounded surface to discharge static electricity before handling the circuit board.

Plugging in the Board

Now you are ready to install the MC/Xe board in your computer. Follow these steps:

1. Turn off your computer's power and remove the cover (refer to your computer's manual for instructions on cover removal and option board installation and cautions).
2. Locate an available Micro Channel slot in your computer and remove the external slot plate (you will need to loosen the thumbscrew to do this).
3. Plug the MC/Xe board into the Micro Channel slot, making sure that the "fork" is in position under the endplate thumbscrew. Tighten the thumbscrew.
4. Replace your computer's cover.

Configuring the Board

After the MC/Xe board has been physically installed in your machine, you need to configure the board for operation in your system. This is done by running the configuration program on the IBM Reference Diskette. Follow these steps:

1. Insert your working copy of the IBM Reference Diskette into your boot drive (Drive A) and turn on the computer's power. Expect an error message-the MC/Xe board won't be found in the configuration file at this point.

2. Select "Copy an Option Diskette" from the main menu. Follow the instructions given on your computer screen for copying ADF files onto your Reference Diskette. The name of the ADF file for MC/Xe boards is **@6FE7.ADF**.

3. Select "Set Configuration" from the main menu. Then select "Change Configuration" from the Set Configuration menu. The screen will now display the configuration of the system. Use the <Page UP> and <Page Down> keys to scroll through the configuration until you see the entry for the slot into which you have plugged the MC/Xe board. There are three parameters which can bc set: Memory Start Address, I/O Port Address and Interrupt Vector.

   To change a parameter, use the arrow keys to highlight the item you wish to change, then press the <F5> and <F6> function keys to cycle through the available settings for that parameter.

   When you have set all three parameters to the desired values, press <F10> to save the changes, then press <F3> to exit.

The following options are available:

Memory Start Address (64K):
0C0000h, 0D0000h, F80000h, FAOOOOh or FCOOOOh.

Memory Start Address (8K):
0C0000h, 0C2000h, 0C4000h, 0C6000h, 0C8000h, 0CA000h, 0CC000h, 0CE000h, 0D0000h, 0D2000h, 0D4000h, 0D6000h, 0D8000h, 0DA000h, 0DC000h, 0DE000h, F80000h, FAOOOOh or FCOOOOh.

NOTE: F80000h, FAOOOOh and FCOOOOh arc above the 1 megabyte boundary (in the sixteenth megabyte).

I/O Port Address:
10811, 118h, 128h, 218h, 228h, 308h or 328h.

Interrupt Vectors:
IRQ 3, 5, 7, 10, 11, 12, 15 or None (IRQ disabled).

See *the following section,* Software Installation, for an *explanation of these parameters.*

4. Remove the Reference Diskette from the drive and reboot your machine. This time you should get no error message.

Software Installation

The actual procedures for installing the device driver software for the MC/Xe board are covered in a separate manual, included with the software diskette. There are, however, a couple of points that should be made here to make the software installation go more smoothly.

I/O Port Address

The MC/Xc board has four 8-bit I/O registers which the computer uses to communicate with the board. The four registers occupy consecutive I/O addresses, the first of which is defined by the I/O Port Address parameter in the POS (Programmable Option Select) registers of your Micro Channel machine. The I/O Port Address selection is made by the configuration program on the IBM Reference Diskette (see page 18).

If you are installing multiple MC/Xe boards, each board must have its own I/O address. The MC/Xe board can be set to seven different I/O addresses (108h, 118h, 128h, 218h, 228h, 308h or 328h), so it should be easy to find an address that isn't already in use.

You can narrow the field of choices by looking at the configurations of other devices in your computer (boot your machine with the IBM Reference Diskette and select "Set Configuration", then "View Configuration") to see what I/O port addresses they use.

Memory Window Size and Starting Address

The MC/Xe board requires at least 8K bytes of unused memory address space in your computer. This is normally allocated from tbc area between 0C0000h and 0DFFFFh in your computer's memory map. It is also possible to map the MC/Xe board's memory into the sixteenth megabyte of your computer's memory map (this is, however, generally not supported by device driver software due to potential conflicts with system memory and memory cache controllers).

The memory window size can bc either 64K bytes or 8K bytes-this is determined by the Memory Start Address selection when you use the configuration program on the IBM Reference Diskette (see page 18). ***There is no difference in performance between an*** 8K ***window and a*** 64K ***window,*** and on DOS based systems where the board must be mapped into the first megabyte, it is much easier to allocate 8K bytes of address space than 64K (there are only

two 64K blocks between OCOOOOh and 0DFFFFh, while there are sixteen 8K blocks in the same address range).

