EK-CMIV6-RM-005

Networks . Communications

Communications Options Minireference Manual

Volume 6 Ethernet Devices (Part 2)

DIGITAL INTERNAL USE ONLY

Digital Equipment Corporation

1st Edition, December 1981
2nd Edition, August 1984
3rd Edition, August 1986
4th Edition, August 1987
5th Edition, August 1988

Printed in U.S.A.

This document was set on a DIGITAL DECset Integrated Publishing System.

- Class A Computing Devices:

Notice: This equipment generates, uses, and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such radio frequency interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference in which case the user at his own expense may be required to take measures to correct the interference.

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DEFTR BROADBAND ETHERNET FREQUENCY TRANSLATOR

General Description

The DEFTR broadband Ethernet frequency translator is used in conjunction with the DIGITAL broadband Ethernet transceivers (DECOM-BA and DECOM-BB) to create an Ethernet channel in single-cable broadband networks.

The frequency translator receives signals transmitted by the DECOM-BA or DECOM-BB transceivers, translates the signals to a higher frequency, transposes the signals, and retransmits them to the transceivers.

DEFTR INSTALLATION

DEFTR Versions (Figure 1)

There is only one version of the DEFTR-AX* frequency translator.

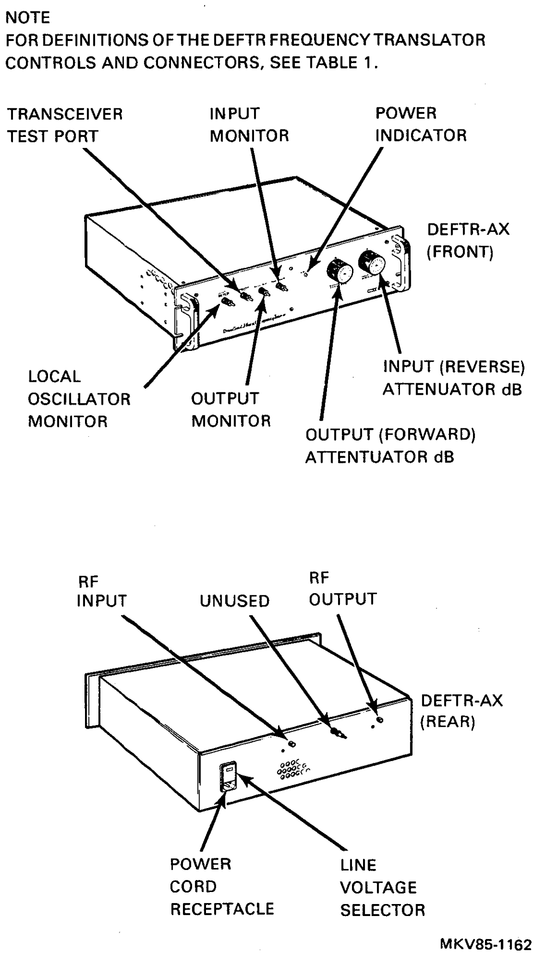

Figure 1 DEFTR-AX* Frequency Translator

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*The letter "A" or "B" will appear in place of the "X" in the model designation to signify the following frequency translator input voltages.

Model	Input Voltage
DEFTR-AA	120 Vac
DEFTR-AB	240 Vac

Table 1 DEFTR Controls, Connectors, and Indicators

Component	Description
Front Panel	
INPUT Attenuator	Adjusts the input (reverse channel) signal level to the frequency translator in 1 dB increments, from 0 to 10 dB.
OUTPUT Attenuator	Adjusts the output (forward channel) signal level of the frequency translator in 1 dB increments, from 0 to 10 dB.
INPUT MONITOR Connector	Monitors the input signal received by the frequency translator and reduces its level by 20 dB.
OUTPUT MONITOR Connector	Monitors the output signal produced by the frequency translator and reduces its level by 20 dB.
LOCAL OSCILLATOR MONITOR Connector	Presents the local oscillator output signal (282.25 MHz) and reduces its level by 20 dB.
TRANSCEIVER TEST PORT Connector	Provides a means for testing a DECOM transceiver.
POWER Indicator	Green LED indicating, when ON, that the frequency translator is plugged in and that ac power is applied.
Rear Panel	
RF INPUT Connector	Accepts the RF input signal.
RF OUTPUT Connector	Delivers the RF output signal.
Unused Connector	

Components
The following parts are supplied with each DEFTR frequency translator.

Table 2 Frequency Translator Components

Model	Owner's Manual	Power Cord	Country Kit
DEFTR-AA	X	X	
DEFTR-AB	X		X*

*Power cord for DEFTR-AB unit comes in accompanying country kit DEBBK-AX, where "X" identifies the country.

DEFTR INSTALLATION

Country Kits

Appropriate power cords are shipped in country kits that must be ordered separately with each DEFTR frequency translator. The following table indicates the country kit for each particular country.

Table 3 Country Kits

Country Used In	Country Kit Designation
Australia	DEBBK-AZ
Belgium	DEBBK-AB
Canada - English	DEBBK-AQ
Canada - French	DEBBK-AC
Denmark	DEBBK-AD
Finland	DEBBK-AF
France	DEBBK-AN
Germany	DEBBK-AG
Holland	DEBBK-AH
Italy	DEBBK-AI
Norway	DEBBK-AN
Spain	DEBBK-AS
Sweden	DEBBK-AM
Switzerland - French	DEBBK-AK
Switzerland - German	DEBBK-AL
United Kingdom	DEBBK-AE

Reference Documentation

Title	Document Number
DEFTR Broadband Ethernet Frequency Translator Owner's Manual	EK-FRETR-OM
DEFTR Broadband Ethernet Frequency Translator Technical Description	EK-FRETR-TD
DECOM Broadband Ethernet Transceiver Owner's Manual	EK-OOBET-OM
DECOM Broadband Ethernet Transceiver Technical Manual	EK-OOBET-TM
Broadband Ethernet Channel Specification and Certification Guide	EK-OOBEC-SM
The Ethernet Specifications	AA-K759X*-TK

*The letter "X" indicates the version of the document.

Device Placement

- Select the headend location of the cable plant within reach of an ac power source.
- Mount the frequency translator in a standard 48.26 cm (19 in) rack or on top of a desk or table at this location.

NOTE
ALLOW AT LEAST 15.24 CM (6 IN) IN THE REAR AND 2.54 CM (1 IN) ON EACH SIDE OF THE UNIT FOR AIR CIRCULATION.

WARNING
THE DEFTR FREQUENCY TRANSLATOR HAS BEEN CERTIFIED BY THE CANADIAN STANDARDS ASSOCIATION (CSA) AS A SYSTEM COMPONENT. THE CSA HAS NOT TESTED THE SAFETY OF THE DEFTR WITH THE USE OF OTHER COMPONENTS IN THE RACK.

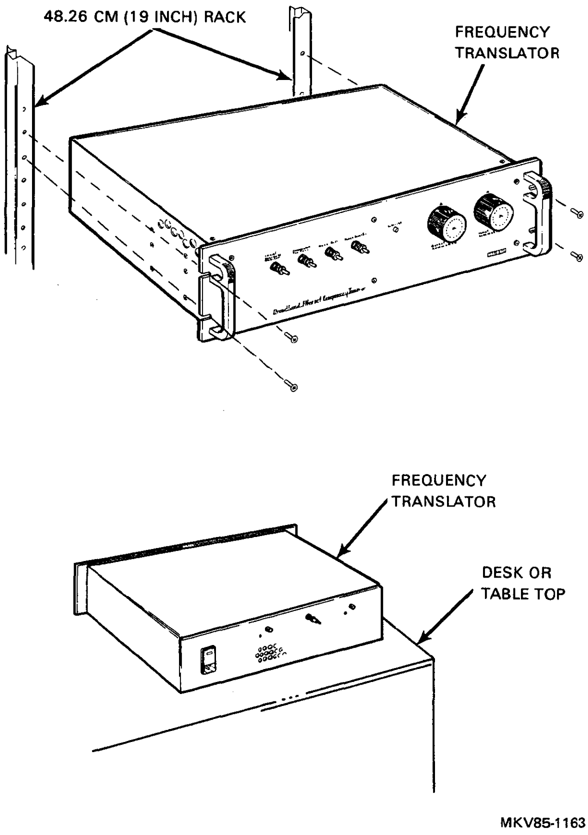


Figure 2 Frequency Translator Placement

DEFTR INSTALLATION

Power Requirements

AC input power is selectable.

120 Vac, 60 Hz, 0.29 A, 35 W

or

240 Vac, 50 Hz, 0.15 A, 35 W

Preinstallation Steps

1. Check that the network in which the frequency translator is being installed has been certified according to the *Broadband Ethernet Channel Specification and Certification Guide* (EK-OOBEC-SM).

2. Set the INPUT (Reverse) and OUTPUT (Forward) attenuators to the appropriate dB settings by using the procedures given in the Attenuator Settings section.

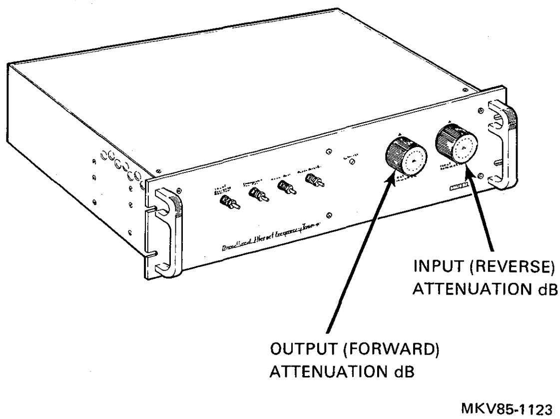


Figure 3 DEFTR Attenuator Locations

Attenuator Settings

The midrange path (leg) losses for the Forward and Reverse Ethernet channels are needed to determine the attenuator settings. These path losses are included in the *Ethernet Channel Site Management Guide* or *Cable Facility Site Management Guide*, which are produced as a result of the certification process. If the midrange path losses are not included in either of these guides, use the following procedures to determine the attenuator settings. If they are included, go to Step 3 in both the input and output attenuator value determinations.

Input (Reverse Channel) Attenuator Value Determination –

1. Determine the minimum and maximum reverse signal levels from certification or proof of performance testing performed on the Ethernet channel or cable facility. This information should be in the *Ethernet Channel Site Management Guide* or the *Cable Facility Site Management Guide.*

2. Determine the midrange of the reverse path loss by using the following formula:

   Midr = LTSA – (Minr + Maxr)/2

   Where:

   Midr = Midrange reverse channel path loss (dB)
   Minr = Minimum reverse channel signal level (dBmV) at 61 MHz
   Maxr = Maximum reverse channel signal level (dBmV) at 61 MHz
   LTSA = Level of test signal asserted (dBmV)

3. Determine the input attenuator setting by using the following formula:

   Input Attenuator Setting = 50 – Midr

NOTE
If the input attenuator setting is a negative value, set the input attenuator to 0 dB. If the input attenuator setting is between 10 and 13 dB, set the input attenuator to 10 dB.

Output (Forward Channel) Attenuator Value Determination –

1. Determine the minimum and maximum forward signal levels from certification or proof of performance testing performed on the Ethernet channel or cable facility. This information should be in the *Ethernet Channel Site Management Guide* or the *Cable Facility Site Management Guide.*

2. Determine the midrange of the forward path loss by using the following formula:

   Midf = LTSA – (Minf + Maxf)/2

   Where:

   Midf = Midrange forward channel path loss (dB)
   Minf = Minimum forward channel signal level (dBmV) at 221 MHz
   Maxf = Maximum forward channel signal level (dBmV) at 221 MHz
   LTSA = Level of test signal asserted (dBmV)

3. Determine the output attenuator setting by using the following formula:

   Output Attenuator Setting = 50 – Midf

NOTE
If the output attenuator setting is a negative value, set the output attenuator to 0 dB. If the attenuator setting is between 10 and 13 dB, set the output attenuator to 10 dB.

DEFTR INSTALLATION

Installation Flow Diagram

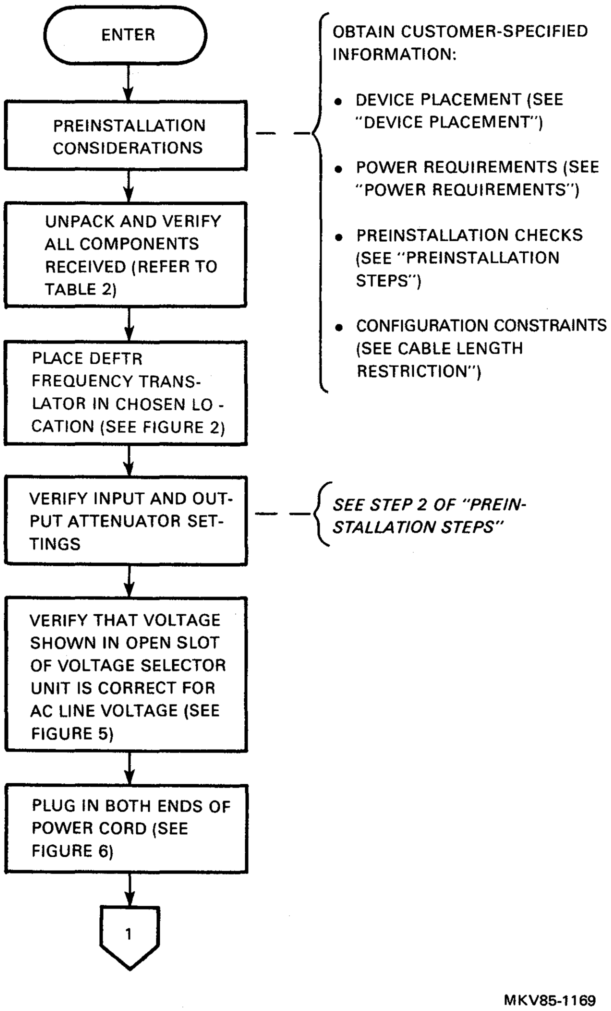


Figure 4 DEFTR Installation Flow Diagram (Sheet 1 of 2)

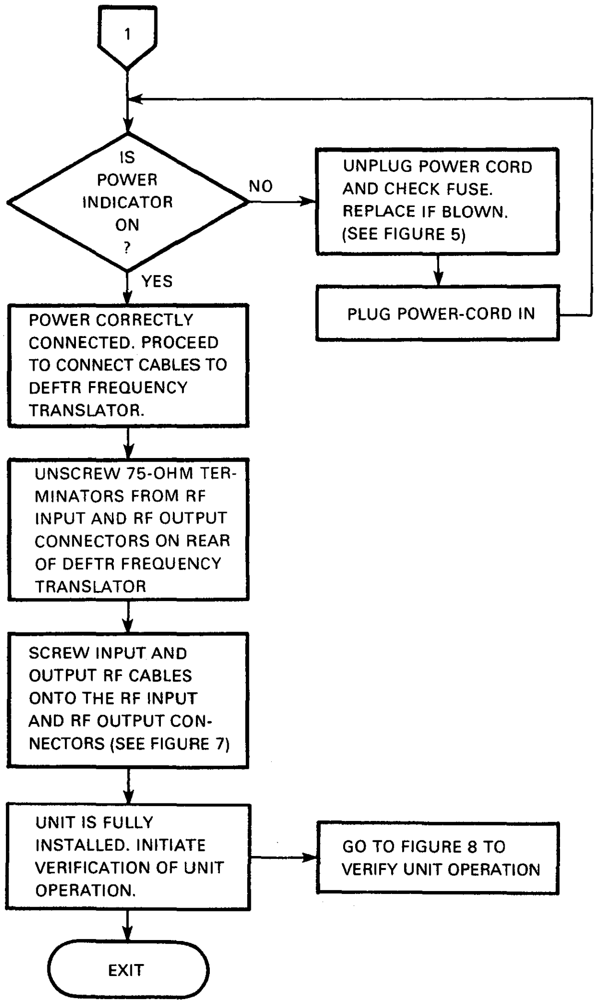


Figure 4 DEFTR Installation Flow Diagram (Sheet 2 of 2)

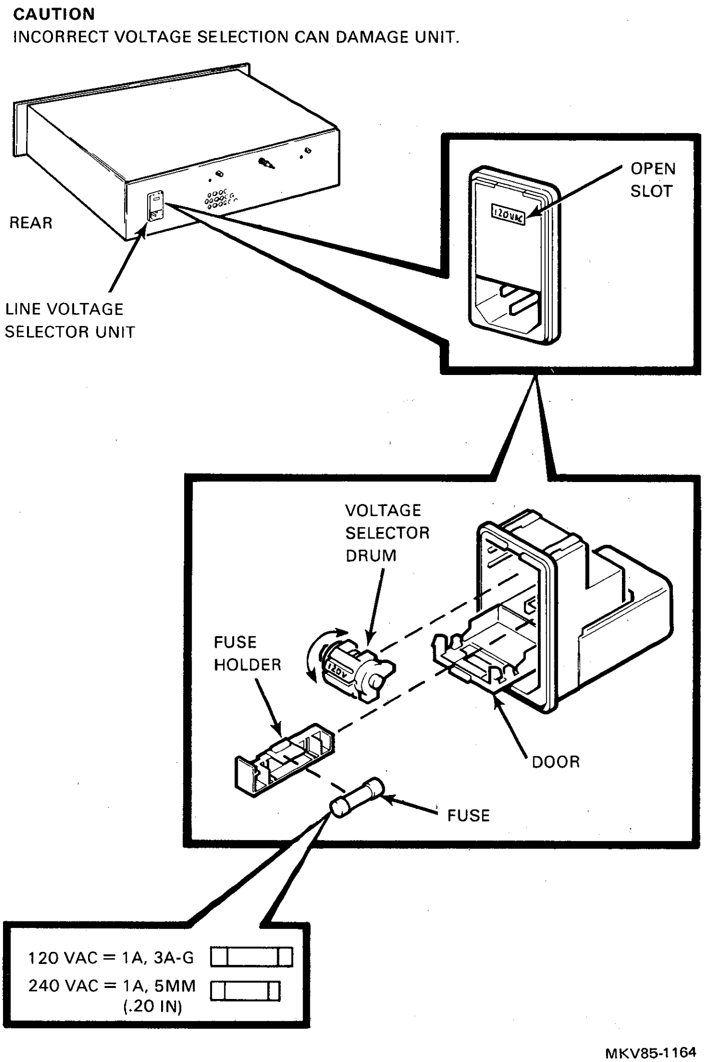


Figure 5 Diagram for Setting Line Voltage

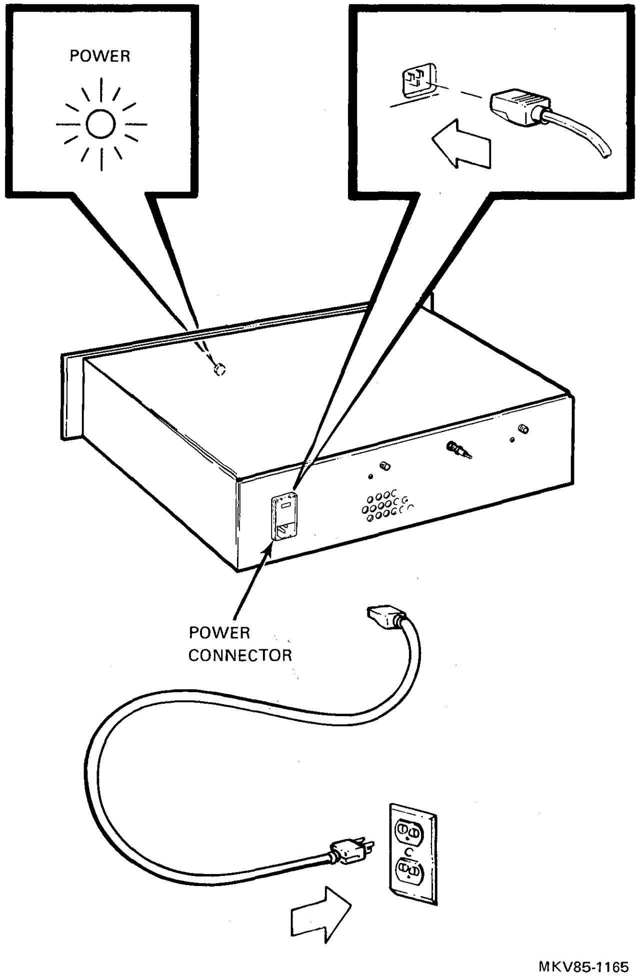
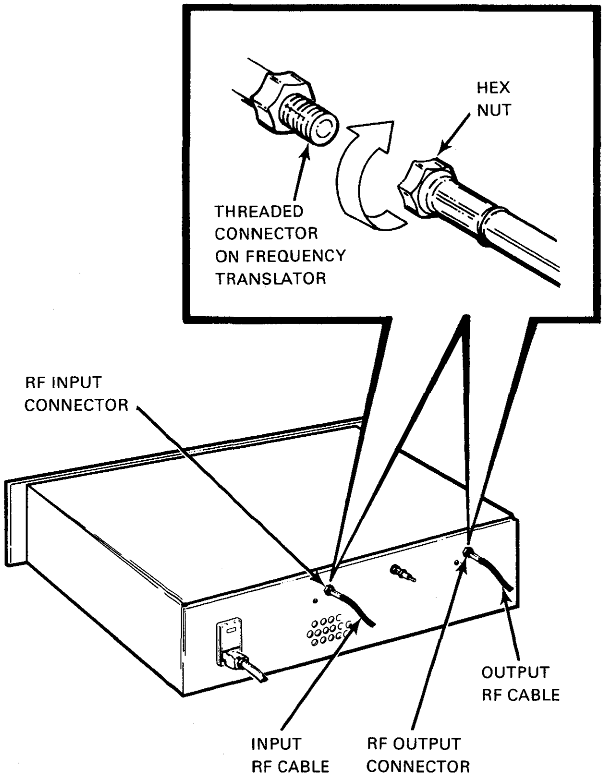


Figure 6 Diagram for Connecting Power Cord

CAUTION
DO NOT OVERTIGHTEN THE HEX-NUTS. FINGER TIGHTEN ONLY.



NOTE
THESE CABLES SHOULD BE MARKED INPUT AND OUTPUT.

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Figure 7 Diagram for Connecting RF Cables to DEFTR Frequency Translator

Cable Length Restriction

Make sure that the RF cable length from the DEFTR frequency translator to any DECOM transceiver does not exceed 1900 m (6234 ft).

DEFTR DIAGNOSTICS

Diagnostics

There are no diagnostics designed specifically for the DEFTR frequency translator. The NIE (Network Exerciser) diagnostic, however, can be helpful in isolating faults to the frequency translator as discussed in the Maintenance Aids section.

Prechecks

1. Test all transceiver cables and make sure that they work properly, as described in the user documentation for the Ethernet controller.

2. Check that the RF cable length from the DEFTR frequency translator to any DECOM transceiver does not exceed 1900 m (6234 ft).

Ethernet Controller Self-Test
The flow diagram in Figure 8 assumes that the Ethernet controller has a loopback test capability (such as, NI exerciser), which can be used to test the translator and network cable facility. When the flow diagram indicates "RUN ETHERNET CONTROLLER SELF-TEST," run this test on the translator by using the Ethernet controller self-test or functional level testing software. Refer to the user and software documentation for the particular Ethernet controller being used.

Network Troubleshooting Table
Use Table 4 for a simple method of isolating a network problem to a DEFTR frequency translator, DECOM transceiver, or network cable facility.

Table 4 Network Troubleshooting

Problem	Probable Cause	Remedy
All DECOM transceivers are NOT working and other applications* are NOT working.	Network cable facility	Get service for network cable facility.
All DECOM transceivers are NOT working and other applications* are working.	Frequency translator (DEFTR)	Get service for DEFTR frequency translator or proceed to DEFTR checkout flow diagram.
Some DECOM transceivers are NOT working.	Network cable facility section	Get service for network cable facility.
	DEFTR attenuator settings	Check settings.
One DECOM transceiver is NOT working.	DECOM transceiver	Use checkout flow diagrams in the DECOM owner's manual for a more thorough isolation procedure or get service for DECOM transceiver.
	DEFTR attenuator settings	Check settings.

*"Other applications" means other datamodems, video equipment, T1 type modems, and so forth, that use the network cable facility as their transmission medium.

NOTE

Since Digital Equipment Corporation's certification process does not always test every tap in large networks, a "certified" network may have some taps that were not individually certified. After thoroughly checking out the DEFTR frequency translator and DECOM transceiver, check to find out if the taps being used have been certified.

DEFTR Checkout Flow Diagram

Use the flow diagram in Figure 8 to check the operation of the DEFTR frequency translator.

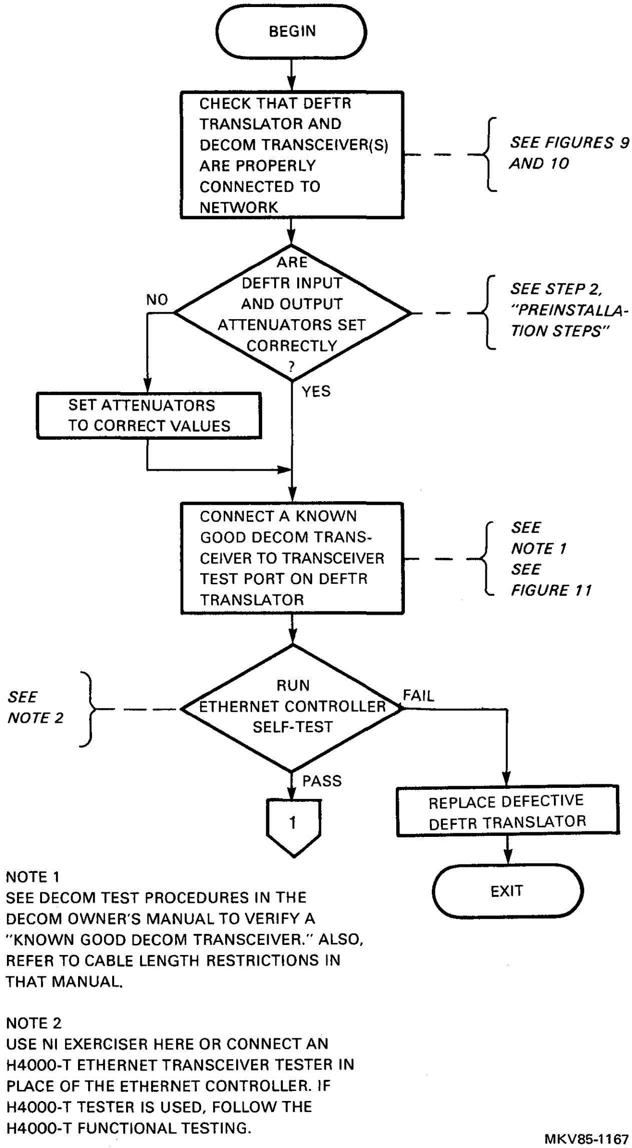


Figure 8 Checkout Flow Diagram for DEFTR Frequency Translator (Sheet 1 of 2)

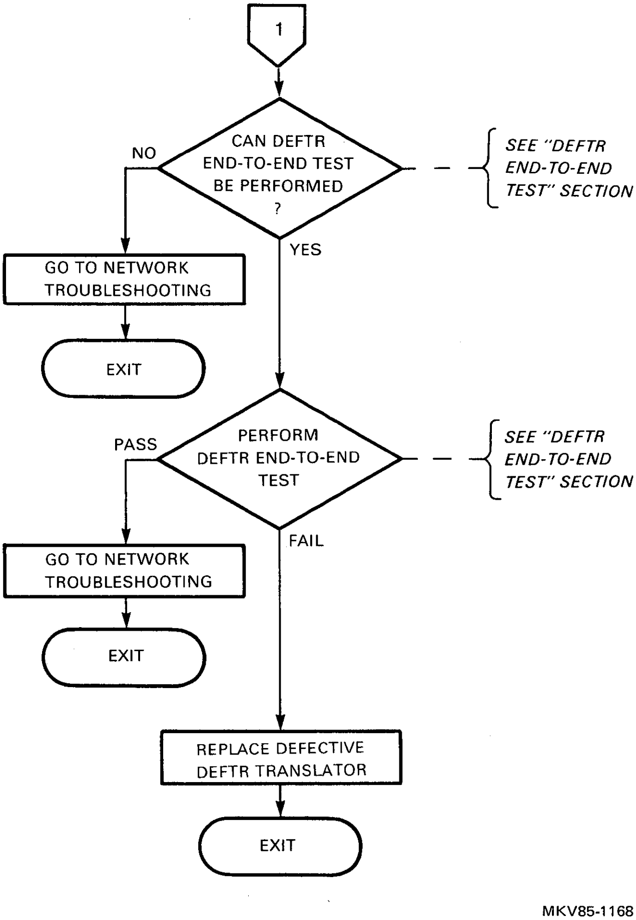


Figure 8 Checkout Flow Diagram for DEFTR Frequency Translator (Sheet 2 of 2)

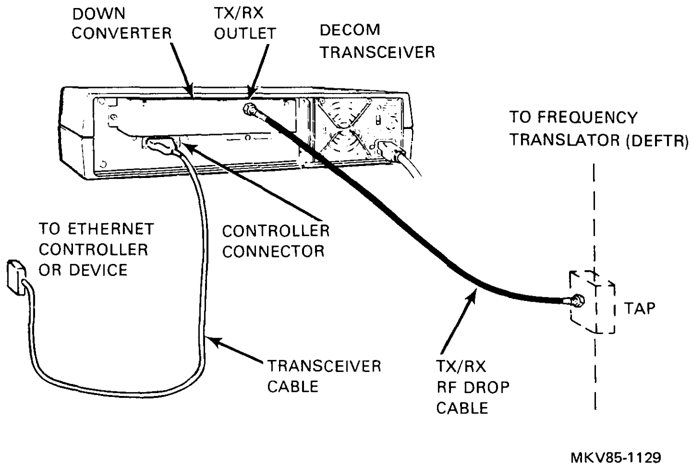


Figure 9 Network Connection Diagram for Transceiver

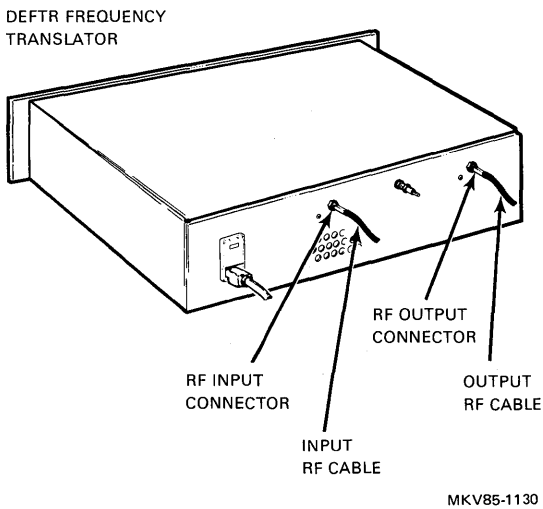


Figure 10 Network Connection Diagram for DEFTR Frequency Translator

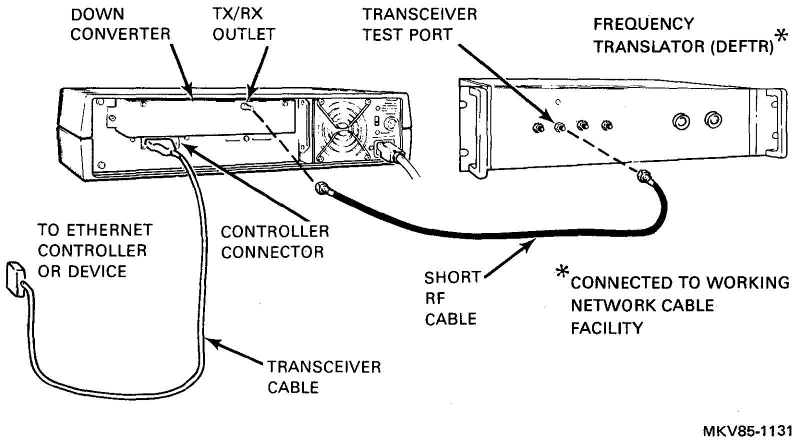


Figure 11 Transceiver to DEFTR Test Connection Diagram

DEFTR End-to-End Test
This section contains the test referred to when the DEFTR checkout flow diagram indicates "PERFORM DEFTR END-TO-END TEST." The purpose of the test is to determine if the DEFTR frequency translator will accept a known input signal, translate it to a higher frequency, and present this higher frequency signal at the DEFTR output.

Required Test Equipment –

- Calibrated signal generator – Capable of generating a 60 MHz signal at 0 dBmV into a 75-ohm load.
- Calibrated tunable signal level meter – Capable of measuring a 222.25 MHz signal in a 34 to 58 dBmV range into a 75-ohm load.

Test Procedure –

1. Disconnect the DEFTR frequency translator from the network by unscrewing the network RF cables from the RF INPUT and RF OUTPUT connectors on the DEFTR frequency translator.
2. Refer to Figure 12. Note the settings of the OUTPUT (Forward) and INPUT (Reverse) attenuators on the DEFTR frequency translator.
3. Adjust the signal generator for an output signal of 60 MHz, 0 dBmV into a 75-ohm load.
4. Adjust the level meter for an input signal of 222.25 MHz, 56 dBmV.
5. Set the INPUT (Reverse) attenuator on the DEFTR frequency translator to 0 dB.

6. Connect the output cable from the signal generator to the DEFTR RF INPUT connector.
7. Set the OUTPUT (Forward) attenuator on the DEFTR frequency translator to 0 dB.
8. Connect the input cable from the signal level meter to the DEFTR RF OUTPUT connector.
9. Measure the frequency and level of the DEFTR output signal with the signal level meter.

IF:	THEN:
Frequency = 222.25 MHz and Level = 56 dBmV ±2 dBmV	DEFTR frequency translator passes test. Go to Step 10.
Frequency and/or level not equal to above	DEFTR frequency translator fails test. Return to DEFTR flow diagram.

10. Set the OUTPUT (Forward) and INPUT (Reverse) attenuators on the DEFTR frequency translator to the values noted above in Step 2.
11. Measure the level of the DEFTR output signal with the signal level meter.

IF:	THEN:
Level = 56 dBmV ±2 dBmV minus the sum of the OUTPUT (Forward) and INPUT (Reverse) attenuator settings	DEFTR frequency translator passes end-to-end test. Return to DEFTR flow diagram.
Level not equal to above	DEFTR frequency translator fails end-to-end test. Return to DEFTR flow diagram.

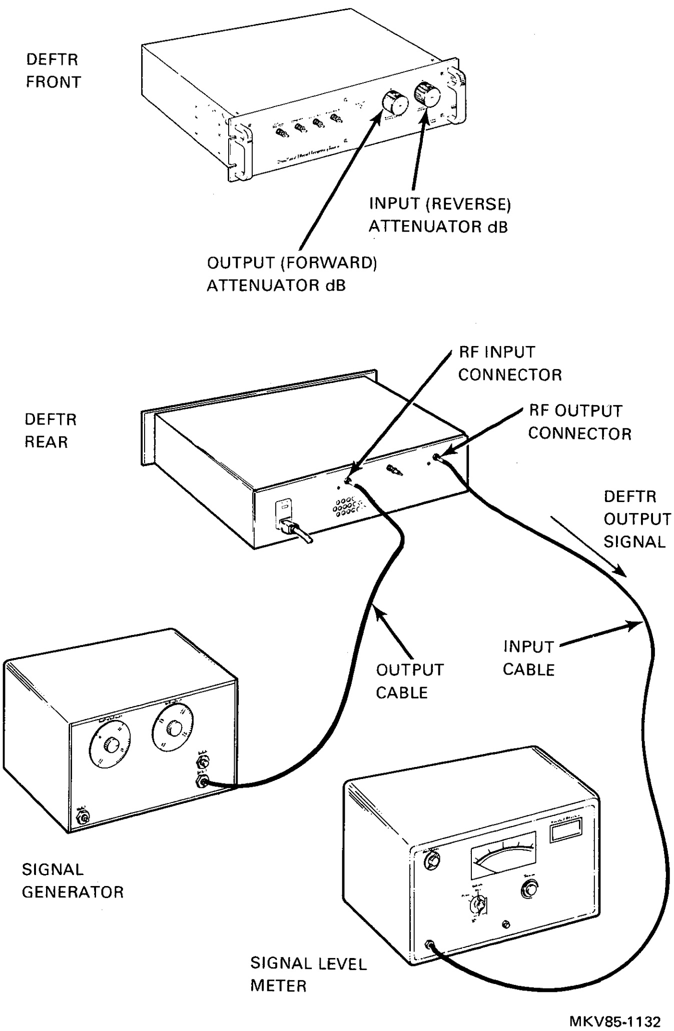


Figure 12 Diagram for DEFTR End-to-End Test

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.

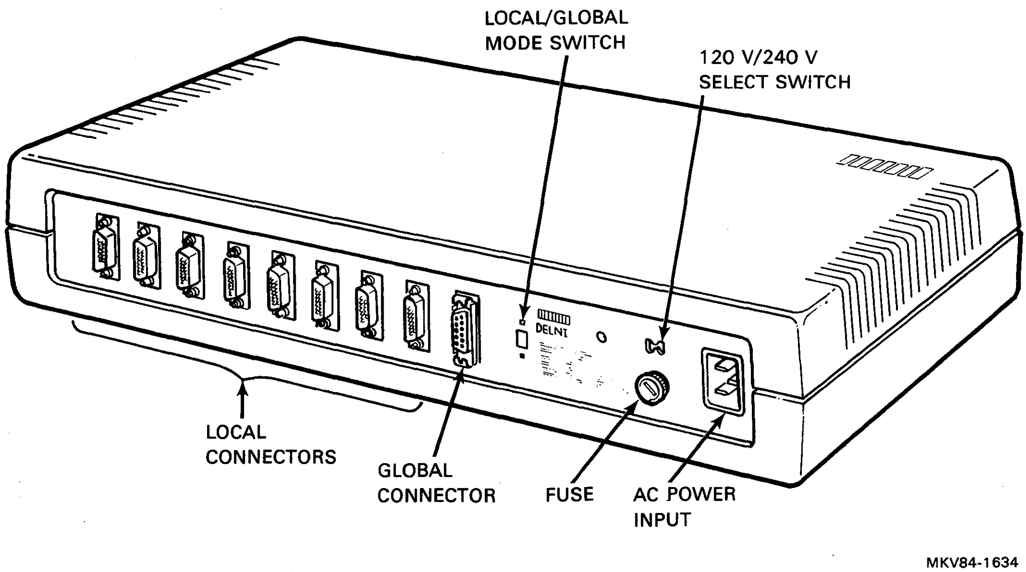


Figure 1 DELNI Local Network Interconnect

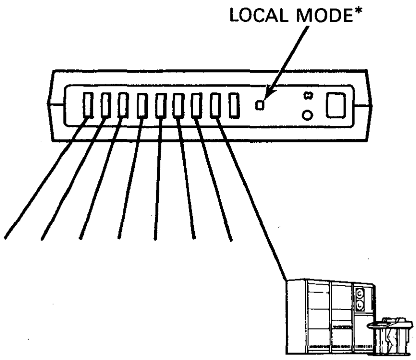
DELNI Configurations
The DELNI interconnect may be used to configure the following LANs (local area networks).

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.

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Figure 2 Single-Tier DELNI LAN Configuration

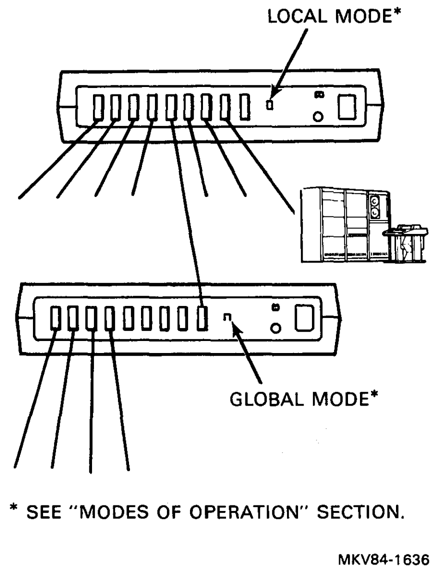


Figure 3 Two-Tier DELNI LAN Configuration

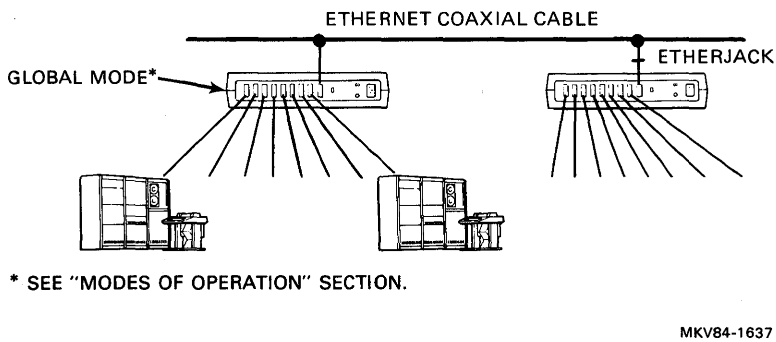


Figure 4 DELNI LAN Connected to an Ethernet Network

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.

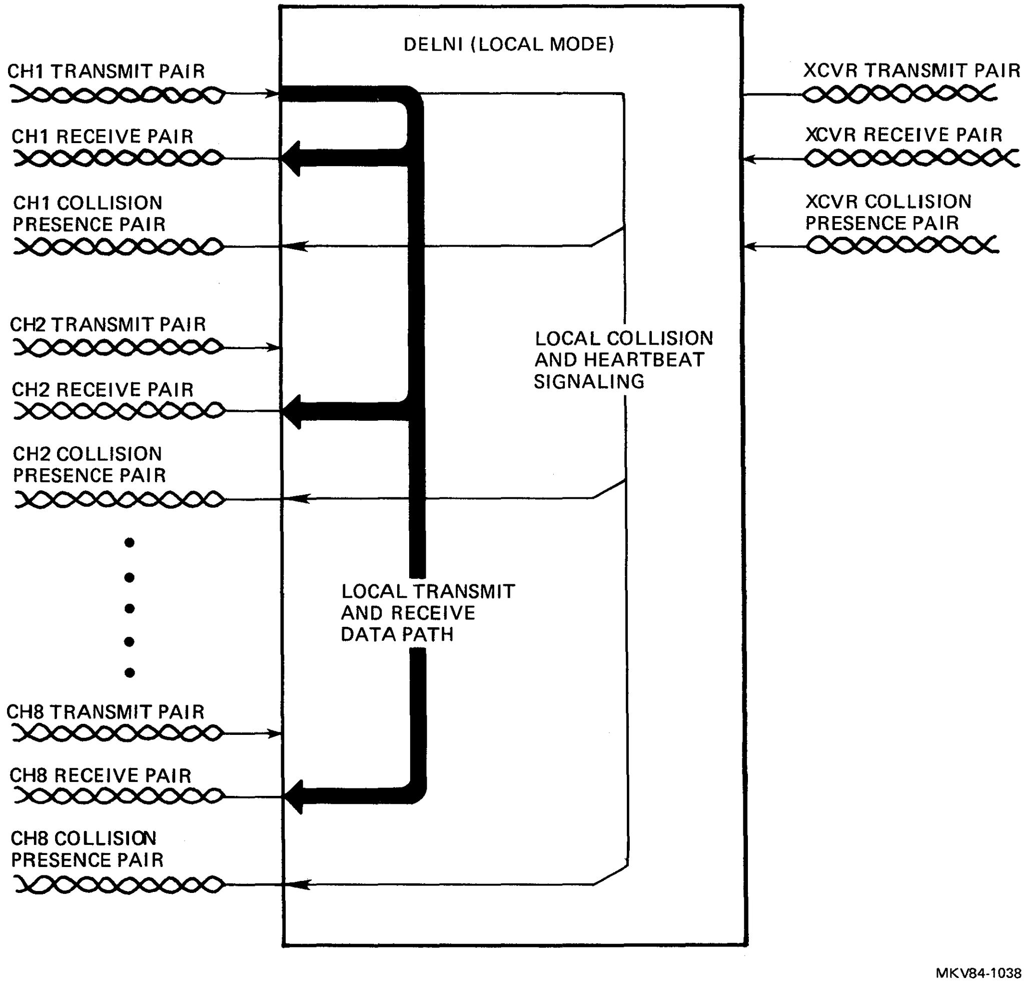


Figure 5 LOCAL Mode Input/Output Signal Flow

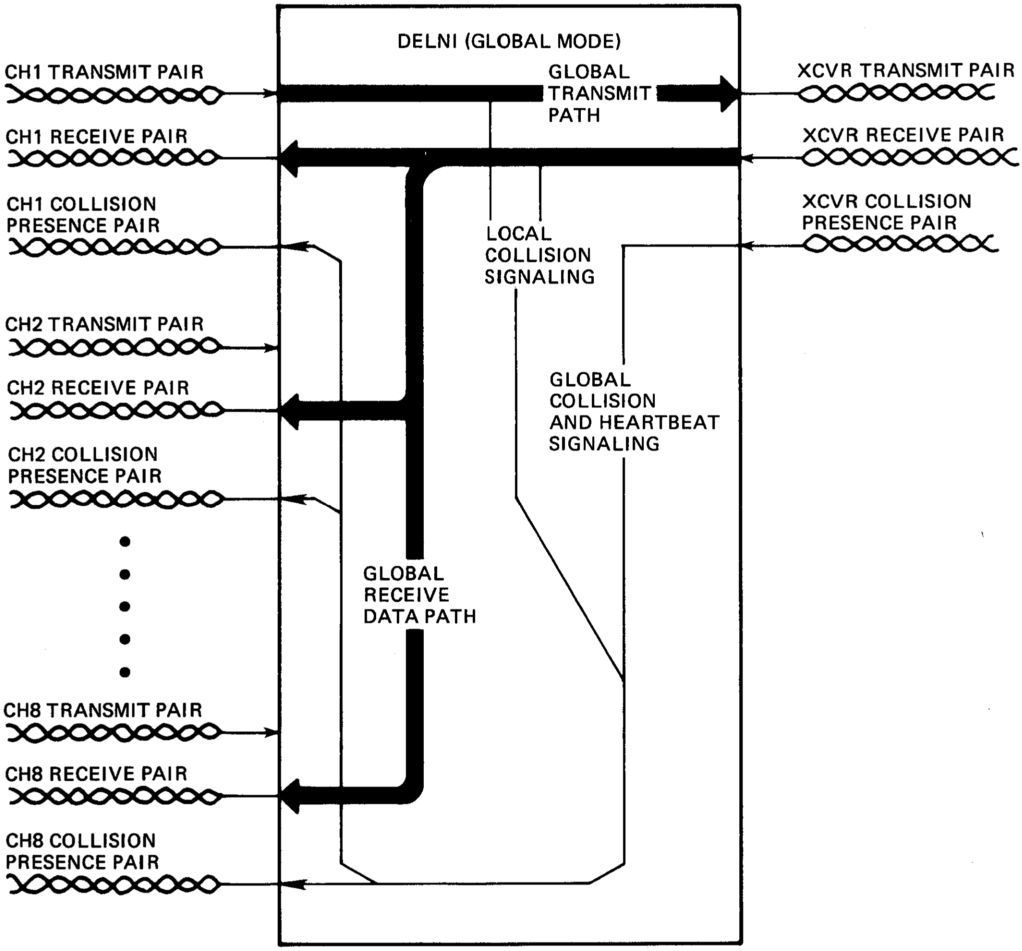


Figure 6 GLOBAL Mode Input/Output Signal Flow

Physical Description

Length	19.68 cm (7.75 in)
Width	44.45 cm (17.50 in)
Height	5.72 cm (2.25 in)
Weight	6.35 kg (14.0 lbs)

Environmental Requirements

Temperature	5° to 50°C (41° to 122°F)
Relative Humidity	10% to 90% (no condensation)

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/GIA applications)

The following table lists the differences between the versions.

Table 1 DELNI Version Differences

Version	Fuse Rating	Fuse Holder	Voltage Switch Setting
DELNI-AA	AGC 1/2	.06 mm (.25 in)	120 Vac
DELNI-AB	.5 A	5.0 mm (.20 in)	240 Vac

DELNI Hardware Components

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

Table 2 DELNI-AA Parts List

Description	Part Designation
DELNI-AA	• DELNI system box • Power cord • *DELNI Installation/Owner's Manual*

Table 3 DELNI-AB Parts List

Description	Part Designation
DELNI-AB	DELNI system box
DELNK-Ax	DELNI country kit: • Power cord • *DELNI Installation/Owner's Manual*

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

Country Used In	Country Kit Designation
Australia	DELNK-AZ
Belgium	DELNK-AB
Canada – English	DELNK-AQ
Canada – French	DELNK-AC
Denmark	DELNK-AD
Finland	DELNK-AF
France	DELNK-AN
Germany	DELNK-AG
Holland	DELNK-AH
Italy	DELNK-AI
Norway	DELNK-AN
Spain	DELNK-AS
Sweden	DELNK-AM
Switzerland – French	DELNK-AK
Switzerland – German	DELNK-AL
United Kingdom	DELNK-AE

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.

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.

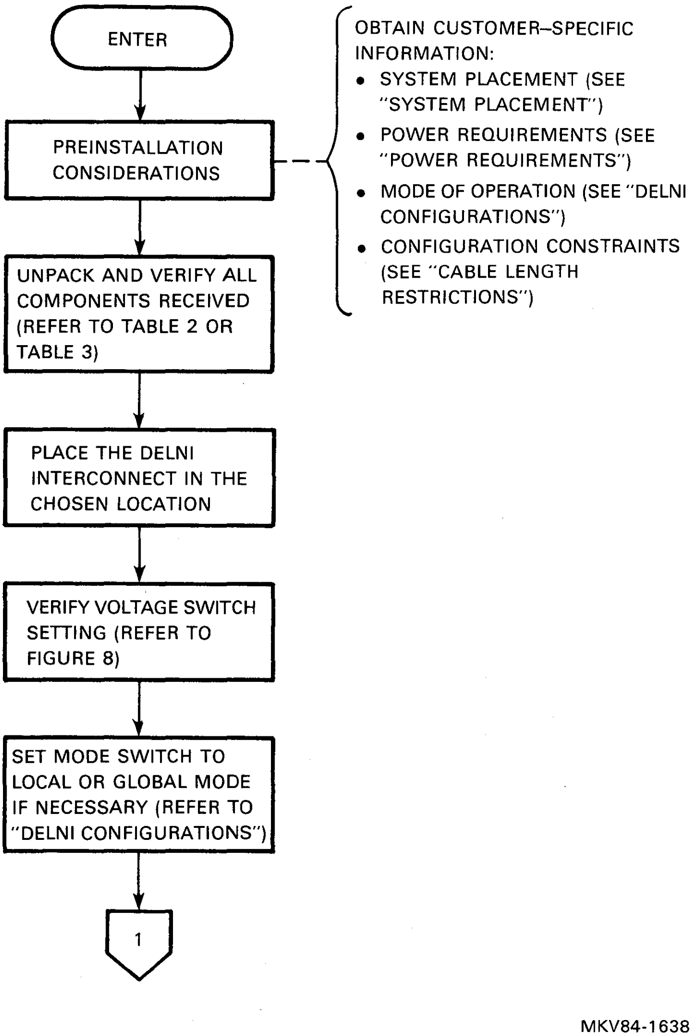


Figure 7 Installation Flow Diagram (Sheet 1 of 3)

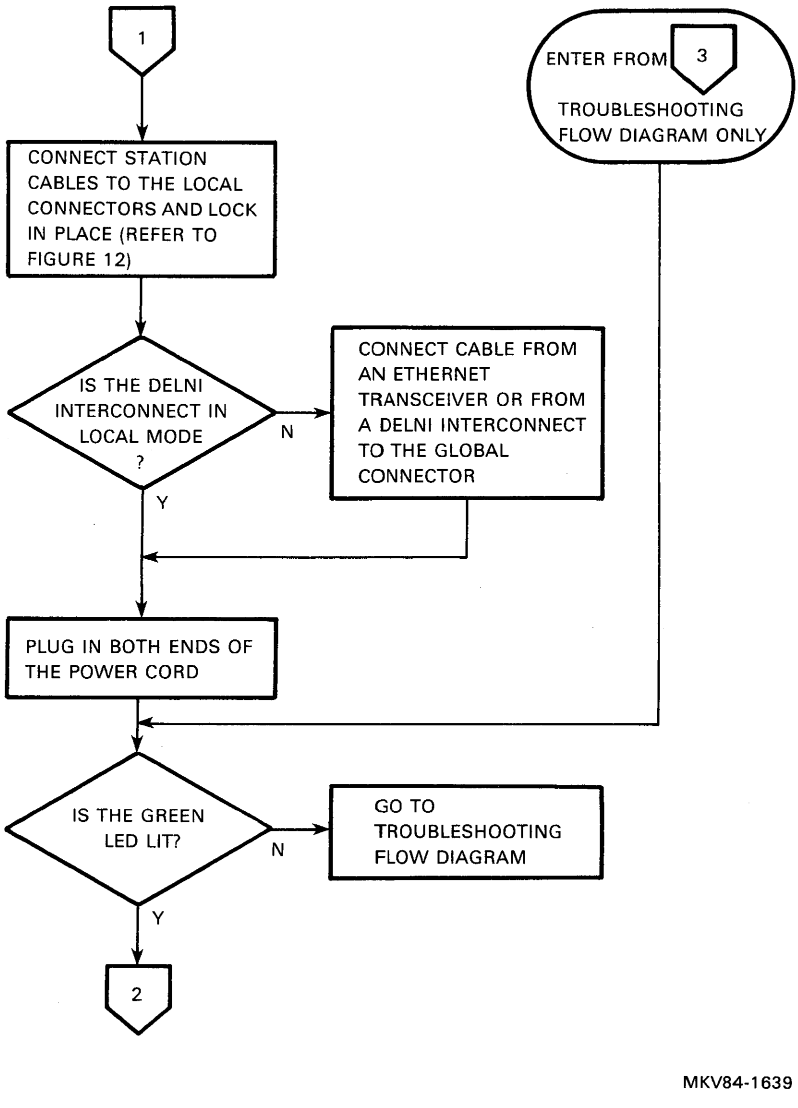


Figure 7 Installation Flow Diagram (Sheet 2 of 3)

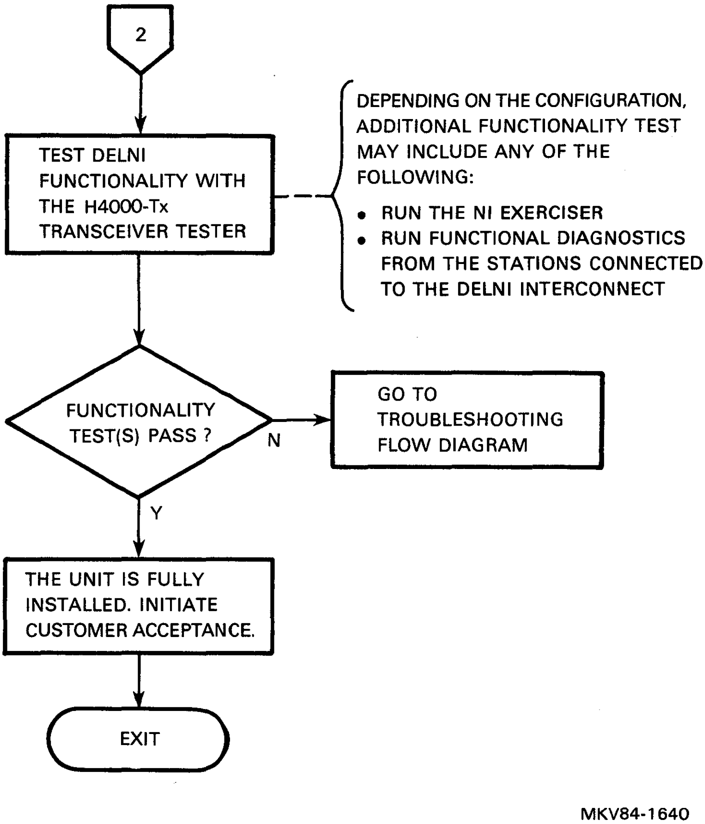


Figure 7 Installation Flow Diagram (Sheet 3 of 3)

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.

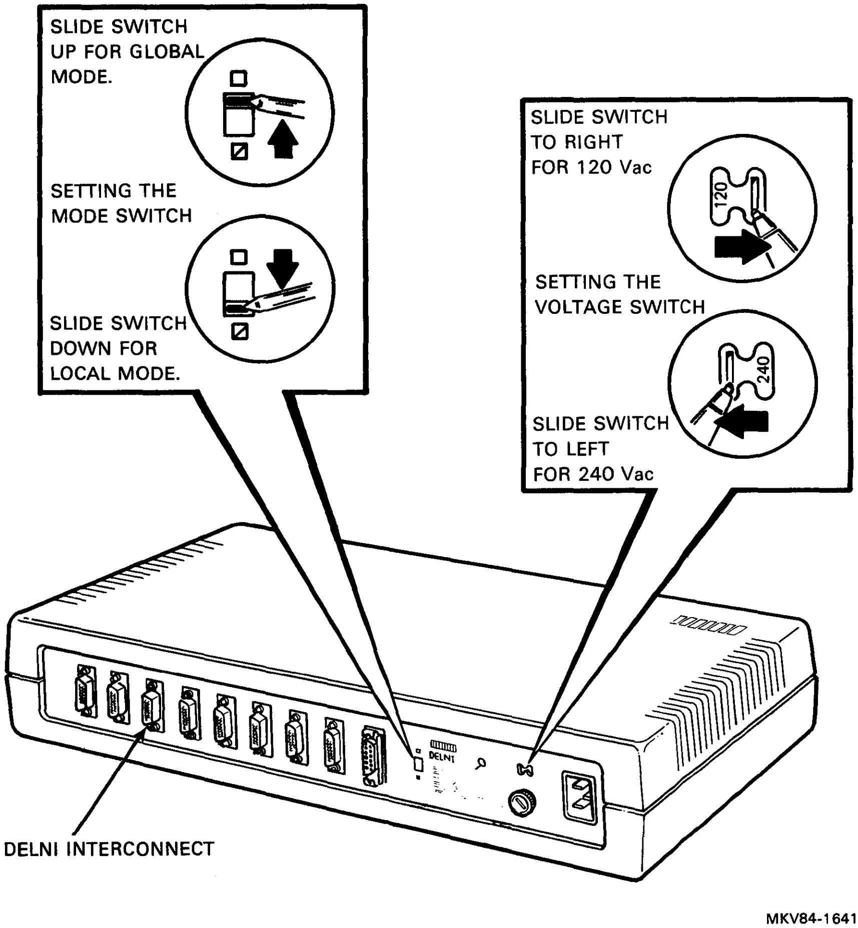


Figure 8 Setting the DELNI Voltage and Mode Switches

DELNI CABLING

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.

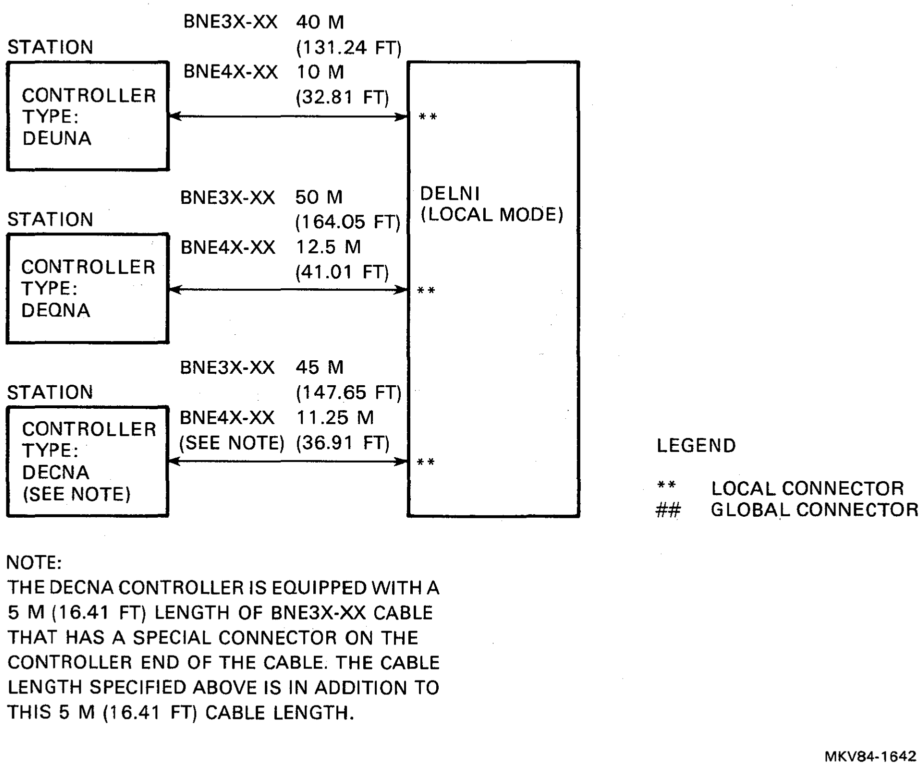
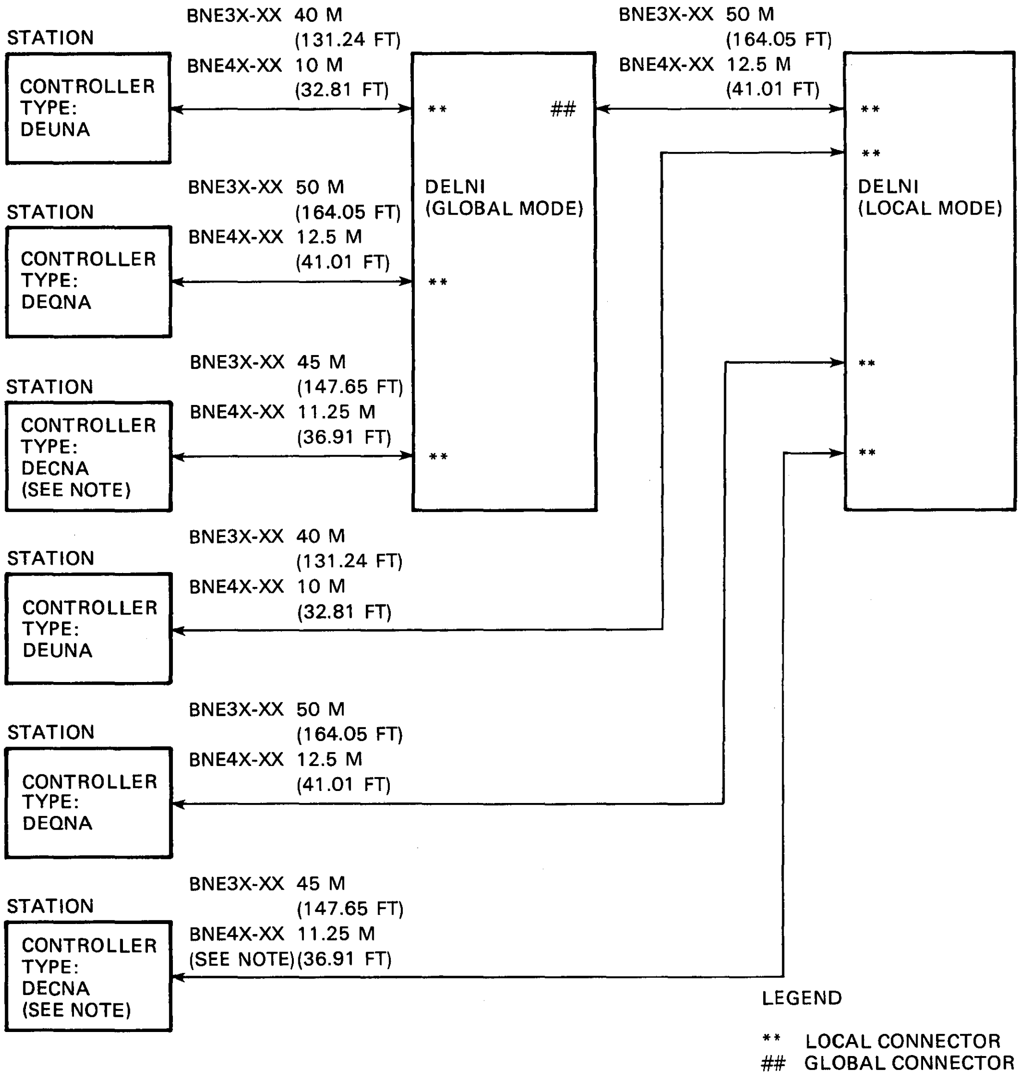


Figure 9 Maximum Cable Lengths with Single-Tier DELNI LAN



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.

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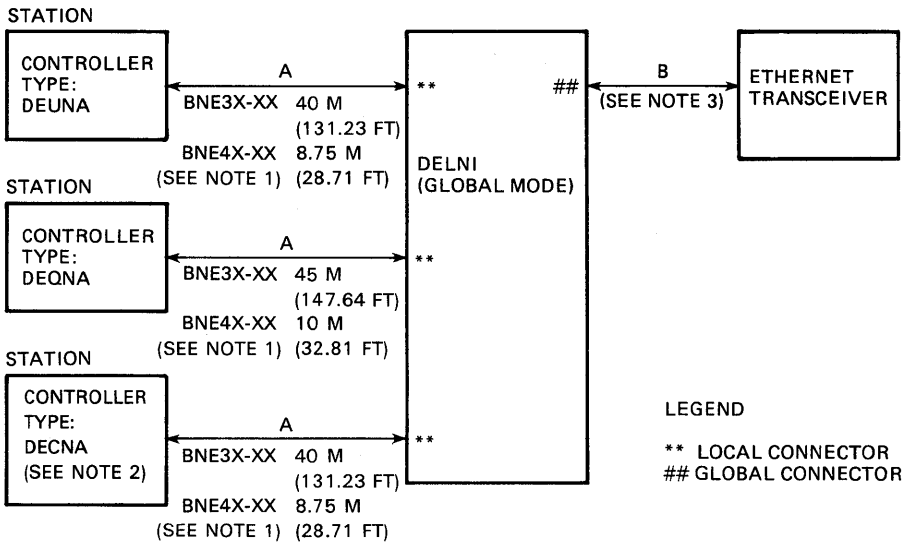
Figure 10 Maximum Cable Lengths with Two-Tier DELNI LAN



NOTES

1. THE LENGTH SPECIFIED IS THE TOTAL CABLE LENGTH ALLOWABLE BETWEEN THE CONTROLLER AND THE DELNI INTERCONNECT AND BETWEEN THE DELNI INTERCONNECT AND THE ETHERNET TRANSCEIVER (THAT IS, LENGTHS A + B).
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.

MKV85-1225

Figure 11 Maximum Cable Lengths with a Connected DELNI LAN

Cable Connections
The following illustration shows:

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

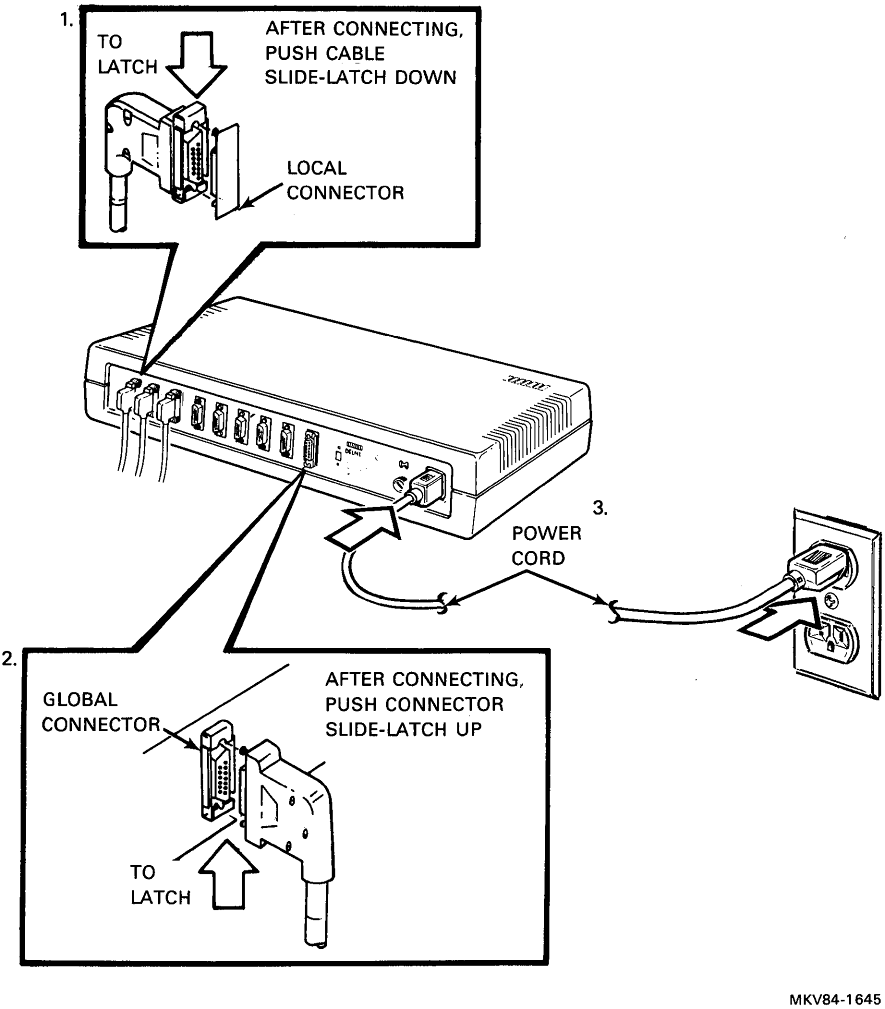


Figure 12 Connecting Cables to the DELNI Interconnect

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 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.

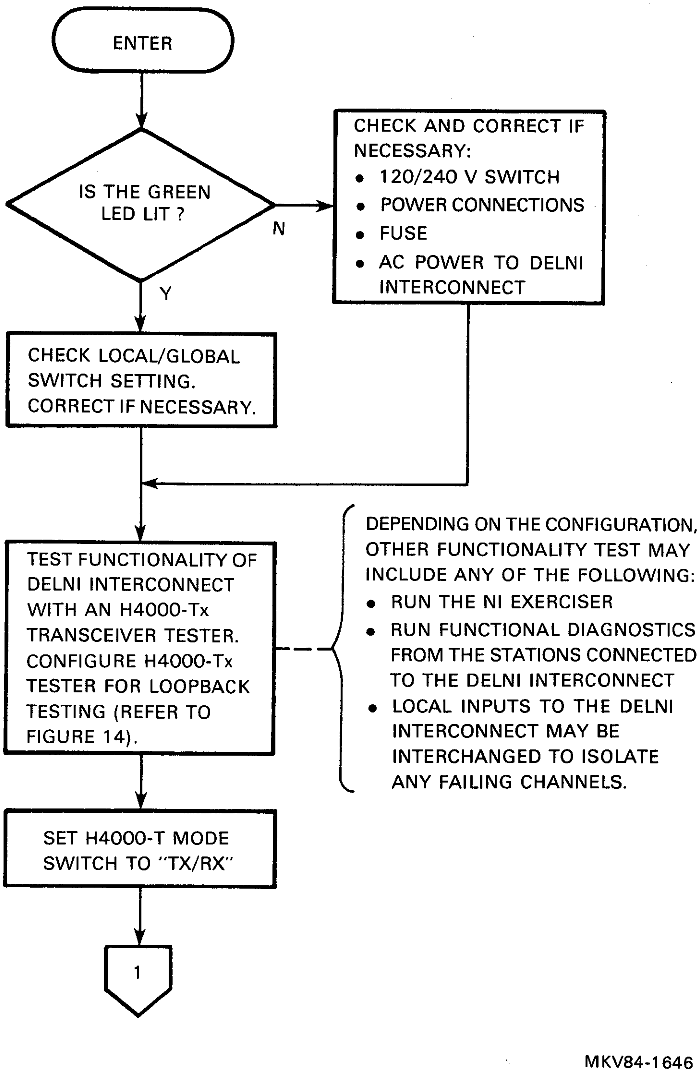
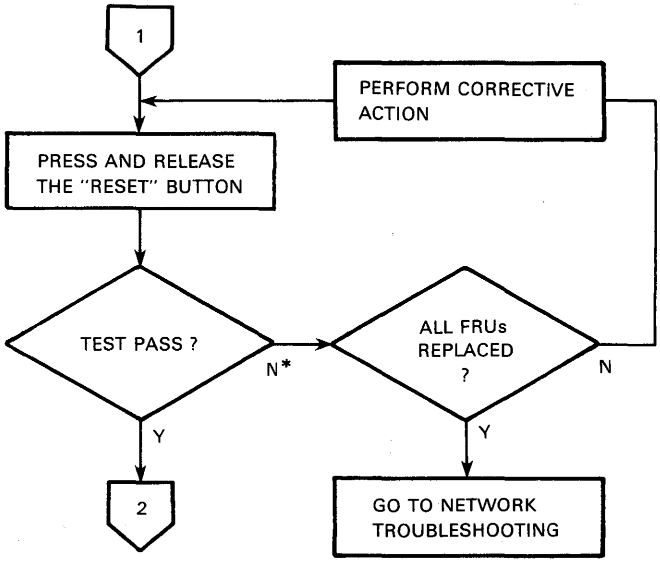


Figure 13 Troubleshooting Flow Diagram (Sheet 1 of 7)



* 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.

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Figure 13 Troubleshooting Flow Diagram (Sheet 2 of 7)

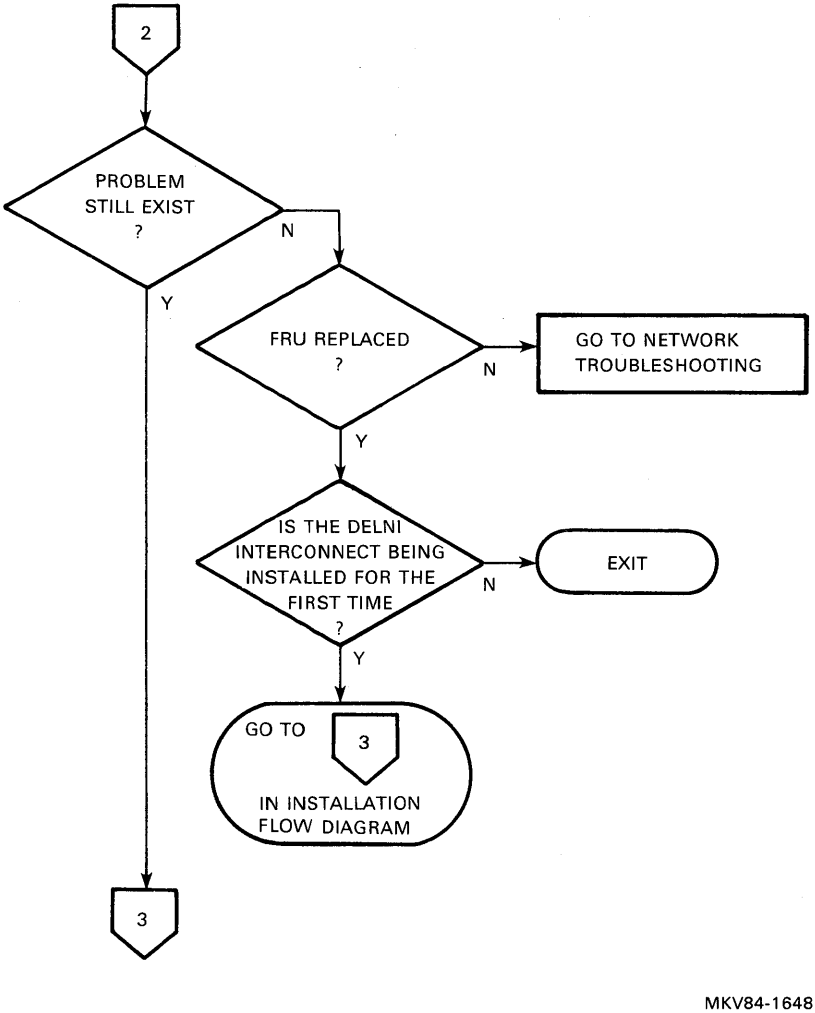

Figure 13 Troubleshooting Flow Diagram (Sheet 3 of 7)

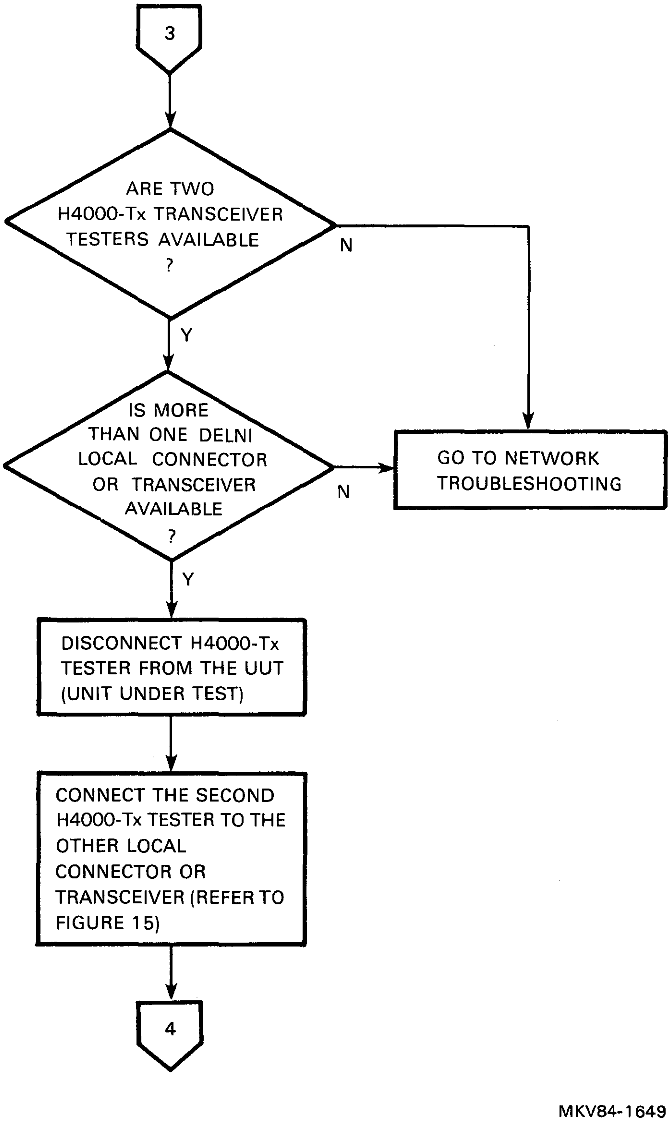

Figure 13 Troubleshooting Flow Diagram (Sheet 4 of 7)

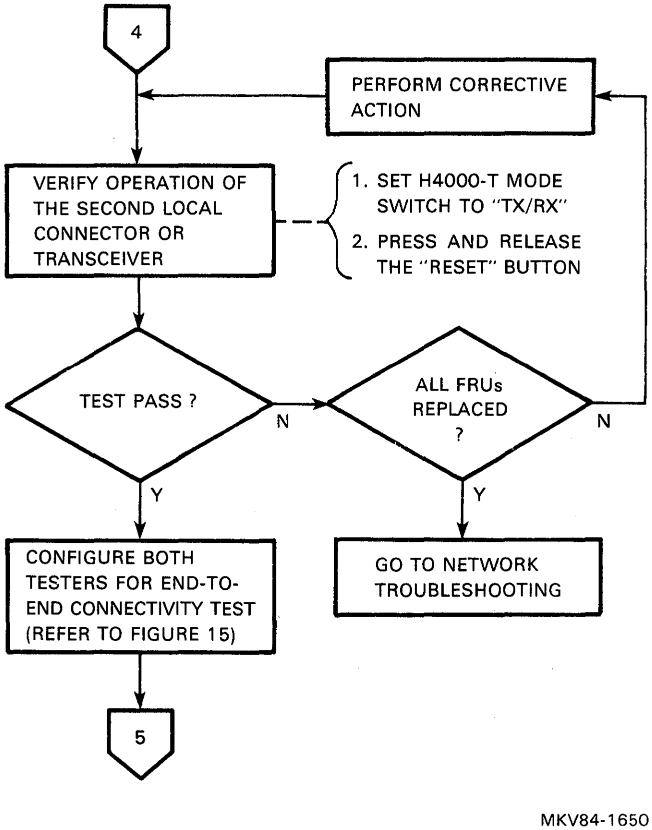

Figure 13 Troubleshooting Flow Diagram (Sheet 5 of 7)

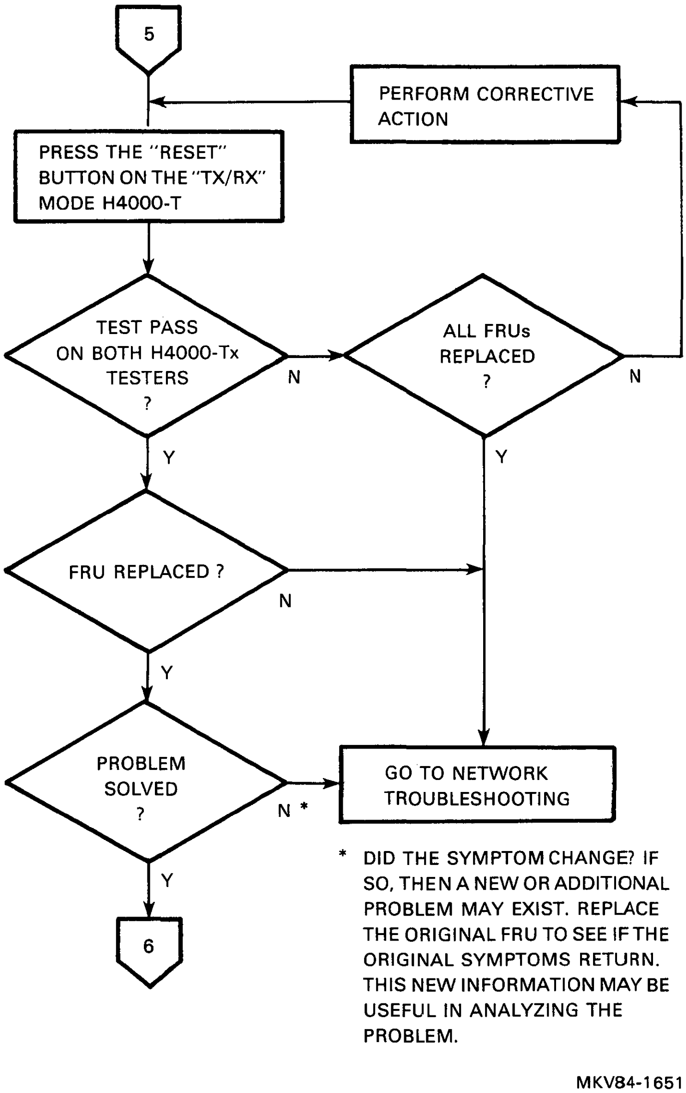

Figure 13 Troubleshooting Flow Diagram (Sheet 6 of 7)

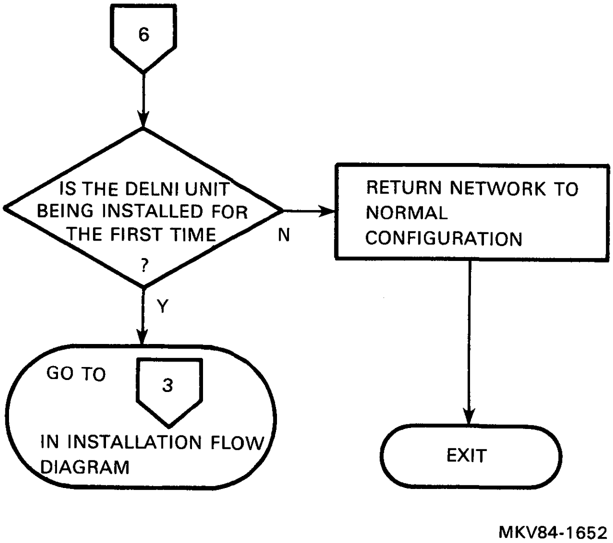

Figure 13 Troubleshooting Flow Diagram (Sheet 7 of 7)

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.

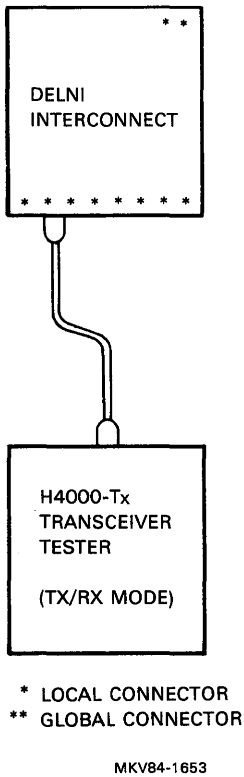

Figure 14 Typical H4000-Tx Configuration for Loopback Testing

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.

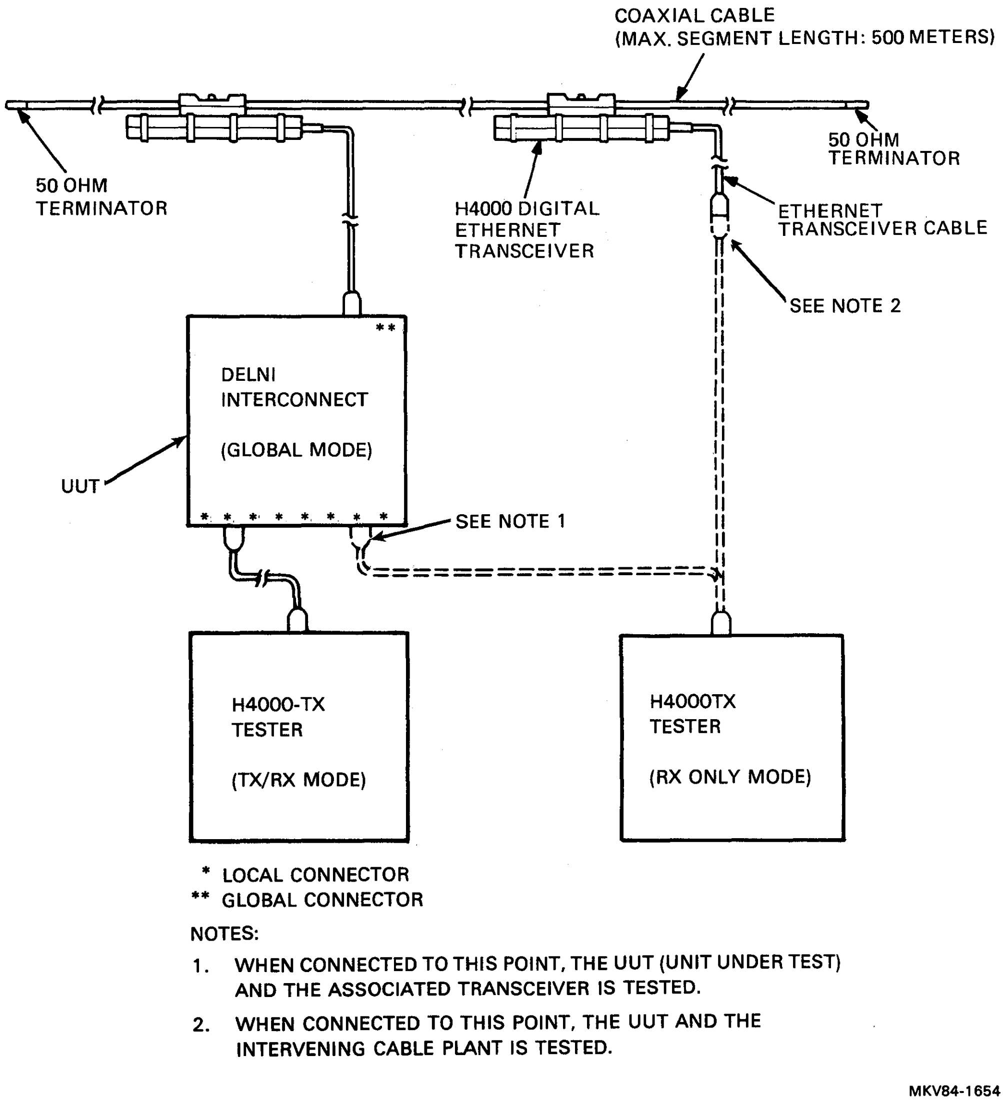

Figure 15 Typical H4000-Tx Configuration for End-to-End Testing

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 5 DELNI Tech Tips/FCO Index

Tech Tip No.	Title	Speed Bulletin
	DELNI Troubleshooting	296
TT2	DELNI Installation Precautions	297
TT3A	DELNI & H4000-T Transceiver Tester	385

DELQA COMMUNICATIONS CONTROLLER

General Description
The DELQA module is a Q-Bus communications controller that enables higher-level software, such as DECnet, to communicate over an Ethernet network.

The DELQA module conforms to the Ethernet Local Area Network Specification (Version 2.0) and is compatible with IEEE Specification 802.3 for Local Area Networks.

The DELQA module transfers encapsulated data packets of 60 to 1514 bytes between buffers in host memory and an Ethernet transceiver. A 4-byte CRC is appended to these transmit packets by the DELQA to make the length of the packets on the Ethernet between 60 and 1518 bytes. When packets are received by the DELQA, the 4-byte CRC is stripped from each packet.

The DELQA module is programmed from the Q-Bus using 8-word addresses in the I/O page, and can perform block-mode DMA to and from Q-Bus memory. In addition to providing an Ethernet interface, the DELQA module supports some functions of the Maintenance Operations Protocol (MOP).

DELQA Features
The DELQA module operates in one of two switchable modes: normal mode or DEQNA-lock mode.

In normal mode, the DELQA module supports the following functions:

- Maintenance operation protocol (MOP) messages for remote boot, request ID, transmit system ID, and loopback
- IEEE 802.3 maintenance messages for XID and TEST on NULL LSAP access points
- Self-test on powerup and via host command
- Single Ethernet physical address
- Multiple Ethernet multicast address
- All standard DEQNA functions, except multiple Ethernet physical address and the automatic enabling of the on-board sanity timer at powerup.

In DEQNA-lock mode, the DELQA module provides functional compatibility with DEQNA modules, but at the expense of some normal mode functions. The functions supported are:

- Multiple Ethernet physical addresses
- Multiple Ethernet multicast addresses
- Sanity timer (switch enabled on powerup).

Reference Documentation
Refer to the following documents for more information on the DELQA communications controller.

- *DECnet Maintenance Operations Protocol (MOP) Functional Specification V3.0* — AA-X436A-TK
- *DECnet-RSX System Manager's Guide* — AA-H224C-TC
- *DECnet-ULTRIX Guide to Network Management* — AA-EE38A-TE

• *DECnet-VAX System Manager's Guide*	AA-H803C-TE
• *DEC/X11 User's Manual*	AC-F053-MC
• *DELQA Technical Manual*	EK-DELQA-TM
• *DELQA User's Guide*	EK-DELQA-UG
• *DELQA-S Installation Guide*	EK-DELQA-IN
• *Field Maintenance Print Set*	MP-02379-01

DELQA Components

The DELQA-M communications controller shipment consists of:

- One DELQA-M (M7516) base module
- One *DELQA User's Guide* (EK-DELQA-UG).

Table 1 lists the cabinet kits that must be ordered separately with each DELQA-M communications controller.

Table 1 DELQA Cabinet Kits

Cabinet Kit	Cabinet	Cable Length
CK-DELQA-YB	BA23	30.5 cm (12 inch)
CK-DELQA-YA	BA123	53.6 cm (21 inch)
CK-DELQA-YF	H9642	91.5 cm (36 inch)

Each kit is supplied with a module-to-bulkhead cable of the appropriate length, and a 15-pin bulkhead loop-back connector (12-22196-02).

The DELQA-SF communications controller shipment consists of:

- One M7516-PA quad-height BA200 format Ethernet interface module
- One *DELQA-S Installation Guide* (EK-DELQA-IN)
- One gap filler assembly
- One loopback connector (12-22196-02).

Device Placement
The DELQA module is a dual-height module and may be placed in either a Q/CD or Q/Q backplane slot. If it is installed in a Q/Q slot with no adjacent module, an M9047 grant continuity card is required in the vacant slot.

Power Requirements/Q-Bus Loading
Table 2 shows the power requirements and bus loading for the DELQA module.

Table 2 Power Requirements/Q-Bus Loading

Q-Bus Load		Current		Power	
AC	DC	Typical	Maximum	Typical	Maximum
3.3	0.5	+5 V +12 V	+5 V +12 V	–	–
–	–	2.7 A 0.5 A	3.0 A 1.5 A	19.5 W	33.0 W

NOTE
At powerup, the surge current into the transceiver is sufficiently high enough to current-limit some power supplies.

