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**DECrepeater 350
Service Guide**

Order Number EK-DETPR-SV-001

Digital Equipment Corporation

First Edition, October 1990

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About This Guide

This manual provides a functional overview, configuration guidelines, troubleshooting information, and specifications for the DECRepeater 350 signal repeater. The DECRepeater 350 is also known as the Digital Ethernet twisted-pair multiport repeater (DETPR). It can connect eight node devices to a standard Ethernet backbone network. The DECRepeater 350 uses twisted-pair cable to transmit Ethernet signals between itself and the eight nodes.

The DECRepeater 350 is available in four versions:

Model	Version	Description	
DECRepeater	AA	Desktop, plastic enclosure	120 V
DECRepeater	AB	Desktop, plastic enclosure	220 V
DECRepeater	BA	Rackmount, aluminum box	120 V
DECRepeater	BB	Rackmount, aluminum box	220 V

Organization

This guide has four chapters and one appendix.

- Chapter 1 gives an overview of the DECRepeater 350 unit and an introduction to twisted-pair wiring.
- Chapter 2 gives a functional overview of the DECRepeater 350.
- Chapter 3 describes configuration rules and guidelines for installing and using the DECRepeater 350.
- Chapter 4 provides troubleshooting information for use when servicing the DECRepeater 350.
- Appendix A lists specifications, environmental constraints, and connector pinouts.

Related Documents

You can order the following documents from Digital:

Document	Order Number
Network and Communications Buyer's Guide	EC-I0391-42
DECconnect System General Description	EK-DECSY-GD
DECconnect System Requirements Evaluation Workbook	EK-DECSY-EG
DECconnect System Planning and Configuration Guide	EK-DECSY-CG
DECconnect System Installation Verification Guide	EK-DECSY-VG
Installing and Using the DECrepeater 350	EK-DETPR-IN
H3350 Transceiver Installation	EK-H3350-IN

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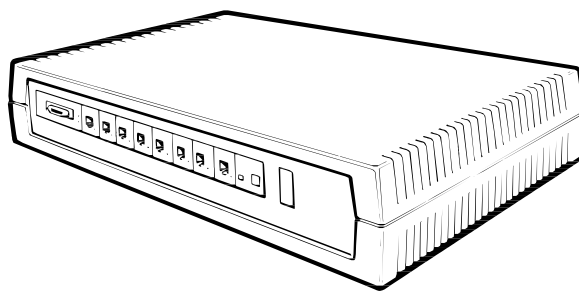
DECRepeater 350 Overview

This chapter provides an overview of the DECRepeater 350 (DETPR) signal repeater and twisted-pair technology.

DECRepeater 350 Unit

The DETPR is an ac-powered signal repeater that has eight twisted-pair ports and one *attachment unit interface* (AUI) port (Figure 1-1). The eight twisted-pair ports (two pairs for each port) use 8-pin modular jack (MJ) connectors. The AUI port has one 15-pin female D-subminiature connector to connect to an H4000/H4005 Ethernet transceiver or an IEEE 802.3 *medium attachment unit* (MAU).

The DETPR treats all of the twisted-pair ports and the AUI port as a common data bus by way of a gate array. The gate array performs all arbitration for the use of the ports. The joining of the twisted-pair ports and the AUI port creates a larger Ethernet. The DETPR passes all data received from a port to the other eight ports of the unit. The DETPR is not an Ethernet-addressable unit on the network.



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Figure 1-1 DECRepeater 350

Twisted-Pair Technology

A *twisted-pair* cable consists of two continuous insulated conductors helically twisted around one another. This wiring normally consists of 0.4 mm to 0.6 mm diameter (26 AWG to 22 AWG) unshielded wire in a multipair cable. The wire is used as a medium for a Type 10BaseT MAU and an Ethernet transceiver IEEE AUI cable.

The MAU provides an inexpensive, flexible electrical interface for attaching devices and stations to a local network medium such as Ethernet. The MAU is aimed primarily at office applications where telephone twisted-pair cable is often installed. This type of cable and connector offers simplicity of installation and reconfiguration.

A *repeater* unit is used to extend the physical system topology and to provide coupling for two or more segments. A *segment* is a medium used for interconnecting MAUs. This medium includes the *medium dependent interface* (MDI), a mechanical and electrical interface between the twisted-pair cable and the MAU.

