FCC ID: AO9-DE212

FCC NOTICE: This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

Any changes or modifications made to this equipment may void the user's authority to operate this equipment.

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to 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 to correct the interference by one or more of the following measures:

– Re-orient or relocate the receiving antenna

– Increase the separation between the equipment and 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

The use of unshielded Ethernet cable on BNC ports with this equipment is prohibited due to non-compliance with FCC regulations for a Class B computing device pursuant to Part 15 of FCC Rules.

BENUTZERHINWEIS: Das DEC EtherWORKS MC/TP_BNC-Modul in Verbindung mit IBM PS/2 Personalcomputersystemem entsprechen den Funkentstöranforderungen der DBP-Verfugung 523/69 und VDE0871 Grenzwertklasse B.

This document was prepared using VAX DOCUMENT, Version 2.0.

DEC EtherWORKS
MC/TP_BNC

Owner's Manual

Order Number: EK-DE212-OM. B01

Digital Equipment Corporation
maynard, massachusetts

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Preface

The 10BaseT[1] DEC EtherWORKS *MC/TP_BNC* board is a communications option for PS/2 personal computers that have a Micro Channel bus. The adapter board interfaces the computer to either a ThinWire (BNC) Ethernet network or to a Twisted-Pair (telephone jack) Ethernet network.

This manual describes how to install and configure the board. The installation diskette has an automatic configuration feature you use with the installation process.

Using this manual, you should be able to prepare a PS/2 personal computer and an *MC/TP_BNC* board for use on a Digital network. This manual describes how to change the board configuration for use with either a ThinWire or Twisted-Pair Ethernet network. To install the board, you need to understand the basic concepts and uses of Ethernet networks, and be familiar with personal computers.

For more information about the PS/2 personal computer, see the technical reference manual or similar documentation for your system.

This manual is organized as follows:

- Chapter 1 explains how to install and configure the board.
- Chapter 2 contains problem solving information.
- Appendix A provides the hardware and software specifications.
- Appendix B provides a ROM installation procedure.
- Appendix C provides cable requirements.

[1] 10BaseT IEEE standard interface.

This document uses the following conventions:

Convention	Meaning
Caution	Provides information to prevent damage to equipment.
Note	Provides general information.
PN	Part number.
❶	A number in a black circle in text refers to the corresponding number in an accompanying illustration.

Product Kit Contents

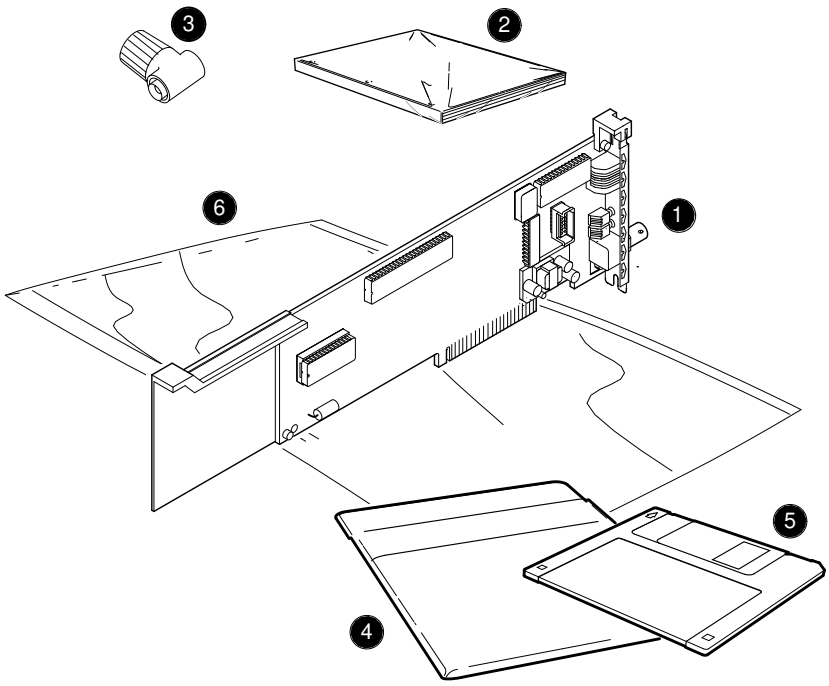
Before you install the DEC EtherWORKS *MC/TP_BNC* board, be sure you have the following components, shown in Figure 1.

- DEC EtherWORKS *MC/TP_BNC* board ❶, packaged in an anti-static bag ❻
- *DEC EtherWORKS MC/TP_BNC Owner's Manual* ❷
- T-Connector ❸
- Installation diskette (5¼ inch) ❹
- Installation micro-diskette (3½ inch) ❺

Note

If your board does not have a ROM ❼ in the location shown in Figure 1, refer to Appendix B.