When deciding on a memory start address, keep in mind that the MC/Xe board may have to coexist with a number of other devices (such as video adapters, ESDI hard disk controllers, network interfaces, SCSI interfaces, etc.) which also require memory address space. You may have to try a number of different starting addresses before you find a free area. The supported starting addresses for the MC/Xe board are listed in Table 3. Addresses in bold print can be used for either 8K or 64K windows; addresses in normal print can only be used for 8K windows. *The three addresses in the third column are in the sixteenth megabyte, and cannot be used in DOS based machines or machines with sixteen or more megabytes of memory.*

You can narrow the field of choices by looking at the configurations of other devices in your computer (boot your machine with the IBM Reference Diskette and select "Set Configuration", then "View Configuration") to see what, if any, memory addresses they use.

Important!

If you are installing the MC/Xe board in a DOS based system with an expanded memory manager (e.g. EMM386, QEMM, etc.), be sure to exclude the memory address range used by the MC/Xe board. This is usually done with a command line option in the `DEVICE=` line for your memory manager in **CONFIG.SYS**. Consult the documentation for your expanded memory manager for **instructions.**

Table 3 Memory Start Addresses for MC/Xe Boards

OCOOOOh	**0D0000h**	**F80000h**
0C2000h	0D2000h	**FA0000h**
0C4000h	0D4000h	**FC0000h**
0C6000h	0D6000h	
0C8000h	0D8000h	
0CA000h	0DA000h	
0CC000h	0DC000h	
0CE000h	0DE000h	

Interrupt Vector (IRQ)

Depending upon the operating system or environment, it may be necessary to assign an IRQ (Interrupt Request) line to the board. The MC/Xe board can be set to use IRQs 3, 5, 7, 10, 11, 12 or 15, or interrupts can be disabled (some DigiBoard device drivers, **such as the OS/2 driver, do not use IRQs).** The IRQ selection is made by the configuration program on the IBM Reference Diskette (see page 18).

When run with an IRQ enabled (such as with Windows), the IRQ chosen for the board must be unique—that is, no other board **or device can have the same** IRQ **assigned to it.**

The most common sources of contention for IRQs are:

IRQ3: Used by standard serial ports COM2 and COM4, **if present.**
IRQ5: **Used by secondary parallel printer port, if present.**
IRQ7: **Used by primary parallel printer port, if present.**

You can narrow the field of choices by looking at the configurations of other devices in your computer (boot your machine with the IBM Reference Diskette and select "Set Configuration", then "View Configuration") to see what, if any, IRQs they use.

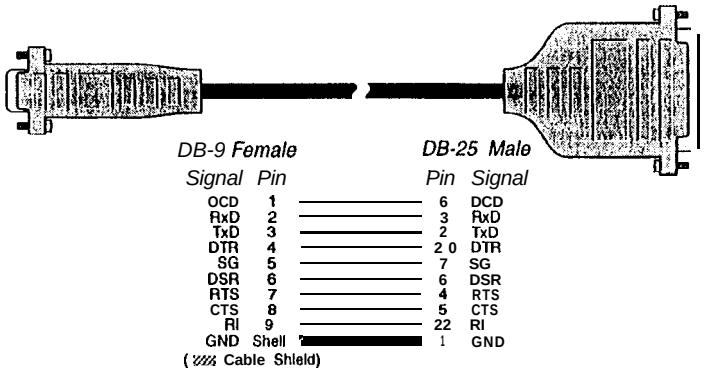
Connecting Peripherals

Connecting to a Modem

DB-9 Equipped Boards

To connect a DB-9 equipped board (PC/2e and MC/2e boards, or PC/4e, PC/8e, MC/4e and MC/8e boards with DB-9 fanout cable assemblies) to a modem, use standard PC modem cables, available from most electronics stores and computer dealers. The wiring diagram for a 9-pin to 25-pin modem cable is shown in Figure 7.

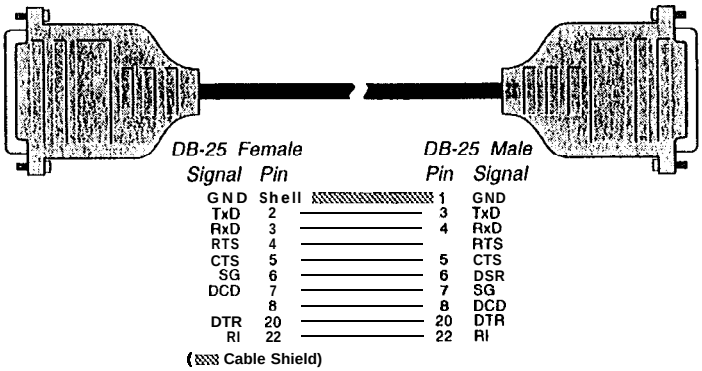
Figure 7 **DB-9 to DB-25 Modem Cable**



Important! Shielded cable must bc used to remain in compliance with Part 15 of FCC rules.

