FCC NOTICE: The equipment described in this manual has been certified to comply with the limits for a Class A computing device, pursuant to Subpart J of Part 15 of FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etcetera) certified to comply with the Class B limits may be attached to this computer. Operation with noncertified peripherals may result in interference to radio and television reception. This equipment generates and uses radio frequency energy and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio and television reception. It has been type tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause 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:

– Reorient the receiving antenna.

– Move the computer away from the receiver.

– Plug the computer into a different outlet so that computer and receiver are on different branch circuits.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: *How to Identify and Resolve Radio-TV Interference Problems*. This booklet is available from the US Government Printing Office, Washington, DC 20402, Stock No. 004–000–00398–5

The use of unshielded Ethernet cables for the AUI port connection to this equipment is prohibited due to noncompliance with FCC regulations for a class A computing device pursuant to Subpart J of Part 15 of FCC Rules.

This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

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

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DEC EtherWORKS™ *Turbo/TP_BNC* Ethernet Controller Owner's Manual

Order Number EK-DE202-OM.001

Digital Equipment Corporation

July 1991

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About This Manual

Overview

The DEC EtherWORKS *Turbo/TP_BNC* is a personal computer bus adapter board that lets you integrate various IBM/AT or compatible personal computers into a network using IEEE 10BaseT[1] twisted-pair network cabling or ThinWire Ethernet cabling.

The board can use twisted-pair telephone conductor lines (4-wire, full-duplex cables) for transmission of Ethernet signals. This method of transmitting Ethernet signals allows you to use standard building wiring served from a telephone/data wiring closet.

Manual Organization

This manual is organized as follows:

- Chapter 1 contains installation instructions.
- Chapter 2 contains information about board configuration.
- Chapter 3 contains problem solving information.
- Appendix A provides information about hardware and software features.
- Appendix B provides the ROM installation procedure.
- Appendix C provides cable specifications.
- Appendix D provides building wiring specifications.

[1] Designed to comply with the IEEE 802.3 10BaseT standard.

This manual shows you how to install and configure the DEC EtherWORKS *Turbo/TP_BNC* board. The installation diskette contains the software data link.

Using this manual, you should be able to prepare an IBM/AT or compatible personal computer and a DEC EtherWORKS *Turbo /TP_BNC* board for use on a network. This manual describes how to change the DEC EtherWORKS *Turbo/TP_BNC* board configuration for use with 10BaseT Twisted-Pair or ThinWire Ethernet networks.

This document uses the following conventions:

Convention	Meaning
CAUTION	Provides information to prevent damage to equipment
NOTE	Provides general information
PN	Part number
❶	Refers to the corresponding number in an illustration.

Before You Start

You do not have to know a lot about computers to install the *Turbo /TP_BNC* board; however, this manual assumes that you already understand the basic concepts and uses of Ethernet networks, and that you are familiar with personal computers. For more information on compatibility of the *Turbo/TP_BNC* board with your computer, see your system administrator.

Necessary Equipment

Before you start, you should have the appropriate transceiver cable.

Refer to Appendix C for information about on-site cable requirements and constraints.

Product Kit

Before you install the DEC EtherWORKS *Turbo/TP_BNC* board, be sure you have the following components, shown in Figure 1. The final product may vary slightly from the illustrations shown.

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

NOTE
If your DEC EtherWORKS *Turbo/TP_BNC* board does not have a ROM in location ❽ shown in Figure 1 , refer to Appendix B.

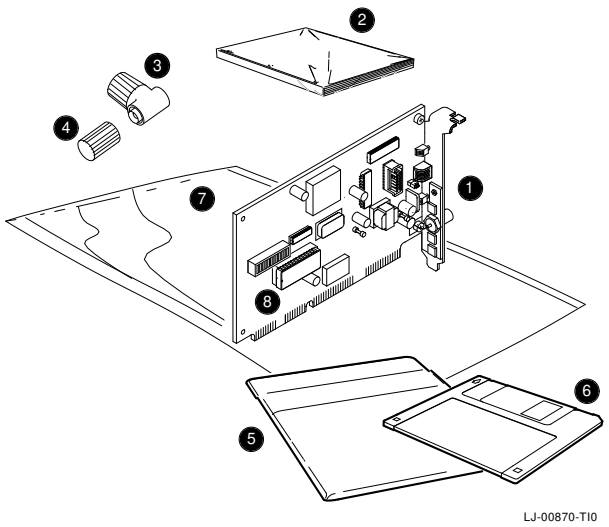


Figure 1 DEC EtherWORKS *Turbo/TP_BNC* Product Kit (PN DE202-AA)

1
Installing the DEC EtherWORKS *Turbo/TP_BNC* Board

1.1 Introduction

This chapter describes how to install the DEC EtherWORKS *Turbo/TP_BNC* board into an IBM/AT or compatible personal computer. The tools you need are a Phillips screwdriver and a small, flat-head screwdriver. Before you begin, make a copy of the diskette (Figure 1–1) you need from the DEC EtherWORKS *Turbo/TP_BNC* Product Kit.

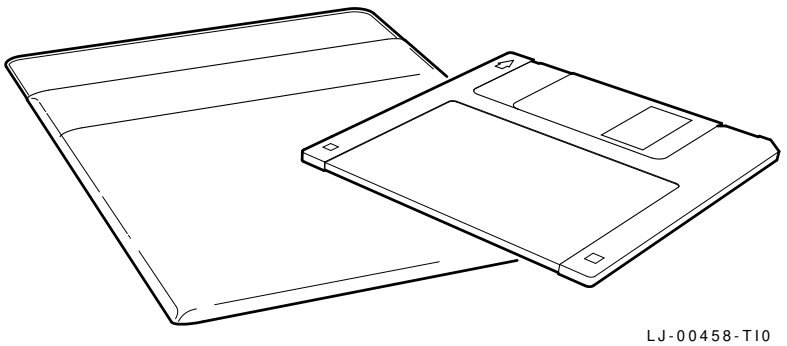


Figure 1–1 Product Kit Diskettes

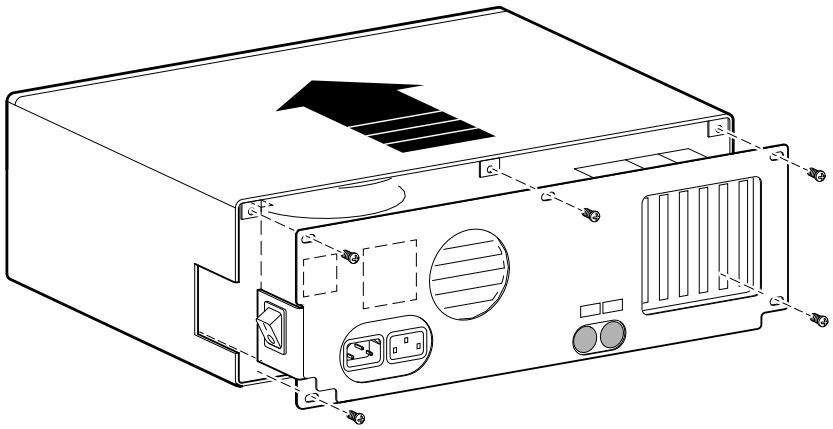
1.2 Preparing Your Computer System

Perform the following steps to prepare your IBM/PC/AT or compatible personal computer. The following illustrations show an IBM/AT personal computer. For other personal computers, you can use a similar procedure to install the DEC EtherWORKS *Turbo/TP_BNC* board.