DELQA INSTALLATION

Installing the Module

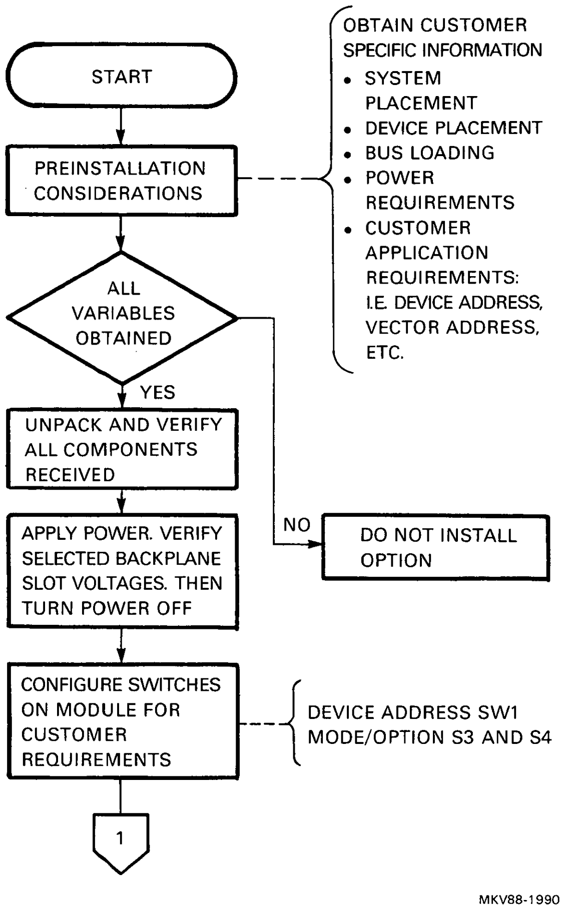

Figure 1 Installation Flowchart (Sheet 1 of 3)

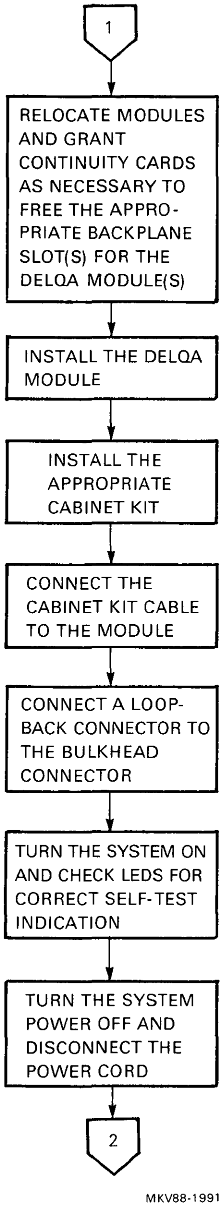

Figure 1 Installation Flowchart (Sheet 2 of 3)

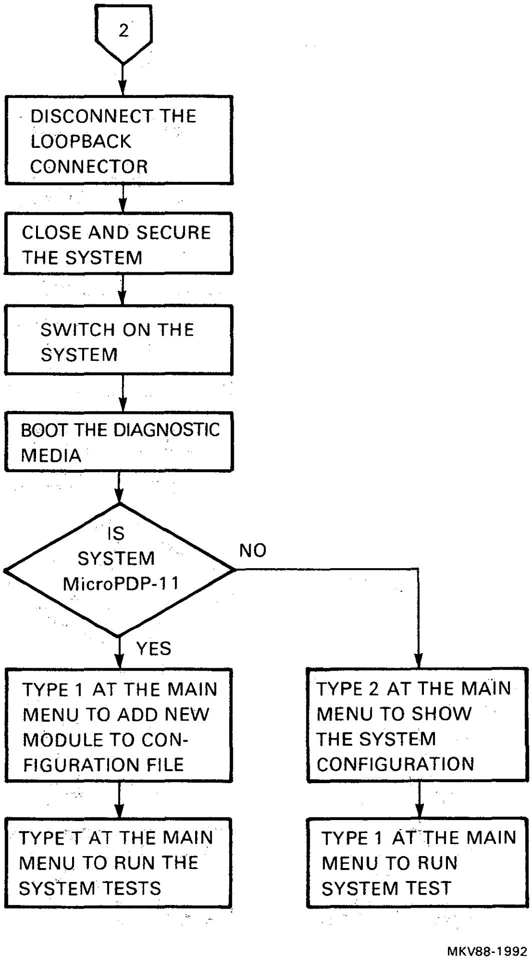

Figure 1 Installation Flowchart (Sheet 3 of 3)

DELQA Module Address and Vector

Table 3 Module Address and Vectors

Base Address	Vector Address	Slot	Module
17774440	120 (fixed)	DELQA 1	DELQA or DEQNA
17774460	Floating (rank 47)	DELQA 2	DELQA or DEQNA

DELQA Switch Settings

The DELQA module switches (Figures 2 and 3) must be set for compatibility with the host system configuration.

NOTE
Static electricity can damage the DELQA module. Always wear an antistatic wrist strap connected to an active ground and use a grounded work surface when working on a system with covers removed.

The DELQA contains five switches, S1 through S5; however, only three are used to establish a DELQA configuration. The remaining switches are reserved. Table 4 shows the switches and describes them.

All the default switch settings are closed, which results in the following:

- Base address = 17774440
- Mode = Normal
- MOP remote boot disabled.

This is the recommended configuration for most applications.

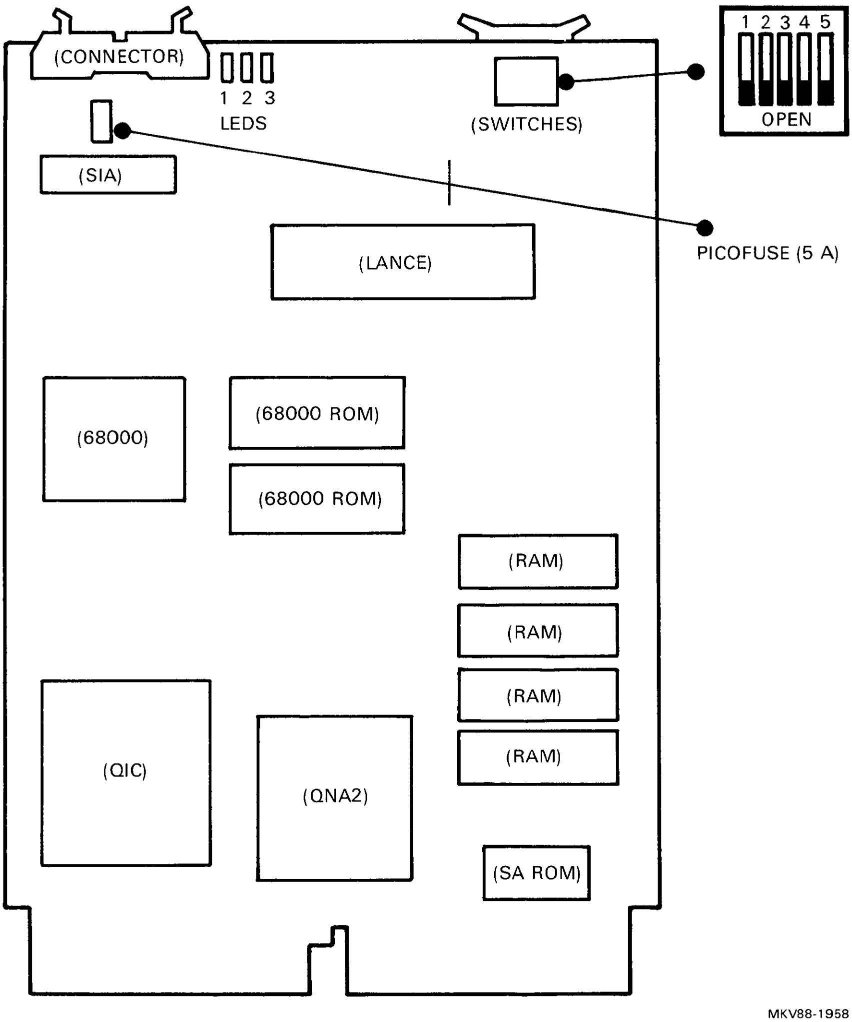

Figure 2 DELQA-M Module Layout

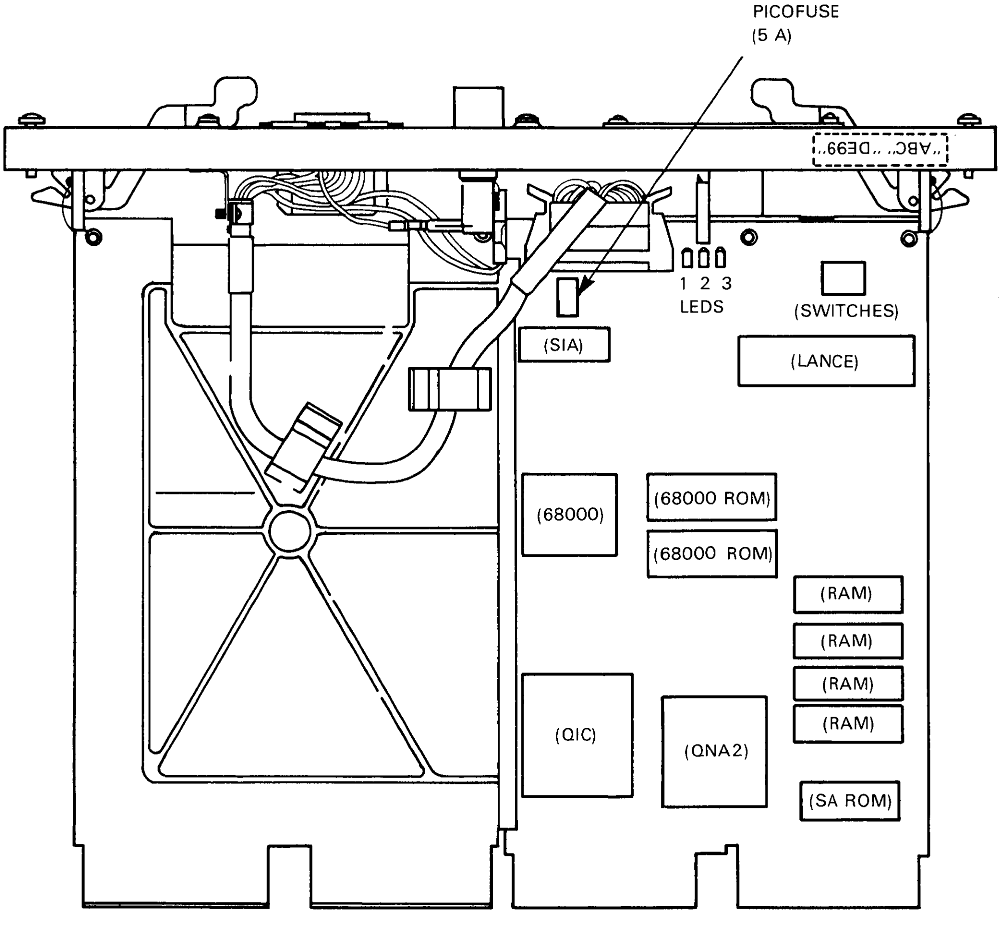

Figure 3 DELQA-S Module Layout

Table 4 DELQA Switches

Switch	Position	Description		
S1		**Unit Select Switch**		
	Closed	Selects the modules default address (17774440)		
	Open	Selects the address 17774460		
S2	–	Reserved		
S3		**Mode Switch**		
	Closed	Selects normal mode		
	Open	Selects DEQNA-lock mode		
		S3 determines the function of S4 as shown below.		
S4	–	**Option Switch**		
		S3	**S4**	
		Closed	Closed	Remote boot disabled
		Closed	Open	Remote boot enabled
		Open	Closed	Sanity timer disabled at powerup
		Open	Open	Sanity timer enabled at powerup*

* This condition causes a host boot every four minutes if the sanity timer is not reset by the host software.

Ethernet Address
The unique physical address of the DELQA module within Ethernet is stored in the station address ROM on the DELQA module. A record of this address is printed on a sticker on the handle of the module.

This address should be given to the network manager for configuration.

NOTE
Because of the risk of damage to the module and ROM, the following procedure is not recommended and should be used only if there is no alternative.

If it is necessary to replace the DELQA module while retaining the same physical Ethernet address, it is possible to swap the station address ROM to the replacement module. The stickers must be swapped also if this procedure is used.

If the Ethernet address is changed, the only software change required is to update the physical Ethernet address of the node at those host systems that use the node for down-line loading over the Ethernet.

Connection to Ethernet
When the diagnostics have shown an error-free system, connect the DELQA module to an H4xxx transceiver or DELNI interconnect with a BNE3xx cable. Table 5 lists the transceiver cable options.

Table 5 BNE3X-nn Transceiver Cable Options

Cable	Material	Connector	Length
BNE3A-05/J2	PVC	Straight	5 m (16.4 ft)
BNE3A-10/J2	PVC	Straight	10 m (32.8 ft)
BNE3A-20/J2	PVC	Straight	20 m (65.6 ft) BNE3A-40/J2 PVC Straight 40 m (131.2 ft)
BNE3B-05/J2	PVC	Right angle	5 m (16.4 ft)
BNE3B-10/J2	PVC	Right angle	10 m (32.8 ft)
BNE3B-20/J2	PVC	Right angle	20 m (65.6 ft)
BNE3B-40/J2	PVC	Right angle	40 m (131.2 ft)
BNE3C-05/J2	Teflon™	Straight	5 m (16.4 ft)
BNE3C-10/J2	Teflon	Straight	10 m (32.8 ft)
BNE3C-20/J2	Teflon	Straight	20 m (65.6 ft)
BNE3C-40/J2	Teflon	Straight	40 m (131.2 ft)
BNE3D-05/J2	Teflon	Right angle	5 m (16.4 ft)
BNE3D-10/J2	Teflon	Right angle	10 m (32.8 ft)
BNE3D-20/J2	Teflon	Right angle	20 m (65.6 ft)
BNE3D-40/J2	Teflon	Right angle	40 m (131.2 ft)

Teflon is a trademark of E.I. duPont de Nemours & Company, Inc.

DELQA Diagnostics

The DELQA module is designed to help diagnostics find a faulty Field Replaceable Unit (FRU) rapidly. In addition to thed self-test, there are diagnostic tests that are processor-specific.

Self-Test

The DELQA module has a power-up self-test that includes an external loopback test. In order for the external loopback test to pass, a D-type loopback connector, an H4080 loopback connector, or a valid Ethernet network must be connected to the 15-pin D- subminiature connector on the DELQA module.

The self-test is available only when the DELQA is in normal mode. The host operating system software can request the self-test through the DESQA Q-Bus register.

Table 6 shows the power-up LED sequence and Table 7 shows the remote boot LED sequence when the self-test is run.

Table 6 Module LED Sequences (Power-Up)

LED1	LED2	LED3	Definition
Normal Mode			
ON	OFF	OFF	Executing internal logic self-test
ON	ON	OFF	Self-test executing external loopback test
ON	ON	ON	Ready to execute citizenship tests and/or normal functions, or module self-test
DEQNA Mode			
ON	ON	ON	LEDs turn on and stay on

Table 7 Module LED Sequences (Remote Boot or Citizenship Test) Normal or DEQNA Mode

LED1	LED2	LED3	Definition
ON	ON	ON	Ready to execute citizenship test and/or normal functions, or module self-test
OFF	ON	ON	Executing citizenship tests
OFF	OFF	ON	Internal loopback citizenship tests completed successfully
OFF	OFF	OFF	External loopback citizenship tests completed successfully

These sequences of LEDs should take fewer than 10 seconds. If the LEDs flash after this time, an irrecoverable failure has occurred. See Table 8.

Table 8 Irrecoverable Failure Indications

LED1	LED2	LED3	Failure Indication
F	OFF	OFF	Q-Bus failure
OFF	F	OFF	LANCE failure
OFF	OFF	F	68000 exception
F	F	F	Firmware fault

F indicates the LED is flashing.

Diagnostics for PDP-11 Host Processors

Network Testing

- DECnet Network Control Program (NCP)
- Network Interconnect Exerciser (NIE) running under Diagnostic Runtime Service (DRS)

DECnet Network Control Program (NCP) – Provides a command-driven interface for executing loopback tests on the Ethernet, and for examining network and datalink counters.

Some of the relevant commands are:

- LOOP
- SHOW
- TELL
- TRIGGER.

The TRIGGER command may be used to initiate boot loading from the DELQA for PDP-11 host systems that have the appropriate boot ROM support.

The commands may be issued either from the local host system, or by using the TELL command, from a remote node. The functions are performed concurrently with other DECnet operations and do not interfere with other Ethernet traffic, although there may be some degradation of throughput.

For more information, refer to the *DECnet-VAX System Manager's Guide*.

DELQA DIAGNOSTICS

Network Interconnect Exerciser (NIE) – Is used to:

- Determine the connectivity of nodes on the Ethernet
- Determine the ability of nodes to communicate with each other
- Support node installation verification and problem isolation.

The NIE does not test the DELQA, but the communications link to which it is connected; therefore, the NIE assumes that the DELQA has successfully completed the citizenship test.

The NIE is used with XXDP+ and the MicroVAX Diagnostic Monitor.

Refer to the *DELQA User's Guide*, Appendix B, for additional information.

Module Testing

- Field functional diagnostic (ZQNA??) running under diagnostic runtime service (DRS)
- DEC/X11 exerciser

PDP-11 Field Functional Diagnostic (ZQNA??) – Tests the DELQA in Q-Bus systems. It attempts to isolate faults to the FRU.

Tests are executed under the supervision of the diagnostic runtime service (XXDP+) and are controlled by an operator from a console.

ZQNA?? is not an Ethernet network exerciser, but verifies that the DELQA can execute Ethernet protocol, and that valid network traffic can be transmitted and received.

ZQNA?? tests the DELQA in all loopback modes with or without an external loopback connector or transceiver connected.

External loopback mode is used with a connected transceiver or external loopback connector. Alternatively, external loopback mode can be used with a terminated transceiver that is not attached to a network cable. Executing ZQNA?? using external loopback mode in a system connected to a live Ethernet does not disrupt the Ethernet.

PDP-11 DEC/X11 Exerciser – Exercises one DELQA at maximum activity rates. It transmits and receives random-length packets (using either 18- or 22-bit physical address space). The DELQA transmits and receives the same packet.

Diagnostics for MicroVAX Processors

Network Testing

- DECnet Network Control Program (NCP)
- Network Interconnect Exerciser (NIE) running under the MicroVAX Diagnostic Monitor (MDM)

Module Testing

- MicroVAX Diagnostic Monitor (MDM)

MicroVAX Diagnostic Monitor – Offers the following menu-driven tests and utilities that may be run in verify or service modes:

- Utilities for external loopback tests and NIE
- Service tests for external loopback
- Verify tests for:

  - Internal and internal extended loopback
  - Set-up packet handling
  - Buffer Descriptor List (BDL) handling
  - DMA and interrupt handling
  - Transmit and receive circuitry and firmware
  - Address filtering
- Device exerciser for testing the DELQA simultaneously with other system devices.

Troubleshooting
The general strategy for identifying a fault is:

1. Check the DELQA configuration to ensure that the system can identify the module correctly
2. Run the module test(s) to check for faulty FRUs
3. Run the network test(s) to locate faults in the network configuration and/or operation.

Field Replaceable Units

Figure 4 shows the field replaceable units in the DELQA-M installation. Figure 5 shows the field replaceable units in the DELQA-S installation.

Fuses

A 1.5 A/250 V Slo-Blo™ fuse (PN 90-07213) protects the transceiver and its associated external wiring. This fuse is located in the bulkhead. The fuse may be replaced by:

- Littlefuse™ type 31301.5,
- BEL FUSE™ type 3SB1.5, or
- An equivalent.

A 5.0 A/125 V axial lead picofuse (PN 12-05747-00) protects the DELQA module and internal wiring. This fuse is soldered to the DELQA module and looks like a resistor.

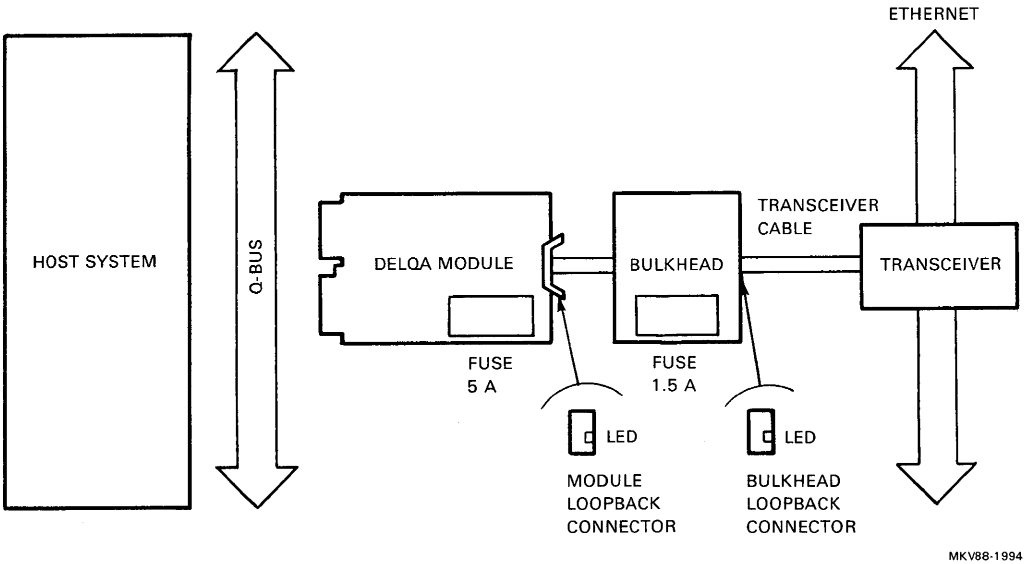

Figure 4 Field Replaceable Units for DELQA-M

Slo-Blo is a trademark of S.B. Fuses.
Littlefuse is a trademark of Littlefuse, Inc.
BEL FUSE is a trademark of Belfuse, Inc.

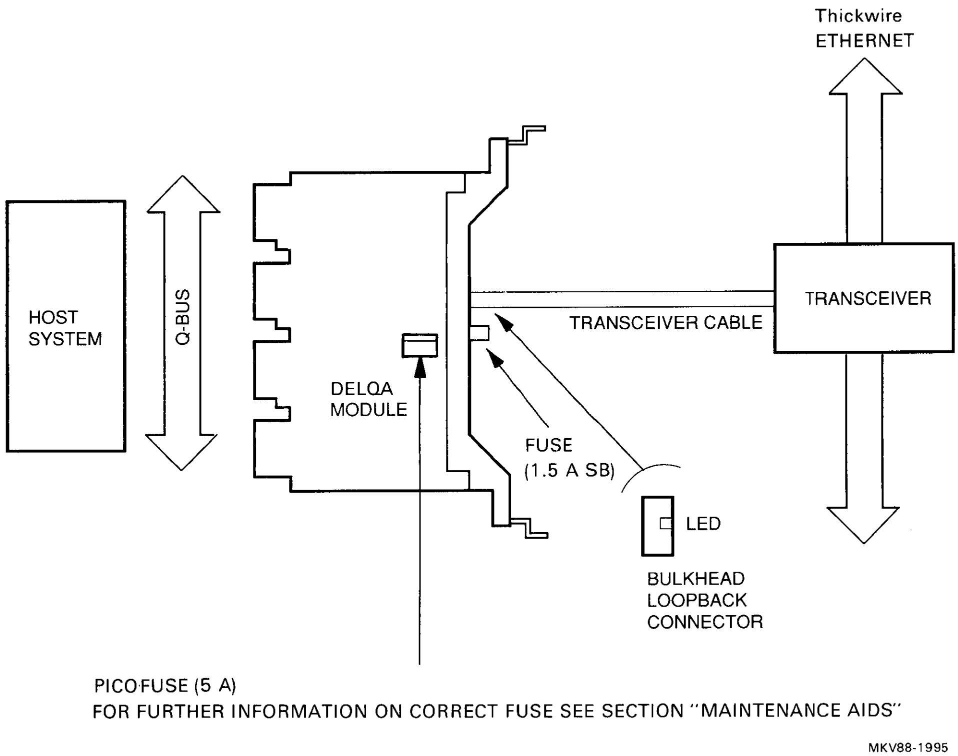

Figure 5 Field Replaceable Units for DELQA-S

Citizenship Test Descriptions
Table 9 lists the host register R0 bit combinations, the tests being run, and their meanings for the citizenship test.

Table 9 Citizenship Test Error Status

R0 Bit Combinations	Test No.	Description
00	1	Station Address Verification – Station address is all zeros or all ones, or is not a valid DELQA address. If this test fails, testing continues until the final external loopback test or another test failure occurs.
11	2,4	No interrupt, premature interrupt, wrong interrupt, or unexpected receive interrupt.
12,01	3	Setup Mode and Receive Processing Test – Setup packet echoed data check.
09,12,01	3	Setup Mode and Receive Processing Test – Setup packet operation timeout.
14,12,01	3	Setup Mode and Receive Processing Test – Setup operation status check.
02	4	Internal Loopback and Address Filter Test – Transmit/receive data compare check.
09,02	4	Internal Loopback and Address Filter Test – True packet transmission and receive error.
12,02	4	Internal Loopback and Address Filter Test – Setup packet echoed data check.
14,02	4	Internal Loopback and Address Filter Test – False packet receive error.
03	5	Internal Extended Loopback and Protocol Test – General packet transmit/receive data compare check. Long packet not detected.
09,03	5	Internal Extended Loopback and Protocol Test – Test packet transmit or receive timeout.
14,03	5	Internal Extended Loopback and Protocol Test – General operation status check. Long packet not detected via operation status.
04	6	DMA to Q-Bus Interface Processing Test – Transmit (scatter/gather) data check.
09,04	6	DMA to Q-Bus Interface Processing Test – Transmit (special) and receive timeout.
14,04	6	DMA to Q-Bus Interface Processing Test – Receive or transmit operation status check.

Table 9 Citizenship Test Error Status (Cont)

R0 Bit Combinations	Test No.	Description
12	7	Transceiver Operational and Status – Setup packet echo data check.
09,12	7	Transceiver Operational and Status – Setup packet operation timeout.
14,12	7	Transceiver Operational and Status – Setup packet operation status check.
15	7,8	CSR carrier bit on too long.
15	7,8	External loopback not operational.
05	8	External Loopback and Ethernet Protocol Test – External loopback transmitted/received packet data compare check.
09,05	8	External Loopback and Ethernet Protocol Test – External loopback operation timeout.
14,05	8	External Loopback and Ethernet Protocol Test – External loopback operation status check.

Table 10 shows the LED display results for the citizenship test.

Table 10 Citizenship Test LED Results

LED1	LED2	LED3	Meaning
OFF	OFF	OFF	Citizenship test passed successfully
OFF	OFF	ON	External loopback test failed
OFF	ON	ON	DELQA internal error
ON	ON	ON	Cannot upline load the BD ROM contents, or the first set-up packet prefill failed.

DELQA MAINTENANCE AIDS

Maintenance Operation Protocol (MOP)
In normal mode, the DELQA implements MOP functions in response to the following remote console messages from other nodes on the Ethernet.

- Request system ID message – The DELQA responds by transmitting its current system ID message.
- Remote boot trigger instruction – The DELQA may respond to a trigger instruction only if option switch S4 is open to enable remote boot. The instruction can be implemented only if the host system has the appropriate boot ROM.
- Loopback request message – The DELQA will respond to a loopback request message.

The DELQA also transmits its current system ID parameters automatically every 8 to 10 minutes.

For more information, refer to the DECnet maintenance operation protocol (MOP) functional specification.

IEEE 802.3 Network Support
In normal mode, the DELQA implements IEEE 802.3 logical link control messages when they are received on a null Link-layer Service Access Point (LSAP) within an 802.3 standard local area network.

These messages can be used to interrogate and test many link layer service points per node. Therefore, IEEE 802.3 logical link control messages, which are received on a non-NULL LSAP, are passed on the the host system as normal datagrams.

For details on this message format and protocol, refer to the ANSI/IEEE Draft International Standard 802.2 Logical Link Control.

DELUA ETHERNET UNIBUS ADAPTOR

General Description
The DIGITAL Ethernet large-scale-integration UNIBUS adaptor (DELUA) is a data communications controller that is used to connnect UNIBUS-based processors to the Ethernet network or Ethernet-compatible networks.

Reference Documentation
Refer to the following manuals for more information on the DELUA adaptor.

Title	**Document Number**
DELUA Technical Description	EK-DELUA-TD
DELUA User's Guide	EK-DELUA-UG
H4000 Technical Description	EK-H4000-TD
Ethernet Installation Guide	EK-ETHER-IN

DELUA Adaptor Components List
The following list describes the parts supplied with each DELUA adaptor and how to unpack and inspect them.

- Static Discharge System Setup
  - Unpack a VELOSTAT™ static discharge system, CD kit A2-W0299-10.
  - Unfold the VELOSTAT™ mat.
  - Attach the 15-ft ground cable to the mat snap fastener.
  - Attach the 15-ft ground cable alligator clip to a *good* electrical ground point in the host computer.
  - Attach one end of the grounding strap to the wrist and the other end to a convenient of the mat.
- Unpacking and Inspection

CAUTION
The DELUA M7521 module and the UNA bulkhead assembly must be unpacked and inspected on a static discharge system mat.

  - Inspect the unopened DELUA shipping container and check it for dents, holes, or crushed corners.
  - Open and unpack the shipping container, and inventory the contents against the DELUA components parts diagram.
  - Inspect the DELUA module for shipping damage. Refer to the *Site Preparation/Installation Guide* for damage reporting.

Velostat is a trademark of Minnesota Mining and Manufacturing Co.

DELUA INSTALLATION

Device Placement

The DELUA adaptor requires a hex-height small peripheral controller (SPC) backplane slot. Any SPC backplane (DD11-B, Rev E or later) can accept the DELUA adaptor module.

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

Installation Procedure

The DELUA installation procedures are detailed in the installation flowchart (Figure 1). If additional information is required refer to the following documents.

Title	Document Number
Ethernet Installation Guide	EK-ETHER-IN
DELUA User's Guide	EK-DELUA-UG

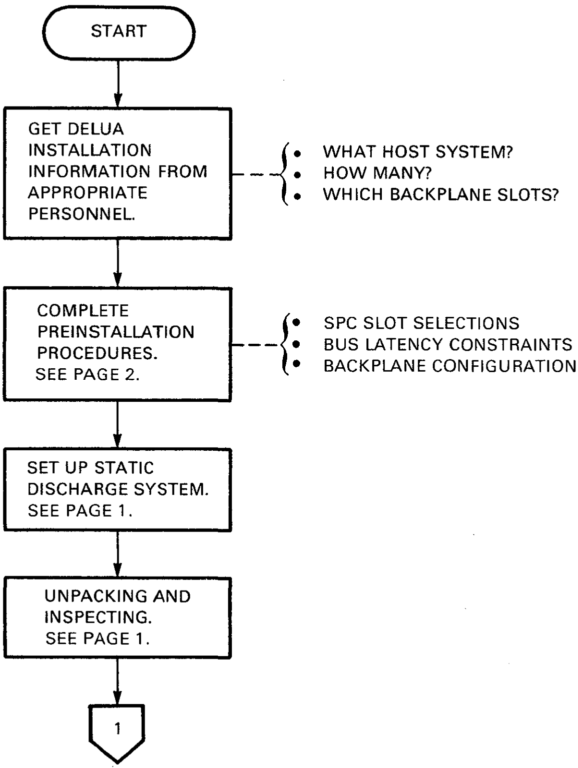

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Figure 1 DELUA Installation Flowchart (Sheet 1 of 4)

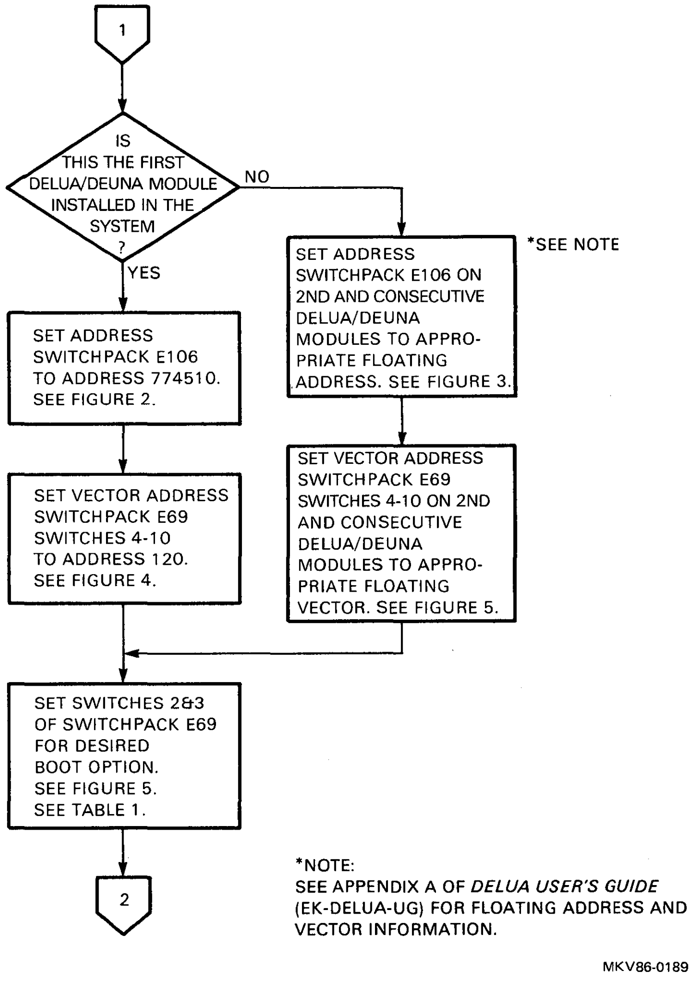
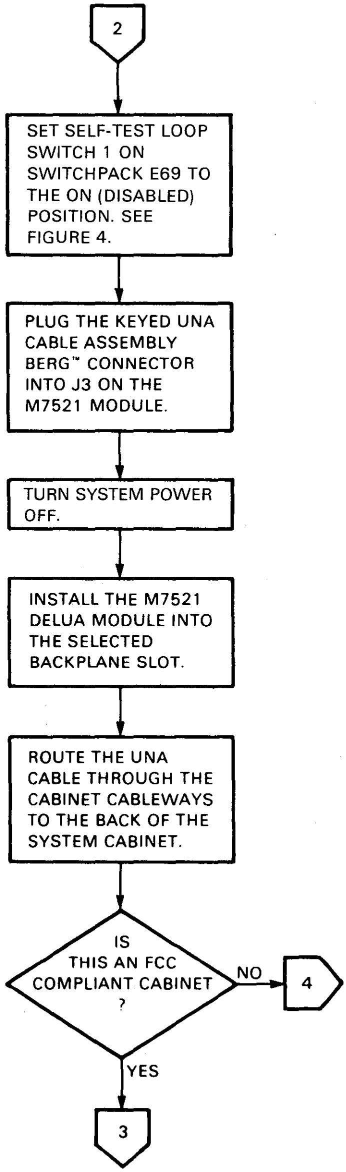


Figure 1 DELUA Installation Flowchart (Sheet 2 of 4)



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MKV86-0500

Figure 1 DELUA Installation Flowchart (Sheet 3 of 4)

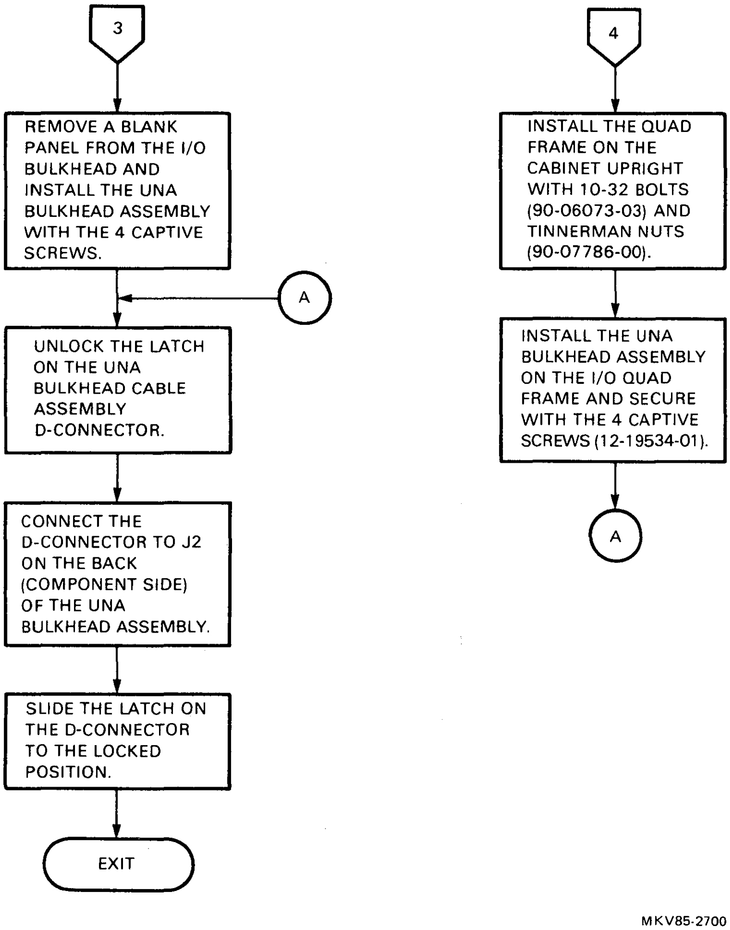

Figure 1 DELUA Installation Flowchart (Sheet 4 of 4)

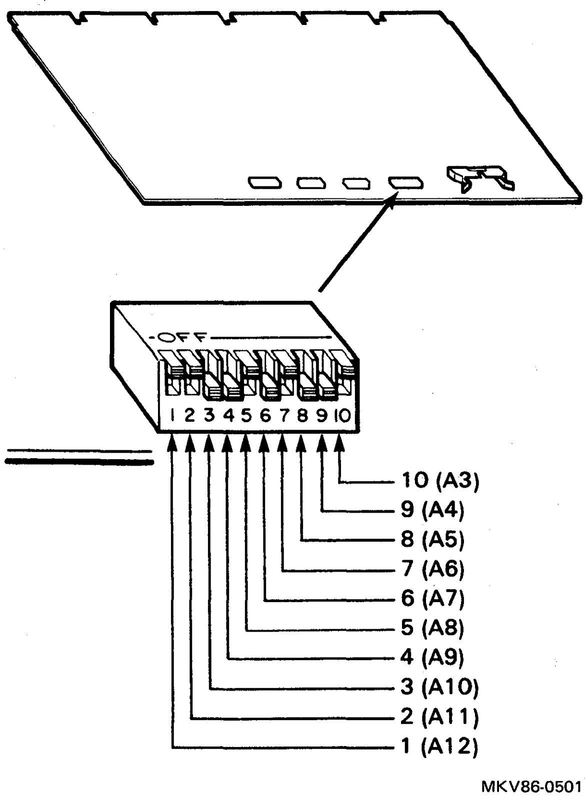

Figure 2 M7521 Address Switchpack Location (E106)

MSB LSB

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	1	SWITCHPACK E106										0	0	0

SWITCH NUMBER	1	2	3	4	5	6	7	8	9	10	FLOATING ADDRESS
										OFF	760010
									OFF		760020
									OFF	OFF	760030
								OFF			760040
								OFF		OFF	760050
								OFF	OFF		760060
								OFF	OFF	OFF	760070
							OFF				760100
											—
						OFF					760200
											—
						OFF	OFF				760300
											—
					OFF						760400
											—
					OFF		OFF				760500
											—
					OFF	OFF					760600
											—
					OFF	OFF	OFF				760700
											—
				OFF							761000
											—
			OFF								762000
											—
			OFF	OFF							763000
											—
		OFF									76400

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Figure 3 M7521 Floating Address Assignment Table

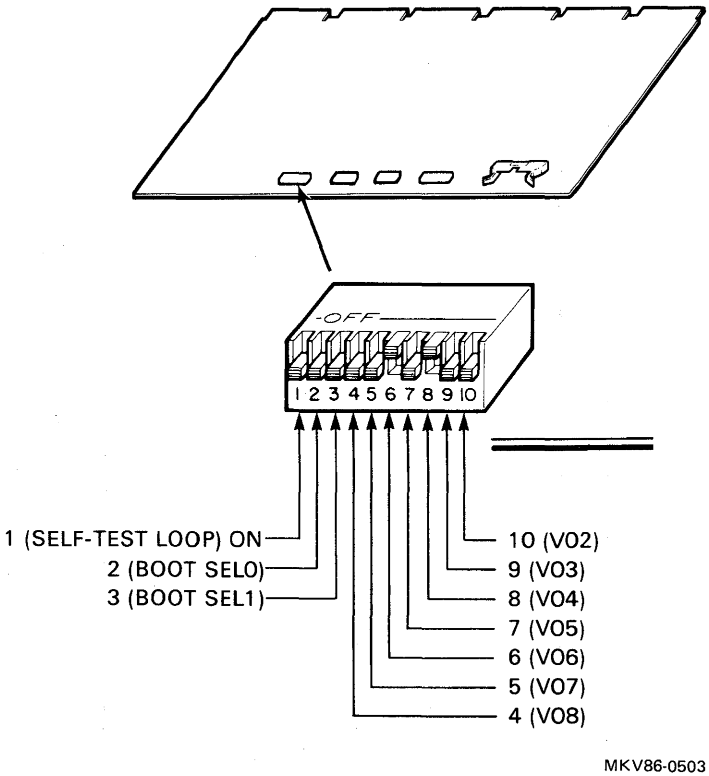

Figure 4 M7251 Vector Address, Boot Sel and Self-Test Switchpack (E69)

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
0	0	0	0	0	0	0	SWITCHPACK E69							0	0

SWITCH NUMBER	4	5	6	7	8	9	10	FLOATING VECTOR
		OFF	OFF					300
		OFF	OFF				OFF	304
		OFF	OFF			OFF		310
		OFF	OFF			OFF	OFF	314
		OFF	OFF		OFF			320
		OFF	OFF		OFF		OFF	324
		OFF	OFF		OFF	OFF		330
		OFF	OFF		OFF	OFF	OFF	334
		OFF	OFF	OFF				340
		OFF	OFF	OFF			OFF	344
		OFF	OFF	OFF		OFF		350
		OFF	OFF	OFF		OFF	OFF	354
		OFF	OFF	OFF	OFF			360
		OFF	OFF	OFF	OFF		OFF	364
		OFF	OFF	OFF	OFF	OFF		370
		OFF	OFF	OFF	OFF	OFF	OFF	374
	OFF							400
								—
	OFF		OFF					500
								—
	OFF	OFF						600
								—
	OFF	OFF	OFF					700
								—

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Figure 5 M7521 Floating Vector Address Assignment Table

Installation Verification
The installation verification procedure is performed with an Ethernet transceiver, DELNI unit, or H4080 loopback test transceiver connected to the DELUA UNA bulkhead assembly. The flowchart in Figure 6 details the verification procedure.

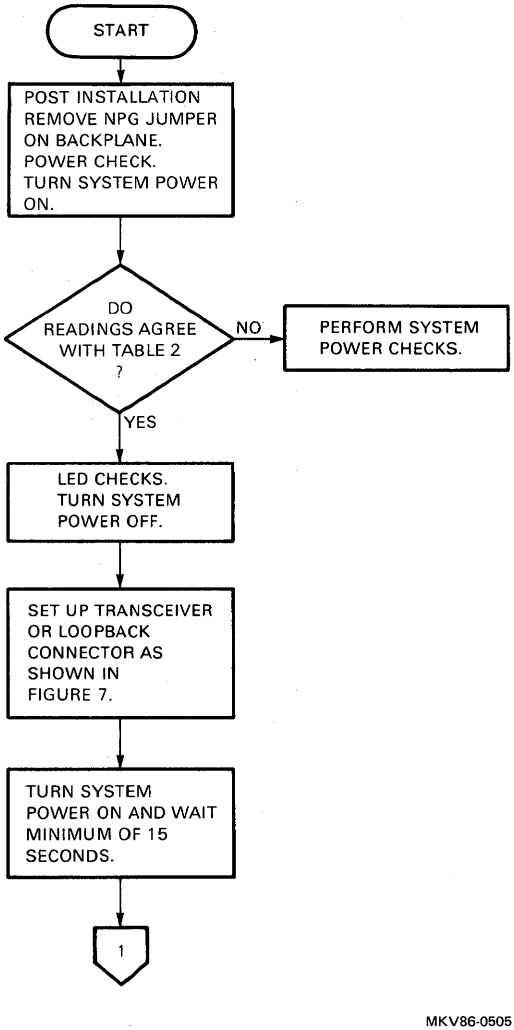

Figure 6 DELUA Installation Verification Flowchart (Sheet 1 of 2)

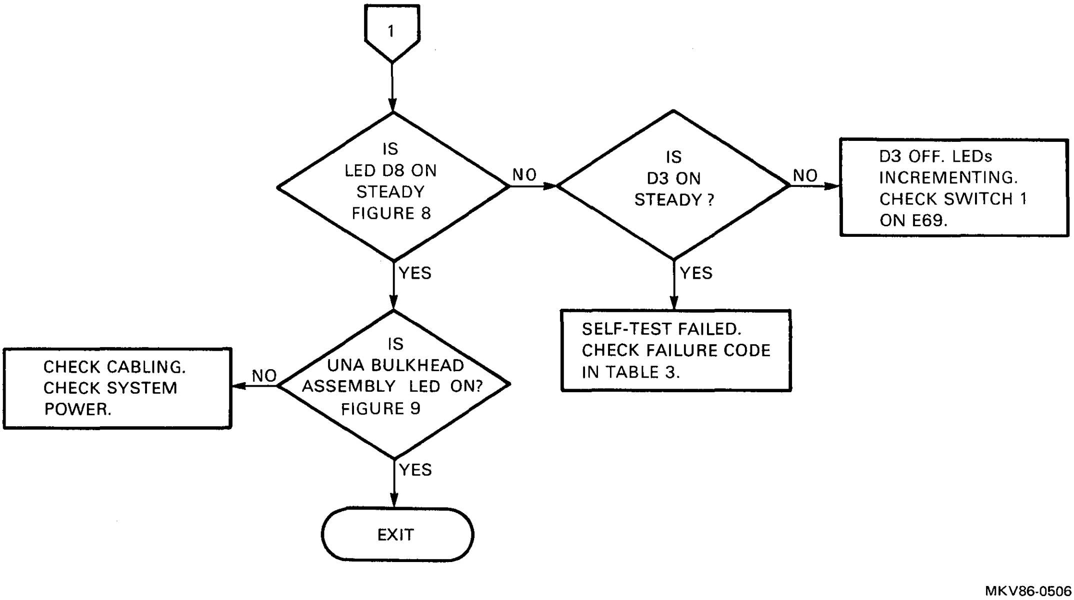

Figure 6 DELUA Installation Verification Flowchart (Sheet 2 of 2)

Table 1 Switchpack E69 Switch Settings

E69-2 Boot Sel 0	E69-3 Boot Sel 1	Function Selected
On*	On*	Remote boot disable
Off	On	Remote boot with system load
On	Off	Remote with ROM
Off**	Off**	Remote boot disable

* Switch settings for DELUA installed in a VAX-11 system.
** Switch settings for DELUA installed in a PDP-11 system.

Table 2 Backplane Pin Voltage Checks

Backplane Pin	Voltage Nominal	Maximum	Minimum
CA2	+5.0 V	+5.25 V	+4.75 V
FB2	−15.0 V	−15.75 V	−14.25 V

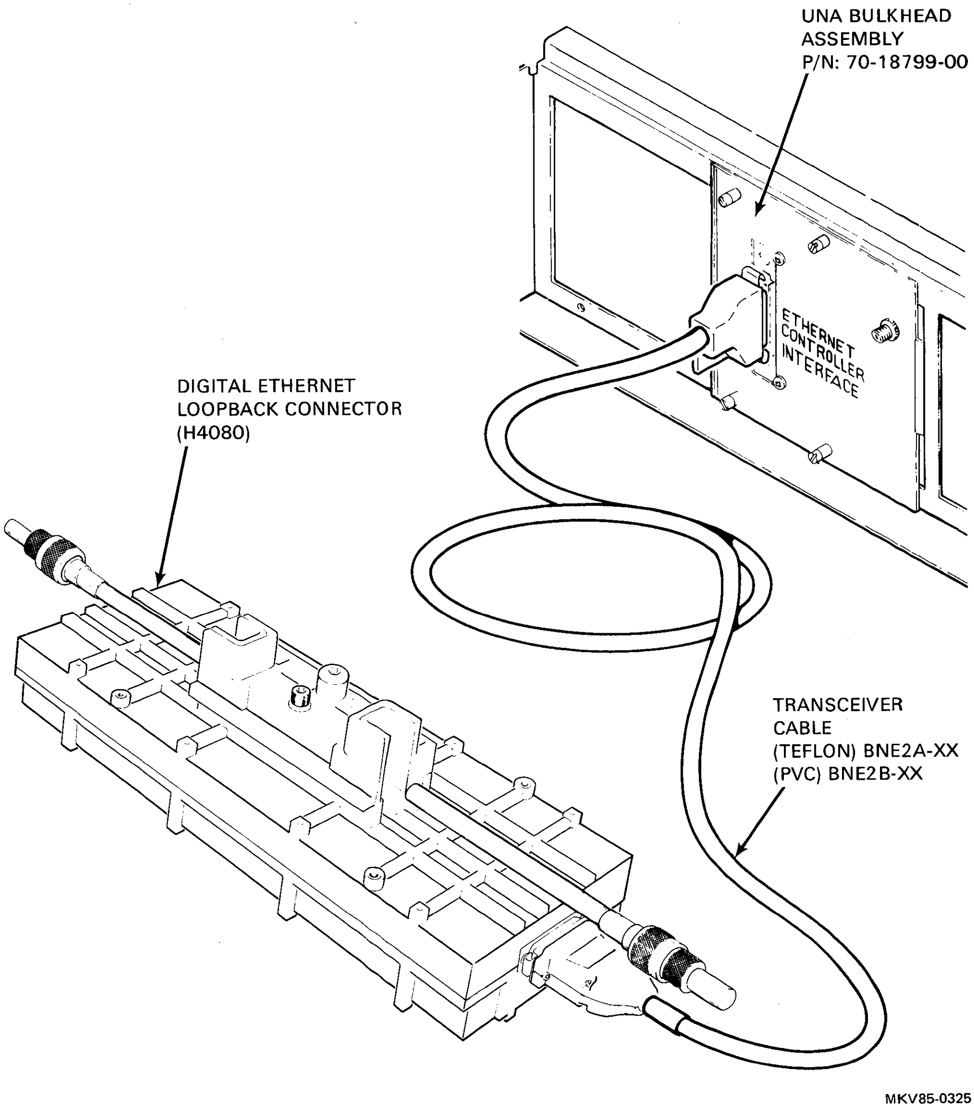

Figure 7 DELUA Microdiagnostics Self-Test Configuration

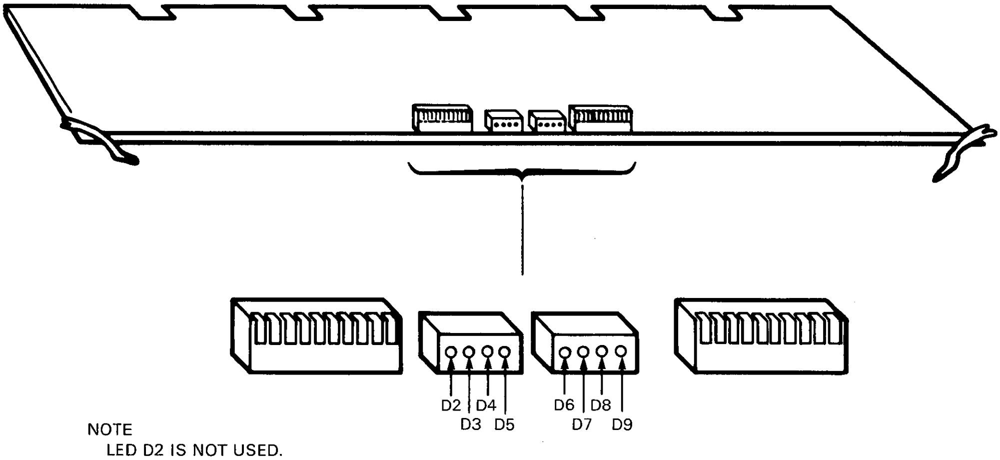

Figure 8 M7521 LED Location

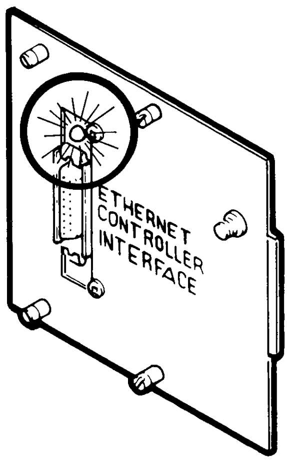

Figure 9 UNA Bulkhead Assembly LED Location

DELUA CABLING

Cabling
This section contains the cabling diagram for the DELUA adaptor.

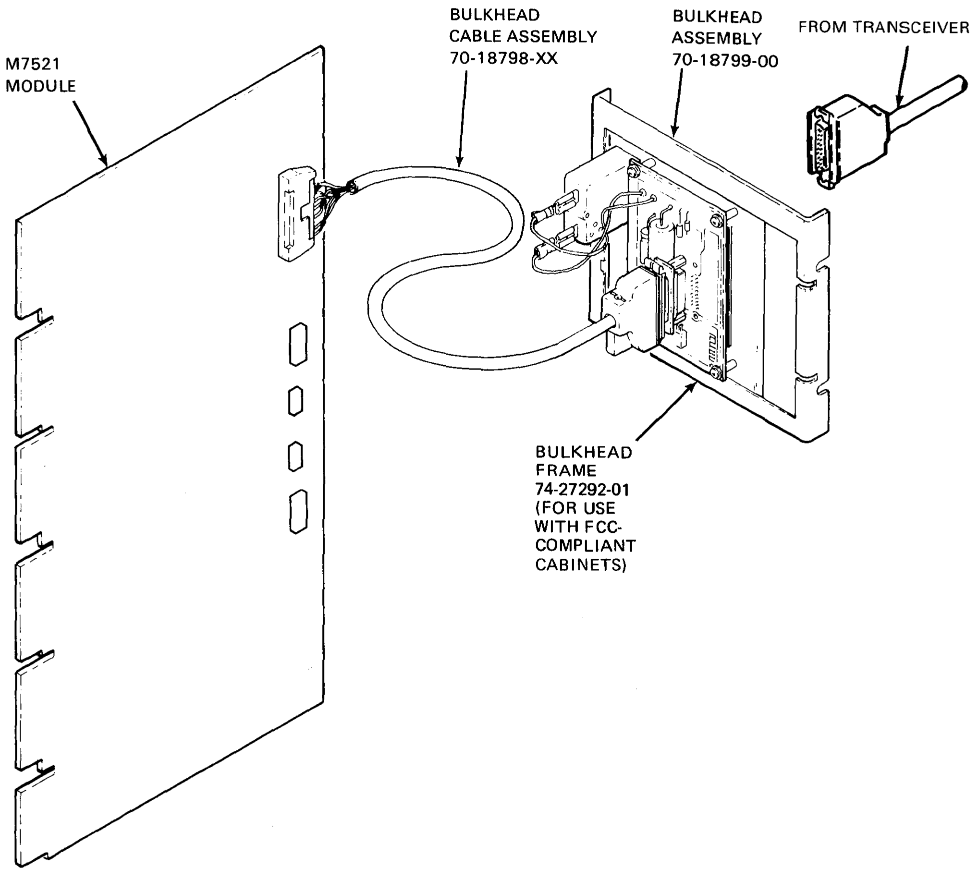

Figure 10 DELUA Cabling

DELUA Diagnostics

Maintenance Features

- Hardware Self-Test
  - Initiated on powerup, or
  - When the user issues a SELF-TEST port command (3 octal) to PCSR0 <3:0>
- LED Indicators
  - Self-Test Failure
  - State/Status Indicators
  - Microcode Failure Indicators
- Diagnostic Testing
  - DELUA VAX-11 On-Line Functional Diagnostics (EVDYB*)
  - DELUA PDP-11 Functional Diagnostic (CZUAD*)
  - VAX-11/PDP-11 NI Exerciser (EVDWC*/CZUAC*)
  - DEC/X11 DELUA Module (CXUAD*)

Self-Test Procedures

The DELUA self-test is a ROM-based test that verifies the:

- Operation of the five subsystems of the DELUA adaptor
- Integrity of the cable signal path from the DELUA adaptor to the transceiver.

The self-test is initiated:

- On powerup, or
- When the user issues a SELF-TEST port command (3 octal) to PCSR0 <3:0>.

Self-test takes approximately 15 seconds to execute. During this time, the seven fault/status LEDs on the M7521 module will be cycling, indicating that the self-test is in progress.

On completion of the self-test, the LEDs will stop blinking and will indicate:

- Which self-test failed, or
- The DELUA state/status (LED D8 is ON and LED D5 may be blinking).

Table 3 M7521 LEDs Self-Test Failure Indications

D3	D4	D5	D6	D7	D8	D9	Test Failed
ON	OFF	OFF	OFF	OFF	OFF	ON	ROM test
ON	OFF	OFF	OFF	OFF	ON	OFF	RAM checkerboard test
ON	OFF	OFF	OFF	OFF	ON	ON	Instruction set test
ON	OFF	OFF	OFF	ON	OFF	OFF	RAM test
ON	OFF	OFF	OFF	ON	OFF	ON	RAM parity memory test
ON	OFF	OFF	OFF	ON	ON	OFF	CPU exception test
ON	OFF	OFF	OFF	ON	ON	ON	RAM parity interrupt test
ON	OFF	OFF	ON	OFF	OFF	OFF	Physical address ROM test
ON	OFF	OFF	ON	OFF	OFF	ON	Timer interrupt test
ON	OFF	ON	OFF	OFF	OFF	OFF	LANCE internal loopback
ON	OFF	ON	OFF	OFF	OFF	ON	LANCE IBUS parity test
ON	OFF	ON	OFF	OFF	ON	OFF	LANCE CRC logic test
ON	OFF	ON	OFF	OFF	ON	ON	LANCE collision detect
ON	OFF	ON	OFF	ON	OFF	OFF	LANCE multicast address
ON	OFF	ON	OFF	ON	OFF	ON	LANCE broadcast address
ON	OFF	ON	OFF	ON	ON	OFF	LANCE physical address reject
ON	OFF	ON	OFF	ON	ON	ON	LANCE external loopback
ON	ON	OFF	OFF	OFF	OFF	OFF	DMA block mover I-Bus address register test
ON	ON	OFF	OFF	OFF	OFF	ON	DMA block mover H-Bus address register bit
ON	ON	OFF	OFF	OFF	ON	OFF	Block mover word count register bit
ON	ON	OFF	OFF	OFF	ON	ON	DMA word mover H-Bus address register bit
ON	ON	OFF	OFF	ON	OFF	OFF	Block mover I-Bus test
ON	ON	OFF	OFF	ON	ON	OFF	DMA UNIBUS access test
ON	ON	OFF	OFF	ON	ON	ON	DMA UNIBUS access test
ON	ON	OFF	ON	OFF	OFF	OFF	DMA word mover data register bit test
ON	ON	OFF	ON	OFF	OFF	ON	Word mover PCSR0 test
ON	ON	OFF	ON	OFF	ON	OFF	Word mover PCSR1,2,3
ON	ON	OFF	ON	OFF	ON	ON	DMA block mover H-Bus to I-Bus test
ON	ON	OFF	ON	ON	OFF	OFF	DMA block mover I-Bus to H-Bus test
ON	ON	OFF	ON	ON	OFF	ON	Port command interlock
ON	ON	ON	OFF	OFF	OFF	OFF	LUNA I-Bus loading test

NOTE
ON equals a logical "1."

Table 4 M7521 State/Status Indicators

D3	D4	D5	D6	D7	D8	D9	State/Status
OFF	OFF	X	OFF	OFF	OFF	OFF	Reset state
OFF	OFF	X	OFF	OFF	OFF	ON	Primary load state
OFF	OFF	X	OFF	OFF	ON	OFF	Ready state
OFF	OFF	X	OFF	OFF	ON	ON	Running state
OFF	OFF	X	OFF	ON	OFF	OFF	Not used
OFF	OFF	X	OFF	ON	OFF	ON	UNIBUS halted state
OFF	OFF	X	OFF	ON	ON	OFF	Ethernet halted state
OFF	OFF	X	OFF	ON	ON	ON	Ethernet and UNIBUS halted state
OFF	OFF	X	ON	OFF	OFF	OFF	Port halted state
OFF	OFF	X	ON	OFF	OFF	ON	Not used
OFF	OFF	X	ON	OFF	ON	OFF	Not used
OFF	OFF	X	ON	OFF	ON	ON	Not used
OFF	OFF	X	ON	ON	OFF	OFF	Not used
OFF	OFF	X	ON	ON	OFF	ON	Not used
OFF	OFF	X	ON	ON	ON	OFF	Not used
OFF	OFF	X	ON	ON	ON	ON	Secondary load state

NOTES
D5 is Activity LED.
ON equals logical "1."

Table 5 M7521 Microcode Failure Indicators

D3	D4	D5	D6	D7	D8	D9	Fault Indication
OFF	ON	OFF	OFF	OFF	OFF	ON	Unsolicited trap occurred
OFF	ON	OFF	OFF	OFF	ON	OFF	LANCE interrupt, No bits set in CSR0
OFF	ON	OFF	OFF	OFF	ON	ON	Lance memory error
OFF	ON	OFF	OFF	ON	OFF	OFF	Parity error
OFF	ON	OFF	OFF	ON	OFF	ON	Port command 0 interrupt
OFF	ON	OFF	OFF	ON	ON	OFF	Transmit error
OFF	ON	OFF	OFF	ON	ON	ON	MOP error
OFF	ON	OFF	ON	OFF	OFF	OFF	Receive error, Queue from empty queue
OFF	ON	OFF	ON	OFF	OFF	ON	Receive error, Bad buffer returned
OFF	ON	OFF	ON	OFF	ON	OFF	Receive error, Bad buffer queued

NOTE
ON equals logical "1."

DELUA DIAGNOSTICS

Diagnostic Description

The DELUA diagnostics consist of the following:

- EVDYB - VAX-11 On-Line Functional Diagnostic
- CZUAD - PDP-11 Functional Diagnostic
- EVDWC/CZUAC - VAX-11/PDP-11 NI Exerciser
- CXUAD - DEC/X11 DELUA Module.

EVDYB VAX-11 On-Line Functional Diagnostic

The VAX-11 on-line diagnostic (EVDYB) is used to verify functional operation of the DELUA adaptor, and test all DELUA hardware functions the DELUA is capable of using. It is a VAX/VMS level 2R (on-line) diagnostic that runs under the VAX-11 diagnostic supervisor. For this diagnostic to run, DECnet and LAT must be shut off.

Table 6 lists and describes the tests performed by EVDYB.

Table 6 EVDYB VAX-11 On-Line Functional Diagnostic Test Summary

Test		Description
1	Read Internal ROM	The internal 16K byte ROM can be read, and there are no CRC errors.
2	Read/Write Internal RAM	Data patterns can be written and read from internal RAM memory.
3	Transmit CRC	Transmit CRC logic functions properly.
4	Receive CRC	Receive CRC logic functions properly.
5	Promiscuous Address	DELUA is in promiscuous mode and will accept all datagrams regardless of the destination address.
6	Enable All Multicast	DELUA is in enable all multicast mode and will accept all datagrams with multicast destination addresses.
7	Station Address	DELUA recognizes the physical, multicast, and broadcast addresses of the node and discards datagrams with non-enabled addresses.
8	No Receive Buffers Available	The appropriate error will be flagged if a loopback is attempted and there are no receive buffers owned by the DELUA.
9	DELUA Stress	DELUA functions properly during heavy traffic loading conditions.

CZAUD PDP-11 Functional Diagnostic

The PDP-11 functional diagnostic (CZUAD) verifies the operation of the DELUA adaptors that have been installed in a PDP-11 processor. CZUAD runs under the PDP-11 diagnostic supervisor in a standalone, off-line environment.

Table 7 lists and describes the tests performed by CZUAD.

Table 7 CZUAD PDP-11 Functional Diagnostic Test Summary

Test		Description
1	PCSR0 Read Access	A device is present at the PCSR0 UNIBUS address specified.
2	PCSR1 Read Access	A device is present at the PCSR1 UNIBUS address specified.
3	PCSR1 DELUA ID Bit	Neither bit <06> nor other bits in PCSR1 device ID field are set.
4	PCSR2 Read Access	A device is present at the PCSR2 UNIBUS address specified.
5	PCSR3 Read Access	A device is present at the PCSR3 UNIBUS address specified.
6	PCSR2 Static Bit	PCSR2 for all STUCK-AT-0 (SA0) and STUCK-AT-1 (SA1) errors. The host will write patterns to PCSR2, and read them back.
7	PCSR3 Static Bit	PCSR3 for all SA0 and SA1 errors. The host will write patterns to PCSR3 and read them back.
8	Self-Test	The ROM-based self-test can be run successfully when invoked via the SELF-TEST port command.
9	Port Command	No errors occur when a DELUA port command is issued.
10	Interrupt Logic	A DELUA interrupt can be generated.
11	Read Internal ROM	Internal ROM can be read.
12	Read/Write Internal Memory	Internal RAM can be written and read.
13	Internal Loopback	No errors occur when a datagram is transmitted and received in internal loopback mode.
14	CRC Checking	CRC checking logic is operational.
15	Force CRC Error	CRC error detection is operational.
16	No Receive Buffer	A receive buffer error (RCBI) can be generated.
17	Disable Receive Chaining	Disable receive chaining mode is operational.

Table 7 CZUAD PDP-11 Functional Diagnostic Test Summary (Cont)

Test		Description
18	Transmit Chaining Error	Buffer length error can be set in the transmit descriptor ring.
19	Data Chaining	Transmit and receive data chaining.
20	Physical Address	Physical address detection is operational.
21	Multicast Address	Multicast address detection is operational.
22	Promiscuous Address	DELUA in promiscuous mode will accept all frames regardless of the destination mode.
23	Enable All Multicast	DELUA in multicast mode will accept all frames with multicast destination addresses.
24	Internal Loopback Transmit Length Error	If port driver attempts to transmit greater than a 32 byte <DCTR=0> or 36 byte <DCTR=1> transmit frame, the device will return a transmit length error.
25	Simultaneous Operations	Simultaneous operations can be performed.
26	External Loopback (Manual Intervention Required)	Using an external loopback connector, it ensures that no errors occur when a datagram is transmitted and received in external loopback mode.
27	Print Device Parameters	Prints the default physical address, the microcode revision, and the switchpack settings.

EVDWC/CZUAC Network Interconnect Exerciser (NIE)
The Network interconnect exerciser (NIE) allows nodes on the Ethernet LAN to communicate with each other. It consists of two operational modes:

- Default or operator-directed
- Unattended.

The default section allows the operator to select different modes of operation, such as:

- SIZE NI
- USE LOOP ASSIST
- FULL ASSISTANCE TEST OF ALL NODES.

This section is operator-driven, allowing the operator to select tests and test parameters.

The unattended mode collects a table of node addresses and tests the selected nodes, using the low-level maintenance functions of the specified controller.

CXUAD DEC/X11 DELUA Module
CXUAD sustains maximum bus activity for a period of time by transmitting multiple frames on each iteration. At the start of each pass, the program allocates a number of transmit buffers. A table is generated, which contains for each frame:

- Starting address
- Byte count
- Expected CRC.

Receive buffers are are allocated to align with the transmit buffers, allowing for header, data, and CRC verification.

In each iteration, two frames are transmitted in the normal mode. The purpose of these frames is to generate UNIBUS activity. No attempt is made to check received data. After transmission of these frames, the operating mode is changed to internal loopback and 32 short (36-byte) frames are transmitted. Received frames, status, and data are verified.

NOTE
The DELUA adaptor supports internal loopback only. External loopback mode use during DEC/X11 will cause errors and be detrimental to network operations.

Troubleshooting Flowchart
DELUA troubleshooting is detailed in the flowchart on the next two pages (Figure 11).

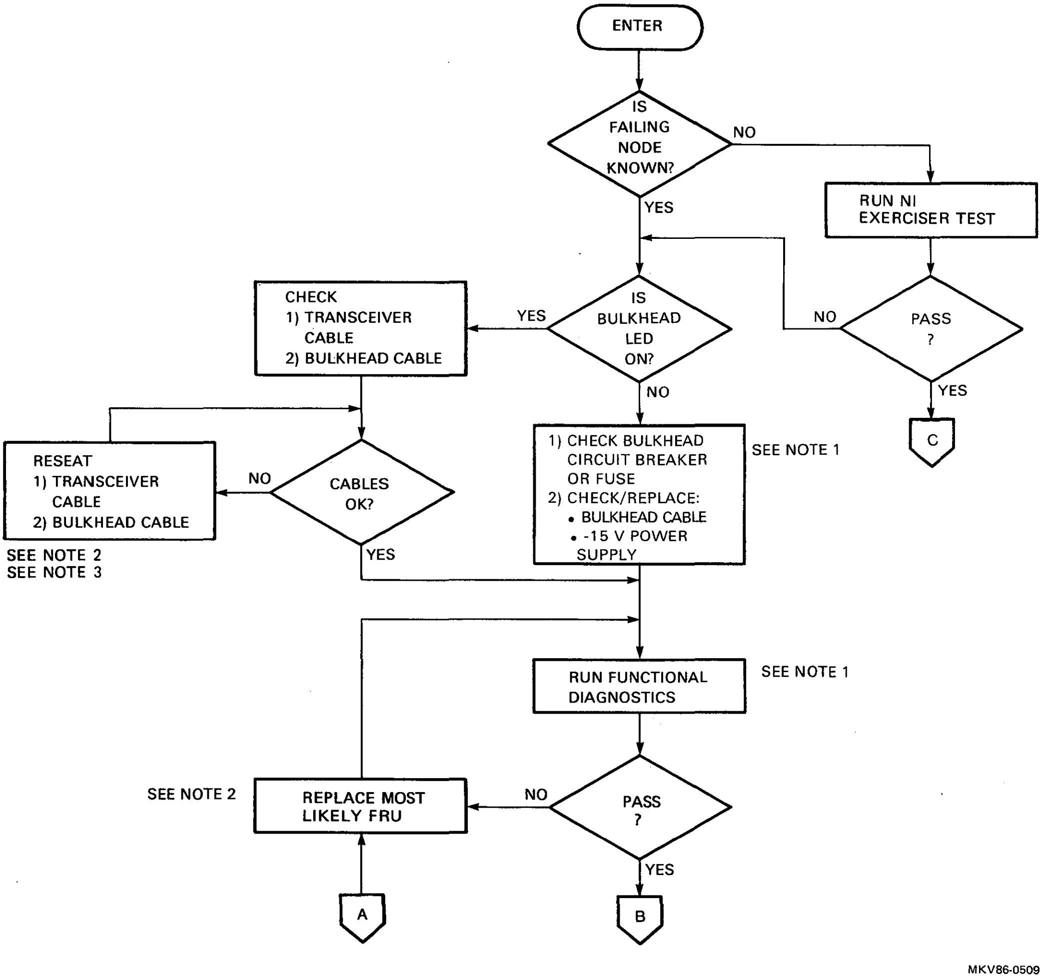

Figure 11 DELUA Troubleshooting Flowchart (Sheet 1 of 2)

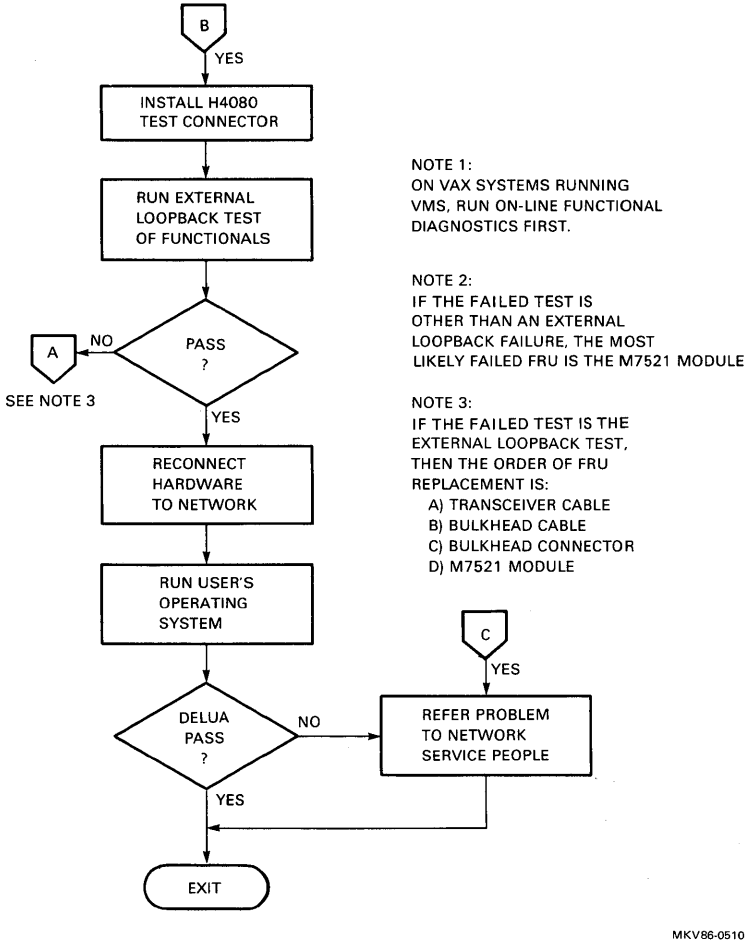

Figure 11 DELUA Troubleshooting Flowchart (Sheet 2 of 2)

DELUA Tech Tips/FCO Index

The following table lists Tech Tips and FCOs that pertain to the DELUA Ethernet UNIBUS adaptor.

Table 8 DELUA Tech Tips/FCO Index

Tech Tip No.	Title	Speed Bulletin
TT04A	DELUA ESD Precautions	442

DEMPR MULTIPORT REPEATER

General Description

The DEMPR is a ThinWire repeater that connects eight ThinWire coaxial cable segments, each up to 185 m (607 ft) in length. Up to 29 stations can be daisy-chained on each segment. The DEMPR can be used as a standalone network hub or connected to a standard Ethernet or IEEE 802.3 "backbone." There are two versions of the DEMPR:

- DEMPR-AA, 110 Vac
- DEMPR-AB, 220 Vac

Reference Documentation

Refer to the following documents for more information regarding the DEMPR.

• *DEMPR Installation User's Guide*	EK-DEMPR-UG
• *Ethernet/IEEE 802.3 ThinWire Repeaters(DEMPR/DESPR) Technical Manual*	EK-THNRP-TM
• *DECconnect System General Description*	EK-DECSY-GD
• *DECconnect System Requirements Evaluation Workbook*	EK-DECSY-EG
• *DECconnect System Planning and Configuration Guide*	EK-DECSY-CG
• *DECconnect System Installation and Verification Guide*	EK-DECSY-VG
• *H4000-TA Ethernet Transceiver Tester User's Guide*	EK-ETHTT-UG
• *DECconnect System ThinWire Planning and Installation Guide*	EK-DECSY-IG
• *ThinWire Ethernet Coaxial Cable Connector Installation Card*	EK-CABLE-IN

ThinWire and Standard Ethernet Differences

The major differences are:

- ThinWire coaxial cable is used instead of Ethernet coaxial cable.
- ThinWire compatible equipment uses BNC connectors instead of N-connectors.
- ThinWire stations interconnect with DESTA station adapters or directly to the ThinWire coaxial cable via BNC TEE connectors instead of H4000 transceivers.
- ThinWire repeater is a DEMPR instead of a DEREP.

Repeater Configuration Limitations

Standalone DEMPR –

- One to eight ThinWire coaxial cable segments can be attached to a DEMPR.
- Each coaxial cable segment can be up to 185 m (607 ft) long.
- Stations can be attached directly to the cable using TEE connectors. TEE connectors plug directly into the station.
- There must be at least 0.5 m (1.6 ft) between ThinWire station connections.
- There can be up to 29 stations per coaxial cable segment.
- TEE connectors cannot be directly attached to DEMPR ports.

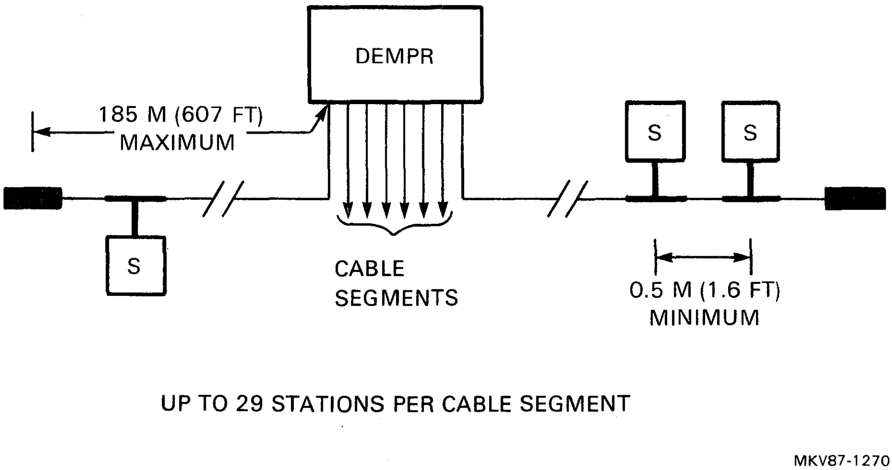

Figure 1 Standalone DEMPR with ThinWire Cables

Standalone Cascading DEMPR –

- The DEMPR is connected to the ThinWire cable via a DESTA transceiver.
- A single DEMPR coaxial cable segment is used to allow up to 29 DEMPR multiport repeaters to be attached via DESTA station adapters.

NOTE
When connecting a DEMPR to a DESTA, the switches on the DESTA unit must be set in the DOWN position (away from the dimple).

- Only two repeaters* (DEMPR, DESPR, or DEREP) are allowed between any two stations on the Ethernet network.

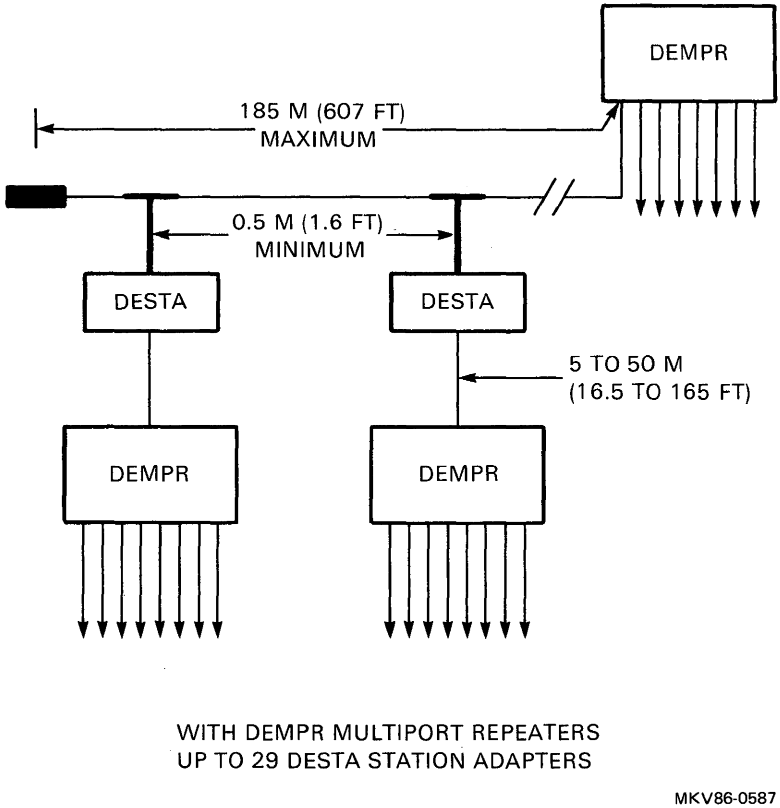

Figure 2 Standalone Cascading DEMPR with Multiport Repeaters

* Ethernet timing starts again at a LAN Bridge. This means that it is possible to have more than two repeaters between stations when remote bridges are used. No more than two repeaters may be placed between the bridges.

Standalone DELNI with DEMPR Multiport Repeaters –

- With the use of a loopback connector (P/N 12-22196-01) on the DELNI, a user can connect up to eight DEMPR multiport repeaters using 5 to 50 m (16.5 to 165 ft) of transceiver cable for each DEMPR.
- Only two DEMPR multiport repeaters* are allowed between any two stations.
- The DELNI is configured in GLOBAL mode with a loopback connector installed.

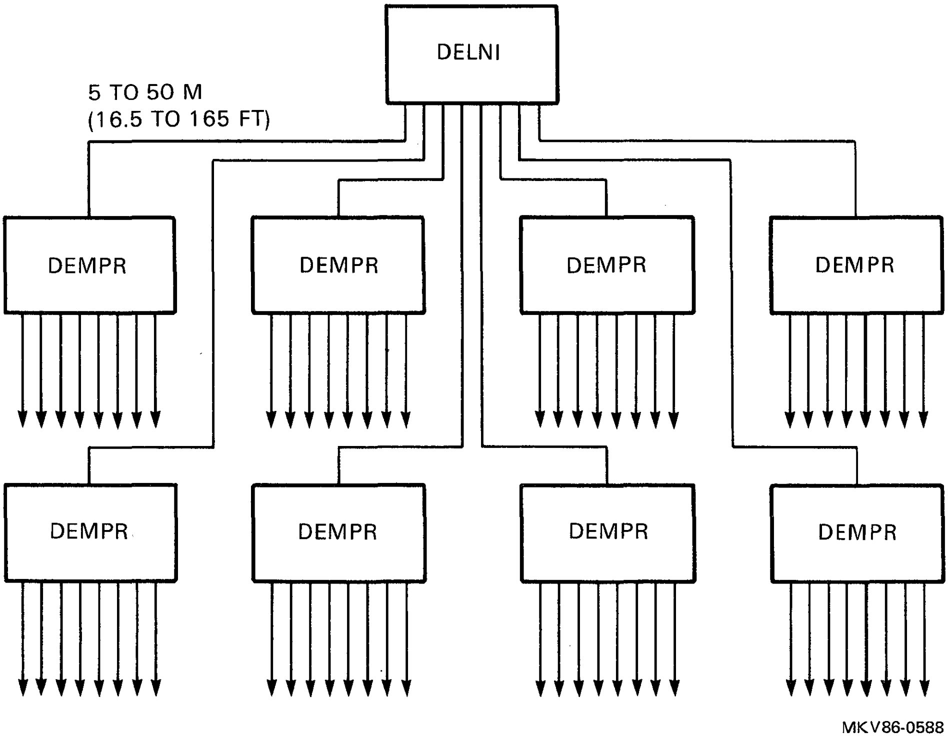

Figure 3 Standalone DELNI with DEMPR Multiport Repeaters

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* Ethernet timing starts again at a LAN Bridge. This means that it is possible to have more than two repeaters between stations when remote bridges are used. No more than two repeaters may be placed between the bridges.

DEMPR on a Standard Ethernet Coaxial Cable –

- A DEMPR can be connected to a standard Ethernet or IEEE 802.3 cable by a 5 to 50 m (16.5 to 165 ft) transceiver cable and a transceiver.
- One to eight ThinWire Ethernet coaxial segments can be attached to a DEMPR.
- Other repeaters, such as the DEREP, may be attached to the standard Ethernet backbone.
- Only two repeaters are allowed between any two stations within a LAN (Local Area Network).
- Multiple DEMPR repeaters can be connected to the standard Ethernet backbone via an H4000 or H4005 transceiver with heartbeat disabled. (The two repeater* rule applies.)

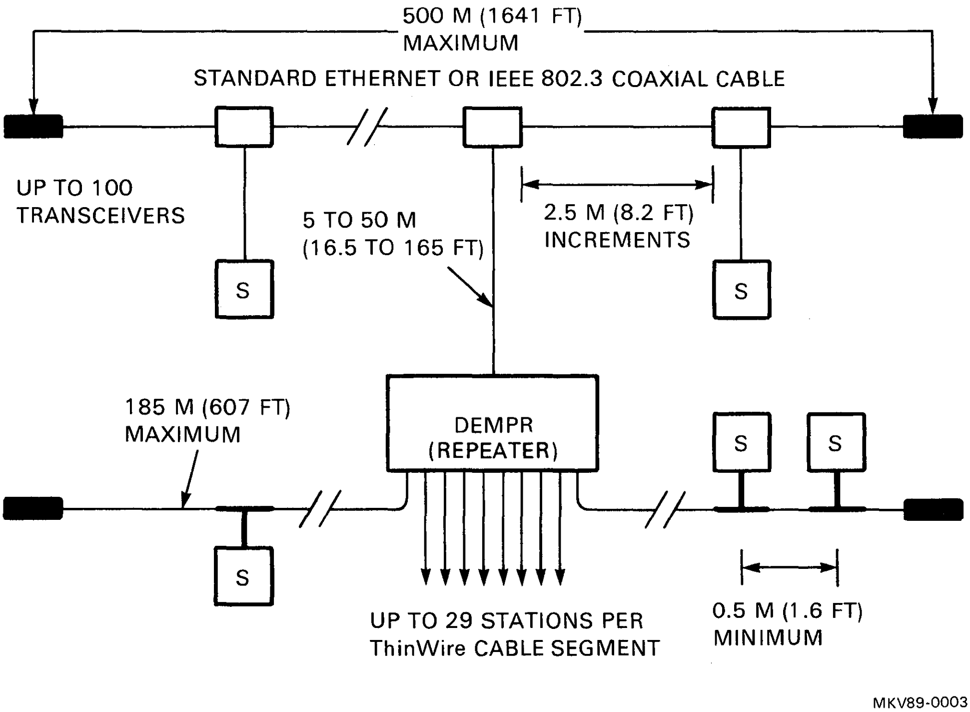


Figure 4 DEMPR on a Standard Ethernet Coaxial Cable

* Ethernet timing starts again at a LAN Bridge. This means that it is possible to have more than two repeaters between stations when remote bridges are used. No more than two repeaters may be placed between the bridges.

DEMPR/DELNI Pyramids on a Standard Ethernet or IEEE 802.3 Coaxial Segment –

- DEREP repeaters can be used on the standard Ethernet or IEEE 802.3 backbone as long as no more than two repeaters* are between any two stations.

- Multiple DEMPR/DELNI pyramids can be hooked up to a standard Ethernet or IEEE 802.3 backbone via transceivers (see Figure 5). In this case, the backbone is limited to 300 m (984 ft).

- The H4000-BA (or equivalent) or H4005 with heartbeat disabled can be used to hook up DEMPR/DELNI pyramids to the backbone.

NOTE
When connecting to an H4005 transceiver, the switches on the H4005 unit must be set in the DOWN position (away from the dimple).

- When a DELNI is installed between a transceiver and a DEMPR (see Figure 5), the combined lengths of the transceiver cable between the transceiver and the DELNI, and between the DELNI and the DEMPR, *must not* exceed 45 m (148 ft) . The DELNI consumes 5 m (16.5 ft) of the usual cable allowance of 50 m (165 ft).

- Standard Ethernet or IEEE 802.3 backbone segments using multiple pyramids are limited to 300 m (984 ft) lengths instead of the usual 500 m (1641 ft).

- Only two DEMPR multiport repeaters are allowed between any two stations.

- A DELNI-to-DELNI-to-DEMPR configuration is not allowed. If a DELNI has a DEMPR attached to one of its local connectors (ports), the global connector (port) of the DELNI must attach directly to the standard Ethernet via a transceiver or have a loopback connector attached to its global port. The DELNI must be placed in GLOBAL mode.

- The DELNI used in this configuration does not pass heartbeat to any of its ports. For example, a DEUNA expects to receive heartbeat each time it transmits a message. In the DEMPR/DELNI configuration, this will not occur and error counters will be incremented.

NOTE
When a DEMPR is connected to a DELNI, no other device which expects a heartbeat can be connected to the DELNI.

- Additional coaxial segments [up to 500 m (1641 ft)] can be connected to the standard Ethernet or IEEE 802.3 backbone using a repeater (provided that the two repeater* rule is enforced).

---

* Ethernet timing starts again at a LAN Bridge. This means that it is possible to have more than two repeaters between stations when remote bridges are used. No more than two repeaters may be placed between the bridges.

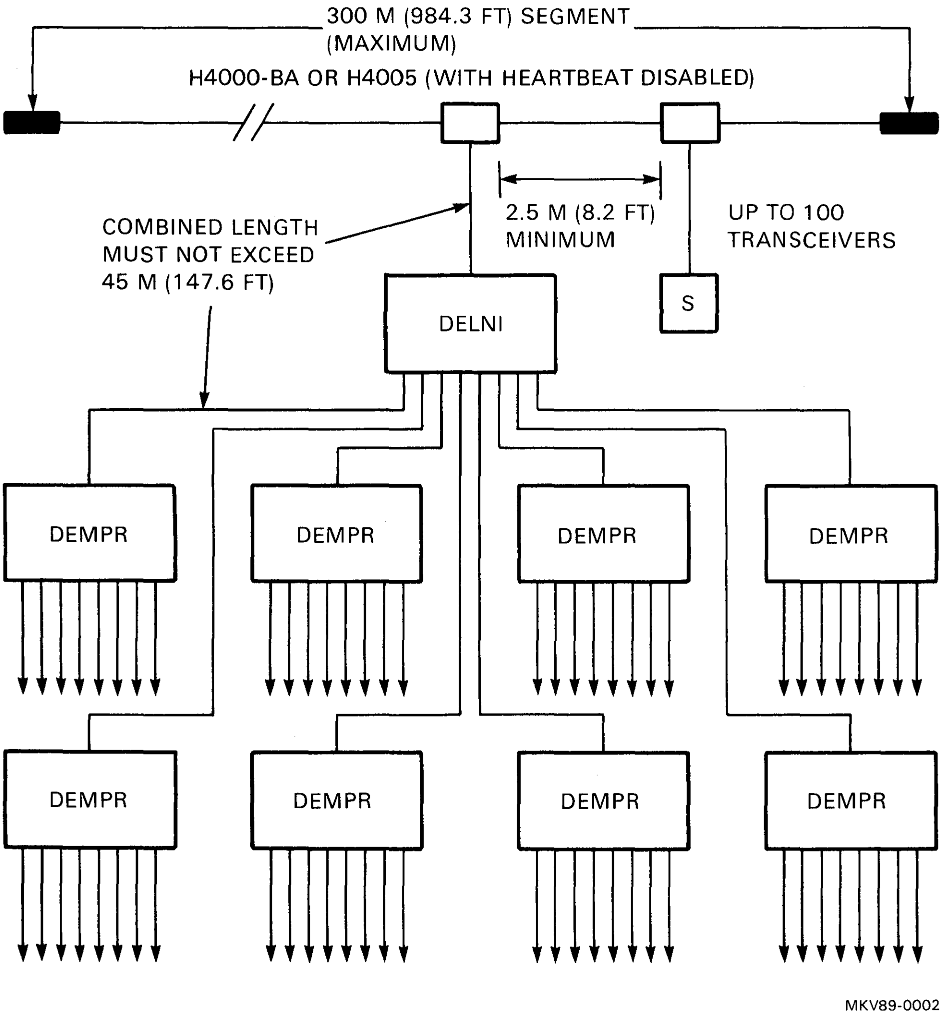


Figure 5 DEMPR/DELNI Combination on a Standard Ethernet Coaxial Cable

DEMPR Component List

The following parts are supplied with each repeater.

Table 1 DEMPR Parts List

Description	Part Designation	AA Version	AB Version
DEMPR-AA or -AB	DEMPR-nn*		
Power cord	17-00083-07	X	See Table 2
Loopback terminator	12-22196-01	X	X
Terminator	H8225	X	X
Cab mounting brackets	H041-AA	X	X
DEMPR Installation/User's Guide	EK-DEMPR-UG	X	X
ThinWire Ethernet Coaxial Cable Connector Installation Card	EK-CABLE-IN	–	–

*nn = version -AA or -AB

The DEMPR-AB (220 V) version requires a power cord specific to individual countries. The following table lists power cord requirements for specific countries.

