EK-CMIV7-RM-005

Networks . Communications

Communications Options Minireference Manual

Volume 7 Ethernet Devices (Part 3)

DIGITAL INTERNAL USE ONLY

Digital Equipment Corporation

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

The information in this document is subject to change without notice and should not be construed as a commitment by Digital Equipment Corporation. Digital Equipment Corporation assumes no responsibility for any errors that may appear in this document.

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.

The following are trademarks of Digital Equipment Corporation:

digital™	DECUS	RSTS
	DECwriter	RSX
DEC	DIBOL	Scholar
DECmate	MASSBUS	ULTRIX
DECset	PDP	UNIBUS
DECsystem-10	P/OS	VAX
DECSYSTEM-20	Professional	VMS
	Rainbow	VT
		Work Processor

CONTENTS

CONTENTS (Cont)

CONTENTS (Cont)

CONTENTS (Cont)

CONTENTS (Cont)

QUICK REFERENCE CHECK

Use this quick reference as a resource to identify the major sections in the 7 volumes of the *Communications Options Minireference Manual.*

VOLUME 1 COMMUNICATIONS OPTIONS

Float-Address Vectors
Cables
Test Connectors
Special Test Programs
Special Tools and Equipment
EIA/CCITT Data
Vendor Modem Products
Data Communication Troubleshooting
Communication Devices

- DH11
- DHB32
- DHQ11
- DHU11
- DHV11
- DMB32
- DMC11
- DMF32

VOLUME 2 COMMUNICATIONS OPTIONS (CONT)

- DMP11
- DMR11
- DMV11
- DMZ32
- DPV11
- DSB32
- DSV11
- DUP11
- DUV11
- DZ11
- DZ32
- DZQ11
- DZV11
- KMV1A/KMV1A-S

VOLUME 3 DIGITAL MODEMS (PART 1)

EIA/CCITT Data
Vendor Modem Products
Modems

- DF02/DF03
- DF112
- DF124
- DF124+
- DF126
- DF127
- DF129
- DF212-CA
- DF224
- DF242-CA
- DFA01
- Command Summary

VOLUME 4 DIGITAL MODEMS (PART 2)

Enclosures
DFM Devices
- DFM Statistical Multiplexer
- DFM X.25 PAD

Test Procedures
Modem Option Dictionary
Modem Theory
Autodialer Command/Response

VOLUME 5 ETHERNET DEVICES (PART 1)

Ethernet Devices
- DEBNA/DEBNK
- DECmux II
- DECNA
- DECOM
- DECrouter 200
- DECSA
- DECserver 100
- DECserver 200
- DECserver 500

VOLUME 6 ETHERNET DEVICES (PART 2)

Ethernet Devices (Cont)
- DEFTR
- DELNI
- DELUA
- DEMPR
- DEMWA
- DEPCA
- DEQNA
- DEREP
- DESNC
- DESPR
- DESTA

VOLUME 7 ETHERNET DEVICES (PART 3)

Ethernet Devices (Cont)
- DEUNA
- H4000
- H4005
- LAN Bridge 100
- MUXserver 100
- TPENET

Cables
Special Tools and Test Equipment
Network Troubleshooting
Ethernet Configuration

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 INSTALLATION

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

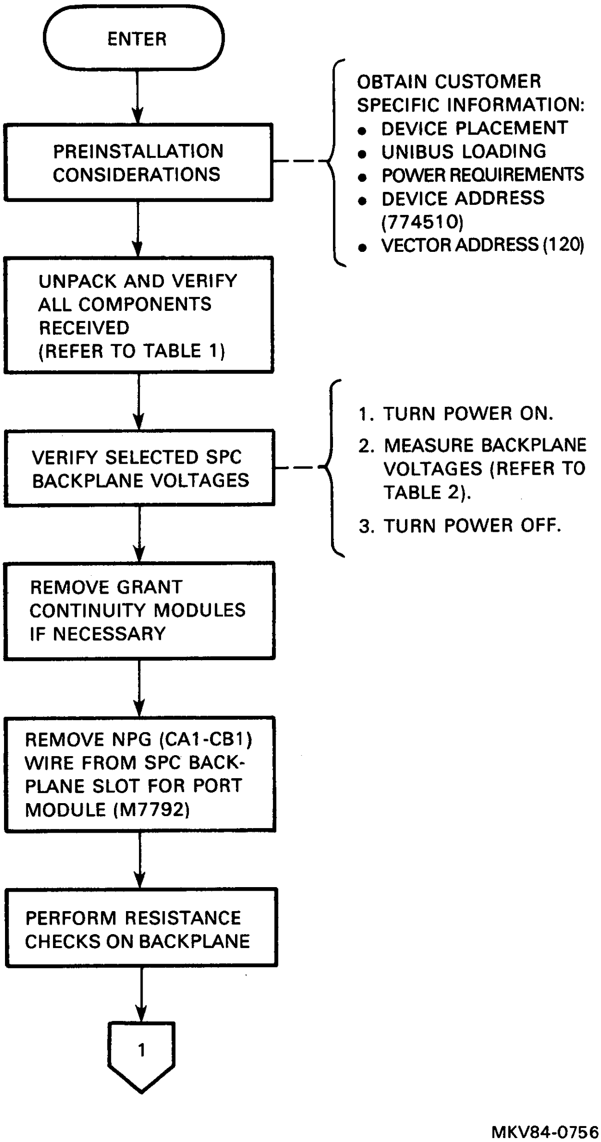
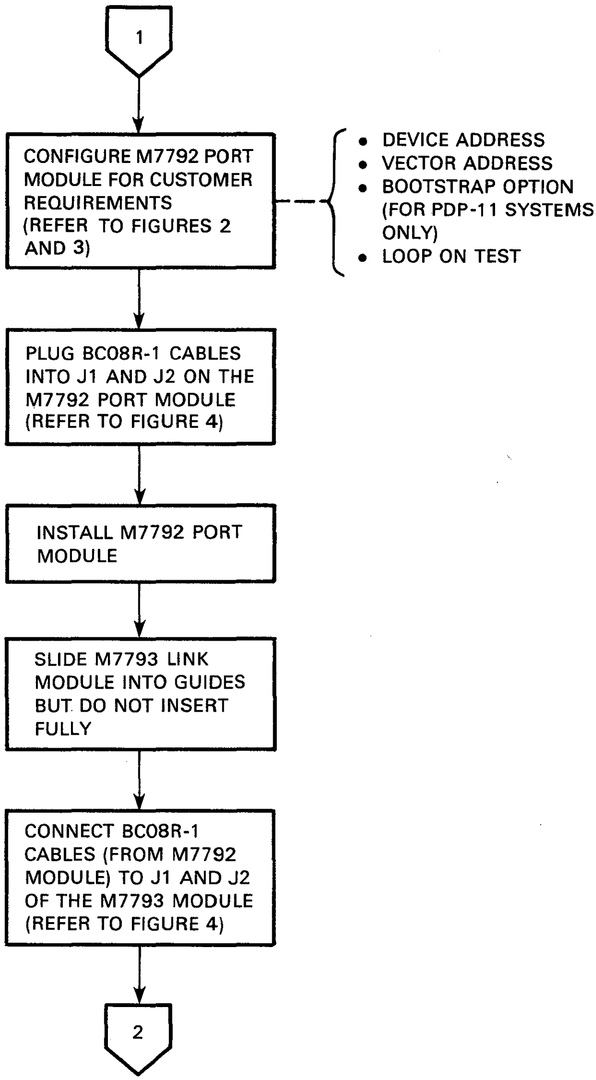


Figure 1 Installation Flow Diagram (Sheet 1 of 5)



MKV84-0757

Figure 1   Installation Flow Diagram (Sheet 2 of 5)

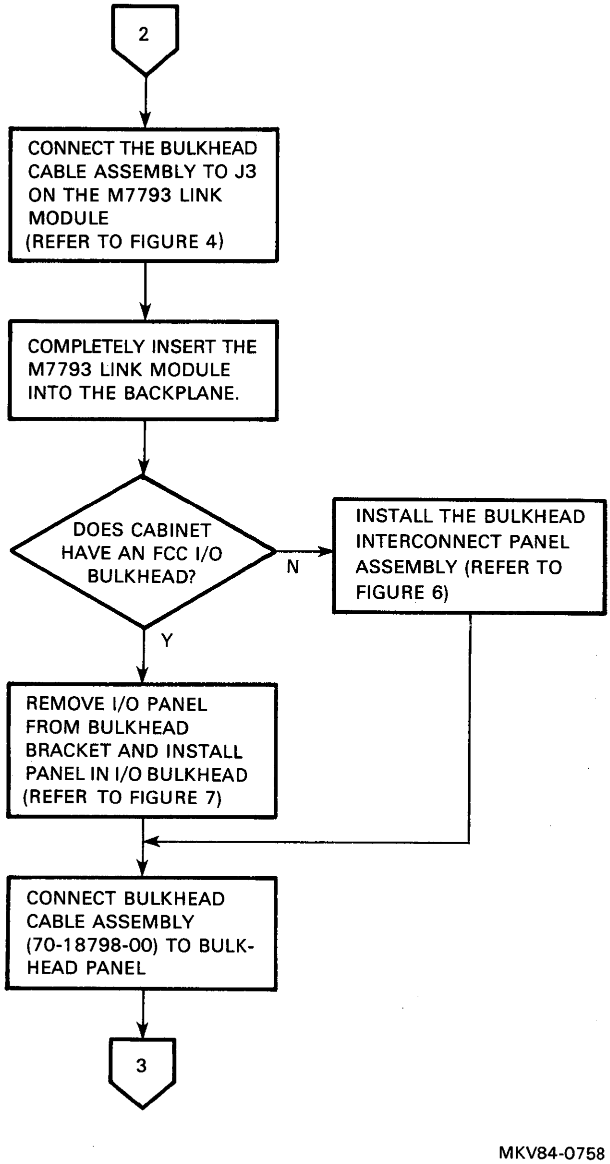


Figure 1 Installation Flow Diagram (Sheet 3 of 5)

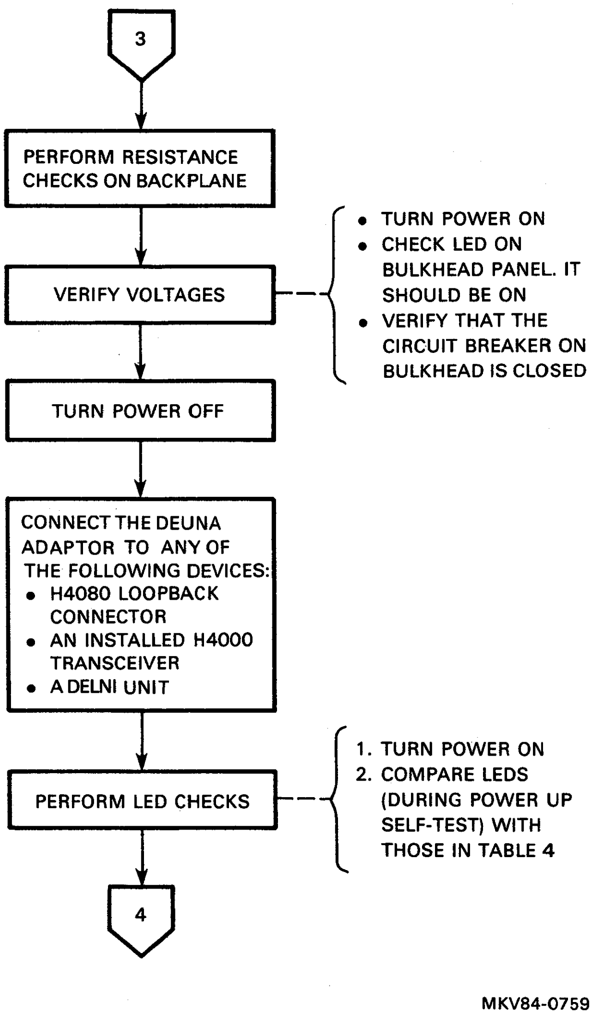


Figure 1 Installation Flow Diagram (Sheet 4 of 5)

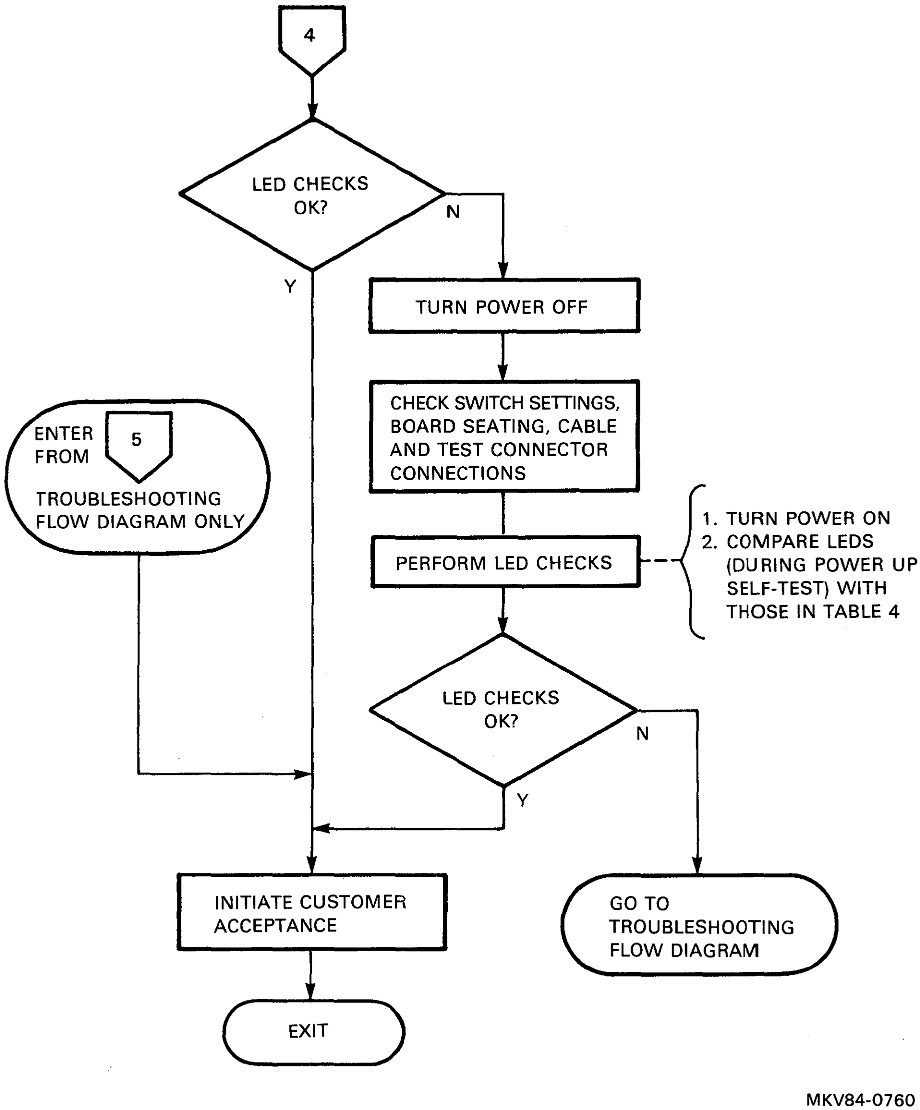


Figure 1 Installation Flow Diagram (Sheet 5 of 5)

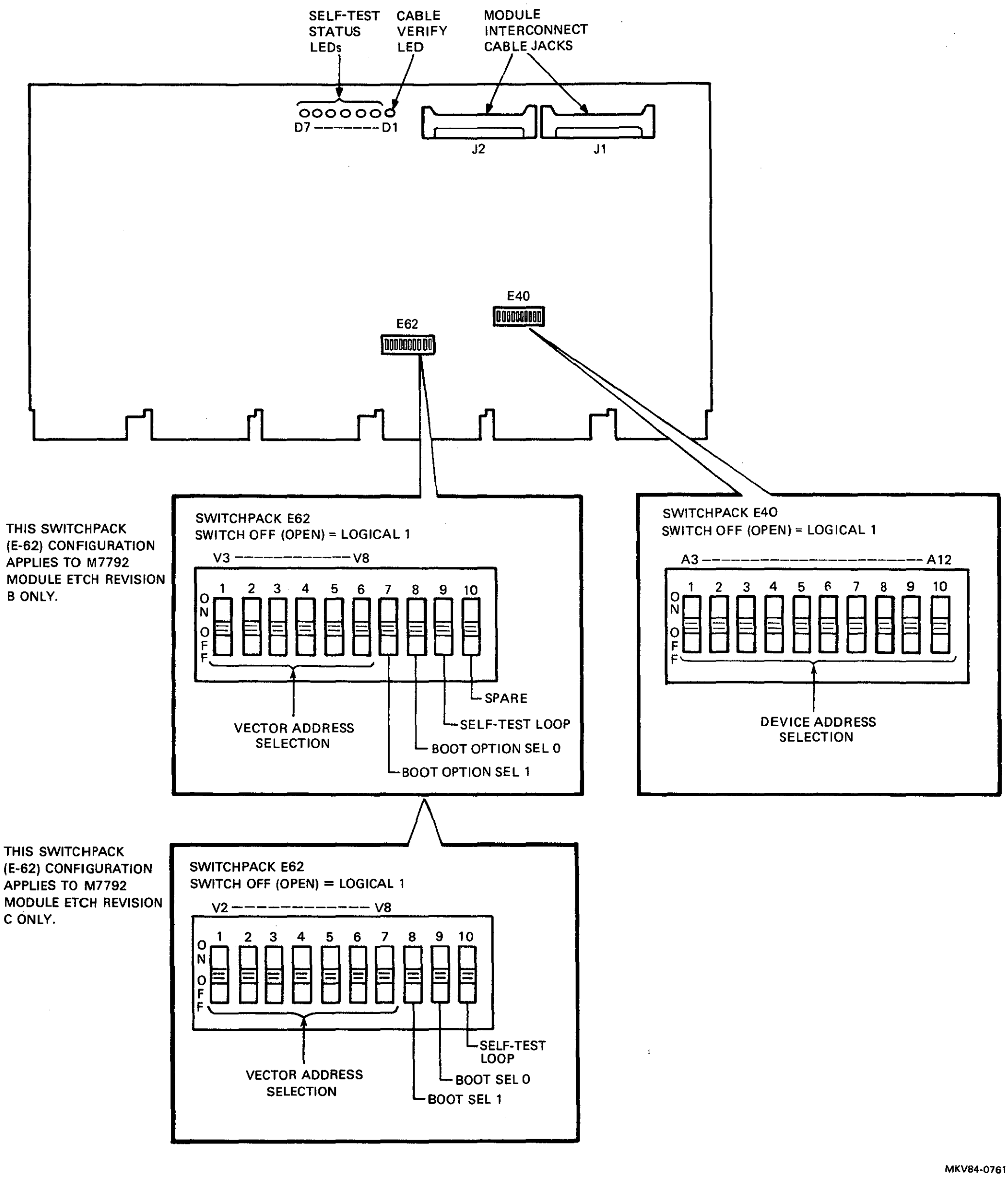


Figure 2 M7792 Switchpacks and Jumpers (Sheet 1 of 2)

NORMAL SETUP DEVICE ADDRESS (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 (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 forEtch rev B modules
M7792 E62 S10 forEtch 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 15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	LSB 0
1	1	1	SWITCHPACK E40										0	0	0

SWITCH NUMBER	S10	S9	S8	S7	S6	S5	S4	S3	S2	S1	FLOATING ADDRESS
										OFF	760010
									OFF		760020
									OFF	OFF	760030
								OFF			760040
								OFF		OFF	760050
								OFF	OFF		760060
								OFF	OFF	OFF	760070
							OFF				760100

						OFF					760200

						OFF	OFF				760300

					OFF						760400

					OFF		OFF				760500

					OFF	OFF					760600

					OFF	OFF	OFF				760700

				OFF							761000

			OFF								762000

			OFF	OFF							763000

		OFF									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)

DEUNA CABLING

Cabling

This section contains cabling diagrams for DEUNA adaptor configurations.

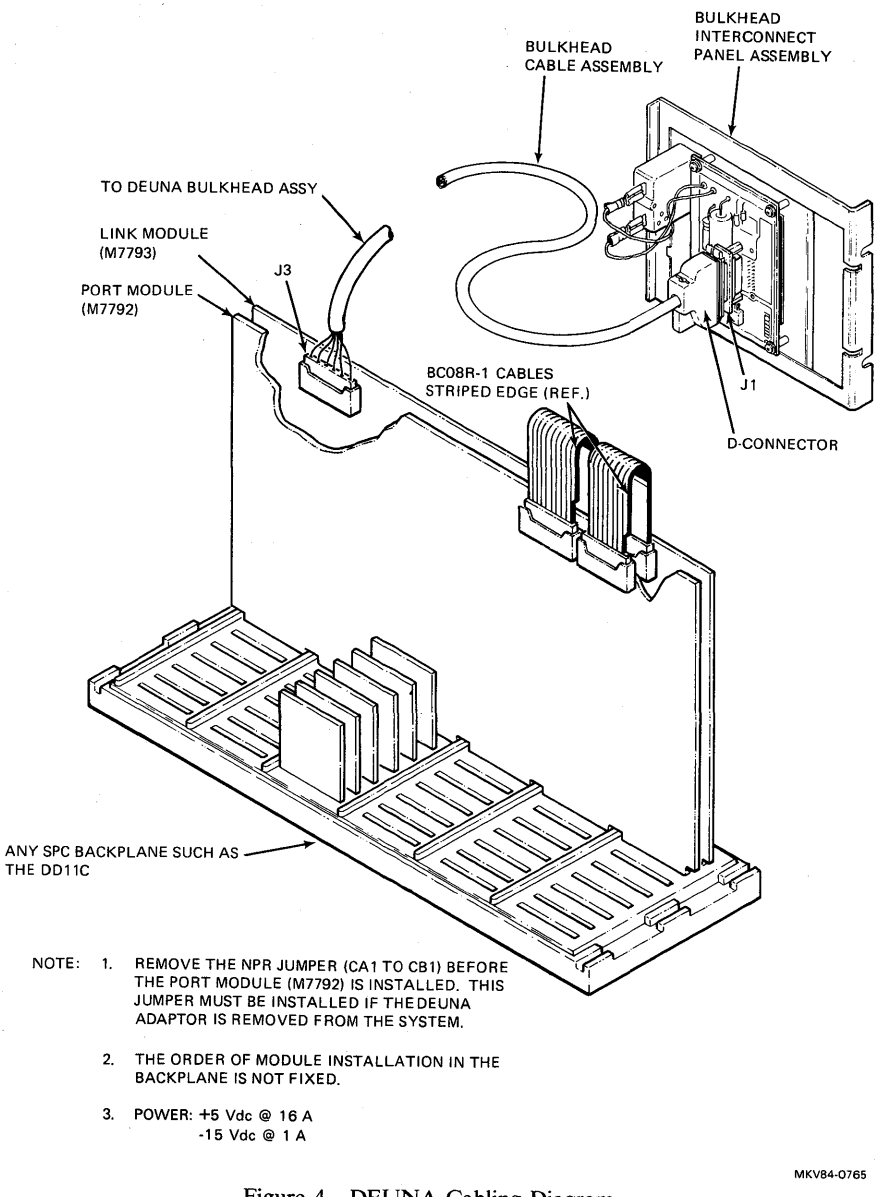


Figure 4 DEUNA Cabling Diagram

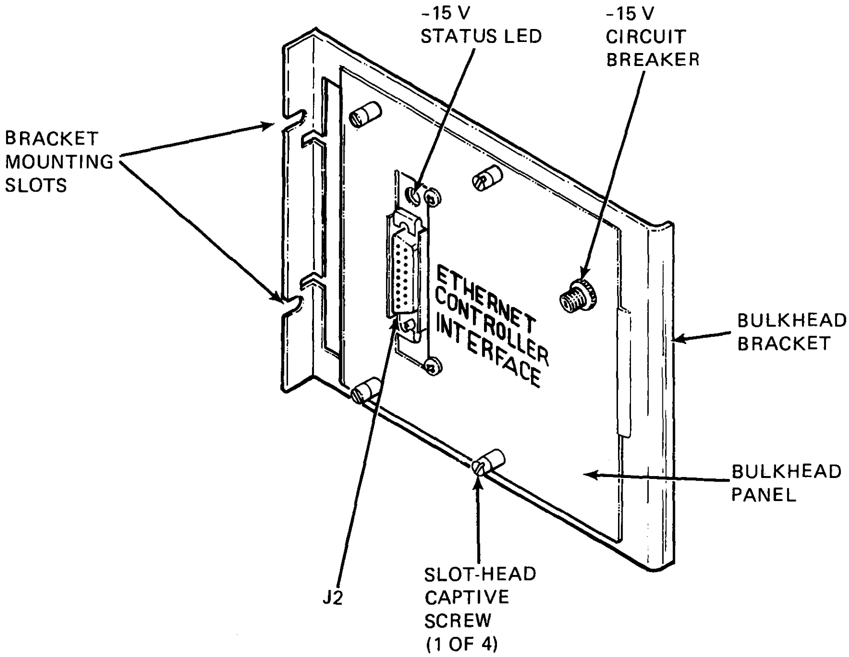
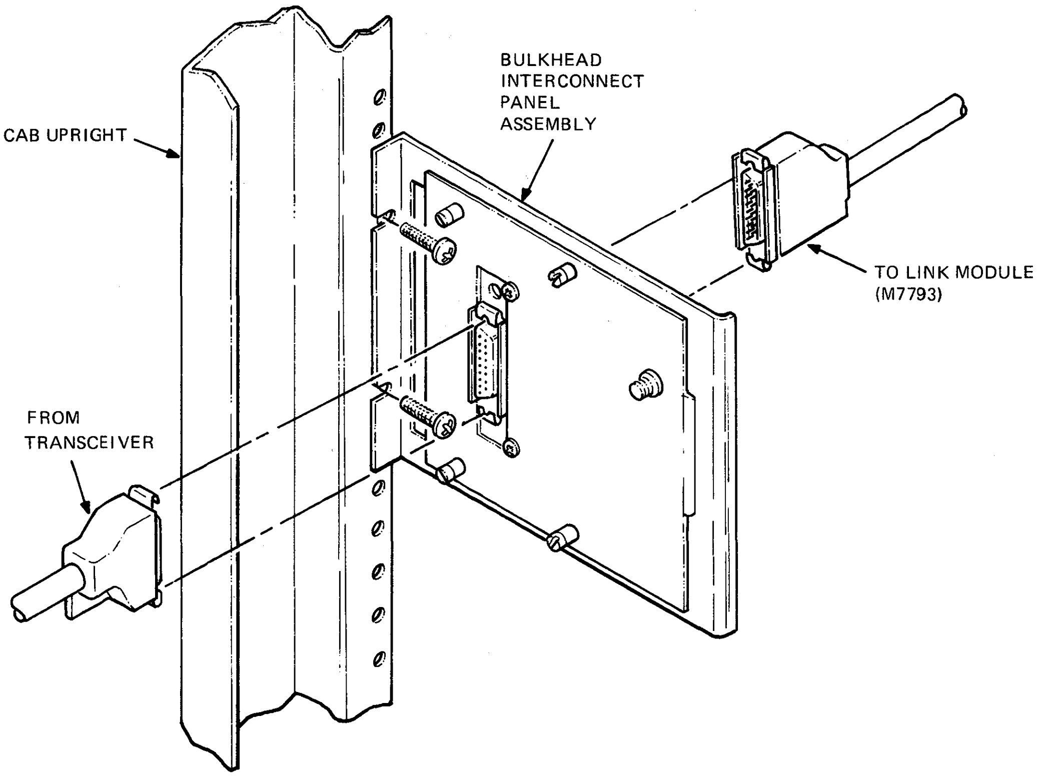