1. Remove any diskette(s) from the diskette drive(s).
2. Set all power switches to O (off).
3. Unplug the keyboard connector from the rear of the system unit.
4. Disconnect any option cables and the monitor cable from the rear of the system unit.
5. Unplug the power cord from the wall socket, then disconnect the cord from the rear of the system unit.
6. Remove the screws from the rear of the system unit (Figure 1–2).
7. Slide the cover toward the front of the system unit until the cover is free.

NOTE

The DEC EtherWORKS *Turbo/TP_BNC* board has a switch pack that lets you set the operational parameters of the board. This switch pack is already set to correspond to most customers' needs (*default settings*). The settings may meet your computer's requirements. If they do not, you must change the settings on the DEC EtherWORKS *Turbo /TP_BNC* board (see Chapter 2).



LJ-00583-TI0

Figure 1–2 Removing the Screws and System Unit Cover

NOTE

If the board is set to use an interrupt request line, base memory address, or I/O address that another option module uses, your computer or other boards may not operate correctly when you start the system. To test the board with the default settings, you may need to remove other option modules from the computer.

1.3 Selecting the Network Interface

The DEC EtherWORKS *Turbo/TP_BNC* board has a *shunt connector* (❶ Figure 1–3) that lets you determine how the board interfaces with the network—either 10BaseT Twisted-Pair or ThinWire Ethernet networks. The board is shipped with the shunt connector set for use with ThinWIRE Ethernet network cabling.

You may need to move the shunt connector on the board before you install it in your computer.

Figure 1–3 shows the shunt connector settings and Table 1–1 summarizes the shunt connector settings.

Table 1–1 Decision Table for Moving the Shunt Connector

If you Want To ...	Then ...
Connect to a ThinWire Ethernet network ❷	Move the shunt connector so the arrows on the board point to the THINWIRE position (*default setting*).
Connect to a 10BaseT network ❸	Leave the shunt connector in the right side position. The arrows on the board should point to the TWISTED PR position.

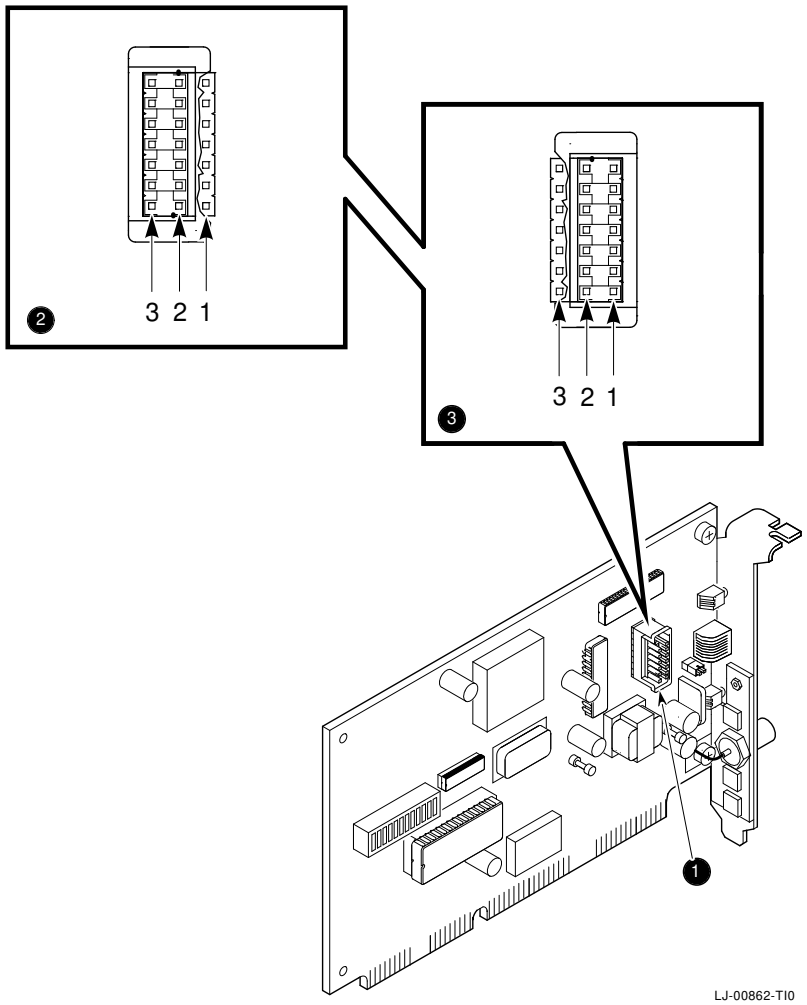
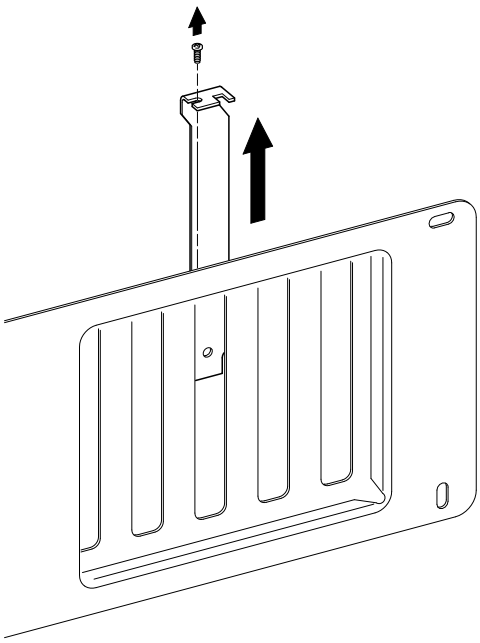


Figure 1–3 Network Interface Settings

1.4 Installing the DEC EtherWORKS *Turbo/TP_BNC* Board

Use the following steps to install the *Turbo/TP_BNC board*:

1. Remove the option slot cover from the slot you plan to use.
2. Remove the screw from an available option slot on the rear panel insert. Save the screw for later use.



LJ-00462-TI0

Figure 1–4 Removing the Slot Cover

3. Place the DEC EtherWORKS *Turbo/TP_BNC* board in the option slot. (Figure 1–5).
4. Firmly press the board into place until it is securely seated.
5. Replace the screw on the slot cover.

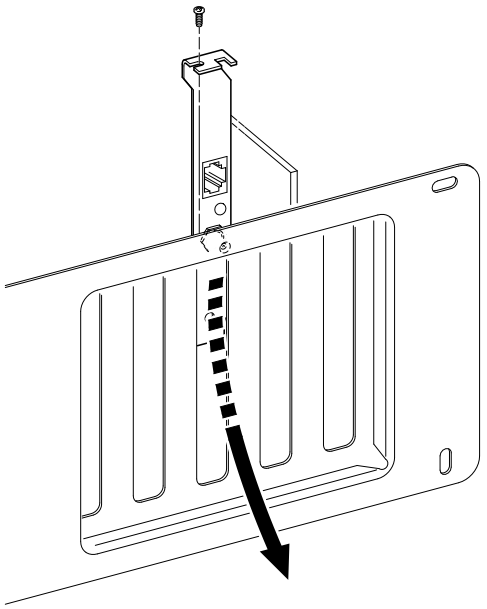


Figure 1–5 Installing the DEC EtherWORKS *Turbo/TP_BNC* Board

1.5 Replacing the System Unit Cover

Use the following steps to replace the system unit cover:

a. Slide the cover toward the rear of the system unit.

b. Replace the screws (Figure 1–6) at the rear of the system unit.

