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DEC EtherWORKS *LC/TP* Owner's Manual

EK-DE101-OM.003

Digital Equipment Corporation

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– 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

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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 LC TP-Modul in Verbindung mit IBM PS/2 Personalcomputersystemem entsprechen den Funkentstöranforderungen der DBP-Verfugung 523/69 und VDE0871 Grenzwertklasse B.

February, 1992

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Preface

The Digital EtherWORKS *LC/TP* board is a personal computer bus adapter that enables you to integrate various IBM/PC/XT/AT or compatible personal computers into a network, using either ThickWire Ethernet cables or Twisted-Pair wiring.

You do not have to know a lot about computers to install the *LC /TP* board. 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 *LC/TP* board with your computer, see your system administrator.

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 a ROM installation procedure.
- Appendix C provides cabling requirements.
- Appendix D provides information on building wiring considerations.

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.

Before you install the *LC/TP* board, be sure you have the following components, shown in Figure 1.

- The DEC EtherWORKS *LC/TP* Board ❶, packaged in an anti-static bag ❺
- Owner's manual ❷
- Installation diskette (5¼ inch) ❸
- Installation micro-diskette (3½ inch) ❹

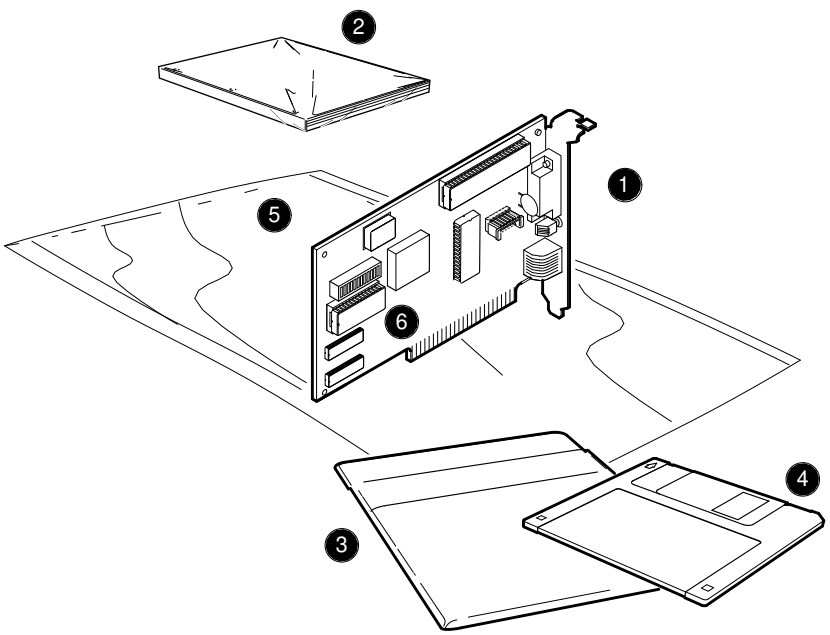
NOTE

If your *LC/TP* board does not have a ROM ❻ in the location shown in Figure 1, refer to Appendix B.

This manual shows you how to install and configure the *LC/TP* board. You use the installation diskette to test the system.

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

Figure 1 DEC EtherWORKS *LC/TP* Product Kit (PN DE101-AB)



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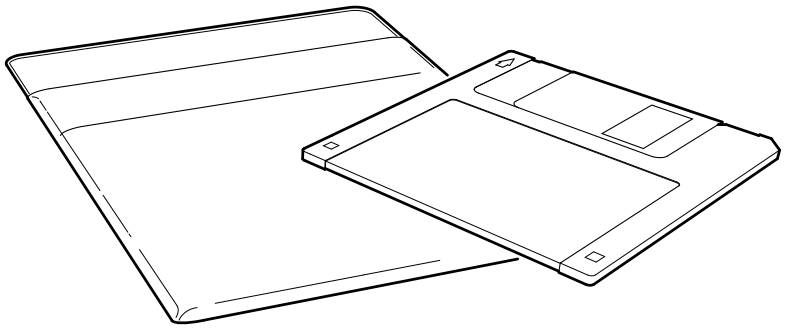
1
Installing the DEC EtherWORKS *LC/TP* Board

1.1 Introduction

This chapter describes how to install the DEC EtherWORKS *LC/TP* board into an IBM/PC/XT/AT or compatible personal computer. The only tool you need is a flat-head screwdriver. Before you begin, make a copy of the diskette (shown in Figure 1–1) you need to use from the DEC EtherWORKS *LC /TP* Product Kit.

Figure 1–1 Product Kit Diskettes



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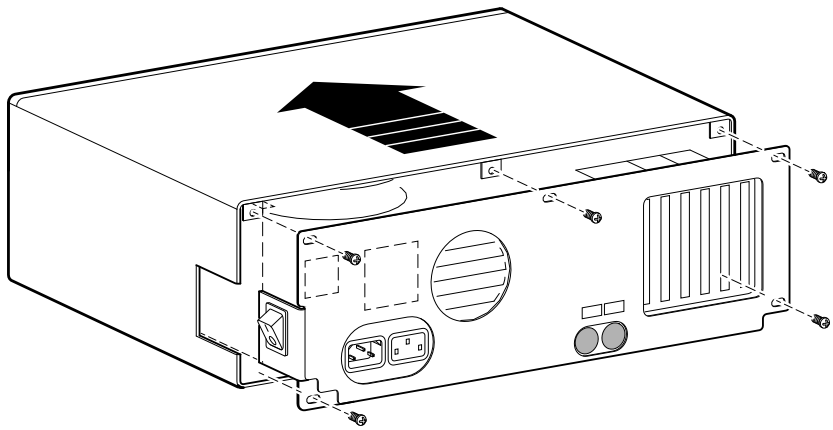
1.2 Preparing Your Computer System

Perform the following steps to prepare your IBM/PC/XT/AT or compatible personal computer. The illustrations in this manual show an IBM PC personal computer. For other personal computers, you can use a similar procedure with only minor modifications.

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 and disconnect any cables.
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.

Figure 1–2 Removing the System Unit Cover



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NOTE

The DEC EtherWORKS *LC/TP* board has a switch pack that lets you determine how the board operates. This switch pack is already set to correspond to the needs of most customers (*default settings*). The settings may meet your computer's requirements. If they do not, you must change the settings on the board. (The settings are found in Chapter 2.)