Figure 5 Bulkhead Interconnect I/O Panel Assembly



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

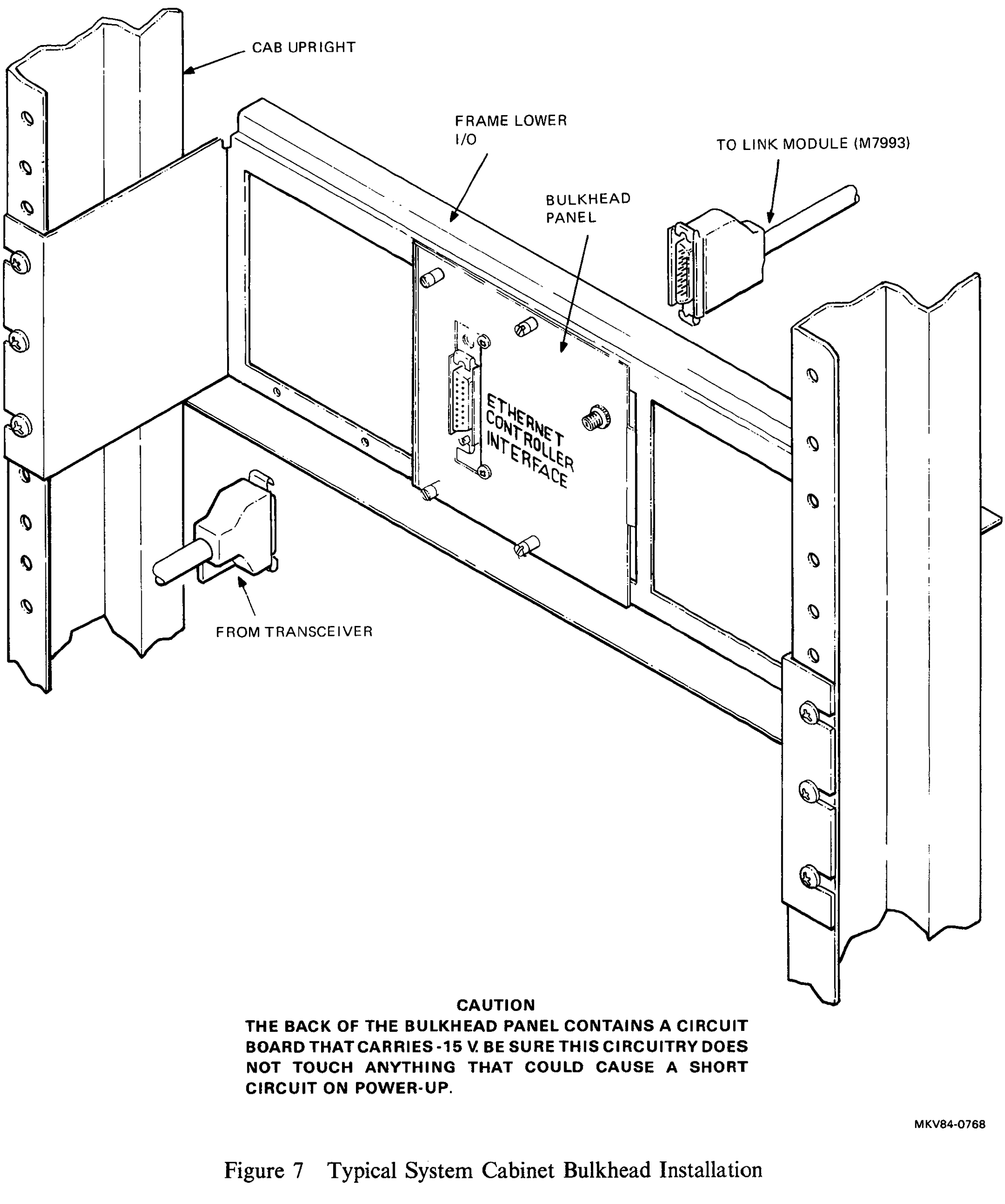


Figure 7 Typical System Cabinet Bulkhead Installation

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
```

DEUNA DIAGNOSTICS

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

DEUNA MAINTENANCE AIDS

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

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

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

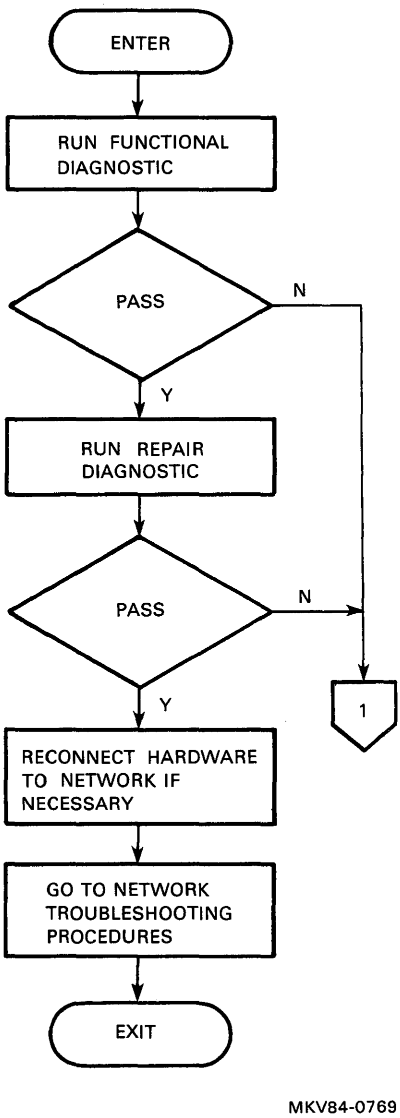
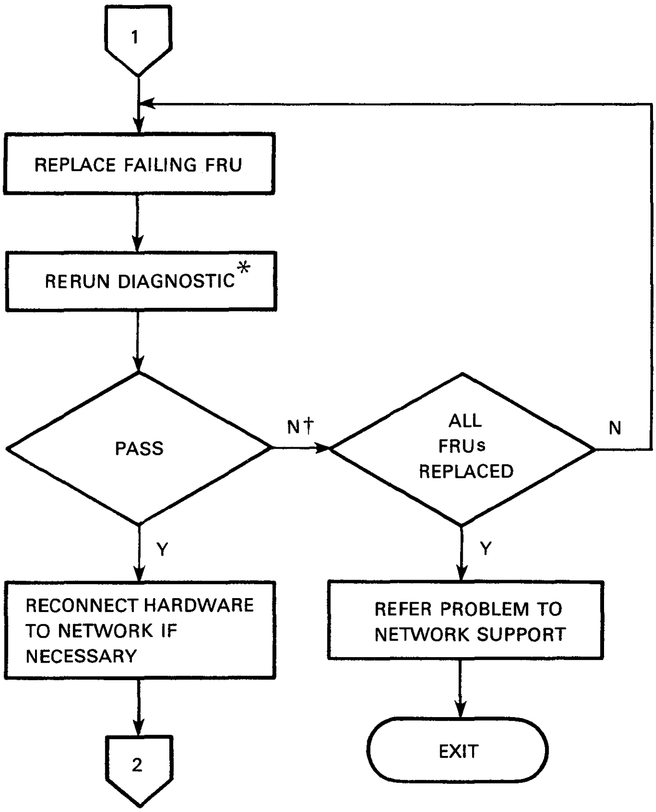


Figure 9 DEUNA Troubleshooting Flow Diagram (Sheet 1 of 3)



* 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)

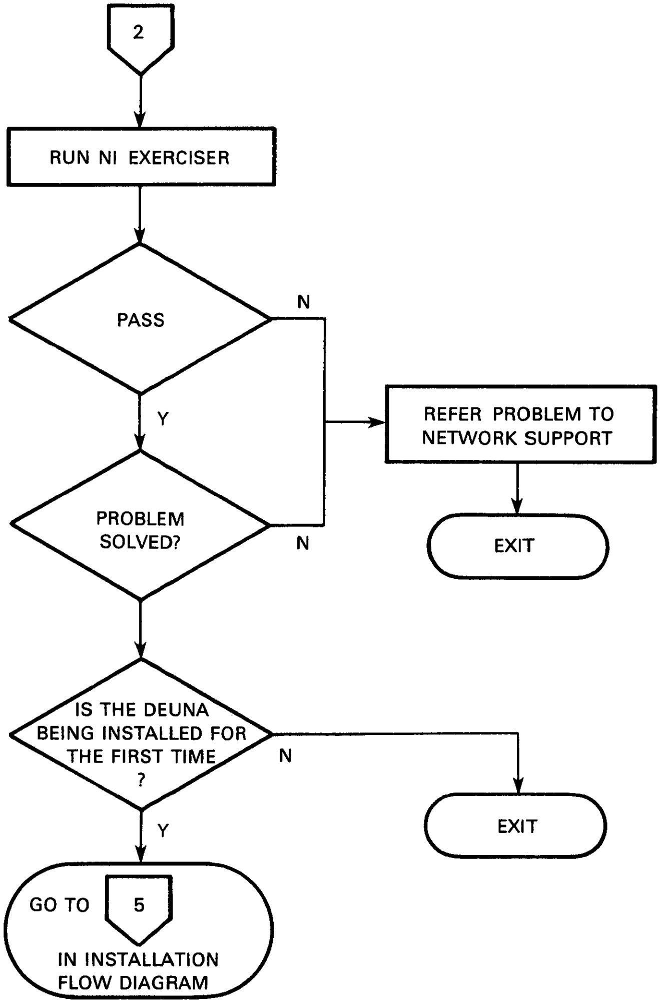


Figure 9 DEUNA Troubleshooting Flow Diagram (Sheet 3 of 3)

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.

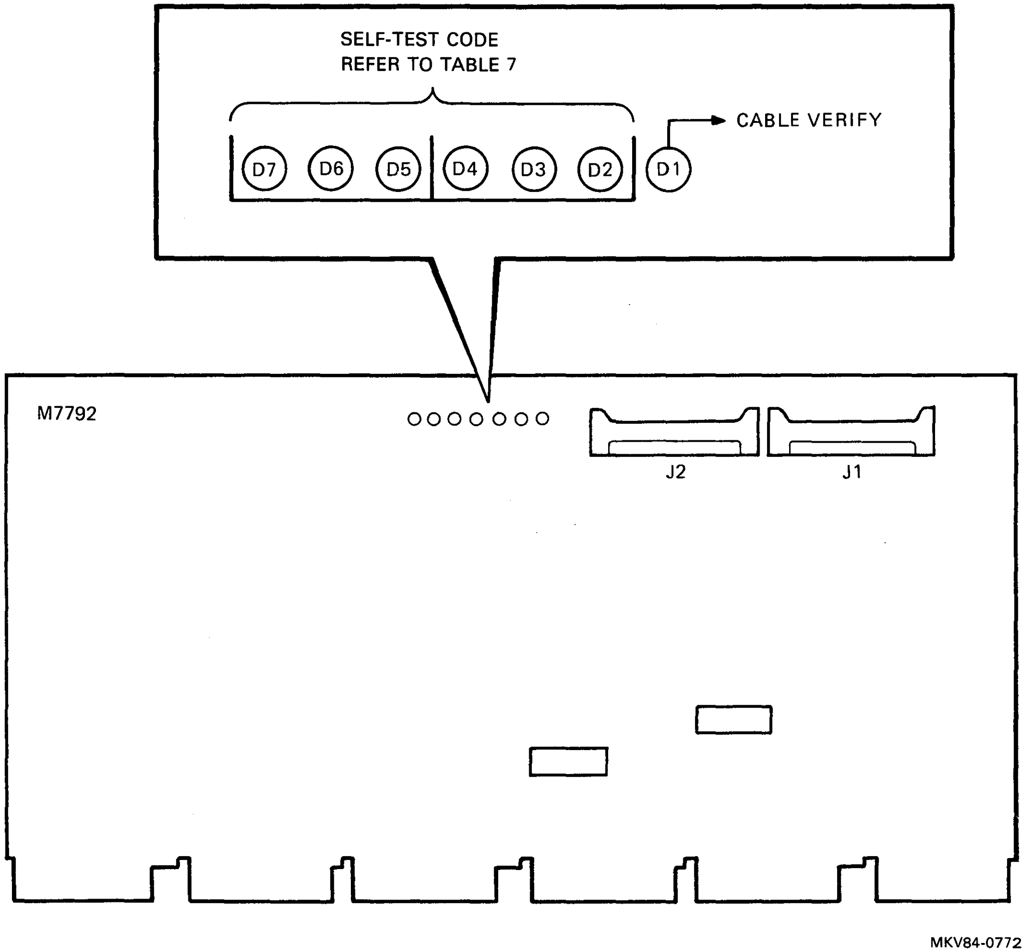


Figure 10 DEUNA Port Module Self-Test LEDs

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

DTQNA TOKEN-BUS TO Q-BUS NETWORK ADAPTER

General Description

The DIGITAL Token-Bus to Q-Bus Network Adapter (DTQNA) is a communications processor and 10 Mbits/s broadband modem that along with the DEC/MAP software, allows a MicroVAX II to communicate with other nodes on an IEEE 802.4 broadband token-bus network.

The DTQNA is implemented as two quad-height, Q-Bus modules. The M7130 controller module is installed into the MicroVAX II system backplane and the M7131 modem module is installed in either the system backplane or an external NEMA-12 enclosure (optional). See Figure 1.

The DTQNA can be installed in MicroVAX II BA23A, BA123, and H9642 systems; and in BA213, BA214, BA215, and BA220 systems (collectively referred to in this document as BA2XX).

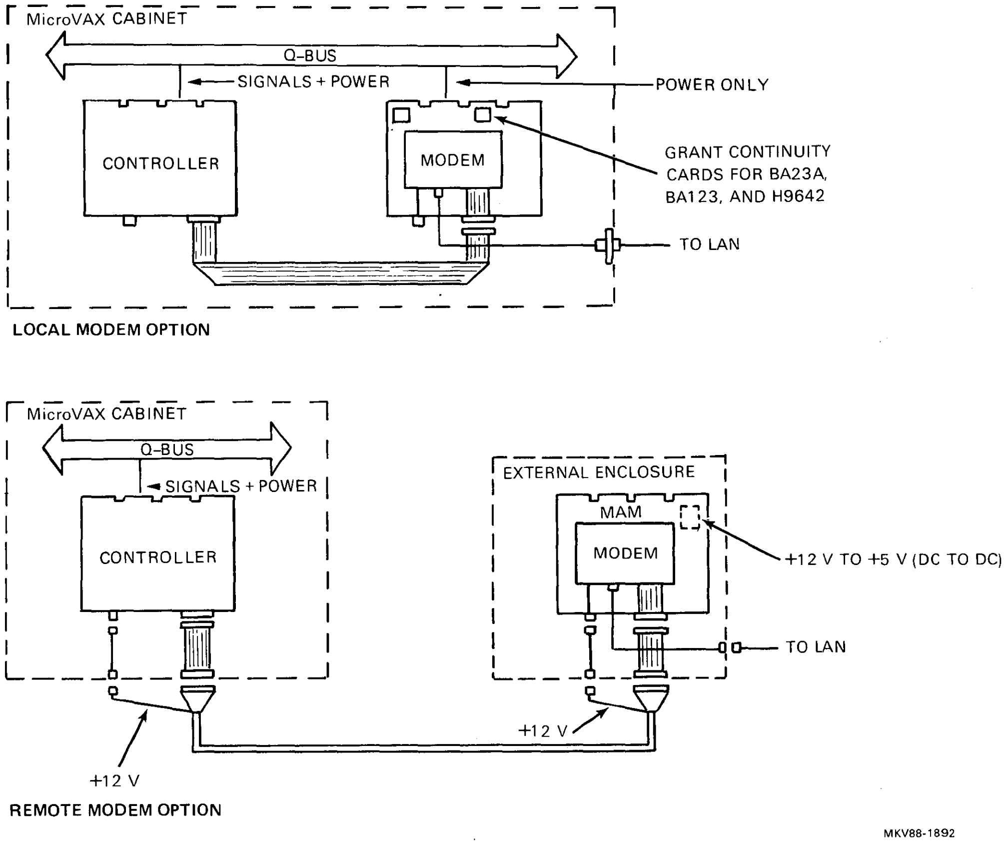


Figure 1 DTQNA Hardware Configuration

DTQNA INSTALLATION

DTQNA Features

Features of the DTQNA adapter include the following.

- Eight maintenance LEDs
- Power-up diagnostics
- Nonvolatile memory for power-outage data and set-up protection
- RAM to support diagnostic and operational software
- Q-Bus resident system configuration/boot ROM
- DECnet support at the data link layer interface
- ROM-based firmware for cold start

Reference Documentation

Refer to the following documents for more information on the DTQNA adapter.

• *DTQNA Technical Manual*	EK-DTQNA-TM
• *DTQNA Installation and Maintenance Manual*	AA-LE97A-TE
• *VAX DEC/MAP Introduction*	AA-HM33A-TE
• *VAX DEC/MAP Network Manager's Guide*	AA-HM31A-TE
• *VAX DEC/MAP Software Installation Guide*	AA-HM34A-TE

DTQNA Configuration Options

The DTQNA is available in installation kits for the four configurations listed below. Table 1 lists the hardware components for each configuration.

- DTQNA-BA – The controller and modem modules mount in the internal MicroVAX II BA23A, BA123, H9642, and BA2XX systems.
- DTQNA-BB – The controller module mounts in the internal MicroVAX II BA23A system, and the modem module mounts in the external NEMA-12 enclosure.
- DTQNA-BC – The controller module mounts in the internal MicroVAX II BA2XX system, and the modem module mounts in the external NEMA-12 enclosure.
- DTQNA-BE – The controller module mounts in the internal MicroVAX II BA123 and H9642 systems, and the modem module mounts in the external NEMA-12 enclosure.

Table 1 Installation Kit Components

Components	Configuration DTQNA-BA	DTQNA-BB,-BE	DTQNA-BC
M7130 Controller	X	X	X
M7131 Modem	X	–	–
RF Patch Panel 12-26731-01	X	–	–
Internal Ribbon Cable 17-01404-01	X	–	–
Grant Continuity Card (2) M9048	X	–	–
RF Patch Cable 17-01403-01 (BA23A and BA2XX) 17-01403-03 (BA123) 17-01403-04 (H9642)	X	–	–
BA2XX Bulkhead 12-26729-01	X	–	–
Choke Assembly	X	X	–
Filler Kit 70-24071-01	X	–	X
External Power/Signal Cable 17-01402-01	–	X	–
Patch Panel 12-26730-01 (BA23A) 12-26730-03 (H9642)	–	X	–
External Modem 30-28371-01	–	X	X
Loopback Connector 12-27499-01	–	X	X
Power Test Plug 12-27500-01	–	X	X
External Power/Signal Cable 17-01506-01	–	–	X
BA2XX Bulkhead 12-27501-01	–	–	X

DTQNA INSTALLATION

Slot Selection

Depending on the DTQNA configuration and the MicroVAX II system into which it is installed, the required number of Q-Bus backplane slots varies.

- DTQNA-BA (BA23A, BA123, H9642) – 3 adjacent slots
- DTQNA-BA (BA2XX) – 2 adjacent slots
- DTQNA-BB, -BC, and -BE – 1 slot

Depending on the other Q-Bus options installed in the MicroVAX II system, the relative position of the slot(s) used to install the DTQNA from the memory modules varies. Table 2 lists the Q-Bus options and their relative position from the memory modules. Relative position 1 must be installed closest to the memory modules, and relative position 22 is installed farthest from the memory modules.

Table 2 Relative Position of Q-Bus Options

Relative Position	Q-Bus Option
1	TSV05 Tape Drive
2	DMV11 Communication Device
3	TK25 Leah Tape Drive
4	LNV21 Laser Printer/Scanner Controller
5	VSV21 Graphics Controller
6	VCB02 Graphics Controller
7	DHV11 Communication Device
8	CXA16 Communication Device CXY08 Communication Device
9	TK50 Maya Tape Drive
10	DELQA Ethernet Interface
11	DEQNA Ethernet Interface
12	DTQNA Token-Bus Interface
13	RLV12 Disk Controller
14	RRD50 Read Only, Disk Controller
15	KDA50-Q Disk Controller KDA45-Q Disk Controller

Table 2 Relative Position of Q-Bus Options (Cont)

Relative Position	Q-Bus Option
16	RQDX3 Disk Controller
17	KLESI-QA Disk/Tape Controller
18	TQK70 Tape Controller
19	RQDX2 Disk Controller
20	DRQ3B Parallel I/O Interface
21	DRV11-WA General-Purpose Interface
22	IBQ01 Communication Interface

Preinstallation

The static discharge system and the switches and jumpers on the M7130 controller module must be set up before hardware installation can begin.

Static Discharge System Setup

Use the following procedure to set up the static discharge system.

1. Unpack the VELOSTAT™ static discharge system (CD kit A2-WO299-01).
2. Unfold the VELOSTAT™ mat.
3. Attach the 15-foot ground cable to the mat snap fastener.
4. Attach the 15-foot ground cable alligator clip to a good electrical ground point in the host computer.
5. Attach the wrist strap to your wrist.
6. Attach the wrist strap grounding strap to a convenient part of the mat.

VELOSTAT is a trademark of the Minnesota Mining and Manufacturing Company.

Controller Module Switches and Jumpers

Table 3 lists all the switches and jumpers on the M7130 controller module. Figure 2 shows the location of the switches and jumpers.

Table 3 Controller Module Switch and Jumper Settings

Item	Description	Purpose
SW1-1 through SW1-10	Q-Bus address	Selects Q-Bus address (factory set to 17772570_8). See Figure 3.
SW2-1	MicroPDP-11 or NORMAL select	Selects boot ROM location of either 2000000_8 for MicroVAX II, or 17740000_8 for MicroPDP-11.
SW2-2	Configuration ROM normal/disable	Enables boot/configuration ROM.
W1	Pass-through timer	Inserted = Enabled. Enabled to prevent remote triggering (from network manager) and host reboot (by inhibiting BINIT L to Q-Bus).
W2	Holdoff timer	Inserted = Enabled. Enabled to initiate 6.4 μs wait between Q-Bus requests.
S1	Spare clock	Not used.
S2	Software strap	Software readable jumper 1. Read at ISRO <8>.
S3	Software strap	Software readable jumper 2. Read at ISRO <9>.
S4	EPROM size select	With S9, selects total ROM capacity (Table 4).
S6	Q-Bus interrupt request 7	Installed (Figure 4).
S7	Q-Bus interrupt request 6	Installed (Figure 4).
S8	Q-Bus interrupt request 5	Installed (Figure 4).
S9	EPROM size select	With S4, selects total ROM capacity (Table 4).

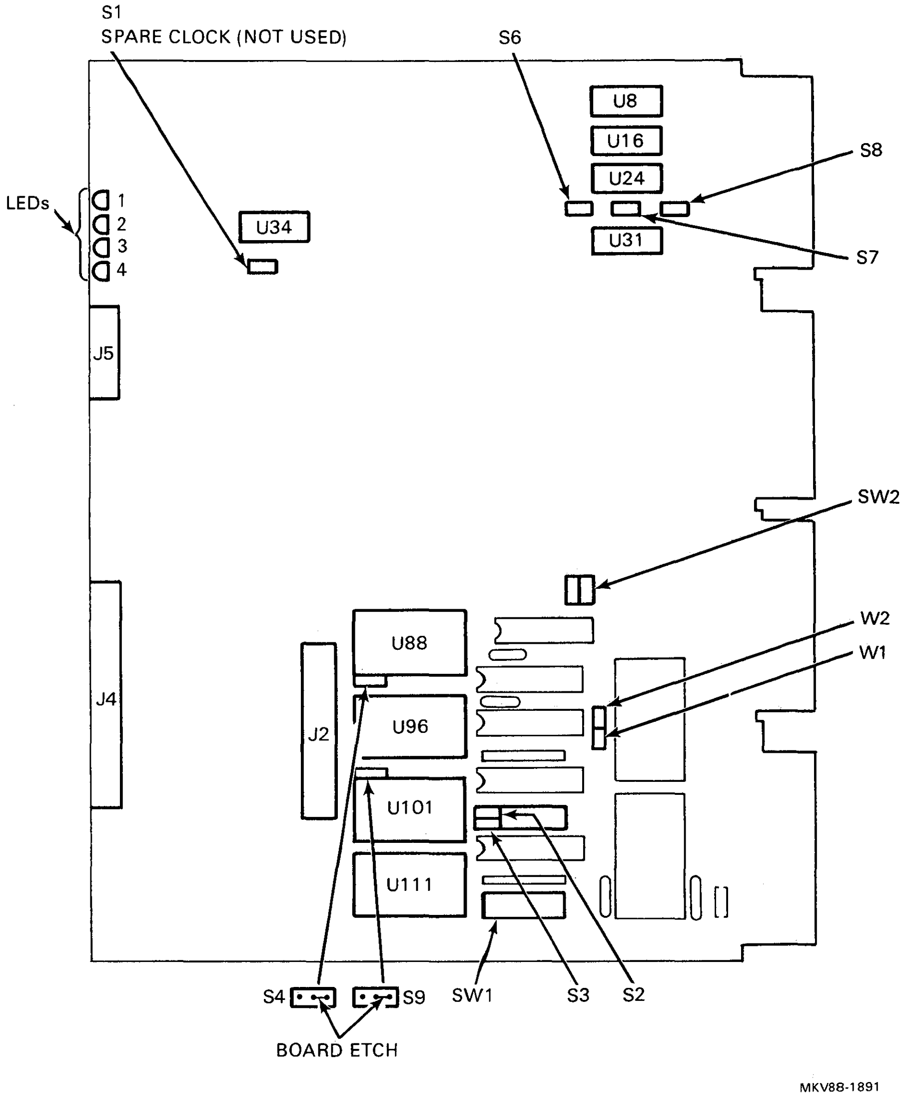


Figure 2 M7130 Controller Module Switch and Jumper Location

Table 4 EPROM Size Configuration

Total ROM Capacity (Kilowords)	U111	U96 (Kilobytes)	U101	U88	S9 Configuration	S4 Configuration
16	–	–	16	16	O*O*O	O-OXO
32	16	16	16	16	O-OXO	O-OXO
32	–	–	32	32	O*O*O	O-OXO
48	16	16	32	32	O-OXO	O-OXO
64	32	32	32	32	O-OXO	O-OXO
64	–	–	64	64	O*O*O	O*O*O
80	16	16	64	64	O-OXO	O*O*O
96	32	32	64	64	O-OXO	O*O*O
128	64	64	64	64	O*O*O	O*O*O

Symbols for S4 and S9 configurations are:

X = cut etch
- = add jumper
* = no jumper or etch cut required.

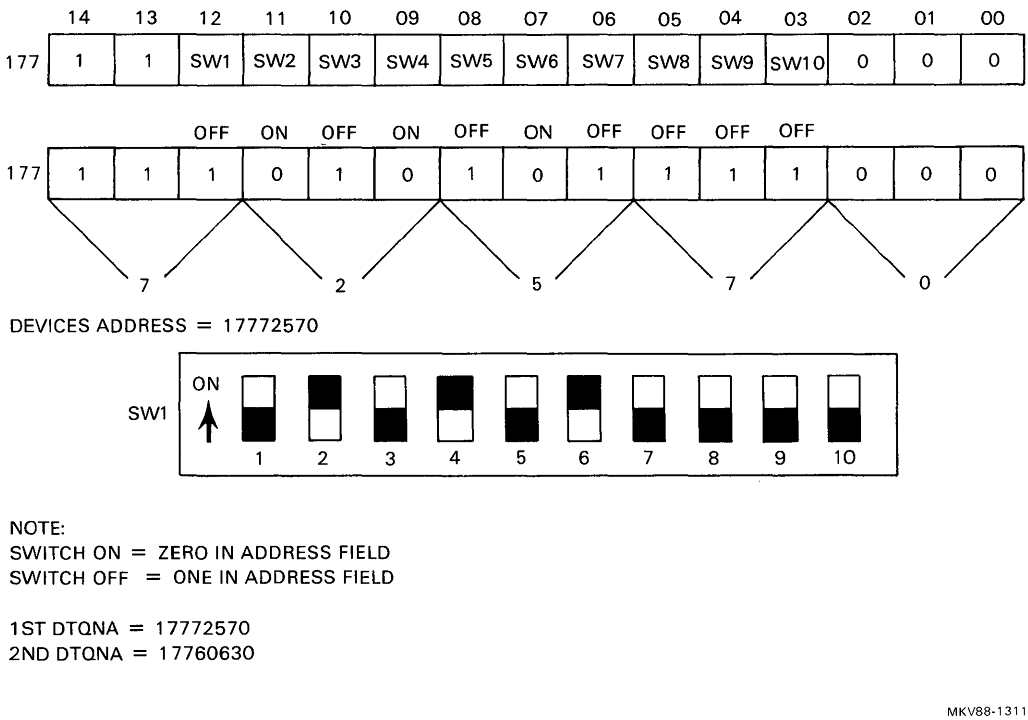


Figure 3 DTQNA Q-Bus Address Selection

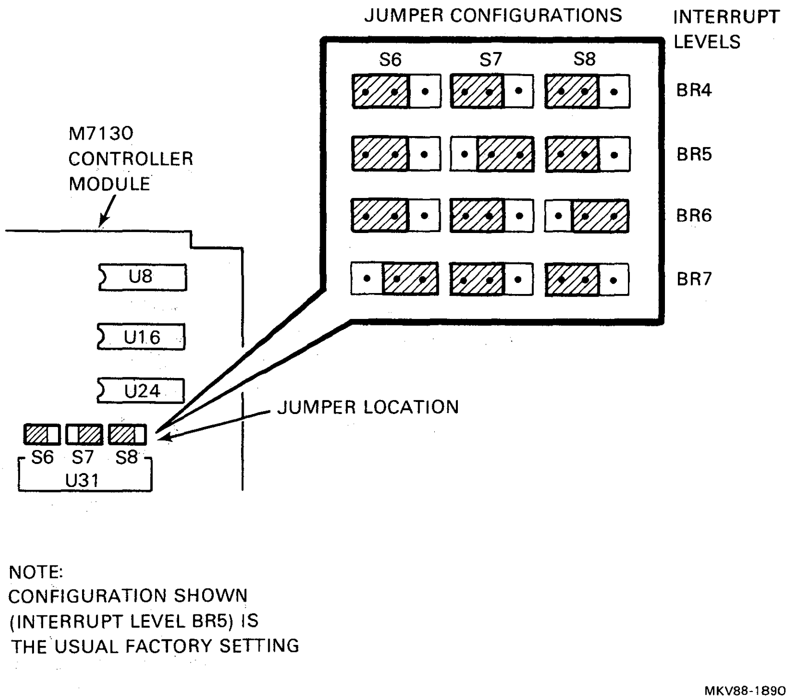


Figure 4 Q-Bus Interrupt Level Selection

Hardware Installation

Use the flowchart in Figure 5 to install the DTQNA in the BA23A, BA123, and H9642 systems. Use the flowchart in Figure 6 to install the DTQNA in the BA2XX systems.

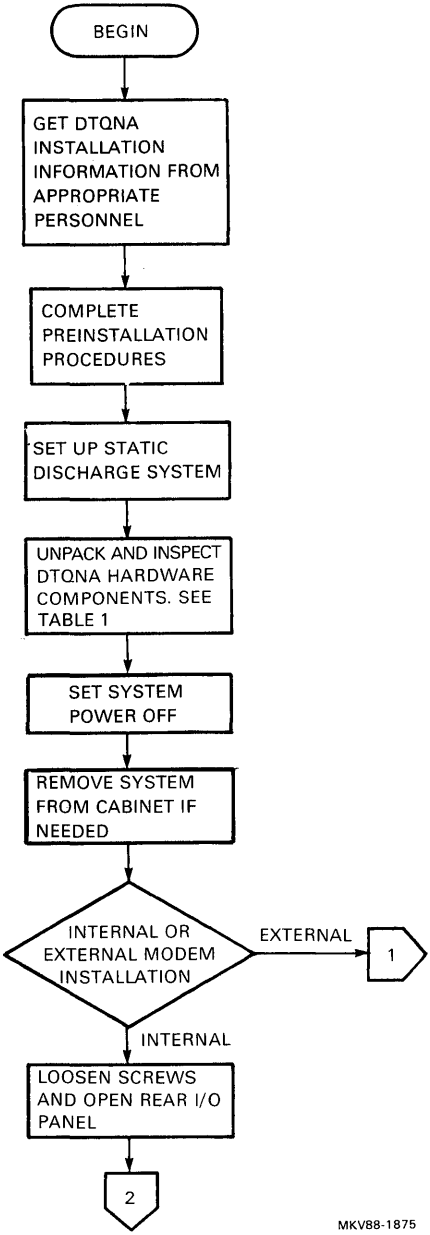


Figure 5 Installation Flowchart for DTQNA in BA23A, BA123, and H9642 Systems (Sheet 1 of 5)

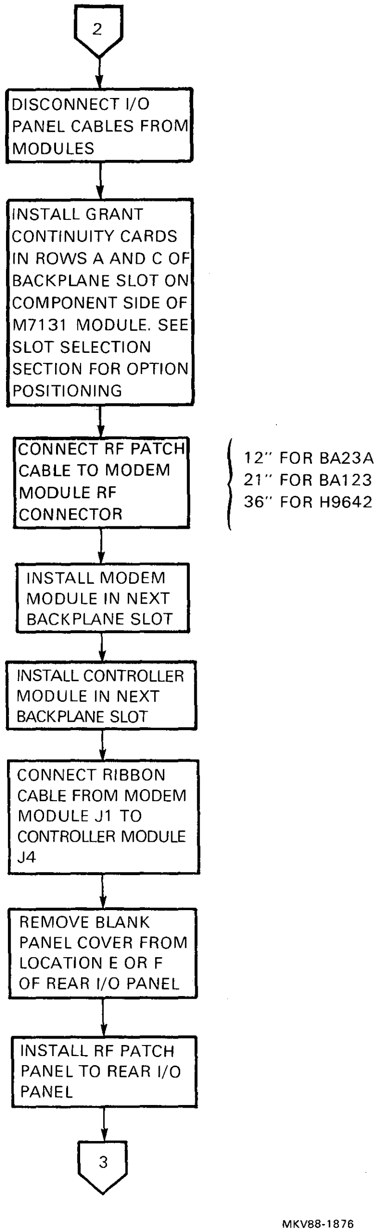


Figure 5 Installation Flowchart for DTQNA in BA23A, BA123, and H9642 Systems (Sheet 2 of 5)

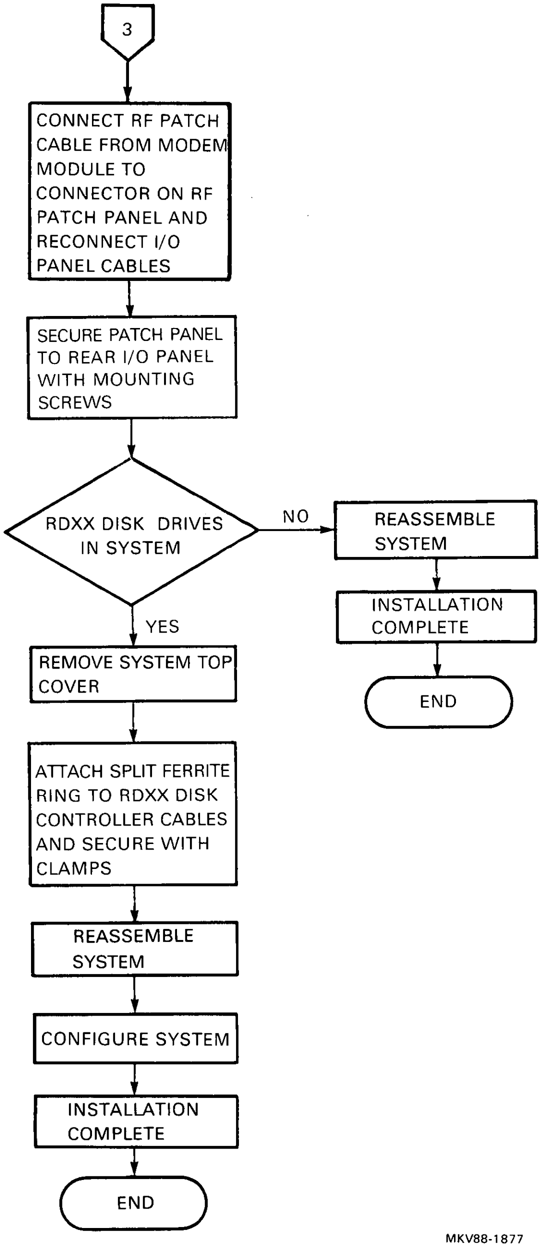


Figure 5 Installation Flowchart for DTQNA in BA23A, BA123, and H9642 Systems (Sheet 3 of 5)

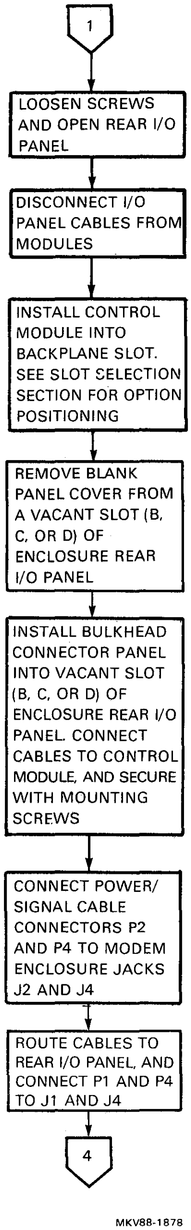


Figure 5 Installation Flowchart for DTQNA in BA23A, BA123, and H9642 Systems (Sheet 4 of 5)

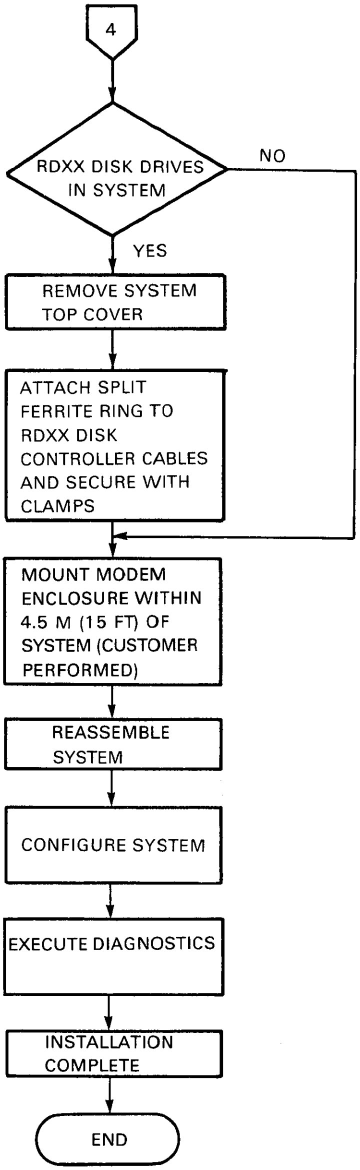


Figure 5 Installation Flowchart for DTQNA in BA23A, BA123, and H9642 Systems (Sheet 5 of 5)

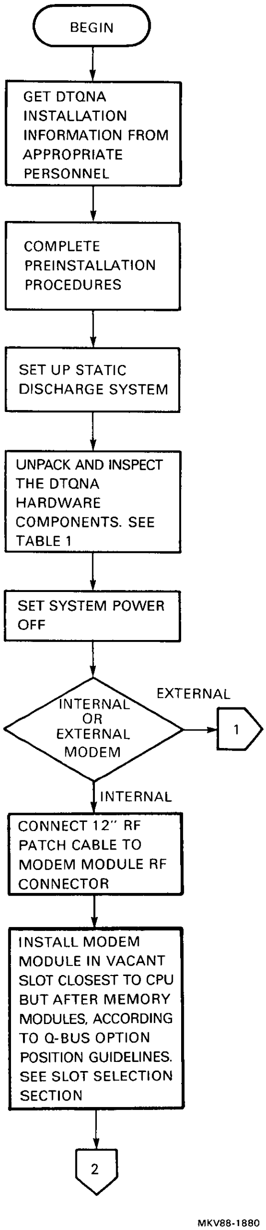


Figure 6 Installation Flowchart for DTQNA in BA2XX Systems (Sheet 1 of 3)

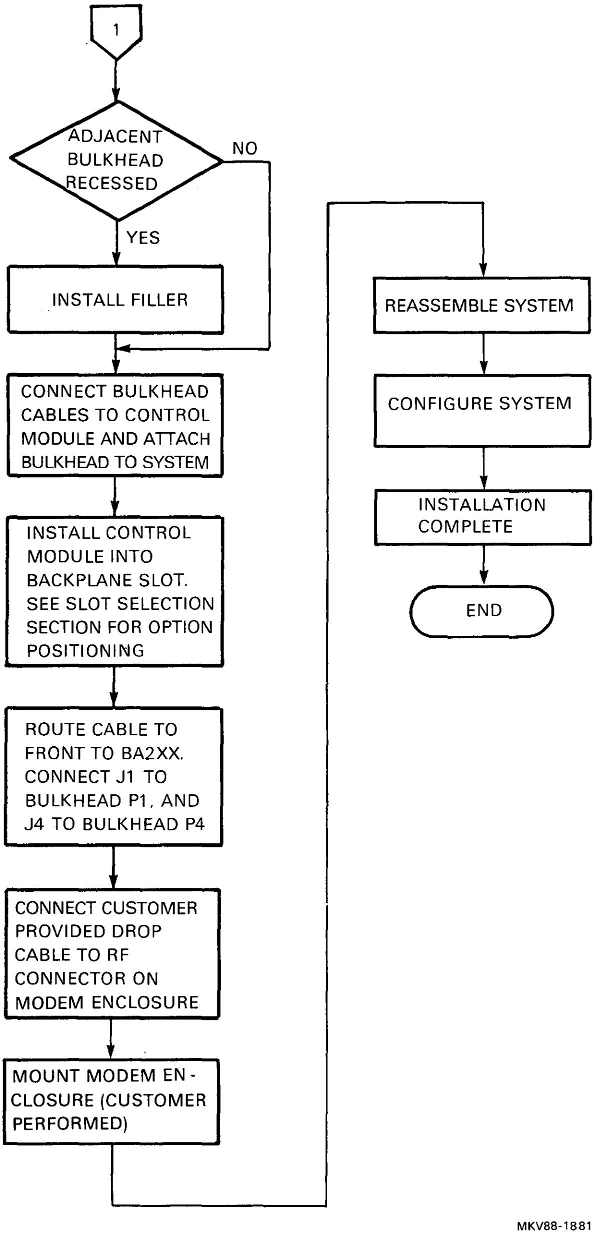


Figure 6 Installation Flowchart for DTQNA in BA2XX Systems (Sheet 2 of 3)

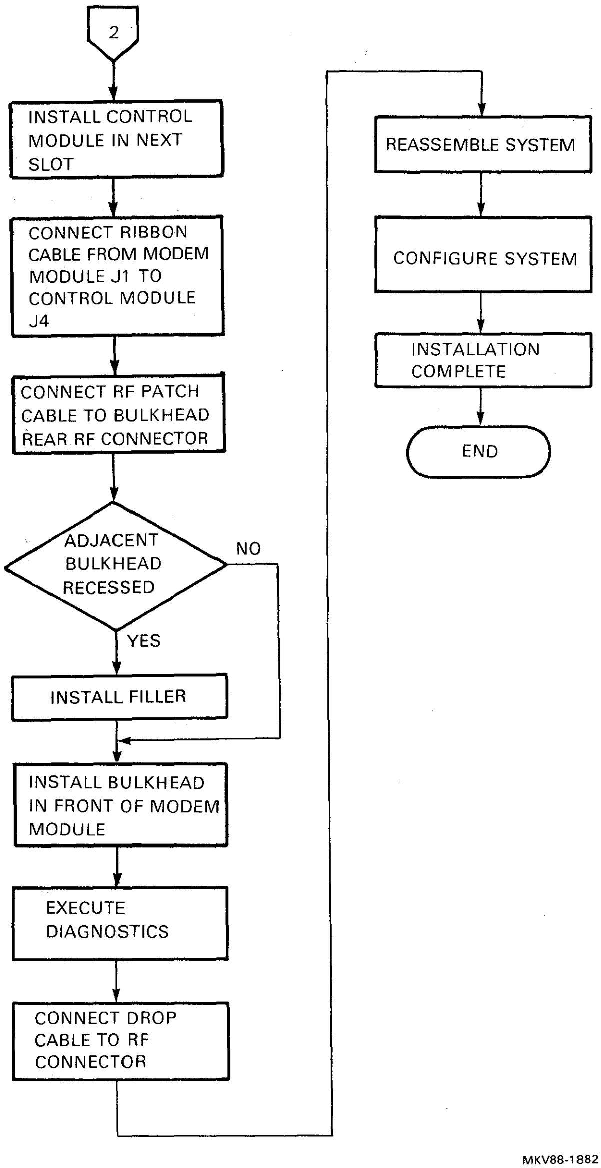


Figure 6 Installation Flowchart for DTQNA in BA2XX Systems (Sheet 3 of 3)

DTQNA Configuration

After the DTQNA hardware is installed, the configuration vector of the port functional parameters must be performed. DTQNA port configuration is initiated by the operator from the console mode (>>> prompt), with the HALT ENABLE/DISABLE switch in the DISABLE position. Refer to the *DTQNA Installation and Maintenance Manual* for the configuration procedures.

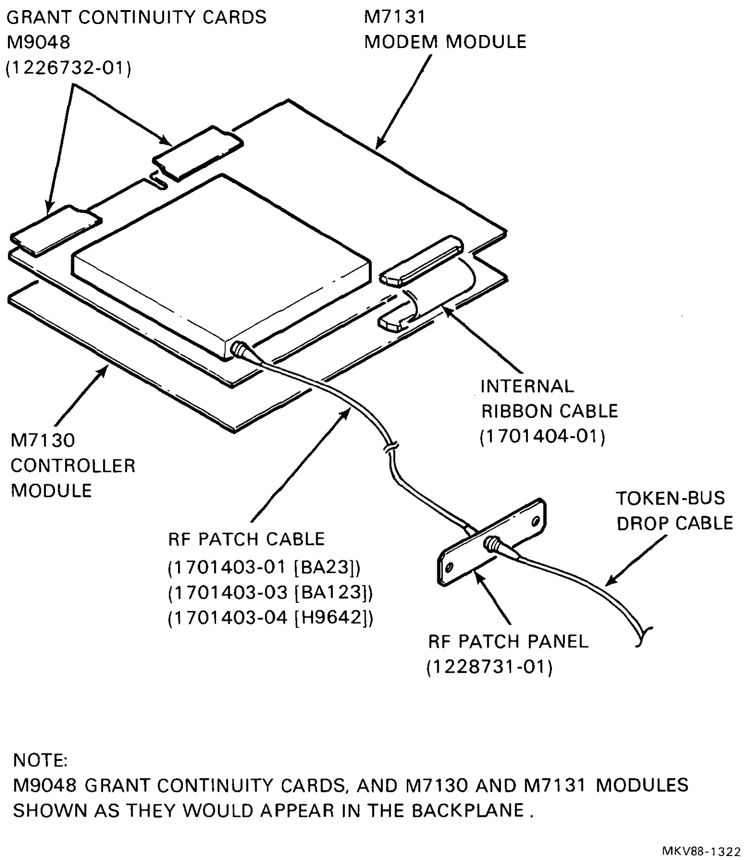


Figure 7 DTQNA Internal Installation in BA23A, BA123, and H9642 Systems (DTQNA-BA)

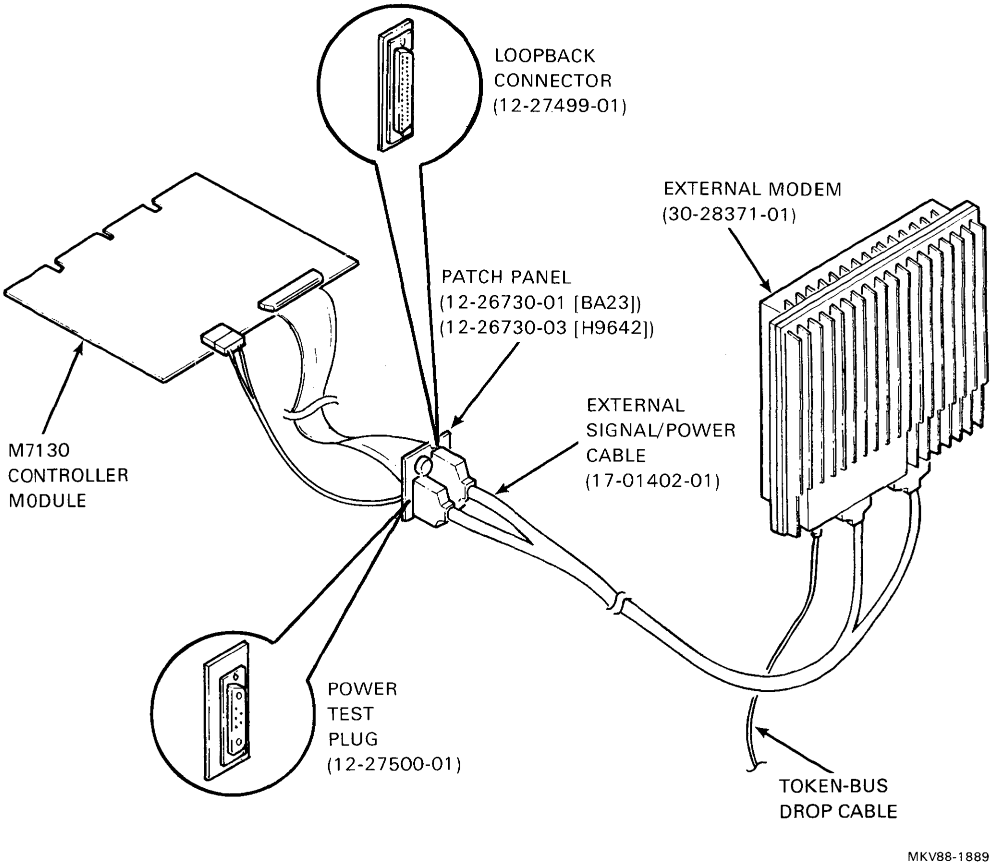


Figure 8 DTQNA External Installation in BA23A, BA123, and H9642 Systems (DTQNA-BB and -BE)

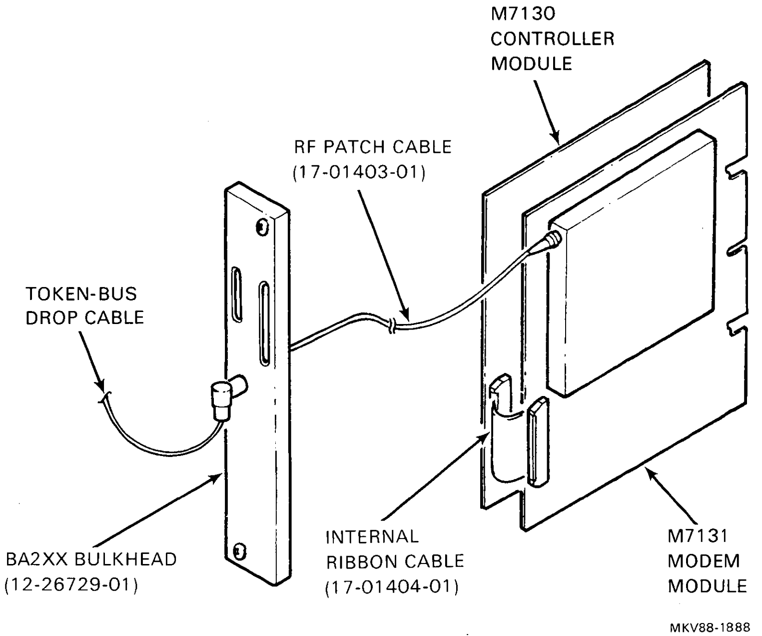


Figure 9 DTQNA Internal Installation in BA2XX Systems (DTQNA-BA)

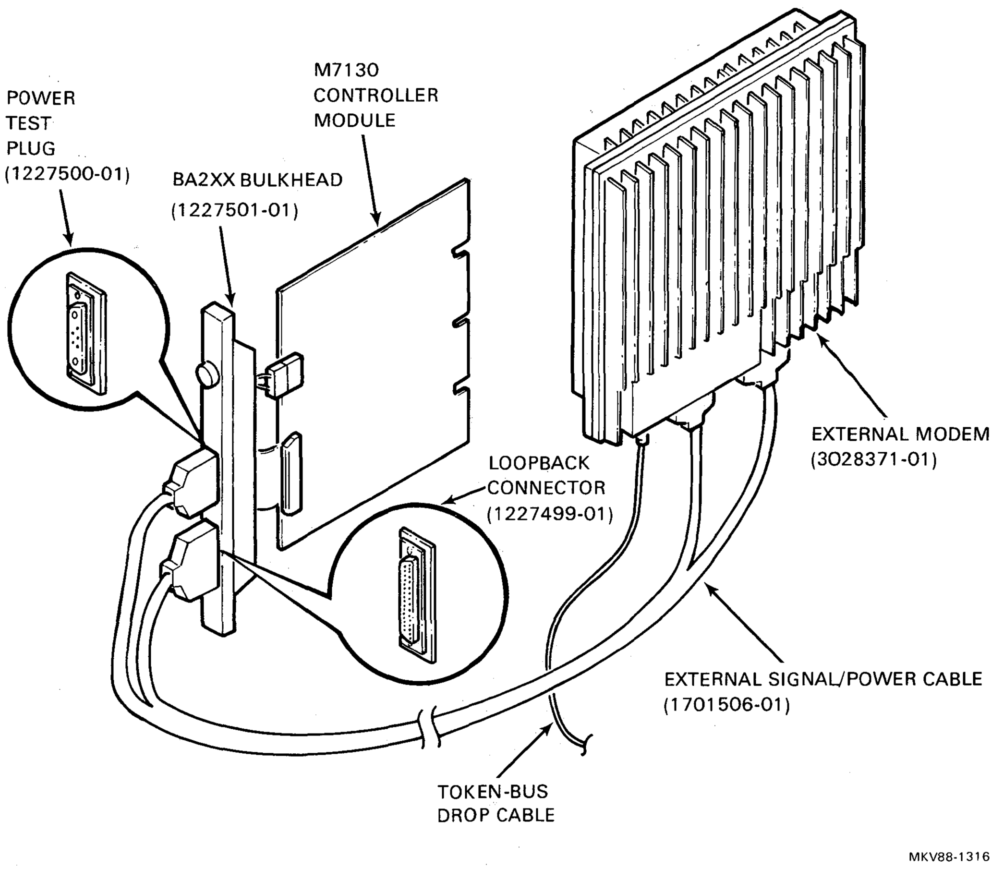


Figure 10 DTQNA External Installation in BA2XX Systems (DTQNA-BC)

DTQNA Diagnostics

The DTQNA has both power-up self-test and user-initiated diagnostics. The power-up self-test diagnostics exist for the controller and modem modules, the results of which are indicated by the LEDs on the modules. The user-initiated diagnostics are part of the MicroVAX Diagnostic Monitor (MDM) diagnostics that identify a faulty field replaceable unit in the DTQNA.

Power-Up Self-Test Diagnostics

When power is applied to the DTQNA controller and modem modules a series of self-tests are executed.

The four LEDs on the controller module indicate which self-test is being executed. If all self-tests pass successfully, a rotating pattern appears on the LEDs. The failure of a self-test is indicated by steadily lit LEDs, whose pattern shows which self-test failed (Table 5).

Table 5 Controller Module LED Status

LED 4	LED 3	LED 2	LED 1	Test Status	Probable Faulty FRU
0	0	0	0	Initial Power ON	–
0	0	0	1	CPU Test	Controller
0	0	1	0	ROM Checksum Test	Controller
0	0	1	1	PCSR 1-3 RAM Test	Controller
0	1	0	0	QIC Test	Controller
0	1	0	1	Local RAM Test	Controller
0	1	1	0	TBC Test	Controller
1	0	0	0	Controller Loopback Test	Controller
1	0	0	1	Cable Loopback Test	Cable/Modem
1	0	1	0	Modem Test	Cable/Modem
1	1	0	0	Modem On-Line Test	Modem
1	1	1	0	MAC Address Test	Controller
0	1	1	1	DMA Test	Controller
1	1	1	1	NVM Test	Controller
1	1	1	0	The LEDs show this	–
1	1	0	1	rotating pattern at a	–
1	0	1	1	cycle time of 2 seconds	–
0	1	1	1	after all tests have passed.	–

* 0 = ON and 1 = OFF.

DTQNA DIAGNOSTICS

The status of the M7131 modem module is indicated by the four LED indicators on the modem module (Table 6).

Table 6 Modem Module Status Indicators

LED	Status
POWER OK (Green)	ON indicates that modem is supplied with proper dc power.
RECEIVE (Green)	ON indicates that modem is receiving network data.
TRANSMIT (Green)	ON indicates that DTQNA is transmitting data/tokens (station is part of logical ring on network).
FAULT (Red)	ON indicates that modem is in a fault condition.

User-Initiated Diagnostics

The DTQNA diagnostic NAZQAA executes under the MicroVAX Diagnostic Monitor (MDM). The MDM is a menu-driven system that performs two types of tests: verification and service tests. The verification tests are performed every time the system is booted, and can also be selected to be run on the MDM menu. The service tests are also run by the MDM menu and require certain set-up steps to be performed, such as the connection of loopback connectors and/or the RF tester. Each procedural step is prompt-driven, and detailed prompt instructions are provided. Refer to the *MicroVAX Diagnostic Monitor User's Guide* (AA-FM7AB-DN) before running the user-initiated diagnostics.

Troubleshooting

Use the flowchart in Figure 11 to troubleshoot DTQNA problems and identify a faulty FRU.

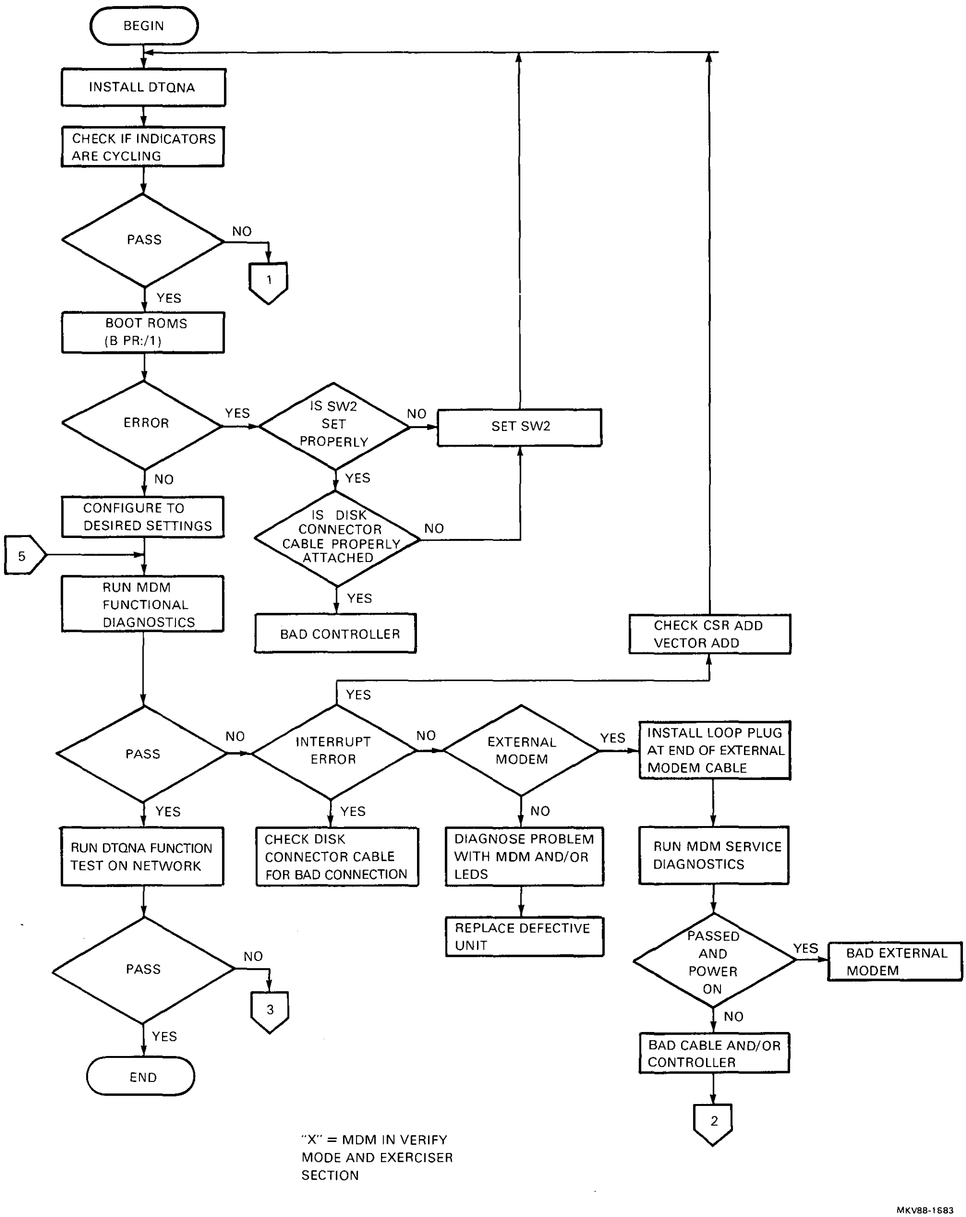


Figure 11 DTQNA Troubleshooting Flowchart (Sheet 1 of 5)

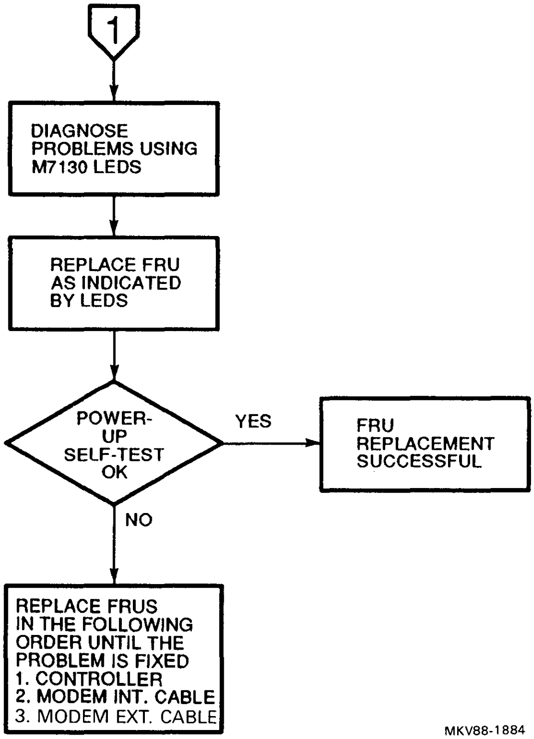


Figure 11 DTQNA Troubleshooting Flowchart (Sheet 2 of 5)

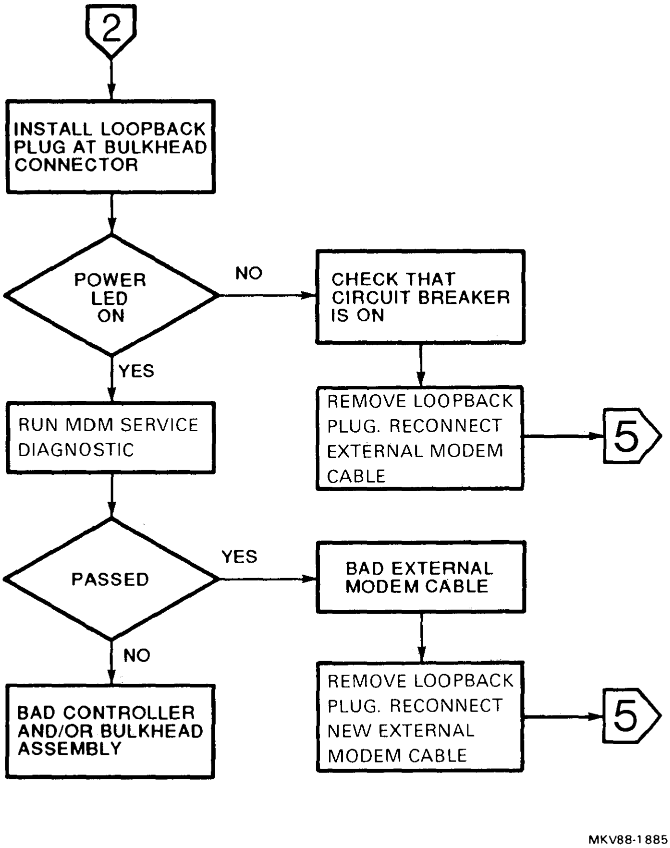


Figure 11 DTQNA Troubleshooting Flowchart (Sheet 3 of 5)

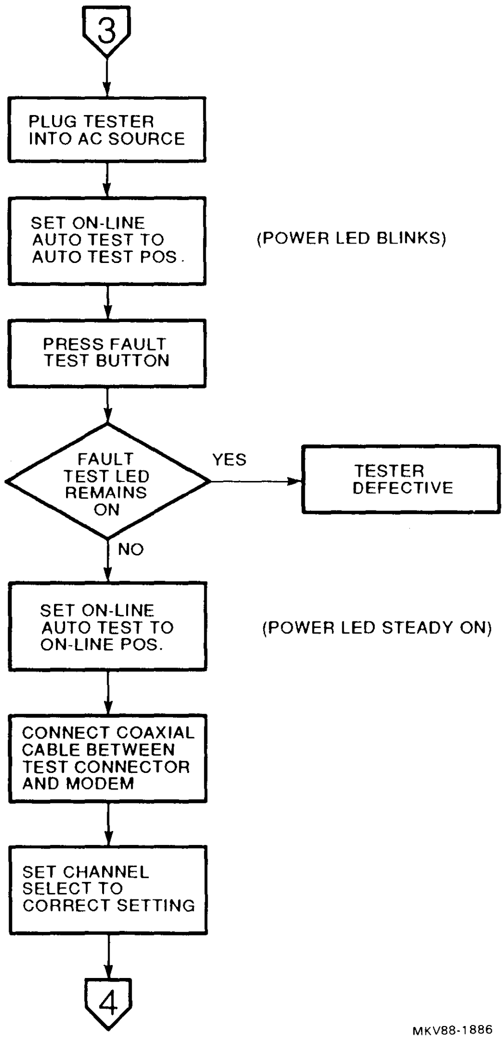


Figure 11 DTQNA Troubleshooting Flowchart (Sheet 4 of 5)

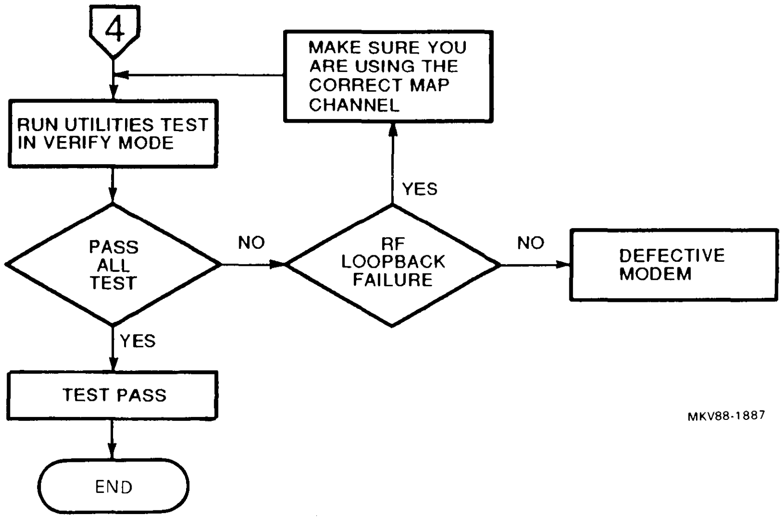


Figure 11 DTQNA Troubleshooting Flowchart (Sheet 5 of 5)

DTQNA Registers

Figure 12 shows the DTQNA internal registers.

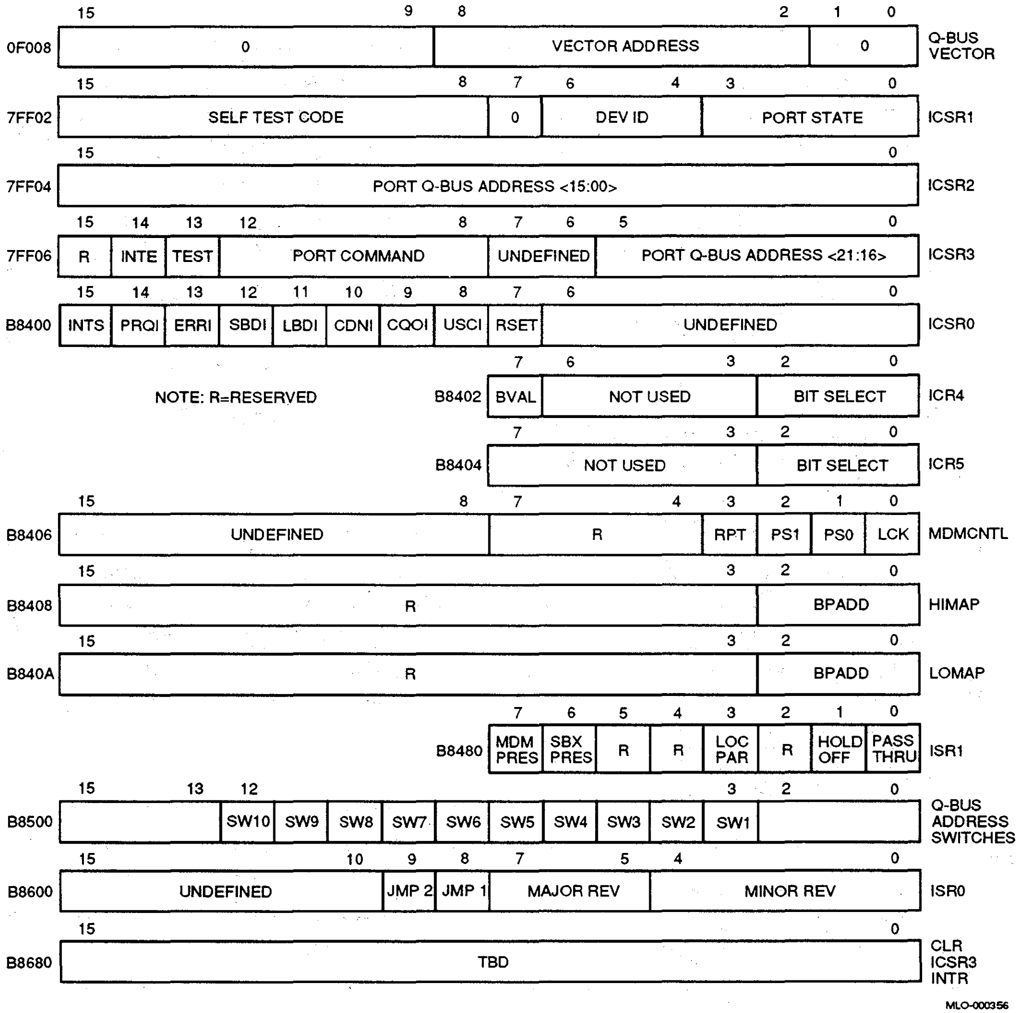


Figure 12 DTQNA Internal Registers

DTUNA TOKEN UNIBUS NETWORK ADAPTER

General Description
The DIGITAL Token UNIBUS Network Adapter (DTUNA) is a means of implementing the Manufacturing Automated Protocol (MAP) for VAX/VMS UNIBUS systems.

The DTUNA consists of software and hardware that permit a VAX/VMS UNIBUS system to participate in a MAP network environment. The software implements layers 3 through 7 of MAP. The hardware provides the connection to layers 1 and 2 of MAP.

The DTUNA hardware (Figure 1) consists of a KMS1P single-line synchronous controller, the TIM unit, and interconnecting cables. The TIM unit is a MAP server manufactured by Concord Communications Incorporated and is the RS-422 interface to the MAP network. The TIM unit implements the physical and data link layers (layers 1 and 2) of MAP.

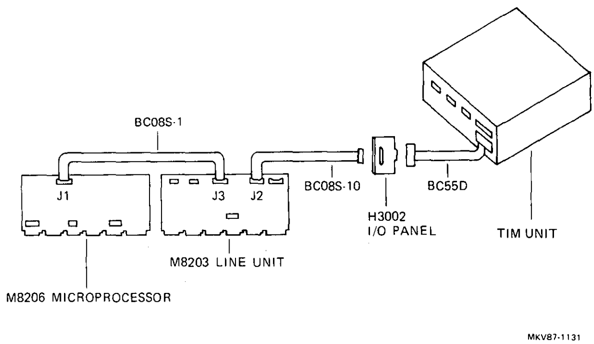


Figure 1 DTUNA Hardware

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

Title	Document Number
VAX UNIBUS/MAP Hardware Installation Manual	AA-HM25A-TE
VAX DEC/MAP Introduction	AA-HM33A-TE
VAX DEC/MAP Network Manager's Guide	AA-HM31A-TE
VAX DEC/MAP Software Installation Guide	AA-HM34A-TE
KMS11 Synchronous Communications Processor Pocket Service Guide	EK-KMS11-PS
KMS11-P Synchronous Communications Processor Technical Manual	EK-KMS1P-TM

DTUNA INSTALLATION

Unpacking and Inspection

1. Set up the static discharge system as follows.

   a. Unpack a VELOSTAT™ static discharge system (CD kit A2-WO299-01).

   b. Unfold the VELOSTAT™ mat.

   c. Attach the 15-foot ground cable to the mat snap fastener.

   d. Attach the 15-foot ground cable alligator clip to a good electrical ground point in the host computer.

   e. Attach the wrist strap to your wrist.

   f. Attach the wrist strap grounding strap to a convenient part of the mat.

2. Inspect and unpack the DTUNA adapter as follows.

   NOTE
   The DTUNA components must be unpacked and inspected on a static discharge system mat.

   a. Inspect the unopened DTUNA shipping containers and check for dents, holes, or crushed corners.

   b. Open and unpack the shipping container and inventory the contents against the DTUNA component parts diagram (Figure 2).

   c. Check all software media and accompanying documentation against the bill of materials and carefully inspect all items for damage. Report any shortages or damages to the carrier and notify Support.

VELOSTAT is a trademark of the Minnesota Mining and Manufacturing Co.

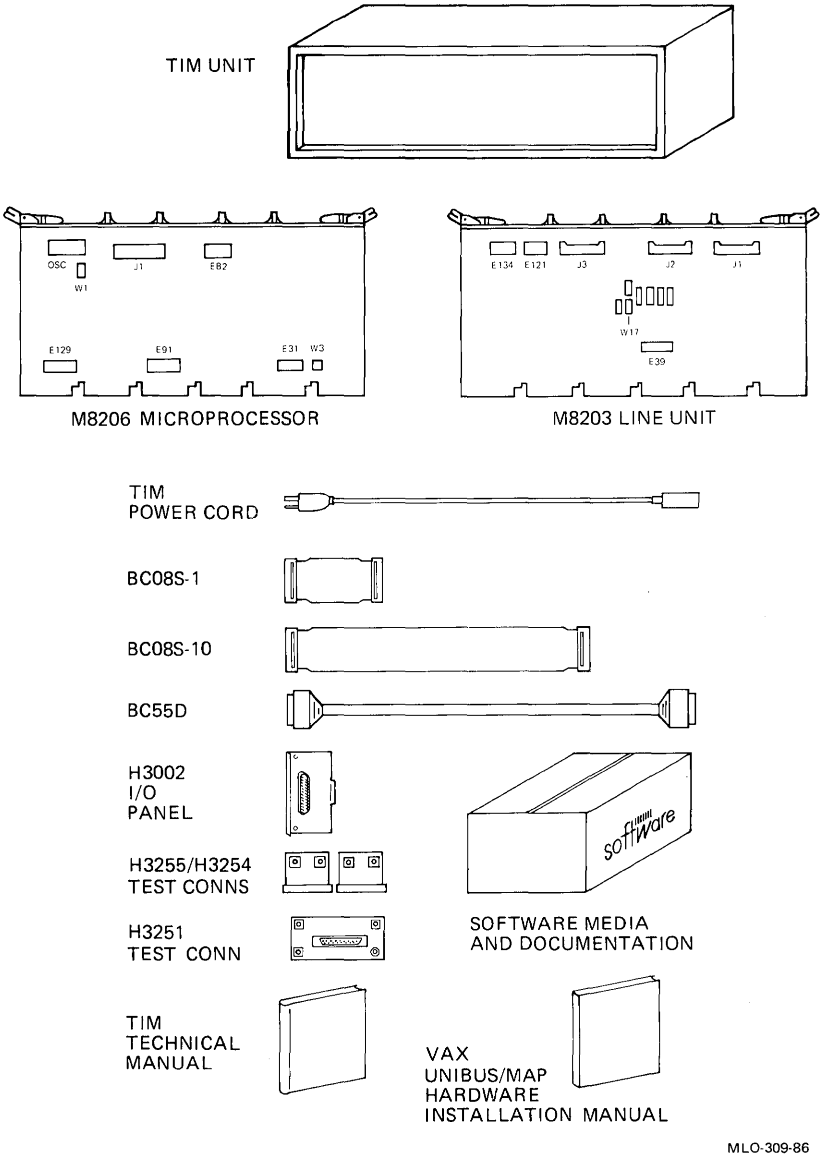


Figure 2 DTUNA Hardware Component Parts Diagram

DTUNA INSTALLATION

Preinstallation

Device Placement – Ensure that there are two adjacent small peripheral controller (SPC) hex-height backplane slots available for the M8206 and M8203 modules. Any DD11-C or DD11-D backplane can accept the KMS1P which can be placed anywhere on the UNIBUS backplane before the first UNIBUS repeater.

Bus Latency Constraints – Latency is the delay between the time a device initiates a request for service and the time it takes to receive a response. If the system in which the KMS1P is installed contains many high-speed direct memory access (DMA) devices, there is a possibility of unacceptable KMS1P performance. To prevent this from occurring, and to provide a higher DMA device priority, the KMS1P should be installed as close as possible to memory and the central processor.

Backplane Configuration – To configure an SPC slot for installation of the M8206 module:

1. Remove the bus grant continuity module (if applicable).

2. Install the bus grant continuity module in any unused backplane slot.

3. Ensure that the backplane has the following reserve power supply capacities.

   10.5 A on the +5 Vdc power supply at pin C1A2,
   150 mA on the +15 Vdc power supply at pin C1U1,
   200 mA on the −15 Vdc power supply at pin C1B2.

   Ground reference is pin C1C2.

4. Remove the nonprocessor grant (NPG) jumper between pins CA1 and CB1 of the backplane slot for the M8206 module (Figure 3).

NOTE

The host system will be nonoperational if the M8206 module is removed and the NPG jumper is not reinstalled.

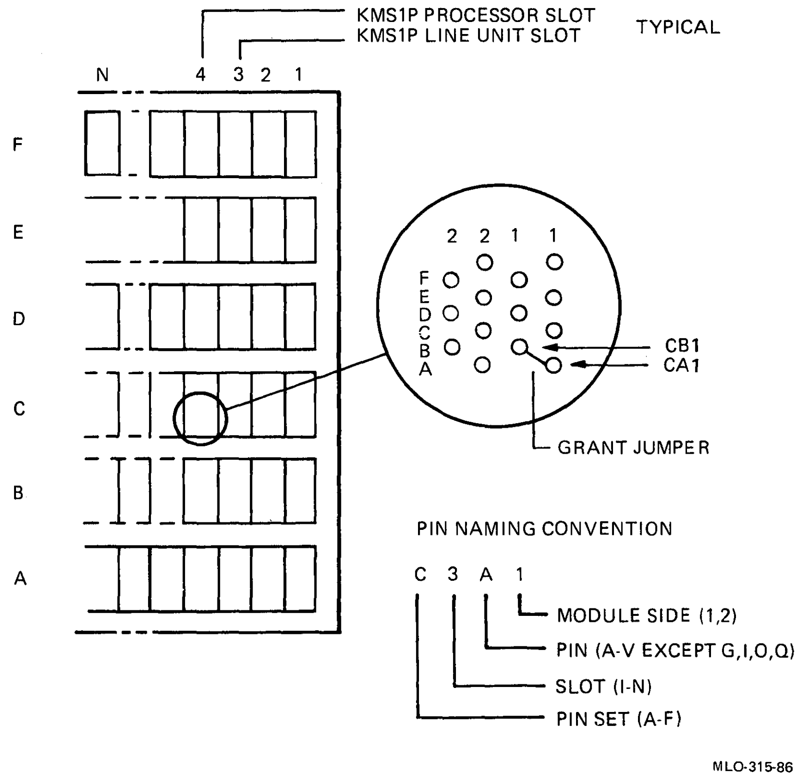


Figure 3 Locating the NPG Jumper

DTUNA INSTALLATION

Installation Procedure

Hardware Installation – The DTUNA installation procedures are detailed in the installation flowchart (Figure 4). If additional information is required, refer to the *VAX UNIBUS/MAP Hardware Installation Manual* AA-HM25A-TE.

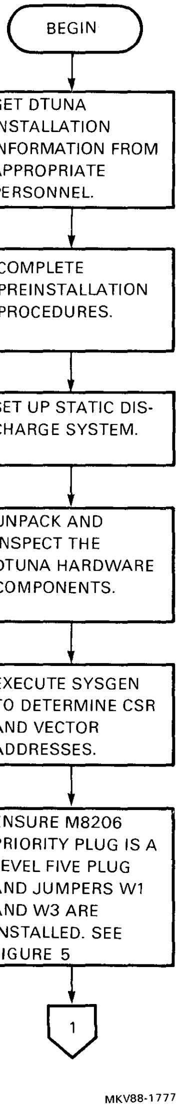


Figure 4 DTUNA Hardware Installation Flowchart (Sheet 1 of 7)

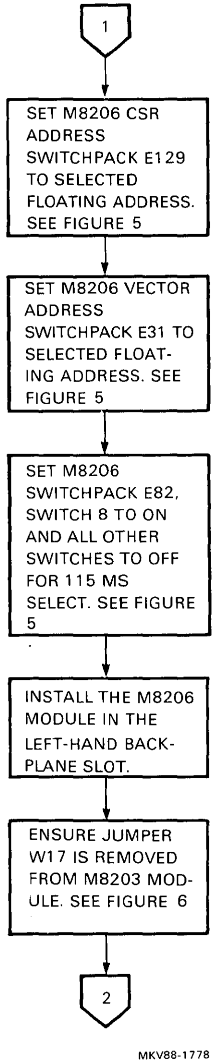


Figure 4 DTUNA Hardware Installation Flowchart (Sheet 2 of 7)

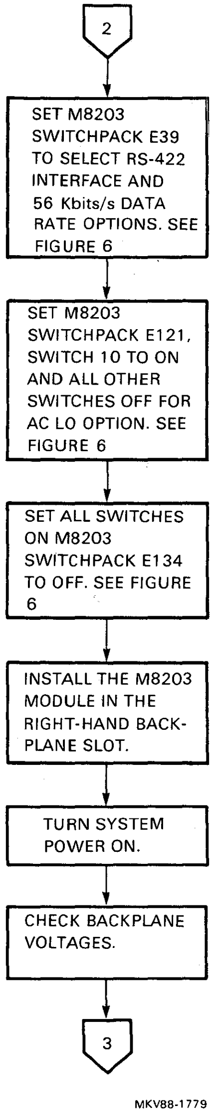


Figure 4 DTUNA Hardware Installation Flowchart (Sheet 3 of 7)

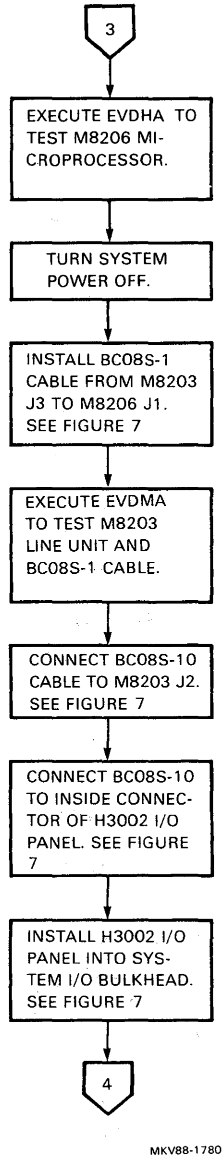


Figure 4 DTUNA Hardware Installation Flowchart (Sheet 4 of 7)

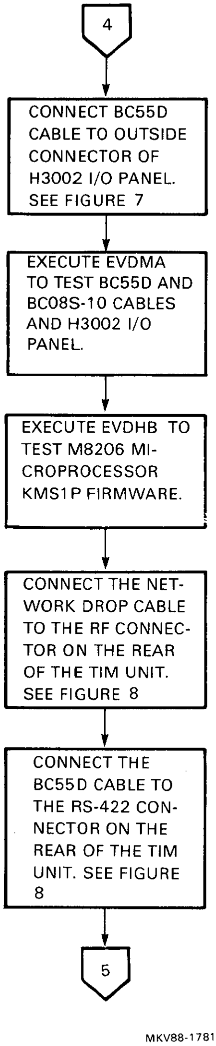


Figure 4 DTUNA Hardware Installation Flowchart (Sheet 5 of 7)

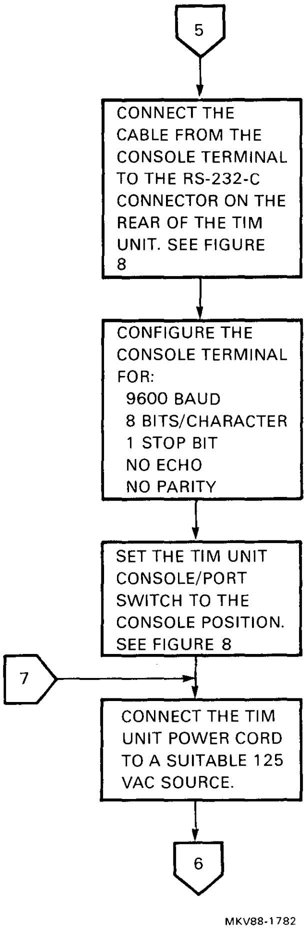


Figure 4 DTUNA Hardware Installation Flowchart (Sheet 6 of 7)

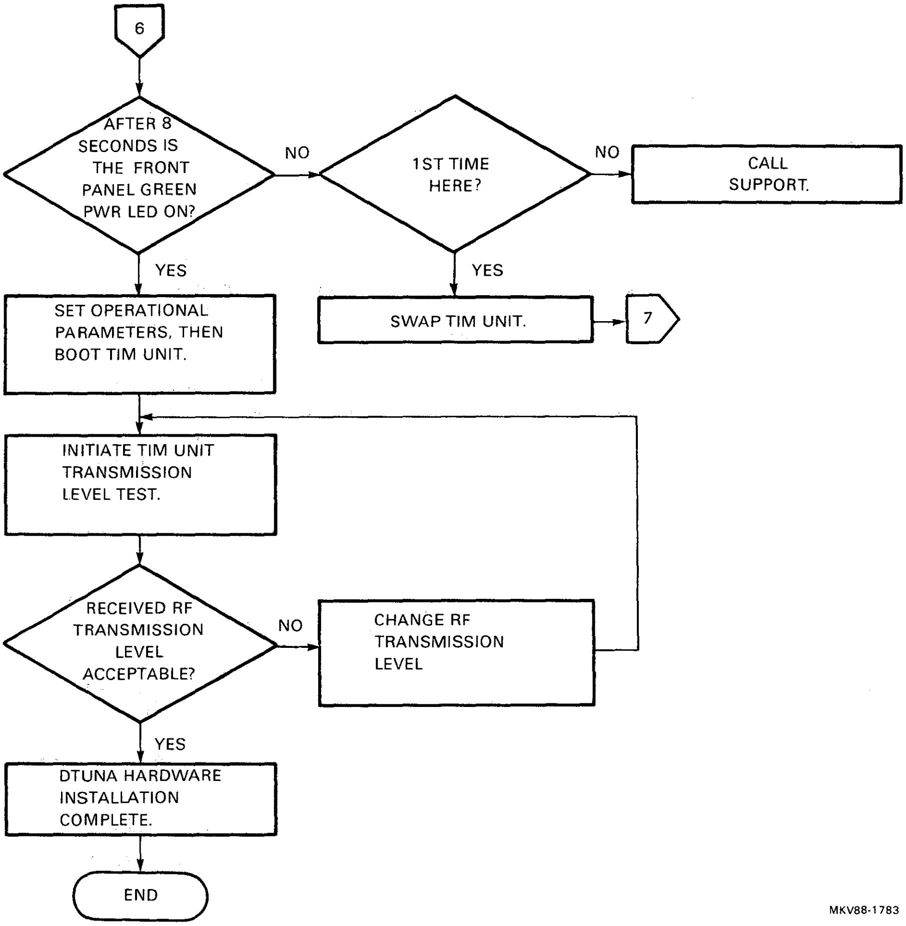
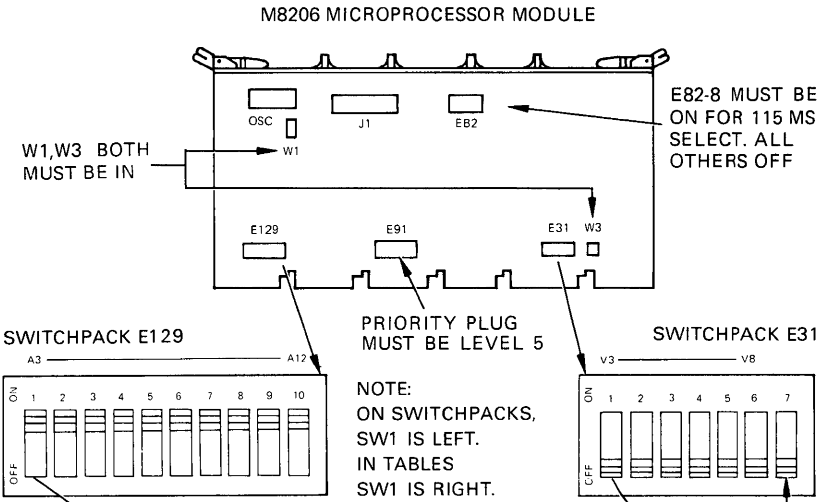


Figure 4 DTUNA Hardware Installation Flowchart (Sheet 7 of 7)



CSR ADDRESS SELECTION

MSB															LSB
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	1	SWITCH PACK E 129										0	0	0

SWITCH NB	10	9	8	7	6	5	4	3	2	1	DEVICE ADD.
										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 responds to logical 1 on the UNIBUS

OPEN=OFF
CLOSED=ON

VECTOR ADDRESS SELECTION

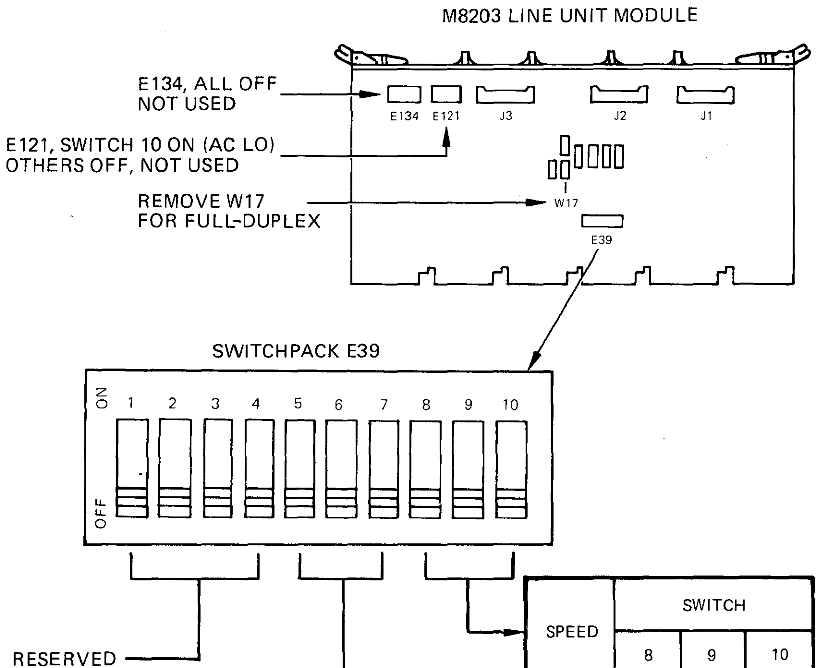
MSB															LSB
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
1	1	0	0	0	0	0	SWITCH PACK E31						1	0	0

SWITCH NB	6	5	4	3	2	1	VECTOR ADD.
		ON	ON				300
		ON	ON			ON	310
		ON	ON		ON		320
		ON	ON		ON	ON	330
		ON	ON	ON			340
		ON	ON	ON	ON		360
		ON	ON	ON	ON	ON	370
	ON						400
	ON		ON				500
	ON	ON					600
	ON	ON	ON				700

NOTE: Switch ON produces logical 1 on the UNIBUS

MLO-312-86

Figure 5 M8206 Microprocessor Module Configuration



INTERFACE	SWITCH 5	SWITCH 6	SWITCH 7
RS232-C OR RS423-A OR INTEGRAL**	OFF	OFF	OFF
V-35	ON	OFF	OFF
RS-422	OFF	OFF	ON

**INTEGRAL MODEM OPTION IS NOT USED IN KMS 11-P INTERFACE

SPEED	SWITCH 8	SWITCH 9	SWITCH 10
1 MEG	ON	ON	ON
500K	OFF	ON	ON
250K	ON	OFF	ON
56K	OFF	OFF	ON
19.2K	ON	OFF	OFF
9.6K	OFF	ON	OFF
4.8K	ON	OFF	OFF
2.4K	ON	OFF	OFF

MLO-313-86

Figure 6 M8203 Line Unit Module Configuration

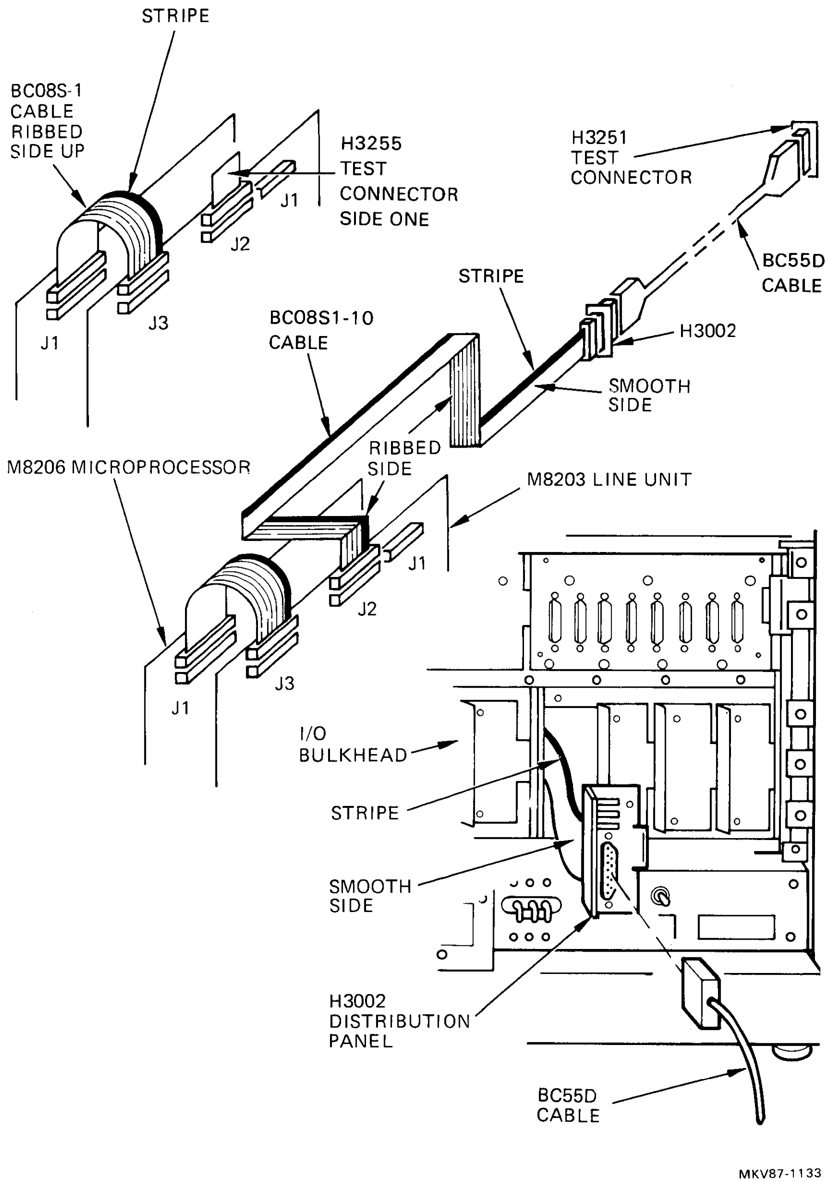


Figure 7 DTUNA Cabling and Diagnostic Test Connector Installation

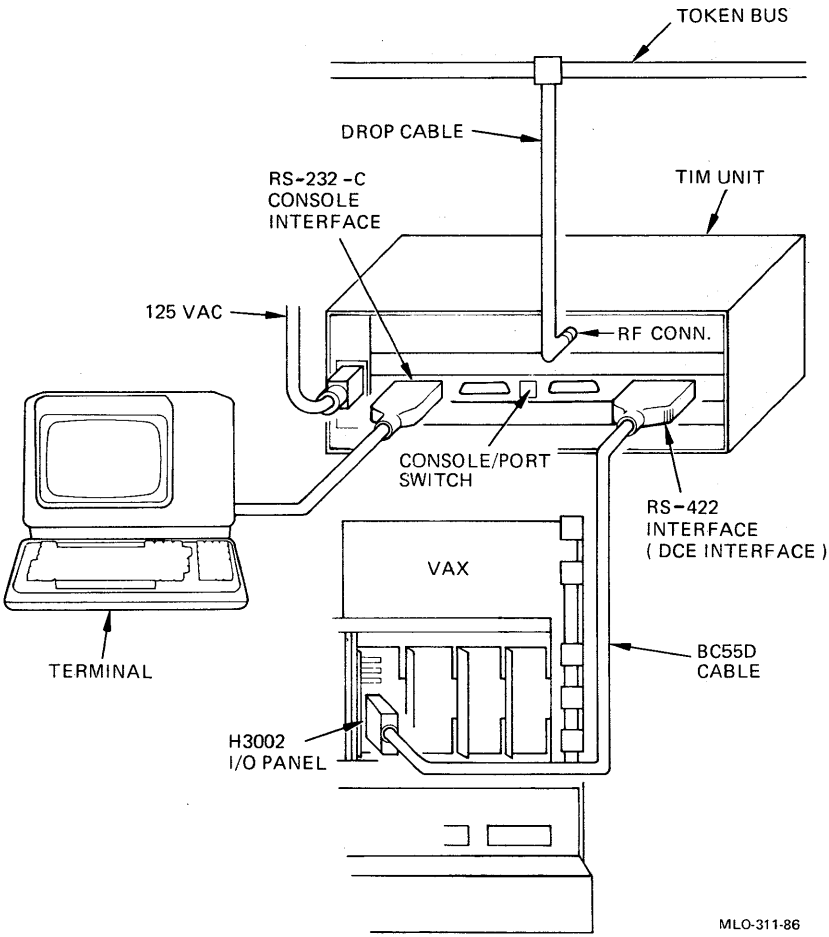


Figure 8 TIM Unit Installation

Setting TIM Unit Parameters – After the TIM unit is physically installed, operational parameters must be loaded. The following example shows a *typical* session for setting TIM parameters. The *actual* parameters must be supplied by the system manager.