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

d. Connect any option cables and the monitor cable to the rear of the system unit.

e. Connect the power cord to the rear of the system unit, then plug the other end into the wall socket.

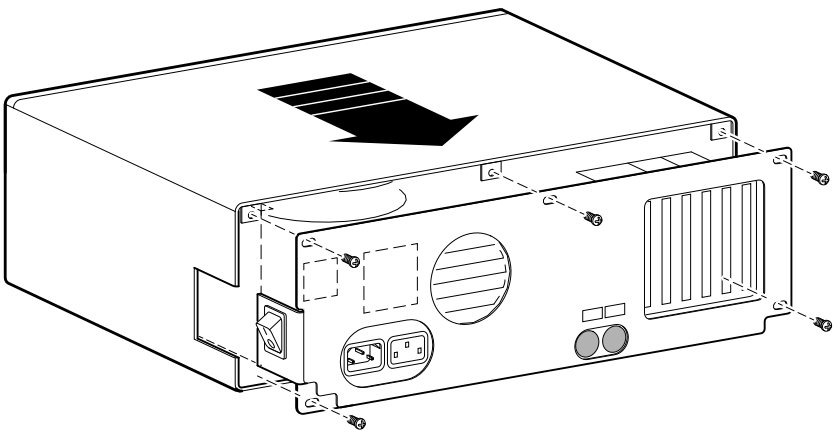


Figure 1–6 Replacing the Screws and the Cover

1.6 Running the Power Up Self-Test

A power up self-test automatically runs each time the computer is turned on or reset.

To run the self-test, turn power to your monitor and system unit on.

If an error code, such as DE202 88, displays on the screen during the restart process, a self-test error has occurred. Note the self-test code and refer to Section 3.3.

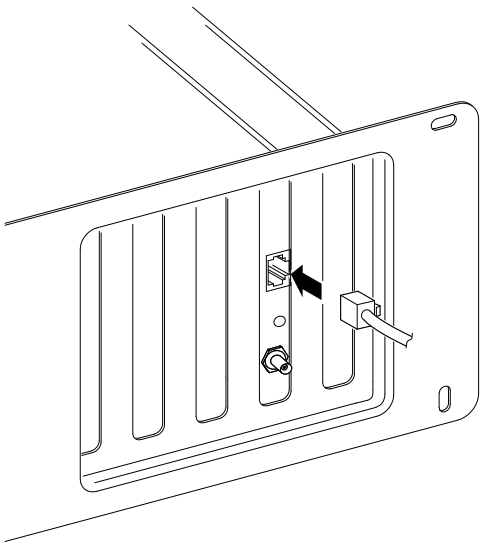
1.7 Connecting to a Network

Depending on how you configured the DEC EtherWORKS *Turbo /TP_BNC* board in Section 1.3, use one of the following procedures to connect your system to the network.

1.7.1 Connecting the DEC EtherWORKS *Turbo/TP_BNC* Board to 10BaseT Twisted-Pair Ethernet

Push the twisted-pair cable connector into the socket on the DEC EtherWORKS *Turbo/TP_BNC* board until it clicks, locking it into place (Figure 1–7).

See your system administrator for more information if needed.



LJ-00889-TI0

Figure 1–7 Connecting to a 10BaseT Twisted-Pair Ethernet

1.7.2 Connecting the DEC EtherWORKS *Turbo/TP_BNC* Board to ThinWire Ethernet

Connect the transceiver cable to the ThinWire Ethernet connector (Figure 1–8).

CAUTION
For safe operation, make sure all option slot covers are in place when you complete the installation.

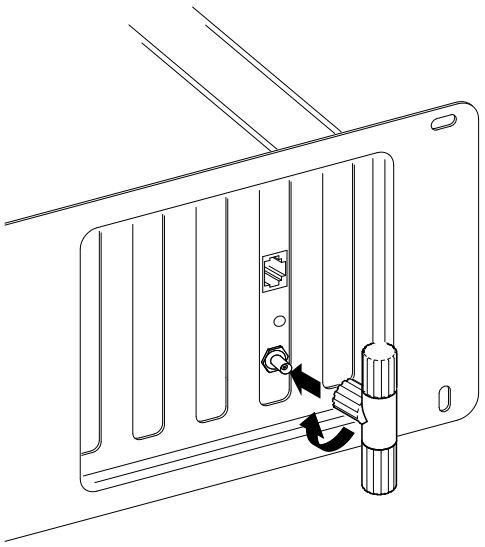


Figure 1–8 Connecting to a ThinWire Ethernet Network

1.8 Software Installation

Read the file named "README.TXT" on the installation diskette. This file contains the instructions for loading the DEC EtherWORKS *Turbo/TP_BNC* software drivers onto your system.

2
Configuring the DEC EtherWORKS *Turbo/TP_BNC* Board

2.1 Introduction

The DEC EtherWORKS *Turbo/TP_BNC* board switch pack has 12 switches that enable the board to operate in a configuration without interference from the other boards in your computer. This chapter describes how to change the settings on the switch pack.

If you have many options in your system, you may have to change the interrupt request (IRQ) line, the I/O address setting, or the memory address setting on the DEC EtherWORKS *Turbo/TP_BNC* board to create a compatible operating set.

2.2 Default Settings

The DEC EtherWORKS *Turbo/TP_BNC* board is shipped with the switches preselected (*default settings*) to work in most installations. Table 2–1 lists the default settings.

Table 2–1 Default Settings on the DEC EtherWORKS *Turbo/TP_BNC* Board

Switch	Position	Function	Meaning
SW1 SW2	ON OFF	Sets the memory address range.	Sets the memory address range to D0000 - DFFFF (hex).
SW3 SW4	ON ON	Selects the buffer memory size.	Enables 64 KB memory size.
SW5	ON	Sets the I/O address.	The I/O starting address is set to 300 (hex).
SW6	ON	Enables or disables the remote boot feature.[1]	Remote boot is disabled.
SW7	OFF	Sets the timeout period for the remote boot attempt. [1]	Sets a 30 second timeout period.
SW8	ON	Enable IRQ5	IRQ5 Enabled.
SW9	ON	Enable IRQ9	IRQ9 Disable.
SW10	ON	Enable IRQ10	IRQ10 Disabled.
SW11	ON	Enable IRQ11	IRQ11 Disabled.
SW12	ON	Enable IRQ25	IRQ15 Disabled.

[1]This feature requires a remote boot ROM chip; see Appendix B for more information.

The default settings are illustrated in Figure 2–1.