DB-25 Equipped Boards

Figure 8 **DB-25 to DB-25 Modem Cable**

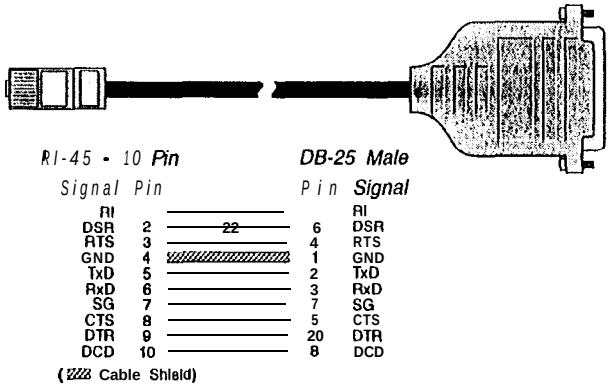


To connect a DB-25 equipped PC/Xe or MC/Xe (four and eight port versions) board to a modem, use a standard "straight-through" cable (see Figure 8) to connect the modem to one of the DB-25 connectors on the fan out cable or connector box.

RJ-45 Equipped Boards

The simplest way to connect a modem to a board with RJ-45 connectors is to use RJ-45 to DB-25 "Cable Legs", available from DigiBoard (see page 40 for a description and part numbers). These adapters use IO-pin RJ-45 plugs, and therefore provide full modem support (Ring Indicator and Data Carrier Detect are only available on IO-pin RJ-45 connectors).

Figure 9 **RJ-45 to DB-25 Modem Cable (10 Wire)**

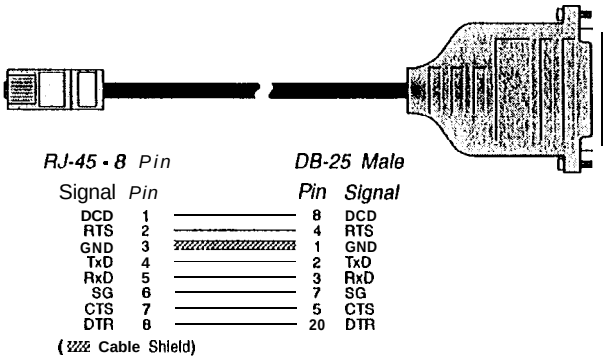


If you wish to build your own modem cable, follow the diagram in Figure 9.

ALTPIN Modem Wiring (RJ-45 Versions)

IO-pin RJ-45 plugs may be difficult to obtain in the retail market; therefore, rnost DigiBoard device driver software incorporates an optional feature called ALTPIN, which swaps the logical functions of DSR (Data Set Ready) with DCD (Data Carrier Detect). When ALTPIN is enabled (see your device driver software reference manual for instructions), DCD becomes available on pin 1 of an 8-pin RJ-45 connector (equivalent to pin 2 of a IO-pin connector).

Figure 10 &Wire Modem Cable for use with ALTPIN Configuration



If you wish to build an 8-wire modern cable for an RJ-45 equipped board, use an 8-pin RJ-45 plug wired as shown in Figure IO.

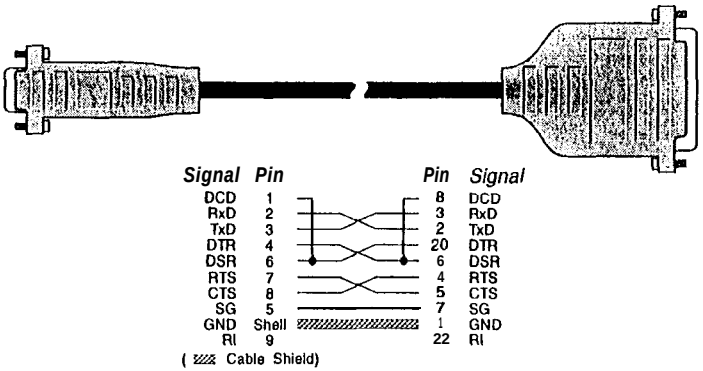
Connecting the PC/Xe or MC/Xe Board to a DTE Device

A DTE device is a terminal, serial printer, another computer's serial port, etc. To connect the PC/Xe or MC/Xe board (which are also DTE devices) to another DTE device, you need a *null modem* cable or adapter.

DB-9 Equipped Boards

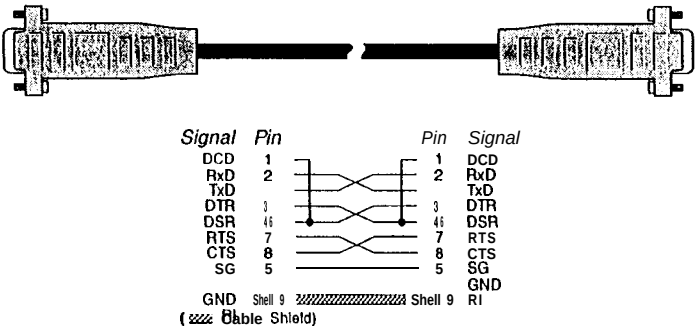
Use a standard PC printer cable, or build a cable as shown in Figures 11 or 12.