```
COMMAND/PARAMETER                     DESCRIPTION

Password: SYSTEM                      (login to TIM unit console monitor)
TIM Console Monitor n.n
tcm:                                  (TIM console monitor prompt)
tcm:CON                               (invoke CONfigure utility)
CON:DEF ALL                           (set all parameters to default)
CON:DEF HDL                           (changes SPA port 4 to HDL)
CON:WRITE PHY:03 03                   (set channel pair)
CON:WRITE PHY:16 60                   (set head-end type)
CON:WRITE PHY:18 0C                   (set RF transmission level, 45.5 dBmV)
CON:WRITE MAC:06 02 00 00 00 00 F0    (set token address)
CON:WRITE MAC:0C 04                   (set preamble length)
CON:WRITE LLC:12 FE                   (set HDL layer LSAP value)
CON:WRITE HDL:04 08                   (set RS-422 interface speed)
CON:SAVE ALL                          (prepare to save parameters in NVRAM)
CON:EXIT                              (exit CONfigure utility)
tcm:BOOT                              (boot TIM unit to save parameters)
Password:
```

For more information on setting TIM unit parameters, refer to the TIM Technical Manual.

TIM Unit Transmission Level Test – The transmission level test verifies that the transmission RF level properly set. The test transmits a group of frames through the cable plant to the head-end remodulator an determines their received RF signal level.

The test is initiated from the TIM console monitor (tcm:) with the following command.

tcm:NDE START 1000

This command initiates a test in the network diagnostic exerciser (NDE) to transmit a series of 1000 frame:

After the test is completed, the results are viewed with the following command.

tcm:COU PHY

The following is a typical response.