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 boot the system. To test the board with the default settings, you may need to remove all other option modules from the computer.

1.3 Selecting the Network Interface

The DEC EtherWORKS *LC/TP* board has a *shunt connector* ❶ (Figure 1–3) that lets you determine how the board interfaces with the network—either Twisted-Pair or ThickWire Ethernet networks. The board is shipped with the setting preselected for the Twisted-Pair Ethernet network.

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

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

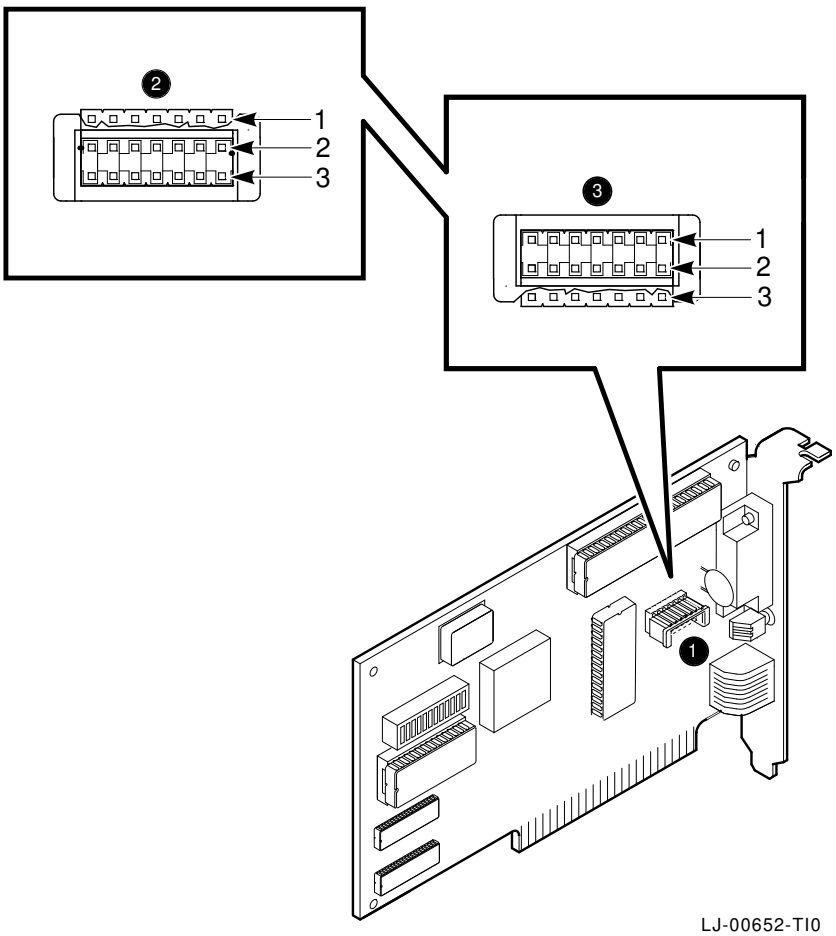
Table 1–1 Decision Table for Shunt Connector

If you Want To ...	Then ...
Connect to a Twisted-Pair Ethernet network ❷	Leave the shunt connector in the position connecting pin rows 2 and 3 (*default setting*).
Connect to a ThickWire Ethernet network ❸	Move the shunt connector to connect pin rows 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 1–3 Selecting the Network Interface



1.4 Installing the DEC EtherWORKS *LC/TP* Board

Use the following steps for the installation procedure:

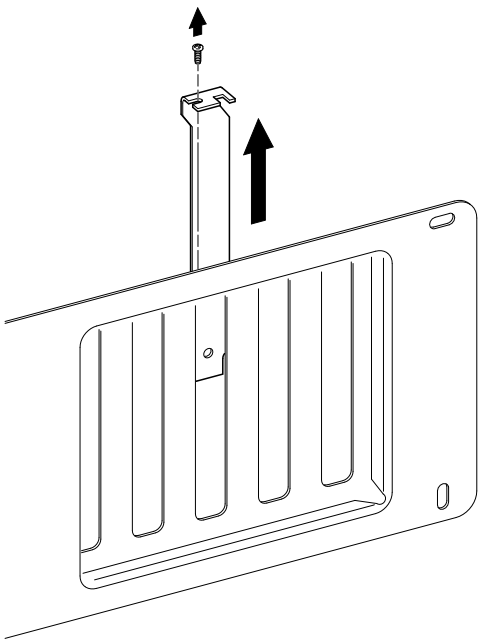
1. **Remove the option slot cover from the slot you plan to use** (Figure 1–4).

   Remove the screw from an available option slot on the rear panel insert. Save the screw for later use.

   CAUTION

   For safe operation, be sure there are no missing slot covers when you complete the installation.

Figure 1–4 Removing the Slot Cover



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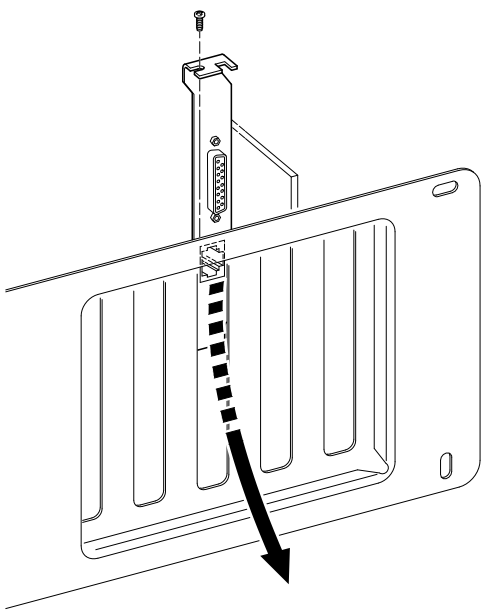
2. **Place the DEC EtherWORKS *LC/TP* board in the option slot** (Figure 1–5).
3. **Firmly press the DEC EtherWORKS *LC/TP* board into place until it is securely seated.**
4. **Replace the screw on the slot cover.**

