EK-CMIV5-RM-004

Networks . Communications

Communications Options Minireference Manual

Volume 5 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

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.

CONTENTS

Page

CONTENTS (Cont)

CONTENTS (Cont)

CONTENTS (Cont)

CONTENTS (Cont)

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.

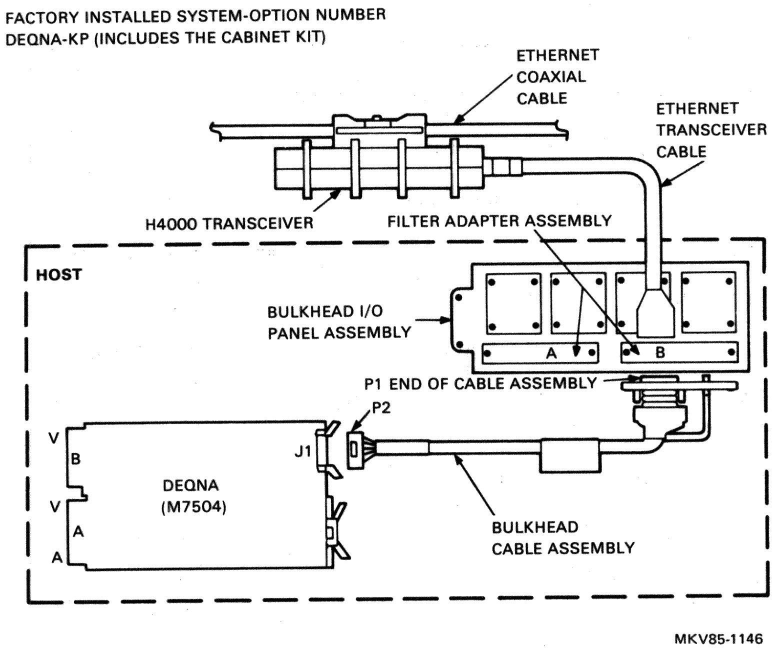


Figure 1 DEQNA to Ethernet Connection

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.

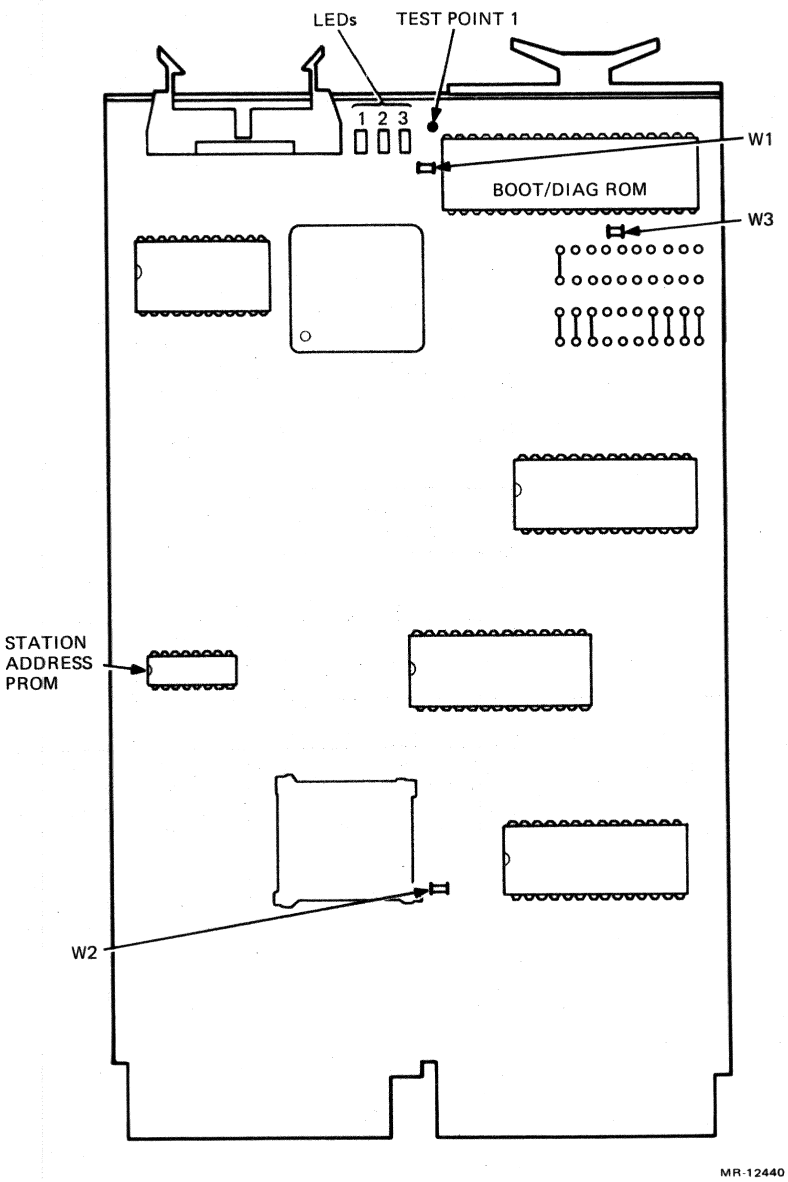


Figure 2 DEQNA Module (M7504)

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

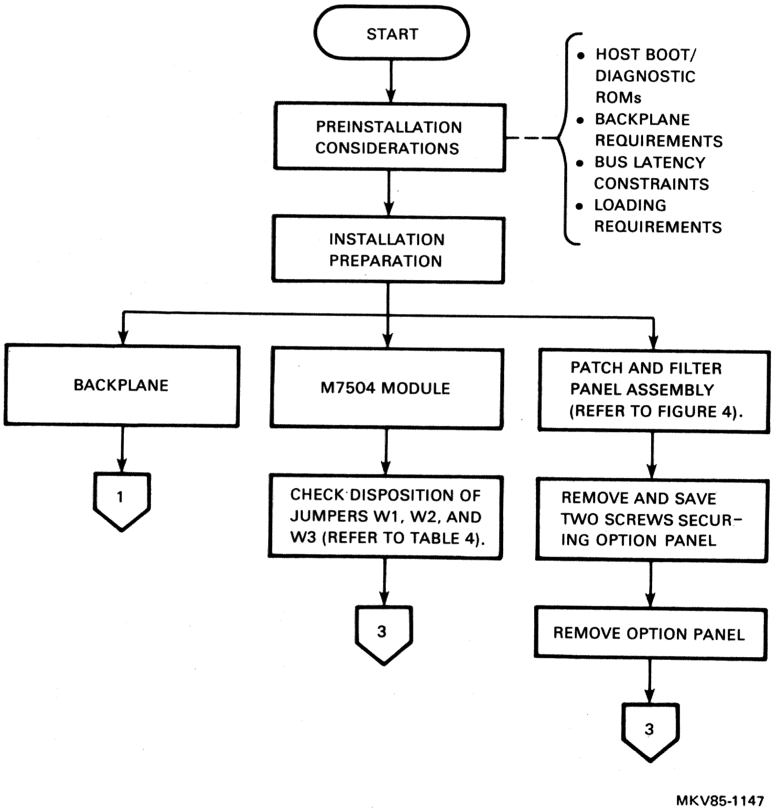
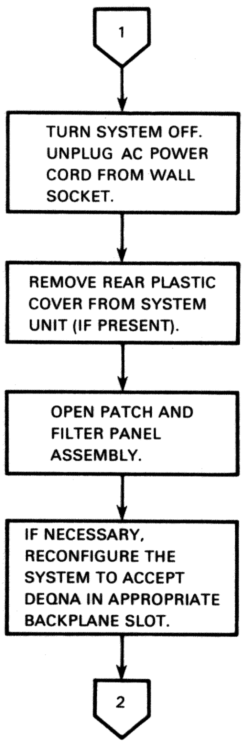


Figure 3 Installation Flow Diagram (Sheet 1 of 4)



MKV85-1148

Figure 3 · Installation Flow Diagram (Sheet 2 of 4)

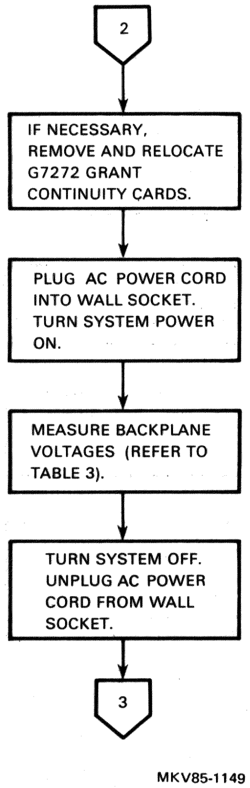


Figure 3 Installation Flow Diagram (Sheet 3 of 4)

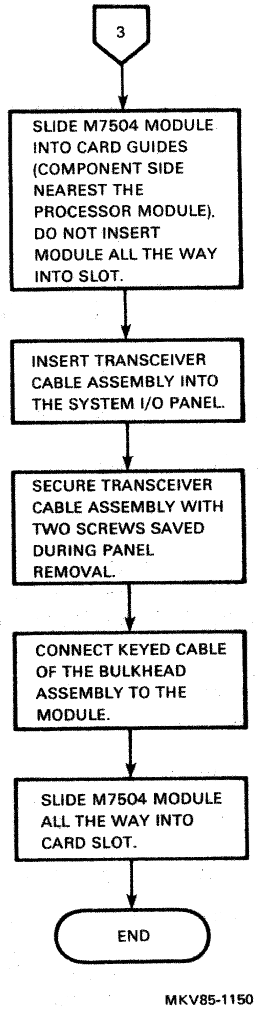


Figure 3 Installation Flow Diagram (Sheet 4 of 4)

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

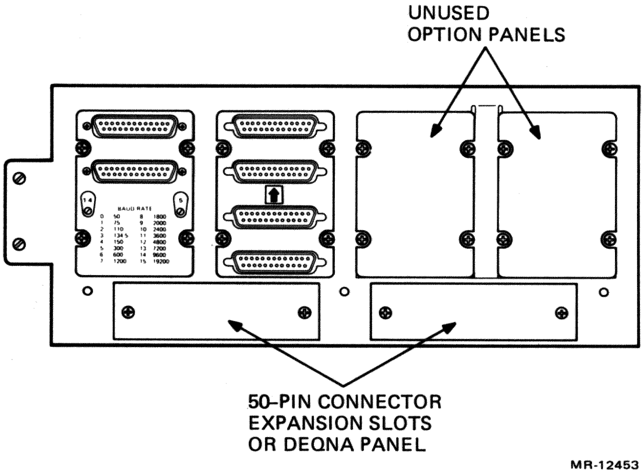


Figure 4 Typical Patch and Filter Panel Assembly

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.

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

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*	Loopback Mode Set-up	Internal	Internal Extended	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 loopback 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
```

MKV85-1151

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
```

MKV85-1152

Figure 6 Typical Extended Error Message Format

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 1	Position 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

MKV85-1153

Figure 7 DEQNA DEC/X11 Exerciser Error Message Format

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.

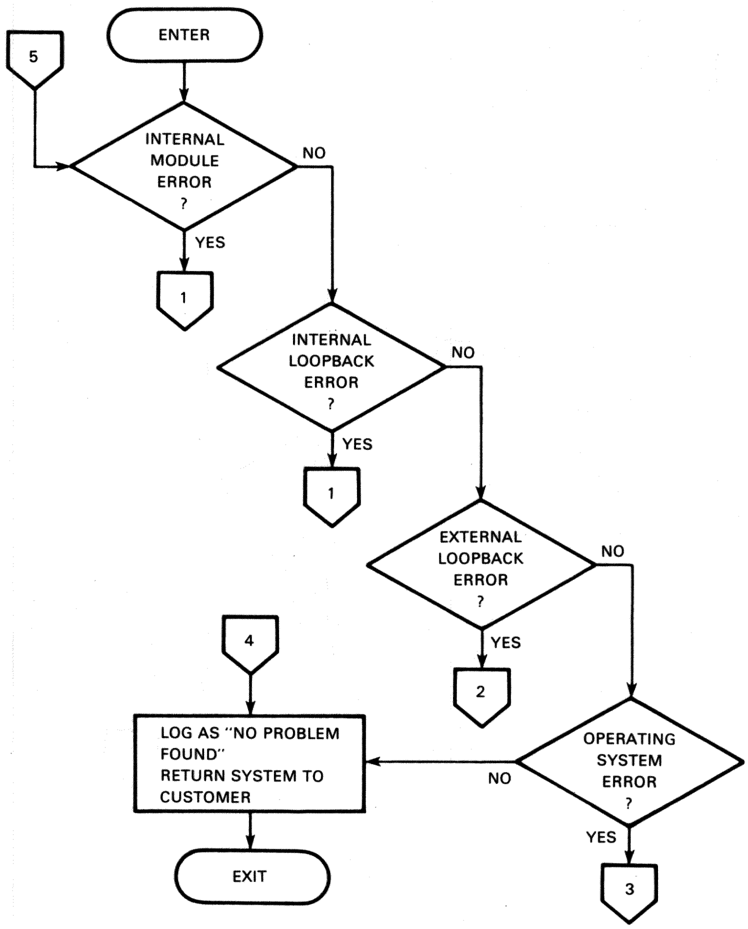


Figure 8 Troubleshooting Flow Diagram (Sheet 1 of 4)

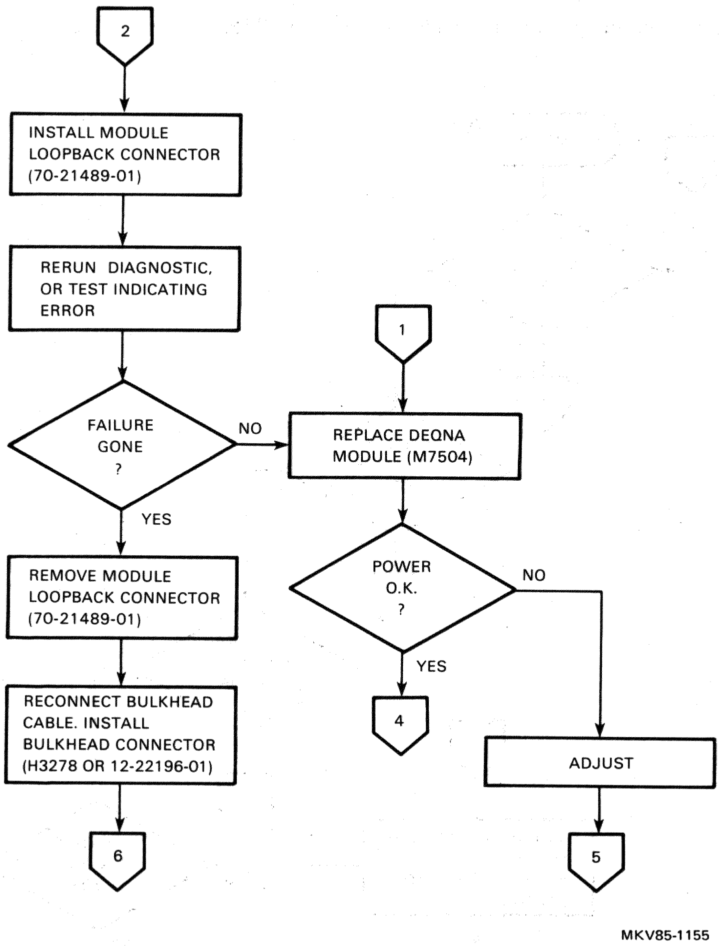


Figure 8 Troubleshooting Flow Diagram (Sheet 2 of 4)

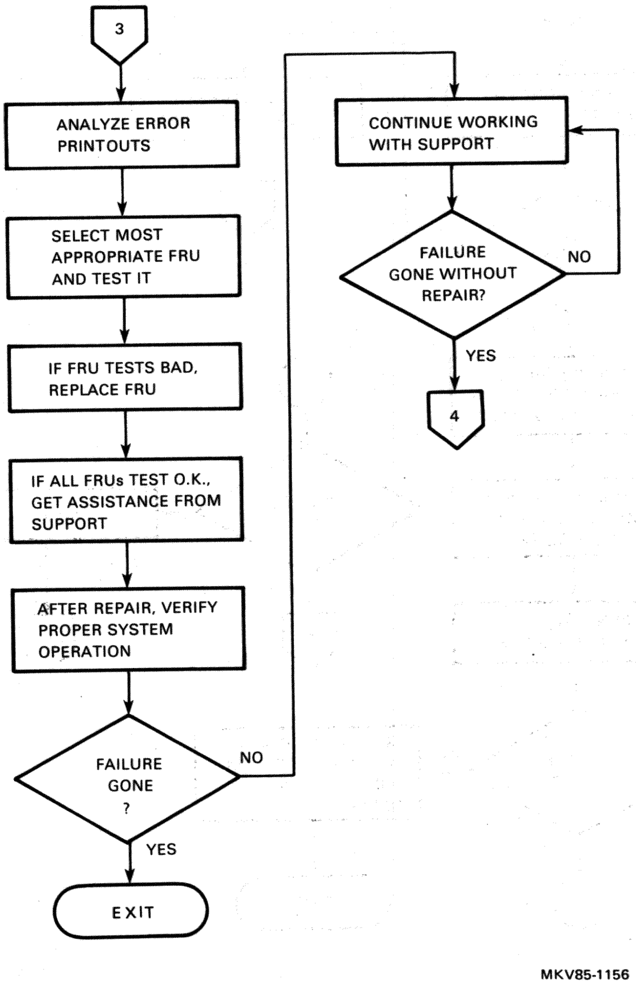
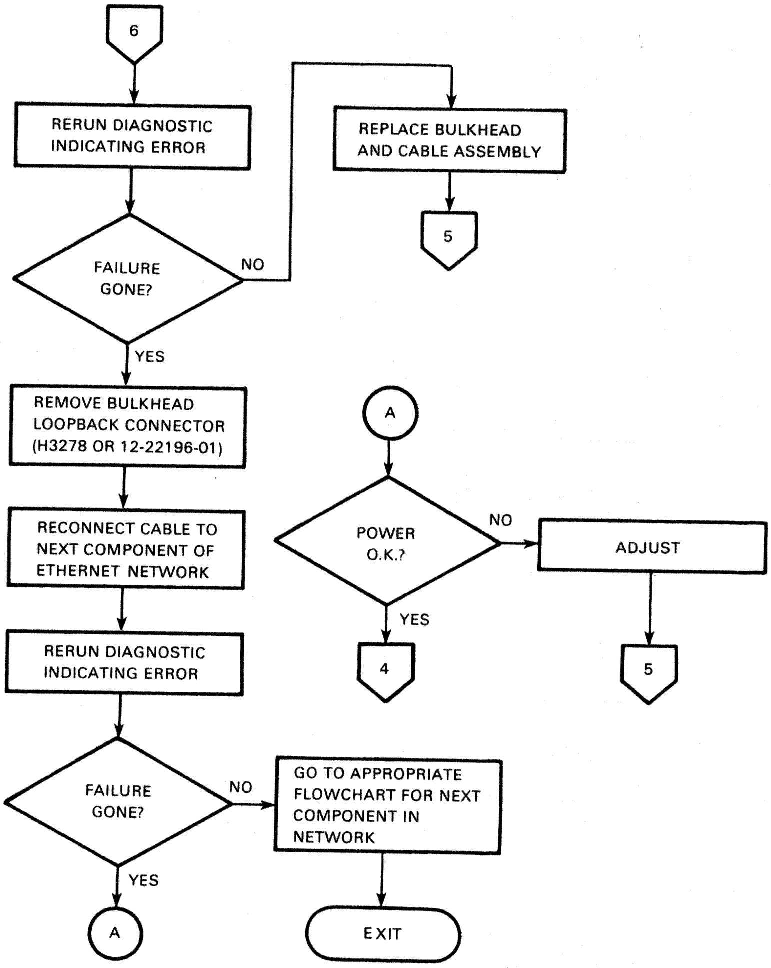


Figure 8 Troubleshooting Flow Diagram (Sheet 3 of 4)



MKV85-1157

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-RA – 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.
  - Includes two identical repeater boxes each containing a fiber-optic module, logic module, and power supply. Requires a fiber-optic cable to connect the two repeaters to each other.

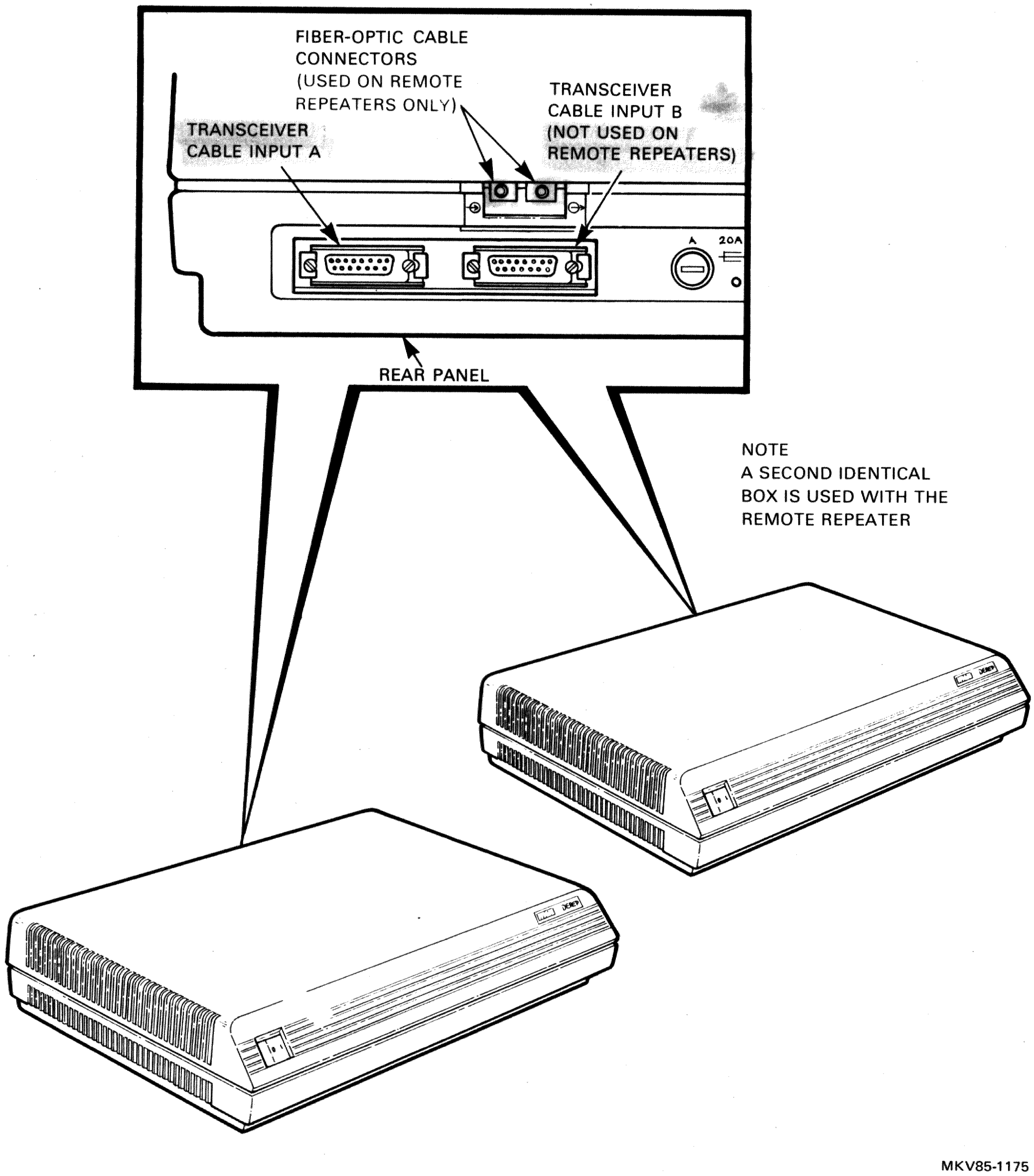


Figure 1 Ethernet Repeater

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 repeater halves. Each repeater half 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 repeater halves 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).

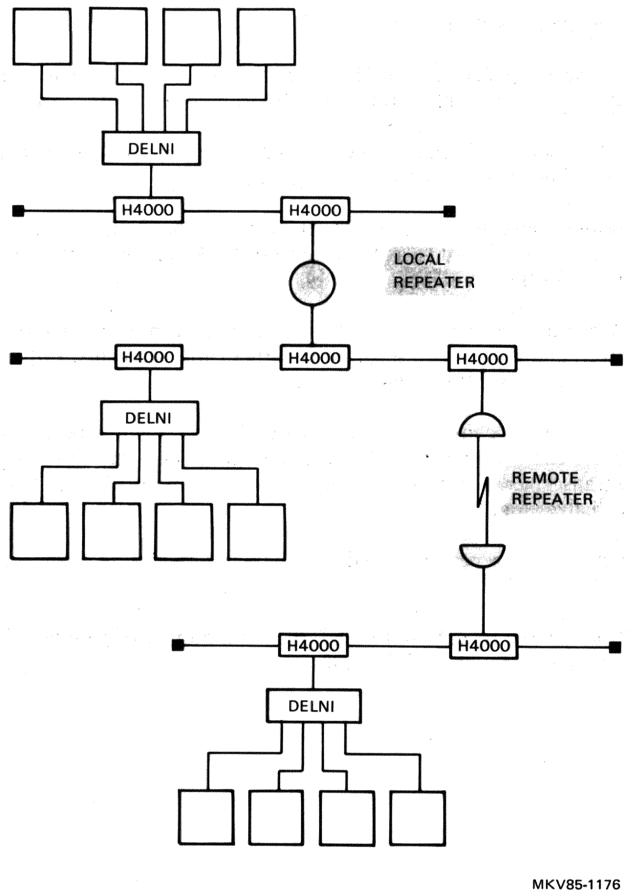


Figure 2 DEREP Example Configurations

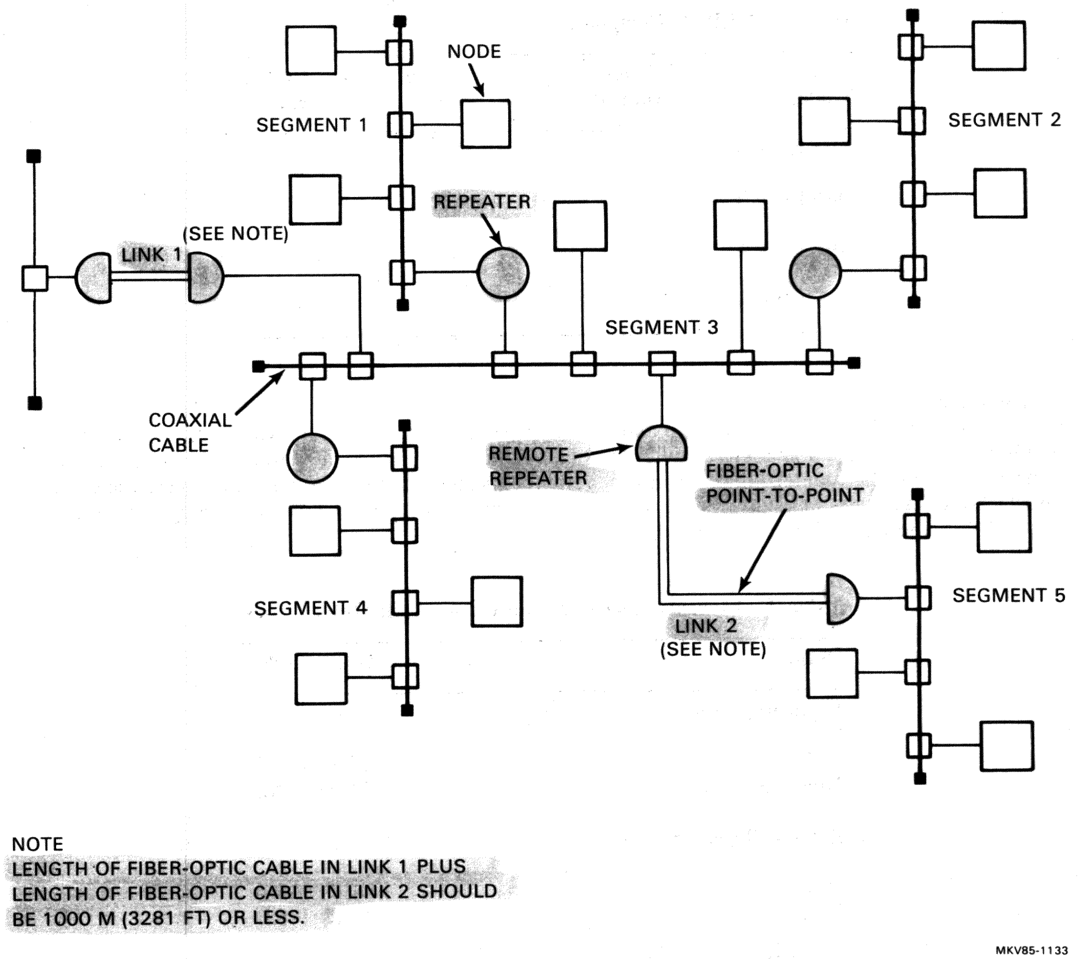


Figure 3 Typical Repeater Installation

DEREP 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-RA	X	X	
DEREP-RB			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-RA
Non-U.S.	DEREP-RB
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

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).

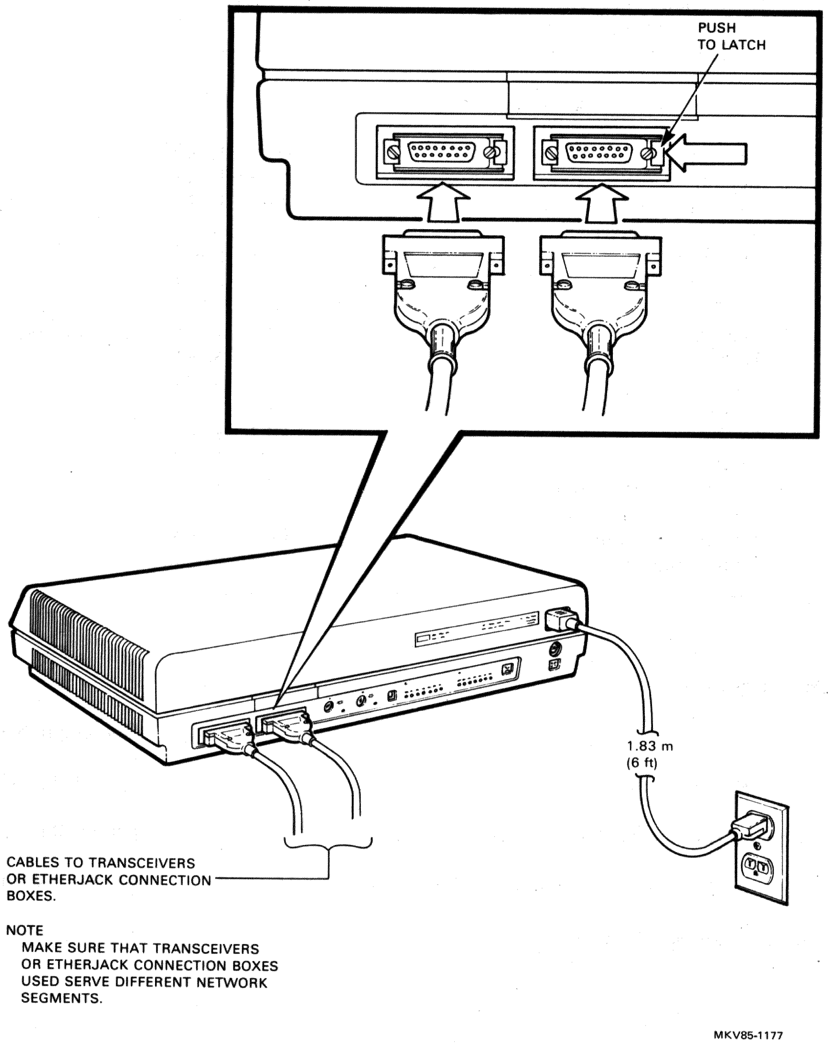


Figure 4 Typical Local Repeater Cabling

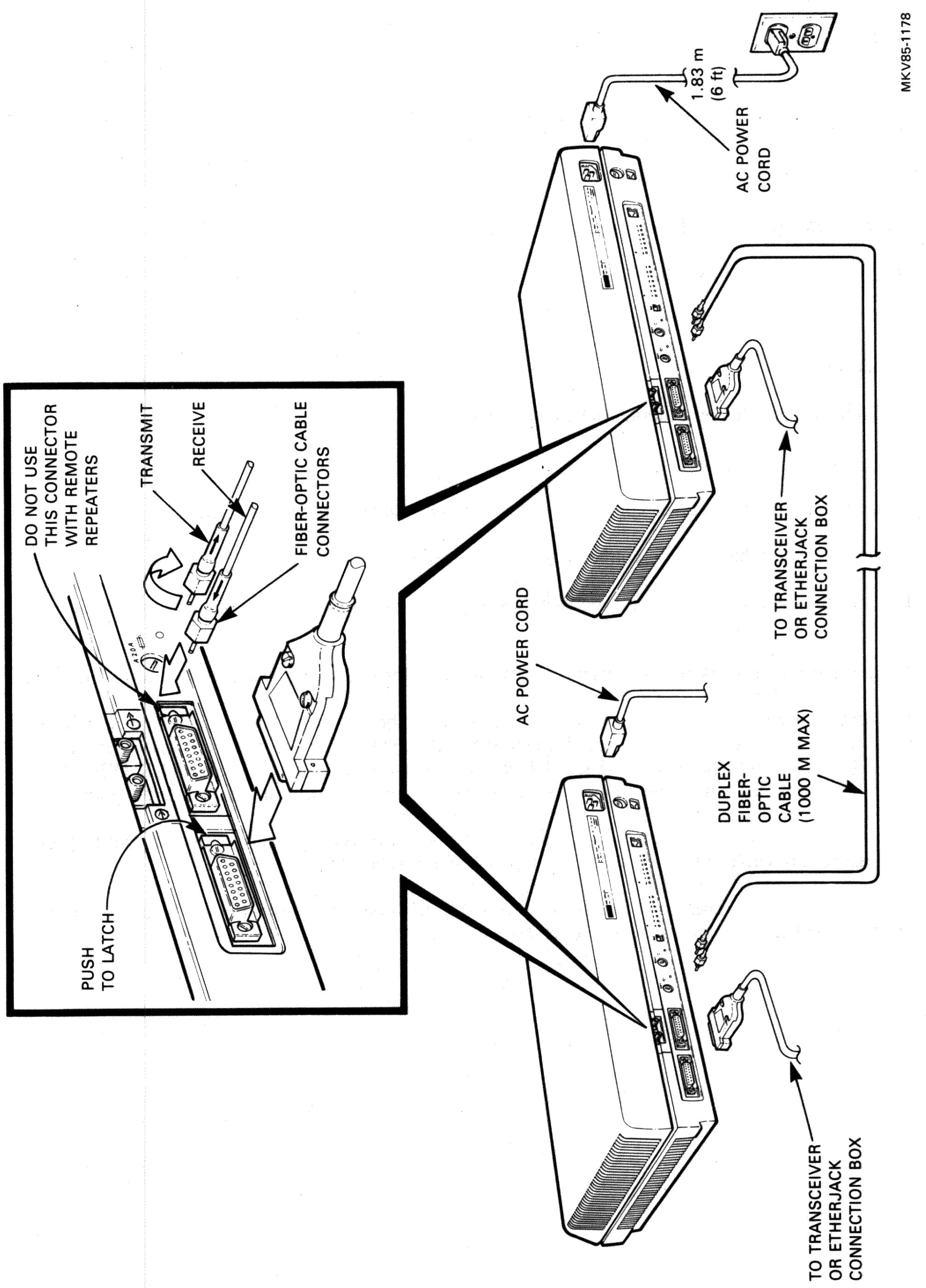


Figure 5 Typical Remote Repeater Cabling

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 (found in Appendix A of the *Ethernet Installation Guide* EK-ETHER-IN-002 or in the *DEREP Ethernet Repeater Technical Manual* EK-DEREP-TM-001). 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.

Installation Flow Diagrams

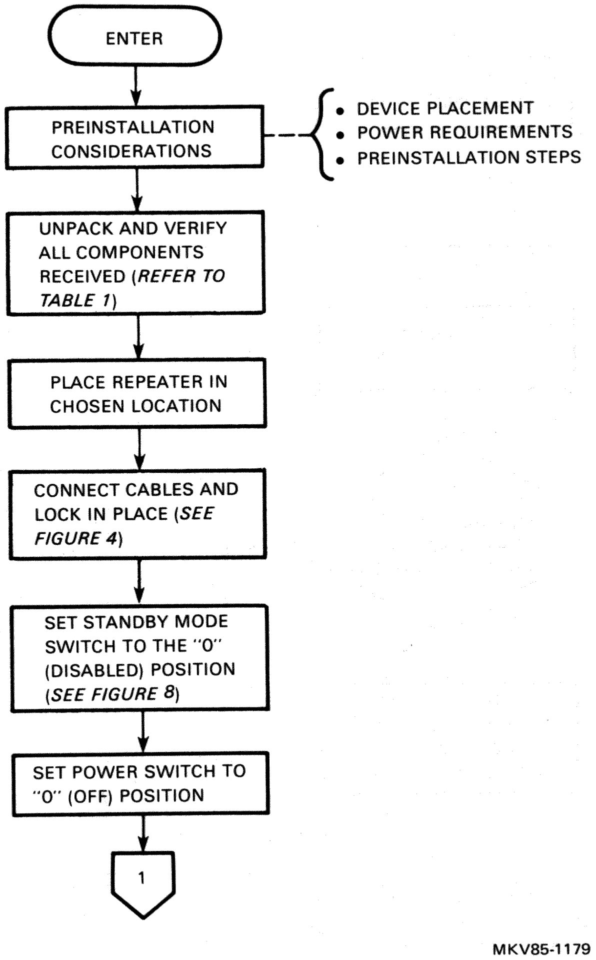


Figure 6 DEREP Installation Flow Diagram – Local Repeater (Sheet 1 of 5)

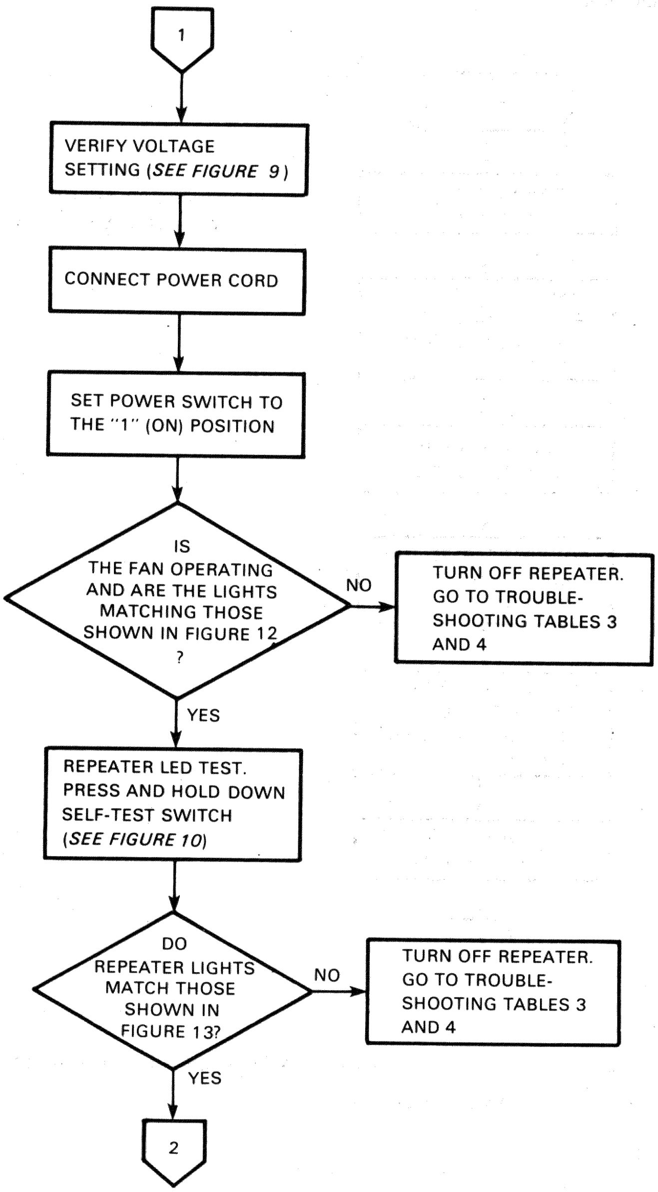


Figure 6 DEREP Installation Flow Diagram – Local Repeater (Sheet 2 of 5)

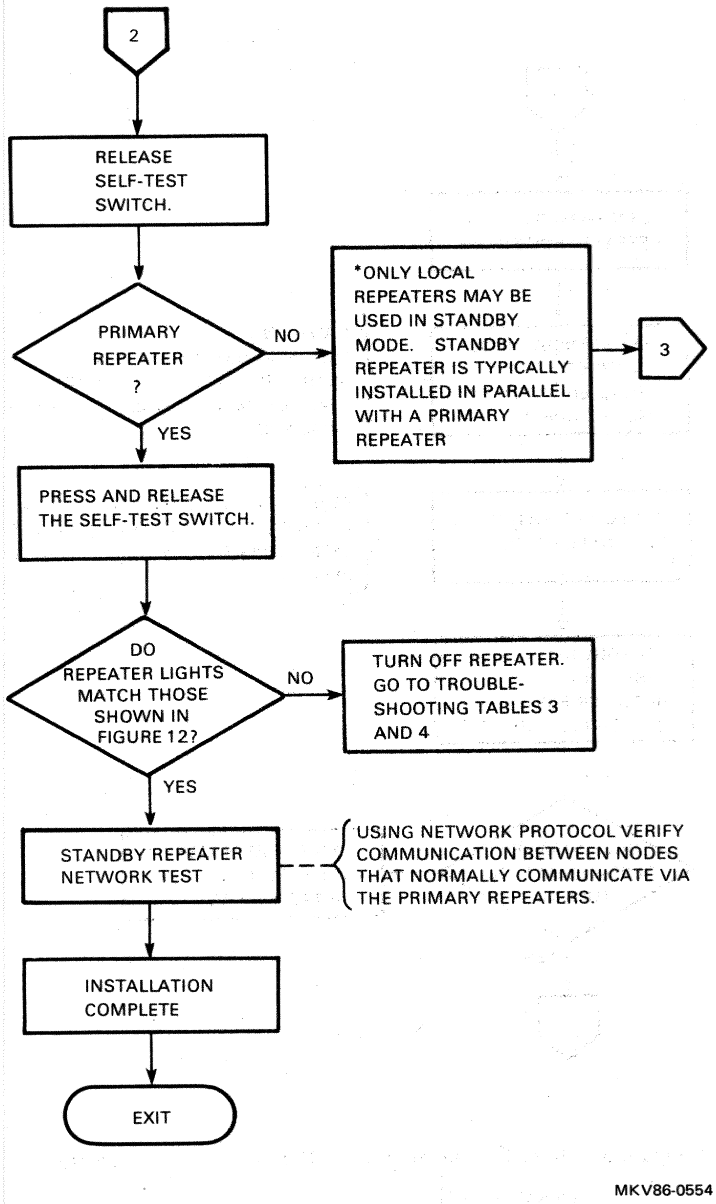


Figure 6 DEREP Installation Flow Diagram – Local Repeater (Sheet 3 of 5)

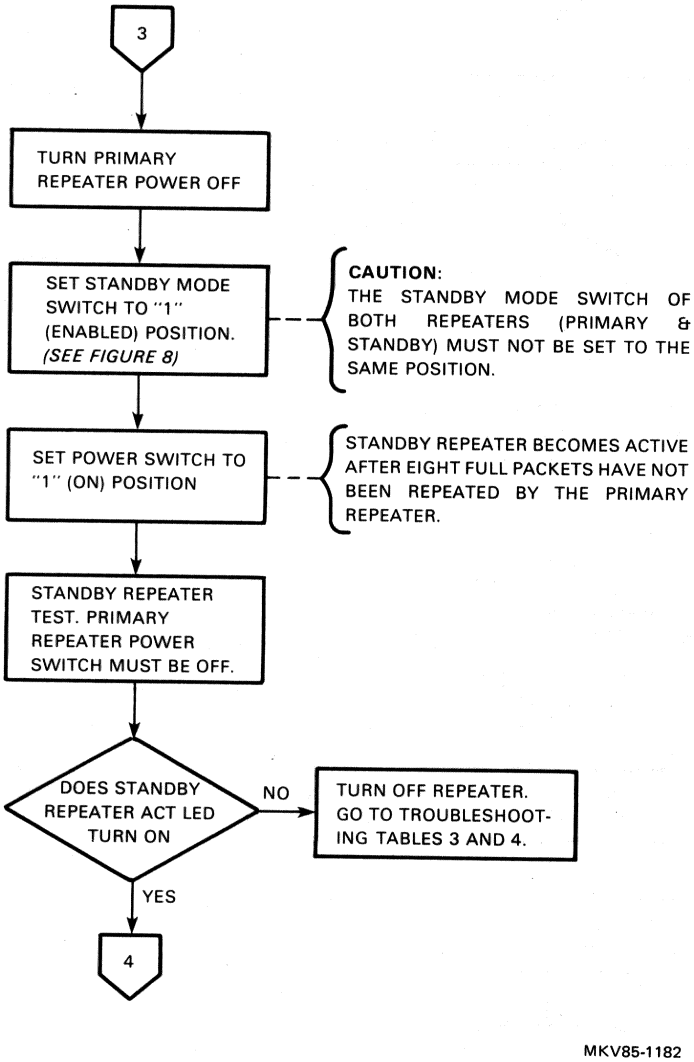


Figure 6 DEREP Installation Flow Diagram – Local Repeater (Sheet 4 of 5)

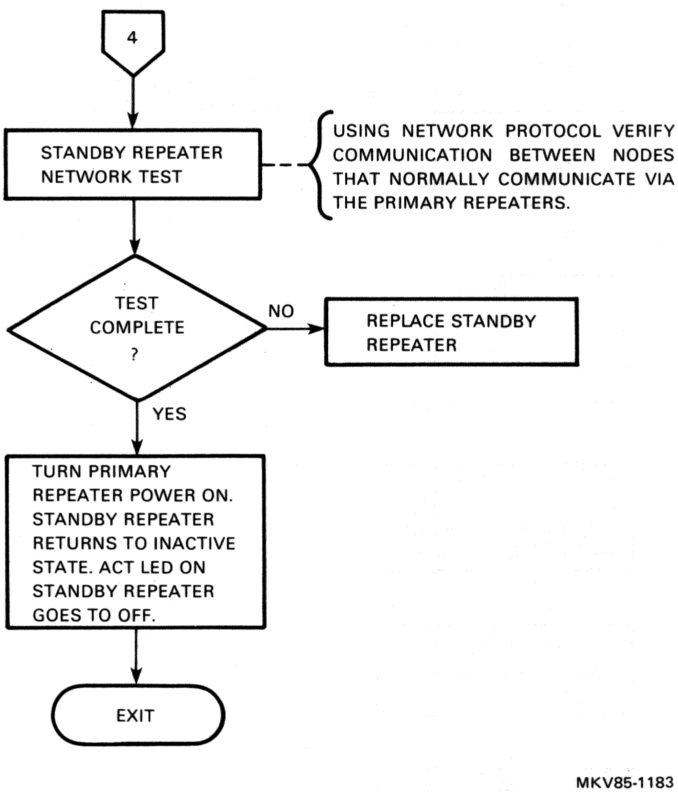


Figure 6 DEREP Installation Flow Diagram – Local Repeater (Sheet 5 of 5)

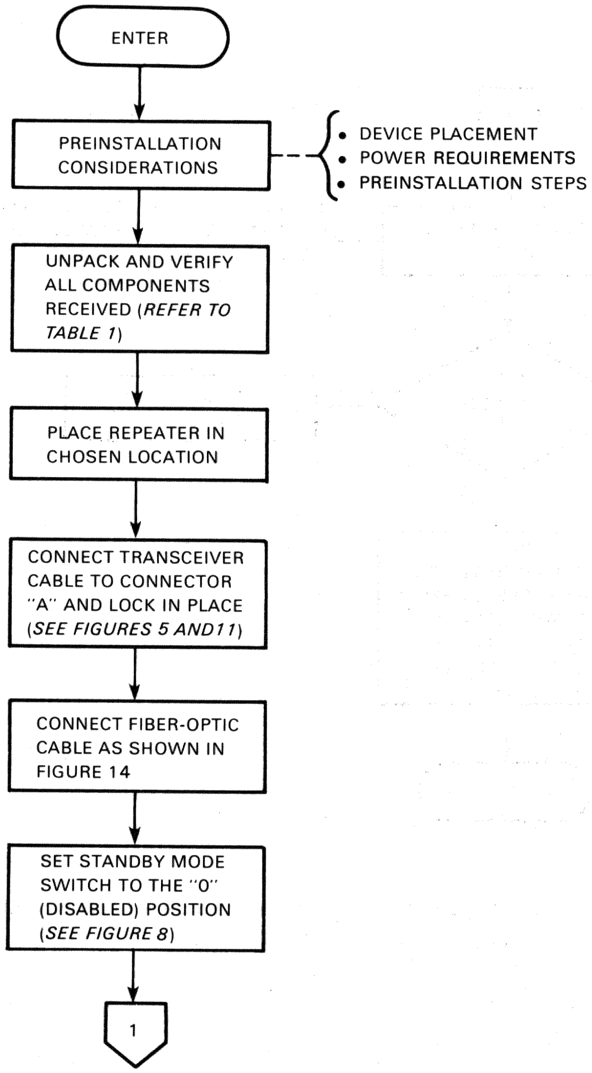


Figure 7 DEREP Installation Flow Diagram – Remote Repeater (Sheet 1 of 4)

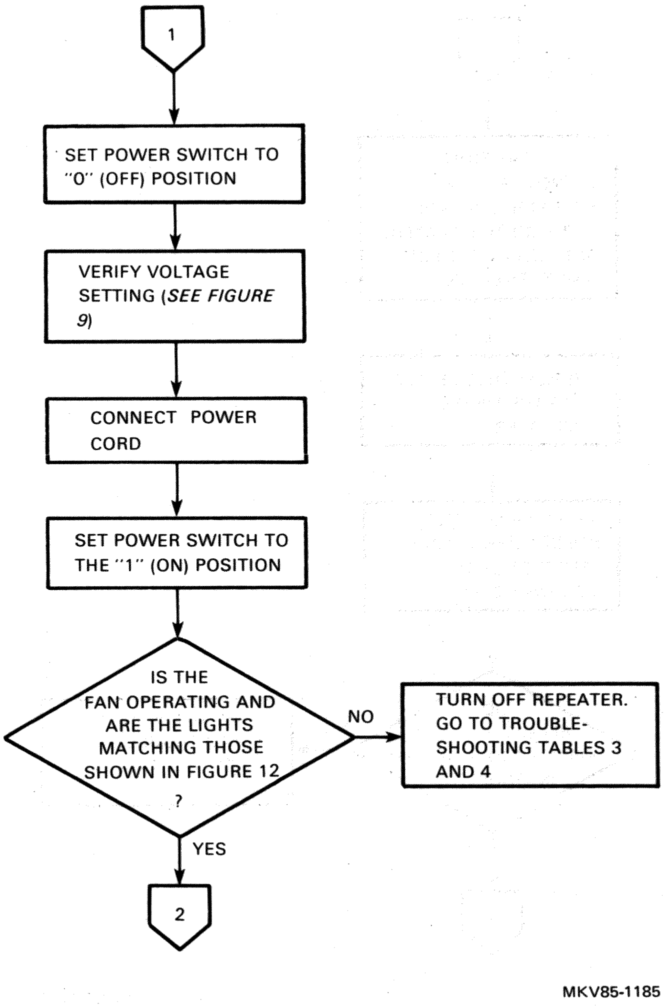


Figure 7 DEREP Installation Flow Diagram – Remote Repeater (Sheet 2 of 4)

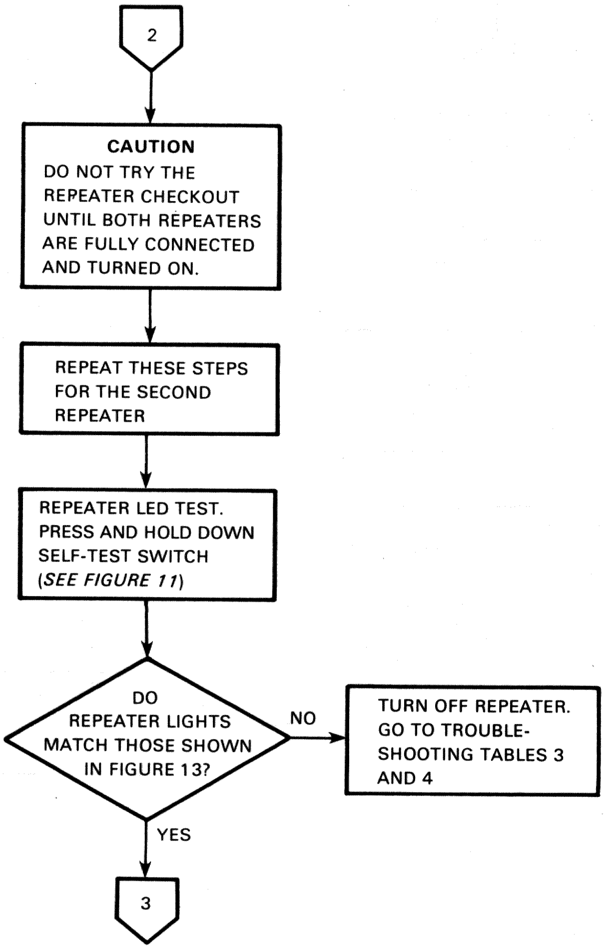


Figure 7 DEREP Installation Flow Diagram – Remote Repeater (Sheet 3 of 4)

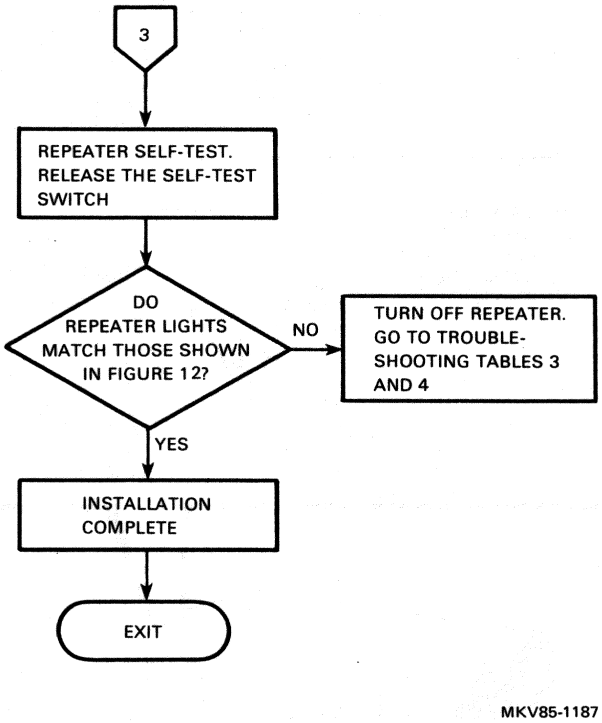


Figure 7 DEREP Installation Flow Diagram – Remote Repeater (Sheet 4 of 4)