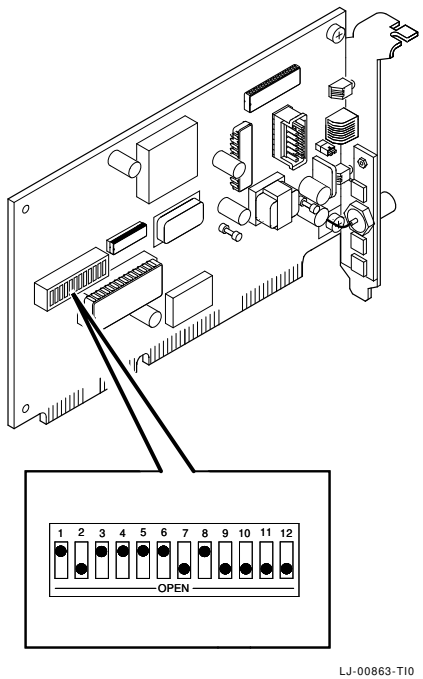


Figure 2–1 DEC EtherWORKS *Turbo/TP_BNC* Board Switch Pack

2.3 Check the Other Options

You can set only one adapter board in the computer to use a specific interrupt request line, I/O address, or memory address. If you do not know the settings for the other adapters:

- Ask your system administrator for a list of the settings.
- Check the adapter documentation for the possible settings.
- Inspect the adapter boards to determine the actual settings.

If a conflict exists, change the appropriate setting on the DEC EtherWORKS *Turbo/TP_BNC* board by refering to the following sections. The switches being described are highlighted in the illustrations.

2.4 Memory Addressing Range and Size Selection (SW1 - SW4)

Switches SW1 and SW2 select the memory addressing range. Switches SW3 and SW4 select the size of the system memory space the DEC EtherWORKS *Turbo/TP_BNC* board uses. Table 2–2 lists six possible memory addressing ranges and the switch settings to select them.

Table 2–2 Switch Settings and Memory Addressing Ranges

Buffer Size	SW1	SW2	SW3	SW4	Memory Addressing Range
64 Kbyte	On	On	On	On	C0000—CFFFF
	On	Off	On	On	D0000—DFFFF (*default setting*)
	Off	On	On	On	E0000—EFFFF[1]
32 Kbyte	On	On	Off	Off	C8000—CFFFF
	On	Off	Off	Off	D8000—DFFFF
	Off	On	Off	Off	E8000—EFFFF[1]

[1]Some PCs do not support the E0000 - EFFFF or E8000 - EFFFF address ranges. Check your PC manual for this information.

Only one adapter can be set to use a given memory addressing range. Check the documentation supplied with your personal computer and other adapters to determine memory address requirements. If the other adapters in your computer use memory addressing ranges that conflict with one of these ranges, select a range that is unused.

NOTE

Setting both switch SW1 and switch SW2 to the OFF position is an illegal configuration and may prevent your computer from working correctly.

The DEC EtherWORKS *Turbo/TP_BNC* board works best when the entire 64 Kbytes of network buffer memory is enabled for its operation. Some adapter boards and system configurations do not permit the allocation of this amount of memory. Network performance is slower when you select 32 Kbytes, but you can use the DEC EtherWORKS *Turbo/TP_BNC* board in configurations where address space is at a premium.

Example:

Figure 2–2 shows the settings for switches SW1 through SW4 that select a buffer size of 32 Kbytes in the C8000 - CFFFF (hex) system memory addressing range.

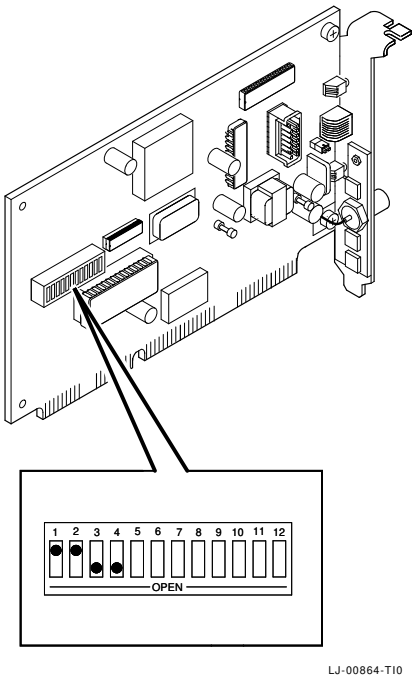


Figure 2–2 Setting Memory Range C8000-CFFFF for 32 Kbyte

2.5 I/O Address Selection (SW5)

The DEC EtherWORKS *Turbo/TP_BNC* board uses one of two I/O address ranges (primary or secondary) to communicate with the CPU. Only one adapter board in the computer can be set to use a given I/O address range.

- Switch SW5 set to ON selects the primary I/O address range (300 - 30F; *default setting*).
- Switch SW5 set to OFF selects the secondary I/O address range (200 - 20F) (Figure 2–3).

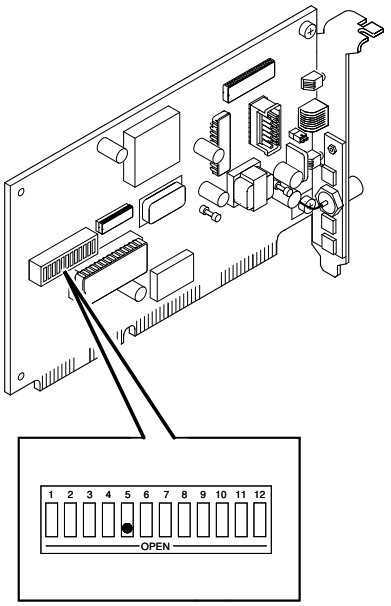


Figure 2–3 Switch Selecting I/O Address 200 - 20F (hex)

2.6 Remote Boot Selection (SW6)

Switch SW6 determines whether the remote boot feature is enabled or disabled. [1]

- Switch SW6 set to ON disables remote boot (*default setting*).
- Switch SW6 set to OFF enables remote boot (Figure 2–4).

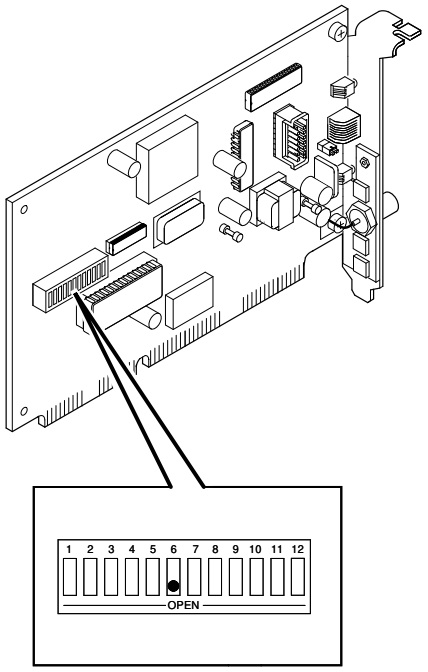


Figure 2–4 Switch Enabling Remote Boot

[1] This feature requires a remote boot ROM chip. Refer to Appendix B for more information.

2.7 Remote Boot Period Selection (SW7)

Switch SW7 controls the timeout period for trying to enable a remote boot operation.

- Switch SW7 set to OFF sets the remote boot timeout to 30 seconds (*default setting*).
- Switch SW7 set to ON sets the remote boot timeout to 150 seconds.

Example:

To set the longer remote boot timeout, set switch SW7 to the ON position (Figure 2–5).