Figure 1–5 Installing the DEC EtherWORKS *LC/TP* board



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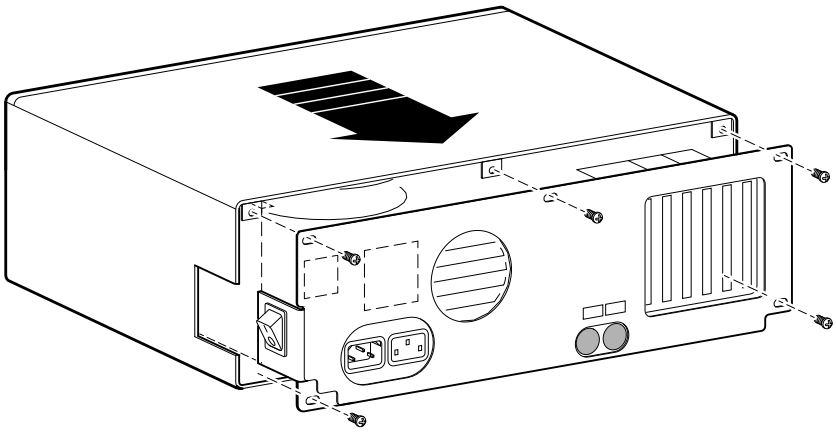
5. **Replace the system unit cover.**

   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.

Figure 1–6 Replacing the Cover



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6. **Plug the keyboard connector into the rear of the system unit and connect the cables.**

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

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

1.5 Running the Power Up Self-Test

A power up self-test runs automatically each time the computer is turned on or reset. There is no on-screen prompt or other information on the screen if the test runs properly.

If an error code, such as DE101 88, displays on the screen during the restart process, a self-test error has occurred. Note the self-test error code and refer to Section 3.3.

NOTE

The amber LED on the module will light during self-test.

1.6 Connecting to a Network

Depending on how you configured the DEC EtherWORKS *LC/TP* board in Section 1.3, use one of the following procedures to connect your system to the network. For Twisted-Pair Ethernet, refer to Section 1.6.1. For ThickWire Ethernet, refer to Section 1.6.2.

1.6.1 Connecting the DEC EtherWORKS *LC/TP* board to Twisted-Pair Ethernet

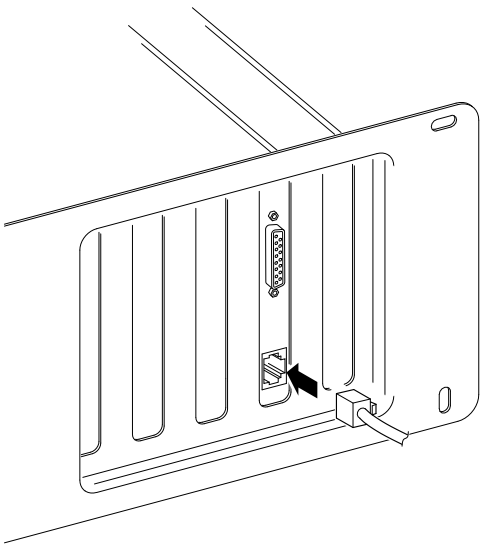
Plug the Twisted-Pair cable into the Twisted-Pair Ethernet connector.

Push the Twisted-Pair cable connector into the socket on the bottom of the DEC EtherWORKS *LC/TP* board mounting bracket, until it clicks, locking into place (Figure 1–7).

NOTE

The green LED on the module will light when the board detects the link integrity.

Figure 1–7 Connecting To Twisted-Pair Ethernet



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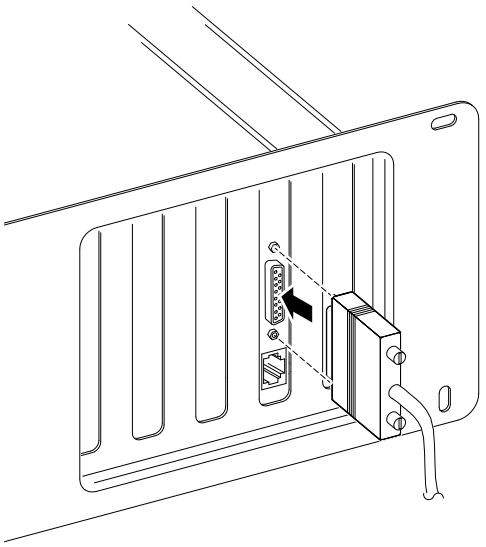
1.6.2 Connecting the DEC EtherWORKS *LC/TP* board to ThickWire Ethernet

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

Figure 1–8 Connecting To ThickWire Ethernet



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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 DEC EtherWORKS *LC/TP* software drivers, problems found, and how to configure your system.

2
Configuring the DEC EtherWORKS *LC/TP* Board

2.1 Introduction

The DEC EtherWORKS *LC/TP* board has a switch pack containing 12 switches that enable the board to operate in a configuration without interference with 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 *LC/TP* board to create a compatible operating set.

2.2 Default Settings

The DEC EtherWORKS *LC/TP* board is shipped with the switch pack preselected (*default settings*) to work in most installations. These settings are shown in Table 2–1 and illustrated in Figure 2–1.

Table 2–1 Default Settings on DEC EtherWORKS *LC/TP* Board

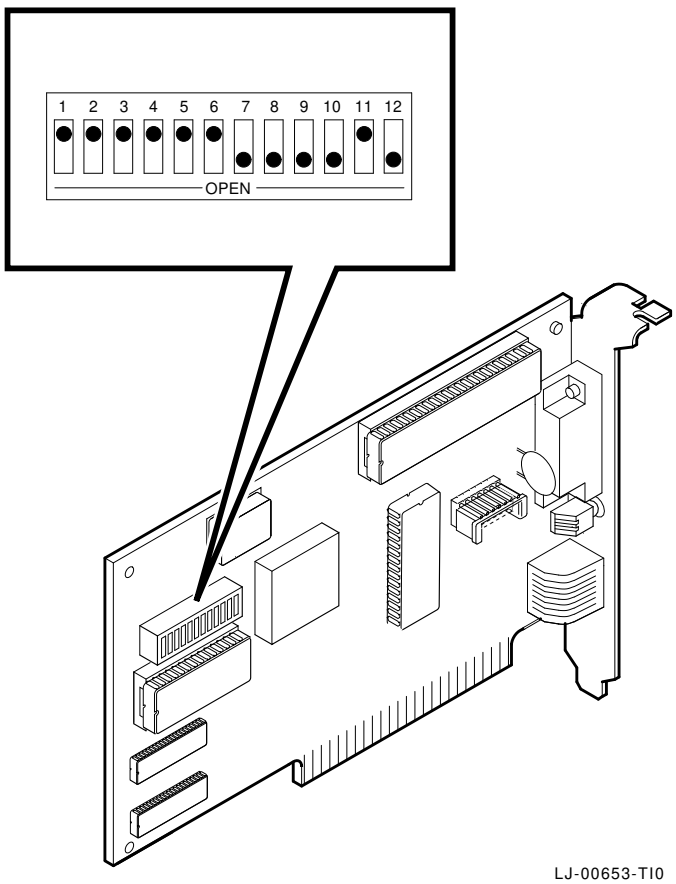
Switch	Position	Function	Meaning
SW1 SW2	ON ON	Sets the base memory address range.	Sets the base memory address range to D0000 - DFFFF (hex).
SW3 SW4	ON ON	Selects the buffer memory size.	Enables 64 Kbyte memory size.
SW5	ON	Sets the I/O memory address.	I/O starting address set to 300 (hex).
SW6	ON	Enables or disables remote boot feature.[1]	Remote boot disabled.
SW7	OFF	Sets the timeout period for the remote boot attempt.[1]	Sets a 30 second timeout period.
SW8	OFF	Enable IRQ2	
SW9	OFF	Enable IRQ3	
SW10	OFF	Enable IRQ4	
SW11	ON	Enable IRQ5	IRQ5 enabled.
SW12	OFF	Enable IRQ7	