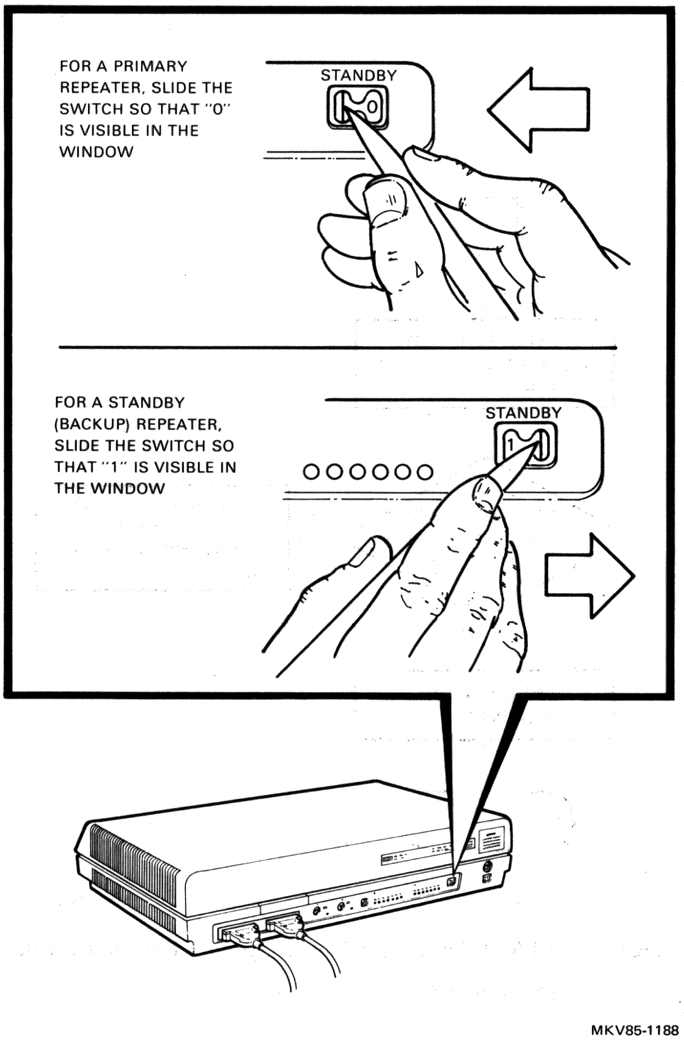


Figure 8 Standby Mode Switch Setting

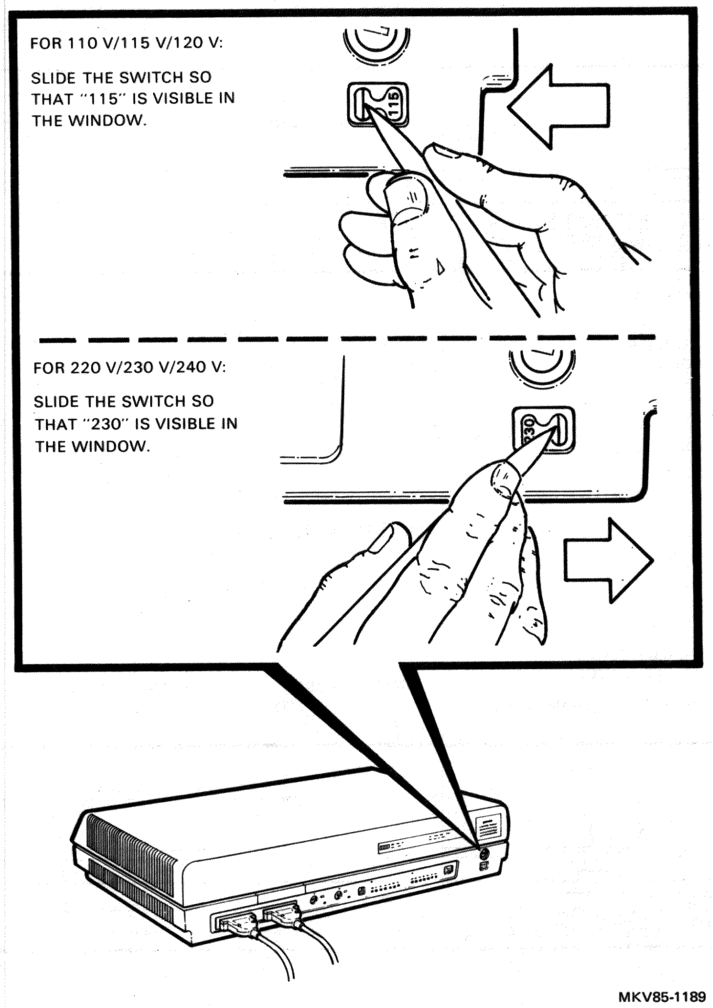


Figure 9 DEREP Voltage Setting

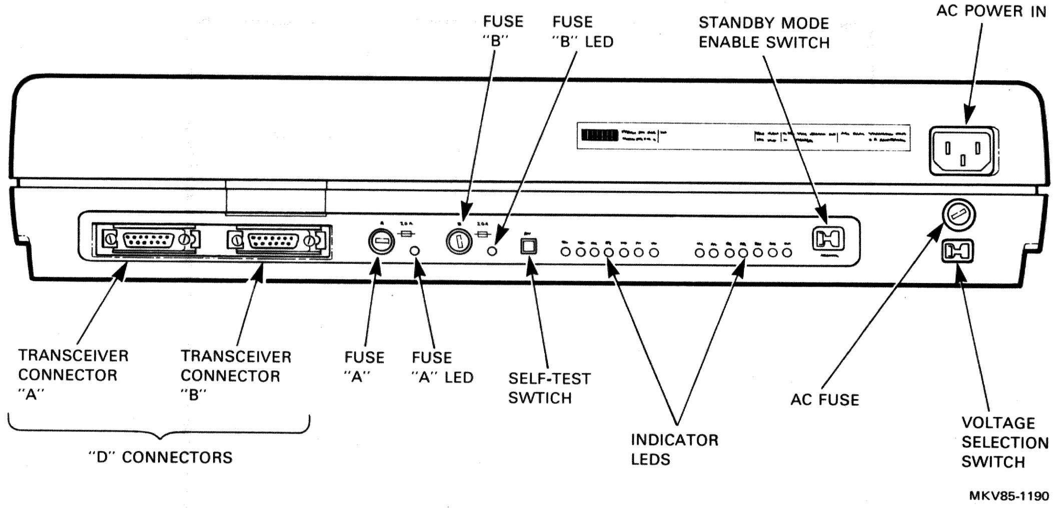


Figure 10 Local Repeater Rear Panel

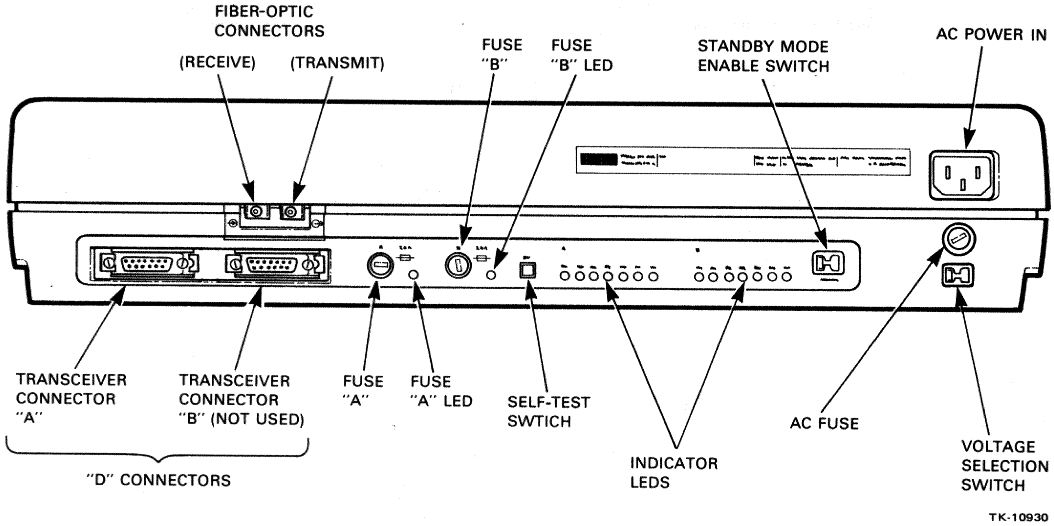


Figure 11 Remote Repeater Rear Panel

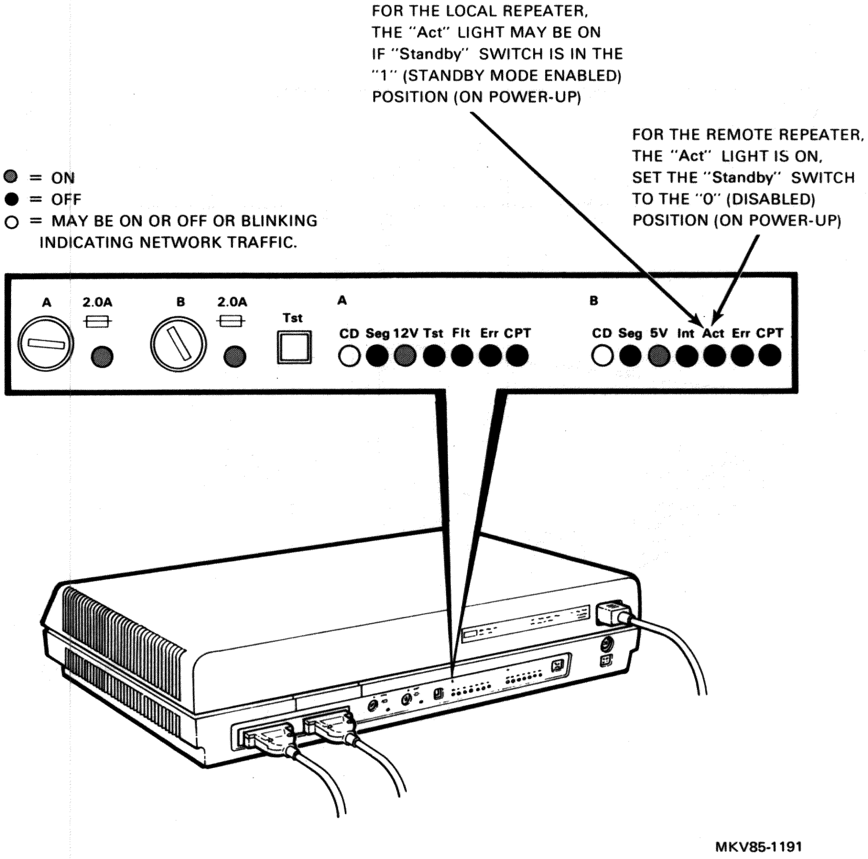


Figure 12 Local/Remote Repeater LEDs on Powerup and Self-Test

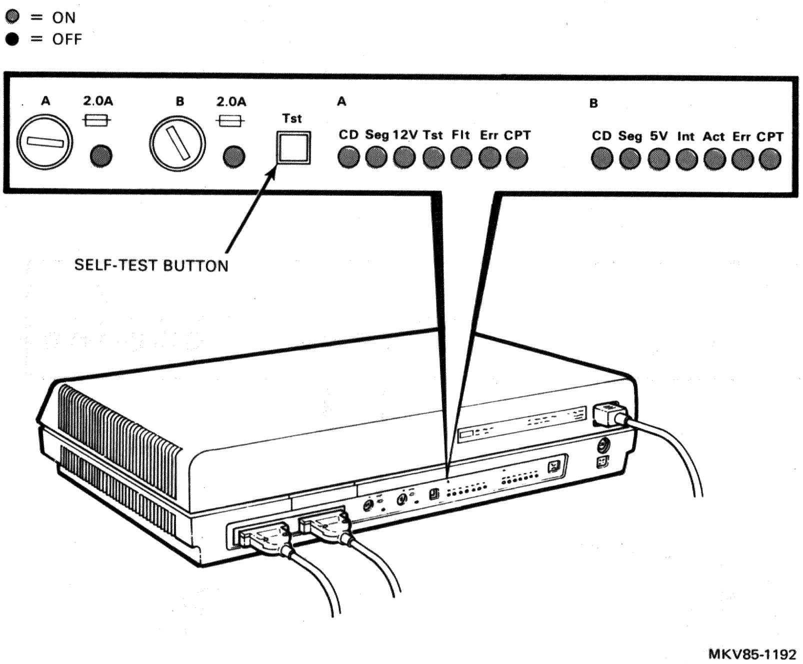


Figure 13 Local and Remote Repeater LED Test

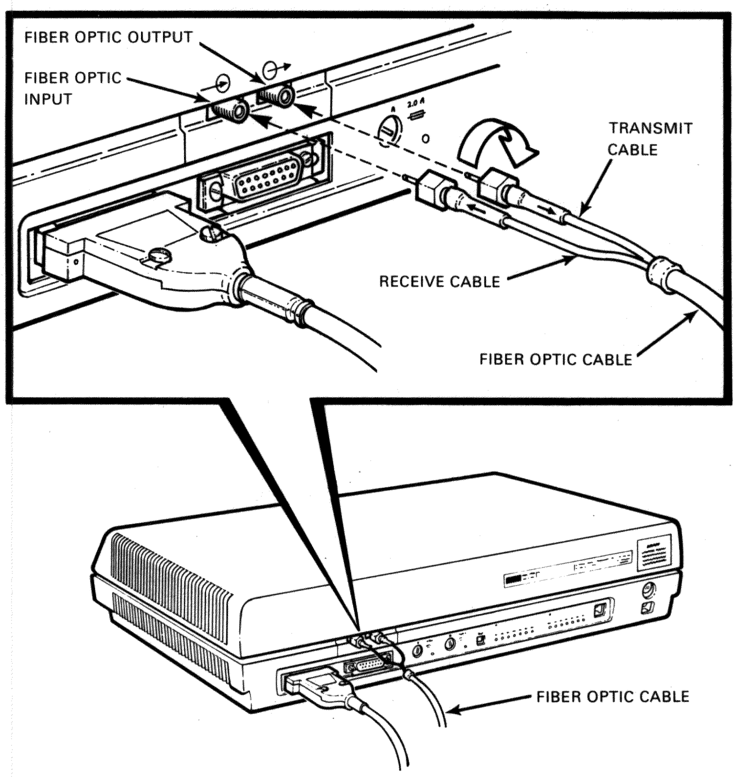


Figure 14 Remote Repeater Fiber-Optic Cable Connections

Cabling

There are no special cabling considerations for the repeater.

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 15 and 16 diagram the loopback tests.

- Internal and external loopback are both performed when the self-test switch is momentarily pressed and released. Figures 15 and 16 diagram the loopback tests.

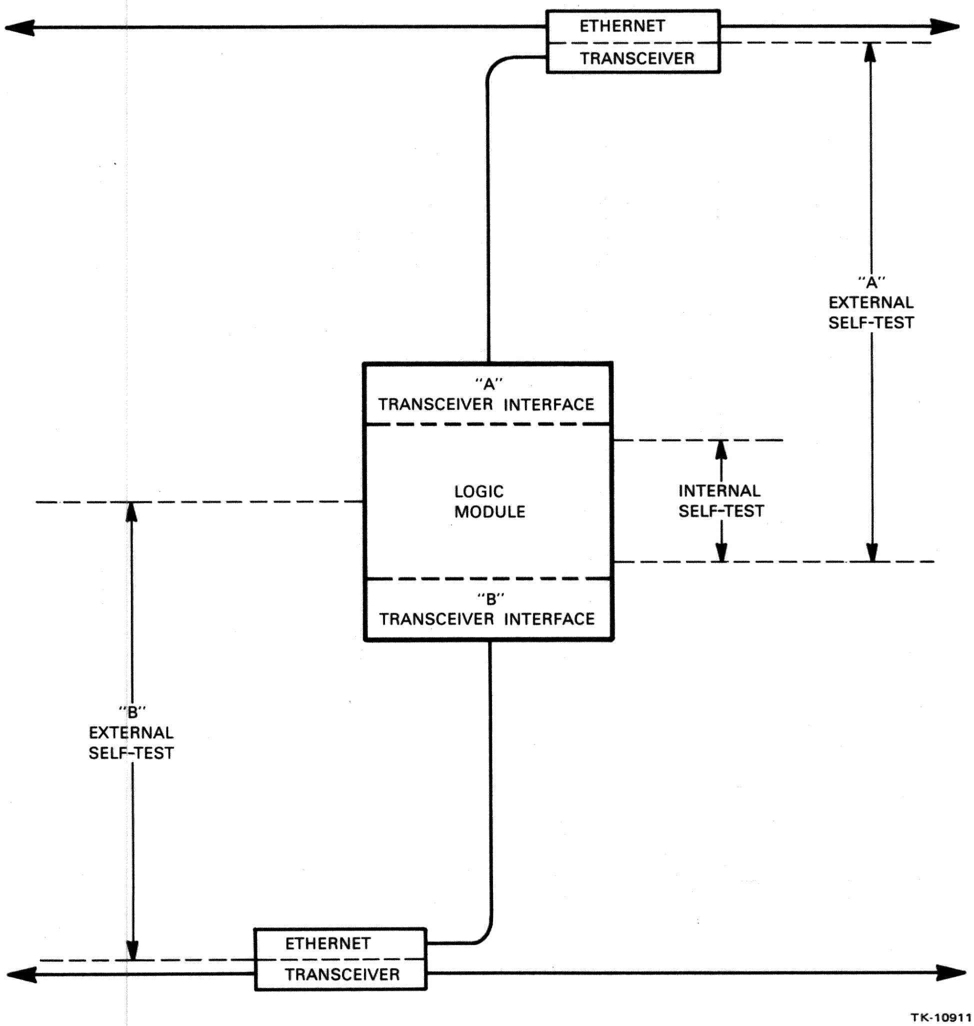


Figure 15 Local Repeater Self-Test Diagram

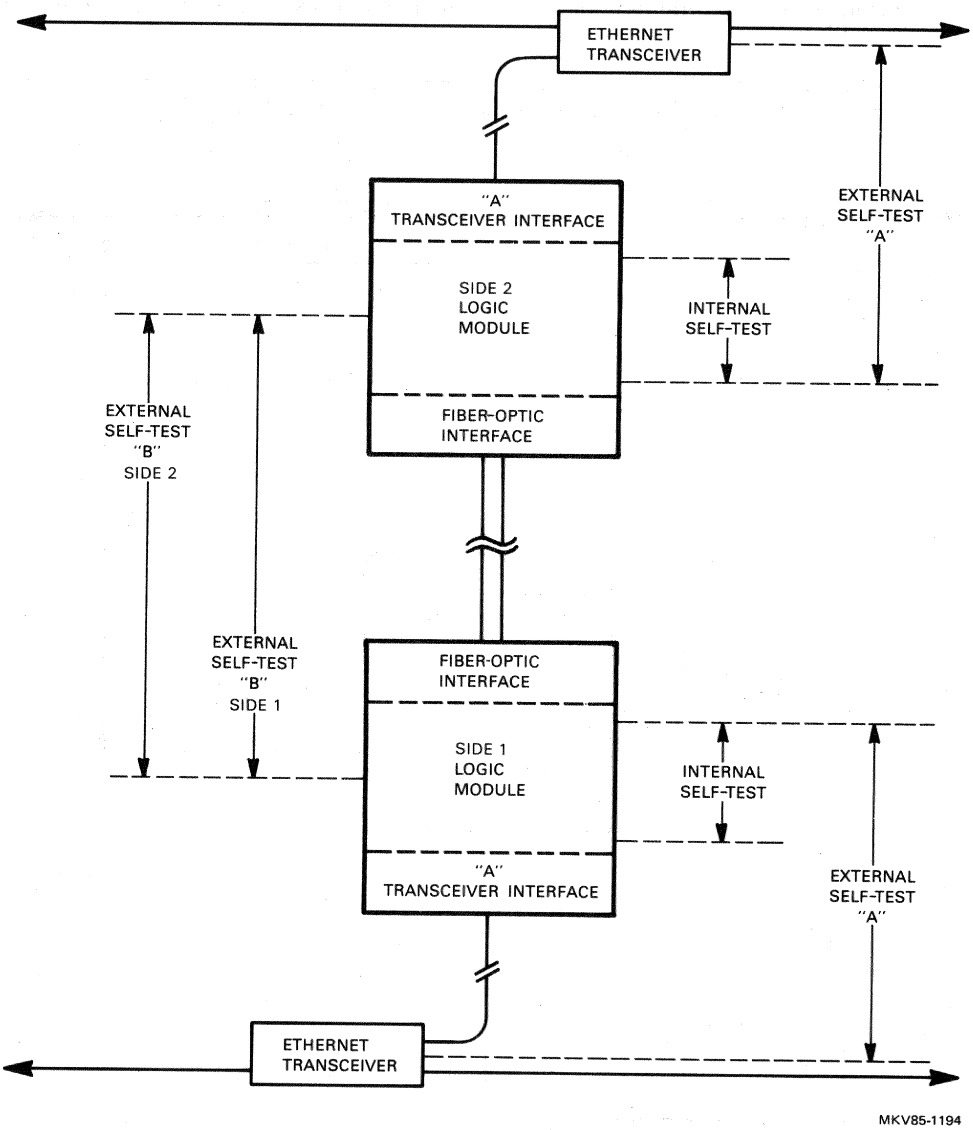


Figure 16 Remote Repeater Self-Test Diagram

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 17 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 19.05 cm (7.5 in) fiber-optic cable loop (P/N 29-25037-01). This test connector replaces the fiber-optic cable for off-line external loopback testing of a remote repeater.

Optional Equipment –

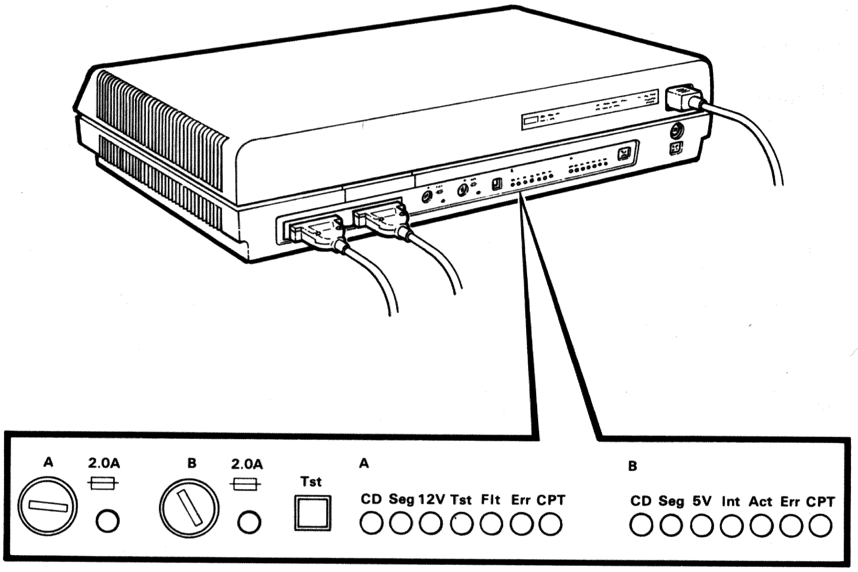
- An H4080 test connector replaces the on-line transceiver for off-line self-testing of the repeater.
- An H4000-TA (or TB) Ethernet transceiver tester transmits a packet onto an Ethernet coaxial segment (via a transceiver), then monitors the transmission via a second transceiver and verifies network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

Preventive Maintenance –

- Involves periodic use of the repeater self-test (see Figures 15 and 16).
- The self-test should be exercised when network PM is performed.

Field Replaceable Units – See Figures 18 through 22 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

MKV84-0050

Figure 17 LED Definitions

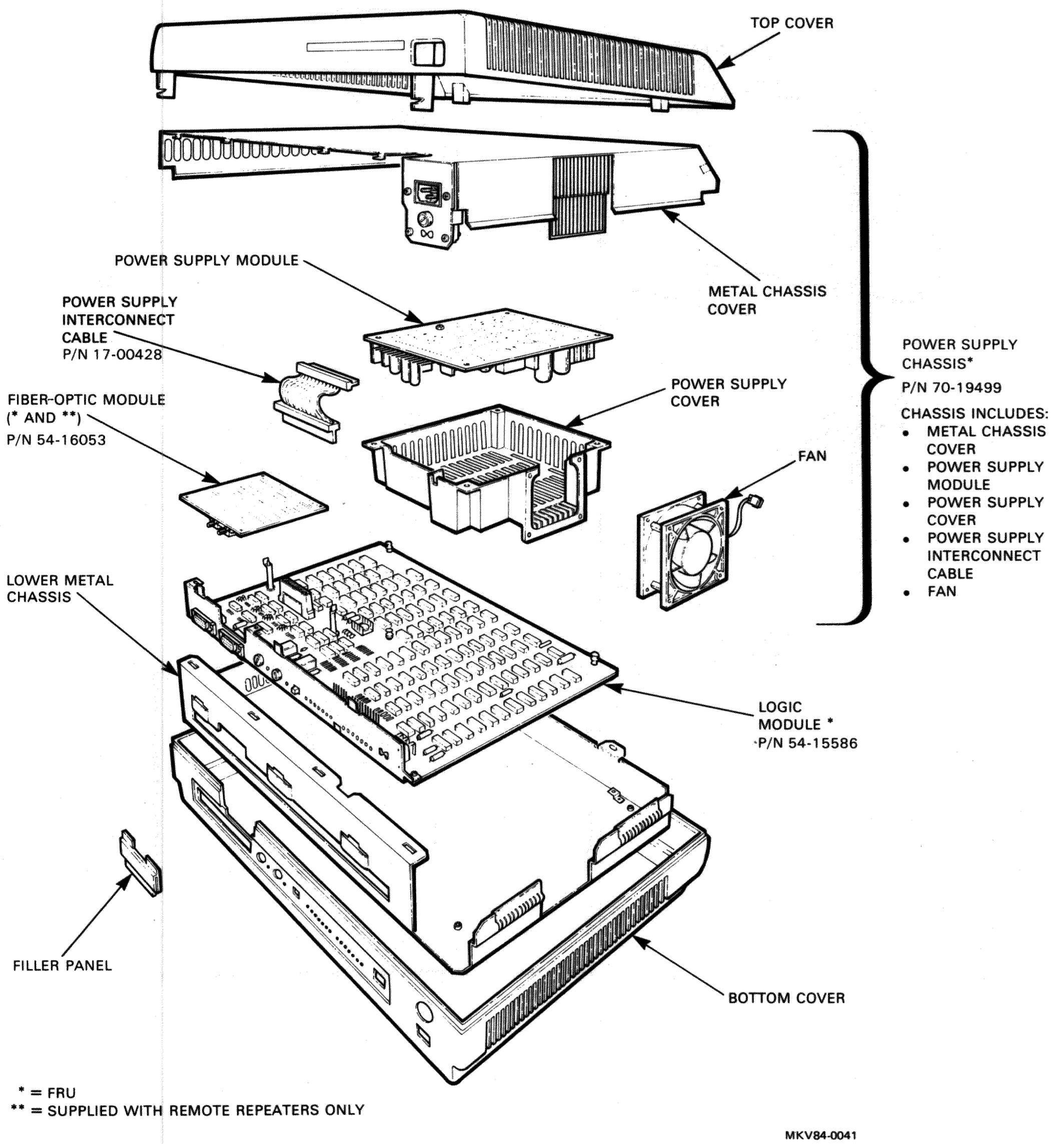


Figure 18 Repeater FRU Locations

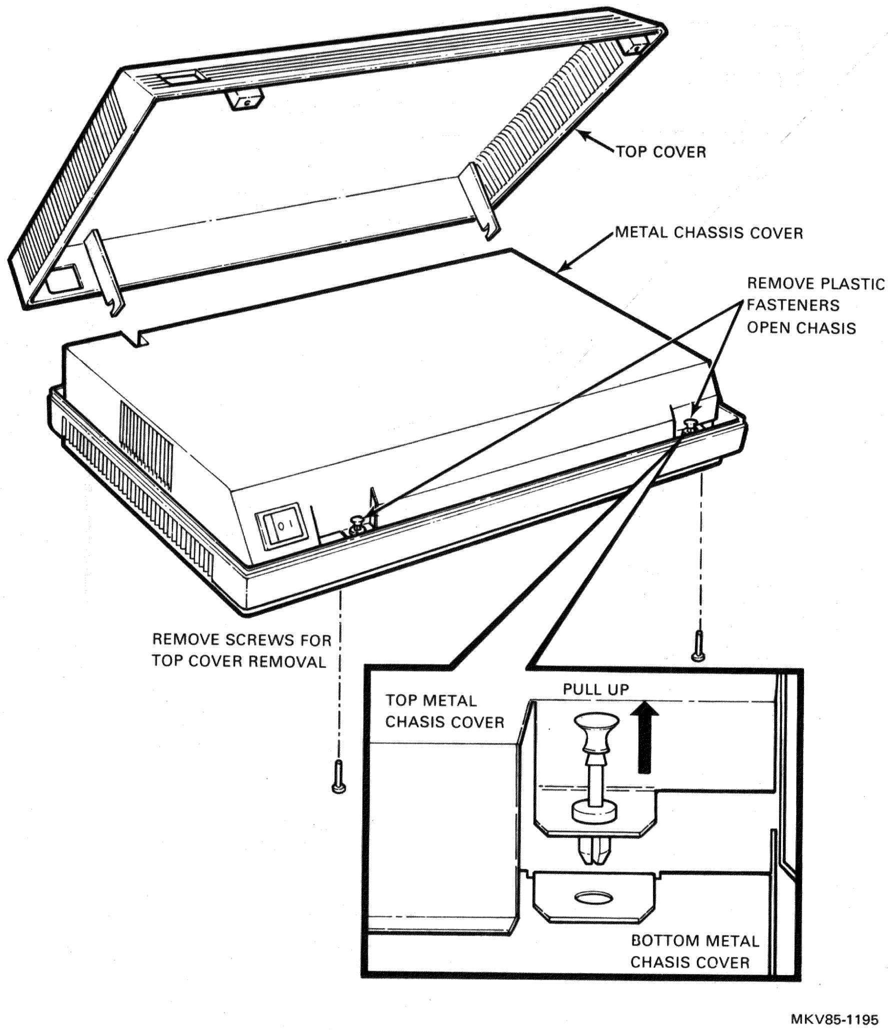


Figure 19 Top Cover Removal/Opening and Closing the Internal Metal Chassis

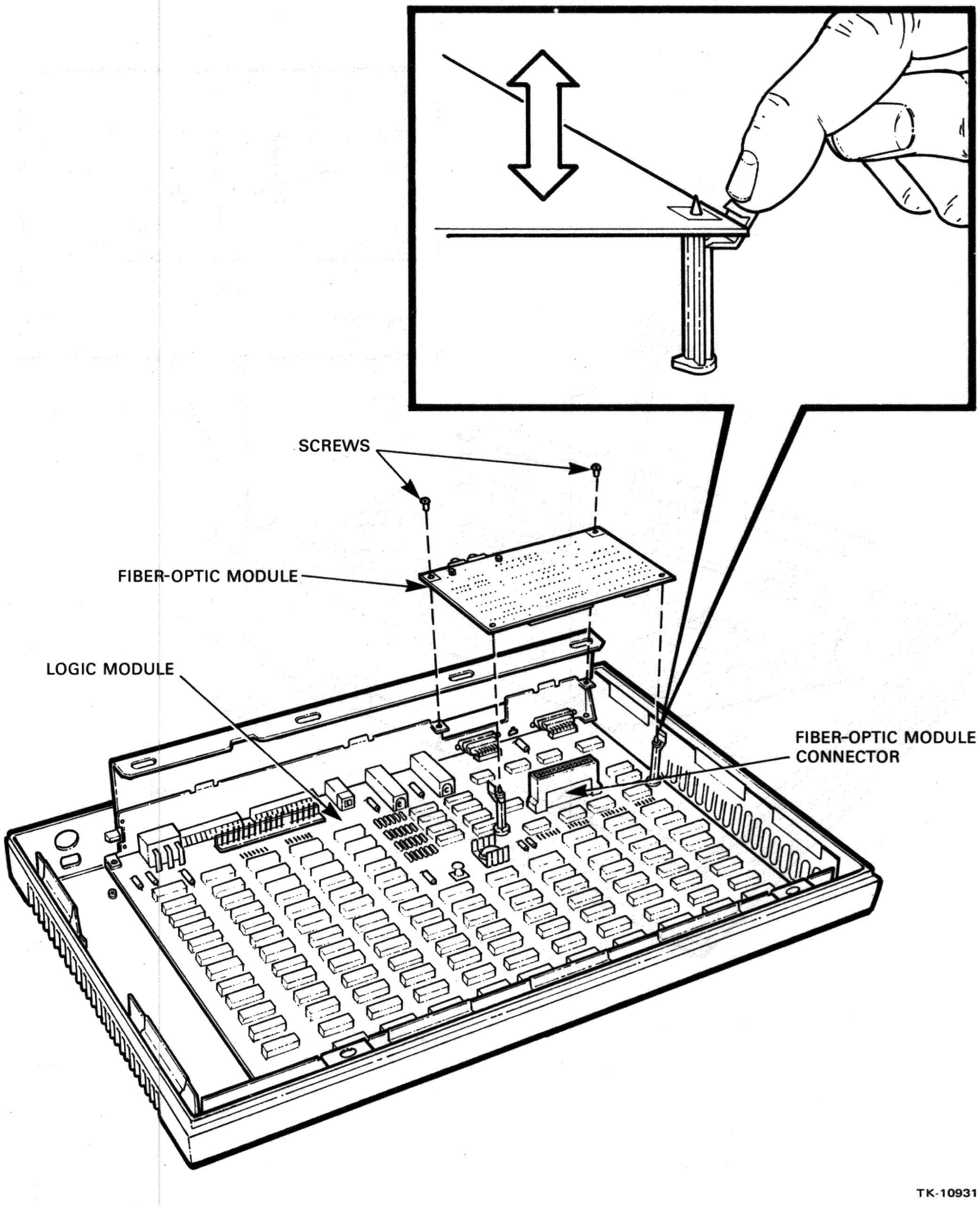


Figure 20 Fiber-Optic Module Removal and Replacement

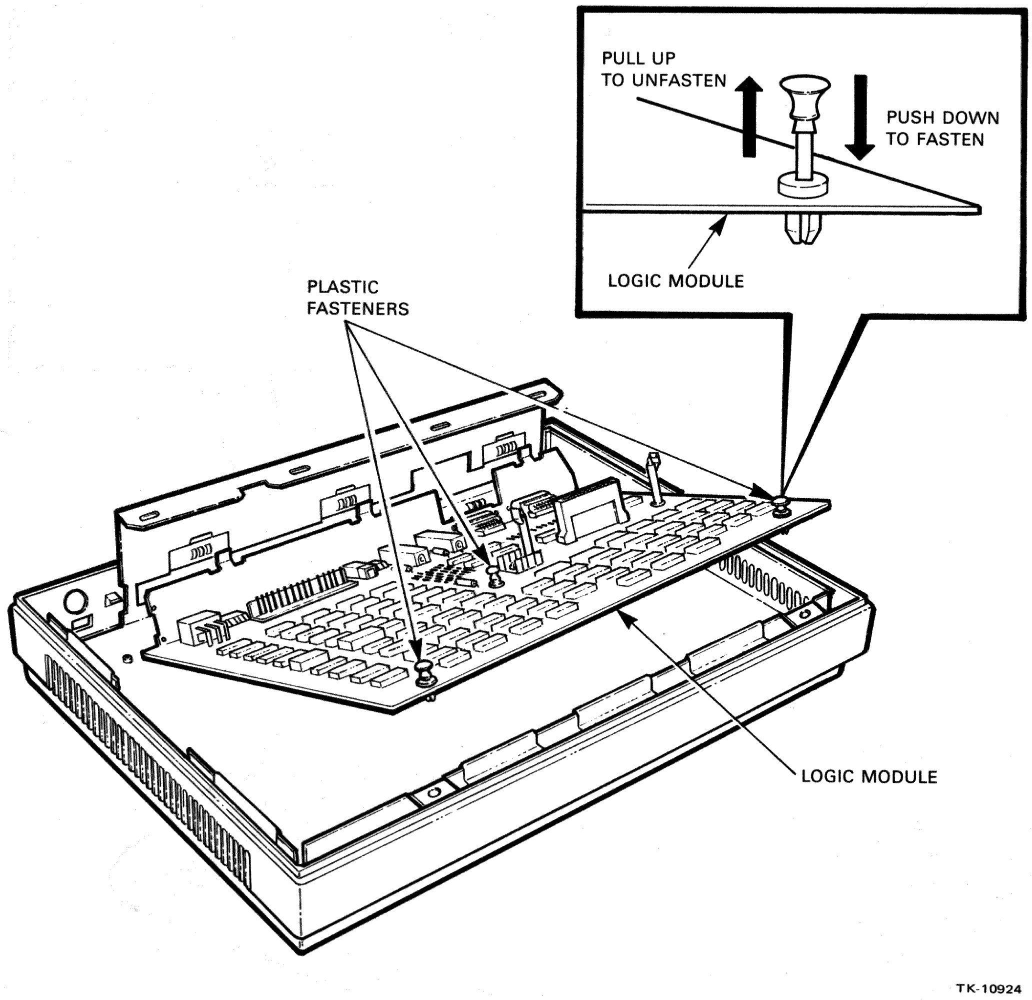


Figure 21 Logic Module Removal and Replacement

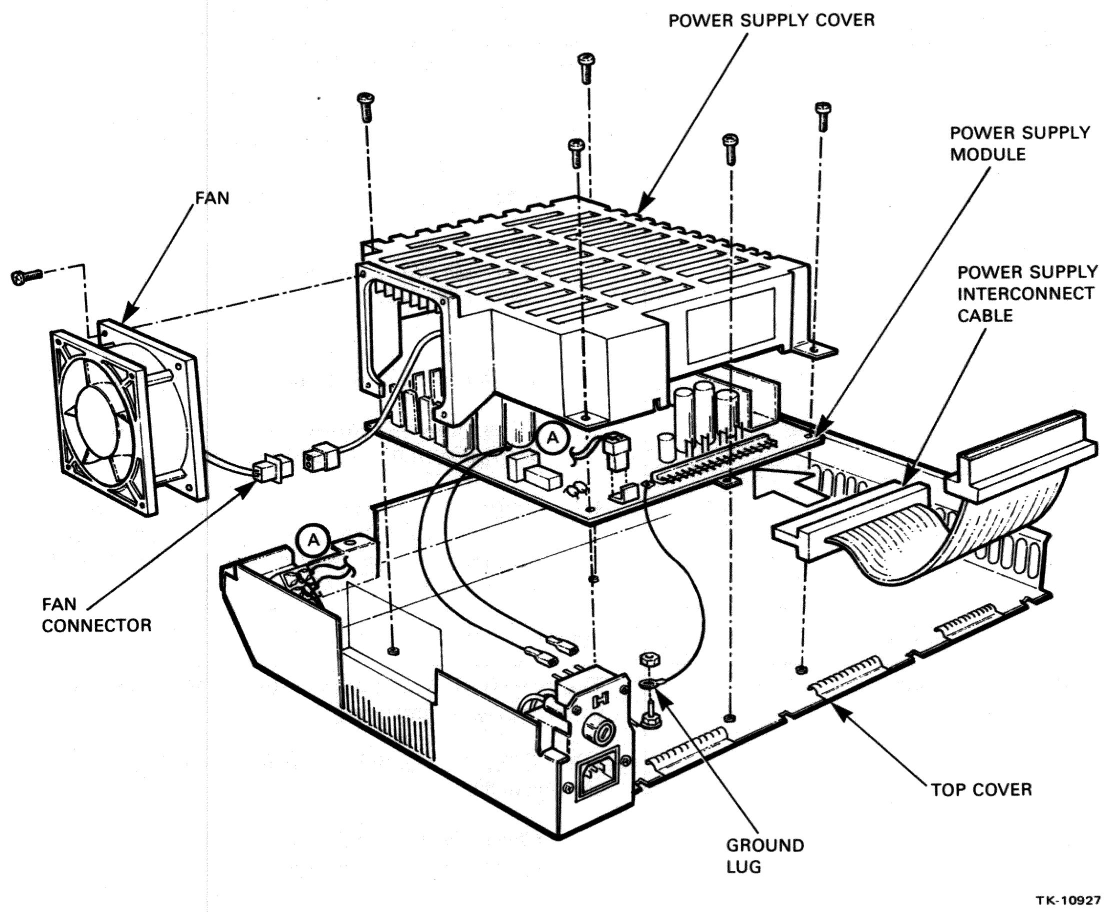


Figure 22 Power Supply Chassis

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

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).

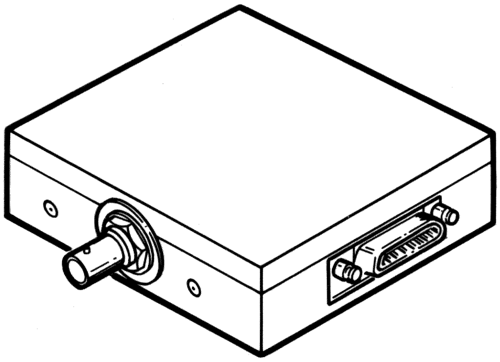


Figure 1 DESTA Station Adapter

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.

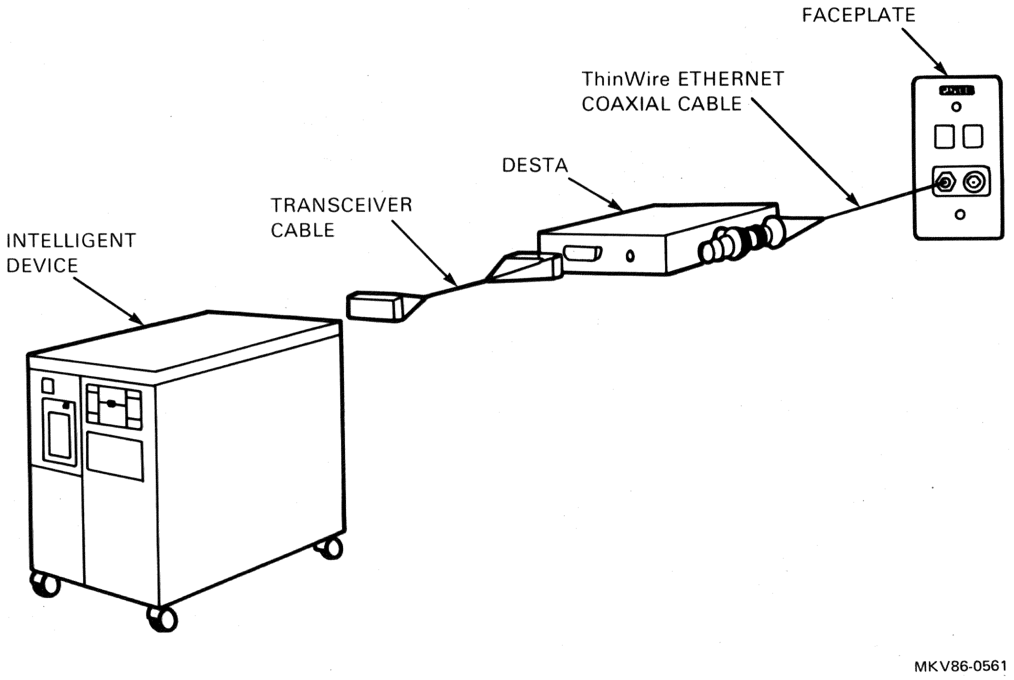


Figure 2 DESTA Configuration

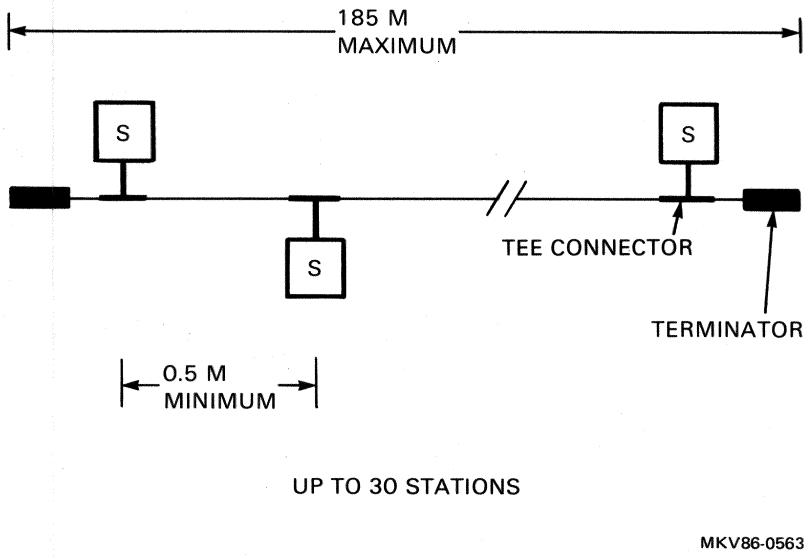


Figure 3 ThinWire Ethernet Coaxial Cable with Two Terminators

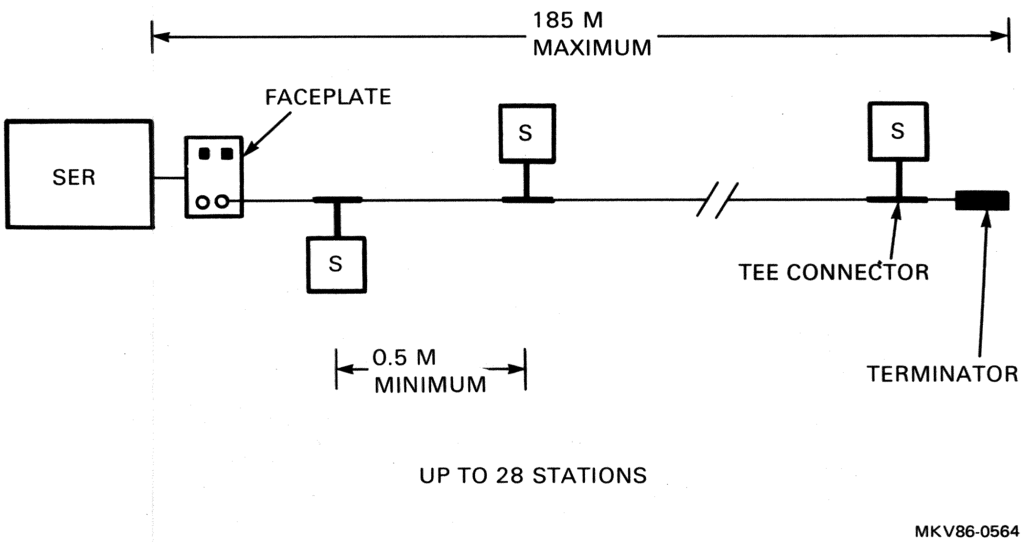


Figure 4 ThinWire Ethernet Coaxial Cable from an SER

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).

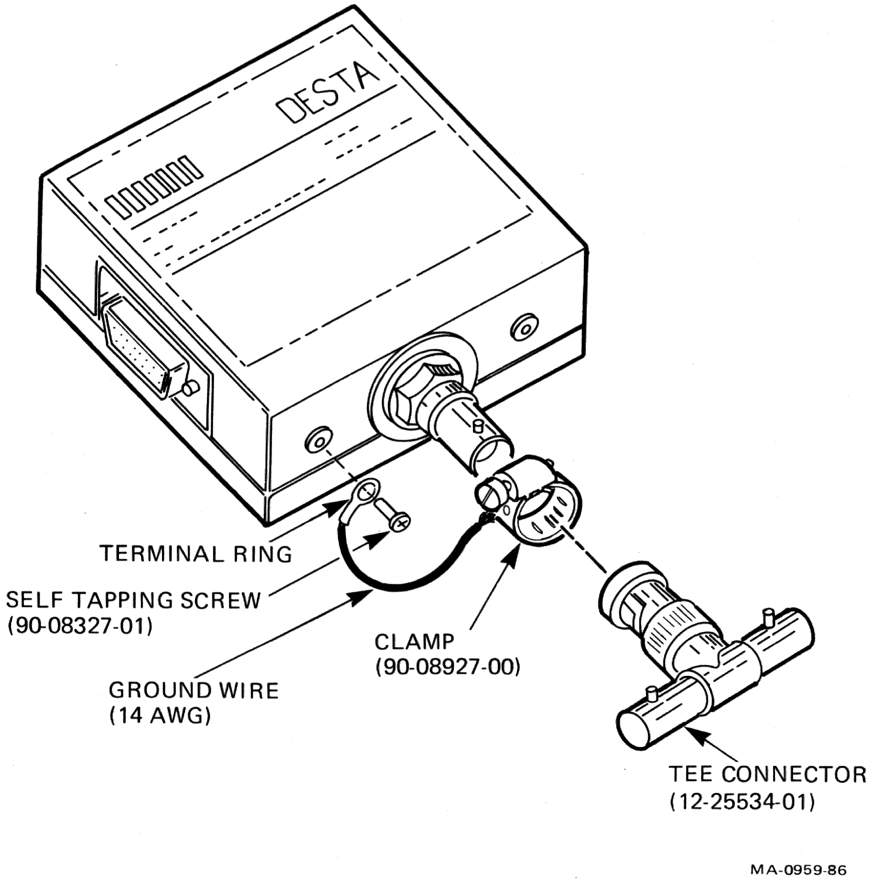


Figure 5 Proper Grounding of the ThinWire Segment

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.

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.)

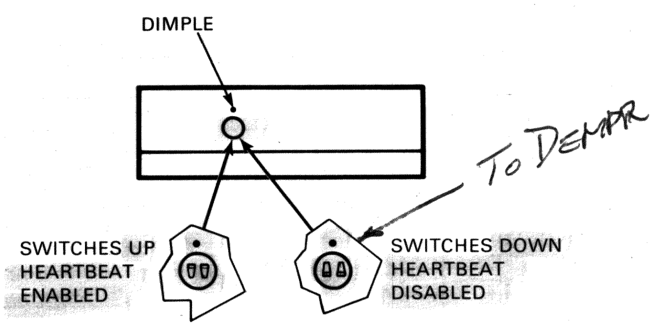
Hardware Requirements
The following hardware items may be needed for completion of the installation and are not included with the DESTA.

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

Installation Flow Diagram

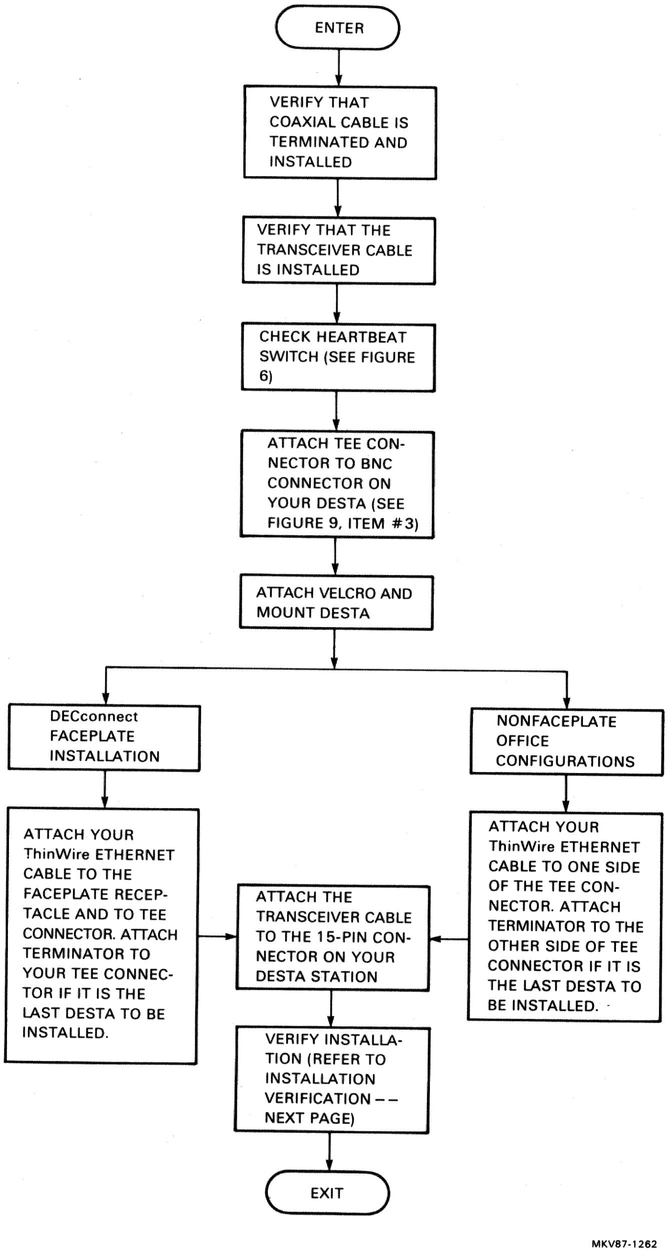


Figure 7 DESTA Installation Flow Diagram

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.

Cabling

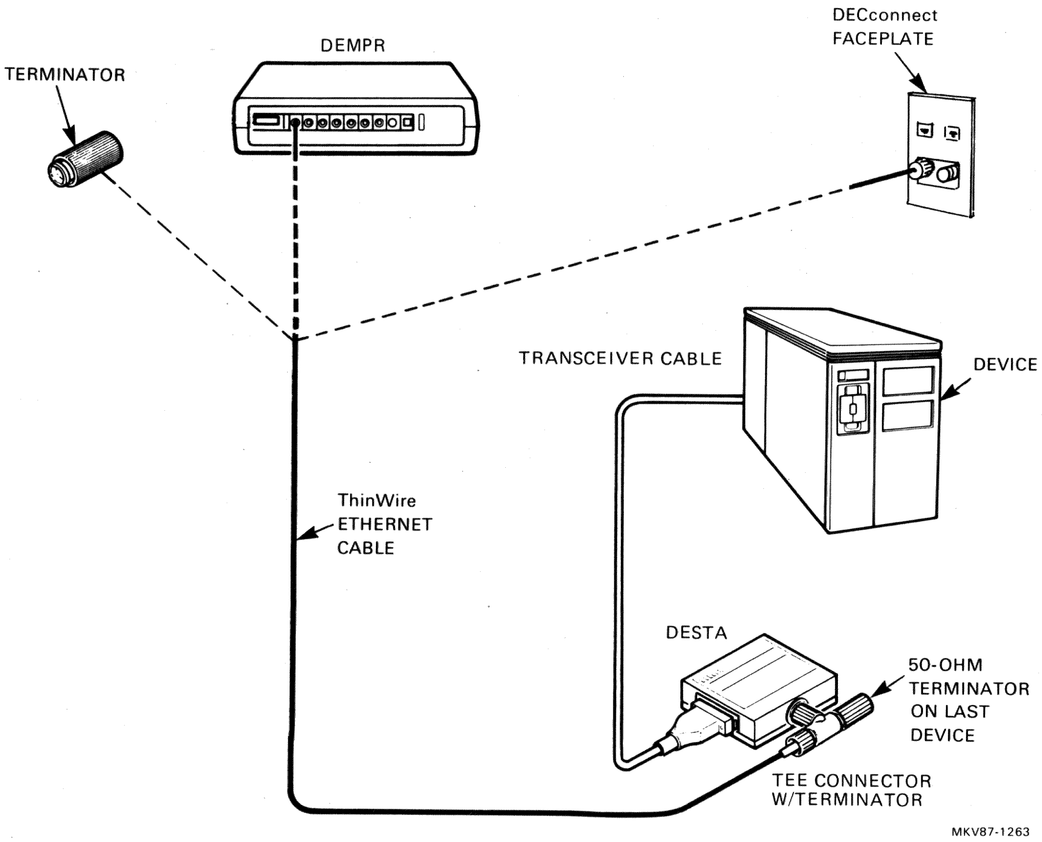


Figure 8 DESTA Cabling

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.

