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<td>Troubleshooting Flow Diagram</td>
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CHAPTER 1
INTRODUCTION

The Communications Options Minireference series of manuals provide Field Service personnel (trained in Digital Equipment Corporation's communications options, DEC modem products, and Ethernet products) with easy-to-use references that focus on essential installation and maintenance procedures.

This series of manuals is a replacement for and supersedes the Communications Options Minireference Manual (EK-CMINI-RM). All of the information contained in the Communications Options Minireference Manual is included. Information concerning most of Digital Equipment Corporation's new communication options, modem products, and Ethernet products has also been included. These manuals will be updated as new communications options, modem products, and Ethernet products are produced.

To effectively use these reference manuals and to quickly locate the desired information, it is important that the user be aware of the organization and content of the various manuals.

- Volume 1 contains generic communications information such as: cables, test connectors and terminators, special test programs, and special tools and equipment. Volume 1 also contains information concerning installation and maintenance of some of the communications options.
- Volume 2 contains only communications options. Communications options are presented in alphanumerical order beginning in Volume 1 and continuing into Volume 2.
- Volume 3 contains information concerning Digital Equipment Corporation's modem products.
- Volume 4 contains information concerning installation and maintenance of Ethernet products. Chapters include Ethernet Devices, Cables, Special Tools and Test Equipment, Accessories, and Network Troubleshooting. Provisions are made for adding information as it becomes available.

Option-specific data is located alphanumerically by option designation; that is, DECSA followed by DELNI through H4000.

For consistency and familiarity, the material contained in each option-specific section is organized and presented in the same format and sequence; installation data (which includes installation flowcharts, module outline drawings, device/vector address selection, and various other switch/jumper selectable options) is presented first. This material is followed by cabling diagrams, diagnostics (PDP-11 diagnostics, VAX-11 diagnostics, or both), maintenance aids, and Tech Tip/FCO index.
CHAPTER 2
ETHERNET DEVICES

2.1 INTRODUCTION
This chapter contains all information needed to configure, install, and test a variety of Digital Equipment Corporation's Ethernet devices.

The purpose of this chapter is to provide Field Service personnel (trained in servicing Ethernet devices) with a quick reference guide, highlighting important factors concerning installation and maintenance. The information contained in these sections is, therefore, short and to the point. If more detailed information is needed, reference should be made to microfiche, the technical manual, or other reference material concerning that particular device.

Each specific section contained in this chapter is organized in alphanumeric order.
DECSA COMMUNICATIONS SERVER

General Description
The DECSA communications server is an Ethernet-based communication subsystem for local area networks. The four basic versions of the communications server are:

- **DECSA-CA** Terminal server – supports up to 16 lines for VT100-like asynchronous terminals (see note).
- **DECSA-DA** Terminal server – supports up to 32 lines for VT100-like asynchronous terminals (see note).
- **DECSA-EA** DECnet router/X.25 gateway – supports up to 8 lines for interconnection between DECnet and X.25 networks.
- **DECSA-FA** DECnet/SNA gateway – supports up to 2 lines for interconnection between DECnet networks as well as between DECnet and SNA networks.

NOTE
The terminal server configurations provide the following features.

- Asynchronous terminal support
- Modem control
- Auto baud detection
- Split-speed terminal operation (up to 19.2K bits/s full-duplex)

Reference Documentation
Refer to the following documents for more information on the DECSA communications server.

- *Ethernet Communications Server Operations and Maintenance Guide* EK-DECSA-OP
- *Ethernet Communications Server Site Preparation and Planning Guide* EK-DECSA-SP
- *Ethernet Communications Server Installation Guide* EK-DECSA-IN
- *Ethernet Communications Server Technical Description* EK-DECSA-TD
- DECSA Print Set MP01385
- DECSA Microfiche EP-DECSA-OP

DECSA Communications Server Hardware Components
The following hardware components make up the DECSA communications server.

- PDP-11/24 processor
- Memory module (512K bytes or 1M byte)
- DEUNA Ethernet to UNIBUS adaptor
DECSA INSTALLATION

- Console/bootstrap/terminator (CBT)
- Protocol assist modules (PAM) set
- Line cards (see the following table)
- H7200 and H7211 power supply modules

The following table describes the line cards and data types supported by the different versions of the DECSA communications server.

<table>
<thead>
<tr>
<th>DECSA Version</th>
<th>Line Card Supported</th>
<th>Module Number</th>
<th>Recommended Cable</th>
<th>Module Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECSA-CA</td>
<td>DCSAX-LC</td>
<td>M3102</td>
<td>BC22D</td>
<td>Two line asynchronous up to 19.2K bits/s each full-duplex, RS-232-C/CCITT V.24.</td>
</tr>
<tr>
<td>DECSA-DA</td>
<td></td>
<td></td>
<td>BC22E</td>
<td></td>
</tr>
<tr>
<td>DECSA-EA</td>
<td>DCSAX-LA</td>
<td>M3100</td>
<td>BC17C</td>
<td>One line synchronous up to 19.2K bits/s full- or half-duplex, RS-232-C/CCITT V.24.</td>
</tr>
<tr>
<td>DECSA-FA</td>
<td></td>
<td></td>
<td>BC17D</td>
<td></td>
</tr>
<tr>
<td>DECSA-EA</td>
<td>DCSAX-LB</td>
<td>M3101</td>
<td>BC17E</td>
<td>One line synchronous up to 500K bits/s full- or half-duplex, CCITT V.35.</td>
</tr>
<tr>
<td>DECSA-FA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**
The following cables are recommended for use with RS-232-C/V.24 configurations.

- BC22D – Asynchronous null modem cable
- BC22E – Asynchronous modem extension cable
- BC17D – Synchronous null modem cable
- BC17C – Synchronous modem extension cable

The BC17E synchronous modem cable is recommended for use with V.35 configurations.

**DECSA Communications Server Software Components**
The following software components are included with any DECSA configuration.

- RSX-11S operating system
- NS: QIO$ interface (logical link facility)
- NX: QIO$ interface (direct line access facility)
- System level interface
- Initialization task
- PAM device driver
- DEUNA device driver
- Network management
- Down-line load/up-line dump across the Ethernet

DECSA-2
Remote console support (console carrier only)
Loadable diagnostic image (LDI)

The following table indicates which additional software is required for DECSA-EA and DECSA-FA DECnet routers and/or gateways.

Table 2 Additional Software Requirements for DECnet Routers

<table>
<thead>
<tr>
<th>Software Package</th>
<th>Configuration</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DECSA-EA</td>
<td>DECSA-FA</td>
</tr>
<tr>
<td>Looper/mirror</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Line watcher</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>RSX extension package (XEP)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>VAX X.25/X.29 extension package (XEP)</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>DECnet/SNA gateway software</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

System Placement
The DECSA system should be placed on a table that supports at least 57.0 kg (125.7 lbs).

CAUTION
The DECSA system weighs approximately 50 kg (110.25 lbs). Three people are required to lift or move the system.

Power Requirements
The operating range of the DECSA system is contained in the following table.

Table 3 DECSA Power Requirements

<table>
<thead>
<tr>
<th>Nominal Voltage Required</th>
<th>Voltage Range</th>
<th>Current*</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 Vac (rms)</td>
<td>90-128</td>
<td>7.0</td>
<td>47-63 Hz</td>
</tr>
<tr>
<td>240 Vac (rms)</td>
<td>180-256</td>
<td>3.5</td>
<td>47-63 Hz</td>
</tr>
</tbody>
</table>

*When operating at nominal voltage specified.
DECSA INSTALLATION

Installation Flow Diagram
The following flow diagram illustrates the procedures for installing and testing the DECSA communications server.

START

PREINSTALLATION CONSIDERATIONS

- SYSTEM PLACEMENT
- POWER REQUIREMENTS
- VENTILATION AND ACCESS SPACE

UNPACK AND VERIFY ALL COMPONENTS RECEIVED

PLACE THE COMMUNICATIONS SERVER ON A WELL SUPPORTED TABLE

REMOVE SLOT COVERS FROM THOSE SLOTS THAT ARE TO RECEIVE LINE CARDS

INSTALL EACH LINE CARD IN ITS DESIGNATED LINE-CARD SLOT

1

Figure 1  Installation Flow Diagram (Sheet 1 of 5)
1

CONNECT CABLES TO THE LINE CARDS (ROUTE CABLES THROUGH CABLE CHANNELS ON THE SIDE(S) OF THE DECSA CABINET)

SET THE VOLTAGE SWITCH TO MATCH THE VOLTAGE SOURCE

INSERT THE KEY AND TURN THE KEY SWITCH TO THE "OFF" POSITION

SET THE CIRCUIT BREAKER TO THE DOWN (OFF) POSITION

CONNECT BOTH ENDS OF THE POWER CORD

Figure 1  Installation Flow Diagram (Sheet 2 of 5)
Figure 1  Installation Flow Diagram (Sheet 3 of 5)
1. Press the "Test" button so that it catches in the in position.
2. Press and release the start button.
3. Observe front panel indicators during the test (refer to Figure 2).
4. Record the Ethernet address (the 12-digit hex address is displayed in three consecutive presentations of the front panel digital readout) refer to Figure 3.

1. Press and release the start button.
2. Compare the address (displayed in the digital readout) to the recorded address.

Figure 1 Installation Flow Diagram (Sheet 4 of 5)
DECSA INSTALLATION

CONNECT THE TRANSCEIVER CABLE TO THE D-CONNECTOR ON THE REAR OF THE DECSA CABINET

PERFORM FINAL ACCEPTANCE CHECK (THIS TEST TAKES FROM 20 TO 40 MINUTES TO EXECUTE)

TEST PASS ?

Y

INITIATE CUSTOMER ACCEPTANCE

END

N

1. TURN THE KEY SWITCH TO THE "ON" POSITION
2. COMPARE THE FRONT INDICATIONS TO THOSE IN TABLE 7.

CHECK
- BOARD SEATING
- TRANSCEIVER CABLE CONNECTION
- REPLACE ANY MODULES INDICATED AS BEING DEFECTIVE

Figure 1 Installation Flow Diagram (Sheet 5 of 5)
Initial Test Indications
The following figure describes the expected initial test indications that are displayed by the front panel indicators.

![Diagram of fault indicators]

<table>
<thead>
<tr>
<th>(1) Indicator</th>
<th>(2) Color</th>
<th>(3) While Test Is Running</th>
<th>(4) After Test Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Card Fault</td>
<td>Red</td>
<td>Blinks</td>
<td>Off</td>
</tr>
<tr>
<td>Logic Fault</td>
<td>Red</td>
<td>Blinks</td>
<td>On†</td>
</tr>
<tr>
<td>Cable Fault</td>
<td>Red</td>
<td>Blinks</td>
<td>Off</td>
</tr>
<tr>
<td>Segment Display 1</td>
<td>Red</td>
<td>Blinking ☒</td>
<td>_ Underscore On</td>
</tr>
<tr>
<td>Segment Display 2</td>
<td>Red</td>
<td>Blinking ☒</td>
<td>_ Underscore On</td>
</tr>
<tr>
<td>Segment Display 3</td>
<td>Red</td>
<td>Blinking ☒</td>
<td>☒</td>
</tr>
<tr>
<td>Segment Display 4</td>
<td>Red</td>
<td>Blinking ☒</td>
<td>☒</td>
</tr>
<tr>
<td>Test</td>
<td>Red</td>
<td>Blinks</td>
<td>Off</td>
</tr>
<tr>
<td>Start</td>
<td>Red</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>Power</td>
<td>Green</td>
<td>On</td>
<td>On</td>
</tr>
<tr>
<td>Run</td>
<td>Green</td>
<td>On</td>
<td>Off</td>
</tr>
<tr>
<td>Line Card Lights†</td>
<td>Red</td>
<td>On</td>
<td>On</td>
</tr>
</tbody>
</table>

* Blinking rates: 3 per second for short version of Initial Test; 1 per second for long version of Initial Test.
† Located on the individual line cards.

Expected indication: Communications Server NOT connected to Ethernet yet.

Figure 2  Expected Initial Test Front Panel Indications
DECSA INSTALLATION

Ethernet Address Display
The following figure provides an example of an Ethernet address display.

1. The first display (lasting ten seconds) provides the first four characters of the address.
2. The second display (lasting five seconds) provides the second four characters of the address.
3. The first display (lasting five seconds) provides the last four characters of the address.

NOTE:
THE CHARACTERS SHOWN HERE ARE EXAMPLES ONLY.

Figure 3  Example of an Ethernet Address Display

DECSA-10
DECSA Cabling
This section provides information for connecting cables to the communications server.

The following figure illustrates connecting a cable to a line card.

NOTE:
USE CABLES LISTED IN TABLE 1. OTHER CABLES (THOSE WITH TWO-PIECE CONNECTOR HOUSINGS) USE MORE SPACE AND MAY REQUIRE A BC17L ADAPTOR CABLE.

Figure 4  Connecting Cables to Line Cards
DECSA CBLING

The following figure illustrates connecting and locking a transceiver cable to the Ethernet connector on the rear of the server.