Figure 1 Product Kit (Digital PN DE212-AB)



Caution

Static electricity can damage printed circuit boards and chips. It is strongly recommended that a grounded wrist strap and grounded work-surface-to-earth ground be used when handling these components.

1

Installing and Configuring

1.1 Introduction

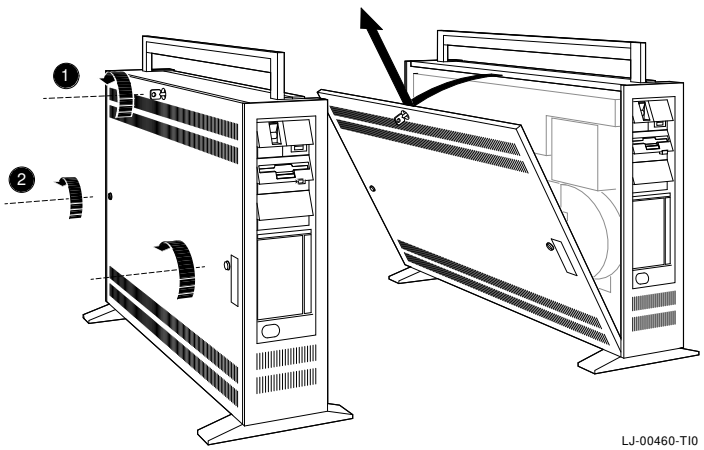
This chapter describes how to install and configure the *MC/TP_BNC* board in your personal computer. Before you begin, make a copy of the diskette that you need to use from the product kit.

1.2 Preparing Your PS/2 System

Prepare your PS/2 system before installing the board and other network integration kit components (Figure 1–1). For personal computers other than the ones shown in this manual, you can use the same procedure with only minor modifications.

1. Remove any diskette(s) from the diskette drive(s).
2. Set all power switches to 0 (off).
3. Unplug the power cord from the wall socket, then remove all cables from the rear of the system unit.
4. If the cover is locked, use the key ❶ to unlock it.
5. Loosen the two large screws ❷ from the side of the system unit.
6. Pull the cover away from the system unit and lift it out of the grooves on the pedestal.

Figure 1–1 Removing the System Unit Cover



1.3 Selecting the Network Interface

The board has a *shunt connector* ❶ (Figure 1–2) that lets you determine how the PS/2 computer interfaces with the network—either a ThinWire or Twisted-Pair network. The connector, J2, has a 3-row jumper arrangement. The connector should be preselected for ThinWire Ethernet networks.

You may need to move the shunt connector before you install it in a PS/2 computer. Table 1–1 summarizes the settings and Figure 1–2 shows the settings.