2

Functional Description

This chapter provides a brief functional description of the DETPR repeater.

Overview

The DETPR is used to expand the topology of the Twisted-Pair Ethernet to the extended Ethernet LAN. The DETPR restores the amplitude and timing margins as signals are propagated through the unit to the other ports attached to the DETPR.

The passing of data from one port to eight other ports is not a simple switching task. The timing differences of the ports require the buffering of the received data. Collisions on any port on the network are passed to all of the other ports. The received data is decoded by a single-chip Manchester encoder/decoder to separate the data and the clock for the gate array. All packets that are received have the 64-bit preamble restored as it is repeated to the other ports.

The contention-free operation of the DETPR is as follows:

1. A signal is received and detected on one of the ports.
2. A preamble is sent to all of the other eight ports.
3. The end of the preamble is detected on the receive port, and the replication of the data to the other ports is begun.
4. The collision-detect input from all other ports is continuously monitored and enforced at all other ports as collisions occur.

The data path of the DETPR is made up of the TPMAU (T7220) media dependent interface (MDI) chip, the access unit interface (AUI), the serial interface adapter (SIA), and a gate array. Figure 2-1 is a simple functional block diagram of the DETPR.

4 Functional Description

The gate array contains four subsystems to control the flow of data:

- Chip data path subsystem
- Control subsystem
- Automatic partition and reconnection subsystem
- Self-test subsystem

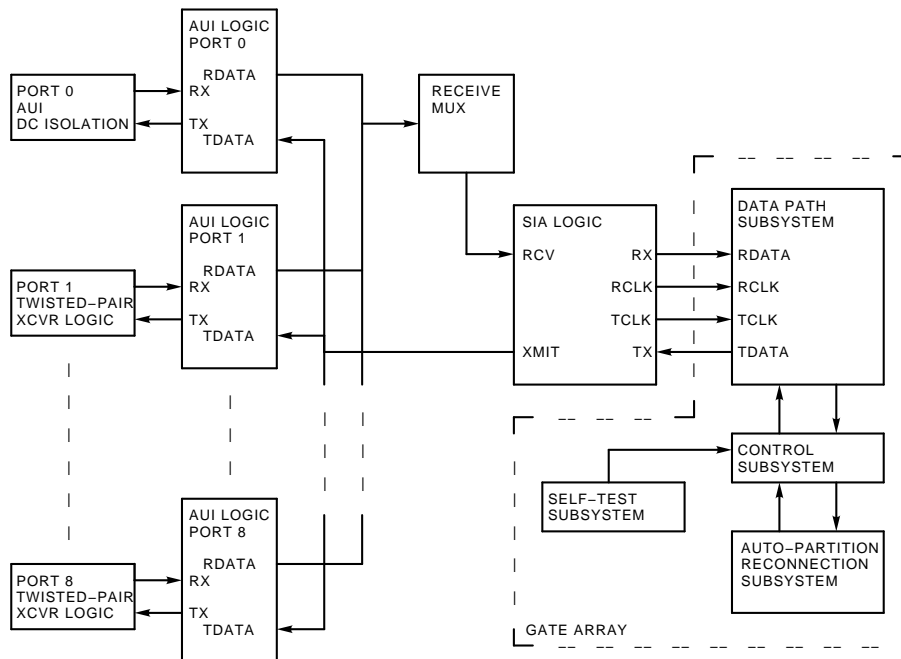


Figure 2-1 DETPR Functional Block Diagram

Data Path

Data is received by the transceiver chip from the twisted-pair wire and sent to the Manchester decoder. The decoded data is sent to the gate array, where it is buffered in a first-in/first-out (FIFO) buffer. The transmit ports are determined, the preamble is regenerated, and the data is sent to the selected transmit ports.

Chip Data Path

The chip data path is made up of a multiplexer, a FIFO buffer, and a transmit selector circuit. The function of the data path is to select the data from the Manchester decoder and send it to the FIFO buffer.

The FIFO buffer is a 32-bit buffer for data received from any of the ports. It allows for speed differences within the network and holds the data until the entire 64-bit preamble is regenerated.

The transmit-data selector receives data from the FIFO buffer and transmits that data to the Manchester encoder.