Figure 11 Q-Pin to 25-Pin Null Modem Cable



Important! Shielded cable must bc used to remain in compliance with Part 15 of FCC rules.

Figure 12 **O-Pin Null Modem Cable**



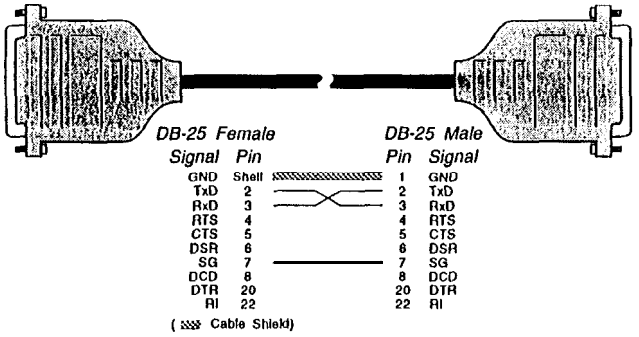
DB-25 Equipped Boards

Software Handshaking (XON/XOFF)

In most cases, serial terminals and printers need only a "three-wire" connctio to the PC/Xe or MC/Xe board. All DigiBoard device driver software support XON/XOFF (software) handshaking, so the only signal lines necessary ar Transmitted Data (TxD), Received Data (RxD) and Signal Ground (SG). It ma be necessary to disable DCD (Data Carrier Detect) sensing through a softwar command-see your DigiBoard device driver software manual for instruction! Cables must be shielded to remain in compliance with FCC certification require ments, and the shield should be connected to Chassis Ground (GND) at bot ends of the cable run.

A simple cable for connecting a terminal or a printer to a DB-25 equippe PC/Xc or MC/Xe board is shown in Figure 13.

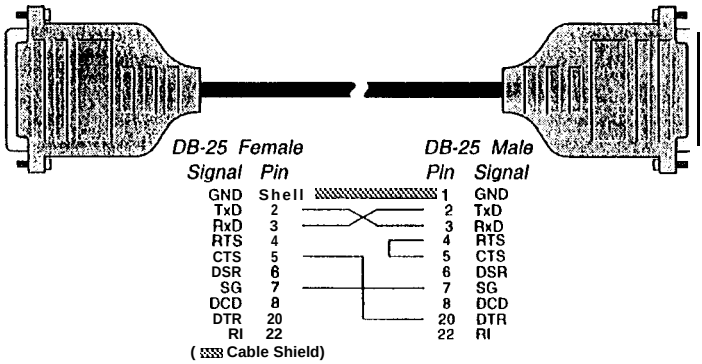
Figure 13 Simple Terminal/Printer Cable (DB-25



The cable shown in Figure 13 is a three-wire null modem cable-that is Transmitted Data on one end of the cable is connected to Received Data at th other end, and vice versa.

The male DB-25 end can be plugged directly into most serial terminals an printers without any adapters. The female DB-25 end plugs directly into one o the DB-25 connectors on the fan out cable or connector box assembly.

Figure 14 Terminal/Printer Cable with DTR Handshaking (DB-25)



Most terminals and printers use Data Terminal Ready (DTR) for Ready/Busy hardware handshaking. The cable shown in Figure 14 supports this method.

Note:

Some Okidata printers use a control signal on pin 11, called Supervisory Send Data (SSD) instead of DTR. In this case, simply connect CTS on the female DB-25 side to pin 11 of the male DB-25, instead of pin 20.

Other printer manufacturers may use different methods of flow control. Consult your printer's documentation for specific wiring requirements.

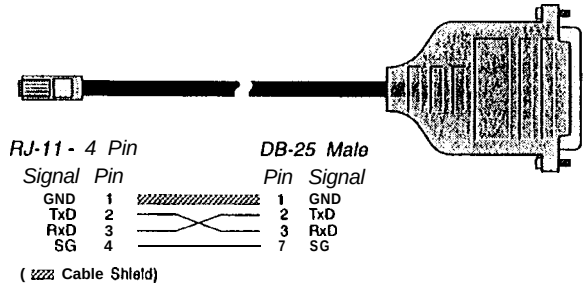
RJ-45 Equipped Boards

Software Handshaking (XON/XOFF)

In most cases, serial terminals and printers need only a "three-wire" connection to the PC/Xe or MC/Xe board. All DigiBoard device driver software supports XON/XOFF (software) handshaking, so the only signal lines necessary are Transmitted Data (TxD), Received Data (RxD) and Signal Ground (SG). It may bc necessary to disable DCD (Data Carrier Detect) sensing through a software command-see your DigiBoard device driver software manual for instructions. Cables must be shielded to remain in compliance with FCC certification requirements, and the shield should be connected to Chassis Ground (GND) at both ends of the cable run.