[1]This feature requires that the optional ROM chip be installed; refer to Appendix B for more information.

NOTE

When the switches are depressed in the open position this means the switch setting is off.

Figure 2–1 DEC EtherWORKS *LC/TP* 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 memory address, or base 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 you find that a conflict exists, you can change the appropriate setting on the DEC EtherWORKS *LC/TP* board. To do this, refer to the sections that follow. 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 the DEC EtherWORKS *LC/TP* board uses. Table 2–2 lists the possible memory address ranges and the switch settings that select them.

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

Table 2–2 Switch Settings and Memory Address Ranges

Buffer Size	SW1	SW2	SW3	SW4	Memory Addressing Range
64 Kbytes	Off	On	On	On	C0000—CFFFF
	On	On	On	On	D0000—DFFFF *(default setting)*
	Off	Off	On	On	E0000—EFFFF[1]
32 Kbytes	Off	On	Off	On	C8000—CFFFF
	On	On	Off	On	D8000—DFFFF
	Off	Off	Off	On	E8000—EFFFF[1]
2 Kbytes[2]	-	-	-	Off	-

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

[2]At this time, Digital PCSA software does not support 2 Kbyte mode.

NOTE

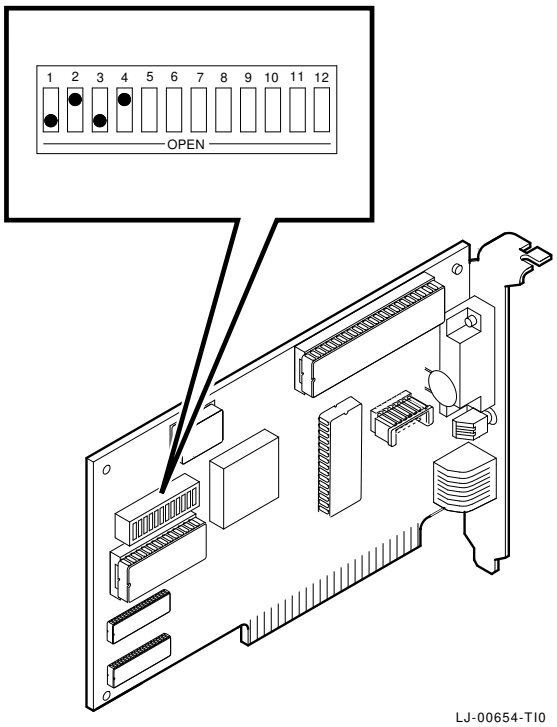
Setting SW1 to the ON position and SW2 to the OFF position is an illegal configuration and can prevent the computer from working correctly.

The DEC EtherWORKS *LC/TP* board works best when the entire 64 Kbytes of network buffer memory is enabled for operation. Some option cards and system configurations do not permit the allocation of this amount of memory. Network performance is slower when you select 32 Kbytes or 2 Kbytes, but you can use the DEC EtherWORKS *LC/TP* board in configurations where address space is at a premium.

Example:

> Figure 2–2 shows the settings for SW1 through SW4 that select the C8000 to CFFFF (hex) system memory addressing range.

Figure 2–2 Setting Memory Range C8000 to CFFFF for 32 KB

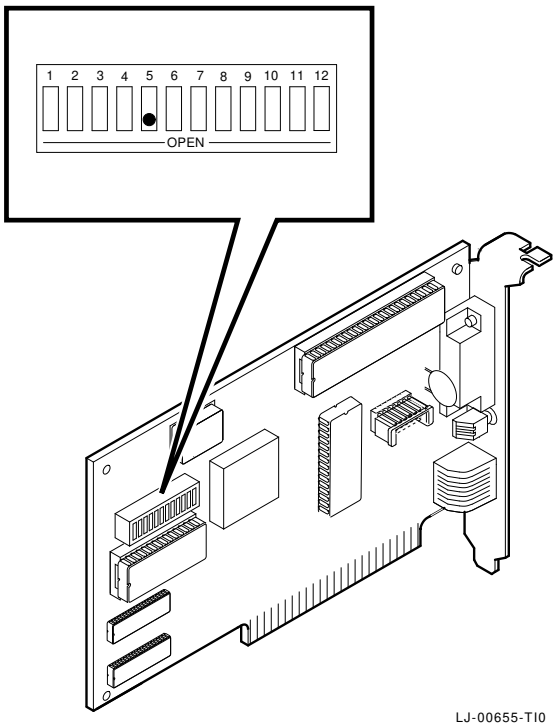


2.5 I/O Address Selection (SW5)

The DEC EtherWORKS *LC/TP* board uses one of two I/O address ranges (primary or secondary) to communicate with the CPU. Only one adapter 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 200 - 20F (hex) I/O Memory