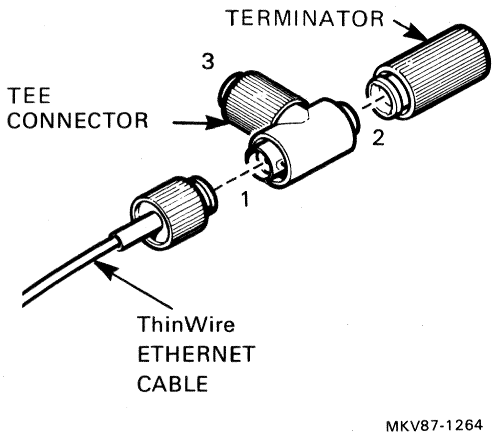


Figure 9 TEE Connector

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).

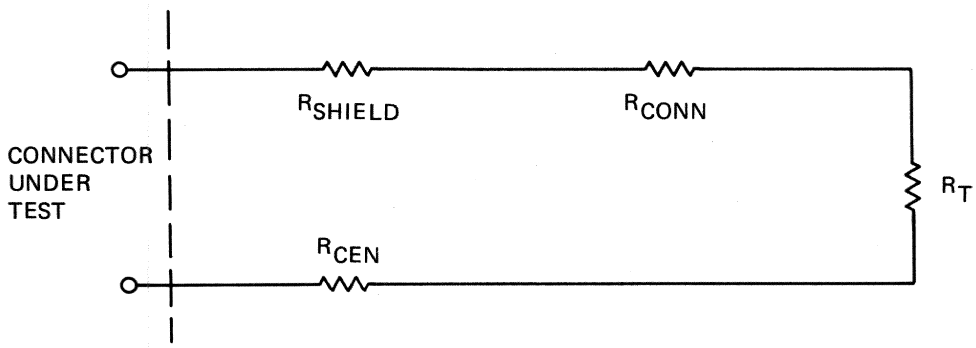
Cable Testing

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 = $49.9\ \Omega \pm 0.1\%$

R_{CEN} = CENTER CONDUCTOR RESISTANCE

$$R_{TOT} = R_{SHIELD} + R_{CONN} + R_T + R_{CEN}$$

$$= 49\,\Omega \text{ TO } 59.75\,\Omega$$

MKV86-0576

Figure 10 Coaxial Cable Segment Equivalent Circuit

DEUNA UNIBUS NETWORK ADAPTOR

General Description

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

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

Features of the DEUNA adaptor include the following.

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

Reference Documentation

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

• *DEUNA Technical Manual*	EK-DEUNA-TM
• *DEUNA User's Guide*	EK-DEUNA-UG
• *H4000 Technical Manual*	EK-H4000-TM
• *H4000 Installation Guide*	EK-H4000-IN
• *H4000 DIGITAL Ethernet Transceiver with Removable Tap Assembly Installation Card*	EK-H4TAP-IN
• DEUNA Print Set	MP01378
• DEUNA Microfiche	EP-DEUNA-TM

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

Table 1 DEUNA Parts List

Part	Part Designation
DEUNA port module	M7792
DEUNA link module	M7793
Module interconnect cable	BC08R-1 (2)
Bulkhead cable assembly	70-18798-**
Bulkhead interconnect panel assembly	70-18799-00
DEUNA User's Guide	EK-DEUNA-UG

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

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

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

- 1 dc load
- 4 ac loads

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

Table 2 DEUNA Power Chart

Module	Voltage Rating (Approximate Values)	Maximum Voltage	Minimum Voltage	Backplane Pin
M7792	+5 V @ 7.0 A*	+5.25 V	+4.75 V	CA2
M7793	+5 V @ 9.0 A*	+5.25 V	+4.75 V	CA2
	−15 V @ 1.0 A	−15.75 V	−14.25 V	FB2

*Refer to Tech Tip # DEUNA-TT-1

Installation Flow Diagram

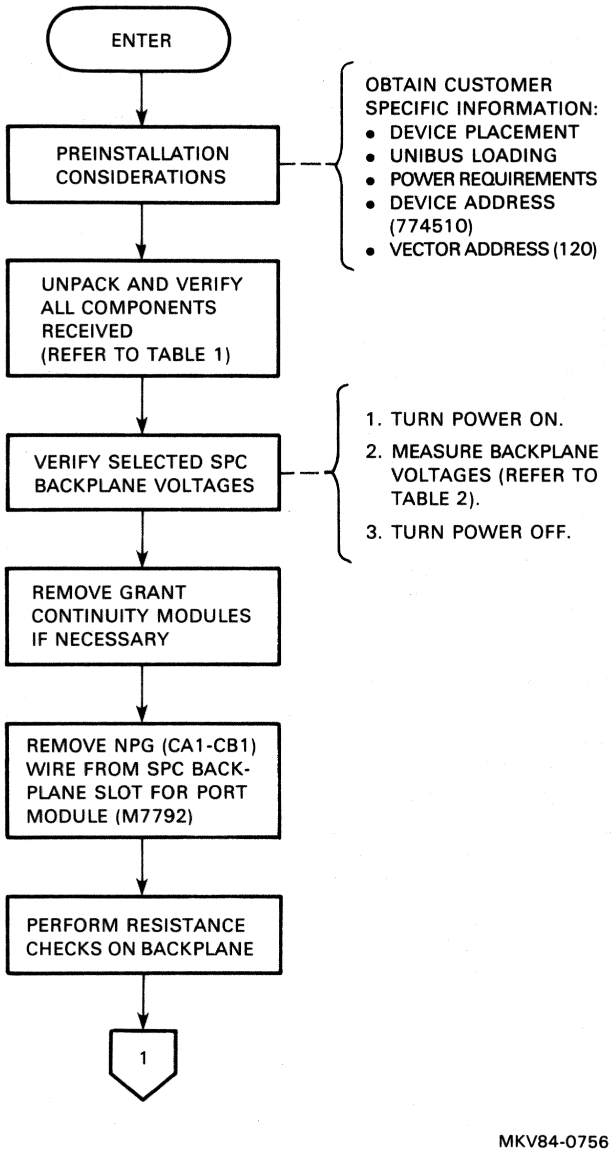


Figure 1 Installation Flow Diagram (Sheet 1 of 5)

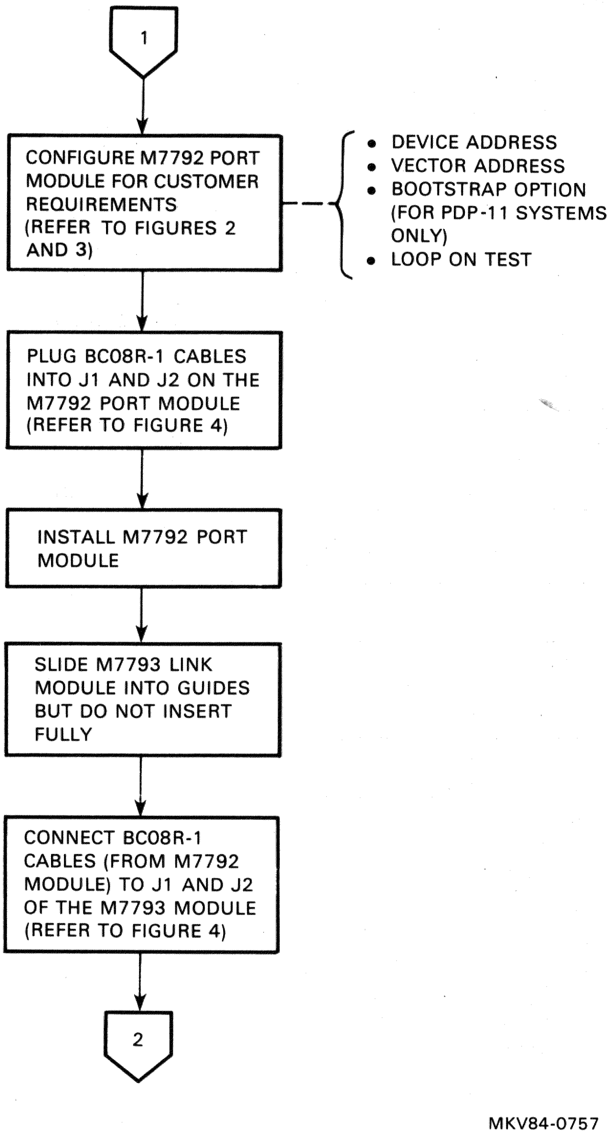


Figure 1 Installation Flow Diagram (Sheet 2 of 5)

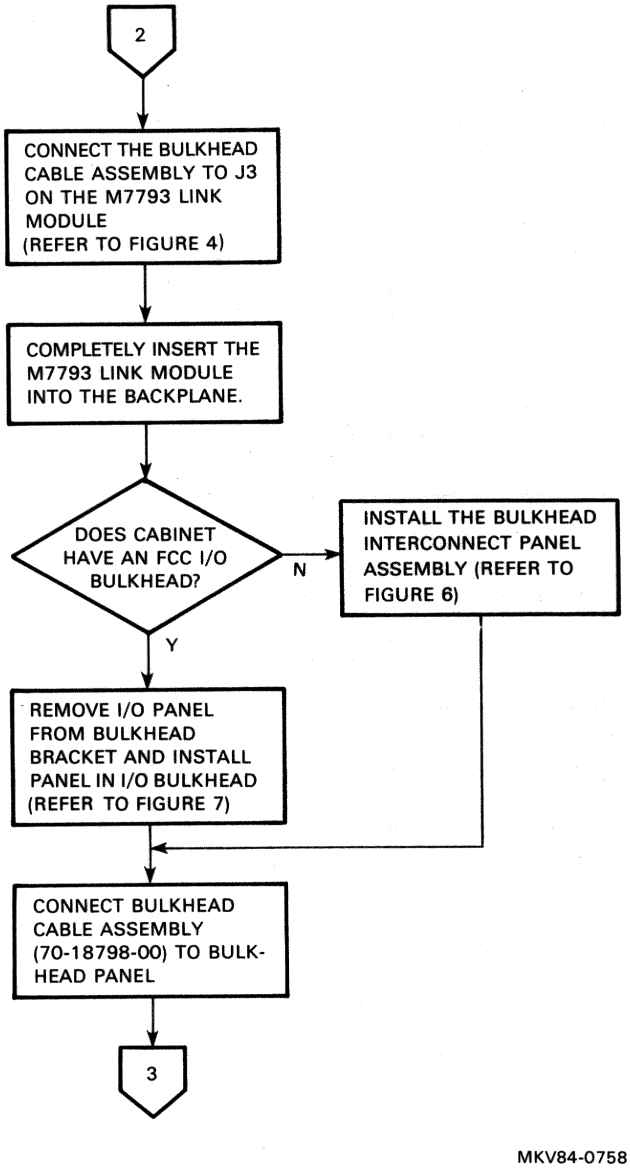


Figure 1 Installation Flow Diagram (Sheet 3 of 5)

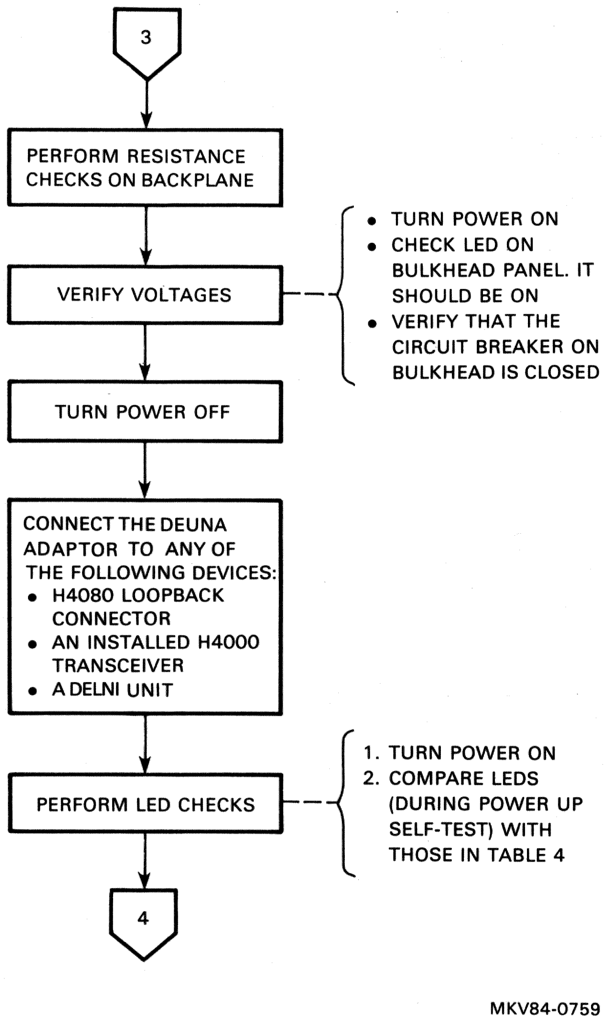


Figure 1 Installation Flow Diagram (Sheet 4 of 5)

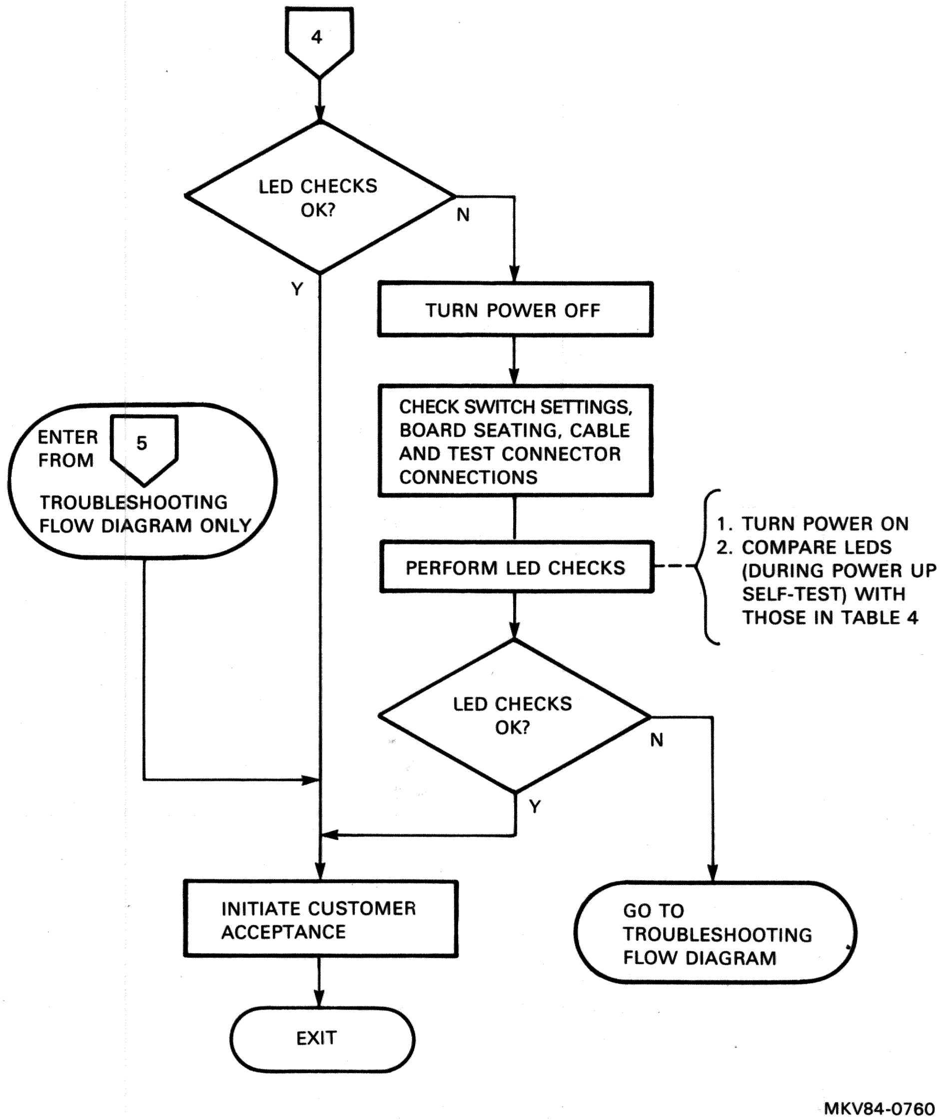


Figure 1 Installation Flow Diagram (Sheet 5 of 5)

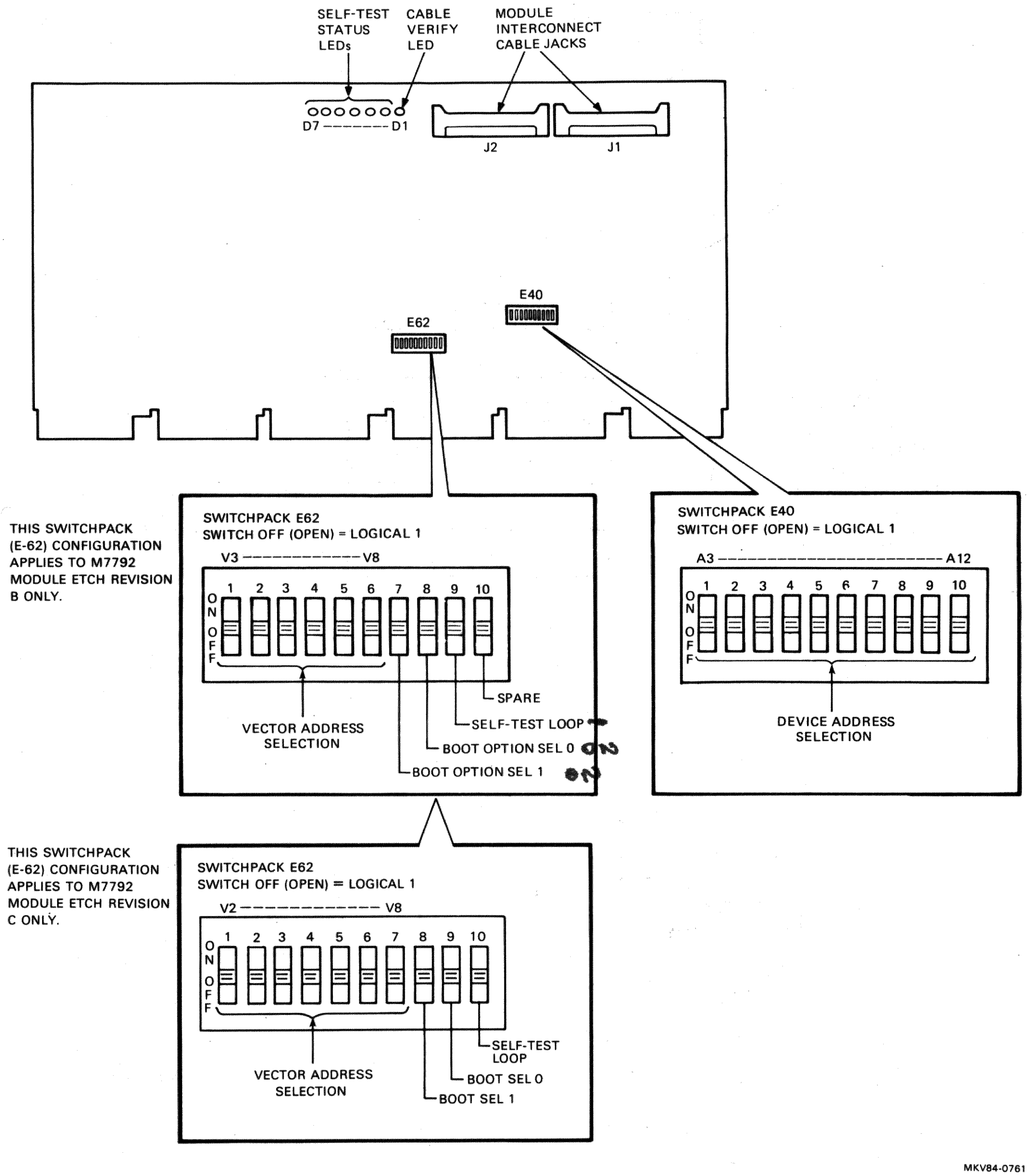


Figure 2 M7792 Switchpacks and Jumpers (Sheet 1 of 2)

EVDWA - OFFLINE
EVDWB - Functional

NORMAL SETUP DEVICE ADDRESS $\boxed{(774510)}$

M7792 – E40									
S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
OFF	ON	ON	OFF	ON	OFF	ON	ON	OFF	OFF

NORMAL SETUP VECTOR ADDRESS $\boxed{(120)}$

M7792 – E62						
S1	S2	S3	S4	S5	S6	S7
ON	ON	OFF	ON	OFF	ON	ON

Boot Option Selection*

SEL 1	SEL 0	Function
✓ ON	ON	Remote boot disabled†
OFF	ON	Remote boot with system load
ON	OFF	Remote boot with ROM
OFF	OFF	Remote boot with power-up boot and system load

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

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

NOTE:
DEUNA boot ROM (23-E22A9-00) for M9312. New DEUNA boot ROMs (23-E32A9 and 23-E33A9).

Self-Test Loop Switch*

Switch Position	Function
ON (closed)	Disabled
OFF (open)	Enabled

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

MKV86-0550

Figure 2 M7792 Switchpacks and Jumpers (Sheet 2 of 2)

FLOATING ADDRESS ASSIGNMENT

FOR ETCH REV B AND C MODULES

	MSB													LSB
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	1	SWITCHPACK E40										0	0	0

	S10	S9	S8	S7	S6	S5	S4	S3	S2	S1	FLOATING ADDRESS
SWITCH NUMBER											
										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									764000

NOTE: SWITCH OFF (OPEN) RESPONDS TO LOGICAL ONE ON THE UNIBUS.

MKV84-0763

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

FLOATING VECTOR ASSIGNMENT

FOR ETCH REV B MODULES

MSB 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	LSB 0
0	0	0	0	0	0	0	SWITCHPACK E62						1/0	0	0

SWITCH NUMBER	S6	S5	S4	S3	S2	S1	FLOATING VECTOR
		OFF	OFF				300
		OFF	OFF			OFF	310
		OFF	OFF		OFF		320
		OFF	OFF		OFF	OFF	330
		OFF	OFF	OFF			340
		OFF	OFF	OFF		OFF	350
		OFF	OFF	OFF	OFF		360
		OFF	OFF	OFF	OFF	OFF	370
	OFF						400

	OFF		OFF				500

	OFF	OFF					600

	OFF	OFF	OFF				700

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

FOR ETCH REV C MODULES

15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
0	0	0	0	0	0	0	SWITCHPACK E62							0	0

SWITCH NUMBER	S7	S6	S5	S4	S3	S2	S1	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

MKV84-0764

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

Cabling

This section contains cabling diagrams for DEUNA adaptor configurations.

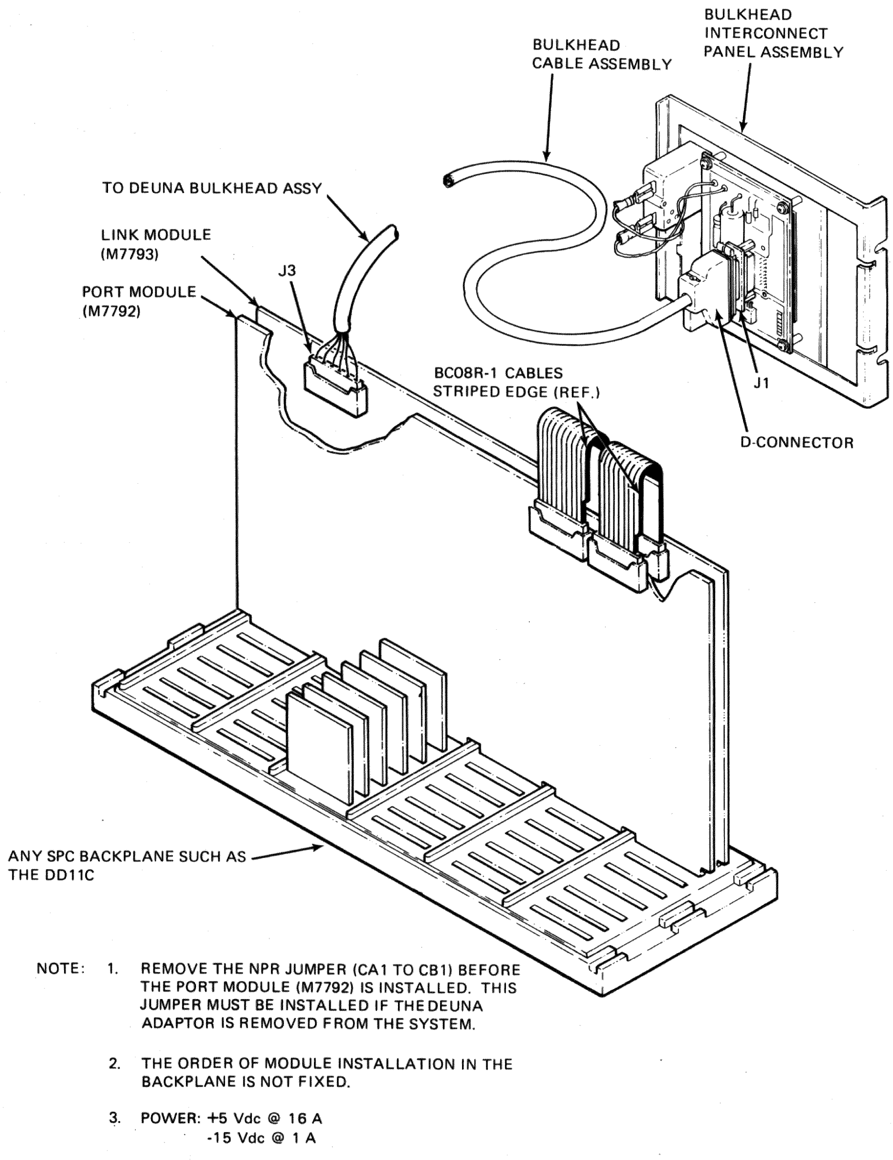


Figure 4 DEUNA Cabling Diagram

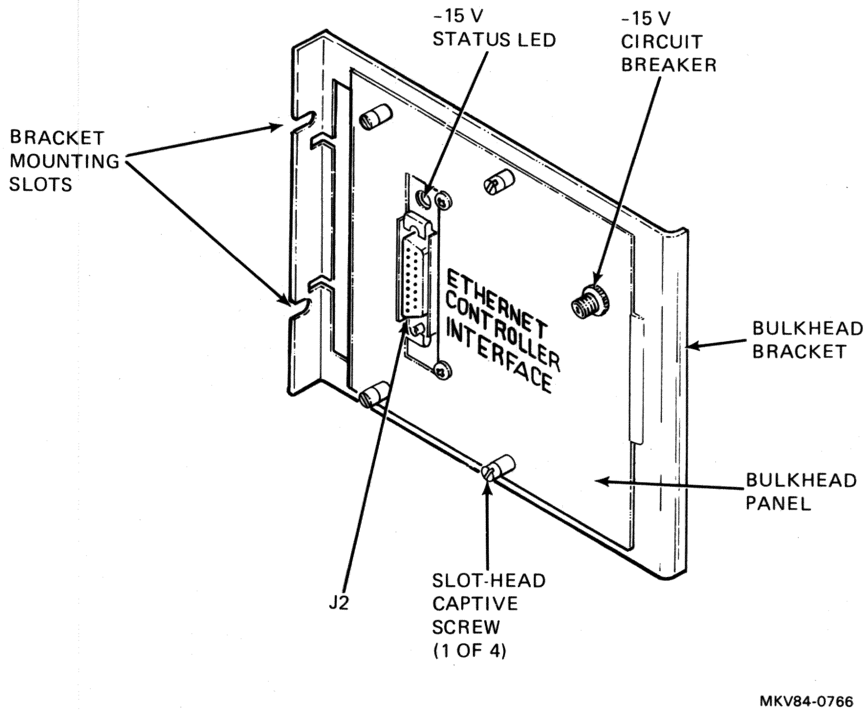
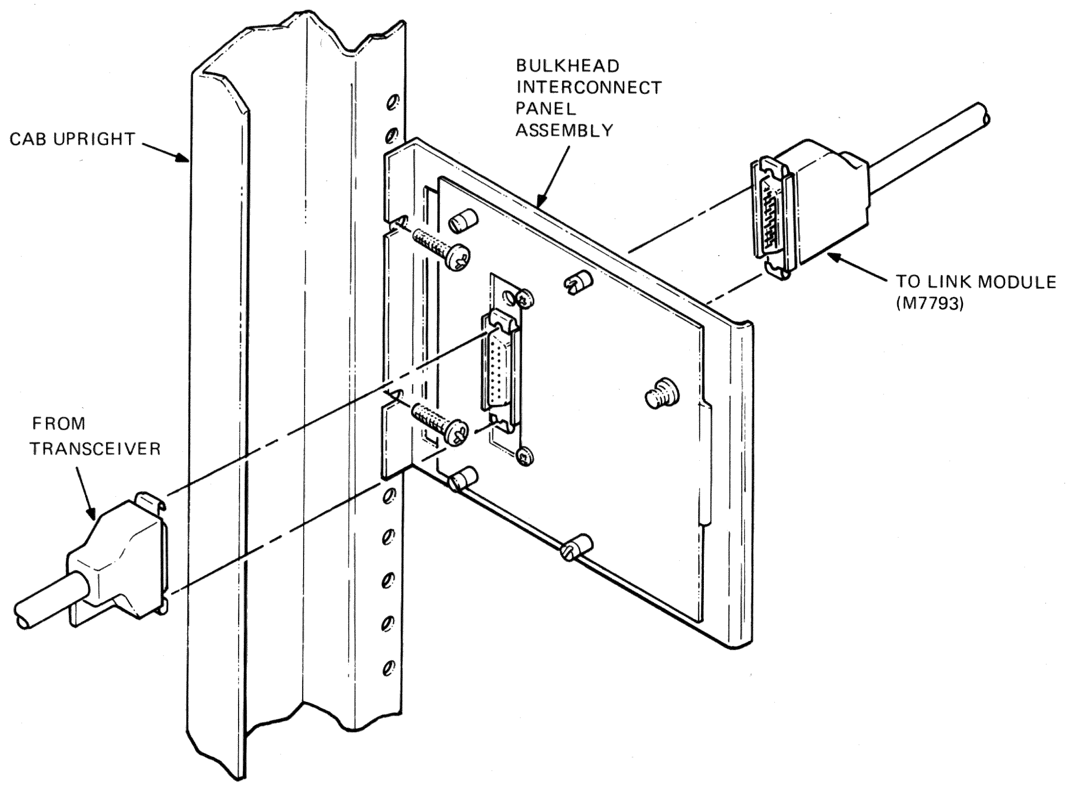


Figure 5 Bulkhead Interconnect I/O Panel Assembly



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

MKV84-0767

Figure 6 Bulkhead Interconnect Panel Assembly Installation

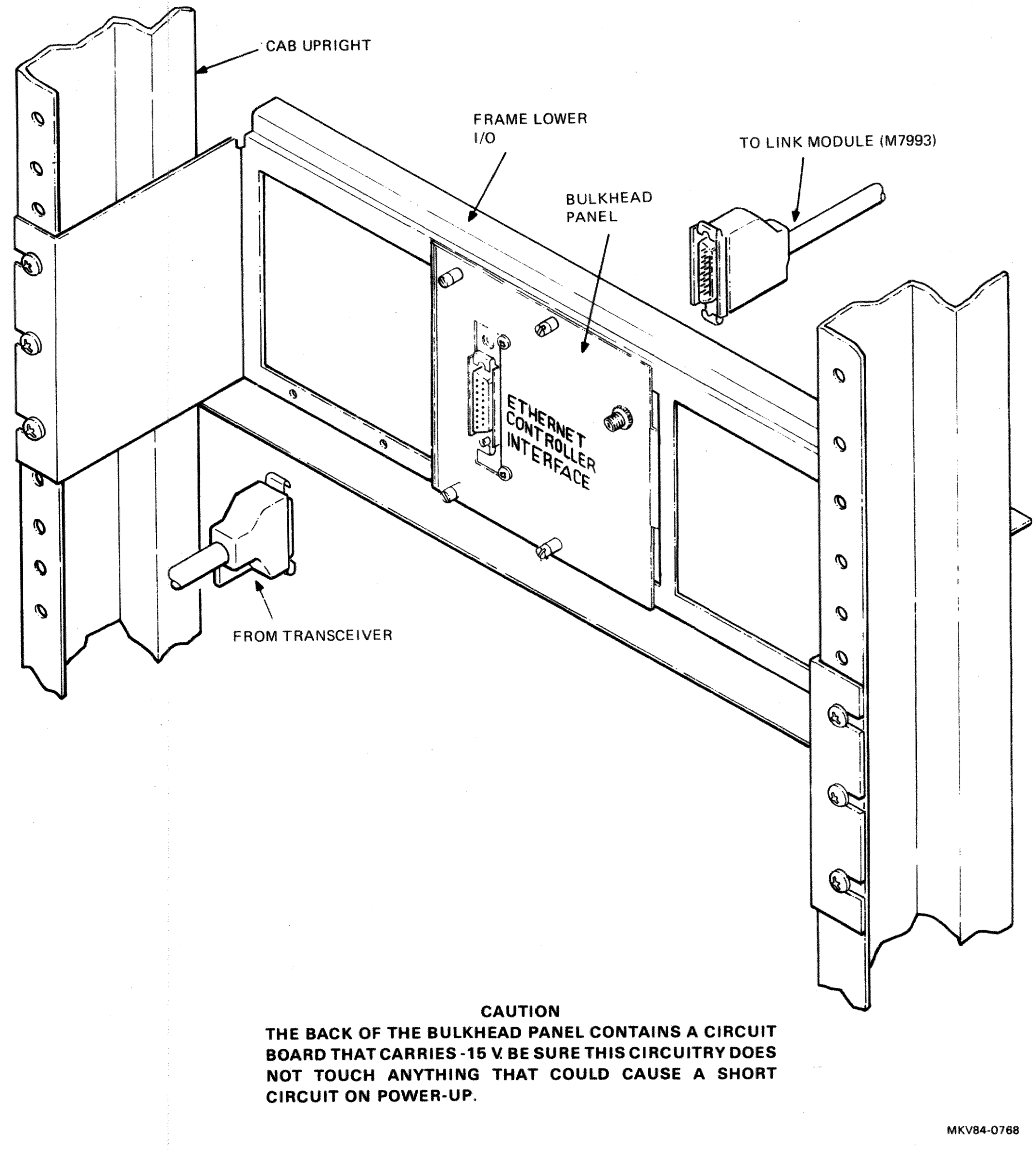


Figure 7 Typical System Cabinet Bulkhead Installation

Table 3 DEUNA Diagnostics for VAX-11 and PDP-11 Systems

Diagnostic Function	Diagnostic Name	PDP-11 Systems	VAX-11 Systems
Self-test	ROM-based self-test	N/A	N/A
Off-line test	Repair level diagnostic	CZUAA*	EVDWA*.*
Functional test	Functional diagnostic	CZUAB*	EVDWB*.*
System exerciser (PDP-11 only)	DEC/X11 DEUNA module	CXUAC*	N/A
Network exerciser	Network interconnect exerciser	CZUAC*	EVDWC* *

Table 4 DEUNA LED Check Indications

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

NOTES

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

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

Diagnostic Dialogs

Table 5 Typical PDP-11/DEUNA (CZUAA*) Diagnostic Dialog

PROMPT DR> The operator must respond by typing one or more commands; for example, STA/PASS:NNNN/TEST:NNNN

Dialog	Description
R CZUAAB DRS LOADED DIAG. RUN-TIME SERVICES REV. D APR-79 CZUAA-B-0 DEUNA REPAIR DIAGNOSTIC UNIT IS DEUNA DR>START	
CHANGE HW (L) ? YES	The program asks if any logical hardware changes are required.
# UNITS (D) ? 1	The number of units on the system to be tested.
UNIT 0	Designates unit to be tested.
WHAT IS THE PCSR0 ADDRESS? (0) ? 174510	Enter appropriate octal values.
WHAT IS THE VECTOR ADDRESS? (0) ? 120	
ETHERNET DEFAULT ADDRESS (HEX): AA-00-03-12-0A-E3	The ROM-based address is displayed.
ROM MICROCODE VERSION (DECIMAL): 5 SWITCHPACK SET FOR :	Displays hardware switch settings.
SELF-TEST LOOP DISABLED	
REMOTE BOOT ENABLED	
CZUAA EOP 1 0 CUMULATIVE ERRORS ^C	End of first pass. Number of errors.

VAX-11/DEUNA Diagnostics

The VAX-11 diagnostics run under a diagnostic supervisor. In the example (Table 6), the diagnostic supervisor prompt = DS>.

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

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

NOTE

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

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

```
SYSTEM MAXBUF = 1600
PROCESS BYTLM = 30000
```

To change BYTLM parameter:

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

To change the SYSGEN MAXBUF parameter:

```
$ MCR SYSGEN
SYSGEN> SET MAXBUF 1600
SYSGEN> WRITE ACTIVE
SYSGEN> EXIT
```

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

Table 6 Typical VAX-11/DEUNA Diagnostic Operation

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

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

```
**************************************************************
Test 1: READ INTERNAL ROM
Test 2: READ/WRITE INTERNAL WCS
Test 3: INTERNAL LINK ADDRESS TEST
Test 4: READ/WRITE INTERNAL LINK MEMORY
Test 5: TRANSMIT CRC TEST
Test 6: RECEIVE CRC TEST
Test 7: PROMISCUOUS ADDRESS TEST
Test 8: ENABLE ALL MULTICAST TEST
Test 9: STATION TEST
Test 10: PAD RUNT TEST
Test 11: NO RECEIVE BUFFERS AVAILABLE
Test 12: UNA STRESS TEST
UNA11 COUNTER SUMMARY - INTERNAL LOOPBACK MODE
SECONDS SINCE LAST ZEROED    : 1
PACKETS RECEIVED             : 0
MULTICAST PACKETS RECEIVED   : 0
PACKETS RECEIVED IN ERROR    : 21
BYTES RECEIVED                      : 0
MULTICAST BYTES RECEIVED     : 0
RCVS LOST - LOCAL BUF ERROR  : 0
LOCAL BUFFER ERRORS          : 0
PACKETS TRANSMITTED          : 21
MULTICAST PACKETS TRANSMITTED       : 0
PKTS XMITTED WITH 1 COLLISION       : 0
PKTS XMITTED WITH > 1 COLLISION     : 0
PKTS XMITTED BUT DEFERRED    : 0
BYTES TRANSMITTED            :14532
MULTICAST BYTES TRANSMITTED  : 0
TRANSMIT PACKETS ABORTED     : 0
XMIT COLLISION CHECK FAILURE        : 21
UNRECOGNIZED FRAME DESTINATION      : 0
SYSTEM BUFFER ERROR          : 0
USER BUFFER ERROR            : 0

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

ROM MICROCODE VERSION (DECIMAL): 5

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

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

MKV84-0773

Figure 8 Typical VAX-11 Functional Diagnostic Printout

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

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

- M7792 — DEUNA port module
- M7793 — DEUNA link module
- BC08R-1 — Module interconnect cable
- 70-18798-** — Bulkhead cable assembly
- 70-18799-00 — Bulkhead interconnect panel assembly

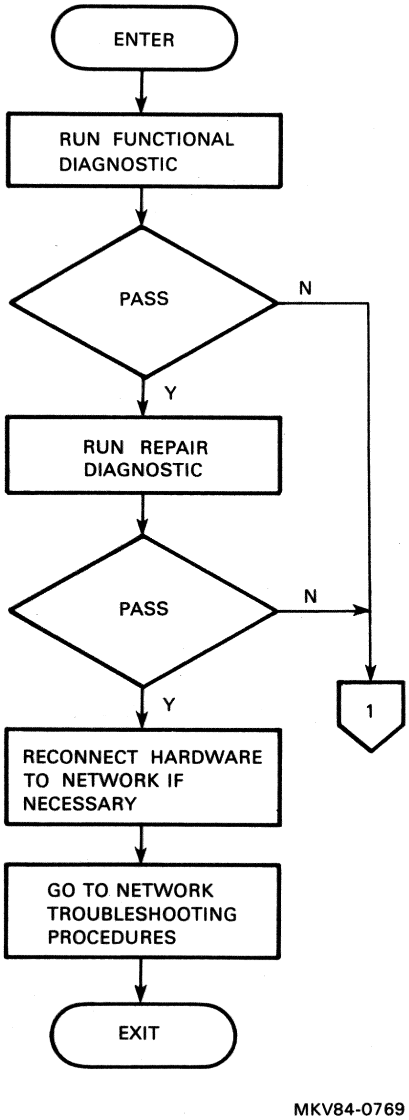
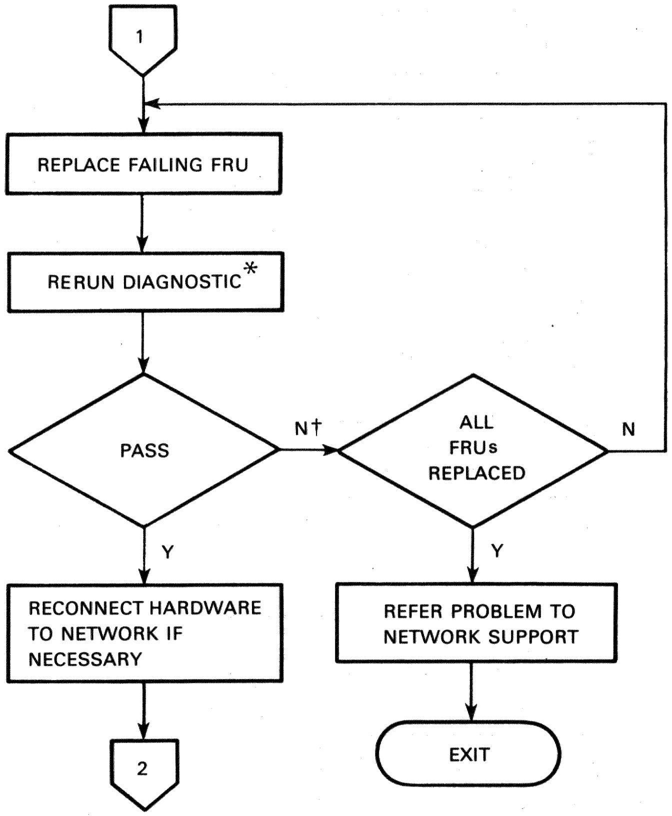


Figure 9 DEUNA Troubleshooting Flow Diagram (Sheet 1 of 3)



* REFERS TO PREVIOUSLY RUN DIAGNOSTIC

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

MKV84-0770

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

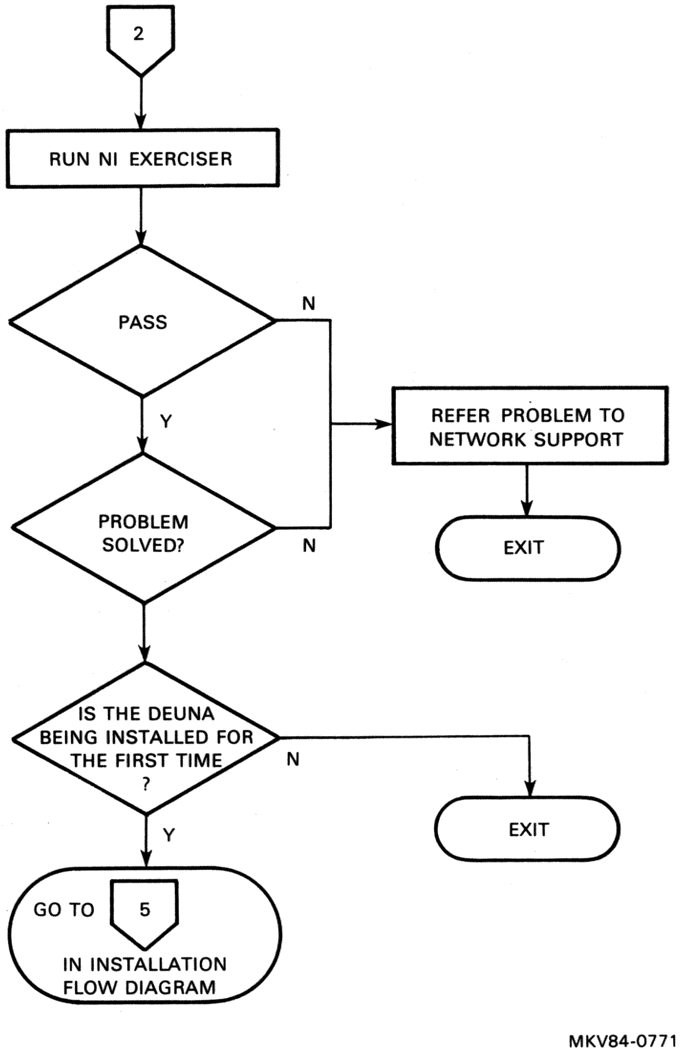


Figure 9 DEUNA Troubleshooting Flow Diagram (Sheet 3 of 3)

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

1. On power up

2. On issuing the following self-test port command to the low byte of PCSR0:

   a. Perform a device reset by setting bit 5 of PCSR0,

   b. Verify that the DNI bit (PCSR0 – bit 11) is set,

   c. Issue self-test port command by setting bits 0 and 1 in the low byte of PCSR0,

   d. Verify that the DNI bit (PCSR0 – bit 11) is set, and

   e. Observe the self-test results (they should be displayed by LEDs on the port module.

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

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

          MOVB #RSET, @# PCSR0        ;device reset
LOOP1:    BIT #DNI, @# PCSR0          ;test for reset complete
          BEQ LOOP1

          MOVB #3, @# PCSR0           ;self-test port command
LOOP2:    BIT #DNI, @# PCSR0          ;test for self-test complete
          BEQ LOOP2
          HALT                        ;self-test results appear
                                      ;in port LEDs
```

DEUNA Self-Test LEDs and Codes
The following figure shows the location of the DEUNA self-test LEDs.

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

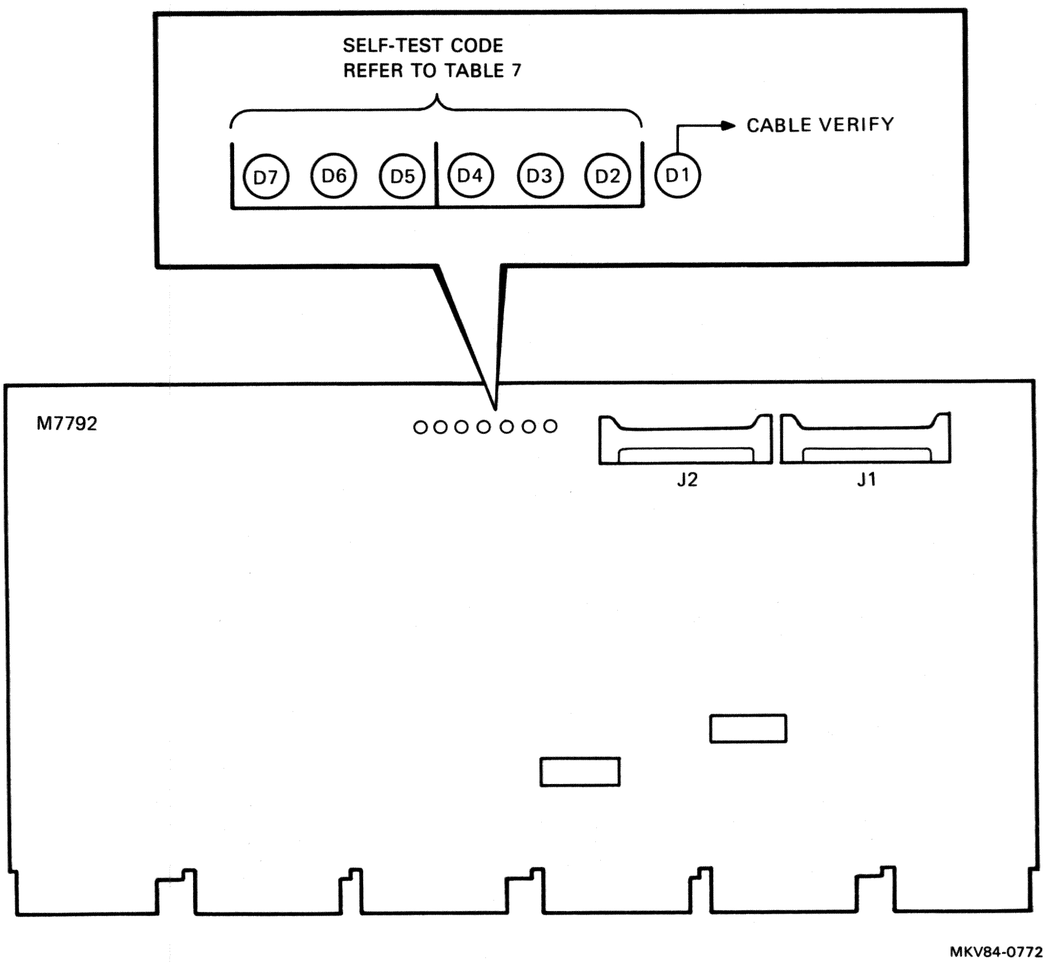


Figure 10 DEUNA Port Module Self-Test LEDs

Table 7 DEUNA Self-Test LED Codes

LED Code (Octal)	D7	D6	D5	D4	D3	D2	Test Name	(Module)
77	ON	ON	ON	ON	ON	ON	Never Got Started	M7792/M7793
1						ON	CPU Instruction	M7792
2					ON		ROM	M7792
3					ON	ON	Writeable Control Store	M7792
4				ON			T11 UNIBUS Address Register	M7792
5				ON		ON	Receiver UNIBUS DMA	M7792
6				ON	ON		PCSR1 Lower Byte & T11 DMA Read	M7792/UNIBUS
7				ON	ON	ON	PCSR0 Upper Byte & T11 DMA Write	M7792
10			ON				PCSR0 Lower Byte & Link Mem. DMA	M7792
11			ON			ON	PCSR2 & PCSR3	M7792
12			ON		ON		Timer	M7792
13			ON		ON	ON	Physical Address ROM	M7792
20		ON					Link Memory	M7792/M7793
							Local Loopback	
26		ON		ON	ON		Bugcheck (N1 & UNIBUS in HALTED STATE) – Internal	M7792/M7793
							Transmit Buffer Resource Allocation Error on Boot	
30		ON	ON				Transmitter Timeout	M7792/M7793
31		ON	ON			ON	Receiver Timeout	M7792/M7793
32		ON	ON		ON		Buffer Comparison	M7792/M7793
33		ON	ON		ON	ON	Byte Count	M7792/M7793
34		ON	ON	ON			Receiver Status	M7792/M7793
35		ON	ON	ON		ON	CRC Error	M7792/M7793
36		ON	ON	ON	ON		Match Bit Error	M7792/M7793
37		ON	ON	ON	ON	ON	TDR Error	M7792/M7793
							Transmitter Buffer Address	
40	ON						Transmitter Timeout	M7793
41	ON					ON	Receiver Timeout	M7793
42	ON				ON		Buffer Comparison	M7793
43	ON				ON	ON	Byte Count	M7793
44	ON			ON			Receiver Status	M7793
45	ON			ON		ON	CRC Error	M7793
							Receiver Buffer Address	
50	ON		ON				Transmitter Timeout	M7793
51	ON		ON			ON	Receiver Timeout	M7793
52	ON		ON		ON		Buffer Comparison	M7793
53	ON		ON		ON	ON	Byte Count	M7793
54	ON		ON	ON			Receiver Status	M7793
55	ON		ON	ON		ON	CRC Error	M7793
60	ON	ON					Runt Packet	M7793
61	ON	ON				-	Minnimum Packet Size	M7793
62	ON	ON			ON		Maximum Packet Size	M7793
63	ON	ON			ON	ON	Oversize Packet	M7793
64	ON	ON		ON			CRC	M7793
65	ON	ON		ON		ON	Collision	M7793
66	ON	ON		ON	ON		Heartbeat	M7793
	ON	ON		ON	ON	ON	Half Duplex	M7793
70	ON	ON	ON				Multicast	M7793
71	ON	ON	ON			ON	Address Recognition	M7793
72	ON	ON	ON		ON		External Loopback	M7793/H4000
73	ON	ON	ON		ON	ON	Internal Transmit Buffer Resource Allocation	M7792/M7793
74	ON	ON	ON	ON			Link Memory Parity Error	M7792/M7793
75	ON	ON	ON	ON		ON	Internal Unexpected Interrupt	M7792/M7793
76	ON	ON	ON	ON	ON		Internal Register Error	M7792/M7793
77	ON	ON	ON	ON	ON	ON	Self Test Done, No Errors (State = 2, DNI set)	

NOTE

During the self-test, the LEDs should be observed counting from 1-77 octal.

MKV85-1227

DEUNA Tech Tips/FCO Index
The following table lists Tech Tips and FCOs that pertain to the DEUNA UNIBUS network adaptor. Space is provided for adding new information.

Table 8 DEUNA Tech Tip Index

Tech Tip No.	Title	Speed Bulletin
DEUNA-TT-1	Revised DC Power Requirements	313
DEUNA-TT-2	DEUNA Switchpack E-62	313

H4000 ETHERNET TRANSCEIVER

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

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

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

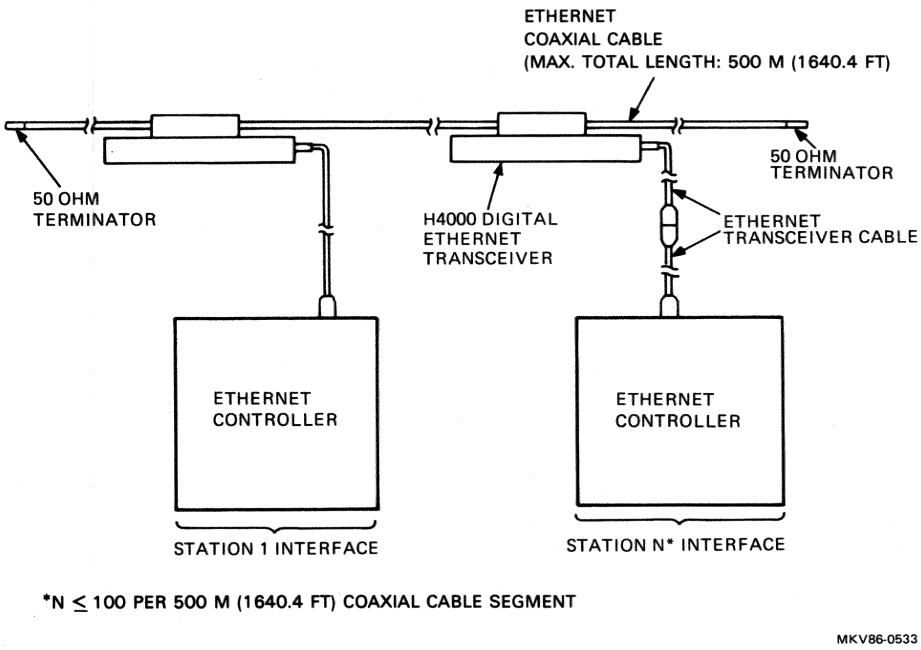


Figure 1 Typical H4000 Transceiver Configuration

H4000 Versions
There are three versions of the H4000 transceiver.

- H4000 transceiver (see Figure 2)
- H4000 transceiver with removable tap (see Figure 3)
- H4000-BA

The H4000-BA is an H4000 transceiver without heartbeat. The application for this product is restricted to DEMPR connected through a DELNI to the network.

The installation instructions for the H4000-BA are identical to the H4000 requirements.