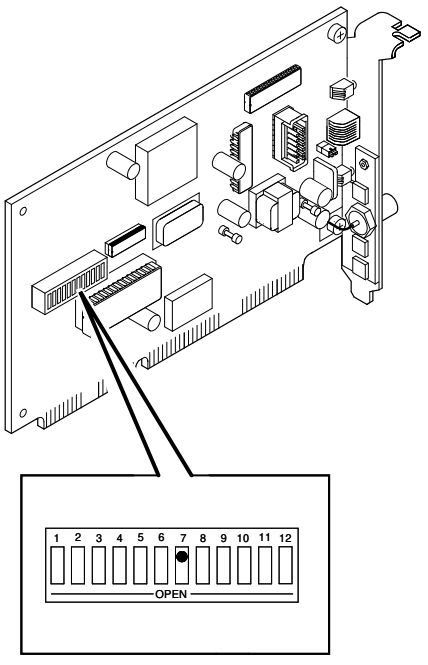


Figure 2–5 Switch Selecting 150 Seconds for Remote Boot

2.8 Interrupt Request Line Selection (SW8 - SW12)

You can use switches SW8 through SW12 to select an interrupt request line (IRQ). The DEC EtherWORKS *Turbo/TP_BNC* board uses one IRQ line for the network interface (NI). Table 2–3 lists switches and the interrupt request lines enabled.

Table 2–3 Switch and Interrupt Request Line

Switch	Interrupt Request Line
SW8	IRQ5 *(default setting)*
SW9	IRQ9
SW10	IRQ10
SW11	IRQ11
SW12	IRQ15

Only one switch should be set to the ON position. By default, SW8 is set to the ON position, selecting IRQ5.

Example:

To select IRQ10 as the interrupt request line, set switch SW10 to the ON position and set switches SW8, SW9, SW11, and SW12 to the OFF position (Figure 2–6).

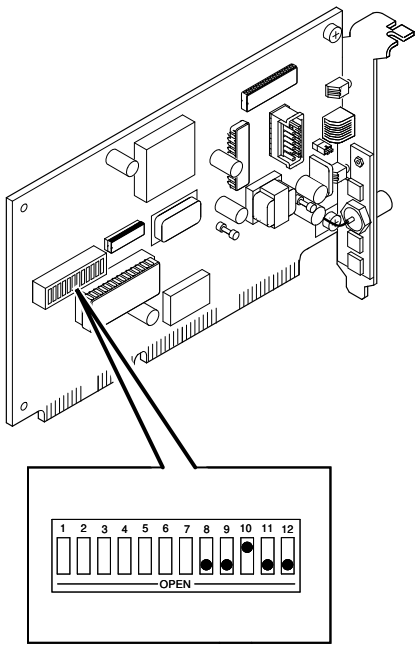


Figure 2–6 Switch SW10 Selecting IRQ10

3
Problem Solving

This chapter describes problems you may encounter with the DEC EtherWORKS *Turbo/TP_BNC* board and suggests possible causes and solutions.

3.1 Fault Isolation By Symptom

Table 3–1 lists problems that you might encounter, the possible cause, and the recommended corrective action.

Table 3–1 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.	Make sure the monitor cable is firmly connected to the video board. Set the monitor power switch to on.
	The DEC EtherWORKS *Turbo/TP_BNC* board is not seated firmly.	Remove and reinsert the board **firmly** in the option slot. (Refer to Chapter 1.)
	The I/O or memory address is set wrong or is causing a conflict with another module.	Check the settings for switches SW1 - SW5.

Table 3–1 (Cont.) Fault Isolation By Symptom

Symptom	Possible Cause	Recommended Action
	The DEC EtherWORKS *Turbo/TP_BNC* board is preventing the computer from operating correctly.	Disconnect the transceiver cable or the twisted-pair cable from the DEC EtherWORKS *Turbo/TP_BNC* board. Turn the computer off then on again. If the problem persists, contact your system administrator or authorized service representative.
The system is on. The DEC EtherWORKS *Turbo/TP_BNC* board amber LED is on for longer than 30 seconds, and the keyboard does not respond.	The DEC EtherWORKS *Turbo/TP_BNC* board is preventing the computer from operating correctly.	Disconnect the transceiver cable or the twisted-pair cable from the DE202 DEC EtherWORKS *Turbo /TP_BNC* board. Turn the system off then on again.
	The I/O or memory address is set wrong or is causing a conflict with another module.	Check the settings for switches SW1 - SW5. An address range conflict may exist between the DEC EtherWORKS *Turbo /TP_BNC* board and another option. If the problem persists, contact your system administrator or authorized service representative.

Table 3–1 (Cont.) Fault Isolation By Symptom

Symptom	Possible Cause	Recommended Action
The system does not boot from the diskette.	Switch SW6 is set to the OFF position.	Set switch SW6 to the ON position.
	The system diskette may be corrupted.	See your system administrator for a bootable system diskette.
The system does not remote boot.	Switch SW6 is set to the ON position, disabling remote boot.	Set switch SW6 to the OFF position.
	A 30-second remote boot timeout may not be enough for a busy network.	Set switch SW7 to the ON position enabling a timeout of 150 seconds.
	The Ethernet address is not registered for this address node.	Re-register this module. If the problem persists, contact your system administrator.
The system is on, but the network does not start. The green LED is not on.	The Network interface or remote boot is set incorrectly.	Check the shunt connector setting.
	There are loose network cables.	Be sure all cables are securely connected.
	A conflict may exist with another board in the system:	
	• IRQ switch settings are incorrect.	Check the switch settings for SW8 - SW12. Refer to Chapter 2.

Table 3–1 (Cont.) Fault Isolation By Symptom

Symptom	Possible Cause	Recommended Action
	• The I/O address or memory address range is set incorrectly.	Check switch settings for SW1 - SW5. Refer to Chapter 2.
	The ethernet address is not registered for this address node.	Re-register this module. If the problem persists, contact your system administrator.
The system cannot return to network operation after leaving an application program.	You may be using a program written or compiled in Version 1.0 BASIC (IBM BASIC Version 1.0, Interpreter or Compiler, GW-BASIC Version 1.0).	Do not use these versions of the program. Recompile the program using Version 2.0 or later of BASIC, or contact your software vendor for an updated version of the program.
The system is on and displays DE202 and a self-test code during system start-up.	A problem may exist with the DEC EtherWORKS *Turbo /TP_BNC* board.	See Table 3–3. Press the F1 key to continue. Replace or reinsert the DEC EtherWORKS *Turbo/TP_BNC* board and try starting the system again.
	The I/O or memory address setting is incorrect or is causing a conflict with another module.	Check the settings for switches SW1 - SW5. An address range conflict could exist between the DEC EtherWORKS *Turbo /TP_BNC* board and another option.

Table 3–1 (Cont.) Fault Isolation By Symptom

Symptom	Possible Cause	Recommended Action
	The error code may be an IBM error code.	See your IBM owner's manual for additional information. If the problem persists, contact your system administrator.

3.2 DEC EtherWORKS *Turbo/TP_BNC* Board LED Activity

There are two light emitting diodes (LEDs) on the DEC EtherWORKS *Turbo/TP_BNC* board mounting bracket that display the operating status of the DEC EtherWORKS *Turbo/TP_BNC* 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.

Table 3–2 LED Activity

Activity	Cause	User Action
The amber LED stays on for 20 seconds, then goes off.	This is 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 the DEC EtherWORKS *Turbo /TP_BNC* board self-test error codes, Table 3–3.
The amber LED blinks rapidly.	This is normal.	None.