Figure 5 Connecting a Transceiver Cable to the Server
DECSA Diagnostics
This section contains the following tables.
- Self-Test and Diagnostics Descriptions
- Locally Initiating Diagnostics
- Remote Execution of Diagnostics
- Successful Initial Test (Short and Long Versions) Indications
- Successful Loadable Diagnostic Image (LDI) Indications
- Initial Test (Short and Long Versions) Fault Indications
- LDI Fault Indications
- Logic Module Slot Numbers

Diagnostic Descriptions
The following table briefly describes the diagnostics for the DECSA communications server. The diagnostics are:
- Initial test (short version)
- Initial test (long version)
- Loadable diagnostic image (LDI)

Table 4  Self-Test and Diagnostics Descriptions

<table>
<thead>
<tr>
<th>Hardware or Function Tested</th>
<th>Initial Test Short Version (12 seconds)</th>
<th>Initial Long Version (4 or 8 minutes)*</th>
<th>LDI (Loadable Diagnostic Image) (20 or 40 minutes)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lamps and displays</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>PDP-11/24 processor</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Console/bootstrap/terminator (CBT)</td>
<td>X</td>
<td>X†</td>
<td></td>
</tr>
<tr>
<td>Protocol assist modules (PAMs)</td>
<td></td>
<td>X†</td>
<td></td>
</tr>
<tr>
<td>DEUNA port module</td>
<td>X</td>
<td>X†</td>
<td></td>
</tr>
<tr>
<td>DEUNA link module</td>
<td>X</td>
<td>X†</td>
<td></td>
</tr>
<tr>
<td>Display Ethernet address</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line cards</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>External loopback‡</td>
<td></td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

* The longer time is for testing the DECSA-FA (with 1M byte memory). The shorter time is for testing other DECSA versions that have 512K bytes of memory.
† The LDI runs a more extensive test than the initial test.
‡ Loopback is via line-card test connectors.
DECSA DIAGNOSTICS

Running Initial Tests and Diagnostics
Initial tests and diagnostics may be initiated:

1. Locally by using the front panel controls as shown in the following table.

2. Remotely (from a DECnet host on the same Ethernet network):
   a. By sending an INIT signal over the Ethernet, or
   b. By starting a down-line load of software.

Table 5 Locally Initiating Diagnostics

<table>
<thead>
<tr>
<th>Desired Operation</th>
<th>Front Panel Controls</th>
<th>“TEST” Button</th>
<th>“START” Button</th>
<th>What the Server Does</th>
</tr>
</thead>
<tbody>
<tr>
<td>Run Initial Test*</td>
<td>Turn ON †</td>
<td>OUT</td>
<td>–</td>
<td>X</td>
</tr>
<tr>
<td>Restart/ Rerun Initial Test*</td>
<td>ON †</td>
<td>OUT</td>
<td>Press and Release †</td>
<td>X</td>
</tr>
<tr>
<td>Run Full Diagnostics</td>
<td>Turn ON ††</td>
<td>IN ††</td>
<td>–</td>
<td>X</td>
</tr>
<tr>
<td>Restart/ Rerun Full Diagnostics</td>
<td>ON ††</td>
<td>IN ††</td>
<td>Press and Release †</td>
<td>X</td>
</tr>
</tbody>
</table>

* These procedures are also used to “start” the DECSA server.
† Set the other controls if necessary, then perform this action.
† † Return “TEST” button to OUT position after test completes.

Running DECSA Diagnostics from a Remote Host
The DECSA LDI may be run from a remote host. The following steps represent a typical sequence from an RSX host.

**NOTE**
The <CR> symbol used in the following examples denotes typing a carriage return.

1. Load the “target” DECSA system with the LDI.

   The image is found in the NETUIC on the system volume (LB:) and is named as follows:

   a. Terminal server/router/SNA configurations – CSVLDI.SYS
   b. X.25 configurations – CSVDIAG.SYS

DECSA-14
The following is an example of the commands needed to load a DECSA node "xxx" with a service password of "yyy".

>SET /NETUIC [100,54]<CR> ; netuic for this system is [100,54]

>NCP LOAD NODE xxx FROM LB[100,54]CSVLDI.SYS SERVICE PASS yyy<CR>

**NOTE**
After approximately one minute the > prompt should be displayed indicating that the LDI is loaded. Otherwise a timeout error message is displayed.

2. Connect the remote console (CONSOLE CARRIER) with the following command.

>CCR NODE xxx<CR>

The system should respond with:

[REMOTE CONSOLE RESERVED ...]

**NOTE**
If the [REMOTE CONSOLE RESERVED ...] prompt does not appear, a possible problem exists in making the connection. The connection attempt eventually aborts (after several minutes) and control of the terminal is returned to the host system.

3. Type <CR> in response to the [REMOTE CONSOLE RESERVED ...] prompt. The system should respond with "PLU>" (Plumon prompt).

4. Enter any of the commands from the following table.

<table>
<thead>
<tr>
<th>Command</th>
<th>Diagnostic</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUN CIDSAA</td>
<td>Runs PAM Repair Diagnostic 1</td>
</tr>
<tr>
<td>RUN CIDSBA</td>
<td>Runs PAM Repair Diagnostic 2</td>
</tr>
<tr>
<td>RUN CIDSCA</td>
<td>Runs LINE CARD Repair Diagnostic 1</td>
</tr>
<tr>
<td>RUN CIDSDA</td>
<td>Runs LINE CARD Repair Diagnostic 2</td>
</tr>
<tr>
<td>RUN CIDSEA</td>
<td>Runs the CBT Repair Diagnostic</td>
</tr>
<tr>
<td>RUN SYSEX</td>
<td>Runs the DECSA systems exerciser</td>
</tr>
<tr>
<td>AUTO</td>
<td>Starts/restarts the default script</td>
</tr>
<tr>
<td>HELP</td>
<td>Lists the valid commands</td>
</tr>
</tbody>
</table>

Any DRS (diagnostic runtime services) commands may be entered in response to the DR> prompt with the following exceptions.

- PRINT
- \^ Z (Control Z)
- \^ C (Control C)
DECSA DIAGNOSTICS

The following commands control the console carrier.

- **^D (Control D)** – disconnects the link.
- **^B (Control B)** – halts the DECSA PDP-11/24 CPU and enters MICRO ODT.

**NOTE**
If a DRS start command (STA to the DR> prompt) is given after repair-level diagnostics finish executing, the remote console may UN-LOAD. The following sequence may be used to reconnect the remote console.

1. Enter **^D (Control D)** which disconnects the console carrier.

2. Enter the “**CCR NODE:...**” command to reconnect the console (the CCR command previously described in Step 2 of this procedure).

**Diagnostic Results**
The results of all DECSA diagnostics are indicated by the front panel display and lights of the CBT (console/bootstrap/terminator).

![CBT Display During Test](Figure 6)

DECSA-16
Successful Initial Test Indications

The following table describes the front panel LED and digital readout indications during and after both versions of the initial test.

<table>
<thead>
<tr>
<th>DECSA State</th>
<th>Logic</th>
<th>Cable</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
<th>Test</th>
<th>Start</th>
<th>Power</th>
<th>Run</th>
</tr>
</thead>
<tbody>
<tr>
<td>During Initial Test</td>
<td>*</td>
<td>*</td>
<td>8*</td>
<td>8*</td>
<td>8*</td>
<td>8*</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>After Initial Test†</td>
<td>OFF</td>
<td>OFF</td>
<td>‡</td>
<td>‡</td>
<td>‡</td>
<td>‡</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

* Blinking rates = 3 per second for short version of initial test; 1 per second for long version of initial test.
† In the long (4 – 8 minute) version of the initial test, this display occurs after the Ethernet address is displayed.
‡ After either version of the initial test these displays are blank. An “L” is displayed when the LDI and/or server software load process begins.
DECSA DIAGNOSTICS

Successful LDI Indications
The following table describes the front panel digital readout indications during loading and running of the LDI and server software.

Note that line-card lights (located on each line card) should always be ON prior to initialization by the server software.

<table>
<thead>
<tr>
<th>Event</th>
<th>Approximate Duration</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loading LDI</td>
<td>2 minutes</td>
<td><img src="image" alt="L.DI" /></td>
</tr>
<tr>
<td>Running LDI</td>
<td>20 to 40 minutes</td>
<td>A series of changing numbers is displayed. †</td>
</tr>
<tr>
<td>Loading Server Software</td>
<td>2 minutes</td>
<td><img src="image" alt="L.DI" /></td>
</tr>
<tr>
<td>Running Server Software</td>
<td>Until server</td>
<td>A regular repeating light pattern in the digital readout.</td>
</tr>
<tr>
<td></td>
<td>is turned OFF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alternating with <img src="image" alt="4.DI" /> node address † †</td>
</tr>
</tbody>
</table>

* The 3rd and 4th digits of the digital readout change as the LDI is loaded.
† The number of the test being run is displayed. More information on the test being run may be obtained by connecting a 1200 baud / RS-232-C terminal to the maintenance panel connector of the DECSA communications server.
† † A node address is not displayed by the LAT terminal server. Otherwise, the node address is indicated by three consecutive displays. An example of a displayed node address (40125) is:
1. 1st display (5 seconds) 4.01
2. 2nd display (3 seconds) 4.01 2
3. 3rd display (2 seconds) 0125

Individual node addresses vary.

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DECSA-18
Fault Indications
If the DECSA communications server fails any diagnostic (including the short or long version of the initial test), the fault indications are displayed until:

- The DECSA server is restarted, or
- The power is turned OFF.

Initial Test Fault Indications – The following table shows front panel indications for faults found during either version of the initial test.

Table 9 Initial Test (Short and Long Versions) Fault Indications

<table>
<thead>
<tr>
<th>Line Card</th>
<th>Logic</th>
<th>Cable</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Line-card slot number</td>
</tr>
<tr>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Logic module slot number</td>
</tr>
<tr>
<td>ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cable fault†</td>
</tr>
</tbody>
</table>

*Underscores (___) in the digital readout indicate that the displayed results are from the initial test.

†A cable fault was detected. Normal troubleshooting equipment such as a TDR (time domain reflectometer) should be used to locate the fault. The numbers displayed in the digital readout reflect internal logic and should be disregarded.
DECSA DIAGNOSTICS

LDI Fault Indications – The following table shows front panel indications for faults found during execution of the LDI.

NOTE
When a failure is detected by the LDI, the slot number of the defective module is displayed. Three module choices are given because the DECSA architecture does not allow the LDI to isolate the failure to a single module. The “1st choice” module should be swapped first, the “2nd choice” module swapped second, and so on.

Table 10  LDI Fault Indications

<table>
<thead>
<tr>
<th>Line Card</th>
<th>Logic</th>
<th>Cable</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>D4</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>1</td>
<td>(01 to 16)</td>
<td></td>
<td>Line-card slot number*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>2</td>
<td>(01 to 16)</td>
<td></td>
<td>1st choice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>3</td>
<td>(01 to 16)</td>
<td></td>
<td>Line-card slot number*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>1</td>
<td>(01 to 10)</td>
<td></td>
<td>2nd choice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>2</td>
<td>(01 to 10)</td>
<td></td>
<td>Logic module slot number†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>3</td>
<td>(01 to 10)</td>
<td></td>
<td>3rd choice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ON</td>
<td>(001 to 999)</td>
<td></td>
<td></td>
<td>Cable fault‡</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Line-card slot numbers are located on the front panel of the DECSA system. The (red) LED on a defective line card should be ON.

†Logic module slot numbers are listed in Table 11.

‡A cable fault was detected. Normal troubleshooting equipment such as a TDR (time domain reflectometer) should be used to locate the fault. The numbers displayed in the digital readout reflect internal logic and should be disregarded.

DECSA-20
**Logic Module Slot Numbers** – The following table shows logic module slot numbers referred to by the initial test and the LDI.

<table>
<thead>
<tr>
<th>Slot Number</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M3112 CBT</td>
</tr>
<tr>
<td>2</td>
<td>M7793 Ethernet-to-UNIBUS adaptor (LINK module)</td>
</tr>
<tr>
<td>3</td>
<td>M7792 Ethernet-to-UNIBUS adaptor (PORT module)</td>
</tr>
<tr>
<td>4</td>
<td>G7273 grant card</td>
</tr>
<tr>
<td>5</td>
<td>M8743-AA or M8743-BA memory</td>
</tr>
<tr>
<td>6</td>
<td>M3110 PAM 1 module 1</td>
</tr>
<tr>
<td>7</td>
<td>M3111 PAM 1 module 2</td>
</tr>
<tr>
<td>8*</td>
<td>M3110 PAM 2 module 1 (optional)</td>
</tr>
<tr>
<td>9*</td>
<td>M3111 PAM 2 module 2 or G7273 grant card</td>
</tr>
<tr>
<td>10</td>
<td>M7133 PDP-11/24 CPU</td>
</tr>
</tbody>
</table>

*For a 32-line terminal server, slots 8 and 9 contain M3110 and M3111 PAM modules respectively. For a 16-line terminal server, a DECnet router server, a DECnet router/X.25 gateway, and a DECnet/SNA gateway, slot 8 is unused and slot 9 contains a G7273 grant card.
DECSA MAINTENANCE AIDS

Required Equipment
The following extender modules may be required to perform some maintenance procedures described in this manual.

- W900 – Dual-height extender module
- W987 – Quad-height extender module
- W904 – Hex-height extender module

The DECSA controlled distribution (CD) repair kit contains only those modules that are unique to the DECSA server. Those modules include:

- Line cards
- PAM modules
- CBT modules
- 512K byte memory modules

The following modules are not included in the DECSA CD repair kit. However, these modules should be available at the DIGITAL Field Service Office.