Table 2 Country Power Cords

Country	Order Code
Ireland, United Kingdom	BN02A-2E
Austria, Belgium, Czechoslovakia, Finland, France, Germany, Hungary, Netherlands, Norway, Poland, Portugal, Spain, Sweden	BN03A-2E
Switzerland	BN04A-2E
Australia, New Zealand	BN05A-2E
Denmark	BN06A-2E
Italy	BN07A-2E

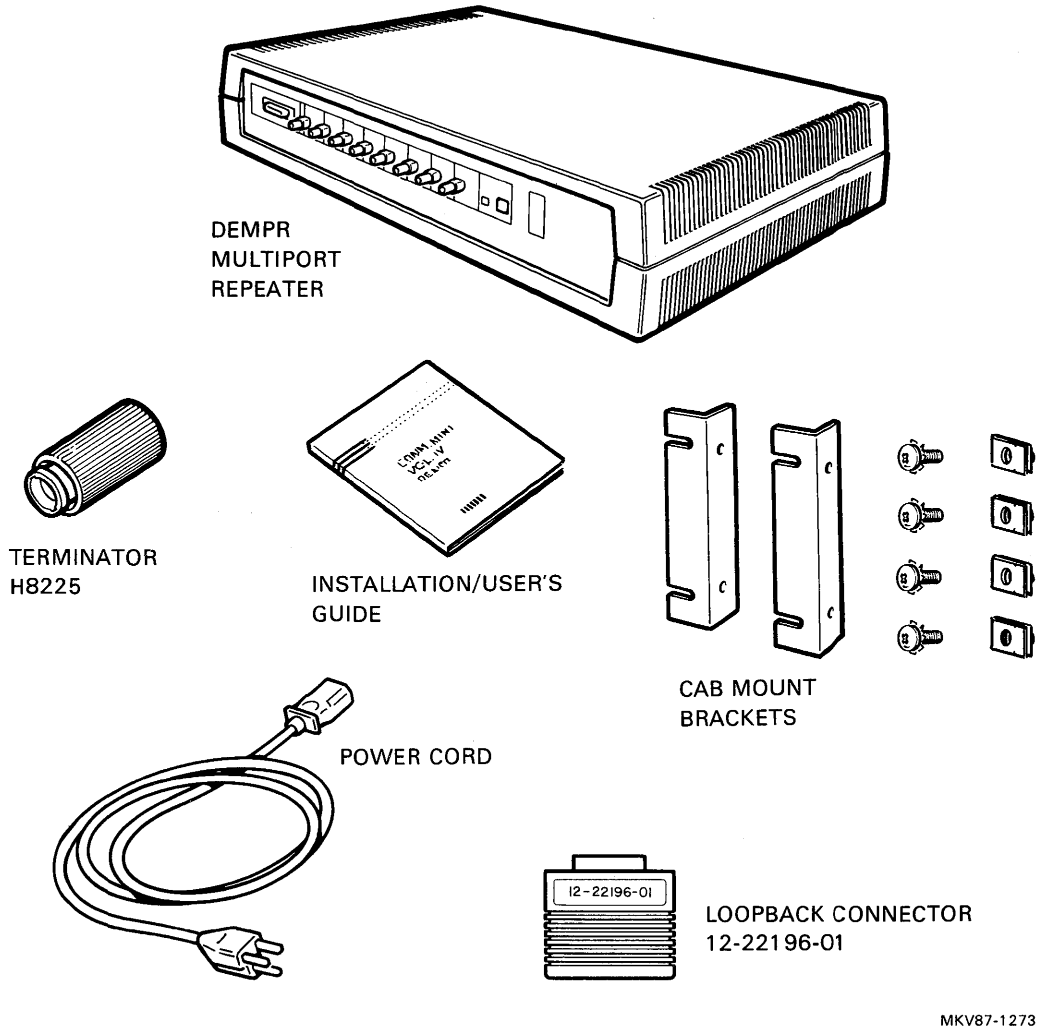


Figure 6 DEMPR ThinWire Multiport Repeater

DEMPR INSTALLATION

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

- A table,
- A rack mount assembly, or
- A wall mount (The H039 wall mount bracket must be ordered separately).

WARNING
The DEMPR cannot be wall mounted with the I/O panel side facing downward.

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

Table 3 DEMPR Power Requirements

Nominal Voltage Required	Voltage Range	Current*	Frequency
120 Vac	88–132 V	2 A	47–63 Hz
240 Vac	176–264 V	1 A	47–63 Hz

*When operating at nominal voltage specified.

Physical Specifications

DEMPR *without* plastic cover:

Length – 43.19 cm (17.0 in)

Width – 29.84 cm (11.75 in)

Height – 8.74 cm (3.44 in)

Weight – 7 pounds 11 ounces

DEMPR *with* plastic cover:

Length – 48.9 cm (19.25 in)

Width – 31.11 cm (12.25 in)

Height – 11.43 cm (4.5 in)

Weight – 11 pounds 14 ounces

Environmental Specifications

Operating Temperature Ranges

With plastic enclosure: 10° – 40°C (50° – 104°F)

Without plastic enclosure: 5° – 50°C (41° – 122°F)

Preinstallation Considerations
Consider the following prior to initiating installation of the DEMPR unit. Ensure that:

1. An ac power outlet is within 1.83 m (6 ft) of the installation location.
2. A suitable platform on which to table-top mount the DEMPR unit is available.
3. Suitable cabling and transceivers are available (as required and that have been tested) to interconnect the DEMPR units to both the standard Ethernet and ThinWire Ethernet devices.
4. A clearance of 10.16 cm (4 in) be maintained between all sides of the DEMPR unit and obstructions to allow for proper ventilation.
5. The network being configured for the ThinWire DEMPR is within allowable limits (refer to the *DECconnect Planning and Configuration Guide*).

Installation Flow Diagram

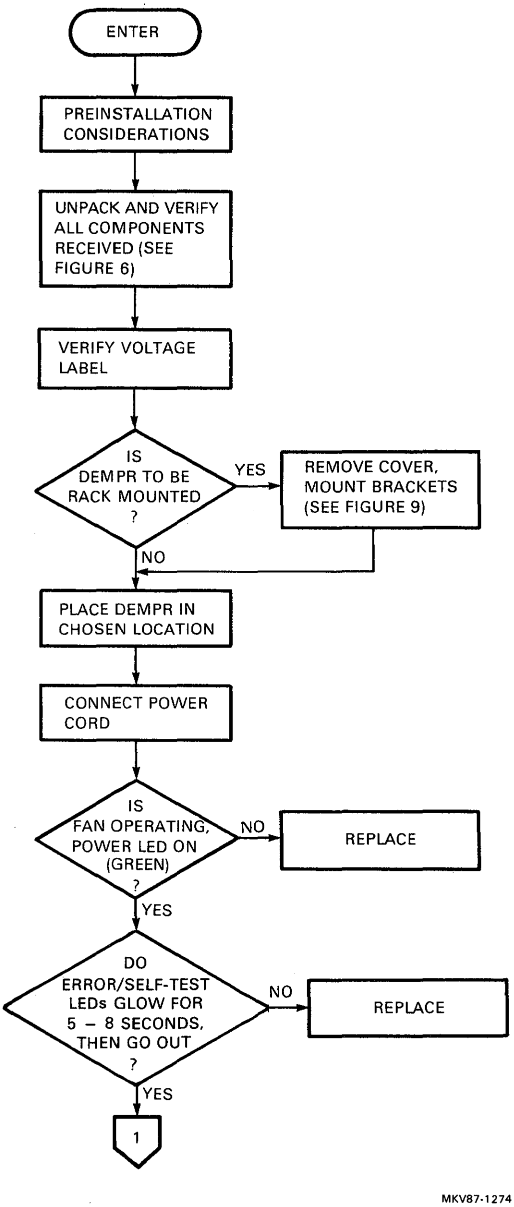


Figure 7 DEMPR Installation Flow Diagram (Sheet 1 of 3)

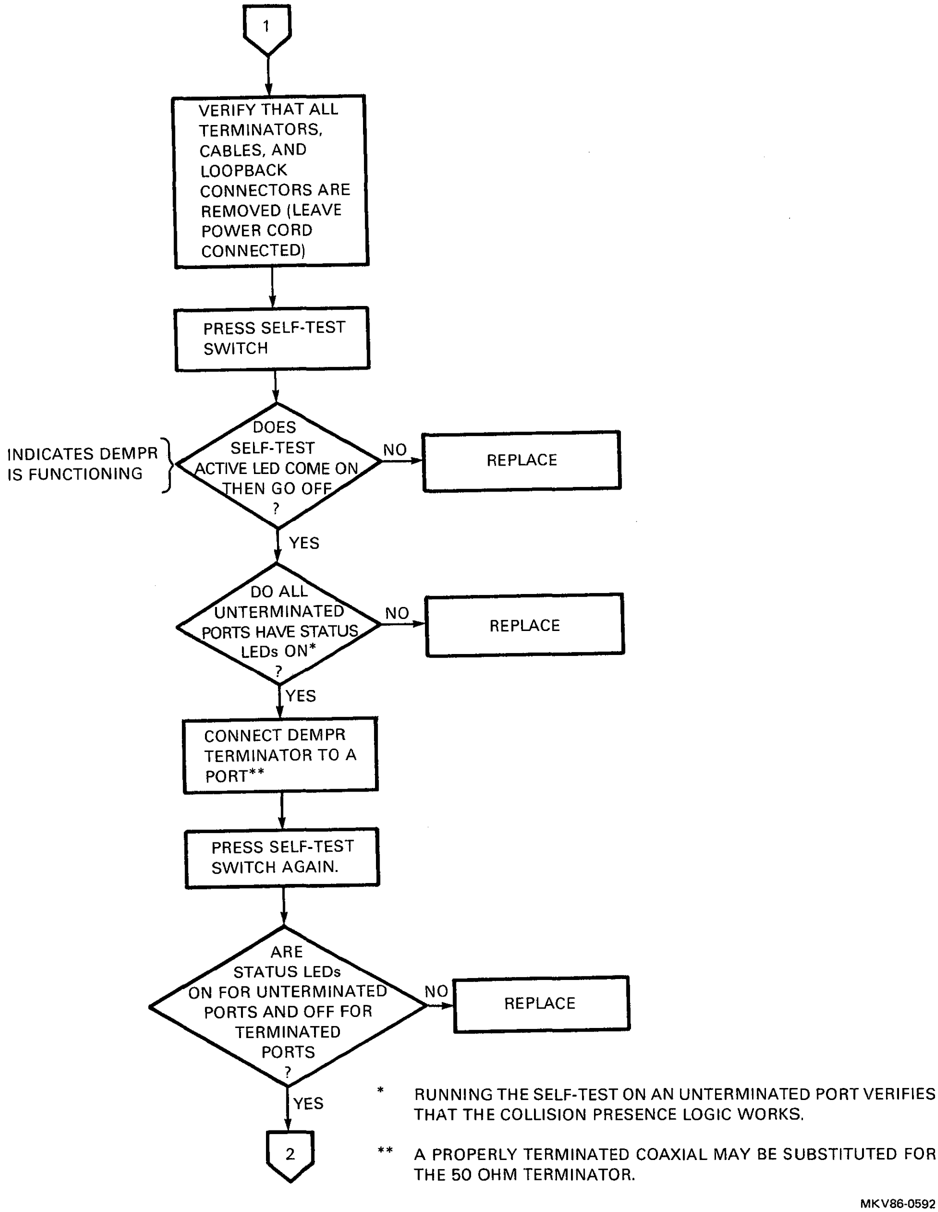


Figure 7 DEMPR Installation Flow Diagram (Sheet 2 of 3)

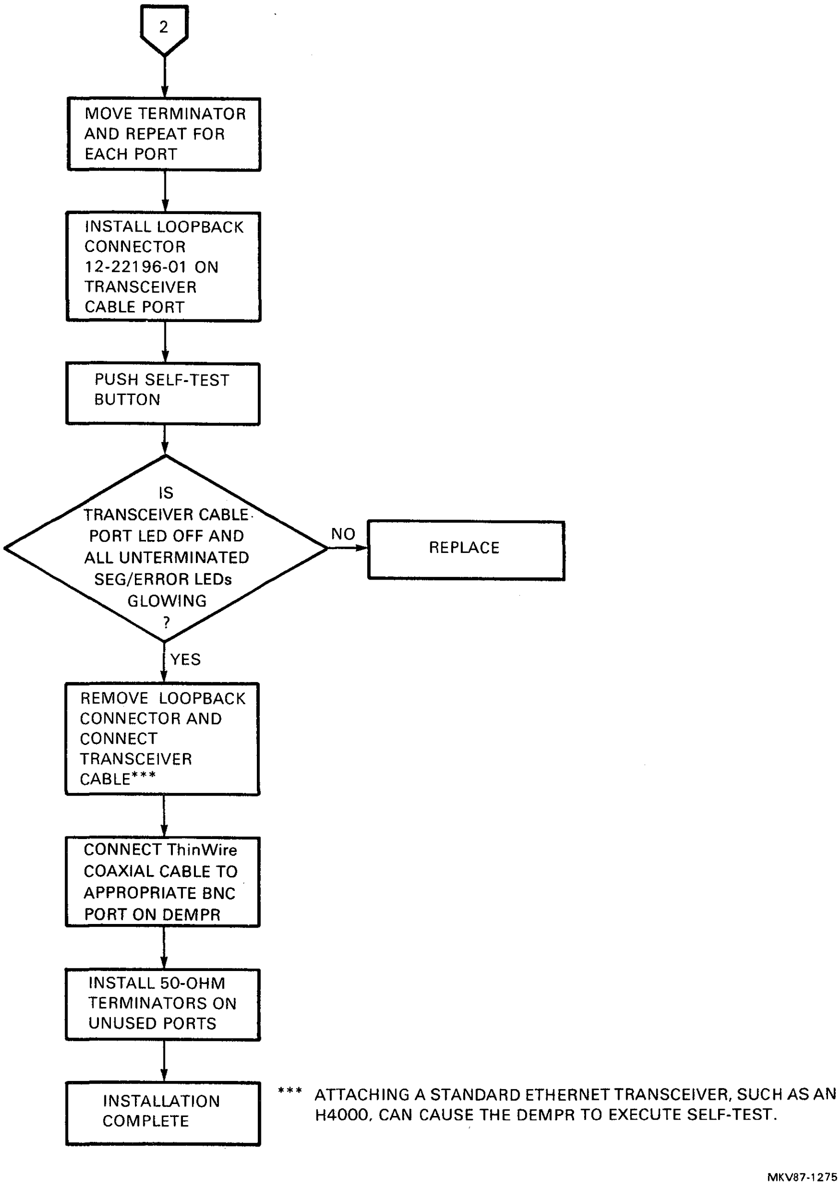


Figure 7 DEMPR Installation Flow Diagram (Sheet 3 of 3)

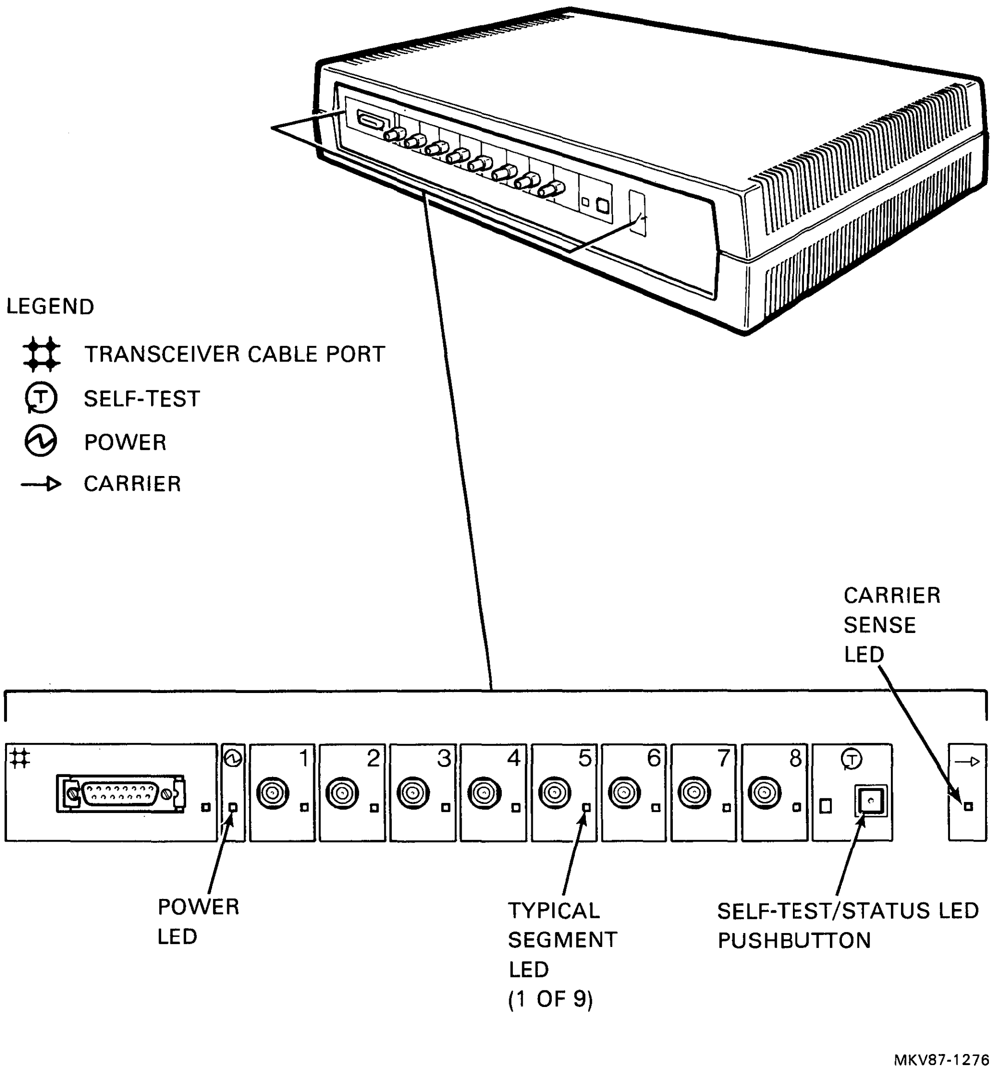


Figure 8 DEMPR Rear Panel

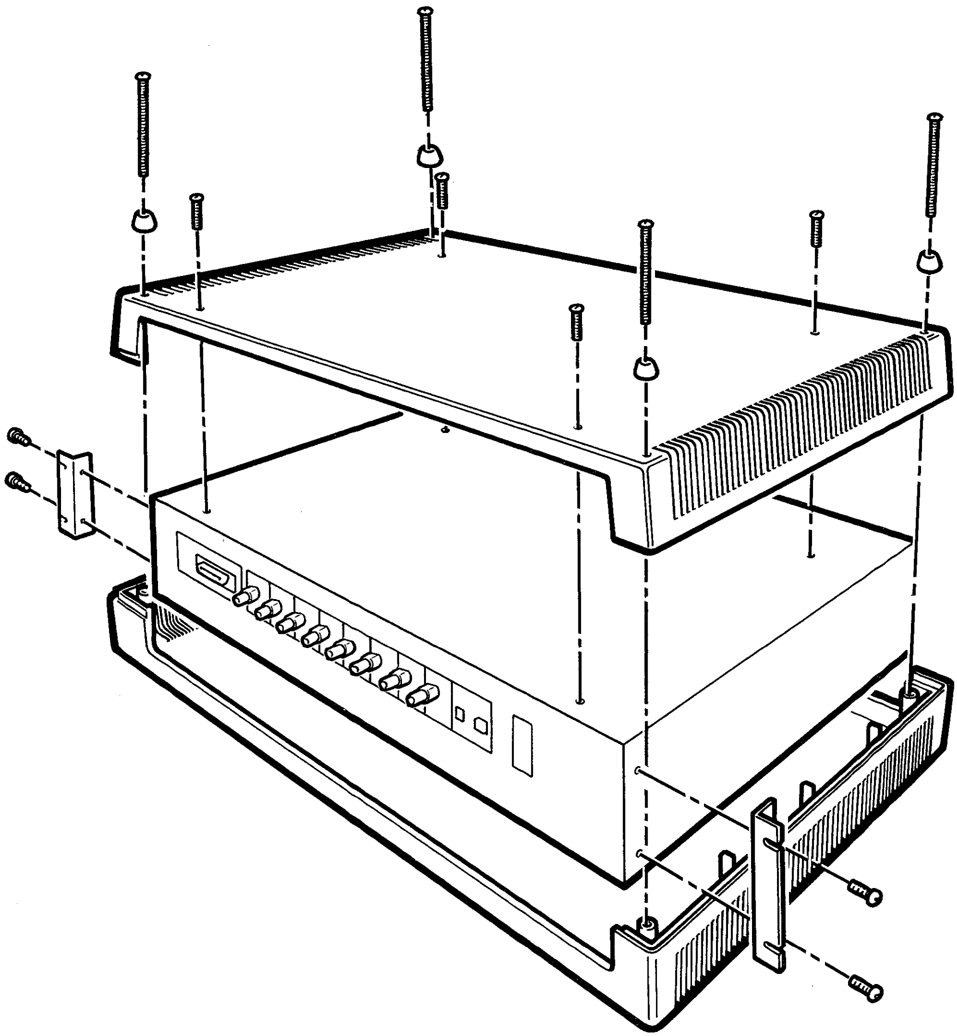


Figure 9 Rack Mounted DEMPR

Cable Connections

Three types of cable must be considered when connecting a DEMPR.

- **Transceiver cable** – Up to 50 m (164 ft) if going directly to a transceiver; 45 m (148 ft) total if using a DELNI.
- **ThinWire Ethernet coaxial cable(s)** – Up to eight, each up to 185 m (607 ft) maximum.
- **Power** – Outlet must be within 1.8 m (6 ft) of the DEMPR.

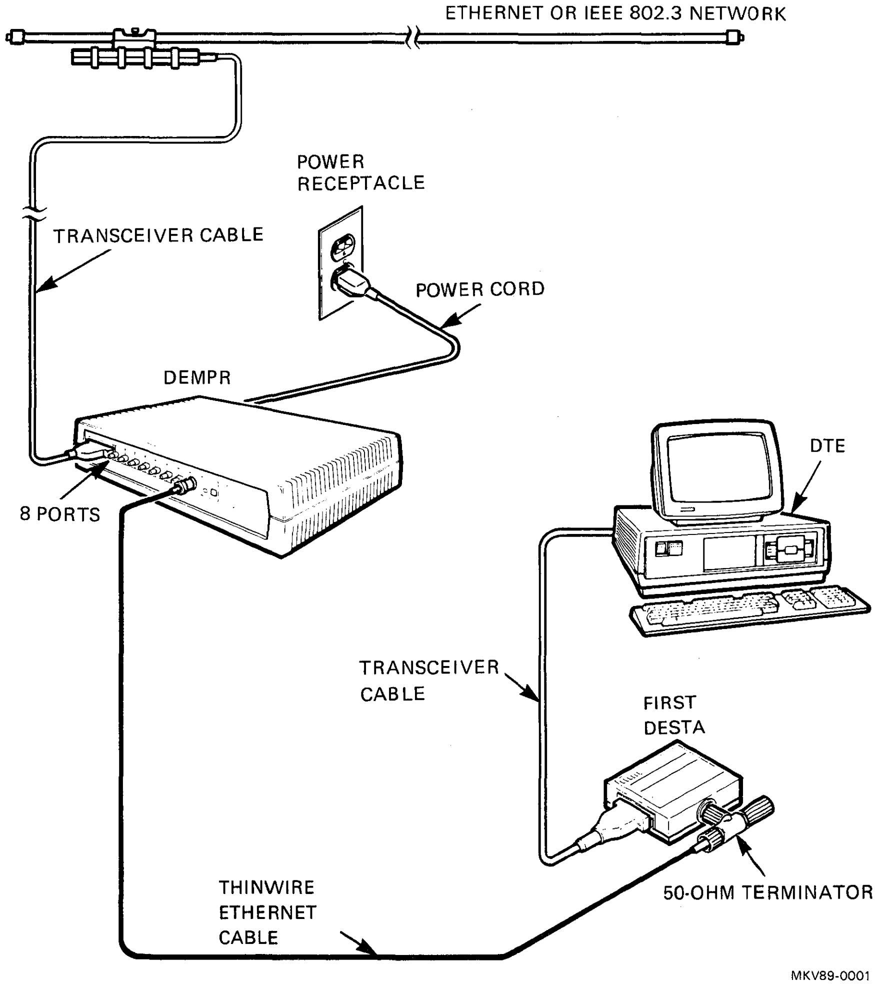


Figure 10 DEMPR Cable Connections

ThinWire Cabling

ThinWire Ethernet coaxial cables transfer data over shorter distances. Typically, *ThinWire* core OD is 0.116 inches while *standard* core OD is about 0.242 inches. There are two types of ThinWire coaxial cable:

- ThinWire Ethernet FEP (Fluoropolymer) coaxial cable, P/N H8244-A (1000 ft roll)
- ThinWire Ethernet PVC (Polyvinyl Chloride) coaxial cable, P/N H8243-A (1000 ft roll)

NOTE
It is recommended that all connectors and terminators used on ThinWire cabling use gold-plated center conductors.

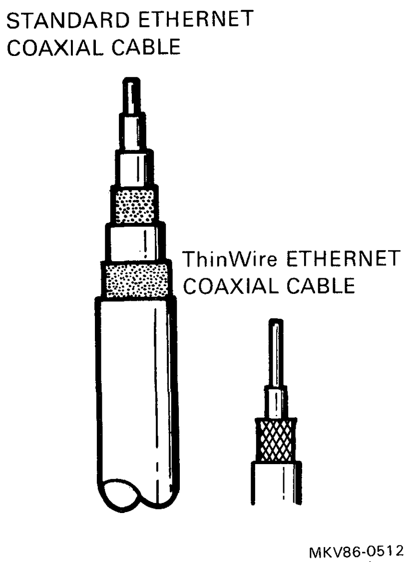


Figure 11 Cable Differences

ThinWire Coaxial Cable Segment Cabling Guidelines

- ThinWire segments may be no longer than 185 m (607 ft).
- Up to 30 stations are supported (DEMPR counts as 1).
- A ThinWire segment can have no more than 60 male/female connector junctions (see Figure 12 item #1 or #2; each counts as a junction). The barrel connector counts as two junctions.
- The ThinWire coaxial cable must be terminated at both ends with 50-ohm terminators. Terminators attach via a TEE or barrel connector. (The DEMPR has an internal terminator.)
- The third connection point of a TEE connector must not be terminated (see Figure 12 item #3).
- No coaxial cable may be placed between the TEE connector and the DESTA or ThinWire station. The TEE connector (see Figure 12 item #3) attaches directly to the DESTA or station.
- TEE connectors cannot connect directly to DEMPR ports.
- There must be at least 0.5 m (1.6 ft) of ThinWire coaxial cable between DESTA station adapters and/or stations (see Figure 4).
- Loops of ThinWire coaxial cable are not allowed between repeater ports.
- When disconnecting a station that is attached to a TEE connector, avoid disconnecting the coaxial cable BNC connectors. Disconnect the BNC attached to the station or DESTA. Disconnecting the coaxial cable disables the entire segment.
- It is recommended that the DEMPR have all unused ports terminated with 50-ohm terminators. It is recommended that unused ThinWire coaxial cable segments be tested during DEMPR installation. The cable segments should then be disconnected from the DEMPR and a terminator installed on the DEMPR. Do not leave an unused coaxial cable attached to the DEMPR.

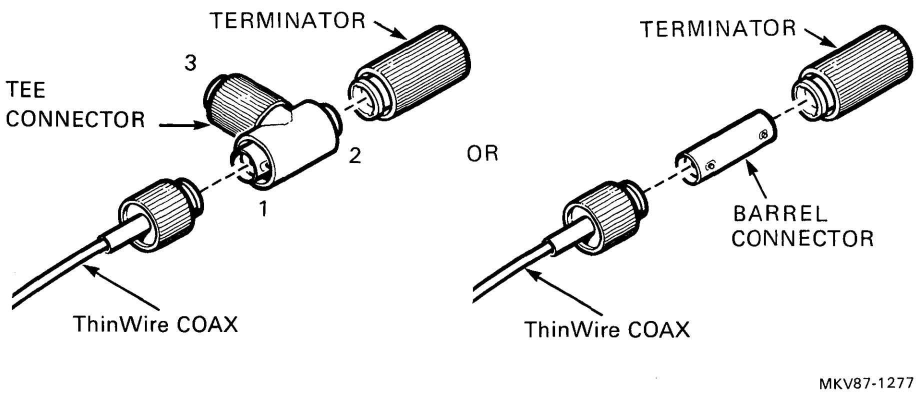


Figure 12 TEE Connector

DEMPR DIAGNOSTICS

Diagnostics
There are no diagnostics designed specifically for the DEMPR multiport repeater other than self-test.

Power-up self-test:

- Occurs during power-up.
- Tests internal logic.
- Upon completion, all error LEDs should be OFF; self-test status should be OFF.

External self-test:

- Occurs when SELF-TEST switch is pressed.
- Performs external data test.
- Unterminated ports will fail.
- Properly terminated coaxial segments should pass.

Attaching a standard Ethernet transceiver, such as an H4000, can cause the DEMPR to execute self-test.

NOTE
Cable continuity testing is important because point testing will not detect a shorted cable.

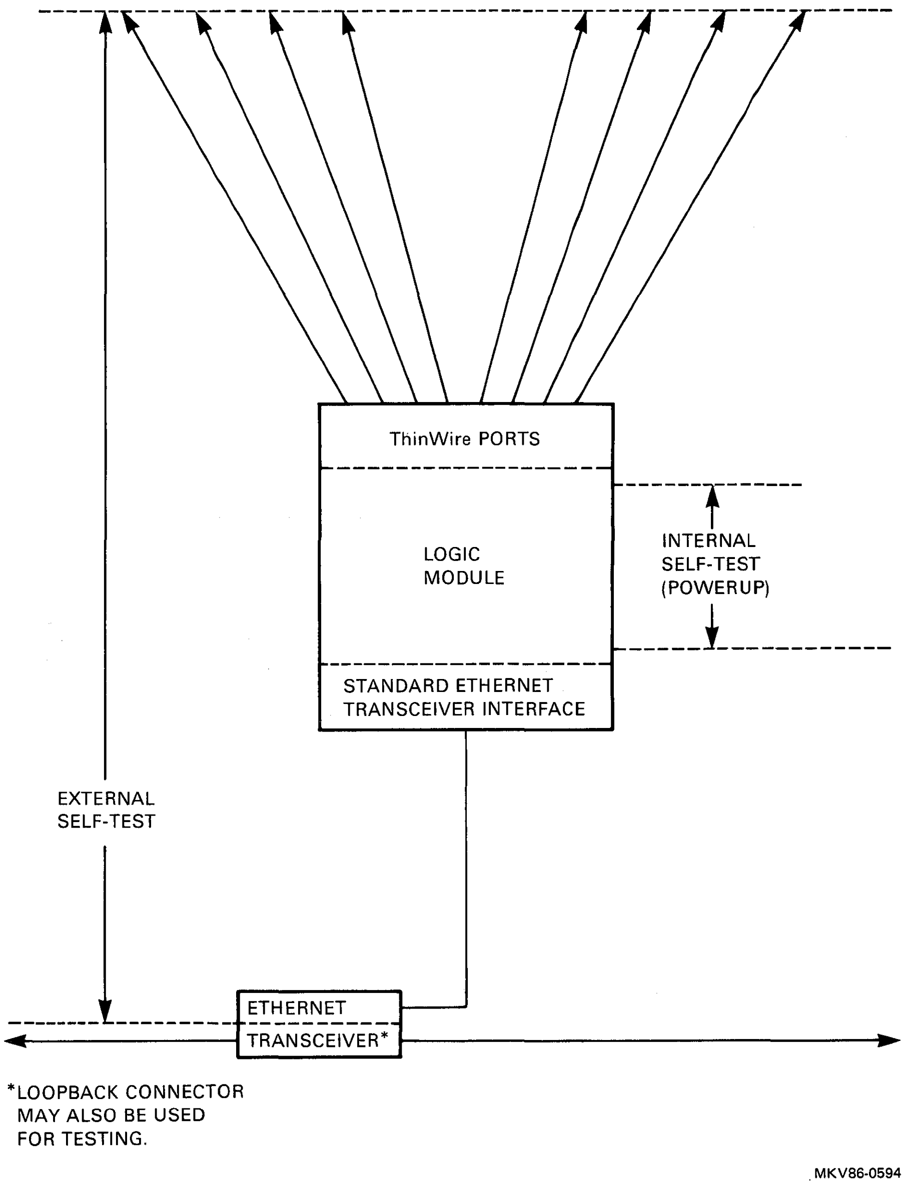


Figure 13 DEMPR Self-Test Diagram

DEMPR Field Replaceable Units (FRUs)

When the DEMPR is suspected of malfunctioning, the entire DEMPR unit should be replaced.

Equipment Required

• ThinWire 50-Ohm BNC Terminator	H8225
• Data Loopback Connector	12-22196-01

Optional Equipment

- An H4080 test connector replaces the on-line transceiver or DELNI for off-line self-testing of the DEMPR.
- An H4000-TA Ethernet transceiver tester modified for use with IEEE 802.3 transceivers.

Preventive Maintenance

There is no preventive maintenance performed on the DEMPR multiport repeater.

Table 4 Power LED (GREEN)

LED State	Indication
ON	Power OK (no error).
OFF	A power supply problem is indicated. Verify that ac power is being supplied to the unit. If power is OK, remove the transceiver cable. Power the unit up and down. If the LED stays OFF, replace the unit. If the LED comes ON, the transceiver may be drawing too much current. Troubleshoot and correct.

Segmentation error LEDs will not light without network activity. The following table assumes that there is some network activity going on.

Table 5 Segmentation/Error LEDs

LED State	Indication
LEDs for ThinWire Ports (1-8)*	
OFF	When the port is properly terminated or a properly working coaxial cable is attached. This indicates normal operation.
ON	When the port is not properly terminated or not operating.
Blinking	When the port has been previously segmented.
LED for the Transceiver Cable Port	
OFF	When the port is properly terminated, the loopback connector is installed, or a working transceiver and transceiver cable are attached. This indicates normal operation.
ON	OK if the port is not connected or if the port is properly connected to a transceiver.
Carrier LED	
ON	Network activity is present.
OFF	There is no network activity.
Self-Test Status LED	
ON	When the DEMPR is being reset or executing self-test. Should never be ON for more than 30 seconds. If ON for more than 30 seconds, replace the DEMPR.
OFF	Normal operation. This LED remains OFF when the self-test disable jumper is installed.

*If the port has a properly installed and terminated coaxial segment, and the LED is ON, verify the operation of the coaxial cable by moving it to a known good port. Reset the DEMPR. If the LED on the new port is ON, verify that the cable is properly installed and terminated. If the LED on the new port is OFF, suspect a fault in the previous DEMPR port.

Table 6 DEMPR Operational Table

	CONDITIONS			RESPONSE	
After Reset	**Network Activity**	**Port Terminated**	**Loopback Connector**	**Segment LED**	**Segment 1-8 LED**
No	No	Yes	Yes	Off	Off
Yes	No	Yes	Yes	Off	Off
No	No	No	No	Off	On*
Yes	No	No	No	On	On
No	Yes	Yes	Yes	Off	Off
No	Yes	No	No	On	On
No	Yes	No	No	On	On*
Yes	Yes	No	No	On	On*
No	Yes	N → Y	N → Y	Blink	Blink
Yes	Yes	N → Y	N → Y	Off	Off

NOTE

The condition of the LEDs is steady state after power-up and the reset timers have timed out. N → Y indicates that the condition of operation changes dynamically in the system.

*Only when more than one port is unterminated.

DEC MicroServer (DEMSA)

General Description
The DEC MicroServer is a data communications router providing a synchronous link between an Ethernet and a Wide Area Network (WAN). The DEC MicroServer allows all Ethernet nodes serviced by the DEC MicroServer to access the resources available to the WAN.

The DEC MicroServer accesses different kinds of WANs based on the software that it is running. For example:

- DECnet/SNA Gateway software is loaded to access an SNA Network,
- X25router 2000 software is loaded to access a Packet Switched Network, and
- DECrouter 2000 software is loaded to access a DECnet Network.

Figures 1 through 3 show these three examples.

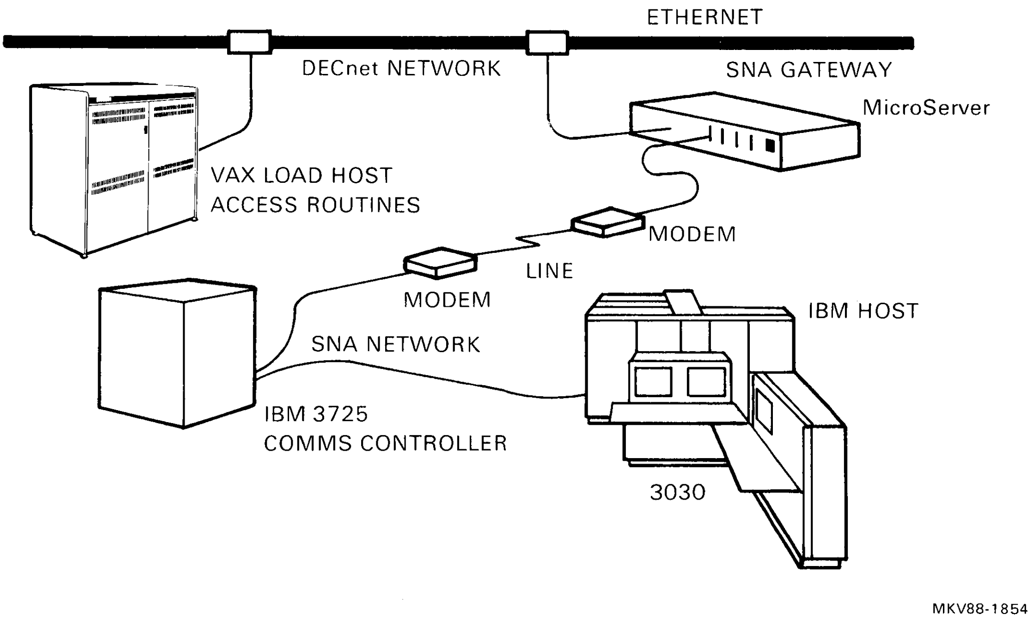


Figure 1 DEC MicroServer Used as a DECnet/SNA Gateway

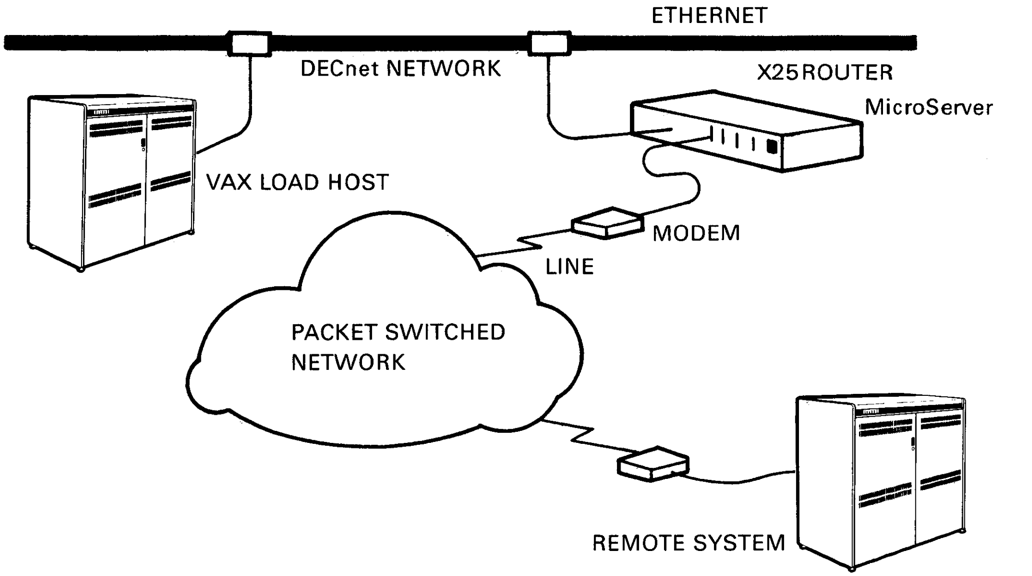


Figure 2 DEC MicroServer Used as an X.25router 2000

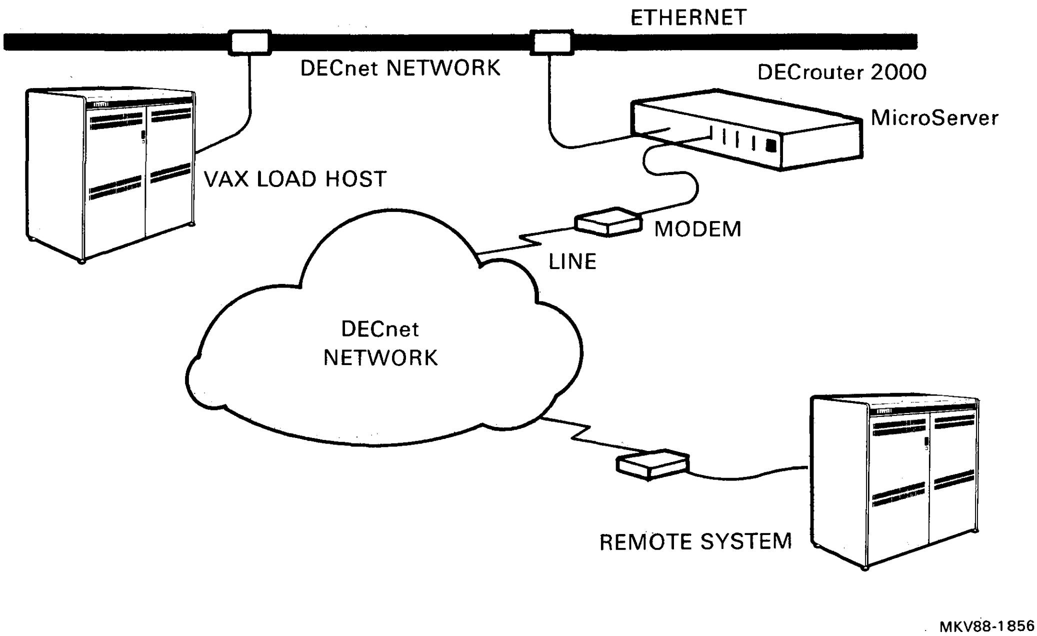


Figure 3 DEC MicroServer Used as a DECrouter 2000

Reference Documentation
Refer to the following documents for more information on the DEC MicroServer.

• *Installing the DEC MicroServer*	EK-DEMSA-IN
• *DEC MicroServer Pocket Service Guide*	EK-DEMSA-PS
• *DEC MicroServer Maintenance Advisory*	EK-DEMSA-MA
• *Field Maintenance Print Set*	MP-01798

DEC MicroServer Hardware Components

DEC MicroServer Box:

DEMSA-AA	120 V DEC MicroServer
DEMSA-AB	240 V DEC MicroServer

Ethernet Connector Cables:

BNE3H-XX	PVC straight connector
BNE3K-XX	PVC right-angle connector
BNE3L-XX	Teflon™ straight connector
BNE3M-XX	Teflon™ right-angle connector
BNE4C-YY	PVC office straight connector
BNE4D-YY	PVC office right-angle connector

Where XX represents:

05	5 m (16.4 ft) long
10	10 m (32.8 ft) long
20	20 m (65.6 ft) long
40	40 m (131.2 ft) long

Where YY represents:

02	2 m (6.6 ft) long
05	5 m (16.4 ft) long

Adapter Cables:

BC19B-02	DEC MicroServer to RS-422
BC19C-02	DEC MicroServer to X.21
BC19S-02	DEC MicroServer to V.24 (includes the 12-27591-00 V.24 to RS-232-C adapter)
BC19E-02	DEC MicroServer to RS-423
BC19F-02	DEC MicroServer to V.35

* Teflon is a trademark of E.I. Dupont de Nemours & Co., Inc.

Synchronous Line Extension Cables:

BC55D-XX	RS-422/RS-423
BC22F-YY	V.24
BC19L-XX	V.35
BC19U-XX	X.21 leased line

Where XX represents:

25 7.6 m (25 ft)
50 15.2 m (50 ft)
75 22.9 m (75 ft)
A0 30.5 m (100 ft)

Where YY represents:

10 3.0 m (10 ft)
25 7.6 m (25 ft)
35 10.7 m (35 ft)
50 15.2 m (50 ft)

Loopback Test Connectors:

H3199	Universal 50-way
H4080	Ethernet loopback
H3248	Synchronous line loopback (RS-232-C)
H3198	Synchronous line loopback (RS-423)
H3198	Synchronous line loopback (RS-422)
H3250	Synchronous line loopback (V.35)
H3047	Synchronous line loopback (X.21)

Data-Rate to Cable-Length Relationships
Table 1 shows the approximate data-rate/cable-length characteristics of the recommended cables.

Table 1 Data-Rate/Cable-Length Relationships

Line Protocol	Data Rate (Bits/s)	Maximum Cable Length
V.24/RS-232-C	Up to 20K	15 m (50 ft)
RS-423	Below 1K	1200 m (3900 ft)
	20K	400 m (1300 ft)
	48K	160 m (500 ft)
	64K	130 m (400 ft)
	100K (max)	85 m (270 ft)
RS-422	Below 90K	1200 m (3900 ft)
	128K	800 m (2600 ft)
	256K	400 m (1300 ft)
V.35	48K	60 m (200 ft)

DEC MicroServer Software Components
The DEC MicroServer software depends on the type of network link it is providing, that is, whether it is functioning as a router or as a gateway. The instructions for loading the particular software are provided with the software.

System Placement
The DEC MicroServer may be placed in any convenient location. Typical locations include:

- Shelf
- Table
- Wall (optional H039 wall mounting bracket required)
- Rack (plastic enclosure must be removed)

There must be 10 cm (4 in) of ventilation space on either side of the DEC MicroServer. To prevent dust from entering the ventilation slots, place the unit at least 46 cm (18 in) above the floor.

Ensure that the placement of the DEC MicroServer does not block access to a fire exit or to safety equipment. Ensure that the cables do not present a hazard to people walking.

Environmental Requirements
Environmental specifications are shown in Table 2. Make sure that the place where the DEC MicroServer is to be installed meets these specifications.

Table 2 Environmental Specifications

Specification	Operating	Nonoperating
Maximum altitude	2438 m (8000 ft)	4877 m (16000 ft)
Temperature range*	5° to 50°C (41° to 122°F)	NOTE 1
Temperature change rate	20°C/hour (68°F/hour)	NOTE 1
Relative humidity	10% to 95% NOTE 2	10% to 95% NOTE 2

* Reduce the maximum temperature specification by 1.8°C for each 1000 m (1°F for each 1000 ft) above sea level.

NOTES:

1. **If the DEC MicroServer is nonoperational for more than 60 days, it should be in a place that meets the DEC MicroServer operating specifications. If it is nonoperational for less than 60 days, it should be in a place that is between –40°C (–40°F) and 66°C (151°F) with a relative humidity below 95%.**

2. **During the operation or storage of the DEC MicroServer, the environment must be noncondensing.**

Preinstallation Steps

1. Gather the following information.

   a. The number of synchronous lines needed

   b. The synchronous line speed to be used

   c. The synchronous line cable types to be used

   d. The synchronous ports to be used

2. Make sure that the place chosen for the installation conforms to the environmental requirements.

3. Check that the following are installed.

   a. The Ethernet network

   b. A transceiver or DELNI, and cable to connect the DEC MicroServer to the Ethernet

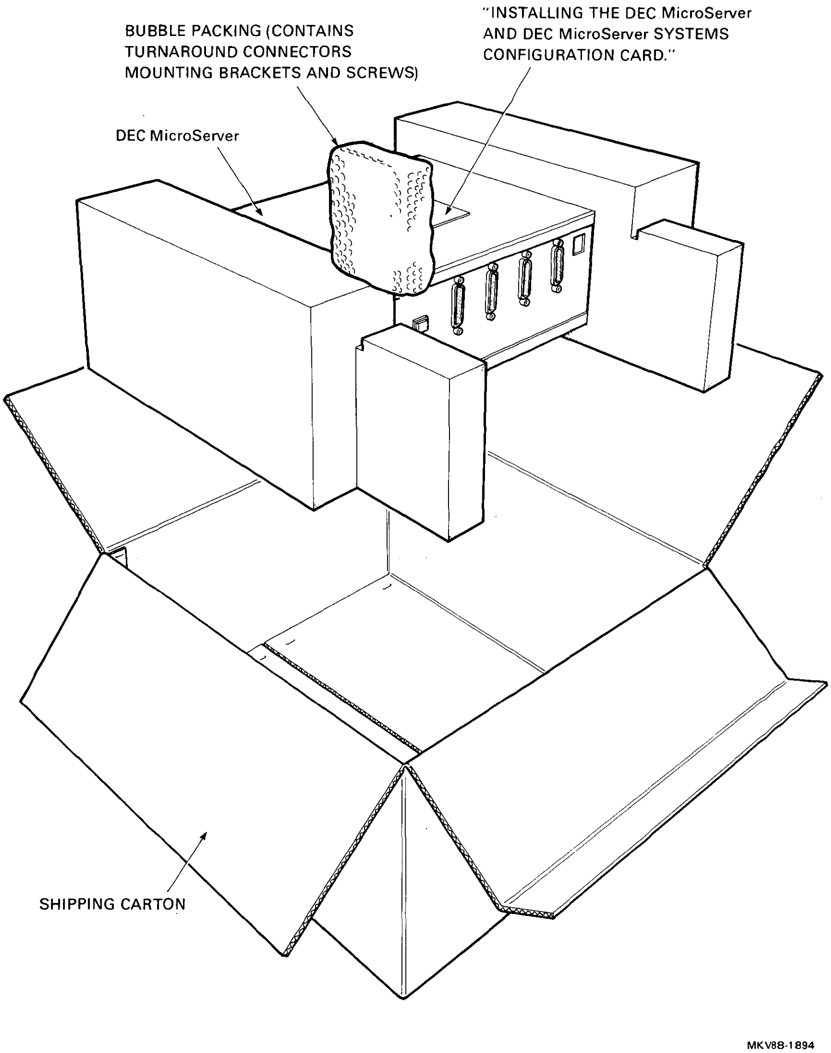
   c. Synchronous communications lines

   d. Modems

4. Clearly label each cable with its function.

Installation Steps

1. Unpack the DEC MicroServer and verify that all components are included and not damaged.

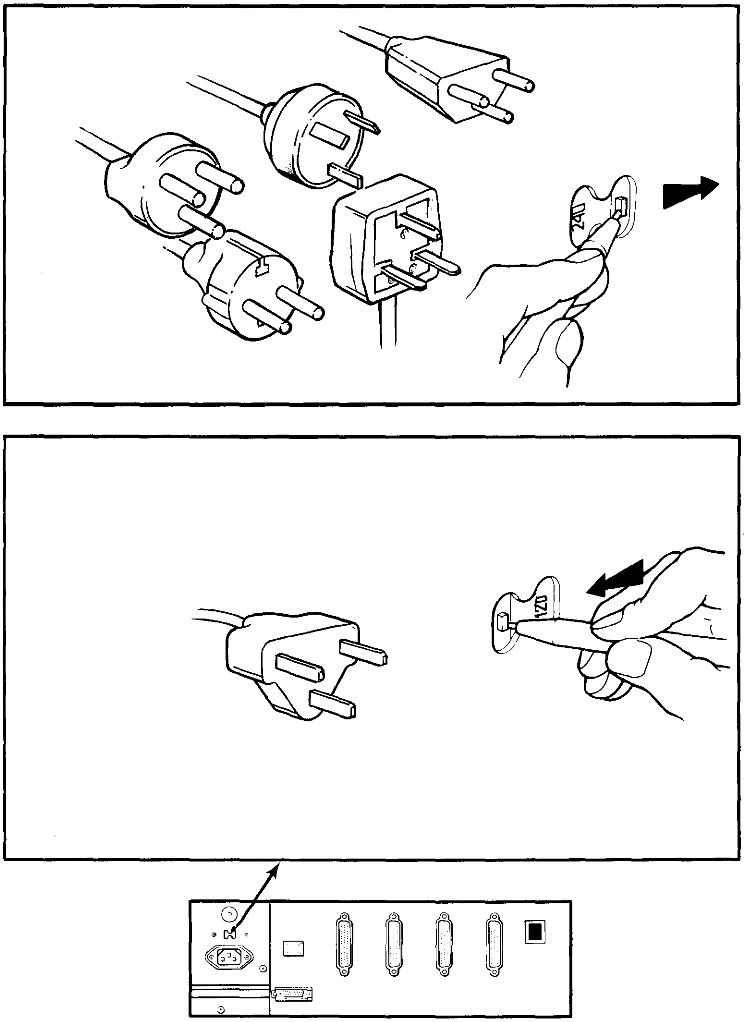


2. Place the DEC MicroServer in the chosen location.

3. Verify that the power cord matches the power outlet (DO NOT plug the cord in yet).

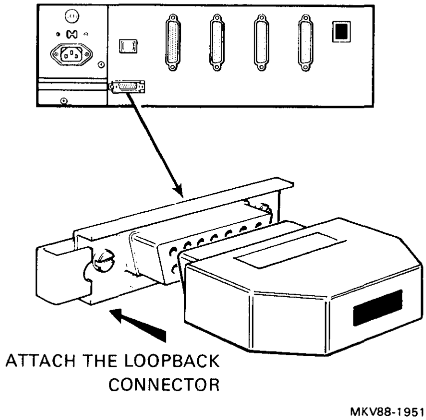
4. Select the correct voltage switch setting by referring to the following diagram.

CAUTION
An incorrect voltage switch setting may damage the DEC MicroServer.

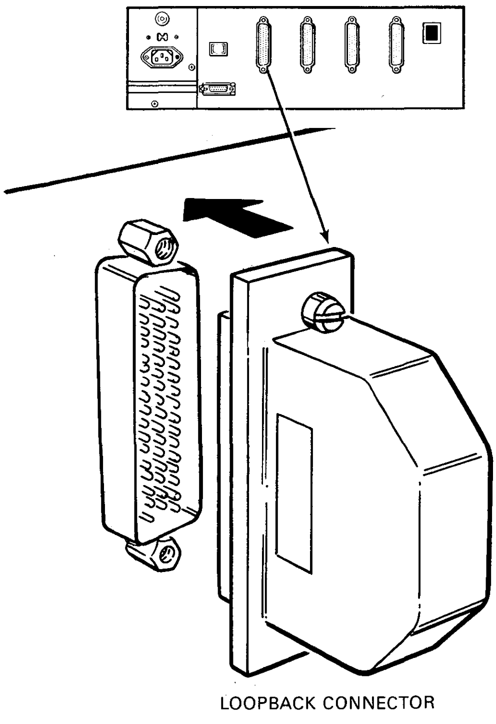


MKV88-1900

5. Attach the Ethernet loopback connector.



6. Attach the 50-way loopback connector.



7. Read and remove the yellow label covering the power connector.

8. Attach the power cord to the DEC MicroServer.

9. Insert the power cord into the power socket.

NOTE
If the DEC MicroServer is powered down, wait at least three seconds before powering it up again.

10. Read the display:

    a. If the decimal point is not lit and/or the cooling fans are not turning, unplug the power cable **immediately** and refer to the troubleshooting flowchart (Figure 4) in the Maintenance Aids Section of this option.

    b. While the DEC MicroServer is running, a ripple pattern is displayed for approximately 90 seconds.

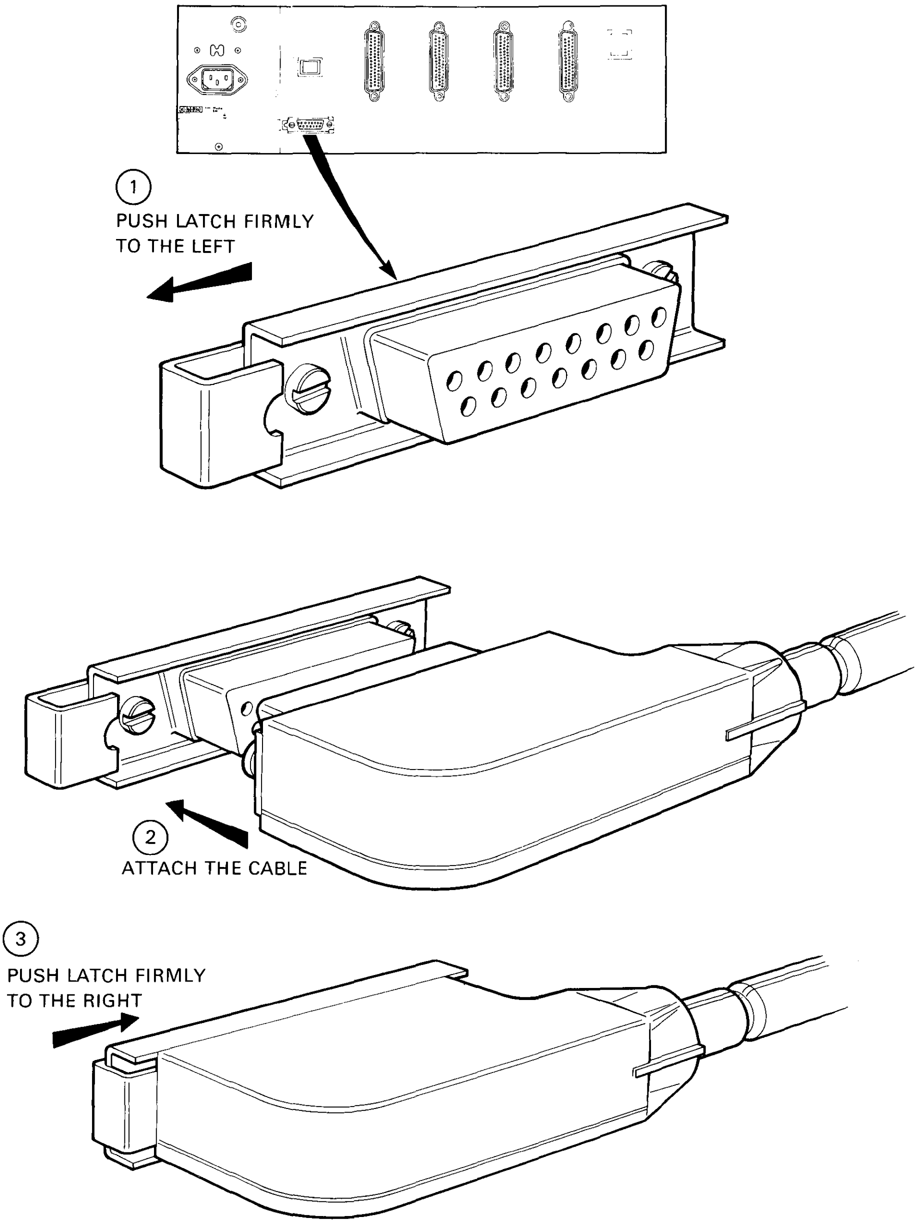
    c. If the display shows F, E, d, or C, a test has failed. See the **Troubleshooting** discussion in the Maintenance Aids Section of this option.

    d. When the display shows a 1 or 3, the DEC MicroServer internal tests have completed successfully. The DEC MicroServer is now ready to be connected to the network.

    e. If the display shows any other value, power down the DEC MicroServer and go to the **Troubleshooting** discussion in the Maintenance Aids Section of this option.

Connecting the DEC MicroServer to the Network

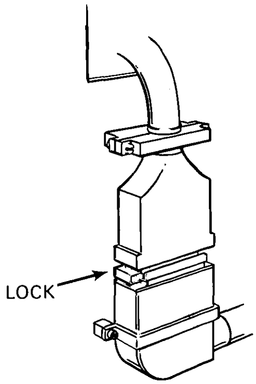
1. Connect the Ethernet cable to the DEC MicroServer.



MKV88-1893

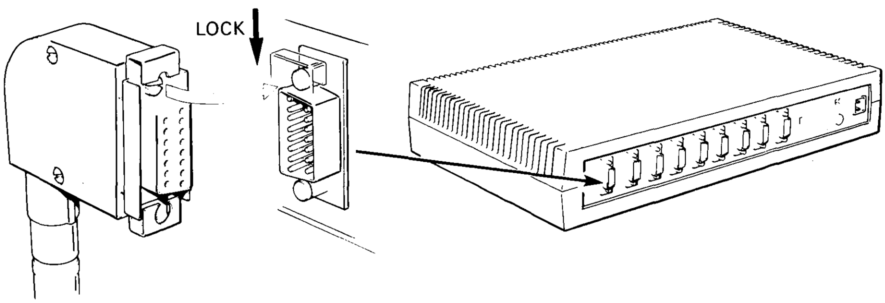
2. Connect the Ethernet cable to one of the following, as appropriate:

   - . Etherjack



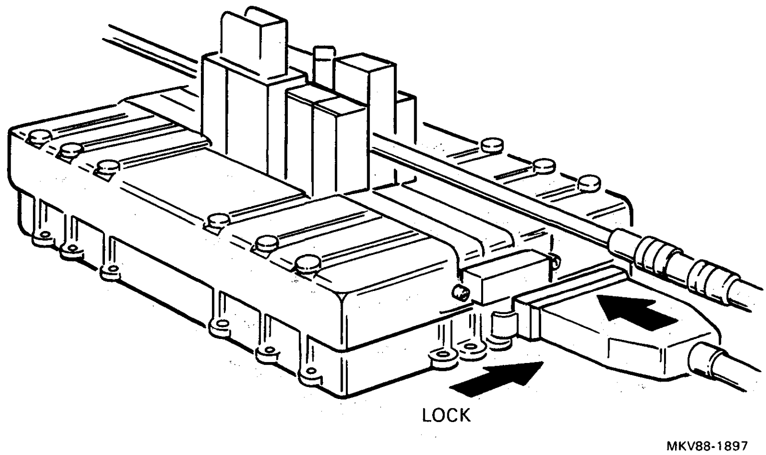
MKV88-1899

   - Ethernet connection device (for example, a DELNI)

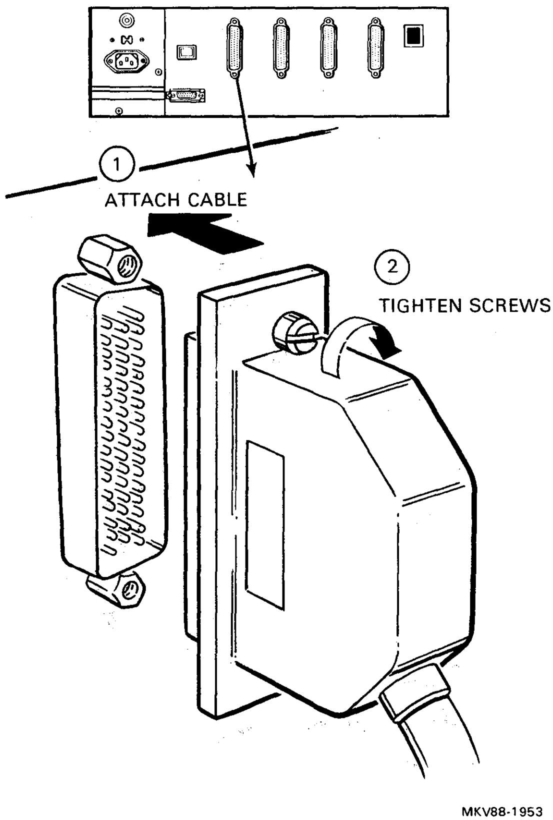


MKV88-1898

- Ethernet transceiver

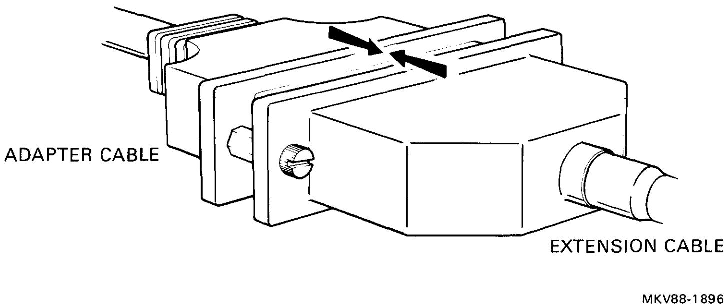


3. Connect the adapter cable to the DEC MicroServer.

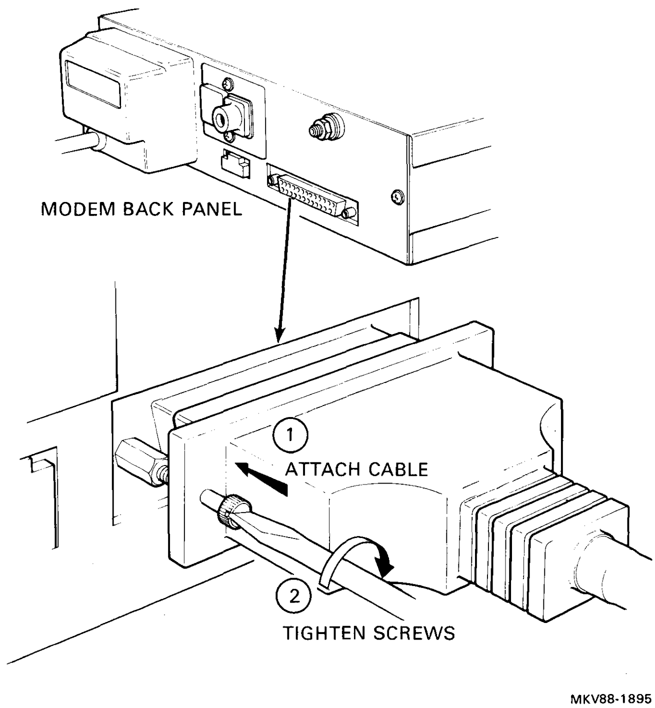


4. Connect the adapter cable to the extension cable and the extension cable to the modem.

   - To connect the adapter and the extension cable



   - To connect the extension cable to the modem



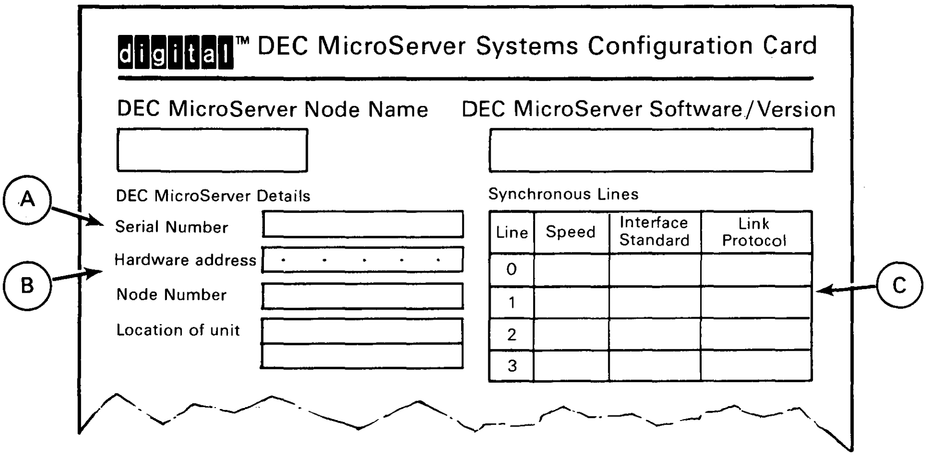
5. Complete the hardware sections of the DEC MicroServer Systems Configuration Card with the following information.

   Ⓐ The serial number of the DEC MicroServer

   Ⓑ The DEC MicroServer hardware address

   Ⓒ Synchronous line and cable details

Keep the card in a convenient place (somewhere near the server) so it can be completed during the software installation.



MKV88-1964

Installing the DEC MicroServer Software
The software media and documentation are in the software carton.

There are currently three software options available for the DEC MicroServer:

- DECrouter 2000 V1.0
- X25router 2000 V1.0
- DECnet/SNA Gateway-ST V1.0

Refer to the documentation in the software carton for instructions on installing the software option

DEMSA CABLING

Cabling
Cabling considerations were addressed in the Installation section of this option.

DEC MicroServer Diagnostics
There are diagnostics designed specifically for the DEC MicroServer that are resident in ROM. These can be run using the remote console command "TEST". The Network Control Program (NCP) can also be used to isolate faults. NCP is discussed in the Maintenance Aids Section of this option.

DEC MicroServer Maintenance Aids
This section contains information on:

- DUMP switch
- Troubleshooting
- Using NCP
- Using the remote console

DUMP Switch
The DUMP switch is a red button on the rear of the unit that is used for:

- Saving the entire context of the DEC MicroServer system
- Resetting the EEPROM

Saving the Entire Context of the DEC MicroServer System – The host system puts all the dump information on disk for future analysis. Reasons for dumping the DEC MicroServer could be:

- The software signals a fatal internal error, or
- A severe error occurs that causes a firmware restart.

A dump is initiated by pressing the DUMP switch or requesting a dump from the remote console.

Refer to the *DEC MicroServer Maintenance Advisory* for information on dumping the system.

Resetting the EEPROM – The EEPROM can be reset by holding the DUMP switch while powering the DEC MicroServer down and then back up (disconnecting and reconnecting the power cord).

Troubleshooting

Table 3 helps to identify problems in the DEC MicroServer. The table points to troubleshooting flowcharts that can help to isolate these problems. These flowcharts suggest procedures for fixing any problems that should occur with the DEC MicroServer.

Table 3 DEC MicroServer Troubleshooting

Symptom	Corrective Action
Decimal point on display not lit or fan does not turn	See Figure 4
Display reads C	Failure to WRITE internal error memory. Replace DEC MicroServer unit.
Display reads d*	Synchronous port error. Replace DEC MicroServer unit.
Display reads E	See Figure 5
Display reads F	Basic hardware error. Replace DEC MicroServer unit.
Display cycles between values 1 and 3. Software does not load	See Figure 6
Software loads but there is no communication with the remote system	See Figure 7

* May be reconfigured. See **Reconfiguring the Customer's System** discussion found at the very end of this option.

NOTE
Units being returned should have RED fault labels attached to them.

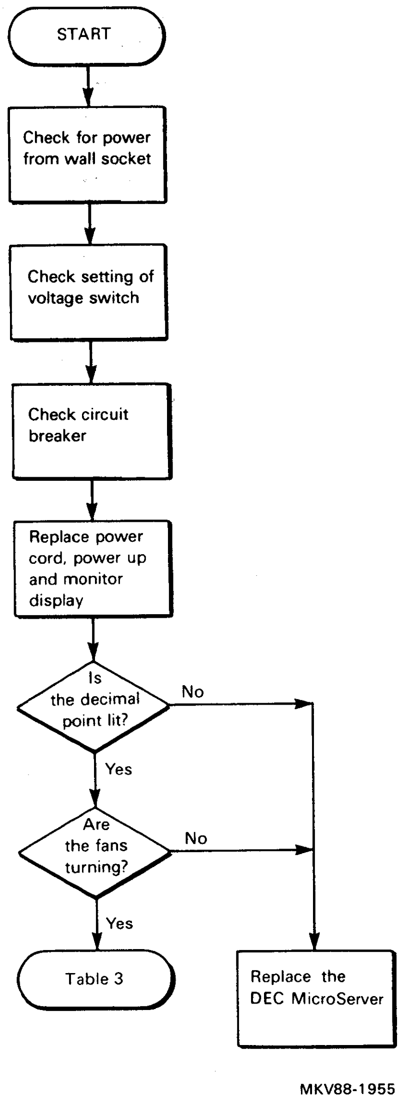


Figure 4 No Decimal Point on Display or Fan Does Not Turn

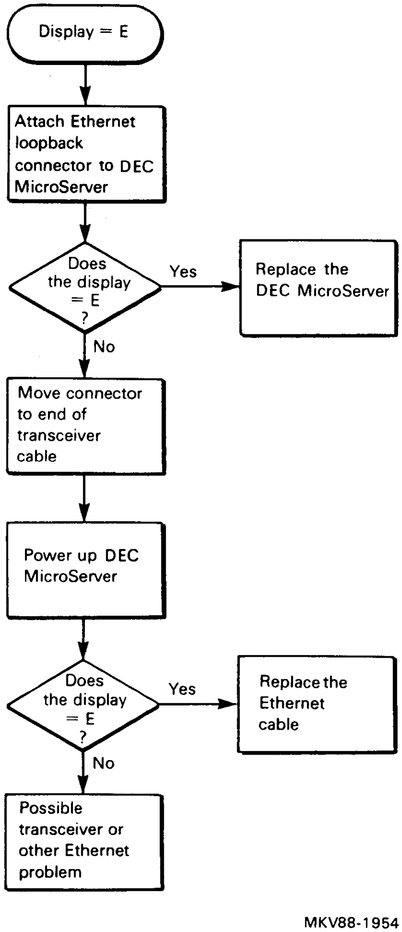


Figure 5 Display Reads "E"

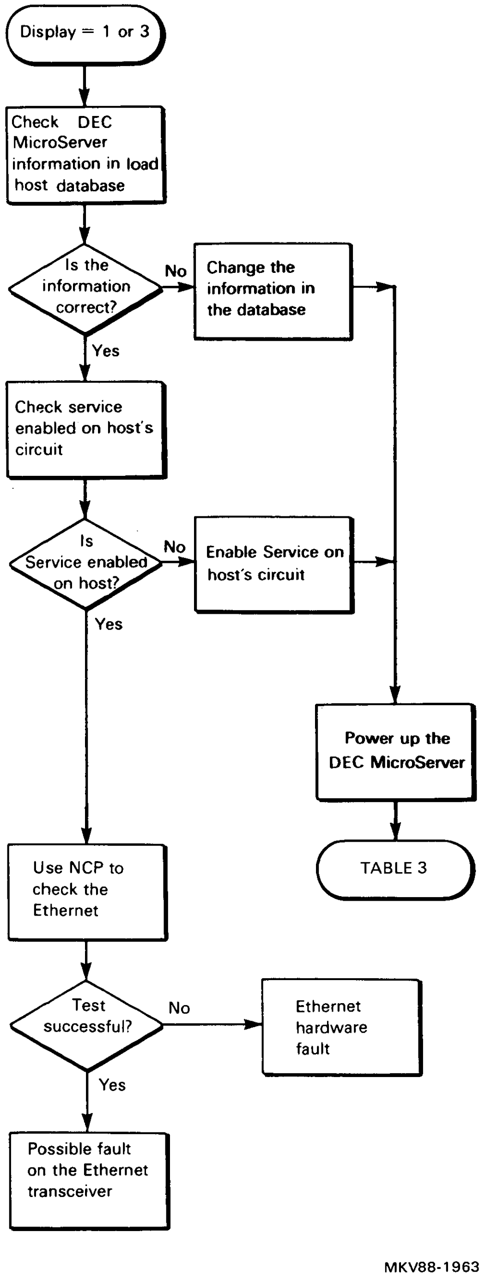


Figure 6 Software Does Not Load

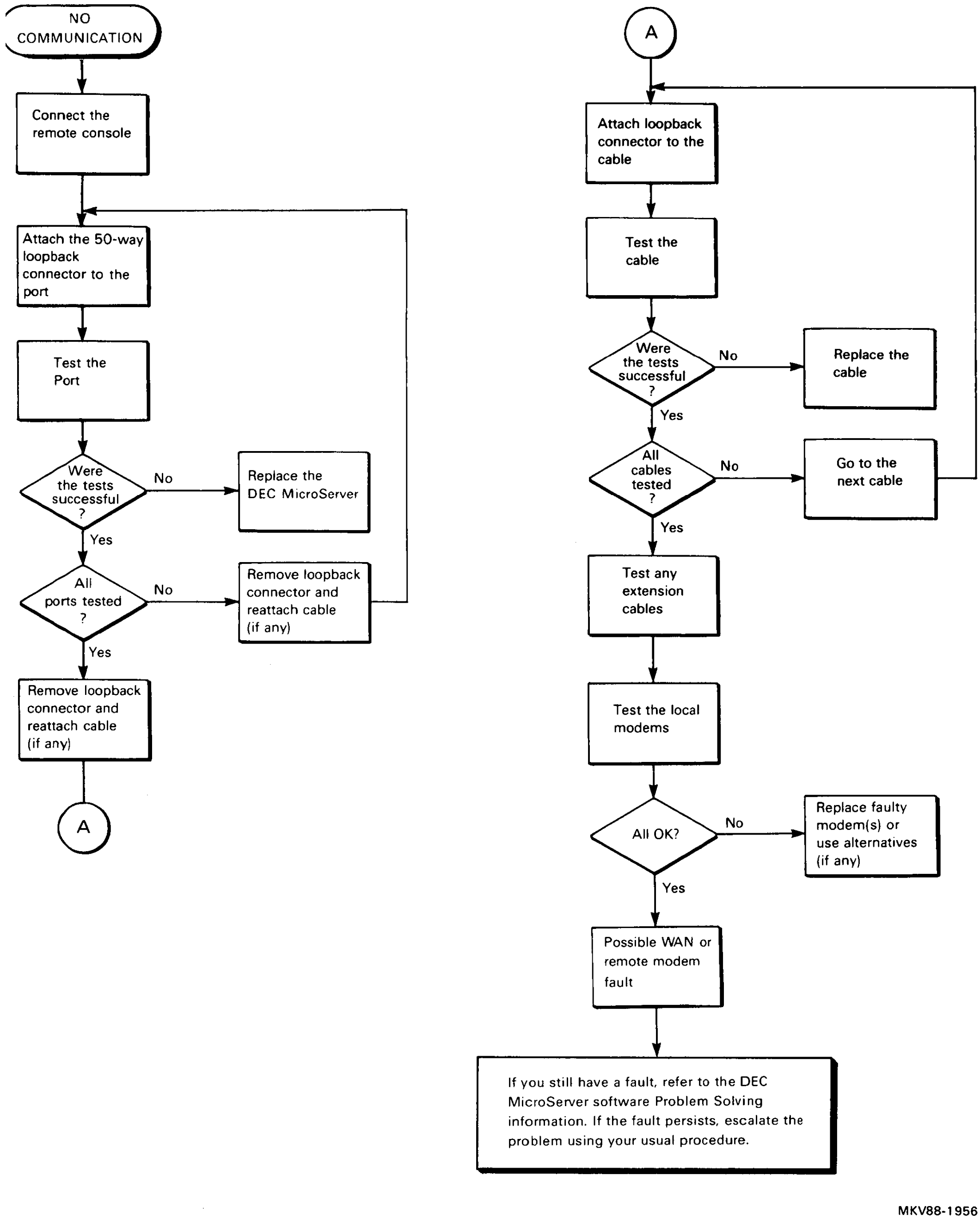


Figure 7 Software Loads but There is No Communication with the Remote System

Using the Network Control Program (NCP) from a Load Host
Using NCP requires access to the SYSTEM account or one with similar privileges on one of the DEC MicroServer's load hosts. This must be coordinated with the customer. Load hosts can be either VAX/VMS or ULTRIX systems. Each system has its own login procedure and uses a different command to start NCP.

VAX/VMS
At the system prompt, enter:

```
$ RUN SYS$SYSTEM:NCP
```

ULTRIX
At the system prompt, enter:

```
%ncp
```

All ULTRIX commands are in lowercase.

Once NCP is running, the tasks listed in Table 4 can be performed. Lowercase words in the commands are to be replaced with the appropriate name or value:

"server name" = the node name of the DEC MicroServer

"server circuit" = the service circuit of the DEC MicroServer

other = another node on the Ethernet

For more detailed information on these tasks, refer to the *DEC MicroServer Pocket Service Guide*.

Table 4 NCP Quick Reference

Task	Commands to Use
Check service circuit on the load host	SHOW NODE “server name” CHAR SHOW CIRCUIT “server circuit” CHAR
Check DEC MicroServer information on the load host	SHOW NODE “server name” CHAR SET NODE server
Check continuity of Ethernet link to DEC MicroServer	LOOP NODE “server name”
Load the DEC MicroServer	TRIGGER NODE “server name” LOAD NODE “server name”
Connect the remote console	CONNECT NODE “server name”
Get information from a running DEC MicroServer	TELL “server name” SHOW COUNTER, KNOW LINES, EXECUTOR CHARACTERIST, ETC
Perform data loopback on the synchronous lines	TELL “server name LOOP CIRCUIT CIR-ID (not X.25) TELL “server name” LOOP LINE* LINE-ID (X.25 only)

* Must first set line state “service” and controller loopback/ controller normal for internal or external respectively.

Using the Network Control Program (NCP) from a Remote Console

1. Connect the DEC MicroServer remote console:

   On **VAX/VMS** use the NCP command:

   CONNECT NODE "server name"
   SERVICE PASSWORD password

   NOTE
   The SERVICE PASSWORD is only needed where a value/character has been used. The system manager has this information.

   where "server name" is the node name of DEC MicroServer, and password is the service passwor of the DEC MicroServer.

   On **ULTRIX**, leave NCP by typing CTRL/D and enter the ULTRIX command:

   ccp -n "server name" -p password

   where "server name" is the node name of the DEC MicroServer, and password is the servic password of the DEC MicroServer.

2. Halt the software before testing the DEC MicroServer or using any of the remote console commands

3. Enter remote console commands. Table 5 lists the most common remote console commands and thei syntax. More detailed information is available in the *DEC MicroServer Pocket Service Guide.*

4. When finished with the remote console, type CTRL/D.

Table 5 Summary of Remote Console Commands

Command	Name	Parameter	Qualifier
BOOT		None	None
CLEAR	COUNTERS PASSWORD SOFTWARE	None	None
DUMP		None	None
HALT		None	None
HELP	MORE TEST	None	None
LOAD		software_id	None
SET	PASSWORD SOFTWARE	hex_password software_id	None
SHOW	ADDRESS ALL COUNTERS ERRORS FIRMWARE HALT MCHECK PASSWORD SOFTWARE STATE VERSION	None	None
TEST	CABLE_TYPE DATA_LOOPBACK MODEM_SIGNAL	None	/ALL /CHn /INTERNAL /LOCAL /MANUAL /REMOTE
START		address	None

Reconfiguring the Customer's System

It may be possible to use another of the DEC MicroServer ports. This depends on:

- The number of lines used
- The synchronous line speed(s) used
- The synchronous port(s) used

Ports are numbered 0, 1, 2, and 3 (above the port). All four ports can support a line speed of 64 Kbits/s, but specific ports (0 and 1) are used for higher speeds. If the port(s) that support the higher speed are faulty, the DEC MicroServer cannot be reconfigured.

The number of lines used and the line speeds are determined by the software. Refer to the software documentation for information on the permitted line and speed configurations to determine if the customer's system can be reconfigured.

If the system is reconfigured, inform the customer so that any system-dependent configuration files, and the configuration card, can be changed. Then reboot the system.

DEMWA ETHERNET MICROWAVE ADAPTER

General Description
The DEMWA Ethernet microwave adapter is a hardware device that provides a communications link between a LAN Bridge 100 and full-duplex microwave equipment. The DEMWA is a DELNI local network interconnect that has been modified to work within the METROWAVE bridge configuration. The DEMWA causes the microwave link to appear as a normal LAN.

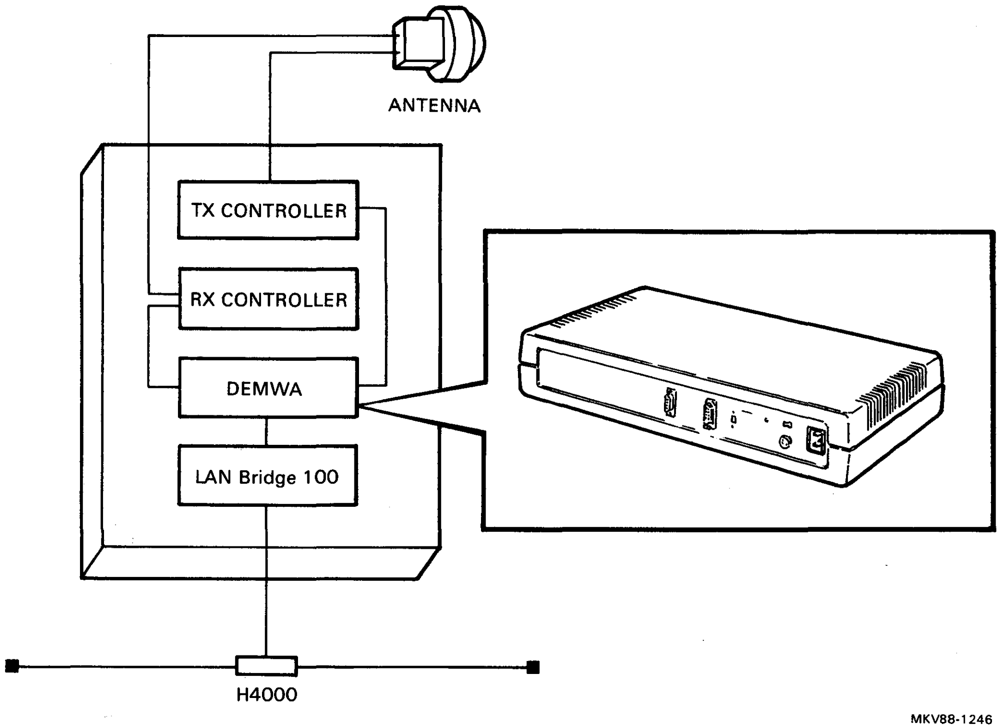


Figure 1 DEMWA Ethernet Microwave Adapter in a METROWAVE Bridge Unit

DEMWA Configurations
The DEMWA microwave adapter is specifically designed to be installed in the METROWAVE bridge system and is only intended to work in that system. The DEMWA microwave adapter is the component that physically connects the LAN Bridge 100 and the microwave equipment. It is recommended that the 2 m transceiver cable (BNE4D-02) be used to interconnect the DEMWA and the LAN Bridge 100.

DEMWA INSTALLATION

Reference Documentation
Refer to the following documents for more information on the DEMWA microwave adapter.

DEMWA Technical Manual	EK-DEMWA-TM
LAN Bridge 100 Installation/User's Guide	EK-DEBET-UG
LAN Bridge 100 Technical Manual	EK-DEBET-TM
DELNI Installation/Owner's Manual	EK-DELNI-IN
DELNI Ethernet Local Network Interconnect Technical Manual	EK-DELNI-TM
H4000 DIGITAL Ethernet Transceiver Installation Card	EK-H4TAP-IN
H4000 Ethernet Transceiver Technical Manual	EK-H4000-TM

MA-23LAN Transmitter/Receiver Operator's Manual (Provided by microwave vendor)

METROWAVE Bridge Terminology
For a clear understanding of how the DEMWA microwave adapter fits into the METROWAVE bridge system, it is necessary to understand the difference between a bridge system and a bridge unit.

A METROWAVE bridge unit refers to one side of a METROWAVE bridge system and consists of the following major components.

- One H4000 transceiver
- One LAN Bridge 100 unit
- One DIGITAL Ethernet microwave adapter (DEMWA)

A METROWAVE bridge system consists of two METROWAVE bridge units and is designated DEMWB.

DEMWB Versions
There are three versions of thc DEMWB bridge system.

Order Number	Installation Version
DEMWB-AA	Two METROWAVE bridge units (each preinstalled in a cabinet).
DEMWB-BA	Two METROWAVE bridge units (mountable in a satellite equipment room (SER) rack).
DEMWA-CA	One METROWAVE bridge unit (preinstalled in a cabinet) and one METROWAVE bridge unit (mountable in an SER rack).

Functionally the three options are the same. The different variations are for installation considerations only.

Installing the DEMWA Microwave Adapter in the SER Rack

1. Remove the plastic enclosure.

2. Using the brackets provided in the accessories box, locate suitable mounting holes in the SER rack allowing 5.1 cm (2 in) of clearance above and below the unit for airflow.

3. Fasten the mounting brackets to the DEMWA unit using the screws provided in the accessories box.

4. Fasten the DEMWA unit to the SER rack with the screws provided in the accessories box.

5. Slide the voltage select switch on the back panel of the DEMWA unit to the 120 Vac position.

6. Insert the power cable into the socket on the DEMWA panel.

7. Plug the other end of the power cord into the SER rack power supply.

   At this point the green light on the connector panel should light up.

8. Connect the DEMWA/LAN Bridge 100 2 m cable to the DEMWA panel port A.

9. Connect the other end of this cable to the LAN Bridge 100 port B.

DEMWA CABLING

Connecting the DEMWA Adapter

The DEMWA adapter should come preattached to port B of the DEMWA microwave adapter. Connect the adapter to port B if it is not already connected.

Installing the Microwave Equipment

The installation of the MA-23LAN equipment is done by the microwave vendor. The cables for this installation are provided by the microwave vendor.

DEMWA Installation Verification Procedure (IVP)
This section describes the specific installation verification procedure that should be followed to verify correct installation and operation of the METROWAVE equipment. This procedure is valid even if the microwave equipment has not been installed.

1. Ensure that the LAN Bridge 100 switches are set as shown in Figure 2.

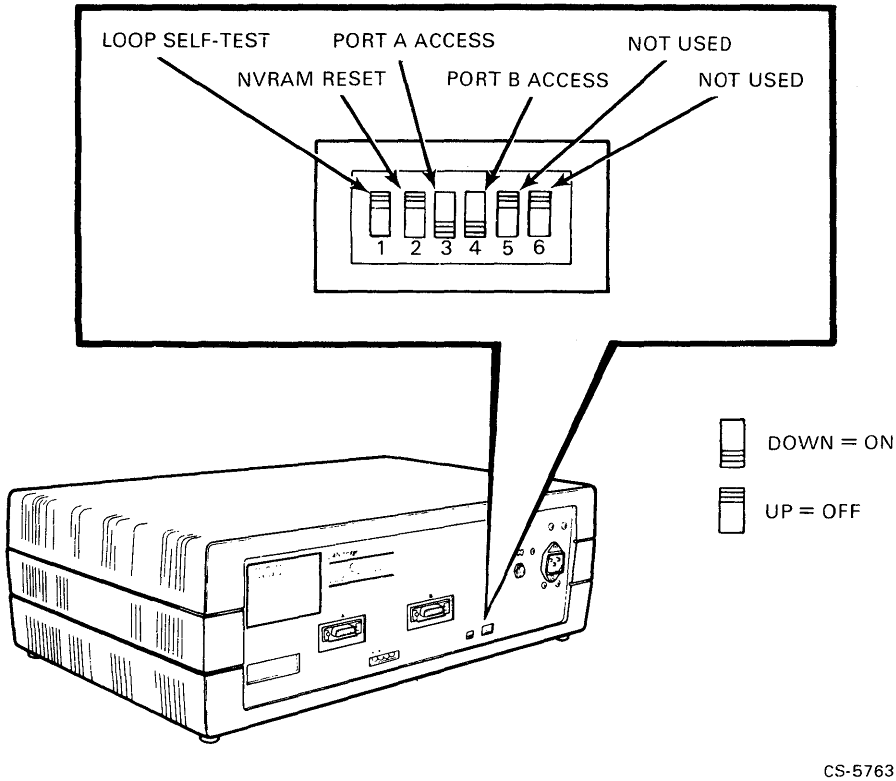


Figure 2 LAN Bridge 100 Switch Settings

2. Remove the DEMWA adapter from port B of the DEMWA unit.

3. Power up the DEMWA unit.

4. Unplug the LAN Bridge 100.

5. Plug in the LAN Bridge 100.

   After 15 seconds, the green light on the LAN Bridge 100 should light indicating that it passed self-test. If the green light does not light, replace the LAN Bridge 100.

6. Unplug the LAN Bridge 100.

7. Connect a loopback connector to port B of the DEMWA unit.

8. Plug in the LAN Bridge 100.

   After 15 seconds, the green light should remain OFF. If the green light is ON, the DEMWA unit is not operating properly.

9. Connect the DEMWA adapter to port B of the DEMWA unit.

10. Unplug the LAN Bridge 100.

11. Using a short piece of coaxial cable, connect both connectors on the DEMWA adapter together.

12. Plug in the LAN Bridge 100.

    After 15 seconds, the green light should remain OFF. If the green light is ON, the DEMWA adapter is not operating properly.

13. Unplug the LAN Bridge 100.

14. Disconnect the coaxial cable from the DEMWA adapter.

15. Plug in the LAN Bridge 100.

This verifies correct installation of the METROWAVE bridge unit.

METROWAVE Bridge Troubleshooting
Proper execution of the specific steps outlined in the following flowchart should point out the component that is failing in a nonworking METROWAVE bridge system.