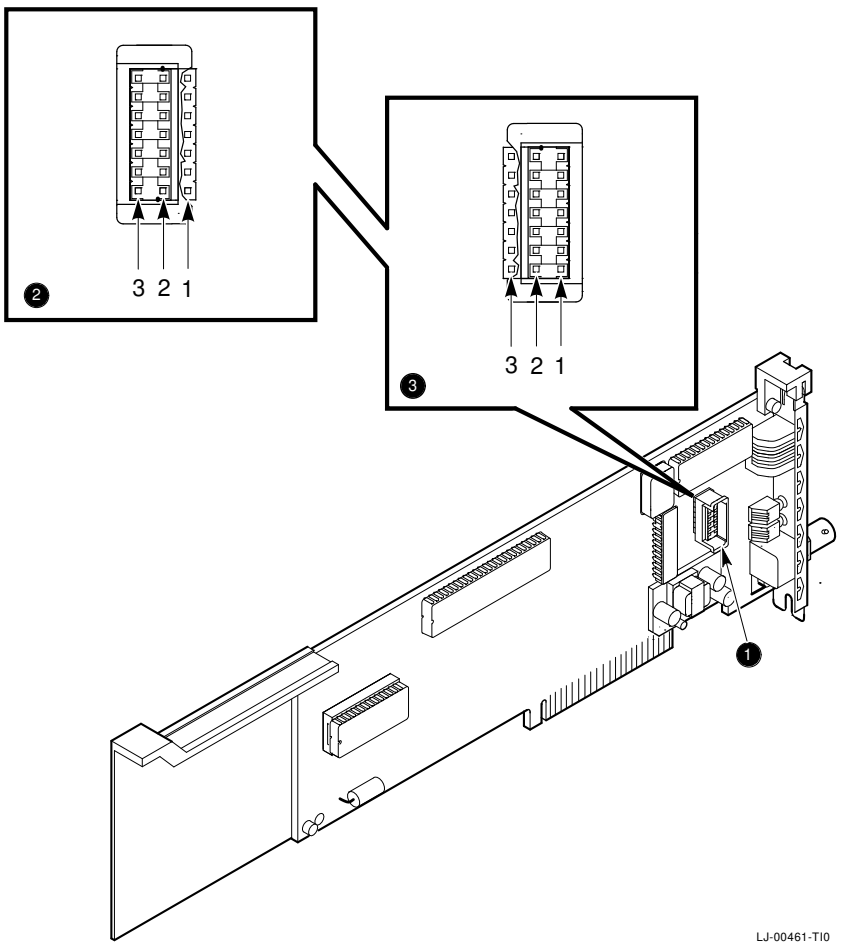
Table 1–1 Shunt Connector Settings

If You Want To...	Then...
Connect to a ThinWire Ethernet network ❷	Leave the shunt connector in the position furthest from the adapter holder, thus connecting pin columns 2 and 3. (*default setting*)
Connect to a Twisted-Pair Ethernet network ❸	Move the shunt connector towards the adapter holder, thus connecting pin columns 1 and 2.

Caution

Static electricity can damage printed circuit boards and chips. It is strongly recommended that a grounded wrist strap and grounded work-surface-to-earth ground be used when handling these components.

Figure 1–2 Selecting the Network Interface



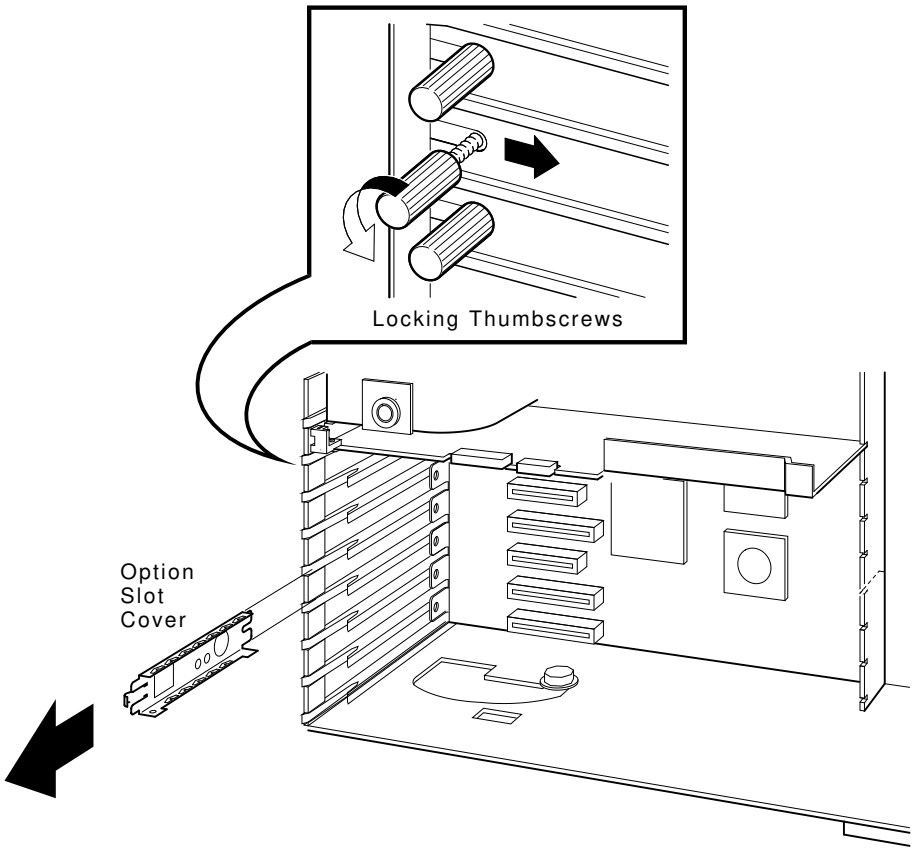
1.4 Installing the *MC/TP_BNC* Board

Use the next procedure to install the board.

1. Prepare you PC as described in Section 1.2.
2. Remove the cover from the option slot you plan to use by loosening the thumbscrew from an available slot (Figure 1–3) and then sliding cover out.
3. Place the board in the option slot.

   Tip the board inward and toward the rear of the system unit at the same time. This allows the connector on the mounting bracket to clear the opening in the rear of the system unit.

Figure 1–3 Removing the Option Slot Cover



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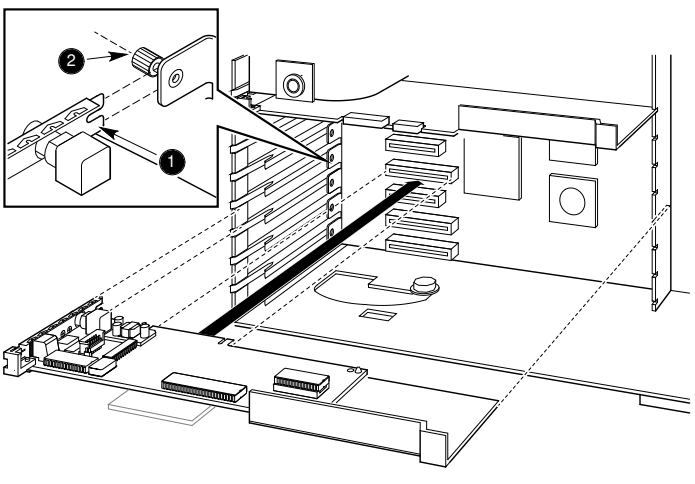
4. *Firmly* press the board into place until it is *securely* seated and the tabs ❶ (Figure 1–4) align behind the thumbscrew.
5. Tighten the thumbscrew ❷ (Figure 1–4) while holding the option slot in place.