- DEUNA modules
- CPU module
- 1M byte memory module
- +5 V regulator
- ±15 V regulator
Troubleshooting
The following flow diagram provides a typical troubleshooting sequence.

![Flow diagram with steps](image)

Figure 7 Troubleshooting Flow Diagram (Sheet 1 of 5)
1

**TURN THE KEY SWITCH TO OFF**

ALL LAMPS FUNCTIONING?

Y

REPLACE FRU (CBT MODULE)

N

FAULT INDICATED?

Y

REPLACE DEFECTIVE FRU

N

RUN LDI *

2

* LDI INDICATES FULL DIAGNOSTIC PROCEDURE

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Figure 7  Troubleshooting Flow Diagram (Sheet 2 of 5)
Figure 7  Troubleshooting Flow Diagram (Sheet 3 of 5)
Figure 7  Troubleshooting Flow Diagram (Sheet 4 of 5)
Figure 7  Troubleshooting Flow Diagram (Sheet 5 of 5)
Module Replacement and Upgrades
The following modules may require setting DIP switches, checking/setting jumper configurations, or changing a PROM.

- M7133 – PDP-11/24 CPU
- M7792 – DEUNA (port module)
- M7793 – DEUNA (link module)
- M8743-AA – 512K byte memory
- M8743-BA – 1M byte memory

M7133 PDP-11/24 CPU Module Replacement – The switch and jumper configurations are outlined in the following table and figure.

<table>
<thead>
<tr>
<th>Switchpack or Jumper</th>
<th>OFF</th>
<th>ON</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jumper IN</td>
<td>Jumper OUT</td>
</tr>
<tr>
<td>E135</td>
<td>1,5</td>
<td>All others</td>
</tr>
<tr>
<td>E124</td>
<td>1,3,5,7,8</td>
<td>2,4,6</td>
</tr>
<tr>
<td>Jumpers</td>
<td>W1,W2,W3,</td>
<td>W4,W5,W6,W7,W8</td>
</tr>
<tr>
<td>W1 – W14</td>
<td>W10,W12</td>
<td>W9,W11,W13,W14</td>
</tr>
</tbody>
</table>

Figure 8  M7133 (PDP-11/24) CPU Switch and Jumper Locations
M7792 DEUNA Port Module Replacement – The switch settings for Revision Etch B and Revision Etch C of the port module are shown in the following figure and table.

Figure 9 M7792 Port Module Switch Settings

Table 13 M7792 Switch Settings

<table>
<thead>
<tr>
<th>Switchpack</th>
<th>OFF</th>
<th>ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>E40</td>
<td>1,4,6,9,10</td>
<td>2,3,5,7,8</td>
</tr>
<tr>
<td>E62 (REV B)</td>
<td>2,4,8</td>
<td>1,3,5,6,7,9,10</td>
</tr>
<tr>
<td>E62 (REV C)</td>
<td>3,5,9</td>
<td>1,2,4,6,7,8,10</td>
</tr>
</tbody>
</table>
DECSA MAINTENANCE AIDS

M7793 DEUNA Link Module Replacement – The PROM in the M7793 link module contains the Ethernet address. When replacing a DEUNA link module adhere to the following conditions:

1. If possible, move the PROM from the defective module to the new module being installed.
2. If the PROM must be changed, report the new Ethernet address to the system or network manager.

M8743-xA Memory Module Replacement – All address switches on a replacement M8743 module must be set to ON.

Verify the following jumper configuration.

<table>
<thead>
<tr>
<th>IN:</th>
<th>OUT:</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1,W2,W3,W4</td>
<td>W5</td>
</tr>
</tbody>
</table>

System Upgrade
When it is necessary to upgrade a terminal server from 16 to 32 lines, an additional (secondary) power supply and PAM set is required.

DECSA-30
The following flow diagram provides the steps for adding a secondary power supply and PAM set.

![Flow Diagram]

Figure 10 Upgrade: Adding a Second PAM Set and Power Supply
(Sheet 1 of 5)
1

REMOVE THE FAN POWER CABLE AND REMOVE THE FAN TRAY

REMOVE THE COVER FROM THE NEW POWER SUPPLY

PLUG THE RIBBON CABLE INTO THE H7200 MODULE

PLUG P1 INTO THE H7211 MODULE

ROUTE CABLES THROUGH THE SLOT IN THE SIDE OF THE POWER SUPPLY BOX

REPLACE THE COVER ON THE POWER SUPPLY

2

MKVB4-1611

Figure 10 Upgrade: Adding a Second PAM Set and Power Supply  
(Sheet 2 of 5)
Figure 10 Upgrade: Adding a Second PAM Set and Power Supply
(Sheet 3 of 5)
Figure 10 Upgrade: Adding a Second PAM Set and Power Supply (Sheet 4 of 5)

DECSA-34
Figure 10 Upgrade: Adding a Second PAM Set and Power Supply
(Sheet 5 of 5)
Backplane Terminal Strip Wiring
The following figure shows the location and wiring of the backplane terminal strip. Also shown are the jumpers that must be removed when adding a second PAM set and power supply.

Figure 11  Backplane Terminal Strip Location and Connections

DECSA-36
Secondary Power Supply Cabling
The following figure shows the relative locations for the main and secondary power supplies. The cabling for both power supplies and the fan is also shown.

Figure 12  Secondary Power Supply Cabling
DECHEMAINTENANCE AIDS

**DECISA Tech Tips/FCO Index**
The following table lists Tech Tips and FCOs that pertain to the DECSA Communications Server. Space is provided for adding new information.

<table>
<thead>
<tr>
<th>Tech Tip No.</th>
<th>Title</th>
<th>Speed Bulletin No.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DEUNA-AA Revised DC Power Requirements</td>
<td>293</td>
</tr>
<tr>
<td></td>
<td>M7792 Switchpack E-62 Switch Assignments</td>
<td>293</td>
</tr>
<tr>
<td></td>
<td>M8743-BA FC0-R0007</td>
<td>315</td>
</tr>
<tr>
<td></td>
<td>M8743-BA DEC-O-LOG</td>
<td>315</td>
</tr>
</tbody>
</table>
DELNI LOCAL NETWORK INTERCONNECT

General Description
The DELNI local network interconnect is a standalone device that permits interconnection and communication between Ethernet-compatible stations. The DELNI local network interconnect is shown in the following figure.

NOTE
The DELNI unit is not addressable or programmable. In addition, the DELNI unit does not require or use the −15 V that is normally supplied by the Ethernet controller or the auxiliary power supply (DEXPS). The DELNI unit does, however, supply −15 V to its GLOBAL connector for use by a connected Ethernet transceiver.

Figure 1  DELNI Local Network Interconnect
DELNI INSTALLATION

DELNI Configurations
The DELNI interconnect may be used to configure the following LANs (local area networks).

1. As a single-tier standalone network interconnect up to 8 stations may be interconnected via the local connectors.

2. As a two-tier standalone network interconnect up to 64 stations may be interconnected.

3. As a connected network interconnect up to 8 stations may be connected to an Ethernet coaxial cable.

The following figures illustrate typical single-tier, two-tier, and connected DELNI LAN configurations. The mode switch position is also shown.

* SEE "MODES OF OPERATION" SECTION.

Figure 2 Single-Tier DELNI LAN Configuration
Figure 3  Two-Tier DELNI LAN Configuration

* SEE "MODES OF OPERATION" SECTION.

Figure 4  DELNI LAN Connected to an Ethernet Network

* SEE "MODES OF OPERATION" SECTION.
Modes of Operation
The DELNI interconnect can operate in one of two modes:

- In LOCAL mode the eight local connectors are interconnected.
- In GLOBAL mode the eight LOCAL connectors and the GLOBAL connector are interconnected.

The following figures show differences in the data and collision signaling paths that characterize the LOCAL and GLOBAL modes of operation.

Figure 5  LOCAL Mode Input/Output Signal Flow
Figure 6  GLOBAL Mode Input/Output Signal Flow

Physical Description

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>19.68 cm (7.75 in)</td>
</tr>
<tr>
<td>Width</td>
<td>44.45 cm (17.50 in)</td>
</tr>
<tr>
<td>Height</td>
<td>5.72 cm (2.25 in)</td>
</tr>
<tr>
<td>Weight</td>
<td>6.35 kg (14.0 lbs)</td>
</tr>
</tbody>
</table>

Environmental Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>5° to 50°C (41° to 122°F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>10% to 90% (no condensation)</td>
</tr>
</tbody>
</table>

DELNI-5
DELNI INSTALLATION

Reference Documentation
Refer to the following documents for more information relative to the DELNI local network interconnect.

- **DELNI Local Network Interconnect Technical Manual** EK-DELNI-TM
- DELNI Local Network Interconnect Microfiche EP-DELNI-TM
- DELNI Field Maintenance Print Set MP-01656
- *The Ethernet - Local Area Network, Data Link Layer and Physical Layer Specifications* AA-K759A-TK
- **DEXRM DELNI Rackmount Kit Installation Guide** EK-DEXRM-IN

DELNI Versions
There are two versions of the DELNI interconnect.

- DELNI-AA (configured for U.S area applications)
- DELNI-AB (configured for European/G1A applications)

The following table lists the differences between the versions.

<table>
<thead>
<tr>
<th>Table 1  DELNI Version Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Version</strong></td>
</tr>
<tr>
<td>DELNI-AA</td>
</tr>
<tr>
<td>DELNI-AB</td>
</tr>
</tbody>
</table>

DELNI Hardware Components
The following tables list the parts that make up a DELNI-AA and DELNI-AB network interconnect.

<table>
<thead>
<tr>
<th>Table 2  DELNI-AA Parts List</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>
| DELNI-AA | • DELNI system box  
• Power cord  
• *DELNI Installation/Owner's Manual* |

DELNI-6
Table 3  DELNI-AB Parts List

<table>
<thead>
<tr>
<th>Description</th>
<th>Part Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DELNI-AB</td>
<td>DELNI system box</td>
</tr>
<tr>
<td>DELNK-Ax</td>
<td>DELNI country kit:</td>
</tr>
<tr>
<td></td>
<td>• Power cord</td>
</tr>
<tr>
<td></td>
<td>• <em>DELNI Installation/Owner's Manual</em></td>
</tr>
</tbody>
</table>

Country Kits
Appropriate power cords and installation/owner’s manuals are shipped in country kits that must be ordered separately with each DELNI interconnect. The following table indicates the country kit associated with each particular country.

Table 4  Country Kits

<table>
<thead>
<tr>
<th>Country Used In</th>
<th>Country Kit Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>DELNK-AZ</td>
</tr>
<tr>
<td>Belgium</td>
<td>DELNK-AB</td>
</tr>
<tr>
<td>Canada – England</td>
<td>DELNK-AQ</td>
</tr>
<tr>
<td>Canada – France</td>
<td>DELNK-AC</td>
</tr>
<tr>
<td>Denmark</td>
<td>DELNK-AD</td>
</tr>
<tr>
<td>Finland</td>
<td>DELNK-AF</td>
</tr>
<tr>
<td>France</td>
<td>DELNK-AN</td>
</tr>
<tr>
<td>Germany</td>
<td>DELNK-AG</td>
</tr>
<tr>
<td>Holland</td>
<td>DELNK-AH</td>
</tr>
<tr>
<td>Italy</td>
<td>DELNK-AI</td>
</tr>
<tr>
<td>Spain</td>
<td>DELNK-AS</td>
</tr>
<tr>
<td>Sweden</td>
<td>DELNK-AM</td>
</tr>
<tr>
<td>Switzerland – France</td>
<td>DELNK-AK</td>
</tr>
<tr>
<td>Switzerland – Germany</td>
<td>DELNK-AL</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>DELNK-AE</td>
</tr>
</tbody>
</table>

System Placement
The DELNI interconnect can be located in any convenient location. Typical locations might include a:

- Shelf,
- Table, or
- DEXRM rackmount assembly (optional).

Power Requirements
The DELNI interconnect operates on ac power, 50 to 60 Hz. A voltage select switch is used to select operation from 120 Vac or 240 Vac.

The DELNI interconnect draws 0.35 A at 120 Vac and 0.18 A at 240 Vac.

DELNI-7
DELNI INSTALLATION

Required Equipment
The H4000-Tx transceiver tester is required to test the function of an installed DELNI network interconnect. The following diagnostics may also be helpful in verifying DELNI functions.

- NI exerciser
- Functional (on-line) diagnostics run from the connected Ethernet controller

Installation Flow Diagram
The following flow diagram illustrates the procedures for installing and testing the DELNI local network interconnect.

![Flow Diagram]

1. **ENTER**
2. **PREINSTALLATION CONSIDERATIONS**
3. **UNPACK AND VERIFY ALL COMPONENTS RECEIVED (REFER TO TABLE 2 OR TABLE 3)**
4. **PLACE THE DELNI INTERCONNECT IN THE CHOSEN LOCATION**
5. **VERIFY VOLTAGE SWITCH SETTING (REFER TO FIGURE 8)**
6. **SET MODE SWITCH TO LOCAL OR GLOBAL MODE IF NECESSARY (REFER TO "DELNI CONFIGURATIONS")**

[GO TO NEXT PAGE]

Figure 7 Installation Flow Diagram (Sheet 1 of 3)
1

CONNECT STATION CABLES TO THE LOCAL CONNECTORS AND LOCK IN PLACE (REFER TO FIGURE 12)

IS THE DELNI INTERCONNECT IN LOCAL MODE?