Receiver Function

The receiver function consists of a twisted-pair wire or a D-subminiature connector, a transceiver and AUI logic, a receive-data and receive-clock multiplexer, a Manchester decoder (SIA logic), and the FIFO buffer in the gate array. The receive function works as follows:

1. The transceiver and AUI logic for a twisted-pair port, or the AUI port (0) with an attached transceiver, detects carrier and collision information.
2. The carrier and collision information is filtered and sent to the gate array. This information is used to determine the receive port and to select the transmit ports.
3. The receive channel is determined and its data input is selected.
4. The SIA logic decodes data encoded by the Manchester encoder and sends it to the gate array.
5. The data is buffered in a FIFO buffer and held until the entire preamble is sent to the eight transmitting ports.
6. The receive data is sent to the eight transmitting ports.

Transmit Function

The transmit logic uses a Manchester encoder that accepts data from the chip data path, encodes it to the Manchester format, and transmits that data to the selected transmit ports. The transmit function works as follows:

1. The gate array sends the regenerated preamble and data to the SIA logic.
2. The SIA logic encodes the data in the Manchester format.
3. The SIA logic sends the encoded data to the AUI logic.
4. The AUI logic sends the data to the selected transmit port transceivers or to the AUI port.

Collision Enforcement

On transmission, the DETPR monitors for collisions and logical (link) integrity faults on each port. When a collision is detected on a transmit port, the DETPR jams all other ports according to the mode of operation (that is, 802.3 96-bit JAM). The JAM continues until the proper amount of JAM bits have been sent and the collision has stopped. In the case of a received collision, the DETPR enters the JAM mode on all other ports except for the port that received the collision. After the JAM has timed out, the DETPR waits for a specified amount of time as determined by the selected mode.

Segmentation of Circuits

Segmentation is the removal of a port from active repeating. The use of segmentation increases the availability of the network. The segmentation of a port occurs when a fault is detected on the DETPR port. After a port is segmented, data received by the port is not repeated to any other ports. However, the faulty port continues to transmit data in order to verify that it is still faulty. This mode of operation is known as *segmentation*.

The DETPR restores a *segmented* port when a reception or transmission is completed without errors. By definition, an error-free reception has (1) no detected collisions, and (2) a minimum of 512-bit times without a logical (link) integrity fault.

The DETPR segments a port for the following conditions:

Excessive Collisions - Each DETPR port has a counter that is incremented for each successive collision. If the counter reaches 64, the port is segmented. The counter is reset on any transmission without a collision.

No Loopback— This condition indicates the DETPR did not detect a loopback (received data) of the transmitted data within a 256-bit time. The cause could be a defective external transceiver or cable fault for port 0, or a defective transceiver for ports 1 through 8.

Link Integrity Fault (Logical)— This condition is the dropout of the received data detect carrier from a port after the data has been sensed on a given transmission to the port. The cause could be noise on the line. This fault is only for one case—the loss of carrier not followed by a collision.

The port is segmented after this condition occurs on two consecutive transmissions. The logical link integrity failure can occur at any time in the repeated packet. The port is restored when a collision is sensed on the port that was segmented due to link failure. If a collision occurs on the port before two failed link packets are sensed, the count is cleared. The port is restored after the completion of four good transmissions.

Excessive-Length Collision— This indicates the port has seen the collision-sense input active for greater than 200 μ sec.

3

Configuration Rules

This chapter provides guidelines, rules, and constraints associated with configuring and using the DETPR twisted-pair repeater.

DETPR Configuration Guidelines

Any configuration that uses DETPRs becomes a multisegment Twisted-Pair Ethernet. You cannot use more than two repeaters of any type between any two nodes on an Ethernet/Twisted-Pair Ethernet. DETPRs have eight (terminated) 8-pin MJ connectors to support up to eight (radial) twisted-pair segments. DETPRs also have a ninth connector for an optional connection to the one backbone segment of an Ethernet or ThinWire Ethernet, using an Ethernet transceiver cable connected to an H4005/H4000-BA or DESTA-B unit.

The concept of labeling only one segment of an Ethernet/Twisted-Pair Ethernet as the backbone enforces the *two-repeater rule*. Multiple backbone segments can interconnect using DEBET bridges.