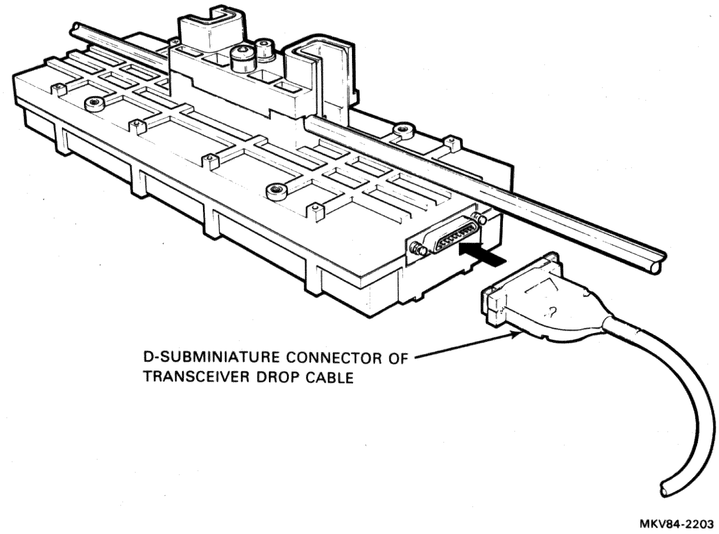


Figure 2 Ethernet H4000 Transceiver

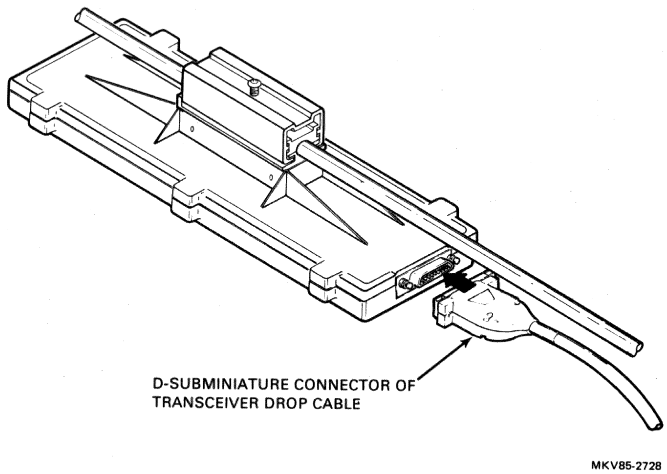


Figure 3 Ethernet H4000 Transceiver with Removable Tap Assembly

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

- H4000 transceiver with tap.
- *H4000 DIGITAL Ethernet Transceiver with Removable Tap Assembly Installation Card*

The H4091 and H4092
The H4091 is an Ethernet to ThinWire adapter. It consists of:

- An H4080,
- A BNC-to-N reducer,
- A barrel connector, and
- An installation card.

The H4092 is a ThinWire segment to Ethernet connection installation kit. It consists of:

- An H4091,
- An H4000,
- A DEREP (Local Ethernet Repeater),
- Two cables, and
- An installation card.

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

- *H4000 Ethernet Transceiver Technical Manual* — EK-H4000-TM
- H4000 Ethernet Transceiver Microfiche — EP-H4000-TM
- H4000 Field Maintenance Print Set — MP-01369
- *Ethernet Installation Guide* — EK-ETHER-IN
  - *Site Survey and Configuration Planning Volume 1*
  - *Installation and Testing Volume 2*
- *H4000 DIGITAL Ethernet Transceiver Installation Manual* — EK-H4000-IN
- *Etherjack Installation Guide* — EK-DEXJK-IN
- *H4000-T Ethernet Transceiver Tester User Guide* — EK-ETHTT-UG
- *H4000 DIGITAL Ethernet Transceiver with Removable Tap Assembly Installation Card* — EK-H4TAP-IN
- DEC Standard 134, Ethernet Specifications, Version 2

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

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

- A maximum of 100 transceivers may be placed on a single 500 m (1640.4 ft) Ethernet coaxial cable segment.
- Transceivers must be positioned on (±5 cm [1.97 in]) to the annular rings marked every 2.5 m (8.2 ft) on the coaxial cable.
- Spacing between transceivers may not be less than 2.5 m (8.2 ft).

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

Required Equipment

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

- H4090-KA/KB installation kit (instructions for using the kit are included with the kit – See Figure 4).
- H4000-TA/TB transceiver tester
- CD Kit (Part Number: A2-W1108-10 – See Figure 5).

Power Requirements

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

- The Ethernet device to which the transceiver is connected.

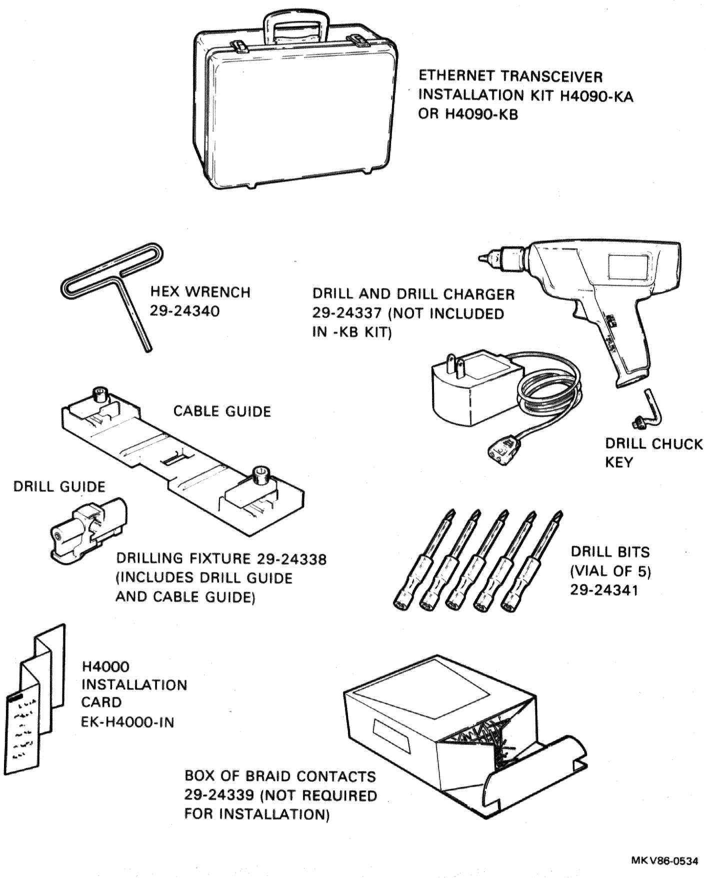
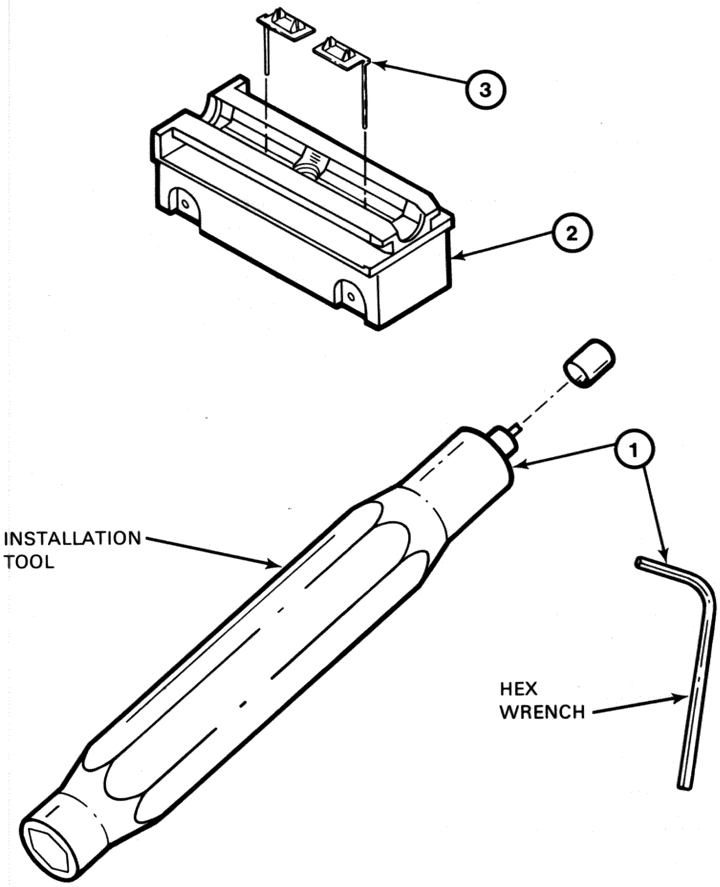


Figure 4 H4000 Transceiver Installation Kit



① ⅛ IN HEX WRENCH AND COMBINATION WRENCH/DRILL (12-24664-02)

② AMP TAP III (12-24664-01)

③ BRAID CONNECTOR (12-24664-04)

MKV86-0535

Figure 5 CD Kit for H4000 Transceiver with Removable Tap

The following flow diagram outlines the H4000 transceiver installation process.

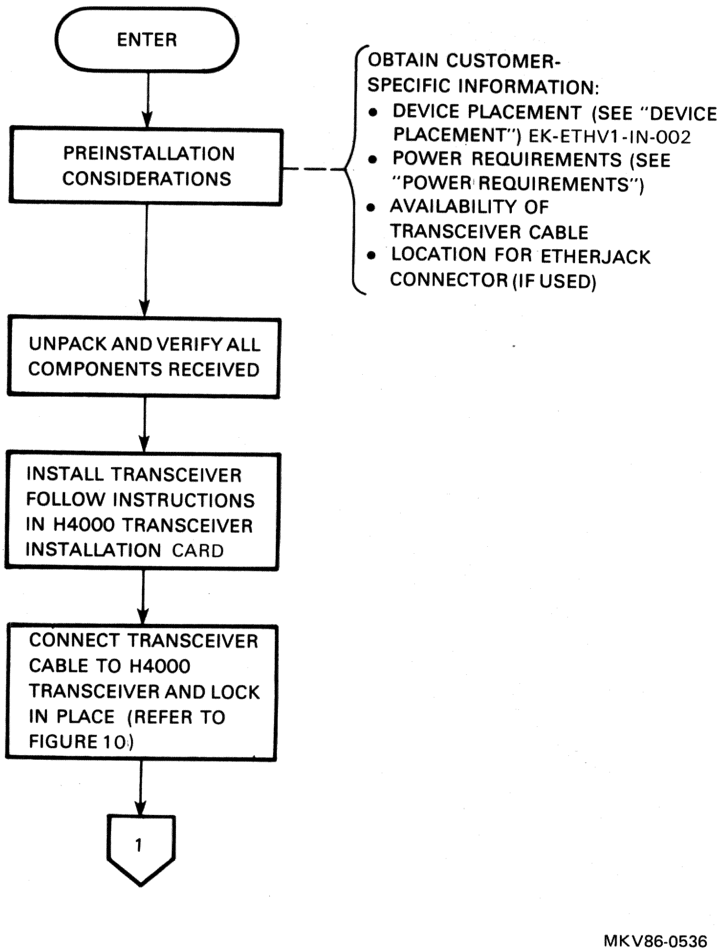


Figure 6 Installation Flow Diagram (Sheet 1 of 3)

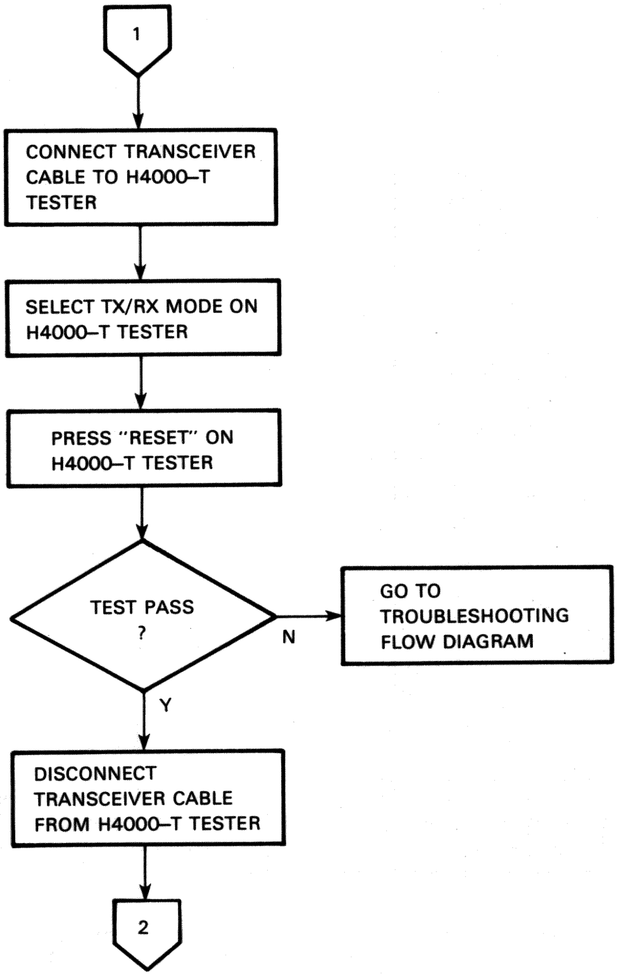


Figure 6 Installation Flow Diagram (Sheet 2 of 3)

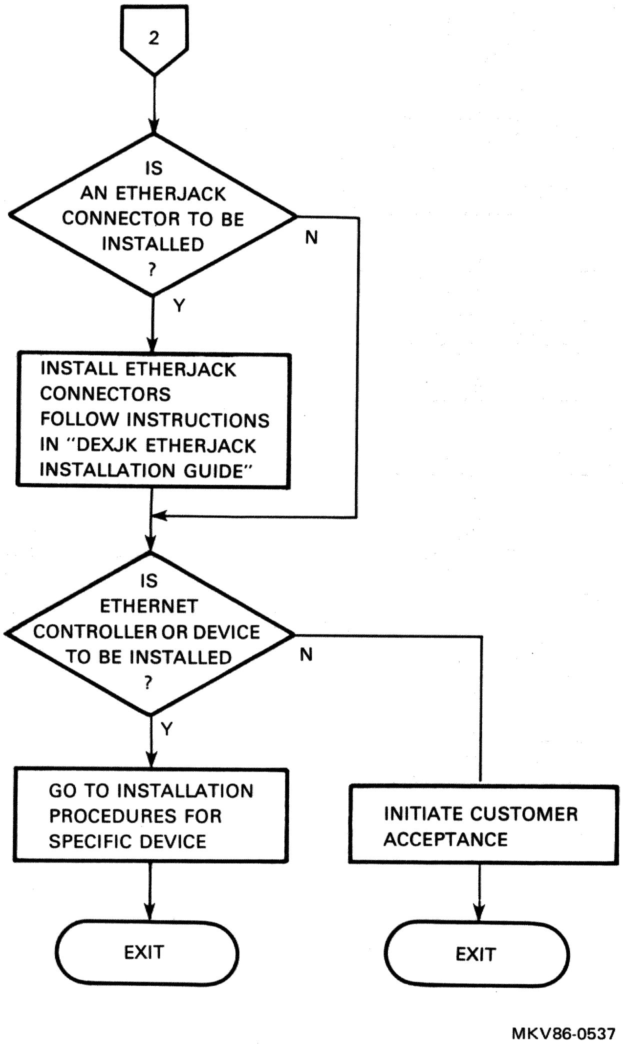


Figure 6 Installation Flow Diagram (Sheet 3 of 3)

The following figures (Figures 7 and 8) show the positions of the center conductor contact and braid contacts for both transceiver versions. Also shown is the clamping block assembly. The clamping block assembly holds the coaxial cable so that it connects with the center conductor contact and braid contacts.

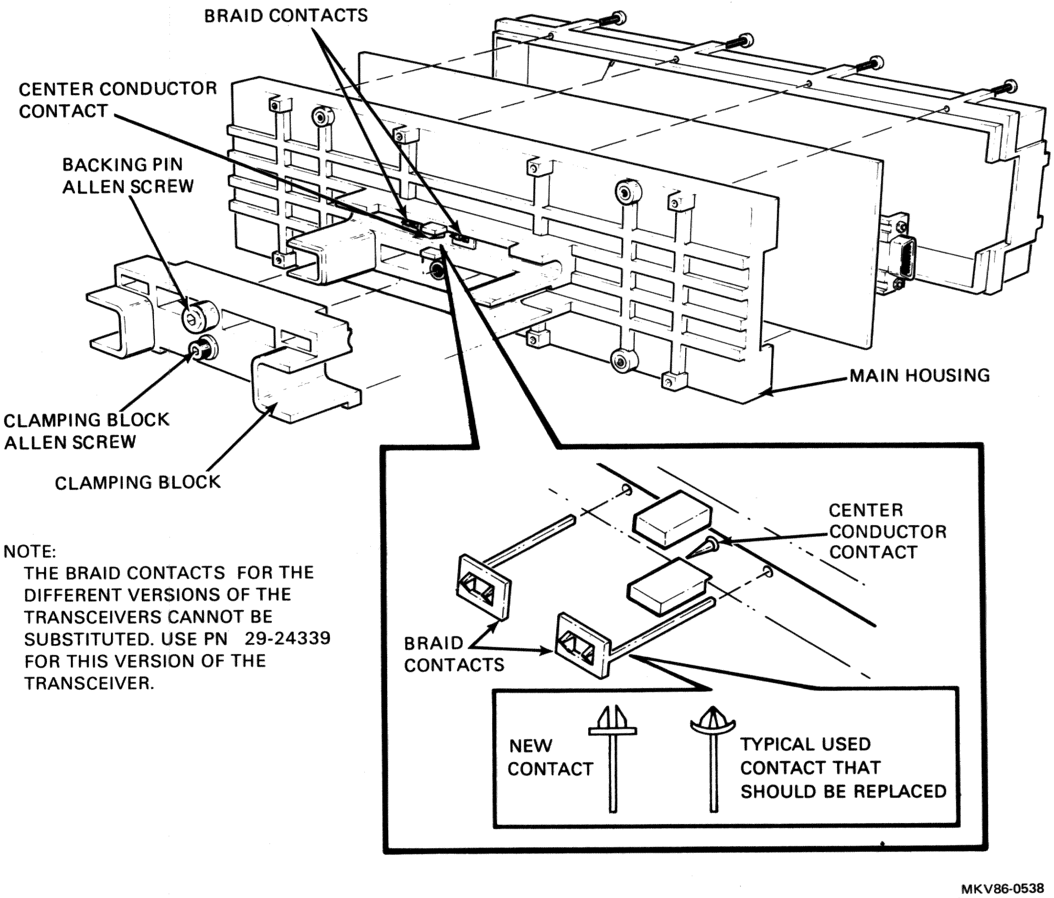
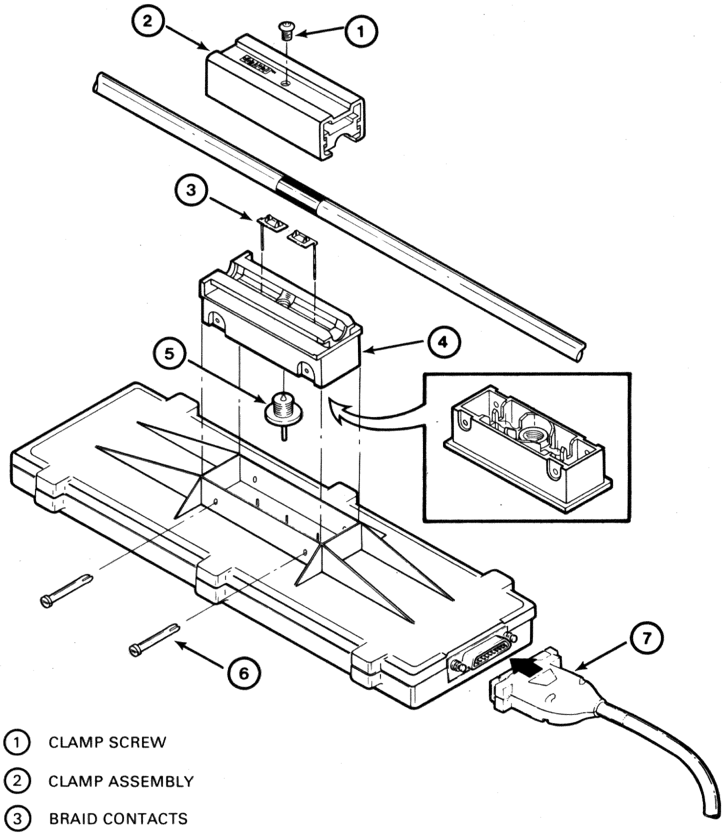


Figure 7 Hardware for Installing the H4000 Transceiver on a Coaxial Cable



1 CLAMP SCREW
2 CLAMP ASSEMBLY
3 BRAID CONTACTS
4 TAP BODY
5 PROBE ASSEMBLY
6 PUSH PINS
7 TRANSCEIVER D-SUBMINIATURE CONNECTOR

NOTE:
BRAID CONTACTS FROM EARLIER VERSIONS OF THE H4000 CANNOT BE SUBSTITUTED. (USE PN 12-24664-01)

MKV86-0539

Figure 8 H4000 Transceiver with Removable Tap Nomenclature

The following figure shows the actual connection between the coaxial cable and the contacts.

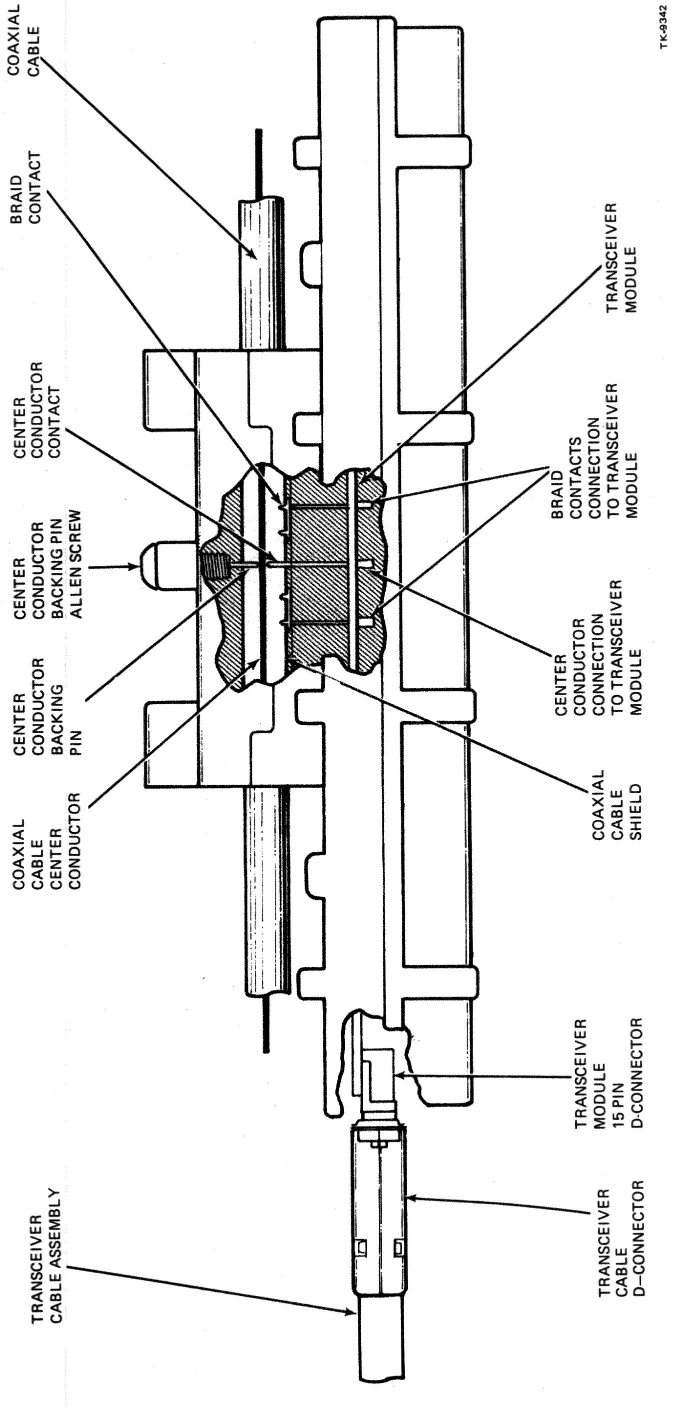


Figure 9 H4000 Ethernet Transceiver: Cutaway View Showing Coaxial Cable Interface

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

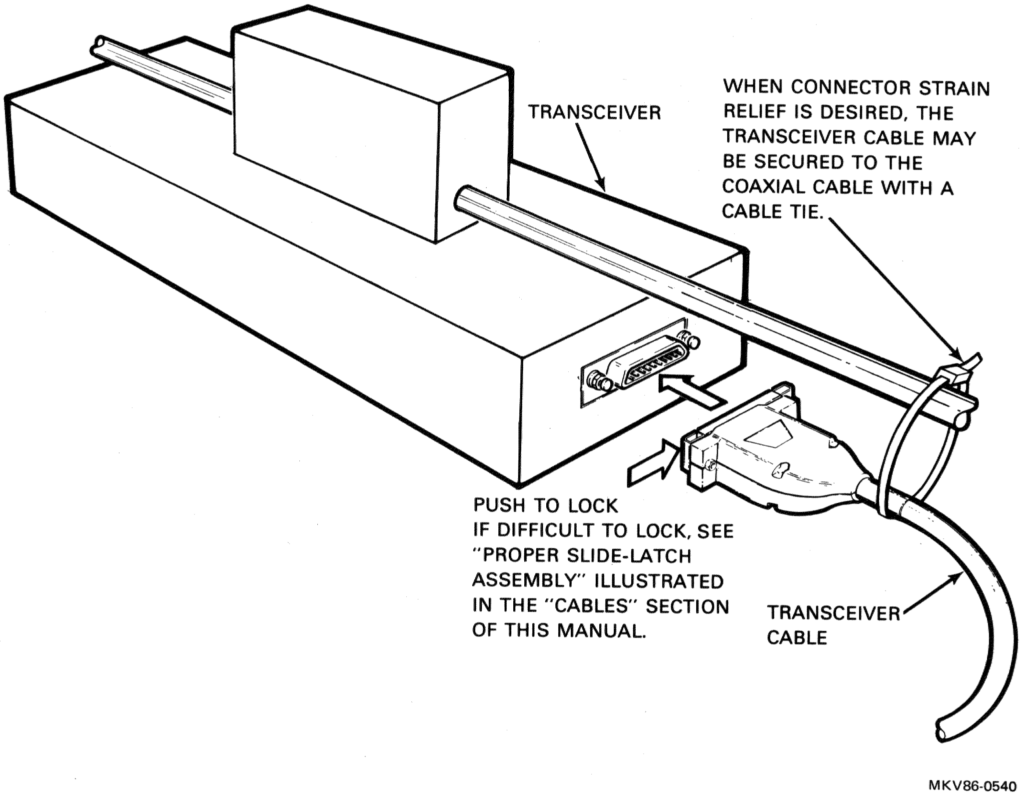


Figure 10 Typical Transceiver Cable Connection

Diagnostics

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

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

- Functional diagnostics for the device connected to the transceiver (refer to specific device for applicable diagnostics).

Required Equipment
The following equipment is required for isolating faulty H4000 Ethernet transceivers.

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

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

H4000 with Inclusive Tap

• Transceiver Module	54-14966-00
• Braid Contacts (Box of 100)	29-24339
• H4000 Transceiver	H4000

H4000 with Removable Tap

• H4000 Assembly	70-27780-00
• Transceiver Module	54-14966-00
• AMP TAP III	12-24664-01
• Braid Contacts	12-24664-04
• Push Pins	74-32789-01

Troubleshooting Flow Diagram

The following troubleshooting flow diagram illustrates the procedures for locating a malfunctioning H4000 Ethernet transceiver.

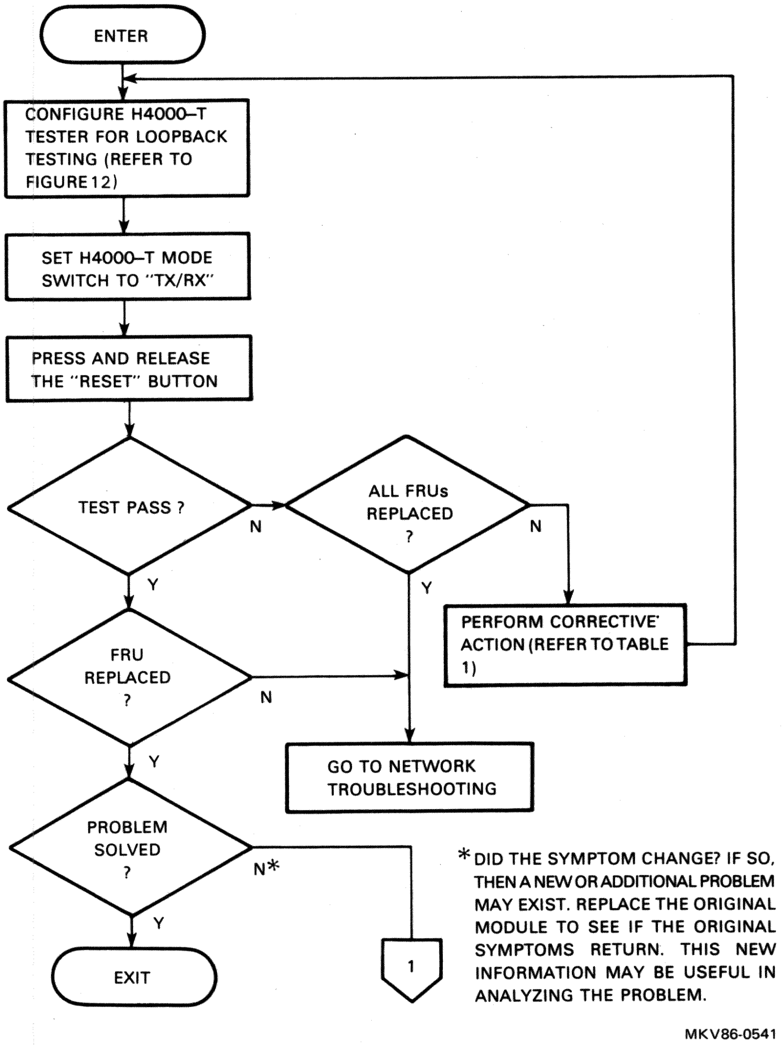


Figure 11 Troubleshooting Flow Diagram (Sheet 1 of 4)

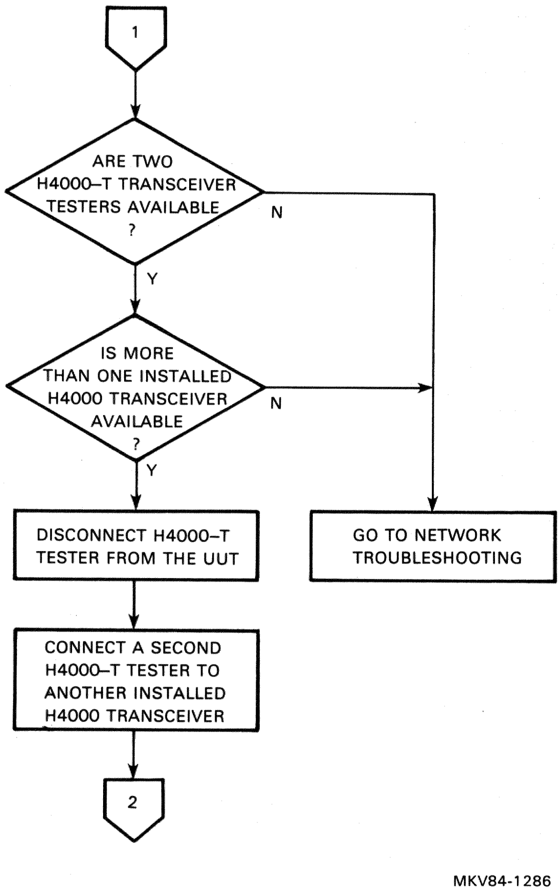


Figure 11 Troubleshooting Flow Diagram (Sheet 2 of 4)

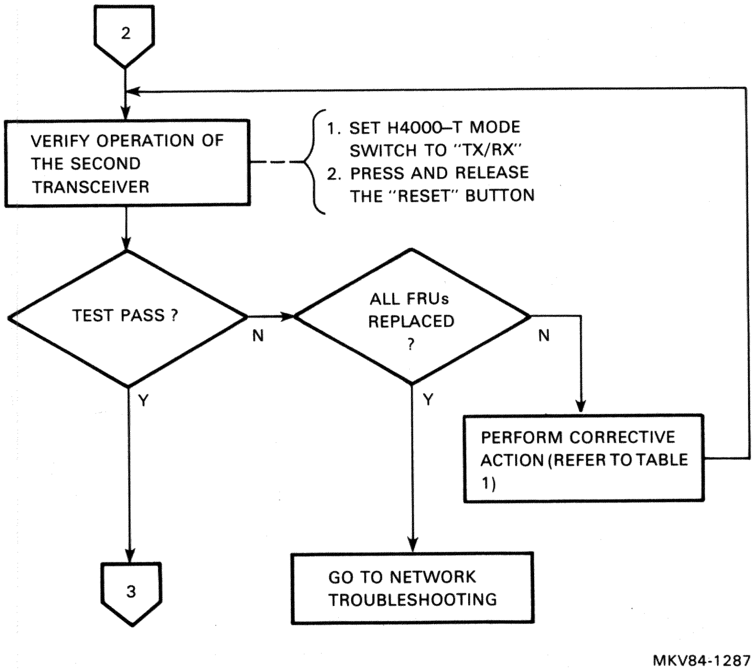


Figure 11 Troubleshooting Flow Diagram (Sheet 3 of 4)

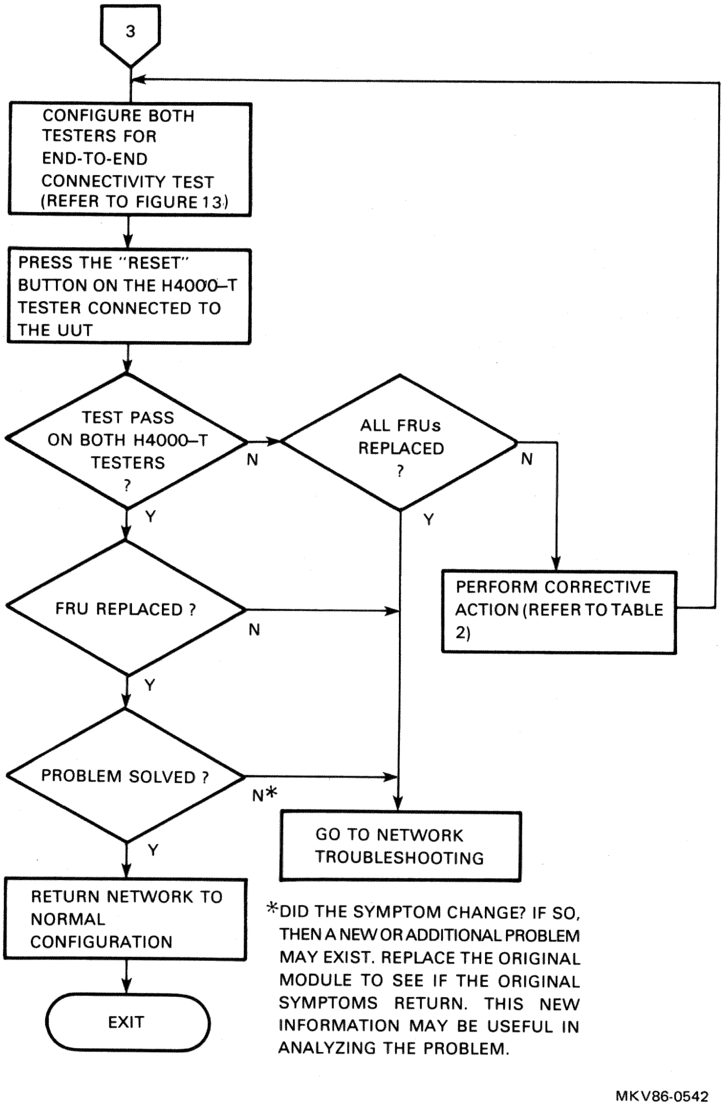


Figure 11 Troubleshooting Flow Diagram (Sheet 4 of 4)

The following figure shows a configuration for a single H4000-T transceiver tester connected to an H4000 UUT (unit under test).

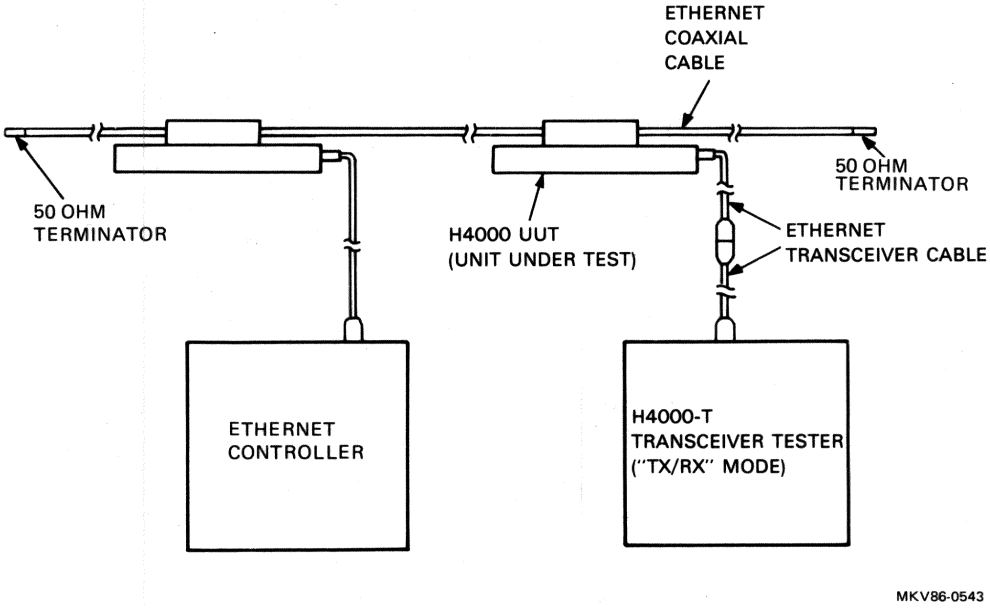


Figure 12 Typical H4000-T Configuration for Loopback Testing

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

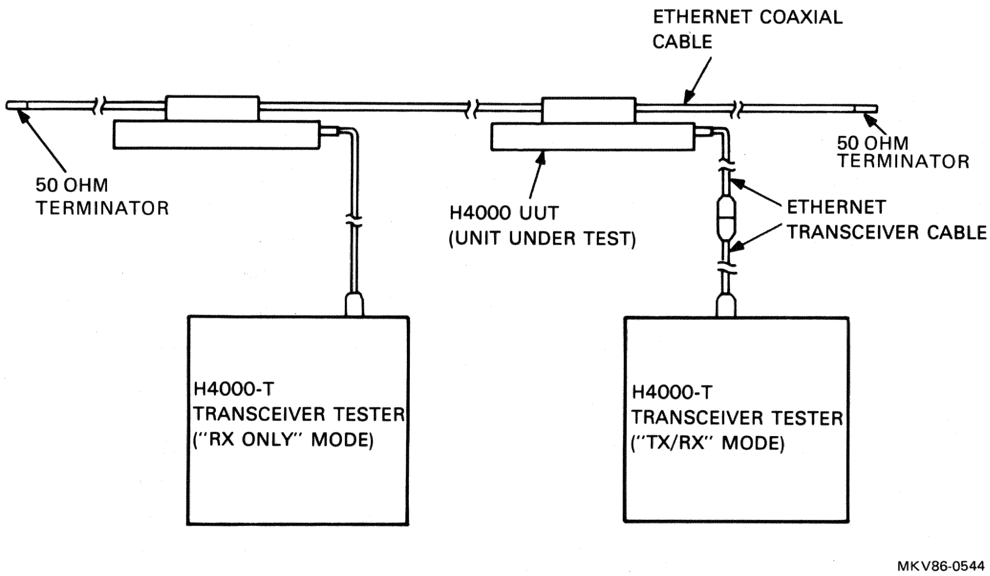


Figure 13 Typical H4000-T Configuration for End-to-End Testing

Table 1 H4000-T Indications and Corrective Action (TX/RX Mode)

Lamp	Indication	Corrective Action*
DATA PASS	Data packet transmitted and received correctly.	
DATA FAIL	Data packet not received correctly.	Repair/replace: • Check tap (Ohm out) • Transceiver cable† • Module‡ • Check tap for bent or broken contacts • Retap • Replace entire H4000 transceiver
COLLISION TEST	Collision test signal not received after sending data packet.	Repair/replace: • Transceiver cable† • Module‡
COLLISION	*Intermittent light*: Normal collision signal received.	
	Steady light: Late collision.	If COLLISION is ON and SELF-TEST is flashing, check for: • Missing terminators • Malfunctioning controller • Improperly configured network
TIMEOUT	Carrier signal not received within 19 microseconds.	Repair/replace: • Check tap (Ohm out) • Transceiver cable† • Module • Retap
SELF TEST PASS	Indicates successful self-test when flashed every 3-4 seconds.	

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

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

‡Before replacing module, remove power by disconnecting transceiver cable.

Table 2 H4000-T Indications and Corrective Action (RX ONLY Mode)

Lamp	Indication	Corrective Action*
DATA PASS	Data packet received correctly.	
DATA FAIL	Data packet not received correctly.	If DATA PASS lamp is lit on TX/RX tester: • Check tap (Ohm out) • Troubleshoot cable plant • Replace UUT • Retap
COLLISION TEST	Not used.	
COLLISION	Steady light:	
	Normal or late collision.	If the COLLISION lamp is also lit on the TX/RX tester, check for: • Missing terminators • Malfunctioning controller • Improperly configured network
TIMEOUT	Not used.	
SELF TEST PASS	Steady ON indicates the single self-test was successful.	

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

Table 3 H4000 Tech Tips/FCO Index

Tech Tip No.	Title	Speed Bulletin
ETHERNET-TT-2	Recommended Use of H4000 and Physical Channel Coax	313
H4000-TT-3	Transceiver Tester DELNI	385
H4000-TT-4	H4000 W/Removable Tap	408
H4000-TT-5	H4000 Braid Connectors	418
H4000-TT-6	Transceiver Tap and Coaxial Cable Compatibility	449

LAN Bridge 100 BRIDGE

General Description

The local area network LAN Bridge 100 is a device that connects two 802.3 and/or Ethernet-style 10 Mbit CSMA/CD LANs together such that they appear as one extended LAN.

Features of the LAN Bridge 100 include the following:

- Operates as a packet forwarding filter between two baseband and/or broadband Ethernet networks.
- Performs packet forwarding without creating an excessive communications bottleneck.
- Supports network management capabilities which include but are not limited to:
  - Monitoring packets transmitted and packets dropped,
  - Monitoring Ethernet activity (such as, number of collisions),
  - Accessing counters over the Ethernet from host applications.
- Connects to H4000, DESTA, DEMPR, DELNI, DECOM, or Ethernet/IEEE 802.3 transceivers.

The LAN Bridge 100 can also be used as a LAN Traffic Monitor (LTM). The LAN Traffic Monitor is an Ethernet monitor that uses the LAN Bridge 100 as a hardware base. The LAN Bridge 100 processes 48-bit Ethernet addresses and the LTM software calculates the Ethernet packet statistics. The statistics are periodically reported to a host system that performs additional data reduction, such as averaging and peak traffic analysis. There are two components of an LTM:

- The LTM Listener – A LAN Bridge 100 unit that is down-line loaded with LTM monitoring software.
- The LTM User Interface (UI) – Remote application software that is installed on any DECnet VAX/VMS system with an Ethernet controller and associated driver.

Down-line loading capability is being added to all LAN Bridge 100 devices with revision D7 and higher. This capability is necessary for the LAN Bridge 100 to operate as a LAN Traffic Monitor. No FCO or update kit will be made available for the LAN Bridge 100 with revision D6 and below. These revisions will not have the LTM capability.

Reference Documentation

Refer to the following documents for more information relative to the LAN Bridge 100.

- *LAN Bridge 100 Installation/User's Guide* — EK-DEBET-UG
- *LAN Bridge 100 Technical Manual* — EK-DEBET-TM
- *DECconnect System Planning and Configuration Guide* — EK-DECSY-CG
- *Remote Bridge Management Software Guide* — AA-FY93A-TE
- *LAN Traffic Monitor User's Guide* — AA-JP16A-TE

Configuration

For message traffic purposes, LANs connected by bridges are considered one extended LAN. For configuration purposes, however, LANs connected by bridges are considered separate. Each of these LANs can be configured up to the normal maximums for length, number of stations, and other specifications. For further information about configuring bridges and LANs, see the *DECconnect System Planning and Configuration Guide.*

There are two versions of the LAN Bridge 100. One version is local bridge and the other remote bridge. The local LAN Bridge 100 (DEBET-AA or -AB) connects two LANs that are separated by less than 100 m (328 ft). This is the maximum combined length of the LAN Bridge 100 transceiver cables, each of which can be up to 50 m (164 ft). (See Figure 1.)

The remote LAN Bridge 100 (DEBET-RC or -RD) connects two LANs together through a transceiver cable and a fiber-optic cable. The fiber-optic cable connects to another remote bridge or to a remote repeater (DEREP-RC/RD). (See Figure 2.)

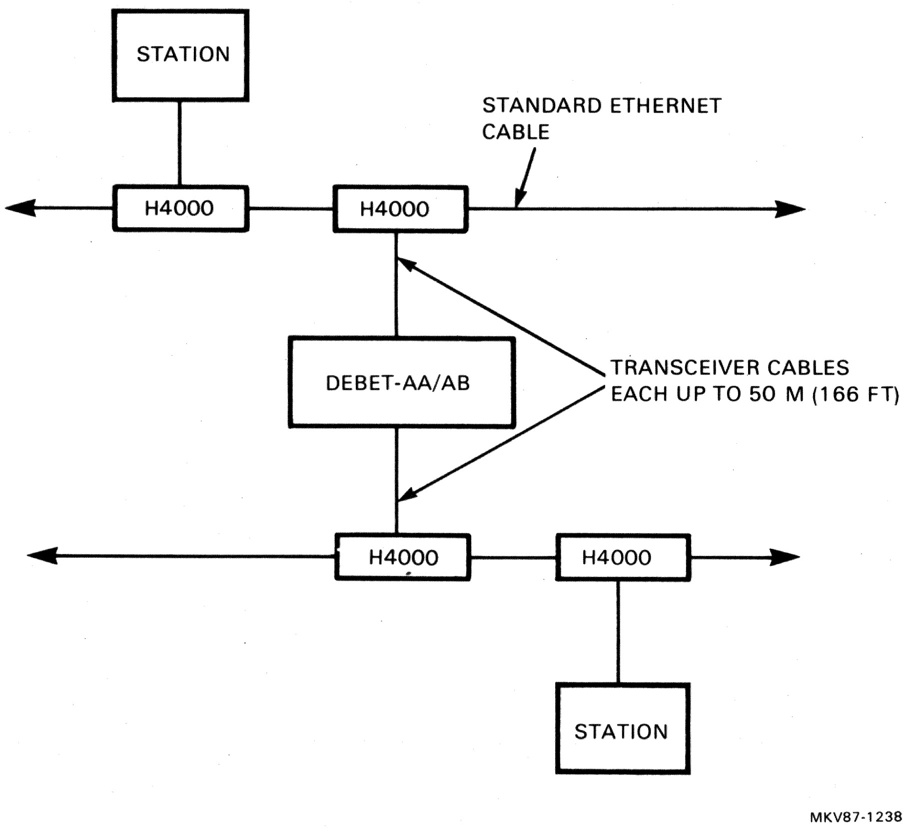


Figure 1 DEBET-AA or -AB Configuration

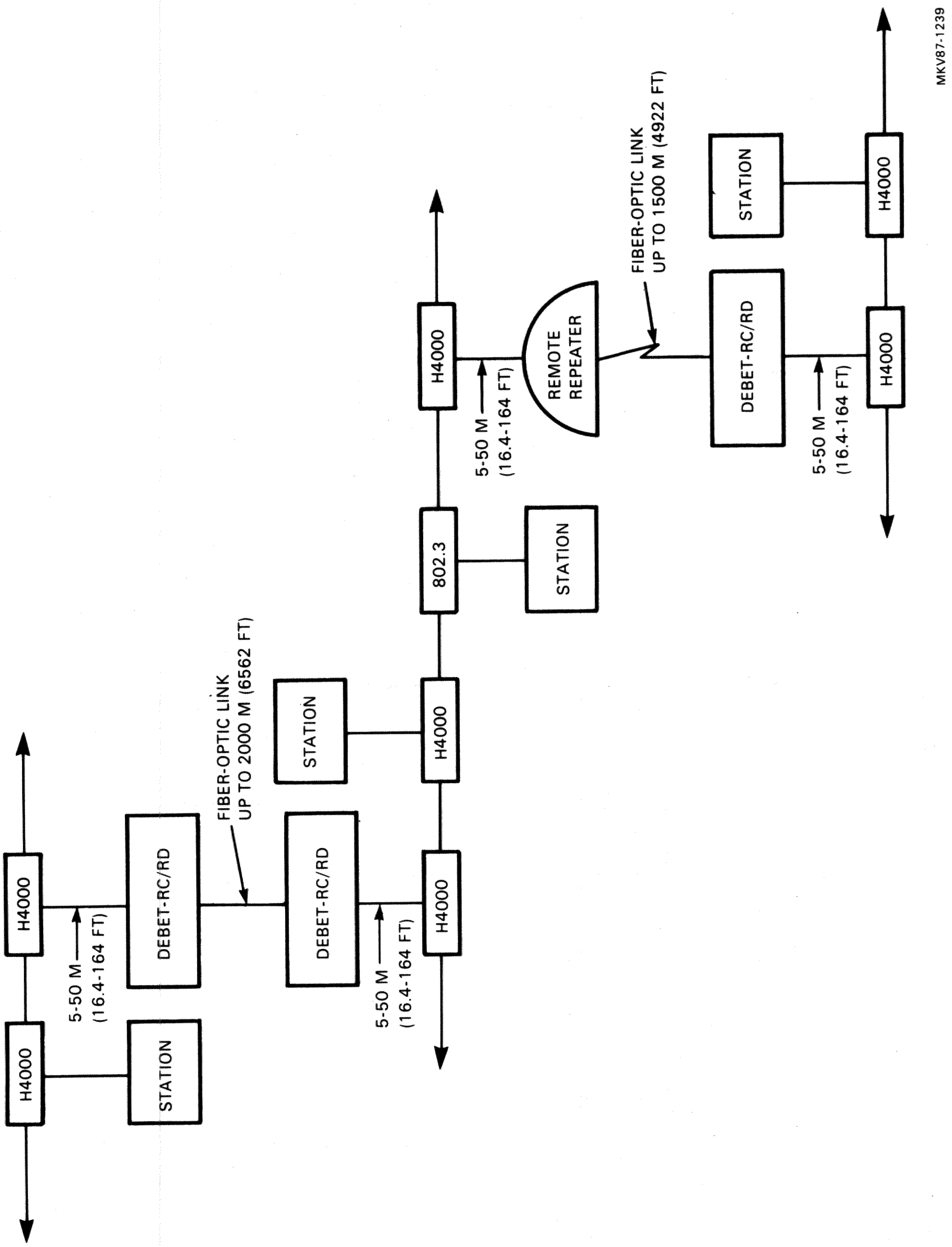


Figure 2 DEBET-RC or -RD Configuration

Transceiver cables connect to baseband transceivers (H4000), to local network interconnects (DELNI), or to broadband modems (DECOM). See Figure 3 for LAN Bridge 100 connections.

For a remote bridge-to-remote repeater link, up to 1500 m (4921.5 ft) of fiber-optic cable is allowed. Note that the length of the fiber-optic link depends on the total length of the network on the repeater side of the link (this length includes the fiber-optic cable between the bridge and the repeater). The maximum network length on the repeater side of the link is 2800 m (9186.8 ft). This includes the fiber-optic link up to the LAN Bridge 100. For more information on bridge-to-repeater configurations, see the *DECconnect System Planning and Configuration Guide.*

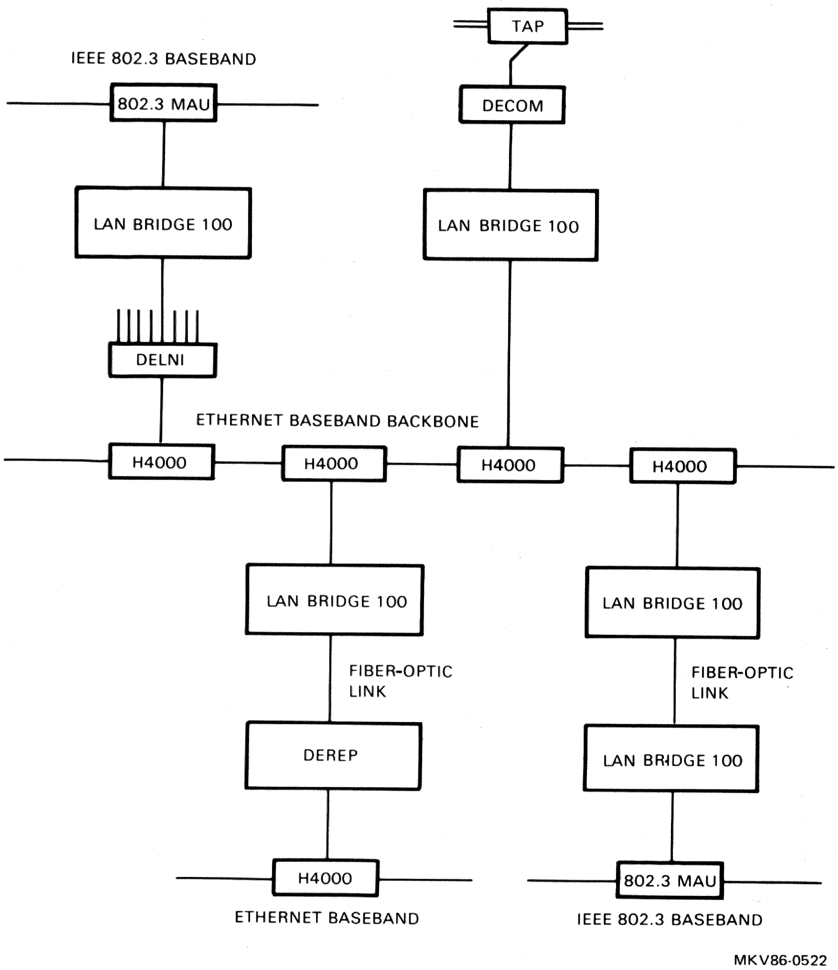


Figure 3 LAN Bridge 100 Connections

Fiber-Optic Cable Between Bridges
In a bridge-to-bridge configuration, the dual cable fiber-optic link that connects the bridges together does not affect the cable configuration guidelines of either of the LANs connected to the bridges. The length of fiber-optic cable between the two bridges must not exceed 2000 m (6562 ft).

CAUTIONS

1. **Follow the guidelines in the LAN Bridge 100 Technical Manual (EK-DEBET-TM, Appendix B). It is extremely important that the recommendations for optical budgets, derating factors, and fiber types are followed.**

2. **Exceeding the 2000 m (6562 ft) limit and/or exceeding the 12.5 dB loss limit will cause the bridge configuration to fail.**

To achieve these longer distances, particularly beyond 1500 m (4921.5 ft), the fiber-optic cable installation must be carefully planned. The type and quality of the cable's optical fiber, the cable repair strategy, and the cable's total end-to-end light loss are very important considerations when planning a successful bridge installation.