N

CONNECT CABLE FROM AN ETHERNET TRANSCEIVER OR FROM A DELNI INTERCONNECT TO THE GLOBAL CONNECTOR

Y

PLUG IN BOTH ENDS OF THE POWER CORD

IS THE GREEN LED LIT?

N

GO TO TROUBLESHOOTING FLOW DIAGRAM

Y

2

ENTER FROM TROUBLESHOOTING FLOW DIAGRAM ONLY

Figure 7  Installation Flow Diagram (Sheet 2 of 3)
DEPNING ON THE CONFIGURATION, ADDITIONAL FUNCTIONALITY TEST MAY INCLUDE ANY OF THE FOLLOWING:
- RUN THE NI EXERCISER
- RUN FUNCTIONAL DIAGNOSTICS FROM THE STATIONS CONNECTED TO THE DELNI INTERCONNECT

FUNCTIONALITY TEST(S) PASS?

N

GO TO TROUBLESHOOTING FLOW DIAGRAM

Y

THE UNIT IS FULLY INSTALLED, INITIATE CUSTOMER ACCEPTANCE.

EXIT

Figure 7  Installation Flow Diagram (Sheet 3 of 3)
Voltage and Mode Selection
Operating voltage and mode selection is accomplished by setting a voltage switch and a mode switch. Operation of the switches is shown in the following illustration.

Figure 8  Setting the DELNI Voltage and Mode Switches
**DELNI CABLE**

**Cable Length Restrictions**
Two cable types may be connected to the DELNI interconnect. They are:

- BNE3x-xx
- BNE4x-xx

The BNE4x-xx cable is a flexible office-type cable that has approximately four times the attenuation of a BNE3x-xx cable.

The following illustrations indicate the maximum allowable cable lengths for the two cable types.

---

**NOTE:**
THE DECNA CONTROLLER IS EQUIPPED WITH A 5 M (16.41 FT) LENGTH OF BNE3X-XX CABLE THAT HAS A SPECIAL CONNECTOR ON THE CONTROLLER END OF THE CABLE. THE CABLE LENGTH SPECIFIED ABOVE IS IN ADDITION TO THIS 5 M (16.41 FT) CABLE LENGTH.

**Figure 9** Maximum Cable Lengths with Single-Tier DELNI LAN
NOTE:
The DECNA controller is equipped with a 5 m (16.41 ft) length of BNE3X-XX cable that has a special connector on the controller end of the cable. The cable length specified does not include this 5 m (16.41 ft) cable length.

Figure 10  Maximum Cable Lengths with Two-Tier DELNI LAN
NOTES
2. THE DECNA CONTROLLER IS EQUIPPED WITH A 5 M (16.41 FT) LENGTH OF BNE3X-XX CABLE THAT HAS A SPECIAL CONNECTOR ON THE CONTROLLER END OF THE CABLE. THE CABLE LENGTH SPECIFIED ABOVE IS IN ADDITION TO THIS 5 M (16.41 FT) CABLE LENGTH.
3. THE CABLE SEGMENT LABELED B MAY BE MADE UP OF TWO TRANSCEIVER CABLES JOINED IN AN ETHERJACK CONNECTION BOX.

Figure 11  Maximum Cable Lengths with a Connected DELNI LAN
Cable Connections
The following illustration shows:

1. Connecting cables to a LOCAL connector.
2. Connecting a cable to the GLOBAL connector.
3. Connecting the power cord.

Figure 12  Connecting Cables to the DELNI Interconnect
DELNI DIAGNOSTICS

Diagnostics
There are no diagnostics designed specifically for the DELNI interconnect. Note, however, that the following may be helpful in isolating faults.

- The NI exerciser (NIE)
- Functional diagnostics run on systems connected to the DELNI unit under test (UUT)
DELNI MAINTENANCE AIDS

DELNI Field Replaceable Units (FRUs)
When the DELNI interconnect is suspected of any malfunction, the entire DELNI unit should be replaced.

Troubleshooting Equipment
The H4000-TA (or "-TB" for non-U.S. versions) transceiver tester is required for maintaining the DELNI local network interconnects.

Troubleshooting Tips
The following hardware problems can affect DELNI interconnect performance.

- Excessive cable lengths or cable damage.
- Cable and/or connector failure.
- Improperly assembled connectors (refer to the "Cables" section of this manual).
- Certain transceiver power problems.
Troubleshooting Flow Diagram
The following flow diagram indicates the procedures for fault isolation in the DELNI interconnect.

1. Enter

2. Is the green LED lit?
   - N: Check and correct if necessary:
     - 120/240 V switch
     - Power connections
     - Fuse
     - AC power to DELNI interconnect
   - Y: Check local/global switch setting. Correct if necessary.

3. Test functionality of DELNI interconnect with an H4000-Tx transceiver tester. Configure H4000-Tx tester for loopback testing (refer to Figure 14).

4. Set H4000-T mode switch to "TX/RX"

Figure 13 Troubleshooting Flow Diagram (Sheet 1 of 7)
DID THE SYMPTOM CHANGE? IF SO, THEN A NEW OR ADDITIONAL PROBLEM MAY EXIST. REPLACE THE ORIGINAL FRU TO SEE IF THE ORIGINAL SYMPTOMS RETURN. THIS NEW INFORMATION MAY BE USEFUL IN ANALYZING THE PROBLEM.

Figure 13  Troubleshooting Flow Diagram (Sheet 2 of 7)
Figure 13  Troubleshooting Flow Diagram (Sheet 3 of 7)
Figure 13  Troubleshooting Flow Diagram (Sheet 4 of 7)
Figure 13  Troubleshooting Flow Diagram (Sheet 5 of 7)
Figure 13  Troubleshooting Flow Diagram (Sheet 6 of 7)
Figure 13  Troubleshooting Flow Diagram (Sheet 7 of 7)
Typical H4000-Tx Tester Configurations
The following figure shows a typical H4000-Tx tester configuration for loopback testing of a DELNI interconnect. Note that the tester may be connected to any local connector on the DELNI unit.

The tester configuration for a DELNI unit connected to an Ethernet cable is the same as shown below. Be sure that the mode switch is set to the GLOBAL mode.

![Diagram of H4000-Tx Tester Configuration for Loopback Testing]

Figure 14  Typical H4000-Tx Configuration for Loopback Testing
The following figure shows a typical H4000-Tx tester configuration for end-to-end testing of a DELNI interconnect. Note that the H4000-Tx tester(s) may be connected to any local connector on the DELNI unit.

**NOTES:**
1. WHEN CONNECTED TO THIS POINT, THE UUT (UNIT UNDER TEST) AND THE ASSOCIATED TRANSCEIVER IS TESTED.
2. WHEN CONNECTED TO THIS POINT, THE UUT AND THE INTERVENING CABLE PLANT IS TESTED.

Figure 15  Typical H4000-Tx Configuration for End-to-End Testing
DELNI Tech Tips/FCO Index
The following table lists Tech Tips and FCOs that pertain to the DELNI local network interconnect. Space is provided for adding new information.

<table>
<thead>
<tr>
<th>Tech Tip No.</th>
<th>Title</th>
<th>Speed Bulletin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DELNI Troubleshooting</td>
<td>296</td>
</tr>
<tr>
<td></td>
<td>DELNI Installation Precautions</td>
<td>297</td>
</tr>
</tbody>
</table>
DEUNA INSTALLATION

DEUNA UNIBUS NETWORK ADAPTOR

General Description
The DEUNA adaptor is a data communications controller used to interface VAX-11 and PDP-11 family computers to the Ethernet local area network. The DEUNA adaptor complies with the “Ethernet Specification” and (using the Ethernet shielded coaxial cable) allows communication with up to 1024 addressable devices.

The DEUNA adaptor physically and electrically connects to the Ethernet coaxial cable via the DIGITAL H4000 transceiver and an appropriate transceiver cable.

Features of the DEUNA adaptor include the following.
- 10M bits/s transmission and reception
- Transmit and receive data link management
- Data encapsulation and decapsulation
- Data encoding and decoding
- Down-line loading and remote load detect capabilities
- Internal ROM-based microdiagnostics to facilitate diagnosis and maintenance to both the DEUNA adaptor and the DIGITAL H4000 transceiver
- Collision detection and automatic retransmission
- 32-bit cyclic redundancy check (CRC) error detection
- 32K byte (16K word) buffer for continuous datagram reception, transmission, and maintenance requirements

Reference Documentation
Refer to the following documents for more information on the DEUNA adaptor.

- DEUNA Technical Manual EK-DEUNA-TM
- DEUNA User’s Guide EK-DEUNA-UG
- H4000 Technical Manual EK-H4000-TM
- H4000 Installation Guide EK-H4000-IN
- DEUNA Print Set MP01378
- DEUNA Microfiche EP-DEUNA-TM
DEUNA INSTALLATION

DEUNA Adaptor Component List
The following table provides a list of the parts supplied with each DEUNA adaptor.

<table>
<thead>
<tr>
<th>Part</th>
<th>Part Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEUNA port module</td>
<td>M7792</td>
</tr>
<tr>
<td>DEUNA link module</td>
<td>M7793</td>
</tr>
<tr>
<td>Module interconnect cable</td>
<td>BC08R-1 (2)</td>
</tr>
<tr>
<td>Bulkhead cable assembly</td>
<td>70-18798-**</td>
</tr>
<tr>
<td>Bulkhead interconnect panel assembly</td>
<td>70-18799-00</td>
</tr>
<tr>
<td>DEUNA User's Guide</td>
<td>EK-DEUNA-UG</td>
</tr>
</tbody>
</table>

Device Placement
The DEUNA adaptor requires two hex-height small peripheral controller (SPC) backplane slots (preferably two adjacent slots). Any SPC backplane [DD11-B (REV E) or later] can accept the DEUNA adaptor modules.

To prevent adverse bus latency, the DEUNA adaptor should be placed on the UNIBUS conductor before all devices that have a lower NPR rate and before all UNIBUS repeaters.

UNIBUS Loading
The M7792 and M7793 modules that make up the DEUNA adaptor have the following UNIBUS loads.

- 1 dc load
- 4 ac loads

DEUNA Power Requirements
The DEUNA adaptor power requirements are shown in the following table.

<table>
<thead>
<tr>
<th>Module</th>
<th>Voltage Rating (Approximate Values)</th>
<th>Maximum Voltage</th>
<th>Minimum Voltage</th>
<th>Backplane Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>M7792</td>
<td>+5 V @ 7.0 A*</td>
<td>+5.25 V</td>
<td>+4.75 V</td>
<td>CA2</td>
</tr>
<tr>
<td>M7793</td>
<td>+5 V @ 9.0 A*</td>
<td>+5.25 V</td>
<td>+4.75 V</td>
<td>CA2</td>
</tr>
<tr>
<td></td>
<td>-15 V @ 2.0 A</td>
<td>-15.75 V</td>
<td>-14.25 V</td>
<td>FB2</td>
</tr>
</tbody>
</table>

*Refer to Tech Tip # DEUNA-TT-1
Figure 1  Installation Flow Diagram (Sheet 1 of 5)
1

CONFIGURE M7792 PORT MODULE FOR CUSTOMER REQUIREMENTS (REFER TO FIGURES 2 AND 3)

• DEVICE ADDRESS
• VECTOR ADDRESS
• BOOTSTRAP OPTION (FOR PDP-11 SYSTEMS ONLY)
• LOOP ON TEST

2

PLUG BC08R-1 CABLES INTO J1 AND J2 ON THE M7792 PORT MODULE (REFER TO FIGURE 4)

INSTALL M7792 PORT MODULE

SLIDE M7793 LINK MODULE INTO GUIDES BUT DO NOT INSERT FULLY

CONNECT BC08R-1 CABLES (FROM M7792 MODULE) TO J1 AND J2 OF THE M7793 MODULE (REFER TO FIGURE 4)

MKV84-0757

Figure 1  Installation Flow Diagram (Sheet 2 of 5)
Figure 1  Installation Flow Diagram (Sheet 3 of 5)
DEUNA INSTALLATION

3

PERFORM RESISTANCE CHECKS ON BACKPLANE

- TURN POWER ON
- CHECK LED ON BULKHEAD PANEL. IT SHOULD BE ON
- VERIFY THAT THE CIRCUIT BREAKER ON BULKHEAD IS CLOSED

VERIFY VOLTAGES

TURN POWER OFF

CONNECT THE DEUNA ADAPTOR TO ANY OF THE FOLLOWING DEVICES:
- H4080 LOOPBACK CONNECTOR
- AN INSTALLED H4000 TRANSCEIVER
- A DELNI UNIT

PERFORM LED CHECKS

- 1. TURN POWER ON
- 2. COMPARE LEDS (DURING POWER UP SELF-TEST) WITH THOSE IN TABLE 4

4

MKV84-0759

Figure 1 Installation Flow Diagram (Sheet 4 of 5)
Figure 1  Installation Flow Diagram (Sheet 5 of 5)
Figure 2  M7792 Switchpacks and Jumpers (Sheet 1 of 2)
**Boot Option Selection**

<table>
<thead>
<tr>
<th>SEL 0</th>
<th>SEL 1</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ON</td>
<td>Remote boot disabled⁺</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>Remote boot with system load</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>Remote boot with ROM</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>Remote boot with power-up boot</td>
</tr>
<tr>
<td></td>
<td></td>
<td>and system load</td>
</tr>
</tbody>
</table>

* For M7792 Etch Rev B modules, SEL 0 = S8 / SEL 1 = S7
For M7792 Etch Rev C modules, SEL 0 = S9 / SEL 1 = S8

⁺ Switch setting for a DEUNA adapter installed in a VAX-11 system.