NOTE

The DETPR is an active, twisted-pair Ethernet repeater. It is not compatible with passive implementations of a twisted-pair Ethernet.

Station Equipment Connection Guidelines

- Maximum number of stations on a segment: 1
- Maximum number of male/female junctions on a segment: 6
Each of the following equals one male/female junction:
 - Wallplate connection
 - DETPR port connection
 - Patch panel connection

DELNI/DETPR Guidelines

This section provides guidelines for Ethernet pyramids and standalone pyramids.

Ethernet Pyramid

You can connect up to eight DETPRs to a backbone through a single transceiver, using a DELNI interconnect unit. To do this, you need $n+1$ Ethernet transceiver cables, where n is the number of DETPRs. This configuration is called a pyramid. You can have more than one such DELNI/DETPR pyramid on a backbone, because each is treated as a normal single load by the backbone.

DELNI/DETPR pyramids can only use the H4005/H4000-BA with the heartbeat signal disabled, or a DESTA unit with the heartbeat/SQE test disabled. You cannot arrange DELNI units in a pyramid to increase the maximum number of DETPRs per transceiver to more than eight.

You can use maximum-length, 40-meter transceiver cables on either side of the DELNI, but the thin/lossy office transceiver cable with its 4-to-1 length reduction is recommended for neatness. Also, Ethernet backbone segments used by such pyramids are limited to 300 meters instead of the usual 500 meters.

Standalone Pyramid

Just like single DETPRs, DELNI/DETPR pyramids can work in standalone configurations without a backbone connection. In this case, you **must** keep the DELNI in **global mode**, with an AUI loopback connector (PN 12-222196-01) connected to the ninth connector normally used for the backbone connection. In this configuration, the SQE test is no longer present on the LOCAL DELNI ports. Therefore, the absence of the test must be taken into account when using the DELNI for other Ethernet controllers.

System Constraints and Guidelines

Twisted-pair cable is the physical medium that allows the DETPR to achieve a low-cost connection to an Ethernet. The characteristics of twisted-pair cable are drastically different from the characteristics of Ethernet coaxial cable. However, the overall system constraints in terms of timing and delay budgets remain the same. The DETPR has eight twisted-pair ports with integral transceivers.

10 Configuration Rules

Twisted-pair cable segments consist of one link of up to 100 meters, maximum. A link is a single length of twisted-pair cable with male 8-pin MP connectors at each end. The delay for a twisted-pair cable segment shall not exceed 1000 ns, and its loss shall not exceed 11.5 db.

You must use an Ethernet transceiver cable for any connection to an Ethernet transceiver (H4000 or the first eight ports of DELNI). For connections to an IEEE-802.3 transceiver (H4005 or DESTA), you must use an IEEE-802.3 transceiver cable.

Twisted-Pair Wire Guidelines

Link length:	100 meters maximum with 24 AWG (typical)
Cable type:	Four twisted-pair 24 AWG or 22 AWG, DECconnect, AT&T type C or D, or equivalent. Maximum ac loss: 0.1 db/meter at 10 MHz Maximum RDC: 0.094 ohms/meter (28.6 ohms/1000 feet) Impedance: 100 \pm 15 ohms at 5 MHz and 10 MHz Near-end crosstalk: 30 db maximum at 10 MHz
Number of nodes:	One node for each link
Termination:	100 ohms \pm 1% at both ends of the segment.

Twisted-Pair Ethernet Restrictions

To ensure the data integrity of the network, you should follow these restrictions for the twisted-pair cable environment:

- No unrepeatd branches are allowed off a twisted-pair Ethernet segment.
- No telephone service should share the same cable sheath.

4

Troubleshooting

This chapter provides information on troubleshooting the DETPR. The chapter covers the diagnostic tools available and how to use them to isolate a problem.

Before beginning to troubleshoot the DETPR you should

1. Verify the installation of the unit.
2. Note the fault condition.
3. Isolate the problem. When isolating a problem, you have to look at three basic components of the system:
 - The DETPR.
 - The wiring between the DETPR and the station equipment.
 - The station equipment. This can be a workstation or a personal computer (PC) using an IEEE 802.3 MAU, such as Digital's H3350 transceiver or DE201 twisted-pair cable adapter.

Diagnostics

This section describes the DETPR unit's internal power-up test and external test.