The end-to-end light loss depends on the quality of the fiber, the number and quality of the splices required for installation, and the number and quality of the connectors used. The cable repair strategy also affects the optical budget because damaged cables may be repaired. The repair typically consists of replacing a section of cable requiring two splices. The repaired link must remain under the end-to-end light loss budget. If the initial installation uses the entire budget, a repair would not be possible. Plan, therefore, for a minimum of two splices or 1.0 dB for repair.

For longer cable runs, or for installation requiring more splices, request a lower loss fiber-optic cable from the vendor. Cables with less than 5 dB/km (measured at 820 nm) are available. For more information on fiber-optic links see the *LAN Bridge 100 Technical Manual* (EK-DEBET-TM, Appendix B).

LAN Traffic Monitor Configurations

The LAN Traffic Monitor can be configured in several ways. In Figure 4 the LTM Listener always monitors Ethernet 2 and sends statistics to the LTM User Interface on Ethernet 2. Port B has a loopback connector installed and is not in operation. As long as the LAN Bridge 100 connects the two LANs, the Listener can send statistics to a User Interface on Ethernet 1.

NOTE
The LAN Bridge 100 will fail self-test if either port is left disconnected. A loopback connector must be connected to the unused port.

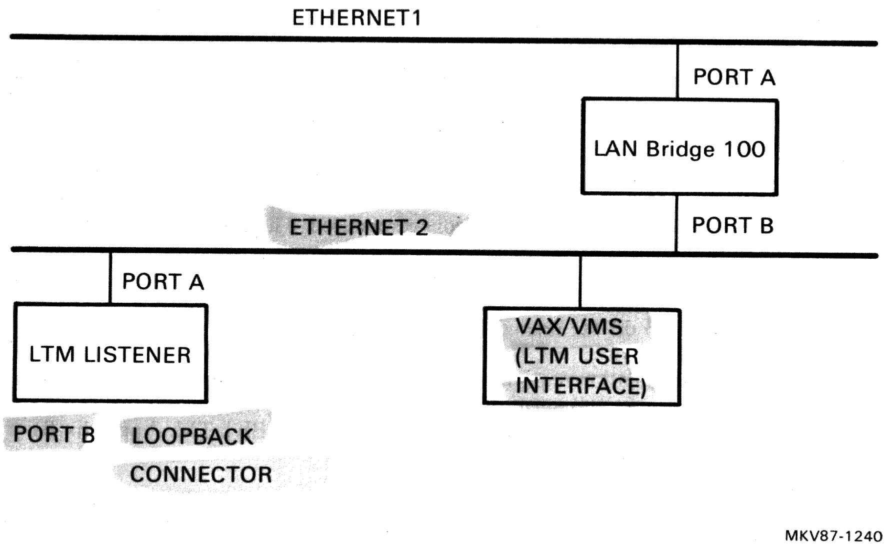


Figure 4 LAN Traffic Monitor Connected to One Port

Figure 5 shows the LTM Listener connected to two completely separate LANs. In this example, the LAN Traffic Monitor can monitor either Ethernet 1 or 2, but must report to the LTM User Interface on Ethernet 1.

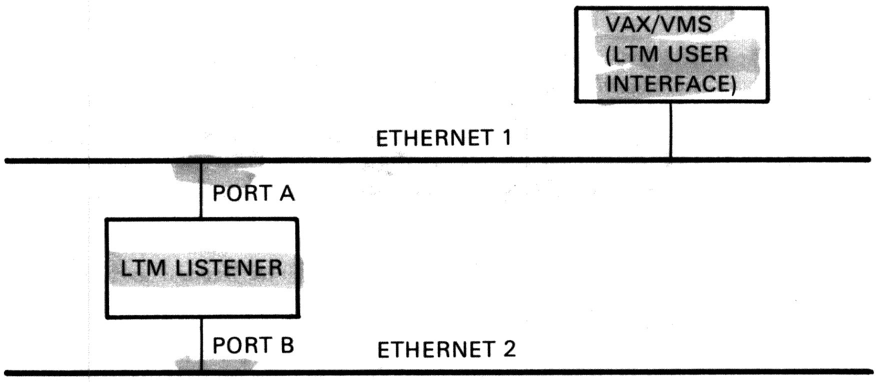


Figure 5 LAN Traffic Monitor Connected to Two Separate LANs

The configuration shown in Figure 6 shows two Ethernet LANs that are bridged together forming a single extended LAN. The LTM Listener can monitor either Ethernet 1 or 2 and can report on either port. It is recommended that the LTM Listener be configured to report on the port which has the least number of intervening bridges between it and the LTM User Interface host(s). Doing so will minimize the impact of a possible bridge failure.

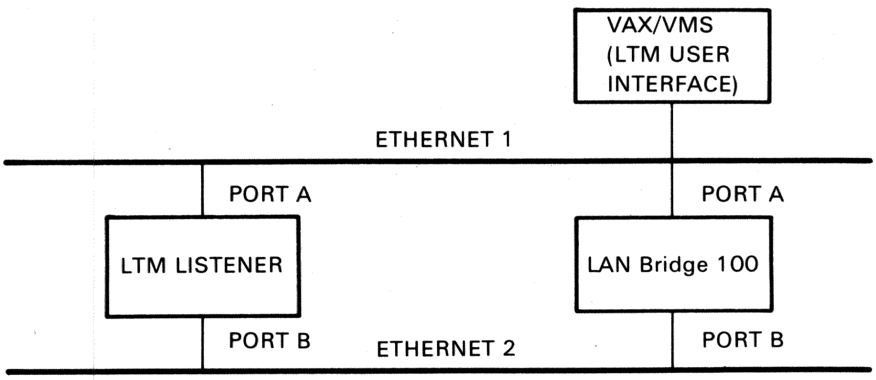


Figure 6 LAN Traffic Monitor on Two Connected LANs

When configured as an LTM Listener, down-line loading is enabled (either by remotely setting the NVRAM RESET switch to ENABLED with RBMS, or by setting hardware Switch 5 to the DOWN position). The unit then initiates a request for a down-line load of the LTM Listener software image from a load host. The down-line loading of the LTM Listener software image could take up to 2 minutes if the network is busy.

NOTE

If RBMS software is used to manage the LAN Traffic Monitor, be sure that the DOWN-LINE LOAD ENABLE switch (Switch 5, Figure 9) is set to the OFF position (UP=OFF). Setting this switch to the ON position (DOWN=ON) when not using RBMS software configures the unit as a LAN Traffic Monitor.

The LTM Listener has two modes of operation: **Waiting for a Start Request** and **Monitoring**. After power-on (or after a RESET command) the LTM Listener hardware is in the "Waiting for a Start Request" mode. This mode is identified by the On-Line indicator flashing at 2 second intervals. That is, it flashes twice, then waits 2 seconds before flashing twice again. During this waiting process, the LTM Listener listens to both Ethernet ports for a Start Request from an LTM host. The Start Request contains the initialization information for the LTM Listener and requests the Listener to begin monitoring.

After receiving a Start Request, the LTM Listener hardware enters the "monitoring" mode (identified by the On-Line indicator flashing once every second).

NOTE

If the On-Line indicator remains ON without blinking, it indicates that the unit is operating as a bridge, not as an LTM.

LAN Traffic Monitor Software

The basic software for installing and operating the LTM is as follows:

- LAN Traffic Monitor distribution software – Installed on each LTM load host.
- DECnet Phase IV software running on VAX Version 4.4 or later – Installed on each LTM load host.

The distribution software must be installed on a load host that runs DECnet Phase IV software and is connected to the same Ethernet segment as the LTM Listener. The distribution software includes an LTM Listener software image file that is down-line loaded to the LTM Listener.

LAN Traffic Monitor Functions
When the LAN Bridge 100 is configured to operate as a LAN Traffic Monitor, the LTM Listener software image must be down-line loaded from a load host. The LTM does not operate without software.

If RBMS software is used to remotely manage the LTM, ensure that the DOWN-LINE LOAD ENABLE switch, Switch 5 (see Figure 9), is set to the OFF position (UP=OFF). This will allow automatic down-line loading requests. With Switch 5 in this position, the LAN Bridge 100 cannot operate as a bridge. RBMS software overrides the hardware switch setting and can remotely configure the unit between operation as an LTM or LAN Bridge 100.

Whenever power is applied to the LAN Bridge 100, the DC OK indicator illuminates and the unit performs a diagnostic self-test. The diagnostic self-test normally takes about 20 seconds to complete and, if successful, causes the Self-Test OK indicator to illuminate.

LAN Bridge 100 Component List
The following parts are supplied with each bridge.

Table 1 LAN Bridge 100 Parts List

Description	Part Designation
Local Bridge: DEBET-AA and -AB	LAN Bridge 100 Loopback Connectors 2 each (12-22196-01) Mounting Brackets Screws Power Cord *DEBET Installation/User's Guide*
Remote Bridge: DEBET-RC and -RD	LAN Bridge 100 Loopback Connectors 1 each (12-22196-01) Mounting Brackets Screws Power Cord *DEBET Installation/User's Guide*

System Placement
The LAN Bridge 100 can be located in any convenient location. Typical locations might include a:

- Shelf,
- Table,
- Rack mount assembly, or
- Wall mount assembly.

Power Requirements
The LAN Bridge 100 operates on ac power, 47 to 63 Hz. A voltage select switch is used to select operation from 120 Vac or 240 Vac.

The LAN Bridge 100 draws 1.6 A at 120 Vac and 0.9 A at 240 Vac.

Installation Flow Diagram

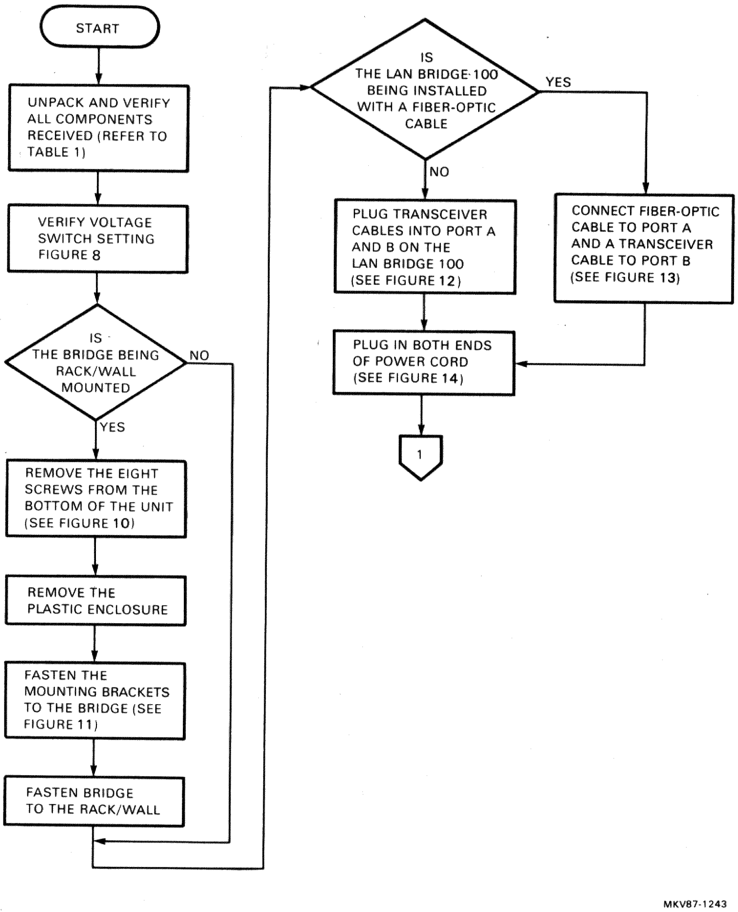


Figure 7 LAN Bridge 100 Installation Flow Diagram (Sheet 1 of 8)

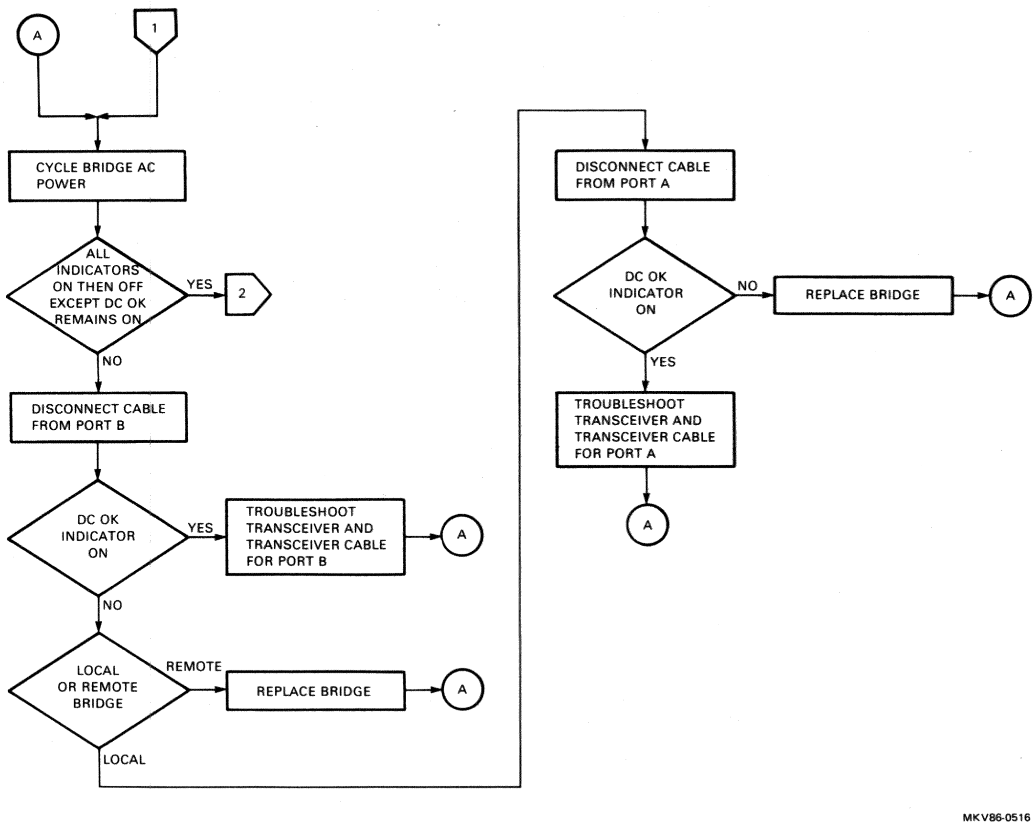


Figure 7 LAN Bridge 100 Installation Flow Diagram (Sheet 2 of 8)

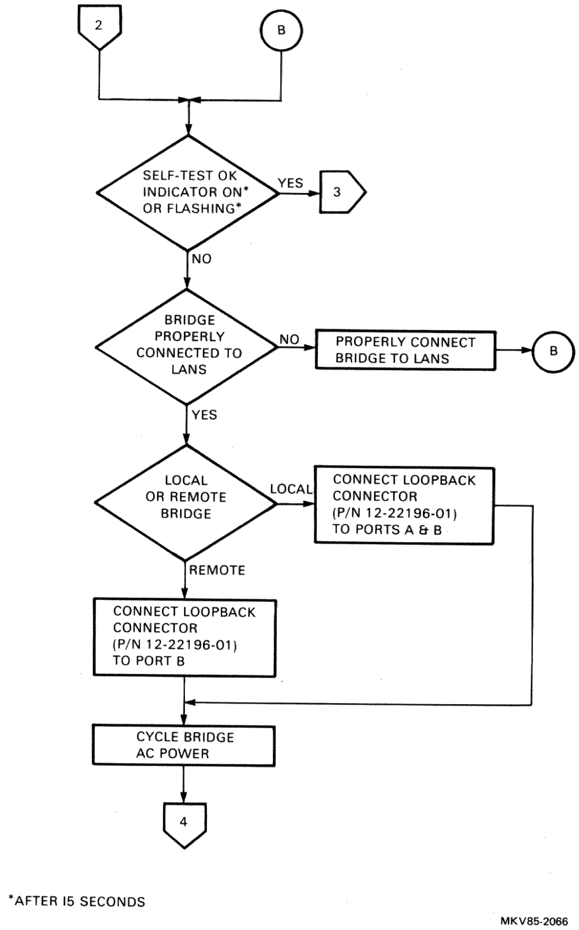


Figure 7 LAN Bridge 100 Installation Flow Diagram (Sheet 3 of 8)

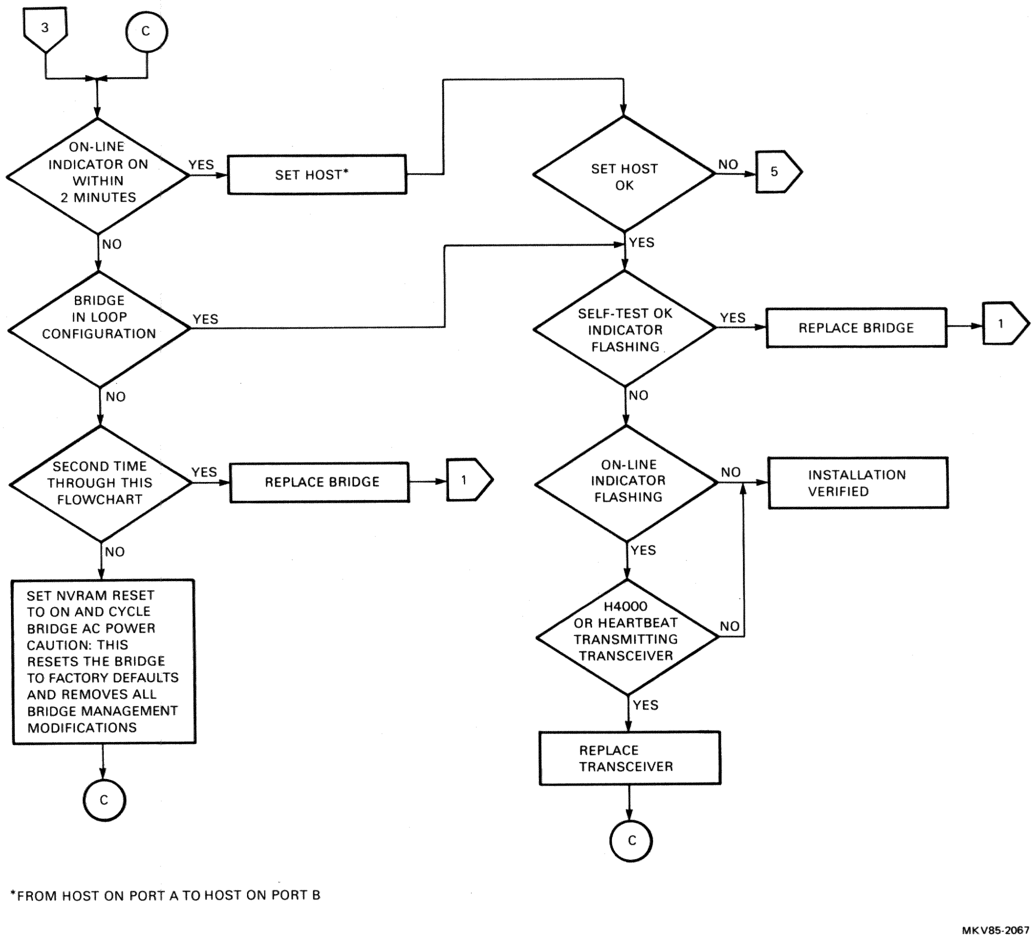


Figure 7   LAN Bridge 100 Installation Flow Diagram (Sheet 4 of 8)

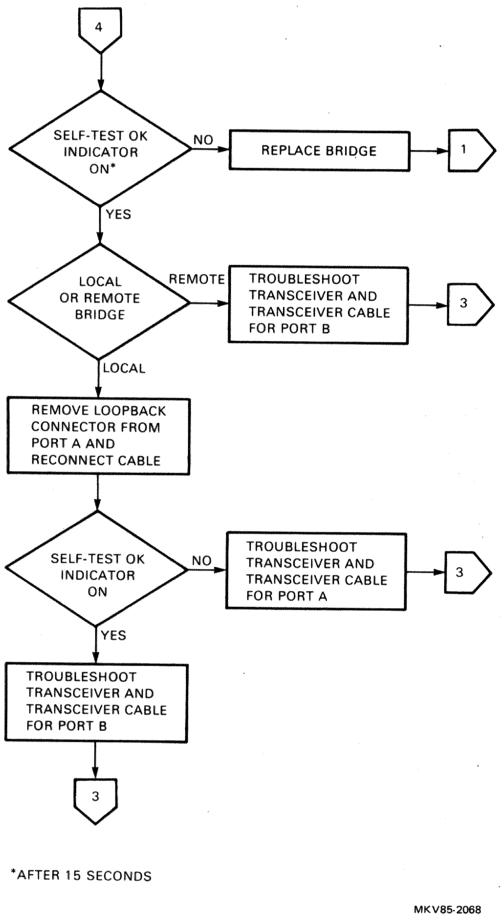


Figure 7 LAN Bridge 100 Installation Flow Diagram (Sheet 5 of 8)

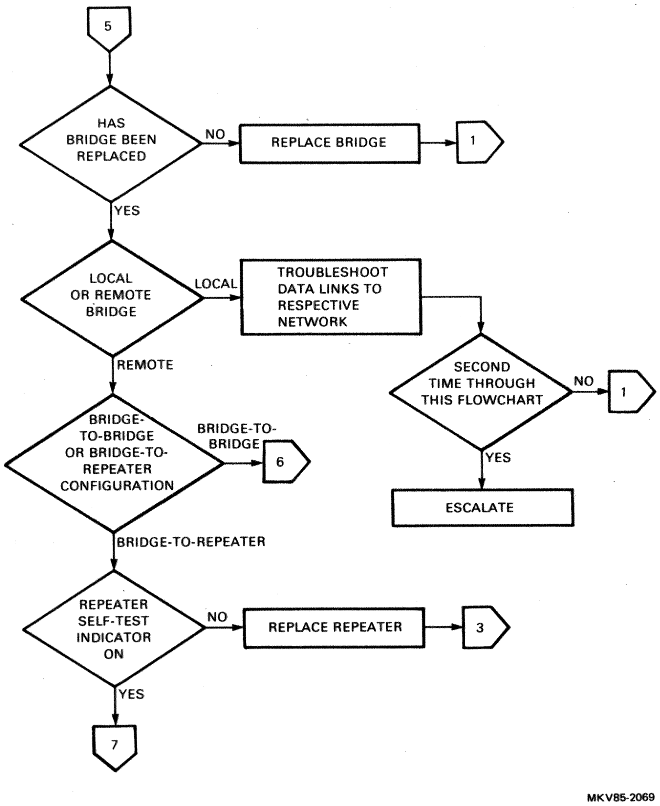


Figure 7 LAN Bridge 100 Installation Flow Diagram (Sheet 6 of 8)

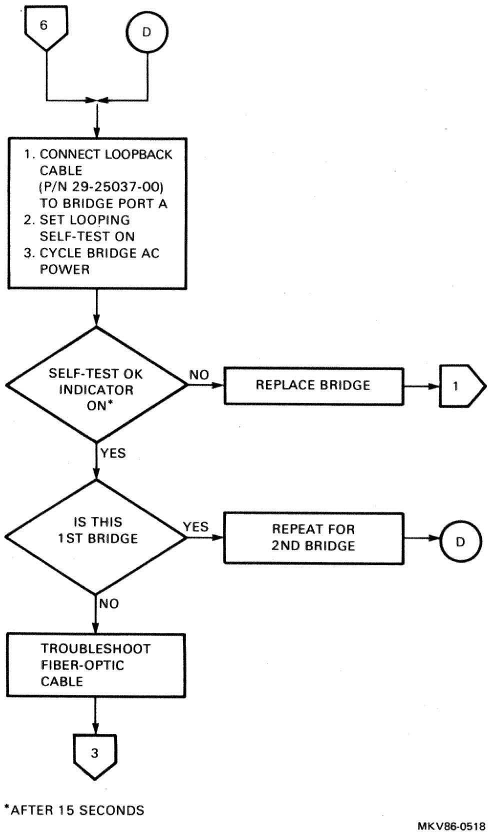


Figure 7 LAN Bridge 100 Installation Flow Diagram (Sheet 7 of 8)

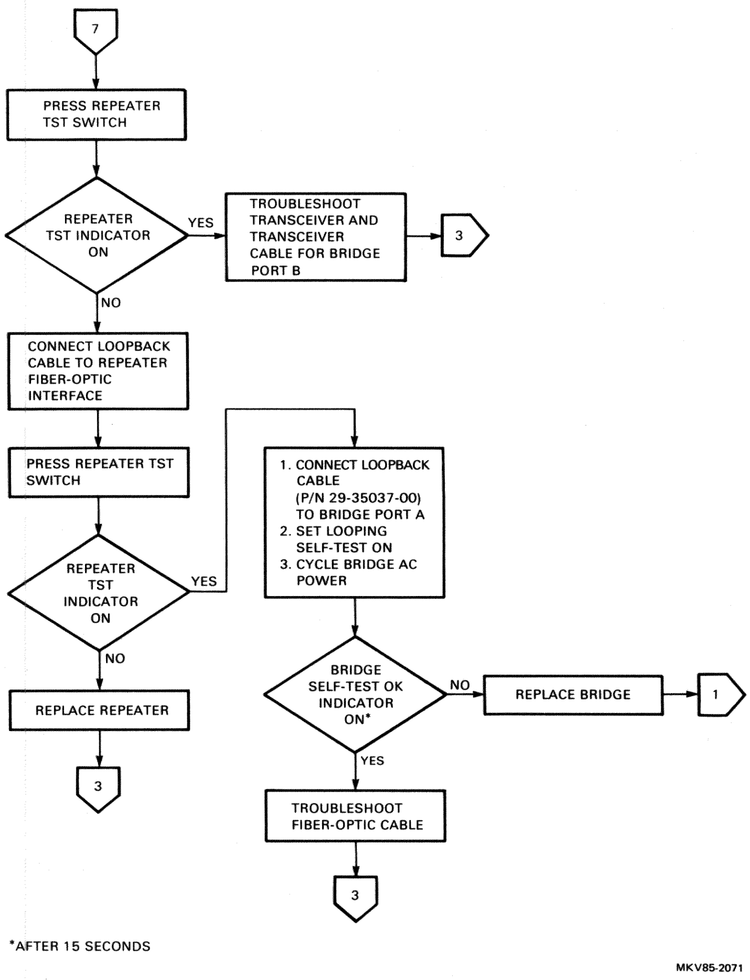


Figure 7 LAN Bridge 100 Installation Flow Diagram (Sheet 8 of 8)

Table 2 Bridge Indicators

	MEANING		
Name	**ON Steady**	**OFF**	**Blinking**
Selftest	Passed self-test	Running or failed self-test	NVRAM* Failed and should be replaced.
On-line	Bridge is fully operational and forwarding messages	Bridge is in INIT, Preforwarding, Backup, or Broken states	Bridge is not receiving a collision test signal**
			Flashes for 2 seconds, then waits 2 seconds before flashing again. The LTM Listener hardware is in "Waiting for a Start Request" mode.
			After receiving a Start Request, the LTM Listener hardware enters the "Monitoring" mode, identified by the On-Line indicator flashing once every second.
Port A Activity	Heavy message activity on Port A	No message traffic on Port A; failure exists	Light message activity on Port A. Bridge is checking for loops once per second.
Port B Activity	Heavy message activity on Port B	No message traffic on Port B; failure exists	Light message activity on Port B. Bridge is checking for loops once per second.
DC OK	Internal power supply *is* functioning properly	Internal power supply *is not* functioning properly	N/A

* NVRAM stores network pointers and parameters set by RBMS so they will not be lost during a power failure.

**If connected to a transceiver transmitting heartbeat, the blinking indicates that the transceiver should be repaired. For transceivers that do not transmit the collision test signal, the blinking is normal.

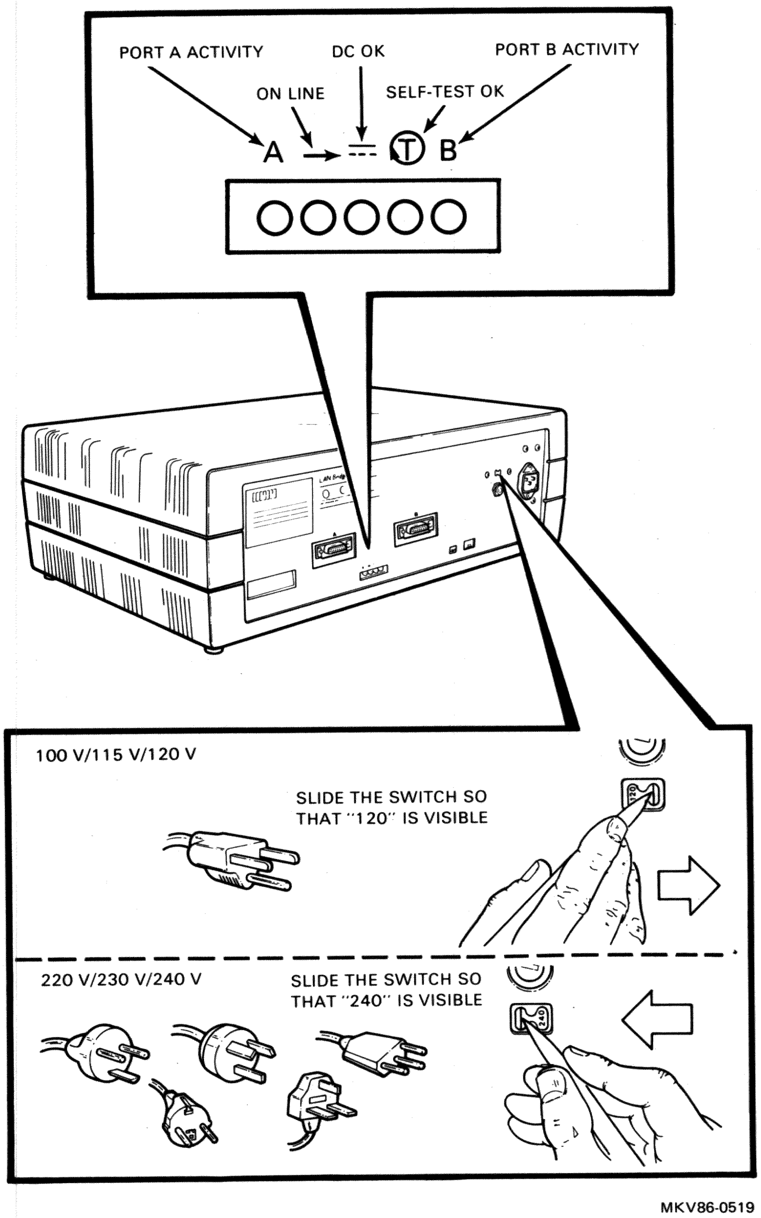


Figure 8 LAN Bridge 100 Indicators

Table 3 Bridge Switches

Num	Name	FUNCTION ON/Down	OFF/Up
1	Loop Selftest	Bridge continuously loops self-test to test remote bridge fiber-optic interface. Fiber-optic looping cable must be installed.*	Remote bridge fiber-optic interface not tested. Normal self-test is run through Ports A and B.
2	NVRAM Reset	NVRAM resets to factory default settings when bridge is powered ON. This removes all bridge management configuration changes.	Prevents NVRAM from resetting when bridge is powered ON. This setting should be used to prevent parameters stored by RBMS from being lost during a power failure.
3	Port A Access	Nodes with bridge management capability on the LAN connected to Port A can WRITE to the bridge.	Prevents bridge management WRITE access from nodes on the LAN connected to Port A.
4	Port B Access	Nodes with bridge management capability on the LAN connected to Port B can WRITE to the bridge.	Prevents bridge management WRITE access from nodes on the LAN connected to Port B.
5	Down-Line Load Enable	Loading of the software image from a load host is enabled. (Unit cannot be configured as a LAN Bridge 100.)	RBMS software may override this hardware switch setting and can remotely configure the unit between operation as an LTM and a bridge. Normal power-up will place the unit in LAN Bridge 100 configuration mode.
6	Not Used	–	–

*If the Loop Selftest switch is ON "down" the local bridge will not operate.

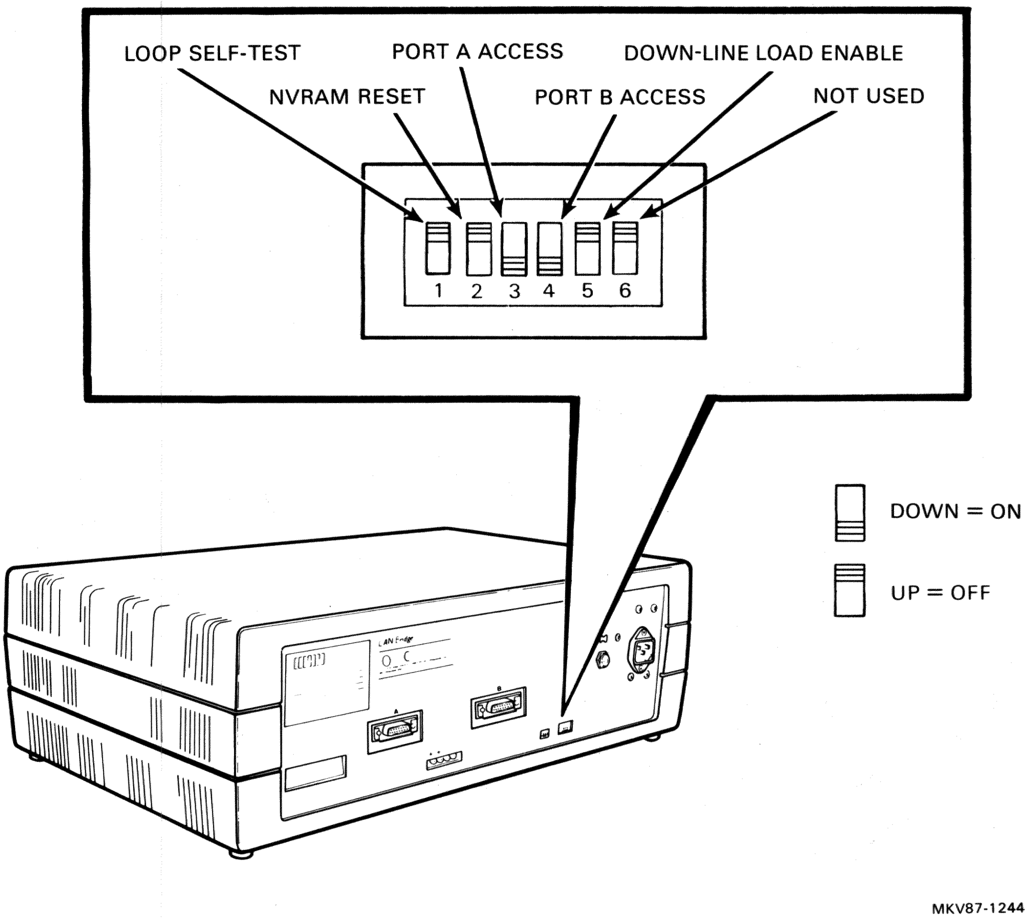


Figure 9 LAN Bridge 100 Switches

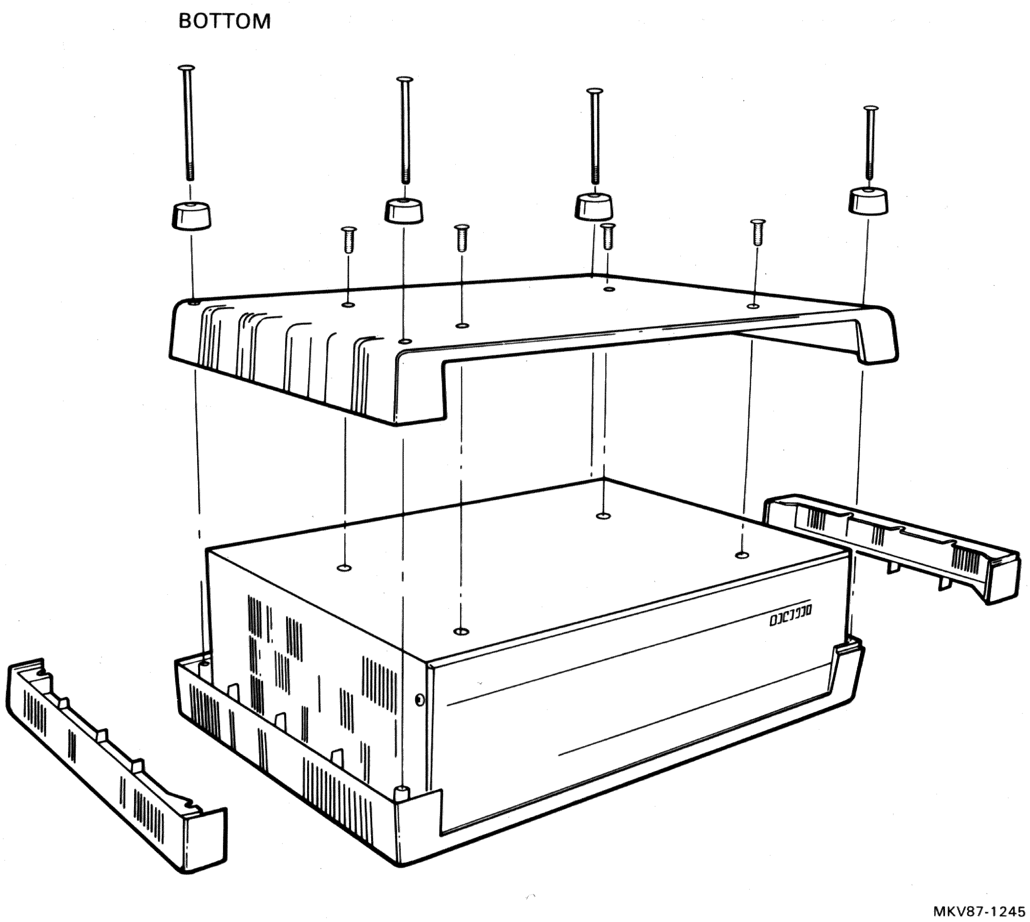
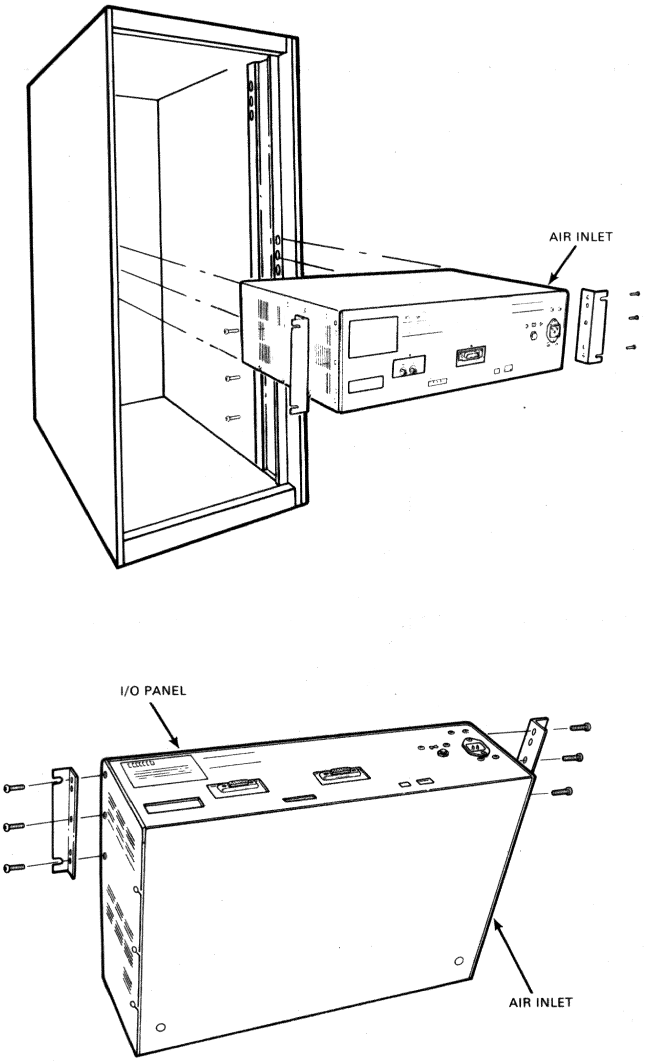


Figure 10 LAN Bridge 100 Table Top Enclosure



NOTE:
BRACKETS ARE SUPPLIED. THE MOUNTING HARDWARE MUST BE OBTAINED SEPARATELY.

NOTE:
THE I/O PANEL CANNOT BE MOUNTED FACE DOWN. THE PREFERRED METHOD IS TO MOUNT THE I/O PANEL FACING UP.

MKV86-0529

Figure 11 LAN Bridge 100 Rack Mount and Wall Mount Bracket Attachment

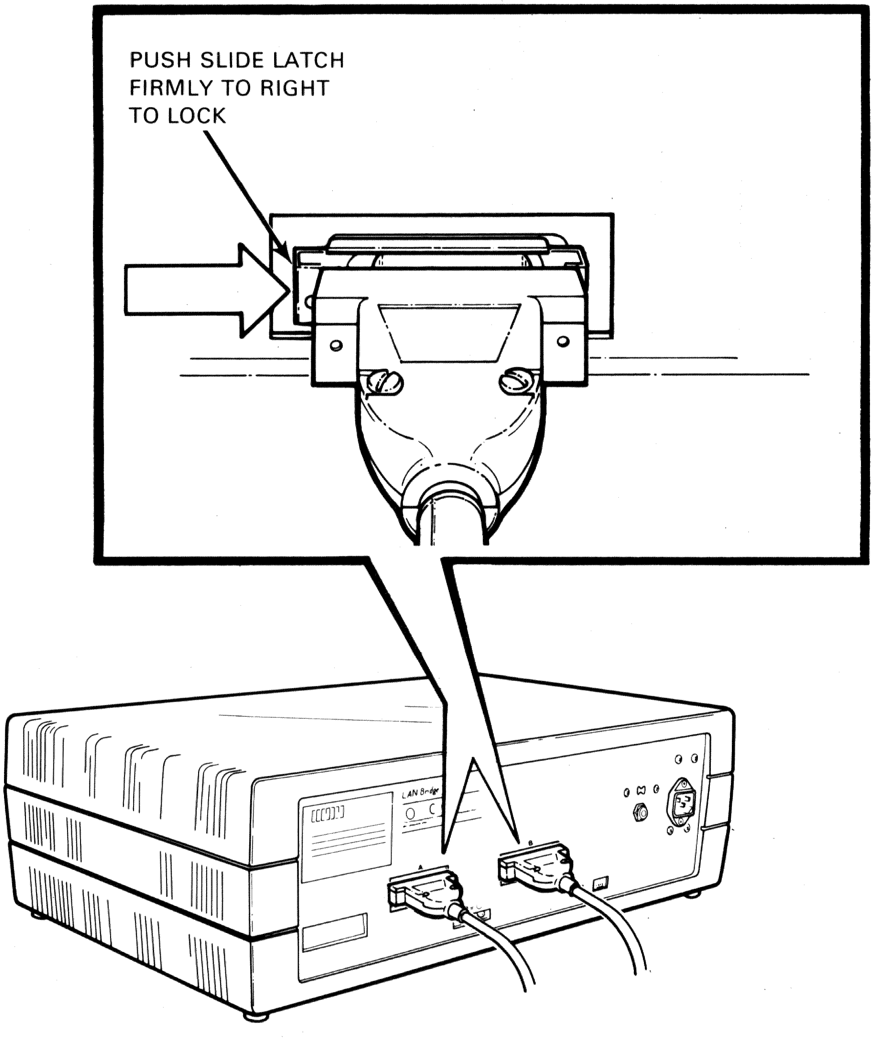


Figure 12 Transceiver Cable Connections

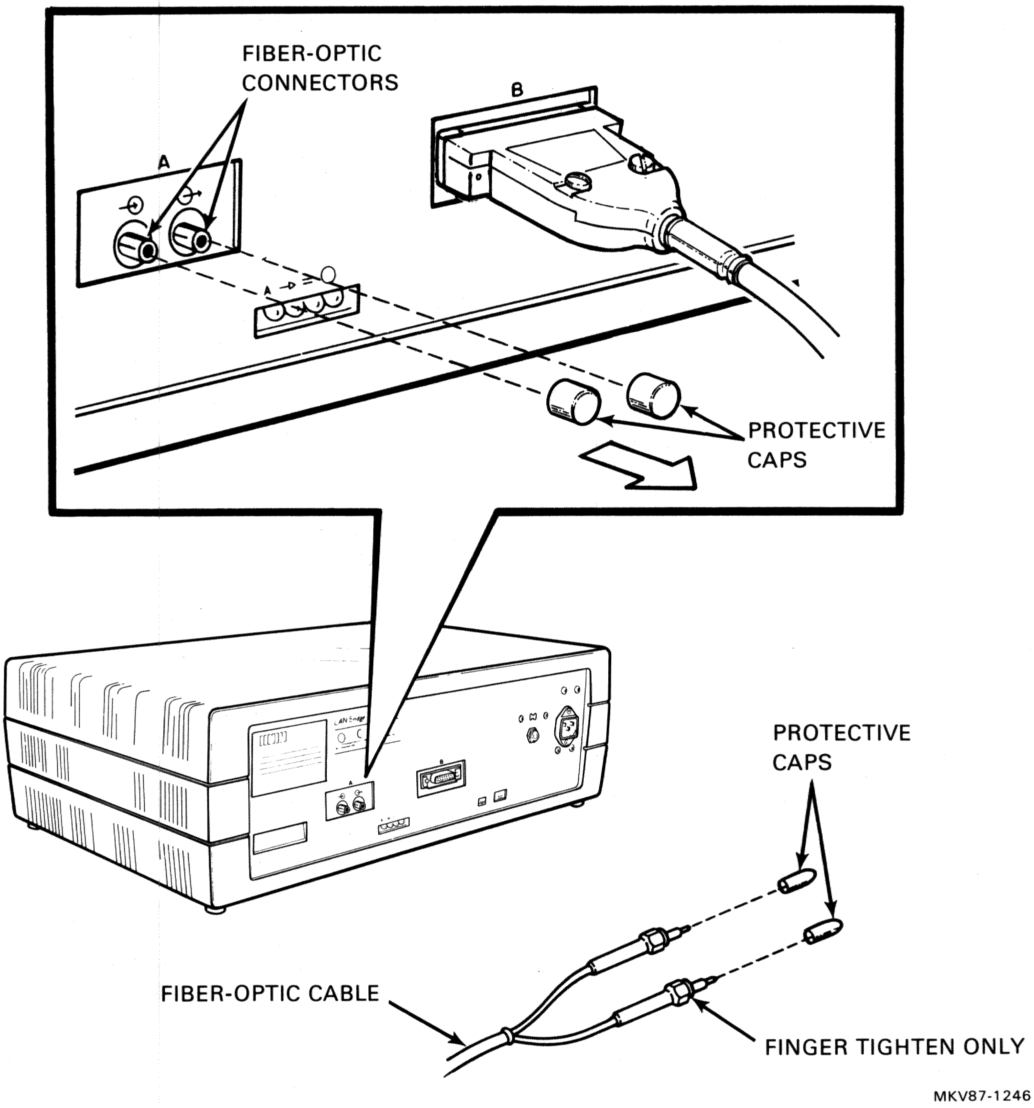


Figure 13 Fiber-Optic Cable Attachment

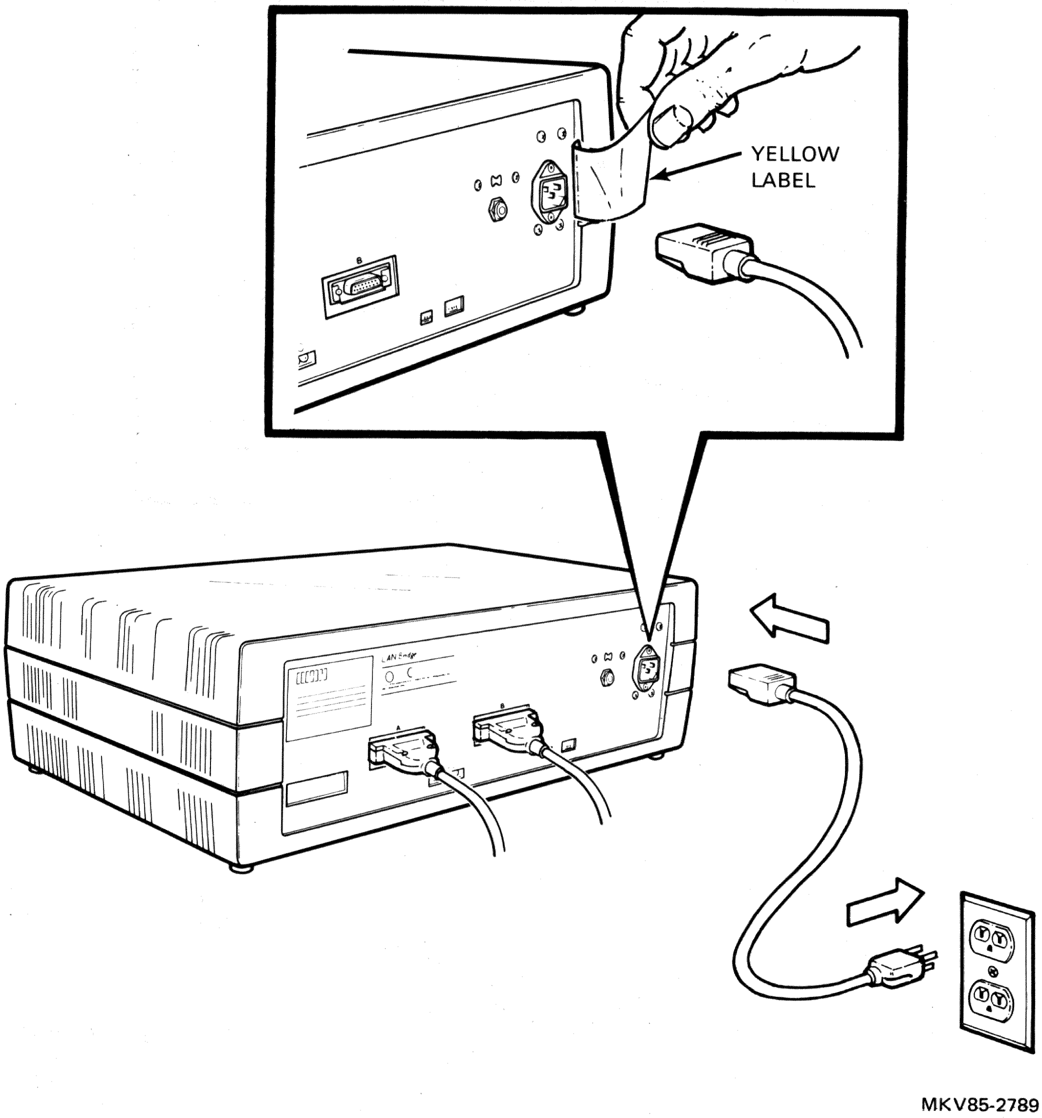


Figure 14 Power Cord Attachment

Cabling

Digital Equipment Corporation sells the BN25B-xx and BN25C-xx fiber-optic cables. These are indoor, general purpose, dual-fiber cables using Corning 1508 type optical fiber. The BN25C-xx cable is not recommended for use with the bridge because of the lower bandwidth (100 MHz) optical fiber used in its construction. The BN25B-xx cable cannot be exposed in an environmental airspace or used outdoors. Digital Equipment Corporation does *not* sell a cable that can be used in outdoor applications. For assistance contact the local DIGITAL Network Design Service.

Fiber-optic cable:

Type:	Corning 1508* (100/140 micron)
Minimum Bandwidth:	300 MHz measured at a wavelength of 820 nm

Fiber-optic connectors:

Type:	Stainless steel, Amphenol 906* type, SMA style, or equivalent
Maximum Attenuation:	Less than 1.5 dB.

Refer to the discussion of fiber-optic cables between bridges in the "Configuration" section for more information concerning loss budget and distance limitations, and to the *LAN Bridge 100 Technical Manual* (EK-DEBET-TM, Appendix B).

---

*Corning 1508 is manufactured by Corning Glass Works.
Amphenol 906 is manufactured by Amphenol, An Allied Company.

Diagnostics
There are no diagnostics designed specifically for the LAN Bridge 100.

LAN Bridge 100 Field Replaceable Units (FRUs)
When the LAN Bridge 100 is suspected of any malfunctions, the *entire* bridge unit should be replaced.

Equipment Required

- Controlled Distribution (CD) spares kit which includes two transceiver looping connectors and a fiber-optic cable for testing purposes.
- The transceiver looping connectors are used to isolate the bridge from transceiver cables and the rest of the network.
- The fiber-optic looping cable replaces the standard fiber-optic cable for off-line testing of the bridge in a fiber-optic link.

Table 4 Controller Distribution Spares Kit

Description	Kit Part Number
Local 115 Vac 60 Hz	A2-W0948-10
Local 240 Vac 50 Hz	A2-W0948-11
Remote 115 Vac 60 Hz	A2-W1043-10
Remote 240 Vac 50 Hz	A2-W1043-11

Optional Equipment

An H4080 test connector replaces the on-line transceiver for off-line self-testing of the bridge. The looping connector supplied with the unit performs the same function as the H4080 connector except that it does not check heartbeat.

NOTE
The H4000-TA can be used to test repeaters but cannot be used to test bridges.

Troubleshooting Flow Diagram
Use the installation flowchart to troubleshoot the bridge.

MUXserver 100 REMOTE TERMINAL SERVER

General Description

The MUXserver 100 is a high performance, low cost, remote terminal server for use on an Ethernet Local Area Network (LAN). It allows up to 16 remote terminals to connect to computer systems on the Local Area Network by means of a public data network as shown in Figure 2. The terminals are physically connected to two DECmux II units which may be at separate remote geographic locations. Each DECmux II communicates with a MUXserver 100 through a statistically multiplexed synchronous communications link provided by RS-232-C synchronous modems and the public data network. (This link is referred to throughout this section as the COMPOSITE LINK). RS-422 long-line drivers are also provided for local links. Each remote terminal appears to have direct connection to the computer systems and resources available on the local area network.

The server offers four major advantages:

1. It provides terminal access to an Ethernet Local Area Network.
2. It permits fast, easy connections between terminals and computer systems on the network.
3. It manages terminal traffic and leaves computer systems with more time for application tasks.
4. It reduces and simplifies cabling required for terminal connections.