**Self-Test Loop Switch**

<table>
<thead>
<tr>
<th>Switch Position</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON (closed)</td>
<td>Disabled</td>
</tr>
<tr>
<td>OFF (open)</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

* M7792 E62 S9 for Etch rev B modules
M7792 E62 S10 for Etch rev C modules

Figure 2  M7792 Switchpacks and Jumpers (Sheet 2 of 2)
### Floating Address Assignment

<table>
<thead>
<tr>
<th>MSB</th>
<th>15</th>
<th>14</th>
<th>13</th>
<th>12</th>
<th>11</th>
<th>10</th>
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<th>5</th>
<th>4</th>
<th>3</th>
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<td>1</td>
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</table>

**Switchpack E40**

<table>
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<tr>
<th>Switch Number</th>
<th>S10</th>
<th>S9</th>
<th>S8</th>
<th>S7</th>
<th>S6</th>
<th>S5</th>
<th>S4</th>
<th>S3</th>
<th>S2</th>
<th>S1</th>
<th>Floating Address</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
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<td>OFF</td>
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<td>760000</td>
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<td>OFF</td>
<td>OFF</td>
<td>760000</td>
</tr>
</tbody>
</table>

**Note:** Switch off (open) responds to logical one on the Unibus.

Figure 3  Address and Vector Switch Assignments (Sheet 1 of 2)
### Floating Vector Assignment

<table>
<thead>
<tr>
<th>FOR ETCH REV B MODULES</th>
<th>MSB</th>
<th>LSB</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td>
<td>SWITCHPACK E62</td>
<td>0 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SWITCH NUMBER</th>
<th>S6</th>
<th>S5</th>
<th>S4</th>
<th>S3</th>
<th>S2</th>
<th>S1</th>
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<tbody>
<tr>
<td>OFF OFF OFF</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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</table>

**NOTE:** SWITCH OFF (OPEN) PRODUCES LOGICAL ONE ON THE UNIBUS.

### Vector Switch Assignments

<table>
<thead>
<tr>
<th>FOR ETCH REV C MODULES</th>
<th>15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00</th>
<th>SWITCHPACK E62</th>
<th>0 0</th>
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<tr>
<td>0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0</td>
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<table>
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<th>S7</th>
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<td></td>
<td></td>
<td></td>
<td>340</td>
</tr>
<tr>
<td>OFF OFF OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>344</td>
</tr>
<tr>
<td>OFF OFF OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>350</td>
</tr>
<tr>
<td>OFF OFF OFF</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>354</td>
</tr>
<tr>
<td>OFF OFF OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>360</td>
</tr>
<tr>
<td>OFF OFF OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>364</td>
</tr>
<tr>
<td>OFF OFF OFF</td>
<td></td>
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<td></td>
<td>370</td>
</tr>
<tr>
<td>OFF OFF OFF</td>
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<td></td>
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<td>374</td>
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<tr>
<td>OFF OFF OFF</td>
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<td>400</td>
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<td>OFF OFF OFF</td>
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<td></td>
<td>500</td>
</tr>
<tr>
<td>OFF OFF OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>600</td>
</tr>
<tr>
<td>OFF OFF OFF</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>700</td>
</tr>
</tbody>
</table>

**Figure 3** Address and Vector Switch Assignments (Sheet 2 of 2)

**DEUNA-11**
Cabling
This section contains cabling diagrams for DEUNA adaptor configurations.

NOTE:
1. REMOVE THE NPR JUMPER (CA1 TO CB1) BEFORE THE PORT MODULE (M7792) IS INSTALLED. THIS JUMPER MUST BE INSTALLED IF THE DEUNA ADAPTOR IS REMOVED FROM THE SYSTEM.
2. THE ORDER OF MODULE INSTALLATION IN THE BACKPLANE IS NOT FIXED.
3. POWER: +45 Vdc @ 16 A
   -15 Vdc @ 1 A

Figure 4  DEUNA Cabling Diagram
Figure 5  Bulkhead Interconnect I/O Panel Assembly
CAUTION
THE BACK OF THE BULKHEAD PANEL CONTAINS A CIRCUIT BOARD THAT CARRIES -15 V. BE SURE THIS CIRCUITRY DOES NOT TOUCH ANYTHING THAT COULD CAUSE A SHORT CIRCUIT ON POWER-UP.

Figure 6   Bulkhead Interconnect Panel Assembly Installation
CAUTION
THE BACK OF THE BULKHEAD PANEL CONTAINS A CIRCUIT BOARD THAT CARRIES -15 V. BE SURE THIS CIRCUITRY DOES NOT TOUCH ANYTHING THAT COULD CAUSE A SHORT CIRCUIT ON POWER-UP.

Figure 7  Typical System Cabinet Bulkhead Installation
### Table 3  DEUNA Diagnostics for VAX-11 and PDP-11 Systems

<table>
<thead>
<tr>
<th>Diagnostic Function</th>
<th>Diagnostic Name</th>
<th>PDP-11 Systems</th>
<th>VAX-11 Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-test</td>
<td>ROM-based self-test</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Off-line test</td>
<td>Repair level diagnostic</td>
<td>CZUAA*</td>
<td>EVDWA**</td>
</tr>
<tr>
<td>Functional test</td>
<td>Functional diagnostic</td>
<td>CZUAB*</td>
<td>EVDWB**</td>
</tr>
<tr>
<td>System exerciser</td>
<td>DEC/X11 DEUNA module</td>
<td>CXUAC*</td>
<td>N/A</td>
</tr>
<tr>
<td>(PDP-11 only)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network exerciser</td>
<td>Network interconnect exerciser</td>
<td>CZUAC*</td>
<td>EVDWC**</td>
</tr>
</tbody>
</table>
### Table 4 DEUNA LED Check Indications

<table>
<thead>
<tr>
<th>Location</th>
<th>LED #</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>M7792 module</td>
<td>D1</td>
<td>Verifies, when lit (ON), that the two module interconnect cables are properly connected to J1 and J2 on both the port and link modules.</td>
</tr>
<tr>
<td>M7792 module</td>
<td>D2 – D7</td>
<td>Provides a visual indication of the current status of the ROM-based self-test microdiagnostics. All LEDs are lit (ON) following successful completion of the self-test (see Notes 1 and 2).</td>
</tr>
<tr>
<td>Bulkhead panel</td>
<td>D1</td>
<td>Indicates that –15 V transceiver power is available at the bulkhead connector J2. This verifies that:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. The bulkhead cable assembly is properly connected at both ends, and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. The bulkhead interconnect panel circuit breaker is properly set.</td>
</tr>
</tbody>
</table>

### NOTES

1. The self-test microdiagnostic program is initiated each time the DEUNA adaptor is powered up, and takes about 10 seconds to run. During this period, these LEDs blink rapidly as the various functions of the DEUNA adaptor are tested.

2. Whenever the DEUNA protocol enters the RUN state under system software, LED D7 blinks ON and OFF at a one second rate (approximate). For more information on the self-test diagnostics, refer to the following section on DEUNA Maintenance Aids or the DEUNA Technical Manual.
## Table 5  Typical PDP-11/DEUNA (CZUAA*) Diagnostic Dialog

<table>
<thead>
<tr>
<th>Dialog</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHANGE HW (L) ? YES</td>
<td>The program asks if any logical hardware changes are required.</td>
</tr>
<tr>
<td># UNITS (D) ? 1</td>
<td>The number of units on the system to be tested.</td>
</tr>
<tr>
<td>UNIT 0</td>
<td>Designates unit to be tested.</td>
</tr>
<tr>
<td>WHAT IS THE PCSR0 ADDRESS? (0) ? 174510</td>
<td>Enter appropriate octal values.</td>
</tr>
<tr>
<td>WHAT IS THE VECTOR ADDRESS? (0) ? 120</td>
<td></td>
</tr>
<tr>
<td>ETHERNET DEFAULT ADDRESS (HEX): AA-00-03-12-0A-E3</td>
<td>The ROM-based address is displayed.</td>
</tr>
<tr>
<td>ROM MICROCODE VERSION (DECIMAL): 5 SWITCHPACK SET FOR :</td>
<td>Displays hardware switch settings.</td>
</tr>
<tr>
<td>SELF-TEST LOOP DISABLED</td>
<td></td>
</tr>
<tr>
<td>REMOTE BOOT ENABLED</td>
<td></td>
</tr>
<tr>
<td>CZUAA EOP 1 0 CUMULATIVE ERRORS ^C</td>
<td>End of first pass. Number of errors.</td>
</tr>
</tbody>
</table>
VAX-11/DEUNA Diagnostics
The VAX-11 diagnostics run under a diagnostic supervisor. In the example (Table 6), the diagnostic supervisor prompt = DS>.

The following software revision levels are required to run VAX-11/DEUNA diagnostics.

- VMS revision 3.4 or later
- Diagnostic supervisor revision 6.9 or later

NOTE
The DEUNA functional diagnostic (EVDWB*.*), will not run unless both the line and circuit to be tested are set to OFF. System manager privileges are required to perform this operation.

The following SYSTEM and PROCESS parameters are required to run the VAX-11/DEUNA functional diagnostic.

SYSTEM MAXBUF = 1600
PROCESS BYTLM = 30000

To change BYTLM parameter:

$ SET DEF SYS$SYSROOT:[SYSEXE]
$ RUN AUTHORIZE
UAF> MODIFY <USER ACCN'T NAME>/BYTLM = 30000
UAF> EXIT
$ LOGOUT (USER MUST LOGOUT TO WRITE BYTLM QUOTA)

To change the SYSGEN MAXBUF parameter:

$ MCR SYSGEN
SYSGEN> SET MAXBUF 1600
SYSGEN> WRITE ACTIVE
SYSGEN> EXIT
DEUNA DIAGNOSTICS

The following table describes the process used to run VAX-11/DEUNA diagnostics.

Table 6  Typical VAX-11/DEUNA Diagnostic Operation

<table>
<thead>
<tr>
<th>Command Function</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ATTACH the UNIBUS interface (UBA or UBI) to the system bus.</td>
<td>DS&gt; ATT DW750 HUB DW0</td>
</tr>
<tr>
<td>2. ATTACH the device to the system.</td>
<td>DS&gt; ATTACH UNA11 DW0 XEA0</td>
</tr>
<tr>
<td>Enter CSR/VECTOR/BR.</td>
<td>CSR? 774510 120 5</td>
</tr>
<tr>
<td>3. LOAD appropriate diagnostic.</td>
<td>DS&gt; LOAD EVDWB</td>
</tr>
<tr>
<td>4. SELECT devices that have been attached to the system.</td>
<td>DS&gt; SEL ALL (or) SEL XEA0</td>
</tr>
<tr>
<td>5. Optional (if printout is desired).</td>
<td>DS&gt; SET TRACE</td>
</tr>
<tr>
<td>6. Run the test.</td>
<td>DS&gt; START</td>
</tr>
</tbody>
</table>

DEUNA-20
The following figure shows a typical VAX-11/DEUNA diagnostic printout.

**DEUNA DIAGNOSTICS**

Test 1: READ INTERNAL ROM
Test 2: READ/WRITE INTERNAL WCS
Test 3: INTERNAL LINK ADDRESS TEST
Test 4: READ/WRITE INTERNAL LINK MEMORY
Test 5: TRANSMIT CRC TEST
Test 6: RECEIVE CRC TEST
Test 7: PROMISCUOUS ADDRESS TEST
Test 8: ENABLE ALL MULTICAST TEST
Test 9: STATION TEST
Test 10: PAD RUNT TEST
Test 11: NO RECEIVE BUFFERS AVAILABLE
Test 12: UMA STRESS TEST

UNA11 COUNTER SUMMARY
- INTERNAL LOOPBACK MODE
- SECONDS SINCE LAST ZEROED: 1
- PACKETS RECEIVED: 0
- MULTICAST PACKETS RECEIVED: 0
- PACKETS RECEIVED IN ERROR: 21
- BYTES RECEIVED: 0
- MULTICAST BYTES RECEIVED: 0
- RXVS LOST - LOCAL BUF ERROR: 0
- LOCAL BUFFER ERRORS: 0
- PACKETS TRANSMITTED: 21
- MULTICAST PACKETS TRANSMITTED: 0
- PKTS XMITTED WITH 1 COLLISION: 0
- PKTS XMITTED WITH > 1 COLLISION: 0
- PKTS XMITTED BUT DEFERRED: 0
- BYTES TRANSMITTED: 14532
- MULTICAST BYTES TRANSMITTED: 0
- TRANSMIT PACKETS ABORTED: 0
- XMIT COLLISION CHECK FAILURE: 21
- UNRECOGNIZED FRAME DESTINATION: 0
- SYSTEM BUFFER ERROR: 0
- USER BUFFER ERROR: 0

ETHERNET DEFAULT ADDRESS (HEX) AA-00-03-01-0C-70

ROM MICROCODE VERSION (DECIMAL): 5

SWITCH PACK SET FOR:
  NO REMOTE BOOT ENABLED
  SELF TEST LOOP DISABLED

.. End of run, 0 errors detected, pass count is 1.
  time is 11-APR-1984 08:49:22.22
DS> EXIT
$

MARK: MKV84-0773

Figure 8 Typical VAX-11 Functional Diagnostic Printout
DEUNA MAINTENANCE AIDS

Required Equipment
There is no special equipment required for maintaining the DEUNA adaptor. However, the H4080 loopback test transceiver may be helpful in isolating some faults.