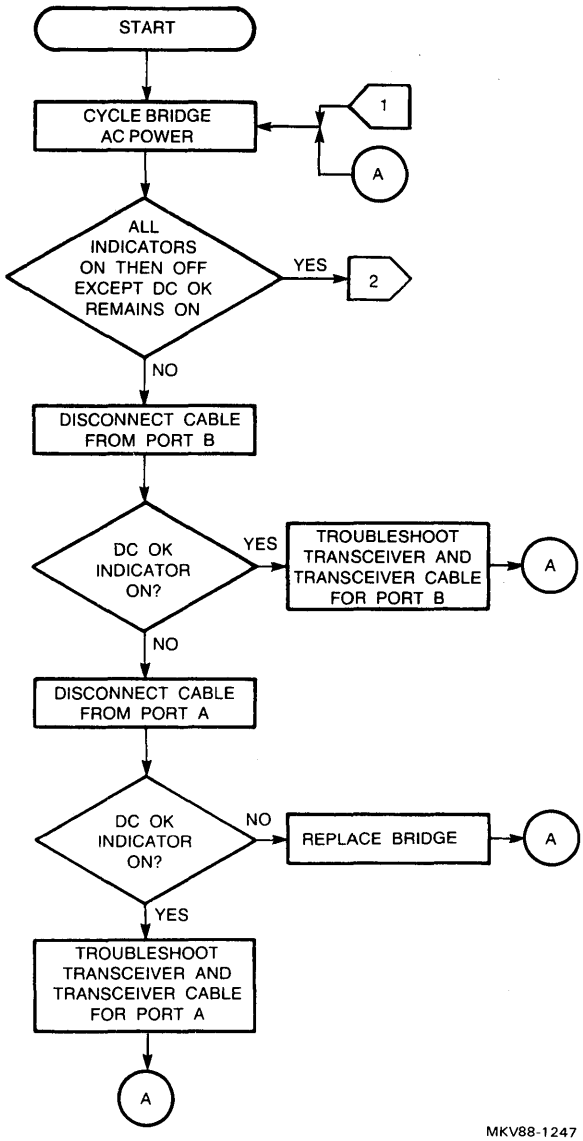


Figure 3 Troubleshooting Flowchart (Sheet 1 of 6)

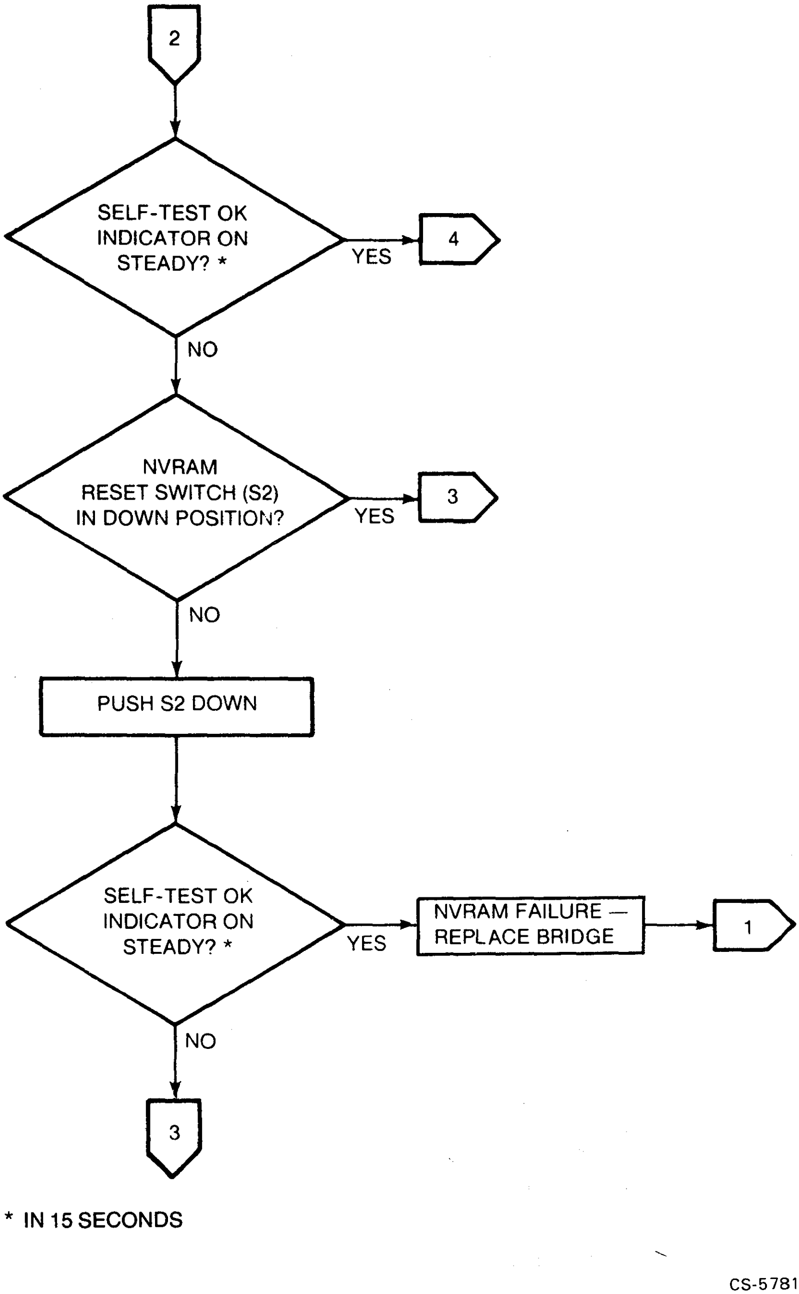


Figure 3 Troubleshooting Flowchart (Sheet 2 of 6)

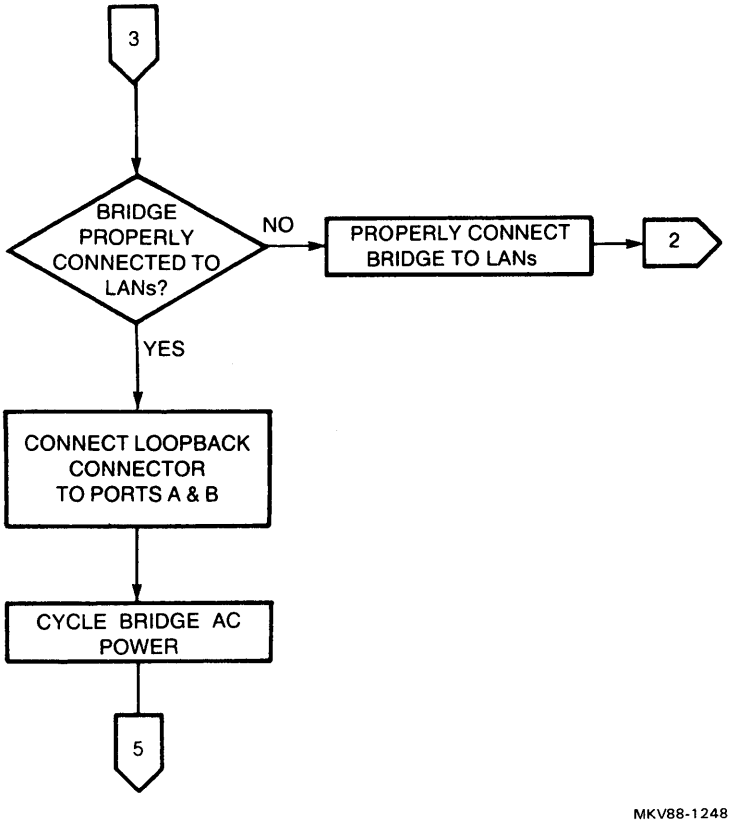


Figure 3 Troubleshooting Flowchart (Sheet 3 of 6)

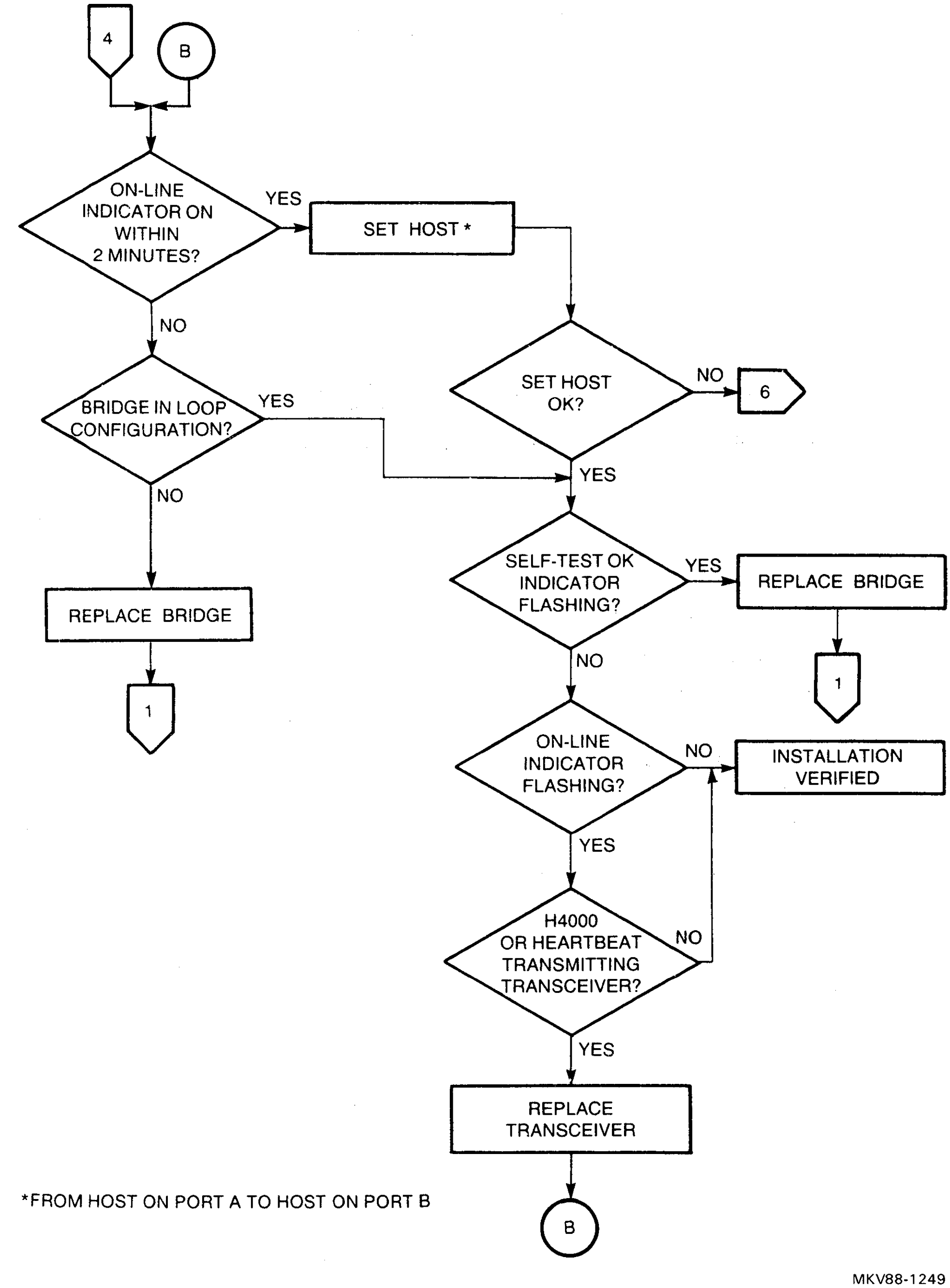


Figure 3 Troubleshooting Flowchart (Sheet 4 of 6)

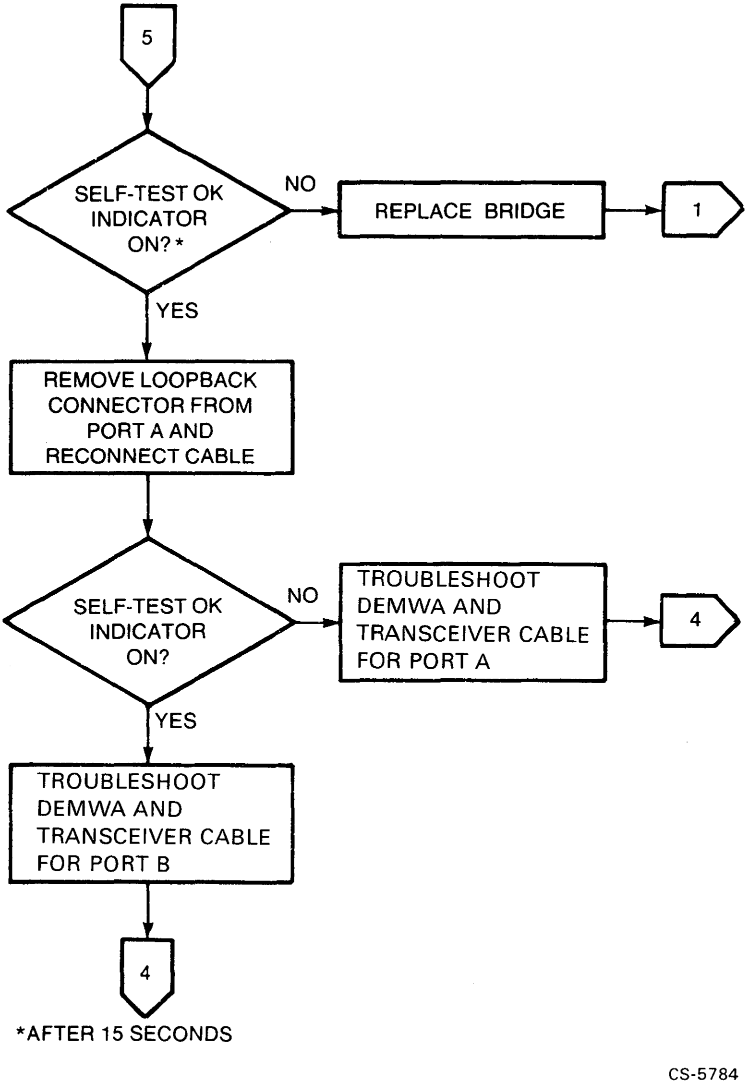


Figure 3 Troubleshooting Flowchart (Sheet 5 of 6)

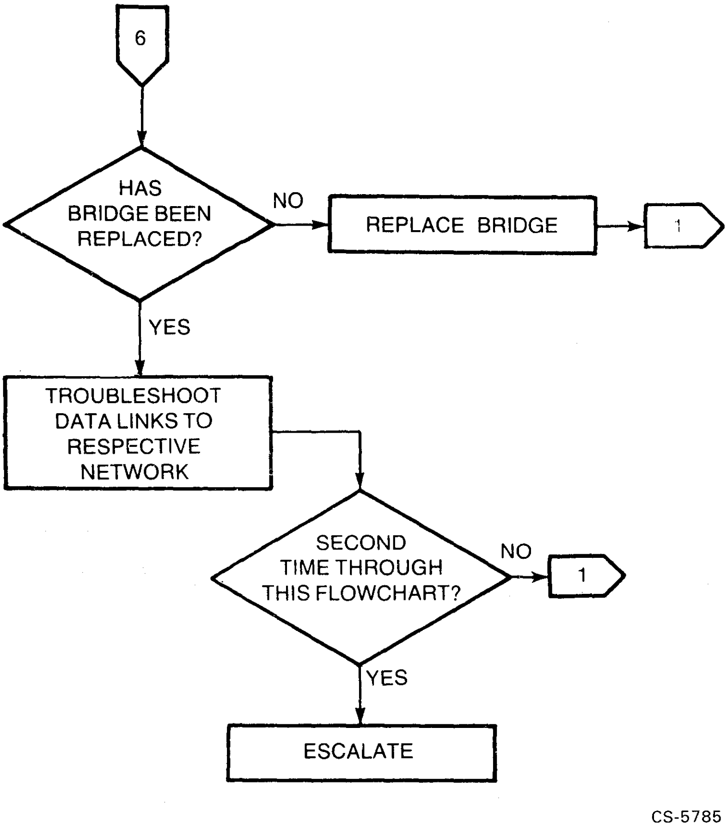


Figure 3 Troubleshooting Flowchart (Sheet 6 of 6)

DEPCA PERSONAL COMPUTER BUS ADAPTER

General Description
The DIGITAL Ethernet Personal Computer Bus Adapter (DEPCA) allows IBM PC, IBM PC/XT, and IBM PC/AT computers to be connected to the ThinWire Ethernet Personal Computing System Architecture (PCSA).

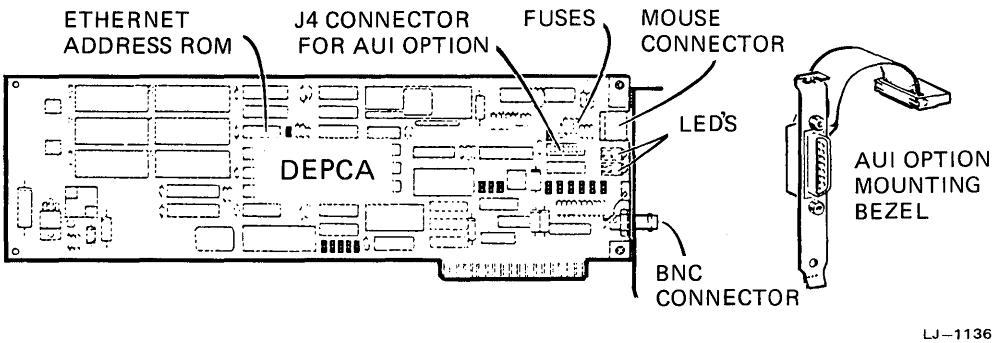


Figure 1 DEPCA Board and AUI Bezel

Reference Documentation
Refer to the following manuals for more information on the DEPCA adapter.

• *DEPCA Owner's Manual* (includes installation guide)	EK-DEPCA-OM
• *Personal Workstation Handbook*	EK-DEPCA-UG
• *DEPCA Field Maintenance Print Set*	MP-02421-01
• *Mini Reference Guide Vol. 5 Systems*	EK-MINI5-RG
• *IBM Hardware Maintenance and Service Manual*	FS-IBM70-01
• *VAX/VMS Server Guide*	AA-JU51A-TE
• *VAXmate Server Guide*	AA-JU52A-TH
• *Enhanced Utilities for the IBM DOS User*	AA-JU55A-TH
• *VAXmate User's Guide*	AA-HD97A-TK
• *VAXmate User's Guide Change Pages*	AA-HD91A-T1
• *Personal Workstation Network Management Guide*	AA-JU54A-TH

DEPCA Configuration
A typical standard Ethernet DEPCA configuration in an office area is made up of a DEPCA board, VSXXX-AA corporate mouse, LK250 keyboard with an LK250/IBM cable, and the AUI and transceiver cable option for standard Ethernet.

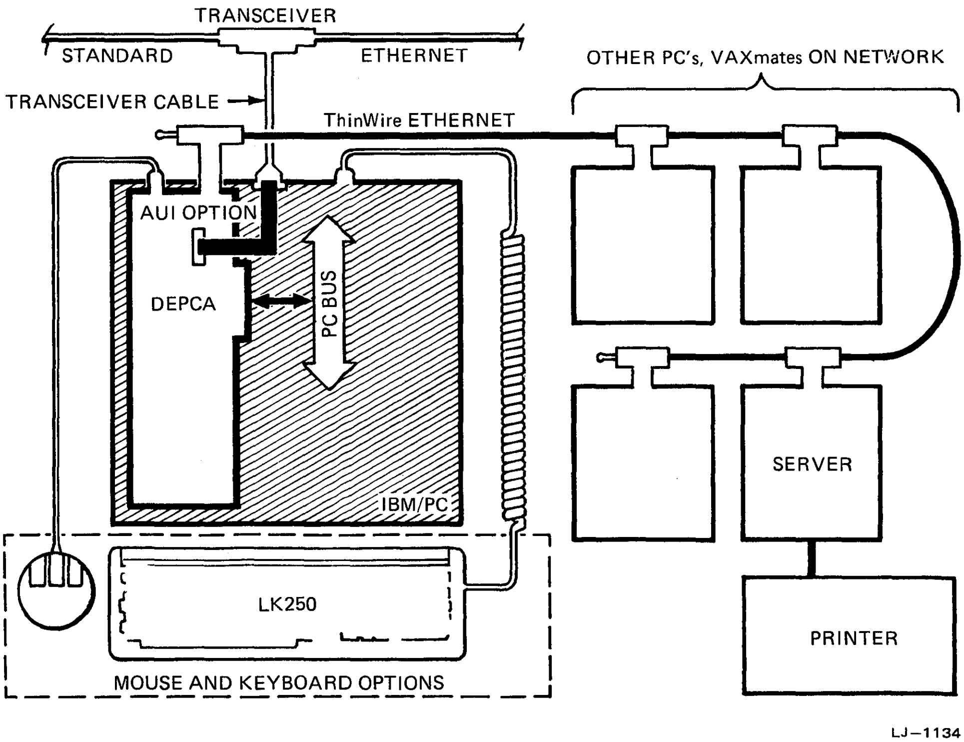


Figure 2 Typical DEPCA Configurations

Versions
The DEPCA is available in three versions (DEPCA-AA, DEPCA-BA, and DEPCA-Kx).

Table 1 DEPCA Parts List

Item	Components	Version AA	Version BA	Version Kx
1	DEPCA Board	X	X	X
2	Plastic Card Guide	X	X	X
3	ThinWire Assembly Kit	X		X
4	*DEPCA Owner's Manual*	X	X	X
5	AUI Transceiver Cable		X	
6	AUI Connector/Bracket Assembly		X	
7	VSXXX Mouse			X
8	LK250 Keyboard (country-specific)			X
9	LK250/IBM Keyboard Cable			X
10	*LK250 Keyboard Cable Installation Card*			X

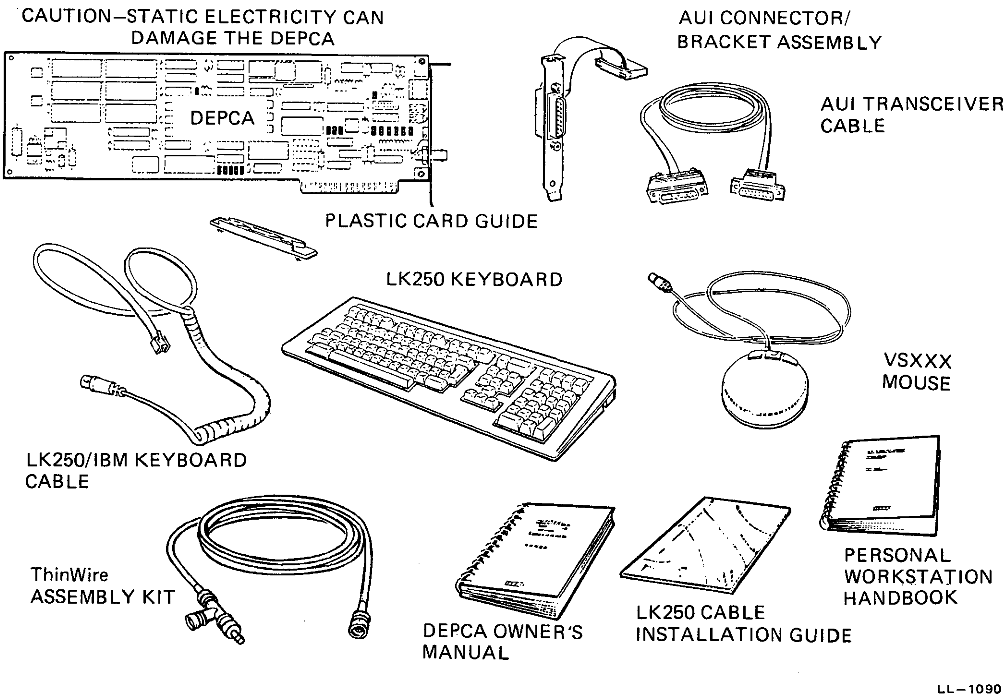


Figure 3 DEPCA Components

Jumper Settings

Figure 4 shows the location and default setting of the DEPCA jumpers.

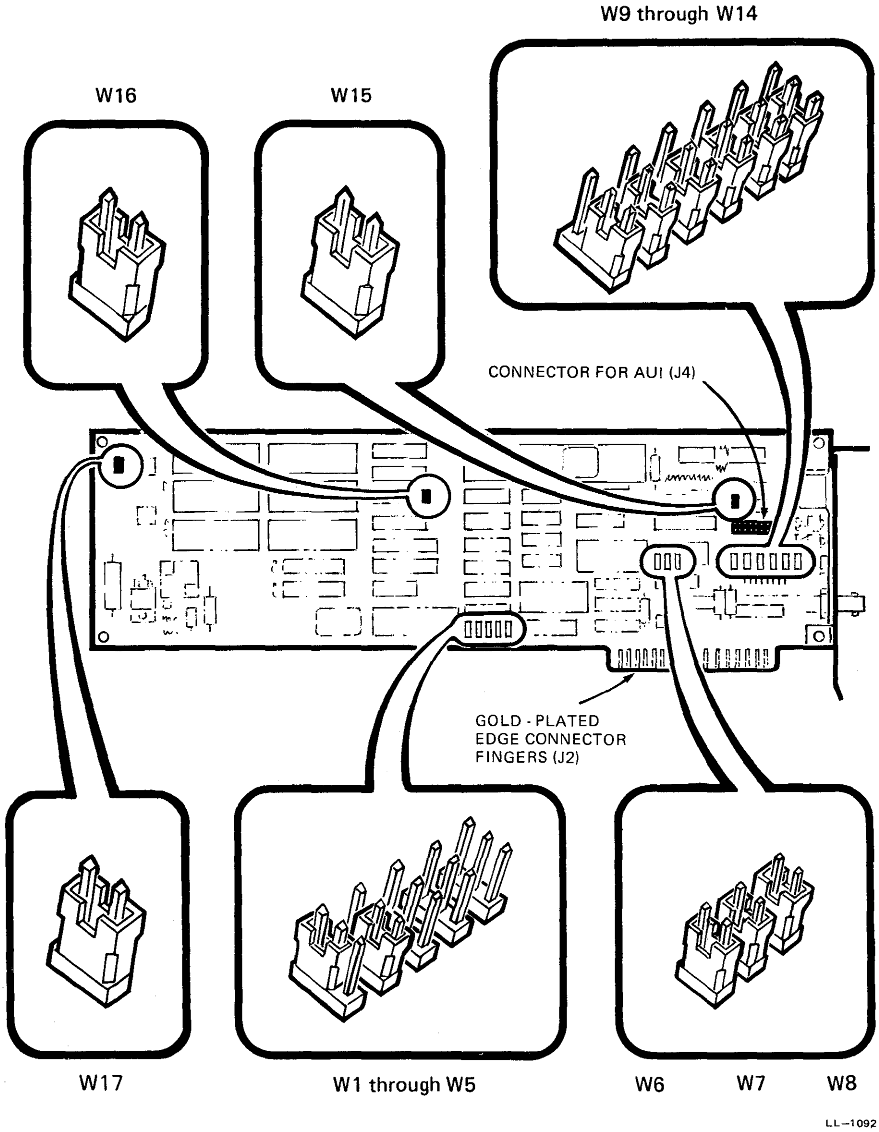


Figure 4 DEPCA Default Jumper Settings

The DEPCA uses 2-pin and 3-pin jumper arrangements. The 2-pin arrangement allows two selections by either installing or removing the jumper.

The 3-pin arrangement allows three selections:

- **No connection** – Jumper removed.
- **Top connection (position)** – Jumper installed on the top and center pins. The top pin in a row of three is the pin farthest away from the gold-plated edge connector (J2).
- **Bottom connection (position)** – Jumper installed on the center and bottom pins. The bottom pin in a row of three is the pin closest to the gold-plated edge connector (J2).

CAUTION
Static electricity can damage the circuitry of the DEPCA board. Always use a grounded wrist strap and work surface.

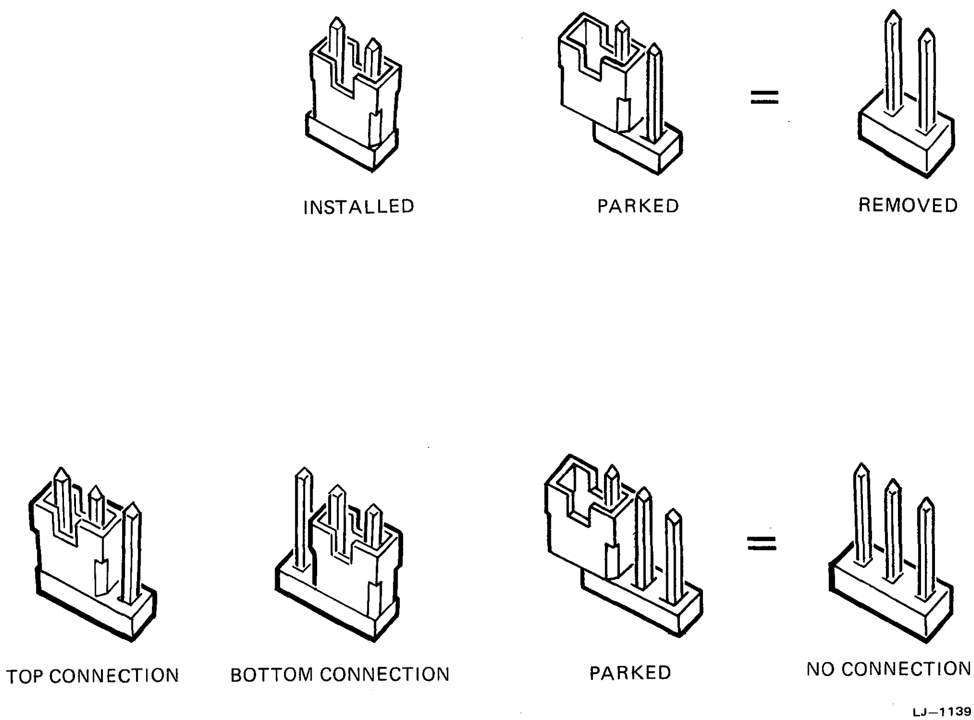


Figure 5 DEPCA 2-Pin and 3-Pin Jumper Installation

Interrupt Request Jumpers
The DEPCA uses two interrupt request lines (IRQ) – one for the mouse and controller, and the other for the DEPCA network interface (NI).

Table 2 DEPCA Interrupt Request Line/Jumpers Select

DEPCA Jumper	IBM Request Line	DEPCA Mouse IRQ (Top Position)	DEPCA NI IRQ (Bottom Position)
W1	IRQ2	Default setting	
W2	IRQ3		Default setting
W3	IRQ4		
W4	IRQ5		
W5	IRQ6		

Table 3 Other DEPCA Jumper Settings

I/O Address Selection	
W6	300 - 30F (default setting) 200 - 20F
Memory Address	
W7	Primary at D0000 - DFFFF (default setting) Secondary at E0000 - EFFFF
Enable/Disable DLL ROM Decode	
W8	Installed (default setting) Not installed
ThinWire/AUI Ethernet Interface	
W9	CD–
W10	CD+
W11	RX+
W12	RX–
W13	TX+
W14	TX–
Bottom position = ThinWire networks. Top position = AUI networks).	
IEEE 802.3/Transceiver II Cable Grounding	
W15	IEEE 802.3 (removed) Transceiver II (installed, default setting)
Remote Boot Selection	
W16	Enabled (installed, default setting) Disabled (removed)
DC Power Conversion	
W17	Enable (installed, default setting) Disable (removed)

DEPCA INSTALLATION

DEPCA System Requirements

To support the DEPCA, the IBM system must have the following components:

- 130 W (or greater) power supply
- System BIOS ROM revision 10-27-82 (or later)
- Minimum of 128 Kbytes of system memory to run diagnostic test for the DEPCA

NOTE
More memory may be required to run PCSA or DECnet-DOS network software.

Power Requirements

The IBM PC/AT is shipped with a 170 W or 250 W power supply.

The IBM PC/XT is shipped with a 130 W power supply. The wattage is usually printed on top cf the power supply.

The IBM PC is shipped with a 63.5 W or 89 W power supply. The wattage is usually printed on top of the power supply. Replace these power supplies with a 130 W power supply (minimum).

NOTE
If the IBM PC has a hard disk or a hard card, the power supply probably has been replaced with a 130 W power supply.

Identifying System BIOS ROM Revision Date

Revisions of the system BIOS ROM dated 10-27-82 or later can handle up to 640 Kbytes of system memory. The IBM PC is shipped with the following ROM revision dates.

- The IBM PC/AT and IBM PC/XT are shipped with a ROM revision date of 10-27-82 or later. These ROMs are acceptable.
- Early versions of the IBM PC were shipped with a ROM revision date earlier than 10-27-82. These ROMs are not acceptable and must be replaced with a ROM with a revision date of 10-27-82 or later.

NOTE
If the IBM PC has a hard disk or a hard card, the ROM probably has been upgraded to 10-27-82 or later.

ROM Revision Date

There are two ways to get the ROM revision date.

- Run PC-DOS DEBUG program.
- Run a BASIC program.

Running the PC-DOS DEBUG Program – Use the following procedure to run the DEBUG program.

1. Start DOS. Check that DEBUG is included in the directory.

2. At the prompt, type: DEBUG <RETURN>

3. At the cursor, type: D FFFF:5 <RETURN>

   The system displays a series of hexadecimal numbers with the ROM revision date in the upper right of the display.

4. At the cursor, type: Q <RETURN>

   The system exits the DEBUG program and returns to the A> prompt.

```
                                              ROM REVISION DATE

31 31 2F-30 38 2F 38 32 FF FF 28          11/27/83..(
01 70 00-5F F8 00 F0 47 01 70 00  r0..G.p. ...G.p.
FF 00 F0-23 FF 00 F0 23 FF 00 F0  G.p.T...#...#...
```

LJ–1135

Figure 6 ROM Revision Using the DEBUG Program

Running the BASIC ROM Revision Date Program – Check the ROM revision date by entering the following BASIC program.

1. Invoke BASIC and then type:

   10 DEF SEG = &HF000 <RETURN>
   20 FOR X = &HFFF5 to &HFFFC <RETURN>
   30 PRINT CHR$ (PEEK(X)); <RETURN>
   40 NEXT <RETURN>

2. To run the program, type: RUN <RETURN>

   The system displays the ROM revision date followed by OK. For example:

   11/27/83
   OK

3. Exit from BASIC

DEPCA INSTALLATION

Installation Flow Diagram

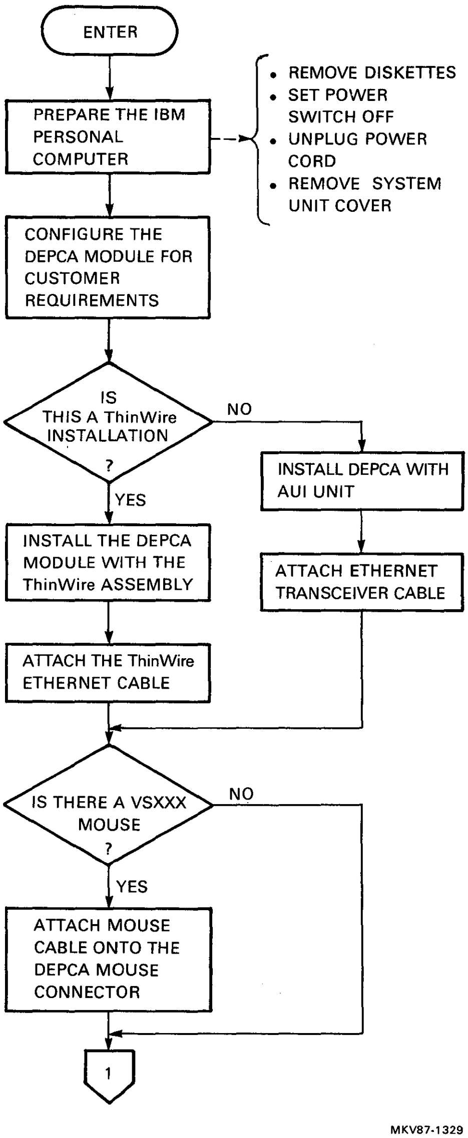


Figure 7 Installation Flow Diagram (Sheet 1 of 2)

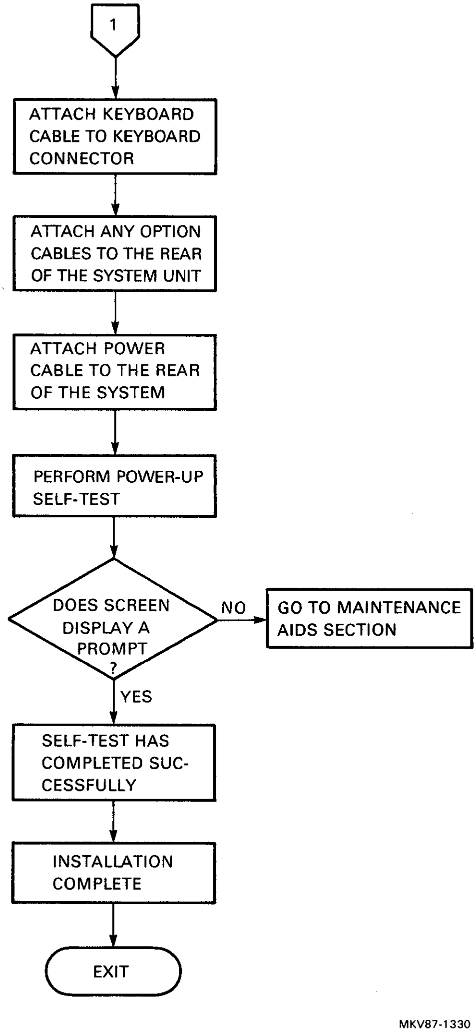


Figure 7 Installation Flow Diagram (Sheet 2 of 2)

DEPCA CABLING

Cabling

This section contains the cabling diagram for the DEPCA adapter.

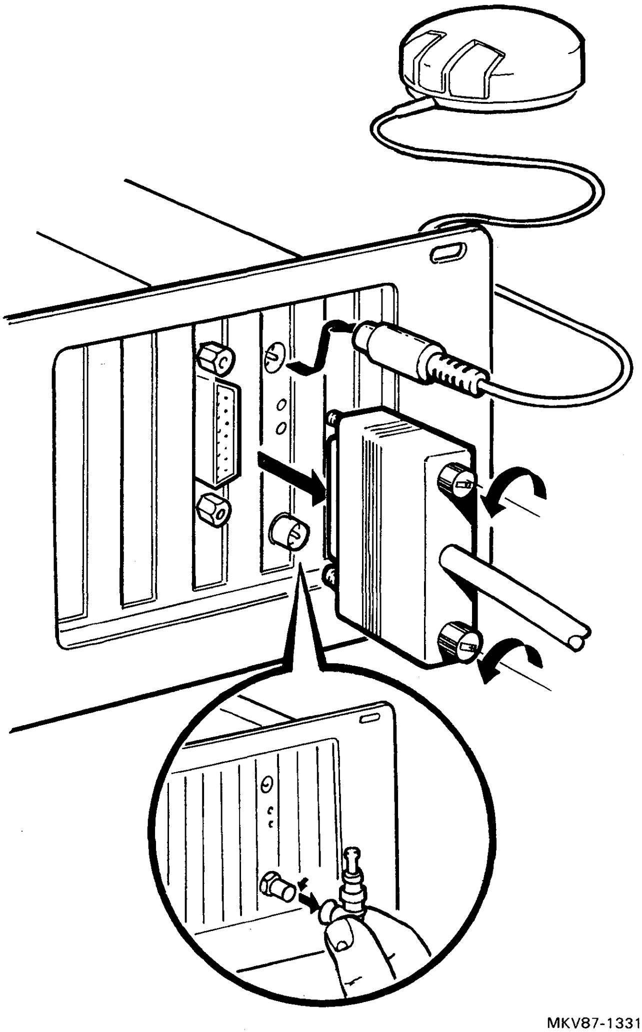


Figure 8 DEPCA Cabling

DEPCA Diagnostics

The DEPCA diagnostics consist of the following tests.

- Self-test that runs each time the IBM PC, IBM PC/XT, or IBM PC/AT is turned ON or RESET.
- Diskette-based service diagnostics for the service engineer that further test the DEPCA.

The self-test and service diagnostic tests display error numbers on the screen when a fault is encountered. The DEPCA diagnostic LED also comes ON when a fault is encountered during testing.

DEPCA Self-Test

When the self-test detects a fault, the screen displays "DEPCA" and an error number followed by a message on how to continue. For example:

DEPCA 72

Press F1 to continue

The red DEPCA FRU failure indicator LED also comes ON. The LED will also come ON when a mouse fault is detected, however, a mouse fault is not considered a fatal error.

Table 4 Self-Test Error Codes

Test No.	Fault Condition	Corrective Action
80	Memory access	Check jumpers for conflict with other installed options (W7).
81	Data path	Check jumpers for conflict with other installed options (W6 and W7). Check jumper W8 (ON).
82	Address test	Check jumpers for conflict with other installed options (W6).
83	RAM test	Check primary/secondary setting W6 and W7.
84	Ethernet ROM checksum	Check network interface jumpers (W9 – W14). Check that Ethernet address ROM is properly seated in socket. Run LANCE service diagnostics. Replace Ethernet ROM. Replace DEPCA – LANCE chip is bad.
85	NI – CSR error	Run LANCE service diagnostics.
86	LANCE internal register	Check primary/secondary setting W6.
87	LANCE initialization	Replace DEPCA – LANCE chip is bad.
88	LANCE interrupt	Check NI IRQ jumper setting (W1 – W5).

Table 4 Self-Test Error Codes (Cont)

Test No.	Fault Condition	Corrective Action
89	NI – CSR mask test	Run LANCE service diagnostics.
8A	LANCE internal loopback	Run LANCE service diagnostics.
8B	LANCE collision	Run LANCE service diagnostics.
8C	LANCE CRC generation	Run LANCE service diagnostics.
71	Mouse internal register	Check mouse IRQ jumper setting.
72	Mouse interrupt	Check mouse IRQ jumper setting.
73	Mouse loopback	Run mouse service diagnostics.
74	Mouse baud rate error	Run mouse service diagnostics.
ANY	System is hung, yellow LED ON, no keyboard response	Power OFF and disconnect DEPCA from the network. Power ON. IF the yellow LED remains ON for more than 30 seconds, replace DEPCA.

Preparing to Run the Service Diagnostics
Perform the following steps before running the service diagnostics.

1. Place the keypad in numeric mode. (The easiest way to do this is to turn the system OFF. When the system is turned ON again, the keypad starts in the default nonnumeric mode.)
2. Connect a mouse loopback connector or a mouse to the DEPCA. Use the following procedure to attach the mouse.
   a. Set the power OFF and remove all cables.
   b. Remove the cover and loosen the restraining screw that secures the DEPCA.
   c. Firmly plug in the mouse or mouse loopback connector.
   d. Tighten the DEPCA restraining screw and replace the cover.
   e. Connect all cables.

3. Disconnect the computer from the active network by removing the ThinWire TEE connector or transceiver cable if an AUI option is installed. Then perform one of the following.

   a. Connect a ThinWire or AUI loopback connector (if the AUI option is installed) to the DEPCA.

   b. Connect a two-station ThinWire or AUI diagnostic cable to this DEPCA and to a remote echo station with an installed DEPCA. This configuration is used to test the ability of the DEPCA to send, receive, and echo packets.

NOTE
The diagnostic program calls the ThinWire and AUI loopback connectors a "LANCE loopback".

Starting the Diagnostic Program
Use the following procedure to start the diagnostic program.

1. Prepare the system and DEPCA for testing as described in the "Preparing to Run the Service Diagnostics" section.

2. Insert the diagnostic diskette in drive A or B and set the system and monitor power switch to 1 (ON).

3. Press *any* key to start the diagnostics.

   The diagnostic program loads its default settings and automatically determines the following DEPCA configurations.

   a. The DEPCA memory and I/O starting address settings. The diagnostic program displays the memory address as "memory segment."

   b. The DEPCA interrupt request (IRQ) settings for the mouse and network interface. The diagnostic program displays the network IRQ as "LANCE IRQ."

   c. The DEPCA Ethernet ROM address. (This address is different for each DEPCA.)

Table 5 Service Diagnostic Error Codes

No.	Fault	Corrective Action
1	Memory data error	Check jumper setting W7.
2	CSR register diagnostic LED failed	Replace DEPCA.
3	CSR register ENB INT failed	Replace DEPCA.
4	CSR register MADT INT failed	Replace DEPCA.
5	CSR register ROM reset failed	Replace DEPCA.
6	Address ROM CRC failed	Check jumper setting (W9 – W14 and W17). Check that Ethernet address ROM is seated correctly. Replace DEPCA (LANCE bad).
7	DLL ROM CRC failed	Check jumper setting W8. Replace DEPCA.
8	LANCE interrupt failed	Check jumper setting W1 – W5. Replace DEPCA.
9	LANCE initialization failed	Replace DEPCA.
10	LANCE babble detected	Run packet passer test. Replace DEPCA.
11	LANCE collision	–
12	LANCE missed packet	Install network loopback connector or connect to packet passer station and repeat test. Check jumper W17. Replace DEPCA (LANCE bad).
13	MERR detected	Replace DEPCA.
14	Receive error detected	Run packet passer test. Check jumper W17. Replace DEPCA.
15	Framing error	Run packet passer test. Check jumper W17. Replace DEPCA.
16	Overflow error	Restart system and test again. Replace DEPCA.
17	CRC error	Check all jumper settings. Replace DEPCA.
18	Buffer error	Check jumper setting W6. Replace DEPCA.
19	Transmit error	Check all jumper settings. Replace DEPCA.
20	DEF XMIT	Check all jumper settings. Replace DEPCA.
21	Multiple retries	Replace DEPCA.
22	Late collision	Run packet passer test. Replace DEPCA (LANCE bad).
23	lost carrier	Run packet passer test. Replace DEPCA (LANCE bad).
24	Underflow	Replace DEPCA.
25	Retry error	Replace DEPCA.
26	Bad memory detected	Press RETURN to continue testing. Replace DEPCA (ROM bad).
27	BAD I/O detected	Replace DEPCA (LANCE bad).
28	Bad IRQ setup	Check W1 – W5. Replace DEPCA.
29	LANCE CRC error	Replace DEPCA.

Table 5 Service Diagnostic Error Codes (Cont)

No.	Fault	Corrective Action
30	Mouse baud rate test failed	Replace DEPCA.
31	Lost received frame	Check jumper W17. Run packet passer test. Replace DEPCA (LANCE bad).
32	Mouse failed to transmit	Install mouse loopback or connect mouse and retest. Check mouse IRQ jumper setting W1 – W5. Mouse controller bad. Replace DEPCA if customer uses mouse.
33	Mouse did not receive expected data	Install mouse loopback or connect mouse and retest. Check mouse IRQ jumper setting W1 – W5. Mouse controller bad. Replace DEPCA if customer uses mouse.
34	Mouse bad data received	Mouse may be bad. Install mouse loopback and retest. Mouse controller bad. Replace DEPCA if customer uses mouse.
35	Mouse did not interrupt	Check IRQ jumper setting. Mouse controller bad. Replace DEPCA if customer uses mouse.
36	Mouse register test failed	Replace DEPCA.

DEPCA MAINTENANCE AIDS

Troubleshooting Sequence
The troubleshooting sequence generally consists of the following steps.

1. Visually check the system for loose cables and connections.
2. Run the DEPCA self-test and service diagnostics to isolate FRUs.
3. Check all jumper settings.
4. Check for problems reported by the customer that are not associated with a fault number reported by the self-test.
5. Replace any FRUs identified by the self-test and service diagnostics.
6. Check the DEPCA ThinWire network cable connection for opens, shorts, and terminations.
7. Check the packet-passing ability of the DEPCA by setting up a remote echo station and running the service diagnostic LANCE tests.

Troubleshooting Procedures
The following describes the procedures to isolate problems connected with the DEPCA. All procedures assume that the IBM computer is operating properly.

No Response at Power-up – No response from the DEPCA at power-up means that the screen fails to display any system start-up messages or the system fails to respond to the keyboard. If this occurs, perform the following steps.

1. Check that the monitor is turned ON.
2. Check the DEPCA LEDs to see if they are ON. If either LED is ON, refer to Table 6.
3. Turn the computer OFF and make sure that the DEPCA jumpers are correctly set and the board is firmly seated in the computer.
4. Check that all cables are firmly connected.
5. Turn computer and monitor ON.

If the problem persists and other options are present, note the location of the other options, remove all options except the disk controller and video options, and try again.

CAUTION

Some third-party options may require installation in specific locations in the computer. Therefore, whenever an option is removed, make sure it is installed in the same location.

Table 6 DEPCA LEDs

LED	Activity	Indication
RED only	ON and OFF (for 20 to 30 seconds)	Normal during self-test.
	ON	A fault has occurred. Check jumper settings and run the service diagnostics.
YELLOW only	Slowly or rapidly flickering	Normal during network activity self-test or service diagnostic tests.
YELLOW and RED	YELLOW rapidly or steadily ON; RED ON	Fault has occurred. Check jumper settings and run the service diagnostics.
(See NOTES)	YELLOW steadily ON for longer than 30 seconds; RED ON. Keyboard does not respond.	DEPCA preventing CPU from operating correctly. Power down, then up again. If problem persists, replace the DEPCA.

NOTES:
It may be difficult to determine the difference between a rapidly flickering and steadily ON YELLOW LED. The difference can be determined by physically disconnecting the network cable from the DEPCA and restarting the computer.

If the YELLOW LED remains ON for longer than 30 seconds and the keyboard does not respond, the DEPCA is preventing the CPU from operating correctly.

Try restarting the computer again. If the problem persists, replace the DEPCA.

Table 7 Fault Isolation by Symptom

Symptom	Probable Cause	Corrective Action
Network starts but cannot use mouse.	Mouse cable loose or mouse IRQ set incorrectly.	Check cable connection and IRQ setting (W1 – W5).
	Possible faulty mouse, mouse cable, or mouse fuse on DEPCA.	Run mouse diagnostics with mouse loop-back connected. If mouse fuse is blown and internal and external loopback tests pass, replace mouse. If external loopback test fails, test the DEPCA fuses with an ohm-meter to make sure the fuses read out at zero. Replace mouse and DEPCA.
System ON but nothing happens.	I/O or memory address set incorrectly.	Check primary/secondary settings for W6 and W7.
System ON but nothing happens. Both LEDs ON. Keyboard does not respond.	DEPCA is preventing the CPU from operating correctly.	Turn computer OFF, then ON again. If condition persists, turn the power OFF and disconnect the DEPCA from the network. Turn the power ON. If the YELLOW LED is ON for longer than 30 seconds, replace the DEPCA.
System ON but no display.	Monitor is not ON.	Turn monitor power switch ON.
System does not boot.	W16 was removed.	Install W16.
System ON but network does not start or other options do not start.	Network cables or AUI ribbon cable loose.	Check all network cables.
	Network and/or IRQ jumpers set incorrectly.	Check W9 – W14 and W1 – W5 settings.
	ThinWire Network present; W17 was removed.	Install W17.
	I/O or memory jumpers set incorrectly.	Check W6 and W7 settings.
	Conflicting network or other option.	Adjust settings on conflicting options. Obtain permission and remove remaining conflicting options.

Table 7 Fault Isolation by Symptom (Cont)

Symptom	Probable Cause	Corrective Action
	AUI option present and DEPCA AUI fuses blown.	Connect AUI loopback connector and run service diagnostics. If loopback GREEN power LED is OFF, fuse is blown. Test fuse with ohmmeter. Replace DEPCA and AUI cable. If problem persists, there is a problem with external connections of the transceiver cable or external devices.
System ON but screen displays an error message when attempting to start the network.	Network and/or IRQ jumpers set incorrectly. Intermittent or fatal fault with DLL ROM on the DEPCA.	Run DEPCA self-test again to determine if a fault occurs. Check all jumper settings.
Running a BASIC program but cannot use the network.	Versions of BASIC prior to Version 2.0 in use and NI IRQ is set at IRQ3 (W2).	Early versions of BASIC mask IRQ3 and IRQ4. Have customer replace BASIC with Version 2.0 or later. The NI IRQ can also be set to IRQ2 (W1); move the default mouse IRQ2 (W1) to IRQ5 (W4) or IRQ7 (W5).

Troubleshooting Flowchart – The following DEPCA troubleshooting flowchart is used in conjunction with the power-up self-test and the DEPCA service diagnostics diskette.

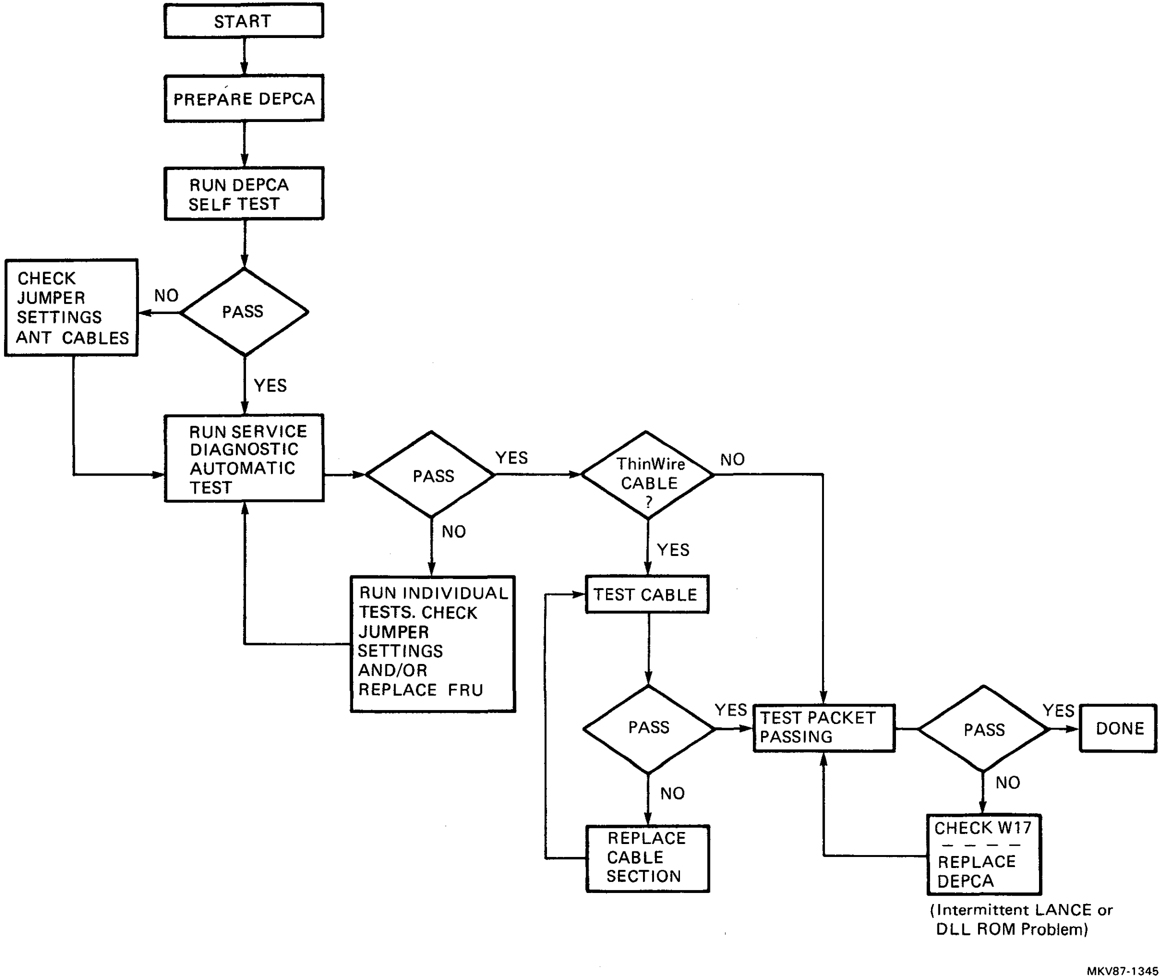


Figure 9 DEPCA Troubleshooting Flowchart

Checking the DEPCA ThinWire LAN Cable Connection – The service diagnostic Local Area Network Controller Ethernet (LANCE) tests include an automatic external loopback test that can be used to test the DEPCA cable connection.

1. Test the DEPCA Ethernet logic circuitry.

   a. Plug in the ThinWire network loopback connector. Make sure two 50-ohm terminators are connected to the TEE connector.

   b. Start the service diagnostics and run the LANCE tests.

2. Test the ThinWire cable section for opens and for correct termination.

   a. Configure the DEPCA using the ThinWire LAN cable assembly kit.

   b. Run the service diagnostic LANCE tests.

3. Test the ThinWire cable and the TEE connectors for shorts. Have the ohmmeter set to the times 1 scale.

   a. Assemble the cable and connectors.

   b. Connect the ohmmeter. The meter should read:

      1) 25 ohms if there is a terminator at each end.

      2) 50 ohms if there is a terminator at only one end.

   c. If a correct value is not read, run the test again with a different cable. Replace the cable, TEE connectors, or terminator, depending on the results of the ohmmeter test.

Field Replaceable Units (FRUs) and Spares

The following table lists the DEPCA FRUs and spares.

Table 8 Field Replaceable Units and Spares

Component	DIGITAL P/N
DEPCA	70-24252-01
AUI connector	17-01491-01
AUI transceiver II cable 4.6 m (15 ft)	BCC06-15 or 17-00612-05
LAN cable assembly 3.8 m (12 ft)*	PC50X-CB or BC16T-12
ThinWire cable, PVC 1.9 m (6 ft)**	BC16M-06
ThinWire cable, PVC 4.4 m (15 ft)**	BC16M-15
ThinWire cable, PVC 9.4 m (30 ft)**	BC16M-30
TEE connector	H8223
Terminator (50 ohm)	H8225
ThinWire loopback connector	H8225 (Qty 2) H8223 (Qty 1)
Mouse loopback connector	12-25628-01
AUI loopback connector	12-22196-01
Corporate mouse	VSXXX-AA
LK250/IBM cable	17-01517-02
Jumper	12-18783-00

* Includes an installed TEE connector, terminator, and BNC connector.
** Includes two installed BNC connectors.

Required Tools

The following tools are required to service the DEPCA.

Table 9 DEPCA Tools

Tool	Part Number
Standard Field Service Tool Kit (U.S.A.)	29-23270-00
Standard Field Service Tool Kit (Europe)	29-23268-00
ESD grounding kit	29-11762-00
Mouse loopback connector	12-25628-01
ThinWire loopback connector	H8225 (Qty 2) H8223 (Qty 1)
AUI option loopback connector (needed if option is present)	12-22196-01

DEQNA Q-BUS DATA COMMUNICATIONS CONTROLLER

General Description

The DEQNA Q-Bus (LSI-11 bus) data communications controller interfaces the Digital Equipment Corporation LSI-11 processor family to the Ethernet local area network.

The DEQNA controller consists of one dual LSI-11 module (M7504) that plugs into the Q-Bus backplane and resides in the same enclosure. It is physically and electrically connected to the H4000 transceiver as shown in Figure 1.

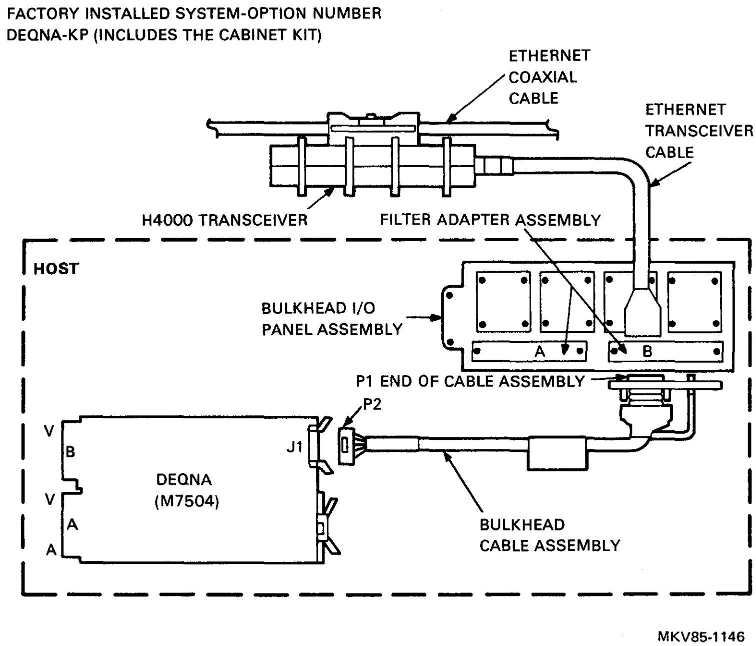


Figure 1 DEQNA to Ethernet Connection

DEQNA INSTALLATION

Features

- Transmits and receives data at a rate of 10M bits/s.
- Recognizes heartbeat and collision detection.
- Performs packet serialization, formatting, Manchester encoding, and multiple retransmission.
- Generates and checks 32-bit cyclic redundancy check (CRC).
- Interfaces with the H4000 Ethernet transceiver.
- Performs Direct Memory Access (DMA) transfers to and from CPU memory.
- Contains quick-verify diagnostics for power-up and boot.
- Performs internal and external loopback, and can assist on loopback of data from other stations.
- Supports host system identification response.
- Supports host down-line load and remote boot by other nodes on the network.

Reference Documentation

• *Introduction to Local Area Networks*	EB-22714-18
• *The Ethernet, A Local Area Network, Data Link Layer, and Physical Layer Specification*	AA-K759B-TK
• *DEQNA Ethernet User's Guide*	EK-DEQNA-UG-001
• *H4000 Ethernet Transceiver Technical Manual*	EK-H4000-TM-001
• *H4000 Ethernet Transceiver Field Maintenance Print Set*	MP-01369
• *H4000 DIGITAL Ethernet Transceiver with Removable Tap Assembly Installation Card*	EK-H4TAP-IN
• *DEQNA (M7504) Maintenance Print Set*	MP-01885
• *DEQNA Cabinet Kits Maintenance Print Set*	MP-01811

Hardware Components

- DEQNA module (M7504)
- Bulkhead cable assembly, one required (refer to Table 1)

Table 1 Bulkhead Cable Assemblies

Length CM	IN	Cable Type	Use	Designation
53.3	21	Shielded cable/bulkhead	(PDP-11/23)	CK-DEQNA-KA
30.5	12	Shielded cable/bulkhead	(MICRO PDP-11)	CK-DEQNA-KB
76.2	30	Shielded cable/bulkhead	(PDP-11/23-PLUS)	CK-DEQNA-KC
M	**FT**	**Cable Type**	**Use**	**Designation**
3.048	10	Shielded cable	General use*	CK-DEQNA-KD

*Non-FCC compliant installations

Software Components
The following software components are included with the DEQNA configuration.

- Citizenship diagnostic
- Maintenance Operation Protocol (MOP) code (resident in ROM on M7504 module)

Bus Latency Constraints
The DEQNA controller should be the highest priority device on the Q-Bus, that is, the DMA device nearest to the CPU. When two DEQNA controllers are installed, a block-mode memory is required if high Ethernet traffic rates are to be handled. The following is a recommended module installation.

Processor	Slot 1
Memory	Slot 2
DEQNA 1	Slot 3
DEQNA 2/Other	Slot 4
Others	Slots 5–8

Loading Requirements

The Q-Bus loads for the M7504 module are outlined in Table 2.

Table 2 DEQNA Q-Bus Loading

Module	Q-Bus DC Loads	Q-Bus AC Loads
M7504	0.5	2.2

Power Requirements

Power supply voltages (Table 3) should be checked before and after installation to verify the absence of overloading and overvoltage conditions.

Table 3 DEQNA Power Requirements

Voltage Rating (Typical Values)	Typical Current	Maximum Current	Backplane Pins
+5 ±0.25 V	3.5 A	5.0 A	AA2, BA2, BV1
+12 ±0.60 V (for transceivers)	0.5 A	*	BD2
Logic Reference			AJ1, AM1, AT1 AC2, BJ1, BM1 BC2
Transceiver Return			BT1

*At power-up, transceiver surge current at the power connection is high enough to current-limit and power-fail some power supplies. The DEQNA controller does not contain power supply surge protection; it must be provided elsewhere if required by the system configuration.

Jumpers
The DEQNA module (Figure 2) is configured with three jumpers (W1, W2, and W3) that are installed during manufacture. See Table 4 for a description of these jumpers.

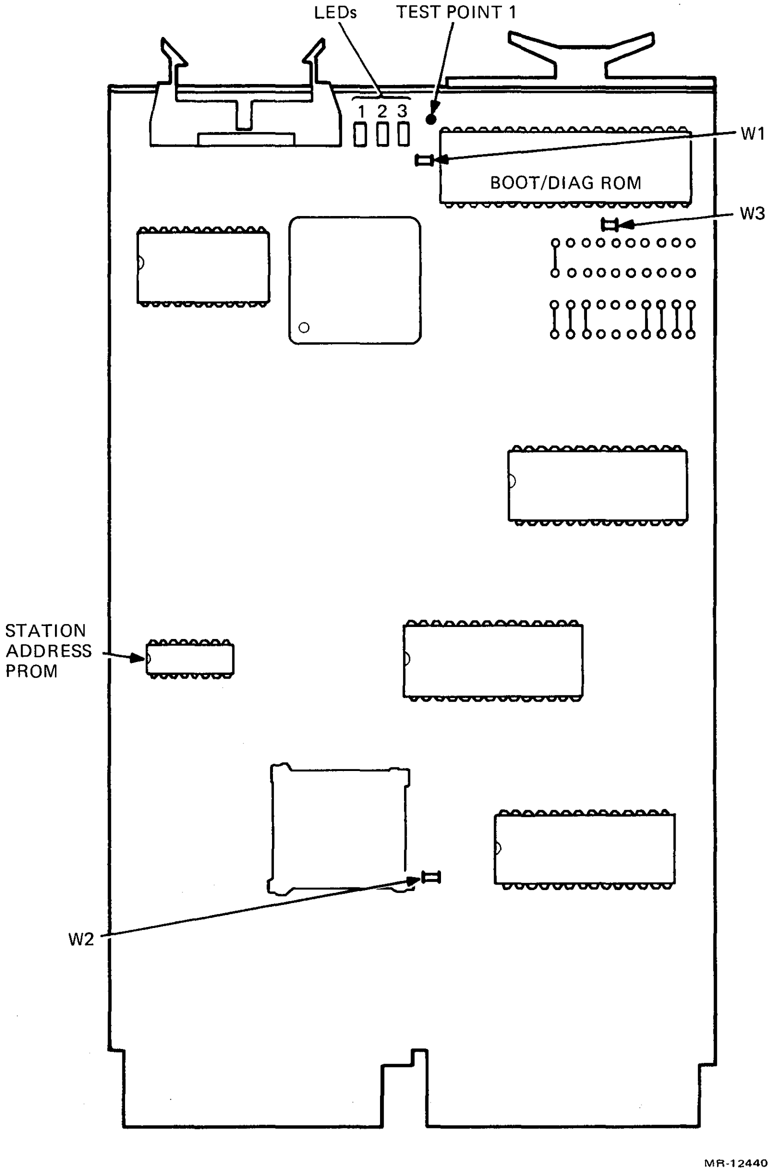


Figure 2 DEQNA Module (M7504)

Table 4 DEQNA Jumper Functions

Jumper	Function	In	Out
W1	I/O Page Address	17774440	17774460*
W2	BDMR Holdoff Timer	No Delay	5 μs Delay
W3	Sanity Timer at Initialization	Disabled	Enabled

*Second DEQNA controller

Installation Flow Diagram

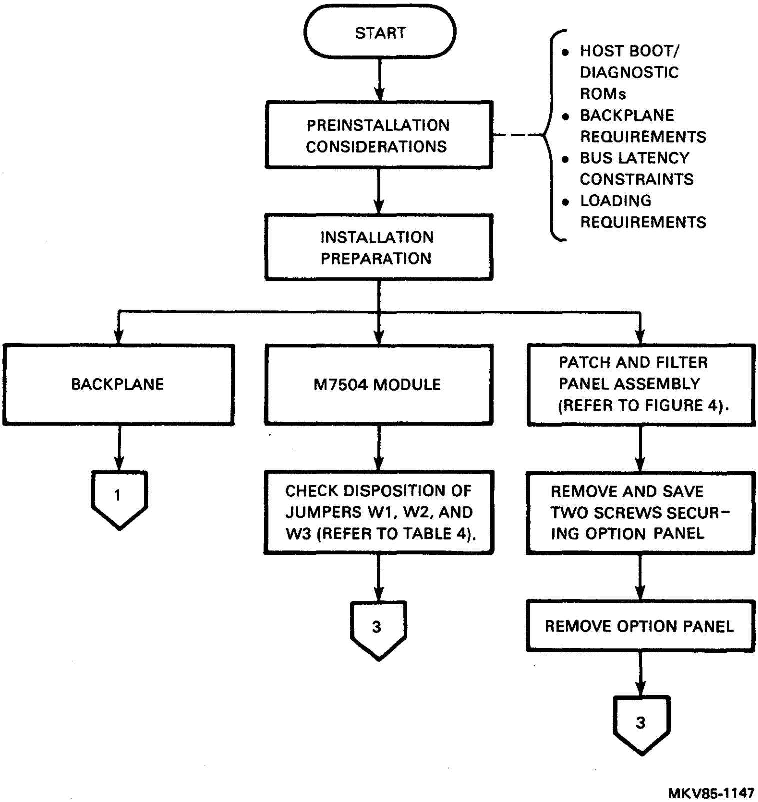


Figure 3 Installation Flow Diagram (Sheet 1 of 4)

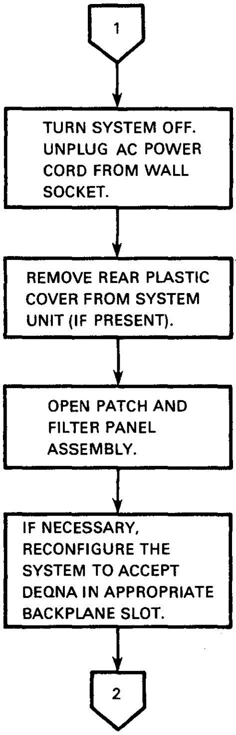


Figure 3 Installation Flow Diagram (Sheet 2 of 4)

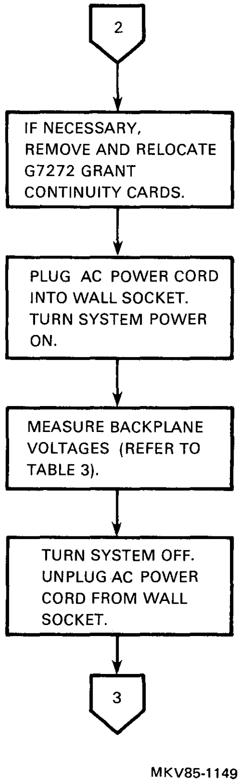


Figure 3 Installation Flow Diagram (Sheet 3 of 4)

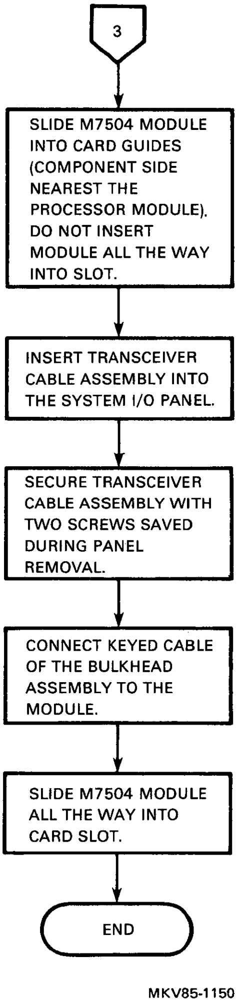


Figure 3 Installation Flow Diagram (Sheet 4 of 4)

Post-Installation Power Checks

1. Plug the ac power cord into the wall socket and turn the system power ON.
2. Measure the backplane voltages at the slot containing the M7504 module. The voltages should be within the tolerances listed in Table 3.
3. Turn the system power OFF.

Light Emitting Diode (LED) Checks (Refer to Table 5)

1. Connect either an Ethernet transceiver with cable or a loopback connector to the transceiver cable connector on the patch and filter panel assembly (refer to Figure 4).
2. Turn the system power ON.

   All three LEDs on the M7504 module should be on within one second.
3. Boot the system from the DEQNA controller.

   The LEDs should turn OFF, one at a time, until none of the LEDs are ON.

NOTE
The new CPU PROMs (with code for booting from the DEQNA controller) must be installed.

Table 5 DEQNA LED Indications

LED 1	2	3	Indication
OFF	OFF	OFF	DEQNA controller passed all Citizenship tests (CQ).
OFF	OFF	ON	Transceiver, Ethernet, or cable error.
OFF	ON	ON	DEQNA internal error.
ON	ON	ON	• Cannot upload BD ROM contents • The bootstrap has not yet executed • The first set-up packet prefill has failed

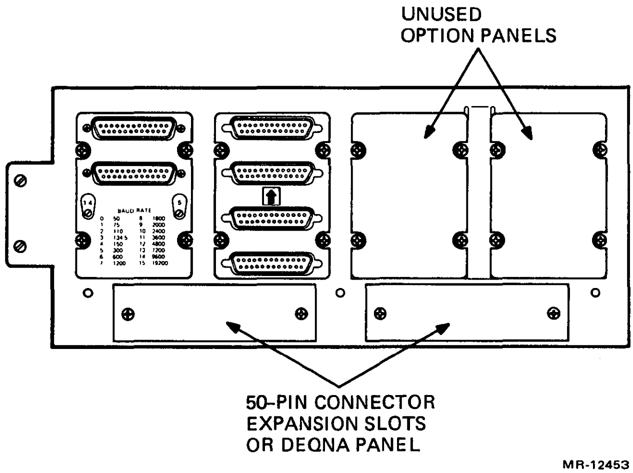


Figure 4 Typical Patch and Filter Panel Assembly

Diagnostic Acceptance Procedure

1. Run the Field Functional Test (refer to the DEQNA Diagnostics section).
2. Turn the system power OFF.
3. Close and fasten the patch and filter panel assembly.
4. IF a loopback test transceiver was used, disconnect it.
5. Replace the rear plastic cover on the system unit (this does not apply to rack mounted panels).
6. IF not already connected, connect the system to an installed Ethernet transceiver.

Installation is now complete.

DEQNA CABLING

Cabling

Figure 1 illustrates how the DEQNA controller is connected to the H4000 transceiver. Refer to Table 1 for a listing of the bulkhead cable assemblies that are available.

DEQNA Diagnostics
The DEQNA diagnostics include:

- Software to boot the DEQNA controller,
- Tests to ensure that the module is working correctly, and
- Tests to isolate faults.

Extended Primary Bootstrap (EPB)
The DEQNA controller is loaded, or booted, in a way that is similar to booting a mass storage device. Host primary boot code passes control to the Extended Primary Bootstrap (EPB) code (loaded from the BD ROM), which continues the bootstrap process by loading the contents of the BD ROM into the host memory. When the load is complete, the DEQNA Citizenship test is run before the DEQNA controller is allowed to access the Ethernet network.

If the Citizenship test is passed, the bootstrap process continues and control is transferred to either:

- The DECnet bootstrap (part of the Maintenance Operation Protocol (MOP) code loaded from the BD ROM).
- An address in the host memory.

If the DEQNA controller fails the Citizenship test, the EPB code attempts to halt the CPU, without attempting to boot DECnet or transferring control to a user's program. The LEDs on the DEQNA controller help to indicate the nature of the failure.

Boot sequence:

1. Load the first 512 bytes of BD ROM (EPB code).

2. Verify descriptor status and the CSR.

3. In the host, set up registers R0 and R1, and location 12 (octal) of main memory (see next step). Continue.

4. IF a failure is detected, examine location 12 (octal) of main memory.

   IF location 12 is zero, halt the EPB.

   IF location 12 is nonzero, transfer control to the address contained in location 12.

5. Load the remaining bytes of the BD ROM into host memory.

6. Verify the BD ROM data transfer using the ROM checksum.

7. The host executes the Citizenship test.

8. IF the Citizenship test fails, return control to the EPB and halt.

9. IF the Citizenship test passes, transfer control (as determined by the value in the host register R0) to either:

   a. The MOP code to boot DECnet. This code continuously attempts to boot DECnet until successful or until stopped by the host.

   b. A user defined code.

Citizenship Test (CQ)
The DEQNA Citizenship test (CQ) is a series of diagnostic test routines that determine if the DEQNA controller is operating correctly and can access the Ethernet network, or is faulty and requires further diagnosis. Test results are indicated by the LEDs on the DEQNA module and are returned to the host's register R0, where they are accessible to software. The CQ test uses internal loopback, internal extended loopback, and external loopback modes, and requires the DEQNA controller and an H4000 transceiver (or equivalent). Connecting the DEQNA controller to the Ethernet network is not required if a loopback connector (H4000 transceiver along with a terminated cable or other connector) is used. Prior to executing the tests, CQ turns OFF the sanity timer. Upon completion of the tests, it turns the sanity timer ON if jumper W3 is removed (timer enabled), or leaves the timer OFF if jumper W3 is in place (timer disabled).

The CQ test is a free-standing subroutine and can be called by other software. For example, during network boot, CQ can determine if the node should be allowed to proceed from the initialized state to either a functional state or a nonfunctional state. If a fault exists, MOP code can call CQ to determine if other DEQNA diagnostics or network-level diagnostics are required for fault isolation. Table 6 lists the various tests and indicates the corresponding bit numbers in the host register R0 along with a description of the error.

Table 6 CQ Tests and Error Indications

No.	Test	R0 Bits	Indications
1	Station Address Verification	00	Station address is all zero bits.
		00	Station address is all one bits.
		00	Station address is not a valid DEQNA address.
		10	Bus time-out or nonexistent memory error.
2	Device Interrupt and Nonexistent Memory	11	No interrupt occurred.
		11	Interrupt occurred prematurely.
		11	Wrong interrupt occurred.
3	Set-up Mode and Receive FIFO Processing	12,01	Target address echoed data check.
		12,09,01	Set-up packet operation time-out.
		14,12,01	Set-up packet operation status check.
4	Internal Loopback and Address Filter	02	Transmitted and received data compare check.
		09,02	Runt packet transmit and receive operation time-out.
		09,02	Valid packet transmit and receive operation time-out.

Table 6 CQ Tests and Error Indications (Cont)

No.	Test	R0 Bits	Indications
4	Internal Loopback and Address Filter (Continued)	12,02	Target address echoed data check.
		14,02	Runt packet transmit and receive operation status check.
		14,02	Valid packet transmit and receive operation status check.
		12,09,02	Set-up packet operation time-out.
		14,12,02	Set-up packet operation status check.
5	Internal Extended Loopback and Protocol	03	Long packet not detected via transmit status.
		03	Internal extended loopback transmit/receive data compare check.
		09,03	Test packet transmit or receive operation time-out.
		14,03	General operation status check and long packet not detected.
6	DMA Q-Bus Interface Processing	04	DMA Q-Bus interface transmit (scatter/gather) data check.
		09,04	Transmit (special) and receive operation time-out.
		14,04	Receive or transmit operation status check.
7	Transceiver Operation and Status	12	Target address packet with LED command echoed data check.
		12,09	Set-up packet operation time-out.
		14,12	Set-up packet operation status check.
		15	CSR carrier bit on too long.
8	External Loopback and Ethernet Protocol	15	External loopback over Ethernet cable is not operational.
		05	Minimum or maximum sized packet data compare check.
		09,05	Minimum/maximum packet operation time-out.
		14,05	Minimum/maximum packet operation status check.

Successful Test Results – If the CQ test passes, the value of host register R0 is zero, and the DEQNA controller is set up as follows.

1. All three LEDs are OFF.

2. All 14 target addresses are set to the physical address from the station address ROM.

3. The sanity timer is set to its default interval (4 minutes) and disabled or enabled according to the disposition of the sanity timer jumper (W3).

4. Promiscuous and all multicast address modes are OFF.

5. The DEQNA controller has been reset:

   a. Receive is enabled
   b. Transmit is disabled

Failed Test Results – If the CQ test fails, the LED indications display the errors listed in Table 5.

Bits in register R0 indicate the test that failed. If bit 15 is the only bit set, the DEQNA controller passed all the CQ tests except those that require a connected transceiver. CQ test error/bits (multiple bits can be set) are defined in Table 7.

Table 7 CQ Test Error /Bit Definition

Error/Bit	Definition	Source(s)
15	External loopback not operational. Ethernet network not operational. H4000 transceiver not operational (blown fuse, disconnected).	Tests 7 and 8
14	Operation complete status checks. CSR status after final reset not nominal. CSR status after transmit and/or receive not nominal. Receive descriptor flags and status word 1 not nominal. Received byte length check. Transmit descriptor flags and status word 1 not nominal. TDR value = 0	All tests

Table 7 CQ Test Error /Bit Definition (Cont)

Error/Bit	Definition	Source(s)
13	Sanity timer interrupt. Power failed during test. Unexpected sanity timer interrupt.	General error
12	Set-up packet or target address echo check. Set-up packet transmit time-out. Transmit status not nominal. Set-up packet receive time-out. Receive status not nominal. Echoed data not identical to transmitted data. Extra word at end of set-up packet not nominal.	All tests
11	Spurious or missing device interrupt. Expected device interrupt not detected. Device did not detect nonexistent memory (NXM) bus state. 18-bit or 22-bit addressing failure. Unexpected DEQNA device interrupt.	General error
10	Bus time-out or NXM interrupt. I/O page not accessible for read or write. Cannot read station address ROM. Test code attempted to access NXM.	General error
09	Device operation time-out. Unit under test failed to complete a transmit and/or receive in time.	All tests

Table 7 CQ Test Error /Bit Definition (Cont)

Error/Bit	Definition	Source(s)
08	Undefined	
07	Undefined	
06	Undefined	
05	Ethernet external loopback test check. Ethernet protocol processing check. Ethernet minimum valid length processing check. Ethernet maximum valid length processing check.	Test 8
04	DMA interface processing check. DMA odd/even length and address processing check. Multielement transmit descriptor processing check. Chained transmit descriptor processing check.	Test 6
03	Internal extended loopback transmit buffer data check. Ethernet protocol processing check. Transmit buffer memory malfunction. Packet size processing error.	Test 5
02	Station address compare test check. Address filter logic passing all addresses. Address filter logic not passing expected addresses.	Test 4

Table 7 CQ Test Error /Bit Definition (Cont)

Error/Bit	Definition	Source(s)
01	Station address/receive FIFO processing check. Target address RAM malfunction. Packets not properly stored in receive FIFO. Receive FIFO memory malfunction.	Test 3
00	Invalid Ethernet station address. I/O page register read failure (see also bit 10). Unit under test is not a DEQNA controller (M7504). Station address ROM malfunction. Invalid DEQNA address.	Test 1

DEQNA DIAGNOSTICS

Field Functional Test (ZQNA)

The Field Functional Diagnostic Program (ZQNA) tests the DEQNA controller in Q18- or Q22-Bus systems. This test attempts to isolate faults to the following FRUs.

- DEQNA controller
- Bulkhead assembly
- Bulkhead assembly fuse
- Transceiver cable
- Transceiver

The ZQNA also attempts to localize faults to the failing DEQNA functional area(s).

- Q-Bus DMA Transfer Controller (QDTC)
- Receive First-In/First-Out (FIFO) and transmit buffer memory
- Ethernet Protocol Processor (EPP)
- Manchester Encoder/Decoder (ED/DE)

Tests are executed under supervision of the XXDP/DRS, and controlled by the operator from a console (hard copy or video). For DRS commands, refer to the *XXDP+ User's Manual.*

NOTE
The ZQNA diagnostic program is not an Ethernet network exerciser. The ZQNA assures that the module can execute Ethernet protocol and that valid network traffic can be transmitted and received. The network exerciser provides a higher level of testing.

Configuration and Set-Up – The DEQNA controller is tested in all loopback modes. The ZQNA tests the DEQNA controller in internal loopback and internal extended loopback modes, with or without an external loopback connector (H3278 or 12-22196-01) or transceiver connected (that is, a connected transceiver or the loopback connector does not have to be unplugged). External loopback mode is used with a connected transceiver or external loopback connector. The H4080 loopback test connector may be used as the external loopback device.

NOTE
Executing ZQNA using external loopback mode in a system connected to a "live" Ethernet network does not interrupt or disrupt the Ethernet network. Alternatively, external loopback mode can be used with a terminated transceiver that is not attached to a network cable.

Functional Areas Tested – Refer to Table 8.

Remove the sanity jumper (W3) to enable the timer before executing the sanity timer test (test number 21 in Table 9).

When the sanity timer test is complete, restore the jumper to its position before the test.

Table 8 ZQNA Tested Functional Areas

Functional Area*	Set-up	Loopback Mode: Internal	Loopback Mode: Internal Extended	Loopback Mode: External
Q-Bus	X	X	X	X
QDTC	X	X	X	X
FIFO	X	X	X	X
ED/DE	X	X		X
EPP	X	X	X	X
EPP Address Checking Logic		X		
Transceiver and Cables				X

*Q-Bus = Processor data bus
QDTC = Q-Bus DMA transfer controller
FIFO = Transmit and receive memory buffers
ED/DE = Manchester encoder/decoder
EPP = Ethernet protocol processor

Hardware Tested – Refer to Table 9.

Table 9 ZQNA Test Descriptions

Test Number	Test	Hardware Tested
1	Nonexistent I/O Page Register Test	• Q-Bus to DEQNA port register interface
2	CSR Bit Test	• Q-Bus to DEQNA port register interface
3	Ethernet Station Address Verify Test	• Station address PROM • Q-Bus to DEQNA port register interface
4	Interrupt Vector Address Test	• DEQNA vector address register • Port registers
5	Boot/Diagnostic ROM Checksum Test	• Q-Bus DMA interface • 8051 microprocessor • 8051 ROM • CSR • Receive FIFO

Table 9 ZQNA Test Descriptions (Cont)

Test Number	Test	Hardware Tested
6	Interrupt Sanity Test	• Q-Bus QDIC interface • CSR • Q-Bus time-out logic • QDTC interrupt logic
7	Ethernet Carrier Sense Test	• Carrier sense circuitry • ED/DE chip
8	Station Address RAM Test	• Station address RAM • Q-Bus QTDC interface • CSR bit 00 (Receive Enable) • Part of receive and transmit FIFO
9	Promiscuous Station Test	• Promiscuous addressing mode logic
10	Transmit and Receive FIFO Memory Test	• Transmit buffer address logic • Transmit buffer memory • Receive FIFO address logic • Receive FIFO memory
11	Packet Length Test	• Transmit and receive RAM
12	Descriptor List Address and Interrupt Test	• Q-Bus to QTDC interface
13	Buffer Address and Interrupt Test	• Q-Bus to QTDC interface
14	DMA Timing Test	• Internal extended loopback and transmit status
15	Long Packet Test	• Receive status
16	Odd Packet Test	• CSR bit 04, CSR bit 05, and transmit descriptor bits
17	Station Address Test	• Address filter circuitry
18	All Multicast Station Test	• All multicast addressing • 8051 microprocessor • Address filter circuitry
19	Runt Packet Test	• EPP • Address filter circuitry
20	FIFO Overflow Test	• Receive status word 1, bit 14 (Error), bit 12 (Discard), bit 00 (Overflow), and EDLC byte FIFO
21	Sanity Timer Test	• Sanity timer logic

Operation – Tests are executed under the supervision of the XXDP/DRS. ZQNA specific prompts and responses can be divided into three categories.

- Start-up procedure (XXDP+)
- Hardware questions
- Software questions

Start-Up Procedure (XXDP+) –

- Boot XXDP+
- Give the date
- Type: R NAME (where NAME is the name of the program's BIN file)
- Type: START
- Type: Y (yes) in response to the CHANGE HW prompt
- Answer all hardware questions
- Type: Y (yes) in response to CHANGE SW prompt
- Answer all software questions

This procedure uses only the defaults for flags and software parameters.

Hardware Questions – When a diagnostic is started, the DRS begins a dialog with the operator and requests hardware information with the prompt.

CHANGE HW (L) ?	Y (yes) is the correct response after a START command, unless hardware information has been preloaded using the Set-Up Utility (see *XXDP+ User's Manual*). When a Y response is received, the DRS requests the number of units.

The DRS then requests the following information for each unit.

# OF DEVICES (D)?	The response is the number of units to be tested (no default). This response determines the number of times the following information is requested. One device must be specified.
DEQNA I/O PAGE ADR (O) 174440 ?	The response is the address of the I/O page register assigned for one of the DEQNA devices. The legal I/O page addresses are 174440 and 174460.
INTERRUPT VECTOR ADR (O) 700?	The response is the DEQNA interrupt vector address. The interrupt vector address is 700 (octal) for the DEQNA controller at I/O page address 174440, and 704 (octal) for the DEQNA controller at I/O page address 174460.

Software Questions – After the hardware questions are answered, or following a RESTART or CONTINUE command, the DRS sets up a dialog with the operator and requests software parameters. These parameters govern some diagnostic-specific operation modes. The prompt is:

CHANGE SW (L) ?	The response is Y (yes) to change any parameter.

Three software questions follow. The *first* question is:

DO YOU WANT TO TEST SANITY TIMER (L)

If the response is Y (yes), the DRS displays two additional prompts:

- IS SANITY TIMER JUMPER ENABLED/CUT (L) ?

  The response is Y (yes) if the sanity timer jumper is removed; otherwise, remove the jumper and then type Y.

- SANITY TIMER TIMEOUT VALUE (O) ?

  The response is a numerical time-out value (between 0 and 7) that represents the time-out period (refer to Table 10).

The *second* question is:

EXECUTE TESTS IN INTERNAL/EXTENDED LOOPBACK MODE (L) ?

Y (yes) response causes test to execute in internal extended loopback modes. N (no) response causes the test to execute in internal and external loop-back modes.

The *third* question is:

SYSTEM HAS BLOCK-MODE MEMORY (L) ?

The response is Y (yes) if the system has a block-mode memory, and N (no) if it has a nonblock-mode memory.

Table 10 Sanity Timer Time-Out Values

Time-Out Value	Time-Out Period
0	1/4 second
1	1 second
2	4 seconds
3	16 seconds
4	1 minute
5	4 minutes
6	16 minutes
7	64 minutes

Error Reporting – A diagnostic can issue general and specific types of error messages.

General error messages are always printed unless the IBE and/or IER flag is set, and have the format shown in Figure 5.

```
NAME        ER_TYPE     ER_NO     UNIT_NO     TEST_NO     PC_ADDR

NAME       = DIAGNOSTIC NAME
ER_TYPE    = ERROR TYPE (ALL ERRORS ARE HARD ERRORS)
ER_NO      = ERROR NUMBER
UNIT_NO    = 0
TEST_NO    = TEST AND SUBTEST WHERE ERROR OCCURRED
PC_ADDR    = PROGRAM COUNTER CONTENTS
```

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Figure 5 General Error Message Format

General error messages may include two sublevels: basic error messages and extended error messages.

Basic Error Messages

- Printed after the associated general error message.
- Contain some additional information about the error.
- Always printed unless one or more DRS error flags (IBE, IXE, IER) are set.

Extended Error Messages

- Printed after the associated general error message and any associated basic error message.
- Contain some additional error information, such as register contents or good/bad data.
- Always printed unless either the IXE or IER flag (or both) is set.

The format of a typical extended error message is shown in Figure 6.

```
TRANSMIT DESCRIPTOR LIST        RECEIVE DESCRIPTOR LIST

FLAG WORD                       FLAG WORD
LOW-ORDER ADDRESS BITS          LOW-ORDER ADDRESS BITS
HIGH-ORDER ADDRESS BITS         HIGH-ORDER ADDRESS BITS
PACKET LENGTH (BYTE)            PACKET LENGTH (BYTE)
STATUS WORD 1                   STATUS WORD 1
STATUS WORD 2                   STATUS WORD 2
```

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Figure 6 Typical Extended Error Message Format

DEQNA DIAGNOSTICS

Specific error messages are defined as needed. The following are examples of possible error messages.

Device fatal error messages:

CSR REGISTER FAILED TO RESPOND
NO INTERRUPT FROM DEQNA

Return status messages:

TRANSMIT STATUS ERROR
RECEIVE STATUS ERROR
CSR STATUS ERROR

DEQNA DEC/X11 Exerciser (XQNA)
The DEQNA DEC/X11 Exerciser (DEQNA DEC/X11 Module) exercises one DEQNA controller at maximum activity rates in order to provoke:

- Noise
- Timing
- Logical interaction failures

The DEQNA DEC/X11 Exerciser transmits and receives random length packets (using 18- or 22-bit physical address space). The DEQNA controller transmits and receives the same packet.

One pass of the exerciser consists of:

- 1000 iterations of transmitting a packet.
- 1000 iterations of receiving a packet.
- Comparing the contents of the transmit packet to the receive packet.

In addition:

- Packet length is random for each iteration.
- Transmit status words are checked for correct contents.
- Receive status words are checked for correct contents.
- CSR status is checked for correct contents.

The DEQNA controller is dropped from further testing if one of the following occurs:

- The DEQNA controller does not reset properly.
- The CSR and/or the receive and/or transmit status word(s) are in error.
- A hard error occurs.
- A transmit and/or receive interrupt is not generated.
- The transceiver is disconnected while in external loopback mode.

Internal extended loopback mode is the default mode of operation.

Configuration and Set-Up – Both the DEQNA Citizenship test and the Field Functional test must have run successfully before running the DEQNA DEC/X11 Exerciser. The default parameters are:

Device address: 174440
Interrupt Vector: 700
BR level: 5
Number of devices: 1

The holdoff jumper (W2) must be removed and the sanity jumper (W3) must be in place (both jumpers as shipped).