```
Physical Counters          {4-18-86}          {14:00}
Signal level of received frames

below                                                             above
expected        okay        nominal           okay                expected
0               218         782               0                   0
```

If the response shows anything other than a 0 in the "below expected" or "above expected" columns, th TIM unit RF transmission level needs adjustment. See the example under "Setting TIM Parameters" fc CON:WRITE PHY:18 0C command.

For more information on executing the TIM unit transmission level test, refer to the *TIM Technica Manual.*

Software Installation and Verification – The KMS1P firmware and DTUNA software installation and verification procedures are provided in the installation flowchart (Figure 9). If additional information is required, refer to the *VAX DEC/MAP Software Installation Guide*, AA-HM34A-TE.

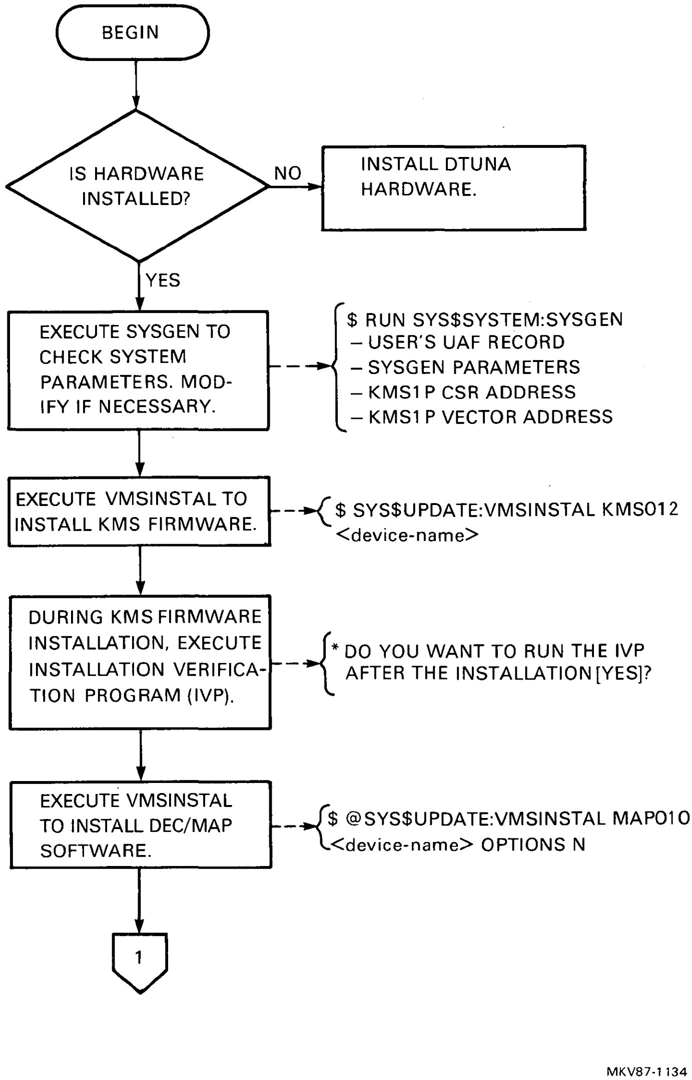


Figure 9 DTUNA Firmware/Software Installation Flowchart (Sheet 1 of 2)

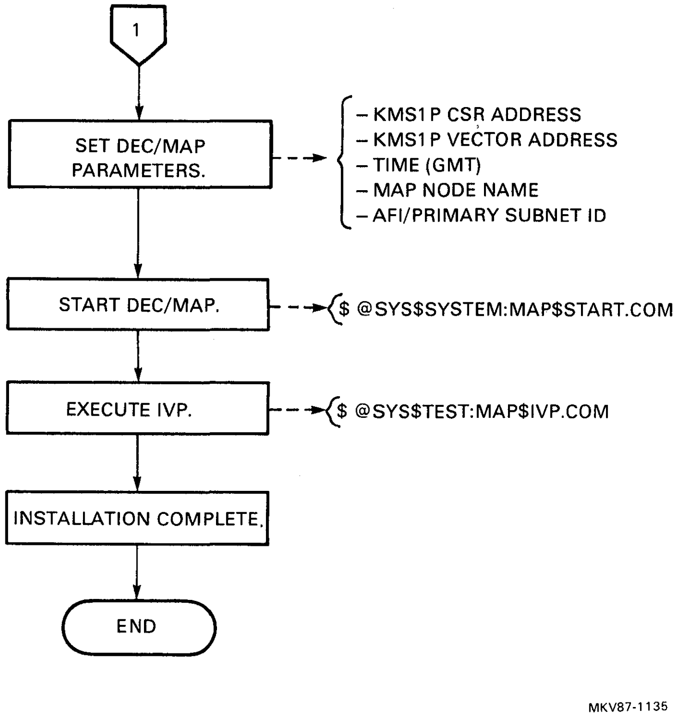


Figure 9 DTUNA Firmware/Software Installation Flowchart (Sheet 2 of 2)

Cabling

Cabling considerations were addressed in the Installation section.

DTUNA DIAGNOSTICS

DTUNA Testing

Maintenance Features – The following are maintenance features for the DTUNA adapter.

- KMS Diagnostic Testing
  - M8206 Microprocessor Repair Level 3 Diagnostic (EVDHA)
  - M8206 Microprocessor Level 2 Diagnostic (EVDHB)
  - M8203 Line Unit Repair Level 3 Diagnostic (EVDMA)
- TIM Unit LED Indicators
  - PWR LED (green) indicates status of power-up self-test
  - POL LED (yellow) indicates proper function of unit

Diagnostic Descriptions – There are three diagnostic programs for the DTUNA adapter.

EVDHA, M8206 Microprocessor Repair Level Diagnostic
This diagnostic tests the logic of the M8206 microprocessor. It performs 20 tests by stepping the microprocessor through various instruction sequences. It is a standalone repair level diagnostic (Level 3) that runs under the VAX diagnostic supervisor.

A typical command series to run the EVDHA diagnostic on a VAX-11/730 system is:

```
>>> I
>>> B SU0
.
.
.
DS> LOAD EVDHA
DS> ATT DW730 HUB DWO
DS> ATT KMC11 DWO KMA 760460 340 5
DS> SET ALL
DS> SET TRACE
DS> START
```

The procedure for using EVDHA to test the M8206 microprocessor is show in Figure 10

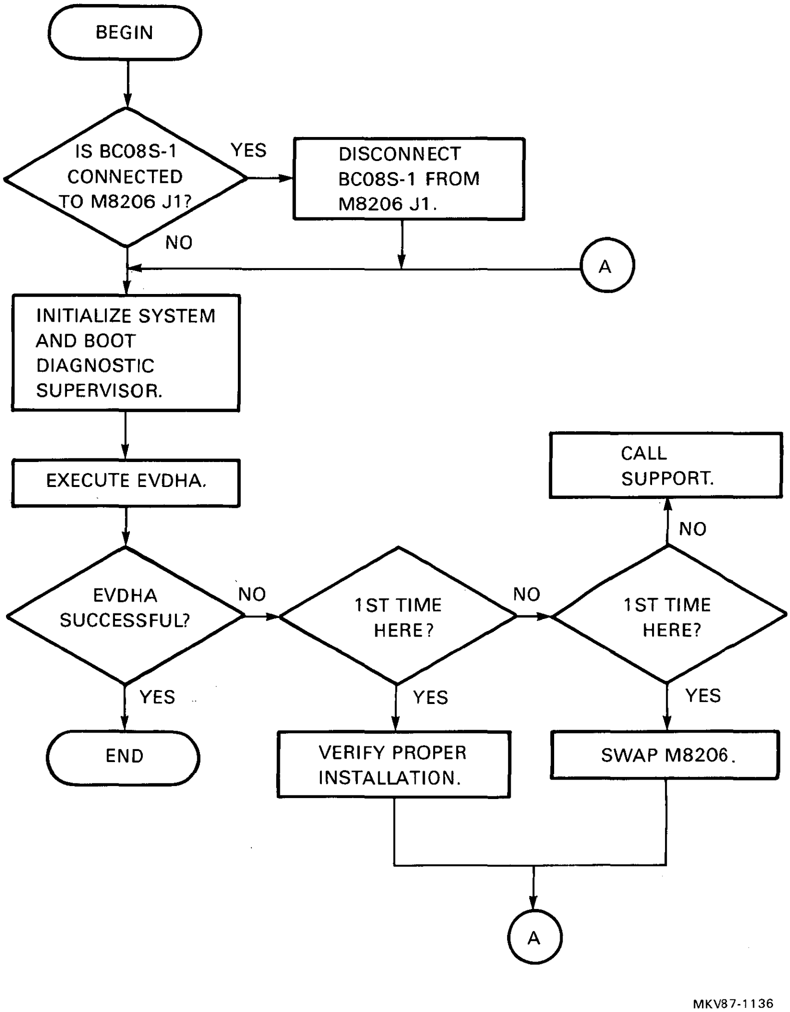


Figure 10 Using EVDHA to Test the M8206 Microprocessor

EVDHB, M8206 Microprocessor Functional Diagnostic
This diagnostic verifies the functional operation of the M8206 microprocessor in a VMS environment. Special diagnostic firmware is loaded into the M8206 microprocessor and is used to transmit, receive, and check buffers of 512 characters. EVDHB is a Level 2 diagnostic and runs either under VMS or standalone. To run EVDHB under VMS, the KMS1P driver (YODRIVER) must be installed.

A typical command series to load YODRIVER is:

```
$ MCR SYSGEN
> RELOAD SYS$MAINTENANCE:YODRIVER.EXE
> CONNECT YOA0 /ADAP=UB0/CSR=%070260/VEC=%0340/NUMVEC=2
> EXIT
```

A typical command series to run the EVDHB diagnostic on a VAX-11/730 system is:

```
>>> I
>>> B SU0
.
.
.
DS> LOAD EVDHB
DS> ATT KMC11 HUB YOA 760460 340 5
DS> SEL YOA
DS> START
```

The procedure for using EVDHB to test the M8602 microprocessor and its interaction with the KMS1P firmware is shown in Figure 11.

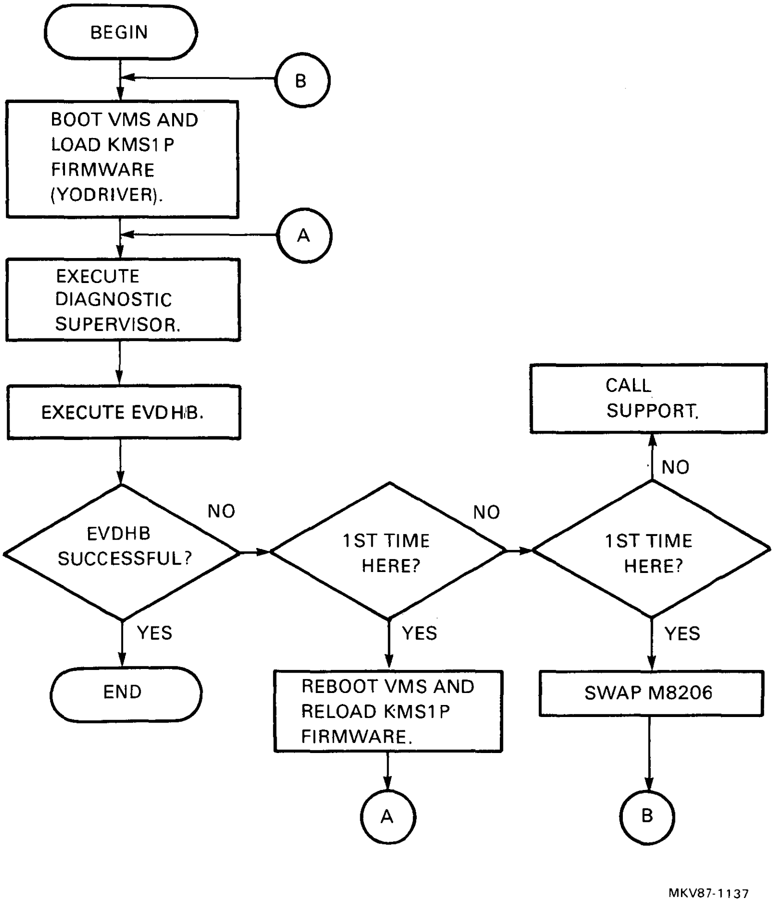


Figure 11 Using EVDHB to Test the M8206 Microprocessor and KMS1P Firmware

EVDMA, M8203 Line Unit Repair Level Diagnostic

This diagnostic verifies the operation of the M8203 line unit and checks the cabling up to the TIM unit. EVDMA is a VAX/VMS Level 3 diagnostic that runs under the diagnostic supervisor.

EVDMA is executed twice. First, the H3255 test connector is connected to J2 on the M8203 module and EVDMA is executed to test that module. Second, the BC08S-10 cable, H3002 I/O panel, and the BC55D cable are connected with the H3251 test connector at the end of the BC55D cable. In this arrangement, EVDMA tests both cables and the I/O panel. Refer to Figure 7 for diagnostic test cabling.

A typical command series to run the EVDMA diagnostic in external loopback mode on a VAX-11/730 system is:

```
>>> I
>>> B SU0
.
.
.
DS> LOAD EVDMA
DS> ATT KMS11 DW0 KMA0 760460 340 5

M8203 REG 11 (E134 SW10,9 E121)? 54
M8203 REG 15 (E134 SW8-1)? 0
M8203 REG 16 (E121 SW8-1)? 0

LOOPBACK TYPE? 3
BAUD RATE? 3
RUN SWITCH? 0

DS> SET ALL
DS> SET TRACE
DS> START
```

The procedures for using EVDMA to test the DTUNA are shown in Figures 12 and 13.

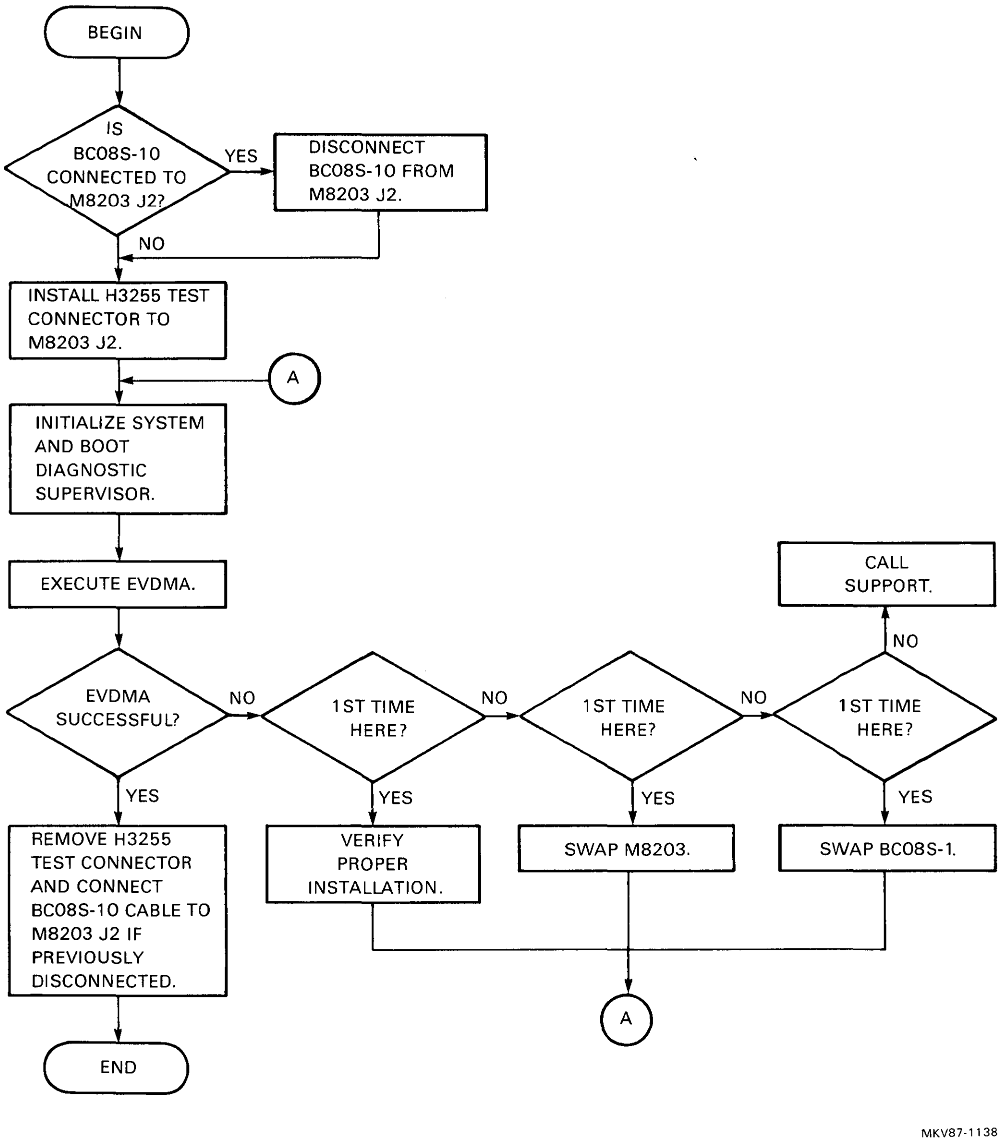


Figure 12 Using EVDMA to Test the M8203 Line Unit and BC08S-1 Cable

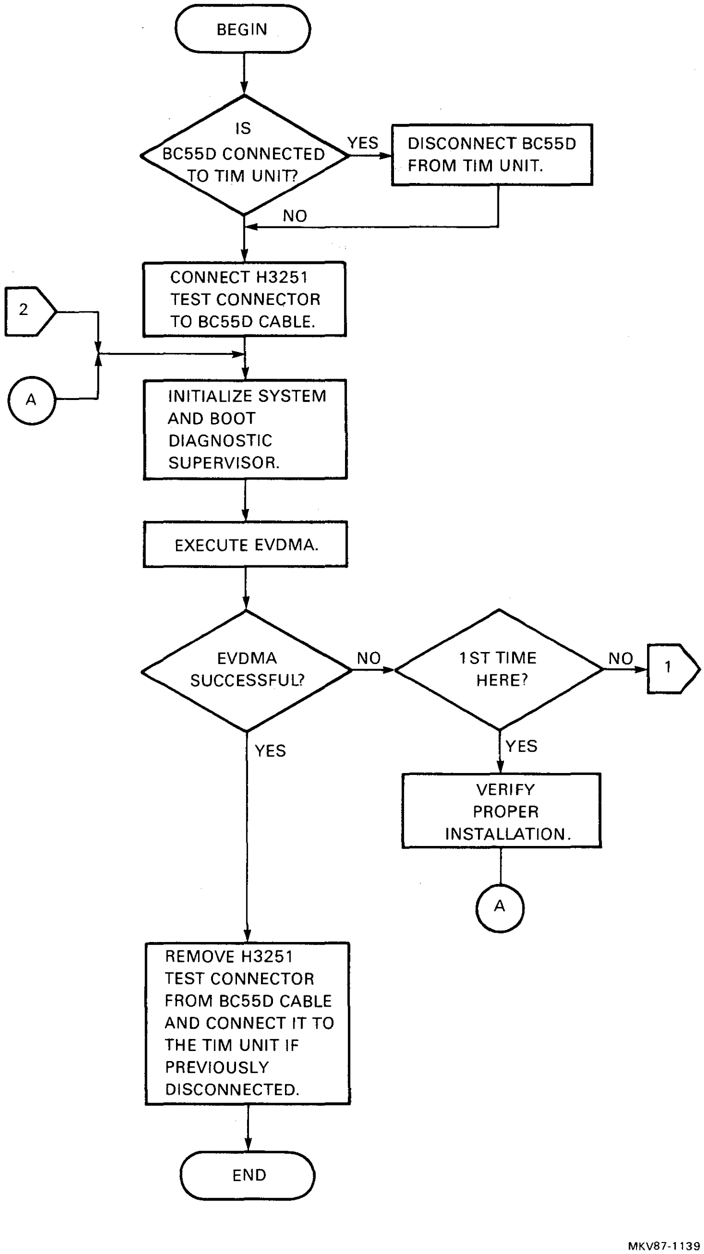


Figure 13 Using EVDMA to Test the BC08S-10 and BC55D Cables, and the H3002 I/O Panel (Sheet 1 of 2)

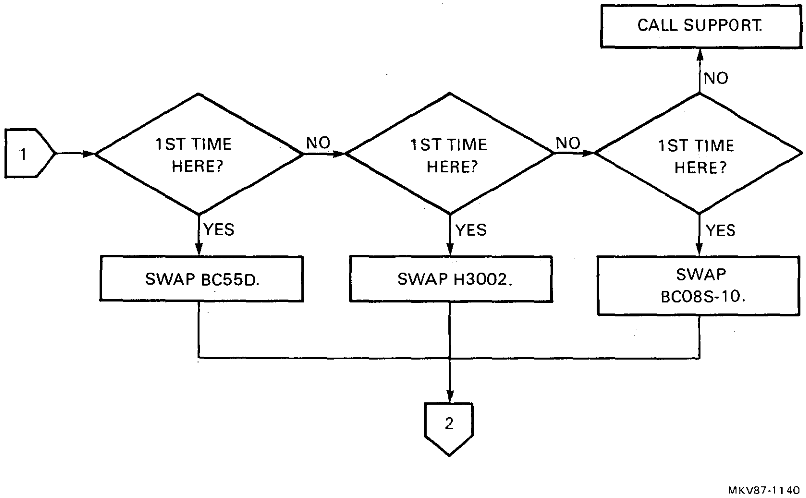


Figure 13 Using EVDMA to Test the BC08S-10 and BC55D Cables, and the H3002 I/O Panel (Sheet 2 of 2)

TIM LED Indicators – The status of the TIM unit can be determined by using Table 1 and the procedure shown in Figure 14.

Table 1 TIM Unit LED Indicators State and Status

LED	State	Status
TXD (yellow)	BLINK	Blinks only when data frames are being transmitted.
	ON	Invalid
	OFF	Invalid
POL (yellow)	BLINK	Blinks when data frames passed on network.
	ON	Data frames being passed on network.
	OFF	No data frames passed on network, TIM unit not connected to network, or TIM unit faulty.
PWR (green)	BLINK	Error detected during power-up diagnostics.
	ON	Passed power-up diagnostics.
	OFF	Failed power-up diagnostics.

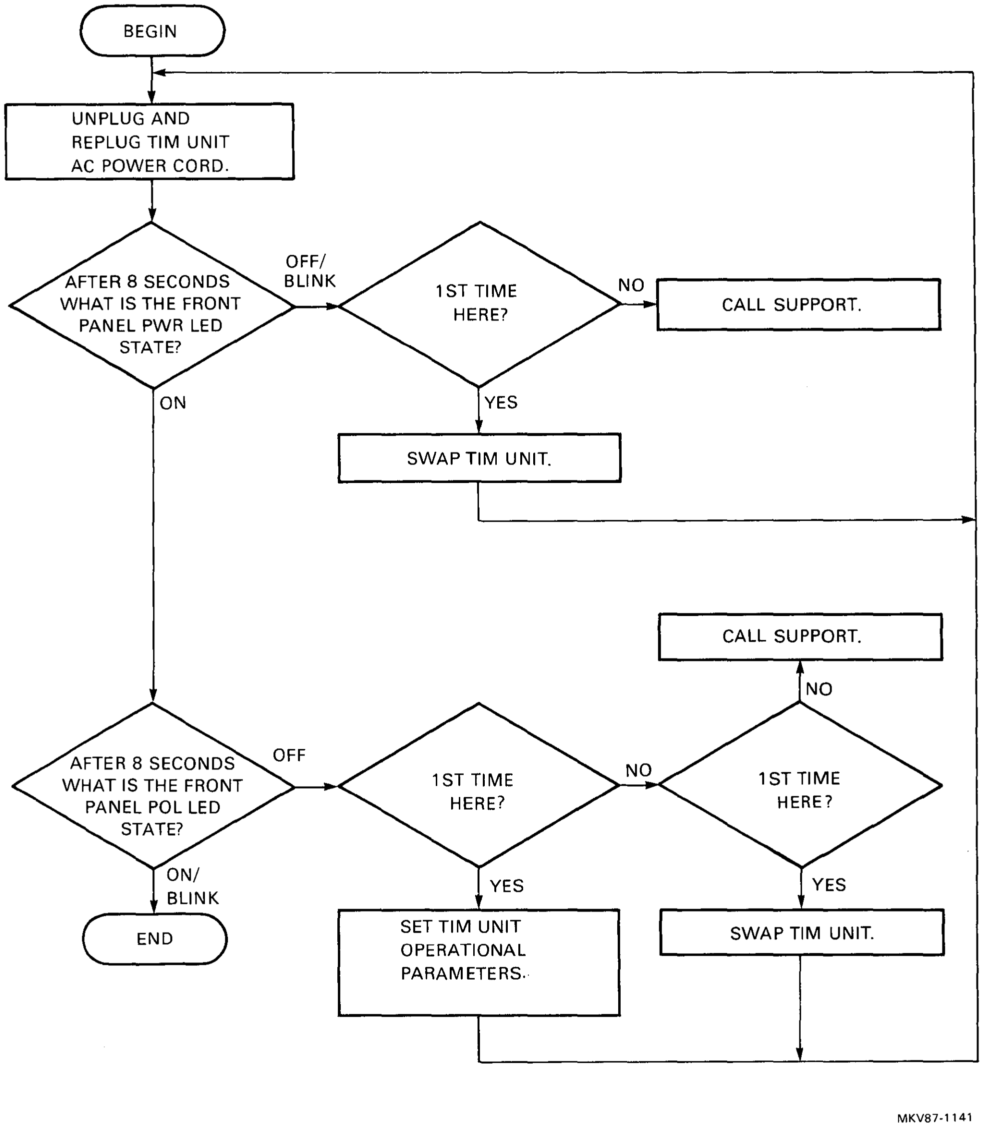


Figure 14 Testing the TIM Unit Using the Front Panel LEDs

Troubleshooting

DTUNA testing is detailed in the Troubleshooting Flowchart (Figure 15) which assumes that the DTUNA of the failing node was at one time operational.

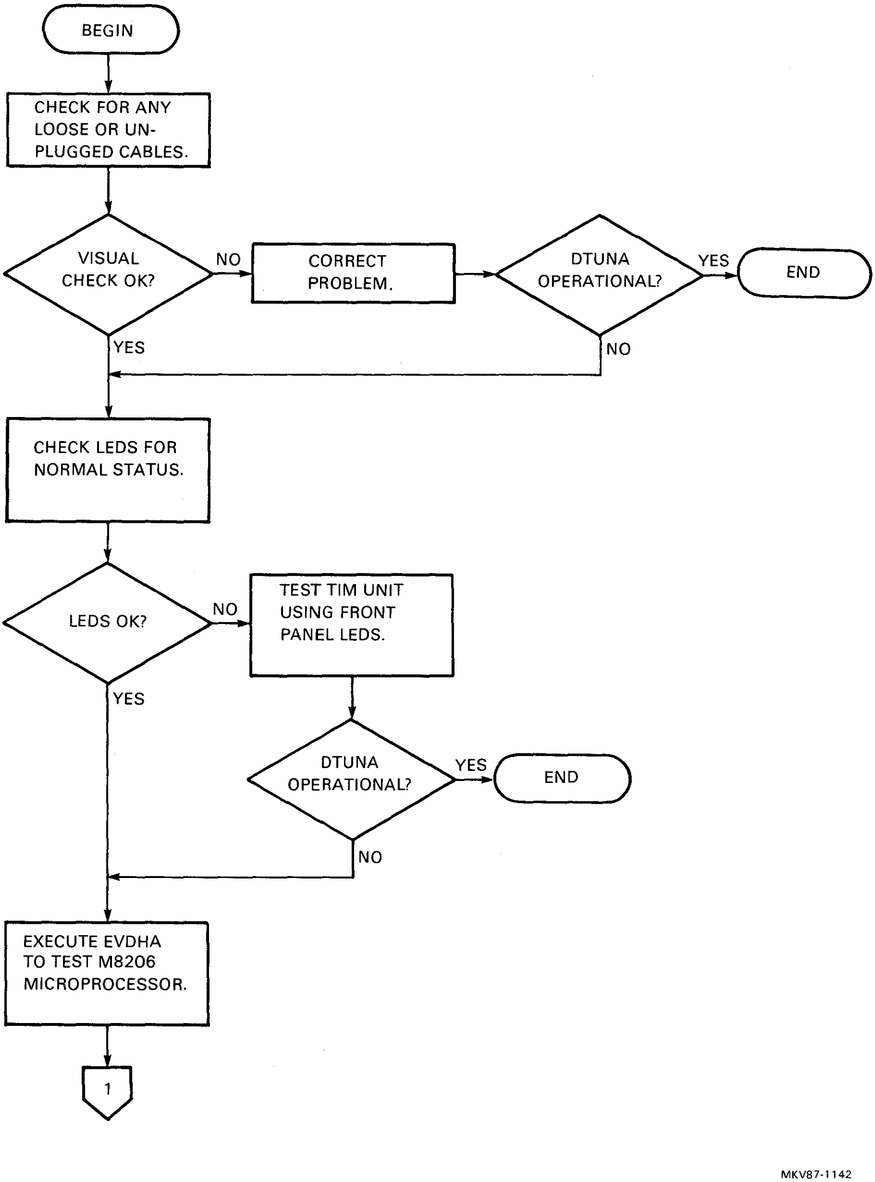


Figure 15 DTUNA Troubleshooting Flowchart (Sheet 1 of 2)

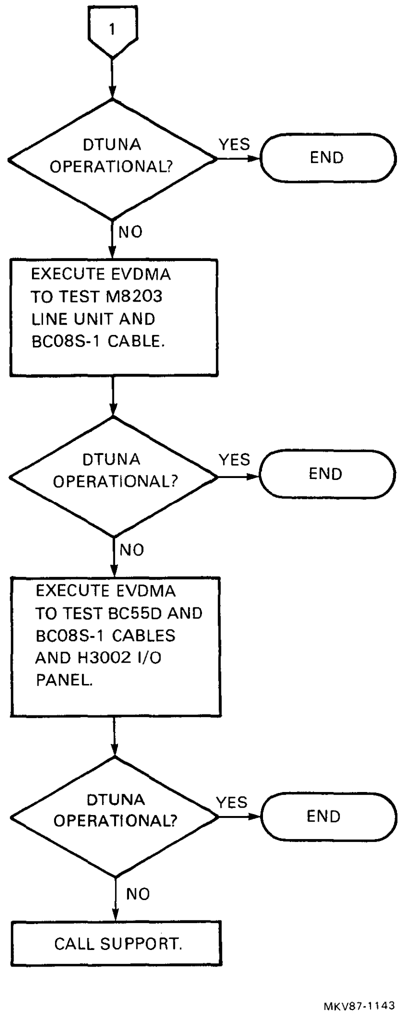


Figure 15 DTUNA Troubleshooting Flowchart (Sheet 2 of 2)

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.

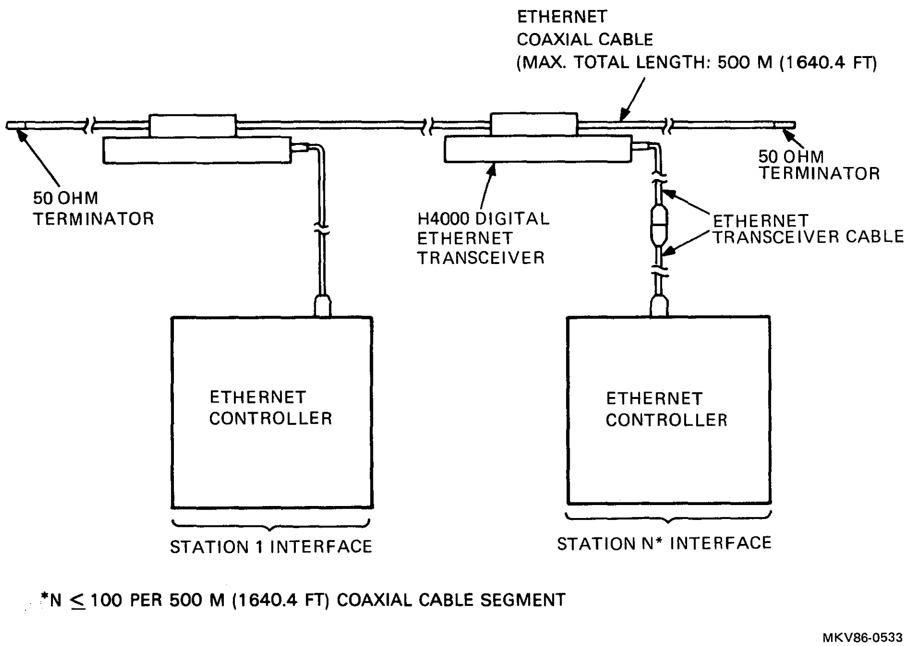


Figure 1 Typical H4000 Transceiver Configuration

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.

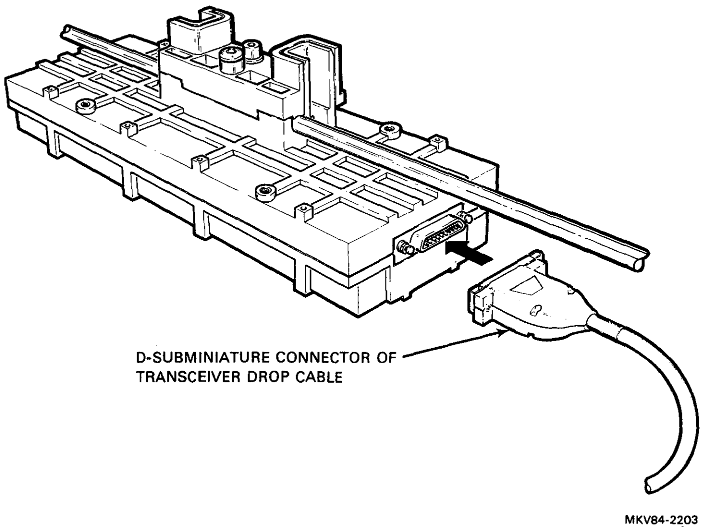


Figure 2 Ethernet H4000 Transceiver

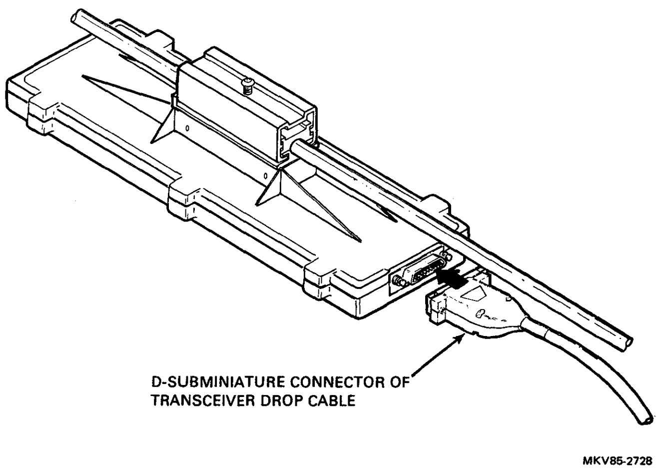


Figure 3 Ethernet H4000 Transceiver with Removable Tap Assembly

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.

H4000 INSTALLATION

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.

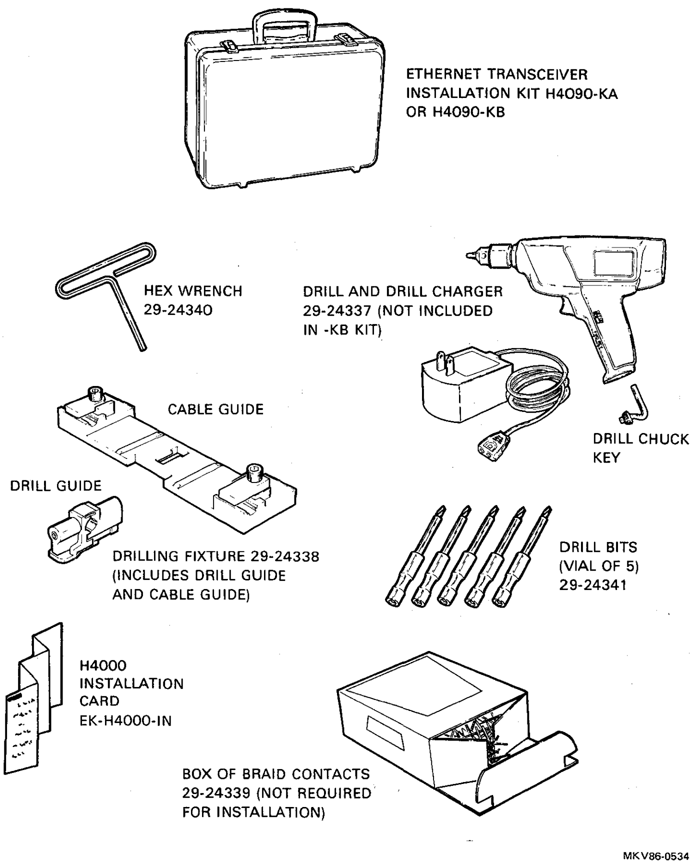
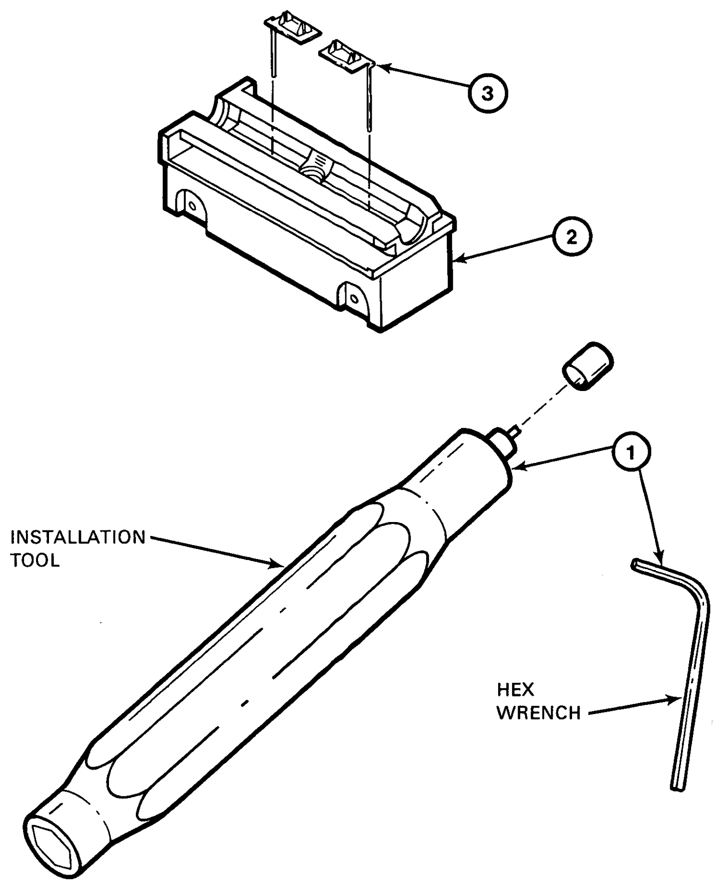


Figure 4 H4000 Transceiver Installation Kit



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

H4000 INSTALLATION

The following flow diagram outlines the H4000 transceiver installation process.

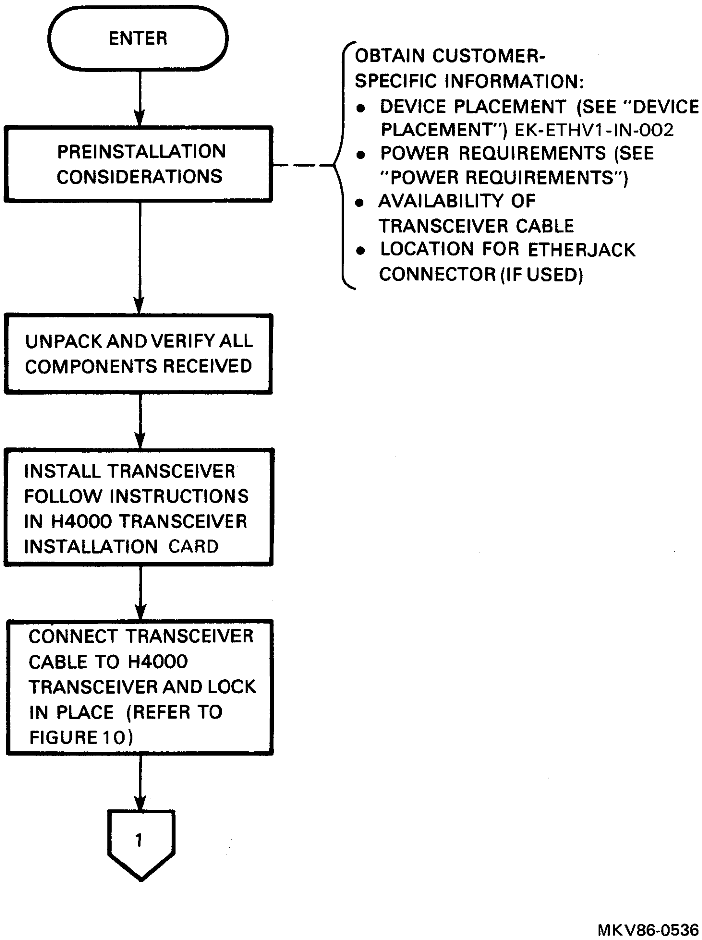


Figure 6 Installation Flow Diagram (Sheet 1 of 3)

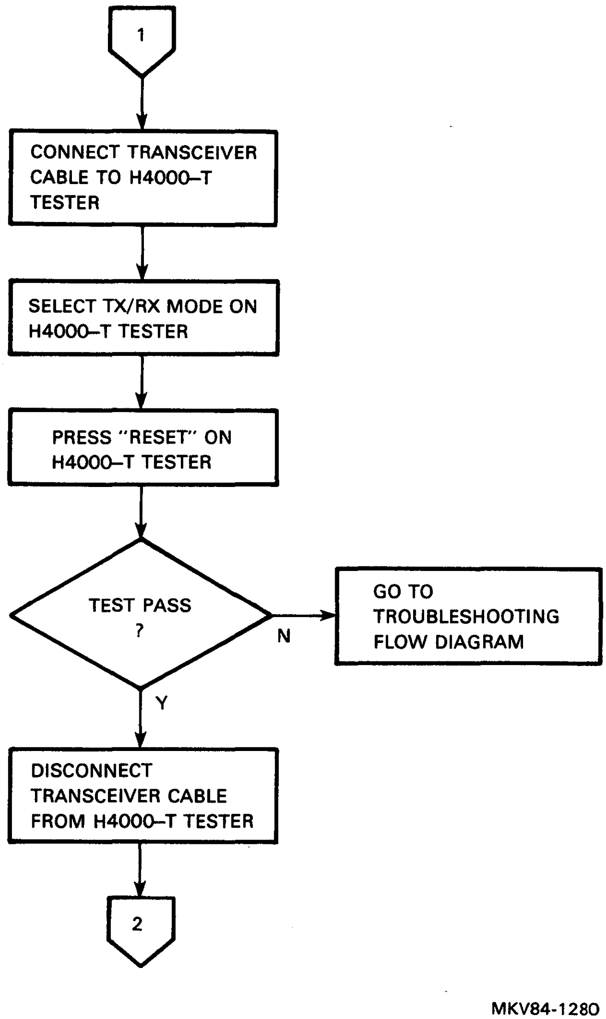


Figure 6 Installation Flow Diagram (Sheet 2 of 3)

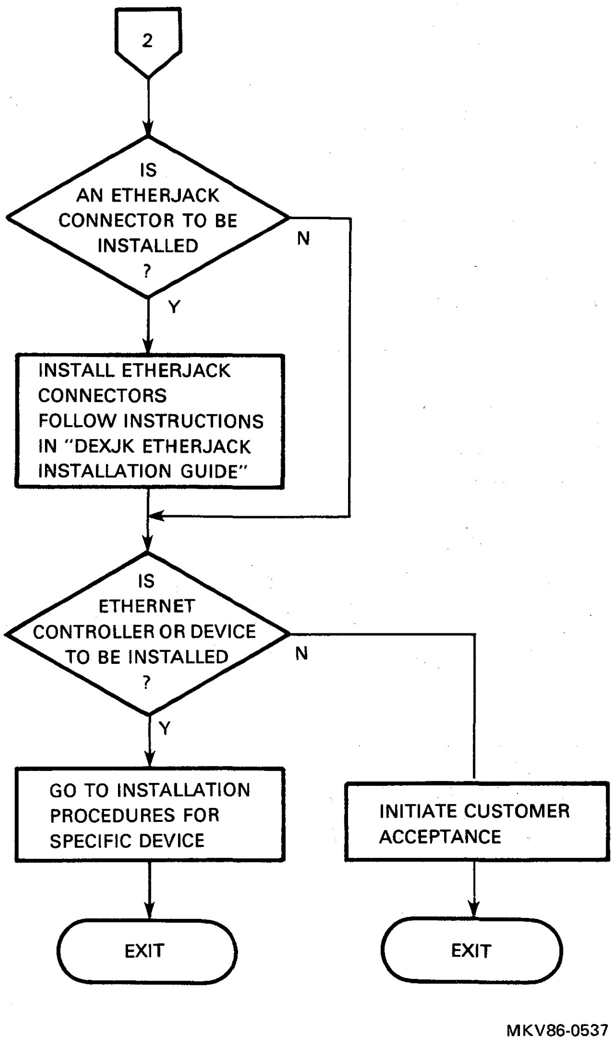


Figure 6 Installation Flow Diagram (Sheet 3 of 3)

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.

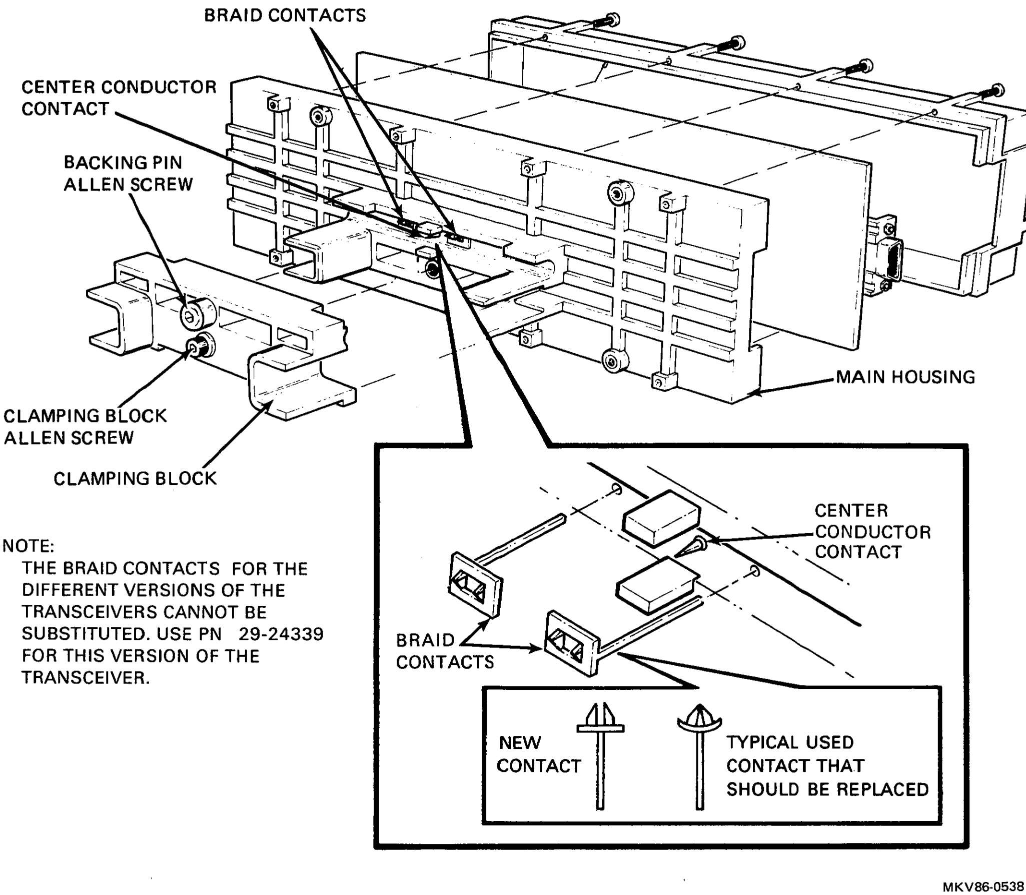
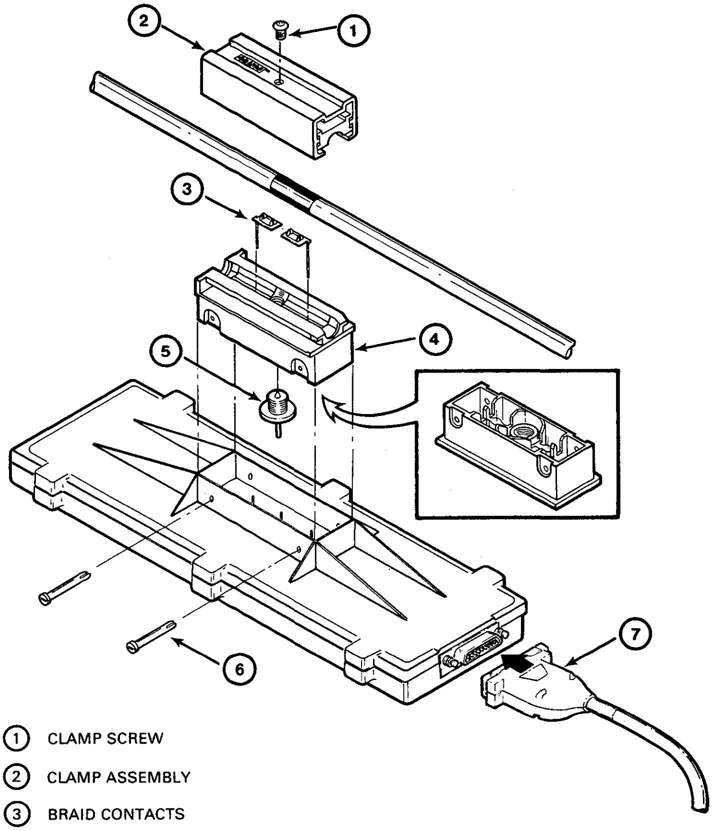


Figure 7 Hardware for Installing the H4000 Transceiver on a Coaxial Cable



(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.

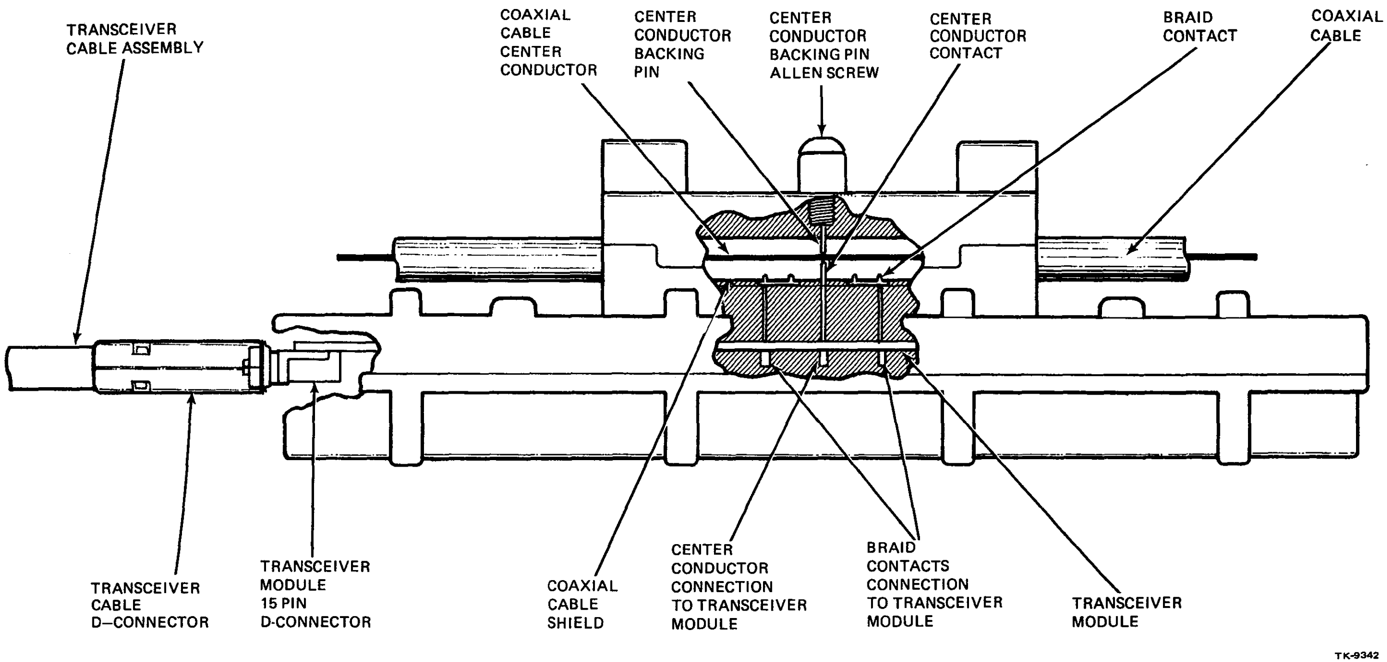


Figure 9 H4000 Ethernet Transceiver: Cutaway View Showing Coaxial Cable Interface

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.

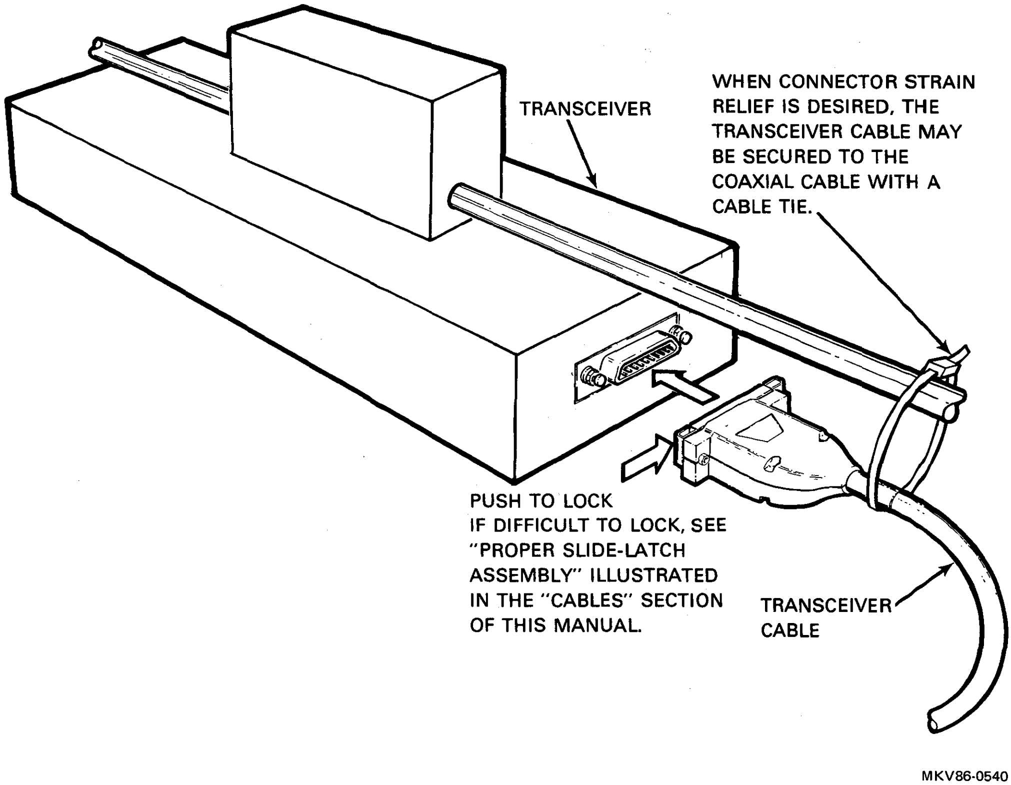


Figure 10 Typical Transceiver Cable Connection

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).

H4000 MAINTENANCE AIDS

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.

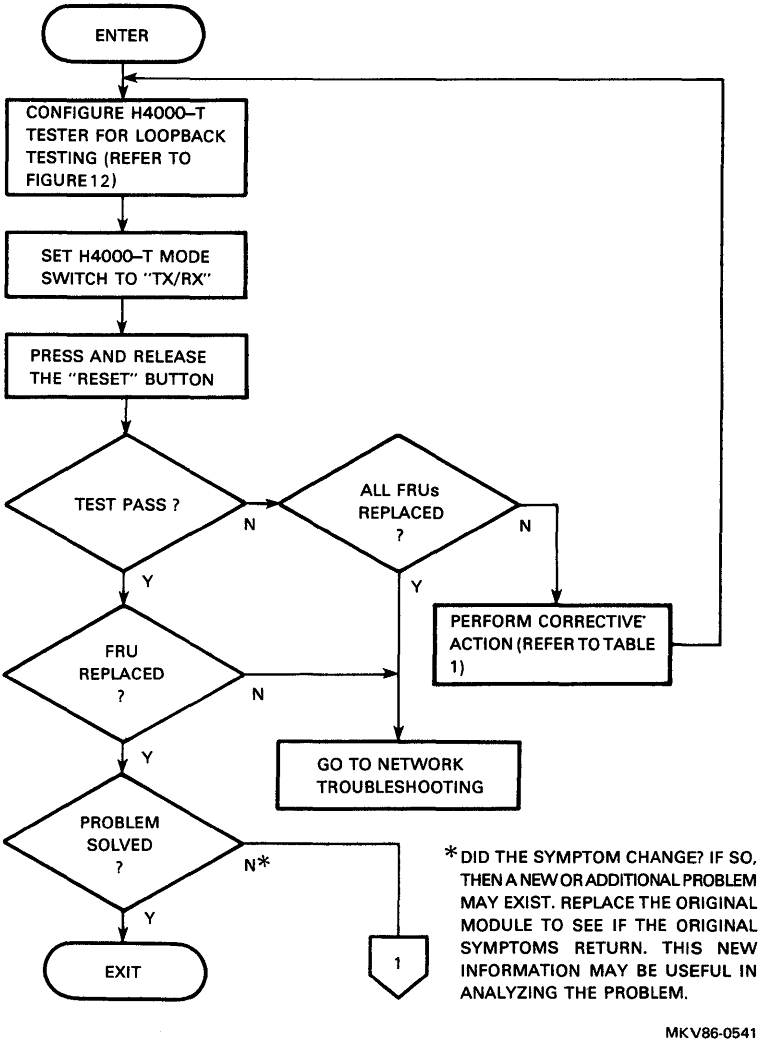


Figure 11 Troubleshooting Flow Diagram (Sheet 1 of 4)

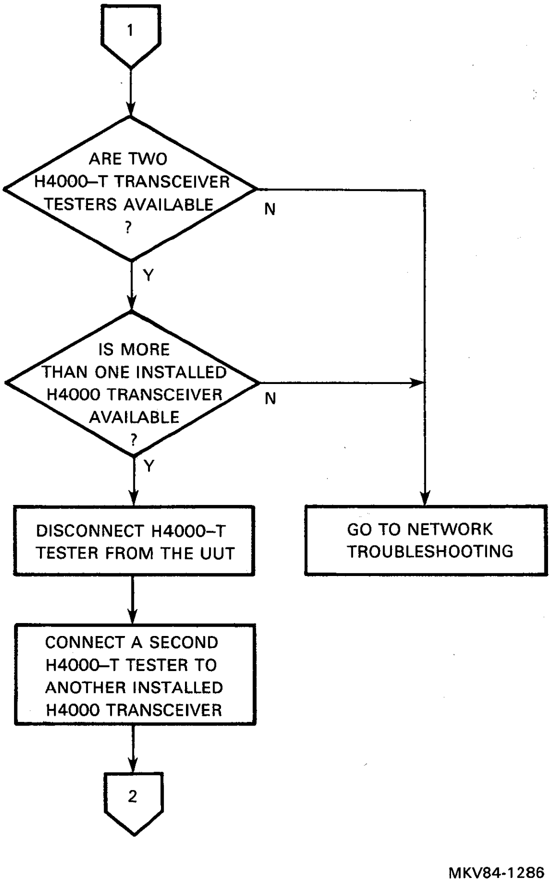


Figure 11 Troubleshooting Flow Diagram (Sheet 2 of 4)

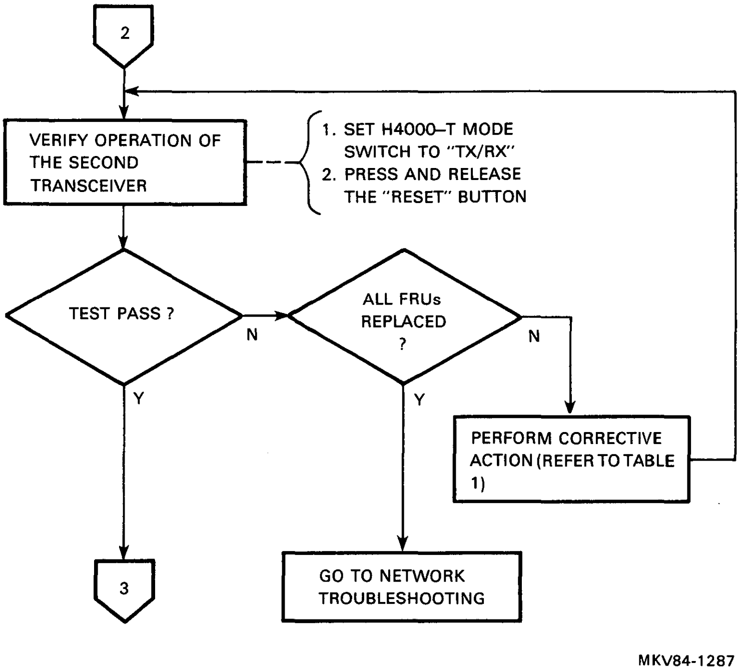


Figure 11   Troubleshooting Flow Diagram (Sheet 3 of 4)

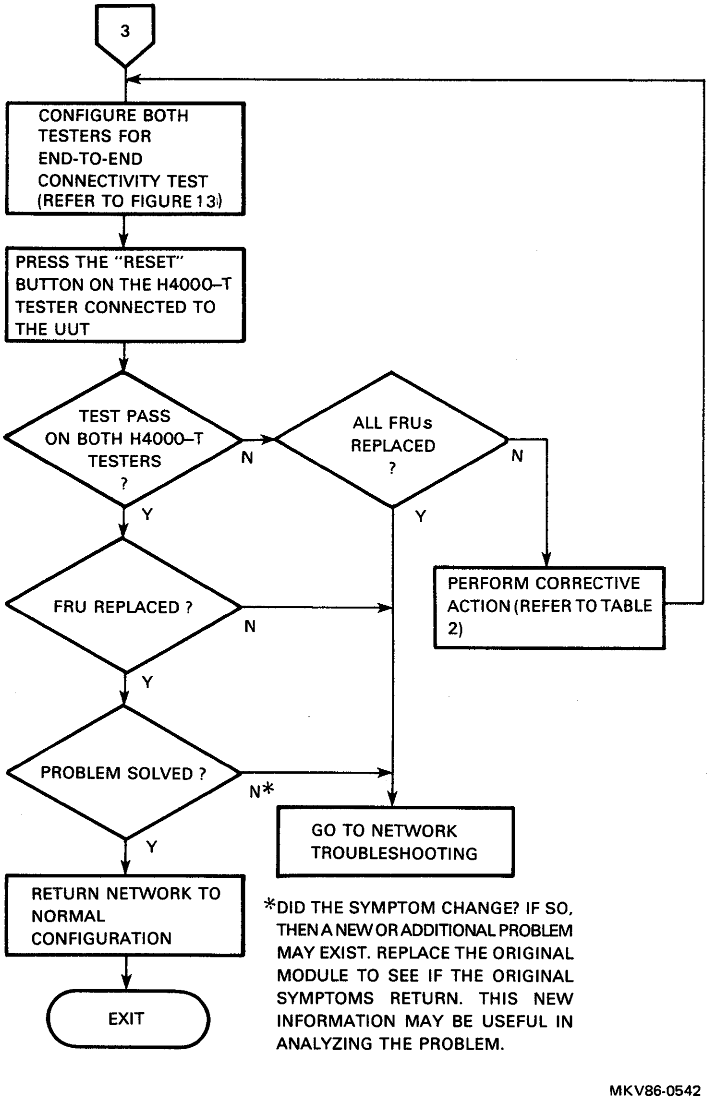


Figure 11 Troubleshooting Flow Diagram (Sheet 4 of 4)

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

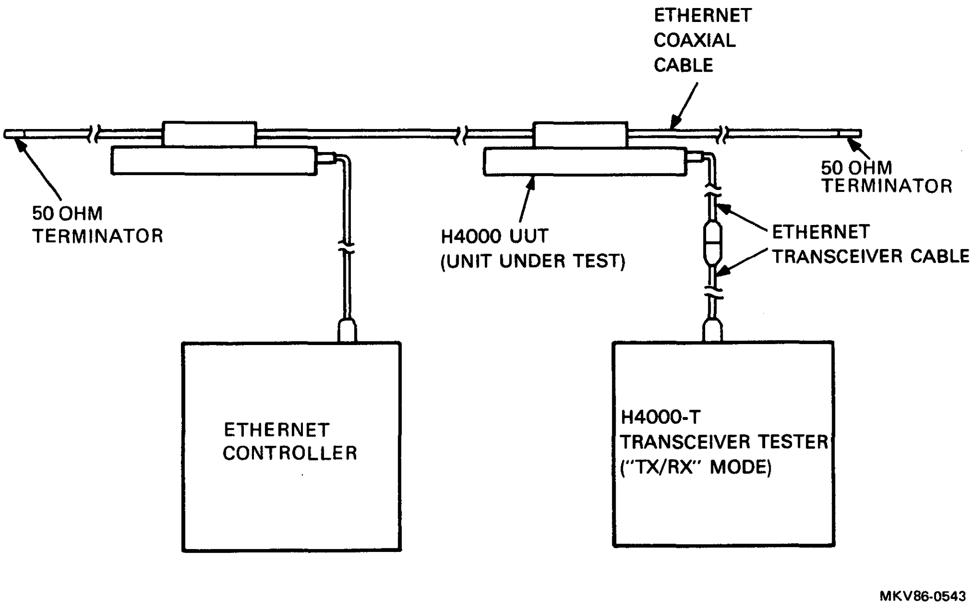


Figure 12 Typical H4000-T Configuration for Loopback Testing

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.

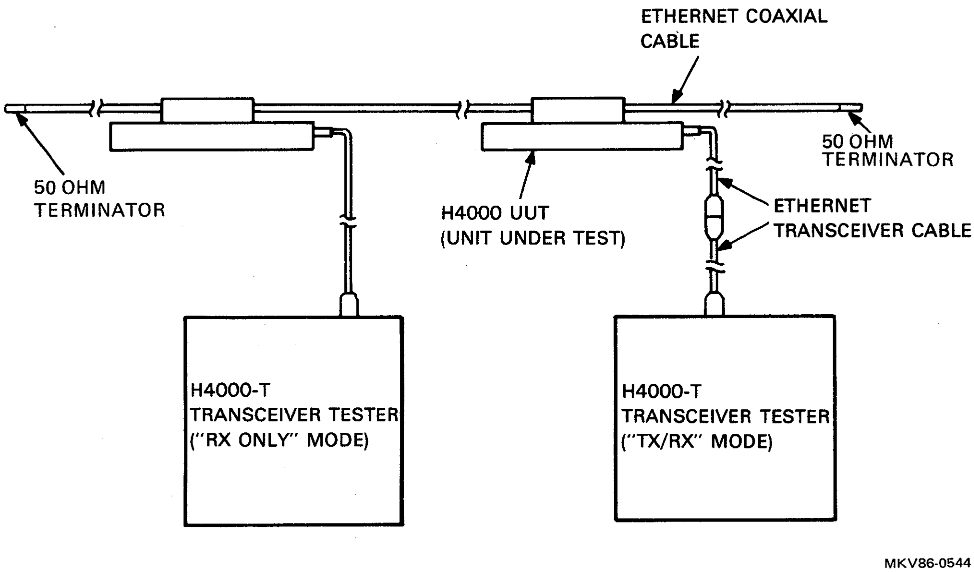


Figure 13 Typical H4000-T Configuration for End-to-End Testing

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

H4005 802.3 TRANSCEIVER

General Description

An H4005 802.3 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 H4005 transceiver has a switch selectable heartbeat that should be disabled when used with devices that do not require heartbeat.

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 H4005 transceiver is transparent to the data layers and is not addressable or programmable in any way.

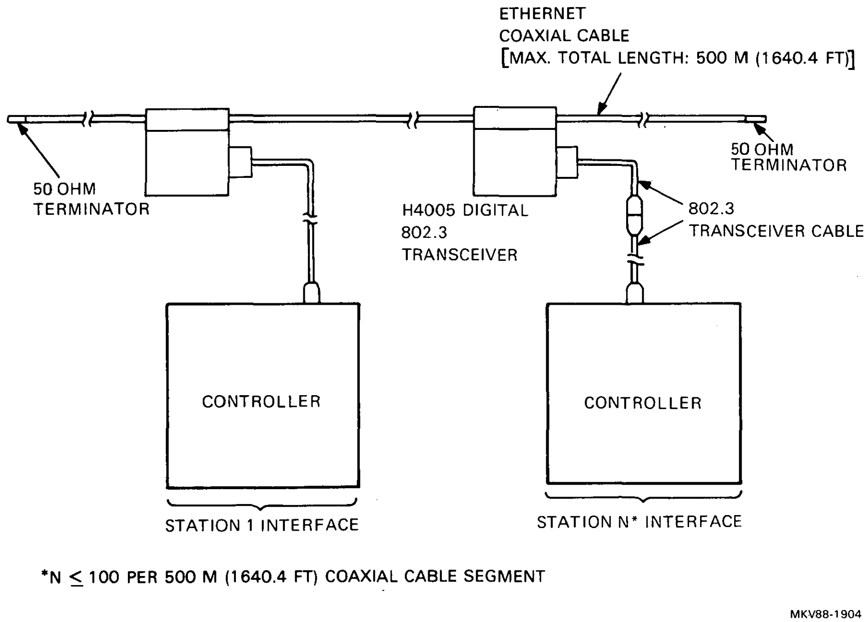


Figure 1 Typical H4005 Transceiver Configuration

H4005 Versions

The H4005 is the only version of the H4005 Ethernet transceiver.

H4005 Transceiver Components

The following parts are supplied with the H4005 transceiver.

- H4005 transceiver
- Tap assembly
- *H4005 DIGITAL Ethernet Transceiver with Removable Tap Assembly Installation Card.*

H4005 INSTALLATION

Reference Documentation

Refer to the following documents for more information regarding the H4005 Ethernet transceiver.

• *H4005 DIGITAL Ethernet Transceiver with Removable Tap Assembly Installation Card*	EK-H4005-IN
• *DEC Standard 134, Ethernet Specifications*	EL-000134-00
• *DECconnect System Installation and Verification Guide*	EK-DECSY-VG
• *Etherjack Installation Guide*	EK-DEXJK-IN
• *H4000-T Ethernet Transceiver Tester User Guide*	EK-ETHTT-UG

System Placement

System placement is not applicable to the H4005 transceiver.

Device Placement

The H4005 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]) 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).
- Cannot be used with Ethernet repeater (DEREP). Use H4000 transceiver with the DEREP repeater.

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 H4005 Ethernet transceiver.

- H4000-TA/TB transceiver tester (must be IEEE 802.3 compatible)
- CD Kit (Part Number: A2-W1108-10)
- Installation Tool (Part Number: 12-24664-02)

Power Requirements

An H4005 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.

Installation Flow Diagram
The following flow diagram outlines the H4005 transceiver installation process.

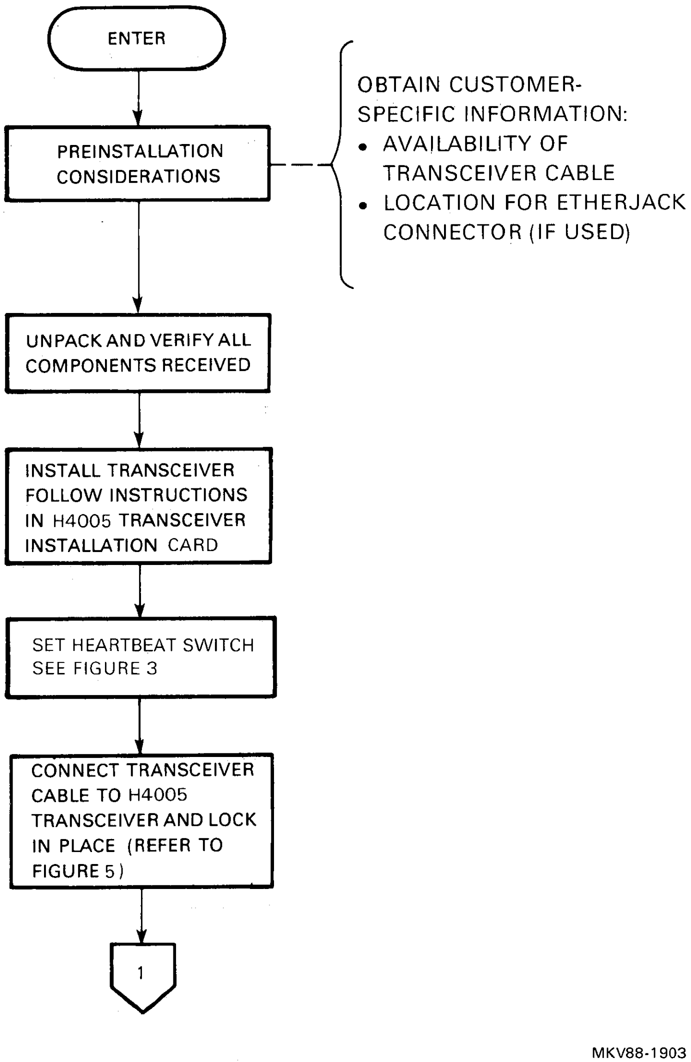


Figure 2 Installation Flow Diagram (Sheet 1 of 3)

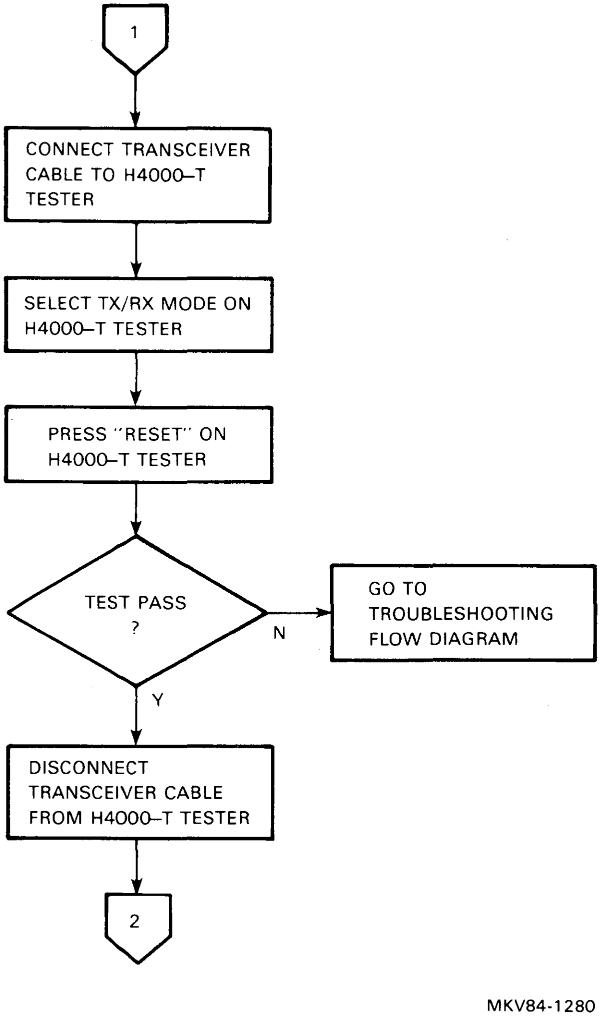


Figure 2 Installation Flow Diagram (Sheet 2 of 3)

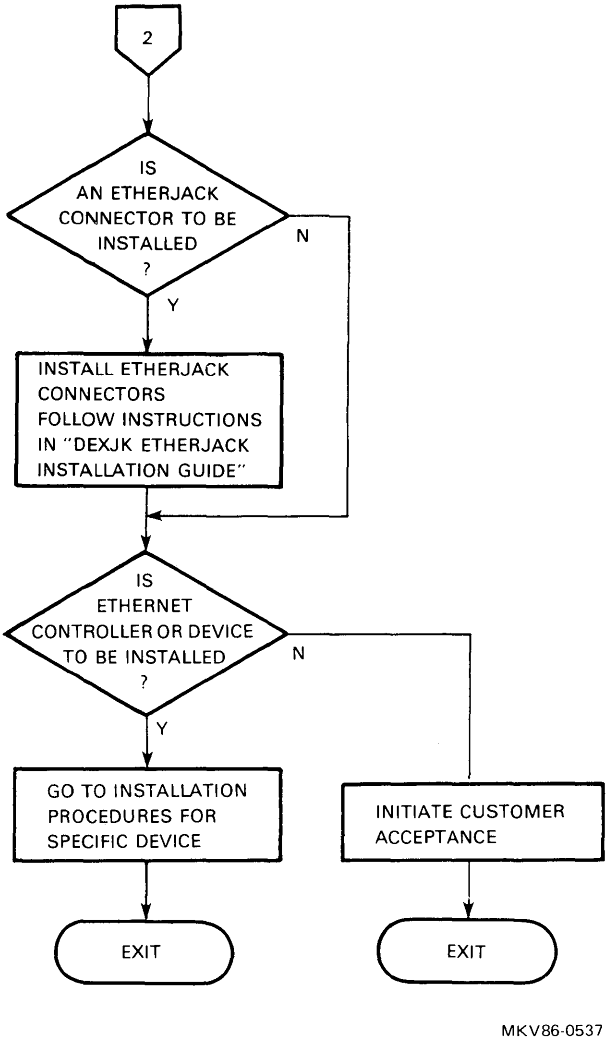


Figure 2 Installation Flow Diagram (Sheet 3 of 3)

Heartbeat Selection

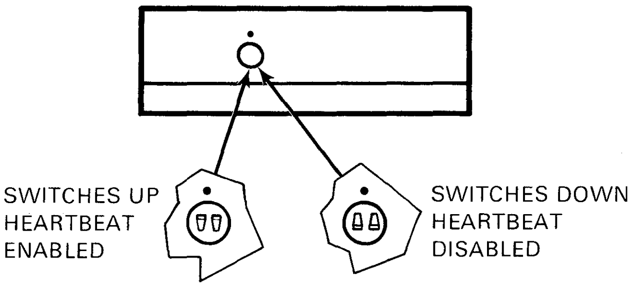
The H4005 transceiver is normally shipped in the heartbeat enabled configuration. Disable heartbeat when installing with devices that do not require heartbeat.

NOTE

H4005 transceivers should be used with all Digital Equipment Corporation Ethernet products except DEREP repeaters. H4000 transceivers should be used with DEREP repeaters.

Heartbeat should be enabled when the H4005 transceiver is used with DIGITAL products except with DEMPR/DELNI or DEMPR in an 802.3 network.

When used with non-DIGITAL products, follow the vendor's recommendations.



NOTES
1. SWITCHES TOWARD DIMPLE ENABLE HEARTBEAT.
2. SWITCHES AWAY FROM DIMPLE DISABLE HEARTBEAT.

MKV88-1912

Figure 3 Setting the H4005 Heartbeat Switches

Installation Hardware
The following figure shows the positions of the center conductor contact and braid contacts. Also shown is the clamping block. The clamping block holds the coaxial cable so that it connects with the center conductor contact and braid contacts.

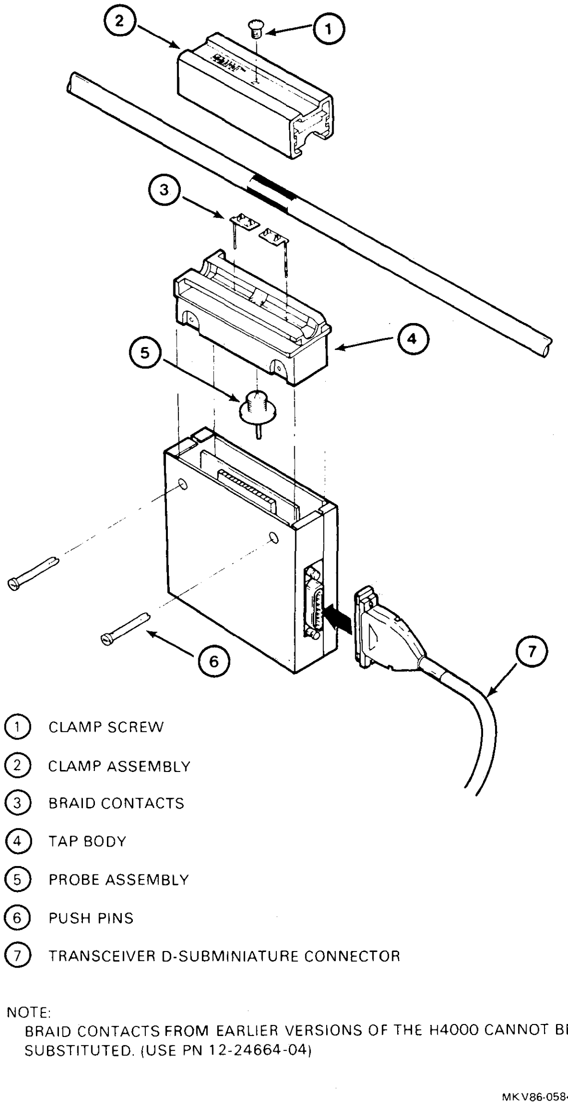


Figure 4 Hardware for Installing the H4005 Transceiver on a Cable

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.

NOTE
For new installs, 802.3 cables are required. When replacing an H4000 transceiver with an H4005 transceiver, it is recommended that the Ethernet transceiver cable be replaced with an 802.3 transceiver cable. Failure to do so could result in some network problems in noisy environments.

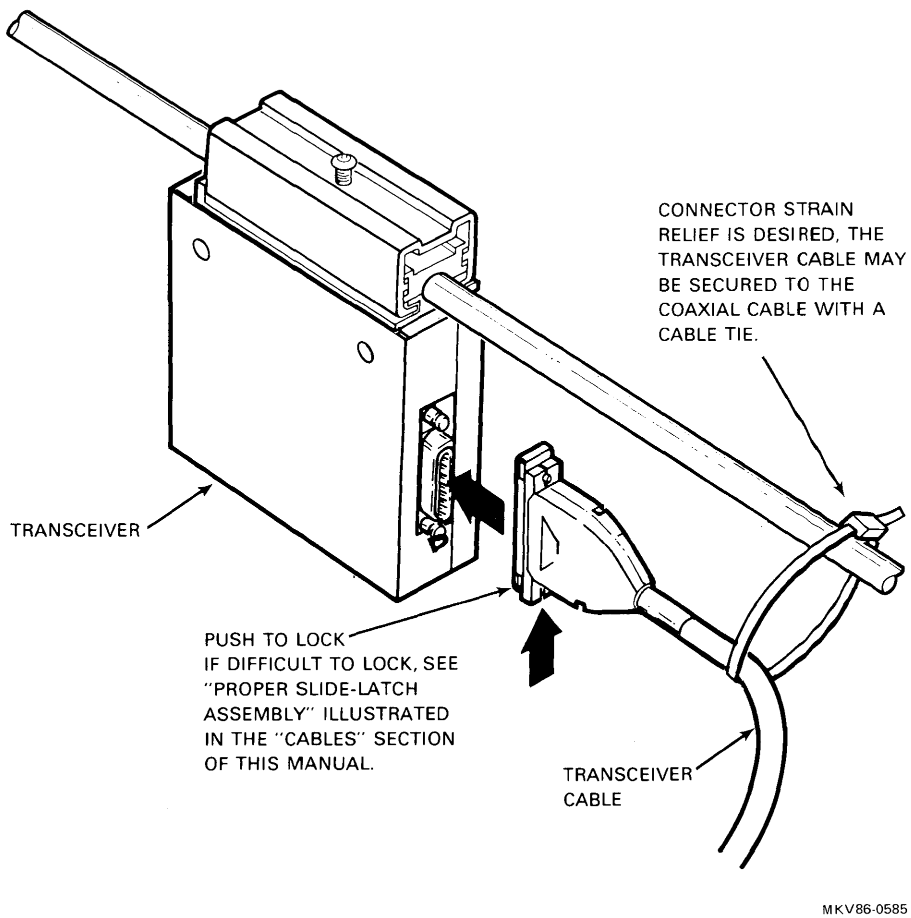


Figure 5 Typical Transceiver Cable Connection

Diagnostics
There are no diagnostics designed specifically for the H4005 Ethernet transceiver. The following diagnostics, however, may be helpful in isolating faults to the transceiver.

- NIE (Network Interconnect 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).

H4005 MAINTENANCE AIDS

Required Equipment
The following equipment is required for isolating faulty H4005 Ethernet transceivers.

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

Field Replaceable Units (FRUs)
The following items are FRUs for the H4005 transceiver.

• Braid contacts (box of 100)	12-24664-02
• AMP Tap III	12-24664-01
• H4005 transceiver (FRU)	70-22781-01

Troubleshooting Flow Diagram

The following troubleshooting flow diagram illustrates the procedures for locating a malfunctioning H4005 Ethernet transceiver.

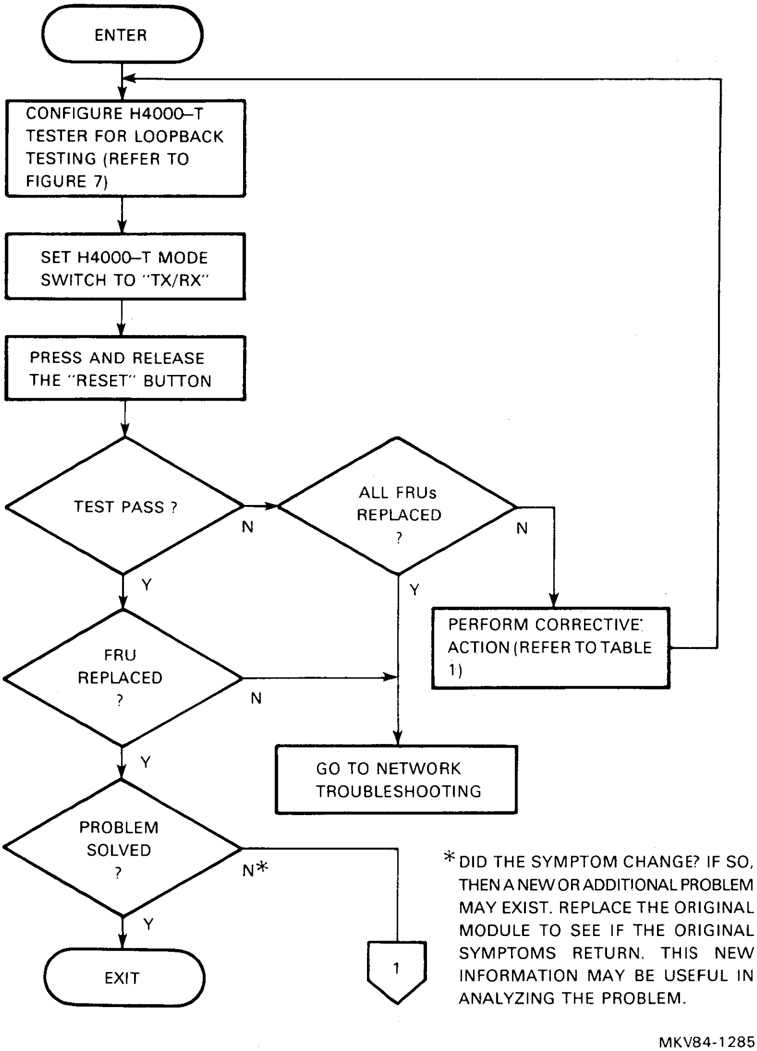


Figure 6 Troubleshooting Flow Diagram (Sheet 1 of 4)

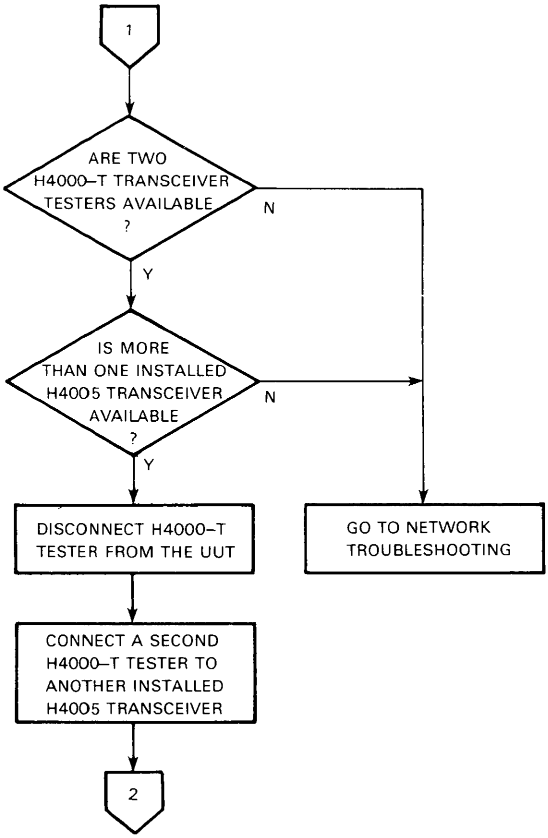


Figure 6 Troubleshooting Flow Diagram (Sheet 2 of 4)

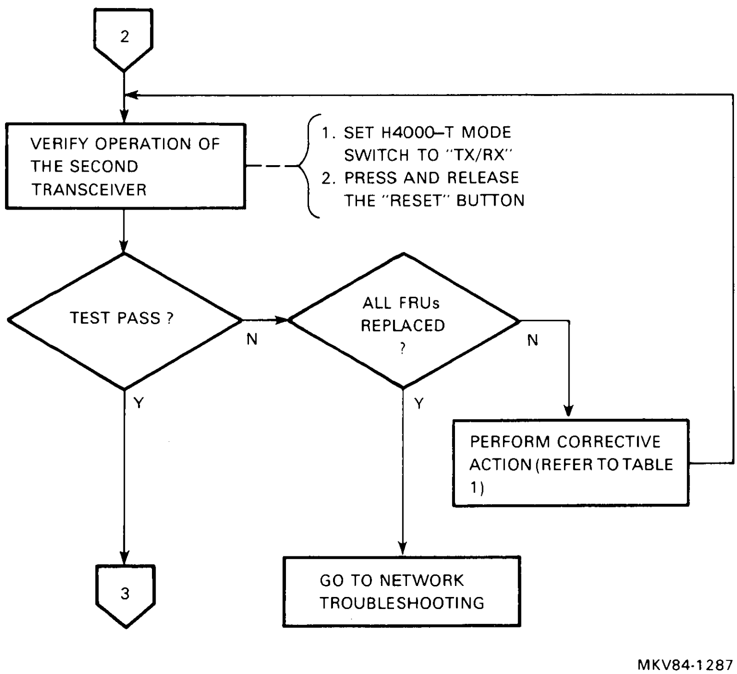


Figure 6 Troubleshooting Flow Diagram (Sheet 3 of 4)

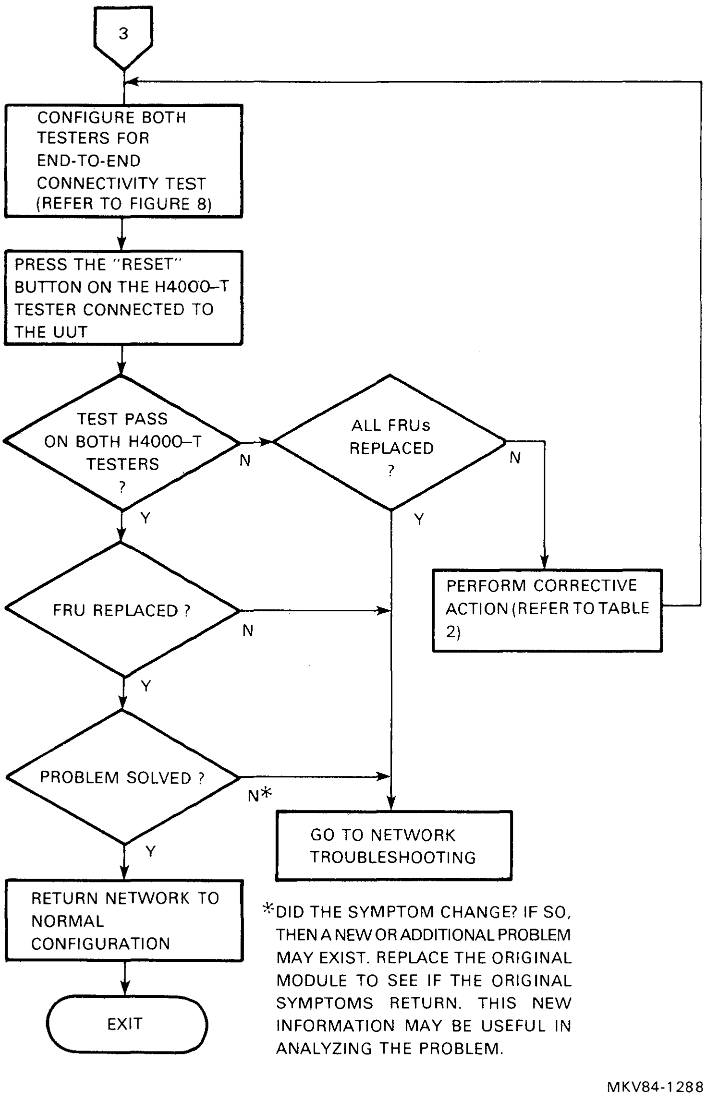


Figure 6 Troubleshooting Flow Diagram (Sheet 4 of 4)

'esting Configurations

'he following figure shows a configuration for a single H4000-T transceiver tester connected to an H4005 JUT (unit under test).

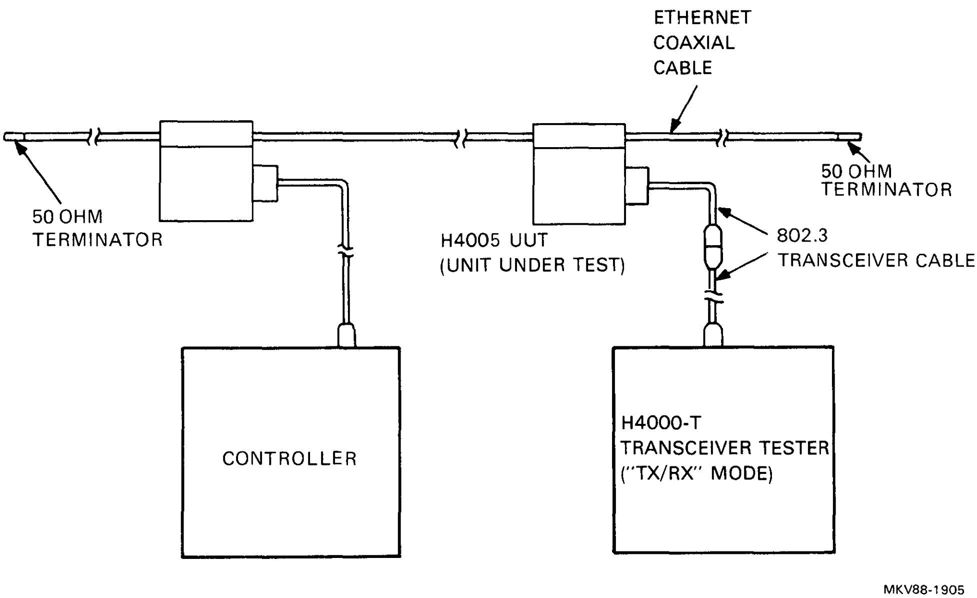


Figure 7 Typical H4000-T Configuration for Loopback Testing

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

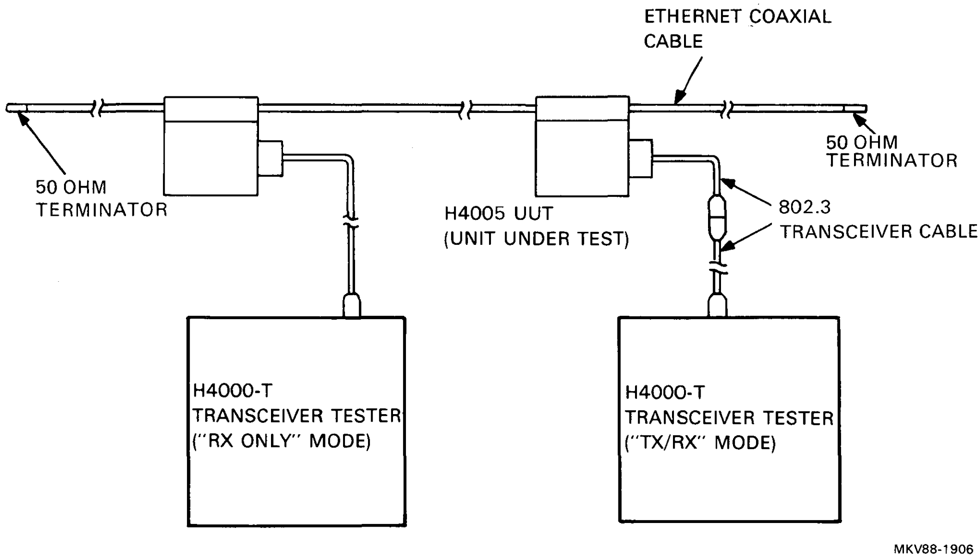


Figure 8 Typical H4000-T Configuration for End-to-End Testing

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

Lamp	Indication	Corrective Action*
DATA PASS	Data packet transmitted and received correctly	None
DATA FAIL	Data packet not received correctly	Repair/replace: - Transceiver - Bent or broken contacts - Transceiver cable** - Connection (retap)
COLLISION TEST	If heartbeat is disabled, collision test failure is normal.	None
	Collision test signal not received after sending data packet	Repair/replace: - Transceiver cable** - Transceiver
COLLISION	Intermittent light: COLLISION ON and TIMEOUT ON	Check shorted coax