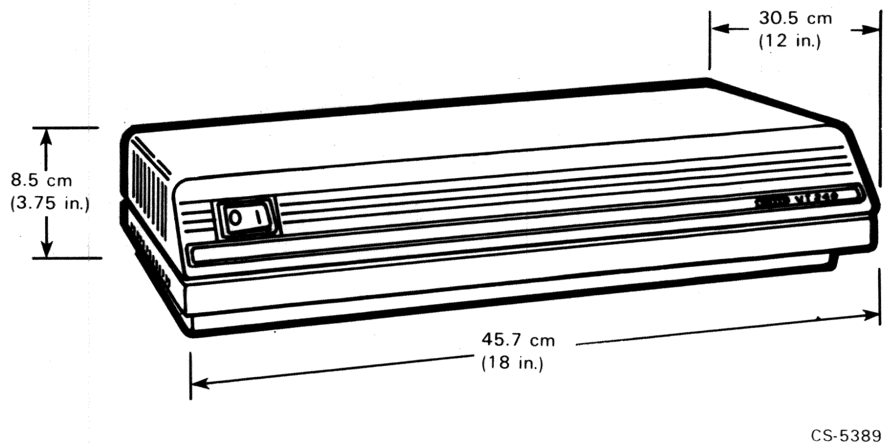


Figure 1 MUXserver 100 Remote Terminal Server

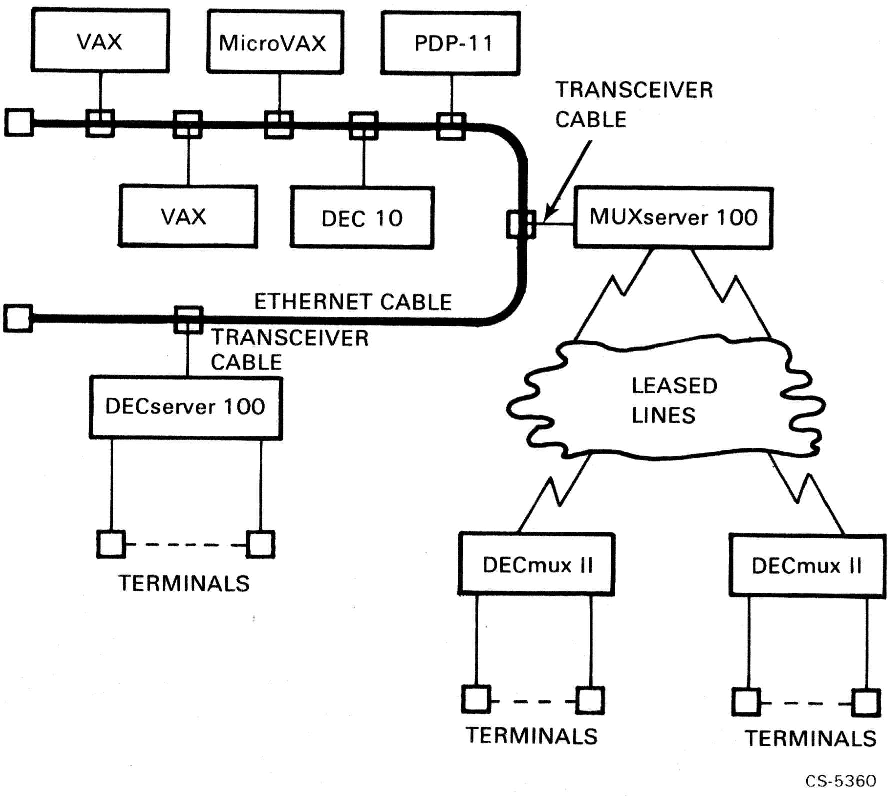


Figure 2 Local Area Network (LAN)

Product Configuration
There are two default configurations available on the MUXserver 100. The MUXserver 100 determines the configuration selected based on the composite link connection.

Configuration Number 1 –

- All composite links are factory preset to 9600 baud, RS-232-C, full-duplex modem.
- All asynchronous lines are factory preset to 9600 baud, eight bits, no parity, and one stop bit.
- A partial configuration consisting of either DECmux II is also quite acceptable.

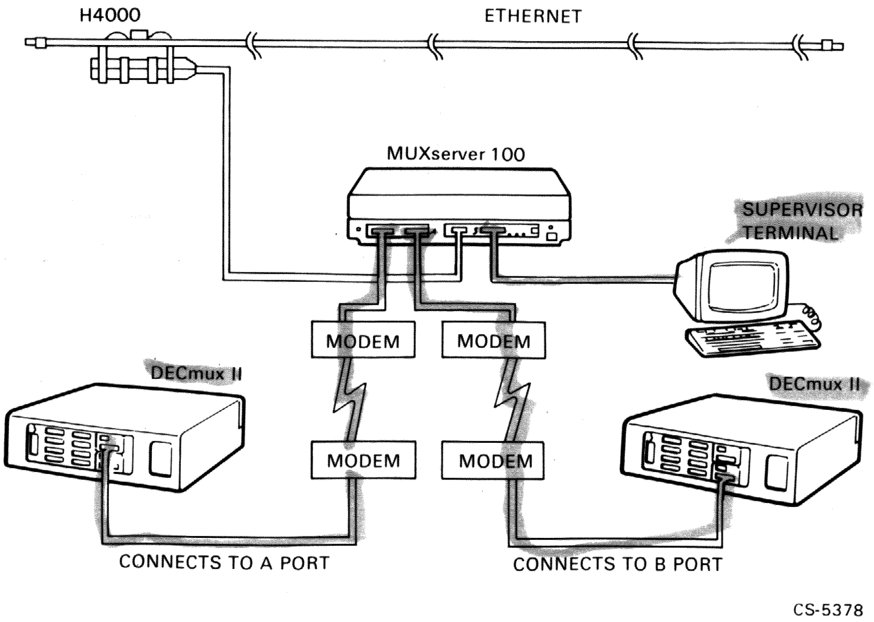


Figure 3 Default Multiplexer Configuration Number 1

Configuration Number 2 –

- All composite links are factory preset to 9600 baud, RS-232-C, full-duplex modem.
- All asynchronous lines are factory preset to 9600 baud, eight bits, no parity, and one stop bit.

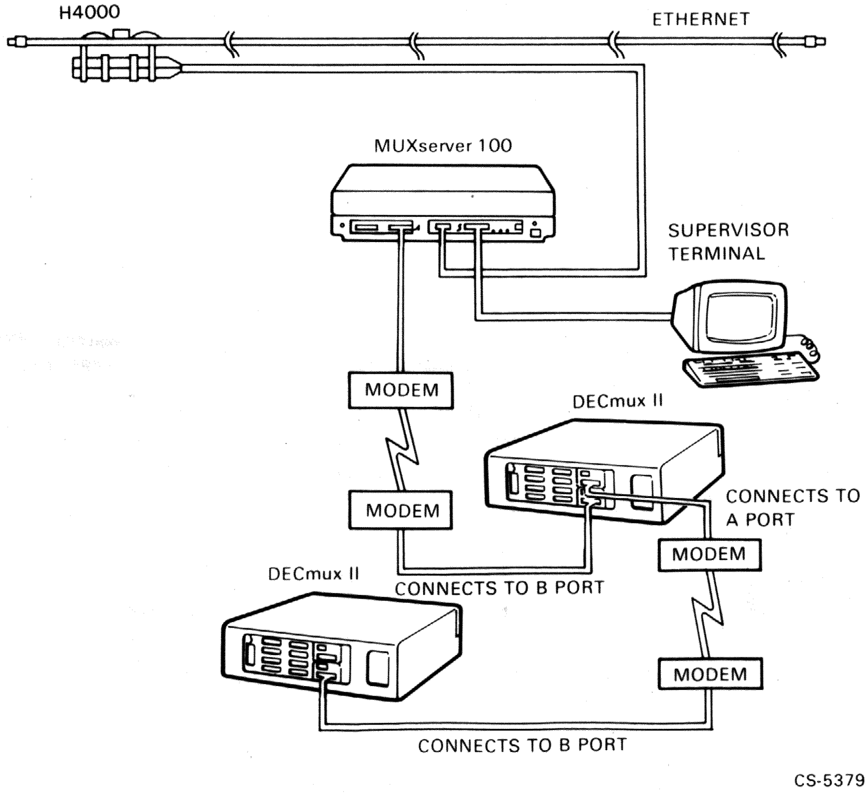


Figure 4 Default Multiplexer Configuration Number 2

MUXserver Versions
The MUXserver is available in two versions (DSRZA-BA and DSRZA-BB). Each version has different power requirements.

Model	Input Voltage
DSRZA-BA	100 – 120 Vac
DSRZA-BB	220 – 240 Vac

Reference Documentation
Refer to the following documents for more information on the MUXserver 100 remoter terminal server.

• *MUXserver 100 Remote Terminal Server Software Installation Guide (VMS/MicroVMS)*	AA-JC20A-TE
• *MUXserver 100 Remote Terminal Server Software Installation Guide (RSX-11M-PLUS)*	AA-JC19A-TC
• *MUXserver 100 Remote Terminal Server Software Installation Guide (Micro/RSX)*	AA-JS34A-TY
• *MUXserver 100 Remote Terminal Server Software Installation Guide (ULTRIX-32/32m)*	AA-JQ09A-TE
• *MUXserver 100 Network Reference Manual*	EK-DSRZA-RM
• *MUXserver 100 Network Installation Manual*	EK-DSRZA-IN
• *MUXserver 100 User's Pocket Guide*	EK-DSRZA-PG
• *MUXserver 100 Network Identification Card*	EK-DSRZA-ID
• *LAT Network Manager's Guide*	AA-DJ18A-TK

Hardware Components
The MUXserver 100 package consists of:

- MUXserver 100 hardware unit – DSRZA-BA or DSRZA-BB
- Country kit – correct power cord, pocket guide, network reference manual, identification card, and installation guide
- RS-422 test cable

The accessories that *are* available with the MUXserver 100 package are:

- Transceiver cable (BNE3C-xx)
- Data terminal cables (BC22D)
- Ethernet transceiver (H4000 or optional H4005)
- Etherjack junction box (optional)
- Synchronous modems (for example; DF124)

The quantities and types of accessories depend on the option ordered.

Software Components
MUXserver 100 operation requires four software packages:

1. Server software installed on at least one load host.
2. DECnet Phase IV software installed on at least one load host.
3. LAT service node software installed on all service nodes.
4. LAT/Plus service node software installed on service node to provide remote printer support (VMS systems only).

The server software kit contains the operational software and the LAT/Plus host software (if required) for service nodes. All software must be installed, verified, and operating properly before the server can be operated.

Table 1 MUXserver 100 Software

Operating System Software	How LAT Service Node Software is Packaged
VMS Version 4.0 or 4.1	LAT software is included with the VMS operating system.
VMS Version 4.2 or later	LAT software is included with the VMS operating system. LATplus/VMS Version 1.0 or later is included with the MUXserver 100 Version 2.0 distribution and documentation kit.
ULTRIX-32 V1.2 ULTRIX-32m V1.2	LAT software is included with the ULTRIX-32/ULTRIX-32m operating system.
RSX-11M-PLUS Micro/RSX	LAT software is included with the RSX-11M-PLUS and Micro/RSX operating systems.

Equipment Placement
The MUXserver 100 can be located in a variety of environments, including offices and computer rooms, and can be stacked in multiple unit installations.

Environmental Requirements

Temperature	5° to 50°C (41° to 122°F)
Relative Humidity	10% to 95% (noncondensing)

Terminals
The following is a partial list of DIGITAL video and hard copy terminals that can be used. The MUXserver 100 supports VT100/VT200 compatible terminals at speeds up to 19200 bits per second. All ports are compatible with EIA RS-232-C electrical connections and support XON/XOFF or DTR/DTS flow control.

VT52	LA12	LA38	Professional series
VT100 series	LA34	LA100	DECmate II
VT200 series	LA36	LA120	Rainbow series

Physical Description

Length	45.7 cm (18 in)
Width	30.5 cm (12 in)
Height	8.5 cm (3.75 in)
Weight	6.8 kg (15 lbs)

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

Table 2 DSRZA Power Requirements

Version	Nominal Voltage Required	Voltage Range	Current	Frequency
-BA	120 Vac	100–120	0.5 A	50/60 Hz
-BB	240 Vac	220–240	0.3 A	50/60 Hz

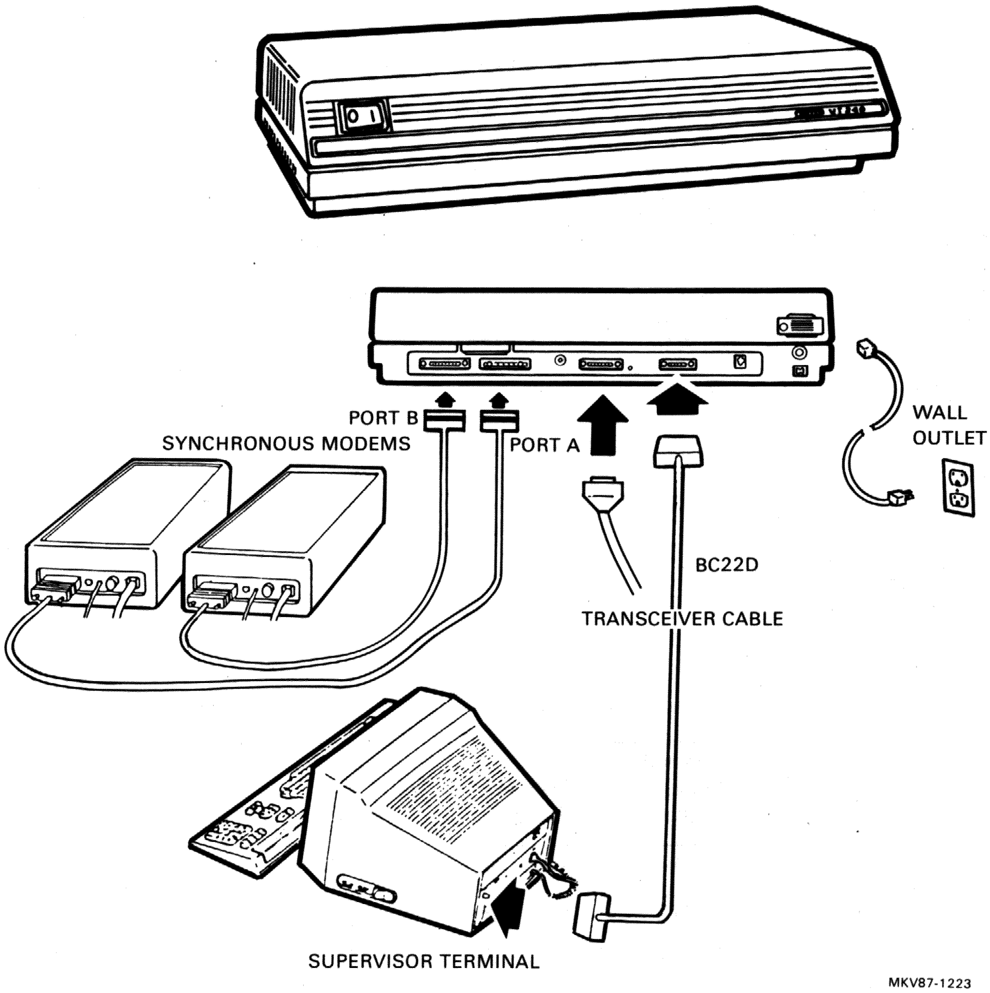


Figure 5 Front and Rear Panels of the MUXserver 100

Installation Flow Diagram

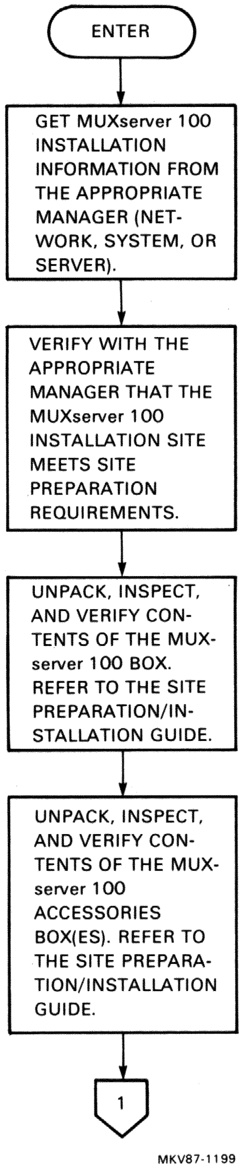


Figure 6 Installation Flow Diagram (Sheet 1 of 3)

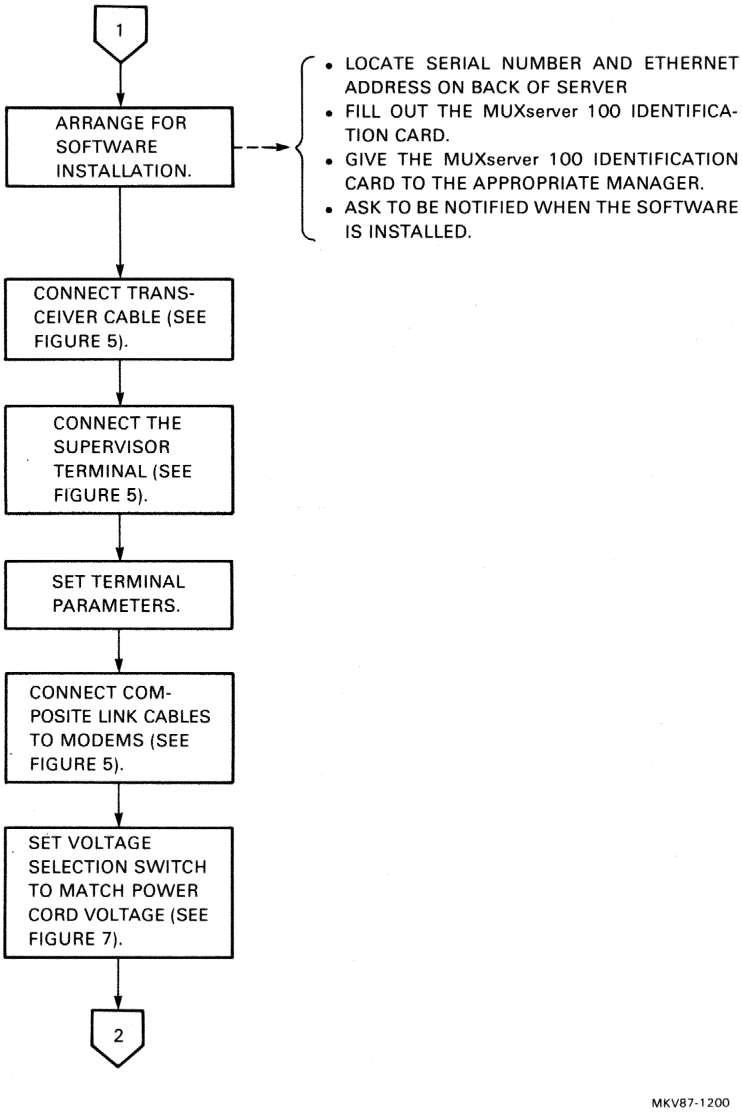


Figure 6 Installation Flow Diagram (Sheet 2 of 3)

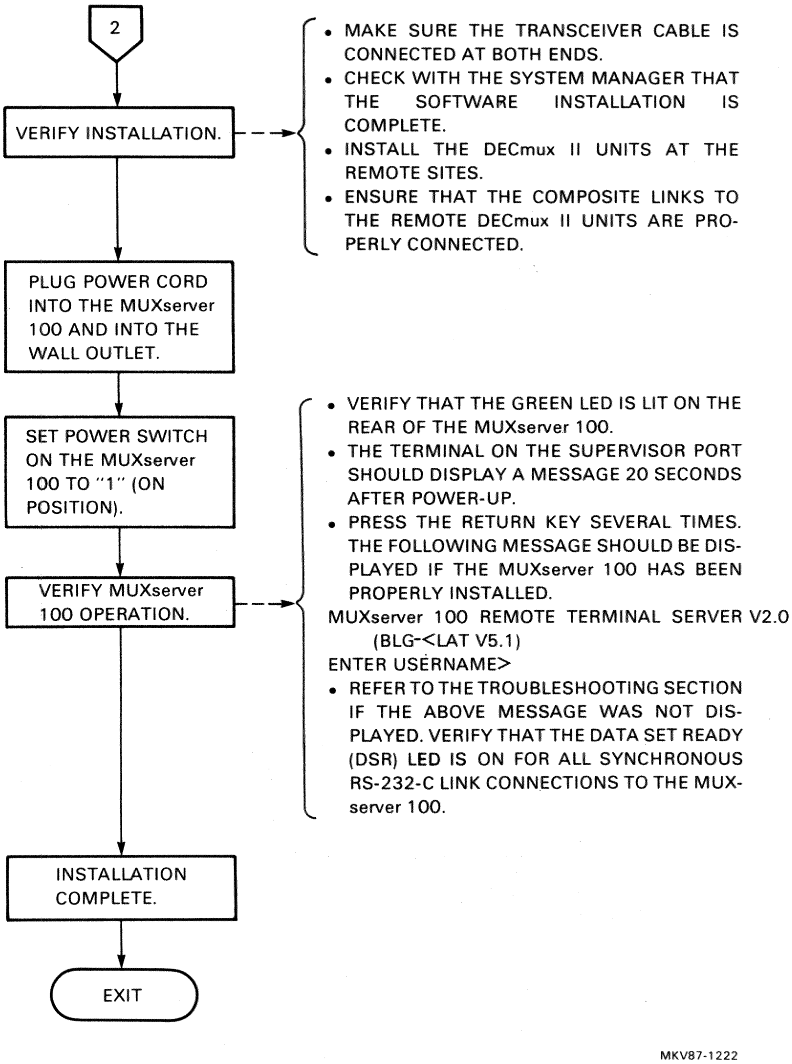


Figure 6 Installation Flow Diagram (Sheet 3 of 3)

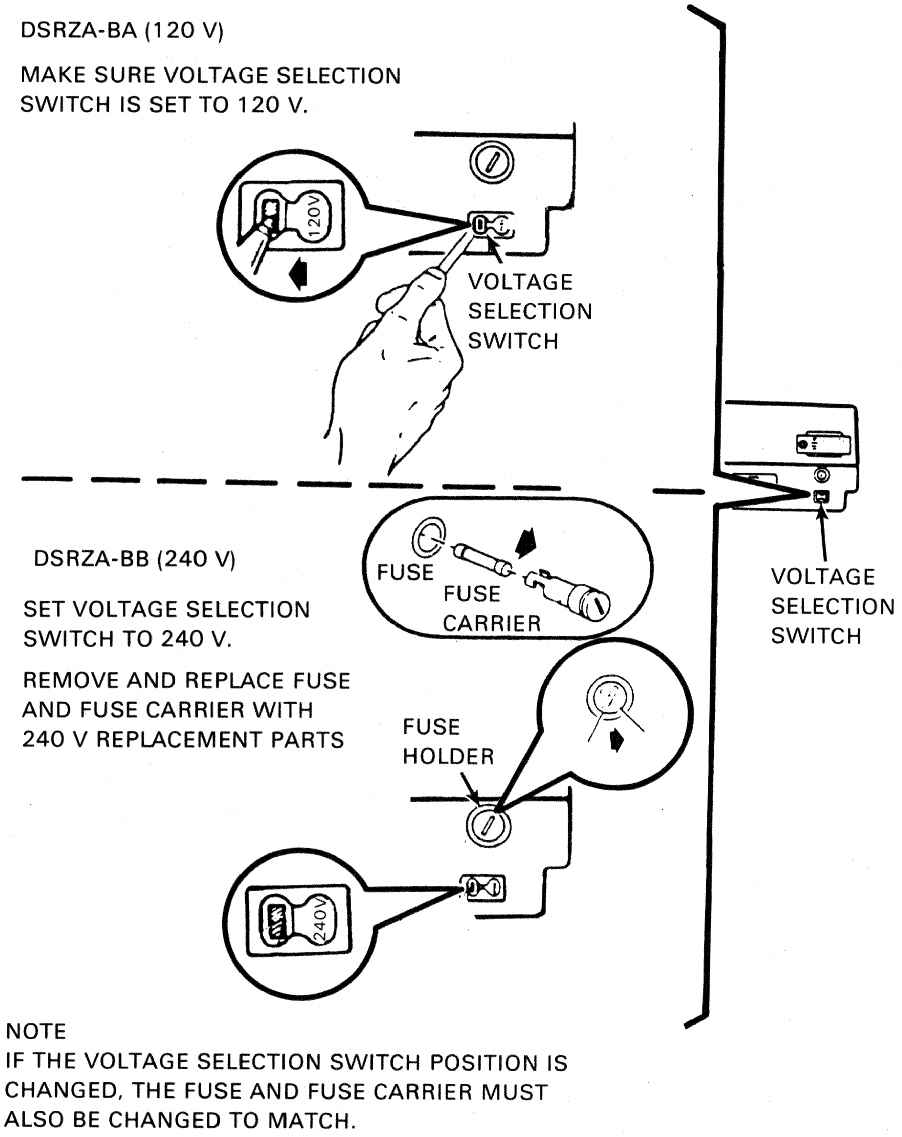


Figure 7 Voltage Selection Switch and Fuse Carrier

Cabling
Figure 8 illustrates how the MUXserver 100 is connected.

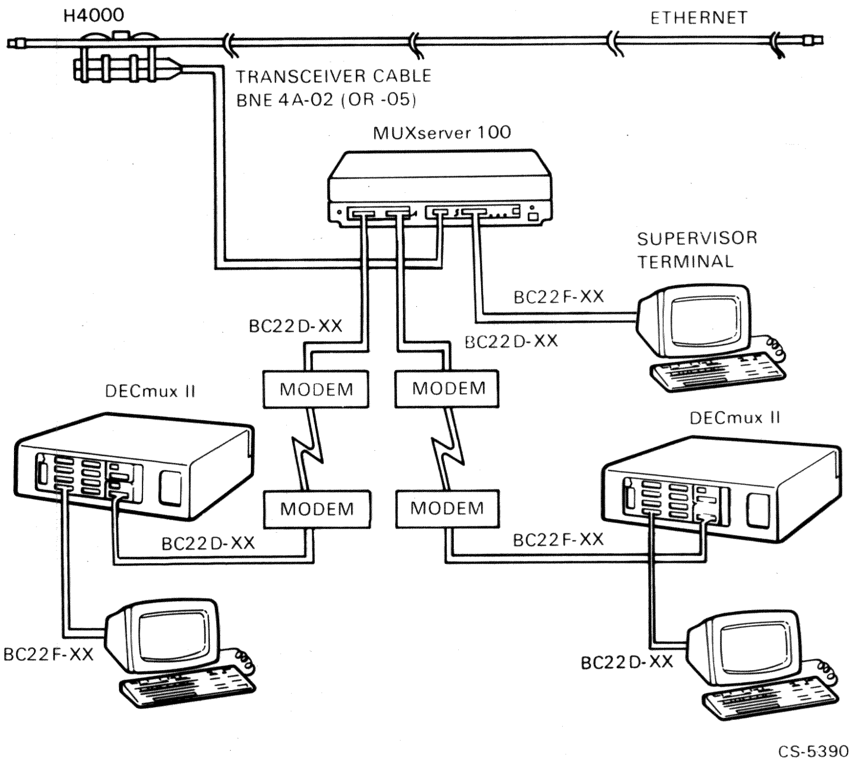


Figure 8 Cable Requirements for a Typical MUXserver 100 Installation

Table 3 MUXserver Cables

Application	Cable	Connects
RS-232-C composite link	BC22F	MUXserver 100 to the modem and DECmux II to the modem.
RS-232-C synchronous link	BC17D	MUXserver 100 to DECmux II and DECmux II to DECmux II.
RS-422 composite link	See Figure 9. Print Set No. 70-22418-xx	RS-422 DECmux II (Port B) to MUXserver 100 (Port A).
	See Figure 10. Print Set No. 70-20983-xx	RS-422 DECmux II (Port A) to MUXserver 100 (Port B).
	See Figure 11. Print Set No. 70-20976-xx	Port A of one DECmux II to Port B of second DECmux II.
	BC22D	Terminal to supervisor port of MUXserver 100 or DECmux II.
	BC22D	Terminal to DECmux II.
RS-422 loopback cable	70-22411-01 70-20984-01	MUXserver 100 DECmux II

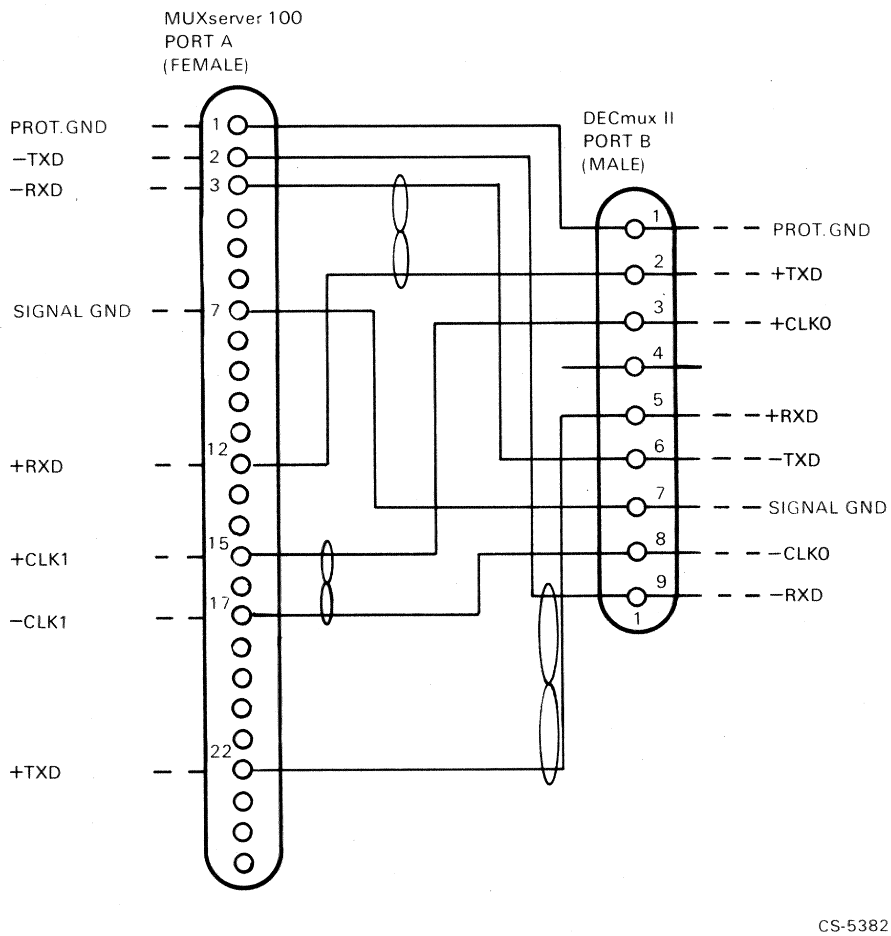


Figure 9 RS-422 DECmux II (Port B) to MUXserver 100 (Port A)

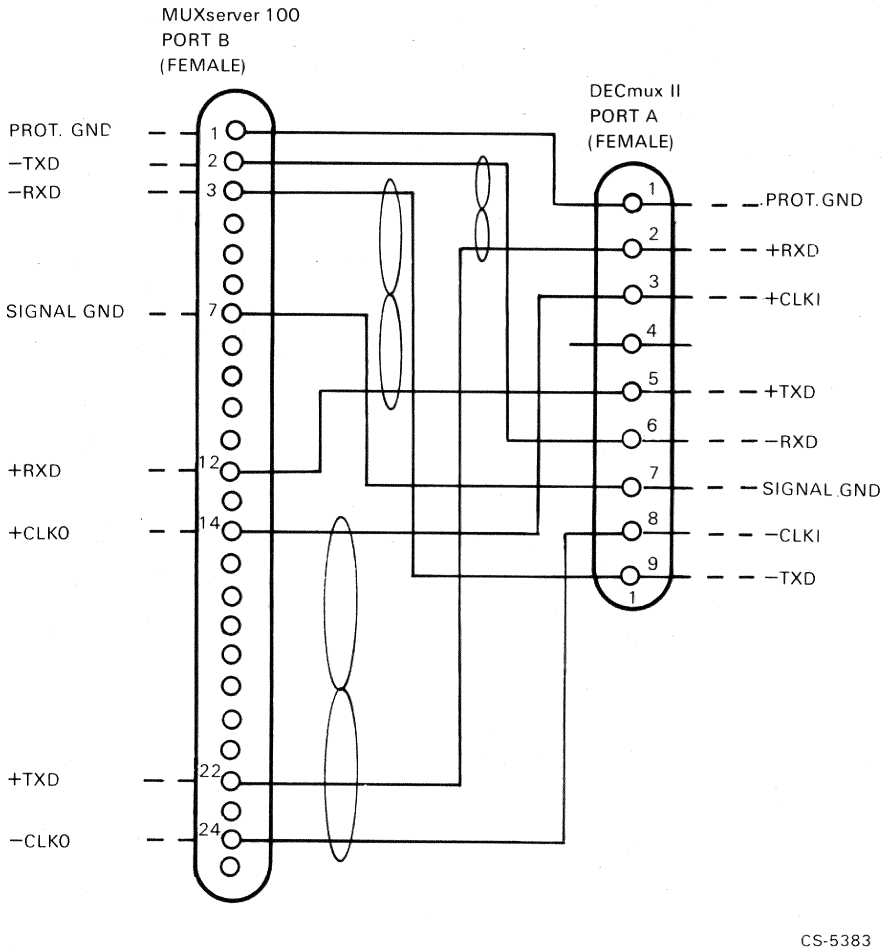


Figure 10 RS-422 DECmux II (Port A) to MUXserver 100 (Port B)

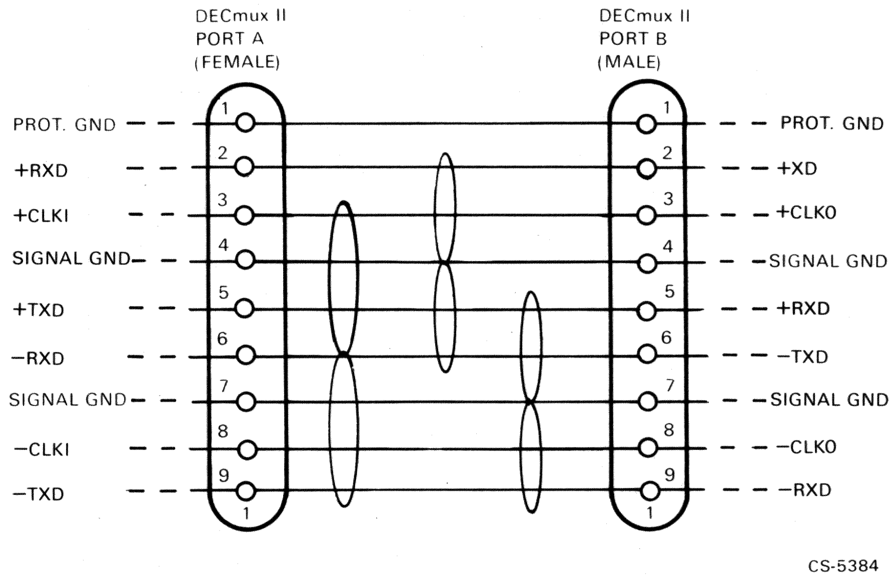


Figure 11 RS-422 Port A to Port B (DECmux II)

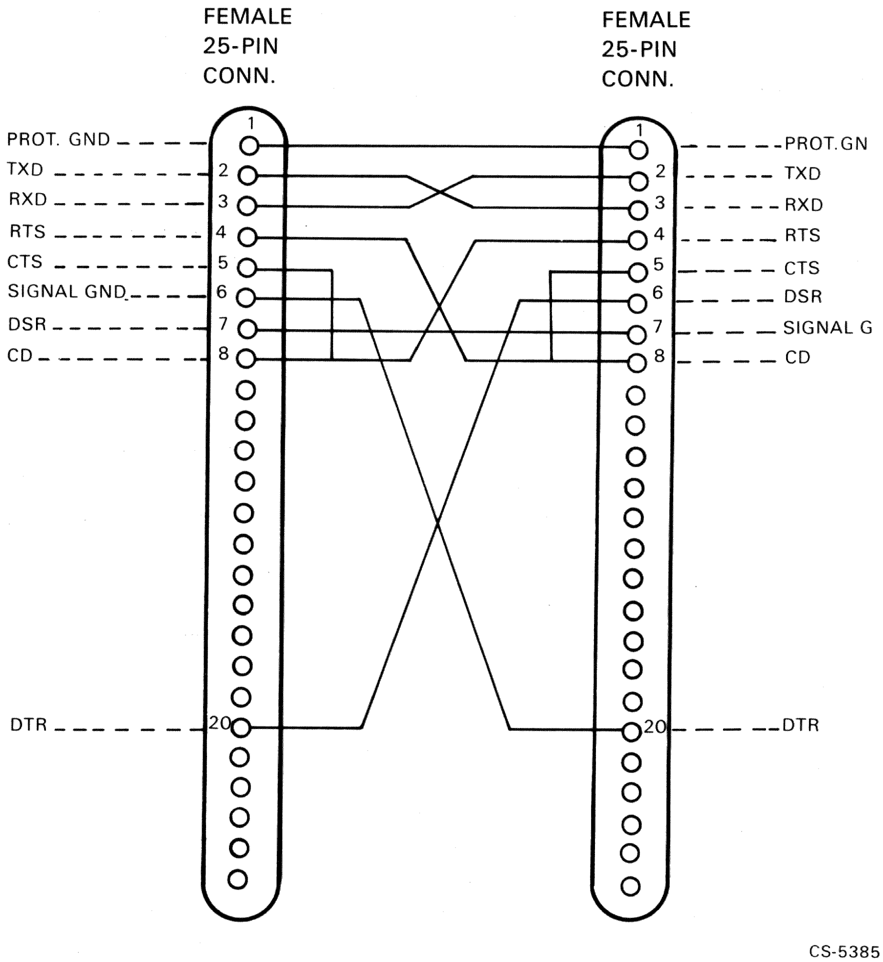


Figure 12 RS-232-C Asynchronous Null Modem Connection

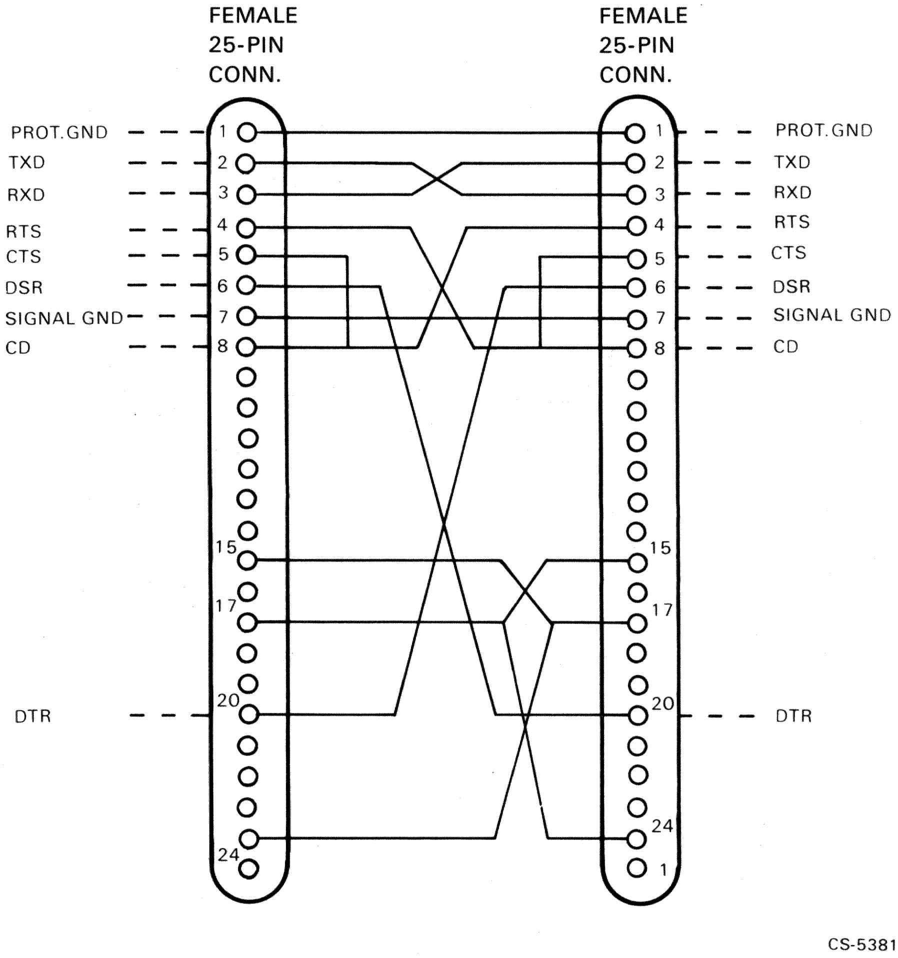


Figure 13 RS-232-C Synchronous Null Modem Connection

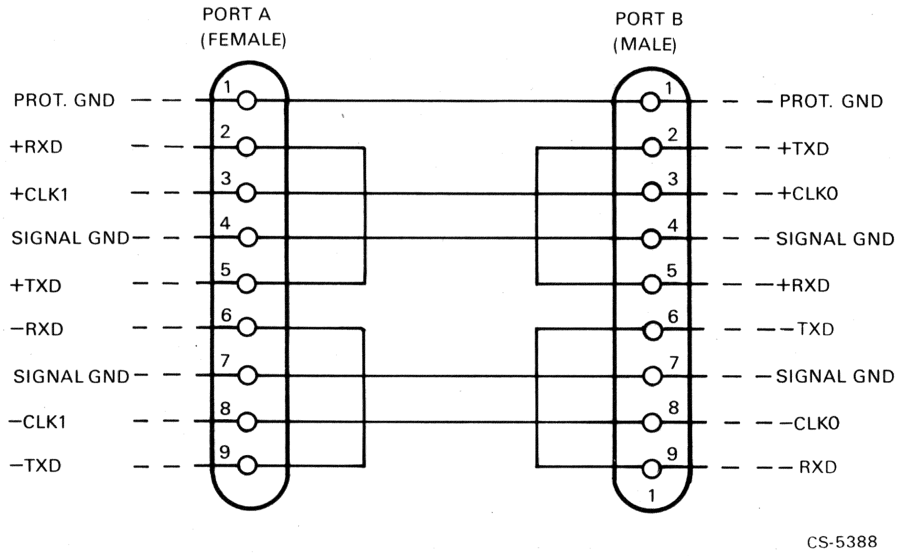


Figure 14 Cable RS-422 Test (DECmux II)

Self-Test Diagnostics

The MUXserver 100 diagnostics (self-test) run at power-up and after an INIT or RESTART command. The self-test provides four main routines that run the following diagnostic tests on the terminal server logic.

- **Module A Server Memory and Timer Tests** – Module A executes from program ROM.
- **Module B UART Transmit/Receive Tests** – Perform this module only in manufacturing test mode. This module requires a loopback connector on the supervisor port. The tests are input and output to the supervisor port.
- **Module C Network Interface (NI) Transmit/Receive Tests** – An image of Module C is written to program RAM from where the test is executed.
- **Module D Hardware Exerciser** – An image of Module D is written to and executed from program RAM.

Server hardware failures are considered to be fatal (hard) errors or nonfatal (soft) errors, depending on their effect on the server's operation. Soft errors consist of failures that may not interfere with normal server operation but can affect overall efficiency. Hard errors are failures that can disable the server or cause unreliable or unpredictable operation.

Soft Errors – Table 4 describes the soft error types. Table 5 describes the status parameter longword that self-test pushes onto the stack before issuing a down-line load request.

Table 4 Nonfatal (Soft) Error Types

Error Type	Description
EEPROM Checksum Error	EEPROM is divided into several functional areas with a parameter checksum maintained in each area. Any checksum error not in the ECO/LANCE revision area of the EEPROM area is considered to be a soft error.
LANCE Error	When the server is operating in the external loopback mode, self-test flags an external loop failure in the status longword. The external loopback mode can be disabled, selecting the internal loopback mode.
Terminal Port Error	If the supervisor port produces errors, self-test will flag the errors in the status longword.

Table 5 Error Status Parameter Longword

Bits	Error Name/Description
High Word	
<15>	Error detected on the UART.
<14>	EEPROM checksum error in the parameter area for Port 1.
<13>	Not used.
<12>	EEPROM checksum error in the ECO/LANCE revision area.
<11>	NI heartbeat error.
<10>	NI external loopback error.
<09>	EEPROM checksum error in the server parameter area.
<08>	EEPROM checksum error in the server parameter area.
<07:00>	EEPROM checksum error in the parameter areas for Ports 10-17.
Low Word	
<15:08>	EEPROM checksum error in the parameter areas for Ports 2-9.
<07>	Power-up flag.
<06:00>	Fatal error code.

Hard Errors – Table 6 describes the hard error types. Table 7 describes the hard error codes written to EEPROM.

Table 6 Fatal (Hard) Error Types

Error Type	Description
Program RAM Data Error	Any program RAM data error detected by the dynamic memory tests.
Program ROM CRC Error	Any error detected on a CRC-16 calculation of the the diagnostic software in the program ROM.
EEPROM Checksum Error	A checksum error in the ECO/LANCE revision area of EEPROM.
Timer Error	Any failure detected by the Refresh or Watchdog Timer tests.
JAM Error	The test failed to unjam from program ROM and continued from program RAM. Testing must be completed from program ROM.
LANCE Error	Any error detected during initialization or on an Internal Loopback operating test.
Communications Processor or Shared Memory Error	If the communications processor fails any of its tests or the shared memory interface to the communications processor fails.
Communications Port Error	If either of the composite communications ports fails, the server is inoperable.

Table 7 Fatal (Hard) Error Codes Written to EEPROM

Error Code	Test Name
Module A	
01	Program RAM READ/WRITE Data Test
02	Program ROM CRC Test
03	PA PROM Checksum Test
04	EEPROM Checksum Test
05	Program RAM Dynamic READ/WRITE Data Test
06	Refresh Timer Test
07	Watchdog Timer Test
08	EEPROM READ/WRITE Data Test
Module B	
10	Incorrect Character
11	Receive Timeout
12	Transmit Timeout
13	Unexpected Rx Interrupt
14	Unexpected Tx Interrupt
Module C	
50	LANCE Internal Loopback Test with Multiple Data Frames
51	LANCE Accept Broadcast Address Test
52	Transmit CRC Logic Test
53	Receive CRC Logic Test (Good CRC)
54	Receive CRC Logic Test (Bad CRC)
55	Collision Detection and Retry Test
56	Accept Multicast Address Test
57	Reject Multicast Address Test
58	Reject Physical Address Test
5A	External Network Interface (NI) Loopback Test
5B	Network Interface (NI) Heartbeat Test (Soft Error)
5C	Shared Memory Test Error
5D	Access Timeout, 8085 Processor not Responding
Module D	
42	NI Error Exerciser
Communications	
1E	Communications Memory Failure
31	ROM 0 Checksum Failure
32	ROM 1 Checksum Failure
33	ROM Checksum Failure
34	Clock Interrupt Failure
36	Communications/DMA Failure

Status and Error Messages Types

Table 8 lists the types of message codes that may be returned by the server software during operation. Status and error messages are displayed in the following format where xxx (unless underlined) is a decimal status or error code.

Local -xxx- Command response or error message

Table 8 Server Status and Error Message Types

Code Range	Message Type
000-999 and 500-599	Informational messages – normal responses to user commands.
100-199 and 600-699	Warning messages – warnings about events that may not be expected or valid.
200-299	Connection error messages – reasons for terminating or not establishing service connections.
700-799	User error messages – explanations of why user commands may not be honored.
900-999	Supervisor port messages – status and error messages issued from the MUXserver 100 ROM software.

Diagnostic Test Loopback Points

Figure 15 summarizes all the loopback tests available from the MUXserver 100 supervisor port. The LOOP command and the START TEST PORT n LOOPBACK command are entered in response to the LOCAL> prompt. All other commands are selected by means of the TEST command in the communications subdirectory (that is; in response to the COM> prompt).

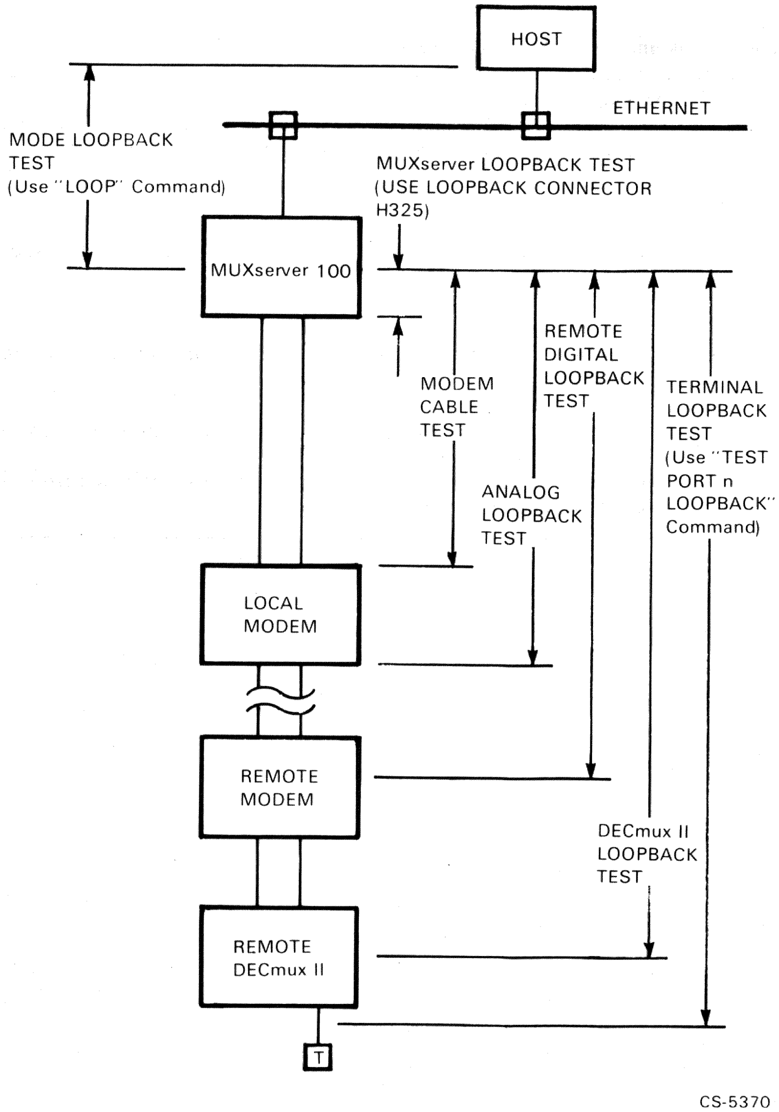


Figure 15 Diagnostic Test Loopback Points

Identifying Problems with the MUXserver 100
This section lists seven possible hardware installation problems, probable causes, and what to do to correct the problems. The problems are:

1. No GREEN light.
2. No messages on the supervisor terminal screen.
3. Ethernet error messages on the supervisor terminal screen.
4. NVR error messages on the supervisor terminal screen.
5. Composite link down messages on the supervisor terminal screen.
6. No DSR light.
7. Enter username> prompt does not display.

If one of these symptoms occurs, go to the appropriate table listed with each symptom.

SYMPTOM: NO GREEN LIGHT

After each action in the **"What To Do"** column, wait approximately 20 seconds and then recheck the indicator light to see if a constant GREEN light displays.

Table 9 No GREEN Light

Probable Cause	What To Do
MUXserver 100 power cable is not connected securely	Check power cable at both ends.
No power in wall outlet	Check outlet with a working device (such as a lamp).
Incorrect voltage switch setting	Check that the voltage select switch on the back of the MUXserver 100 is set at the correct voltage setting. Unplug the power cord before changing it.
MUXserver 100 fuse is defective	Unplug the power cord and replace fuse.

SYMPTOM: NO MESSAGES ON THE SUPERVISOR TERMINAL SCREEN

Before continuing, be sure to press the RETURN key on the terminal several times. If the prompt does not display, perform the actions in the **"What To Do"** column. After each action, press RETURN several times to see if the prompt displays.

Table 10 No Messages

Probable Cause	What To Do
Terminal power switch is OFF	Verify that the terminal is plugged in and turn ON the terminal power switch.
Incorrect terminal operating parameters	Display terminal operating parameters. Change parameters if they are not set to eight bits, no parity, and 9600 bits/s.
Data terminal cable connections are not securely connected	Check that the correct cable is being used and that the connections are tight at both ends.
Terminal is malfunctioning	Use another terminal and press RETURN to see if prompt displays.
Terminal cable is faulty	Replace cable with another cable that is operating correctly.

SYMPTOM: ETHERNET ERROR MESSAGES ON THE SUPERVISOR TERMINAL SCREEN

Before each action in the **"What To Do"** column, turn the power switch OFF on the MUXserver 100. After each action, turn the power switch ON. Wait approximately 20 seconds and then recheck the indicator light to see if the constant GREEN light displays.

Table 11 Ethernet Error Message

Probable Cause	What To Do
Power was applied before transceiver cable was connected.	Switch OFF the power, wait 20 seconds, then turn it ON again.
Transceiver cable connections are not tight	Check transceiver cable connections at both ends.
Transceiver cable is faulty	Connect the MUXserver 100 to another transceiver cable that is operating correctly.
Transceiver/DELNI cable port is faulty	Connect the MUXserver 100 to another transceiver or DELNI cable port that is operating correctly.

SYMPTOM: NVR ERROR MESSAGE ON THE SUPERVISOR TERMINAL SCREEN

Table 12 NVR Error Message

Probable Cause	What to Do
Nonvolatile Memory Checksum Error	Reset the MUXserver 100 to factory settings using the following procedure: Turn the POWER ON/OFF switch on the MUXserver 100 OFF for five seconds and ON again, while at the same time, continuously depressing the RESET switch on the back of the unit. Only after switching ON the POWER switch and waiting for ten seconds can the RESET switch be released. If, after executing this procedure, the same error occurs, there is a fatal error with the unit and it will require repair.

SYMPTOM: COMPOSITE LINK DOWN MESSAGES ON THE SUPERVISOR TERMINAL SCREEN

The MUXserver 100 provides the composite link status on the terminal connected to the supervisor port. For example, the message may be:

"Composite Link A UP" or "Composite Link B DOWN"

Providing a user does not "logon" to the supervisor port in response to:

"ENTER Username>"

any change in the status of the composite links is displayed automatically.

An indication that a composite link is DOWN may not mean that a problem exists. For example, a composite link not in use will be displayed as being DOWN.

Table 13 Problems with the Composite Link

Probable Cause	What To Do
DECmux II at the remote site is not properly installed and powered up	Check that the remote DECmux II sites have been correctly installed.
Composite link cable is not connected properly	Check cable connections between MUXserver 100 and synchronous modem (cable BC22F synchronous modem cable). The DSR light should be ON.
Composite link cable is not connected properly at the remote DECmux II site	Check cable connections between the DECmux II and synchronous modem at the remote site (cable BC22F synchronous modem cable). The DSR light on the DECmux II should be ON.
Incorrect multiplexer configuration	Check that the composite link from Port A of the MUXserver 100 connects to composite Port B of a remote DECmux II. Alternately a link from Port B of the MUXserver 100 must connect to a composite Port A of a remote DECmux II.
Incompatible link	The composite link parameters of both the MUXserver 100 and the DECmux II are preset to the factory default settings of: 9600 baud, RS-232-C, modem control. This installation procedure is based on these settings being unchanged. If these settings have been changed, refer to the *MUXserver 100 Network Reference Manual*, Chapter 2, Section 2.9 to reset them to the factory settings. To set both the MUXserver 100 and the DECmux II to other than the factory settings, refer to Chapter 2 of the *MUXserver 100 Network Reference Manual*.
Composite link unusable	Use the diagnostics on the MUXserver 100 and DECmux II, as outlined in Section 4.3 of the *MUXserver 100 Network Reference Manual*, to identify the faulty component.

SYMPTOM: NO DSR LIGHT

The two RED LED indicators on the rear of the MUXserver 100 indicate the status of the composite port Data Set Ready (DSR) conductors. The ON state indicates the successful connection to a modem on the respective composite port. The OFF state indicates that the modem is either in the process of connecting or not connected.

NOTE
When using RS-422 composite links, the DSR LEDs have no meaning and will not light.

Table 14 No DSR Light

Probable Cause	What To Do
Modem cable not properly connected	Check that modem cable BC22F is properly connected between the composite port (A or B) and the synchronous modem.
Modem faulty	Check modem.