A simple cable for connecting a terminal or a printer to an RJ-45 equipped PC/Xc or MC/Xe board is shown in Figure 15.

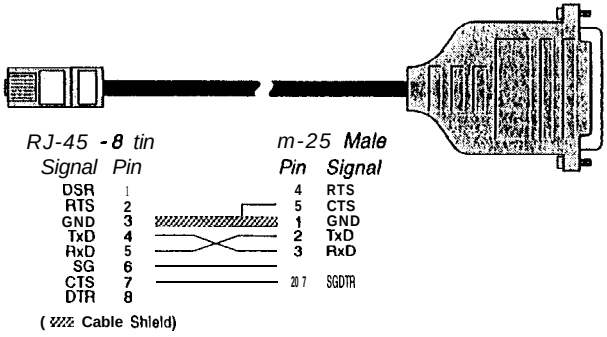
Figure 15 Simple Terminal/Printer Cable (RJ-45)



The cable shown is a three-wire null modem cable-that is, Transmitted Data on one end of the cable is connected to Received Data at the other end, and vice versa.

The male DB-25 end can be plugged directly into most serial terminals and printers without any adapters. The RJ-I 1 plug fits into the center of the RJ-45 jack.

Figure 16 Terminal/Printer Cable with DTA Handshaking (RJ-45)



Note:

Some Okidata printers use a control signal on pin 11, called Supervisory Send Data (SSD) instead of DTR. In this case, simply connect CTS on the RJ-45 side to pin 11 of the DB-25, instead of pin 20.

Other printer manufacturers may use different methods of flow control. Consult your printer's documentation for specific wiring requirements.

Most terminals and printers use Data Terminal Ready (DTR) for Ready/Busy hardware handshaking. The cable shown in Figure 16 supports this method.

RS-232 Cables and Connector Options

Cables

RS-232 serial interface cables should be shielded, low capacitance cables, ideally designed specifically for serial data transmission.

Grounding

The shield should be grounded at both ends of the cable. Chassis Ground-available on the shell of DigiBoard's DB-25 and DB-9 connectors, and pin 4 of our IO-pin RJ-45 connector, is ideal for this purpose.

Environment

While good shielding provides reasonable protection against "noise" (Electro-Magnetic Interference, or EMI), cables should still be routed away from noise sources wherever possible. Avoid laying cables in close proximity to transformers, generators, motors, fluorescent lights, etc.

Capacitance vs. Length of Run

The total capacitance of a cable affects the integrity of transmitted data. As a rule of thumb, the *total* capacitance of a cable (including the connectors) should not exceed 2500 pF. Serial interface cable is usually rated in pico Farads per foot. Therefore, if a cable has a capacitance of 50 pF/ft, and the connectors are 100pF each, the maximum recommended cable length is 46 feet. If the cable is rated at 12.5 pF/ft, the maximum recommended cable length is 184 feet, and 5 pF/ft cable can be run up to 460 feet.

In situations where low-capacitance cable is unavailable, or very long cable runs are required, "short-haul" modems, available from suppliers such as Black Box, can be used to increase the effective range of the RS-232 interface Short-haul modems are similar to standard modems, except that they are connected directly to each other via a cable instead of going through a telephone circuit.

*NOTE—Use only **externally-powered short-haul** modems with DigiBoard **products.***

Connector Options

A variety of connector types is available. PC/4e, PC/8e, MC/4e and MC/8e boards can be set up with DB-25 connectors (male or female, DTE or DCE wiring), DB-9 connectors (male or female, DTE wiring) or 10-pin RJ-45 jacks.

NOTE: PC/2e and MC/2e boards are available only with DB-9 connectors.

The following pages give the part numbers and wiring information for the various connector types.

DB-25 Connectors

Table 4 **DB-25 Connector Pin Assignments**

Signal	Description	DTE Use	DCE Use	Pin #
GND	Chassis Ground	N/A	N/A	Shell
TxD	Transmitted Data	Output	Input	2
RxD	Received Data	Input	Output	3
RTS	Request to Send	Output	Input	4
CTS	Clear to Send	Input	Output	5
DSR	Data Set Ready	Input	Output	6
SG	Signal Ground	*reference*	*reference*	7
DCD	Data Carrier Detect	Input	Output	8
DTR	Data Terminal Ready	Output	Input	20
RI	Ring Indicator	Input	Output	22

DigiBoard PC/4e, PC/8e, MC/4e and MC/8e boards can be configured with DB-25 connectors in any of four configurations: DTE male, DTE female, DCE male or DCE female. The pin assignments for the DB-25 connectors follow the usual conventions for RS-232 wiring.

It should be noted that the DCE configuration is equivalent to a DTE connector plus a fully-wired null modem adapter. Thus, DCD (Data Carrier Detect) and DSR (Data Set Ready) are wired together internally and carry the DTE equivalent of DTR (Data Terminal Ready). *For this reason, DCE cables* cannot *be used with modems.*

DB-25 Connector Options

DB-25 connectors are available in two styles: a quad or octa cable assembly, or a connector box assembly. Either style may be ordered with male or female DB-25 connectors, configured as DTE or DCE devices.