To run the DEQNA DEC/X11 Exerciser in external loopback, the DEQNA controller under test must be connected to the transceiver, or the external loopback connector must be connected.

Software register 1 (SW1) bit 0 and 1 options are described in Table 11.

Table 11 DEQNA DEC/X11 Exerciser Software Register Bits

Bit Position 1	0	Description
X	0	Exerciser runs in internal extended loopback mode (default). Transceiver is not needed.
X	1	Exerciser runs in external loopback mode. Transceiver or external loopback connector is required.
0	X	Print error messages.
1	X	Do not print error messages.

NOTE
X indicates that the bit can be either a 1 or a 0.

Commands – To set external loopback mode, type:

MOD QNAA0 16<RETURN>
1<RETURN>

To test a DEQNA controller in the second slot (address 174460) after the exerciser has been loaded, type:

MOD QNAA0 6<RETURN>
174460<LINE FEED>
704<RETURN>

For additional information refer to the *DEC/X11 User's Manual*, AC-F053C-MC.

Error Messages – Error messages print the contents of the DEQNA descriptor lists in the order shown in Figure 7.

NOTE
Transmit and receive descriptor lists are not printed with a DEQNA WILL NOT RESET error message.

```
DEQNA - "ERROR MESSAGE"

TRANSMIT DESCRIPTOR LIST          RECEIVE DESCRIPTOR LIST

FLAG WORD                         FLAG WORD
LOW-ORDER ADDRESS BITS            LOW-ORDER ADDRESS BITS
HIGH-ORDER ADDRESS BITS           HIGH-ORDER ADDRESS BITS
PACKET LENGTH                     PACKET LENGTH
STATUS WORD 1                     STATUS WORD 1
STATUS WORD 2                     STATUS WORD 2

DEQNA CSR REGISTER
DEQNA I/O PAGE ADDRESS

"ERROR MESSAGE" IS ONE OF THE FOLLOWING:

DEQNA WILL NOT RESET
DEQNA - BAD DEQNA STATUS
DEQNA - BAD RECEIVE STATUS
DEQNA - BAD TRANSMIT STATUS
DEQNA - XMIT PACKET LENGTH NOT = RCV PACKET LENGTH
DEQNA - ATTEMPT TO ACCESS NONEXISTENT MEMORY LOC
```

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Figure 7 DEQNA DEC/X11 Exerciser Error Message Format

DEQNA MAINTENANCE AIDS

Field Replaceable Units (FRUs)

Corrective maintenance is performed by FRU replacement. The following are the FRUs for the DEQNA controller.

1. M7504 module
2. Bulkhead cable assembly
3. Bulkhead fuse
4. Ampere filter (if used)

NOTE

When the module is replaced, the user may be able to retain the original Ethernet address by swapping the station address PROM from the replaced module to the new module, and verifying with diagnostics that the original station address PROM works in the new module.

Corrective Maintenance

Replace the failed FRU as indicated by the error code returned by the Citizenship test in RO or the error indicated by the Field Functional test.

Troubleshooting
The following flow diagram (Figure 8) provides a typical troubleshooting sequence.

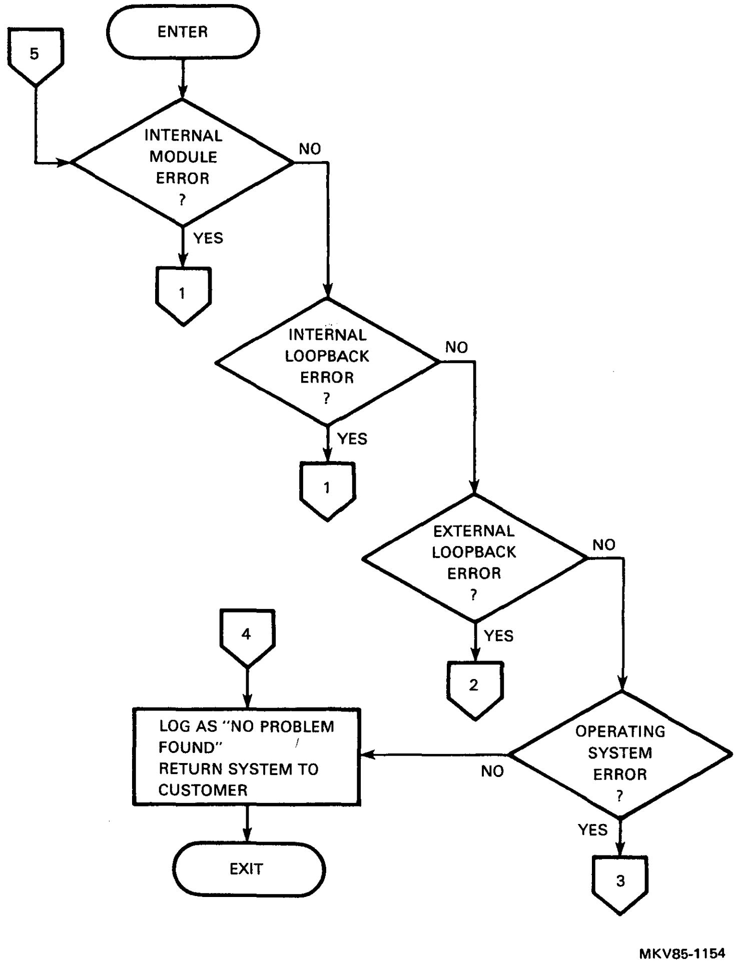

Figure 8 Troubleshooting Flow Diagram (Sheet 1 of 4)

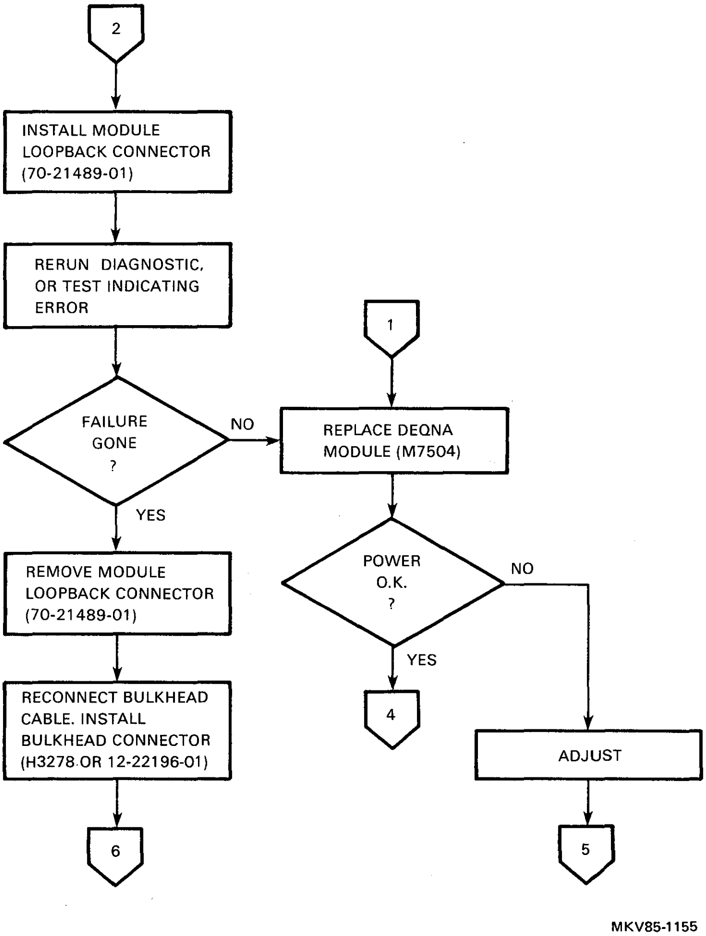

Figure 8 Troubleshooting Flow Diagram (Sheet 2 of 4)

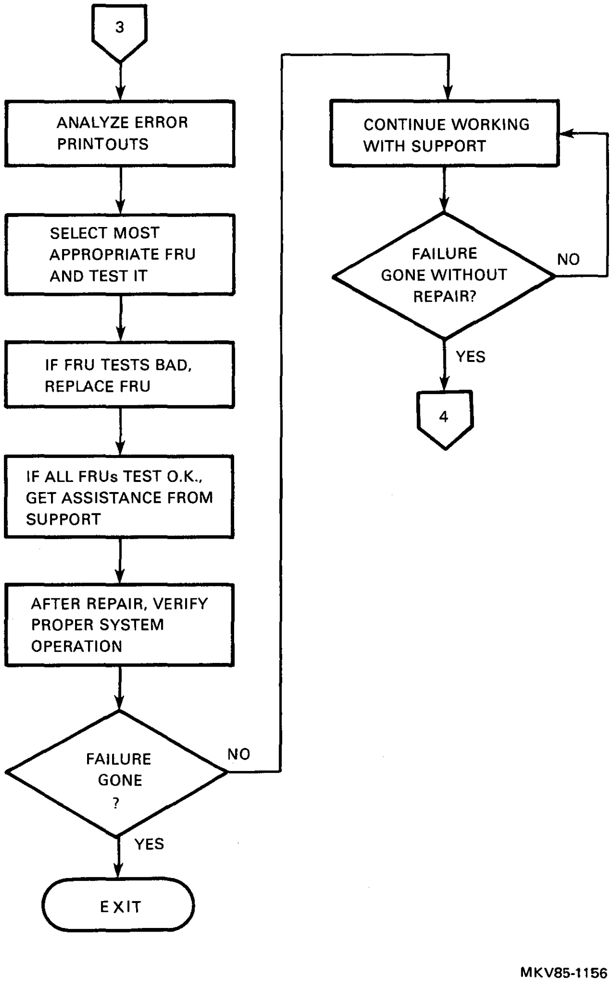

Figure 8 Troubleshooting Flow Diagram (Sheet 3 of 4)

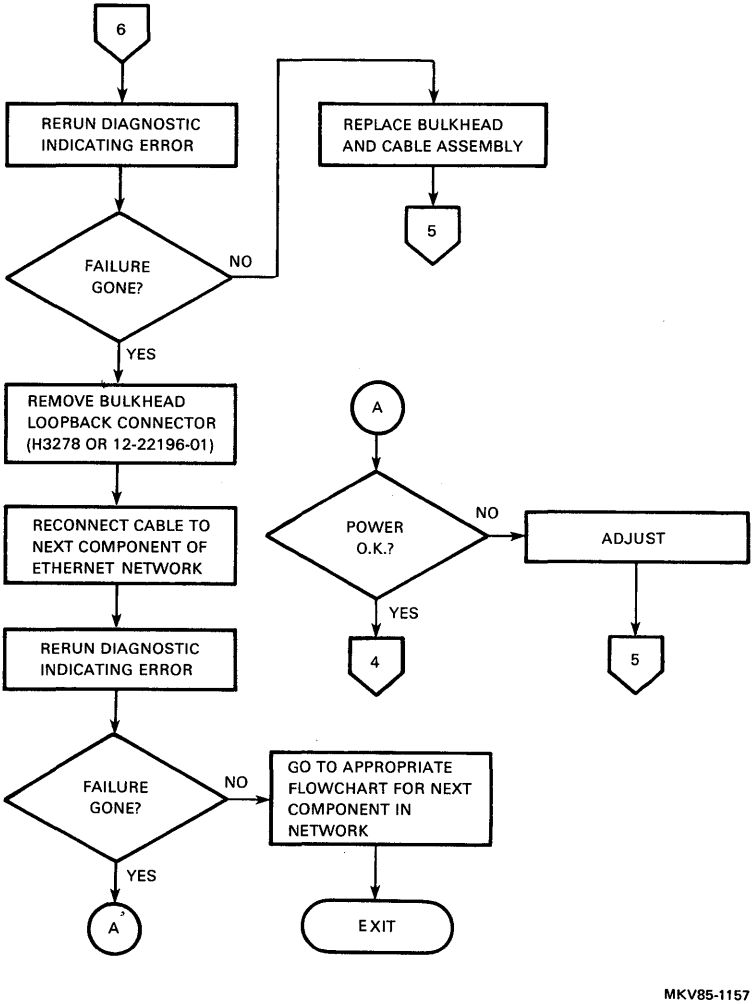

Figure 8 Troubleshooting Flow Diagram (Sheet 4 of 4)

DEQNA Tech Tips/FCO Index

The following table lists Tech Tips and FCOs that pertain to the DEQNA Q-bus data communications controller.

Table 12 DEQNA Tech Tips/FCO Index

Tech Tip No.	Title	Speed Bulletin
TT2A	DEQNA Compatibility	420

DEREP ETHERNET REPEATER

General Description

The Ethernet repeater (hereafter referred to as the repeater):

- Provides a means of extending Ethernet networks beyond the 500 m (1640 ft) limit of a single Ethernet coaxial cable segment.
- Consists of a single unit containing logic module and power supply.
- Resides between two Ethernet cable segments and is connected to each of them via a transceiver cable and Ethernet transceiver.
- Transmits Ethernet signals from one cable segment to another while maintaining synchronization across the network.

DEREP Versions

- DEREP-AA – Local repeater links segments separated by not more than 100 m (328 ft) using two transceiver cables up to 50 m (164 ft) in length.
  - Includes a single repeater box containing a logic module and power supply.
- DEREP-RC/RD – Remote repeater links segments separated by not more than 1100 m (3609 ft) using a fiber-optic link up to 1000 m (3281 ft) in length and two transceiver cables up to 50 m (164 ft) in length.
- DEREP-RH/RJ – Remote repeater links segments separated by not more than 1100 m (3609 ft) using a fiber-optic link up to 1000 m (3281 ft) in length and two transceiver cables up to 50 m (164 ft) in length.

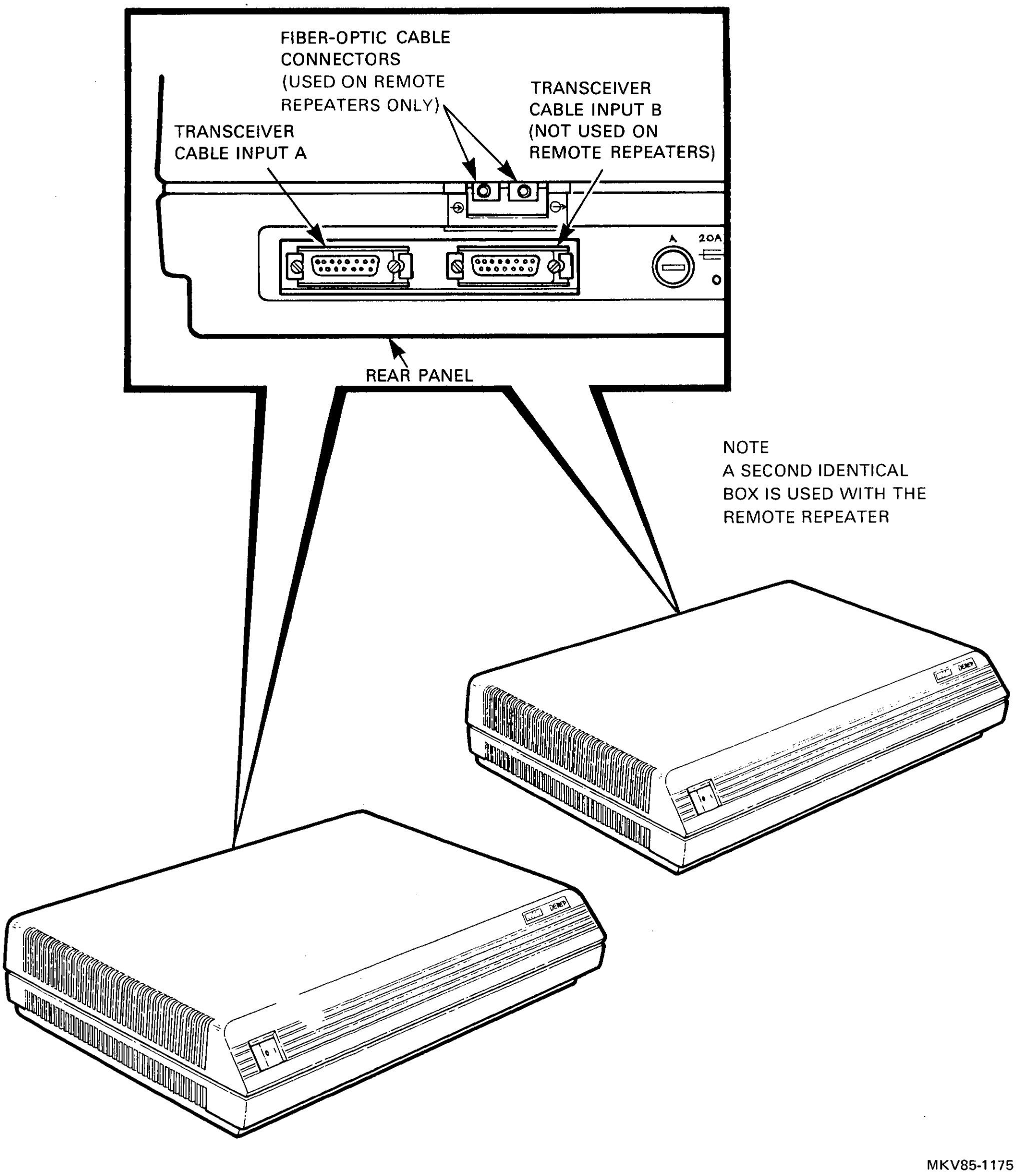

Figure 1 Ethernet Repeater

DEREP Configuration Considerations

- Both local and remote repeaters attach to the Ethernet cable through an H4000 transceiver or equivalent.
- The repeater is never used to connect to a Broadband Ethernet configuration.
- The repeater is never connected to a DELNI unit in any mode. Repeaters and DELNI units can be connected to the same cable through H4000 transceivers (refer to Figure 2).
- When configuring local and remote repeaters, up to 100 repeaters may be in a system configuration. The following rules apply (refer to Figure 3):
  - All repeaters have one side (port) attaching to the same coaxial cable segment. This segment is often referred to as the central or backbone segment. Up to 100 repeaters can be attached to this segment.
  - A local repeater is made up of two transceiver cables, each connected to an H4000 transceiver, and then to two separate Ethernet cable segments. Either of these transceiver cables can be up to 50 m (164 ft) in length.
  - Remote repeaters consist of two units. Each unit attaches to the appropriate cable segment via a transceiver cable [up to 50 m (164 ft) in length] and an H4000 transceiver. A fiber-optic cable up to 1000 m (3281 ft) in length connects the two units together.
  - If a single remote repeater is used, the maximum length of fiber-optic cable that can be used is 1000 m (3281 ft).
  - If multiple remote repeaters are used, the maximum aggregate length of fiber-optic cable in any station-to-station path is 1000 m (3281 ft).

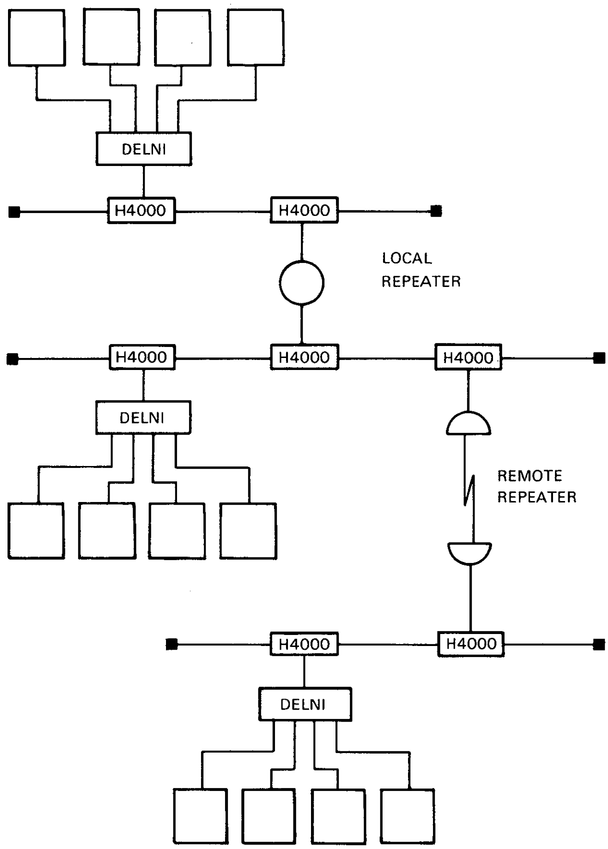

Figure 2 DEREP Example Configurations

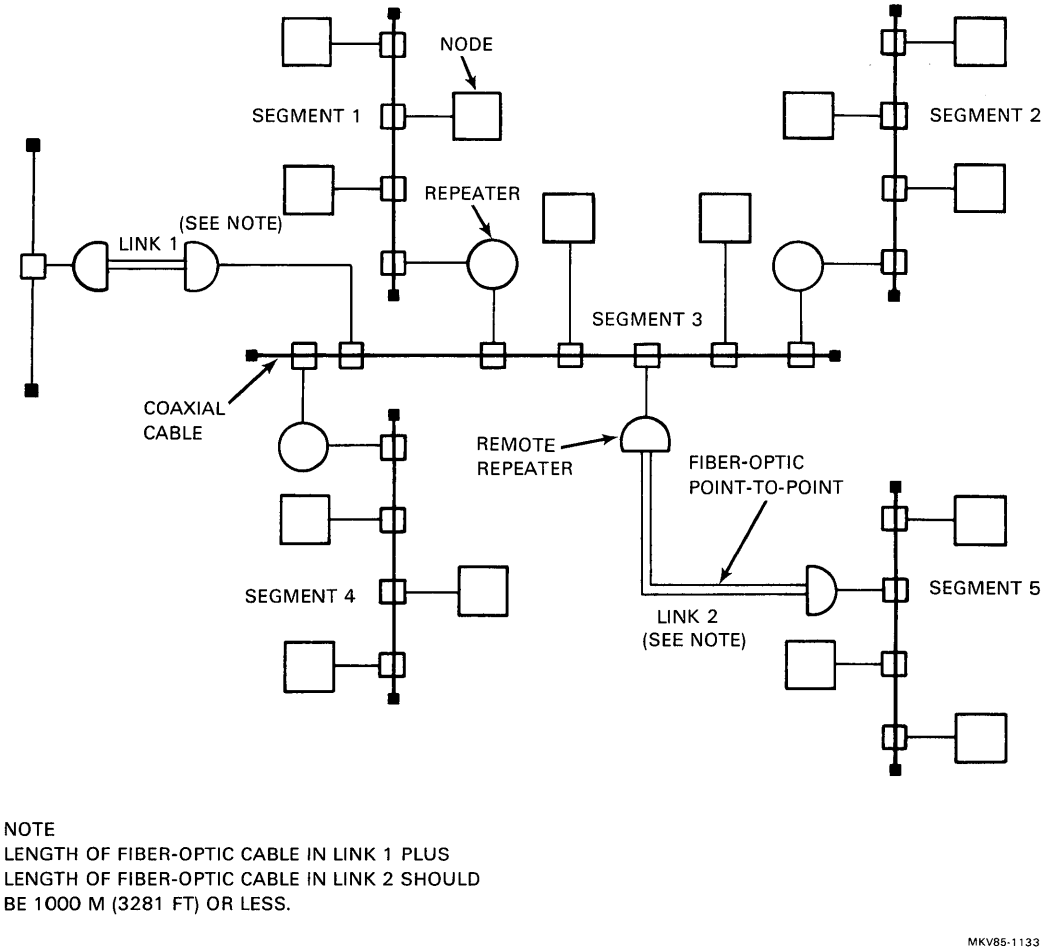

Figure 3 Typical Repeater Installation

DEREP INSTALLATION

DEREP Components

The following parts are supplied with each repeater.

Table 1 DEREP Components

Model	Owner's Manual	Power Cord	Country Kit
DEREP-AA	X	X	
DEREP-AB			X
DEREP-RC	X	X	
DEREP-RD			X
DEREP-RH	X	X	
DEREP-RJ	X	X	X

Country Kits

The non-U.S. versions of both the local and remote repeaters require country kits (U.S. versions do not require a country kit). Each kit contains installation instructions and a power cord. Non-U.S. local repeaters require one country kit, and non-U.S. remote repeaters require two. For cases where the country in which the repeater is to be used is not listed, select a country kit that uses the same plug configuration. Table 2 lists the DEREP kits and ordering codes.

Table 2 Ethernet Repeaters and Country Kit Order Codes

Option	Order Code
Local Repeaters	
U.S.	DEREP-AA
Non-U.S.	DEREP-AB
Remote Repeaters	
U.S.	DEREP-RC, DEREP-RH
Non-U.S.	DEREP-RD, DEREP-RJ
Local Repeater Country Kits	
Australia	DEREK-AZ
Belgium	DEREK-AB
Canada (English)	DEREK-AQ
Canada (French)	DEREK-AC
Denmark	DEREK-AD
Finland	DEREK-AF
France	DEREK-AP
Germany	DEREK-AG
Holland	DEREK-AH

Table 2 Ethernet Repeaters and Country Kit Order Codes (Cont)

Option	Order Code
Italy	DEREK-AI
Norway	DEREK-AN
Spain	DEREK-AS
Sweden	DEREK-AM
Switzerland (German)	DEREK-AL
Switzerland (French)	DEREK-AK
United Kingdom	DEREK-AE
United States	None Required
Remote Repeater Country Kits	
Australia	DEREK-RZ
Belgium	DEREK-RB
Canada (English)	DEREK-RQ
Canada (French)	DEREK-RC
Denmark	DEREK-RD
Finland	DEREK-RF
France	DEREK-RP
Germany	DEREK-RG
Holland	DEREK-RH
Italy	DEREK-RI
Norway	DEREK-RN
Spain	DEREK-RS
Sweden	DEREK-RM
Switzerland (German)	DEREK-RL
Switzerland (French)	DEREK-RK
United Kingdom	DEREK-RE
United States	None Required

Reference Documentation

Title	Document Number
DEREP Ethernet Repeater Technical Manual	EK-DEREP-TM
DEREP-AA Local Ethernet Repeater Installation/Owner's Manual	EK-DEREP-IN
DEREP-RA Remote Ethernet Repeater Installation/Owner's Manual	EK-DERRP-IN
DEREP Field Maintenance Print Set	MP-01810-01
Fiber Optic Attenuator Installation/Configuration Reference Card	EK-DEFOE-RC

Local and Remote Device Placement (Figures 4 and 5)

- Make sure the necessary cables reach the repeater without being strained.
- Place the repeater within 1.83 m (6 ft) of the electrical outlet.

NOTE
Place non-U.S. versions within 2.5 m (7.61 ft).

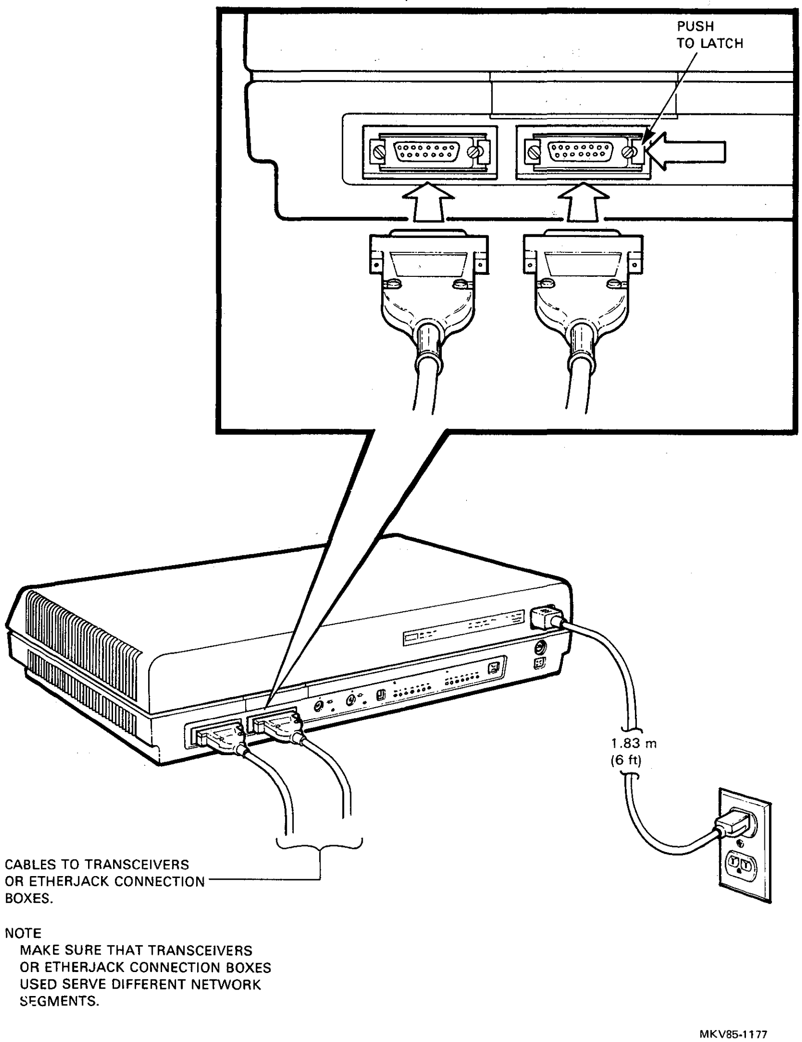

Figure 4 Typical Local Repeater Cabling

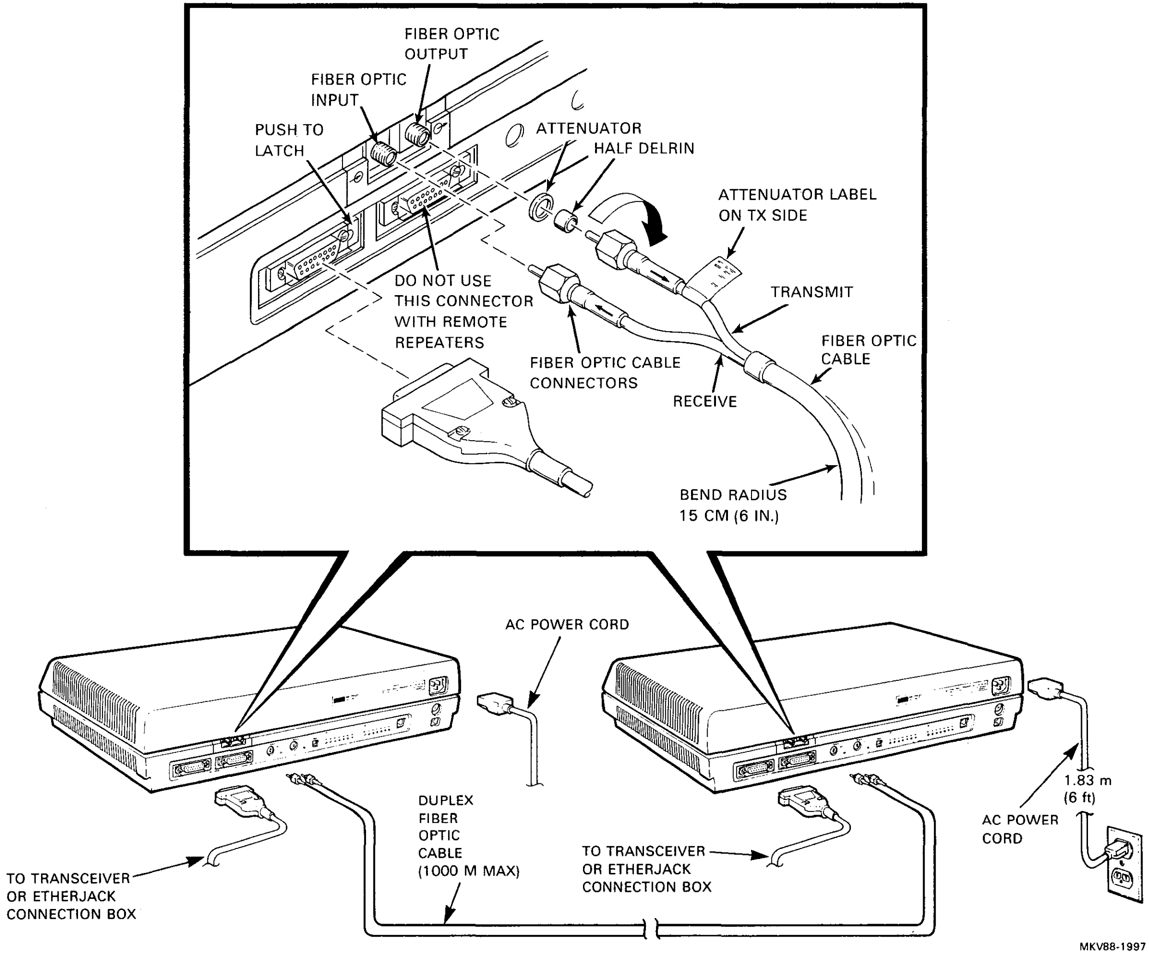

Figure 5 Typical Remote Repeater Cabling

DEREP INSTALLATION

Power Requirements

Local Repeater

- 115 Vac @ 1 A (50/60 Hz)
- 230 Vac @ 0.5 A (50/60 Hz)

Remote Repeater (each standalone package)

- 115 Vac @ 2.5 A (50/60 Hz)
- 230 Vac @ 1.25 Vac (50/60 Hz)

Preinstallation Steps

1. Position the repeater on a desk, shelf, or table top.
2. Verify access to ac power.
3. Determine which transceiver cables or which Ethernet connectors will be used.
4. Ensure that all cables can be connected without straining the cables.
5. Ensure that the total cable length between the repeater and either transceiver does not exceed 50 m (164 ft).
6. Ensure that the network being configured with the repeater follows Ethernet configuration guidelines.
7. For remote installations, a duplex fiber-optic cable must be installed. The cable should be tested via the fiber-optic link certification procedure. This procedure is found in Appendix B of the *DEBET Technical Manual* (EK-DEBET-TM), *DECconnect Facilities Cabling Guide* (EK-DECSY-FC), and shipped with new and upgraded FOTEC kits. The cable ends must be properly marked, identifying transmit and receive cable ends.
8. Allow a minimum of 10.16 cm (4 in) clearance per side to ensure proper ventilation and to prevent damage to any cables attached to the rear panel of the repeater.
9. Avoid locating the repeater in areas such as cable trenches or on the floor where dust or other material is likely to interfere with proper fan ventilation.

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* FOTEC kits are produced by FOTEC, Inc.

Installation Flow Diagrams

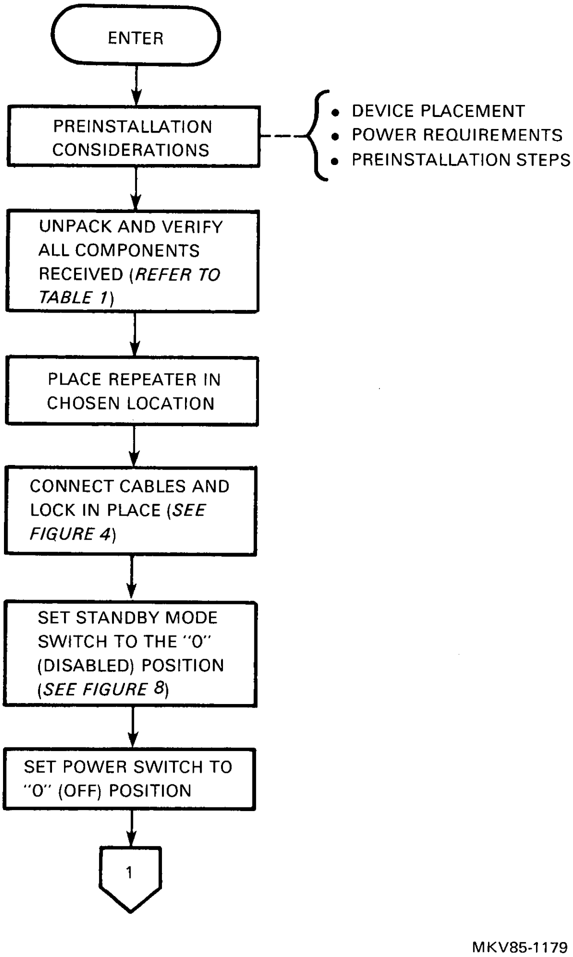


Figure 6 DEREP Installation Flow Diagram – Local Repeater (Sheet 1 of 5)

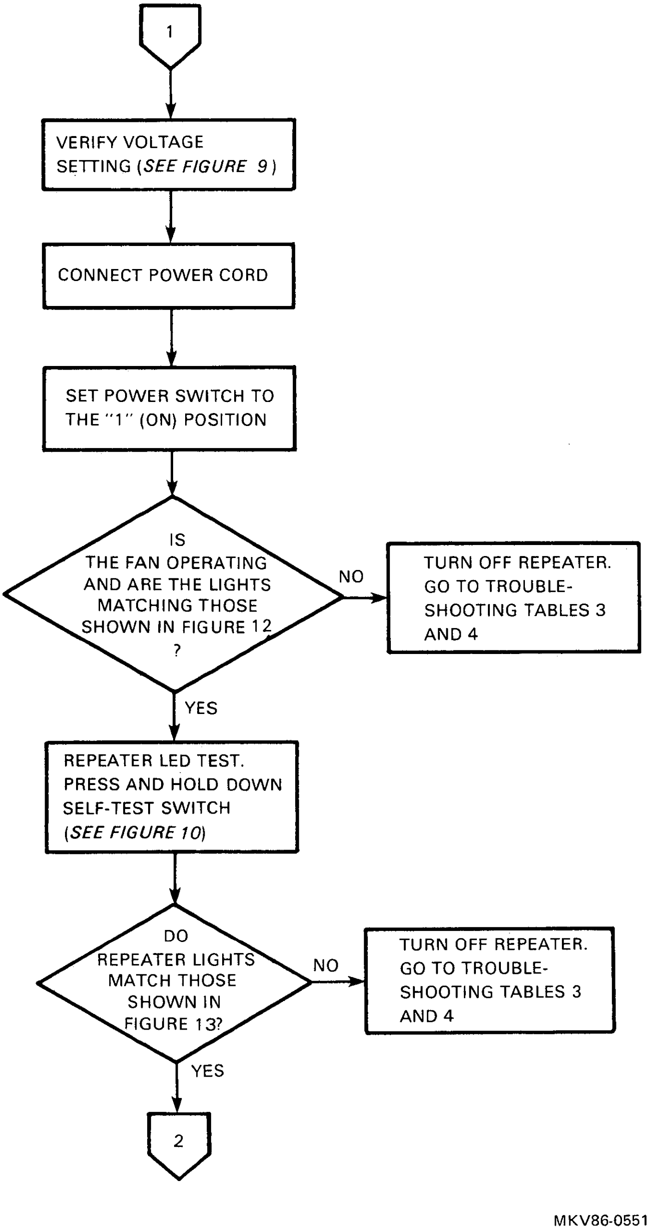


Figure 6 DEREP Installation Flow Diagram – Local Repeater (Sheet 2 of 5)

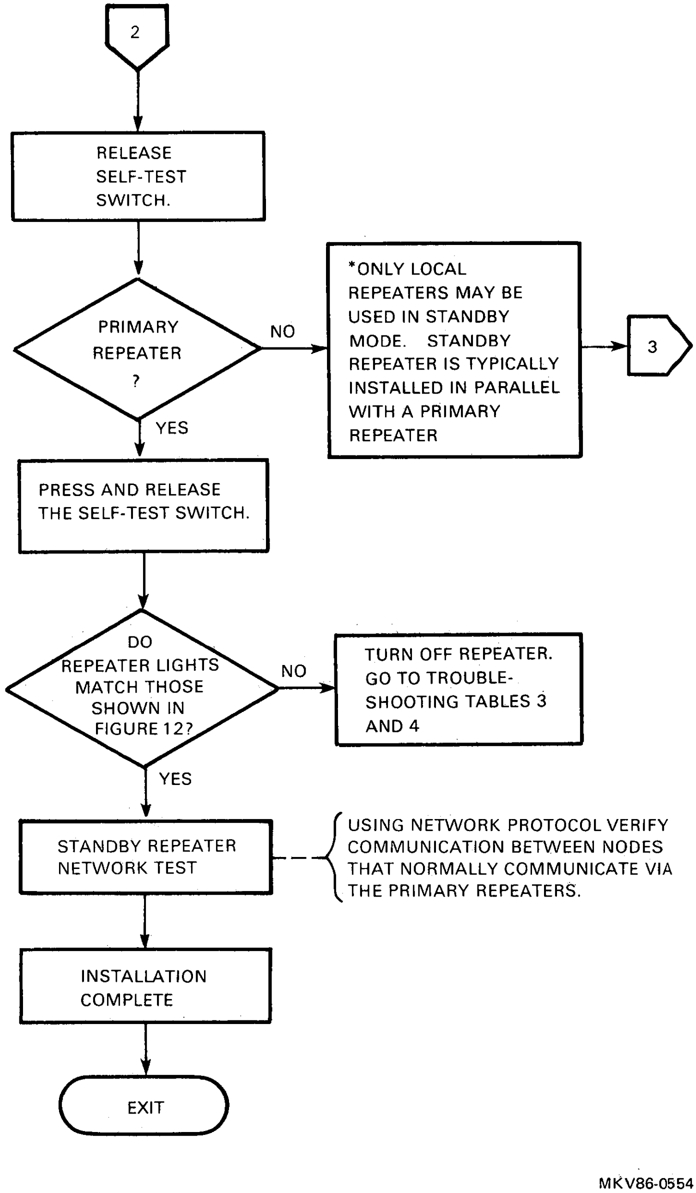


Figure 6 DEREP Installation Flow Diagram – Local Repeater (Sheet 3 of 5)

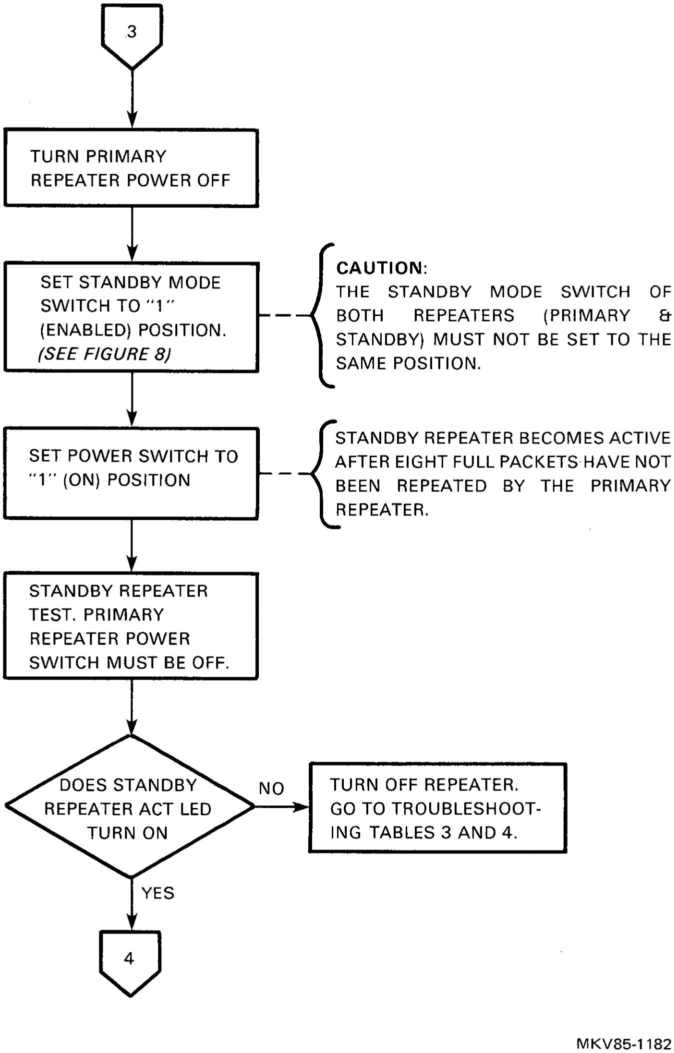


Figure 6 DEREP Installation Flow Diagram – Local Repeater (Sheet 4 of 5)

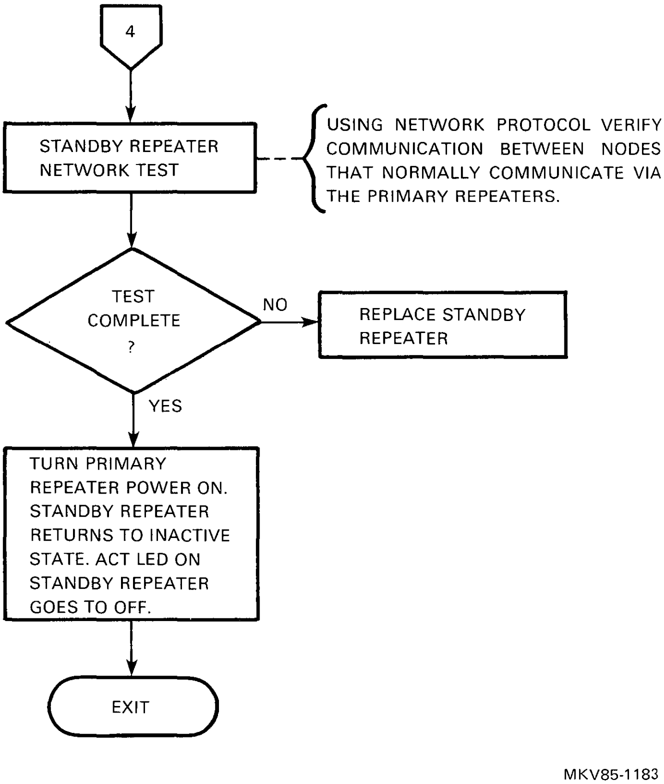


Figure 6 DEREP Installation Flow Diagram – Local Repeater (Sheet 5 of 5)

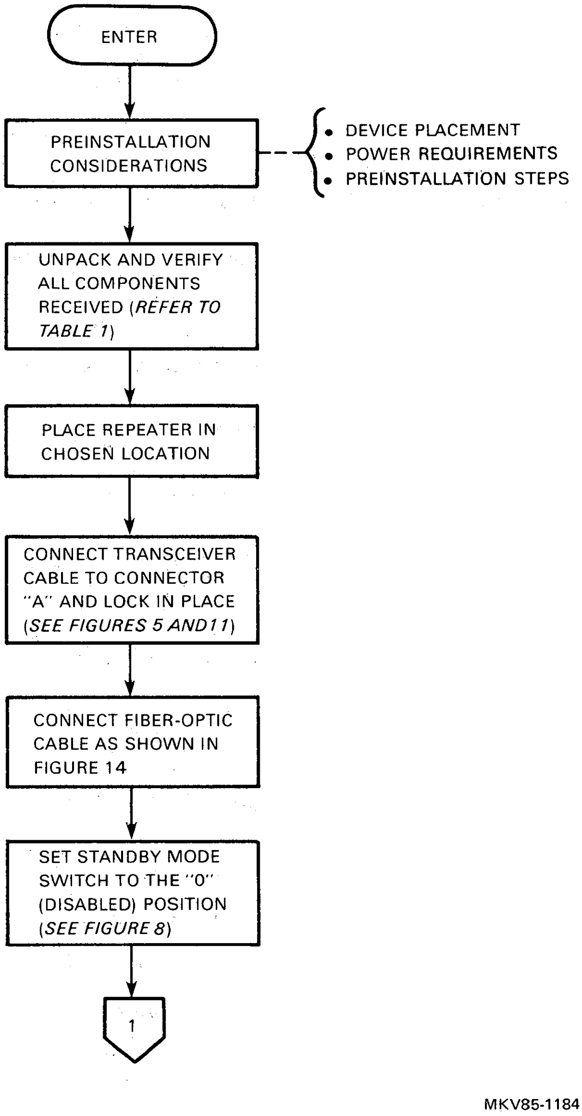


Figure 7 DEREP Installation Flow Diagram – Remote Repeater (Sheet 1 of 4)

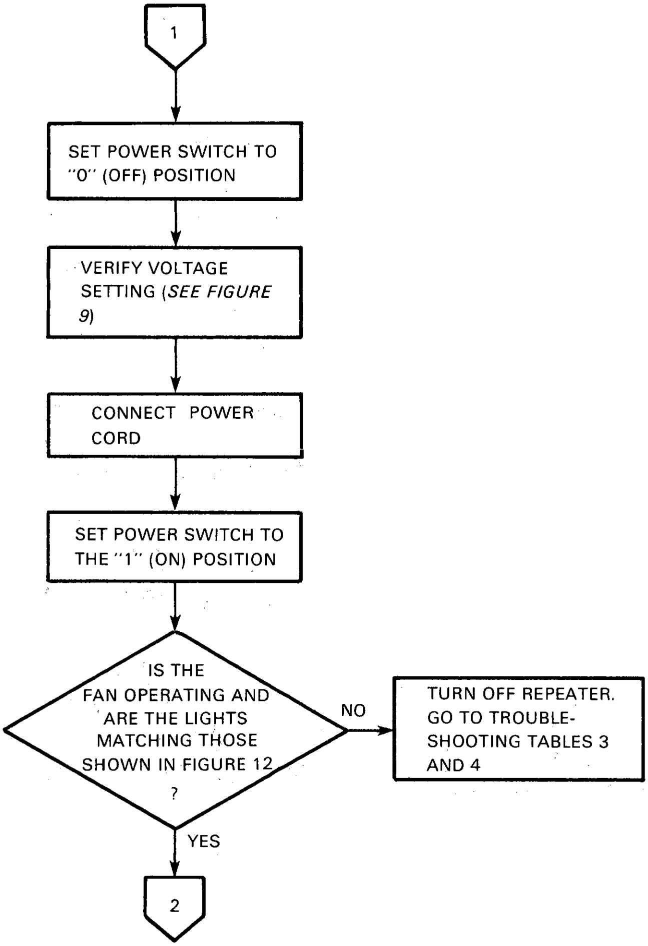


Figure 7 DEREP Installation Flow Diagram – Remote Repeater (Sheet 2 of 4)

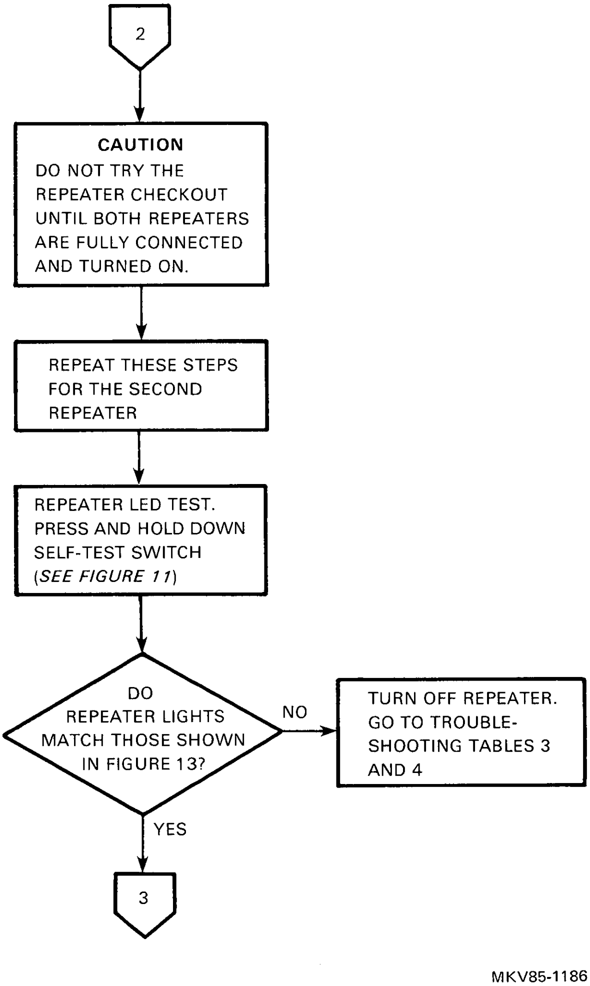


Figure 7 DEREP Installation Flow Diagram – Remote Repeater (Sheet 3 of 4)

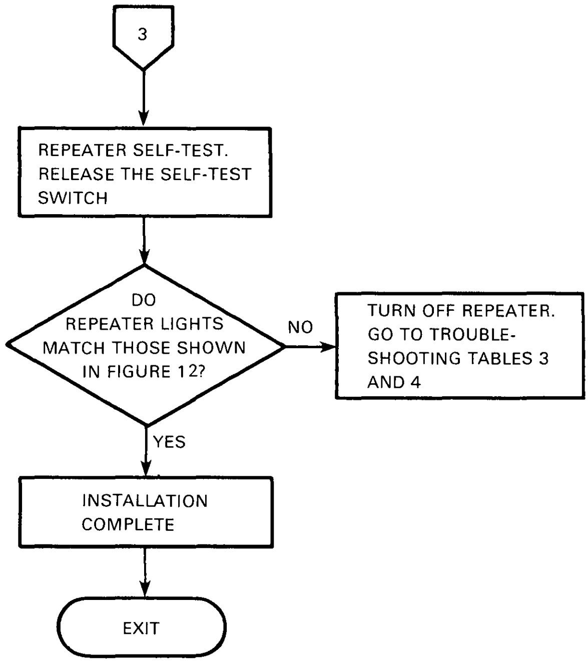


Figure 7 DEREP Installation Flow Diagram – Remote Repeater (Sheet 4 of 4)

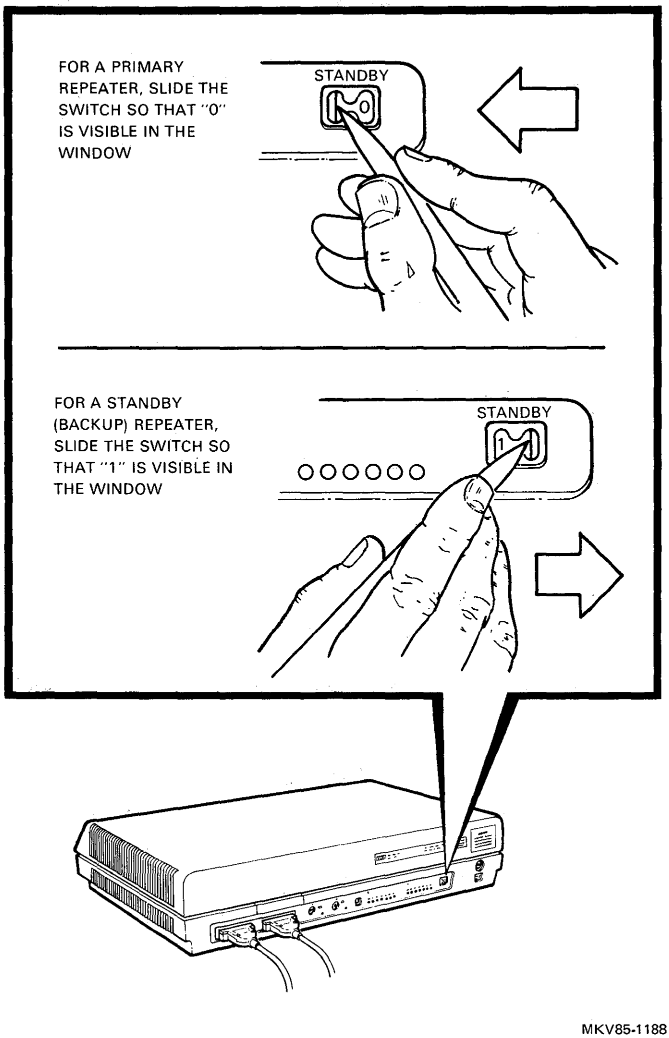


Figure 8 Standby Mode Switch Setting

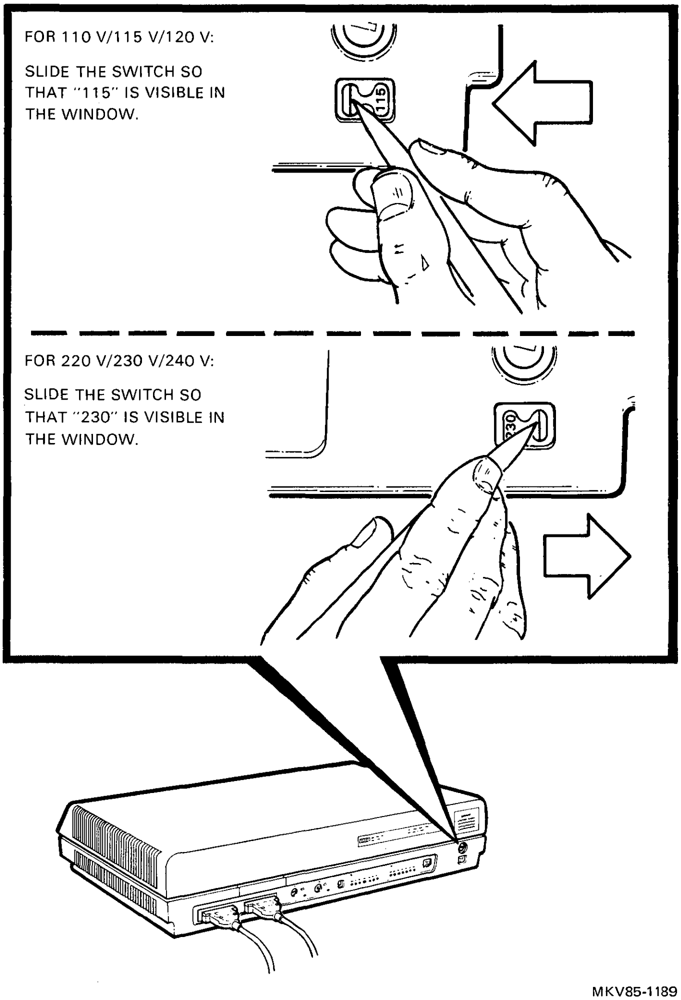


Figure 9 DEREP Voltage Setting

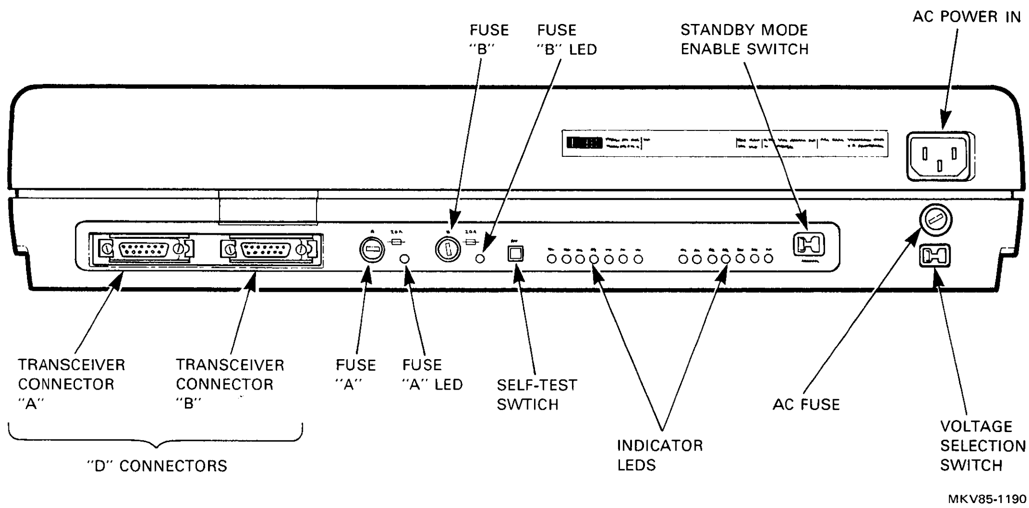


Figure 10 Local Repeater Rear Panel

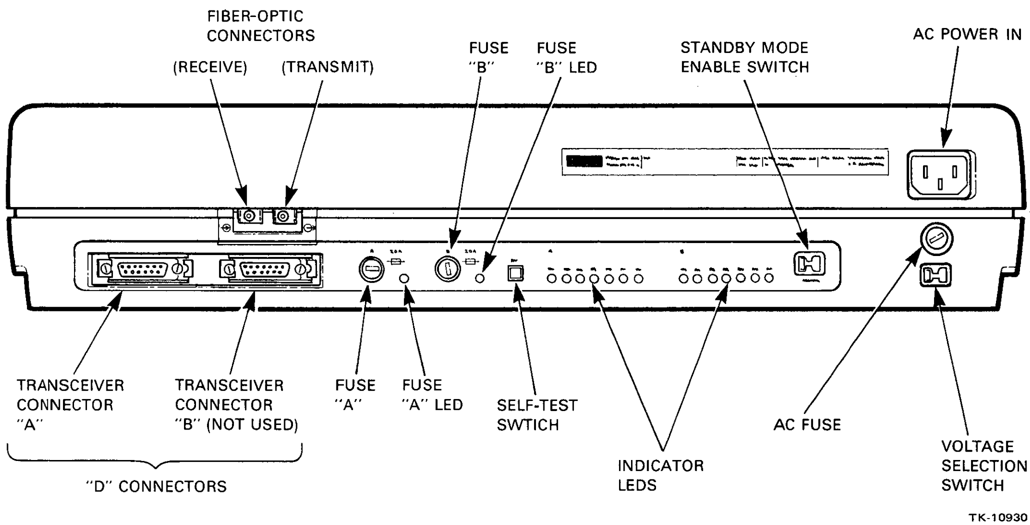


Figure 11 Remote Repeater Rear Panel

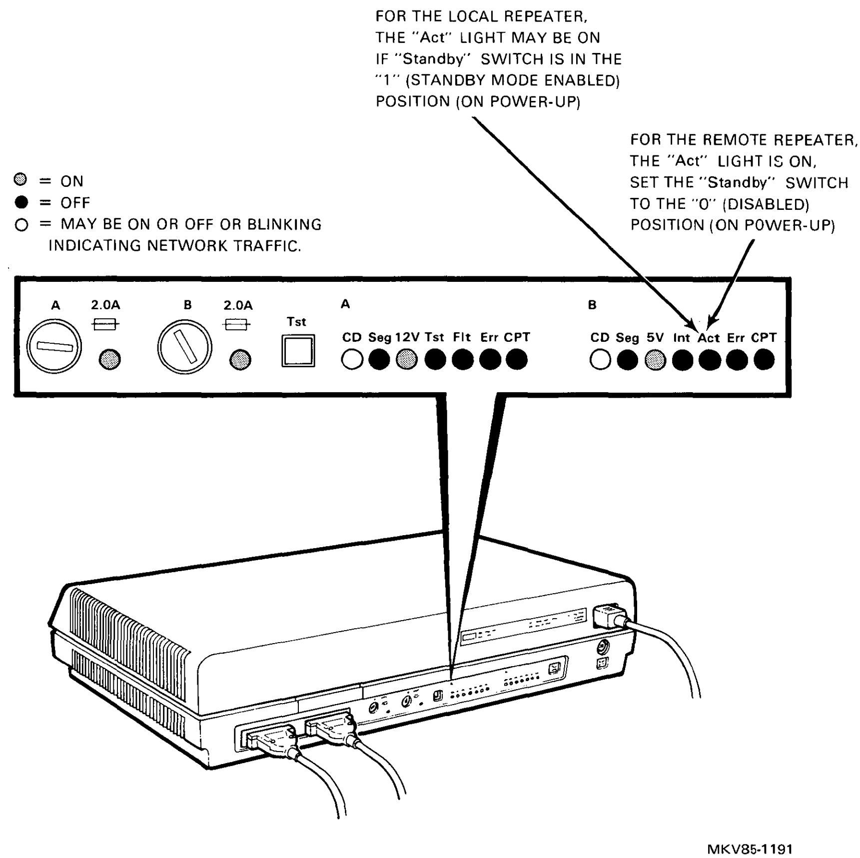


Figure 12 Local/Remote Repeater LEDs on Powerup and Self-Test

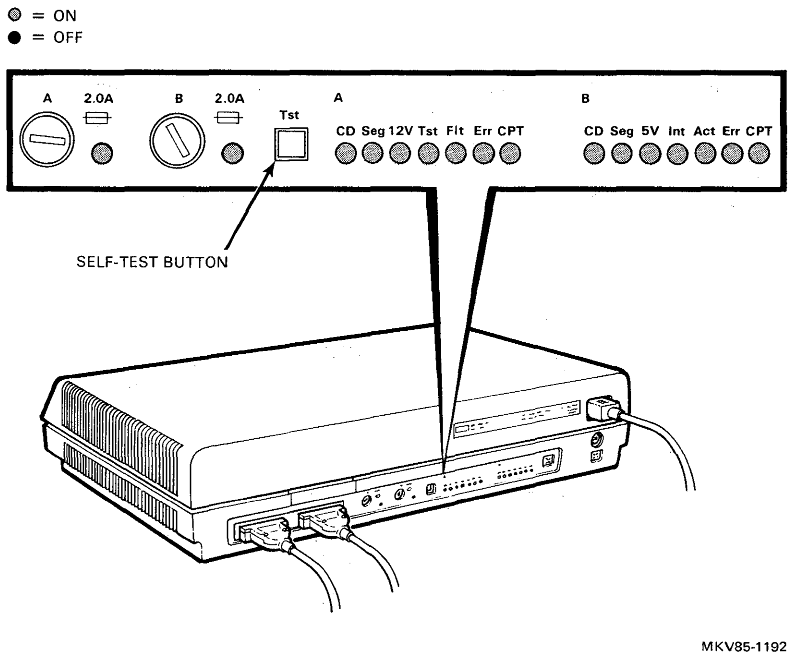


Figure 13 Local and Remote Repeater LED Test

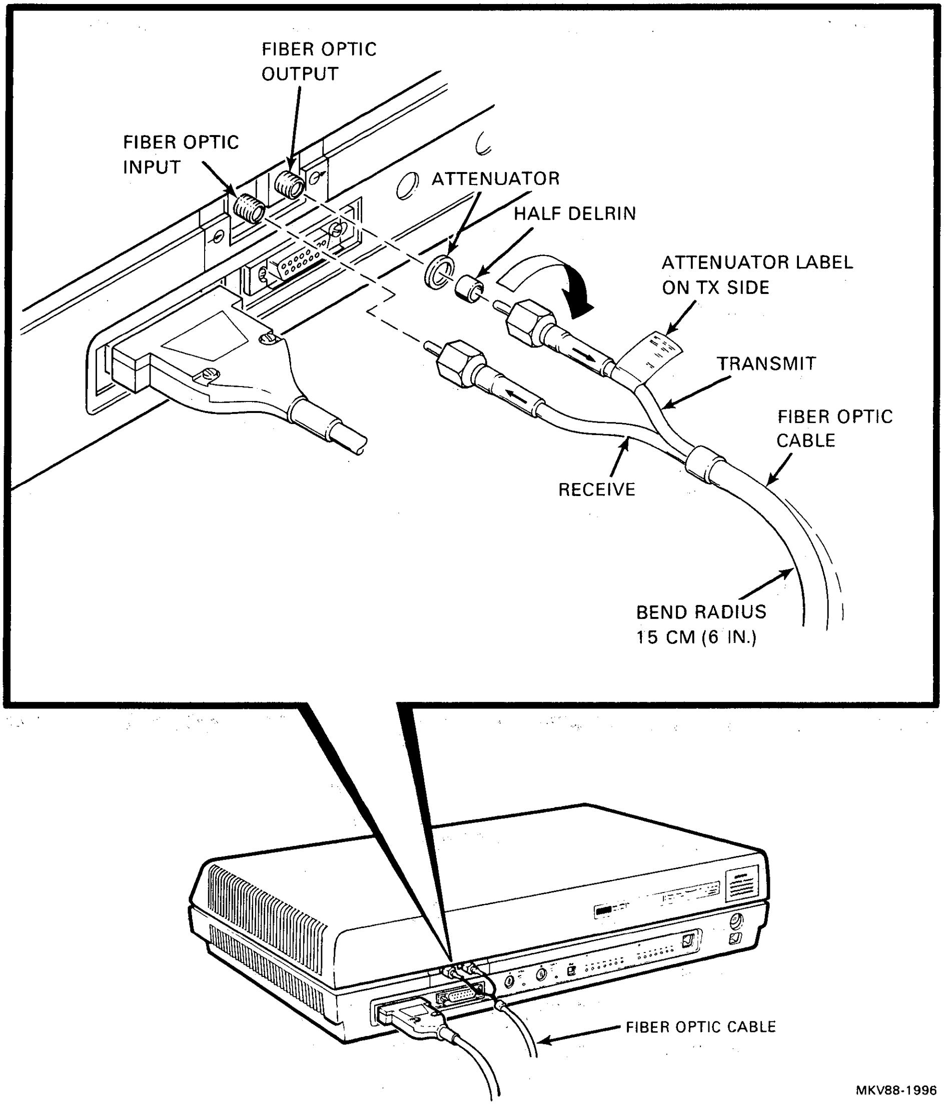


Figure 14 Remote Repeater Fiber-Optic Cable Connections

Fiber-Optic Attenuator

The fiber-optic attenuator (P/N 12-30068-01) is a device that induces a loss of 3 dB in a fiber optic system. The attenuator is designed to be used for 100/140 fiber optic link that is 1000 m (3281 ft) or less.

The attenuator is installed when a DEREP-RH/RJ is connected to another DEREP-RH/RJ or to a DEBET-RH/RJ (Figure 15).

NOTES

If a special condition exists and more budget is required, the attenuator can be removed. This increases the budget by 3 dB.

Do NOT install the attenuator for 100/140 fiber-optic link beyond 1000 m (3281 ft).

Do NOT install the attenuator for 50/125, 62.5/125, and 85/125 fiber-optic links.

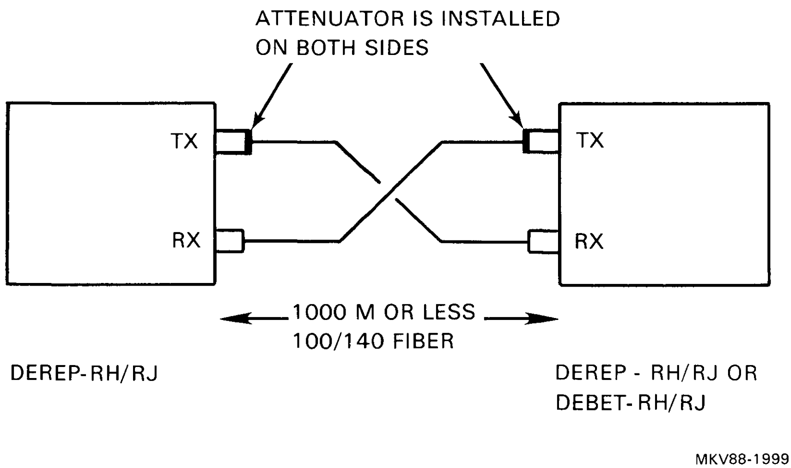


Figure 15 Attenuator Installed on Both Sides

The attenuator is also installed when a DEREP-RH/RJ is connected to a DEREP-RC/RD or to a DEBET-RC/RD (Figure 16).

NOTES

Install the attenuator on one side only by attaching the attenuator to the output (transmit) connector on the DEREP-RH/RJ.

If an older DEREP-RC/RD is being used with a newer DEREP-RH/RJ, the guidelines and budgets of the DEREP-RC/RD must be followed. Refer to the DEREP Hardware Installation/Owner's Guide, (EK-DEREP-UG).

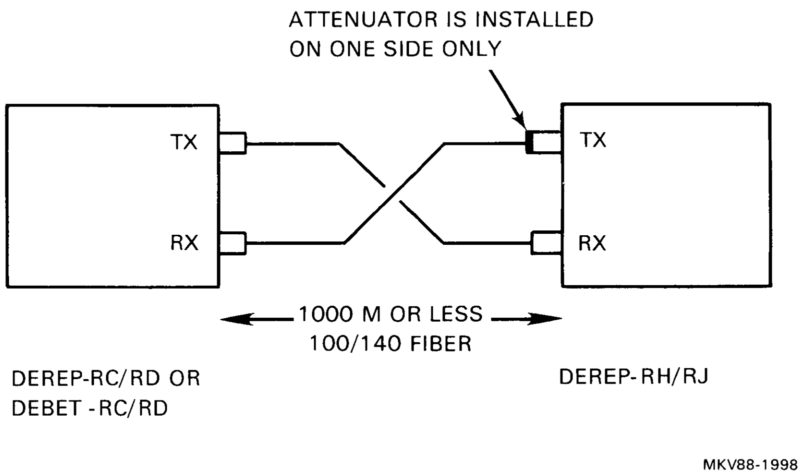


Figure 16 Attenuator Installed on DEBET-RH/RJ Side Only

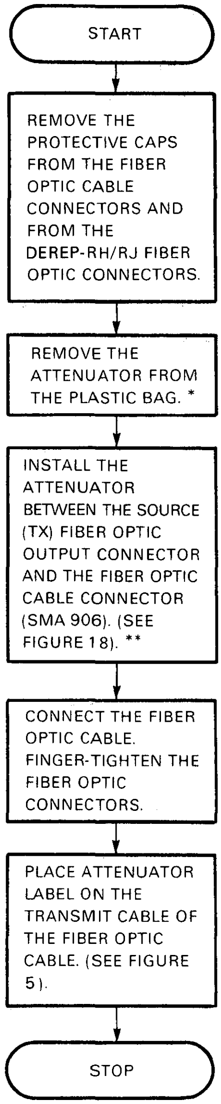
DEREP CABLING

Installation Guidelines

Use the following guidelines and the flowchart in Figure 17 to install the attenuator on the DEREP-RH/RJ.

- Install the attenuator between the fiber-optic cable connector (SMA 906) and the TX connector on the DEREP-RH/RJ unit.
- Install only one attenuator per unit.
- Install attenuators on both TX connectors if both units are DEREP-RH/RJs.
- Label the fiber optic (TX) "3 dB".
- Do NOT install the attenuator into the RX end of the fiber optic cable.
- Do NOT install attenuators on both ends of the same fiber-optic cable.
- Do NOT install the attenuator on a DEREP-RC/RD unit.

DEREP-RH/RJ Attenuator Installation Flowchart



* CAUTION

THE ATTENUATOR MUST BE KEPT FREE OF DIRT AND DUST TO ENSURE PROPER INSTALLATION.

** NOTE

THE ATTENUATOR MAY FALL FROM THE CONNECTOR DURING INSTALLATION. BEFORE SCREWING THE CABLE INTO THE CONNECTOR, ENSURE THAT THE ATTENUATOR IS STILL IN PLACE.

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Figure 17 DEREP-RH/RJ Attenuator Installation Flowchart

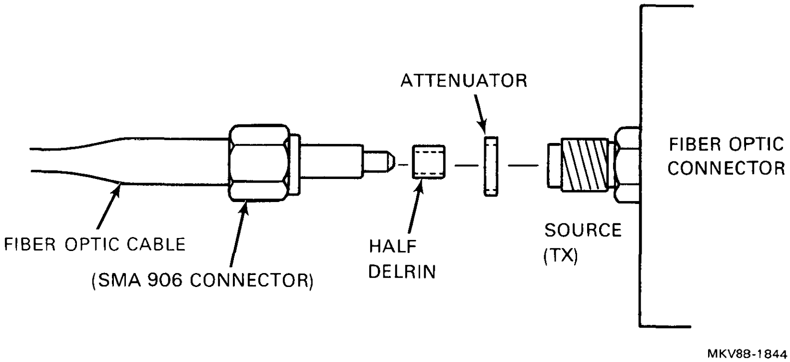


Figure 18 Installing the Attenuator

Diagnostics
There are no diagnostics designed specifically for the repeater. The repeater self-test performs DEREP checkout. The self-test is done on two levels.

- Internal loopback is performed when the repeater is turned ON. Figures 19 and 20 diagram the loopback tests.
- Internal and external loopback are both performed when the self-test switch is momentarily pressed and released. Figures 19 and 20 diagram the loopback tests.

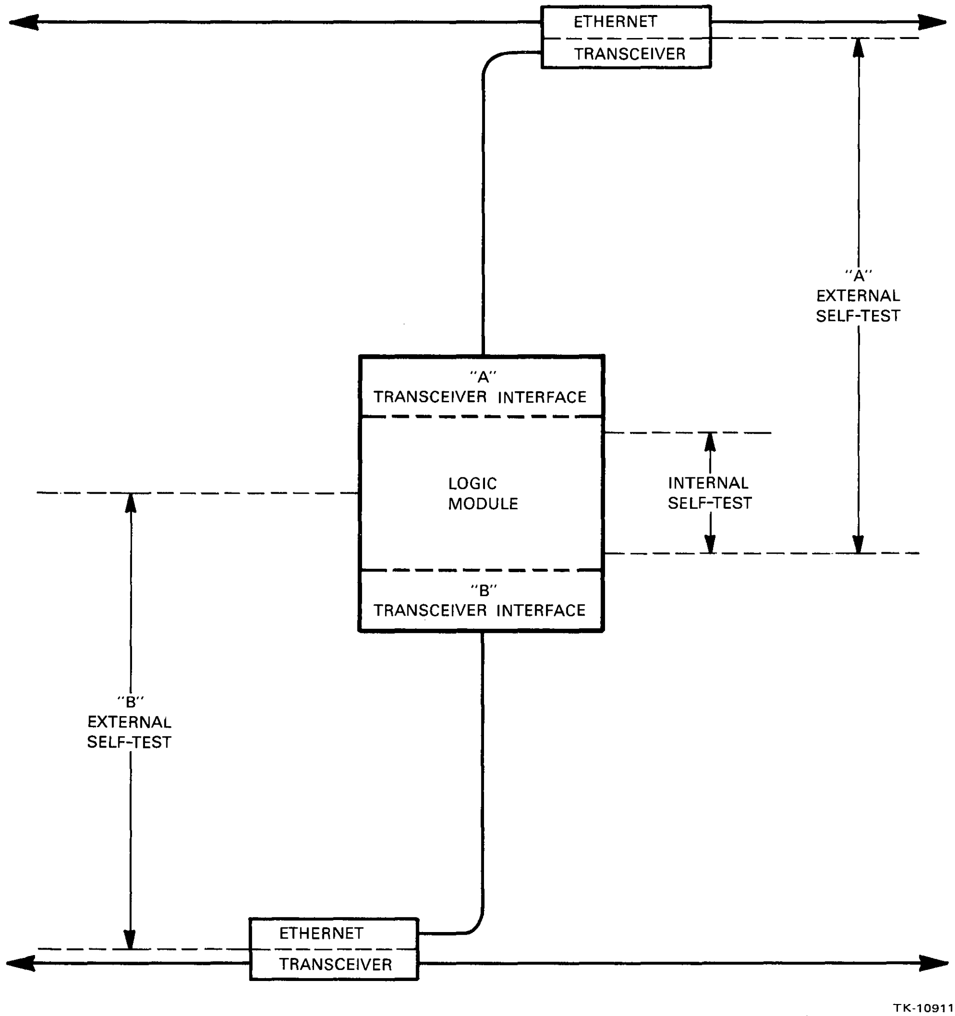


Figure 19 Local Repeater Self-Test Diagram

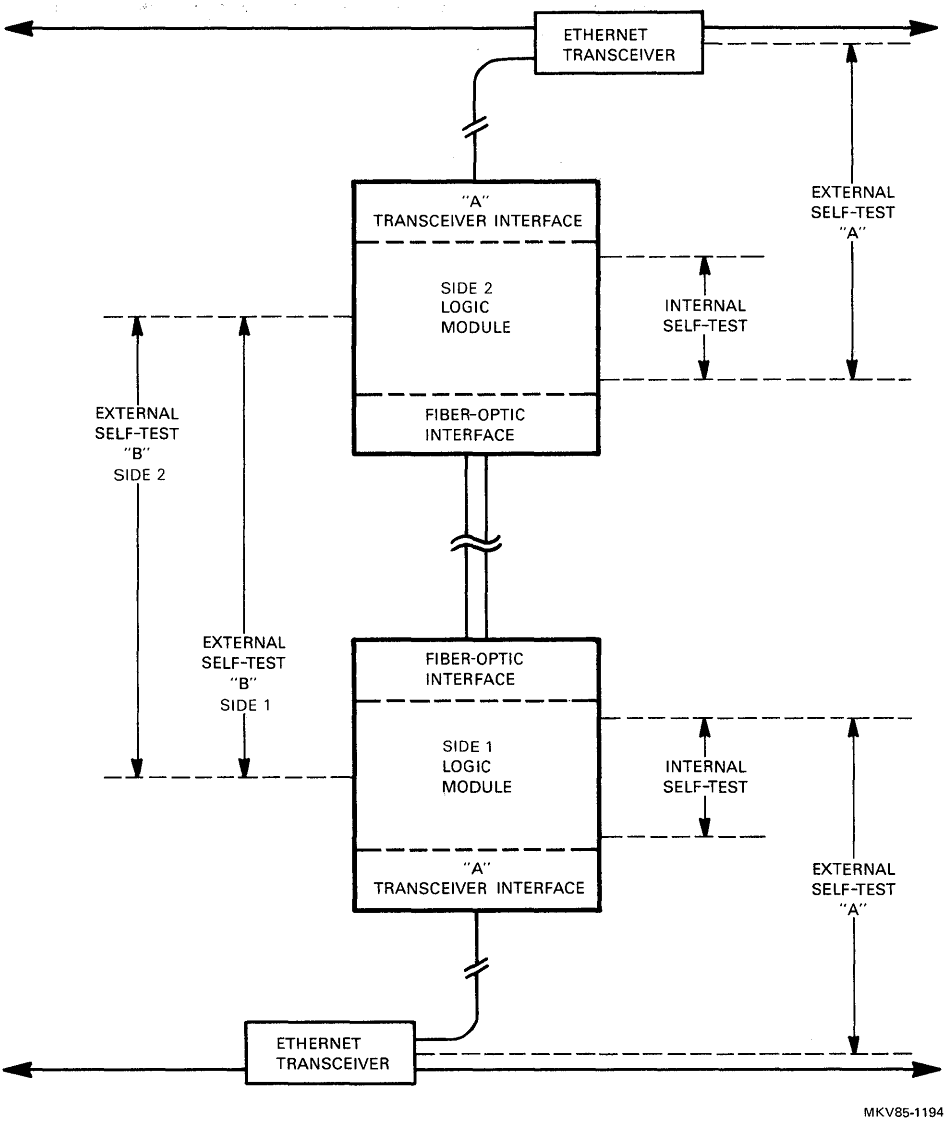


Figure 20 Remote Repeater Self-Test Diagram

Maintenance Aids

Equipment Required –

- For local repeaters, fault isolation to the FRU may be achieved by using the state indicator LEDs on the rear of the repeater. Figure 21 contains the LED definitions.
- For remote repeaters, a fiber-optic turnaround test connector may be required for some fault isolation procedures.
- The fiber-optic turnaround test connector is a 15.24 cm (6.0 in) fiber-optic cable loop (P/N 29-25037-00 or P/N 29-24865-00). This test connector replaces the fiber-optic cable for off-line external loopback testing of a remote repeater.

Optional Equipment –

- An H4080 test connector replaces the on-line transceiver for off-line self-testing of the repeater.
- An H4000-TA (or TB) Ethernet transceiver tester transmits a packet onto an Ethernet coaxial segment (via a transceiver), then monitors the transmission via a second transceiver and verifies network operation.

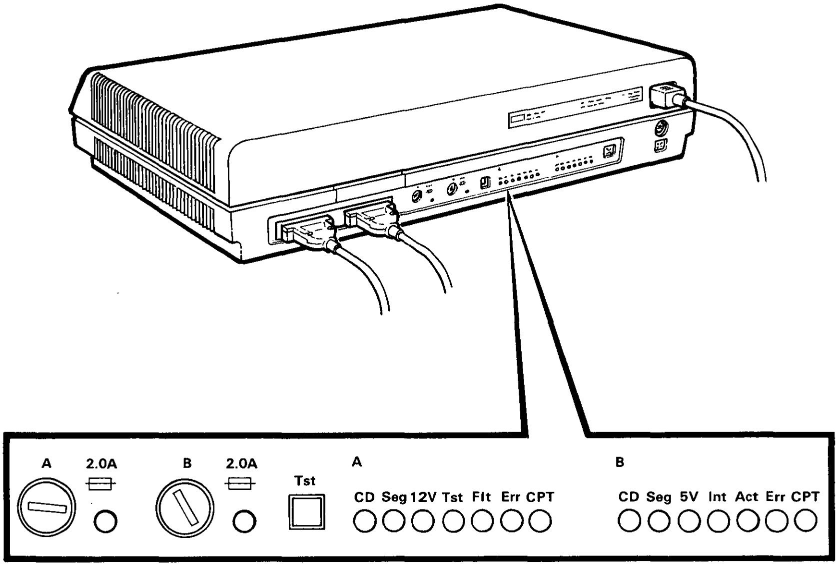
Preventive Maintenance –

- Involves periodic use of the repeater self-test (see Figures 19 and 20).
- The self-test should be exercised when network PM is performed.

Field Replaceable Units – See Figures 22 through 26 for repeater disassembly and FRU removal.

WARNING

To prevent electrical shock and damage to components, turn OFF power and disconnect all cables attached to the repeater before opening the chassis.