Internal Power-Up Test

This test verifies the collision presence test (CPT) function on the twisted-pair ports at the end of the internal self-test. At this time, the CPT is disabled to all the twisted-pair ports. The CPT test sends data to all the ports externally. Any collision sensed on a port verifies the collision presence test.

Test features

- Activated automatically upon initial power-up (plugging in the power cord).
- Runs for one complete cycle on the nine ports of the gate array.
- Passes each port a packet containing 256 bits of preamble and 1792 bits of data (1s). The data is looped internal to the gate array in the internal FIFO buffer, then compared.
- Checks the collision counters and the segmentation of each port before completion.
- If an error is detected on a port, the port's error indicator turns on.

External Self-Test

The sensing of collisions during the verification of a port is handled as a retry. This is done until the port exceeds a collision count of 64, at which time the port is segmented. If an error is sensed during data comparison, the port is permanently segmented. This segmentation can only be cleared by reperforming and passing the external self-test.

Test features

- Activated by pressing the **Test** button.
- Runs after collision presence test (CPT) is complete.
- Loops a packet of 256 bits of preamble and 1792 bits of data (0s), and compares the looped packet.
- Tests each of the eight twisted-pair ports.
- Tests the Ethernet port.
- Checks for link integrity.
- Checks for loopback capability of the transceiver chips.

How These Tests Differ

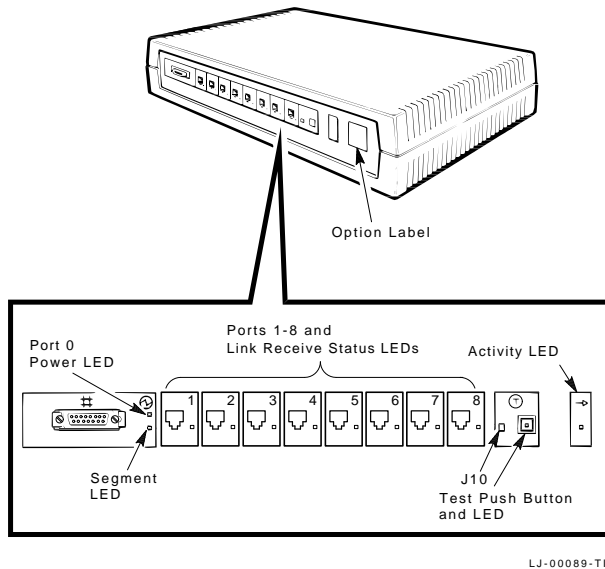
Internal	External
Gate array; a CPT/SQE test for each port; preamble (all 1s)	A CPT/SQE test for each port; preamble (all 0s)
Data path to the external interface circuitry	Data path to the external interface circuitry
	Ability to receive and transmit data

Standalone or Network Testing

Testing the DETPR in a standalone configuration isolates the unit from potential external cabling problems or adverse network conditions. Standalone testing allows you to verify that a problem is internal to the device.

DETPR Control Panel Indicators

The indicators on the DETPR are used in troubleshooting a failing unit. Figure 4-1 show the location of the various indicators on the DETPR. Table 4-1 describes the function of each indicator.



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Figure 4-1 DETPR Control Panel

Table 4-1 Control Panel Indicators

Indicator	When On . . .
Port 0 power LED	+12V is available at the port connector.
Port 0 segment LED	Port 0 is segmented.
Link receive status LED, ports 1 to 8	The port is ready to receive or transmit data. When off, the port is segmented. When blinking slowly (once a second), the port was segmented and has been restored. When blinking fast, there is port activity.
Test status LED	The external self-test is being run.
Activity LED	There is network activity.

Problem Solving

This section describes tests and procedures you can use when troubleshooting the DETPR. The following tests can help you determine the cause of a problem:

- Power-up test
- Self-test
- Test with station equipment connected to the DETPR
- Test with the Ethernet connected to the AUI port (port 0)
- Crossover test

Each of the following test descriptions includes a table that shows how to interpret test results. The tables also provide suggested solutions to problem.

Power-Up Test

The power-up test runs automatically when ac power is applied to the DETPR. After eight seconds, the results of the power-up test should match those described in *Installing and Using the DECRepeater 350*. If the results are different, use Table 4–2 as a guide to determine the probable cause and the suggested solution.