Caution

For safe system operation, be sure there are no open slots remaining when you complete the installation.

Figure 1–4 Installing the DEC EtherWORKS *MC/TP_BNC* Board



6. Replace the system unit cover.

   Align the tabs at the bottom of the cover with the slots in the pedestal ❶ (Figure 1–5). Push the cover into place and tighten the two screws.

7. Reconnect all cables and connectors.

   a. Plug the keyboard connector into the rear of the system unit.

   b. Connect the keyboard and monitor cables and any option cables to the rear of the system unit.

   c. Connect the power cord to the rear of the system unit then plug the other end into the wall outlet.

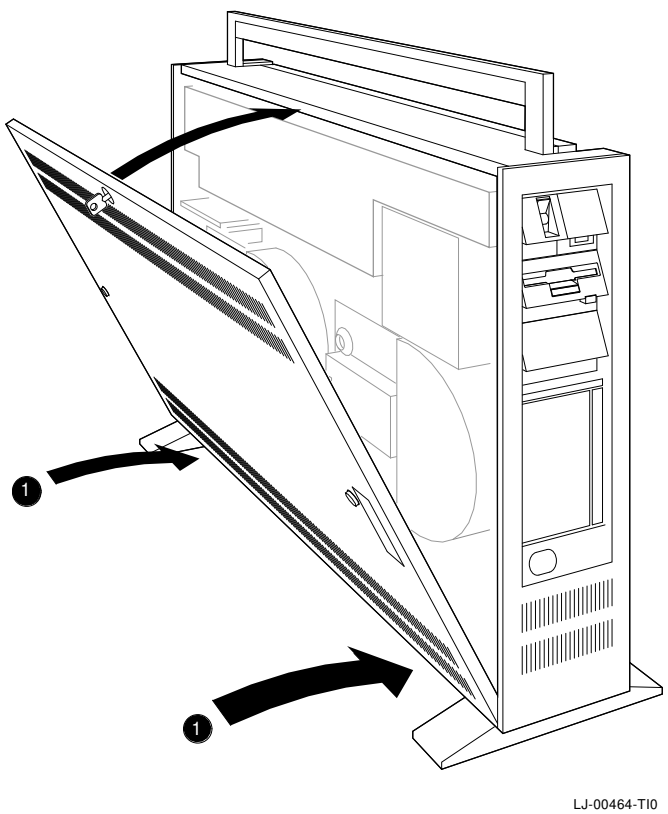
8. Turn power to the monitor and the system on.

If the board passes the startup test, then the board has already been configured and the computer continues the normal startup process. If the board has **not** been configured, the system displays the size of memory in kilobytes and the number 165 in the upper-left corner of the screen.

```
xxxx KB
165
```

If your system displays this information, continue with Section 1.5 to configure your PS/2 computer for the board. If the number 165 does not appear, go to Section 1.6.

Figure 1–5 Replacing the Screws and Cover



1.5 Configuring the *MC/TP_BNC* Board

Before using the board, you must configure it for use with your PS/2 computer. This is done using the adapter description file (ADF) that is on the installation diskette shipped with the package.

The ADF provides default settings for the following board features. These features can be modified, the first three of which are set by the automatic configuration software.

Interrupt line
Memory address
I/O Address
Remote boot enable
Remote boot timeout count

1.5.1 Configuring Board Settings

After you install the board, configure it using the following procedure:

1. Turn off the system power.
2. Insert the backup version of the PS/2 system reference diskette into drive A.
3. Turn on the system power. In the upper-left corner of the screen different memory amounts flash in sequence.
4. At the prompt to run Auto Configuration, enter no.
5. Select the following options from the menu:
   a. Copy Diskette
   b. Set Configuration
   c. Run Automatic Configuration

      If the Automatic Configuration detects a conflict with another board in your computer, select the Change Configuration menu option, then perform a manual configuration.

6. Restart the system by simultaneously pressing Ctrl Alt Del.

Note

If an error code, such as DE212 89, displays on the screen during the restart process, a self-test error has occurred. Refer to Section 2.2.