Field Replaceable Units (FRUs)
The following items are FRUs for the DEUNA adaptor.

- M7792 DEUNA port module
- M7793 DEUNA link module
- BC08R-1 Module interconnect cable
- 70-18798-** Bulkhead cable assembly
- 70-18799-00 Bulkhead interconnect panel assembly
Figure 9  DEUNA Troubleshooting Flow Diagram (Sheet 1 of 3)
1

REPLACE FAILING FRU

RERUN DIAGNOSTIC

PASS

Y

RECONNECT HARDWARE TO NETWORK IF NECESSARY

N

ALL FRUs REPLACED

N

REFER PROBLEM TO NETWORK SUPPORT

EXIT

* REFERS TO PREVIOUSLY RUN DIAGNOSTIC

† DID THE SYMPTOM CHANGE? IF SO, THEN A NEW OR ADDITIONAL PROBLEM MAY EXIST. REPLACE THE ORIGINAL MODULE TO SEE IF THE ORIGINAL SYMPTOMS RETURN. THIS NEW INFORMATION MAY BE USEFUL IN ANALYZING THE PROBLEM.

Figure 9 DEUNA Troubleshooting Flow Diagram (Sheet 2 of 3)
Figure 9  DEUNA Troubleshooting Flow Diagram (Sheet 3 of 3)
DEUNA MAINTENANCE AIDS

ROM-Based Self-Test and LEDs
The ROM-based self-test is initiated in two ways.

1. On power up

2. On issuing the following self-test port command to the low byte of PCSR0:
   a. Perform a device reset by setting bit 5 of PCSR0,
   b. Verify that the DNI bit (PCSR0 – bit 11) is set,
   c. Issue self-test port command by setting bits 0 and 1 in the low byte of PCSR0,
   d. Verify that the DNI bit (PCSR0 – bit 11) is set, and
   e. Observe the self-test results (they should be displayed by LEDs on the port module).

The following is a typical example of a self-test port command.

```
RSET = PCSR0 <05>
DNI = PCSR0 <11>

MOV #RSET, @# PCSR0

LOOP1:
BIT #DNI, @# PCSR0  ;device reset
BEQ LOOP1

MOV #3, @# PCSR0

LOOP2:
BIT #DNI, @# PCSR0  ;self-test port command
BEQ LOOP2
HALT

;test for reset complete
;test for self-test complete
;self-test results appear
;in port LEDs
```
DEUNA Self-Test LEDs and Codes
The following figure shows the location of the DEUNA self-test LEDs.

The accompanying table describes the self-test LED octal codes. In the table, ON represents a logical
ONE (1); OFF represents a logical ZERO (0). For the purpose of this table, all LEDs are assumed to be
OFF unless otherwise noted.

Figure 10  DEUNA Port Module Self-Test LEDs
### Table 7: DEUNA Self-Test LED Codes

<table>
<thead>
<tr>
<th>LED Code (Octal)</th>
<th>D7</th>
<th>D6</th>
<th>D5</th>
<th>D4</th>
<th>D3</th>
<th>D2</th>
<th>Test Name</th>
<th>(Module)</th>
</tr>
</thead>
<tbody>
<tr>
<td>77 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Never Got Started</td>
<td>M7792/M7793</td>
</tr>
<tr>
<td>1 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CPU Instruction</td>
<td>M7792</td>
</tr>
<tr>
<td>3 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ROM</td>
<td>M7792</td>
</tr>
<tr>
<td>4 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Writeable Control Store</td>
<td>M7792</td>
</tr>
<tr>
<td>5 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>T11 UNIBUS Address Register</td>
<td>M7792</td>
</tr>
<tr>
<td>6 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Receiver UNIBUS DMA</td>
<td>M7792</td>
</tr>
<tr>
<td>7 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCSR1 Lower Byte &amp; T11 DMA Read</td>
<td>M7792/UNIBUS</td>
</tr>
<tr>
<td>10 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCSR0 Upper Byte &amp; T11 DMA Write</td>
<td>M7792</td>
</tr>
<tr>
<td>11 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PCSR0 Lower Byte &amp; Link Mem. DMA</td>
<td>M7792</td>
</tr>
<tr>
<td>12 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Timer</td>
<td>M7792</td>
</tr>
<tr>
<td>13 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Physical Address ROM</td>
<td>M7792</td>
</tr>
<tr>
<td>20 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Link Memory</td>
<td>M7792/7793</td>
</tr>
<tr>
<td>26 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Local Loopback</td>
<td>M7792/7793</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bugcheck (N1 &amp; UNIBUS in HALTED STATE) – Internal Transmitter Error</td>
<td>M7792/7793</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Allocation Error on Boot</td>
<td>M7792/7793</td>
</tr>
<tr>
<td>30 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Transmitter Timeout</td>
<td>M7792/7793</td>
</tr>
<tr>
<td>31 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Receiver Timeout</td>
<td>M7792/7793</td>
</tr>
<tr>
<td>32 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Buffer Comparison</td>
<td>M7792/7793</td>
</tr>
<tr>
<td>33 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Byte Count</td>
<td>M7792/7793</td>
</tr>
<tr>
<td>34 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Receiver Status</td>
<td>M7792/7793</td>
</tr>
<tr>
<td>35 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CRC Error</td>
<td>M7792/7793</td>
</tr>
<tr>
<td>36 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Match Bit Error</td>
<td>M7792/7793</td>
</tr>
<tr>
<td>37 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>TDR Error</td>
<td>M7792/7793</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Transmitter Buffer Resource</td>
<td>M7793</td>
</tr>
<tr>
<td>40 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Receiver Timeout</td>
<td>M7793</td>
</tr>
<tr>
<td>41 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Buffer Comparison</td>
<td>M7793</td>
</tr>
<tr>
<td>42 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Byte Count</td>
<td>M7793</td>
</tr>
<tr>
<td>43 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Receiver Status</td>
<td>M7793</td>
</tr>
<tr>
<td>44 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>CRC Error</td>
<td>M7793</td>
</tr>
<tr>
<td>45 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Receiver Buffer Address</td>
<td>M7793</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Transmitter Timeout</td>
<td>M7793</td>
</tr>
<tr>
<td>50 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Receiver Timeout</td>
<td>M7793</td>
</tr>
<tr>
<td>51 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Buffer Comparison</td>
<td>M7793</td>
</tr>
<tr>
<td>52 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Byte Count</td>
<td>M7793</td>
</tr>
<tr>
<td>53 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Receiver Status</td>
<td>M7793</td>
</tr>
<tr>
<td>54 ON ON ON ON ON</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>CRC Error</td>
<td>M7793</td>
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<tr>
<td>55 ON ON ON ON ON</td>
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<td>Receiver Buffer Address</td>
<td>M7793</td>
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<tr>
<td>56 ON ON ON ON ON</td>
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<td></td>
<td>Transmitter Timeout</td>
<td>M7793</td>
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<tr>
<td>57 ON ON ON ON ON</td>
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<td>Receiver Timeout</td>
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<tr>
<td>58 ON ON ON ON ON</td>
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<td></td>
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<td>Buffer Comparison</td>
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<td>Receiver Status</td>
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<td>61 ON ON ON ON ON</td>
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<td>62 ON ON ON ON ON</td>
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<td></td>
<td></td>
<td>Receiver Buffer Address</td>
<td>M7793</td>
</tr>
<tr>
<td>63 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Transmitter Timeout</td>
<td>M7793</td>
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<tr>
<td>64 ON ON ON ON ON</td>
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<td></td>
<td></td>
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<td>M7793</td>
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<tr>
<td>65 ON ON ON ON ON</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>Buffer Comparison</td>
<td>M7793</td>
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<tr>
<td>66 ON ON ON ON ON</td>
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<td>67 ON ON ON ON ON</td>
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<td></td>
<td></td>
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<td>Receiver Status</td>
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<tr>
<td>68 ON ON ON ON ON</td>
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<td></td>
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<td></td>
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<td>CRC Error</td>
<td>M7793</td>
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<td>69 ON ON ON ON ON</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>70 ON ON ON ON ON</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Transmitter Timeout</td>
<td>M7793</td>
</tr>
<tr>
<td>71 ON ON ON ON ON</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Receiver Timeout</td>
<td>M7793</td>
</tr>
</tbody>
</table>

**NOTE**
During the self-test, the LEDs should be observed counting from 1-77 octal.
DEUNA Tech Tips/FCO Index
The following table lists Tech Tips and FCOs that pertain to the DEUNA UNIBUS network adaptor. Space is provided for adding new information.

Table 8 DEUNA Tech Tip Index

<table>
<thead>
<tr>
<th>Tech Tip No.</th>
<th>Title</th>
<th>Speed Bulletin</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEUNA-TT-1</td>
<td>Revised DC Power Requirements</td>
<td>313</td>
</tr>
<tr>
<td>DEUNA-TT-2</td>
<td>DEUNA Switchpack E-62</td>
<td>313</td>
</tr>
</tbody>
</table>

DEUNA-29
H4000 ETHERNET TRANSCEIVER

General Description
An H4000 Ethernet transceiver provides a physical and electrical interface between an Ethernet coaxial cable and other Ethernet devices such as controllers, repeaters, network interconnect devices, and so on.

The transceiver clamps directly onto the coaxial cable and has a 15-pin male D-connector for connecting to a transceiver cable. Power to drive the transceiver (−11.40 to −15.75 Vdc) is provided by the connected device or a DEXPS (auxiliary power supply) via the transceiver cable.

The H4000 transceiver is transparent to the data layers and is not addressable or programmable in any way.

Figure 1 Typical H4000 Transceiver Configuration

H4000 Versions
The H4000 is the only version of the H4000 Ethernet transceiver.

H4000 Transceiver Components
The following parts are supplied with the H4000 transceiver.

- H4000 Transceiver
- H4000 DIGITAL Ethernet Transceiver Installation Manual
H4000 INSTALLATION

Reference Documentation
Refer to the following documents for more information regarding the H4000 Ethernet transceiver.

- **H4000 Ethernet Transceiver Technical Manual** EK-H4000-TM
- **H4000 Ethernet Transceiver Microfiche** EP-H4000-TM
- **H4000 Ethernet Transceiver Print Set** MP-01369
- **The Ethernet – Local Area Network, Data Link Layer and Physical Layer Specifications** AA-K759B-TK
- **Ethernet Installation Guide** EK-ETHER-IN
- **H4000 Installation Guide** EK-H4000-IN
- **Etherjack Installation Guide** EK-DEXJK-IN
- **H4000-T Ethernet Transceiver Tester User Guide** EK-ETHHTT-UG

System Placement
System placement is not applicable to the H4000 transceiver.

Device Placement
The H4000 transceiver clamps directly onto an Ethernet coaxial cable. Note the following constraints.

- A maximum of 100 transceivers may be placed on a single 500 m (1640.4 ft) Ethernet coaxial cable segment.
- Transceivers must be positioned on (or as close as possible) to the annular rings marked every 2.5 m (8.2 ft) on the coaxial cable.
- Spacing between transceivers may not be less than 2.5 m (8.2 ft).

**NOTE**
If annular rings are not marked on the coaxial cable, transceivers must be spaced in multiples of 2.5 m (8.2 ft) only.

Required Equipment
The following equipment is required for installing an H4000 Ethernet transceiver.

- H4090-KA/KB installation kit (instructions for using the kit are included with the kit).
- H4000-TA/TB transceiver tester

Power Requirements
An H4000 transceiver requires −11.40 to −15.75 Vdc for proper operation. The power is supplied by the following sources.

- The Ethernet device to which the transceiver is connected.
- An auxiliary power supply (DEXPS).

H4000-2
The following flow diagram outlines the H4000 transceiver installation process.

- Obtain customer-specific information:
  - Device placement (see "device placement")
  - Power requirements (see "power requirements")
  - Availability of transceiver cable
  - Location for etherjack connector (if used)

1. Enter
2. Preinstallation considerations
3. Unpack and verify all components received
4. Install transceiver follow instructions in H4000 transceiver installation guide
5. Connect transceiver cable to H4000 transceiver and lock in place (refer to figure 5)

Figure 2 Installation Flow Diagram (Sheet 1 of 4)
1

CONNECT TRANSCEIVER CABLE TO H4000-T TESTER

SELECT TX/RX MODE ON H4000-T TESTER

PRESS "RESET" ON H4000-T TESTER

TEST PASS ?

N

GO TO TROUBLESHOOTING FLOW DIAGRAM

Y

DISCONNECT TRANSCEIVER CABLE FROM H4000-T TESTER

2

Figure 2  Installation Flow Diagram (Sheet 2 of 4)
Figure 2  Installation Flow Diagram (Sheet 3 of 4)
Figure 2  Installation Flow Diagram (Sheet 4 of 4)
The following figure shows the positions of the center conductor contact and braid contacts. Also shown is the clamping block. The clamping block holds the coaxial cable so that it connects with the center conductor contact and braid contacts.

Figure 3  Hardware for Installing the H4000 Transceiver on a Coaxial Cable

The following figure shows the actual connection between the coaxial cable and the contacts.
Cabling
The following figure illustrates the procedure for connecting and locking the transceiver cable in place. The transceiver cable should be secured with a cable tie as shown for strain relief.