Table 4–2 Power-Up Test Troubleshooting

If...	Then...	Do this...
The fan does not run continuously.	The unit is faulty.	Replace the unit.
The power LED is blinking.	The unit is faulty.	Replace the unit.
All LEDs are off.	There is a power supply problem.	Check the power outlet and cord to make sure the unit is receiving ac power. If the power LED is still off, replace the unit.
The power LED (+12 V) is off.	The transceiver or cable might have a short.	Disconnect the transceiver cable and use the loopback connector to verify. If the power LED is still off, replace the unit.

Self-Test

After the DETPR has powered up successfully, you can perform an external test. After three seconds, the results of the self-test should match those described in *Installing and Using the DEC repeater 350*. If the results are different, use Table 4-3 as a guide to determine the probable cause and the suggested solution.

Table 4-3 Self-Test Troubleshooting

If...	And...	Then...	Do this...
The port 0 segment LED is off.	The loopback connector is not connected.	The port 0 segment function is not working.	Replace the unit.
The port 1 to -8 LEDs stay on (green).	The lines are not connected.	The twisted-pair port is not working.	Perform the crossover test, Table 4-6.
The power LED is on (green).	The loopback connector is connected, but the loopback LED is out.	The loopback is faulty.	Replace the loopback connector.

Test with Station Equipment Connected to DETPR

Installing and Using the DECrepeater 350 lists the correct LED pattern that should appear 3 seconds after you push the **Test** button. If you observe a different pattern, use Table 4-4 as a guide to determine the probable cause and the suggested solution.

Table 4-4 DETPR-to-Station Equipment Test Troubleshooting

If...	Then...	Do this...
The port 0 segment LED is on (amber).	The loopback connector is faulty, or port 0 is segmented.	Replace the loopback connector or the unit.
The LED for a connected port (1 to 8) or station is off.	The link, port, or station is faulty.	Test the port with the crossover test (Table 4-6), check the link, and connect the station to the operating port.
The LED for a connected port (1 to 8) is off.	The port is segmented because of a station or cabling problem.	Press the Test button to reset. If the test does not reset segmentation, then disconnect the link to the faulty station.
The LED for a connected port (1 to 8) is blinking slowly.	The segmented port is reset. (Test LED is green.)	No action is necessary.
The LED for an unconnected port (1 to 8) is not blinking (green) after the self-test.	The port is faulty.	Replace the unit.
The Test LED is on (amber).	The unit is running the test.	Wait 30 seconds.
The Test LED does not turn off after 30 seconds.	The Test LED or unit is faulty.	Replace the unit.
The activity LED is off.	There is no network activity.	No action is necessary.

Test with Ethernet Connected

Installing and Using the DEC repeater 350 lists the correct LED pattern that should appear 3 seconds after the test starts. If you observe a different pattern, use Table 4-3 as a guide to determine the probable cause and the suggested solution.

Table 4-5 Ethernet Test Troubleshooting

If...	Then...	Do this...
The port 0 segment LED is on (amber).	The cable is not connected.	Check the cable to make sure it is connected properly.
The port 0 segment LED is on, and the port 0 cable is properly installed.	The cable, the transceiver, or the network link is faulty.	Replace the cable or transceiver, then press the Test button to reset. If the test does not reset, correct the network fault.
The LED for a connected port (1 to 8) with station activity is not blinking.	The station connection is faulty.	Replace the station connection and perform the crossover test (Table 4-6).
The activity LED is not flickering.	There is no network activity.	No action is necessary.

Crossover Test

If any two good ports are connected together, you should observe that the green LEDs on both ports turn on. This indicates a successful link test in both directions. This is true for DETPR-to-station and DETPR-to-DETPR connections, and between ports on the same DETPR.

To check a suspected 1 to 8 twisted-pair port:

1. Connect one end of a twisted-pair crossover office cable to the suspected port.
2. Connect the other end to a known good port. If you perform this test between ports on the same DETPR, no network traffic should be passed, so you must remove all active network connections. Do not press the **Test** button during the connection.

The crossover test isolates a problem with any of the ports 1 to 8. Table 4-6 shows the expected LED indications after three seconds.