	COLLISION ON and SELF-TEST flashing	Check for: - Missing terminators - Defective controller - Improperly configured network - Open cable
TIMEOUT	Carrier signal not received within 19 microseconds	Repair/replace: - Transceiver cable** - Transceiver
	If TIMEOUT is ON and COLLISION is ON	Check for shorted coax
SELF TEST PASS	SELF-TEST flashing every 3 to 4 seconds	None

* When several FRUs are listed, begin with the first one before trying the others.

** Ensure that the transceiver cable is properly assembled and is an 802.3 Ethernet transceiver cable.

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

Lamp	Indication	Corrective Action
DATA PASS	Data packet received correctly	None
DATA FAIL	Data packet not received correctly (DATA PASS lamp lit on TX/RX tester)	Replace transceiver Check tap (ohm out) Troubleshoot cable plant
COLLISION TEST	Not used	
COLLISION	Steady light If COLLISION lamp is also lit on TX/RX tester	Check for: - Missing terminators - Defective controller - Improperly configured network
TIMEOUT	Not used	
SELF TEST PASS	Steady ON	None

LAN Bridge 100

General Description

The LAN Bridge 100 is a device that connects two 802.3 and/or Ethernet 10 Mbit CSMA/CD local area networks (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, H4005, 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 E and higher. This capability is necessary for the LAN Bridge 100 to operate as a LAN Traffic Monitor.

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

LAN Bridge 100 INSTALLATION

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 three versions of the LAN Bridge 100. One version is local bridge and the other two are remote bridges. 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 (DEBET-RC/RD or -RH/RJ) or to a remote repeater (DEREP-RC/RD or -RH/RJ). See Figure 2.

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

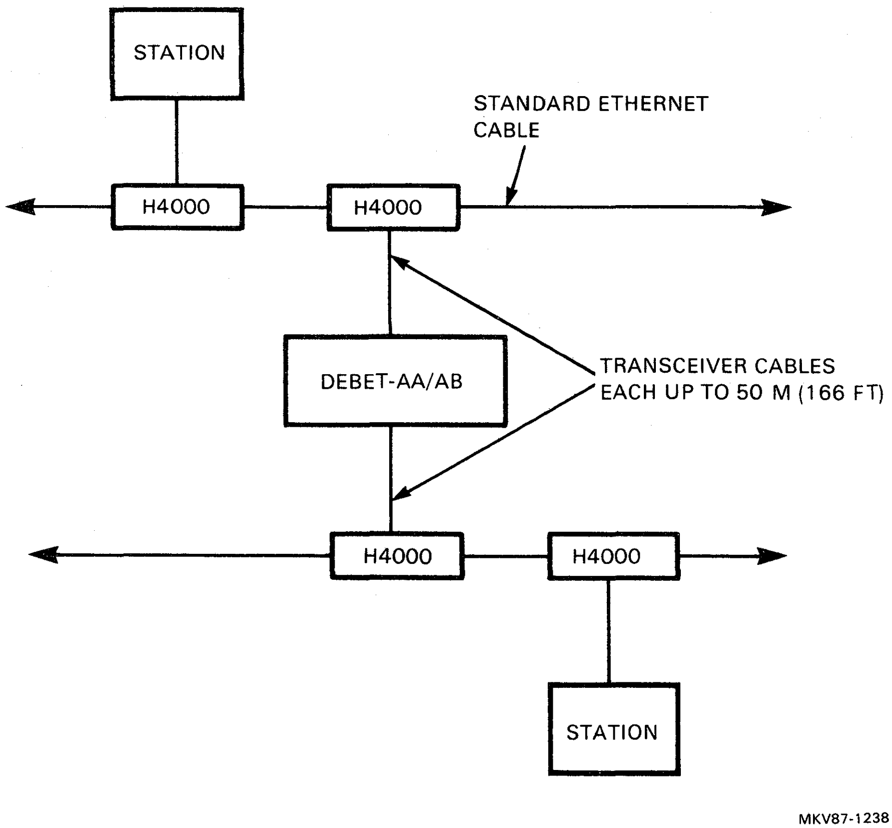


Figure 1 DEBET-AA or -AB Configuration

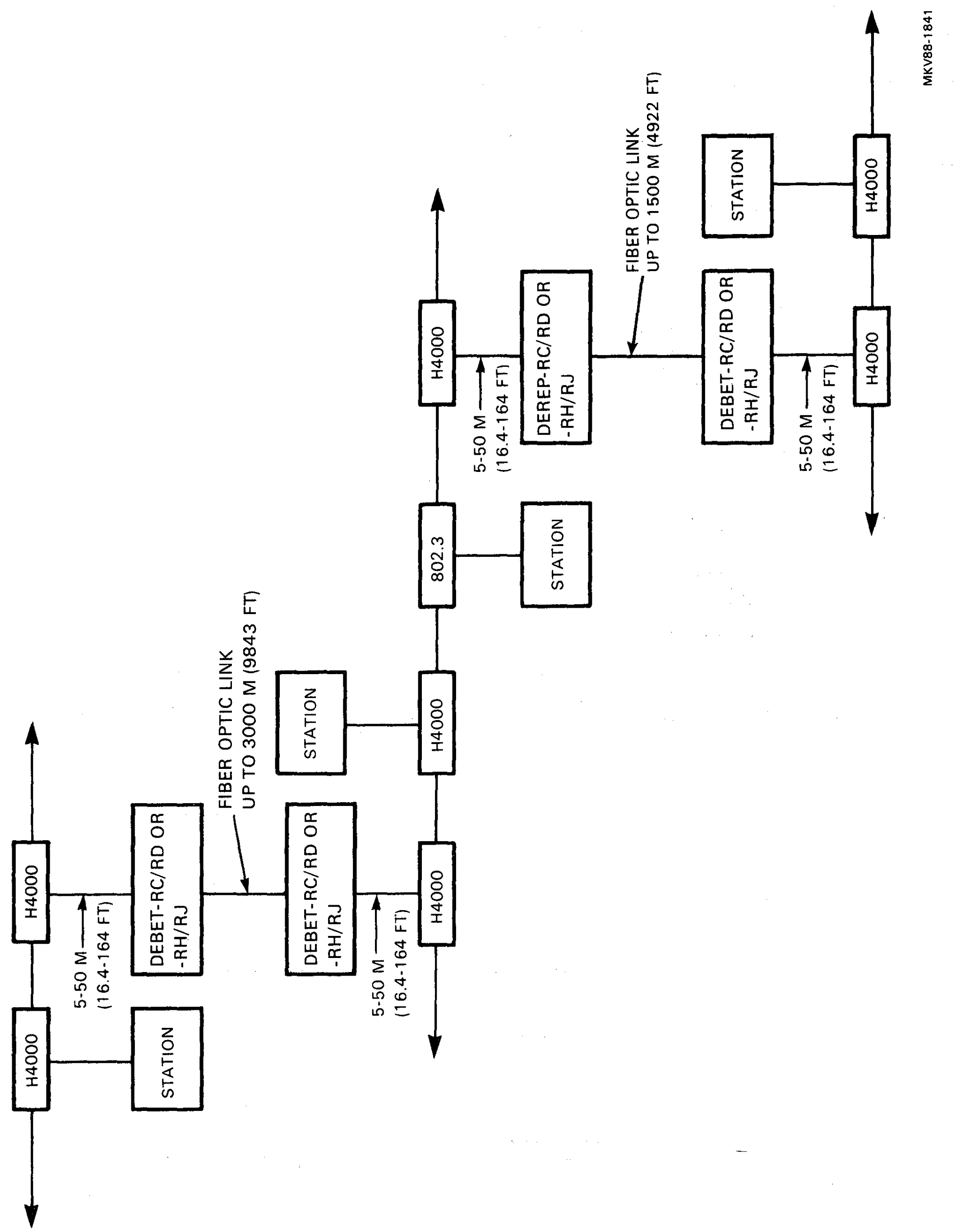


Figure 2 DEBET-RC/RD or -RH/RJ Configuration

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.*

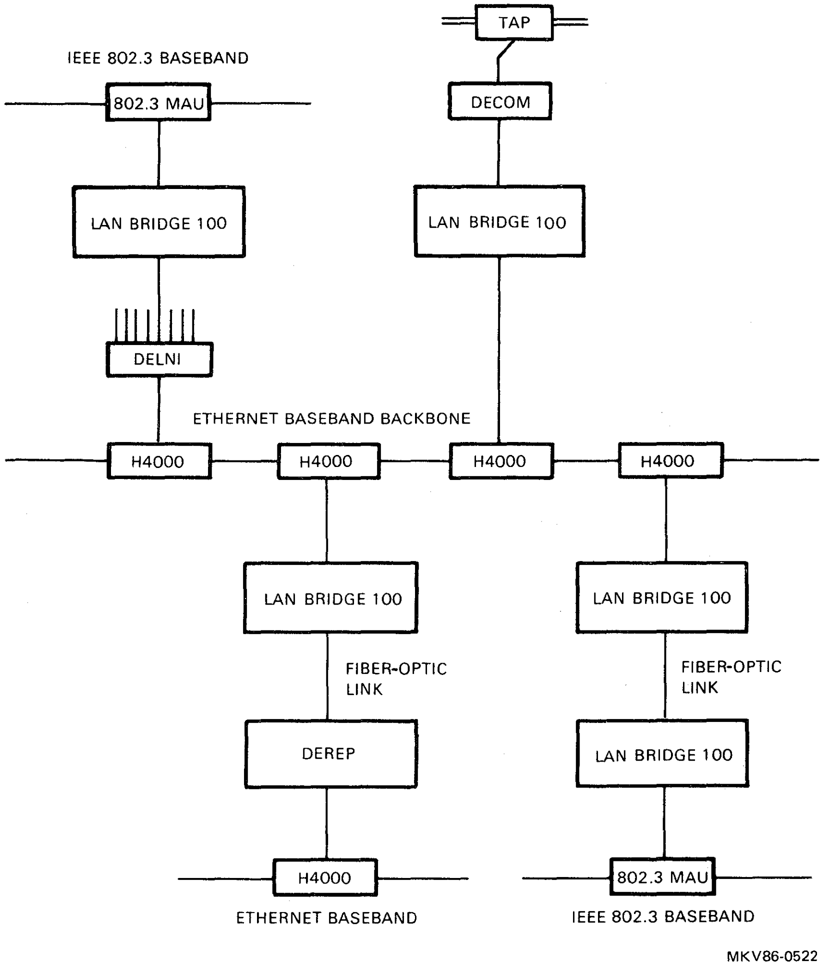


Figure 3 LAN Bridge 100 Connections

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 3000 m (9843 ft).

CAUTIONS
Follow the guidelines in the LAN Bridge 100 Technical Manual (EK-DEBET-TM-003 or later), Appendix B. It is extremely important that the recommendations for optical budgets, derating factors, and fiber types are followed.

Exceeding the 3000 m (9843 ft) limit and/or exceeding the loss budget 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. Therefore, plan for 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 3 dB/km (measured at 850 nm) are available. For more information on fiber optic links, see the *LAN Bridge 100 Technical Manual* (EK-DEBET-TM), Appendix B, and the *DECconnect System Facilities Cabling Installation Guide* (EK-DECSY-FC), Chapter 9.

LAN Bridge 100 (DEBET-RH/RJ) Fiber Optic Attenuator

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

The attenuator is installed when a DEBET-RH/RJ is connected to another DEBET-RH/RJ or to a DEREP-RH/RJ (Figure 4).

NOTES

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

DO NOT install the attenuator for 100/140 fiber optic links beyond 1000 m (3281 ft).

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

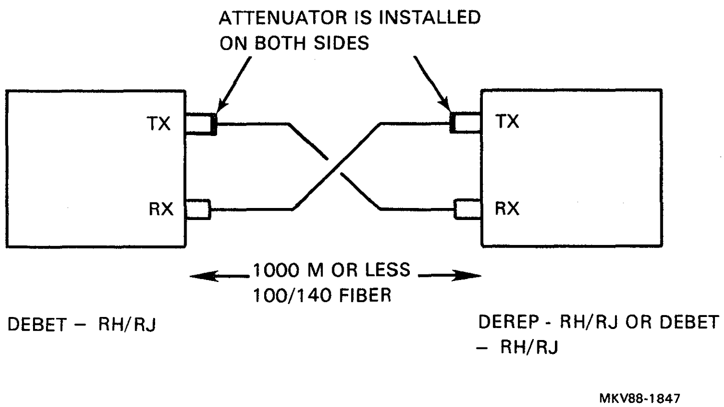


Figure 4 Attenuator Installed on Both Sides

The attenuator is also installed when a DEBET-RH/RJ is connected to a DEBET-RC/RD or to a DEREP-RC/RD (Figure 5).

NOTES

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

If an older DEBET-RC/RD is being used with a newer DEBET-RH/RJ, the guidelines and budgets of the DEBET-RC/RD must be followed. Refer to LAN Bridge 100 Hardware Installation/Owner's Guide (EK-DEBET-UG), Section 3.4.

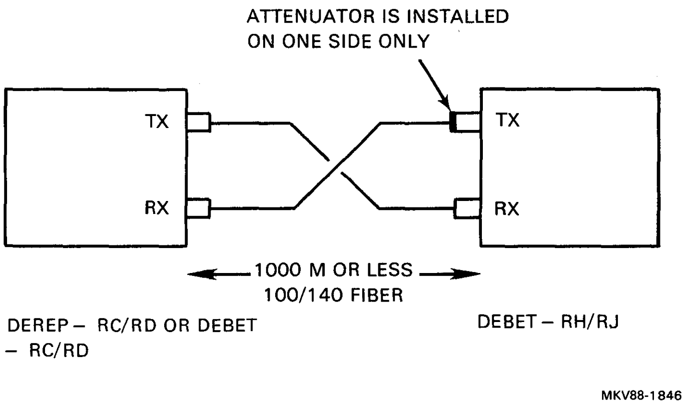
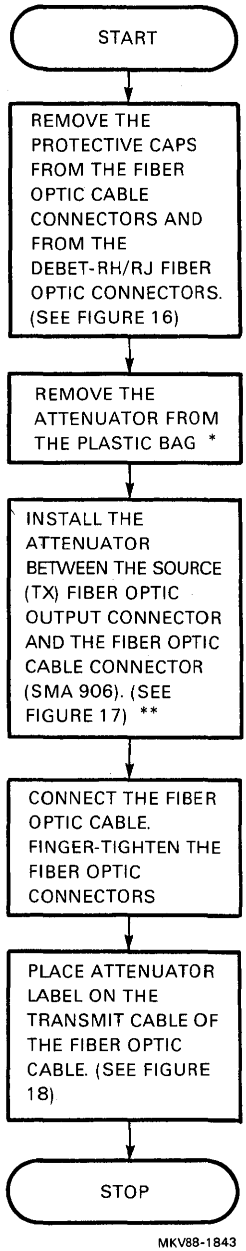


Figure 5 Attenuator Installed on DEBET-RH/RJ Side Only

Use the following guidelines and the flowchart in Figure 6 to install the attenuator on the DEBET-RH/RJ.

Installation Guidelines

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



* CAUTION

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

** NOTE

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

Figure 6 DEBET-RH/RJ Attenuator Installation Flowchart

LAN Traffic Monitor Configurations

The LAN Traffic Monitor can be configured in several ways. In Figure 7, 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 disconnected. A loopback connector must be connected to the unused port.

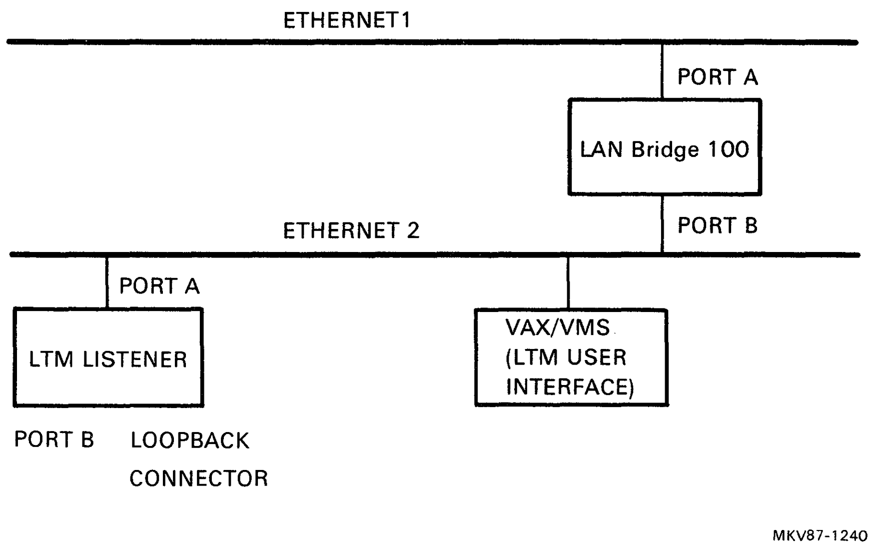


Figure 7 LAN Traffic Monitor Connected to One Port

Figure 8 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 will report to the LTM User Interface on Ethernet 1.

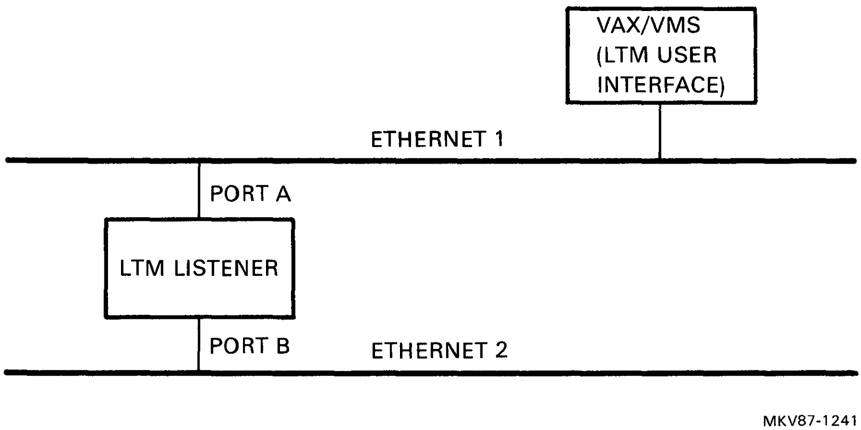


Figure 8 LAN Traffic Monitor Connected to Two Separate LANs

The configuration in Figure 9 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 that has the least number of intervening bridges between it and the LTM User Interface host(s). Doing so will minimize the impact of a bridge failure.

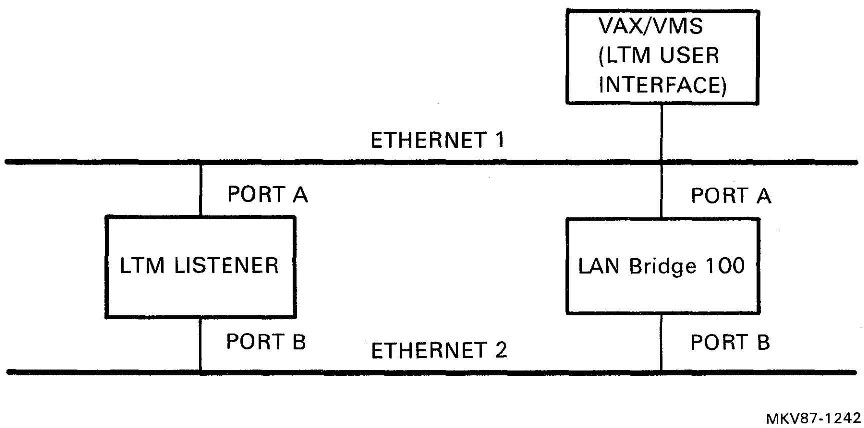


Figure 9 LAN Traffic Monitor on Two Connected LANs

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 12) 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 12), is set to the OFF position (UP=OFF). This will allow remote down-line loading requests. With Switch 5 in the down (ON) position, the LAN Bridge 100 cannot operate as a bridge. RBMS initiated software overrides the hardware switch setting (only when the switch is in the up [OFF] position) 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 *LAN Bridge 100 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 *LAN Bridge 100 Installation/User's Guide*
Remote Bridge:	
DEBET-RH and -RJ	LAN Bridge 100 Loopback Connectors 1 each (12-22196-01) Fiber Optic Attenuator (12-30068-01) Attenuator Label Mounting Brackets Screws Power Cord *Fiber Optic Attenuator Installation /Configuration Reference Card* *LAN Bridge 100 Installation/User's Guide*

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

- Shelf
- Table
- Rack mount assembly
- 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.

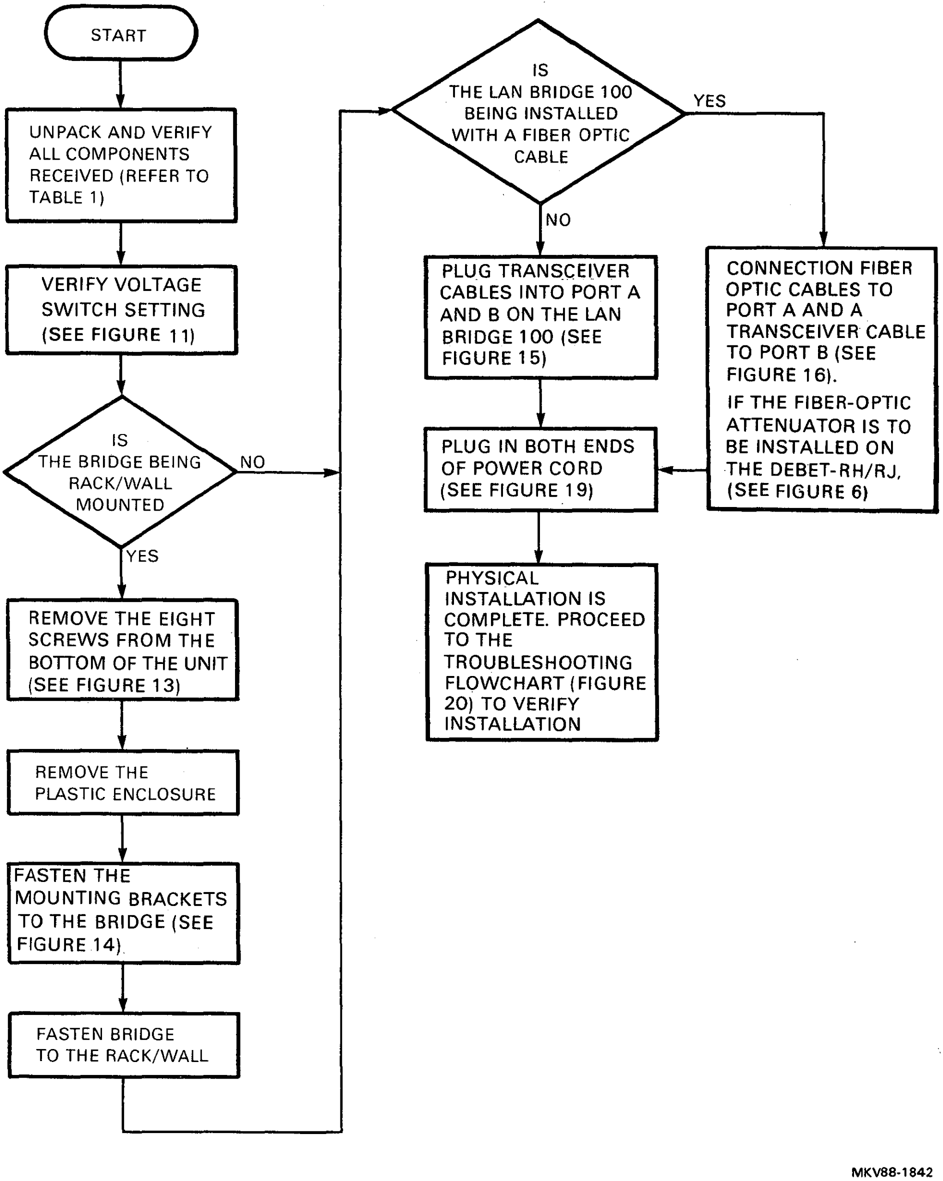


Figure 10 LAN Bridge 100 Installation Flowchart

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.

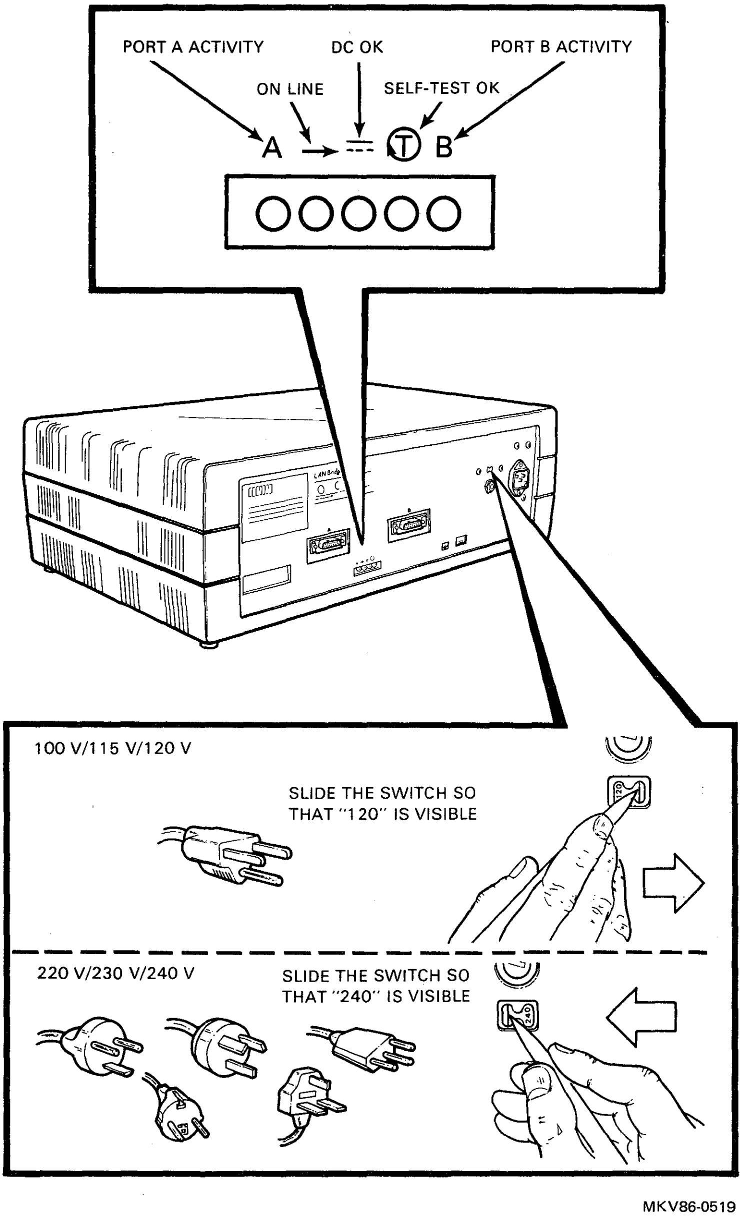


Figure 11 LAN Bridge 100 Indicators

Table 3 Bridge Switches

No.	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 powerup 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.

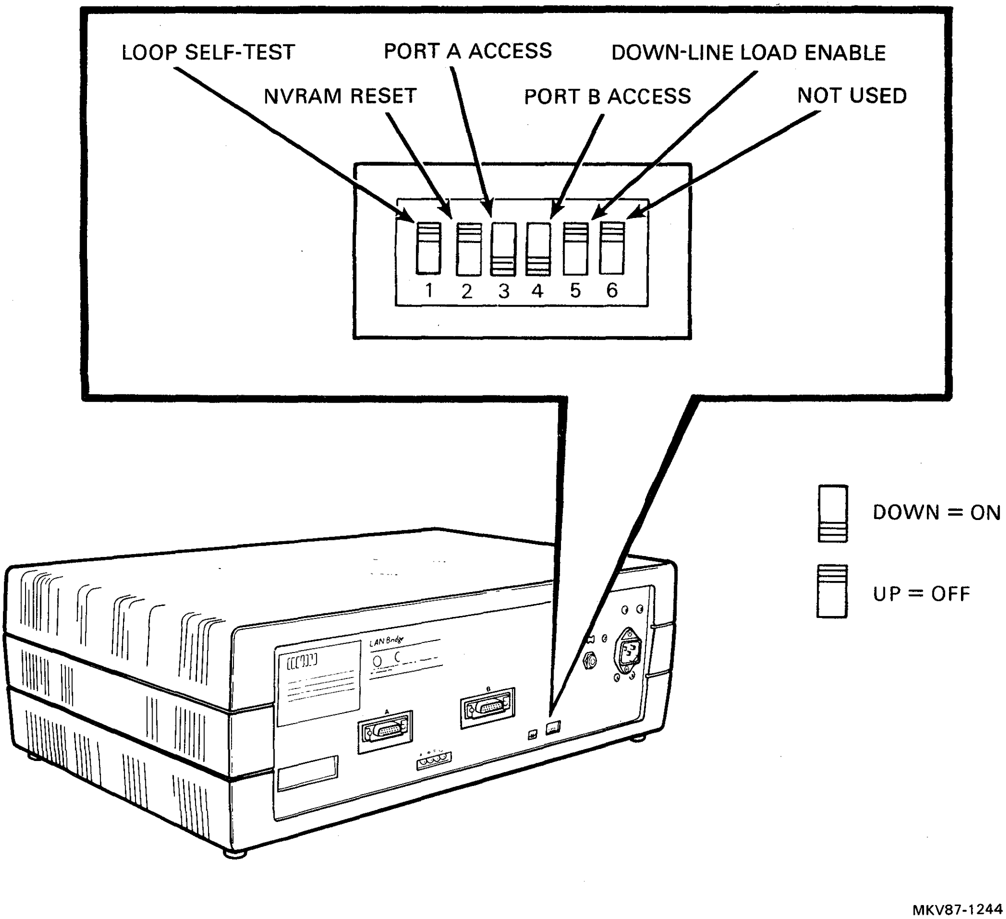


Figure 12 LAN Bridge 100 Switches

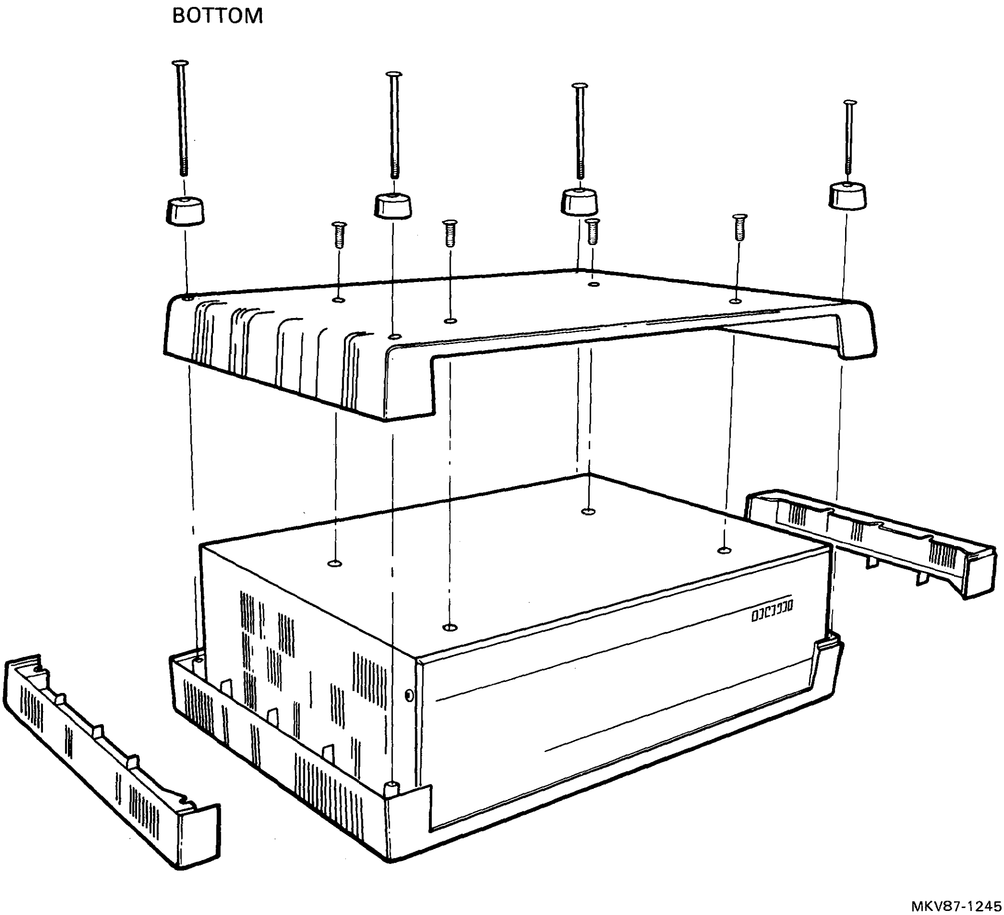


Figure 13 LAN Bridge 100 Table Top Enclosure

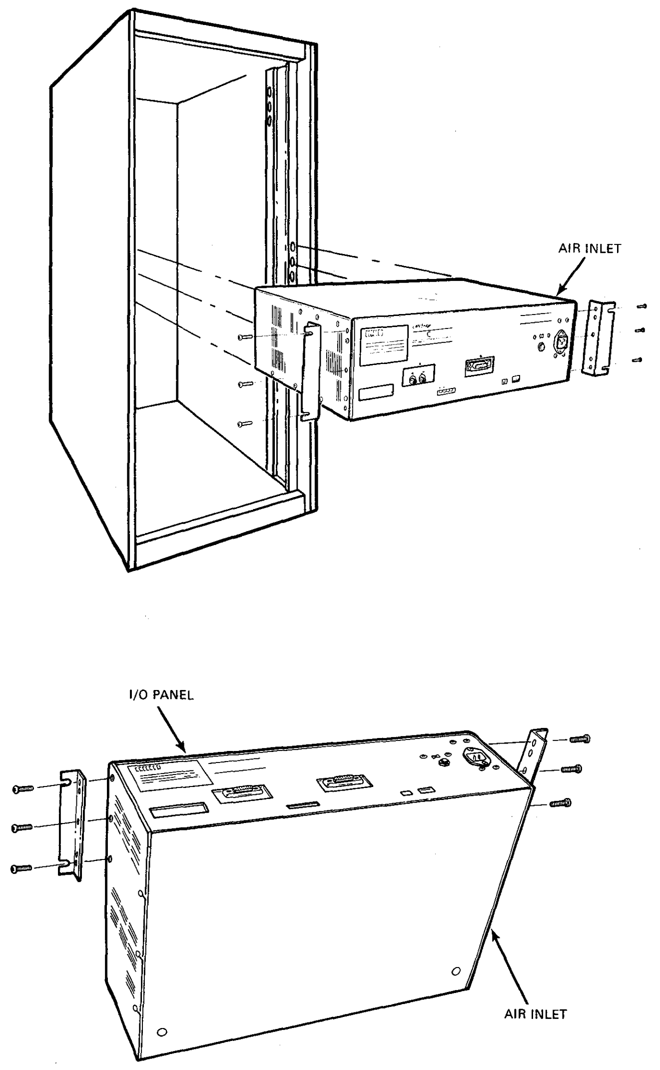


Figure 14 LAN Bridge 100 Rack Mount and Wall Mount Bracket Attachment

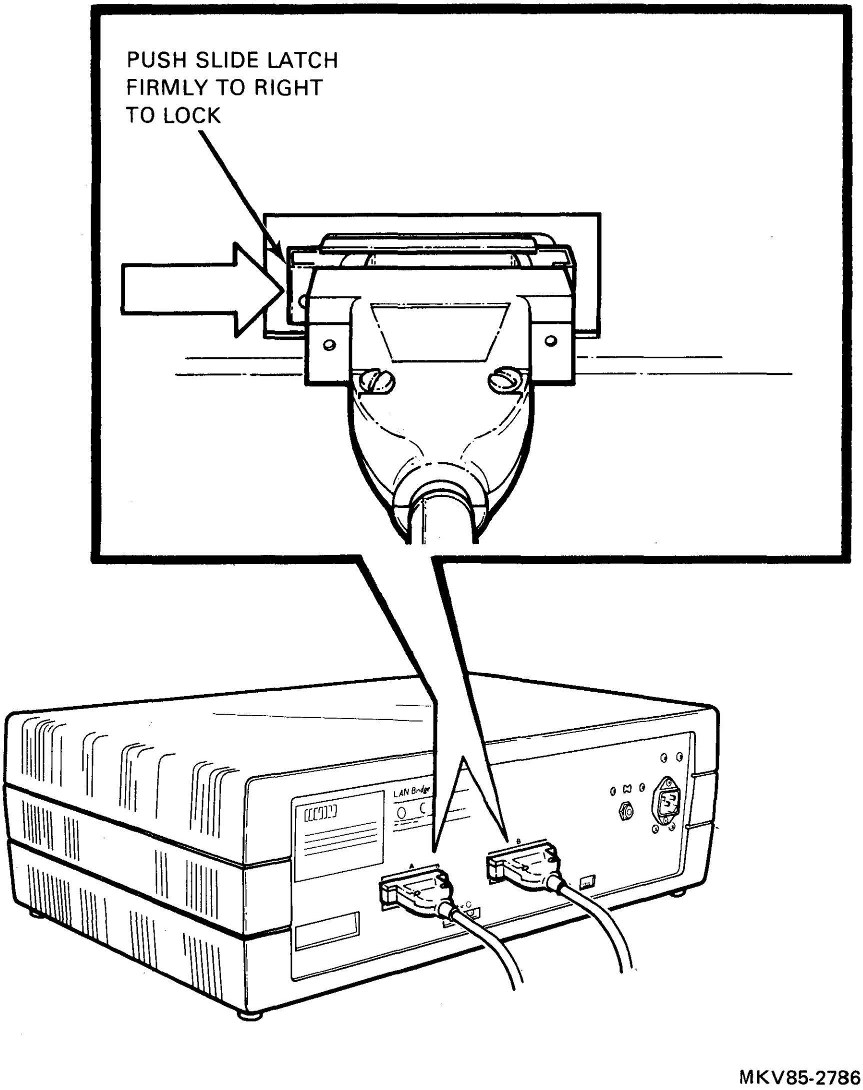


Figure 15 Transceiver Cable Connections

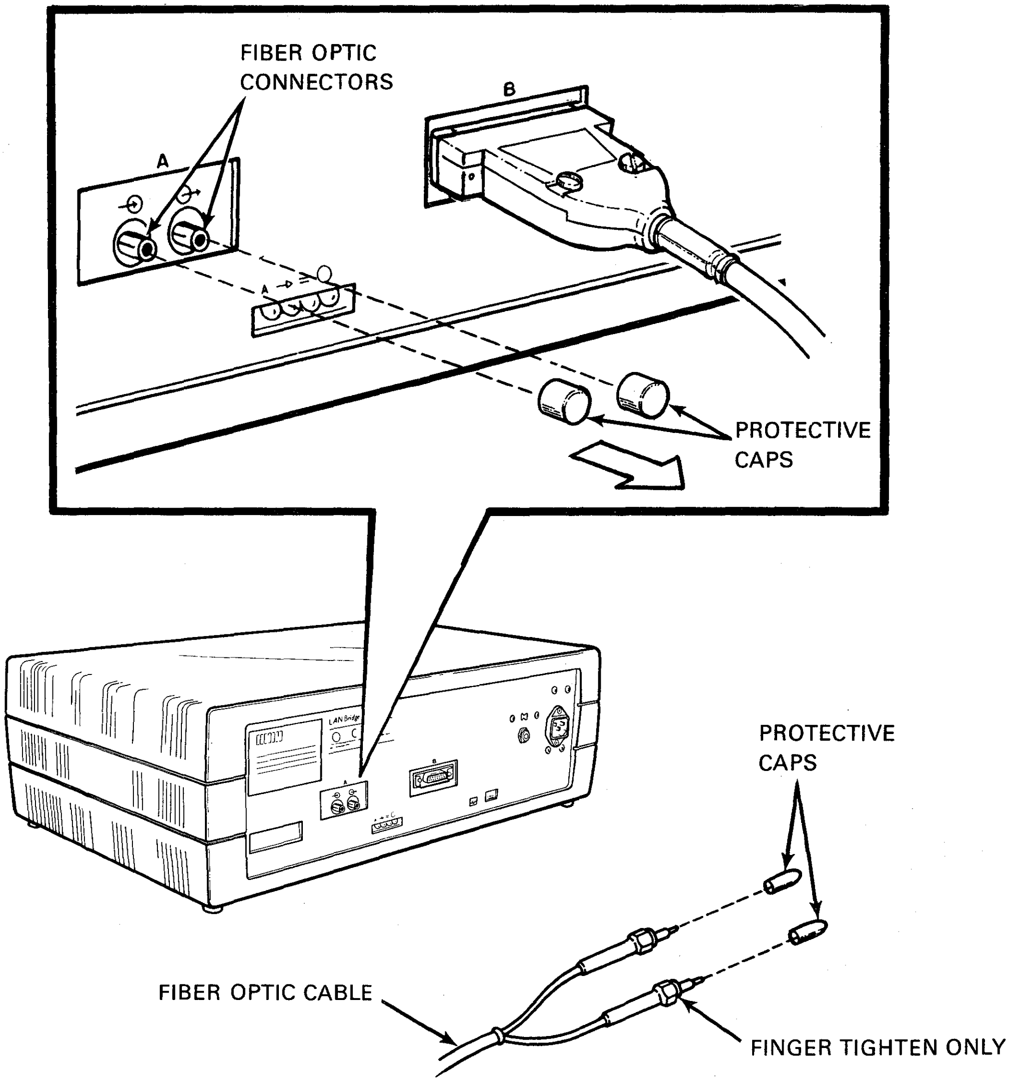


Figure 16 Fiber Optic Cable Attachment

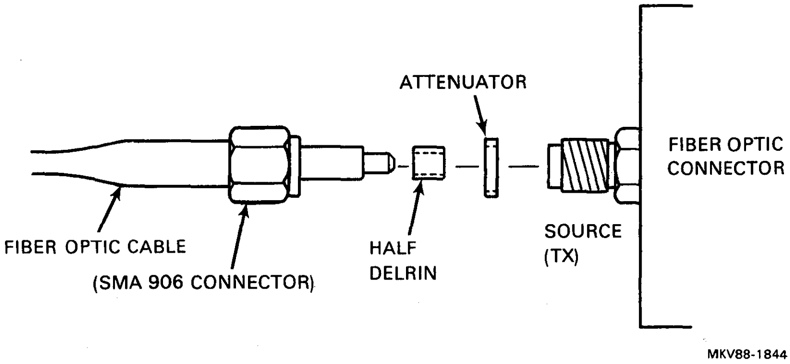


Figure 17 Installing the Attenuator

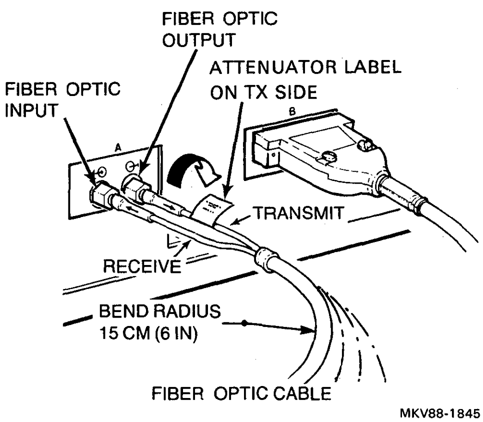


Figure 18 Connecting Fiber Optic Cable to DEBET-RH/RJ

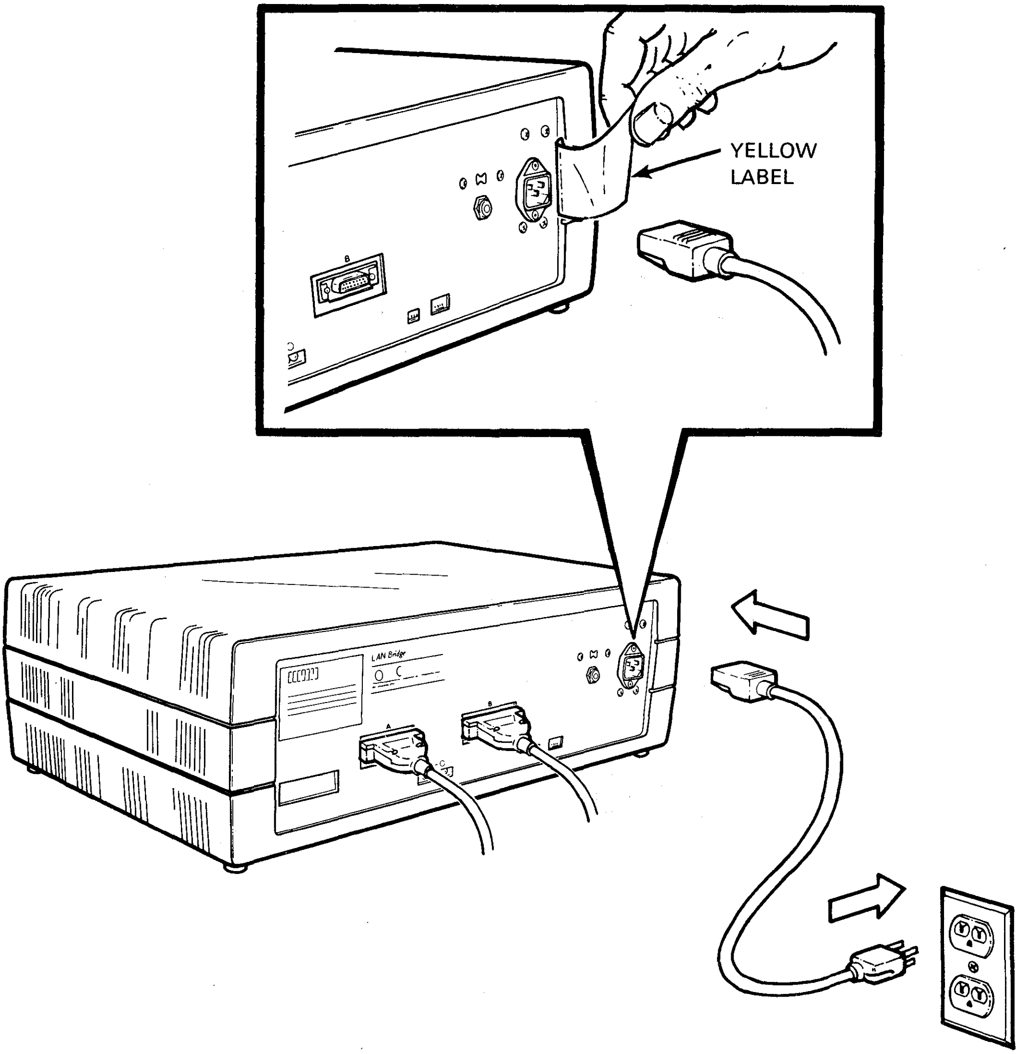


Figure 19 Power Cord Attachment

Cabling
Digital Equipment Corporation sells the BN25B-xx fiber optic cable. This is an indoor, general-purpose, 100/140 dual-fiber cable using Corning 1508 type optical fiber. 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.

The actual power levels of emitted light and detected light in Ethernet devices are not essential in the planning and prediction of a fiber optic network interconnect. The key measurement is the allowable system loss. System losses are caused by fiber attenuation, barrel connector loss, and splice loss. Table 4 lists fiber types, typical cable types, and the attenuation associated with each. Table 5 lists the typical loss and worst case loss for the different types of barrel connectors and splices.

Refer to the "Fiber Optic Cables Between Bridges" section for more information concerning loss budget and distance limitations, the *LAN Bridge 100 Technical Manual* (EK-DEBET-TM) Appendix B, and the *DECconnect System Facilities Cabling Installation Guide* (EK-DECSY-FC), Chapter 9.

Corning 1508, 1509, 1517, and 1519 are manufactured by Corning Glass Works.

Table 4 Typical Cable Attenuation

Fiber Type	Typical Cable Type	Typical Attenuation
Corning 1508	100/140; DEC BN25B-xx	4.5 dB/km*
Corning 1519	85/125; Siecor™ loose tube**	3.5 dB/km
Corning 1519	85/125; Siecor tight buffer	4.0 dB/km
Corning 1509 or AT&T Multimode	62.5/125†; various loose tube	3.0 dB/km
Corning 1517 or AT&T Multimode	50/125; various loose tube	2.5 dB/km
Corning 1517 or AT&T Multimode	50/125; tight buffer tube	4.0 dB/km

* This cable is guaranteed for 6 dB/km under specified applications for all temperature, humidity, and rated tension conditions.

** Loose tube cable is usually very difficult to terminate with a connector. Splicing a connector cable end onto the cable is recommended. Siecor is a trademark of Siecor Corp.

† 62.5/125 is the recommended fiber size for new installations using Digital Equipment Corporation Ethernet products. AT&T Multimode is manufactured by American Telephone and Telegraph.

Table 5 Barrel Connector and Splice Losses

Barrel Connector or Splice Type	Typical Loss in dB	Worst Case Loss in dB (Note 1)
Barrel Connectors		
100/140 Amphenol type 906 (stainless steel)	0.8	1.5
50/125 Amphenol type 906 (stainless steel)	1.5	Note 2
62.5/125, 85/125 Amphenol type 906	1.5	Note 2
50/125 AT&T ST type	1.0	1.5
62.5/125 AT&T ST type	0.8	1.2
85/125 AT&T ST type	Note 2	Note 2
100/140 AT&T ST type	Note 2	Note 2
Splices		
Elastomeric	0.1	0.2 (Note 3)
Capillary tube	0.1	0.2 (Note 3)
Fusion	0.05	0.1 (Note 3)

NOTES

1. **Assumes that the barrel connector is close to the LED source. This is the worst loss condition.**
2. **Consult vendor information.**
3. **Loss assumes the same lot (reel) of fiber is used. Splicing different lots of fiber will yield results based on the fiber differences rather than on the mechanics of the splice.**

Amphenol 906 is manufactured by Amphenol, an Allied Company.
AT&T ST is manufactured by American Telephone and Telegraph.

Diagnostics

There are no software diagnostics designed specifically for the LAN Bridge 100. The LAN Bridge 100 has its own built-in self-test.