Figure 5  Typical Transceiver Cable Connection
H4000 DIAGNOSTICS

Diagnostics
There are no diagnostics designed specifically for the H4000 specifically Ethernet transceiver. However, the following diagnostics may be helpful in isolating faults to the transceiver.

- NIE (Network Exerciser) – See Network Troubleshooting in this volume of the Communications Options Minireference Manual.

- Functional diagnostics for the device connected to the transceiver (refer to specific device for applicable diagnostics).
Required Equipment
The following equipment is required for isolating faulty H4000 Ethernet transceivers.

- H4000-TA (or -TB for non-U.S. versions) transceiver tester.

Field Replaceable Units (FRUs)
The following items are FRUs for the H4000 transceiver.

- Transceiver module 54-14966-00
- Braid contacts (box of 100) 29-24339
- H4000 transceiver H4000
Troubleshooting Flow Diagram
The following troubleshooting flow diagram illustrates the procedures for locating a malfunctioning H4000 Ethernet transceiver.

1. Enter
2. Configure H4000-T tester for loopback testing (refer to Figure 7)
3. Set H4000-T mode switch to "TX/RX"
4. Press and release the "RESET" button

- Test Pass?
  - Yes (Y) → FRU replaced?
    - Yes (Y) → Problem solved?
      - Yes (Y) → Exit
      - No (N) → Go to network troubleshooting
    - No (N) → All FRUs replaced?
      - Yes (Y) → Perform corrective action (refer to Table 1)
      - No (N) → Problem solved?

* Did the symptom change? If so, then a new or additional problem may exist. Replace the original module to see if the original symptoms return. This new information may be useful in analyzing the problem.

Figure 6  Troubleshooting Flow Diagram (Sheet 1 of 4)
Figure 6  Troubleshooting Flow Diagram (Sheet 2 of 4)
Figure 6  Troubleshooting Flow Diagram (Sheet 3 of 4)
Figure 6  Troubleshooting Flow Diagram (Sheet 4 of 4)
The following figure shows a configuration for a single H4000-T transceiver tester connected to an H4000 UUT (unit under test).

Figure 7  Typical H4000-T Configuration for Loopback Testing
The following figure shows a configuration for two H4000-T transceiver testers connected for end-to-end connectivity testing. One tester is set in TX/RX mode, the other tester is set in RX ONLY mode.

Figure 8  Typical H4000-T Configuration for End-to-End Testing
<table>
<thead>
<tr>
<th>Lamp</th>
<th>Indication</th>
<th>Corrective Action*</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA PASS</td>
<td>Data packet transmitted and received correctly.</td>
<td>Repair/replace:&lt;br&gt;• Transceiver cable†&lt;br&gt;• Module‡&lt;br&gt;• Check tap for bent or broken contacts&lt;br&gt;• Retap&lt;br&gt;• Replace entire H4000 transceiver.</td>
</tr>
<tr>
<td>DATA FAIL</td>
<td>Data packet not received correctly.</td>
<td>Repair/replace:&lt;br&gt;• Transceiver cable†&lt;br&gt;• Module‡</td>
</tr>
<tr>
<td>COLLISION TEST</td>
<td>Collision test signal not received after sending data packet.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Intermittent light:</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Normal collision signal received.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>Steady light:</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Late collision.</td>
<td>If COLLISION is ON and SELF-TEST is flashing check for:&lt;br&gt;• Missing terminators&lt;br&gt;• Malfunctioning controller&lt;br&gt;• Improperly configured network</td>
</tr>
<tr>
<td>TIMEOUT</td>
<td>Carrier signal not received within 19 microseconds.</td>
<td>Repair/replace:&lt;br&gt;• Transceiver cable†&lt;br&gt;• Module</td>
</tr>
<tr>
<td>SELF TEST</td>
<td>Indicates successful self-test when flashed every 3-4 seconds.</td>
<td></td>
</tr>
</tbody>
</table>

*When several FRUs are suggested for replacement, begin by replacing the first of the several items.

†Make sure that the transceiver cable is properly assembled. Check “Proper Slide-Latch Assembly” illustrated in the “CABLES” section of this manual.

‡Before replacing module, remove power by disconnecting transceiver cable.
<table>
<thead>
<tr>
<th>Lamp</th>
<th>Indication</th>
<th>Corrective Action*</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATA PASS</td>
<td>Data packet received correctly.</td>
<td>If DATA PASS lamp is lit on TX/RX tester:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Troubleshoot cable plant</td>
</tr>
<tr>
<td>DATA FAIL</td>
<td>Data packet not received correctly.</td>
<td>• Replace UUT</td>
</tr>
<tr>
<td>COLLISION TEST</td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>COLLISION</td>
<td>Steady light:</td>
<td>If the COLLISION lamp is also lit on the TX/RX tester, check for:</td>
</tr>
<tr>
<td></td>
<td>Normal or late collision.</td>
<td>• Missing terminators</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Malfunctioning controller</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Improperly configured network</td>
</tr>
<tr>
<td>TIMEOUT</td>
<td>Not used.</td>
<td></td>
</tr>
<tr>
<td>SELF TEST</td>
<td>Steady ON indicates the single self-test</td>
<td></td>
</tr>
<tr>
<td>PASS</td>
<td>was successful.</td>
<td></td>
</tr>
</tbody>
</table>

*When several FRUs are suggested for replacement, begin by replacing the first of the several items.
<table>
<thead>
<tr>
<th>Tech Tip No.</th>
<th>Title</th>
<th>Speed Bulletin No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETHERNET-TT-2</td>
<td>Recommended Use of H4000 and Physical Channel Coax</td>
<td>313</td>
</tr>
</tbody>
</table>

H4000-20
CHAPTER 3
CABLES

3.1 INTRODUCTION
This chapter contains the following information.

- Outline drawings of each cable type needed to install the network devices described in this manual.
- Outline drawings of connectors and terminators.
- Drawings of proper slide-latch assembly.

The following table alphabetically lists part numbers of the various cables, connectors, and terminators used with Ethernet networks. Use of listed cables is also described.

**Table 1  Ethernet Cable, Connector, and Terminator Usage**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Name</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCO8R-1</td>
<td>Ribbon cable</td>
<td>Interconnects DEUNA link and port modules</td>
</tr>
<tr>
<td>BNC-F*</td>
<td>Female F to male BNC adaptor</td>
<td>Typically used for test equipment connection</td>
</tr>
<tr>
<td>BNE2*-.**</td>
<td>Coaxial cable</td>
<td>Ethernet physical channel cable (50 ohms)</td>
</tr>
<tr>
<td>BNE3*-.**</td>
<td>Low loss transceiver cable</td>
<td>Interconnects Ethernet devices</td>
</tr>
<tr>
<td>BNE4*-.**</td>
<td>High loss transceiver cable</td>
<td>Interconnects Ethernet devices</td>
</tr>
<tr>
<td>BN25B**</td>
<td>Fiber-optic cable</td>
<td>Links remote Ethernet repeater units</td>
</tr>
<tr>
<td>CAB-6*</td>
<td>Broadband cable</td>
<td>Physical channel drop cable (75 ohms) for broadband Ethernet networks</td>
</tr>
<tr>
<td>DEXJB</td>
<td>Fiber-optic junction box</td>
<td>Used to change from one type of fiber-optic cable to another</td>
</tr>
</tbody>
</table>

* Manufactured by Jerrold Div., General Instrument Corp.
<table>
<thead>
<tr>
<th>Part Number</th>
<th>Name</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEXJK</td>
<td>Etherjack connector</td>
<td>Wall-mounted receptacle for connecting a transceiver cable to an H4000 transceiver</td>
</tr>
<tr>
<td>F-56C*</td>
<td>Female F connector</td>
<td>Used for broadband drop cable</td>
</tr>
<tr>
<td>F-81C*</td>
<td>Female F to female F adaptor</td>
<td>Joins two lengths of broadband drop cable</td>
</tr>
<tr>
<td>TR-75F*</td>
<td>Female F terminator (75 ohms)</td>
<td>Terminates 75 ohm male F connectors</td>
</tr>
<tr>
<td>12-19817-01</td>
<td>Barrel connector</td>
<td>Joins two lengths of coaxial cable</td>
</tr>
<tr>
<td>12-19816-01</td>
<td>Terminator (50 ohms)</td>
<td>Terminates coaxial cable in its characteristic impedance (50 ohms)</td>
</tr>
<tr>
<td>70-18798-00</td>
<td>DEUNA bulkhead cable assembly</td>
<td>Interconnects DEUNA link module and bulkhead interconnect panel assembly</td>
</tr>
<tr>
<td>70-18799-00</td>
<td>DEUNA bulkhead interconnect panel assembly</td>
<td>I/O connector panel for DEUNA adaptor bulkhead</td>
</tr>
</tbody>
</table>

*Manufactured by Jerrold Div., General Instrument Corp.
3.2 CABLES AND CONNECTORS
The cables in this section are divided into the following categories.

- Baseband Ethernet coaxial cables  
- Baseband Ethernet connectors and terminators  
- Baseband Ethernet transceiver cables  
- Fiber-optic channel elements  
- Broadband Ethernet coaxial cable  
- Broadband Ethernet connectors and terminators  
- Other cables  

(See Table 2)  
(See Table 3)  
(See Table 4)  
(See Table 5)  
(See Table 6)  
(See Table 7)  

Table 2 Baseband Ethernet Coaxial Cables

<table>
<thead>
<tr>
<th>Cable Number</th>
<th>Length Variations Available*</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNE2A.**</td>
<td>MA, MB, MC, MD</td>
<td>PVC composition</td>
</tr>
<tr>
<td>BNE2B.**</td>
<td>MA, MB, MC, MD</td>
<td>Teflon™ composition</td>
</tr>
</tbody>
</table>

*MA = 23.4 m (76.78 ft)  
MB = 70.2 m (230.33 ft)  
MC = 117.0 m (383.88 ft)  
MD = 500.0 m (1640.50 ft)  

Teflon is a trademark of DuPont de Nemours and Co., Inc.

Table 3 Baseband Ethernet Connectors and Terminators

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Part Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H4060</td>
<td>Male N-connector</td>
<td>Connector for BNE2*.** cable (six per package)</td>
</tr>
<tr>
<td>12-19816-01</td>
<td>Terminator (50 ohms)</td>
<td>50 ohm terminator for BNE2*.** cable</td>
</tr>
<tr>
<td>12-19817-01</td>
<td>Barrel connector</td>
<td>Barrel connector for BNE2*.** cable</td>
</tr>
<tr>
<td>DEXJK</td>
<td>Etherjack</td>
<td>Etherjack connector</td>
</tr>
</tbody>
</table>
Figure 1  BNE2** Coaxial Cable

Figure 2  H4060 (End) Connector

Figure 3  12-19817-01 Barrel Connector

Figure 4  12-19816-01 Terminator
Figure 5  DEXJK Etherjack Connector
### Table 4  Baseband Ethernet Transceiver Cables

<table>
<thead>
<tr>
<th>Cable Number</th>
<th>Lengths Available*</th>
<th>Connector Description</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNE3A-**</td>
<td>05, 10, 20, 40</td>
<td>Straight angle</td>
<td>PVC</td>
</tr>
<tr>
<td>BNE4A-***†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BNE3B-**</td>
<td>05, 10, 20, 40</td>
<td>Right angle</td>
<td>PVC</td>
</tr>
<tr>
<td>BNE4B-***†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BNE3C-**</td>
<td>05, 10, 20, 40</td>
<td>Straight angle</td>
<td>Teflon™</td>
</tr>
<tr>
<td>BNE4C-***†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BNE3D-**</td>
<td>05, 10, 20, 40</td>
<td>Right angle</td>
<td>Teflon™</td>
</tr>
<tr>
<td>BNE4D-***†</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Lengths are in meters (1 meter = 3.281 feet).

†BNE4*-*** cable is a flexible office-compatible transceiver cable. The BNE4*-*** cable has approximately four times the attenuation of a BNE3*-** cable.

Teflon is a trademark of DuPont de Nemours and Co., Inc.
Figure 6  BNE3A-**/BNE4A-** (PVC) and BNE3B-**/BNE4B-** (Teflon™) Transceiver Cables

Figure 7  BNE3C-**/BNE4C-** (PVC) and BNE3D-**/BNE4D-** (Teflon™) Transceiver Cables
<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BN25B.**</td>
<td>Duplex fiber-optic cable (see note for length variations)</td>
</tr>
<tr>
<td>DEXJB</td>
<td>Fiber-optic junction box</td>
</tr>
</tbody>
</table>

**NOTE**

The following length variations are available 15, 30, 60, 90, A5 (=150), C0 (=300), E0 (=500), H5 (=750), and L0 (=1000)*.

*Lengths are in meters (1 meter = 3.281 feet).

Figure 8  Duplex Fiber-Optic Cable
Figure 9  DEXJB Fiber-Optic Junction Box
Broadband Ethernet Coaxial Cable
CAB-6* cable is a flexible office broadband cable. CAB-6 type cable is available in 304.8 m (1000 ft) lengths.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Part Name</th>
<th>Description of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>TR-75F*</td>
<td>Female F terminator</td>
<td>Used to terminate 75 ohm male F connectors</td>
</tr>
<tr>
<td>F-81C*</td>
<td>Female F to female F adaptor</td>
<td>Used to join two lengths of broadband cable</td>
</tr>
<tr>
<td>F-56C*</td>
<td>Female F connector</td>
<td>Used for CAB-6 type (broadband) cable</td>
</tr>
<tr>
<td>BNC-F*</td>
<td>Female F to male BNC adaptor</td>
<td>Typically used for test equipment connection</td>
</tr>
</tbody>
</table>

*Manufactured by Jerrold Div., General Instrument Corp.