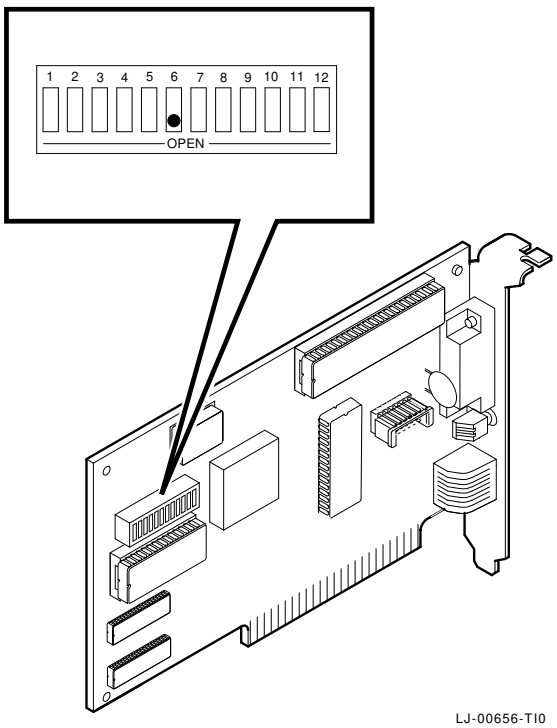


2.6 Remote Boot Selection (SW6)

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



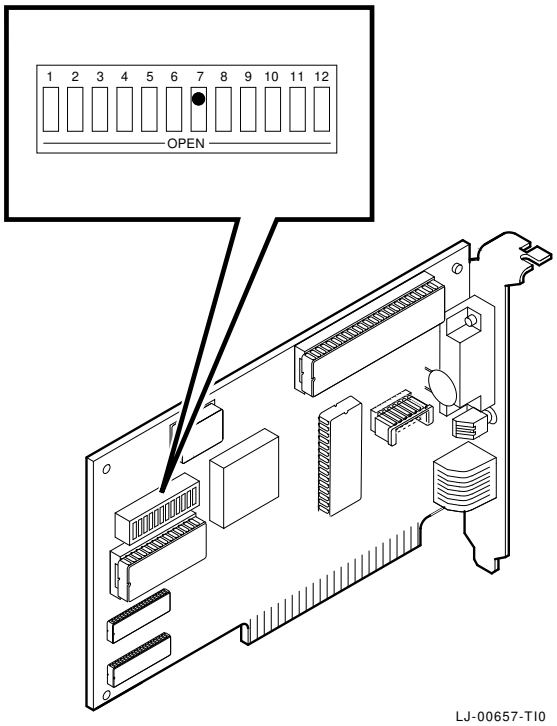
[1] This feature requires that the optional ROM chip be installed; refer to Appendix B for more information.

2.7 Remote Boot Period Selection (SW7)

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 (the longer remote boot timeout).

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 *LC/TP* board uses one IRQ line for the network interface (NI). Table 2–3 lists the switches and the interrupt request line enabled.

Table 2–3 Interrupt Request Line Switches

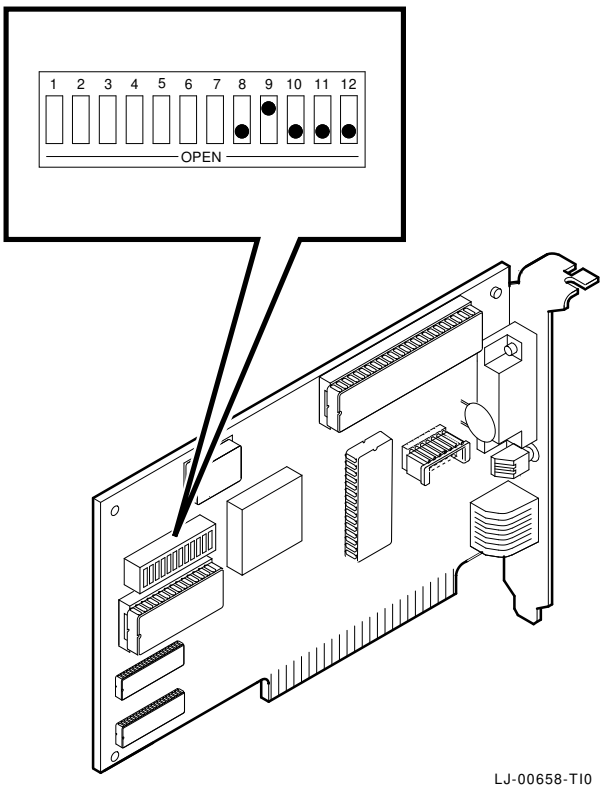
Switch	Interrupt Request Line
SW8	IRQ2
SW9	IRQ3
SW10	IRQ4
SW11	IRQ5 *(default setting)*
SW12	IRQ7

Only one of the switches should be set to ON. By default, SW11 is set to ON, selecting IRQ5.

Example:

To select IRQ3, set SW9 to the ON position and set switches SW8, SW10, SW11, and SW12 to the OFF position (Figure 2–6).

Figure 2–6 Switch Selecting IRQ 3



3
Problem Solving

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

3.1 Fault Isolation By Symptom

Table 3–1 describes how to isolate faults by the symptoms that are occurring.

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 it is not connected to the video board.	Be sure the monitor cable is firmly connected to the video board. Set the monitor power switch to ON.
	The DEC EtherWORKS *LC/TP* board is not seated firmly.	Remove and reinsert the board **firmly** into the option slot (Section 1.4).

Table 3–1 (Continued) Fault Isolation By Symptom

Symptom	Possible Cause	Recommended Action
	The I/O or memory address is set wrong or is causing a conflict with another module.	Check the settings for SW1 - SW5. An address range conflict could exist between the DEC EtherWORKS *LC /TP* board and another option module.
	The DEC EtherWORKS board is preventing the computer from operating correctly.	Disconnect the transceiver cable or the Twisted-Pair cable from the DEC EtherWORKS *LC/TP* board. Turn the computer off then on again. If the problem persists, contact your system administrator or authorized service representative.
The system is on, but nothing happens. The DEC EtherWORKS *LC/TP* board LED is on for longer than 30 seconds. The keyboard does not respond.	The DEC EtherWORKS *LC/TP* board is preventing the CPU from operating correctly.	Disconnect the transceiver cable or the Twisted-Pair cable from the DEC EtherWORKS *LC/TP* board, then turn the computer off then on again.