Quad and Octa Cable Option (DTE or DCE)

Figure 17 **Octa-Cable Assembly**

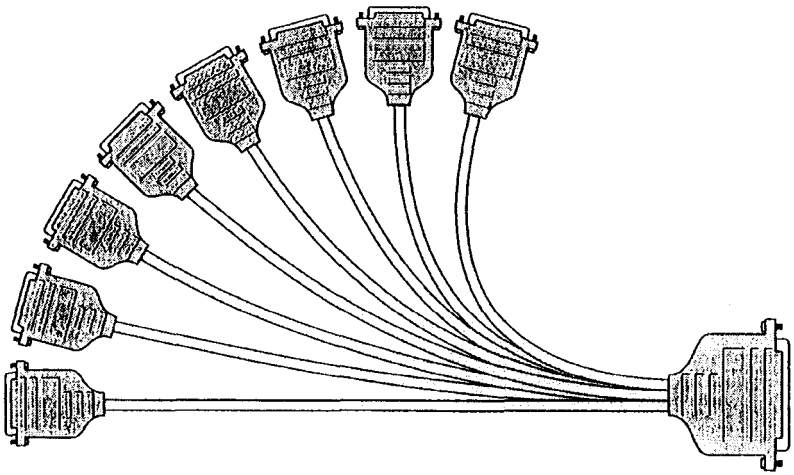


Table 5 **DB-25 Cable Options and Part Numbers**

	DTE Quad	DCE Quad	DTE Octa	DCE Octa
DB-25 Male	76000008	76000007	76000021	76000020
DB-25 Female	76000006	76000005	76000019	76000018

Figure 17 shows the eight-port cable assembly, and Table 5 gives the part numbers of the available configurations.

Figure 18 **Eight-Port DB-25 Connector Box**

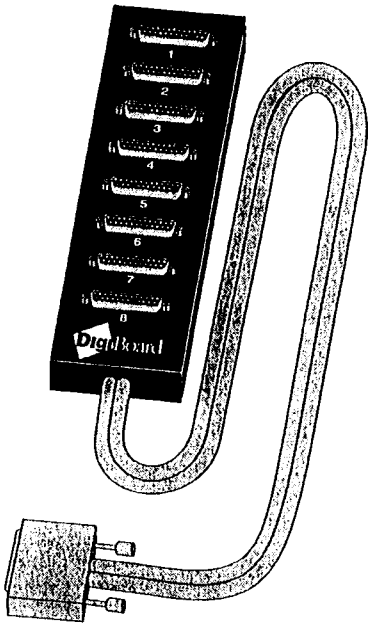


Figure 18 shows the eight-port DB-25 connector box option. A four-port box is also available.

Table 6 **Connector Box Options and Part Numbers**

	DB-25 Male	DB-25 Female
DTE Quad	7600030	7600026
DCE Quad	7600028	7600024
DTE Octa	7600031	7600027
DCE Octa	7600029	7600025

DB-9 Connectors

PC/4e, PC/8e, MC/4e and MC/8e boards can be configured with male or female DB-9 connectors (DTE wiring only). PC/2e and MC/2e boards are available only with male DB-9 connectors.

DB-9 connectors are available only in the "fan-out" cable configuration (see Figure 17, on page 35).

Table 7 DB-9 Quad and Octa Cable Options and Part Numbers

	DB-9 Male	DB-9 Female
DTE Quad	7600003	7600001
DTE Octa	7600015	7600013

Table 8 DB-9 Connector Pin Assignments

Signal	Description	Direction	Pin #
GND	Chassis Ground	N/A	Shell
DCD	Data Carrier Detect	Input	1
RxD	Received Data	Input	2
TxD	Transmitted Data	Output	3
DTR	Data Terminal Ready	Output	4
SG	Signal Ground	*reference*	5
DSR	Data Set Ready	Input	6
RTS	Request to Send	Output	7
CTS	Clear to Send	Input	8
RI	Ring Indicator	Input	9

RJ-45 Connectors

Figure 19 **Eight-Port RJ-45 Connector Box**

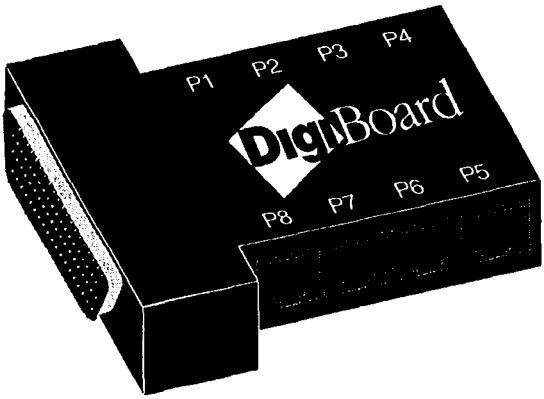


Table 9 **RJ-45 Connector Box Options**

	Quad	Octa
RJ-45	76000038	76000033

PC/4e, PC/8e, MC/4e and MC/8e boards can be configured with 10-pin RJ-45 modular jacks. These accept plastic snap-in plugs like the ones used for connecting telephones. They are less bulky and more convenient to use than the DB-25, but have not undergone the standardization rigors that have been applied to the larger DB-25 connectors. Figure 19 shows the eight-port RJ-45 connector block, and Table 9 gives the associated part numbers.