1.6 Connecting to a Network

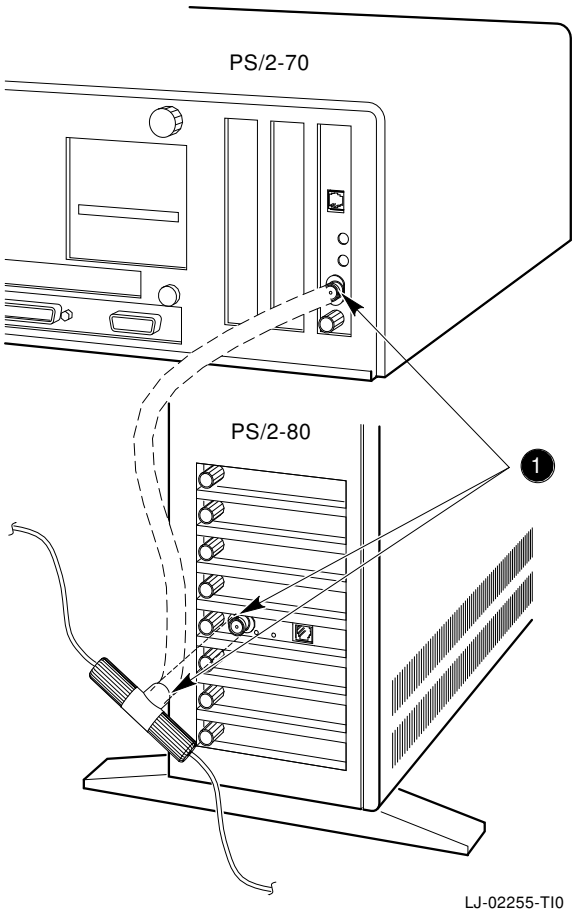
Depending on how you configured the board in Section 1.3, use one of the following procedures to connect your system to the network.

1.6.1 Connecting to ThinWire Ethernet

To connect to ThinWire Ethernet, connect the ThinWire connector to the ThinWire Ethernet socket on the board ❶ (Figure 1–6).

See your system administrator for more information if needed.

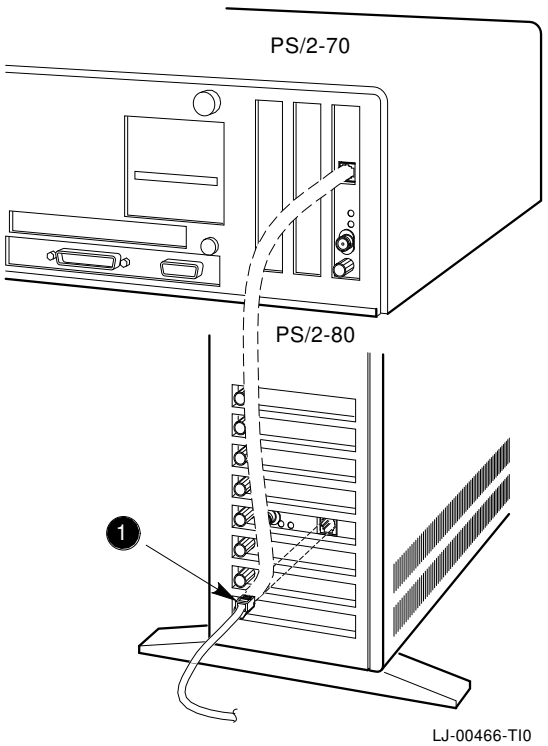
Figure 1–6 Connecting To a ThinWire Ethernet Network



1.6.2 Connecting to Twisted-Pair Ethernet

To connect to Twisted-Pair Ethernet, connect the transceiver cable ❶ to the Twisted-Pair Ethernet connector (Figure 1–7).

Figure 1–7 Connecting to a Twisted-Pair Ethernet Network



1.7 Installing the Software

Read the files named "README.TXT" and "RELEASE.NOT" on the installation diskette. These files contain the instructions for loading the software drivers, problems found, and how to configure your system.

2
Problem Solving

2.1 Introduction

This chapter describes possible problems you may encounter with the DEC EtherWORKS *MC/TP_BNC* board. Possible causes and solutions are provided in the tables.

2.2 Fault Isolation By Symptom

Table 2–1 describes how to isolate faults by the symptoms that are occurring.

Table 2–1 Fault Isolation By Symptom

Symptom	Possible Cause	Recommended Action
The system is on, but there is no display.	The monitor is not on or is not connected to the video board.	Ensure that the monitor cable is firmly connected to the video board. Set the monitor power switch to on.
	The board is not seated firmly.	Remove and re-insert the board **firmly** in the computer. (Section 1.4.)
	The board is preventing the computer from operating correctly.	Disconnect the transceiver cable or the Twisted-Pair connector from the socket on the board. Turn the computer off then on again. If the problem persists, contact your system administrator or authorized service representative.
The system does not boot from the diskette.	The system diskette may be corrupted.	See your system administrator for a bootable system diskette.
The system does not remote boot.	Remote Boot Disable is set.	Set Remote Boot Enable using the System Configuration utility. If the problem persists, contact your system administrator.