LED #		COLOR	DEFINITION
1	2.0A	GREEN	FUSE A FUNCTIONING
2	2.0A	GREEN	FUSE B FUNCTIONING
1	CD	GREEN	CARRIER RECEIVED ON B AND TRANSMITTED TO A
2	SEG	YELLOW	REPEATER WAS SEGMENTED ON SIDE A
3	12V	GREEN	+12 VOLT SUPPLY FUNCTIONING
4	TST	RED	EXECUTING SELF-TEST
5	FLT	RED	CURRENTLY SEGMENTED
6	ERR	RED	EXTERNAL SELF-TEST ERROR ON SIDE A
7	CPT	RED	CPT ERROR ON SIDE A
1	CD	GREEN	CARRIER RECEIVED ON A AND TRANSMITTED TO B
2	SEG	YELLOW	REPEATER WAS SEGMENTED ON SIDE B
3	5V	GREEN	+5 VOLT SUPPLY FUNCTIONING
4	INT	RED	EXECUTING INTERNAL SELF-TEST
5	ACT	RED	STANDBY ACTIVE
6	ERR	RED	EXTERNAL SELF-TEST ERROR ON SIDE B
7	CPT	RED	CPT ERROR ON SIDE B

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Figure 21 LED Definitions

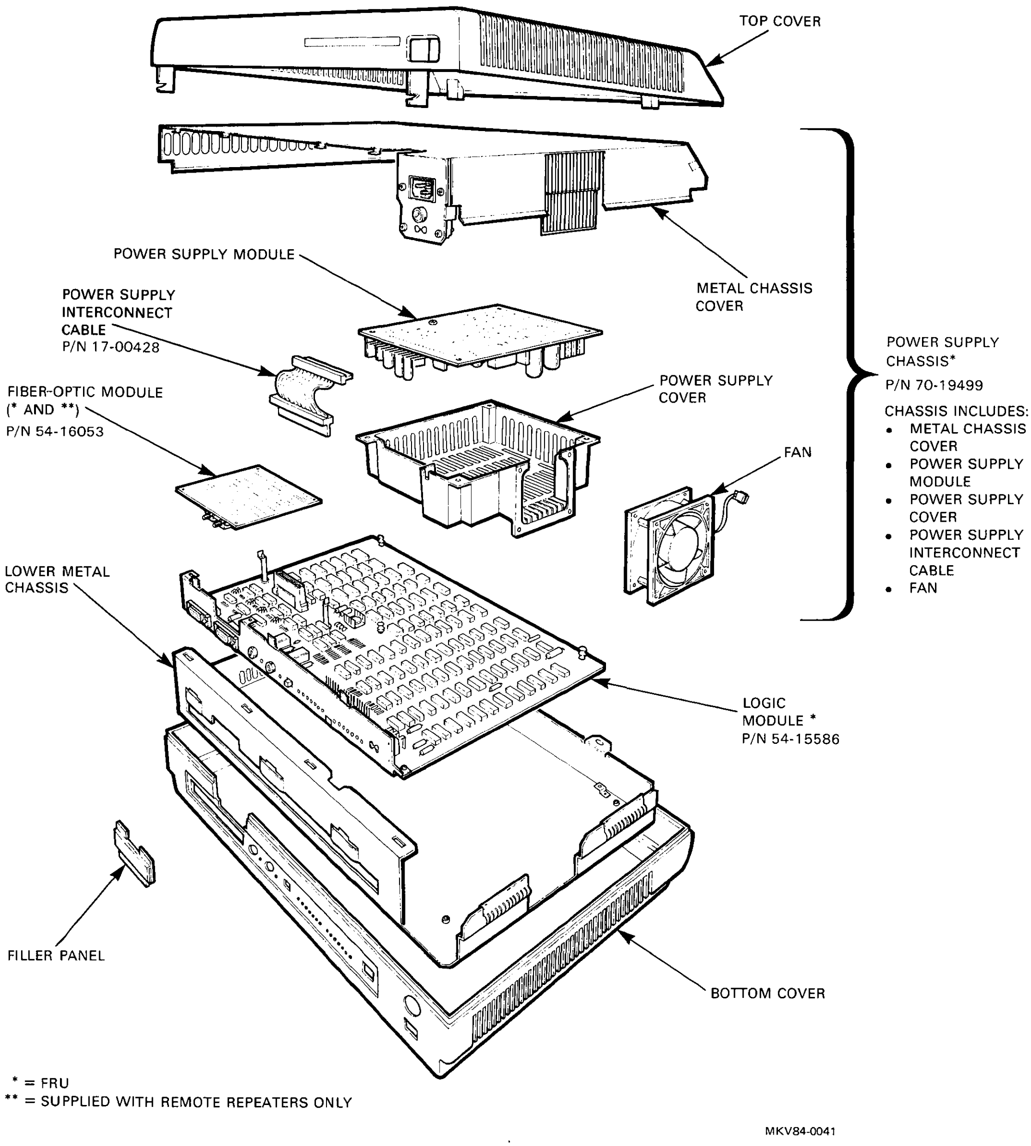


Figure 22 Repeater FRU Locations

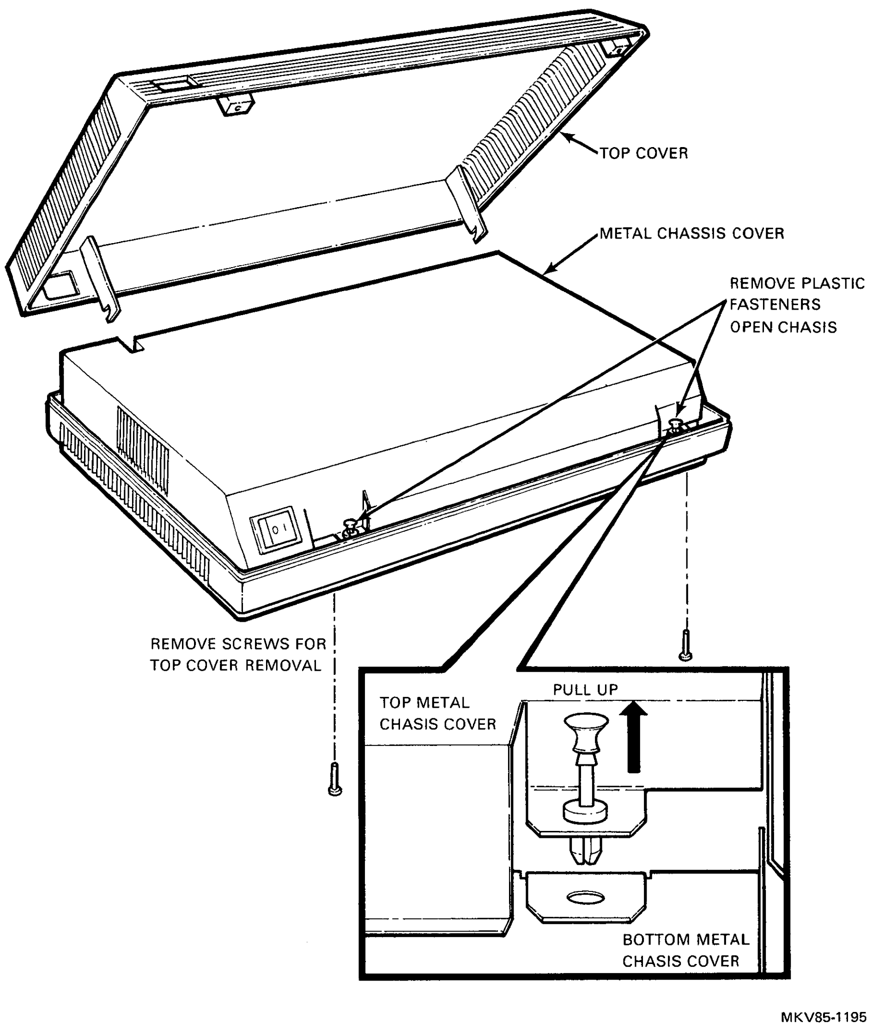


Figure 23 Top Cover Removal/Opening and Closing the Internal Metal Chassis

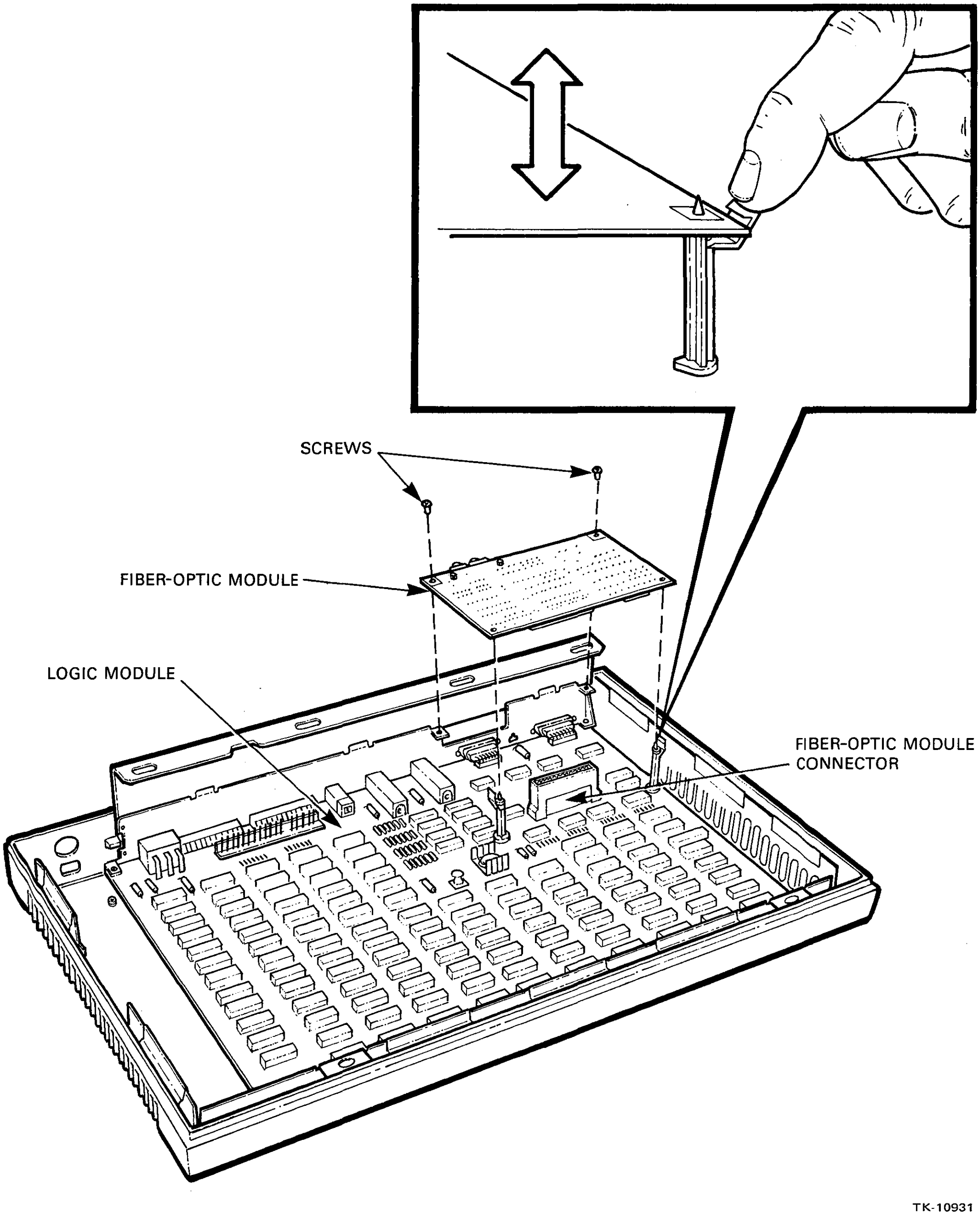


Figure 24 Fiber-Optic Module Removal and Replacement

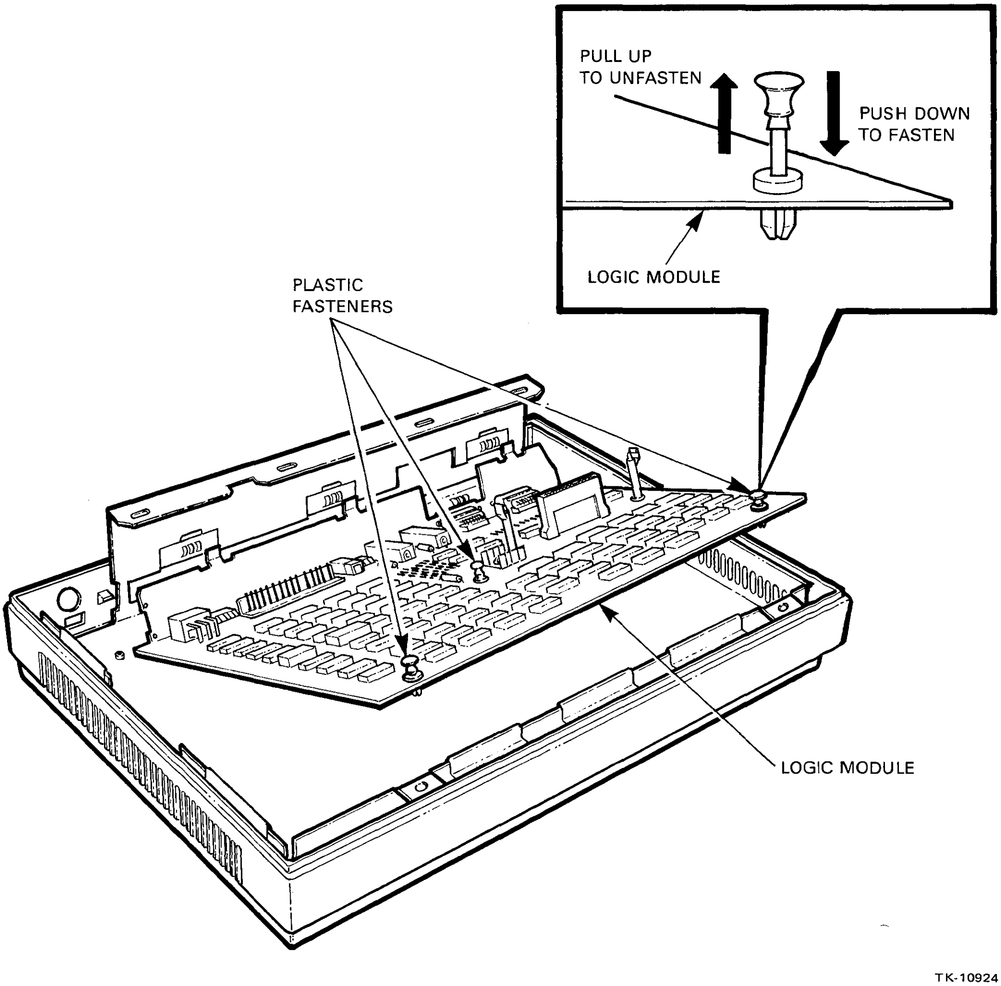


Figure 25 Logic Module Removal and Replacement

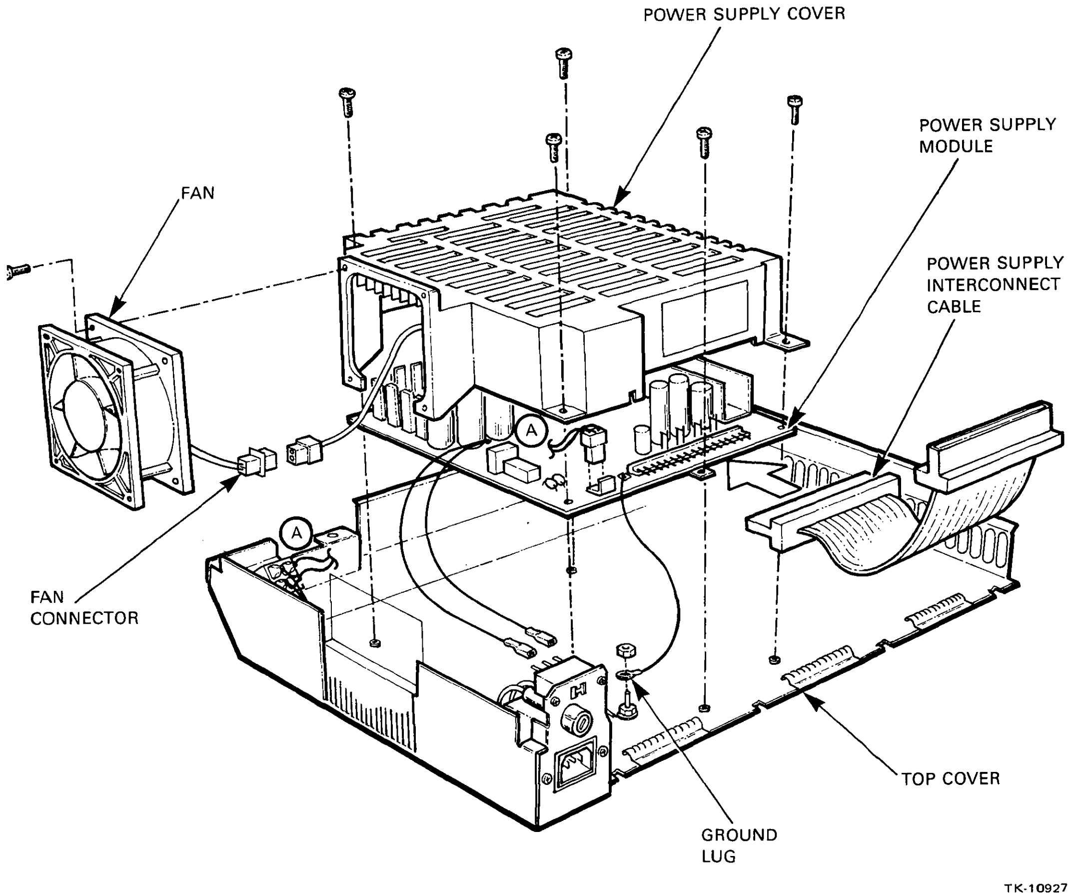


Figure 26 Power Supply Chassis

Table 3 LEDs and Troubleshooting

LED Name	LED Definition	Normal State	Indications/ *Corrective Action*
2.0A	FUSE A	ON	This (green) LED indicates that the +12 V transceiver power fuse on side A is good. When OFF, this indicates that either the fuse is blown or that +12 V is not reaching the fuseholder. 1. *Check the fuse. If blown, replace it with correct fuse* *(2 A – Digital Equipment Corporation part number 90-07215-00).* 2. *If the fuse continues to blow, try connecting to a different transceiver or transceiver cable.* 3. *Check other indicators (5V and 12V LEDs) to determine that the repeater is properly powered.* 4. *Verify that the power switch is ON, and that the power cord is connected to the proper voltage source. Check the line fuse (refer to Note 1 at the end of this table).*
2.0A	FUSE B	ON	Similar to 2.0A (side A)
5V	+5 volts	ON	This (green) LED indicates that the +5 V circuit of the power supply is functioning. When OFF, this may indicate that the +5 V circuit is not functioning. 1. *Check the 12V LED to determine whether the power supply is functioning.* 2. *Check the FUSE A and FUSE B LEDs. These LEDs indicate that +12 V is being supplied to the transceivers.* 3. *Verify that the power switch is ON and that the power cord is connected to the proper voltage source. Check the line fuse (refer to Note 1 at the end of this table).*

Table 3 LEDs and Troubleshooting (Cont)

LED Name	LED Definition	Normal State	Indications/*Corrective Action*
			4. *Press the self-test button. All LEDs should light while the button is pressed. If all LEDs (with the exception of the 5V LED) turn ON, the 5V LED is defective. Replace the logic module.* 5. *If the above procedures do not correct the problem, replace the power supply.*
12V	+12 volts	ON	This (green) LED indicates that the +12 V circuit of the power supply is functioning. When OFF, this indicates that the +12 V circuit is not functioning. 1. *Check the 5V LED to determine that ac power is reaching the power supply.* 2. *Check the FUSE A and FUSE B LEDs. These LEDs indicate that +12 V is being supplied to the transceivers.* 3. *Verify that the power switch is ON and that the power cord is connected to the proper voltage source. Check the line fuse (refer to Note 1 at the end of this table).* 4. *Note whether the fan is running. The fan operates on +12 V and indicates that part of the +12 V section of the power supply is functioning.* 5. *Press the self-test button. All LEDs should light while the button is pressed. If all LEDs (with the exception of the 12V LED) turn ON, the 12V LED is defective. Replace the logic module.* 6. *If the above procedures do not correct the problem, replace the power supply.*

Table 3 LEDs and Troubleshooting (Cont)

LED Name	LED Definition	Normal State	Indications/*Corrective Action*
CD (A)	Carrier Detect A	Should Flicker	This (green) LED flickers when data packets are received from side B AND transmitted to side A. During heavy network traffic, this LED may appear to be steadily lit. When continuously OFF, this may indicate that: • There is no traffic on side B. • The transceiver on side B is not functioning. • The carrier detect circuit on side B is not functioning. • The carrier A LED is not functioning. 1. *Check other indicators (FUSE A, FUSE B, 5V, and 12V LEDs) to determine that the repeater is properly powered and whether the transceiver is getting power.* 2. *Press the self-test button. All LEDs should light while the button is pressed. If the Carrier A LED fails to turn ON, the LED is defective. Replace the logic module. If the LED lights, note the results of the self-test.* 3. *For local repeaters, interchange transceiver cable inputs.* a. *Try swapping transceiver cable inputs to see if the inactive indications shift to side B of the repeater (refer to Note 2 at the end of this table).* b. *If the indication does shift to the other side of the repeater, suspect inactivity on that segment, or a problem with the transceiver and/or transceiver cable.* c. *If the indication stays with side A, check FUSE B. If FUSE B is good, change the logic module.*

Table 3 LEDs and Troubleshooting (Cont)

LED Name	LED Definition	Normal State	Indications/*Corrective Action*
			4. *For remote repeaters, try using a different transceiver or transceiver cable (refer to Note 2 at the end of this table).* a. *If the CD indication improves, suspect a problem in the transceiver or transceiver cable.* b. *If the CD indication does not improve, suspect inactivity (no traffic) on side B or a faulty logic module.*
CD (B)	Carrier Detect B	Should Flicker	Similar to CD (A)
CPT Error A	Collision Presence Test Error (Side A)	OFF	This (red) LED latches ON to indicate that a CPT signal was not detected on side A following a previous data transmission to side A. The CPT signal is sent from the transceiver via the collision pair to indicate that the collision detect circuitry is functional. The absence of CPT suggests: • A malfunction in the collision detect circuitry. • A malfunction in the transceiver or transceiver cable. • Excessive transceiver cable length (over 50 m [164 ft]). 1. *Press the self-test button to reset the error indication. Note that CPT detect is turned OFF during self-test. Monitor the LED for reoccurrence of CPT error.* 2. *For local repeaters, interchange transceiver cable inputs.* a. *Try swapping transceiver cable inputs to see if the CPT error indication shifts to side B of the repeater (refer to Note 2 at the end of this table).* b. *If the indication does shift to the other side of the repeater, suspect a problem with the transceiver and/or transceiver cable.*

Table 3 LEDs and Troubleshooting (Cont)

LED Name	LED Definition	Normal State	Indications/*Corrective Action*
			c. *If the indication stays with side A, suspect a problem in the CPT detect circuitry. Replace the logic module.* 3. *For remote repeaters, try using a different transceiver or transceiver cable (refer to Note 2 at the end of this table).* a. *If the CPT error indication goes away, suspect a problem in the transceiver or transceiver cable.* b. *If the CPT error indication remains, suspect inactivity (no traffic) on side B or a faulty logic module.*
CPT Error B	Collision Presence Test Error (Side B)	OFF	For local repeaters this indication is similar to CPT Error A. For remote repeaters, the CPT circuit on side B is disabled.
FLT	Fault	OFF	When ON, this (red) LED indicates that one of the transceivers and its associated coaxial segments is currently segmented or faulty (refer to Note 3 at the end of this table). 1. *Observe the SEG A and SEG B LEDs. At least one of these should be latched ON to indicate which side is segmented.* 2. *Be aware that the conditions which resulted in segmentation could cease to exist appearing possibly as an intermittent malfunction.* 3. *Run the self-test and note the results.* 4. *For local repeaters only, interchange transceiver cable inputs (refer to Note 2 at the end of this table).* a. *Swap transceiver cable inputs to see if the segmented indication shifts to side B of the repeater.*

Table 3 LEDs and Troubleshooting (Cont)

LED Name	LED Definition	Normal State	Indications/*Corrective Action*
			b. *If the indication does shift to the other side of the repeater, suspect a problem outside the repeater such as a transceiver, transceiver cable, or coaxial segment.* c. *If the indication stays with side A, suspect a problem in the collision detect circuitry. Replace the logic module.*
Act	Standby Active	OFF	When ON, this (red) LED indicates that the repeater is in the active standby mode. The standby mode becomes active when the primary repeater has failed or when no primary repeater exists. *Check the LEDs on the rear of the primary repeater. Follow the suggested corrective procedures.*
SEG (A)	Segmented A	OFF	This (yellow) LED indicates that side A was segmented at least once since the last self-test or power-up was performed (refer to Note 3 at the end of this table). 1. *Note whether side A is currently segmented (the FLT LED would be ON). Press the self-test button to reset the segmented LEDs and to run the self-test. Note the self-test results.* 2. *For local repeaters, try interchanging transceiver cable inputs:* a. *Swap transceiver cable inputs to see if the segmented indication shifts to side B of the repeater (refer to Note 2 at the end of this table).* b. *If the indication does shift to the other side of the repeater, suspect a problem outside the repeater such as a transceiver, transceiver cable, or coaxial segment.* c. *If the indication stays with side A, suspect a problem in the collision detect circuitry. Replace the logic module.*

Table 3 LEDs and Troubleshooting (Cont)

LED Name	LED Definition	Normal State	Indications/*Corrective Action*
			3. *For remote repeaters:* a. *If side A is not currently segmented (the FLT LED is OFF), press the self-test button to reset the SEG LED and to run the self-test. Note the self-test results.* b. *If side A is currently segmented (the FLT LED is ON), try using a different transceiver or transceiver cable (refer to Note 2 at the end of this table).* *If the segmented condition ends, suspect a faulty transceiver or transceiver cable.* *If the condition persists, suspect the coaxial cable or its associated equipment.*
SEG (B)	Segmented B	OFF	Similar to SEG (A)

NOTES

1. **Turn OFF the repeater and unplug the power cord before checking the line fuse.**
2. **Turn the repeater OFF before unplugging any cables.**
3. **Segmentation is an unusual condition resulting from loss of data loopback or from 64 consecutive unsuccessful attempts to transmit a packet. If the A or B segmented indicator is frequently found "ON", it may indicate intermittent problems on the coaxial segment or its associated equipment.**

Table 4 Self-Test Error LEDs

LED Name	LED Definition	Normal State	Indications/*Corrective Action*
TST	Self-Test Executing	OFF	This (red) LED lights briefly (typically .3 seconds) on power-up and on pressing the "TST" (self-test) button. This indicates that the repeater self-test is executing. If the "TST" LED remains lit, the self-test has failed (the repeater never exits self-test). 1. *A remote repeater unit which is failing self-test (the "TST" LED is ON) causes the remaining unit to fail (external) self-test. This problem can be minimized by resetting both units.* a. *Turn each unit OFF for five seconds and then back ON.* b. *Observe the LEDs at this point.* c. *Run self-test on the "good" unit to verify its operation.* 2. *Note the condition of the other self-test LEDs (for both local and remote repeaters):* a. *"INT" (internal self-test)* b. *"ERR" (self-test error A)* c. *"ERR" (self-test error B)*
INT	Internal Self-Test	OFF	When ON, this (red) LED indicates that the repeater is in the internal self-test state. If a data error is found during internal or external self-test, the repeater locks itself into the internal self-test state. This state is maintained until the repeater is reset (turned OFF for five seconds and then turned back ON). 1. *Turn the repeater OFF, wait five seconds, and turn the repeater ON. Only the internal test is performed on power-up (the internal test executes with or without transceiver cables and/or fiber-optic cables being connected).* 2. *If the "INT" LED still remains lit, a malfunction exists in the logic module.*

Table 4 Self-Test Error LEDs (Cont)

LED Name	LED Definition	Normal State	Indications/*Corrective Action*
			3. *If the "INT" LED does not remain lit after power-up, press and release the "TST" button. The transceiver cable and/or fiber-optic cable must be connected (for remote repeaters both units must be ON). This runs both the internal and external self-test. Note the conditions of the "ERR" LEDs for the A and B sides.*
ERR (A)	Self-Test Error A	OFF	This (red) LED lights when the self-test has detected an internal or external data loopback error on side A. If the ERR (A) LED remains ON after the internal test, a malfunction exists in the logic module of the repeater. If this LED remains ON after the external self-test only, a malfunction may exist in: • The transceiver cable interface. • The transceiver cable. • The transceiver connected to side A. • The coaxial segment on side A. 1. *For local repeaters:* a. *Try swapping transceiver cable inputs to see if the error indication shifts to side B of the repeater. Refer to the note at the end of this table.* b. *If the indication does shift to side B, suspect a problem outside the repeater. Typically, such a problem might be the transceiver, transceiver cable, or other equipment on the associated coaxial segment.* c. *If the problem remains on side A after swapping transceiver cable inputs, the logic module should be changed.*

Table 4 Self-Test Error LEDs (Cont)

LED Name	LED Definition	Normal State	Indications/*Corrective Action*
			2. *For remote repeaters:* a. *Try using a different transceiver or transceiver cable (see the note at the end of this table).* b. *Turn the repeater power ON and rerun the external self-test (press and release the "TST" button).* *If the "ERR" (A) indication goes away, suspect a problem in the transceiver cable, the transceiver, or associated coaxial segment.* *If the "ERR" (A) indication remains, replace the logic module.*
ERR (B)	Self-Test Error B	OFF	This (red) LED lights when the self-test has detected an internal or external data loopback error on side B. 1. *For local repeaters, indications and procedures are similar to "ERR" (A).* 2. *For remote repeaters, use the following procedures when the "ERR" (B) LED remains lit following the external self-test.* a. *Turn the repeater OFF.*

Table 4 Self-Test Error LEDs (Cont)

LED Name	LED Definition	Normal State	Indications/*Corrective Action*
			b. *Disconnect the fiber-optic cable and install a fiber-optic turnaround connector in its place (see the note at the end of this table).* c. *Press and release the "TST" button.* *If the "ERR" (B) indication remains, suspect the fiber-optic interface or the logic module.* *If the "ERR" (B) indication goes away, suspect the remote repeater unit or the fiber-optic cable. Perform the self-test on the remote unit.* **CAUTION: Fiber-optic turnaround connectors cause collisions while they are connected. ALWAYS remove a fiber-optic turnaround connector after testing is completed.**

NOTE
Turn repeater power OFF before disconnecting any cables. Turning the power OFF resets error indications.

DEREP Tech Tips/FCO Index

The following table lists Tech Tips and FCOs that pertain to the DEREP Ethernet repeater.

Table 5 DEREP Tech Tips/FCO Index

Tech Tip No.	Title	Speed Bulletin
TT1A	Configuring an Ethernet with DEREP Repeaters	391

DESNA ChannelServer

General Description

The DEC ChannelServer is a communications device that provides a hardware connection from Digital Equipment Corporation networks to a system 370-type compatible mainframe. This connection provides a channel for handling communications protocols between the mainframe and the Ethernet local area network (LAN). The DEC ChannelServer together with DECnet/SNA Gateway-CT form a hardware and software system that enables certain Ethernet nodes to communicate with a 370-type mainframe.

The Gateway-CT handles communications by using systems network architecture (SNA) protocols. The Gateway-CT allows large data transfers and/or high-speed interactive access through a 370-type mainframe channel.

The DEC ChannelServer connects the mainframe channel through bus and tag cables. Multiple channel devices can be daisy chained together with the DEC ChannelServer.

The DEC ChannelServer connects to the Ethernet LAN through a transceiver cable. DECnet/SNA Gateway-CT software is down-line loaded to the DEC ChannelServer from a host system on the LAN.

Reference Documentation

Refer to the following documents for more information about the DEC ChannelServer.

- *DEC ChannelServer Hardware Installation Guide* EK-INDEC-CS
- *DEC ChannelServer Troubleshooting Guide* EK-DECCS-SG
- *DEC ChannelServer Identification Card* EK-DECCS-IC
- *DECnet/SNA Gateway-CT Guide to IBM Parameters* AA-LU36A-TK
- *DECnet/SNA Gateway-CT Installation Guide* AA-MA07A-TE
- *DECnet/SNA Gateway-CT Problem Determination Guide* AA-LU37A-TK

Hardware Components

DEC ChannelServer is based on the MicroVAX II hardware with additional components to interface to the mainframe and an Ethernet LAN. The components are:

- 42-inch cabinet
- Power controller
- BA23 enclosure
- I/O bulkhead
- KA630-AA CPU
- MS630-BB memory module
- Bus grant continuity card
- RQDX3 diskette drive
- DELQA Ethernet controller
- Channel interface module set
- System control panel on the front of the system
- CPU control panel on the I/O bulkhead
- Q22-bus backplane.

The channel interface module set consists of three quad-height Q-bus modules. The modules provide the interface between the driver/receiver module and the Q-bus. The modules contain a microsequencer and firmware that allow automatic responses to channel signals.

The driver/receiver module provides the interface from a mainframe I/O interface channel through four connectors (Figure 1):

- BUS IN
- BUS OUT
- TAG IN
- TAG OUT.

DEC ChannelServer Software
The DEC ChannelServer runs DECnet/SNA Gateway-CT software, which is down-line loaded from a host system on the Ethernet LAN.

System Placement
Place the DEC ChannelServer as follows:

- Allow 10 cm (4 inch) clearance on all sides of the cabinet to allow air circulation through the equipment.
- Allow enough space for maintenance access to the front and rear of the system.
- Ensure that the floor supports a unit of approximately 158 kg (340 lbs).
- Install the system where it will not get bumped.
- Position the system so that it does not block or restrict access to a fire exit or safety equipment.
- Ensure that the cables to the system do not trail where people walk.

Environmental Requirements
Table 1 lists the environmental specifications of the DEC ChannelServer.

Table 1 System Environmental Specifications

Parameter	Operating	Nonoperating
Temperature	15 to 32°C (59 to 90°F)	−40 to 66°C (−40 to 151°F)
Humidity	20 to 80%	Up to 95%
Altitude	2440 m (8000 ft)	Up to 4900 m (16000 ft)

The DEC ChannelServer operates with maximum wet-bulb temperature of 25°C (77°F) and a minimum dew point of 2°C (36°F).

Physical Specifications
Table 2 lists the physical specifications of the DEC ChannelServer.

Table 2 Physical Specifications

Parameter	Dimension
Height:	1.06 m (42 inches)
Width:	58 cm (23.0 inches)
Depth:	91 cm (36.0 inches)
Weight:	Approximately 79 kg (200 lbs)

Power Requirements
Table 3 lists the power requirements for the DEC ChannelServer.

Table 3 Power Requirements

Parameter	120 Vac	240 Vac
Voltage	88 to 128 Vac	176 to 256 Vac
Power source phasing	Single	Single
Frequency	60 Hz	50 Hz
Line frequency tolerance	47 to 63 Hz	47 to 63 Hz
Steady state current (typical)	4.4 A	2.2 A
Steady state current (maximum)	6.0 A	3.0 A
Power consumption (maximum)	345 W	345 W

Installation Flow Diagram

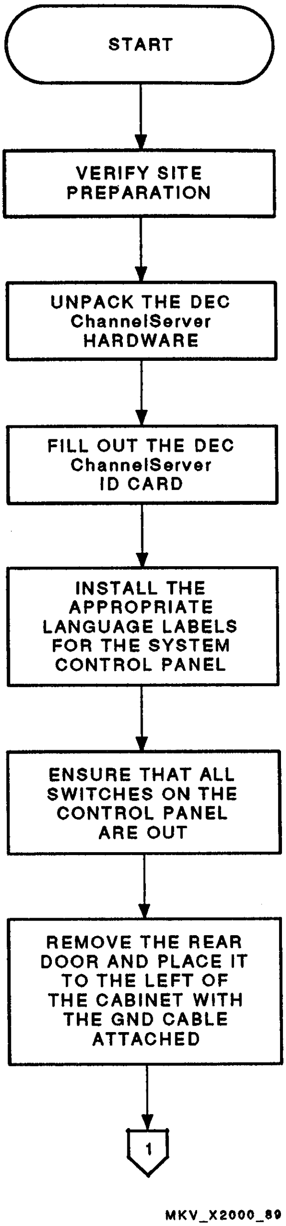


Figure 1 Installation Flow Diagram (Sheet 1 of 4)

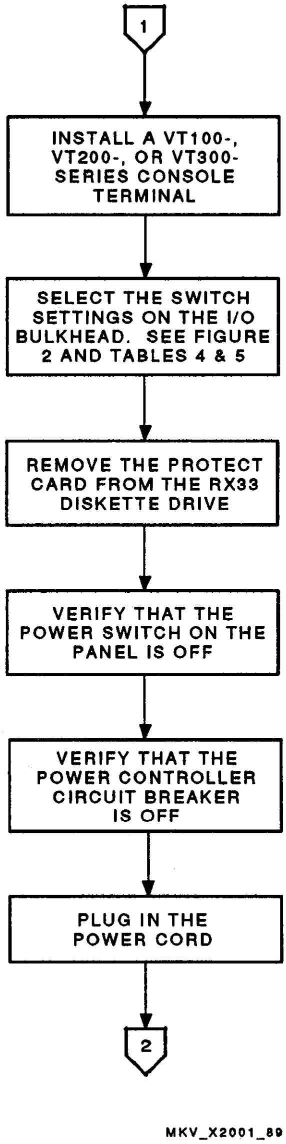


Figure 1 Installation Flow Diagram (Sheet 2 of 4)

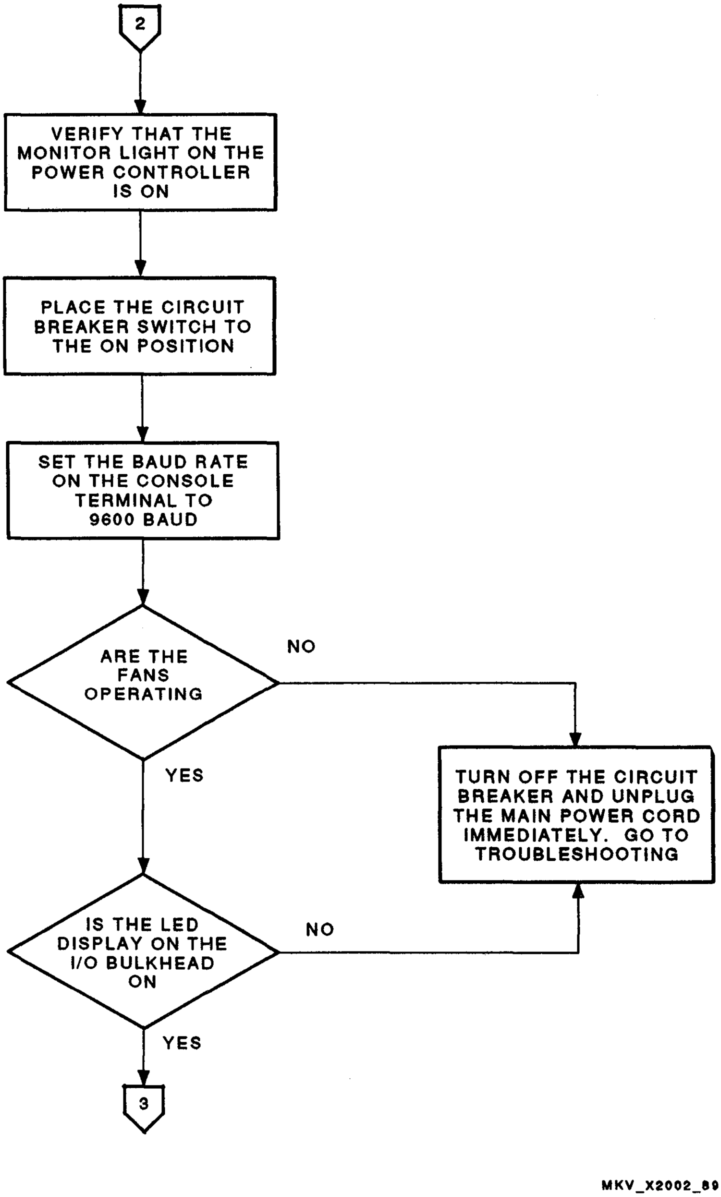


Figure 1 Installation Flow Diagram (Sheet 3 of 4)

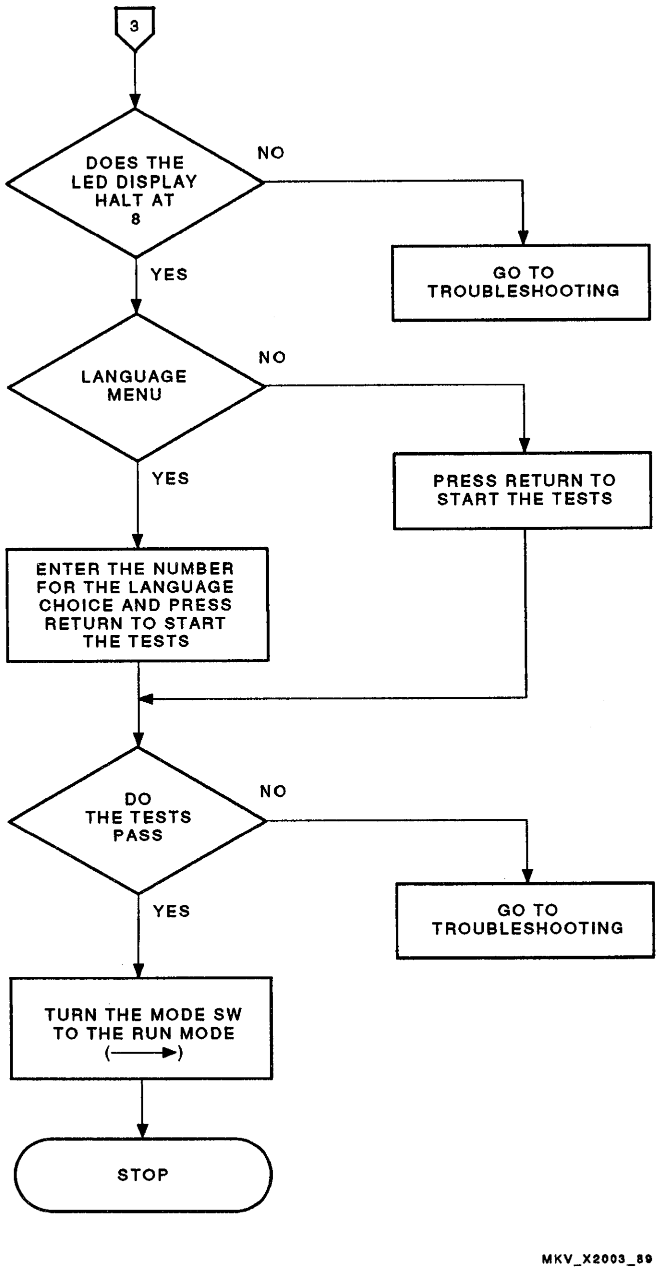


Figure 1 Installation Flow Diagram (Sheet 4 of 4)

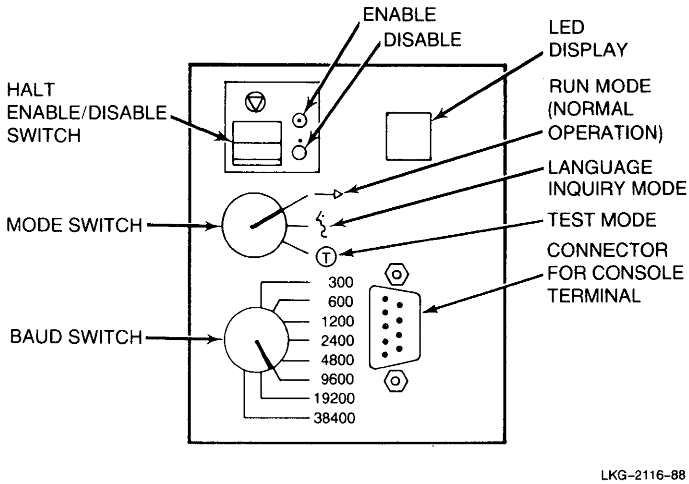


Figure 2 Switch Locations

Table 4 Halt Enable/Disable Switch (Two-Position Toggle)

Switch Position	Function
Dot inside a circle (up)	Halt Enable; on power-up or restart, the system enters Console I/O Mode at the completion of self-tests.
Dot outside a circle (down)	Halt Disable (factory setting); on power-up or restart, the system attempts to load software from one of the boot devices at the completion of internal self-tests.

Table 5 Mode Switch (Three-Position Rotary)

Switch Position	Mode
Arrow	Run (factory setting); if the console terminal supports Multinational Character Sets (MCS), you are prompted for language on power-up and restart only if the battery backup has failed. Full start-up diagnostics are run.
Human profile	Language Inquiry; if the console terminal supports Multinational Character Sets (MCS), you are prompted for language on every power-up and restart. Full start-up diagnostics are run.
T in a circle	Test ROM programs run wraparound serial line unit tests (manufacturing use only).

I/O Bulkhead
The DEC ChannelServer rear I/O panel provides the points of interconnection for all external cables to the system. The points of interconnection are:

- Console terminator connector: Requires a BCC08 terminal cable for connection to the console terminal

- DELQA Ethernet connector: Provides the connection to an Ethernet transceiver. BNE3H, BNE3L, or BNE3M cables can be used to connect to the Ethernet transceiver

- TAG IN, TAG OUT, BUS IN, and BUS OUT connectors: Provide connection to a channel device. A 40-position channel cable (IBM P/N 5353920 or compatible) is used to make these connections.

Channel Principles
Think of the channel as the I/O bus for 370-type architecture systems. The channel connects with two cables; each cable contains up to 24 individually shielded conductors that end in 48-pin connectors. One cable is the bus cable, which carries data and command bytes; the other cable is the tag cable, which carries channel control signals.

Channel devices, including DEC ChannelServer systems, are daisy chained together on the channel. The bus cable from the mainframe is connected to the BUS IN connector on the first channel device. The BUS OUT connector on that device is connected to the BUS IN connector on the next device, and so on. A terminator is installed to the BUS OUT connector on the final channel device.

The connectors on the cables, on the channel, and on channel devices are light or dark colors. The IN connector on the channel or channel device is a dark color; the OUT connector is a light color. In all cases, dissimilar colors connect.

Cabling Procedure
Before starting the cabling procedure, run the maintenance version of MDM, then verify that the DEC ChannelServer system meets the following conditions:

- The power is OFF during the entire cabling procedure

- The mainframe channel bus and tag cables are installed on the channel, and the ends that connect to the DEC ChannelServer are labeled appropriately as bus and tag.

Connect the cabling to the DEC ChannelServer as instructed in the cabling flow diagram (Figure 3).

NOTE
Be very careful when handling the connectors and bus and tag cables. The pins in these connectors are fragile.

Cabling Flow Diagram

IMPORTANT
IBM recommends that the CPU be halted before disabling a channel device. Ensure that the DEC ChannelServer is isolated before connecting the bus and tag cables.

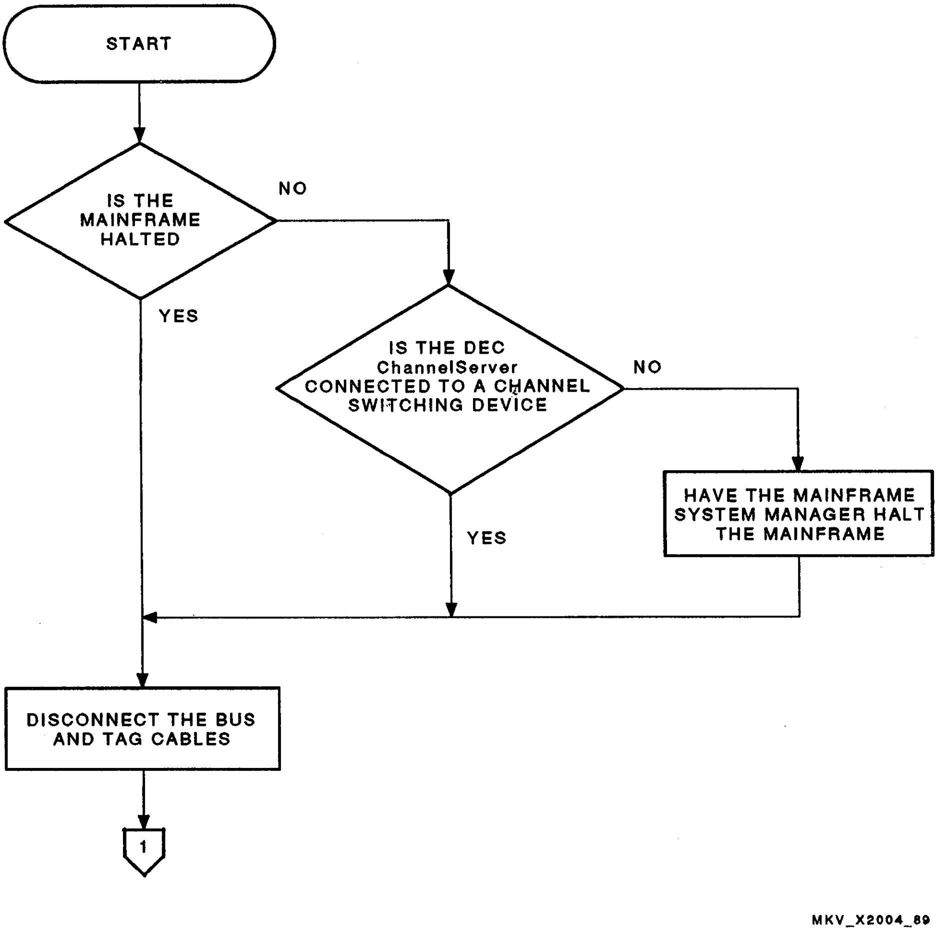


Figure 3 Cabling Flow Diagram (Sheet 1 of 3)

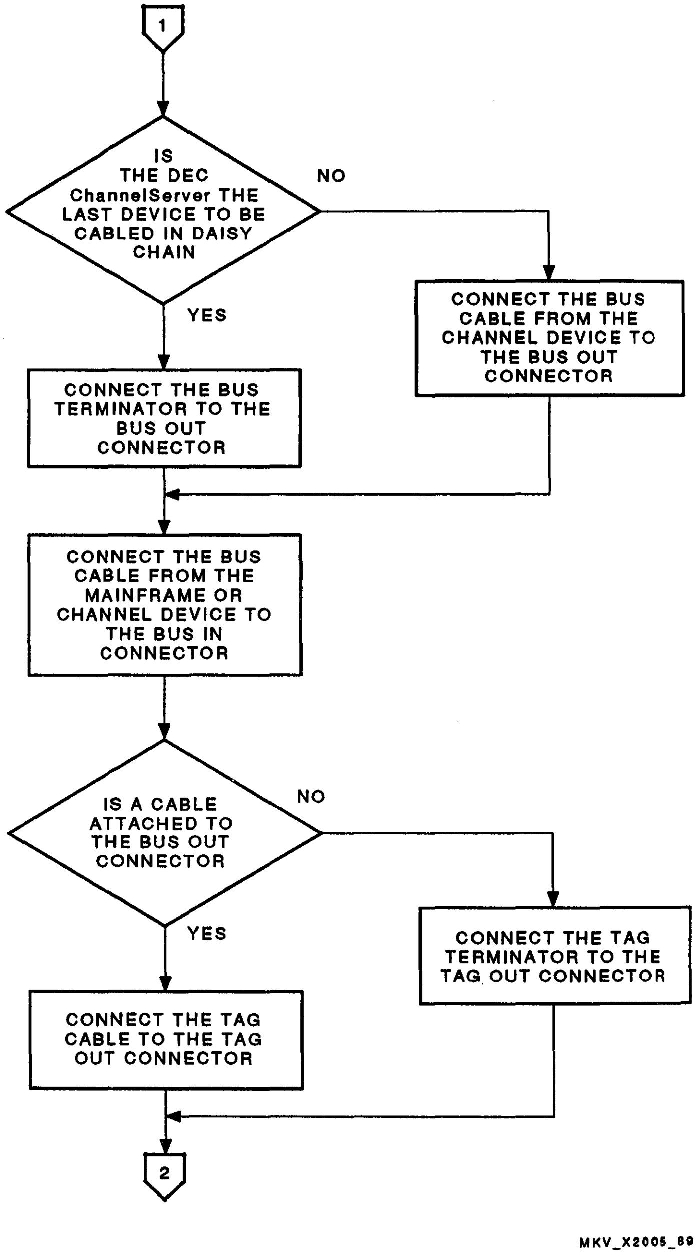


Figure 3 Cabling Flow Diagram (Sheet 2 of 3)

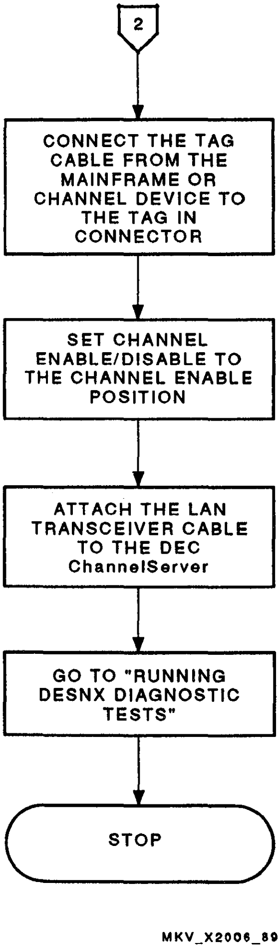


Figure 3 Cabling Flow Diagram (Sheet 3 of 3)

Diagnostics

There are two types of diagnostics available with the DEC ChannelServer:

- DESNX
- MicroVAX Diagnostic Monitor (MDM).

The DESNX diagnostic tests are used to verify proper communication between the 370-type mainframe and the ChannelServer.

The MDM diagnostic tests are designed to isolate and identify faults in the system to the defective FRU.

Running DESNX Diagnostic Tests – To verify communication between the 370-type mainframe and the DEC ChannelServer, perform the following.

1. Have the system manager provide access to a mainframe system console.
2. Verify that the CHANNEL ENABLE/DISABLE switch is set to ENABLE.
3. Verify that the HALT ENABLE/DISABLE switch is set to DISABLE.
4. Verify that the mainframe is using the MVS, VM or VSE/SP operating system.
5. Verify that the DEC ChannelServer system is defined as a channel-attached 3174 control unit to the mainframe operating system and to VTAM. See the *DECnet/SNA Gateway-CT Guide to IBM Parameters*.
6. Find out the channel device address allocated by the mainframe to the DEC ChannelServer system.
7. Write this channel device address on DEC ChannelServer identification card.
8. Determine the names that VTAM gives to the major node and physical unit assigned to the DEC ChannelServer system. Write this information on the DEC ChannelServer identification card.
9. Power up the DEC ChannelServer and insert the DESNX diagnostic disk into the disk drive.
10. Verify that the hardware switch settings for address and vector match those displayed on the console.
11. When DESNX asks for the 3-digit device address allocated to it on the channel, enter the address and press RETURN. Verify the address with a Y or N, and re-enter as required.

12. When the address is verified correct, DESNX begins the tests. When the console displays the "Received sense command" message, issue the following VARY commands from the mainframe system console.

MVS Operating System Commands

VARY nnn,ONLINE
hh.mm.ss IEE302I nnn ONLINE
VARY NET,ACT,ID=majnod,SCOPE=ALL
hh.mm.ss IST093I majnod ACTIVE
hh.mm.ss IST093I puname ACTIVE

VM Operating System Commands

VARY nnn,ONLINE
nnn VARIED ONLINE
ATTACH nnn VTAM
CTLR nnn ATTACH TO VTAM
VARY NET,ACT,ID=majnod,SCOPE=ALL
*IST093I majnod NODE NOW ACTIVE
*IST093I puname NODE NOW ACTIVE

NOTE
The VARY NET commands used in a VSE/SP operating system are the same commands used in the MVS and VM operating systems; however, the VSE/SP operating system responses are different.

Replace **nnn** in the VARY commands by the appropriate hexadecimal device address. Replace **majnod** by the name of the VTAM major node for the DEC ChannelServer. The lines beginning with **hh.mm.ss** represent time-stamped output from the mainframe. There are other output messages that are not time-stamped.

After the link has been connected, DESNX expects VTAM to send it SNA requests to activate the physical unit and logical units that are associated with the control unit. DESNX displays the following sequence of messages when the link is connected:

Datalink disconnected
Datalink connected
Physical Unit activated
Logical Unit(s) activated

NOTE
The "Datalink disconnected" message might not appear on the console.

13. When the "Test complete" message is displayed, the test procedure has been successfully completed.

14. Issue the following commands from the mainframe system console to deactivate the DEC ChannelServer.

    MVS Operating System Commands

    VARY NET,INACT,ID=majnod
    hh.mm.ss IST105I puname NODE NOW INACTIVE
    hh.mm.ss IST105I majnod NODE NOW INACTIVE
    VARY nnn,OFFLINE
    hh.mm.ss IEE794I nnn PENDING OFFLINE

    VM Operating System Commands

    VARY NET,INACT,ID=majnod
    IST105I puname NODE NOW INACTIVE
    IST105I majnod NODE NOW INACTIVE
    DETACH nnn VTAM
    CTLR nnn DETACHED VTAM nnn
    VARY OFFLINE nnn
    nnn VARIED OFFLINE

15. If the DEC ChannelServer passes DESNX, do the following.

    a. Dress cables to the center of the DEC ChannelServer cabinet.

    b. Verify that the HALT/ENABLE switch is set to the DISABLE position.

    c. Verify that the MODE switch is in the RUN MODE position.

    d. Close the rear bulkhead door.

Running MDM Diagnostic Tests – To run MDM diagnostics, do the following.

1. Notify the mainframe system manager to disable the ChannelServer from the channel.

2. When the Channel Active LED is off, set the CHANNEL ENABLE/DISABLE switch to the DISABLE (down) position.

3. Verify that the console terminal is connected to the ChannelServer.

4. Load the MDM diagnostics.

5. If a particular FRU is suspect, select option 4. If no particular FRU is suspect, select option 1.

6. If the Ethernet module is suspect, install the loopback connector to the transceiver end of the transceiver cable and run the appropriate tests. If the test fails, move the loopback connector to the I/O bulkhead connector and test again. This isolates the problem to the cable or controller/internal cable.

DESNA MAINTENANCE AIDS

Fault Isolation Tools
The following tools are available to help in isolating faults in the DEC ChannelServer system.

- MicroVAX status LED
- MicroVAX diagnostic monitor (MDM)
- DESNX diagnostic tests
- Network control program (NCP)
- Systems network architecture NCP (SNANCP)
- Event logging
- IBM system and log recordings

MicroVAX Status LED – Indicates self-test status on power-up/reset or during auto reboot.

MDM Maintenance Version – Diagnostic tests designed to isolate and identify faults in the system to the defective FRU.

DESNX Diagnostic Tests – Tests used to verify proper communication between the 370-type mainframe and the ChannelServer.

NCP – Used to control and show the status of the DECnet side of the network. The following two commands are the most useful in a DEC ChannelServer environment.

- SHOW COMMAND – Use the SHOW NODE Gateway nodename.

- LOOP COMMANDS – Use the following commands.

  LOOP CIRCUIT QNA-0 PHYSICAL ADDRESS Physical Address
  LOOP NODE Gateway nodename

SNANCP – Used to control and show the status of the SNA side of the network. The following commands are the most useful.

- USE COMMAND – Use the USE SYSTEM Gateway nodename command to define which gateway will be used.

- SHOW COMMANDS –

  SHOW LINE CQ-0 COUNTERS shows the following errors.

  Process Errors: Indicates either a device driver or hardware errors.

  Channel Errors: The two categories of channel errors are listed below:

  - Invalid Command Byte – Indicates the following:

    An incorrect IBM parameter
    Incorrect software configuration
    Hardware error in channel interface, channel, or channel cables.

  - Command Byte Parity Error – Indicates that a hardware error caused a command byte to have incorrect parity.

  SHOW CIRCUIT CHAN-0 COUNTERS shows process errors that indicate channel protocol errors.

- SET COMMANDS – The following SET commands are useful during a troubleshooting session with SNANCP.

  SET PU SNA-0 STATE (ON/OFF)
  SET PU SNA-1 STATE (ON/OFF)
  SET CIRCUIT CHAN-0 STATE (ON/OFF)
  SET LINE CQ-0 STATE (ON/OFF)

Event Logging – This is an IBM tool that provides a detailed history of hardware and software problems.

IBM System and Log Recordings – This is an IBM tool that provides a history of all console messages.

Troubleshooting
This section is divided into two main areas:

- General troubleshooting
- Troubleshooting DESNX problems.

General Troubleshooting
This section contains steps that can be helpful in isolating the problem to a general area.

1. Obtain a problem statement that includes the number of users affected, and how the IBM system/channel and adjacent controllers are affected.

2. Review the event log to understand the history of hardware or software problems.

3. Consult the IBM system operator to determine what hardware and software errors have occurred/been recorded and what console messages have been displayed.

4. Check the DESNA status LED. If it is cycling through the self-test, it indicates that a hardware fault has occurred. If this is the case, use SNANCP to:

   SET PU STATES OFF
   SET CIRCUIT STATE(S) OFF
   SET LINE STATE OFF

   a. Ask the IBM operator to:

      VARY LOCAL SNA MAJOR NODE INACTIVE
      VARY DEVICE OFFLINE
      Set CHANNEL ENABLE/DISABLE switch to DISABLE

   b. Halt the gateway by doing the following:

      1) Place the HALT ENABLE/DISABLE switch to ENABLE.

      2) Perform a power-on reset to start the self-test. Self-test should find the failing module.

5. Verify communication between the load host and the gateway by using NCP as follows.

   ncp> LOOP CIRCUIT
   ncp> LOOP NODE

   a. If communications cannot be established, try communicating between another host and the gateway.

   b. If one works and the other does not, check the appropriate Ethernet connection.

6. Verify line and circuits on the IBM channel by using SNANCP as follows.

   snancp> USE SYSTEM Gateway-nodename
   snancp> SHOW LINE CQ-0

   a. If the line state is OFF, set it to ON.

      snancp> SHOW LINE line-id COUNTERS

   b. If channel errors are indicated, run MDM and DESNX.

7. If the gateway cannot be accessed by SNANCP:

   a. Reboot the gateway.

   b. If unsuccessful, run MDM.

Troubleshooting DESNX Problems
If DESNX does not proceed as expected, the following procedure may help to determine the problem.

1. Check the channel cables for damage and loose connections.

2. Verify the operation of other devices on the channel. If the other devices are functioning properly, the cable and mainframe are probably functional.

3. Run the MDM diagnostic tests to verify the basic integrity of the channel interface module set.

If DESNX displays the following message on the console,

"- Warning- channel not operational"

possible causes are:

1. Problem with bus or tag cables – Verify that the bus and tag cables are connected and seated properly, and that there are no bent pins

2. The driver/receiver or channel interface module is defective

3. The channel or mainframe is not functioning.

If DESNX displays the follow message on the console,

"-Warning- asynch status still pending in driver"

possible causes are:

1. Problem with bus or tag cables – Verify that the bus and tag cables are connected and seated properly, and that there are no bent pins

2. The driver/receiver or channel interface module is defective

3. The channel or mainframe is not functioning.

If DESNX displays the follow message on the console,

"-Warning- enable/disable switch is set to disable"

toggle the switch to the CHANNEL ENABLE position and wait 30 seconds for DESNX to retry the operation.

If DESNX displays the following message on the console,

"-Warning- channel reset (system or selective)"
"-Warning- selective reset received on channel"

this indicates that an unassigned channel address was used for the DEC ChannelServer. Verify the address.

If the DEC ChannelServer never receives a SENSE command and no error is indicated, possible causes are:

1. Problem with bus or tag cables – Verify that the bus and tag cables are connected and seated properly, and that there are no bent pins

2. The driver/receiver or channel interface module is defective

3. The channel or mainframe may not be configured correctly.

If the "attempting to contact channel" message is displayed every 30 seconds and the SENSE command is received in reply, however, the "datalink connected" message is never seen and no errors are indicated, the problem is:

The operating system resources are not active.

Ensure that the VARY-ONLINE and VARY-ACTIVE commands were issued correctly.

If the "datalink connection" message is received but no "physical unit activated" message is displayed:

Attempt the previous recovery procedure for no "datalink connected" message.

If the "physical unit activation" message is received but no "logical unit activated" message is displayed:

Attempt the recovery procedure for no "datalink connected" message.

If one of the following messages is received,

"-Error- Command byte parity error"
"-Error- I/O error: parity error on channel"

possible causes are:

1. A malfunctioning driver/receiver
2. A malfunctioning interface module
3. A faulty cable.

If the following message is displayed,

"-Error- Invalid channel command"

possible cause is:

The DEC ChannelServer is not configured in the mainframe as a 3174 controller.

If the following message is displayed,

"System bugcheck, code nnnnnnnn"

Most likely a timing problem exists; reload and run DESNX again.

Replacing Faulty FRUs
The FRUs for the DEC ChannelServer are:

- Central processing unit (KA630)
- Memory module (MS630)
- Bus grant module
- Ethernet module (DELQA)
- Diskette controller module (RQDX3)
- Channel interface module set (three modules)
- Channel interface module set connector blocks
- Driver/receiver module
- Console serial line unit
- Power controller
- Diskette controller cable
- Power supply
- Power supply rear fan
- Power supply front fan
- Control panel
- Q22-bus backplane
- Appropriate cables.

Preparation
Before replacing any FRU, do the following.

NOTE
When replacing any FRU, verify that the cables attached to the FRU are not loose or damaged.

1. Notify the system manager of the mainframe to disable the DEC ChannelServer from the channel.

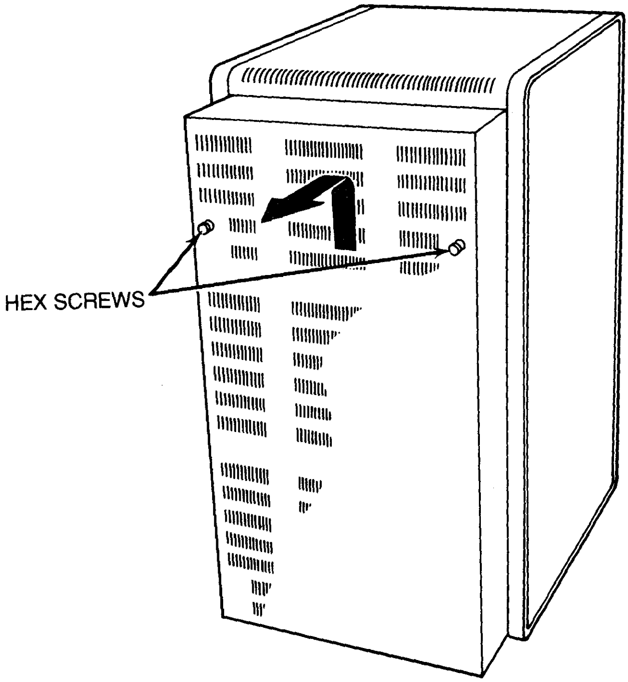
NOTE
Q-bus modules can be replaced without taking the IBM system down, however, care must be taken not to short pins on the driver/receiver module while the channel is active. To do so could result in the IBM system going down. Check with the IBM system manager before proceeding.

2. Consult the system manager to determine if the customer wishes to disable the whole channel. If not, perform the following.

```
snancp> SET PU STATE OFF
snancp> SET CIRCUIT STATE OFF
snancp> SET LINE STATE OFF
```

The channel is not disrupted under normal maintenance procedures except when the bus or tag cables are disconnected.

3. Remove the rear bulkhead door, being careful of the ground strap. Leave the ground strap connected.



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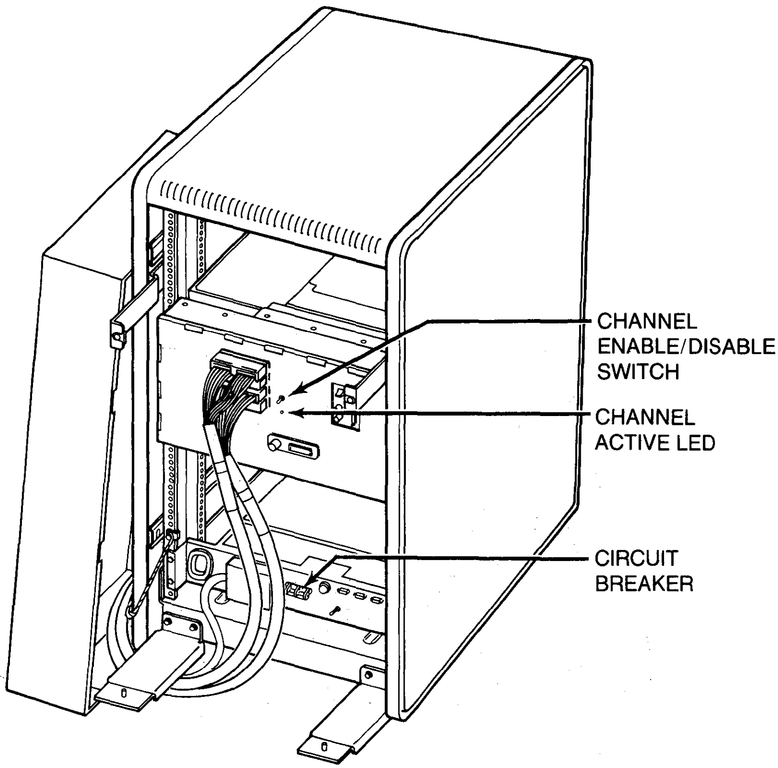
4. Set the CHANNEL ENABLE/DISABLE switch to the DISABLE (down) position.
5. At the front of the cabinet, set the power switch to OFF.
6. At the rear of the cabinet, set the circuit breaker on the power controller to the OFF (down) position .



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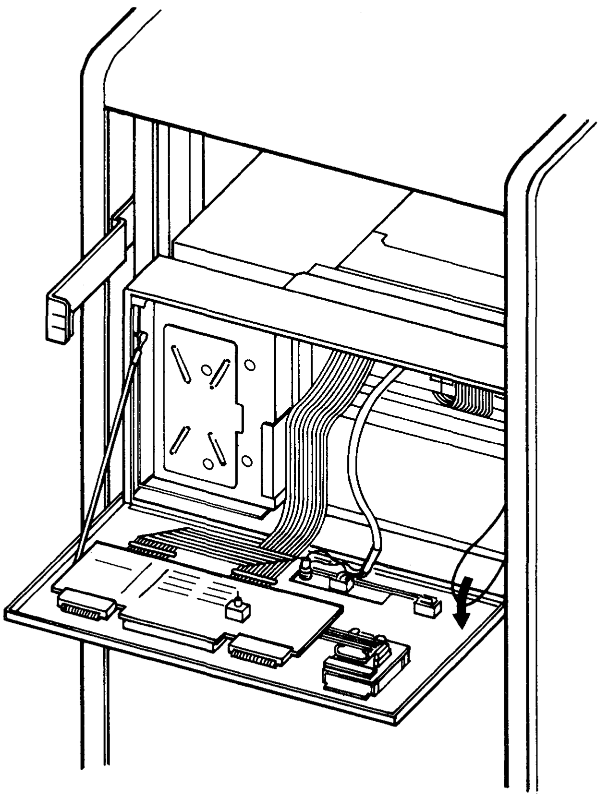
7. Remove the system ac cord from the ac outlet.

WARNING
Remove the system ac cord from the ac outlet to prevent bodily injury during any FRU replacement procedure.

8. Loosen the two captive screws on the I/O bulkhead, and lower the bulkhead.



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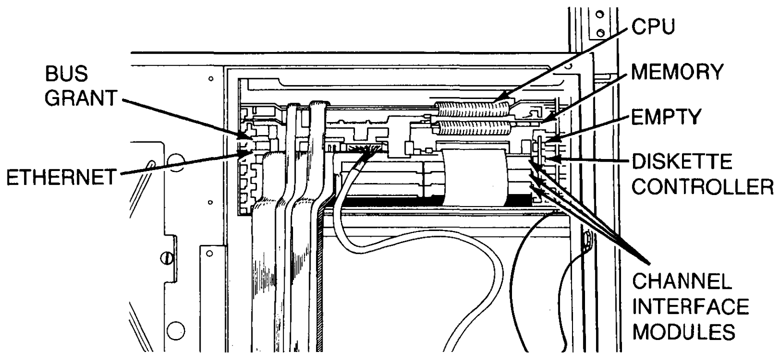
9. Remove the two cables from the left side of the CPU module and label them.

10. Proceed to the appropriate FRU replacement procedure.

DELQA Module Replacement

1. Perform the "Preparation" procedure (if not already done).
2. Locate the bus position of the DELQA module.

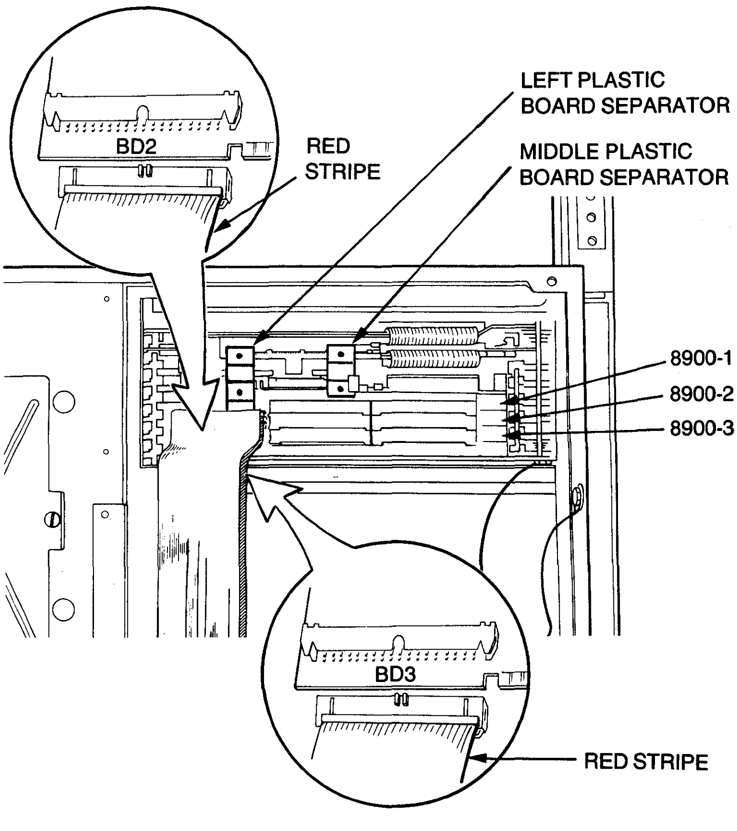


3. Remove the two cables from the left side of the CPU module and label them.
4. Disconnect the Ethernet cable from the DELQA module.
5. Remove the two plastic board separators.
6. Pull the module straight out of the connector and out of the system.
7. Install the replacement module by inserting it into the correct bus slot.
8. Verify that the switch has poles 1, 2, 3, and 5 open, and pole 4 closed.
9. Slide the module into the bus connector, and push it into the slot until it is firmly seated.
10. Proceed to "Completing the FRU Replacement Procedure" to finish the replacement procedure.

Channel Interface Module Set Replacement Procedure
The channel interface module set consists of three modules and two connector blocks. The modules are considered one FRU and the connector blocks are another FRU.

Follow the procedure below to replace the module set and the connector blocks.

1. Perform the preparation (if not already done).
2. Remove the cable from the diskette controller and label it.
3. Remove the cable from the Ethernet DELQA module.
4. Remove the 50-pin connector block (left side) from the module set.
5. Remove the 40-pin connector block (right side) from the module set.
6. Check the connector blocks for damage.
7. Remove the left plastic board separator that is clipped onto the channel interface module.



8. Pull the top module (8900-1) out of the bus connector and out of the system.

9. With the cable still connected, pull the second module out of the bus connector.

10. Disconnect the cable and label it.

11. With the cable still connected, pull the bottom module (8900-3) out of the bus connector.

12. Disconnect the cable and label it.

13. Verify that the switches on the second board of the replacement set match those in Table 6.

Table 6 Channel Interface Module Switch Locations

Pole No.	Switch 1	Switch 2
1	OFF	OFF
2	OFF	OFF
3	ON	OFF
4	ON	ON
5	OFF	OFF
6	OFF	ON
7	OFF	OFF
8	OFF	OFF

14. Install the replacement module set by connecting the bus ribbon cable to the 8900-3 module and installing it into the next-to-bottom bus slot. (The bottom slot always remains empty.)

15. Connect the ribbon cable to the 8900-2 module and install it into the slot just above the 8900-3 module.

16. Install the 8900-1 module into the slot just above the 8900-2 module.

17. Replace the left plastic board separator and clip it onto the channel interface module.

18. Inspect the connector blocks and reinstall them if they are not damaged. If the blocks are damaged, replace them with new ones.

19. Reconnect the cables that were removed from other modules and go to "Completing the FRU Replacement Procedure."

Driver/Receiver Module Replacement Procedure

1. Perform the "Preparation" procedure.
2. Notify the system manager of the mainframe that the channel cables must be disconnected from the DEC ChannelServer, causing a temporary disruption in the channel.

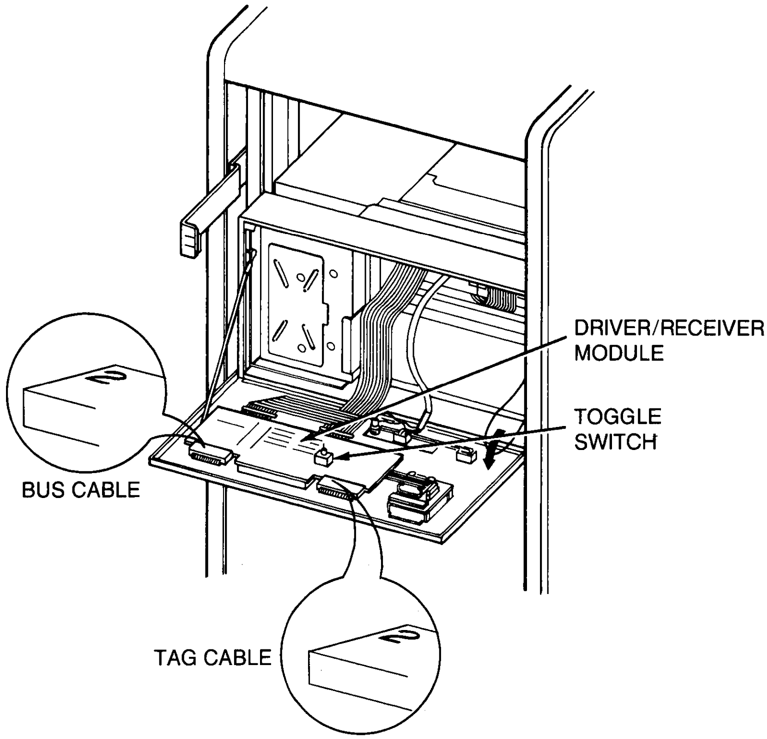
NOTE

There are two possible ways that channel cables may be connected to the DEC ChannelServer.

1. **Hosts connected to the gateway by a T-BAR or MATRIX switch**
2. **Host connected directly to the gateway.**

If the hosts are connected by a switch, have the IBM operator stop the IBM system and disable the unit leg (ensuring that all devices are off-line).

3. Locate the BUS IN, BUS OUT, TAG IN, and TAG OUT cables connected to the DEC ChannelServer and label them (if they are not already labeled).
4. Remove the cables from the BUS IN and BUS OUT connectors. (A terminator instead of a cable might be connected to the BUS OUT connector.)
5. If a replacement driver/receiver module is present, proceed to the next step. If a replacement driver/receiver is not present, connect the BUS IN and BUS OUT cables together.
6. Remove the cables from the TAG IN and TAG OUT connectors. (A terminator instead of a cable might be connected to the TAG OUT connector.)
7. If a replacement driver/receiver module is present, proceed to the next step; if not, connect the TAG IN and TAG OUT cables together.
8. Loosen the two captive screws on the I/O bulkhead, and lower the bulkhead.
9. Disconnect the cables from the driver/receiver module and label them.



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10. Determine the position of the toggle switch on the module (OUT or IN). The replacement module must be set to the same position.

11. At the front of the I/O bulkhead, remove the eight screws that hold the driver/receiver module in place.

12. Remove the module.

13. Remove the plastic shield from the module by pressing in the tab on each of the three snap-in spacers.

14. Install the spacers and shield onto the replacement module.

15. Install the replacement module, ensuring that the LED and CHANNEL ENABLE/DISABLE switch go through their respective slots in the bulkhead.

16. Secure the module with the eight screws.

17. Verify that the toggle switch on the module is in the same position as the removed module.

18. Reverse steps 1 through 9.

NOTE
Incorrectly installing the bus and tag cables could cause the diagnostics not to load, or cause MDM to fail when testing the channel interface.

19. Proceed to "Completing the FRU Replacement Procedure."

Completing the FRU Replacement Procedure
After replacing any FRU in the DEC ChannelServer, perform the following.

1. Install the system ac cord to the ac outlet.
2. Raise the I/O bulkhead and tighten the two captive screws.
3. Set the circuit breaker on the power controller to the ON (up) position.
4. At the front of the cabinet, set the power switch ON.
5. Run diagnostics to verify that the original system fault has been corrected.
6. Set the CHANNEL ENABLE/DISABLE switch to the ENABLE (up) position.
7. Notify the mainframe system manager to enable the DEC ChannelServer on the channel.
8. Run DESNX diagnostics to verify the system.
9. Install the rear bulkhead door to the cabinet.
10. Notify the system manager that the DEC ChannelServer is repaired.

DESNC ETHERNET CONTROLLER

General Description
The DESNC (DIGITAL Ethernet Security Network Controller) is an encryption device that allows secure operations on an Ethernet network. The DESNC encrypts data from a source node and forwards the data to a destination DESNC which decrypts the data and sends it to the destination node. This process allows secure data transfers and prevents other nodes on the network from reading the data.

There are two ways of using the DESNC controller:

- A DESNC controller with an attached node running the VAX KDC (Key Distribution Center) software is used as the primary controller. This controller manages the other DESNC controllers on the user nodes. A VAX KDC DESNC must be installed on each Ethernet Local Area Network (LAN).

- A DESNC controller, with attached nodes that are not running the VAX KDC software, is used to encrypt and decrypt data and is managed by a VAX KDC DESNC.

The DESNC controller is installed between the user nodes and the Ethernet Local Area Network (LAN) backbone segment.

The VAX KDC software is used to manage the DESNC controllers on the network. The network security manager uses the VAX KDC software to:

Server Functions

- Define the conditions under which a host station with a DESNC can communicate with another host with or without a DESNC

- Obtain status information from a selected DESNC

Interface Functions

- Obtain a list of DESNC errors and audit security events

- Distribute association keys to the DESNC controllers

- Enforce VAX KDC security policy

- Perform maintenance

DESNC INSTALLATION

Reference Documentation

DESNC Technical Description	EK-DESNC-TD
DESNC Installation/User's Guide	EK-DESNC-UG
DESNC Maintenance Advisory Brief	EY-7678E-MB
Ethernet Installation Guide	EK-ETHER-IN
VAX Key Distribution Center Installation Guide	AA-KM70A-TE
VAX Key Distribution Center Security Manager's Guide	AA-KM69A-TE

DESNC Modes of Operation

Controlled By Key Switch:

Control Mode	Enables self-test and the entering of initialization keys.
Operational Mode	Enables the encryption and decryption of data.

Controlled By Software:

Bypass Mode	Allows the DESNC controllers to operate when the VAX KDC system is down. Controlled by software and the BYPASS switch.
Standby Mode	Does not allow data frames to be transmitted between user nodes. Only control messages from the VAX KDC node can be transmitted to the standby DESNC. The VAX KDC uses the Standby mode to disable the DESNC and prevent unauthorized use.

DESNC Configuration Considerations
Some conditions and restrictions must be followed when connecting the DESNC controller into the LAN.

On the network side of the DESNC controller:

- Two nodes that communicate with each other cannot have more than two DESNC controllers in that communication path.
- For encrypted communications there can be up to four LAN Bridge 100 bridges (DEBET) and two DESNC controllers in the communication path between two nodes.
- For nonencrypted communications there can be up to five LAN Bridge 100 bridges (DEBET) and one DESNC controller between a secure node and any unsecure node with which it communicates.

On the user node side of the DESNC controller:

- The VAX KDC node must be connected to the Number 1 ThinWire port on the VAX KDC DESNC controller.
- No repeaters (DEMPR or DEREP) can be used. Only a single segment can be connected to each port.
- A DESNC controller can support a maximum of 20 nodes. The 20 nodes can be connected to one port or distributed across the four ports. For maximum security, only one node should be connected to each port.
- Nodes connected to the same port on a DESNC controller can be daisy chained and must have a minimum of 0.5 m (1.64 ft) of cable between nodes.
- Connections must be radial ThinWire cable only. The maximum ThinWire cable length for each port is 185 m (606.9 ft).
- All user nodes on a port must go through a DESNC to reach other user nodes on other ports.
- All user nodes must go through the DESNC to reach the network.
- A ThinWire cable must not connect to any device that connects the ThinWire cable shield to ground.
- A terminator must be installed on all unused ports and at the end of a ThinWire segment connected to a port. (Four 50 ohm terminators are provided with each DESNC controller.)
- Any network failure on one of the ports of a DESNC controller will result in the loss of all four ports on the DESNC controller.

General configuration considerations:

- Nodes on a Local Area VAXcluster (LAVC) that communicate among themselves at continuous high rates, should be connected to a single port on the DESNC if they are located together.
- A DESNC controller can be isolated on either the network side or the user node side by a bridge (DEBET) to provide address filtering.

Power Requirements
The DESNC controller operates on ac power, 47 to 63 Hz. A voltage select switch is used to select either 120 Vac or 240 Vac operation.

The DESNC controller draws 1.5 A at 120 Vac and 0.75 A at 240 Vac.

Device Placement
The DESNC controller is a Class B device and can be installed in an open office or computer-room environment. Typical locations might include a:

- Shelf,
- Table, or
- Rack-mount assembly.

CAUTION
Do not install the DESNC controller on the floor. Excessive dirt and dust infiltration may damage the unit.

Installation Procedure
The following steps give the correct order for installing the hardware, installing the VAX KDC software, configuring the security-enhanced LAN, and initializing the VAX KDC DESNC controller and the non VAX KDC DESNC controller(s). See Figure 1 for hardware components.

1. Install the VAX KDC software on the designated VAX KDC node. Refer to the *VAX Key Distribution Center Installation Guide* for instructions.

2. Configure the security-enhanced Local Area Network (LAN). Refer to the *VAX Key Distribution Center Security Manager's Guide* for instructions.

3. Install and test the DESNC controller to be used by the VAX KDC node. Refer to the *DESNC Installation/User's Guide* for instructions.

4. Initialize the VAX KDC DESNC. Refer to the *VAX Key Distribution Center Security Manager's Guide* Chapter 4 for instructions.

5. Install and test the non VAX KDC DESNC controller(s). Refer to the *DESNC Installation/User's Guide* for instructions.

6. Initialize the non VAX KDC DESNC controller(s). Refer to the *VAX Key Distribution Center Security Manager's Guide* for instructions.

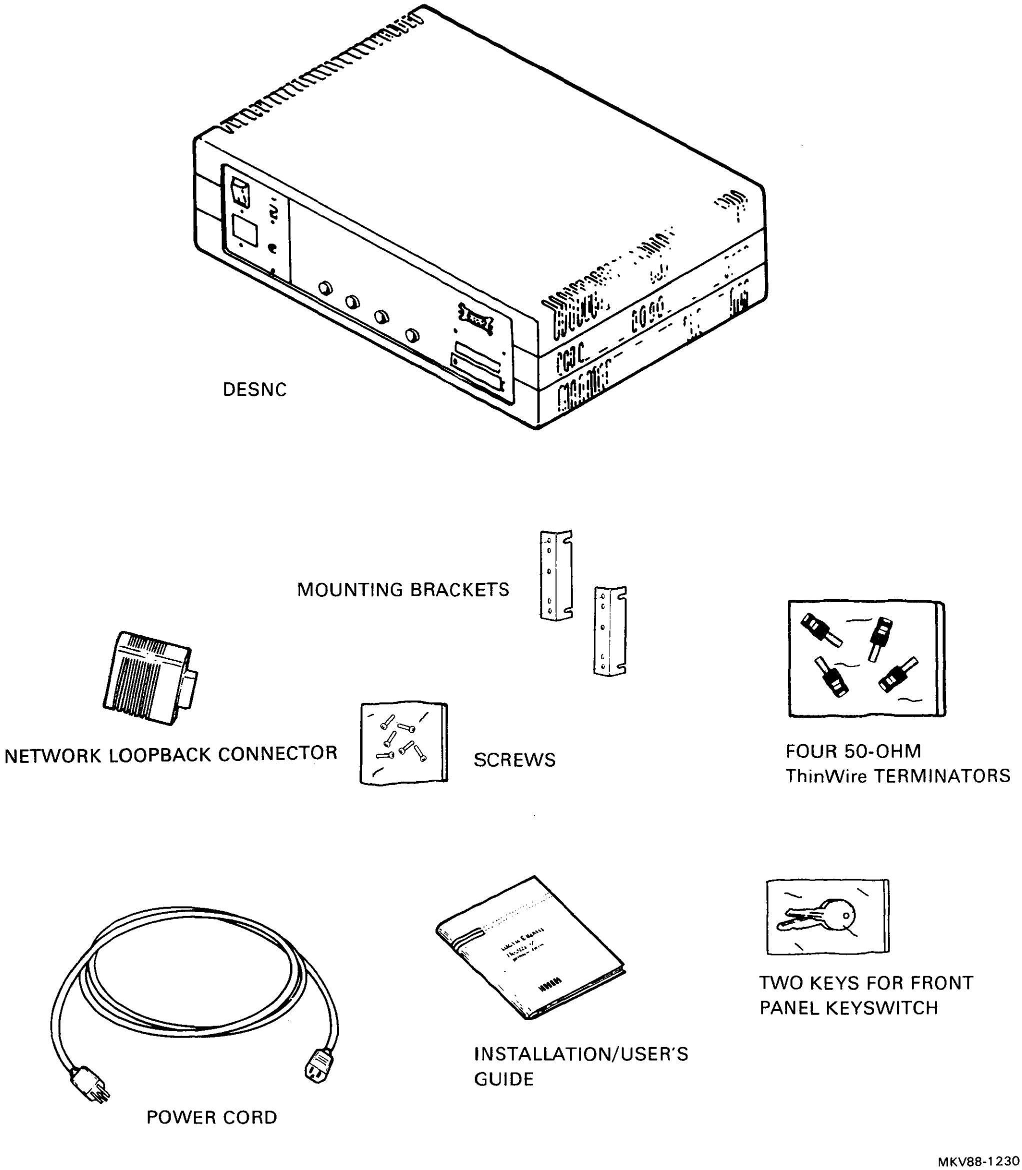

Figure 1 DESNC Hardware Components

Updating the VAX KDC Database

The following procedures are for updating the VAX KDC database when a DESNC is replaced, when a node is moved from one DESNC port to another, and when an Ethernet controller is replaced in a node attached to the DESNC.

1. When a faulty DESNC has been removed, the replacement must have the initialization key and VAX KDC address installed. Use the following procedure to initialize a replacement DESNC.

   Update the DESNC Ethernet address in the VAX KDC database.

   ```
   $KDC
   KDC>MODIFY CONTROLLER [controller name]/
         ADDRESS=XX-XX-XX-XX-XX-XX
   KDC>GENERATE INITIALIZATION_KEYS [controller name]/
         OUTPUT=file.ext
   ```

   a. Print the initialization key file.

   b. Enter initialization key and VAX KDC address information for the replaced DESNC taken from the file printed.

   c. Check that KDC OK LED lights and return to the VAX KDC system.

   d. Destroy the printed initialization key file.

   ```
   KDC>UPDATE [controller name]
   KDC>EXIT
   $DELETE/ERASE [Initialization key file]
   ```

2. When a node has been moved from one DESNC port to another DESNC port, the change has to be noted in the VAX KDC configuration database.

   Update node placement on the DESNC into the VAX KDC database.

   ```
   $KDC
   KDC>MODIFY NODE [node name]/CONTROLLER=[controller name]/
         PORT=[port number]
   KDC>EXIT
   ```

3. When an Ethernet controller is replaced in a node attached to the DESNC, the VAX KDC configuration database must be changed to reflect the change in Ethernet address.

   Update node Ethernet address on the VAX KDC database.

   ```
   $KDC
   KDC>MODIFY NODE [node name]/ADDRESS=XX-XX-XX-XX-XX-XX
   KDC>EXIT
   ```

Cabling

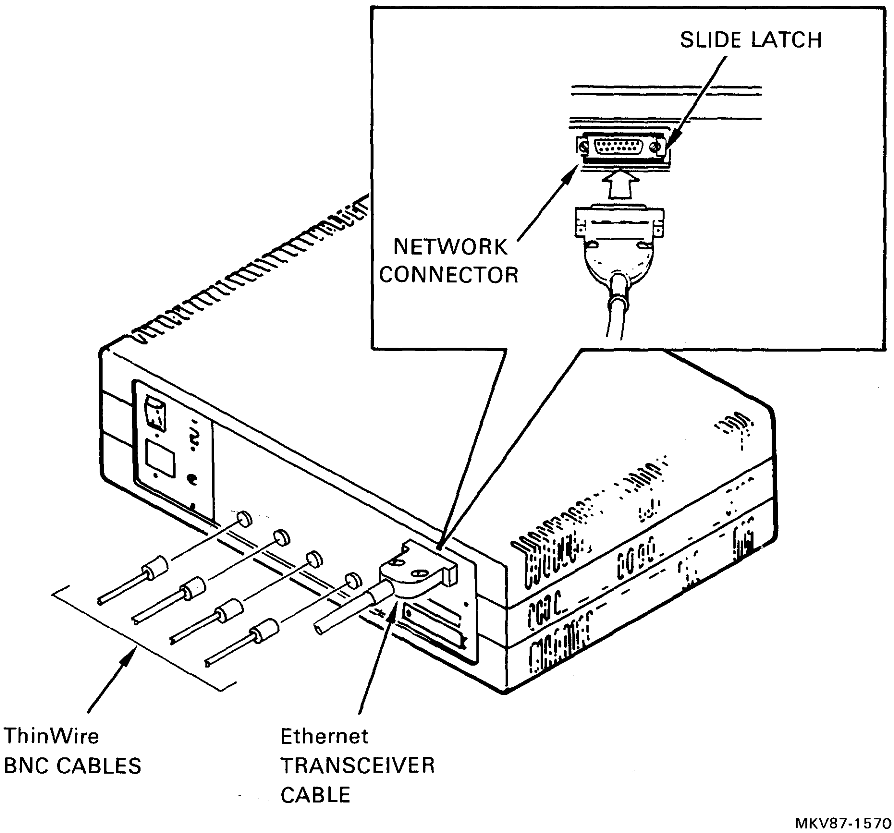

Figure 2 DESNC I/O Cable Connection

Power-Up Self-Test

Use the flowchart in Figure 3 to perform the power-up self-test.

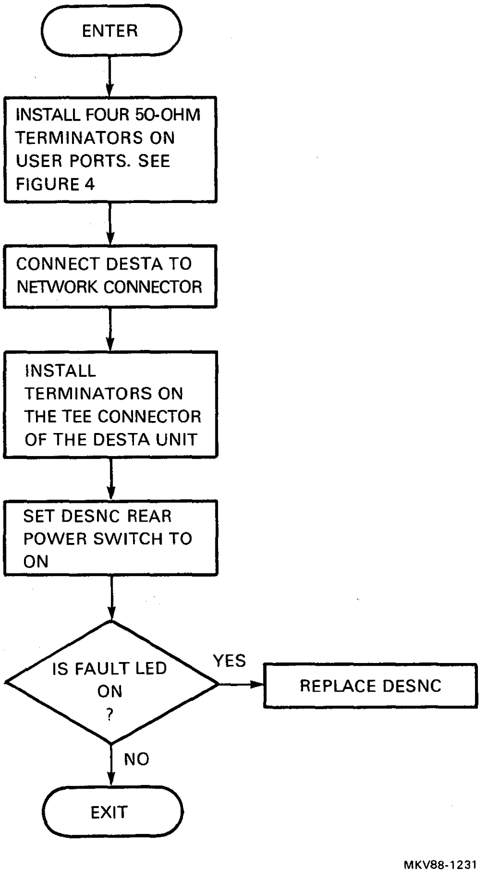

Figure 3 DESNC Power-Up Self-Test Flowchart

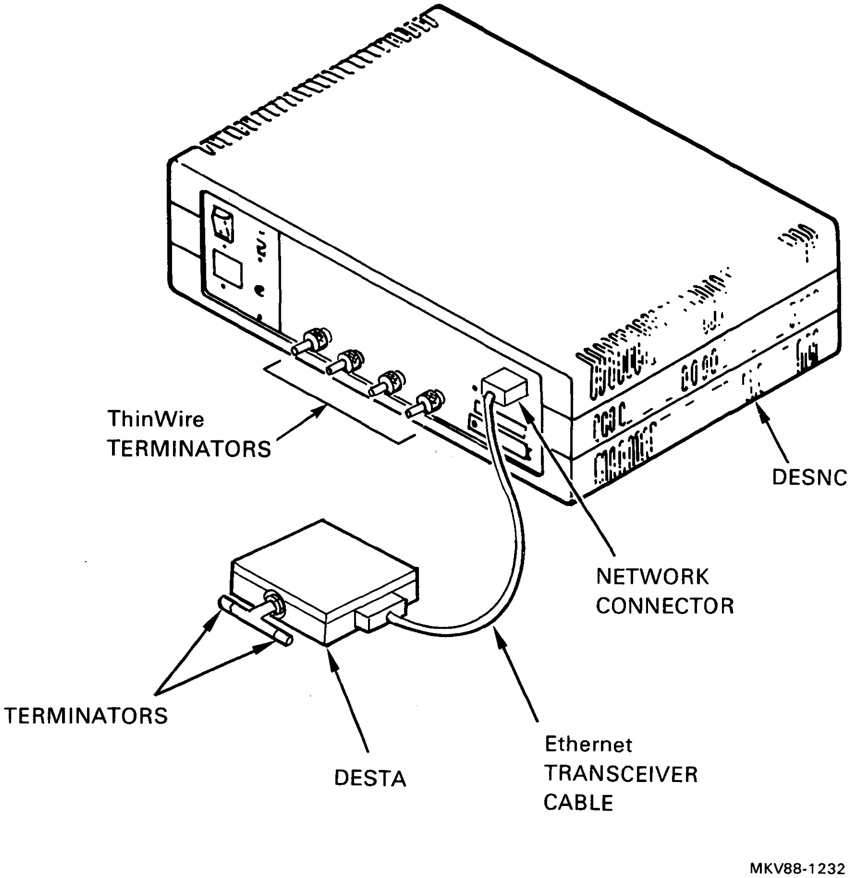

Figure 4 Power-Up Self-Test Configuration

ThinWire Port Check

Use the flowchart in Figure 5 to test and verify the individual ThinWire ports.