Figure 10  CAB-6 Broadband Office Cable

Figure 11  TR-75F Terminator

*Manufactured by Jerrold Div., General Instrument Corp.
MKV84-1682

Figure 12  F-81C Adaptor

MKV84-1683

Figure 13  F-56C Connector

MKV84-1685

Figure 14  BNC-F Adaptor
Table 7  Other Cables

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Part Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BC08R-1</td>
<td>Ribbon cable</td>
<td>A .3 m (1 ft) ribbon cable that interconnects a DEUNA link and port module (two are required).</td>
</tr>
<tr>
<td>70-18798-**</td>
<td>Bulkhead cable assembly</td>
<td>A cable that interconnects a DEUNA link module and bulkhead interconnect panel assembly. The following length variations are available.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 70-18798-04 = 1.2 m (4 ft)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 70-18798-08 = 2.4 m (8 ft)</td>
</tr>
<tr>
<td>70-18799-00</td>
<td>Bulkhead interconnect panel assembly</td>
<td>An I/O connector panel with an adaptor bracket acceptable for installation in various cabinet types.</td>
</tr>
</tbody>
</table>

Figure 15  BC08R-1 Ribbon Cable
Figure 16  70-18798-** Bulkhead Cable Assembly and 70-18799-00 Bulkhead Interconnect Panel Assembly
3.3 PROPER SLIDE-LATCH CONFIGURATION
Slide-latches may not function properly unless they conform to the "correct" configuration shown below.

NOTE
The figure below is correct for bulkhead-mounted slide latches. Differences for cable-mounted slide latches are noted.

Verify the following.

- Each locking pin of the male connector has two flat washers.
- The smaller cutout on a bulkhead-mounted slide latch is close to pin 1.
- The smaller cutout on a cable-mounted slide latch is close to pin 8.
- There is no space between the slide latch and the connector. Note the "incorrect" drawing for detail.

Figure 17 Proper Slide-Latch Configuration
CHAPTER 4
SPECIAL TOOLS
AND TEST EQUIPMENT

NOTE
The following trademarks are used in this chapter:

- AMP 90302-1, 91239-7 are trademarks of AMP Special Industries, Inc.
- Amphenol 906 is a trademark of Amphenol, An Allied Co.
- Blonder Tongue SA-7U is a trademark of Blonder-Tongue Labs, Inc.
- Photodyne 5500 is a trademark of Photodyne, Inc.
- Tektronix 1503, OF-150, 564 are trademarks of Tektronix, Inc.
- Wavetek SAM III, 1801B are trademarks of Wavetek Rockland, Inc.

4.1 INTRODUCTION
This chapter provides brief descriptions of various special tools and test equipment that may be required for installing, testing, and troubleshooting Digital Equipment Corporation's Ethernet networks. The following tools and test equipment (or their equivalent) are recommended.

Baseband Equipment

- DIGITAL H4090 (-KA or -KB) transceiver installation kit
- DIGITAL H4000 (-TA OR -TB) Ethernet transceiver tester*
- DIGITAL H4080 loopback test connector
- Tektronix 1503™ TDR (time-domain reflectometer)*

Broadband Equipment

- Blonder Tongue SA-7U™ variable attenuator (to 62 dB)
- Wavetek 1801B™ swept RF oscillator
- Wavetek SAM III™ RF signal level meter/spectrum analyzer (5 to 400 MHz)

Fiber-Optic Equipment

- Photodyne 5500™ FOTDR (optical time-domain reflectometer)
- Tektronix OF-150™ FOTDR

Baseband Coaxial Cable Tools

- DIGITAL 29-24668 coaxial cable stripper
- DIGITAL 29-24663 ferrule and pin crimper
- DIGITAL 29-24667 coaxial cable cutter

*May also be used for testing broadband networks.
Baseband Transceiver Cable Tools

- AMP 90302™ D-connector pin crimper
- AMP 91239™ cable ferrule crimp tool and die set

4.2 BASEBAND TOOLS AND TEST EQUIPMENT
This section describes the various tools and test equipment required for installing and/or maintaining baseband Ethernet devices.

4.2.1 H4090 (-KA and -KB) Transceiver Installation Kit
The H4090-K* transceiver installation kit is required for installation of an H4000 Ethernet transceiver. Two versions of the kit are available from Digital Equipment Corporation: the H4090-KA and H4090-KB.

The parts that make up the H4090-KA and H4090-KB transceiver installation kits are shown in the following table.

<table>
<thead>
<tr>
<th>H4090-KA</th>
<th>H4090-KB</th>
<th>Part</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>*</td>
<td>29-24337 cordless electric drill and charger</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>29-24341 insulated drill bits</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>29-24338 drilling fixture assembly</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>29-24339 box with 100 braid terminators</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>29-24340 3/16-inch hex wrench</td>
</tr>
</tbody>
</table>

*Equivalent parts must be supplied by a local source.
The following illustration shows the parts that make up the H4090-KA and H4090-KB transceiver installation kits.

DRILL AND DRILL CHARGER 29-24337

DRILL CHUCK KEY

DRILL BITS 29-24341

MKV84-1656

Figure 1  Transceiver Installation Kit Parts (Sheet 1 of 2)
4.2.2 H4000-TA and H4000-TB Ethernet Transceiver Tester

The H4000-T* tester is a portable test device that may be used for on-line verification of the following Ethernet physical channel components.

- H4000 Ethernet transceivers
- Ethernet coaxial cable
- Transceiver cables
- Etherjack connectors
- DELNI network interconnects
- DEREP Ethernet repeaters
- DECOM broadband transceivers

There are two versions of the H4000-T* transceiver tester.

- H4000-TA 120 V/60 Hz
- H4000-TB 240 V/50 Hz
An H4000-T* transceiver tester verifies a transceiver's capability to perform the following:

- Transmit a packet to an Ethernet coaxial cable
- Receive data from an Ethernet coaxial cable
- Detect a collision
- Generate CPT (collision presence test)

The H4000-T* transceiver tester operates in two modes.

- TX/RX (transmit/receive) mode

  In this mode, one tester is used to verify the transceiver to which it is connected. The tester transmits a packet to the transceiver, receives these data packets back from the transceiver, and verifies the data packets.

- RX ONLY (receive only) mode

  In this mode two testers are used to verify Ethernet network connectivity. Connectivity can be between a pair of transceivers, DELNI ports, or similar Ethernet ports. One transceiver tester is set in the TX/RX mode while the other tester (set in RX ONLY mode) receives and verifies the data packets transmitted by the TX/RX tester.


The following illustration shows an H4000-T* transceiver tester.

![H4000-T* Ethernet Transceiver Tester](image)

**Figure 2** H4000-T* Ethernet Transceiver Tester

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4.2.3 H4080 Loopback Test Connector
The H4080 test connector acts as a "known-good" transceiver to simulate connection to an Ethernet coaxial cable. As such, it provides packet loopback, CPT (collision presence test) signals, and draws normal transceiver current. The H4080 connector may be used to test controllers, repeaters, DELNI network interconnects, and similar devices. The following illustration shows an H4080 connector.

Figure 3  H4080 Loopback Test Connector

4.2.4 Tektronix Type 1503 Time-Domain Reflectometer (TDR)
The Tektronix 1503 TDR is a portable test device used to measure the length and attenuation of a single Ethernet coaxial cable (see notes). These parameters may be used to accurately determine the distance to cable faults such as shorted, open, or unterminated cable.

NOTES
1. For testing baseband (BNE2) cable, a BNC to N adaptor is required.
2. For testing broadband (CAB-6) cable, a BNC to F adaptor is required.

The Tektronix type 1503 TDR (or equivalent) is required for certification of the Ethernet coaxial cable.

Its features include:

- An oscilloscope-type display,
- A strip chart (optional) for recording cable "signatures",
- Selectable impedance levels (50, 75, 93 and 125 ohms), and
- Distance calibration switches for entering propagation delay.

The following illustration shows a Tektronix type 1503 TDR.

![Image of Tektronix Type 1503 TDR](MKV84-1659)

**Figure 4** Tektronix Type 1503 TDR

4.3 **BROADBAND TOOLS AND TEST EQUIPMENT**

This section describes the various tools and test equipment required for installing and/or maintaining broadband Ethernet devices.

4.3.1 **Blonder Tongue Model SA-7U Variable Attenuator**

The model SA-7U variable attenuator is used to verify the dynamic range of the broadband transceiver.

The SA-7U attenuator is portable [less than .454 kg (1 lb)] and attenuation may be varied by 1 dB steps to 62 dB.
4.3.2 Wavetek Model 1801B Sweep Signal Generator
The Wavetek model 1801B sweep signal generator provides a means to test the bandpass of a broadband Ethernet cable. Specifically, the 1801B generator may provide a single frequency or may sweep through the entire broadband spectrum.

Features of the model 1801B sweep signal generator include:

- Variable rate of sweep,
- Variable repetition of sweep, and
- Variable voltage level of the output sweep.

The generator should be used in conjunction with the following equipment.

- Signal level meter (Wavetek SAM III or equivalent).
- Spectrum analyzer (or oscilloscope connected to spectrum analyzer output on the SAM III signal meter).

4.3.3 Wavetek SAM III Signal Analysis Meter
The Wavetek SAM III signal analysis meter is a portable test device used to measure RF signal levels in broadband (and other CATV type) cable systems.

The Wavetek SAM III meter has the following capabilities.

- Signal level measurement in dBmV.
- Internal calibration to within ± .25 dBmV.
- A spectrum analyzer output that enables certain oscilloscopes to act as a spectrum analyzer.
- A front panel keyboard that permits selection of preprogrammed standard and HRC channels, or manual selection of any frequency in the 450 MHz (CATV) bandwidth.

4.4 FIBER-OPTIC TOOLS AND TEST EQUIPMENT
This section describes the various tools and test equipment required for installing and/or maintaining fiber-optic cables.
4.4.1 Photodyne Model 5500 Fiber-Optic Time-Domain Reflectometer (FOTDR)
The Photodyne model 5500 FOTDR is a portable test device used to measure the following parameters of a fiber-optic cable.

- Attenuation
- Distance to faults, breaks, and the end of the fiber

Features of the 5500 FOTDR include a four-digit digital readout (an oscilloscope-type display is not provided).

The 5500 FOTDR may be used with the following additional equipment.

- Amphenol type 906™ SMA connector
- Tektronix model 564™ oscilloscope or equivalent

Figure 6 Photodyne Model 5500 FOTDR

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4.4.2 Tektronix Model OF-150 Fiber-Optic Time-Domain Reflectometer (FOTDR)

The Tektronix model OF-150 FOTDR is a portable test device used to measure the following parameters of a fiber-optic cable:

- Attenuation
- Distance to faults, breaks, and the end of the fiber

The Tektronix model OF-150 FOTDR (or equivalent) is required for certification of a fiber-optic link.

The OF-150 FOTDR may require an Amphenol type 906 SMA connector.

Features of the OF-150 FOTDR include:

- An oscilloscope-type display, and
- A strip chart for recording fiber "signatures".

Figure 7  Tektronix Model OF-150 FOTDR
4.5 BASEBAND COAXIAL CABLE TOOLS
This section describes the various tools and test equipment required for installing and/or maintaining Ethernet coaxial cables.

4.5.1 DIGITAL 29-24668 Coaxial Cable Stripper
The DIGITAL 29-24668 coaxial cable stripper is used to strip insulation and braided shield from the coaxial cable in preparation for installing male “N” type connectors.

Figure 8 DIGITAL 29-24668 Coaxial Cable Stripper
4.5.2 DIGITAL 29-24663 Ferrule and Pin Crimper
The DIGITAL 29-24663 ferrule and pin crimper is used to crimp a male "N" type connector ferrule on a prepared coaxial cable end.

Figure 9 DIGITAL 29-24663 Ferrule and Pin Crimper
4.5.3 DIGITAL 29-24667 Coaxial Cable Cutter
The DIGITAL 29-24667 coaxial cable cutter is used to cut coaxial cable with minimum deformation of the cable end.

Figure 10  DIGITAL 29-24667 Coaxial Cable Cutter
4.6 BASEBAND TRANSCEIVER CABLE TOOLS
This section describes the various tools and test equipment required for installing and/or maintaining Ethernet transceiver cables.

4.6.1 AMP 91239-7 Cable Ferrule Crimp Tool and Die Set
The AMP 91239-7 cable ferrule crimp tool and die set is used to crimp the connector ferrule to the end of a transceiver cable.

![Cable Ferrule Crimp Tool](image)

Figure 11 AMP 91239-7 Cable Ferrule Crimp Tool and Die Set
4.6.2 AMP 90302-1 D-Connector Pin Crimper
The AMP 90302-1 D-connector pin crimper is used when installing the connector end on a transceiver cable. The tool can be used for crimping male pins or female sockets to the cable wire.

Figure 12 AMP 90302-1 D-Connector Pin Crimper
Information to be supplied at a later date.
This information to be added at a later date.

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