(continued on next page)

Table 2–1 (Cont.) Fault Isolation By Symptom

Symptom	Possible Cause	Recommended Action
The system is on, but the network does not start.	The Network interface or remote boot is set incorrectly.	Check the setting of the shunt connector.
	Network cables are loose.	Check and secure all cables.
	A conflict exists with another option in the system.	Run the System Configuration utility to check for any conflict. See your system administrator for more information if needed.
The system is on and the screen displays a self-test code during system startup.	A possible problem exists with the *MC/TP_BNC* board.	Refer to Table 2–2 for the error codes.
The system is on, but the Green LED is not on.	Possible missing link integrity pulse on the 10BaseT line.	Check the cabling, cable polarity, and the equipment (for example, DETPR) on the other end of the cable for correct operation.

2.3 LED Activity

There are two light emitting diodes (LEDs) on the *MC/TP_BNC* board mounting bracket that display the operating status of the board. The amber LED stays on to indicate a failure during the power-up self-test. The green LED blinks, indicating network activity. The following table describes the different states of the LEDs.

LED Activity	Cause	User Action
The amber LED[1] stays on for 20 seconds, then goes off.	Normal during self-test.	None.
The amber LED stays on after 20 seconds.	A fault has occurred; an error number displays on the screen.	See Table 2–2, self-test error codes.
The green LED is blinking.	Normal; indicates that the data link is correct and that data on the RCV DATA line is being received..	None.
The green LED is off.	There is no receive data packet activity.	If a problem exists receiving data, see Table 2–1 for other symptoms and recommended action.

[1]The amber LED is internal to the board

2.4 Recovering From Self-Test Errors

Self-test errors can occur at system startup. Table 2–2 lists the *MC /TP_BNC* board self-test codes, their description, and recommended action. If a problem persists, call your Digital authorized service representative.

Note

When the board detects an error and is not operating, you can still use your personal computer.

Table 2–2 Self-Test Error Codes

Code	Description	Recommended Action
80	Memory access conflict	Run the System Configuration utility to check for any memory address conflicts.
81	Data path error	Run the System Configuration utility to check for any memory address conflicts.
82	Address test conflict	Run the System Configuration utility to check for any memory address conflicts.
83	RAM tests conflict	Run the System Configuration utility to check for any memory address conflicts.
84	Ethernet ROM CRC error	Run the System Configuration utility to check for any I/O address conflicts.
85	NI_CSR Error	Call your Digital authorized service representative.

(continued on next page)

Table 2–2 (Cont.) Self-Test Error Codes

Code	Description	Recommended Action
86	LANCE I/O address conflict	Run the System Configuration utility to check for any conflicts.
87	LANCE Initialization error	Call your Digital authorized service representative.
88	LANCE Interrupt request (IRQ) conflict	Run the System Configuration utility to check for any interrupt conflicts.
89	NI_CSR Mask test error	Call your Digital authorized service representative.
8A	LANCE Internal loopback error	Call your Digital authorized service representative.
8B	LANCE Collision error	Call your Digital authorized service representative.
8C	LANCE CRC Error	Call your Digital authorized service representative.
8D	Swap RAM error	Call your Digital authorized service representative.
8E	Shadow RAM enable error	Call your Digital authorized service representative.
8F	Configuration error	Run the System Configuration utility to check for any conflicts. Also, check the parameter setting for your network to make sure it matches the configuration on the board.
90	POS Register verification	Call your Digital authorized service representative.

A

General Information

A.1 Introduction

The *MC/TP_BNC* board lets you integrate PS/2 computers that have the Micro Channel bus architecture into a network. After you install a board, you can use network software products to integrate the computer into a network.

The board can be connected to either a ThinWire Ethernet network or a Twisted-Pair Ethernet network. You cannot, however, connect the board to both kinds of networks at the same time.

A.1.1 Physical Description

The board is a three-quarter length, IBM PS/2 system form factor printed circuit board that uses a 16-bit bus connector.

A.1.2 Functional Components

The major functional blocks on the board are as follows:

- Ethernet network protocol controller (LANCE)
- Twisted-Pair (modular jack) network interface
- Ethernet (BNC connector) network interface
- Network buffer RAM (64 KB)
- Diagnostics and remote-boot ROM (16 KB)
- Ethernet hardware address ROM
- Programmable option select circuitry

A.1.3 Specifications

Table A–1 lists the system specifications.