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 loopback connectors and a fiber optic cable for testing purposes.
- The transceiver loopback connectors are used to isolate the bridge from transceiver cables and the rest of the network.
- The fiber optic loopback cable replaces the standard fiber optic cable for off-line testing of the bridge in a fiber optic link. This cable connects Port A transmit to receive.

Table 6 Controller Distribution Spares Kit

Description	Kit Part Number
Local (AA) 115 Vac 60 Hz	A2-W0948-10
Local (AB) 240 Vac 50 Hz	A2-W0948-11
Remote (RC) 115 Vac 60 Hz	A2-W1043-10
Remote (RD) 240 Vac 50 Hz	A2-W1043-11
Remote (RH) 115 Vac 60 Hz	A2-M1376-10
Remote (RJ) 240 Vac 50 Hz	A2-M1376-11

Optional Equipment

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

NOTE

The H4000-TA can be used to test repeaters but cannot be used to test bridges because all H4000-TA transceiver testers have the same Ethernet address. This prevents the bridge from forwarding the test packets.

Troubleshooting Flow Diagram

Use the troubleshooting flowchart in Figure 20 to troubleshoot the bridge.

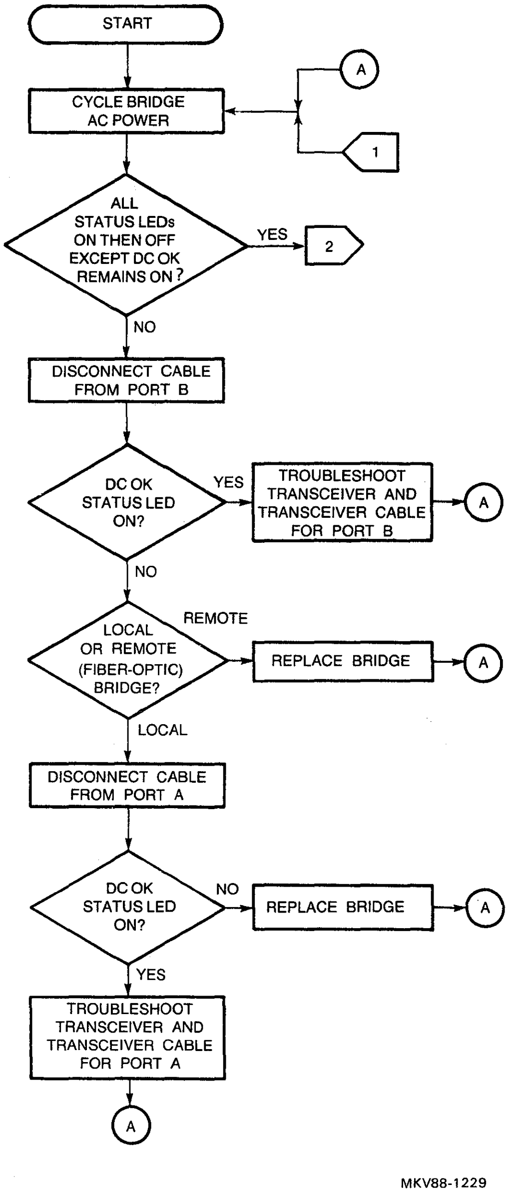
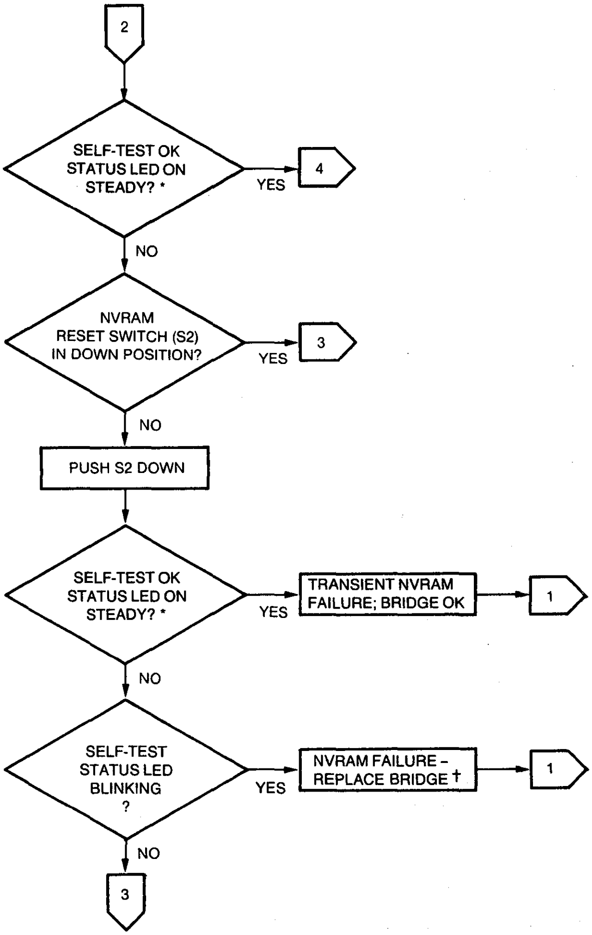


Figure 20 Troubleshooting Flowchart (Sheet 1 of 8)

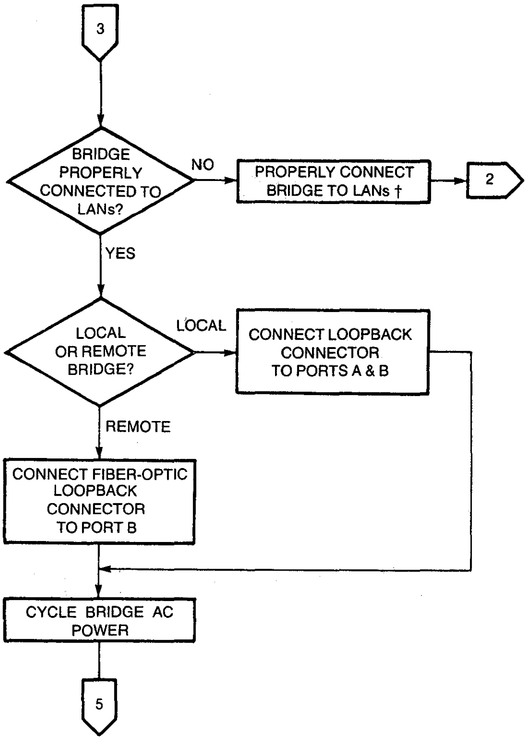


* IN 15 SECONDS

† REFER TO THE "NOTES" IN THE FAULT DIAGNOSIS SECTION OF CHAPTER 5 IN THE *LANBridge 100 TECHNICAL MANUAL* (EK-DEBET-TM)

MKV88-1228

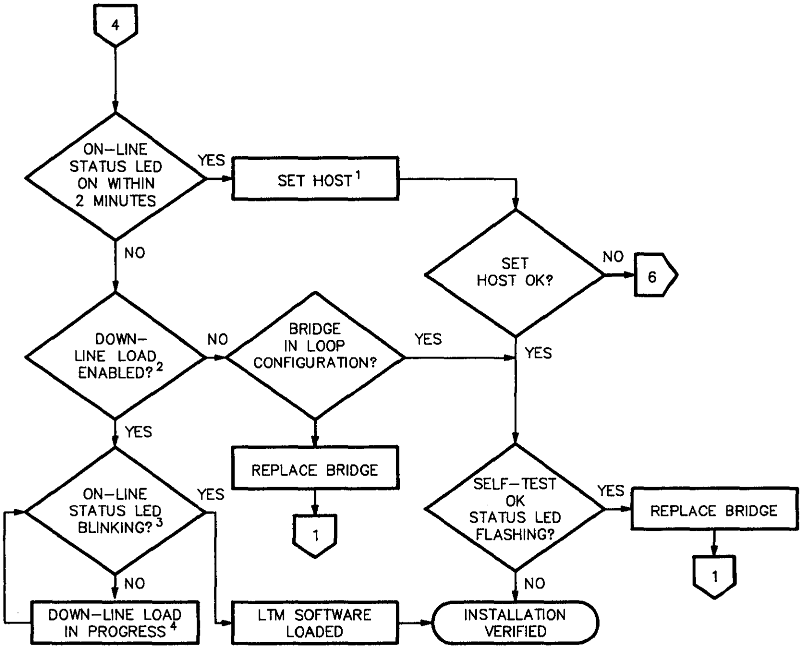
Figure 20 Troubleshooting Flowchart (Sheet 2 of 8)



* AFTER 15 SECONDS
† REFER TO TROUBLESHOOTING TIPS SECTION IN CHAPTER 5 OF THE LAN Bridge 100 TECHNICAL MANUAL (EK-DEBET-TM)

MKV88-1226

Figure 20 Troubleshooting Flowchart (Sheet 3 of 8)



1 FROM HOST ON PORT A TO HOST ON PORT B

2 DOWN-LINE SWITCH MAY BE ENABLED BY SWITCH 5 BEING SET OR VIA A REMOTE COMMAND BY RBMS. SEE LAN BRIDGE 100 HARDWARE INSTALLATION/ OWNER'S GUIDE.

3 FLASHING TWICE EVERY 2 SECONDS INDICATES THAT THE LOAD HOST SUCCESSFULLY DOWN-LINE LOADED THE LTM LISTENER SOFTWARE IMAGE. FLASHING ONCE EACH SECOND INDICATES THAT THE LOAD HOST HAS STARTED THE LTM LISTENER SOFTWARE.

4 CHECK THAT THE DOWN-LINE LOAD HOST HAS BEEN SET UP. SEE LAN TRAFFIC MONITOR INSTALLATION GUIDE FOR DETAILS ON SETTING UP A LOAD HOST.

MKV88-1250

Figure 20 Troubleshooting Flowchart (Sheet 4 of 8)

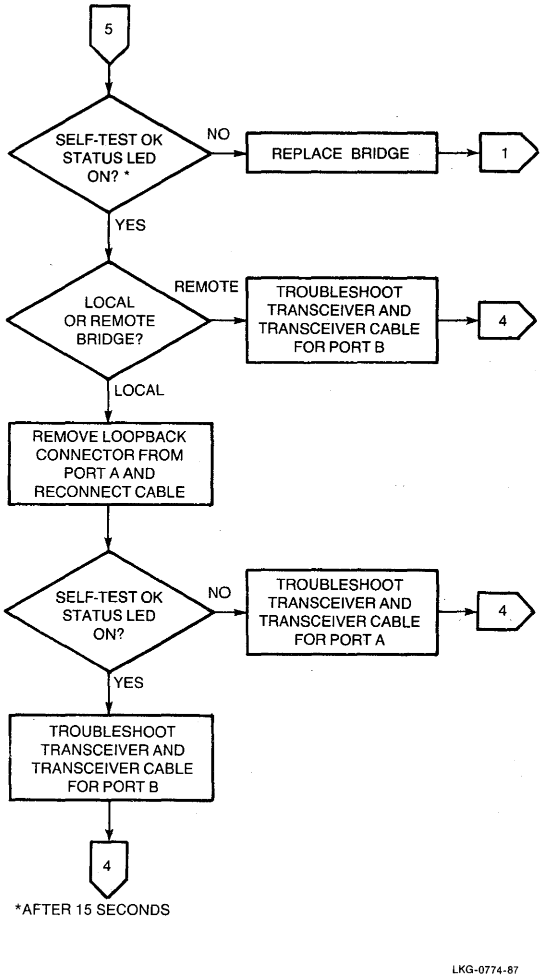


Figure 20 Troubleshooting Flowchart (Sheet 5 of 8)

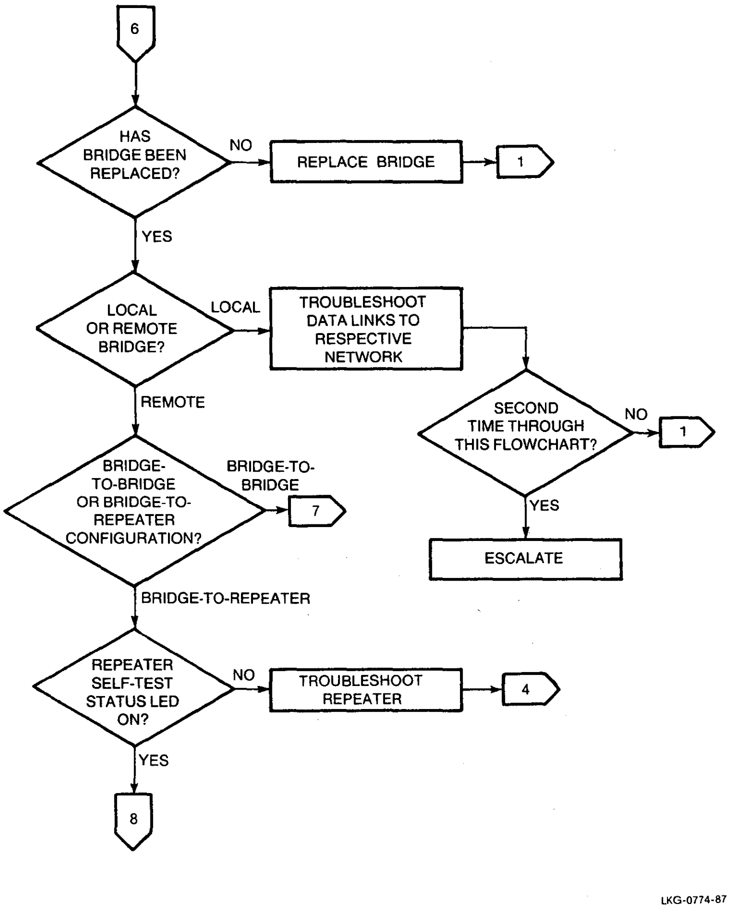


Figure 20 Troubleshooting Flowchart (Sheet 6 of 8)

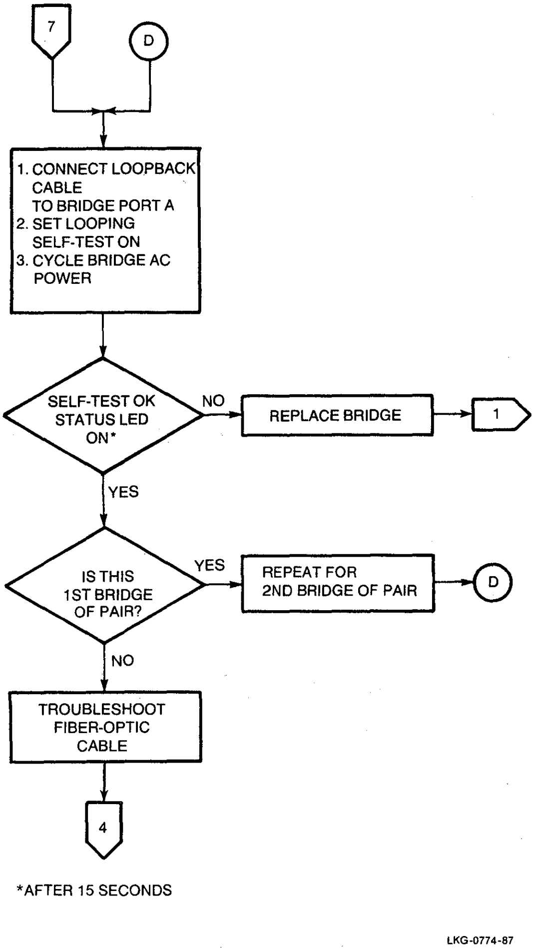


Figure 20 Troubleshooting Flowchart (Sheet 7 of 8)

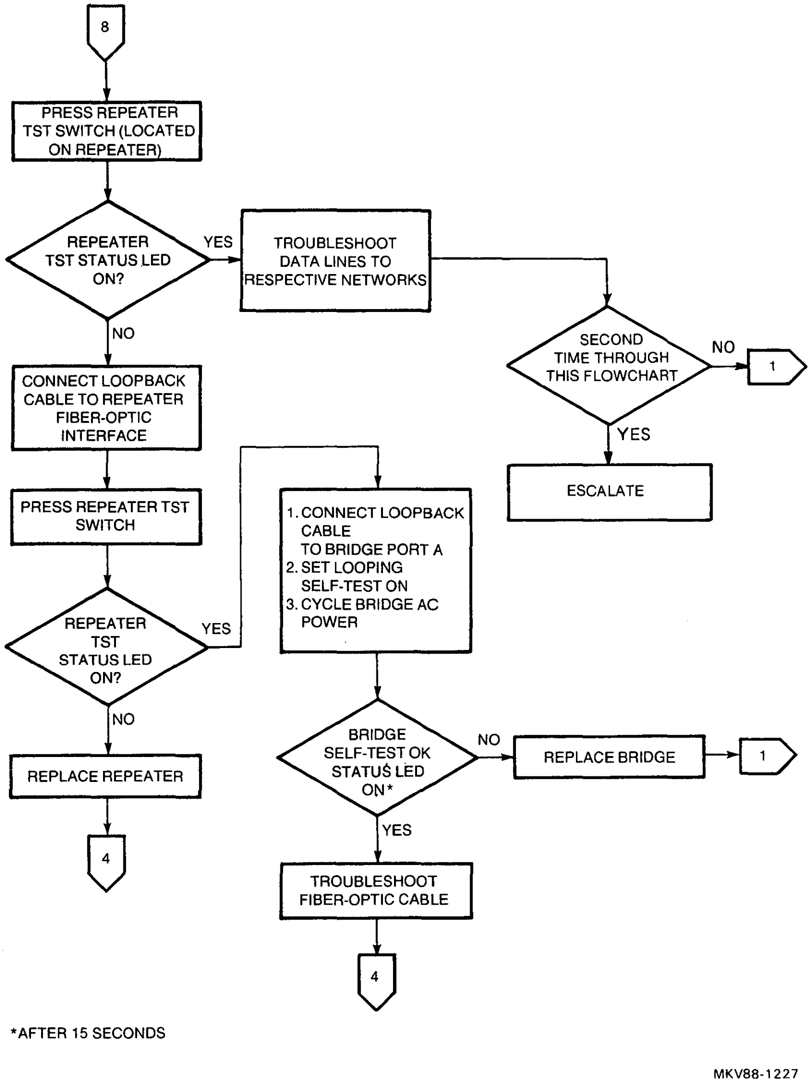


Figure 20 Troubleshooting Flowchart (Sheet 8 of 8)

LAN Bridge 150

General Description

The LAN Bridge 150 hardware unit is a specialized local area network (LAN) station that connects two IEEE 802.3 and/or Ethernet LANs to form a single extended LAN. The LAN Bridge 150 is a functionally enhanced LAN Bridge 100. It has all the functionality of the LAN Bridge 100 plus the three additional features listed below.

- Access (password) protection
- IEEE 802.1 spanning tree compatibility
- IEEE 802.2 test and XID compliance

The LAN Bridge 150 also has a larger physical ROM size than the LAN Bridge 100 and new firmware code.

There are two versions of the LAN Bridge 150; one local bridge version and one remote bridge version.

The local bridge (DEBET-AC/AD) connects two LANs that are separated by less than 100 m (328 ft).

The remote bridge (DEBET-RP/RQ) connects two LANs that are separated by more than 100 m (328 ft) up to 3 km (1.9 miles), or where fiber optic capabilities are needed.

Each version of the LAN Bridge 150 has two models and is designated by the model numbers as described in Table 1.

Table 1 Versions of the LAN Bridge 150

Version	Model	Description
Local	DEBET-AC DEBET-AD*	Used to connect LANs separated by 100 m (328 ft) or less. The distance from the bridge to either LAN cannot exceed the maximum allowable transceiver cable length of 50 m (164 ft).
Remote	DEBET-RP DEBET-RQ*	Provides 14 dB of usable optical power at 850 nanometers. This version is used to connect two DEBET-RP/RQ units up to 3 km (1.9 miles) apart, or a DEBET-RP/RQ and a remote repeater up to 1.5 km (0.93 miles) apart.

* Voltage select switch is factory set for 240 Vac operation, and the power cord is not supplied.

LAN Bridge 150 INSTALLATION

Reference Documentation
Refer to the following documents for more information on the LAN Bridge 150.

• *LAN Bridge 150 Installation*	EK-LB150-IN
• *LAN Bridge 150 Technical Manual*	EK-LB150-TM
• *Bridges and Extended LAN Reference*	EK-DEBAM-HR
• *DECconnect System Planning and Configuration Guide*	EK-DECSY-CG
• *DECconnect System Satellite Equipment Room Installation Guide*	EK-DECSY-SR
• *DECconnect System Facilities Cabling Installation Guide*	EK-DECSY-FC
• *DECconnect System Fiber Optic Network Installation Guide*	EK-DECSY-FI
• *Remote Bridge Management Software Guide*	AA-FY93C-TE
• *Attenuator Installation and Configuration Reference Card*	EK-DEFOE-RC
• *Network Troubleshooting Guide*	EK-339AA-6D
• *LAN Traffic Monitor Installation Guide*	AA-JP15A-TE
• *LAN Traffic Monitor User's Guide*	AA-JP16A-TE
• *LAN Traffic Monitor Identification Card*	EK-LANTM-IC

Configuration and Installation
Refer to the LAN Bridge 100 option in this volume for information on the configuration and installation of the LAN Bridge 150.

LAN Bridge 150 Network Interface
The network interface for the LAN Bridge 150 consists of two ports: Port A and Port B. The ports are located on the bridge I/O panel.

Port A supports an AUI (15-pin standard) transceiver interface for the local bridge (DEBET-AC/AD) or a fiber optic interface for the remote bridge (DEBET-RP/RQ).

Port B supports an AUI (15-pin standard) transceiver interface on both the local and remote bridge.

Refer to the LAN Bridge 100 option in this volume for more information on cabling for the LAN Bridge 150.

Table 2 lists the fiber cable budgets for the LAN Bridge 150 (DEBET-RP/RQ) and the LAN Bridge 100 (DEBET-RH/RJ).

Table 2 Fiber Cable Budgets

Fiber Size	Available Power	Minimum Attenuation	Minimum Cable That Provides Minimum Attenuation
50/125	8 dB	0 dB	0.0 km
62.5/125	12 dB	1 dB	0.3 km
85/125	13 dB	3 dB	0.8 km
100/140	14 dB	4 dB	1.0 km

LAN Bridge 150 DIAGNOSTICS

Diagnostic Self-Test

The LAN Bridge 150 executes a self-test when power is applied. If the LAN Bridge 150 is installed to operate as a bridge, approximately 45 seconds after power is applied, the state of the status LEDs will indicate whether a successful self-test has occurred. If the DC OK and the SELF-TEST OK LEDs are lit, and the Port A Activity and Port B Activity LEDs are lit or blinking, the unit is operating properly. If these conditions are not met, refer to the troubleshooting section in the LAN Bridge 100 option in this volume.

If the LAN Bridge 150 is installed to operate as a LAN Traffic Monitor, approximately two minutes after power is applied, the state of the status LEDs will indicate whether a successful self-test has occurred. If the DC OK and the SELF-TEST OK LEDs are lit, and the Port A Activity and Port B Activity LEDs are lit or blinking and the ON LINE LED is blinking at 2 second intervals, the unit is operating properly. If these conditions are not met, refer to the troubleshooting section in the LAN Bridge 100 option in this volume.

Refer to the LAN Bridge 100 option in this volume for a list of the status LEDs and their definitions.

Troubleshooting
Refer to the troubleshooting flowchart in the LAN Bridge 100 option in this volume to troubleshoot the LAN Bridge 150.

The LAN Bridge 150 has password protection. If password protection is initiated, the password must be included with any management command (RBMS Version 2.0).

LAN Bridge 200 STATION

General Description

The LAN Bridge 200 hardware unit is a specialized local area network (LAN) station that connects two IEEE 802.3/Ethernet LANs to form a single extended LAN. The LAN Bridge 200 can be used with standard Ethernet/10base5 networks, ThinWire Ethernet/10base2 networks, and with broadband networks. Bridge operation is transparent to other stations on the LAN, and no special software is required on any station.

There are three versions of the LAN Bridge 200 (Figure 1); one local bridge version and two remote bridge versions.

The local bridge (DEBAM-AA/AB) connects two LANs that are separated by less than 100 m (328 ft).

The remote bridge (DEBAM-RC/RD) connects two LANs that are separated by up to 3 km (1.9 miles).

The remote bridge (DEBAM-RF/RG) connects two LANs that are separated by up to 10 km (6.2 miles).

Each version of the LAN Bridge 200 has two models and is designated by the model numbers as described in Table 1.

Table 1 Versions of the LAN Bridge 200

Version	Model	Description
Local	DEBAM-AA DEBAM-AB*	Used to connect LANs separated by 100 m (328 ft) or less. The distance from the bridge to either LAN cannot exceed the maximum allowable transceiver cable length of 50 m (164 ft).
Remote 3 km	DEBAM-RC DEBAM-RD*	Provides 14 dB of usable optical power at 850 nm. This version is used to connect two DEBAM-RC/RD units up to 3 km (1.9 miles) apart, or a DEBAM-RC/RD and a DECrepeater 200 remote repeater (DEREN-RC/RD) up to 1.5 km (0.93 miles) apart.
Remote 10 km	DEBAM-RF DEBAM-RG*	Provides 17 dB of usable optical power at 1300 nm. This version is used to connect two DEBAM-RF/RG units up to 10 km (6.2 miles) apart.

* Voltage select switch is factory set for 240 Vac operation, and the power cord is not supplied.

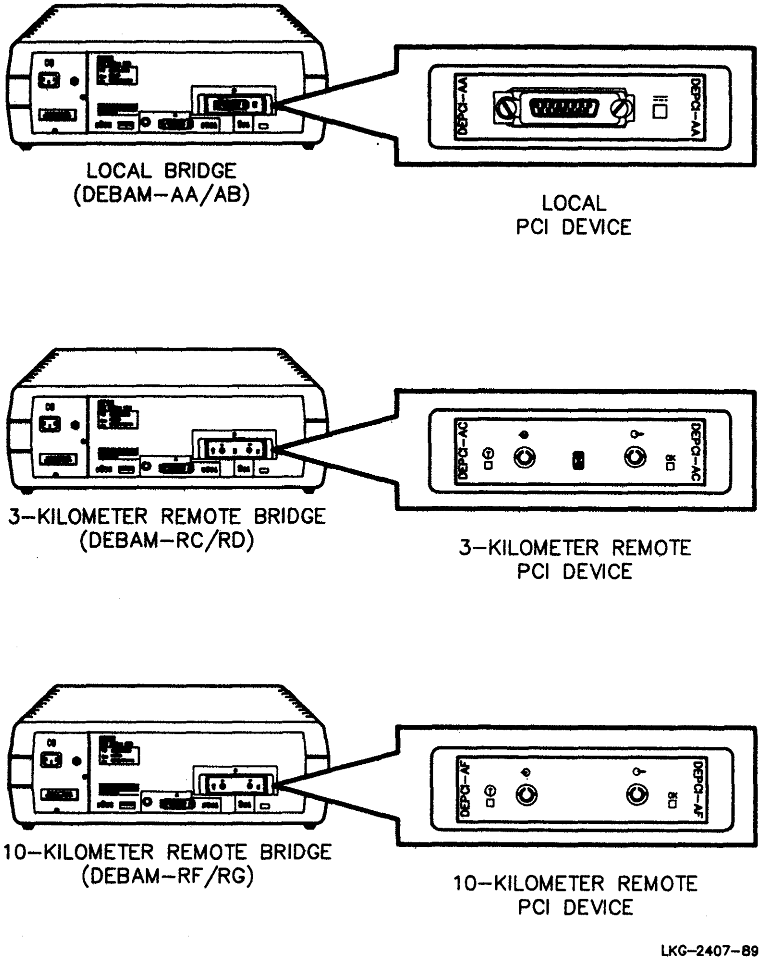


Figure 1 Local and Remote LAN Bridge 200 Units

Reference Documentation
Refer to the following documents for more information relative to the LAN Bridge 200.

• *LAN Bridge 200 Installation*	EK-DEBAM-IN
• *LAN Bridge 200 Problem Solving*	EK-DEBAM-PS
• *LAN Bridge 200 Technical Manual*	EK-DEBAM-TM
• *Bridges and Extended LAN Reference*	EK-DEBAM-HR
• *DECconnect System Planning and Configuration Guide*	EK-DECSY-CG
• *DECconnect System Satellite Equipment Room Installation Guide*	EK-DECSY-SR
• *DECconnect System Facilities Cabling Installation Guide*	EK-DECSY-FC
• *DECconnect System Fiber Optic Network Installation Guide*	EK-DECSY-FI
• *Remote Bridge Management Software Guide*	AA-FY93C-TE

Configuration