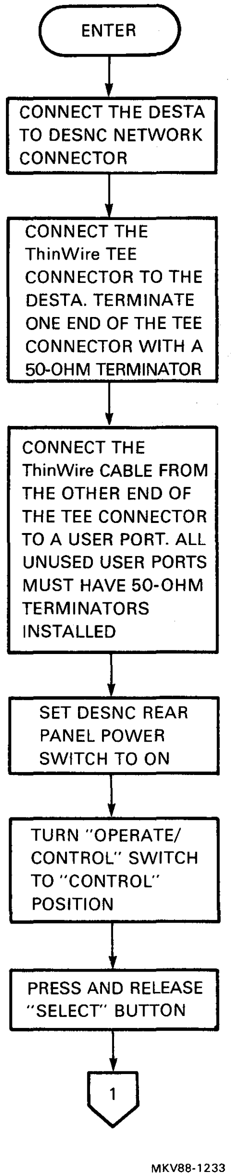

Figure 5 DESNC ThinWire Port Check Flowchart (Sheet 1 of 3)

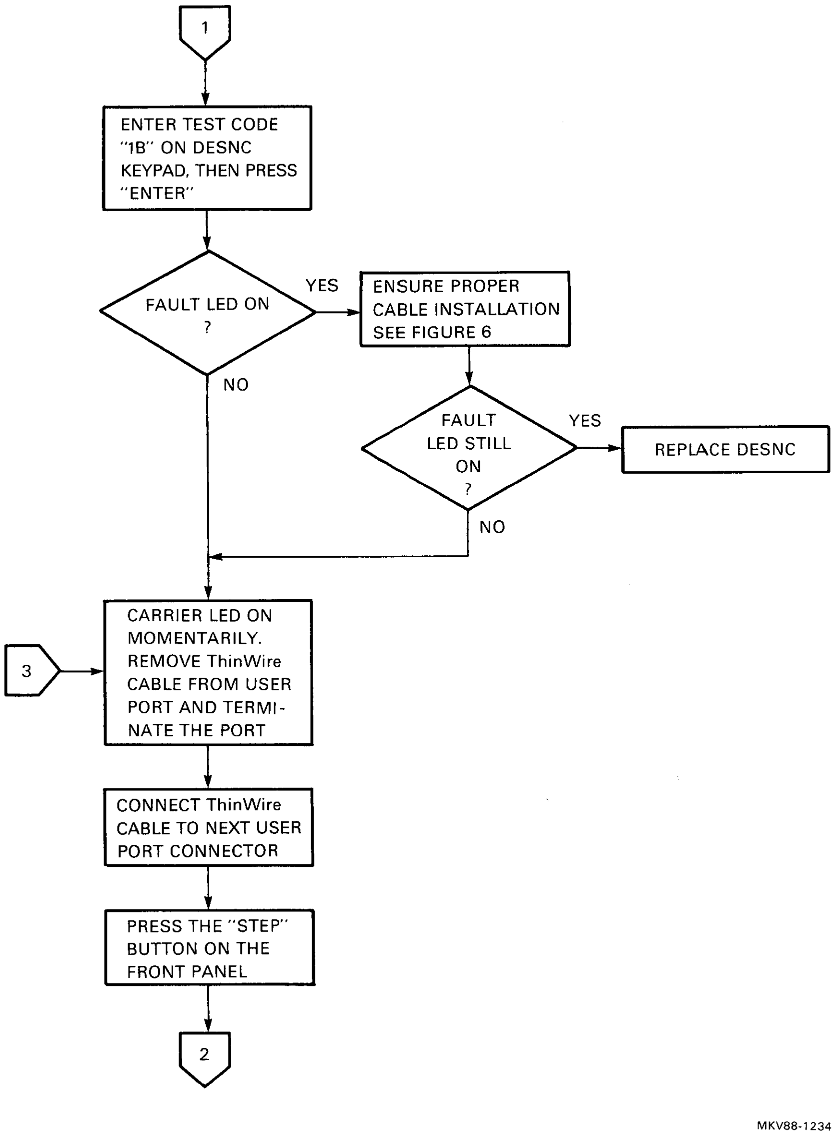

Figure 5 DESNC ThinWire Port Check Flowchart (Sheet 2 of 3)

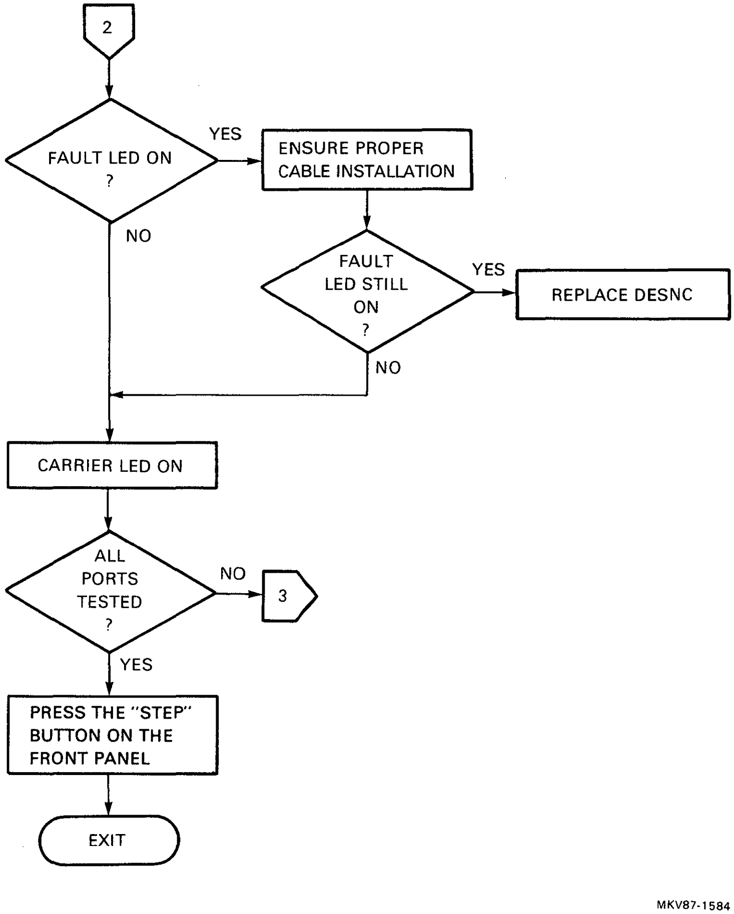

Figure 5 DESNC ThinWire Port Check Flowchart (Sheet 3 of 3)

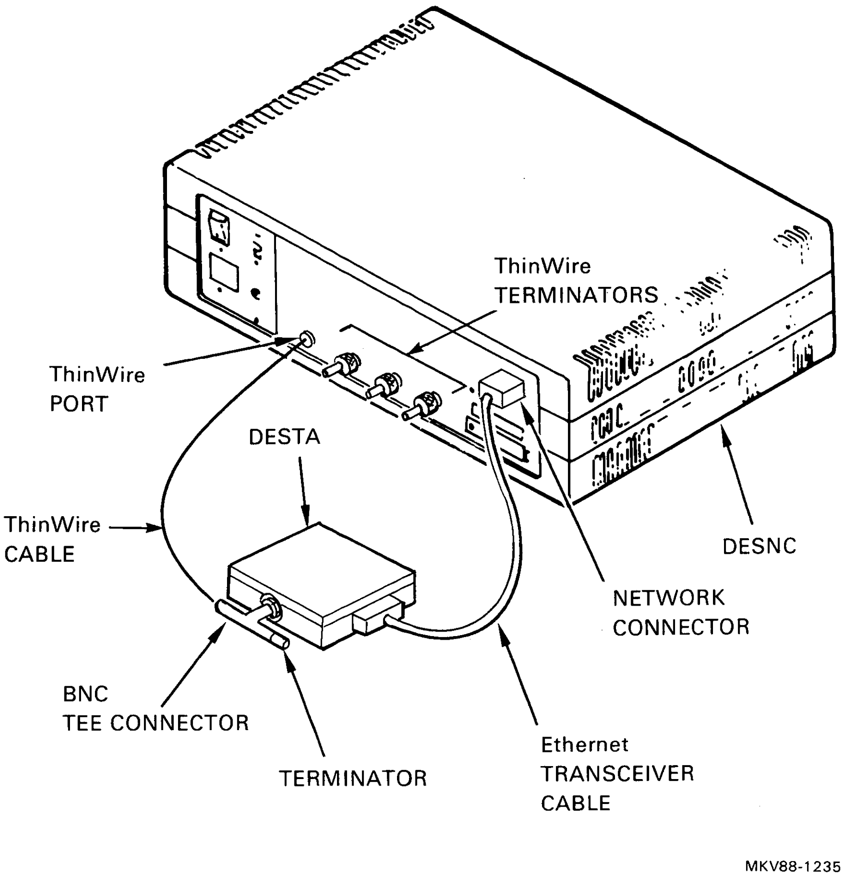

Figure 6 DESNC ThinWire Port Test Configuration

DESNC/VAX KDC Troubleshooting Flowchart

Use the flowchart in Figure 7 to troubleshoot the DESNC/VAX KDC.

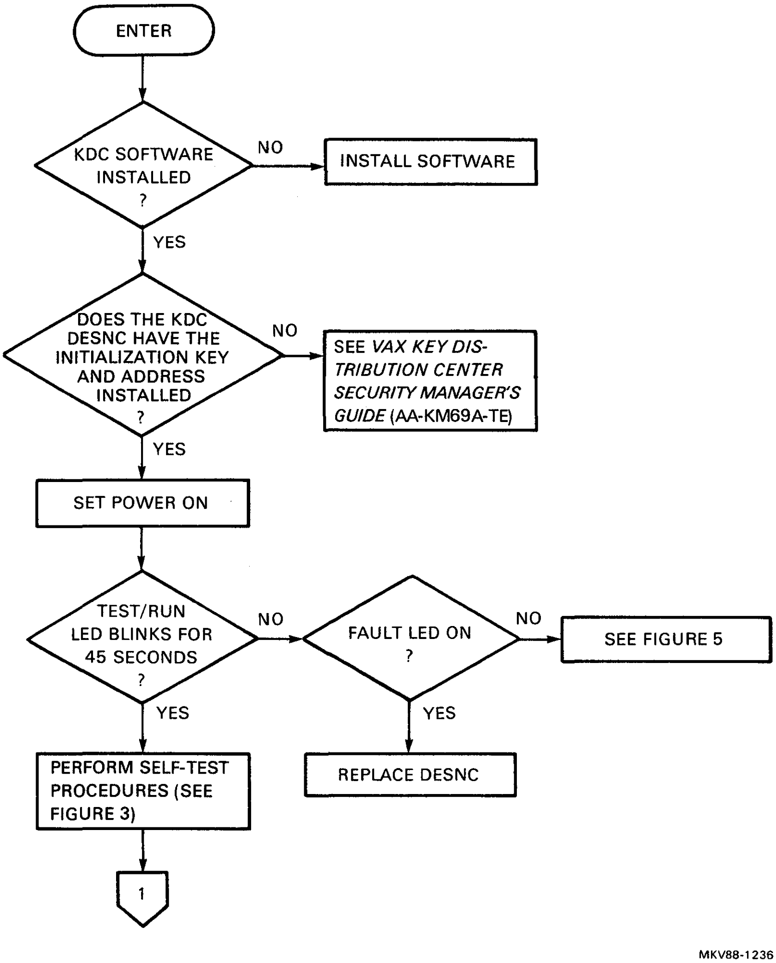

Figure 7 DESNC/VAX KDC Troubleshooting Flowchart (Sheet 1 of 3)

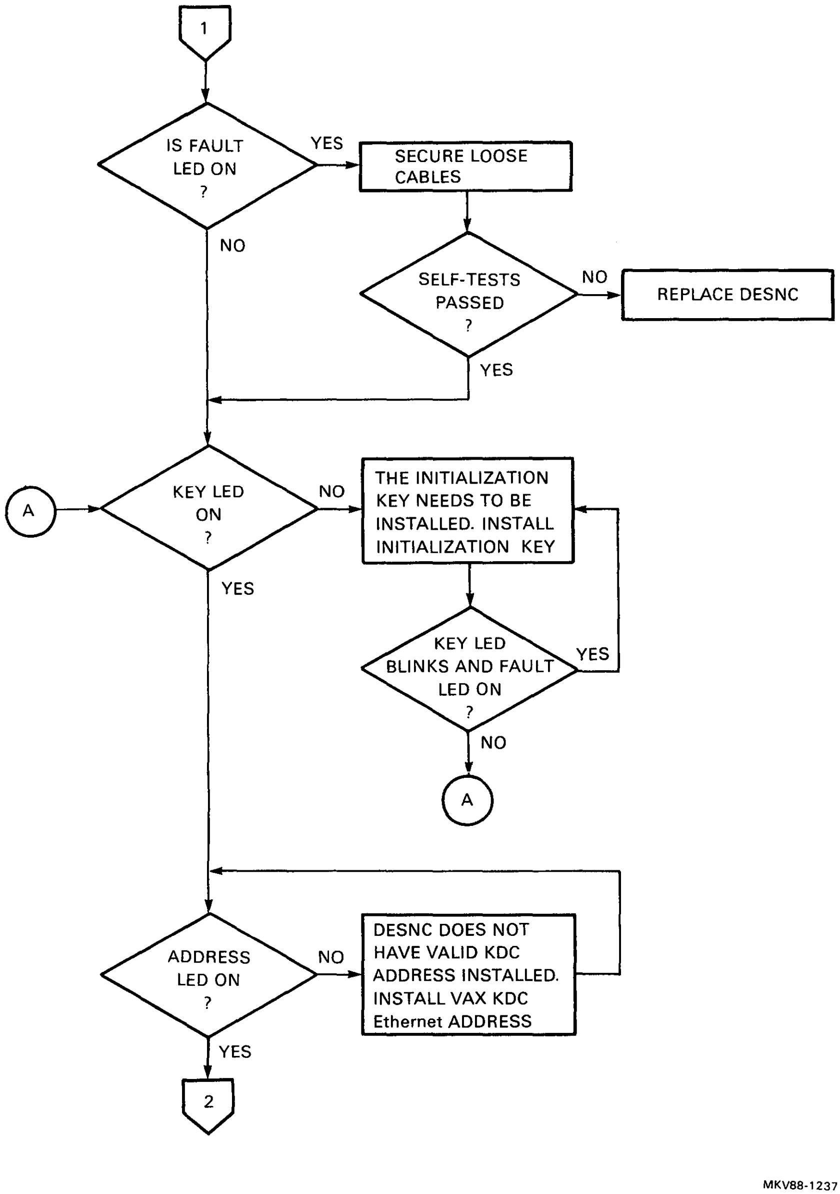

Figure 7 DESNC/VAX KDC Troubleshooting Flowchart (Sheet 2 of 3)

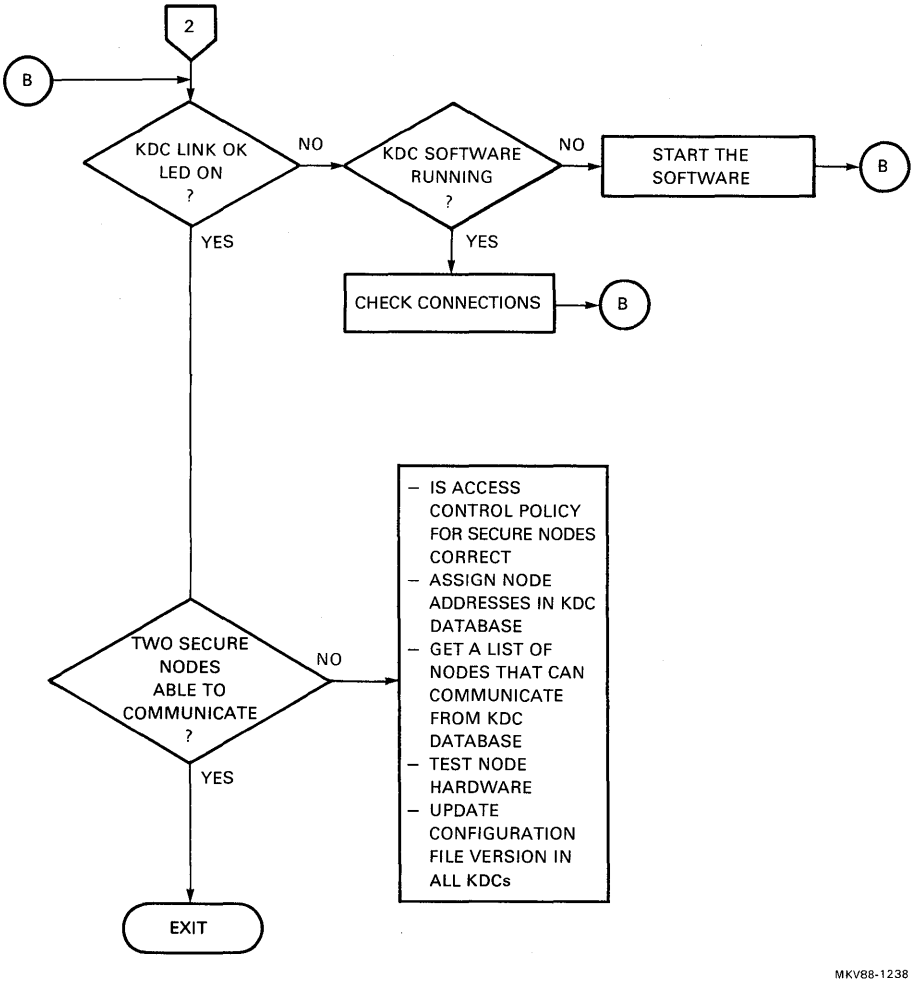

Figure 7 DESNC/VAX KDC Troubleshooting Flowchart (Sheet 3 of 3)

DESNC LED Indicators

The LED indicators on the front panel of the DESNC are used to indicate the status of the DESNC and the VAX KDC software. Table 1 shows the LED indicator combinations and definitions in the Control mode. Table 2 shows the LED indicator combinations and definitions in the Operational mode.

Table 1 DESNC LED Indicators in the Control Mode

X – NOT SIGNIFICANT
0 – ON
* – BLINK
– – OFF

DC POWER OK	TEST/RUN	KDC OPERATION	KEY	ADDRESS	KDC LINK OK	FAULT	BYPASS	
0	–	–	–	–	–	–	–	POWER IS TURNED ON
0	*	–	–	–	–	–	–	POWER IS ON AND SELF-TEST IS RUNNING
0	0	–	–	–	–	–	–	SELF-TEST SUCCESSFULLY COMPLETED
0	*	–	–	–	–	0	–	SELF-TEST FAILED
0	0	*	X	X	–	–	–	KDC MASTER KEY IS NOT ENTERED
0	0	X	0	*	–	–	–	ADDRESS BEING ENTERED
0	0	X	*	X	–	0	–	DESNC DOES NOT HAVE VALID CONTROLLER INITIALIZATION KEY
0	0	X	0	0	–	–	–	DESNC HAS VALID KDC ADDRESS
0	0	X	0	*	–	0	–	DESNC DOES NOT HAVE VALID KDC ADDRESS
0	0	X	*	–	–	–	–	KEY IS BEING ENTERED
0	0	X	0	0	*	–	–	KDC WENT DOWN AFTER DESNC WAS INITIALIZED

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Table 2 DESNC LED Indicators in the Operational Mode

X – NOT SIGNIFICANT
O – ON
* – BLINK
– – OFF

DC POWER OK	TEST/RUN	KDC OPERATION	KEY	ADDRESS	KDC LINK OK	FAULT	BYPASS	
O	–	–	–	–	–	–	–	POWER IS TURNED ON
O	O	O	X	X	–	–	–	DESNC IS A KDC CONTROLLER KDC MASTER KEY IS ENTERED
O	O	*	O	O	*	–	–	DOWN-LINE LOAD IN PROCESS
O	O	X	O	X	–	–	–	DESNC HAS VALID CONTROLLER INITIALIZATION KEY
O	O	X	O	O	O	–	–	KDC IS ON-LINE, DESNC IS OPERATIONAL
O	O	X	O	O	*	O	–	KDC IS DOWN, DESNC NOT OPERATIONAL
O	O	X	O	O	–	–	O	DESNC IS IN BYPASS MODE
O	O	X	O	O	*	O	–	BYPASS MODE REQUESTED WHEN KDC IS DOWN, BUT KDC DID NOT AUTHORIZE BYPASS
O	O	X	*	*	*	–	–	DESNC PLACED IN STANDBY MODE BY KDC

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VAX KDC Testing
Follow the flowchart in Figure 8 to use the VAX KDC software for verifying the DESNC controllers in the network.

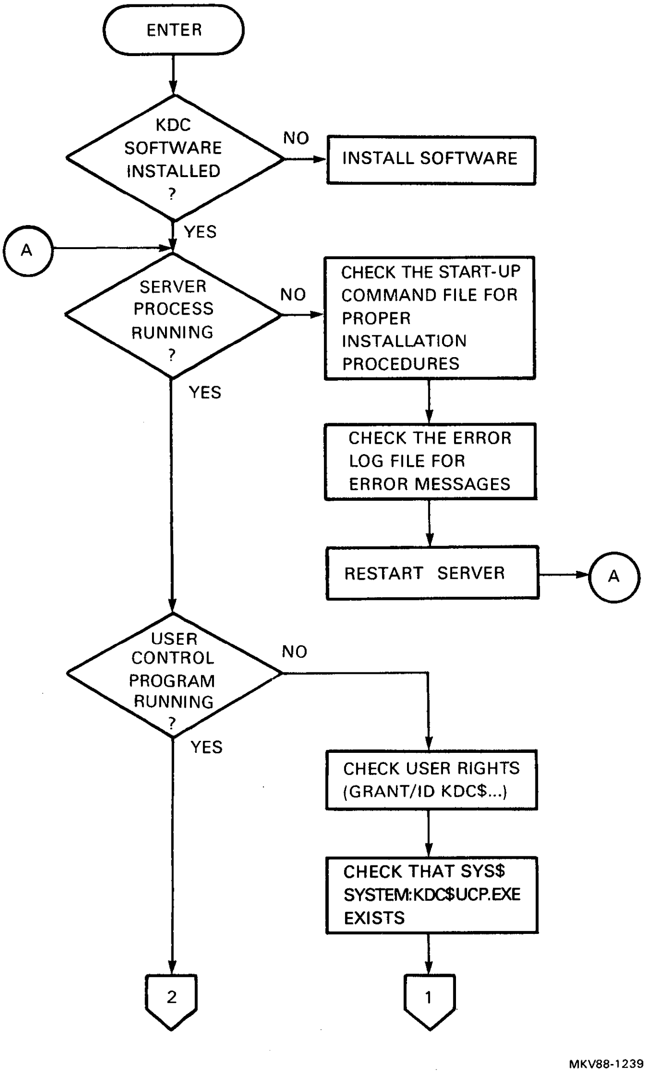


Figure 8 VAX KDC Maintenance Flowchart (Sheet 1 of 4)

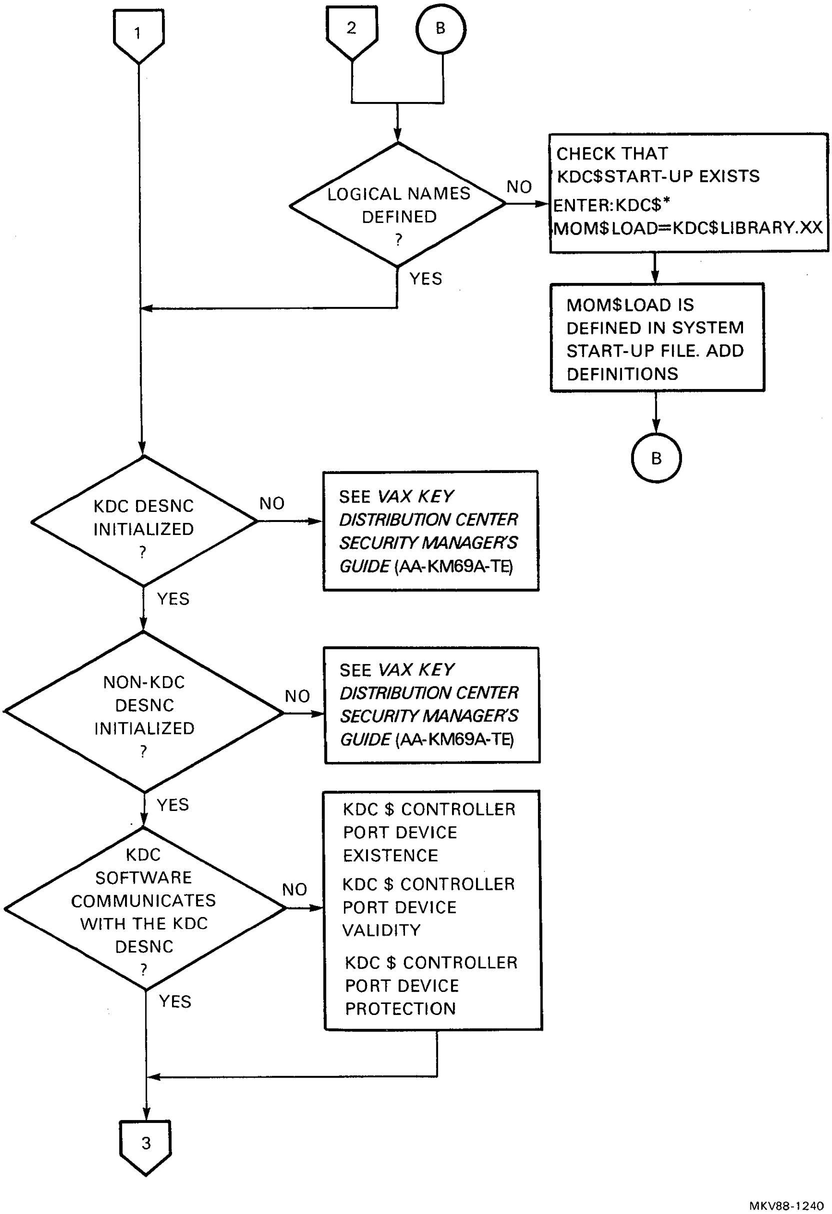


Figure 8 VAX KDC Maintenance Flowchart (Sheet 2 of 4)

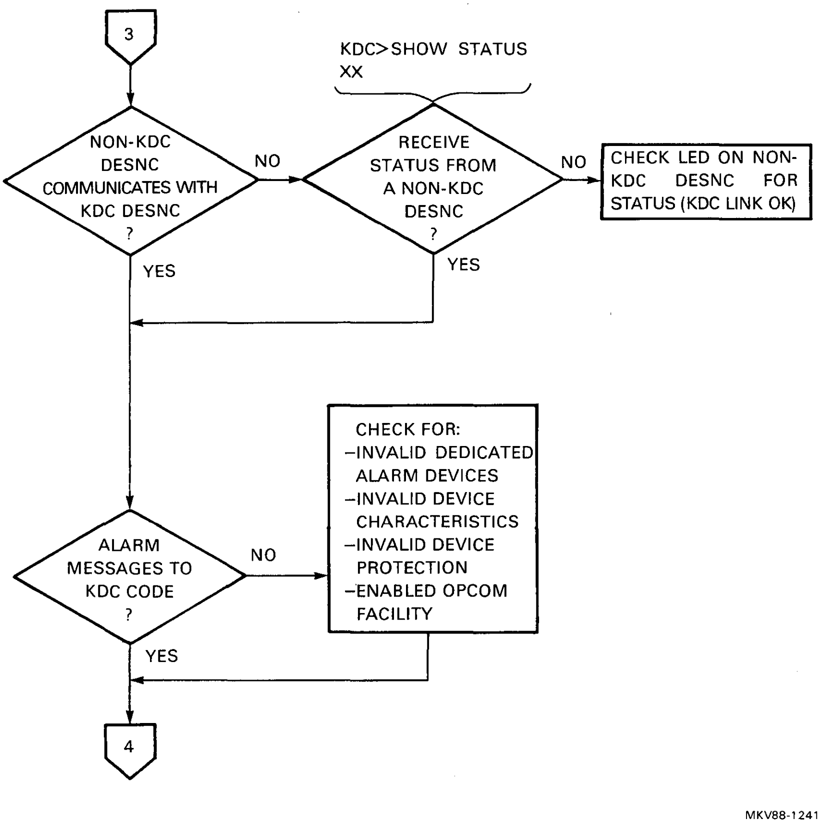


Figure 8 VAX KDC Maintenance Flowchart (Sheet 3 of 4)

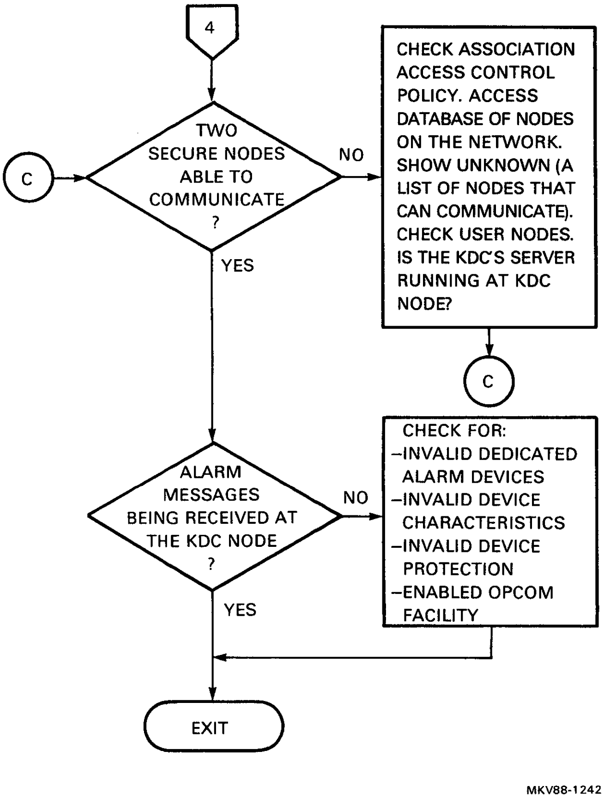


Figure 8 VAX KDC Maintenance Flowchart (Sheet 4 of 4)

VAX KDC Commands and Qualifiers
Table 3 contains a listing of the VAX KDC commands and the qualifiers associated with each command. For a description of each command, refer to Chapter 7 in the *VAX Key Distribution Center Security Manager's Guide.*

Table 3 VAX KDC Commands and Qualifiers

Commands	Qualifiers
ABORT controller-list	/[NO]CONFIRM /[NO]LOG
ACCOUNTING [file-spec,...]	/BEFORE /[NO]BRIEF /BY_CONTROLLER /BY_EVENT /[NO]FULL /BY_KDC /BY_NODE /[NO]LOG /OUTPUT /SINCE
ADD CONTROLLER controller-list	/[NO]ADDRESS /[NO]AUDIT /KDC_LIST /LIKE /STATE /TYPE
ADD KDC node-list	/[NO]ALARM /[NO]AUDIT /LIKE
ADD NODE node-list,...	/[NO]ADDRESS /[NO]ALLOW /[NO]AUDIT /[NO]CONTROLLER /[NO]DECNET_ADDRESS /INTEGRITY /LIKE /PORT /SECRECY
CHECK ASSOCIATION node-1 node-2	(None)
DEFINE TYPE type-name	/DIAGNOSTIC_CODE /FIRMWARE_VERSION /HARDWARE_VERSION /NODES /OPERATIONAL_CODE /PORTS

Table 3 VAX KDC Commands and Qualifiers (Cont)

Commands	Qualifiers
EXIT	(None)
GENERATE INITIALIZATION_KEYS [controller-list]	/[NO]CONFIRM /MODIFIED /OUTPUT
HELP [keyword...]	(None)
MODIFY CONTROLLER controller-list	/[NO]ADDRESS /[NO]AUDIT /[NO]CONFIRM /KDC_LIST /LIKE /NAME /STATE /TYPE
MODIFY KDC kdc-list	/[NO]ALARM /[NO]AUDIT /[NO]CONFIRM /LIKE /NAME
MODIFY NODE node-list	/[NO]ADDRESS /[NO]ALLOW /[NO]AUDIT /[NO]CONFIRM /[NO]CONTROLLER /[NO]DECNET_ADDRESS /INTEGRITY /LIKE /NAME /PORT /SECRECY
NEW AUDIT_FILE	(None)
NEW CONFIGURATION_FILE	(None)
REMOVE CONTROLLER controller-list	/[NO]CONFIRM
REMOVE KDC kdc-list	/[NO]CONFIRM
REMOVE NODE node-list	/[NO]CONFIRM
REMOVE TYPE type-name	/[NO]CONFIRM

Table 3 VAX KDC Commands and Qualifiers (Cont)

Commands	Qualifiers
SET DURATION [time]	(None)
SET GENERATED_KEYS	(None)
SET UNKNOWN	/INTEGRITY /SECRECY
SHOW CONTROLLER [controller-list]	/MODIFIED /[NO]OUTPUT
SHOW COUNTERS [controller-list]	/[NO]OUTPUT
SHOW DURATION	/OUTPUT
SHOW GENERATED_KEYS	/OUTPUT
SHOW KDC [kdc-list]	/OUTPUT
SHOW NODE [node-list]	/OUTPUT
SHOW STATUS [controller-list]	/[NO]AUTHENTICATE /[NO]CURRENT /OUTPUT
SHOW TYPE [type-name]	/OUTPUT
SHOW UNKNOWN	/OUTPUT
SHOW VERSION	/OUTPUT
SHUTDOWN	(None)
SPAWN [command-string]	(None)
TEST CONTROLLER controller-list	(None)
UPDATE [controller-list]	/[NO]LOG /MODIFIED

DESNC MAINTENANCE AIDS

DESNC Keyboard Commands

The following is a list of the DESNC keyboard commands and their functions:

1E	Extended terminator test
1B	Network to port loop test
C	Enter master key (for VAX KDC DESNC only)
A	Enter key generation key (for VAX KDC DESNC only)
D	Enter key generation seed (for VAX KDC DESNC only)
E	Enter initialization key and VAX KDC Ethernet address (for all DESNC controllers)

DESPR SINGLE-PORT REPEATER

General Description

The DESPR Ethernet single-port repeater is a ThinWire repeater that connects one ThinWire coaxial cable segment of up to 185 m (607 ft) in length. Up to 29 stations can be daisy-chained on this segment. The DESPR is connected to a standard Ethernet or IEEE 802.3 "backbone." There are four versions of the DESPR in the field; however, only the DESPR-EE/EF are currently being sold.

- DESPR-AA, 110 Vac
- DESPR-AB, 220 Vac
- DESPR-EE, 110 Vac
- DESPR-EF, 220 Vac

The DESPR is identical to the DEMPR except that it has only one ThinWire port, whereas the DEMPR has eight ThinWire ports (see Figure 1).

For information on installation, cabling, diagnostics, and maintenance aids, refer to the DEMPR option in the *Communications Options Minireference Manual.*

NOTE

The DESPR uses the same Ethernet configuration guidelines as the DEMPR. This includes:

- **There can be no more than two repeaters* between any two stations.**
- **When attaching a DESPR to a DELNI, follow the same guidelines used when attaching a DEMPR to a DELNI.**
- **The DESPR provides ground for the ThinWire coaxial cable. No other ground connections are allowed.**

---

* Ethernet timing starts again at a LAN Bridge. This means that it is possible to have more than two repeaters between stations when remote bridges are used. No more than two repeaters may be placed between the bridges.

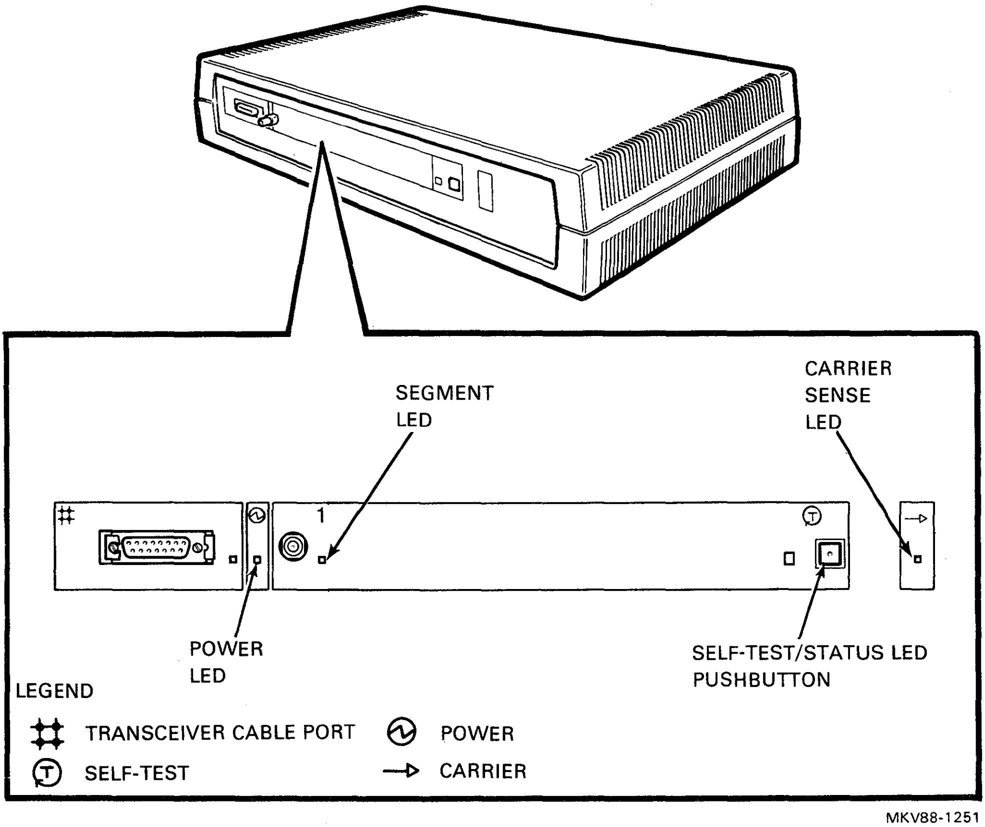
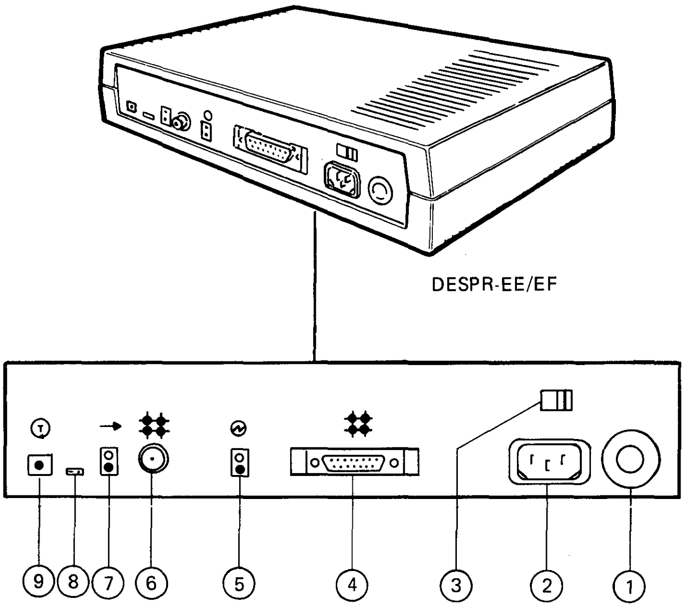


Figure 1 DESPR-AA or -AB Rear Panel



LEGEND:

1: 2 A Thermal Circuit Breaker

2: AC Input Connector

3: 115 V/235 V Voltage Selector

4: 15-Pin D-SUB Connector (Port 0)

5: Port 0 Status Indicator
TOP: Green LED - Transceiver Port Power (+12 V) OK Indicator
BOTTOM: Red LED - Port 0 Segmentation Indicator

6: BNC Connector (Port 1)

7: Activity and Port 1 Status Indicator
TOP: Green LED - Any Network Activity Indicator
BOTTOM: Red LED - Port 1 Segmentation Indicator

8: Loop-on Self-Test Jumper

9: Reset Switch with Red LED (self-test indicator)

MA-0972-88

Figure 2 DESPR-EE or -EF Rear Panel

DESQA COMMUNICATIONS CONTROLLER

General Description
The DESQA module is a Q-Bus communications controller that enables higher-level software, such as DECnet, to communicate over an Ethernet network.

The DESQA module conforms to the Ethernet Local Area Network Specification (Version 2.0) and is compatible with IEEE Specification 802.3 for local area networks.

The DESQA module provides a high-speed asynchronous connection between a Q-Bus system and a local area network (LAN) based on Ethernet or IEEE 802.3. The DESQA can also support either of two possible baseband Ethernet cabling systems – Standard (Thickwire) or ThinWire Ethernet. A jumper block on the module is used to select the cabling system. The DESQA can also connect to a broadband network using a broadband transceiver.

The DESQA is functionally equivalent to the DELQA with a cabkit for Thickwire networks combined with a DESTA ThinWire transceiver for interfacing to ThinWire networks.

The DESQA module is programmed from the Q-Bus using eight-word addresses in the I/O page, and can perform block-mode DMA to and from Q-Bus memory. In addition to providing an Ethernet interface, the DESQA module supports some functions of the Maintenance Operation Protocol (MOP).

DESQA Features
The DESQA module operates in one of two switchable modes: Normal mode or DEQNA-lock mode.

In Normal mode, the DESQA module supports the following functions.

- Maintenance Operation Protocol (MOP) messages for Remote BOOT, Request ID, Transmit System ID, and Loopback.
- IEEE 802.3 Maintenance messages for XID and TEST on NULL LSAP access points.
- Self-test on power-up and via host command.
- Single Ethernet physical address.
- Multiple Ethernet multicast address.
- All standard DEQNA functions, except multiple Ethernet physical address and the automatic enabling of the on-board sanity timer at power-up.

In DEQNA-lock mode, the DESQA module provides functional compatibility with DEQNA modules but at the expense of some Normal mode functions. The functions supported are:

- Multiple Ethernet physical addresses.
- Multiple Ethernet multicast addresses.
- Sanity timer (switch enabled on power-up).

DESQA INSTALLATION

Reference Documentation

Refer to the following documents for more information on the DESQA communications controller.

• *DECnet Maintenance Operations Protocol (MOP) Functional Specification V3.0.*	AA-X436A-TK
• *DECnet-RSX System Manager's Guide*	AA-H224C-TC
• *DECnet-ULTRIX Guide to Network Management*	AA-EE38A-TE
• *DECnet-VAX System Manager's Guide*	AA-H803C-TE
• *DEC/X11 User's Manual*	AC-F053-MC
• *DESQA Technical Manual*	EK-DESQA-TM
• *DESQA-SF Switchable Q-Bus to Ethernet Adapter Option Installation Guide*	EK-DESQA-IN
• *Field Maintenance Print Set*	MP-02435

DESQA Components

The DESQA-SF option kit consists of:

- One DESQA-S Q-Bus to Ethernet adapter module (M3127-PA)
- One *DESQA-SF Switchable Q-Bus to Ethernet Adapter Option Installation Guide* (EK-DESQA-IN)
- One gap filler assembly, consisting of a gap filler and two flathead screws (70-24505-01)
- One BNC TEE connector (12-25869-01)
- Two BNC 50 ohm terminators (12-26318-02)
- One ThinWire cable clamp (12-29702-01)

Device Placement

Up to two DESQA modules can be used in each system, and these should be the highest priority devices on the Q22-Bus.

Bus Grant Continuity – To ensure the continuity of the bus grant signal, use bus grant continuity cards (M9047) in empty backplane slots.

Power Supplies – The BA200 series enclosure contains one or two 230 watt power supplies.

- A 6-slot enclosure has one power supply.
- A 12-slot enclosure has two power supplies. The power supply on the right side powers slots 1 through 6, and the power supply on the left side powers slots 7 through 12.

Each power supply in the enclosure must have a minimum 5 amp load on the +5 volt output. If this is not the case, install an M9060-YA load module in one of the open slots powered by that power supply.

If a power supply meets the minimum load requirement, remove an existing load module.

Recommended Order of Modules – Use Table 1 as a guide when installing modules.

Table 1 Recommended Module Order

MicroVAX	MicroPDP-11/53	MicroPDP-11/83
KA620/KA630	KDJ11-SA/-SB	KDJ11-BF
MS630-B/-C	MSV11-QA	MSV11-JD/-JE
MRV11	MRV11	MRV11
DELQA/DESQA	DELQA/DESQA	DELQA/DESQA
DPV11	DPV11	DPV11
DFA01	DFA01	DFA01
DZQ11	DZQ11	DZQ11
CXA16	CXA16	CXA16
CXB16	CXB16	CXB16
CXY08	CXY08	CXY08
IEQ11*	IEQ11*	IEQ11*
IBQ01*	DRQ3B	DRQ3B
DRQ3B	DRV1W	DRV1W
DRV1W	TQK50**	TQK50**
TQK50**	RQDX3**	RQDX3**
RQDX3**		

* No restrictions on position.
**Not to be installed in the BA214 enclosure.

Power Requirements/Q-Bus Loading
Table 2 shows the power requirements and bus loading for the DESQA module.

Table 2 Power Requirements/Q-Bus Loading

Q-BUS LOAD		CURRENT				POWER	
AC	DC	Typical		Maximum		Typical	Maximum
3.3	0.5	+5 V	+12 V	+5 V	+12 V	13.27 W	31.5 W
–	–	2.15 A	0.21 A	2.7 A	1.5 A	–	–

DESQA INSTALLATION

Installing the Module

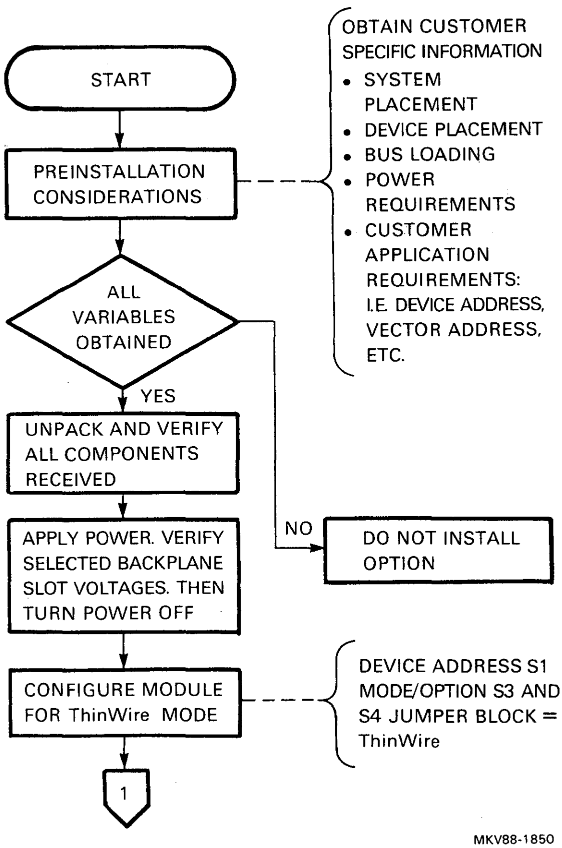
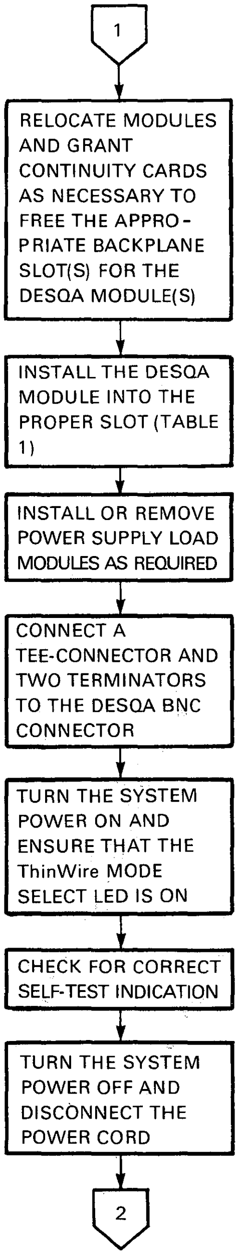


Figure 1 Installation Flowchart (Sheet 1 of 3)



MKV88-1849

Figure 1 Installation Flowchart (Sheet 2 of 3)

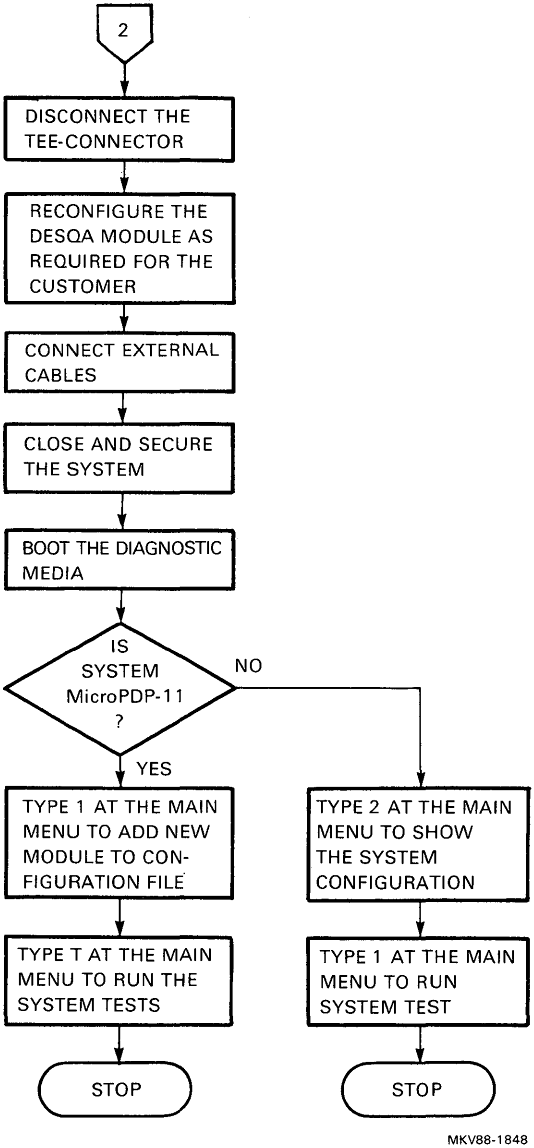


Figure 1 Installation Flowchart (Sheet 3 of 3)

DESQA Module Address and Vector

The DESQA module CSR address and interrupt vector are set using switchpack E15 (Figure 2). Table 3 shows the functions of the switchpack.

When a DESQA module is added to the backplane, the modules already in the system may have to be reconfigured. If it is necessary to reconfigure existing modules, their CSR addresses and interrupt vectors need to be determined

Determine the CSR address and interrupt vector of modules as follows.

- For MicroPDP-11 systems, refer to the *MicroPDP-11 System Maintenance Guide.*
- For MicroVAX systems:
  - Use the CONFIG program, or
  - Manually calculate values as shown in Chapter 5 of the *MicroVAX Systems Maintenance Guide.*
- For devices that were not manufactured by Digital Equipment Corporation, see the vendors' documentation for the configuration information.

CAUTION

Static electricity can damage the DESQA module. Always wear an antistatic wriststrap connected to an active ground, and use a grounded work surface when working on a system with covers removed.

DESQA Switch and Jumper Settings

The cabling mode of the DESQA is selected by a jumper block (Figure 2). The jumper can be in one of two possible positions. To select ThinWire, cover the middle row of pins and the pins labeled ThinWire. To select Thickwire, cover the middle row of pins and the pins labeled Thickwire. The DESQA module is shipped from the factory in ThinWire cable mode.

The DESQA module switches (Figure 2) must be set for compatibility with the host system configuration.

The DESQA contains five switches, S1 through S5. Only three switches, however, are used to establish a DESQA configuration. The remaining switches are reserved. Table 3 shows the switches and their descriptions.

The default switch settings are all closed which results in the following.

- Base address = 17774440
- Mode = NORMAL
- MOP remote boot DISABLED

The default switch settings are the recommended configuration for most applications.

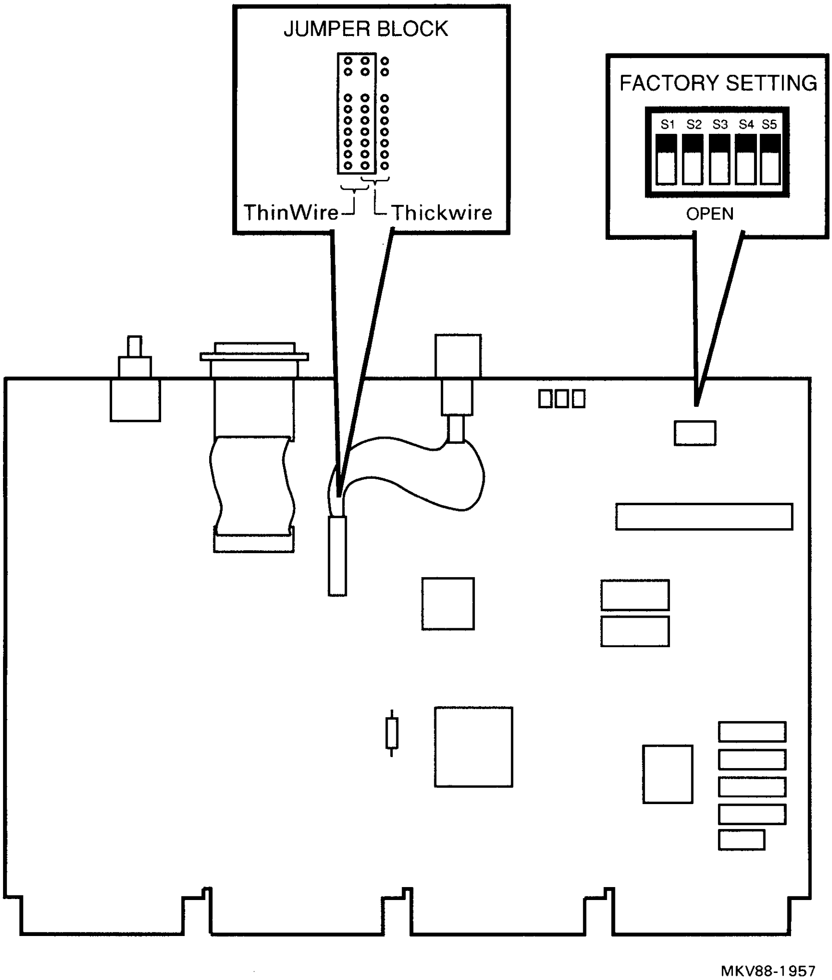


Figure 2 DESQA Module Layout

Table 3 DESQA Switches

Switch	Position	Description		
S1		**UNIT SELECT** Switch		
	Closed	Selects the modules default address (17774440)		
	Open	Selects the address 17774460		
S2		Reserved		
S3		**MODE** Switch		
	Closed	Selects Normal mode		
	Open	Selects DEQNA-lock mode		
		S3 determines the function of S4 as shown below.		
S4		**OPTION** Switch – Function is determined by S3 as follows.		
		S3	**S4**	
		Closed	Closed	Remote boot DISABLED
		Closed	Open	Remote boot ENABLED
		Open	Closed	Sanity timer DISABLED at power-up
		Open	Open	Sanity timer ENABLED at power-up*

* This condition causes a host boot every four minutes if the sanity timer is not reset by the host software.

Ethernet Address

The unique physical address of the DESQA module within Ethernet is stored in the station address ROM on the DESQA module. A record of this address is printed on a sticker on the handle of the module. This address should be given to the network manager for configuration.

CAUTION

Because of the risk of damage to the module and ROM, the following procedure is not recommended and should only be used if there is no alternative.

If it is necessary to replace the DESQA module while retaining the same physical Ethernet address, it is possible to swap the station address ROM to the replacement module. The stickers must be swapped also if this procedure is used.

If the Ethernet address is changed, the only software change required is to update the physical Ethernet address of the node at those host systems that use the node for down-line loading over the Ethernet.

DESQA CABLING

Connection to the Network

When the diagnostics have shown an error-free system, connect the DESQA module to either a standard Ethernet network or to a ThinWire network.

CAUTION
Before connecting the DESQA module into an existing ThinWire network, inform the system manager that the network service will be disrupted.

Connecting the DESQA Module to ThinWire Ethernet –

1. Connect the TEE connector to the BNC connector on the DESQA module handle.

2. Connect the ThinWire Ethernet cable(s) to the TEE connector (Figure 3). If only one ThinWire cable is connected to the TEE connector, ensure that the unused TEE connection is terminated using a terminator (P/N: 12-26318-01) supplied with the module. If two cables are connected, the cables must be routed as shown in Figure 4 using the cable clamp (P/N: 12-29702-01) supplied with the module.

3. Install the covers that were removed to gain access to the modules.

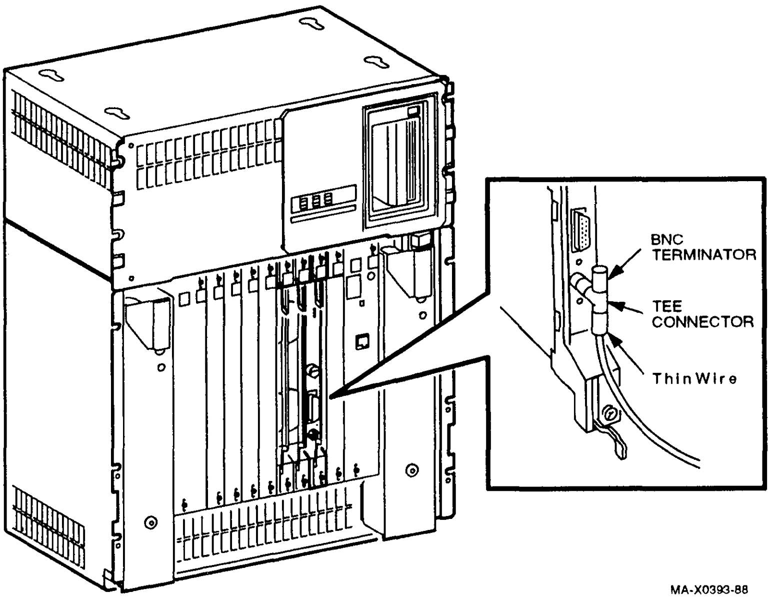


Figure 3 Connecting the DESQA Module to One ThinWire Cable

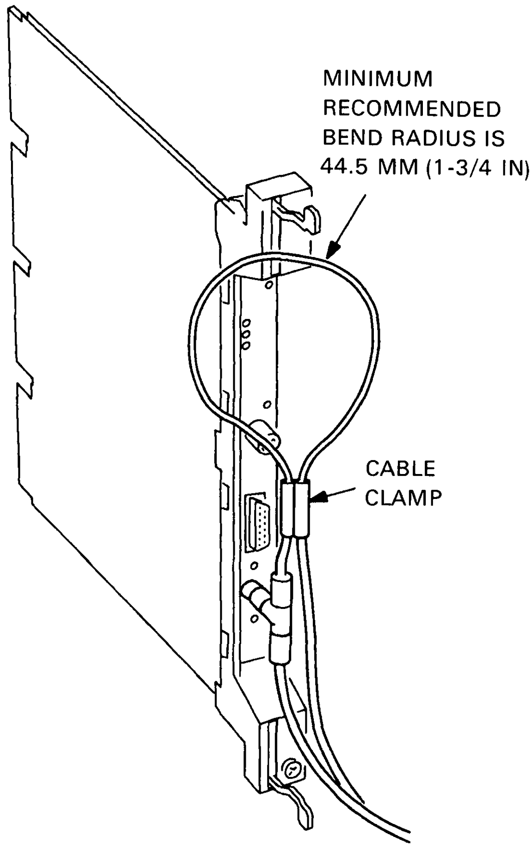


Figure 4 Connecting the DESQA Module to Two ThinWire Cables

Connecting the DESQA Module to Standard Ethernet –

1. Connect the male connector of an Ethernet transceiver cable (P/N: BNE3B or BNE3D) to the female connector on the DESQA module. Table 4 lists the transceiver cable options.

2. Connect the other end of the cable to one of the following devices.

   a. An H4000 transceiver (located on a traditional baseband Ethernet cable).

   b. A DELNI, which can be connected to a baseband Ethernet or configured in a standalone LAN.

3. Install the covers that were removed to gain access to the modules.

Table 4 BNE3X-nn Transceiver Cable Options

Cable	Material	Connector	Length
BNE3B-05/J2	PVC	Right-angle	5 m (16.4 ft)
BNE3B-10/J2	PVC	Right-angle	10 m (32.8 ft)
BNE3B-20/J2	PVC	Right-angle	20 m (65.6 ft)
BNE3B-40/J2	PVC	Right-angle	40 m (131.2 ft)
BNE3D-05/J2	Teflon™	Right-angle	5 m (16.4 ft)
BNE3D-10/J2	Teflon™	Right-angle	10 m (32.8 ft)
BNE3D-20/J2	Teflon™	Right-angle	20 m (65.6 ft)
BNE3D-40/J2	Teflon™	Right-angle	40 m (131.2 ft)

Teflon is a trademark of E.I DuPont de Nemours & Co., Inc.

DESQA Diagnostics

The DESQA module is designed to help diagnostics find a faulty field replaceable unit (FRU) rapidly. In addition to the self-test, there are diagnostic tests that are processor specific.

Self-Test

The DESQA module has a power-up self-test that includes an external loopback test.

NOTE

In order for the external loopback test to pass, the DESQA must be connected to a valid Ethernet network or to an external loopback connector. For Standard Ethernet, use the bulkhead loopback connector (12-22196-02) or, alternatively, an H4080 Ethernet tester. For ThinWire, the "T" piece with two terminators (12-26318-01) attached should be connected to the BNC connector.

The self-test is only valid in Normal mode, and the host operating system software can request the self-test through the DESQA Q-Bus register.

Table 5 shows the power-up LED sequence and Table 6 shows the remote boot LED sequence when the self-test is run.

Table 5 Module LED Sequences (Power-Up)

LED1	LED2	LED3	Definition
Normal Mode			
ON	OFF	OFF	Executing internal logic self-test.
ON	ON	OFF	Self-test executing external loopback test.
ON	ON	ON	Ready (to execute Citizenship tests and/ or normal functions) or module self-test.
DEQNA-lock Mode			
ON	ON	ON	LEDs turn ON and stay ON.

Table 6 Module LED Sequences (Remote Boot or Citizenship Test) Normal or DEQNA-lock Mode

LED1	LED2	LED3	Definition
ON	ON	ON	Ready (to execute Citizenship test and/or normal functions) or module self-test.
OFF	ON	ON	Executing Citizenship tests.
OFF	OFF	ON	Internal loopback Citizenship tests completed successfully.
OFF	OFF	OFF	External loopback Citizenship tests completed successfully.

These sequences of LEDs should take less than 10 seconds. If the LEDs flash after this time, an irrecoverable failure has occurred (see Table 7).

Table 7 Irrecoverable Failure Indications

LED1	LED2	LED3	Failure Indication
F	OFF	OFF	Q-bus failure
OFF	F	OFF	LANCE failure
OFF	OFF	F	68000 exception
F	F	F	Firmware fault

F indicates that the LED is flashing.

Diagnostics for PDP-11 Host Processors

NETWORK TESTING

- DECnet Network Control Program (NCP)
- Network Interconnect Exerciser (NIE) running under the Diagnostic Runtime Services (DSR)

DECnet Network Control Program (NCP) – This diagnostic provides a command-driven interface for executing loopback tests on the Ethernet, and for examining network and data-link counters.

Some of the relevant commands are:

LOOP

SHOW

TELL

TRIGGER

The TRIGGER command may be used to initiate boot loading from the DESQA for PDP-11 host systems that have the appropriate boot ROM support.

The commands may be issued either from the local host system or by using the TELL command from a remote node. The functions are performed concurrently with other DECnet operations, and do not interfere with other Ethernet traffic (although there may be some degradation of throughput).

For more information, refer to the *DECnet-VAX System Manager's Guide.*

Network Interconnect Exerciser (NIE) – This diagnostic is used to:

- Determine the connectivity of nodes on the Ethernet.
- Determine the ability of nodes to communicate with each other.
- Support node installation verification and problem isolation.

The NIE *does not* test the DESQA, but *does* test the communications link to which it is connected; therefore, the NIE assumes that the DESQA has successfully completed the Citizenship test.

The NIE is used with XXDP+ and the MicroVAX Diagnostic Monitor.

Refer to the *DESQA Technical Manual*, Appendix B, for additional information.

MODULE TESTING

- Field Functional Diagnostic (ZQNA??) running under Diagnostic Runtime Services (DSR)
- DEC/X11 Exerciser

DESQA DIAGNOSTICS

Field Functional Diagnostic (ZQNA??) – This diagnostic tests the DESQA in Q-Bus systems. It attempts to isolate faults to the FRU.

Tests are executed under the supervision of the Diagnostic Runtime Services (XXDP+) and controlled by an operator from a console.

ZQNA?? is not an Ethernet network exerciser but verifies that the DESQA can execute Ethernet protocol, and that valid network traffic can be transmitted and received.

ZQNA?? tests the DESQA in all loopback modes with or without an external loopback connector or transceiver connected.

External loopback mode is used with a connected transceiver or external loopback connector. Alternatively, external loopback mode can be used with a terminated transceiver that is not attached to a network cable. Executing ZQNA?? using external loopback mode, in a system connected to a live Ethernet, does not disrupt the Ethernet.

DEC/X11 Exerciser – This diagnostic exercises one DESQA at maximum activity rates. It transmits and receives random-length packets (using either 18- or 22-bit physical address space). The DESQA transmits and receives the same packet.

Diagnostics for MicroVAX Processors

NETWORK TESTING

- DECnet Network Control Program (NCP)
- Network Interconnect Exerciser (NIE) running under the MicroVAX Diagnostic Monitor (MDM)

MODULE TESTING

- MicroVAX Diagnostic Monitor (MDM)

MicroVAX Diagnostic Monitor – This diagnostic offers the following menu-driven tests and utilities that may be run in Verify or Service modes.

- Utilities for external loopback tests and NIE.
- Service tests for external loopback.
- Verify tests for:

  – Internal and internal extended loopback
  – Set-up packet handling
  – Buffer Descriptor List (BDL) handling
  – DMA and interrupt handling
  – Transmit and receive circuitry and firmware
  – Address filtering

- Device exerciser for testing the DESQA simultaneously with other system devices.

Troubleshooting
The general strategy for identifying a fault is to:

1. Check the DESQA configuration to ensure that the system can identify the module correctly.
2. Run the module test(s) to check for faulty FRUs.
3. Run the network test(s) to locate faults in the network configuration and/or operation.

Figures 5 and 6 are flowcharts for troubleshooting the DESQA module. If the DESQA is configured in the ThinWire mode, use Figure 5. If the DESQA is configured for a standard Ethernet, use Figure 6.

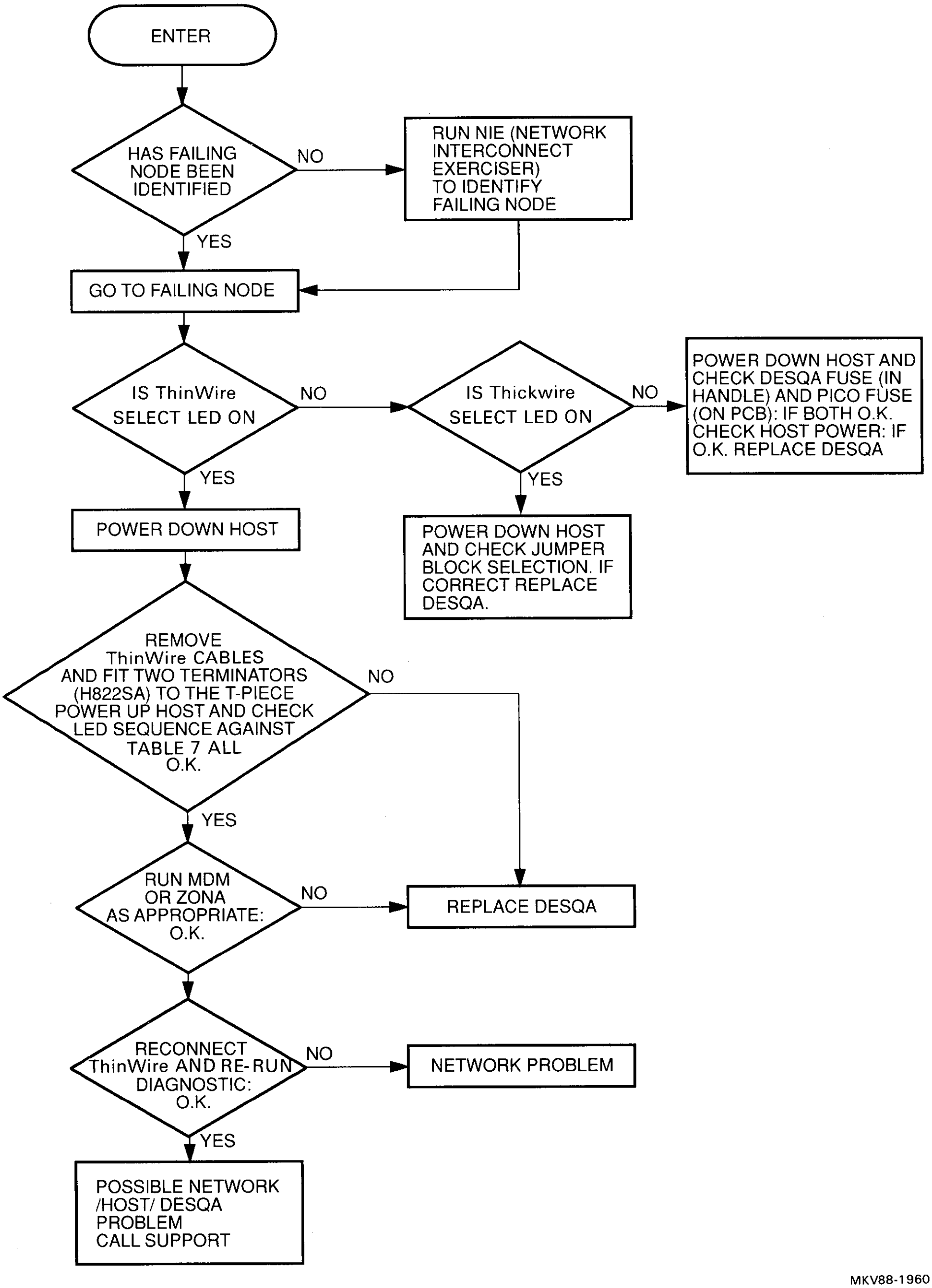


Figure 5 DESQA Troubleshooting (ThinWire Mode)

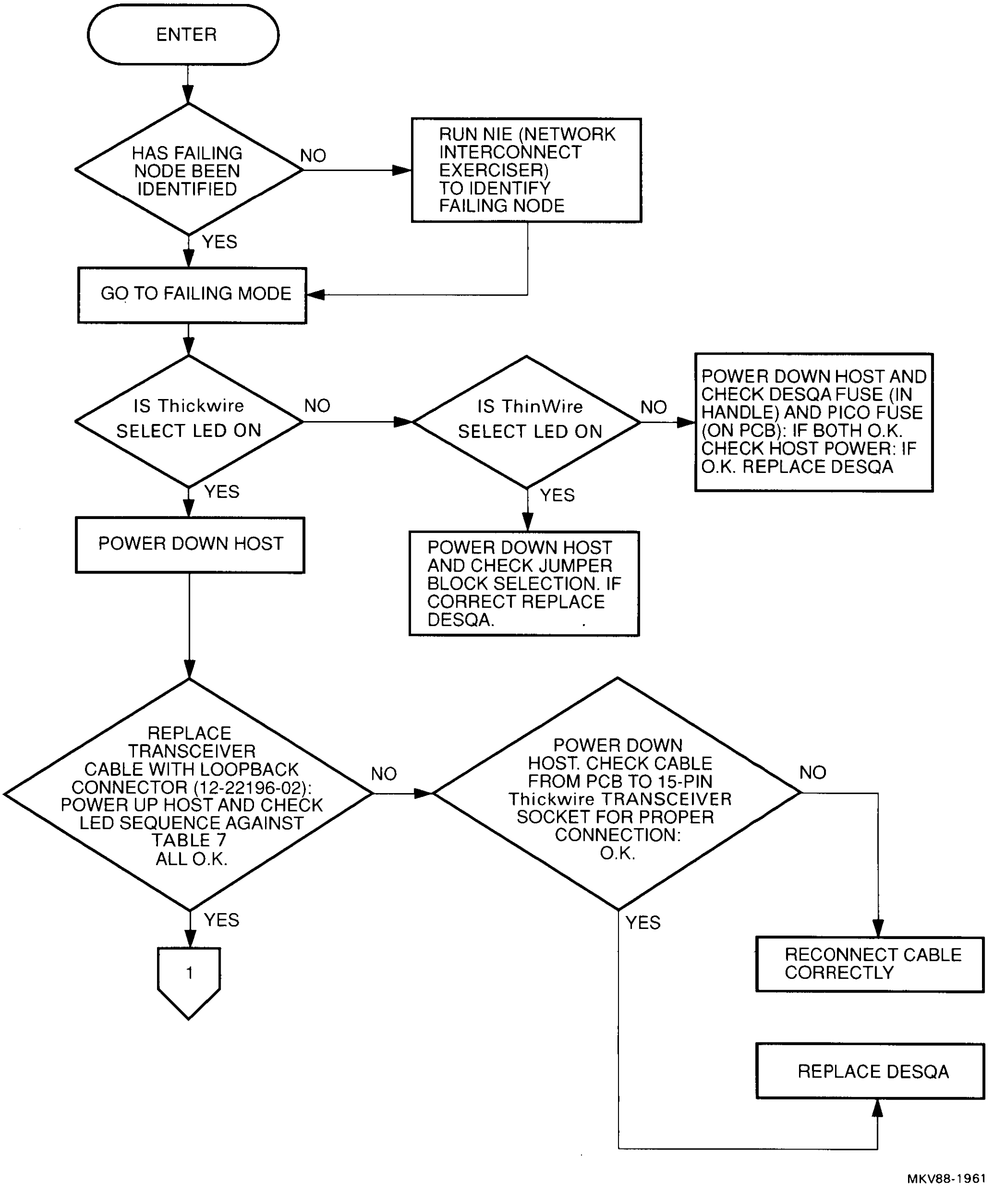


Figure 6 DESQA Troubleshooting – Standard Ethernet (Sheet 1 of 2)

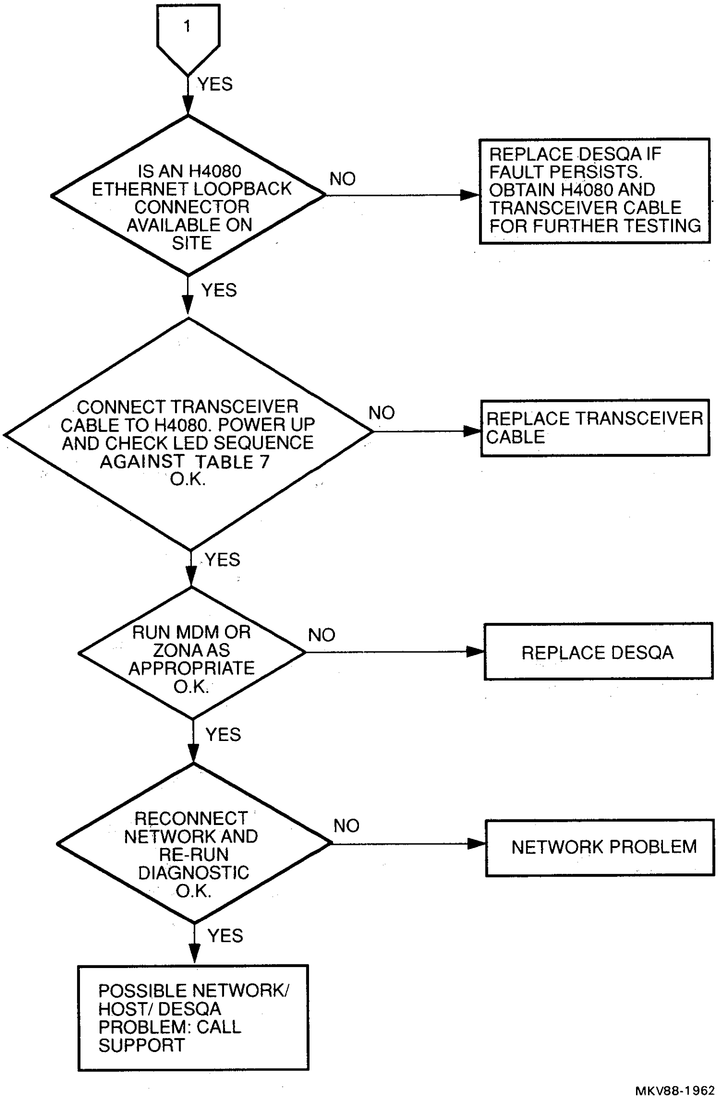


Figure 6 DESQA Troubleshooting – Standard Ethernet (Sheet 2 of 2)

Field Replaceable Units

Figure 7 shows the field replaceable units in the DESQA installation.

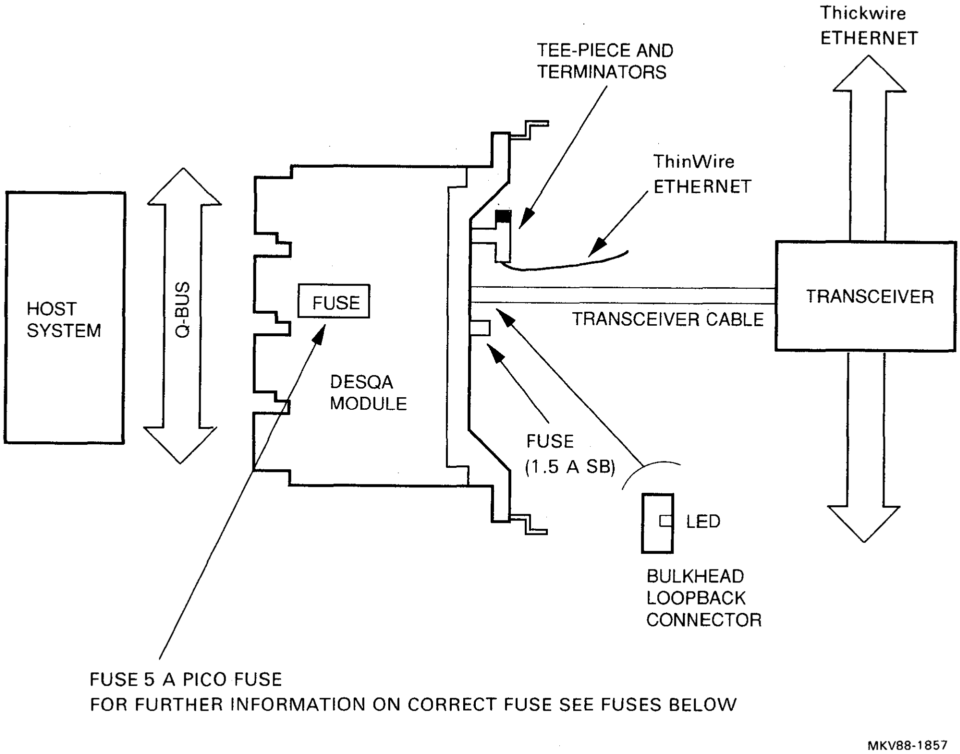


Figure 7 Field Replaceable Units

DESQA MAINTENANCE AIDS

Fuses
A 1.5 A/250 V Slo-Blo™ fuse (order number 90-07213) protects the transceiver and its associated external wiring. This fuse is located in the DESQA bulkhead. The fuse may be replaced by:

- Littlefuse™ type 31301.5,
- BEL FUSE™ type 3SB1.5, or
- An equivalent.

A 5.0 A/125 V axial lead pico fuse (order number 12-05747-00) protects the DESQA module and internal wiring. This fuse is soldered to the DESQA module and looks like a resistor.

Citizenship Test Descriptions
Table 8 lists the host register R0 bit combinations, the test being run, and their meanings for the Citizenship tests.

Table 9 shows the LED display results for the Citizenship test.

Maintenance Operation Protocol (MOP)
In Normal mode the DESQA implements (MOP) functions in response to the following remote console messages from other nodes on the Ethernet.

- The request system ID message – The DESQA responds by transmitting its current system ID message.

- Remote boot trigger instruction – The DESQA may respond to a trigger instruction only if option switch S4 is open to enable remote boot. The instruction can only be implemented if the host system has the appropriate boot ROM.

- Loopback request message – The DESQA responds to a loopback request message.

The DESQA also transmits its current system ID parameters automatically every 8 to 10 minutes.

For more information, refer to the DECnet Maintenance Operation Protocol (MOP) functional specification.

IEEE 802.3 Network Support
In Normal mode the DESQA implements IEEE 802.3 logical link control messages when they are received on a NULL Link-layer Service Access Point (LSAP) within an 802.3 standard local area network.

These messages can be used to interrogate and test many link layer service points per node. Therefore, IEEE 802.3 logical link control messages which are received on a non-NULL LSAP are passed on to the host system as normal datagrams.

For details on this message format and protocol, refer to the ANSI/IEEE Draft International Standard 802.2 logical link control.

Slo-Blo is a trademark of S.B. Fuses
Littlefuse is a trademark of Littlefuse Inc.
BEL FUSE is a trademark of Belfuse Inc.

Table 8 Citizenship Test Error Status

R0 Bit Combinations	Test #	Description
00	1	Station Address Verification – Station address is all zeros, or all ones, or is not a valid DESQA address. If this test fails, testing continues until the final external loopback test or another test failure occurs.
11	2,4	No interrupt, premature interrupt, wrong interrupt, or unexpected receive interrupt.
12,01	3	Set-up Mode and Receive Processing Test – Set-up packet echoed data check.
09,12,01	3	Set-up Mode and Receive Processing Test – Set-up packet operation timeout.
14,12,01	3	Set-up Mode and Receive Processing Test – Set-up operation status check.
02	4	Internal Loopback and Address Filter Test – Transmit/receive data compare check.
09,02	4	Internal Loopback and Address Filter Test – True packet transmission and receive error.
12,02	4	Internal Loopback and Address Filter Test – Set-up packet echoed data check.
14,02	4	Internal Loopback and Address Filter Test – False packet receive error.
03	5	Internal Extended Loopback and Protocol Test – General packet transmit/receive data compare check. Long packet not detected.
09,03	5	Internal Extended Loopback and Protocol Test – Test packet transmit or receive timeout.
14,03	5	Internal Extended Loopback and Protocol Test – General operation status check. Long packet not detected via operation status.
04	6	DMA to Q-Bus Interface Processing Test – Transmit (scatter/gather) data check.
09,04	6	DMA to Q-Bus Interface Processing Test – Transmit (special) and receive timeout.
14,04	6	DMA to Q-Bus Interface Processing Test – Receive or transmit operation status check.
12	7	Transceiver Operational and Status – Set-up packet echo data check.

Table 8 Citizenship Test Error Status (Cont)

R0 Bit Combinations	Test #	Description
09,12	7	Transceiver Operational and Status – Set-up packet operation timeout.
14,12	7	Transceiver Operational and Status – Set-up packet operation status check.
15	7,8	CSR carrier bit on too long.
15	7,8	External loopback not operational.
05	8	External Loopback and Ethernet Protocol Test – External loopback transmitted/received packet data compare check.
09,05	8	External Loopback and Ethernet Protocol Test – External loopback operation timeout.
14,05	8	External Loopback and Ethernet Protocol Test – External loopback operation status check.

Table 9 Citizenship Test LED Results

LED1	LED2	LED3	Meaning
OFF	OFF	OFF	Citizenship test passed successfully
OFF	OFF	ON	External loopback test failed
OFF	ON	ON	DESQA internal error
ON	ON	ON	Cannot upload the BD ROM contents or the first set-up packet prefill failed

DESTA STATION ADAPTER

General Description

The DESTA Ethernet station adapter provides a physical and electrical interface between a ThinWire Ethernet coaxial cable and other Ethernet devices (such as controllers, servers, and so on) via the Ethernet transceiver cable.

The DESTA attaches to the ThinWire cable via a BNC type TEE connector. It has a 15-pin D-connector for connecting to a transceiver cable.

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

There is only one version of the DESTA although a switch allows enabling or disabling heartbeat (which is sometimes known as collision presence test or CPT).

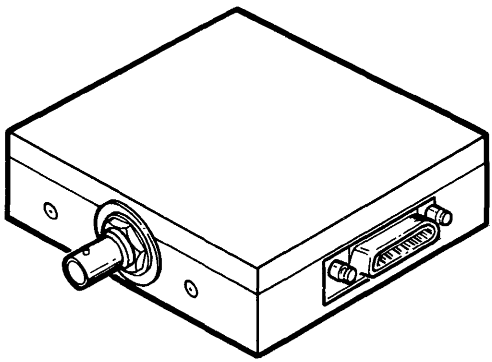


Figure 1 DESTA Station Adapter

ThinWire Coaxial Segment Cabling Guidelines

- The ThinWire coaxial cable can be up to 185 m (607 ft) long.
- No more than 30 stations are allowed on a segment. The DEMPR, if configured, counts as one station. In a DECconnect configuration with faceplates and satellite equipment rooms, only 28 stations are allowed.
- On the ThinWire coaxial cable there must be at least 0.5 m (1.6 ft) of ThinWire coaxial cable between DESTA station adapters or other station attachments (see Figure 3).
- No coaxial cable may be placed between the TEE connector and the DESTA (or station). The TEE connector attaches directly to the DESTA or station.
- No more than 60 male/female connector junctions are allowed on the coaxial segment (see Figure 9, connections 1 or 2). For example, both a barrel connector and a TEE connector have two male/female connector junctions.

- The ThinWire coaxial cable must be properly terminated at both ends with 50-ohm terminators.
- The male (third) connection of a TEE connector must not be terminated (see Figure 9, connection 3).
- The male connection of the TEE connector (Figure 9, connection 3) does not count towards the maximum of 60 male/female connections.
- When disconnecting a station that is attached to a TEE connector, disconnect the connector attached to the DESTA or station. Disconnecting the connector to the DESTA does not affect the ThinWire coaxial cable segment, but disconnecting either coaxial cable will disable the entire segment.
- A DEREP cannot be connected to a DESTA.

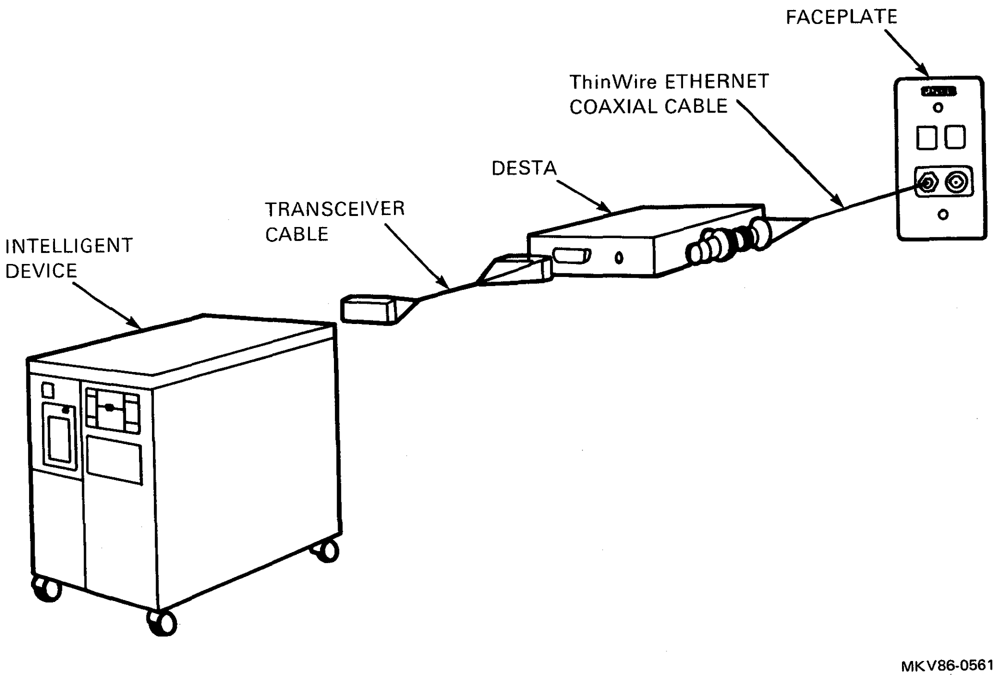


Figure 2 DESTA Configuration

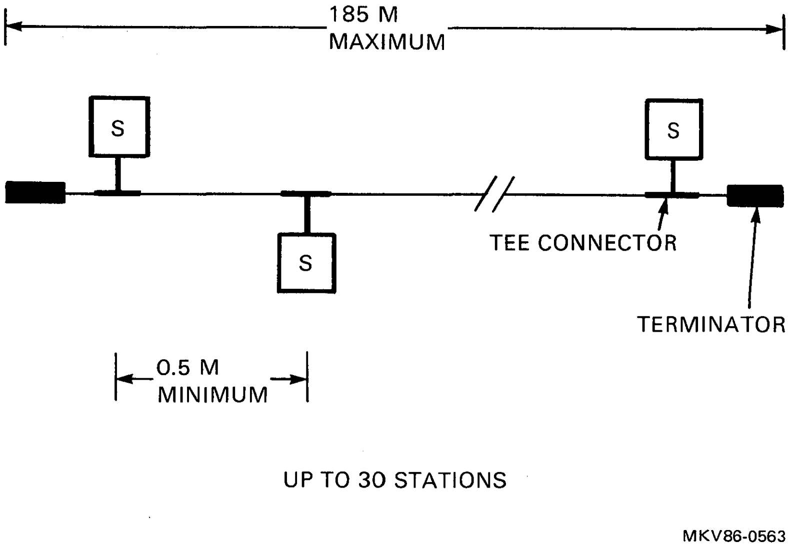


Figure 3 ThinWire Ethernet Coaxial Cable with Two Terminators

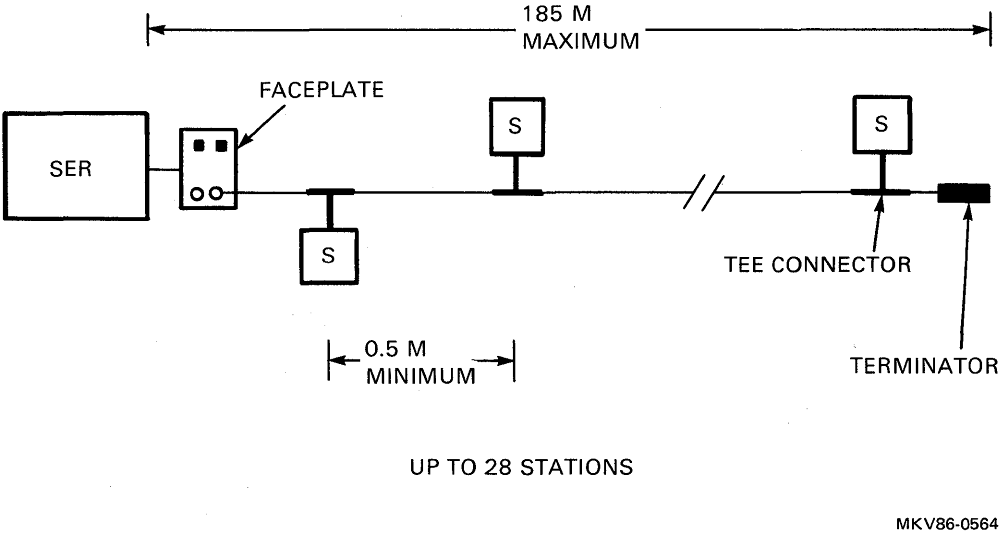


Figure 4 ThinWire Ethernet Coaxial Cable from an SER

FCC and Grounding Requirements
This product generates, uses, and may emit radio frequency energy. When used with a DEQNA Ethernet Controller, it has been type tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules if the following configuration rules are followed:

1. For DESTA adapters Revision B1 and earlier, the BNExx-xx transceiver cable from the system Ethernet bulkhead to the DESTA must be at least 20 m (65.4 ft) in length.

2. The ThinWire segment must be properly grounded if it is not connected to a DEMPR (DIGITAL ThinWire Ethernet Multiport Repeater). This can be attained by connecting a 7.62 cm (3 in) ground wire from the TEE connector to the DESTA as shown in Figure 5.

Failure to observe the above configuration rules can cause the system containing the DESTA not to comply with FCC Class A limits (functional operation *is* still intact).

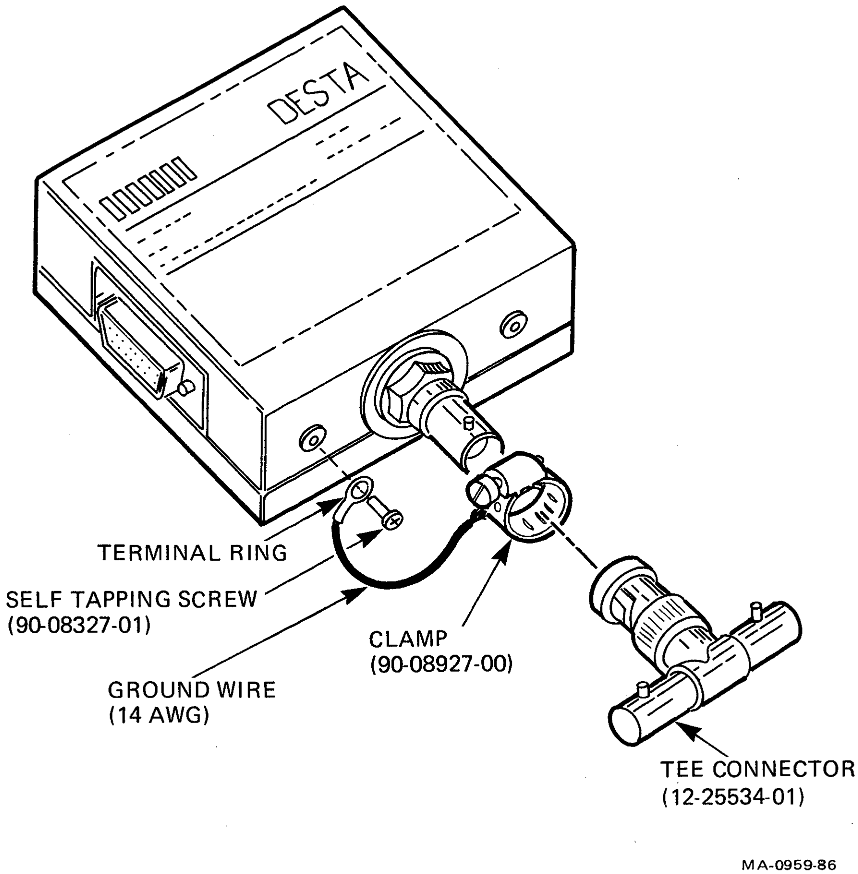


Figure 5 Proper Grounding of the ThinWire Segment

Reference Documentation
Refer to the following documents for more information regarding the DESTA.