Table A–1 System Specifications

Interrupt Vector Assignments	Available Selections
Interrupt request (IRQ) line	IRQ5, IRQ9, IRQ10, IRQ11

Remote Boot Selection	Available Selections
Remote boot	Enabled; disabled
Remote boot timeout	30 seconds; 2.5 minutes

(continued on next page)

Table A–1 (Cont.) System Specifications

I/O Address Assignments	Available Selections
I/O	2C00—2C0F
	2C10—2C1F
	2C20—2C2F
	2C30—2C3F

Memory Buffer Size	Available Selections
64 KB	C0000—CFFFF
	D0000—DFFFF
	E0000—EFFFF[1]
32 KB	C8000—CFFFF
	D8000—DFFFF
	E8000—EFFFF[1]
16 KB	C0000 — C3FFF
	C1000 — C4FFF
	C2000 — C5FFF
	C3000 — C6FFF
	C4000 — C7FFF
	C5000 — C8FFF
	C6000 — C9FFF
	C7000 — CAFFF
	C8000 — CBFFF
	C9000 — CCFFF
	CA000 — CDFFF
	CB000 — CEFFF

[1]E0000 range is not available on IBM PS/2 systems.

(continued on next page)

Table A–1 (Cont.) System Specifications

Memory Buffer Size	Available Selections
	CC000 — CFFFF
	D0000 — D3FFF
	D1000 — D4FFF
	D2000 — D5FFF
	D3000 — D6FFF
	D4000 — D7FFF
	D5000 — D8FFF
	D6000 — D9FFF
	D7000 — DAFFF
	D8000 — DBFFF
	D9000 — DCFFF
	DA000 — DDFFF
	DB000 — DEFFF
	DC000 — DFFFF
	E0000 — E3FFF
	E1000 — E4FFF
	E2000 — E5FFF
	E3000 — E6FFF
	E4000 — E7FFF
	E5000 — E8FFF
	E6000 — E9FFF
	E7000 — EAFFF
	E8000 — EBFFF

(continued on next page)

Table A–1 (Cont.) System Specifications

Memory Buffer Size	Available Selections
	E9000 — ECFFF
	EA000 — EDFFF
	EB000 — EEFFF
	EC000 — EFFFF

Power Requirements Amps DC (maximum)	Wattage (maximum)
Twisted-Pair: @ +5V: 1.6 A	8
ThinWire: @ +12V: 0.34 A	12.1

Operating Environment	
Temperature (at sea level)	15° - 32° C 59° - 90° F
Relative humidity	8% to 80% (non-condensing)
Radiated emissions	FCC Class B

B

Installing an Option ROM

B.1 Introduction

The ROM chip is optional on the *MC/TP_BNC* board and is not required for correct operation. If you purchased the board from Digital (PN DE212-AB), then the option ROM is already installed.

Caution

Static electricity can damage printed circuit boards and chips. It is strongly recommended that a grounded wrist strap and grounded work-surface-to-earth ground be used when handling these components.

If your configuration requires that the ROM chip be installed, use the following procedure to install it.

B.2 ROM Installation Procedure

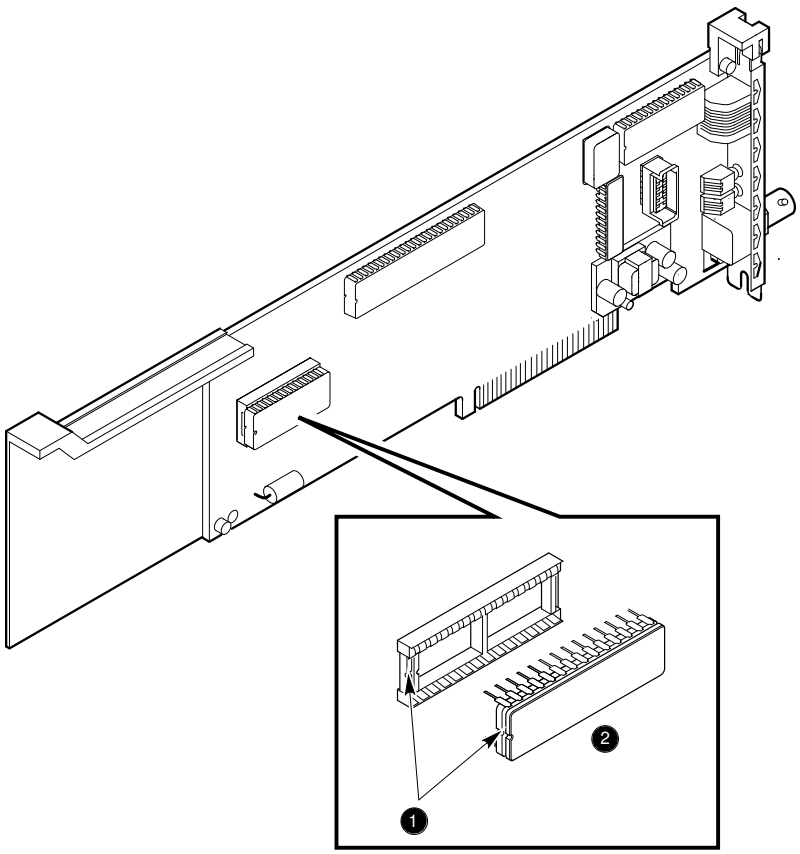
Refer to Figure B–1 when installing the ROM chip.