Table 3–2 (Cont.) LED Activity

Activity	Cause	User Action
The green LED blinks.	This is normal activity indicating that link integrity is correct and there is reception of data on the RCV DATA line.	None.
The green LED is off.	There is no receive data packet activity.	See Table 3–1 for other symptoms and recommended action.

3.3 Recovering From Self-Test Error Codes

Self-test errors can occur at system startup. Table 3–3 lists the DEC EtherWORKS *Turbo/TP_BNC* board self-test error codes, the possible cause, and a recommended action. To recover from some error codes, you can try pressing the F1 function key to resume system operation.

NOTE
Although the DEC EtherWORKS *Turbo/TP_BNC* board detects an error and may not operate properly, you can still use your personal computer.

Table 3–3 DEC EtherWORKS *Turbo/TP_BNC* Board Self-Test Error Codes

Error	Description	Recommended Action
80	Memory access conflict	Check switches SW1 - SW5 for a conflict with another installed adapter.
81	Data path error	Check switches SW1 - SW5 for a conflict with another installed adapter. If the problem persists, call your Digital authorized service representative.

Table 3–3 (Cont.) DEC EtherWORKS *Turbo/TP_BNC* Board Self-Test Error Codes

Error	Description	Recommended Action
82	Address test conflict	Check switches SW1 - SW5 for a conflict with another installed adapter.
83	RAM test conflict	Check switches SW1 - SW5 for a conflict with another installed adapter.
84	Ethernet ROM CRC error	Check switch SW5 for a conflict with another installed adapter. If the problem continues, call your Digital authorized service representative.
85	NI_CSR error	Call your Digital authorized service representative.
86	LANCE I/O address conflict	Check swith setting for SW5.
87	LANCE initialization error	Call your Digital authorized service representative.
88	LANCE IRQ conflict	Check the IRQ switch settings, SW8 - SW12.
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	Shadow RAM error	Call your Digital authorized service representative.
8E	Shadow RAM enable error	Call your Digital authorized service representative.

Table 3–3 (Cont.) DEC EtherWORKS *Turbo/TP_BNC* Board Self-Test Error Codes

Error	Description	Recommended Action
8F	Configuration error	Check switches SW8 - SW12 to be sure that only one is set to the ON position. Also check the parameter settings for your network to make sure they match the board configuration.

A
General Information

A.1 Introduction

The DEC EtherWORKS *Turbo/TP_BNC* board lets you integrate IBM-AT compatible computers into a network. After installing a DEC EtherWORKS *Turbo/TP_BNC* board, you can use various network software products to integrate the computer into a network.

You can install a DEC EtherWORKS *Turbo/TP_BNC* board in any IBM-AT or a computer that has an IBM-AT compatible bus.

You can connect the DEC EtherWORKS *Turbo/TP_BNC* board to either a 10BaseT Twisted-Pair network or a ThinWire Ethernet network. You cannot, however, connect the DEC EtherWORKS *Turbo/TP_BNC* board to both kinds of networks at the same time.

A.2 Physical Description

The DEC EtherWORKS *Turbo/TP_BNC* board is a half-length, IBM-AT form-factor board that uses the full 16-bit bus connector.

The board measures 17.2 cm x 10.8 cm (6.75 inches x 4.25 inches).

A.2.1 Functional Components

The major functional blocks on the DEC EtherWORKS *Turbo/TP_BNC* board are as follows:

- Ethernet network protocol controller (LANCE)
- Unshielded twisted-pair (RJ45 connector) network interface
- Standard Ethernet ThinWire (BNC connector) network interface
- Diagnostics and remote-boot ROM - 16 Kbytes (optional)
- Network buffer RAM - 64 Kbytes
- Ethernet hardware address ROM

A.2.2 LED

There are two light emitting diodes (LEDs) on the mounting bracket that display the operating status of the DEC EtherWORKS *Turbo/TP_BNC* board. The amber LED comes on during power-up testing and stays on if the test discovers a fault. The amber LED also blinks during normal activity. When the green LED is on it indicates normal network activity. Chapter 3 contains additional information on the LEDs.

A.2.3 Environmental Requirements

The environmental (temperature and humidity) requirements for the DEC EtherWORKS *Turbo/TP_BNC* board are the same as for your IBM-AT personal computer.

A.3 System Specifications

The DEC EtherWORKS *Turbo/TP_BNC* board operates correctly at an I/O channel bus speed of 6, 8, or 10 MHz. Table A–1 lists the system specifications of the board.

Table A–1 DEC EtherWORKS *Turbo/TP_BNC* Board System Specifications

Memory Buffer Size	**Memory Addressing Ranges**
64 Kbytes	C0000—CFFFF D0000—DFFFF E0000— EFFFF[1]
32 Kbytes	C8000—CFFFF D8000—DFFFF E8000— EFFFF[1]
I/O Memory Assignments	
I/O	200—20F 300—30F
Network Interface	**Selections**
Interrupt request (IRQ) lines	IRQ5, IRQ9, IRQ10, IRQ11, IRQ15
Power Requirements:	**Twisted-Pair: 12.5 w (maximum)** **ThinWire: 16.7 w (maximum)**
DC Amps @ +5V: 2.5 A (maximum)	
DC Amps @ +12V: 0.35 A (maximum) for ThinWire only	
Bus Loads: 2 LSTTL	

[1]Some PCs do not support the E0000 - EFFFF or E8000 - EFFFF memory address ranges; check your PC manual for this information.

Table A–1 (Cont.) DEC EtherWORKS *Turbo/TP_BNC* Board System Specifications

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

CAUTION

When adding any option module to your computer, verify that the combined power (wattage) required for all modules in your computer does not exceed the power supply rating. Check your documentation for this information.

B
Installing an Option ROM

B.1 Introduction

The ROM chip is optional on the DEC EtherWORKS *Turbo/TP_BNC* board and is not required for correct operation. If you purchased the DEC EtherWORKS *Turbo/TP_BNC* board from Digital (PN DE202-AA), then the board already has the option ROM 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 to install the ROM chip.

CAUTION
Improper insertion of the ROM chip can damage the board.

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

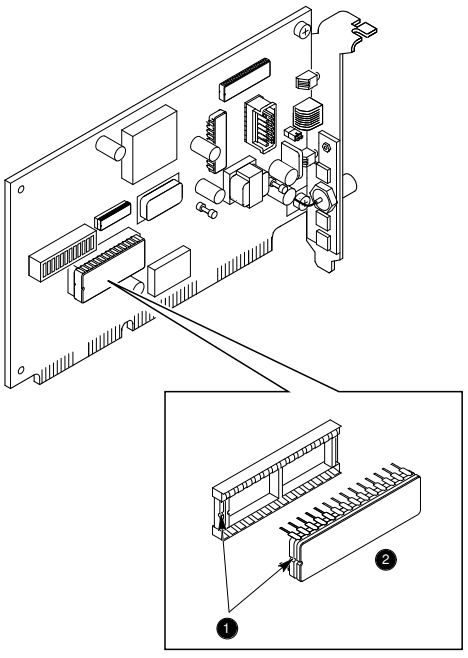


Figure B–1 Installing the DEC EtherWORKS *Turbo/ TP_BNC* ROM

C
Cable Specifications

C.1 Cabling Requirements

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

- Twisted-Pair cable—such as PN BN24F or BN24G, as long as 100 m (328 feet). Refer to Section C.1.1 and Section C.1.2 for more information.
  - — BN24F - Office cable with crossover for unshielded twisted pair, (4-conductor, 2-twisted pair) to connect a workstation or to an office wall plate or to a DECrepeater 350.
  - — BN24G - Point-to-point patch cable (8-conductor, 4-twisted pair) to connect DECrepeater to building wiring (wall plate or patch field).
- ThinWire transceiver cable—such as PN BNE4G-02, 50 m (164 feet) maximum if going directly to a transceiver, or 45 m (148 feet) maximum if connected to a DELNI.