Table 4-6 Crossover Test Troubleshooting

If Known Good Port is...	And Suspected Port is...	Then the Suspected...	Do this...
On (green)	Off	Receive port is inoperative* or segmented.	Disconnect the faulty port and replace the unit at your earliest convenience.
Off	On (green)	Transmit port is inoperative* or segmented.	Disconnect the faulty port and replace the unit at your earliest convenience.
Off	Off	Transmit and receive ports are inoperative* or segmented.	Disconnect the faulty port and replace the unit at your earliest convenience.
On (green)	On (green)	Ports are both operative.	No action is necessary.

*Reset segmentation by removing the office crossover cable and pressing the **Test** button. If the **Test** button is pressed during the crossover test, and both ports are good, then both LEDs turn off (segmentation condition).

Isolating Cable Faults

If a DETPR and H3350 MAU are connected by twisted-pair cabling, observing their LEDs can help you isolate cable faults. Table 4–7 describes the meaning of different LED displays and the possible cable fault indicated.

Table 4–7 DETPR and H3350 Twisted-Pair Cable Fault Isolation

If...	And...	Then...	Check for a...
The H3350's LI LED is off, and its X LED is on or blinking.	The DETPR's port LED is on.	The H3350 is not receiving link pulses. The H3350 may try to transmit, but cannot because it is not receiving link pulses from the DETPR port. The DETPR port LED does not blink when the X LED blinks. Note: The X LED on the H3350 may blink, indicating that the H3350 is trying to receive data from its AUI port. However, data is not transmitted because of the lack of link pulses.	Short or open in the DETPR's transmit pair.
The H3350's LI and CP LEDs are blinking when its X LED is blinking	The DETPR's port LED is off or blinking.	A collision is occurring whenever the H3350 tries to transmit. When this happens, the X, LI, and CP LEDs blink together. Note: If there is DETPR activity present, the DETPR's port LED should be off, indicating port segmentation. (See the following.)	Short between the transmit pair and the receive pair.
The H3350's LI LED is on or blinking, and its X LED is on.	The DETPR port's LED is off.	A collision is occurring each time the DETPR port tries to transmit. The DETPR port is segmented and continues to transmit link pulses and data.	Short between the transmit pair and the receive pair.

Table 4-7 (Cont.) DETPR and H3350 Twisted-Pair Cable Fault Isolation

If...	And...	Then...	Check for a...
The H3350's LI LED is on, and its X LED is on or blinking	The DETPR's port LED is off.	The H3350 is trying to transmit. The DETPR port is segmented because it is not receiving link pulses or data from the H3350. The LI LED will not blink because the DETPR port cannot transmit, due to the lack of link pulses.	Short or open in the DETPR's receive pair.
The H3350's LI LED is on, and its X LED is on.	The DETPR port's LED is off.	The DETPR port is trying to transmit, but cannot because it is not receiving link pulses or data from the H3350. The DETPR port segments on DETPR activity. Note: The H3350's LI LED does not blink with DETPR activity.	Short or open in the DETPR's receive pair.

A

DETPR Specifications

This appendix list the physical, electrical, and environmental specifications for the DETPR unit. The appendix also provides part numbers, cable requirements, and connector pinouts.

Physical Specifications

Part	Height	Width	Depth
DETPR-AA /BA	4.63 inches (11.76 cm)	19.25 inches (48.9 cm)	12.00 inches (30.48 cm)
DETPR-AA /BB	3.44 inches (8.74 cm)	17.0 inches (43.18 cm)	11.75 inches (29.85 cm)

Electrical Specifications

The DETPR input voltage is factory set, and is not field selectable.

AC Power Requirements

Requirement	DETPR-AA/BA	DETPR-AB/BB
Factory-set normal voltage	110 V to 120 V, 3-wire, single phase	220 V to 240 V, single phase
Frequency	47 Hz to 63 Hz	47 Hz to 63 Hz
Running current (maximum)	0.725 amps	0.360 amps
Power (maximum)	80 watts	80 watts
Overload protection	Fuse (not field replaceable) 3 AG, 2.0 amps, 250 V	Fuse (not field replaceable) 3 AG, 2.0 amps, 250 V

NOTE

AC power is provided to the unit through a single standard (3-prong) IEC connector. AC power is not switched, to prevent the accidental loss of power to the unit. When powered down, the unit exhibits no load to any of the ports. The fuse is mounted on the power supply module and is not field replaceable.