Table 3–1 (Continued) Fault Isolation By Symptom

Symptom	Possible Cause	Recommended Action
	The I/O or memory address is set wrong or is causing a conflict with another module.	Check the settings for SW1 - SW5. An address range conflict could exist between the DEC EtherWORKS *LC/TP* board and another option module. If the problem persists, contact your system administrator or authorized service representative.
The system does not boot from the diskette.	Switch SW6 is in the OFF position.	Set SW6 to the ON position.
	The system diskette could 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 time out could be insufficient 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 off.	The Network interface or remote boot is set incorrectly.	Check the shunt connector for the correct setting.

Table 3–1 (Continued) Fault Isolation By Symptom

Symptom	Possible Cause	Recommended Action
	The network cables are loose.	Check and secure all cables.
	A conflict exists with another board in the system:	
	• The IRQ jumpers are set incorrectly.	Check the settings for SW8 through SW12 (Chapter 2).
	• The I/O address or memory address range is set incorrectly.	Check settings for SW1 - SW5 (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 is on and displays DE101 and a self-test code during system startup.	A possible problem exists with the DEC EtherWORKS *LC/TP* board.	See Table 3–3. Press the F1 key to continue. Replace or reinsert the LC/TP board and try starting the system again.
	I/O address or memory address range is set incorrectly, or is causing a conflict with another module.	Check settings for SW1 - SW5. An address range conflict could exist between the DEC EtherWORKS *LC/TP* board and another option module.
	The error code could be an IBM error code.	See your IBM owner's manual for additional information. If the problem persists, contact your system administrator.

Table 3–1 (Continued) Fault Isolation By Symptom

Symptom	Possible Cause	Recommended Action
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.

3.2 DEC EtherWORKS *LC/TP* Board LED Activity

There are two light emitting diodes (LEDs) on the DEC EtherWORKS *LC/TP* board mounting bracket that display operating status of the DEC EtherWORKS *LC/TP* board. The amber LED stays on when a failure occurs during the power-up self-test. The green LED blinks indicating network activity. Table 3–2 describes the different states of the LED.

Table 3–2 LED Activity

LED Activity	Cause	User Action
The amber LED stays on for 20 seconds, then it goes off.	Normal during self-test	None.
The amber LED stays on after 20 seconds.	A fault has occurred and an error number displays on the screen.	See Table 3–3, DEC EtherWORKS *LC/TP* board self-test error codes.
The green LED stays on.	Indicates that the link integrity signal is present.	None.
The green LED blinks.	Normal. Indicates that the link integrity is correct and the Twisted-Pair RCD DATA line is receiving data.	None.

Table 3–2 (Continued) LED Activity

LED Activity	Cause	User Action
The green LED is off.	There is no receive data packet activity nor any link integrity signal.	If a problem exists receiving data, see Table 3–1 for other symptoms and recommended action. Verify that the repeater and the board are operating correctly and that the cabling is correct.

3.3 Recovering From Self-Test Errors

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

NOTE

Although the DEC EtherWORKS *LC/TP* board detects an error and is not operating, you can still use your personal computer.

Table 3–3 DEC EtherWORKS *LC/TP* 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 continues, call your Digital authorized service representative.
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.

Table 3–3 (Continued) DEC EtherWORKS *LC/TP* Board Self-Test Error Codes

Error	Description	Recommended Action
86	LANCE I/O address conflict	Check the setting for switch SW5.
87	LANCE initialization error	Call your Digital authorized service representative.
88	LANCE IRQ conflict	Check 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.
8F	Configuration error	Check switches SW8 - SW12 to be sure only one of the switches is in the ON position. Also check the parameter settings for your network to be sure they match the board configuration.

A
General Information

A.1 Introduction

The DEC EtherWORKS *LC/TP* board lets you integrate IBM/PC/XT/AT and compatible personal computers into a network. After installing a DEC EtherWORKS *LC/TP* board, you can use various network software products to integrate the computer into a network.

You can install a DEC EtherWORKS *LC/TP* board in any IBM/PC/XT/AT or any personal computer that has an IBM/PC/XT/AT compatible bus.

You can connect the DEC EtherWORKS *LC/TP* board into either a Twisted-Pair network or a ThickWire network. You cannot, however, connect the DEC EtherWORKS *LC/TP* board to both kinds of networks at the same time.

A.2 Physical Description

The DEC EtherWORKS *LC/TP* board is a half-length IBM PC form-factor printed circuit board that uses the 8-bit bus connector with no "overhang" interference.

The circuit board measures 17.2 cm x 10.8 cm (6.75 inches x 4.25 inches); the length to the end of the connector is 18.7 cm (7.38 inches).

A.2.1 Functional Components

The major functional blocks on the DEC EtherWORKS *LC/TP* board are as follows:

- Ethernet network protocol controller (LANCE)
- Twisted-Pair (RJ45 connector) network interface
- Standard Ethernet ThickWire (DB-15S connector) network interface
- Network buffer RAM - 64 Kbytes
- Diagnostics and remote-boot ROM - 16 Kbytes (optional)
- 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 *LC/TP* board. The amber LED comes on during power-up testing and stays on if the test discovers a fault. The green LED, when on, indicates normal network activity. Chapter 3 contains additional information about the LEDs.

A.2.3 Environmental Requirements

The environmental (temperature and humidity) requirements for the DEC EtherWORKS *LC/TP* board are the same as for your IBM/PC/XT/AT personal computer.

A.3 System Specifications

The DEC EtherWORKS *LC/TP* operates correctly at an I/O channel bus speed of 4.77, 6, 8, or 10 MHz. Table A–1 lists the system specifications of the DEC EtherWORKS *LC/TP* board.

Table A–1 DEC EtherWORKS *LC/TP* System Specifications

Memory Buffer Size	Memory Addressing Range
64 Kbytes	C0000—CFFFF D0000—DFFFF E0000— EFFFF[1]
32 Kbytes	C8000—CFFFF D8000—DFFFF E8000— EFFFF[1]
2 Kbytes[2]	—-

I/O Memory Assignments	
I/O	200-20F 300-30F

Network Interface	Available Selections
Interrupt request (IRQ) line	IRQ2, IRQ3, IRQ4, IRQ5, IRQ7

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

[2]At this time, Digital PCSA software does not support the 2 Kbyte mode.