For configuration planning, refer to the *DECconnect System Planning and Configuration Guide* (PN EK-DECSY-CG). The DEC EtherWORKS *Turbo/TP_BNC* board configuration guidelines are the same as the DEMPR, except for cable length. Daisy chaining is not permitted.

C.1.1 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

C.1.2 Unshielded Cable Environmental Constraints

Constraint	Description
FCC regulations (in the US)	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 A computing device, pursuant to Subpart J of Part 15 of FCC Rules. 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.

Constraint	Description
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.1.3 Shielded Twisted-Pair Cable Constraints

For countries that require shielded twisted-pair cables, a jumper (W1) is provided on the DEC EtherWORKS *Turbo/ TP_BNC* board for use with these cables (see Figure C–1). Installing jumper W1 connects GROUND to pin 8 of the twisted-pair connector.

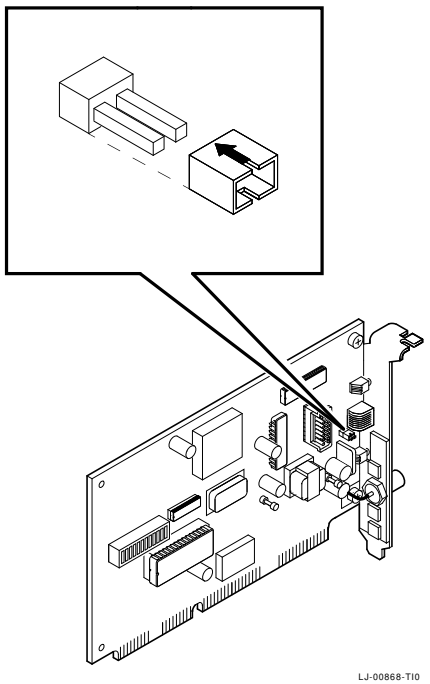


Figure C–1 Installing Jumper for Shielded Twisted-Pair Cables

C.1.4 Card Connector Pinning (RJ45)

If you are using your DEC EtherWORKS *Turbo/ TP_BNC* board to connect 10BaseT Twisted-Pair networks, the connector has the following pin signals. (See Figure C–2).

Pin Number	Signal Name
1	Transmit +
2	Transmit -
3	Receive +
6	Receive -
8	NC (no connection)

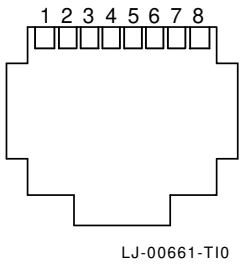


Figure C–2 RJ45 Connector (Front View)

D
Building Wiring Considerations

This appendix describes some special building wiring considerations when connecting a DECrepeater 350 Ethernet Repeater (DETPR) to either the H3350 or any 10BaseT System. Refer to the section that you need for your system.

For...	Refer to...
DETPR to Workstation without Embedded Crossover	Section D.2
DETPR to Workstation with Embedded Crossover	Section D.3

D.1 Connecting a DECrepeater 350 to a Workstation

This section provides information on wiring a DECrepeater 350 Ethernet Repeater to:

- H3350 transceivers and other IEEE 802.3 10BaseT [1] twisted-pair products
- Building wiring to connect 10BaseT products
- Wiring diagrams for future DETPR products
- Twisted-Pair Ethernet restrictions.

[1] Designated to comply with IEEE 802.3 10BaseT standard for building wiring.

The DETPR can be connected directly to either a workstation using local wiring, or it can be connected through building wiring using a cross-over cable. Figure D–1 shows a topology of these types of connections.

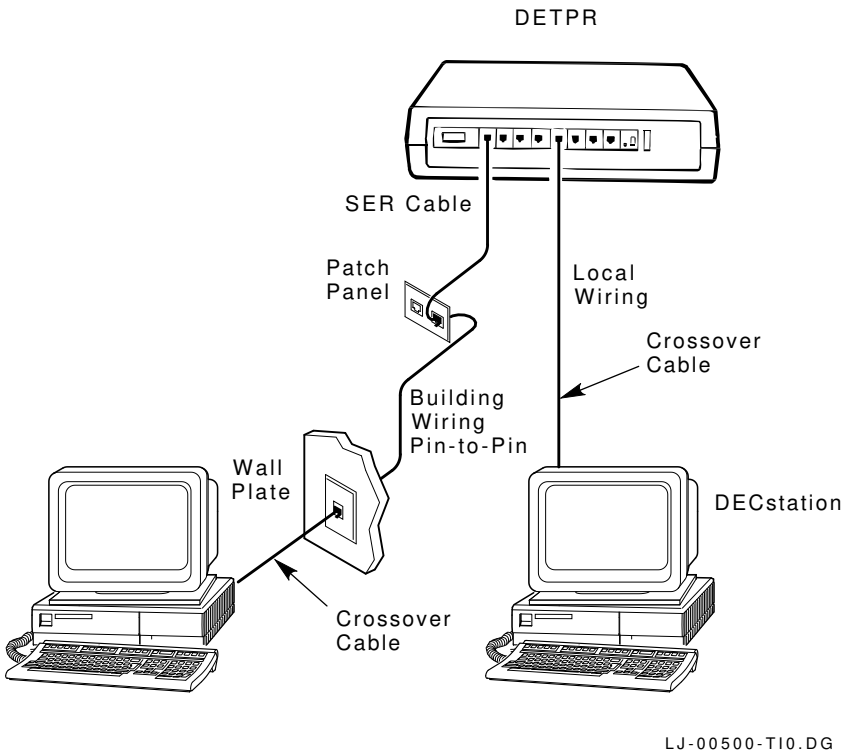


Figure D–1 Connecting a DECrepeater 350 to a Workstation

D.1.1 Cross-Over Connection

A cross-over connection must be implemented in every twisted-pair link. The cross-over connection connects the transmitter on one media access unit (MAU) to the receiver of the MAU at the other end of the twisted-pair link. The cross-over connection may be implemented either internally in a repeater, or externally in a twisted-pair link.

D.1.2 Implementation

Any medium dependent interconnect (MDI) connector or cable that implements the cross-over function internally should be marked with an "X."

Figure D–2 shows the connections and cables needed to connect the DETPR to either an H3350 or any 10BaseT workstation. The diagram also indicates where a cross-over must be used to maintain correct wiring.