• *DESTA Technical Manual*	EK-DESTA-TM
• *DIGITAL ThinWire Ethernet Station Adapter Installation Card*	EK-DESTA-IN
• *DESTA Installation Card*	EK-DESTA-IN
• *DESTA Print Set*	MP-02090
• *DEMPR Installation User's Guide*	EK-DEMPR-UG
• *DEMPR Ethernet Multiport Repeater Technical Manual*	EK-DEMPR-TM
• *DECconnect System General Description*	EK-DECSY-GD
• *DECconnect System Requirements Evaluation Workbook*	EK-DECSY-EG
• *DECconnect System Planning and Configuration Guide*	EK-DECSY-CG
• *DECconnect System Installation Verification Guide*	EK-DECSY-VG
• *H4000-TA Ethernet Transceiver Tester User's Guide*	EK-ETHTT-UG
• *DECconnect System ThinWire Planning and Installation Guide*	EK-DECSY-IG
• *ThinWire Ethernet Coaxial Cable Installation Card*	EK-CABLE-IN

Table 1 DESTA Transceiver Part Numbers

Description	Part Designation
DIGITAL Ethernet station adapter	DESTA-AA
Velcro™ strips (2 3/4 in)	12-26595-01
BNC 50-ohm terminator	H8225
BNC barrel connector	H8224
Male BNC connector	H8222
ThinWire TEE connector	H8223
Installation card	EK-DESTA-IN-001
ThinWire Ethernet Coaxial Cable Installation Card	EK-CABLE-IN

Velcro is a trademark of VELCRO USA, Inc.

DESTA INSTALLATION

Power Requirements
Power for the DESTA is +12 Vdc (−11.50 to −15.60 Vdc) at 0 to 500 mA. The +12 Vdc is supplied externally from the user's Ethernet controller.

Physical Specifications

Length – 9.3 cm (3.7 in)
Width – 7.6 cm (3.0 in)
Height – 3.5 cm (1.2 in)

Environmental Specifications

Operating Temperature Range	5° to 50°C (41° to 122°F)

Preinstallation Considerations
Prior to installing the DESTA, check the following:

1. Verify that the configuration guidelines are followed per the ThinWire coaxial segment cabling guidelines.

2. Verify that a properly terminated and tested ThinWire coaxial cable has been identified, located, and is available for installation of the DESTA (refer to the *DECconnect System Installation Verification Guide* EK-DECSY-VG). Both ends of the ThinWire coaxial cable must be terminated. A DEMPR, if used, will supply termination for one end of the coaxial cable; a 50-ohm terminator must be used at the other end. Terminators are attached to the coaxial cable via a barrel or TEE connector.

Component	Part Number
BNC 50-ohm terminator	H8225
BNC barrel connector	H8224
BNC TEE connector	H8223

3. Determine if a TEE connector has already been installed on the coaxial cable for the installation of the DESTA. If not, a TEE connector will need to be installed on the coaxial cable. This may require cable termination. Cable termination is the action of installing a male BNC connector on a cable end (refer to the Cabling chapter of the *Communications Options Minireference Manual – Volume 5* or the *ThinWire Ethernet Coaxial Cable Installation Card*).

   If termination is required, ensure that the tools and connector parts needed for BNC termination are available.

Tool/Part	Part Number
BNC crimping tool (with dies installed)	47-00115-01
Coaxial wire stripper	47-00114-01
Spare blade cassette for coaxial wire stripper	29-26133-00
Male BNC connector	H8222

NOTE
Installation of the DESTA may require that the ThinWire coaxial cable segment be cut and terminated. The termination process will make the Ethernet segment unavailable to any other users. Other LAN segments should remain unaffected. (Refer to the Cabling chapter of the Communications Options Minireference Manual – Volume 5 for termination procedures.)

4. Verify that the transceiver cable going to the station is installed.

5. Verify that a terminated length of ThinWire coaxial cable is available to go from the faceplate to the DESTA (if the faceplate is used).

6. Set the DESTA heartbeat ENABLED/DISABLED switch. The DESTA has a switch-selectable heartbeat. Heartbeat is sometimes referred to as collision presence test or CPT. The DESTA is shipped with heartbeat ENABLED. (Refer to Figure 6 for disabling heartbeat.)

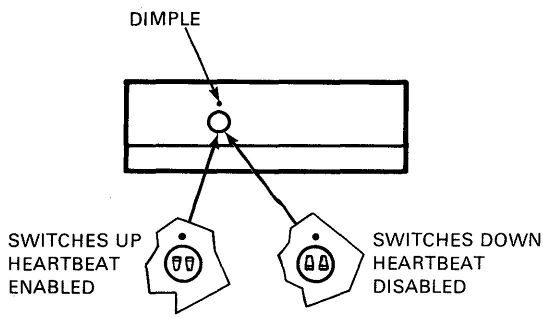
Hardware Requirements
The following hardware items may be needed for completion of the installation and are not included with the DESTA.

1. IEEE 802.3 transceiver cable, such as BNE3x-xx or BNE4x-xx, which is ordered in various lengths and types. The transceiver cable will connect the DESTA to the Ethernet station controller. Use of IEEE 802.3 compliant transceievr cable is required. (Refer to Table 3 in the Cabling chapter of the *Communications Options Minireference Manual – Volume 5* for part numbers).

2. Parts for two BNC male connectors may be required when the TEE connector is to be installed on the coaxial cable. (Refer to the *ThinWire Ethernet Coaxial Cable Installation Card*).

3. A terminated coaxial cable, used from the faceplate to the DESTA TEE connectors, or from the last station to the DESTA being installed.

Heartbeat Selection



NOTES
1. SWITCHES TOWARD DIMPLE ENABLE HEARTBEAT.
2. SWITCHES AWAY FROM DIMPLE DISABLE HEARTBEAT.
3. CONSULT DECconnect DOCUMENTATION FOR HEARTBEAT SELECTION.

MKV86-0565

Figure 6 DESTA Heartbeat Selection Switch

DESTA INSTALLATION

Installation Flow Diagram

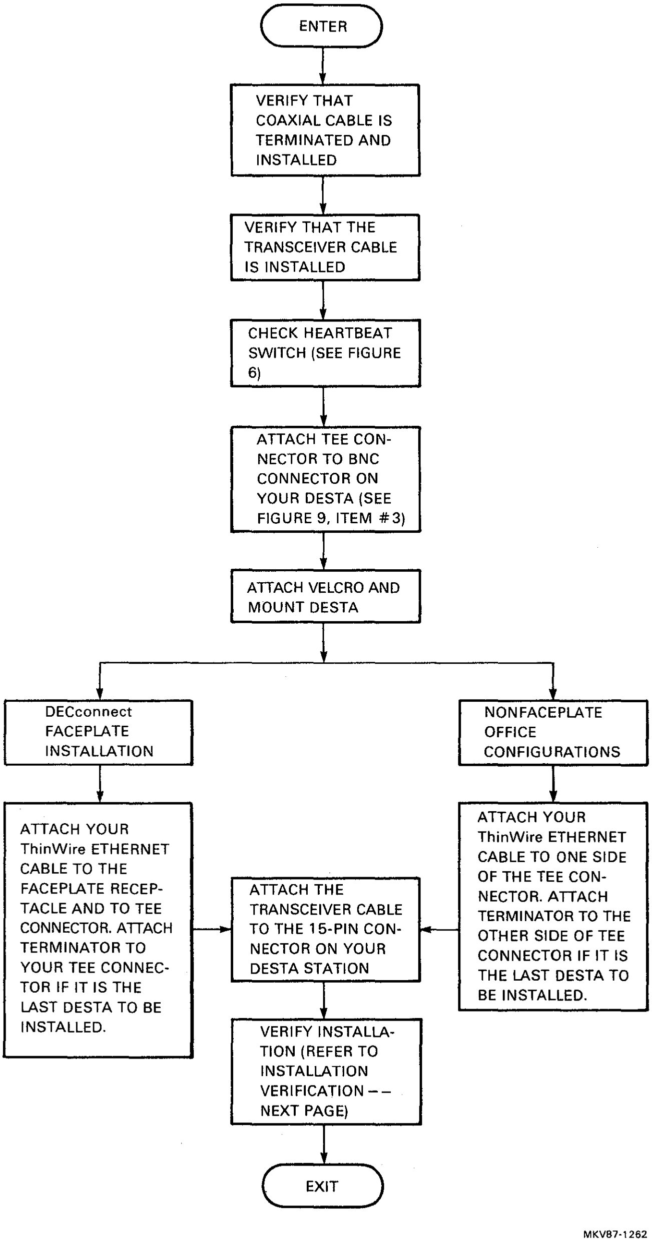


Figure 7 DESTA Installation Flow Diagram

Installation Verification
Ensure that the Ethernet station controller or device is powered ON. Verify that the DESTA has power applied (green power LED ON). If this LED is OFF, a failure is indicated. The failure may be the Ethernet station power supply, the Ethernet transceiver cable, or the DESTA.

There are no diagnostics specifically written for the DESTA. Use one or more of the following to verify proper operation.

- Station controller external data loopback self-tests, which if available, will completely test the DESTA. The station controller test, however, will not detect a coaxial cable problem.
- NIE and NCP Utility programs, which can be used for station-to-station testing.
- Two H4000-TA Revision B transceiver testers, which are IEEE 802.3 compatible for transceiver testing. Earlier versions of the H4000-TA need to be modified for IEEE 802.3. A metal connector on the H4000-TA is a quick check to ensure that the H4000-TA is IEEE 802.3 compatible.
- Nodes, which can be used for station-to-station testing.

DESTA CABLING

Cabling

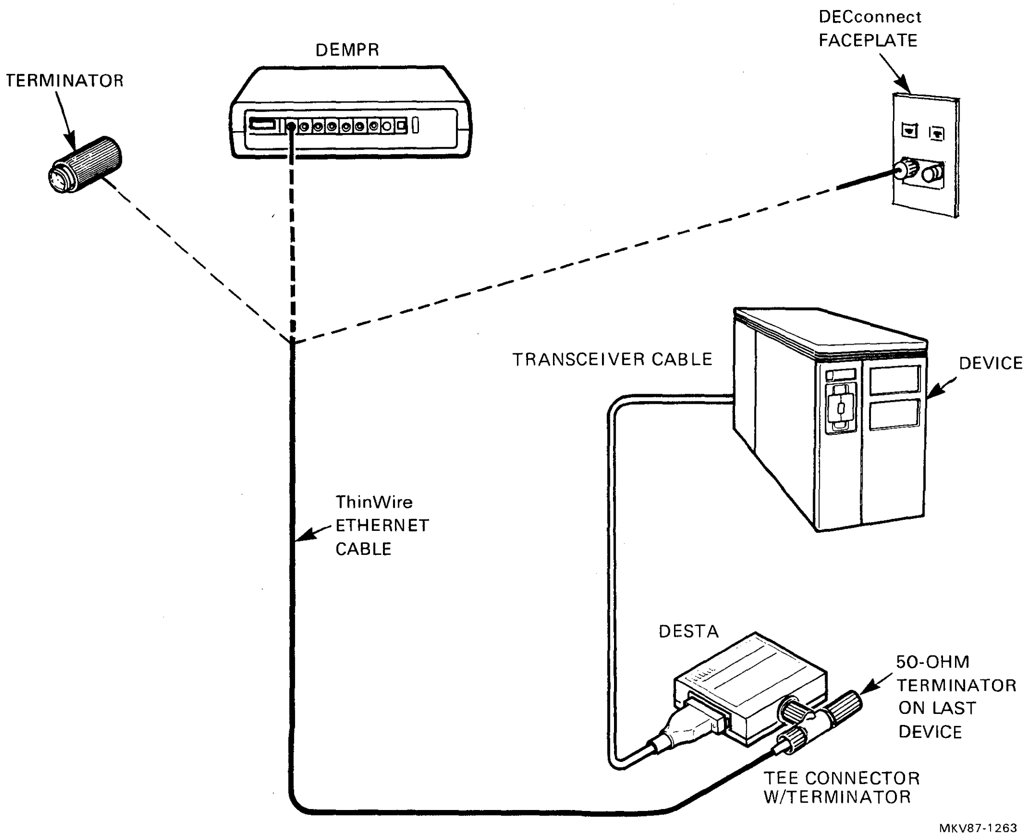


Figure 8 DESTA Cabling

Diagnostics

There are no diagnostics specifically written for the DESTA. Use one or more of the following to verify proper operation.

- Station controller external data loopback self-tests, which if available, will completely test the DESTA. The station controller test, however, will not detect a coaxial cable problem.
- NIE and NCP Utility programs, which can be used for station-to-station testing.
- Two H4000-TA Revision B transceiver testers, which are IEEE 802.3 compatible for transceiver testing. Earlier versions of the H4000-TA need to be modified for IEEE 802.3. A metal connector on the H4000-TA is a quick check to ensure that the H4000-TA is IEEE 802.3 compatible.
- Nodes, which can be used for station-to-station testing.

Maintenance Aids
When terminating the ThinWire coaxial cable with BNC connectors, disconnect the ThinWire coaxial segment from the DEMPR.

When working with the DESTA, avoid disconnecting the coaxial cable from the TEE connector (Figure 9, connections 1 and 2). If the coaxial cable is disconnected from the TEE connector, all the stations on the entire segment will be unable to communicate with each other and the rest of the LAN.

It is recommended that the BNC connectors, terminators, and TEE connectors used with the ThinWire coaxial cable have gold-plated center conductors. Use "boots" or electrical tape to ensure that a safety hazard is not created by improper grounding.

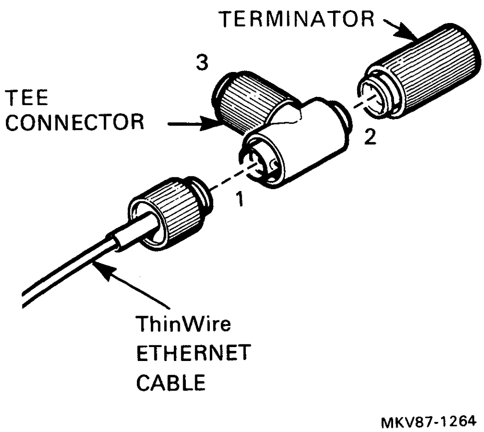


Figure 9 TEE Connector

Field Replaceable Units (FRUs)
The following item is the FRU for the DESTA station adapter.

DESTA-AA which consists of the following:

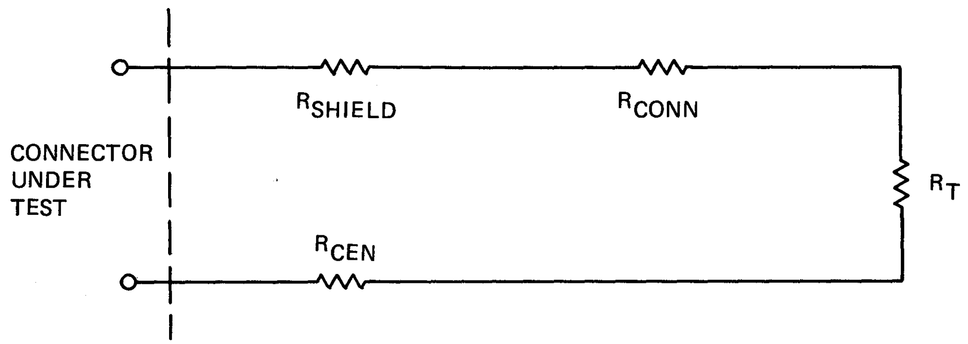
- DESTA,
- BNC TEE connector, and
- Two Velcro™ strips.

A DESTA can be ordered separately, without the TEE or Velcro™ (P/N 70-22782-01).

Cable Testing
For new coaxial cable installations and suspected coaxial cable problems, an ohmmeter should be used to verify coaxial cable continuity. Measure the resistance between the coaxial shield and the center conductor to check termination and cable continuity. These measurements can be made at the BNC or at the TEE connector.

With both ends terminated, the center conductor-to-shield resistance of connection 3, Figure 9 of the installed TEE connector will measure approximately 25 ohms of resistance. If only one end is terminated, or the TEE is disconnected from one side of the coaxial cable, the meter will indicate 59.75 ohms. If the coaxial cable is unterminated, the meter will indicate infinity. Resistance measurements will vary depending on the lengths of coaxial cable being measured.

NOTE
Cable continuity testing is important because testing will not detect a shorted cable. Point-to-point testing, however, is the best means available to verify the cable and transceiver.



R_{SHIELD} = RESISTANCE OF COAXIAL CABLE SHIELD

R_{CONN} = CONNECTOR RESISTANCE

R_T = TERMINATOR RESISTANCE = 49.9 Ω ± 0.1%

R_{CEN} = CENTER CONDUCTOR RESISTANCE

$R_{TOT} = R_{SHIELD} + R_{CONN} + R_T + R_{CEN}$

$= 49\,\Omega$ TO $59.75\,\Omega$

MKV86-0576

Figure 10 Coaxial Cable Segment Equivalent Circuit

DECxpress 100 GATEWAY

General Description

The DECxpress 100 gateway (DEFAT-AA) shown in Figure 1 is a software-dependent gateway used to connect an Ethernet/IEEE 802.3 network to the Datakit™ network using a fiber optic link.

The DECxpress 100 gateway can connect up to 512 multiplexed logical channels from a Datakit Virtual Circuit Switch (VCS™) to VAX processors on an Ethernet/IEEE 802.3 network. The VAX System V operating system can only use up to 256 channels.

NOTE

VAX System V is Digital's implementation of the AT&T UNIX™ System V operating system running on specific VAX processors. It is intended exclusively for the telecommunications industry and distribution is restricted to specific accounts.

The gateway has two high-speed serial ports. One port supports a full-duplex fiber optic link to a Datakit VCS. This connection supports the AT&T Computer Port Module-High Speed (CPM-HS) interface with A and B levels of the Datakit VCS protocol. The second port supports an Ethernet/IEEE 802.3 interface connection to a Digital Network Interface (NI) port.

Using the DECxpress 100 gateway, VAX systems running on either the VMS operating system or the VAX System V operating system can communicate with:

- VAX systems on other Ethernet/IEEE 802.3 networks connected in the same manner to the Datakit network and running the same operating system
- Terminals connected to the Datakit network by way of asynchronous ports such as terminal port modules (TPM)
- Datakit network by way of a CPM-HS device

Datakit and VCS are trademarks of the American Telephone and Telegraph Company.
UNIX is a registered trademark of the American Telephone and Telegraph Company.

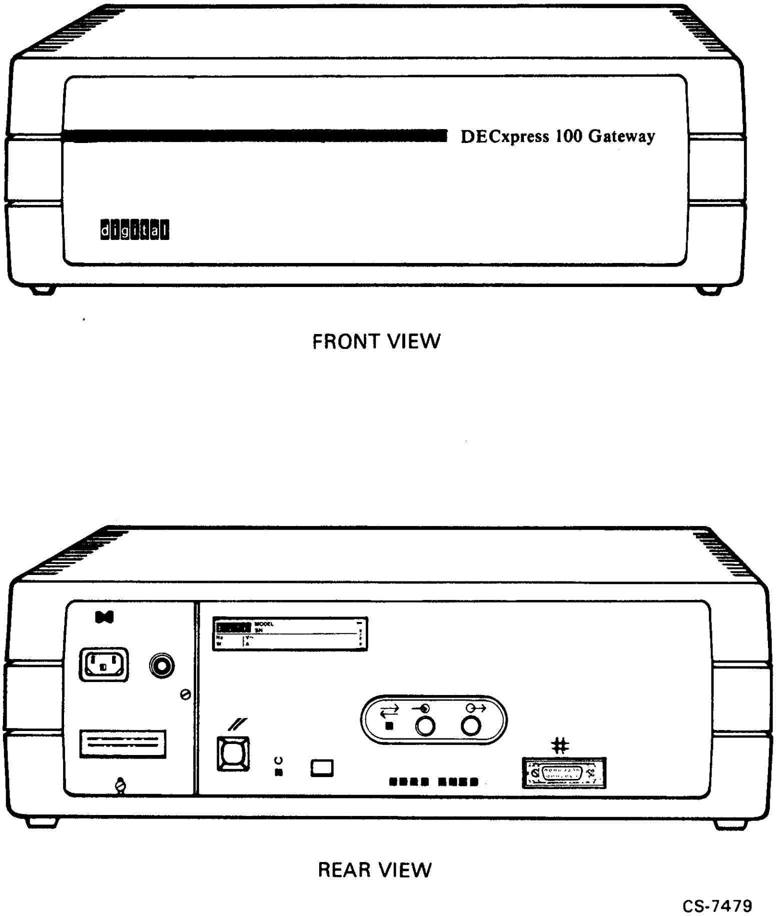


Figure 1 DECxpress 100 Gateway

DECxpress 100 Gateway Options
The DECxpress 100 gateway is available in two option numbers; one for the VMS operating system, and one for the VAX System V operating system. The two DECxpress 100 gateway options and the contents of each are listed below.

The VMS version of the DECxpress 100 gateway (DEDKS-AA) consists of:

- DECxpress 100 gateway hardware — DEFAT-AA
- DECxpress 100 VMS Client Distribution Kit — QA-VXCAA-HM
  - *DECxpress 100 VMS Client Software System Manager's Guide* — AA-NA42A-TE
  - *DECxpress 100 VMS Client Software Installation Manual* — AA-NF25A-TE
  - VMS client software (includes gateway software)
  - SPD 29.69.01
- Single use VMS client license — QL-VXCA9-AA

The VAX System V version of the DECxpress 100 gateway (DEDKS-BA) consists of:

- DECxpress 100 gateway hardware — DEFAT-AA
- DECxpress 100 VAX System V Client Distribution Kit — QA-VZ6AA-HM
  - *The Data Game: A Tutorial for Learning Datakit VCS Multiplexed Host Interface Commands* — AA-NF27A-TE
  - *Datakit VCS Multiplexed Host Interface Software and DECxpress 100 Gateway Software Installation & System Administration Manual* — AA-NF26A-TE
  - VAX System V client software (includes gateway software)
  - SPD 31.50.00
- Single use VAX System V client license — QL-VZ6A9-AA

DECxpress 100 INSTALLATION

Reference Documentation

Refer to the following documents for more information on the DECxpress 100 gateway.

- *DECxpress 100 Gateway Installation/Owner's Manual* — EK-DK100-IN
- DECxpress 100 Gateway VMS Documentation Kit — QA-VXCAA-GZ
  - *DECxpress 100 VMS Client Software System Manager's Guide* — AA-NA42A-TE
  - *DECxpress 100 VMS Client Software Installation Manual* — AA-NF25A-TE
  - VMS client and gateway software — SPD 29.69.01
- DECxpress 100 Gateway VAX System V Documentation Kit — QA-VZ6AA-GZ
  - *The Data Game: A Tutorial for Learning Datakit VCS Multiplexed Host Interface Commands* — AA-NF27A-TE
  - *Datakit VCS Multiplexed Host Interface Software and DECxpress 100 Gateway Software Installation & System Administration Manual* — AA-NF26A-TE
  - DECxpress 100 VAX System V client and gateway software — SPD 31.50.00

Configuration

The DECxpress 100 gateway is supported in both VMS and VAX System V operating system environments. Configuration rules are operating system dependent. In both environments the DECxpress 100 gateway performs the same function. It provides connections between the Datakit network and a VAX processor running VMS or VAX System V, allowing terminals directly connected to the Datakit network to connect to either type of node. Connections between nodes must be from one VMS node to another VMS node, or from one VAX System V node to another VAX System V node. These connections are transparent to both users and hosts.

Configuration rules for the VMS operating system (Figure 2) are as follows:

- A single DECxpress 100 gateway can support multiple VMS systems connected to a common Ethernet/IEEE 802.3 LAN.
- The VMS client software communicates with a single DECxpress 100 gateway.

Configuration rules for the VAX System V operating system (Figure 3) are as follows:

- A single DECxpress 100 gateway can support only one VAX System V system connected to a common Ethernet/IEEE 802.3 LAN.
- The VAX System V client software can communicate with two DECxpress 100 gateways if they are on separate Ethernet/IEEE 802.3 LANs.

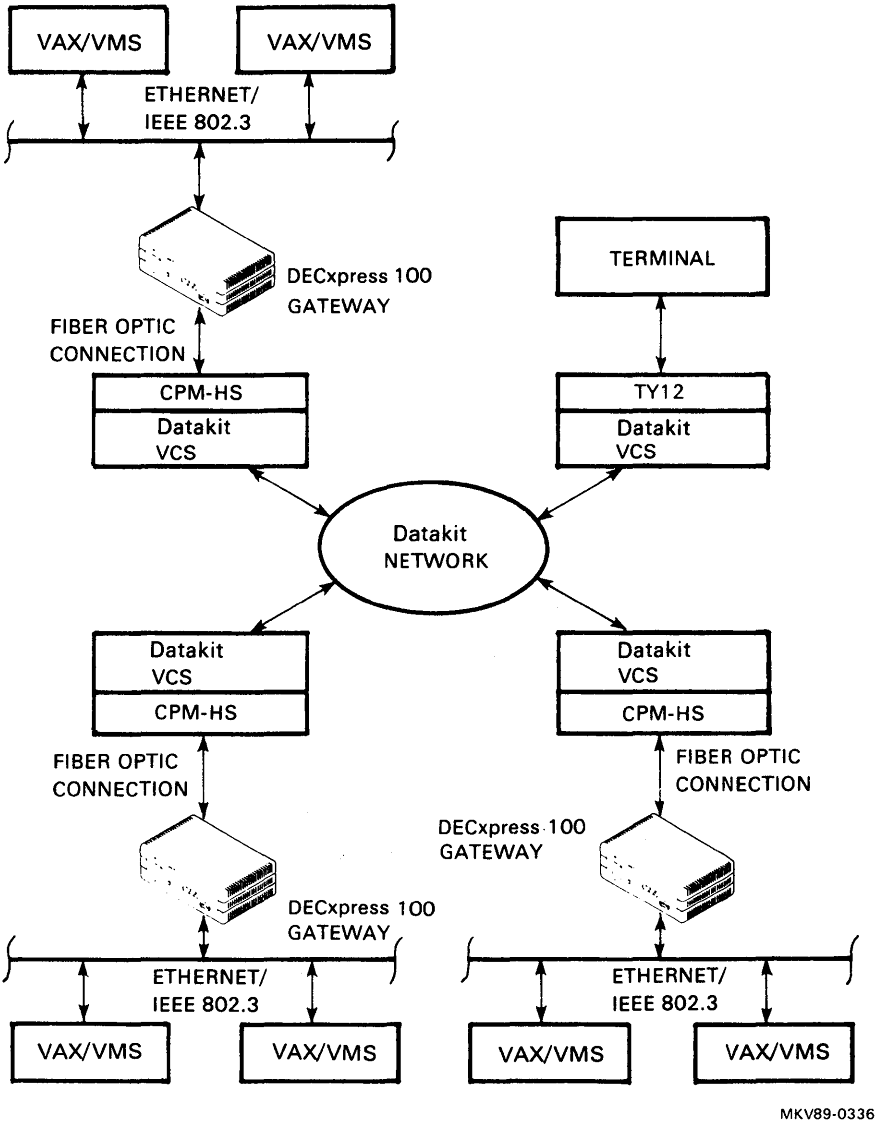


Figure 2 DECxpress 100 Gateway in a VMS Operating System Configuration

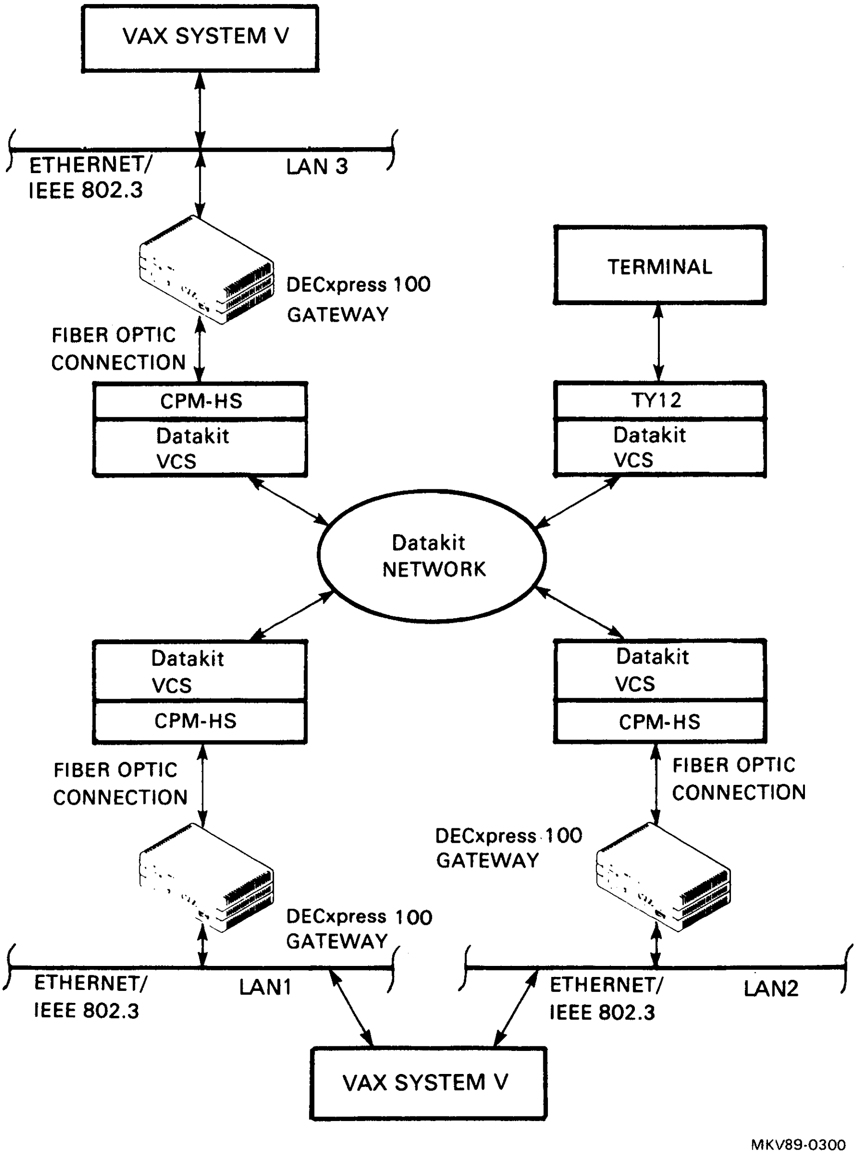


Figure 3 DECxpress 100 Gateway in a VAX System V Operating System Configuration

Hardware Components
The DECxpress 100 gateway shipment consists of the items shown in Figure 4.

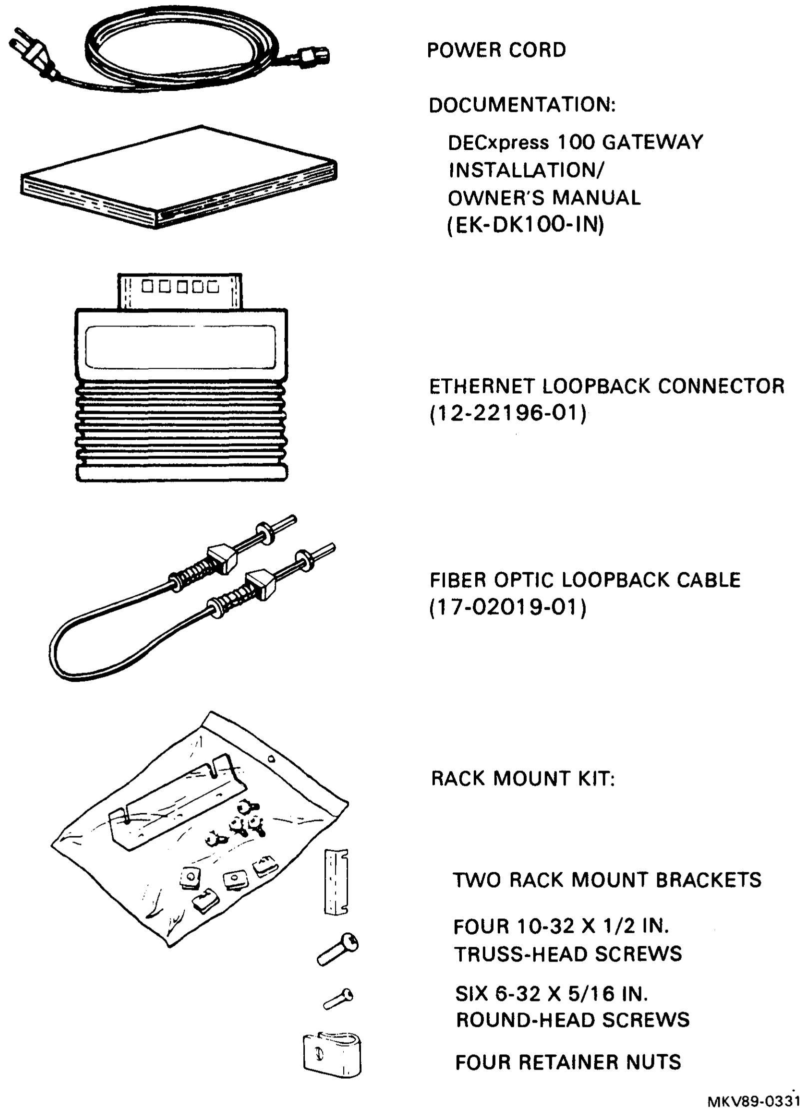


Figure 4 DECxpress 100 Gateway Components

Software Components
The DECxpress 100 gateway is supported in both VMS and VAX System V operating system environments. There is only one version of the loadable gateway microcode. The loadable gateway microcode and the client software (either VMS or VAX System V) will be included together in a single distribution kit specific to the host operating system.

Equipment Placement
The DECxpress 100 gateway can be located in a variety of environments as long as the environmental requirements are met. The gateway can be either rack mounted in a standard 19-inch RETMA (Radio Electronics Television Manufacturers Association) rack cabinet or placed on a table (provided the location is at least 45 cm (18 in.) above the floor). Space must be allowed for proper ventilation and maintenance.

Environmental Requirements

Operating Temperature	10°C (50°F) to 40°C (104°F)
Operating Relative Humidity (noncondensing)	10% to 90%

Physical Dimensions

	With Plastic Covers	Without Plastic Covers
Height	16.2 cm (6.4 in.)	13.3 cm (5.3 in.)
Width	49.4 cm (19.4 in.)	43.6 cm (17.2 in.)
Depth	31.3 cm (12.3 in.)	29.8 cm (11.7 in.)
Weight	7.3 kg (16 lbs)	5.2 kg (11.5 lbs)

Power Requirements
The DECxpress 100 gateway operates on either 120 Vac, 60 Hz or 240 Vac, 50 Hz (switch selectable). Maximum power consumption is 240 W. Typical power consumption is approximately 100 W.

Maximum Heat Dissipation
275 BTU/hr

Site Preparation Considerations
This section identifies the things that must be accomplished prior to the installation of the DECxpress 100 gateway.

Arranging for Software Installation – Before the gateway can be fully operational, the software must be loaded into the host computer system. The software and its documentation are shipped in a separate kit that is operating system dependent (VMS or VAX System V).

Perform the following steps to arrange for software installation:

1. Locate the *serial number* and the *Ethernet address* on the rear panel of the gateway. These are on separate labels (Figure 5).

2. Fill in the information requested on the DECxpress 100 Identification Card (Figure 6) which is located in the back of the *DECxpress 100 Gateway Installation/Owner's Manual* (EK-DK100-IN).

3. Give the identification card and any software received to the person responsible for software installation.

4. Ask to be notified when the software is installed on the load host(s) and when the gateway is configured in the load host database, if this is required by the load host(s).

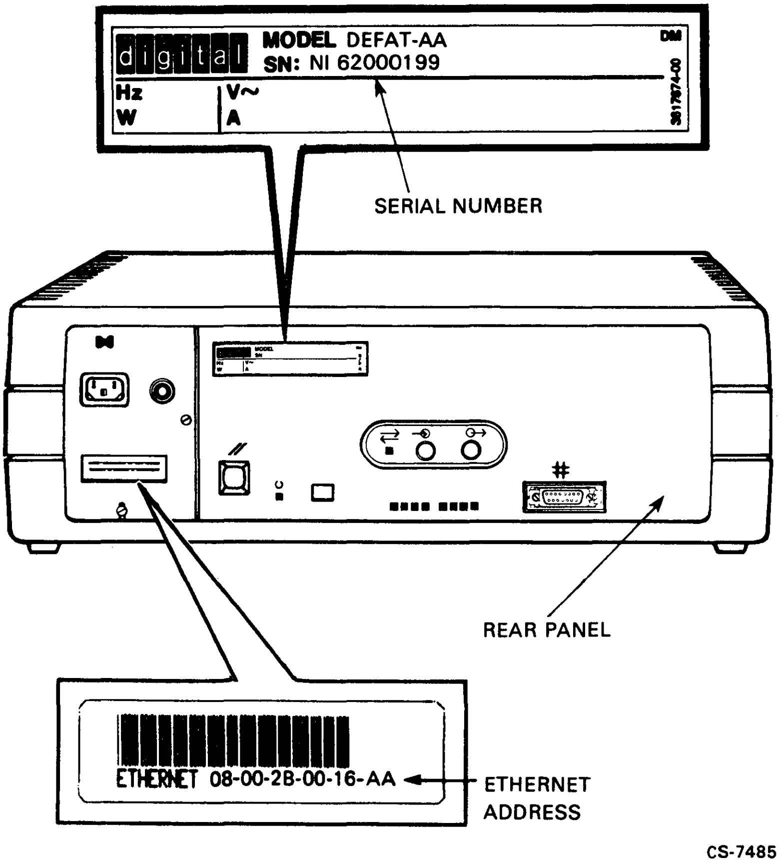
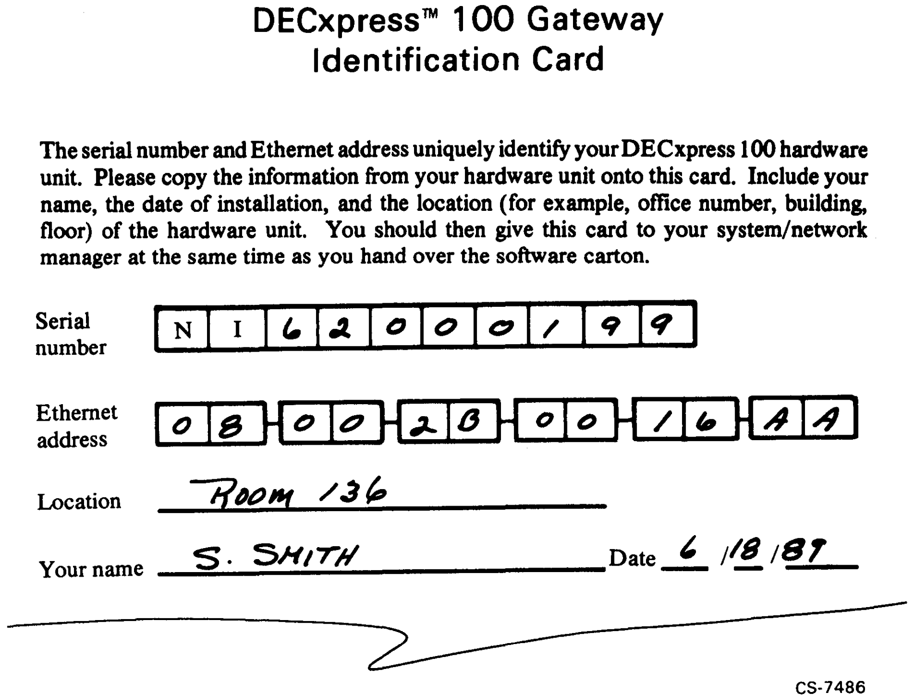


Figure 5 Serial Number and Ethernet Address Label Locations



DECxpress™ 100 Gateway
Identification Card

The serial number and Ethernet address uniquely identify your DECxpress 100 hardware unit. Please copy the information from your hardware unit onto this card. Include your name, the date of installation, and the location (for example, office number, building, floor) of the hardware unit. You should then give this card to your system/network manager at the same time as you hand over the software carton.

Serial number: N I 6 2 0 0 0 1 9 9

Ethernet address: 08-00-2B-00-16-AA

Location: ROOM 136

Your name: S. SMITH Date: 6/18/87

CS-7486

Figure 6 DECxpress 100 Gateway Identification Card

Checking the Site – Check the following items to ensure that the site is prepared for the DECxpress 100 gateway installation.

1. The appropriate baseband network interface (for example; an Etherjack junction box, DELNI, DESTA, or Ethernet transceiver) is installed, and the required transceiver cabling is installed, tested, and tagged.

2. Fiber optic cables are installed, tested, tagged, and terminated with protective caps.

3. The ac power outlet matches the power requirements of the gateway and is within 1.8 m (6 ft) of the gateway location.

4. The environmental requirements are met.

5. The space is adequate for ventilation and for maintenance access.

6. The location is at least 45 cm (18 in.) above the floor.

Initializing the Gateway in the System
Before initializing the gateway, ensure that the distribution software is installed on the load host(s). Also ensure that the gateway is configured in the load host database, if this is required by the load host(s). This can be confirmed by the system manager.

NOTE
If the distribution software is not installed, the load host cannot send the gateway image to the gateway. The gateway does not operate without software.

To initialize the gateway in the system, proceed as follows:

1. With the gateway plugged in and power applied, press the Reset switch (Figure 12).

   NOTE
   Initialization of the gateway can be initiated by unplugging the gateway and plugging it back in, manually by pressing the Reset switch, or remotely via the software.

2. Observe that the green self-test indicator lights in approximately 30 seconds. If the self-test indicator does not light, record the numbers of the status indicators (D1 through D8) that are ON and refer to the MAINTENANCE AIDS section.

3. Shortly afterwards the status indicator D1 starts blinking to indicate that the software is loading. When the software is loaded, D1 remains ON.

4. If the gateway passes the self-test but D1 does not indicate that the software is loading, check with the system manager to ensure that:

   a. The gateway software has been installed in the host system

   b. The host system knows the correct Ethernet address for the gateway

   c. There is no problem with the operation of the Datakit VCS

Hardware Installation Flow Diagram

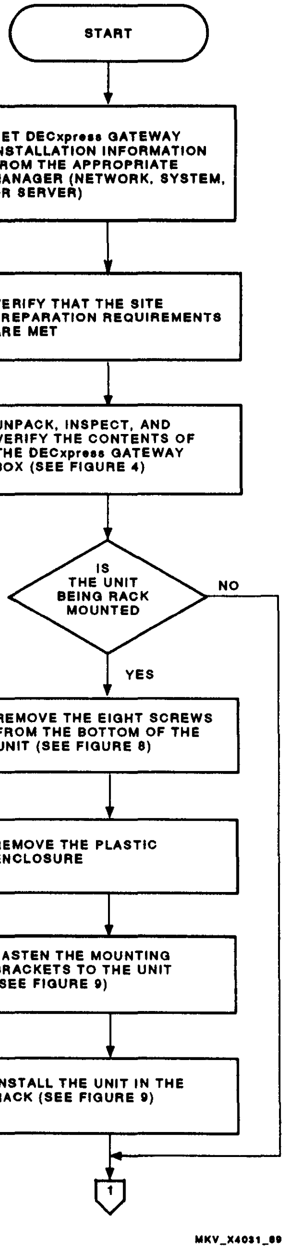


Figure 7 Hardware Installation Flow Diagram (Sheet 1 of 4)

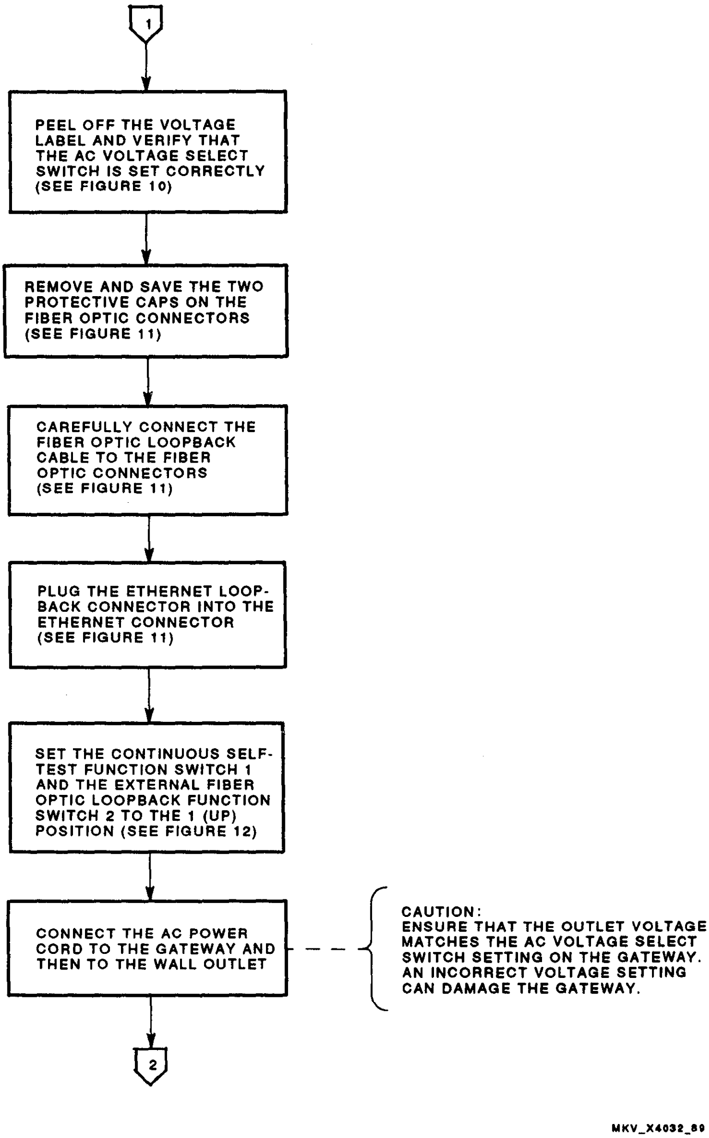


Figure 7 Hardware Installation Flow Diagram (Sheet 2 of 4)

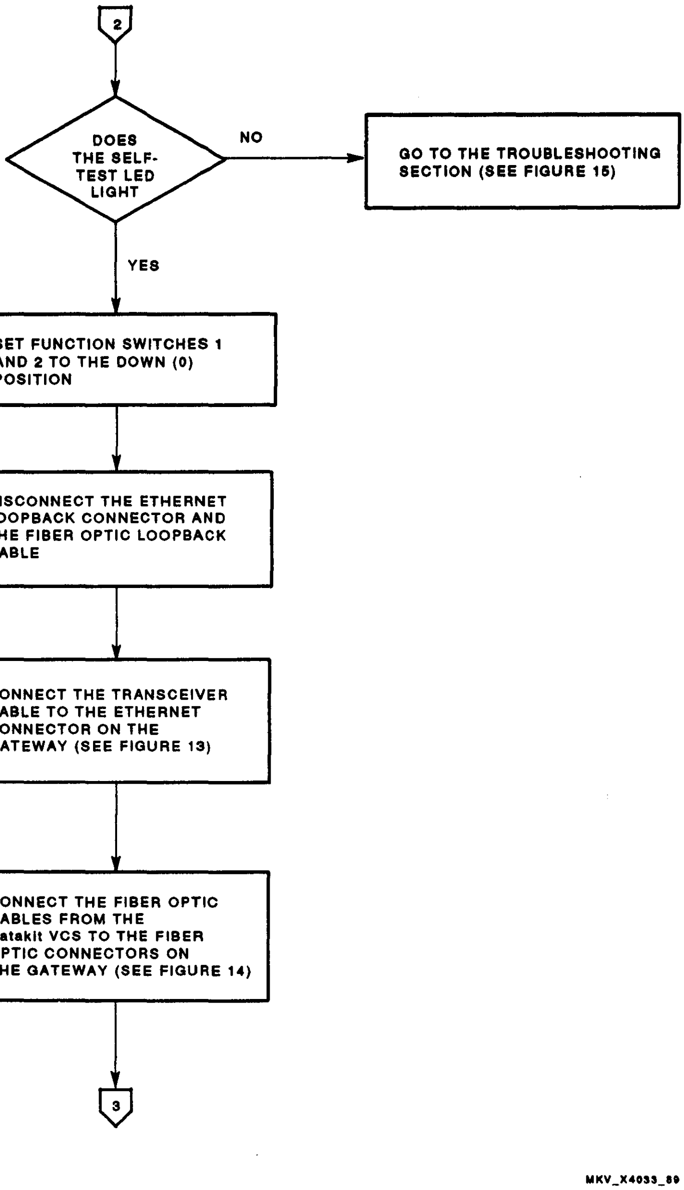


Figure 7 Hardware Installation Flow Diagram (Sheet 3 of 4)

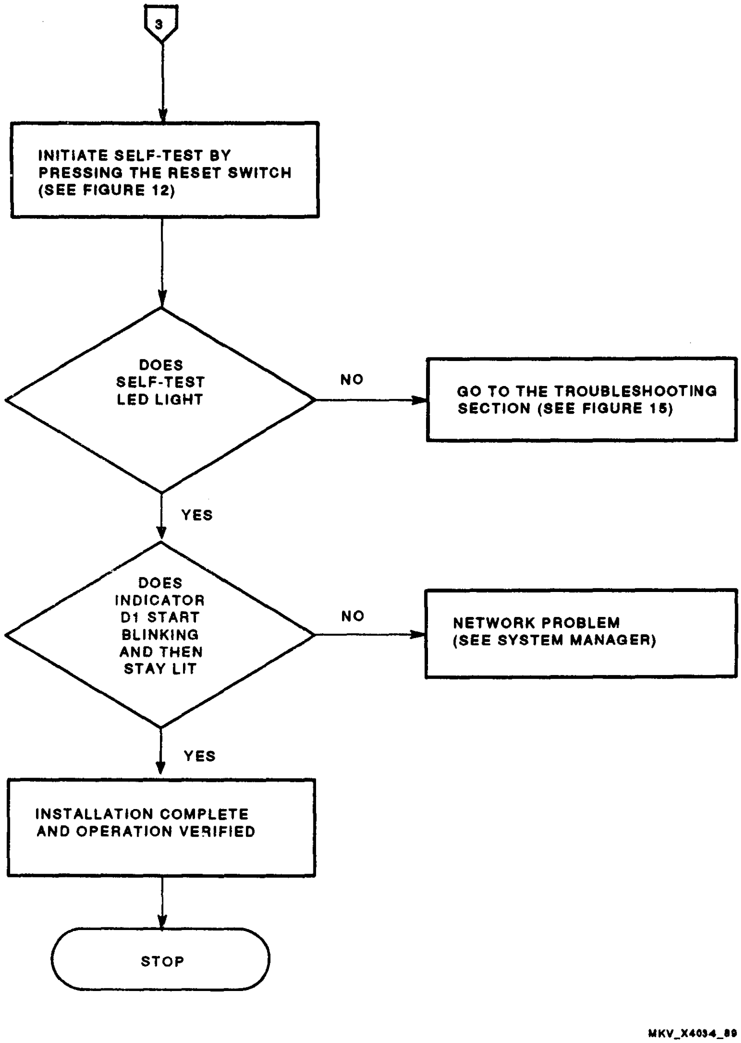


Figure 7 Hardware Installation Flow Diagram (Sheet 4 of 4)

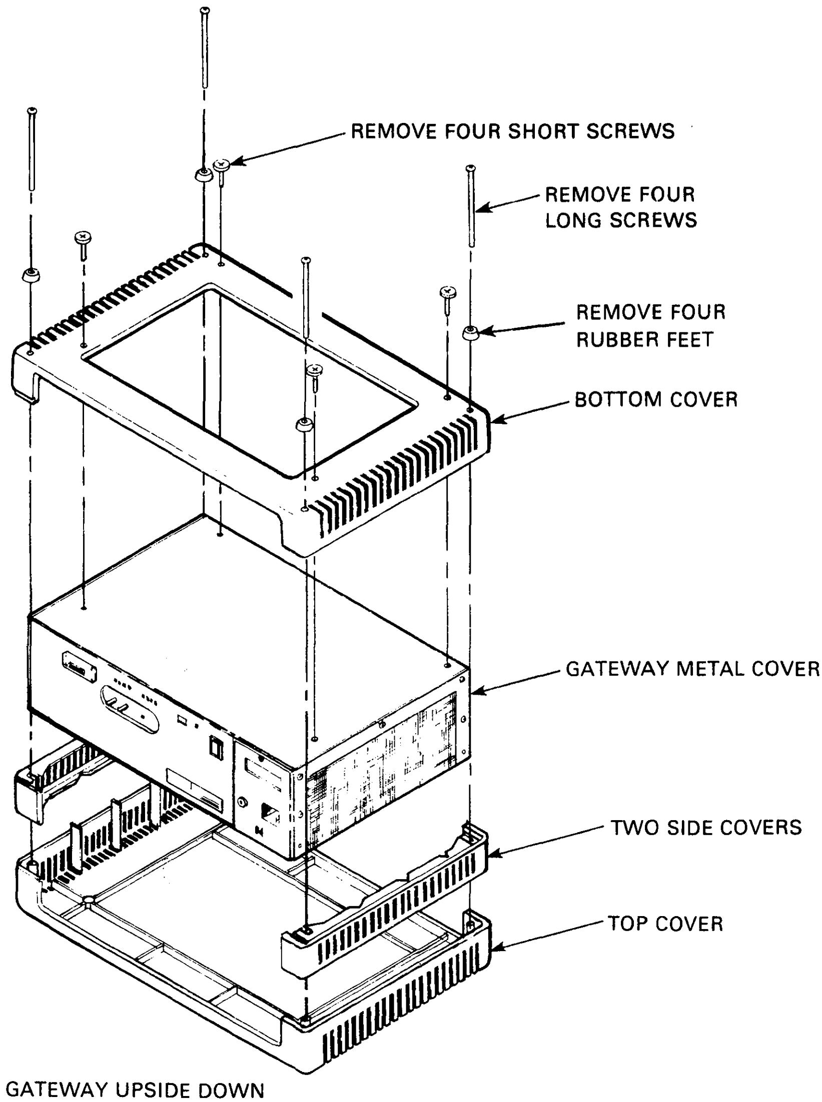


Figure 8 Removing the Plastic Covers

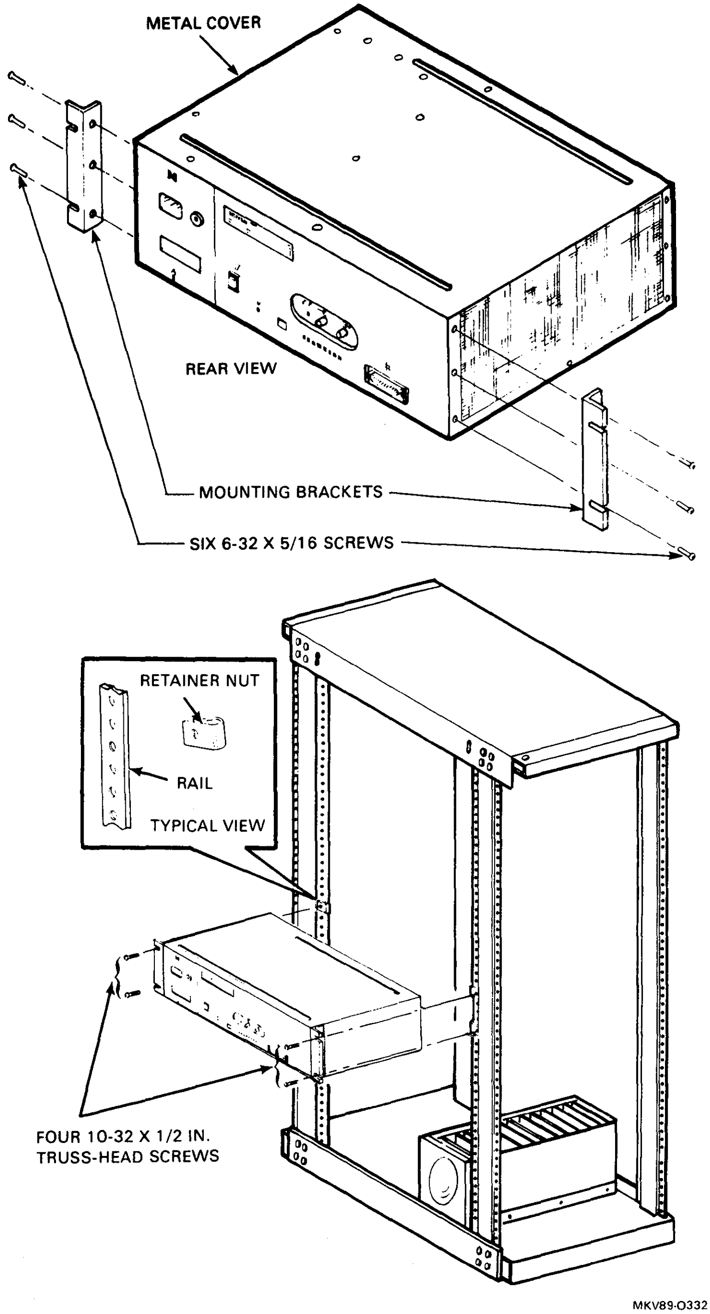


Figure 9 Rackmount Installation

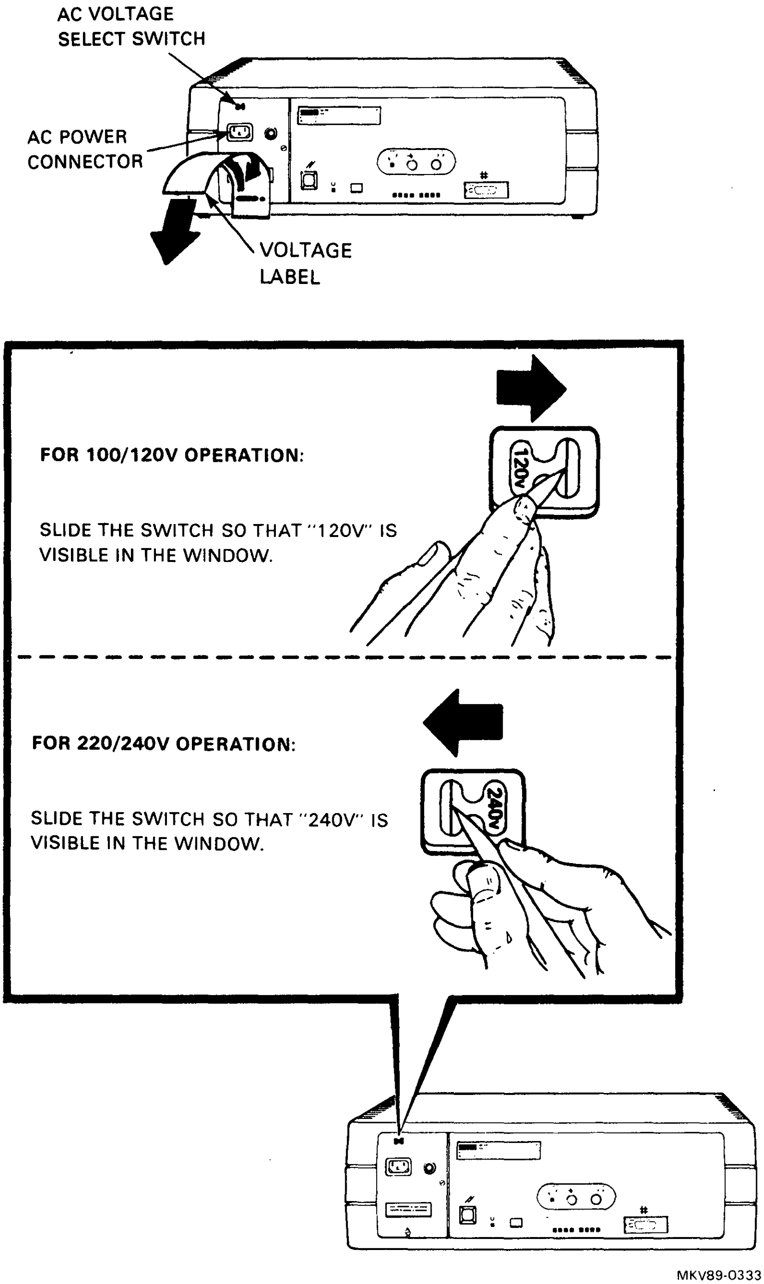


Figure 10 Verifying the AC Voltage Select Switch Setting

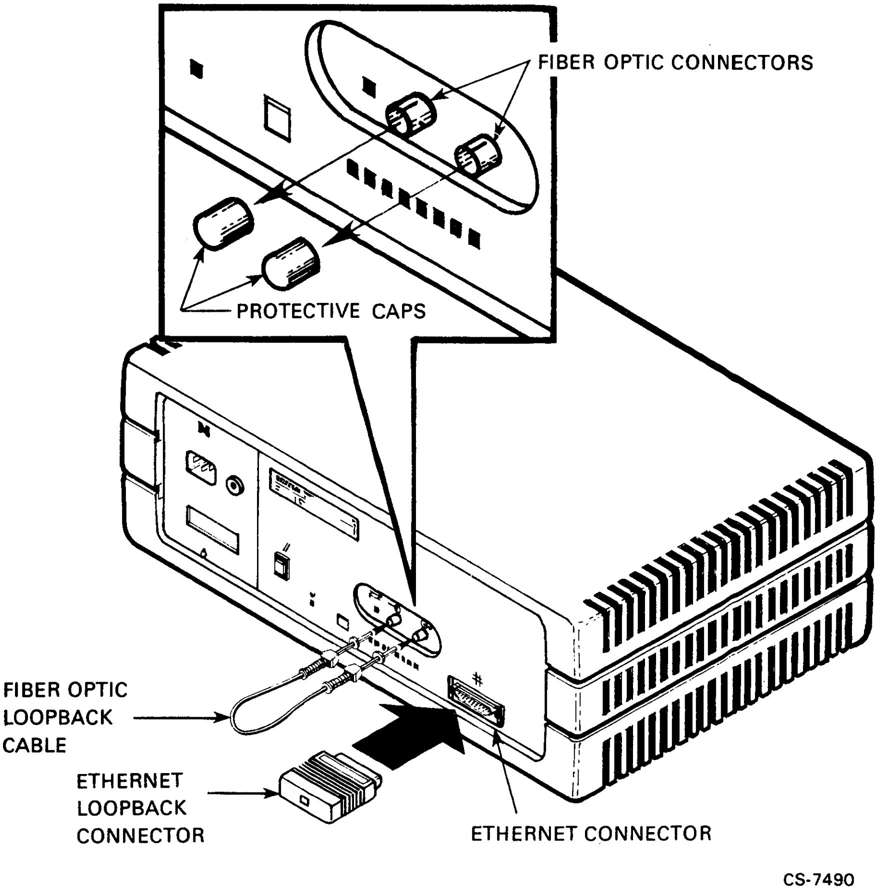


Figure 11 Connecting the Loopback Connector and Cable

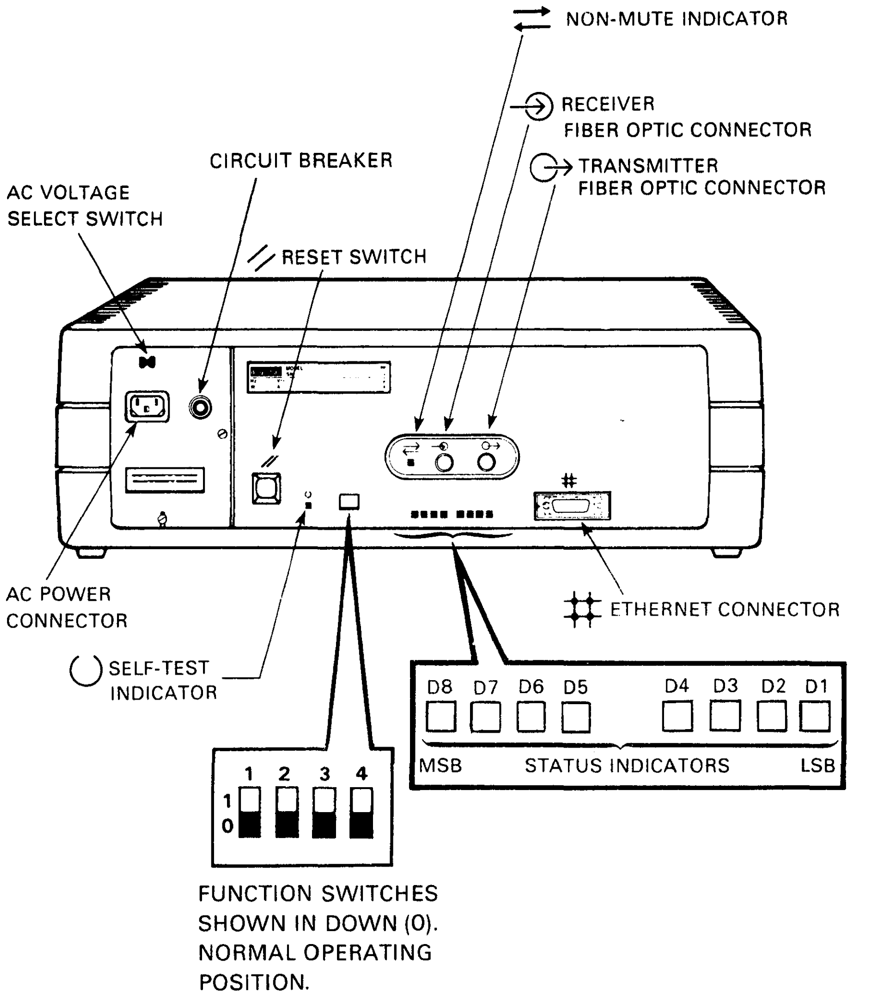


Figure 12 DECxpress 100 Gateway Controls, Indicators, and Connectors

Table 1 DECxpress 100 Function Switches

Switch Number	Function
1 (Continuous Self-test)	When set to 0 (down) and the ac power cord is plugged in or the Reset switch is pressed, the gateway runs its self-test and then requests the host computer to down-line load the operating software. When set to 1 (up) and the ac power cord is plugged in or the Reset switch is pressed, the gateway continuously runs its self-test without requesting a down-line load of the software. The self-test only halts on an error condition.
2* (External Fiber Optic Port Loopback)	When set to 0 (down), causes the gateway to loopback internally between the fiber optic transmitter and receiver ports. When set to 1 (up), the gateway is set up to loopback externally over a connection between the transmitter and receiver fiber optic ports. When the gateway is not in self-test, the fiber optic ports are activated for normal communication.
3	This switch is reserved and should be left in the 0 (down) position.
4	This switch is reserved and should be left in the 0 (down) position.

* Switch 2 is effective only when the gateway is performing its self-test.

Table 2 DECxpress 100 Indicators

Indicator	Function
Self-Test	A green indicator that lights when the gateway passes its self-test. This indicator remains lit until power is disconnected or the gateway detects a failure. This indicator is not lit while self-test is in progress. When a failure is detected, the self-test indicator goes out and the status indicators display an error code indicating the failure.
Non-Mute	A green indicator that lights when the fiber optic receiver is receiving information from the Datakit VCS. This is a non-mute condition. When not lit, it indicates that information is not being received. This is a mute condition.
Status	Red indicators (D1 through D8) that provide dynamic status information (listed below) during normal operation, and static error information if the gateway detects a failure (Table 4).
D1	When not lit, indicates that the software is not loaded. When blinking, indicates that the software is being loaded from the host. When lit, indicates that the software is loaded and ready to connect clients.
D2	Lights when the Datakit Common Signaling Channel (CSC) is operational.
D3	Lights when at least one client is connected.
D4	Lights when at least one channel other than the CSC channel is operational.
D5 through D8*	These indicators show the relative number of clients (traffic) being handled by the gateway as described below. • When D8 is lit, there is a low amount of traffic. • When D8 and D7 are lit, there is a moderate amount of traffic. • When D8, D7, and D6 are lit, there is heavy traffic. • When D8, D7, D6, and D5 are lit, the gateway is operating near capacity.

* These four indicators also show that the gateway is operational by blinking approximately every two seconds.

Cable Configuration Rules
Ensure that the transceiver cables, device cables, and the gateway power cord do not exceed the maximum lengths as shown in Table 3 and in the following configuration rules.

Table 3 Maximum Cable Lengths

From	To	Cable Length (Maximum)	Cable Type
Transceiver	Gateway	50 m (164 ft) (See rules 1 and 2)	IEEE 802.3 compliant transceiver cable
Datakit VCS	Gateway	1 km (3281 ft) (See rule 3)	62.5/125 fiber optic pair with ST™ connectors
Wall outlet	Gateway	1.8 m (6 ft)	110/120 volt power cord

ST is a registered trademark of the American Telephone and Telegraph Company.

The basic cable configuration rules are as follows:

1. The maximum length of the transceiver cable cannot exceed 50 meters (164 feet). This maximum length, however, is reduced by the internal cabling equivalency of a device (such as a DELNI) connected between the gateway and the transceiver, or by the use of office transceiver cable.

   Cabling equivalency is a measure of the internal timing delay of a device, expressed in meters of transceiver cable. This cabling equivalency must be subtracted from the 50 meter maximum length. For example, if the device has a 5 meter cabling equivalency, then its maximum allowable transceiver cable length is 45 meters (50 m – 5 m).

2. When connecting the gateway to a configuration that includes a DELNI, allow a 5 meter equivalency loss for the DELNI.

3. The gateway only accepts 62.5/125 micron fiber optic cables with ST-type connectors.

Cable Connections
This section provides information on connecting the transceiver cable and the fiber optic cables to the gateway.

Connecting the Transceiver Cable – The transceiver cable connects the gateway Ethernet connector to one of the following devices:

- Etherjack junction box
- DELNI
- Ethernet transceiver
- DESTA ThinWire Ethernet station adapter

To connect the transceiver cable to the gateway Ethernet connector, refer to Figure 13.

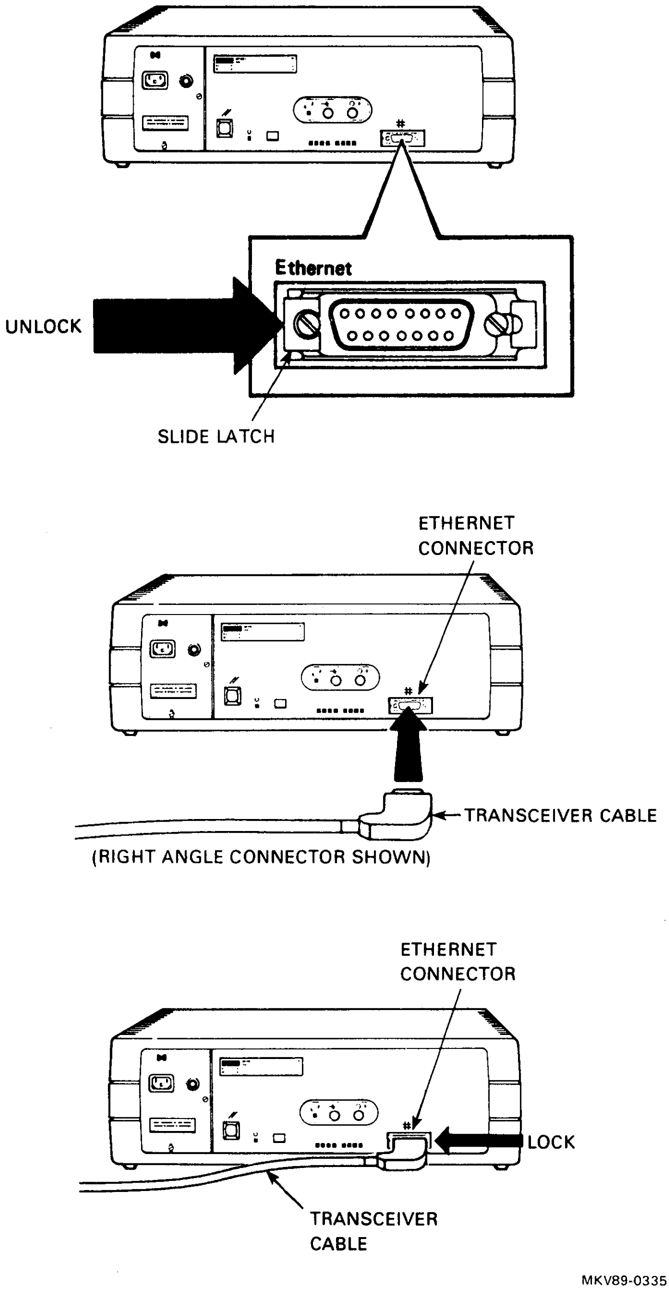


Figure 13 Connecting the Transceiver Cable

Connecting the Fiber Optic Cables – Connect the fiber optic cables to the gateway fiber optic connectors by referring to Figure 14.

WARNING
Never look into the fiber optic connectors or cables. High intensity light can cause eye damage.

CAUTION
To prevent damaging the fiber optic cables, ensure that the cable bends have a minimum radius of 15.24 cm (6 in.).

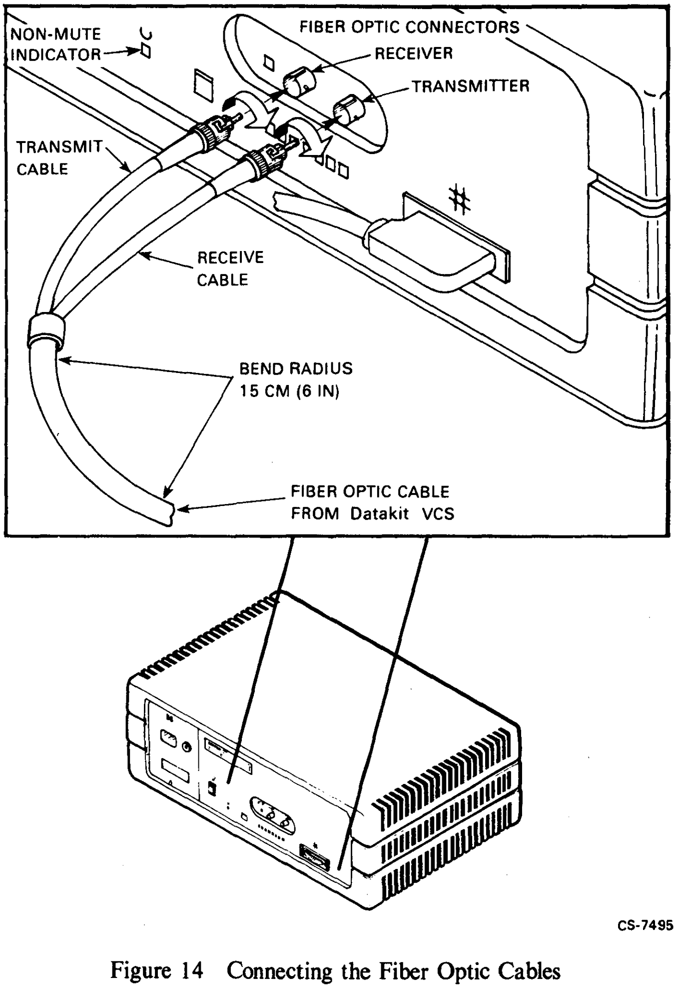


Figure 14 Connecting the Fiber Optic Cables

Self-Test

The DECxpress 100 gateway has an internal ROM based self-test. The self-test exercises all of the functional areas of the gateway. If the fiber optic loopback connector is present, and Function Switch 2 is in the up position, the gateway self-test will check the transmit and receive capabilities of the fiber optic interface port.

The self-test is initiated by either pressing the Reset switch, or unplugging and then plugging the gateway power cord into the ac outlet. After approximately 30 seconds the green self-test indicator should light, and shortly afterwards, the red D1 status indicator should start blinking and then stay lit to indicate that the software has been loaded and the gateway is on-line. If the self-test fails, the red status indicators will display an error code. The error codes and corrective actions are listed in Table 4.

Table 4 Self-Test Error Codes

Error Code (hex)	Indication	Corrective Action
00-07	Reserved	N/A
08-12	μVAX CPU Error	Replace CPU/NI Module
13	RAM Controller Error	Replace CPU/NI Module
14	ROM Error	Replace CPU/NI Module
15	Status Register Error	Replace CPU/NI Module
16	Station Address Error	Replace CPU/NI Module
17-20	μDMA Controller Error	Replace CPU/NI Module
21-28	I/O Memory Error	Replace CPU/NI Module
29-30	VIC Error	Replace CPU/NI Module
31-35	RAM Error	Replace CPU/NI Module
36-45	Clance Error	Replace CPU/NI Module
46-6A	SSC Error	Replace CPU/NI Module
80-B3	CPM Subsystem Error	Replace FPM-HS Protocol Module

Troubleshooting Flowchart

Use the flowchart in Figure 15 to help identify and correct problems in the DECxpress 100 gateway.

NOTE

Prior to starting any troubleshooting activity, notify ⁴he Datakit VCS system manager.

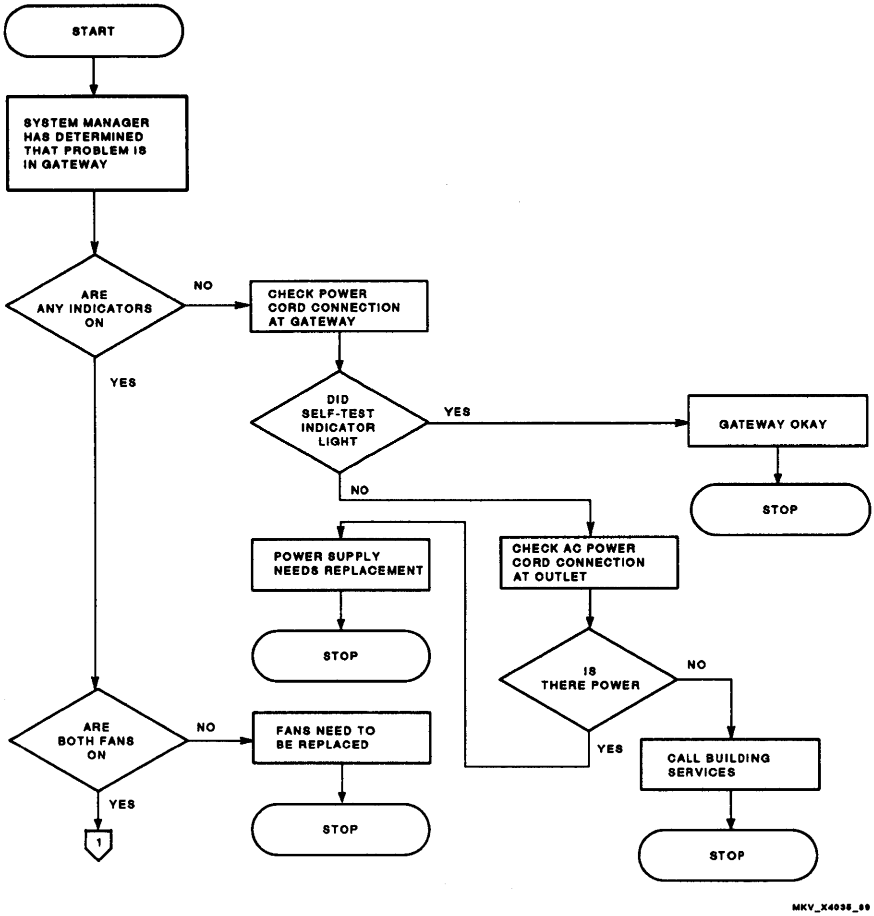


Figure 15 DECxpress 100 Gateway Troubleshooting Flowchart (Sheet 1 of 4)

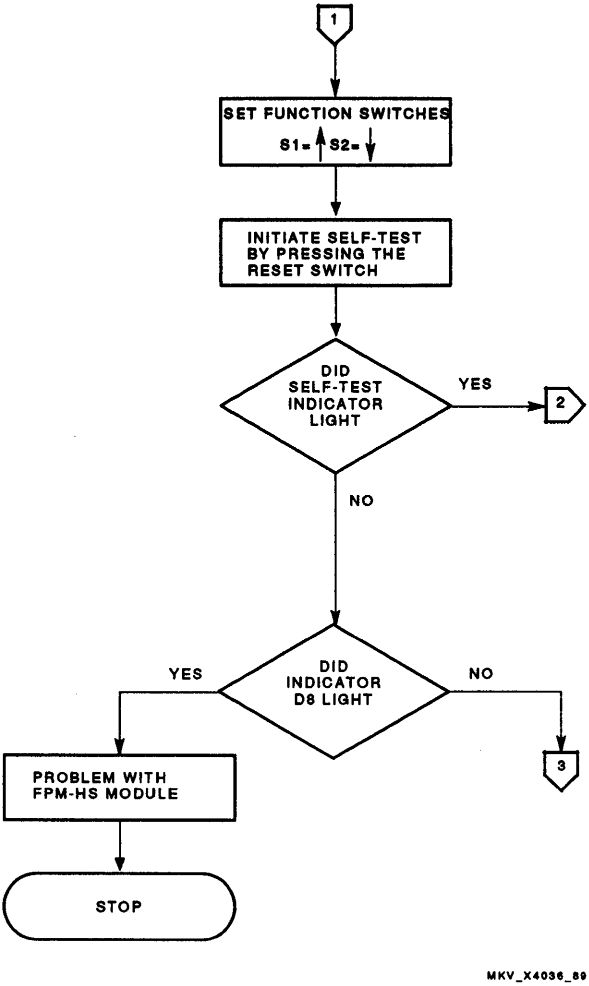


Figure 15 DECxpress 100 Gateway Troubleshooting Flowchart (Sheet 2 of 4)

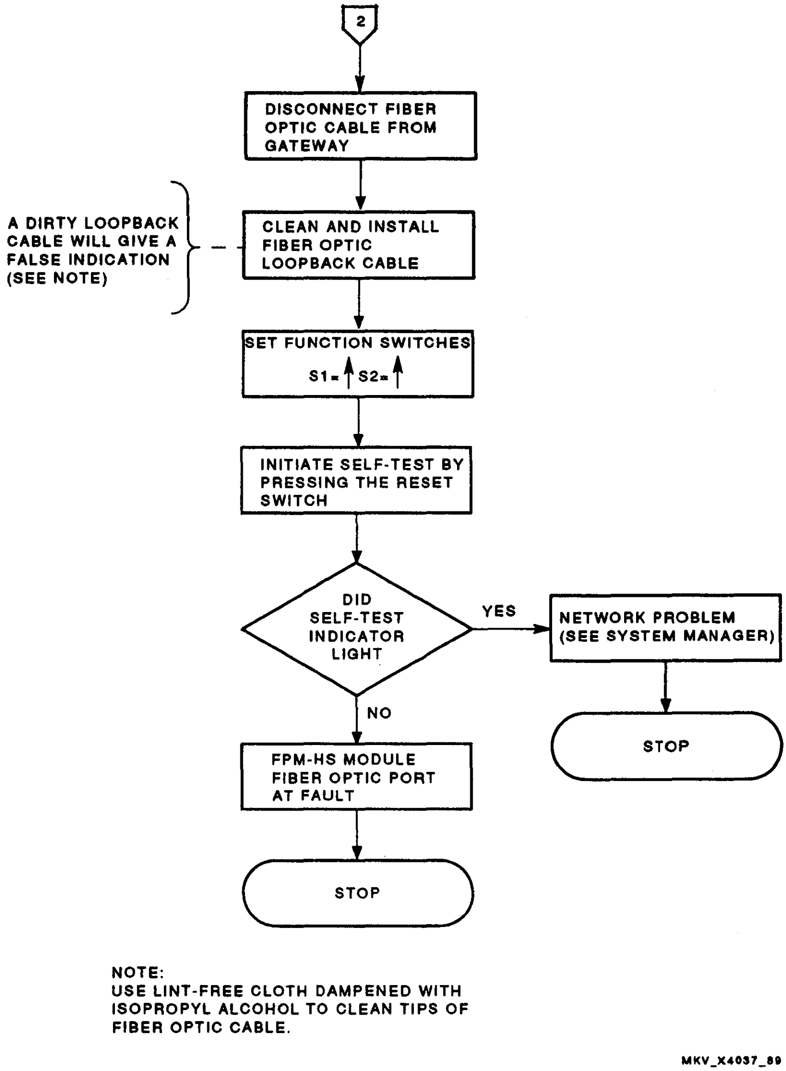


Figure 15 DECxpress 100 Gateway Troubleshooting Flowchart (Sheet 3 of 4)

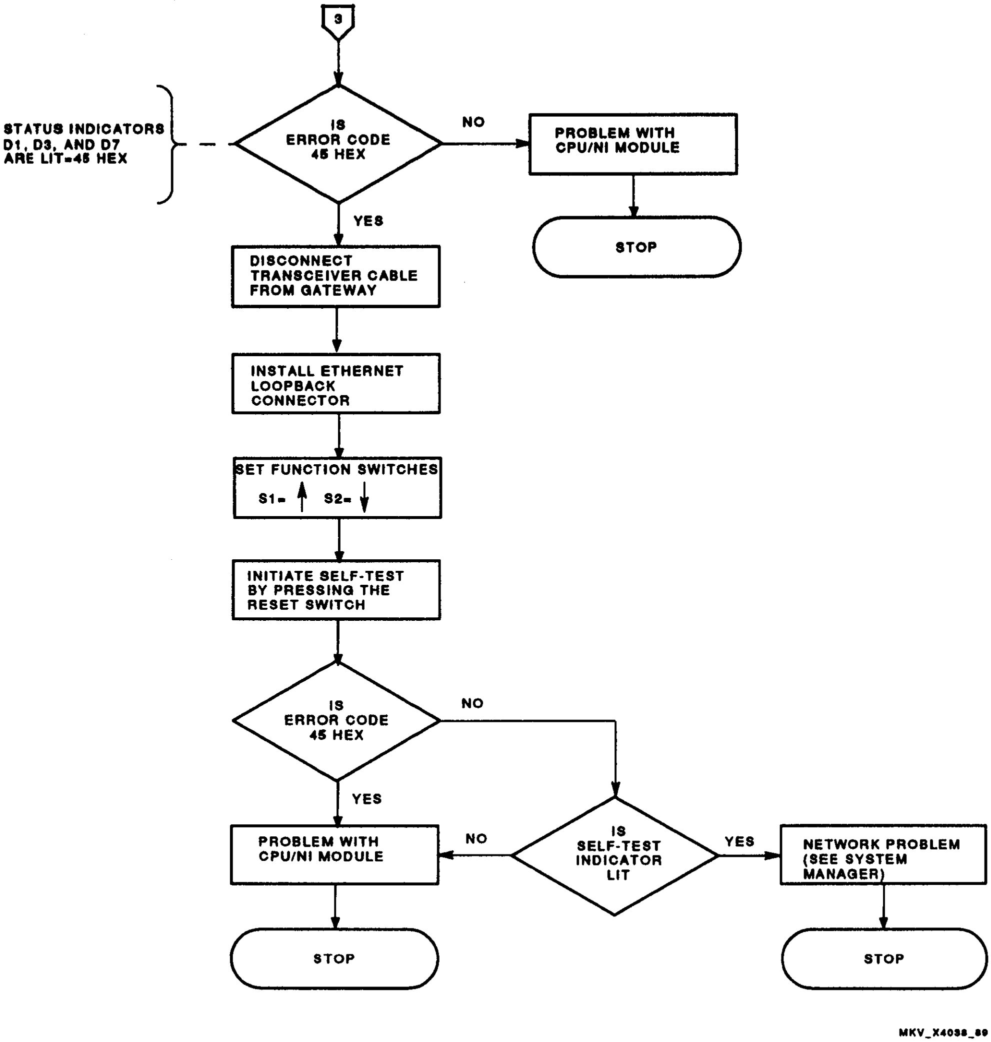


Figure 15 DECxpress 100 Gateway Troubleshooting Flowchart (Sheet 4 of 4)

FRU Removal and Replacement

Figure 16 shows the field replaceable units (FRUs) of the DECxpress 100 gateway. The FRUs and their part numbers are listed below.

FRU	Part Number
Fan Assembly	70-25518-01
FPM-HS Protocol Module	54-18699-01
CPU/NI Module	54-18697-01
Power Supply	H7859-A
AC Wire Harness	17-01971-01
Voltage Selection Switch	17-16901-04
Breaker, 4 A, 250 V	12-19912-02

WARNING

The removal and replacement procedures should be performed by qualified service personnel only. DO NOT attempt to remove any FRU while the DECxpress 100 gateway is connected to a power source.

CAUTION

Static electricity can damage electrical components. Use a grounded wriststrap (29-11762-00) and a grounded work surface when accessing any internal components of the DECxpress 100 gateway.

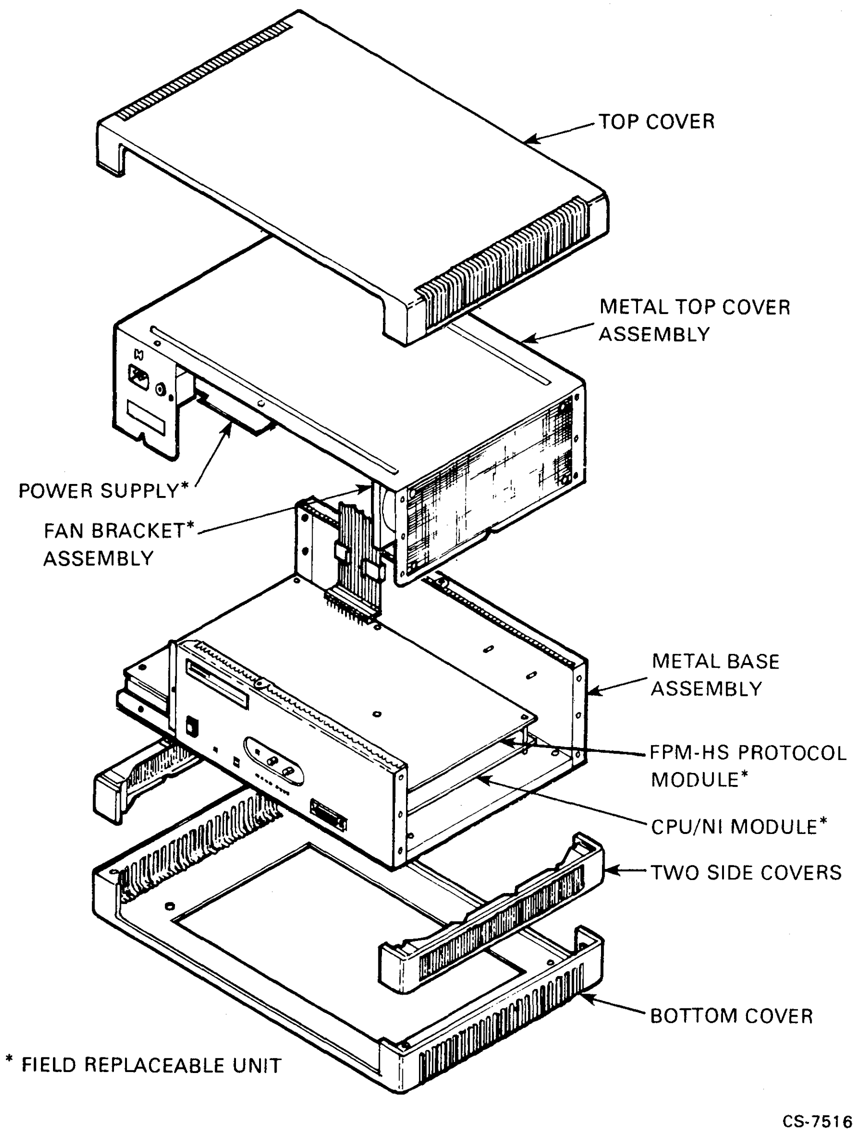


Figure 16 DECxpress 100 Gateway FRU Locations

Communications Options Minireference Manual
Volume 6 Ethernet Devices (Part 2)
EK-CMIV6-RM-005

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