Table A–1 (Continued) DEC EtherWORKS *LC/TP* System Specifications

Power Requirements:	**Twisted-Pair: 5 watts (maximum)** **ThickWire: 9.2 watts (maximum)**

DC Amps @ +5V: 1.0 A (maximum)

DC Amps @ +12V: 0.35 A (maximum) Twisted-Pair (0.5 A [maximum] to power external transceiver, DEC AUI [H4000 or equivalent])

Bus Loads: 2 LSTTL

PC 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 PC documentation for this information.

NOTE

Jumpers W2, W3, W19, W20, and W21 are factory preset. Do not change these jumpers.

B
Installing an Option ROM

B.1 Introduction

The ROM chip is optional on the DEC EtherWORKS *LC/TP* board and is not required for correct operation. If you purchased the DEC EtherWORKS *LC/TP* board from Digital (PN DE101-AB), 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

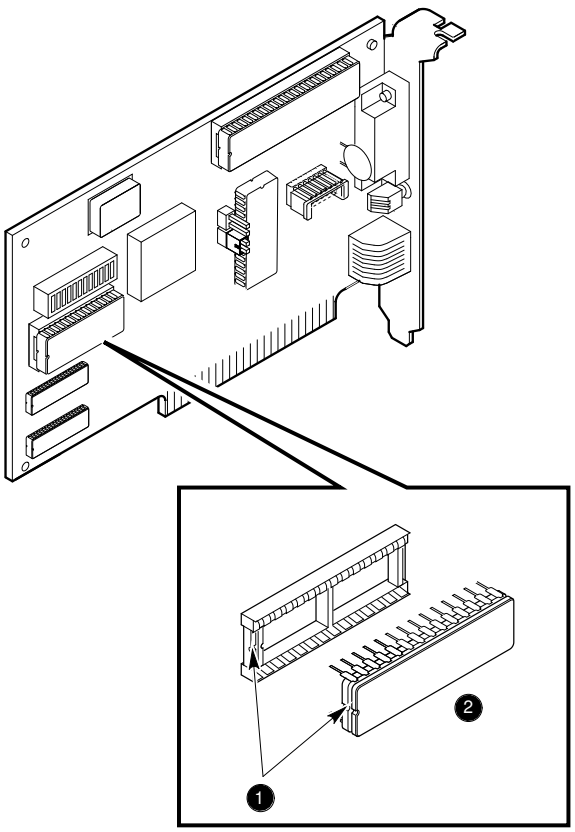
Refer to Figure B–1 to install the ROM chip.

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.
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 *LC/TP* ROM



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C
Cable Specifications

C.1 Cabling Requirements

Be sure you have a cable to connect the DEC EtherWORKS *LC/TP* board as planned. You need to consider either of the following types of cable connections.

- Unshielded Twisted-Pair cable—such as PN BN24F or PN BN26K, as many as 100 m (328 ft). Refer to Section C.1.3 and Section C.1.1 for more information.
  - — BN24F - Office cable with crossover for unshielded Twisted-Pair cable, (4-conductor, 2-twisted pair) to connect a workstation or PC to either an office wall plate or to a DECrepeater 350.
  - — BN26K - Point-to-point patch cable (8-conductor, 4-twisted pair) to connect a DECrepeater 90T to building wiring (wall plate or patch field).
- ThickWire transceiver cable—such as PN BNE4G-02, as many as 50 m (164 ft) maximum if going directly to a transceiver, or 45 m (148 ft) total maximum if connected to a DELNI.

For configuration planning, refer to the *DECconnect System Planning and Configuration Guide* (PN EK-DECSY-CG). The *LC/TP* board configuration guidelines are the same as the DEC Repeater 350, except for cable length. Also, daisy chaining is not permitted.

C.1.1 Unshielded Cable Environmental Constraints

Constraint	Description
In the US: FCC regulations	The use of unshielded Ethernet cables for the ThickWire 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 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 0.3 m (1 ft) from any type of high voltage power device or electrical noise source.

C.1.2 Shielded Twisted-Pair Cable Constraints

For countries that require shielded Twisted-Pair cables, use point-to-point shielded cable (PN BN26L) or Cross-over shielded cable (PN BN26N)

C.1.3 Unshielded Twisted-Pair Cable Requirements

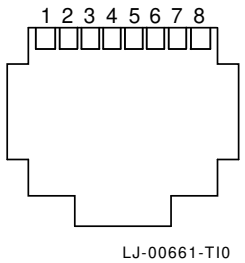
Requirement	Description
Wire specification	22-24 gauge wire, solid copper
Cable supported	DECconnect Twisted-Pair data cable, AT&T Type C or D, IBM Type 3, or Northern Telecom 4 pair unshielded Twisted-Pair cable
Cable length	90 m (296 ft) typical maximum from wiring closet or Satellite Equipment Room (SER) to office.
DC Resistance per conductor, maximum	0.094 Ω/m (28.6Ω/1000 ft)
Impedance at 5 MHz and 10 MHz	100Ω

C.1.4 CARD Connector Pinning (RJ45)

If you are using your DEC EtherWORKS *LC/TP* board to connect 10BaseT Twisted-Pair networks, the connector has the following pin signals (Figure C–1):

Pin Number	Signal Name
1	Transmit +
2	Transmit -
3	Receive +
6	Receive -

Figure C–1 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 Imbedded Crossover	Section D.2
DETPR to Workstation with Imbedded Crossover	Section D.3

D.1 Connecting a DECrepeater 350 to a Workstation

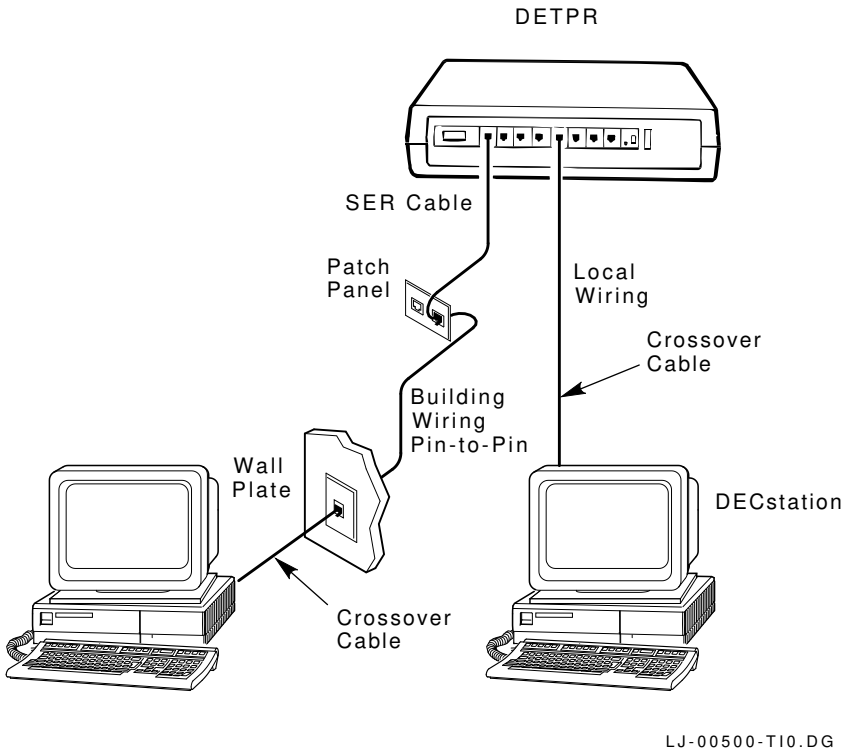
This section contains information you need to wire a DETPR to a workstation.