There are four types of modular plugs that can be used with DigiBoard's RJ-45 10-pin jack. These are the 4 or 6-pin RJ-11 plugs, and the 8 or 10-pin RJ-45 plugs.

The 8 and 10-pin RJ-45 plugs are the same physical size, but the 10-pin version has one additional wire at each end of the row of contacts. Thus pins 1-8 of an 8-pin RJ-45 directly correspond to pins 2-9 of a 10-pin RJ-45 connector.

Similarly, the two RJ-11 plugs have the same physical dimensions, but the 6-pin version has an extra pin at each end. The RJ-11 plugs are physically smaller than RJ-45 plugs, but are designed so that they fit into the *center* of an RJ-45 jack. In this way, the four pins closest to the center of any size connector will always carry the same signals as the middle four pins of any other connector. The contacts of a 6-pin RJ-11 connector correspond directly to the middle six pins of an 8 or 10-pin RJ-45 connector, and so on.

RJ-45 to DB-25 Conversion

Figure 20 **RJ-45 to DB-25 "Cable Leg"**



Pin	*Signal*
Shell	Chassis Ground
2	TxD
3	RxD
4	RTS
5	CTS
6	DSR
7	Signal Ground
8	DCD
20	DTR
22	RI

Pin	*Signal*
1	RI
2	DSR
3	RTS
4	Chassis Ground
5	TxD
6	RxD
7	Signal Ground
8	CTS
9	DTR
10	DCD

Table 10 **Cable Leg Options and Part Numbers**

	DB-25 Male	DB-25 Female	DB-9 Male
24 Inch Cables	6102024	6103024	6107024
48 Inch Cables	6102048	6103048	N/A

Since most RS-232 devices are equipped with DB-25 connectors, it is necessary to buy or build an adapter to transfer the signals to a DB-25 plug. The most simple and direct approach is to purchase ready-made "Cable Legs" from a DigiBoard dealer or distributor. These are made with a full 10-pin RJ-45 plug (which can be difficult to obtain in the retail market), connected via a two or four foot cable to a DTE-configured DB-25 plug.

The pin configuration of the DB-25 connector on the Cable Leg is identical to that of the DB-25 connectors on the standard DigiBoard DTE octa cable, and provides full modem control.

If you don't need full modem control, you can use one of the many commercially available RJ-45 to DB-25 adapters. These have both an 8-pin RJ-45 jack and a DB-25 plug in a housing no larger than that found on a standard DB-25 plug. The plug and jack are connected within the housing by jumpers which may be installed by the user in any desired configuration.

Specifications

PC/2e

- **Power Requirements**

+5 Volts ±5%	1.00 Amps typical
+12 Volts ±5%	0.040 Amps typical
-12 Volts ±5%	0.040 Amps typical

- **Board Dimensions**

Length:	9.8 inches (overall)
Width:	0.5 inches
Height:	4.2 inches
Weight:	6.25 ounces

- **Operating Environment**

Ambient temperature:	10° C to 55° C
Relative humidity:	5% to 90%
Air movement:	30 CFM forced
Altitude:	0 to 12,000 feet

- **Serial Interface Surge Suppression**

Threshold Voltage	13 Volts
Response Time	Less that 10 nS

MC/2e

- **Power Requirements**

+5 Volts ±5%	1.3 Amps, max.
+12 Volts ±5%	.039 Amps, max.
-12 Volts ±5%	.039 Amps, max.

- **Board Dimensions**

Length:	12.5 inches (overall)
Width:	0.75 inches
Height:	3.5 inches
Weight:	6.20 ounces

- **Operating Environment**

Ambient temperature:	10° C to 55° C
Relative humidity:	5% to 90%
Air movement:	30 CFM forced
Altitude:	0 to 12,000 feet

- **Serial Interface Surge Suppression**

Threshold Voltage	13 Volts
Response Time	Less that 10 nS

PC/4e

- **Power requirements**

+5 VDC ±5%:	1.8 Amps max.
+12 VDC ±5%:	130 mA max.
-12 VDC ±5%:	110 mA max.