SYMPTOM: ENTER USERNAME> PROMPT DOES NOT DISPLAY

Before continuing, be sure to press the RETURN key on the terminal several times to see if the prompt displays.

Table 15 No Enter Username> Prompt

Probable Cause	What To Do
Software is not installed or is installed incorrectly on the load host.	Report problem to system/network manager.
Server Ethernet address is not configured on the load host.	Report problem to system/network manager.

Resetting the MUXserver 100 Unit to Factory Settings
The software reset feature permits a change of data in the permanent database to DIGITAL factory specifications. It is recommended that software reset be executed only when absolutely necessary.

To cause a software reset, locate the RESET switch on the back of the MUXserver 100 hardware unit. Simultaneously press the RESET switch while switching the power ON/OFF switch on the front of the unit OFF then ON. An immediate server initialization occurs and all permanent and operational database parameters are reset to factory settings.

Following the reset procedure, the privilege password is "system", and the login password is "access".

Setting Up the Network MAP
The mapping concept allows the server manager to modify the logical asynchronous line connections. The factory setting of the MUXserver 100 has all 16 asynchronous lines of the remote DECmux II units mapped to the MUXserver 100.

To change the MAP enter the following sequence:

```
LOCAL> SET PRIVILEGE
PASSWORD> (Enter the "privilege" password)
LOCAL> COMM
COM> MAP
```

The COM command provides access to the subdirectory of commands that apply to the composite and remote DECmux II units. Enter HELP for a listing of the available commands.

```
COM> MAPHELP
```

This command provides specific HELP with the MAP command.

To alter the MAP, enter the MAP command.

```
COM> MAP
```

Setting Up Printers
Any DECmux II port devices can be replaced with an asynchronous serial printer. This allows the MUXserver 100 users to obtain hard-copy printouts from network services. Printer ports have remote access, and sessions between printers and service nodes are remote sessions.

The system manager needs to know the names given to the remote access ports on the server. The system manager can then use LAT control program commands to create a *path* from virtual ports on the service nodes to the printer ports on the MUXserver 100.

Use the DEFINE PORT command to set up these port characteristic values for each printer port.

CHAPTER 3
CABLES

3.1 INTRODUCTION

This section contains the following information.

- Outline drawings of cable types needed to install devices described in this manual.
- Outline drawings of connectors and terminators.
- Drawings of proper slide-latch assembly.
- ThinWire Ethernet coaxial cable termination procedures.

3.2 CABLES AND CONNECTORS

The cables in this section are divided into the following categories.

- Baseband Ethernet coaxial cables (See Table 1)
- Baseband Ethernet connectors and terminators (See Table 2)
- Baseband Ethernet transceiver cables (See Tables 3, 4)
- Fiber-optic channel elements (See Table 5)
- Broadband Ethernet connectors and terminators (See Table 6)
- Other Cables (See Table 7)
- DECconnect twisted pair and office data cables (See Table 8)
- ThinWire Ethernet cables (See Table 9)
- ThinWire Ethernet connectors and boots (See Table 10)

Table 1 Baseband Ethernet Coaxial Cables

Cable Number	Length Variations Available*	Description
BNE2A-xx	MA,MB,MC,MD	PVC composition
BNE2B-xx	MA,MB,MC,MD	Teflon™ composition

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

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

Table 2 Baseband Ethernet Connectors and Terminators

Part Number	Part Name	Description
H4060	Male N-connector	Connector for BNE2x-xx cable (six per package)
12-19816-01	Terminator (50 ohms)	50 ohm terminator for BNE2x-xx cable
12-19817-01	Barrel connector	Barrel connector for BNE2x-xx cable
DEXJK	Etherjack	Etherjack connector

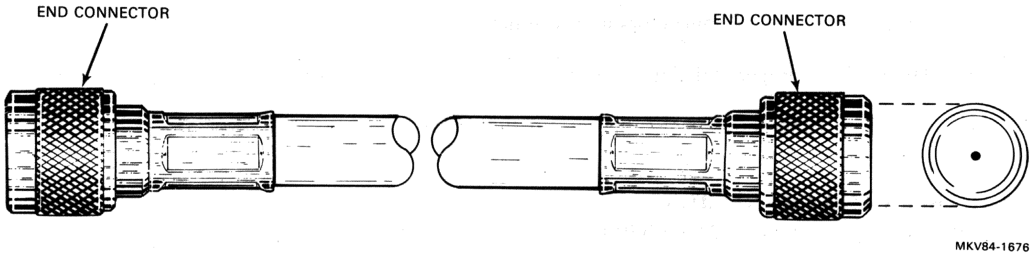


Figure 1 BNE2x-xx Coaxial Cable

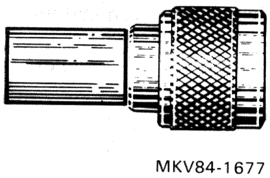


Figure 2 H4060 (End) Connector

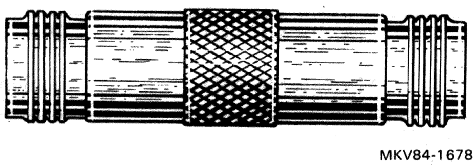


Figure 3 12-19817-01 Barrel Connector

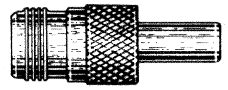


Figure 4 12-19816-01 Terminator

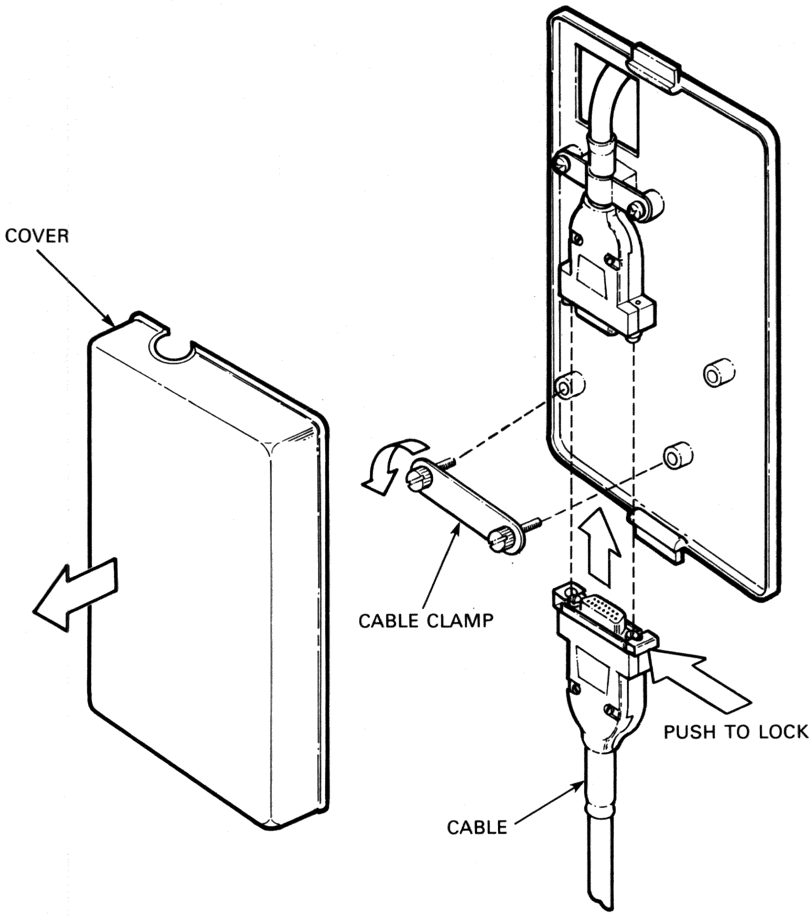


Figure 5 DEXJK Etherjack Connector

Table 3 Baseband Ethernet Transceiver Cables

Cable Number	Length Available*	Connector Description	Composition
Ethernet:			
BNE3A-xx	05, 10, 20, 40	Straight angle	PVC
BNE3B-xx	05, 10, 20, 40	Right angle	PVC
BNE3C-xx	05, 10, 20, 40	Straight angle	Teflon™
BNE3D-xx	05, 10, 20, 40	Right angle	Teflon™
BNE4A-xx	02, 05	Straight angle	PVC
BNE4B-xx	02, 05	Right angle	PVC
IEEE 802.3:			
BNE3H-xx	05, 10, 20, 40	Straight angle	PVC
BNE3K-xx	05, 10, 20, 40	Right angle	PVC
BNE3L-xx	05, 10, 20, 40	Straight angle	Teflon™
BNE3M-xx	05, 10, 20, 40	Right angle	Teflon™
BNE4C-xx	02, 05	Straight angle	PVC
BNE4D-xx	02, 05	Right angle	PVC

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

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

Any combination of drop cable lengths may be connected to achieve the necessary total length. It is recommended that no more than two cables be used.

Table 4 Transceiver Drop Cable Applications

Condition	Cable Types	Maximum Lengths
H4000 transceiver to host or server	BNE3 (only)	40 m (131.2 ft)
	BNE3 + BNE4-02	32 m (105.0 ft)
	BNE3 + BNE4-05	25 m (82.0 ft)
	BNE4 (only)	10 m (32.8 ft)
DELNI interconnect to host or server	BNE3 (only)	40 m (131.2 ft)
	BNE3 + BNE4-02	32 m (105.0 ft)
	BNE3 + BNE4-05	25 m (82.0 ft)
	BNE4 (only)	10 m (32.8 ft)
H4000 transceiver to DELNI interconnect to host or server (total of both cables)	BNE3 (only)	40 m (131.2 ft)
	BNE3 + BNE4-02	32 m (105.0 ft)
	BNE3 + BNE4-05	25 m (82.0 ft)
	BNE4 (only)	10 m (32.8 ft)
H4000 transceiver to repeater	BNE3 (only)	50 m (164.1 ft)
	BNE3 + BNE4-02	42 m (137.8 ft)
	BNE3 + BNE4-05	30 m (98.4 ft)
	BNE4 (only)	12 m (39.4 ft)
DELNI interconnect to DELNI interconnect (cascaded)	BNE3 (only)	50 m (164.1 ft)
	BNE3 + BNE4-02	42 m (137.8 ft)
	BNE3 + BNE4-05	30 m (98.4 ft)
	BNE4 (only)	12 m (39.4 ft)

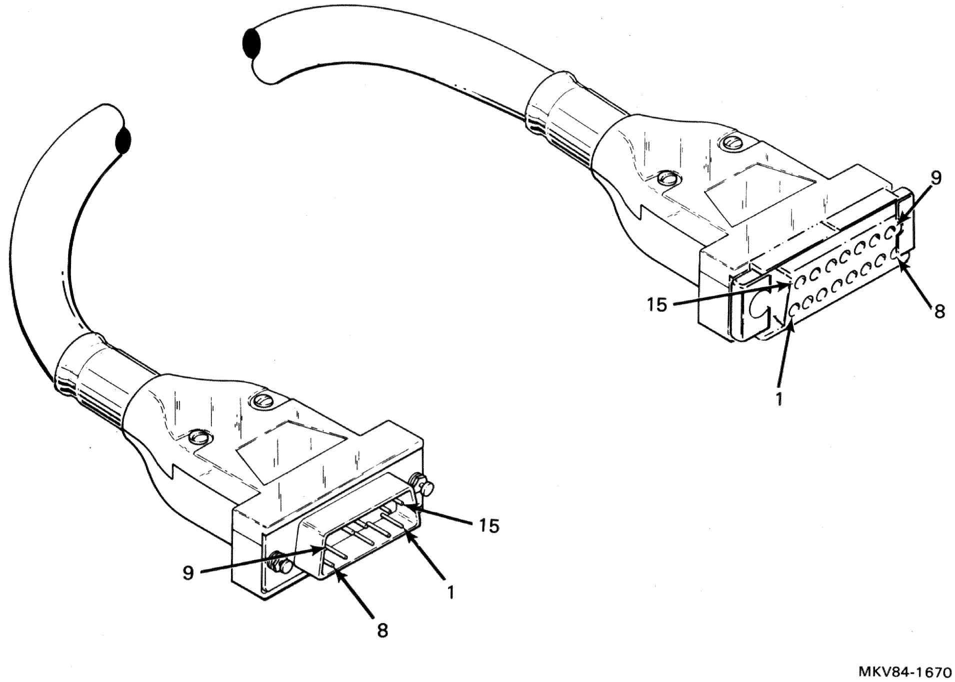


Figure 6 BNE3A-xx/BNE4A-xx and BNE3B-xx/BNE4B-xx Transceiver Cables

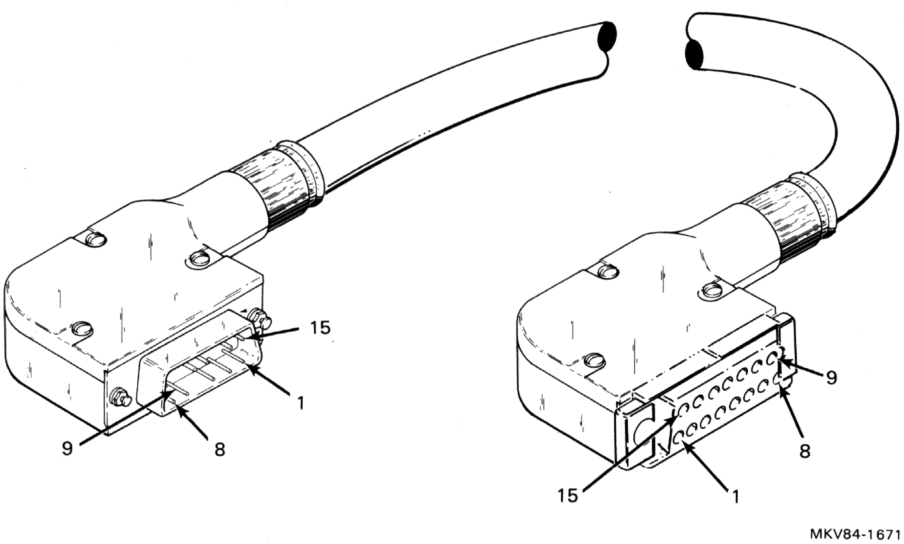


Figure 7 BNE3C-xx/BNE4C-xx and BNE3D-xx/BNE4D-xx Transceiver Cables

Table 5 Fiber-Optic Channel Elements

Part Number	Description
BN25B-xx BN25C-xx	Duplex fiber-optic cable (see note for length variations)
DEXJB	Fiber-optic junction box

NOTE

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

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

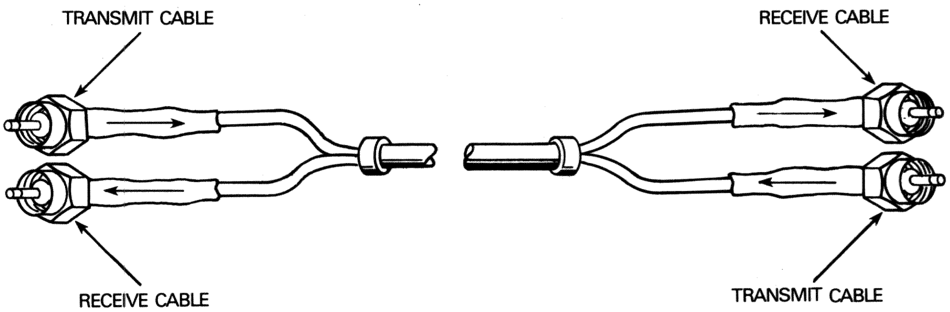


Figure 8 Duplex Fiber-Optic Cable

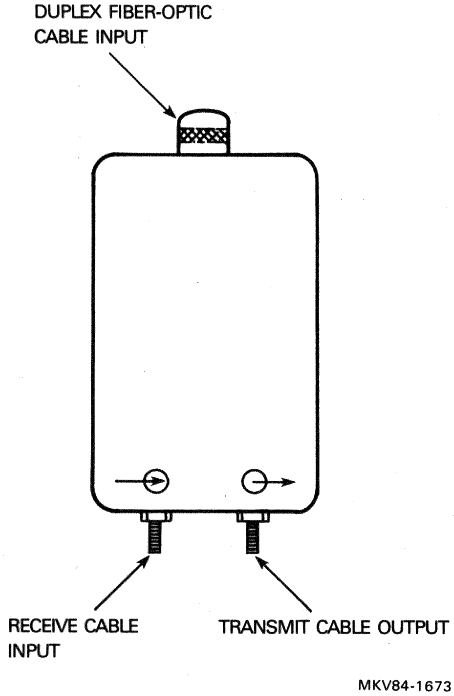


Figure 9 DEXJB Fiber-Optic Junction Box

Broadband Ethernet Coaxial Cable
CAB-6* cable is a flexible office broadband cable. CAB-6 type cable is available in 304.8 m (1000 ft) lengths.

Table 6 Broadband Ethernet Connectors and Terminators

Part Number	Part Name	Description of Use
TR-75F*	Female F terminator	Used to terminate 75 ohm male F connectors
F-81C*	Female F to female F adapter	Used to join two lengths of broadband cable
F-56C*	Female F connector	Used for CAB-6 type (broadband) cable
BNC-F*	Female F to male BNC adapter	Typically used for test equipment connection

*Manufactured by Jerrold Div., General Instrument Corp.

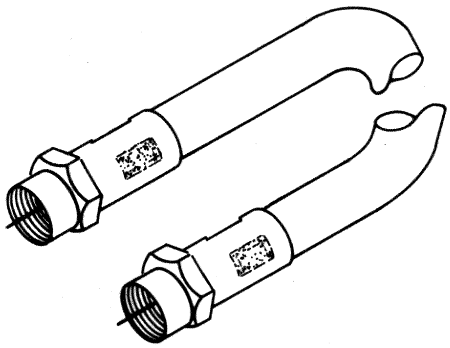


Figure 10 CAB-6 Broadband Office Cable

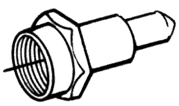
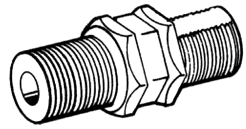


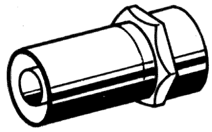
Figure 11 TR-75F Terminator

*Manufactured by Jerrold Div., General Instrument Corp.



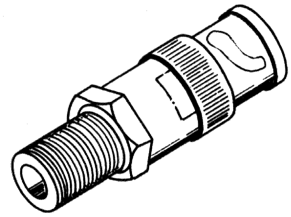
MKV84-1682

Figure 12 F-81C Adapter



MKV84-1683

Figure 13 F-56C Connector



MKV84-1685

Figure 14 BNC-F Adapter

Table 7 Other Cables

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

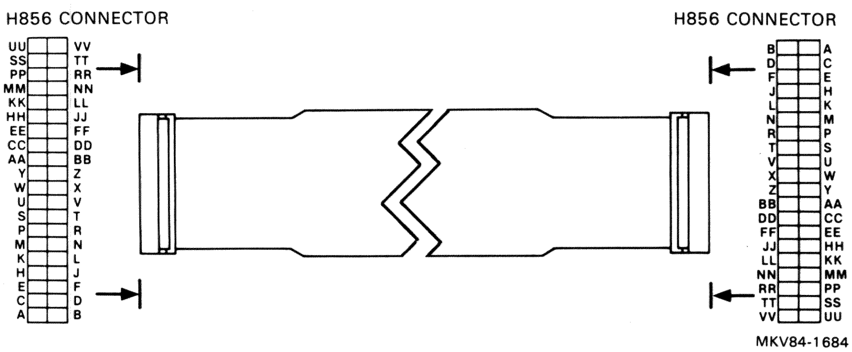


Figure 15 BC08R-1 Ribbon Cable

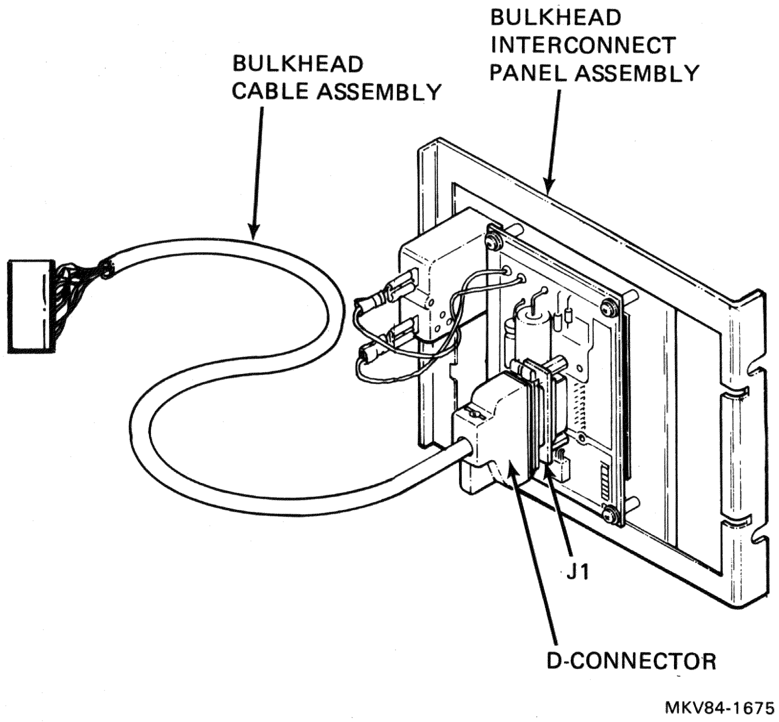


Figure 16 70-18798-xx Bulkhead Assembly and 70-18799-00 Bulkhead Interconnect Panel Assembly

Table 8 DECconnect Twisted-Pair and Office Data Cables

Part Number	Description
H8240	6-conductor cable, 1000 ft spool, unterminated
H8245-A	DECconnect Twisted-Pair PVC cable, 1000 ft spool
H8246-A	DECconnect Twisted-Pair Teflon™ cable, 1000 ft spool

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

Table 9 ThinWire Ethernet Cables

Part Number	Description
H8243-A	ThinWire cable, PVC
H8244-A	ThinWire cable, Teflon™

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

Table 10 ThinWire Ethernet Connectors and Boots

Part Number	Description
H3112-A	Modular jack (AT&T connection)
H3112-B	Modular jack (Northern Telecom, Rolm PBX connection)
H3112-D	Modular jack (universal phone connection)
H3114	ThinWire Ethernet BNC connector
H8222	ThinWire male connector and boot
H8223	TEE connector and boot
H8224	Barrel connector and boot
H8225	Terminator and boot

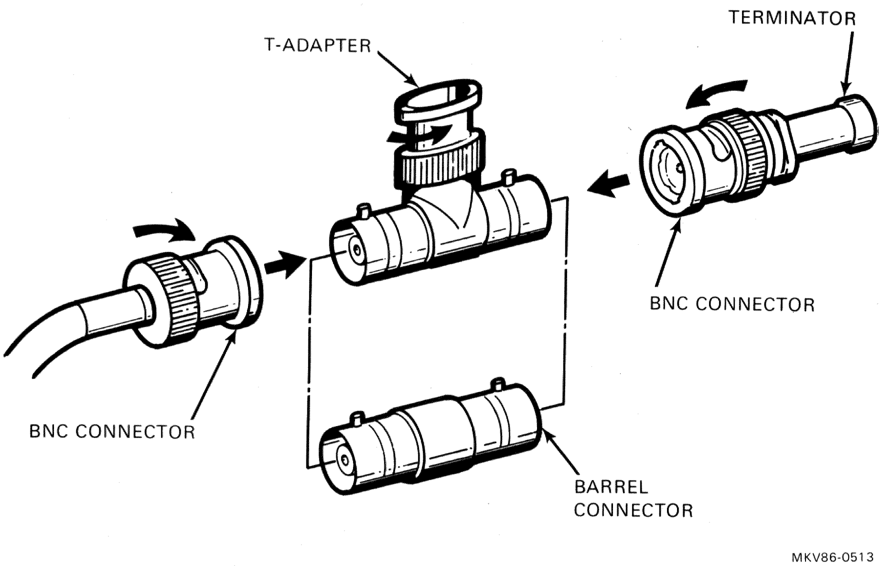


Figure 17 T-Adapters, Barrel Connectors, and Terminators

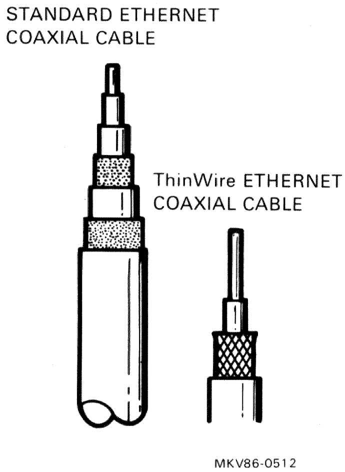


Figure 18 Cable Differences

3.3 PROPER SLIDE-LATCH CONFIGURATION

Slide-latches may not function properly unless they conform to the "correct" configuration shown below.

NOTE

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

Verify the following.

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

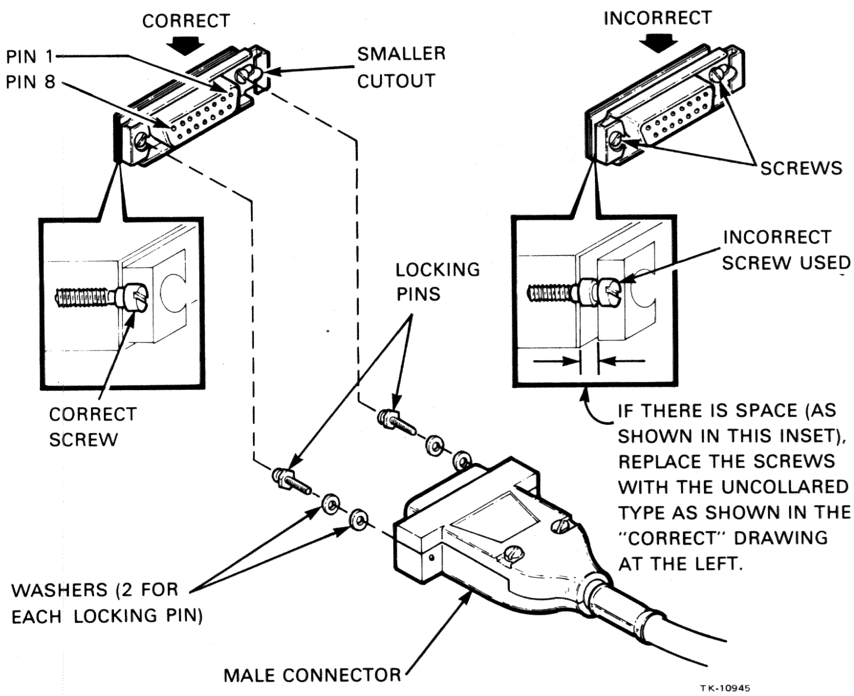


Figure 19 Proper Slide-Latch Configuration

3.4 ThinWire Ethernet COAXIAL CABLE TERMINATION

The following four-part procedure must be performed by service personnel who have completed training on the ThinWire cable stripper and connector tools.

3.4.1 Adjusting the Stripper Tool

The ThinWire cable stripper contains two cutting blades that must be adjusted to properly cut the jacket and braid of the ThinWire cable. The following procedure describes the adjustment of the cable stripper blades.

NOTE
Use a scrap piece of ThinWire cable for the following procedure.

1. Check that the blue V-block (AMP 603997-2) is installed in the stripper.

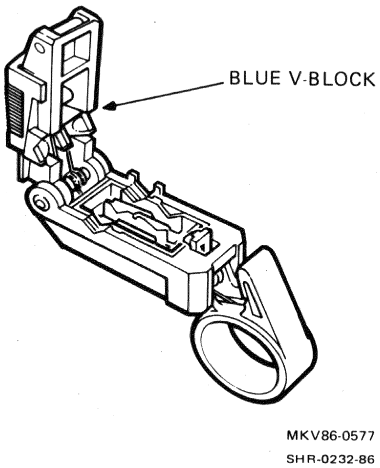


Figure 20 AMP Tool Blue V-Block

2. Use the stripper hex wrench to turn set screws A and B counterclockwise until resistance is felt. This retracts the blades.

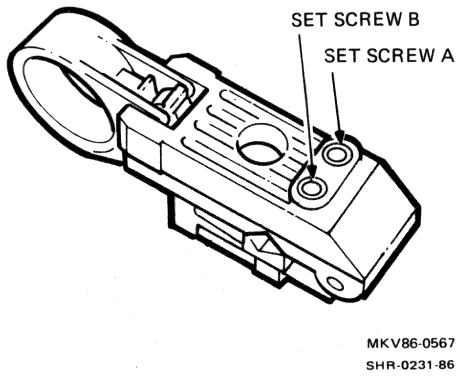


Figure 21 AMP Tool Set Screws

3. Turn set screw A 2-1/2 turns clockwise.
4. Turn set screw B 1-1/2 turns clockwise.
5. Push the slide to position 3.

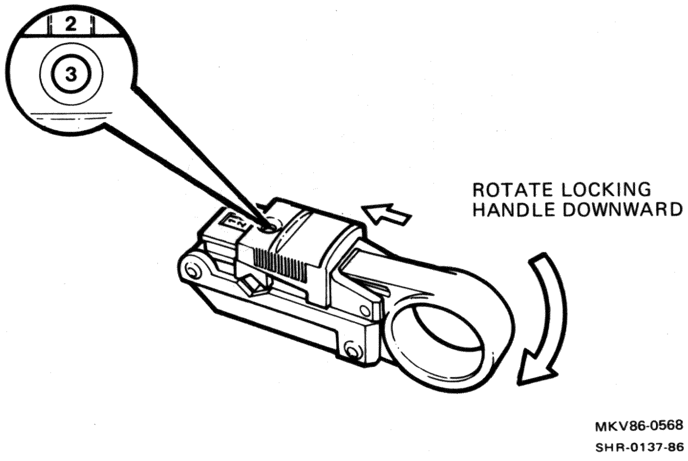


Figure 22 AMP Tool Slide Position 3

6. Open the stripper by rotating the locking handle downward.

7. With the locking handle facing you, place the cable in the stripper from the left side with the end of the cable flush with the right side of the stripper.

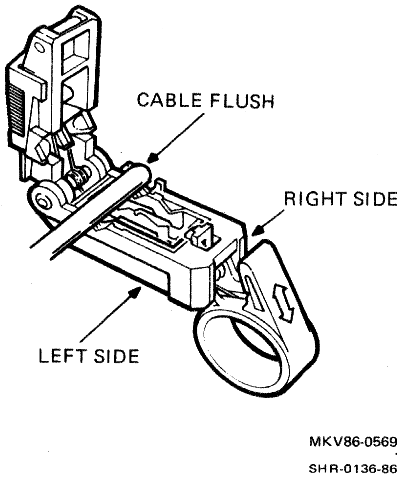


Figure 23 Cable Placement

8. Close the stripper and rotate it around the cable five times.

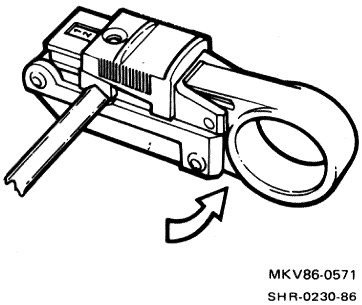


Figure 24 AMP Tool in Closed Position

9. Open the stripper and remove the cable.

10. Remove the cut jacket and braid from the cable.

11. Check the practice cuts on the cable to make sure that:

   a. Cut A cuts *only* the jacket, exposing the braid. This cut should not damage *any* braid strands.

   b. Cut B cuts the jacket, braid, and foil. This cut should not damage the dielectric beneath the foil. When stripping the cable to install a male connector, you must remove the foil.

NOTE
Even after the blade depth has been adjusted repeatedly, Cut B may leave a few strands of the braid that must be removed with diagonal cutters.

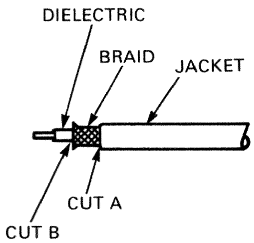


Figure 25 ThinWire Coaxial Cable

12. Adjust the stripper blades as needed to produce the correct stripper cut. Turning the set screws clockwise extends the blades, increasing the depth of the cut. Turning the set screws counterclockwise retracts the blades, decreasing the depth of the cut.

NOTE
If repeated adjustments fail to produce correct cuts, replace the blade cassette. See Step 13.

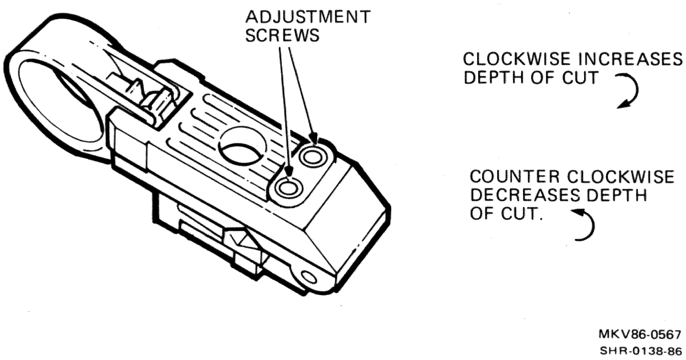


Figure 26 Adjusting the Stripper Blades

13. Install a new blade cassette.

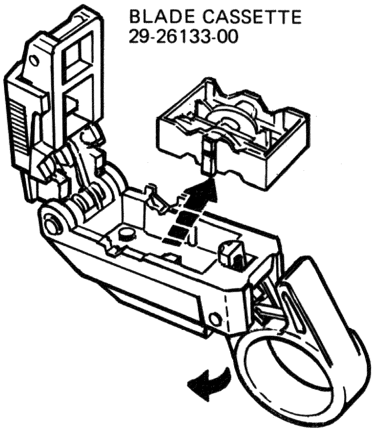


Figure 27 Installing Blade Cassette

14. Discard the practice piece of ThinWire cable.

3.4.2. Stripping the Cable

Prepare for male ThinWire BNC connector installation by stripping the cable as follows.

1. Use the diagonal cutters to trim the end of the cable flush.

2. Mark the jacket of the cable 3/16 inch from the end of the cable. This is the center conductor length.

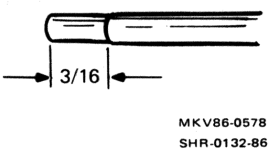


Figure 28 Marking the Cable

3. Place the ferrule on the cable.

4. Push the slide to position 1.

5. Bring the cable in from the right side of the stripper and place the mark on the cable over the right blade.

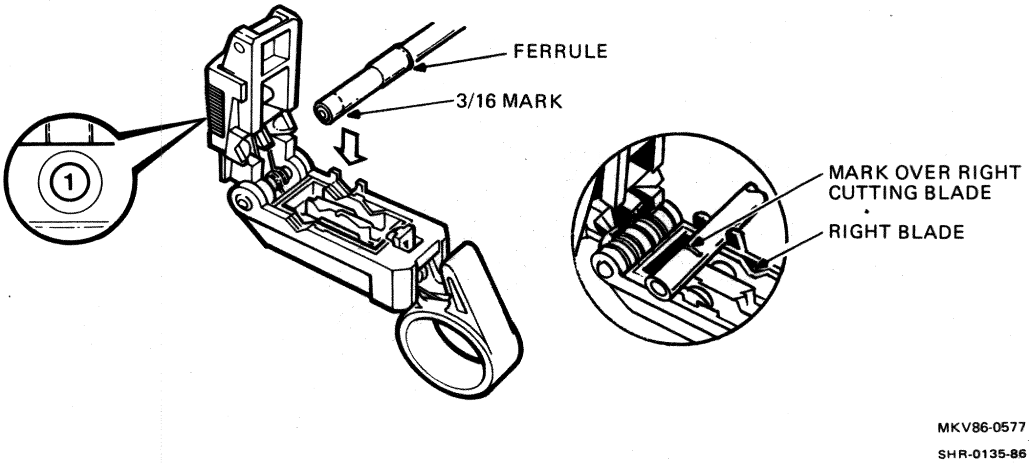


Figure 29 Placing the Cable in the AMP Tool

6. Close the stripper and rotate it around the cable five times.

7. Open the stripper and remove the cable.

8. Remove the cut jacket and dielectric from the cable, exposing the center conductor.

9. Push the slide to position 3.

10. Mark the jacket of the cable 1/16 inch from the end of the jacket (not the end of the exposed center conductor). This is the exposed dielectric length.

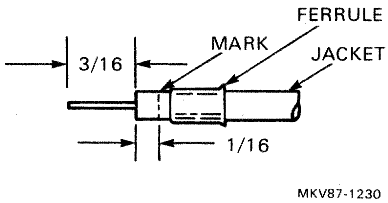


Figure 30 Marking the Jacket of the Cable

11. Bring the cable in from the left side of the stripper and place a mark on the cable over the right blade.

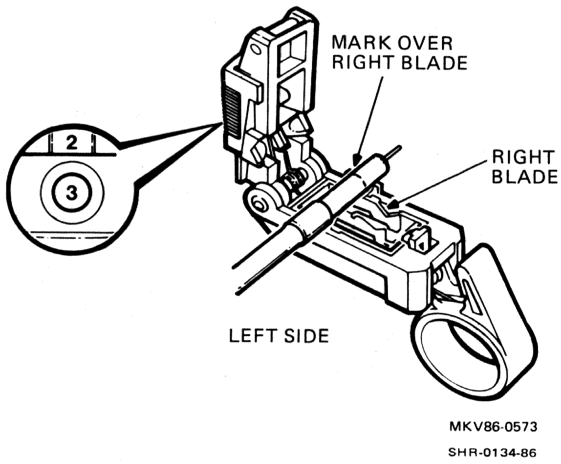


Figure 31 Placing the Cable over the Right Blade

12. Close the stripper and rotate it around the cable five times.

13. Open the stripper and remove the cable.

14. Remove the cut jacket and braid from the cable. If the stripper has not fully cut 1/16 inch off of the cable, or if the cut has spiraled off the end of the cable, return to Step 1 and repeat the procedure.

15. Check the cable to make sure that:

    a. The first stripper blade cuts *only* the jacket, exposing the braid. This blade should not cut *any* braid strands.

    b. The second stripper blade cuts the jacket, braid, and foil. This blade should not cut the dielectric beneath the foil.

16. Remove the 1/16 inch strip of foil from the top of the dielectric to expose the dielectric.

NOTE
Removing the foil ensures that the center conductor (when installed) will not short to the foil.

17. Check the stripped cable.

    Even after the blade depth has been adjusted repeatedly, Cut C may leave a few strands of braid that must be removed with diagonal cutters.

    If Cut A cuts any braid strands or Cut B cuts the dielectric, return to Step 1 and repeat the procedure. If the second attempt fails to produce properly stripped cable, the stripper is not correctly adjusted. Return to the Adjusting the Stripper Tool procedure (Section 3.4.1).

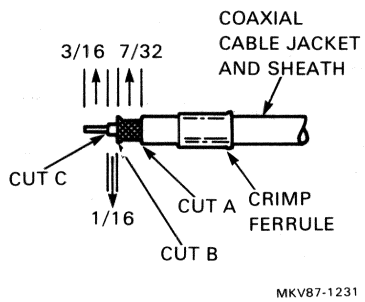


Figure 32 Cable Strip Lengths

3.4.3 Attaching the Male BNC Connector

1. Slip the center contact onto the center conductor. Make sure that the center contact butts against the dielectric. Make sure that the foil does not touch the center contact.

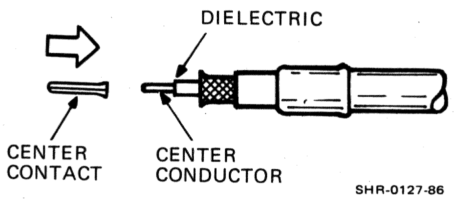


Figure 33 Installing Center Contact

2. Crimp on the center contact using the crimping tool.

NOTE
The center contact should be firmly attached to the center conductor after crimping.

3. Insert the center contact through the center of the connector, slipping the support sleeve of the connector over the dielectric and under the braid.

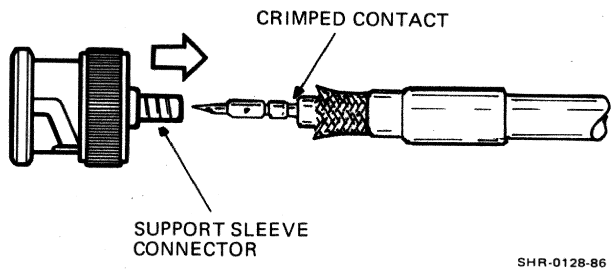
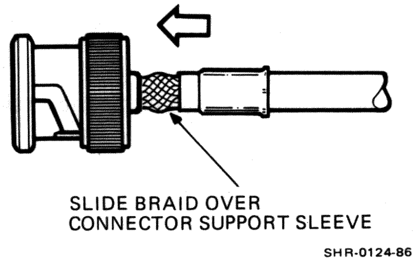


Figure 34 Installing Support Sleeve

4. Slide the ferrule over the braid, ensuring contact with the connector shoulder.



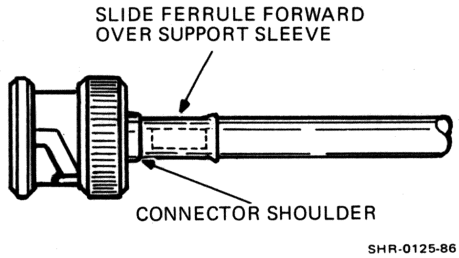


Figure 35 Sliding Ferrule over the Braid

5. Crimp the ferrule onto the cable using the crimping tool.

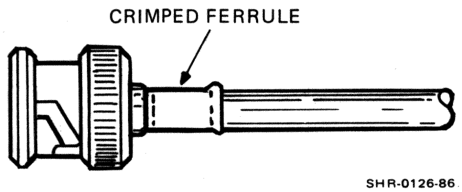


Figure 36 Crimping the Ferrule

3.4.4 Checking the Cable

Check the cable for continuity and shorts after the connectors are attached to *both* ends of the ThinWire cable.

1. Install a 50-ohm terminator on one end of the ThinWire cable using a TEE connector or barrel connector.

2. Check for cable continuity on the other end of the cable using an ohmmeter.

   a. Connect the ohmmeter leads to the center pin of the connector and the connector body.

   b. The ohmmeter reading *must* be 60 ohms or less, indicating continuity in both the shield and center conductor.

3. Remove the 50-ohm terminator.

4. Check for an open circuit (no connection) between the center conductor and the shield (using the ohmmeter).

   a. Connect the ohmmeter leads to the center pin of the connector and the connector body.

   b. The ohmmeter *must* read infinite ohms, indicating no shorts between the shield and center conductor.

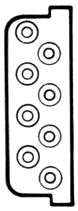
3.5 INSTALLING MMJ CONNECTORS ON TWISTED-PAIR CABLES

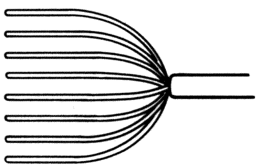
Tools required: MMJ/MJ punch tool 47-00117-01

1. The *first* operation is to remove the jacket.
2. Use diagonal cutters to trim the cable flush.
3. Use a stripper cutter to cut the cable jacket 3.16 cm (1.25 in) from the end of the cable and pull off the jacket.
4. The *second* operation is to arrange the individual wires and install MMJ connectors. Starting on the left side with the white wire with the blue stripe, arrange the individual wires so that they are in the same order as indicated on the MMJ connector stuffer cap.
5. When the wires are arranged, trim them so that they are even.

Wire and Stuffer Cap Code

Wire Number	Solid Wire/ Cap Outer Ring	Tracer Wire/ Cap Center Dot
8	Brown	White
7	White	Brown
6	Green	White
5	White	Green
4	Orange	White
3	White	Orange
2	Blue	White
1	White	Blue





MKV86-1046

Figure 37 Wire and Stuffer Cap Code

6. Starting with the white wire with the blue stripe, cut 1/8 inch off of each white wire. The four white wires should now be 1/8 inch shorter than the colored wires.
7. Place the connector on a flat surface. The front of an extra faceplate with modular wallbox is a good surface to use. The MMJ cutout on the faceplate holds the connector in place while the wires are being installed.

8. Place the wires over the connector barrels of the MMJ connector. Notice that the white wire with the blue stripe is to the left. Use the color code on the stuffer cap to check the order of installation.

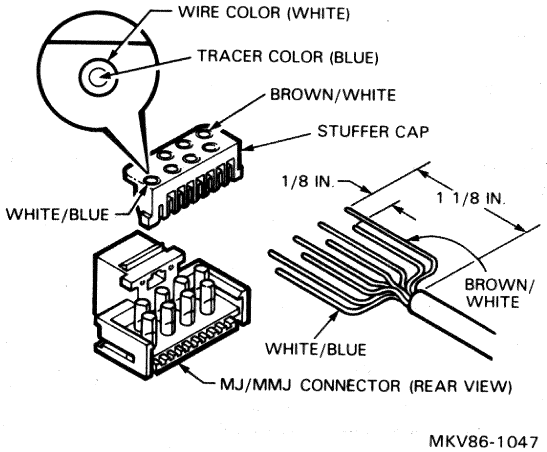


Figure 38 Placement of Wire over the Connector Barrels

9. Using the punchdown tool, press one wire at a time into its connector barrel. Notice that as each wire is pressed into its connector barrel, a click is heard.

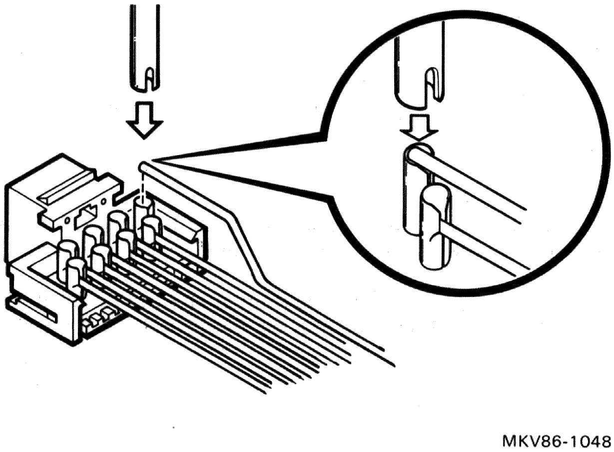


Figure 39 Using the Punchdown Tool

10. After all wires are pressed into the barrels, press the stuffer cap onto the MMJ connector. When the stuffer cap is about halfway on, check to make sure that each wire is in the proper slot in the stuffer cap. If all wires are in their associated slot, continue pressing the stuffer cap onto the MMJ connector. When the stuffer cap is completely installed, the ridges on the cap engage the slots on the MMJ connector.

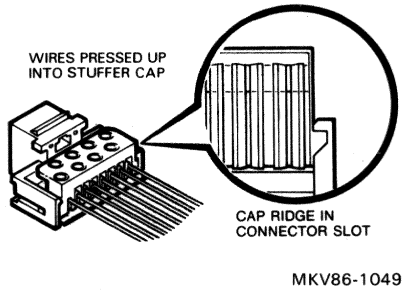


Figure 40 Cap Ridge in Connector Slot

CHAPTER 4
SPECIAL TOOLS AND TEST EQUIPMENT

NOTE
The following trademarks are used in this chapter:

- AMP 90302-1, 91239-7 are trademarks of AMP Special Industries, Inc.
- Amphenol 906 is a trademark of Amphenol, An Allied Co.
- Blonder Tongue SA-7U is a trademark of Blonder-Tongue Labs, Inc.
- FOTEC T302D is a trademark of FOTEC, Inc.
- Photodyne 5500 is a trademark of Photodyne, Inc.
- Tektronix 1503, OF-150, 564 are trademarks of Tektronix, Inc.
- Wavetek SAM III, 1801B are trademarks of Wavetek Rockland, Inc.

4.1 INTRODUCTION

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

Baseband Equipment

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

Broadband Equipment

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

Fiber-Optic Equipment

- Photodyne 5500™ FOTDR (optical time-domain reflectometer)
- Tektronix OF-150™ FOTDR
- FOTEC T302D™ fiber-optic test set

Baseband Coaxial Cable Tools

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

*May also be used for testing broadband networks.

Baseband Transceiver Cable Tools

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

DECconnect Tools and Repair Equipment

- H8241 MMP Crimp Tool
- H8242 Faceplate Tool Kit
- Standard Ethernet Cable Cutter
- Standard Ethernet Cable Stripper
- Standard Ethernet Cable Crimp Tool and Die Set
- H4090 Transceiver Installation Kit
- Transceiver Cable Ferrule Crimp Tool and Die Set
- Transceiver Cable D-Connector Pin Crimp Tool
- H4054 Transceiver Cable Straight Connector Kit
- H4055 Transceiver Cable Right-Angle Connector Kit
- Fiber-Optic Pulling Device
- Fiber-Optic Swivel

4.2 BASEBAND TOOLS AND TEST EQUIPMENT

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

4.2.1 H4090 (-KA and -KB) Transceiver Installation Kit

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

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

Table 1 Parts Included in H4090 Transceiver Installation Kits

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

*Equivalent parts must be supplied by a local source.

The following illustration shows the parts that make up the H4090-KA and H4090-KB transceiver installation kits.

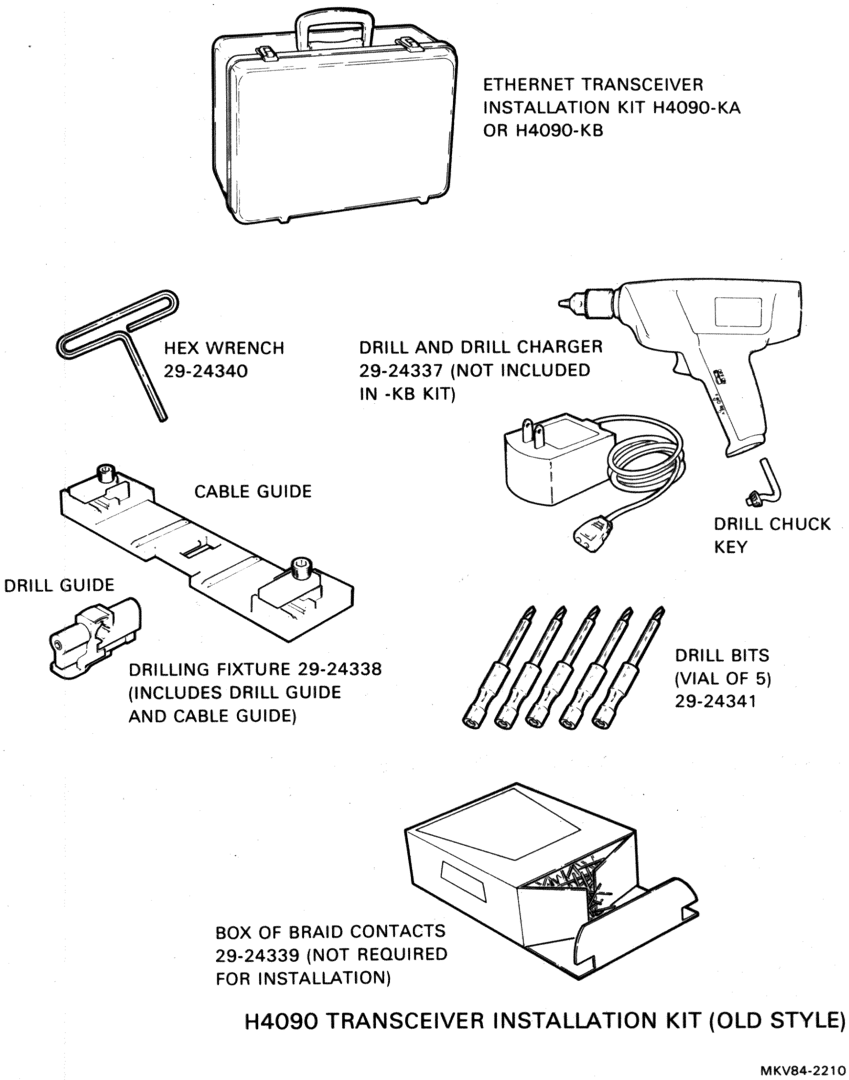


Figure 1 Transceiver Installation Kit Parts (Sheet 1 of 2)

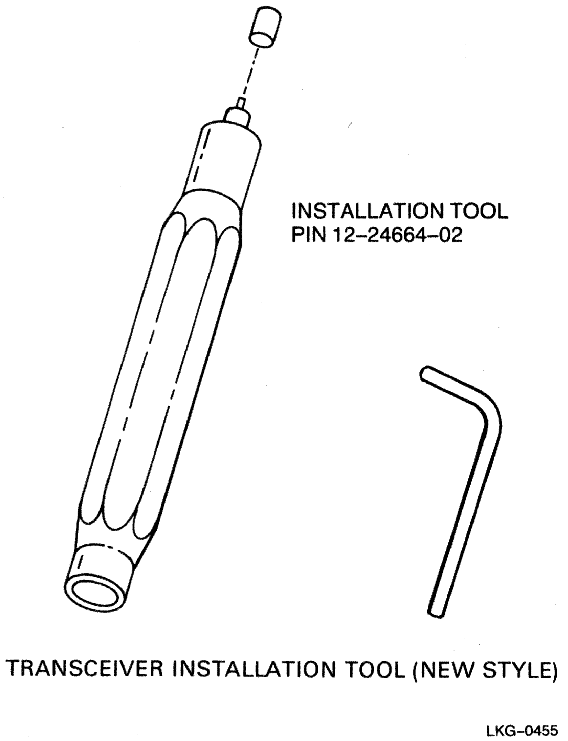


Figure 1 Transceiver Installation Kit Parts (Sheet 2 of 2)

4.2.2 H4000-TA and H4000-TB Ethernet Transceiver Tester

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

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

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

- H4000-TA 120 V/60 Hz
- H4000-TB 240 V/50 Hz

An H4000-T* transceiver tester verifies a transceiver's capability to perform the following.

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

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

- TX/RX (transmit/receive) mode

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

- RX ONLY (receive only) mode

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

For specific instructions on the use of the H4000-T* transceiver tester, consult the *Ethernet Transceiver Tester User's Manual* (EK-ETHTT-UG).