- Wiring 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.

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.

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

Figure D–1 Connecting a DECrepeater 350 to a Workstation



D.1.1 Cross-Over Connection

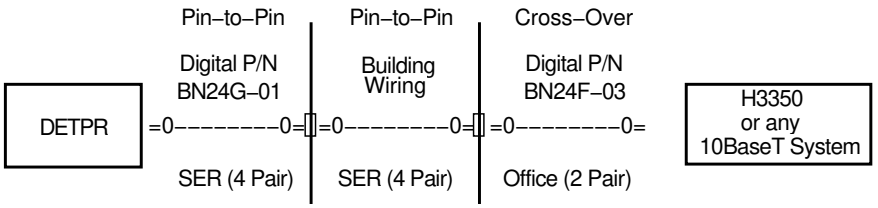
A cross-over connection must be implemented in every Twisted-Pair link. The cross-over connection connects the transmitter on one media access unit (MAU) to the receiver of the MAU at the other end of the Twisted-Pair link. The cross-over connection may be implemented either internally in a repeater, 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 shall be marked with an "X."

Figure D–2 depicts 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



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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.

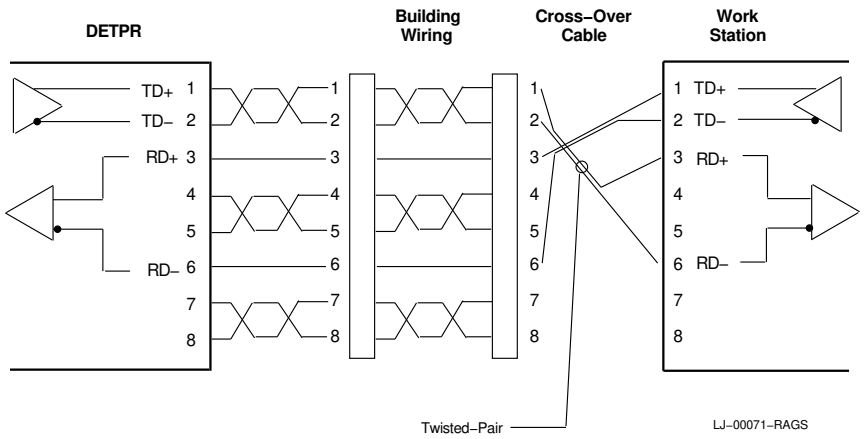
The building wiring is in accordance with prescribed standards and must follow appropriate pair and color code assignments.

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-M4506-78).

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.

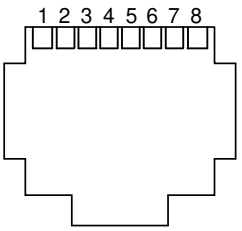
D.2.2 Connector Pinouts

Table D–1 describes the connector pinouts and building wiring for the DETPR, H3350, and any 10BaseT stations. 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 Station (DETPR Ports 1 to 8) and Building Wiring

Pin	Signal Name	Building Wiring 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

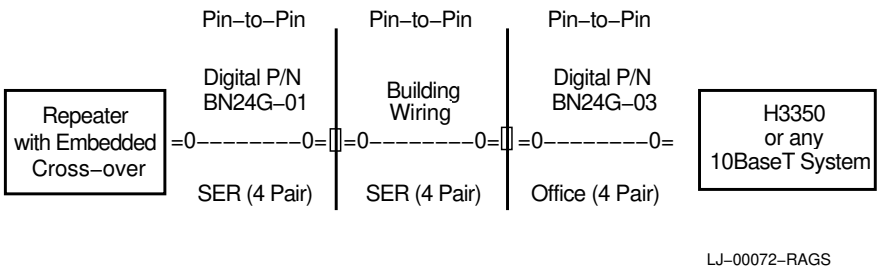
Figure D–4 8-Pin Modular Jack Pin Locations (Front View)



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

Figure D–5 depicts the connections and cables needed to connect a repeater that has embedded cross-over connections to an H3350 and any 10BaseT workstation. The station 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* (EB-K2407-41-001).

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

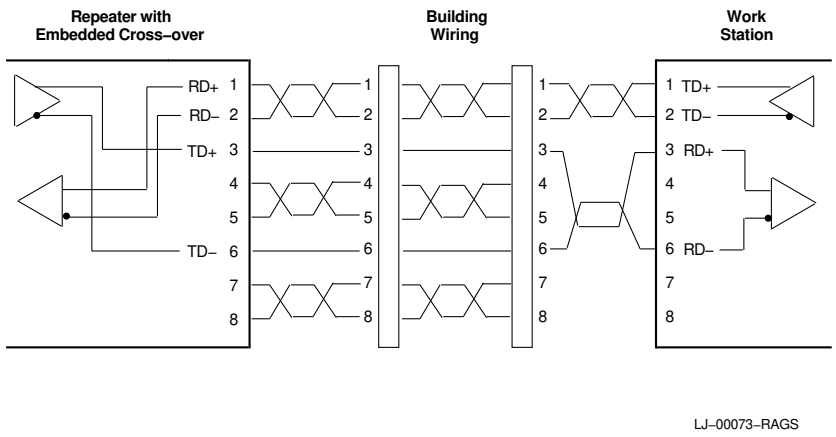


Table D–2 describes the pinouts for units with an embedded cross-over.

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