Caution

Incorrect insertion of the ROM chip can damage the board.

1. Note the location of the notch ❶ on the area surrounding the ROM socket.
2. Be sure that the notch on the ROM chip ❷ aligns with the notch on the socket.
3. Align the pins on the chip and press from side to side until the chip is fully seated.

Figure B–1 DEC EtherWORKS *MC BNC/TP* ROM Installation



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C
Cable Specifications

C.1 Cabling Requirements

Make sure you have a cable to connect the *MC/TP_BNC* board as planned. You need to consider the following types of cable connections:

- Twisted-Pair cable—such as PN BN24F, BN25G, or BN26K.
  - BN24F - Unshielded Twisted-Pair office cable with crossover (4-conductor, 2-twisted pair) to connect a DE212 to another DE212, or a DE212 to an office plate from a DECrepeater 350.
  - BN25G or BN26K - Point-to-point unshielded Twisted-Pair patch cable to connect a DE212 to an office plate from a DECrepeater 90T.
- ThinWire cable—such as PN BNE4G-02, and a ThinWire T-Connector such as H8223-00/CDA, and a ThinWire terminator such as H8225-00/CDA, to connect the DE212 to the office wall plate or to DECrepeater 90C.

For configuration planning, refer to the *DECconnect System Planning and Configuration Guide* (PN EK-DECSY-CG).

C.1.1 Unshielded Twisted-Pair Cable Requirements

The next two tables contain information about unshielded Twisted-Pair cable requirements and environmental constraints.

Table C–1 Unshielded Twisted-Pair Cable Requirements

Requirement	Description
Wire specification	22-24 gauge wire, solid copper
Cable supported	DECconnect Twisted-Pair data cable, AT&T Type C or D, IBM Type 3, or Northern Telecom 4-pair unshielded Twisted-Pair cable
Cable length	90 m (296 ft) typical maximum from wiring closet or satellite equipment room (SER) to office.
DC Resistance per conductor, maximum	.094 Ω/m (28.6Ω/1000 ft)
Impedence at 5 MHz	100Ω

Table C–2 Unshielded Cable Environmental Constraints

Constraint	Description
FCC Regulations (US only)	The use of unshielded Ethernet cables for the ThinWire BNC port connection to this equipment is prohibited due to noncompliance with FCC regulations for a class B computing device, pursuant to Part 15 of FCC Rules.

(continued on next page)

Table C–2 (Cont.) Unshielded Cable Environmental Constraints

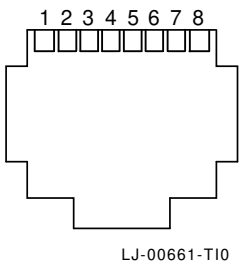
Constraint	Description
	This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions: 1. This device can not cause harmful interference. 2. This device must accept interference received, including interference that can cause undesired operation.
Signals	No other signals should be used in the same cable sheath; for example, voice and data cannot be run within the same sheath.
Noise	Unshielded Twisted-Pair cable must be at least .3 m (1 ft) from any type of high voltage power device or electrical noise source.

C.1.2 Card Connector Pinning (RJ45)

If you are using your board to connect 10BaseT Twisted-Pair networks, the connector has the pin signals as described in the following table and shown in Figure C–1.

Pin Number	Signal Name
1	Transmit +
2	Transmit -
3	Receive +
4	NC (no connection)
5	NC (no connection)
6	Receive -
7	NC (no connection)
8	Shielded Ground (Requires W1 installed)

Figure C–1 RJ45 Connector (Front View)



C.1.3 Twisted-Pair Ethernet Guidelines

To ensure the data integrity of the network, follow the structured wiring plan as documented in the *Open DECconnect Building Wiring Components and Applications Catalog* (PN EB-K2407-41). The following rules apply:

- No branches are allowed off a Twisted-Pair Ethernet segment.
- All wiring must be 100 ohm Twisted-Pair.
- Care must be taken to ensure correct pairing of wires. The medium for 10BaseT is Twisted-Pair wiring.
- The wiring must be of such quality to meet the standard requirements typical of 100 meter (24 Awg) unshielded Twisted-Pair.
- Care must be taken to avoid routing a cable near high level radiated energy, such as radio transmitters, or near high current switching equipment. Cables must also be separated from EMD sources such as power wiring, motors, generators, and light fixtures.

C.1.4 Specifications

The following minimum specifications must be observed:

- Insertion loss of a link must be less than 11.5 dB at the signal band frequency.
- The cross-talk between wire pairs must be less than 30 dB at the signal frequency.
- The noise level induced from the environment must be less than 200 mV peak.