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

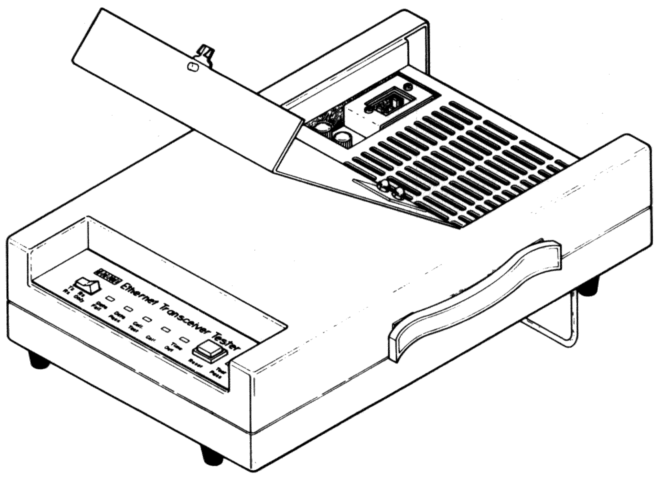


Figure 2   H4000-T* Ethernet Transceiver Tester

4.2.3 H4080 Loopback Test Connector

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

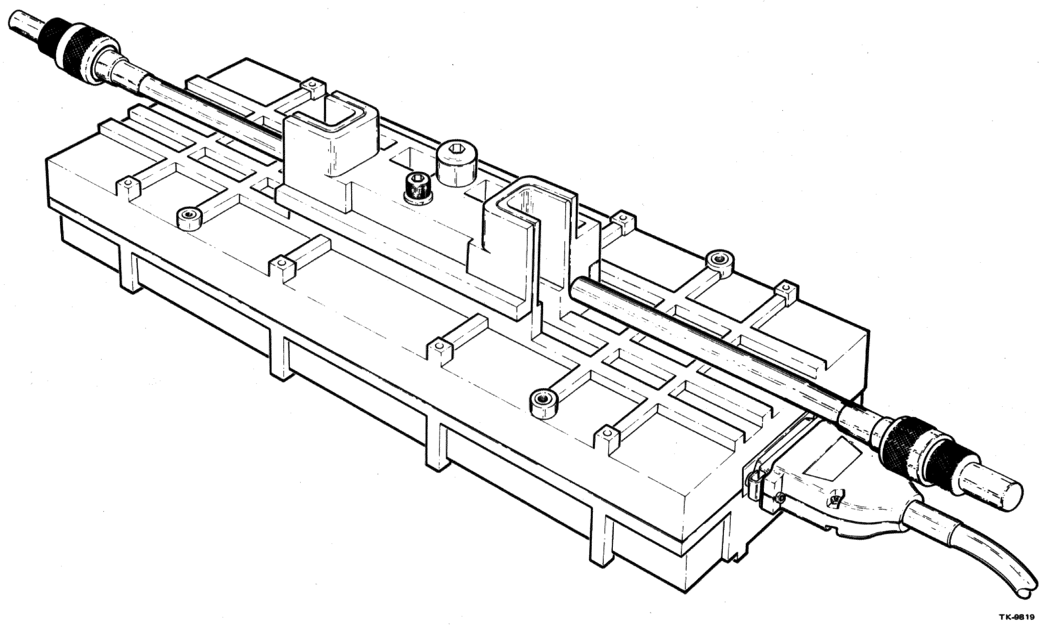


Figure 3 H4080 Loopback Test Connector

4.2.4 Tektronix Type 1503 Time-Domain Reflectometer (TDR)

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

NOTES

1. **For testing baseband (BNE2) cable, a BNC to N adaptor is required.**

2. **For testing broadband (CAB-6) cable, a BNC to F adaptor is required.**

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

Its features include:

- An oscilloscope-type display,
- A strip chart (optional) for recording cable "signatures",

- Selectable impedance levels (50, 75, 93 and 125 ohms), and
- Distance calibration switches for entering propagation delay.

The following illustration shows a Tektronix type 1503 TDR.

Figure 4 Tektronix Type 1503 TDR

4.3 BROADBAND TOOLS AND TEST EQUIPMENT

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

4.3.1 Blonder Tongue Model SA-7U Variable Attenuator

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

The SA-7U attenuator is portable [less than .454 kg (1 lb)]and attenuation may be varied by 1 dB steps to 62 dB.

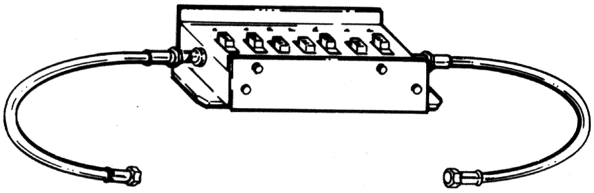


Figure 5 Blonder-Tongue Model SA-7U Variable Attenuator

4.3.2 Wavetek Model 1801B Sweep Signal Generator

The Wavetek model 1801B sweep signal generator provides a means to test the bandpass of a broadband Ethernet cable. Specifically, the 1801B generator may provide a single frequency or may sweep through the entire broadband spectrum.

Features of the model 1801B sweep signal generator include:

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

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

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

4.3.3 Wavetek SAM III Signal Analysis Meter

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

The Wavetek SAM III meter has the following capabilities.

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

4.4 FIBER-OPTIC TOOLS AND TEST EQUIPMENT

This section describes the various tools and test equipment required for installing and/or maintaining fiber-optic cables.

4.4.1 Photodyne Model 5500 Fiber-Optic Time-Domain Reflectometer (FOTDR)

The Photodyne model 5500 FOTDR is a portable test device used to measure the following parameters of a fiber-optic cable.

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

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

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

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

Figure 6 Photodyne Model 5500 FOTDR

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

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

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

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

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

Features of the OF-150 FOTDR include:

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

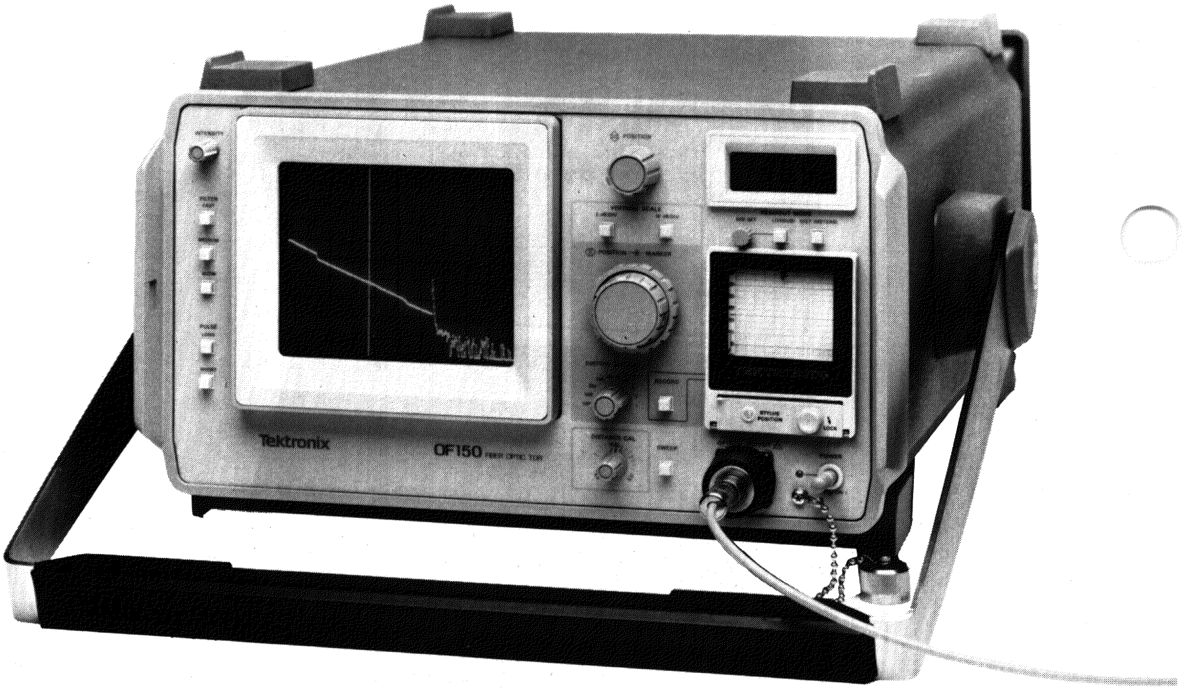


Figure 7 Tektronix Model OF-150 FOTDR

4.4.3 FOTEC Optical Test Set

The FOTEC Optical Test Set is a portable test device used to measure and perform the following:

- Cable loss
- Coupled source power
- Receiver power level
- Loopback testing

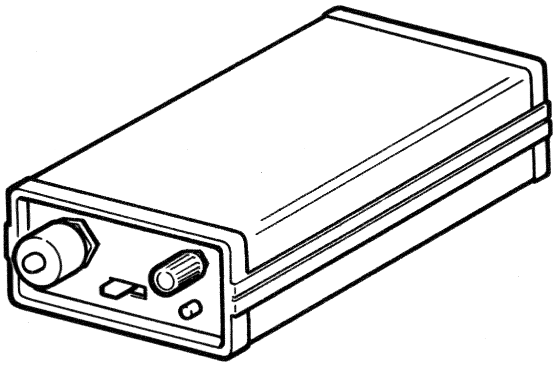


Figure 8 FOTEC S300 Signal Source

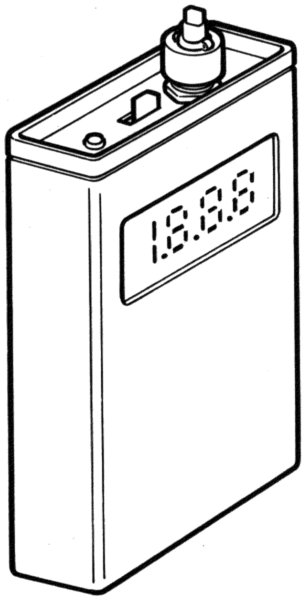


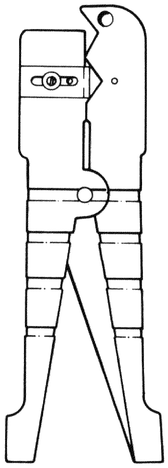
Figure 9 FOTEC M200 Optical Power Meter

4.5 BASEBAND COAXIAL CABLE TOOLS

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

4.5.1 DIGITAL 29-24668 Coaxial Cable Stripper

The DIGITAL 29-24668 coaxial cable stripper is used to strip insulation and braided shield from the coaxial cable in preparation for installing male "N" type connectors.

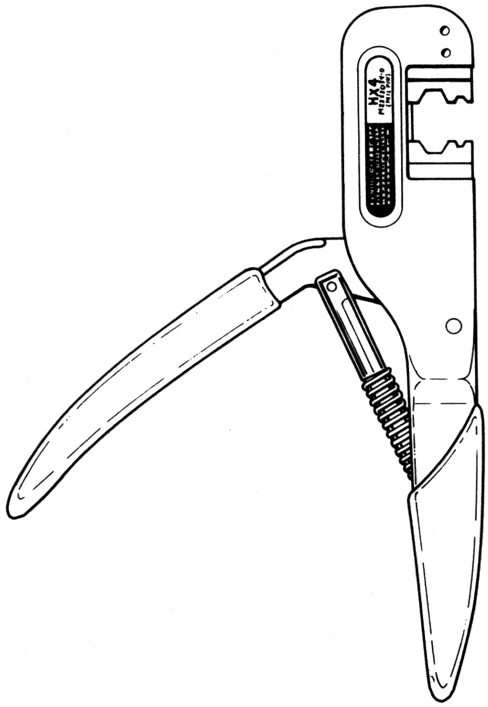


MKV84-1663

Figure 10 DIGITAL 29-24668 Coaxial Cable Stripper

4.5.2 DIGITAL 29-24663 Ferrule and Pin Crimper

The DIGITAL ferrule and pin crimper (P/N 29-24663) and die set (P/N 29-24662) are used to crimp a male "N" type connector ferrule on a prepared coaxial cable end.



MKV84-1664

Figure 11 DIGITAL 29-24663 Ferrule and Pin Crimper, and Die Set 29-24662

4.5.3 DIGITAL 29-24667 Coaxial Cable Cutter

The DIGITAL 29-24667 coaxial cable cutter is used to cut coaxial cable with minimum deformation of the cable end.

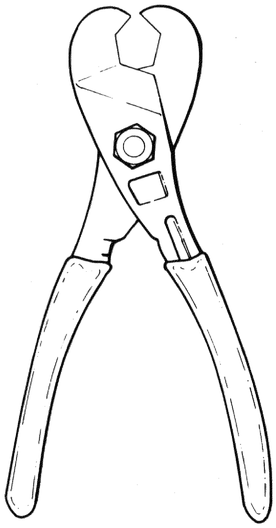


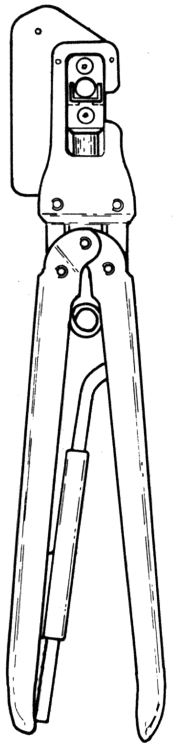
Figure 12 DIGITAL 29-24667 Coaxial Cable Cutter

4.6 BASEBAND TRANSCEIVER CABLE TOOLS

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

4.6.1 AMP 91239-7 Cable Ferrule Crimp Tool and Die Set

The AMP 91239-7 cable ferrule crimp tool and die set is used to crimp the connector ferrule to the end of a transceiver cable.

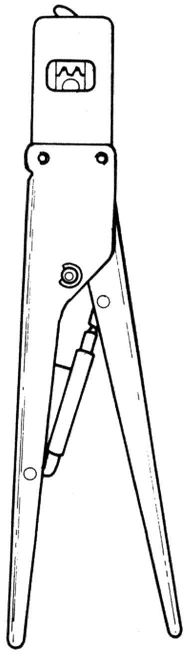


MKV84-1666

Figure 13 AMP 91239-7 Cable Ferrule Crimp Tool and Die Set

4.6.2 AMP 90302-1 D-Connector Pin Crimper

The AMP 90302-1 D-connector pin crimper is used when installing the connector end on a transceiver cable. The tool can be used for crimping male pins or female sockets to the cable wire.



MKV84-1667

Figure 14 AMP 90302-1 D-Connector Pin Crimper

4.7 DECconnect TOOLS AND REPAIR COMPONENTS

This section describes the various tools that are used to install and maintain DECconnect systems.

4.7.1 H8241 MMP Crimp Tool

The MMP crimp tool is used to attach loose-piece modified modular plugs (MMPs) to H8240 6-conductor flat cable.

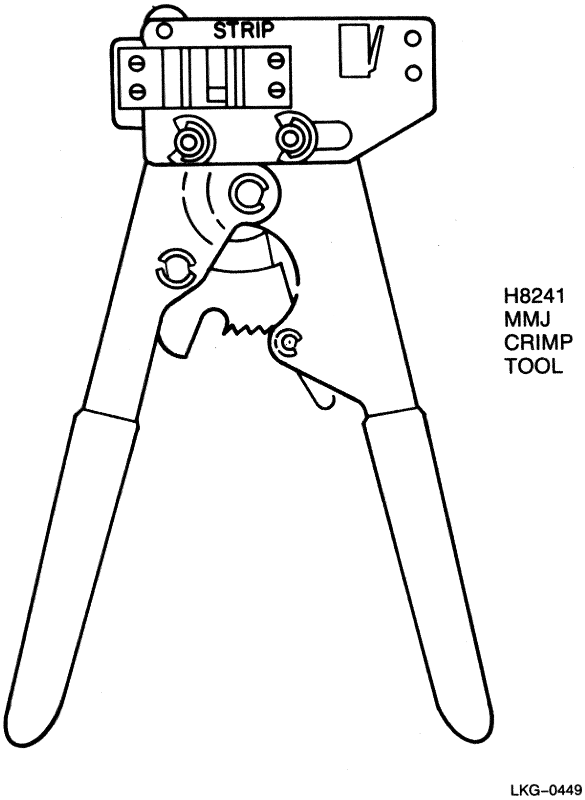


Figure 15 H8241 MMP Crimp Tool

4.7.2 H8242 Faceplate Tool Kit

The H8242 faceplate tool kit contains the following tools:

- ThinWire cable stripper (47-00114-01)
- ThinWire cable crimp tool (47-00115-01) and die set (47-00113-00)
- A dual socket wrench to attach the BNC and F-connectors (47-00110-00)
- MMJ loopback connectors (H3103)
- 36-pin loopback connectors (H3101)
- MMJ/MJ punch tool (47-00117-01)
- ThinWire terminators (H8225)

4.7.3 Standard Ethernet Cable Cutter

The standard Ethernet cable cutter is used to cut standard Ethernet cable.

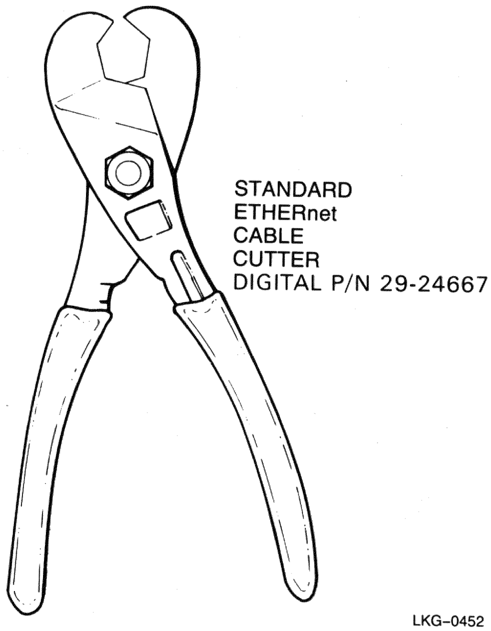


Figure 16 Standard Ethernet Cable Cutter

4.7.4 Standard Ethernet Cable Stripper

The standard Ethernet cable stripper is used to strip insulation from standard Ethernet cable.

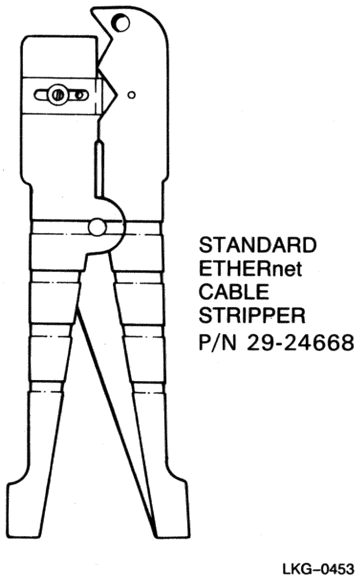


Figure 17 Standard Ethernet Cable Stripper

4.7.5 Standard Ethernet Cable Crimp Tool and Die Set

The standard Ethernet cable crimp tool is used to crimp cable ferrules on standard Ethernet coaxial cable.

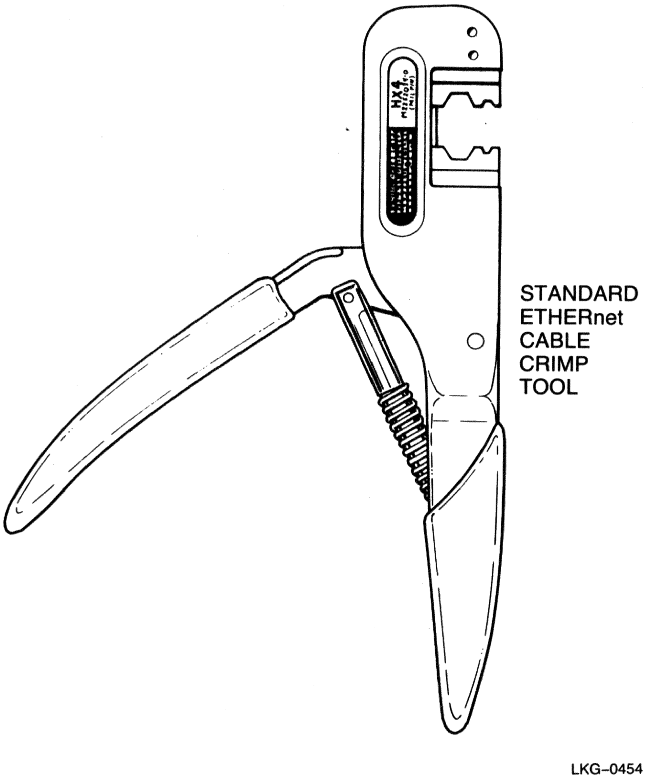


Figure 18 Standard Ethernet Cable Crimp Tool and Die Set

4.7.6 H4090 Transceiver Installation Kit

The H4090 transceiver installation kit is used to attach the old style H4000 transceiver to the standard Ethernet coaxial cable. Refer to the Baseband Tools and Test Equipment section of this chapter for more information.

4.7.7 Transceiver Cable Ferrule Crimp Tool and Die Set

The transceiver cable ferrule crimp tool is used to attach the cable ferrule to the transceiver cable.

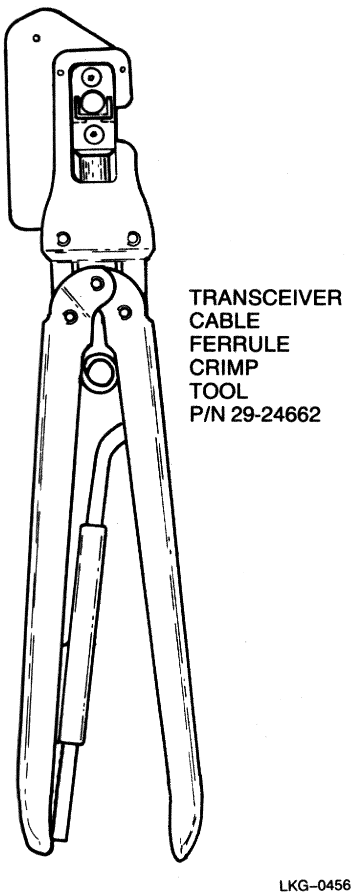


Figure 19 Transceiver Cable Ferrule Crimp Tool and Die Set

4.7.8 Transceiver Cable D-Connector Pin Crimp Tool

The transceiver cable D-connector pin crimp tool is used to attach the D-connector pins to the individual wires of the transceiver cable.

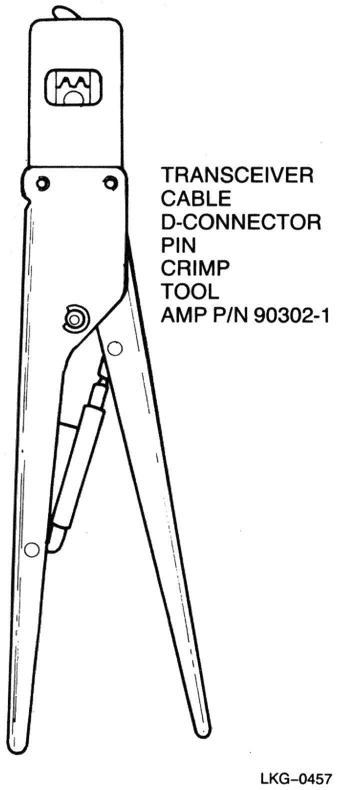


Figure 20 Transceiver Cable D-Connector Pin Crimp Tool

4.7.9 H4054 Transceiver Cable Straight Connector Kit

The H4054 connector kit contains the supplies necessary to repair a straight connector transceiver D-connector.

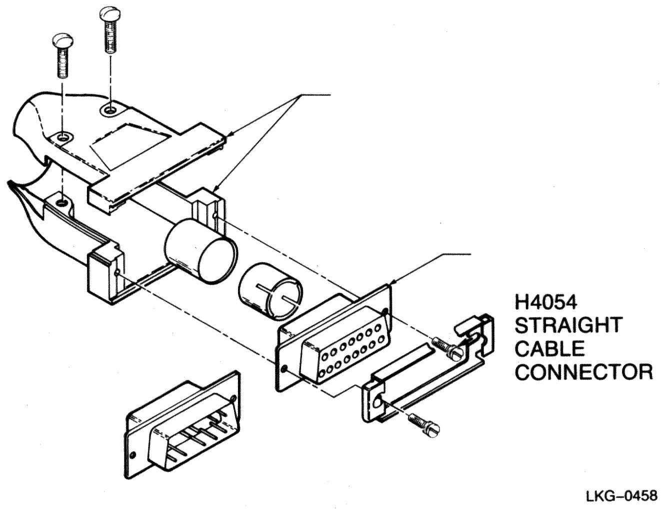


Figure 21 H4054 Transceiver Cable Straight Connector Kit

4.7.10 H4055 Transceiver Cable Right-Angle Connector Kit

The H4055 connector kit contains the supplies necessary to repair a right-angle D-connector.

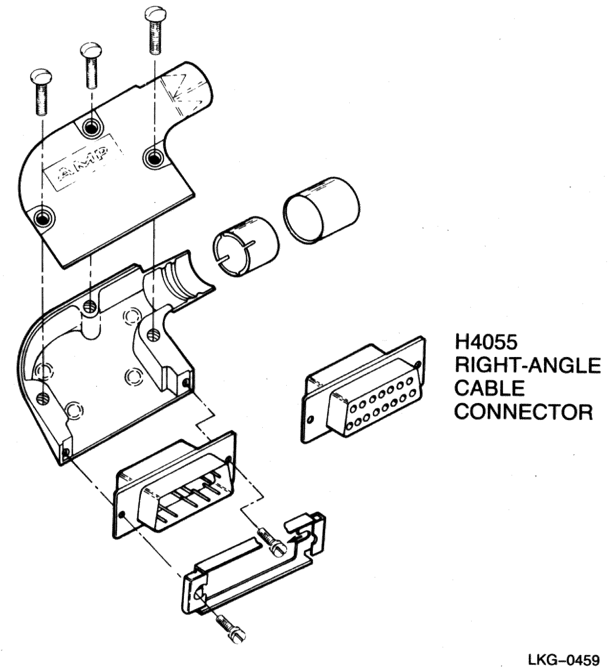


Figure 22 H4055 Transceiver Cable Right-Angle Connector Kit

4.7.11 Fiber-Optic Pulling Device

The pulling device properly distributes the pulling force over the strength elements in a fiber-optic cable. When pulling, the device grips the outside of the fiber-optic cable.

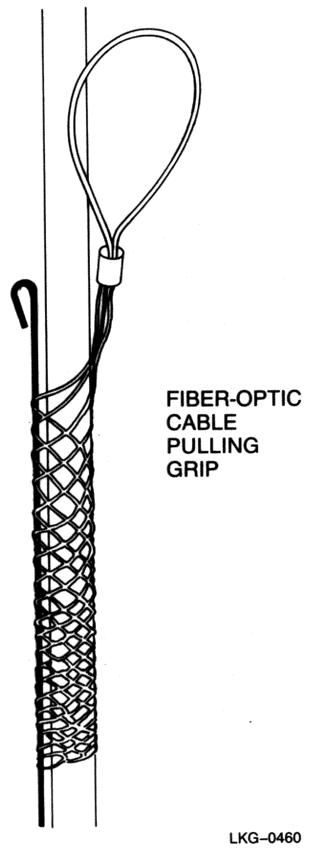


Figure 23 Fiber-Optic Pulling Device

4.7.12 Fiber-Optic Swivel

The fiber-optic swivel allows the cable coils to unwind naturally without causing cable kinks.

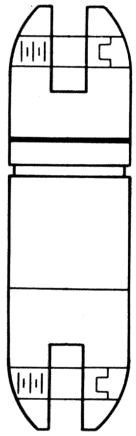


Figure 24 Fiber-Optic Swivel

CHAPTER 5
NETWORK TROUBLESHOOTING

5.1 INTRODUCTION

The object of troubleshooting an Ethernet network is to isolate problems affecting network operation. There are several tools available to accomplish this. Since space and time restrict the documenting of all the tools, this chapter will concentrate on the Network Interconnect Exerciser (NIE) with a brief description of the Network Control Program (NCP).

This chapter contains the following information:

- An overview of the Network Interconnect Exerciser (NIE).
- NIE operating instructions
- Listing of the NIE commands
- Listing of NIE error messages
- Network Control Program (NCP) overview

5.2 NETWORK INTERCONNECT EXERCISER (NIE) OVERVIEW

The NIE is a program that enables the user to test whether nodes on an Ethernet can communicate with one another. The NIE operates at the data link level of the Ethernet architecture and uses the loopback features of the Maintenance Operation Protocol (MOP).

The following capabilities are provided by the NIE:

Testing – Enables the user to determine whether nodes on the network can communicate with one another. This kind of testing is called *connectivity testing* and can be performed at any time. Such tests, however, should always be conducted when a node is added to the network. Connectivity testing provides four types of tests to verify the connectivity of new and existing nodes. Each test loops packets through different paths to verify that the tested nodes can communicate with each other.

Monitoring – Enables the user to monitor network traffic to determine the volume and characteristics of the packets moving through the network. Statistics returned by this capability can help analyze problems that may be caused by traffic flow and protocol errors between sending and receiving nodes.

A user can specify that the monitor listen to the traffic and log statistics based on any one, any combination, all, or none of the following parameters:

- Specified source node address
- Specified destination node address
- Specified protocol type

If values are not specified for any of these parameters, all nodes will be monitored for messages of all protocol types.

5.3 VMS OPERATING INSTRUCTIONS

5.3.1 Setting DECnet and VMS Parameters

Certain network and system parameters must be set or reset for NIE to run. SERVICE must be disabled on the host node.

```
NCP> SHOW CIRCUIT UNA-n CHARACTERISTICS
```

The network returns a list of characteristics for the specified circuit. SERVICE is specified as ENABLED or DISABLED. If DISABLED, exit NCP. If ENABLED, use the following command.

```
NCP> SET CIRCUIT UNA-n STATE OFF
NCP> SET CIRCUIT UNA-n SERVICE DISABLED
NCP> SET CIRCUIT UNA-n STATE ON
NCP> EXIT
```

NOTE

Setting CIRCUIT STATE OFF dissolves all links for the specified circuit. It might be a good idea, therefore, to SHOW KNOWN LINKS before setting the CIRCUIT STATE OFF.

The following VMS parameters must be adjusted:

MAXBUF Parameter

```
$MCR SYSGEN
SYSGEN>SHOW MAXBUF
```

If this parameter is 1600 or greater, exit SYSGEN. If the parameter is not 1600 or greater, enter the following commands:

```
SYSGEN>SET MAXBUF 1600
SYSGEN>WRITE ACTIVE
SYSGEN>EXIT
```

BYTLM Parameter

```
$SET DEF SYS$SYSTEM
$RUN AUTHORIZE
UAF>MODIFY <username>/BYTLM=30000
UAF>EXIT
```

A user must log out and log in again for this change to take effect.

NOTE

When the NIE run is complete, use the above procedure to return the MAXBUF and BYTLM parameters to their orignal values.

5.3.2 DECnet Implications

When running concurrently with DECnet, the Ethernet adapter internal counters are shared. They contain information concerning full operation of the NI adapter, not just information developed by the NIE. A SHOW COUNTERS command displays full counter information since the time the counters were last zeroed. This includes information generated by DECnet operation. The NIE cannot zero the NI adapter counters.

5.3.3 Loading and Starting NIE

When in the VAX Diagnostic Supervisor (VDS), enter the following series of commands:

```
DS>LOAD EVDWC


                  [730]
DS>ATTACH DW[750] HUB DWO
                  [780]

DS>ATTACH [UNA 11]  DWO XEAO  774510 120
          [LUA 11 ]

DS>SELECT XEAO

DS>START
```

In the above, 774510 is the device address, and 120 is the vector. After the START command is issued, the NIE prompt (NIE>) appears. Help can be obtained using NIE by typing HELP or a question mark (?) to the NIE prompt.

NOTE

Running NIE increases traffic on the network. If more than one NIE runs concurrently on the network, normal operation could be severely affected. Note also that NIE does not guarantee packet delivery. Test packets lost during normal operation are reported to the operator.

5.4 PDP-11 XXDP+ OPERATING INSTRUCTIONS

5.4.1 Requirements

- Network Interconnect Exerciser (NIE) CZUACC Version CO
- XXDP+ Monitor Version 2.0 or later
- Diagnostic Runtime Services (DRS) Version 2.0 or later

5.4.2 Loading NIE

Boot the medium and the XXDP+ prompt, a dot (), appears. Type the following:

```
$R CZUACC
```

This loads the DRS along with NIE into system memory. The following prompt informs the user that XXDP+ has passed control to DRS.

```
DR>
```

Under DRS the following commands can be used:

STA	Start the NIE
RES	Restart the NIE
CON	Continue running the NIE after <CTRL C> is entered
DIS	Display content of hardware parameter table
EXI	Exit the DRS to the XXDP+ monitor

START, RESTART, and CONTINUE can be used with the following switches:

/NOR	Informs the DRS not to perform checksum after DRS traps
/FLA:flaglist	Sets all flags that are specified in flaglist

Flags that may be used are:

IER - Inhibit all error reports

IBE - Inhibit all error reports except first level

IXE - Inhibit extended error reports

5.4.3 Starting the ME

The following commands and responses are used to start the NIE:

DR> START/NOR

Change HW (L)? TYPE Y

UNITS (D) ENTER 1

WHAT IS THE PCSRO ADDRESS (0) ? 174510? ENTER THE ADDRESS

WHAT IS THE VECTOR ADDRESS (0)? 120? ENTER VECTOR

WHAT IS THE PRIORITY LEVEL (0)? 5? ENTER PRIORITY

When this dialogue is complete, control passes to the NIE. An identification message appears, followed by the NIE prompt (NIE>).

5.5 NIE COMMANDS

BOUNCE

FUNCTION

Enables the user to loop a packet through a sequence of nodes specified in the command line.

FORMAT

BOUNCE addrlst

addrlst is a list of physical addresses or logical node names in sequence through which the packet will be looped. If a node table is not built, physical addresses must be used. The addresses and/or node names must be separated by commas.

EXAMPLE

NIE>BOUNCE/AA-00-04-00-02-10,N5,N3,N6,N4

This BOUNCE command loops a packet from the NIE to Node AA-00-04-00-02-10, to Node 5, to Node 3, to Node 6, to Node 4, and back to the NIE. This table assumes the availability of a node table in which N3, N4, N5, and N6 are defined.

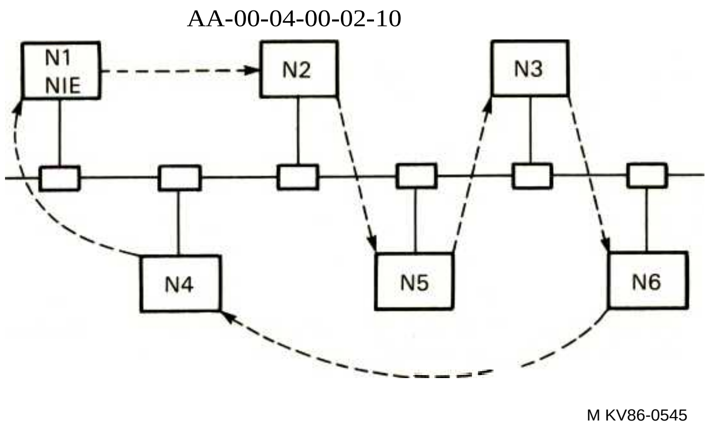


Figure 1 BOUNCE Command

BUILD

FUNCTION

Calls the BUILD routine to build a node table. The node table defines the network to the NIE. It consists of the following information:

- Logical address
- Hardware default address
- Physical node address
- Node type
  DECnet address (for DECnet nodes)

FORMAT

BUILD

EXAMPLE

NIE>BUILD

CLEAR

FUNCTION

Clears the entire node table, specified nodes, and other operating parameters as specified by the user.

FORMAT

```
CLEAR NODE/addrlst
      NODES/ALL
      SUMMARY
      LISTEN
      MESSAGE
```

addrlst is one or more logical names or physical addresses of nodes to be cleared from the node table. Node addresses and/or logical names must be separated by commas.

EXAMPLE

NIE>CLEAR NODES/Nl,N2,AA-00-03-00-10-53

This CLEAR command clears nodes N1, N2, and AA-00-03-00-10-53 from the node table.

NOTE

CLEAR MESSAGE sets MESSAGE parameters to default values.

EXIT

FUNCTION

Exits the NIE to Diagnostic Supervisor and deallocates allocated buffer space.

FORMAT

NIE>EXIT

HELP

FUNCTION

Displays HELP text.

FORMAT

HELP or ? (type a question mark)

EXAMPLES

NIE>HELP
NIE>?

IDENTIFY

FUNCTION

Issues a request ID packet to be sent to a specified node or nodes.

FORMAT

IDENTIFY/addr

addr is the physical address or logical name of a node the user wants identified.

EXAMPLES

NIE>IDENTIFY/AA-00-04-00-27-10
NIE>IDENTIFY/N6

These IDENTIFY commands cause nodes AA-00-04-00-27-10 and N6 to return the following identifying information about itself:

- Hardware default address
- Current physical address
- Node type [DEUNA, DELUA, DSRVA (DECserver 100)]
- MOP version number
- ECO version numbers
- Device-specific information (where implemented)

LISTEN

FUNCTION

Monitors the network for packets that pass user-specified filters.

FORMAT

LISTEN SOURCE/addr
DESTINATION/addr
PROTOCOL/protype

SOURCE/addr is the physical address or logical name of the transmitting node. Default = accepts packets with any valid source address.

DESTINATION/addr is the physical address or logical name of the destination node. Default = accepts packets with any valid destination address.

PROTOCOL/protype is the protocol type specified in the packet. Default = accepts packets of any valid protocol type.

Protocol Types

60-00	Loopback functions
60-01	Dump/load functions
60-02	Remote console functions
60-03	DECnet
60-04	LAT (Ethernet terminal server)
60-06	Reserved for customer use by Digital Equipment Corporation
00-08	TCP/IP (as implemented by 4.2BSD UNIX)
90-00	Cross-company loopback messages

EXAMPLES

NIE>LISTEN

This LISTEN command logs source and destination of messages of all protocol types.

NIE>LISTEN SOURCE/AA-00-03-00-23-45

This LISTEN command logs destination and protocol types of all messages transmitted by node AA-00-03-00-23-45.

NIE>LISTEN DESTINATION/N2/SOURCE/N1/PROTOCOL/60-03

This LISTEN command logs messages of protocol 60-03 sent by Node 1 to Node 2.

MESSAGE

FUNCTION

Establishes the type of data to be contained in the message field of a packet to be looped.

FORMAT

MESSAGE/TYPE=type
/SIZE=n
/SIZE=ALL
/COPIES=n

Type specifies the following message types:

- ALPHANUMERIC: A-Z, a-z, 0-9
- ONES
- ZEROS
- 1ALT: 1010101
- 0ALT: 0101010
- CCITT: Random test pattern, in accordance with CCITT standard.
- TEXT: User-selected pattern; maximum of 72 characters
- ALL: Enables packet to cycle among all of the above

SIZE=n is the number of bytes in a packet. Valid range: 46-1500. Default: 512

SIZE=ALL indicates various packet sizes. If TEXT is defined, and the user specifies SIZE=ALL, a message of minimum, nominal, and maximum will cycle for all of the message types. If TEXT is not defined, messages of minimum, nominal, and maximum will cycle for all message types except TEXT.

COPIES=n is the number of times the message type is transmitted. Default=1. An entry of -1 or "loop" causes the test to loop until a <CTRL/C> is entered.

EXAMPLE

NIE>MESSAGE/TYPE=0ALT/SIZE=1024/COPIES=3

This MESSAGE command causes a test message of 0ALT, 1024 bytes long, 3 copies.

NOTE
If only MESSAGE is entered, default values will be set for all parameters.

NODE

FUNCTION

Adds a specified node or nodes to the node table.

FORMAT

NODE/addrlst

addrlst is a physical address or addresses of a node or nodes that a user wants to add to the node table.

EXAMPLE

NIE>NODE/AA-00-03-00-27-10,AA-00-03-01-04-26

Adds specified nodes to the node table.

NOPRINT

FUNCTION

Puts NIE into the NOPRINT mode.

FORMAT

NIE> NOPRINT

PRINT

FUNCTION

Puts NIE into the PRINT mode.

FORMAT

NIE> PRINT

RUN

FUNCTION

Causes the specified test to execute the specified number of times.

FORMAT

RUN test[/PASS=n]

Test is DIRECT, LOOPPAIR, or ALL.

DIRECT - Loops a packet to each node in the node table and maintains test summary data in a summary data table. Message parameters are set up in the MESSAGE command. NIE waits a maximum of three (3) **seconds for** a reply.

LOOPPAIR - Loops a packet through each logically adjacent pair of nodes in the node table. In a 4-node network, for example, the loop path would be: N1 to N2 to N1, N2 to N3 to N2, N3 to N4 to N3, N4 to N1 to N4.

ALL - First invokes DIRECT for one pass and goes to LOOPPAIR.

NOTE
In all cases, the test begins and ends at the node in which NIE resides.

/PASS=n indicates the number of times the test is to be run. Default = value of /COPIES in the MESSAGE command. An entry of -1 or "loop" causes the test to loop until <CTRL/C> is entered.

EXAMPLES

NIE> RUN DIRECT/PASS=3
NIE> RUN LOOPPAIR
NIE> RUN ALL

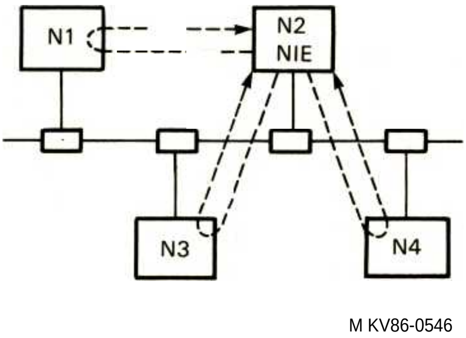


Figure 2 RUN DIRECT

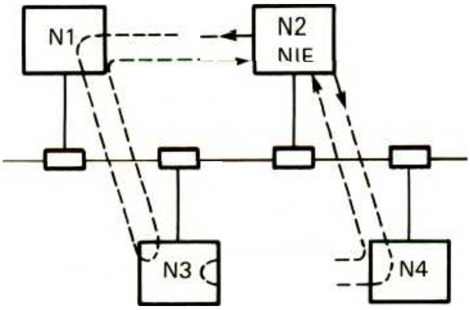


Figure 3 RUN LOOPPAIR

SAVE

FUNCTION

Writes the current node table to a text file.

FORMAT

SAVE [filespec]

filespec is a valid VMS file specification. Default = NIE.TBL.

EXAMPLES

NIE>SAVE NTBL.TXT

This command writes the current node table to a file called NTBL.TXT.

NIE>SAVE

This command writes the current node table to the default file, NIE.TBL.

SHOW

FUNCTION

This command displays information as specified by the command's qualifier.

FORMAT

SHOW [NODES]
[MESSAGES]
[COUNTERS]
[LISTEN]
[REMOTE addr]

SHOW NODES displays the contents of the node table.

SHOW MESSAGES displays the current MESSAGE parameters.

SHOW COUNTERS displays counters maintained by the node on which the NIE is running.

SHOW LISTEN displays the contents of two data logs. One log consists of source address, destination address, protocol type, packet length, and count indicating the number of times a packet passes a specified filter. The second log contains source addresses for packets that have passed filters and a count of the number of times packets with that source address have been received.

SHOW REMOTE displays the counters maintained by the specified remote node, if the node supports this function. The remote node may be specified by physical address or logical name.

NOTE
SHOW REMOTE has not been implemented.

EXAMPLE

NIE>SHOW NODES

SUMMARY

FUNCTION

Displays summary data of all test runs since the CLEAR SUMMARY command was last issued or since the NIE was started.

FORMAT

SUMMARY

EXAMPLE

NIE>SUMMARY

UNSAVE

FUNCTION

Restores the latest version of the node table that was written to a specified file or to the default file by the SAVE command.

FORMAT

UNSAVE [filespec]

filespec is a valid VMS file specification. Default = NIE.TBL.

EXAMPLES

NIE>UNSAVE NTBL.TXT

This command restores the latest version of a file called NTBL.TXT.

NIE>UNSAVE

This command restores the latest version of the default file NIE.TBL.

5.6 ERROR MESSAGES

The NIE issues three types of error messages:

- NIE QIO error messages
- System error messages
- Test error messages

When the NIE aborts because of an error condition, you will go to the Diagnostic Supervisor level; other errors leave you in NIE.

SAMPLE ERROR MESSAGE #1

The following is an error message when the MAXBUF was set at 1400 bytes instead of 1600 bytes and the following NIE commands were issued:

```
NIE>MESSAGE/SIZE=1500
NIE>B0UNCE/N1
   Starting bounce - 1500 bytes, ASCII data pattern...
******NI EXERCISER EXTENDED- 2.0******************
Pass 0, initialization section, error 29, 7-MAR-1986 16:12:52.51
System fatal error while testing XEAO: QIO error in Bounce procedure
RO status error queueing packet transmit. Exceeded quota.

******End of System fatal error number 29***********

.. Aborted program at pass 0, initialization section, PC 00009652
DS>
```

To correct this error and confirm the system, use the following commands:

```
SYSGEN>SET  MAXBUF 1600
SYSGEN>WRITE ACTIVE
SYSGEN>EXIT
$RUN ENSAA
```

```
DS>ATTA  DW730 HUB DW0
DS>ATTA   UNA11   DW0 XEA0 774510 120 5
DS>SEL  ALL
DS>RUN  EVDWC
```

```
NIE>UNSAVE
    12 Entries have been added to the node table
(this command uses the existing node table)

NIE>MESSAGE  SIZE 1500
NIE>BOUNCE  N1
   Starting bounce - 1500 bytes, ASCII data pattern..Test ok
```

SAMPLE ERROR MESSAGE #2

The following error message was encountered trying to run NIE with service enabled.

```
$MC NCP
NCP>CIR  UNA-0 STATE OFF
NCP>CIR  UNA-0 SERVICE ENABLE
NCP>CIR  UNA-0 STATE ON
NCP>EXIT
$RUN ENSAA



DS>ATTA  DW730 HUB DW0
DS>ATTA  UNA11 DW0 XEA0 774510 120 5
DS> SEL ALL
DS>RUN  EVDWC
..program: NI EXERCISER EXTENDED, revision 2.0, 1 test, at 16:29:27.19
Testing:XEAO
******NI EXERCISER EXTENDED- 2.0***************
Pass 0, Initialization section, error 10, 7-MAR 1986 16:29:27:.71
System fatal error while testing XEA): Error starting NI channel.

Cannot start loopback (MOP) ,channel.
Device already allocated to another user.
There were 0 (dec) bytes transferred.
I/0 Status Block status = 00000000 (hex)

******End of System fatal error number 10**********

..Aborted at pass 0, Initialization section, PC 00007CB7
DS>EXIT
```

To correct the error do the following:

```
$ MC NCP
NCP>SET CIR UNA-0 STATE OFF
NCP>SET CIR UNA-0 SERVICE DISABLE
NCP>SET CIR UNA-0 STATE ON
NCP>EXIT
```

SAMPLE ERROR MESSAGE #3

The following error message occurs when no device is attached.

```
DS>RUN EVDWC
.. Program: NI EXERCISER EXTENDED, revision 2.0, 1 test, at 16:33:01.02.
??No units to test, none selected with device types UNA11, LUA11
DS>
```

To correct the problem the user must do the attaching in the Diagnostic Supervisor as follows:

```
DS>ATTA DW730 HUB DW0
DS>ATTA UNAI l DW0 XEA0 774520 120 5
DS>SEL ALL
```

5.7 TROUBLESHOOTING PROBLEMS

The two problems discussed in this section show the use of NIE as a network troubleshooting tool. When running NIE, there is no need to turn off DECnet or LAT-11. This allows the system to stay up and running on the network.

NOTE

Service, however, must he disabled on the node running the NIE.

PROBLEM # 1

Customer at Node N2 cannot communicate with Node N4.

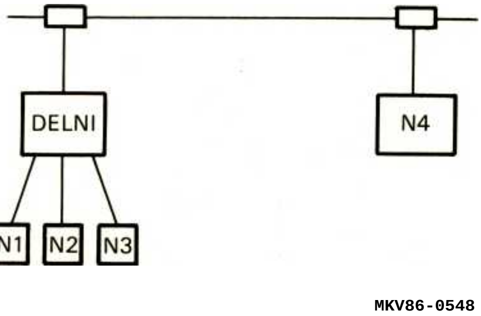


Figure 4 Network Configuration for Problem # 1

Probable troublehooting method. After starting NIE the following commands can be used:

NIE> UNSAVE (Loads "saved" node table)
NIE> BOUNCE/N 1,N3
Starting bounce - 512 bytes, ASCII data pattern..Test ok
Proves that N2 can talk to N1 and N3.)

NIE> BOUNCE/N4
Starting bounce - 512 bytes, ASCII data pattern..Test timed out

*******NI EXERCISER EXTENDED - 2.0*****************
Pass 0, initialization section, error 100 25-NOV-1985 09:51:41.59
System fatal error while testing XEAO: Error looping packets.

BOUNCE command
ASCII data pattern
Packet frame length = 512 (dec) bytes
Pass 0

******End of System fatal error 100******************

This should indicate that something is wrong with N4 or the path to N4. A check of the DELNI unit shows that the Mode Selection switch is in the LOCAL position. Put switch in GLOBAL position. Check network using NIE as follows:

NIE> BOUNCE/N 1,N3,N4
Starting bounce - 512 bytes, ASCII data pattern..Test ok

Problem solved.

PROBLEM #2

Customer at Node N 1 cannot talk to Node N4.

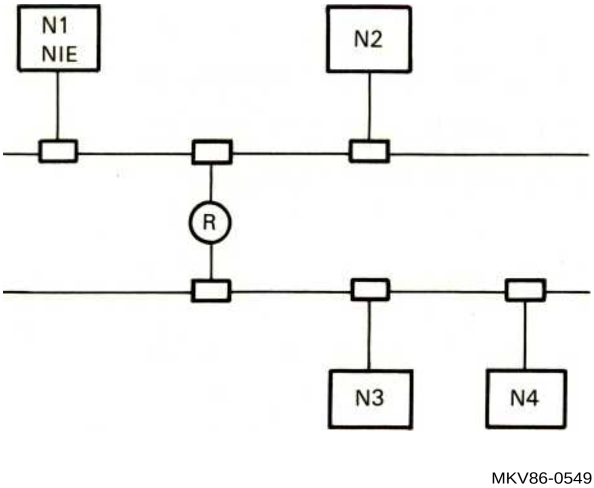


Figure 5 Network Configuration for Problem #2

Probable troubleshooting method using NIE. After NIE is running use the following commands.

NIE>UNSAVE
NIE>BOUNCE/N2,N3,N4
Starting bounce - 512 bytes, ASCII data pattern..Test timed out

*******NI EXERCISER EXTENDED - 2.0******************
Pass 0, initialization section, error 100, 25-NOV-1985 09:41:51.59
System fatal error while testing XEAO: Error looping packets.

BOUNCE command
ASCII data pattern
Packet frame length = 512 (dec) bytes
Pass 0

******End of System fatal error 100*******************

NIE>BOUNCE/N2
Starting bounce - 512 bytes, ASCII data pattern..Test ok

Go to N3 and run NIE.

NIE>UNSAVE
NIE>BOUNCE/N4
Starting bounce - 512 bytes, ASCII data pattern..Test ok

NIE>BOUNCE/N1,N2
Starting bounce - 512 bytes, ASCII data pattern..Test timed out

*******NI EXERCISER EXTENDED - 2.0***************
Pass 0, initialization section, error 100, 25-NOV-1985 09:45:51.19
System fatal error while testing XEAO: Error looping packets.

BOUNCE command
ASCII data pattern
Packet frame length = 512 (dec) bytes
Pass 0

******End of System fatal error 100*****************

Test results show that nodes on either side of the repeater can communicate; nodes cannot communicate across the repeater.

This indicates that the repeater linking the two segments. is the probable cause.

5.8 NCP OVERVIEW

This is a brief overview of three basic NCP commands. In-depth information on NCP can be obtained from the NCP Reference Manual (AA-Z425A-TE). The commands described below allow the user to loop within or between nodes and to set circuits for running NIE.

LOOP NODE

FUNCTION

The LOOP NODE command tests a specified node (other than the executor node) in the network by causing test blocks of data to be transmitted to the node. The parameters are optional and can be entered in any order.

FORMAT

NCP>LOOP node - component [parameter][...]

PARAMETERS

ACCOUNT
Identifies the user's account for access control verification for the designated node.

COUNT
Number of blocks to be sent during loopback. Range = 1 through 65,535 (decimal). Default - l.

LENGTH
Specifies length (in bytes) of the blocks to be sent during loopback. Range = I through 65,535. Default = 40.

PASSWORD
Identifies the user's password for access **control verification for** the designated node.

USER
Specifies the user's identification for access control verification for the designated node.

WITH
Specifies the type of binary information to be sent during testing. The three types of data that can be sent are:

MIXED
ONES
ZEROS

EXAMPLE

NCP>LOOP NODE LAUREL

LOOP CIRCUIT

FUNCTION

The LOOP CIRCUIT command tests a specified circuit in the network by transmitting test blocks of data over the specified circuit. Parameters are optional and can be entered in any order.

FORMAT

NCP>LOOP circuit-component[parameter][...]

CIRCUIT-COMPONENT - Identifies the circuit for loopback testing.

PARAMETERS

ASSISTANT PHYSICAL ADDRESS
Ethernet physical address of the node that will be loopback assistant for Ethernet third party loop testing. Must be included if HELP is used in this command. Cannot be a multicast address.

ASSISTANT NODE
Can be used instead of PHYSICAL ASSISTANT ADDRESS.

COUNT
Specifies the number of blocks to be sent during loopback testing. Range = 1 through 65,535. Default = l.

HELP
Indicates assistance to be provided during Ethernet loopback testing by the assistant node. Three types are:

TRANSMIT
RECEIVE
FULL

If HELP is specified, ASSISTANT PHYSICAL ADDRESS or ASSISTANT NODE must be specified.

LENGTH
Specifies length (in bytes) of blocks to be sent during loopback testing. Range = 1 through 65,535. Default = 40.

NODE
Identifies the destination node to be used for loopback testing. Can be used instead of PHYSICAL ADDRESS parameter.

PHYSICAL ADDRESS
Identifies the Ethernet physical address of the destination node in Ethernet loopback testing.

WITH

Specifies type of binary data to be sent during testing. Three types are:

MIXED
ONES
ZEROS

Default = MIXED

EXAMPLES

NCP>LOOP CIRCUIT UNA-0 PHYSICAL ADDRESS AA-00-04-00-FF-04

NCP>LOOP CIRCUIT UNA-0 NODE 224

NCP>LOOP CIRCUIT UNA-0 PHYSICAL ADDRESS AA-00-04-00-12-02
ASSISTANT NODE GULL HELP RECEIVE

SET CIRCUIT

FUNCTION

The SET CIRCUIT command is needed to set circuit characteristics for running NIE.

FORMAT

NCP>SET CIRCUIT UNA-n STATE OFF
(circuit not in use)

NCP>SET CIRCUIT UNA-n SERVICE DISABLED
(circuit may not perform any service functions)

NCP>SET CIRCUIT UNA-n STATE ON
(circuit is available for normal use)

Communications Options Minireference Manual
Volume 5 Ethernet Devices (Part 2)
EK-CMIV5-RM-004

READER'S COMMENTS

Your comments and suggestions will help us in our efforts to improve the quality of our publications.

1. **How did you use this manual? (Circle your response.)**

   (a) Installation (c) Maintenance (e) Training
   (b) Operation/use (d) Programming (f) Other (Please specify.) ____________

2. **Did the manual meet your needs? Yes ☐ No ☐ Why?** ____________

3. **Please rate the manual on the following categories. (Circle your response.)**

	Excellent	Good	Fair	Poor	Unacceptable
Accuracy	5	4	3	2	1
Clarity	5	4	3	2	1
Completeness	5	4	3	2	1
Table of Contents, Index	5	4	3	2	1
Illustrations, examples	5	4	3	2	1
Overall ease of use	5	4	3	2	1

4. **What things did you like *most* about this manual?** ____________

5. **What things did you like *least* about this manual?** ____________

6. **Please list and describe any errors you found in the manual.**

Page	Description/Location of Error

Name ____________ Job Title ____________
Street ____________ Company ____________
City ____________ Department ____________
State/Country ____________ Telephone Number ____________
Postal (ZIP) Code ____________ Date ____________

THANK YOU FOR YOUR COMMENTS AND SUGGESTIONS.

Please do not use this form to order manuals. Contact your representative at Digital Equipment Corporation or (in the USA) call our DECdirect™ department at this toll-free number: 800-258-1710.

FOLD HERE AND TAPE. DO NOT STAPLE.

digital™

No Postage Necessary if Mailed in the United States

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 33 MAYNARD, MA

POSTAGE WILL BE PAID BY ADDRESSEE

DIGITAL EQUIPMENT CORPORATION
Educational Services/Quality Assurance
12 Crosby Drive BUO/E08
Bedford, MA 01730-1493
USA

FOLD HERE AND TAPE. DO NOT STAPLE.