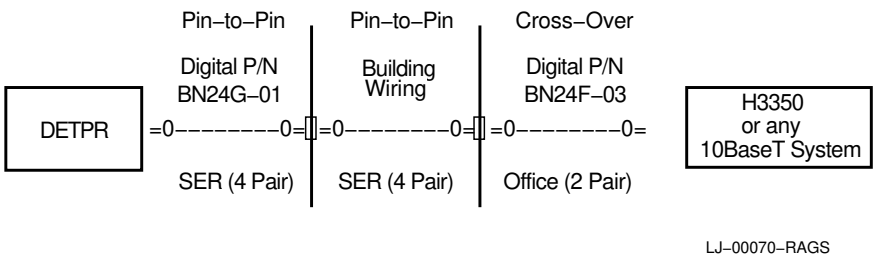


Figure D–2 DETPR—Digital-Only Wiring

The DETPR has no embedded cross-over connection so it requires an external cross-over cable.

To maintain a proper connection between the DETPR and either an H3350 or any 10BaseT workstation, a cross-over cable must be used.

NOTE
Some repeater products could include embedded cross-over wiring.

D.2 DETPR to Workstation without Embedded Cross-over Wiring Connections

D.2.1 External Cross-Over Wiring Schematic

Figure D–3 is a detailed schematic of the pin-to-pin wiring.

The building wiring is in accordance with prescribed standards and must follow appropriate pair and color code assignments.

NOTE
All connectors are not pin-to-pin.

For a more detailed drawing of the DETPR wiring, refer to the *Open DECconnect Building Wiring Components and Applications Catalog* (PN EB-K2407-41).

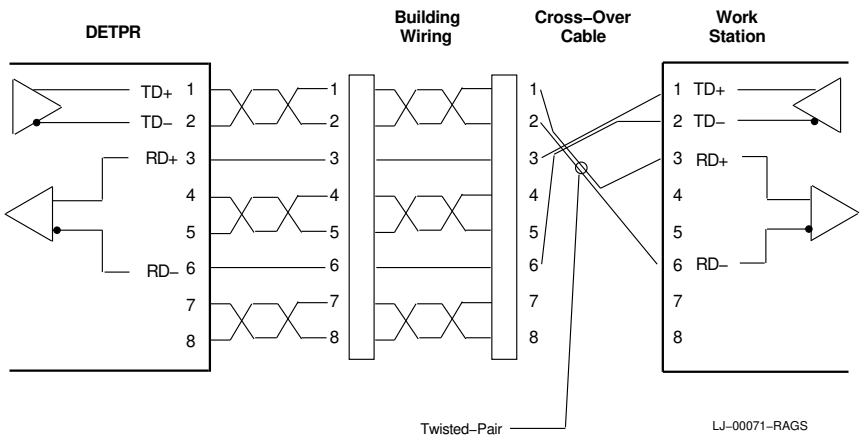


Figure D–3 DETPR—Digital-Only Wiring Cross-Over Wiring Schematic

The connectors at the DETPR, patch panel, wall plate, and workstation are all 8-pin modular jacks with the same pin assignments.

NOTE

The DETPR, H3350, and any 10BaseT workstations all have the same pin assignments.

D.2.2 Connector Pinouts

Table D–1 describes the connector pinouts and building wiring for the DETPR, H3350, and any 10BaseT workstations. The DETPR has an 8-pin MJ connector for its twisted-pair ports (1 to 8). See Figure D–4.

Table D–1 8-Pin Modular Jack Connector on Workstation (DETPR Ports 1 to 8) and Building Wiring

Pin	Signal Name	Building Wiring (Pair Number)	Building Wiring (Color Code)
1	Transmit +	3	White/Green
2	Transmit -	3	Green/White
3	Receive +	2	White/Orange
4	NC (no connection)	1	Blue/White
5	NC	1	White/Blue
6	Receive -	2	Orange/White
7	NC	4	White/Brown
8	NC	4	Brown/White

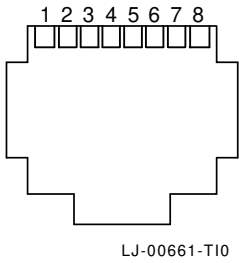


Figure D–4 8-Pin Modular Jack Pin Locations (Front View)

D.3 DETPR to Workstation with Embedded Cross-Over Wiring Connections

Figure D–5 shows the connections and cables needed to connect a repeater that has embedded cross-over connections to an H3350 and any 10BaseT workstation. The workstation can not be a repeater with an embedded cross-over.

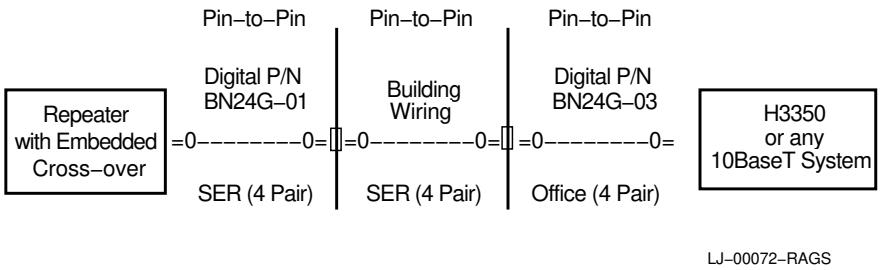


Figure D–5 Repeater or Other Twisted-Pair MAU Embedded Cross-Over Wiring

D.3.1 Internal Cross-Over Wiring Schematic

Figure D–6 is a detailed schematic of the pin-to-pin wiring for a repeater that has implemented internal cross-over wiring. For a more detailed drawing of the DETPR wiring, refer to the *Open DECconnect Building Wiring Components and Applications Catalog* (PN EB-K2407-41).

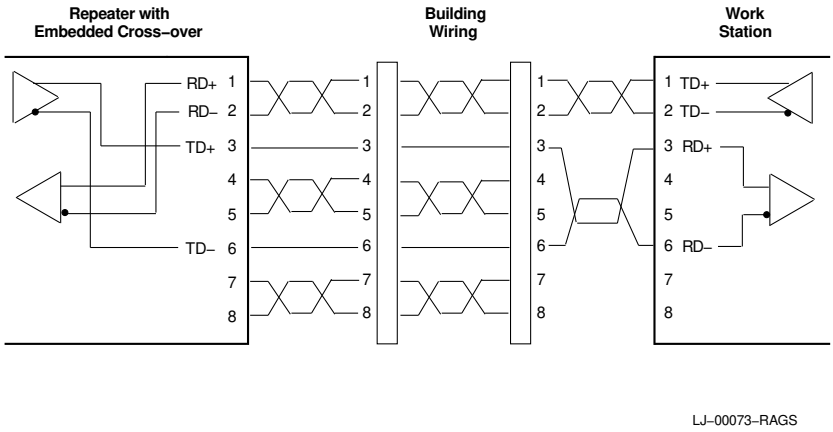


Figure D–6 Wiring Schematic in an Embedded Cross-Over Repeater

Table D–2 describes the pinouts for units with an embedded cross-over.

Table D–2 Wiring Assignments for a System with Embedded Cross-Over Repeater

Repeater Embedded		Building Wiring		Workstation	
Pin	**Signal Name**	**Pair Number**	**Color Code**	**Pin**	**Signal Name**
1	Receive +	3	White/Green	1	Transmit +
2	Receive -	3	Green/White	2	Transmit -
3	Transmit +	2	White/Orange	3	Receive +
4	NC (no connection)	1	Blue/White	4	NC
5	NC	1	White/Blue	5	NC
6	Transmit -	2	Orange/White	6	Receive -
7	NC	4	White/Brown	7	NC
8	NC	4	Brown/White	8	NC