- **Board dimensions**

Length:	8.25 inches
Width:	0.5 inches
Height:	4.2 inches
Weight:	6.25 ounces

- **Operating environment**

Ambient temperature:	10° C to 55° C
Relative humidity:	5% to 90%
Air movement:	30 CFM forced
Altitude:	0 to 12,000 feet

- **Serial Interface Surge Suppression (Optional)**

Threshold Voltage	13 Volts
Response Time	Less that 10 nS

MC/4e

- **Power requirements**

+5 VDC ±5%:	1.5 Amps max.
+12 VDC ±5%:	81 mA max.
-12 VDC ±5%:	89 mA max.

- **Board dimensions**

Length:	12.5 inches
Width:	0.75 inches
Height:	3.5 inches
Weight:	7.1 ounces

- **Operating environment**

Ambient temperature:	10° C to 55° C
Relative humidity:	5% to 90%
Air movement:	30 CFM forced
Altitude:	0 to 12,000 feet

- **Serial Interface Surge Suppression (Optional)**

Threshold Voltage	13 Volts
Response Time	Less that 10 nS

PC/8e

- **Power requirements**

+5 VDC ±5%:	1.8 Amps max.
+12 VDC ±5%:	130 mA max.
-12 VDC ±5%:	110 mA max.

- **Board dimensions**

Length:	8.25 inches
Width:	0.5 inches
Height:	4.2 inches
Weight:	6.25 ounces

- **Operating environment**

Ambient temperature:	10° C to 55° C
Relative humidity:	5% to 90%
Air movement:	30 CFM forced
Altitude:	0 to 12,000 feet

- **Serial Interface Surge Suppression (Optional)**

Threshold Voltage	13 Volts
Response Time	Less that 10 nS

MC/8e

- **Power requirements**

+5 VDC ±5%:	1.5 Amps max.
+12 VDC ±5%:	81 mA max.
-12 VDC ±5%:	89 mA max.

- **Board dimensions**

Length:	12.5 inches
Width:	0.75 inches
Height:	3.5 inches
Weight:	7.1 ounces

- **Operating environment**

Ambient temperature:	10° C to 55° C
Relative humidity:	5% to 90%
Air movement:	30 CFM forced
Altitude:	0 to 12,000 feet

- **Serial Interface Surge Suppression (Optional)**

Threshold Voltage	13 Volts
Response Time	Less that 10 nS

Index

Adapter Description Files, 15, 18
ADF files, 15, 18
ALTPIN, 26
Cable configuration
    RS-232 peripherals, 25, 29, 30, 31, 32
Cable leg
    RJ-45 to DB-25, 40
        Part numbers, 40
Cable legs, 25
Cables
    Capacitance, 33
    Environment, 33
    Grounding, 33
    RS-232, 33
Connector Box
    DB-25
        Part numbers, 36
Connector box
    DB-25, 36
Connector options, 34-41
    DB-25, 34-36
    DB-9, 37
    RJ-45
        Part numbers, 38
Connectors
    RJ-11
        4 pin, 39
        6 pin, 39
    RJ-45
        10 pin, 39
        8 pin, 39
Converting RJ-45 to DB-25, 40
DB-25, 34-36
DB-25 connectors, 29, 30, 34-36
Diagnostics, 3, 6
DIP switches
    PC/Xe, 11
DTE connections, 27
EMM386, 21
Expanded memory managers, 21
Flow control, 29, 30, 31, 32
    DTR, 30, 32
    Hardware, 30, 32
    Ready/Busy, 30, 32
    Software, 29, 31
Handshaking, 29, 30, 31, 32
    DTR, 30, 32
    Hardware, 30, 32
    Ready/Busy, 30, 32
    Software, 29, 31
I/O port address, 20
    MC/Xe, 19
    PC/Xe, 10
Installation tips, 3
Interrupt request line
    MC/Xe, 19, 22
    PC/Xe, 14
IRQ
    MC/Xe, 19, 22
    PC/Xe, 14
Jumper settings, 7
Memory
    Starting address
        MC/Xe, 19
Memory map utility, 3, 5
Memory window
    Size
        MC/Xe, 20
        PC/Xe, 12
    Starting address
        MC/Xe, 20
        PC/Xe, 12
Modems, 23, 25
Modular plugs, 39
Null modem, 27

Octa cable
DB-25, 35
Part numbers, 35
DB-9, 37
Part numbers, 37
Pin assignments
DB-25, 34
DB-9, 37
QEMM, 21
Quad cable
DB-25, 35
Part numbers, 35
DB-9, 37
Part numbers, 37
Reference diskette, 15, 18
RJ-11 plugs, 39
RJ-45 connectors, 25, 26, 31, 32
RJ-45 plugs, 39
Software installation
ISA version, 10
MC/2e, 20
Micro Channel version, 20
PC/Xe, 10
Specifications, 42, 43
Board dimensions, 42, 43, 44, 45, 46, 47
Operating Environment, 42, 43, 44, 45, 46, 47
Power requirements, 42, 43, 44, 45, 46, 47
XON/XOFF, 29, 31

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