DC Power Requirements**Voltages**

+5.1 V, +12.0 V, and +10.0 V

Environmental Requirements**Temperature**

Rapid temperature changes may affect operation. Therefore, do not operate the DETPR near heating or cooling devices, large windows, or doors that open to the outside.

- Operating: 5° to 50°C (41° to 122°F)
The DETPR must be within operating temperature range before power-up.
- Nonoperating: -40° to 66°C (-40° to 151°F)
- Maximum temperature change per hour: 20°C (36°F)

Altitude

If you are operating the DETPR above 2.4 km, decrease the operating temperature by 1.8°C/1000 m (1°F/1000 ft).

- Operating: 2.4 km (8000 ft)
- Nonoperating: 9.1 km (30,000 ft)

Relative Humidity

- Operating: 10% to 90% (noncondensing)
40% to 60% is normally recommended.
- Nonoperating: 10% to 90% (noncondensing)

Part Numbers

Part	Part Number
Transceiver port Ethernet loopback connector	12-22196-01
Rackmount kit (for -BA, -BB versions only)	H041-AA
Power cord	
United States	17-00083-09
Ireland, United Kingdom	BN02A-2E
Austria, Belgium, Czechoslovakia, Finland, France, Germany	BN03A-2E
Switzerland	BN04A-2E
Australia, New Zealand	BN05A-2E
Denmark	BN06A-2E
Italy	BN07A-2E

Cable Requirements

For configuration planning information, see the *DECconnect System Planning and Configuration Guide*. The configuration guidelines for the DECRepeater 350 are the same as for the DEMPR unit, except cable lengths are different and daisy-chaining is not permitted with the DECRepeater 350.

Cable Type	Digital Part Number	Length Restrictions
Transceiver cable	BNE3H BNE4C	50 meters (164 feet) maximum if going directly to a transceiver, or up to 45 meters (148 feet) total maximum if connected to a DELNI unit.
Twisted-pair cable	H8245A (non-Plenum rated) H8246A (Plenum rated)	Maximum of 90 meters/port.

Cable Type	Digital Part Number	Length Restrictions
Twisted-pair office crossover cable, 8MP × 8MP, 4 cond, 2 UTP office cable with crossover 10BaseT	BN24F	Available in lengths of 3, 4, and 7 meters
SER cable, 8MP × 8MP, 8 cond, 4 UTP patch cable pin to pin	BN24G	Available in lengths of 1, 3, 4, and 7 meters

Unshielded Twisted-Pair Cable Requirements

Requirement	Description
Wire specification	22 to 24 gauge wire, solid copper
Cable supported	DECconnect twisted-pair data cable (H8245A or H8246A), AT&T Type C or D, IBM Type 3, or Northern Telecom 4 Pair unshielded twisted pair
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 (28.6 Ω /1000 ft)
Impedance at 5 MHz and 10 MHz	100 Ω

Unshielded Twisted-Pair Cable Environmental Constraints

Constraint	Description
Signals	No other signals should be used in the same cable sheath. For example, voice and data signals cannot be run within the same sheath.
Noise	Unshielded twisted-pair cable must remain at least 30.48 cm (1 ft) from any type of high-voltage power device or electrical noise source.

Connector Pinouts

The DETPR has an 8-pin MJ connector for its twisted-pair ports (1 to 8) and a 15-pin D connector for its AUI port (0).

8-Pin MJ Connector (Ports 1 to 8)

Pin	Signal Name
1	Transmit +
2	Transmit –
3	Receive +
4	NC (no connection)
5	NC
6	Receive –
7	NC
8	NC

15-Pin D Connector (Port 0)

Pin	Signal Name
1	NC (no connection)
2	Collision presence +
3	Transmit +
4	Logic ground
5	Receive +
6	Power return
7	Ground (not used)*
8	Logic ground
9	Collision presence –
10	Transmit –
11	Logic ground

*Terminated to ground by a 0.1 μ fd capacitor and balanced by a 39.2 ohm resistor.

Pin	Signal Name
12	Receive –
13	+12 Vdc power
14	Logic ground
15	Ground (not used)*
Connector (metal shell)	Chassis ground

*Terminated to ground by a 0.1 μ fd capacitor and balanced by a 39.2 ohm resistor.