For packet traffic purposes, LANs connected by bridges are considered one extended LAN. For all other configuration purposes, LANs connected by bridges are considered separate; therefore, each of these LANs can be configured up to the standard maximum amount for length, number of stations, and other LAN related specifications.

NOTE

When routers are connected to an extended LAN, ensure that the total number of routers in the extended LAN does not exceed the maximum allowed for a single LAN.

The fiber optic links between the remote bridge (DEBAM-RC/RD) and the remote DECrepeater 200 (DEREN-RC/RD) should not exceed 1.5 km (0.93 miles). Refer to Figure 3 and Figure 4.

The maximum length allowed for the bridge-to-repeater fiber optic link is calculated by adding 500 m (1640 ft) to the maximum 1000 m (3280 ft) fiber optic length allowed for repeater-to-repeater links. For more detailed information on bridge-to-repeater configurations, refer to the DECconnect System Planning and Configuration Guide (EK-DECSY-CG).

Figure 2 shows a local LAN Bridge 200 (DEBAM-AA/AB) connecting two LANs that are separated by fewer that 100 m (328 ft). This is the maximum combined length of the local LAN Bridge 200 unit's transceiver cables, each of which can be up to 50 m (164 ft) in length.

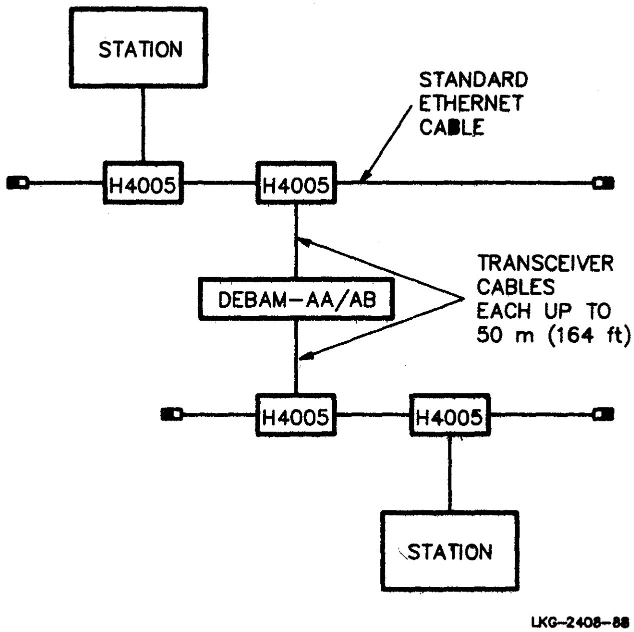


Figure 2 DEBAM-AA/AB Configuration

Figure 3 shows remote LAN Bridge 200 units (DEBAM-RC/RD and DEBAM-RF/RG) connecting LANs separated by more than 100 m (328 ft). Note the use of each model for efficiently connecting the distant LANs, and the fiber optic length restrictions that apply when connecting to a remote DECrepeater 200 unit (DEREN-RC/RD).

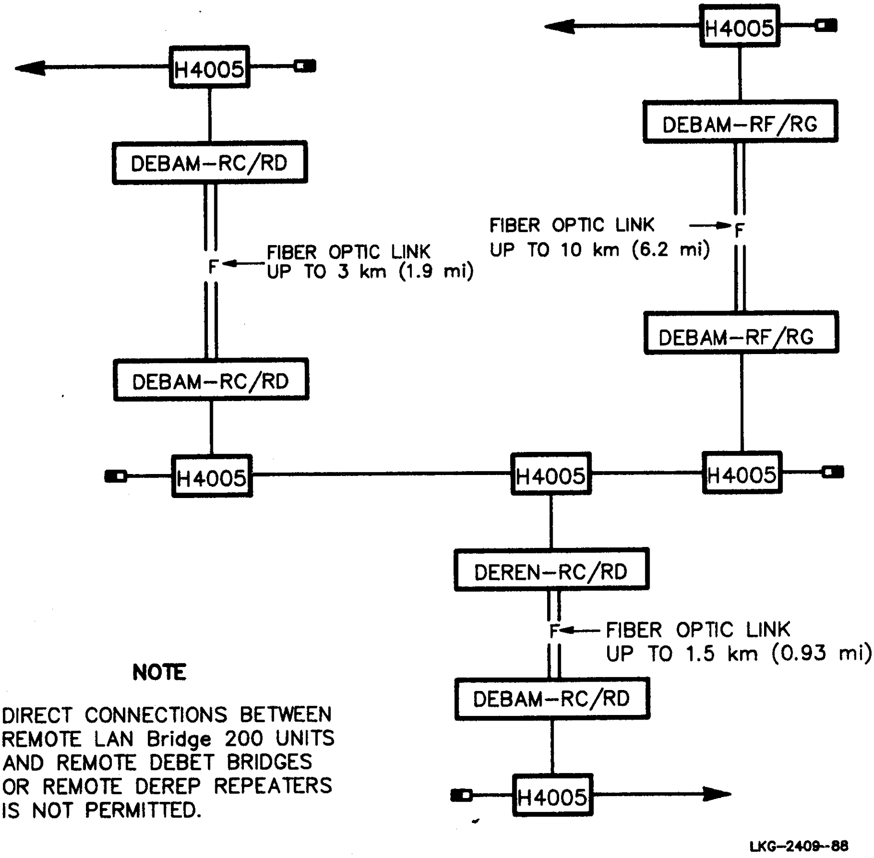


Figure 3 DEBAM-RC/RD and DEBAM-RF/RG Configuration

Figure 4 shows transceiver cables connecting bridges to various network interconnect devices.

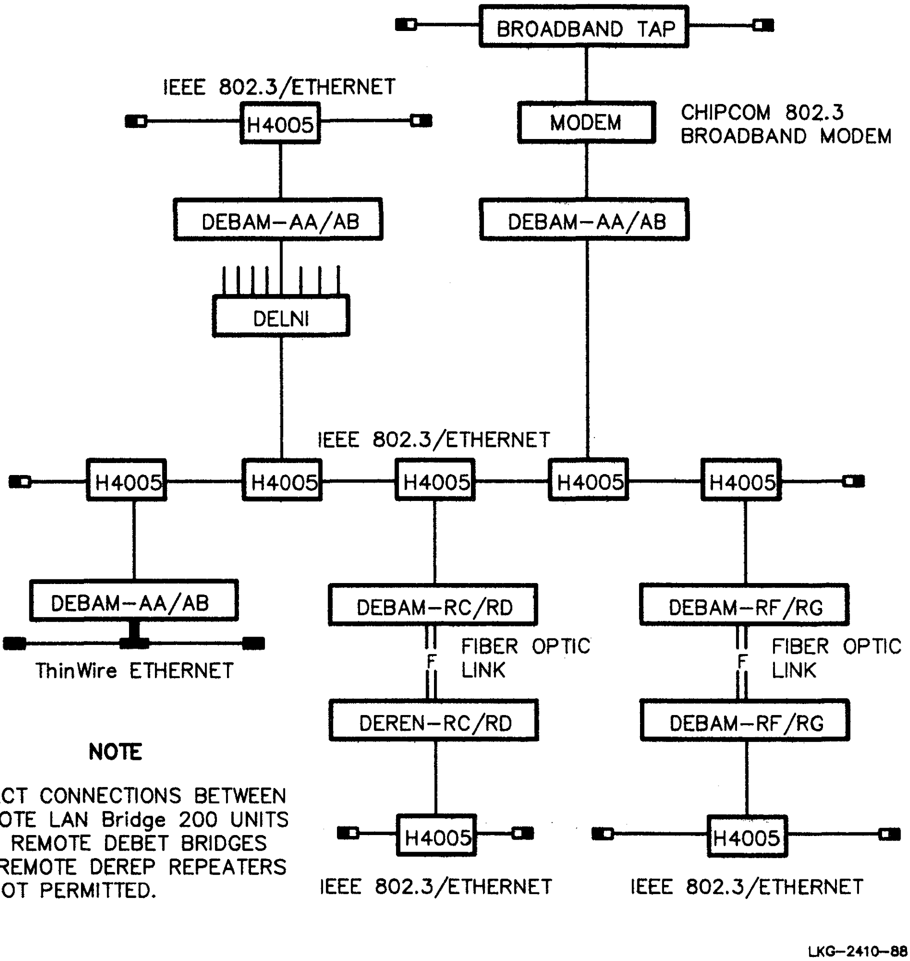


Figure 4 LAN Bridge 200 Connections

There is no physical limit to the number of bridges that a packet can travel through before reaching its destination station. Network performance, however, can be adversely affected if a packet must travel through many bridges. Network delay is particularly noticeable with interactive tasks such as character echoing for users on terminal servers. A guideline for networks with typical packet traffic loading (less than 40% maximum) is to limit the number of bridges between any two stations to seven.

When the LAN Bridge 200 is powered up, it runs its built-in self-test for approximately 30 seconds. It then initiates the procedure to participate in a spanning tree with other bridges on the network to eliminate loops in the topology. The spanning tree topology ensures that packets do not loop, and that only a single copy of a packet is delivered to each LAN. The LAN Bridge 200 can run either the LAN Bridge 100 implementation of the spanning tree algorithm, or the IEEE 802.1 implementation of the spanning tree algorithm.

The LAN Bridge 200 determines if there are any loops by communicating with other Digital or IEEE 802.1 compliant bridges in the network. If a loop is detected, one of the bridges becomes the designated packet forwarder and the other bridge automatically enters the backup state. When in the backup state, a bridge does not forward any packets; instead, the backup bridge constantly monitors the designated bridge. When a backup bridge detects a failure, it automatically begins a procedure to take over and forward packets after 45 seconds.

If a LAN Bridge 200 is in a loop with a repeater, or if both of its links are connected to the same LAN, it will not forward traffic, but will monitor this loop for reception of its own multicast "hello" message. If the repeater is removed, the bridge will start forwarding traffic after it has detected the absence of its own "hello" message being received on its other port.

NOTES

Use caution when configuring a bridge in a loop with a router. If the bridge protocol filtering is not properly set up, degradation of network performance could result.

Digital does not recommend the use of a non-Digital IEEE 802.1 bridge in the same extended LAN with a LAN Bridge 100. These bridges use protocols that are not compatible, and without careful manual planning of the network configuration, degradation of network performance could result.

Non-Digital IEEE 802.1 bridges can be used in the same extended LAN with a LAN Bridge 200 unit because the LAN Bridge 200 automatically compensates and runs the 802.1 spanning tree algorithm if there are no LAN Bridge 100 units in the extended LAN.

LAN Bridge 200 INSTALLATION

Hardware Components

A LAN Bridge 200 shipment consists of the items shown in Figure 5. Check the shipment for damage and missing parts.

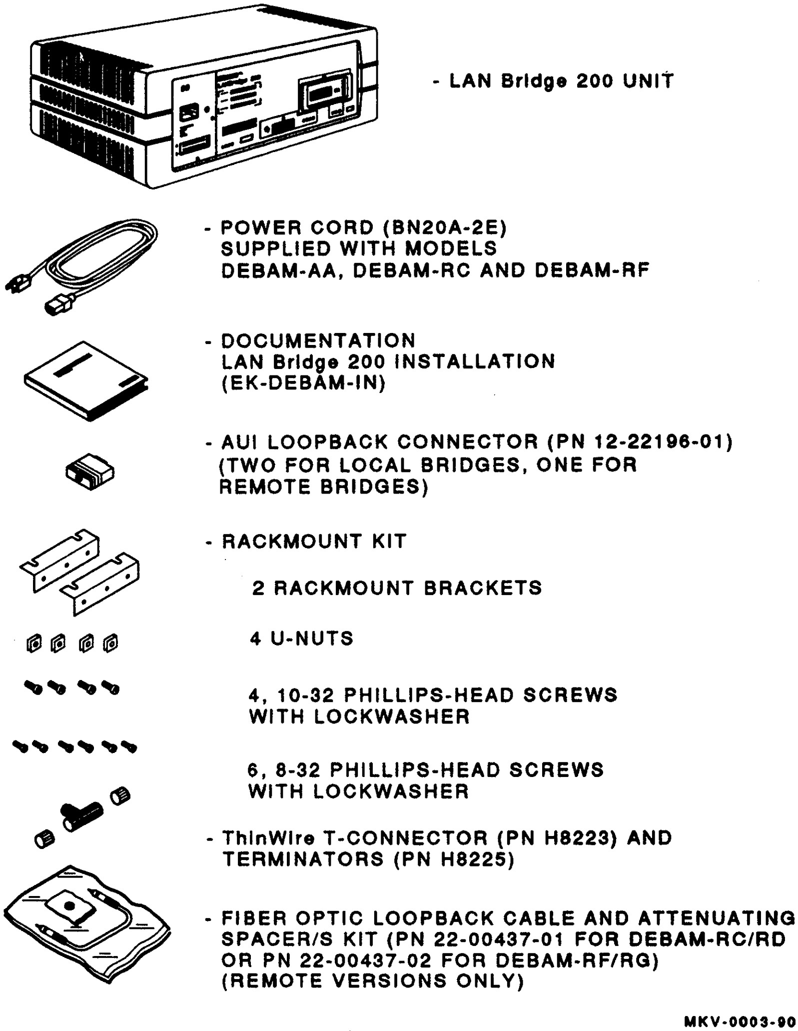


Figure 5 LAN Bridge 200 Components

Equipment Placement
The LAN Bridge 200 can be located in a variety of environments as long as the environmental requirements are met. The bridge can be either rack mounted in a standard 48 cm (19 in.) RETMA (Radio Electronics Television Manufacturers Association) rack cabinet, or placed on a table or shelf provided the location is at least 45 cm (18 in.) above the floor. Space must be allowed for ventilation and maintenance.

Environmental Requirements
The LAN Bridge 200 is designed to operate in a non-air conditioned environment or in an exposed area of an industrial site. However, 50°C (122°F) is the maximum ambient temperature allowable at the air intake. Table 2 shows the environmental parameters.

Table 2 Environmental Parameters

Parameter	Minimum	Maximum
Temperature		
Operating	5°C (41°F)	50°C (122°F)
Nonoperating	−40°C (−40°F)	66°C (151°F)
Maximum temperature change per hour	–	20°C (36°F)
Altitude		
Operating	–	2.4 km (8,000 ft)
Nonoperating	–	9.1 km (30,000 ft)
Relative Humidity		
Operating (noncondensing)	10%	95%
Nonoperating (noncondensing)	0%	95%
Wet-bulb temperature (operating)	–	32°C (90°F)
Dew point (operating)	–	2°C (36°F)
Airflow*	70.0 cubic feet per minute	–

* Minimum of 10 cm (4 in.) of space must be provided on both sides of the unit for adequate airflow.

Physical Dimensions

	With Plastic Covers	Without Plastic Covers
Height	16.2 cm (6.4 in.)	13.3 cm (5.3 in.)
Width	49.4 cm (19.4 in.)	43.6 cm (17.2 in.)
Depth	31.3 cm (12.3 in.)	29.8 cm (11.7 in.)
Weight	7.3 kg (16 lbs)	5.2 kg (11.5 lbs)

Power Requirements
Table 3 provides the power requirements for all versions of the LAN Bridge 200.

Table 3 Power Requirements

Parameter	120 Vac Operation DEBAM-AA/RC/RF	240 Vac Operation DEBAM-AB/RD/RG
Voltage	90 Vac to 128 Vac	190 Vac to 256 Vac
Line current	2.3 A	1.2 A
Frequency	47 to 63 Hz	47 to 63 Hz
Power consumption	230 W	230 W
Heat dissipation	275 BTU/hr	275 BTU/hr

Site Preparation Considerations
Check the following items to ensure that the site is prepared for the LAN Bridge 200 installation.

1. The appropriate baseband or broadband network interface is installed, and the required transceiver cabling is installed, tested, and tagged (if a Chipcom Ethermodem™ is used, AUI ECHO MODE must be disabled).
2. If a remote bridge is being installed, ensure that the fiber optic cables are installed, tested, tagged, and terminated with protective caps.
3. The ac power outlet matches the power requirements of the bridge and is within 1.8 m (6 ft) of the bridge location.
4. The environmental requirements are met.
5. The space is adequate for ventilation and for maintenance access.
6. The location is at least 45 cm (18 in.) above the floor.

™ Ethermodem is a trademark of Chipcom Corporation

Installation Flow Diagram

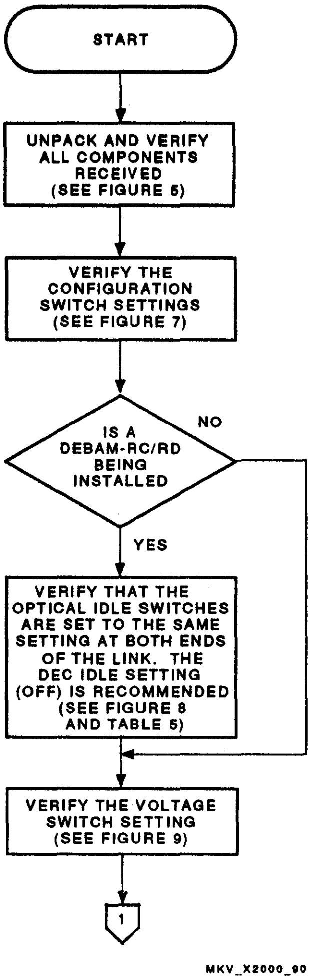


Figure 6 LAN Bridge 200 Installation Flow Diagram (Sheet 1 of 6)

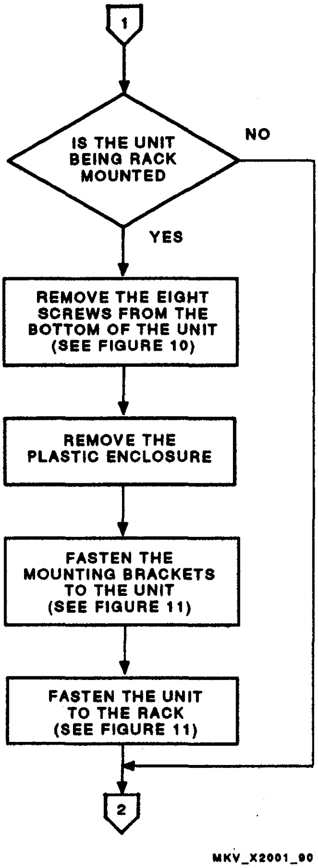


Figure 6 LAN Bridge 200 Installation Flow Diagram (Sheet 2 of 6)

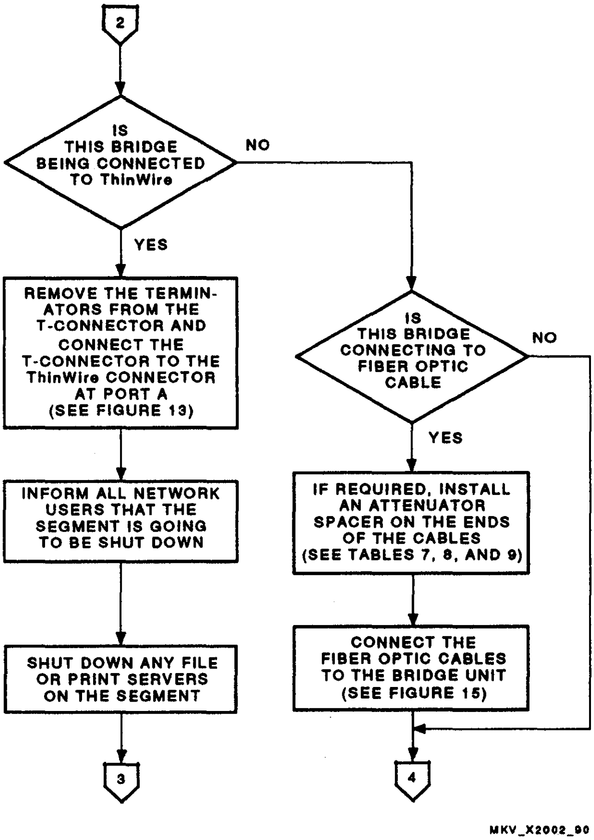


Figure 6 LAN Bridge 200 Installation Flow Diagram (Sheet 3 of 6)

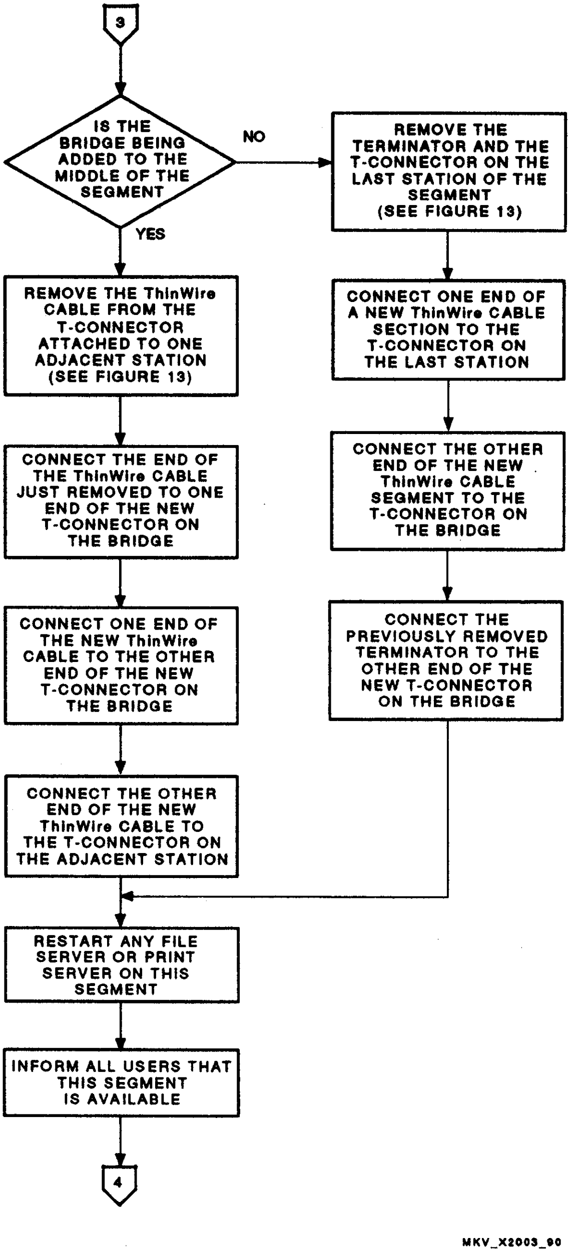


Figure 6 LAN Bridge 200 Installation Flow Diagram (Sheet 4 of 6)

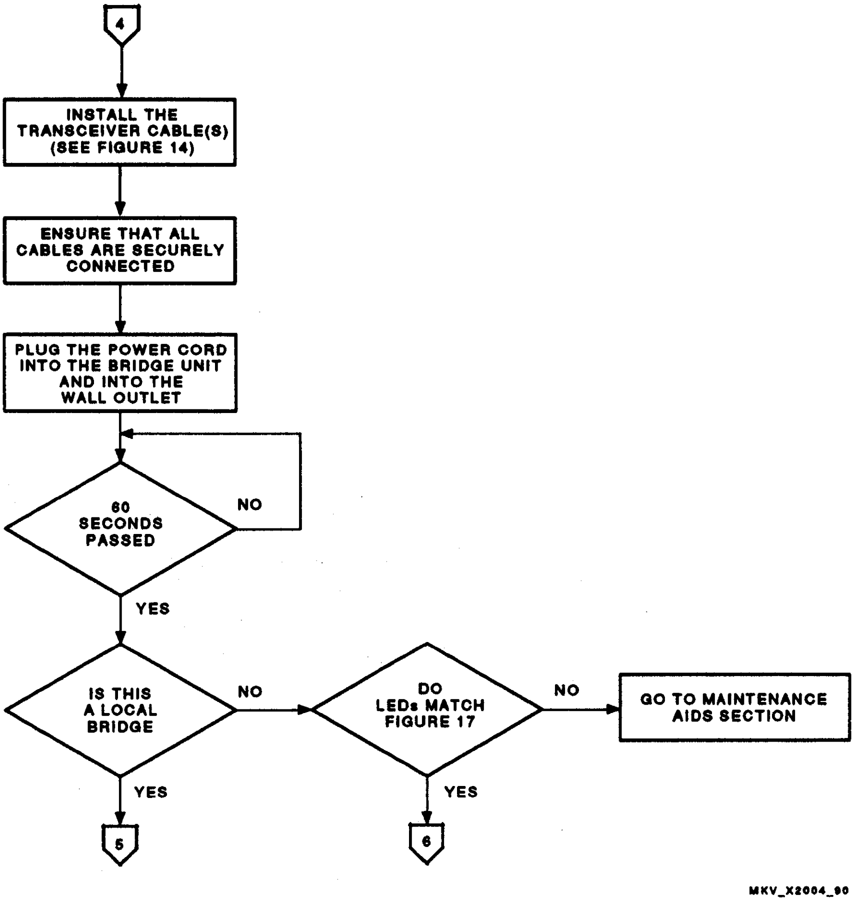


Figure 6 LAN Bridge 200 Installation Flow Diagram (Sheet 5 of 6)

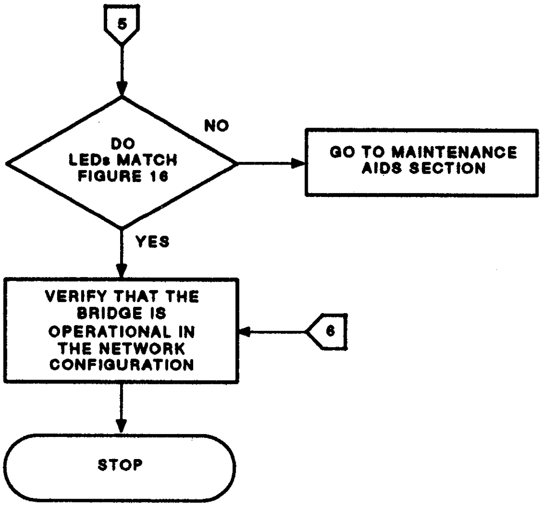


Figure 6 LAN Bridge 200 Installation Flow Diagram (Sheet 6 of 6)

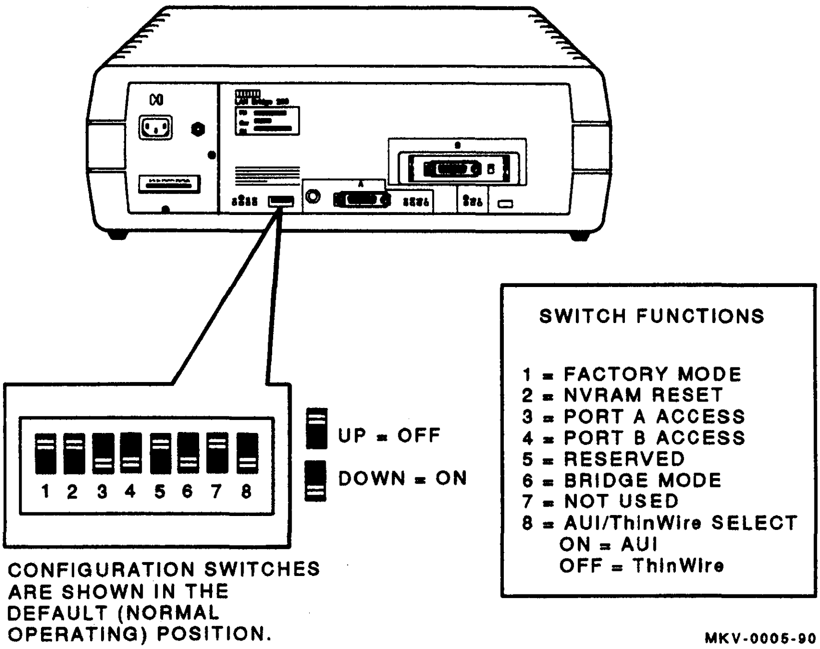


Figure 7 Configuration Switch Settings

Table 4 LAN Bridge 200 Configuration Switch Functions

Switch Number	Name	ON (Down)	OFF (Up)
1	Factory Mode	For troubleshooting only (refer to loopback test).	Normal Mode – Must be in this position for correct bridge operation.
2	NVRAM Reset	NVRAM resets to factory default settings when the bridge is powered up. NVRAM Reset removes all bridge management configuration changes.	Prevents NVRAM from resetting to factory default settings when the bridge is powered up. This setting should be used to prevent the loss of parameters stored by the bridge management software during a power failure.

Table 4 LAN Bridge 200 Configuration Switch Functions (Cont)

Switch Number	Name	ON (Down)	OFF (Up)
3	Port A Access	Network stations connected to Port A that have bridge management capabilities are allowed to READ and WRITE (modify) bridge management parameters.	Network stations connected to Port A that have bridge management capabilities are allowed to READ, but cannot WRITE bridge management parameters.
4	Port B Access	Network stations connected to Port B that have bridge management capabilities are allowed to READ and WRITE (modify) bridge management parameters.	Network stations connected to Port B that have bridge management capabilities are allowed to READ, but cannot WRITE bridge management parameters.
5	Reserved For Future Use	N/A	Normal Mode - Must be in this position for correct bridge operation.
6	Bridge Mode	Normal Mode - Must be in this position for correct bridge operation.	N/A
7	Spare Switch– Not Assigned	N/A	N/A
8	AUI/ThinWire Mode Select	Selects AUI connection for Port A.	Selects ThinWire connection for Port A.

Table 5 Optical Idle Switch Settings

Type	Switch 1	Switch 2
DEC Idle*	OFF	OFF
802.3 Idle	OFF	ON
Reserved	ON	ON
Reserved	ON	OFF

* The switches on a LAN Bridge 200 at the other end of the link must also be set to the OFF position as shown in Figure 8 for DEC Idle.

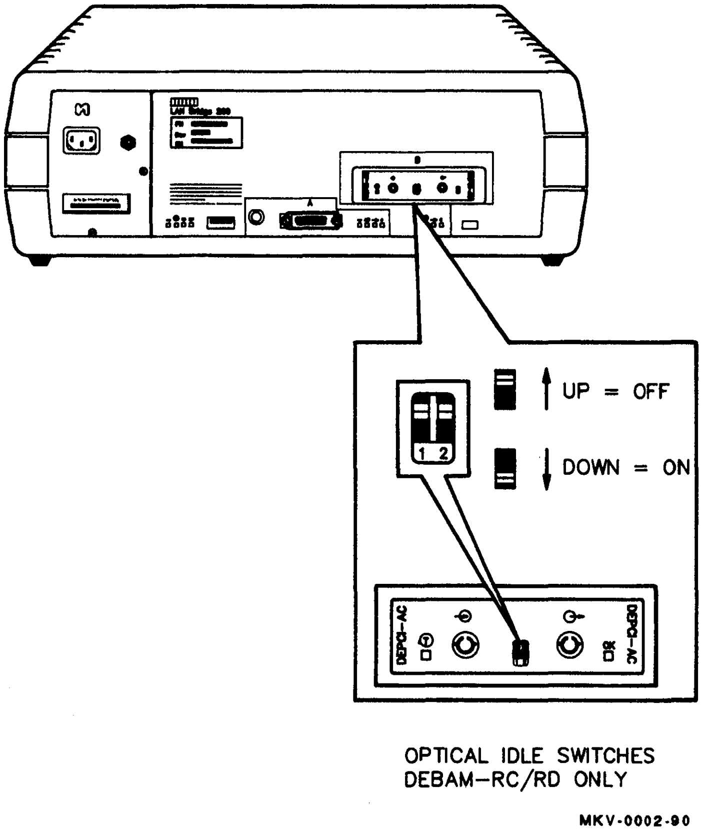


Figure 8 Optical Idle Switch Settings

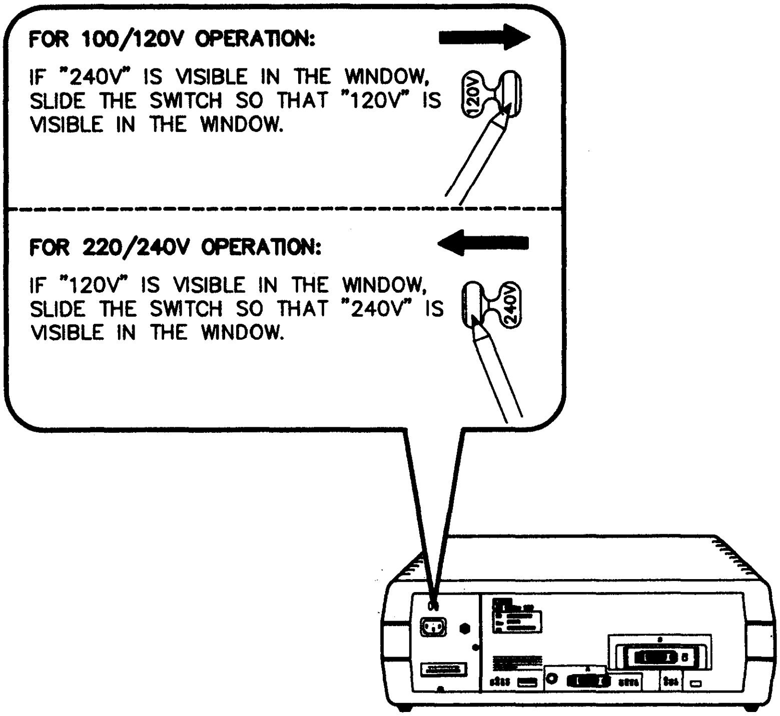


Figure 9 Verifying the AC Voltage Select Switch Setting

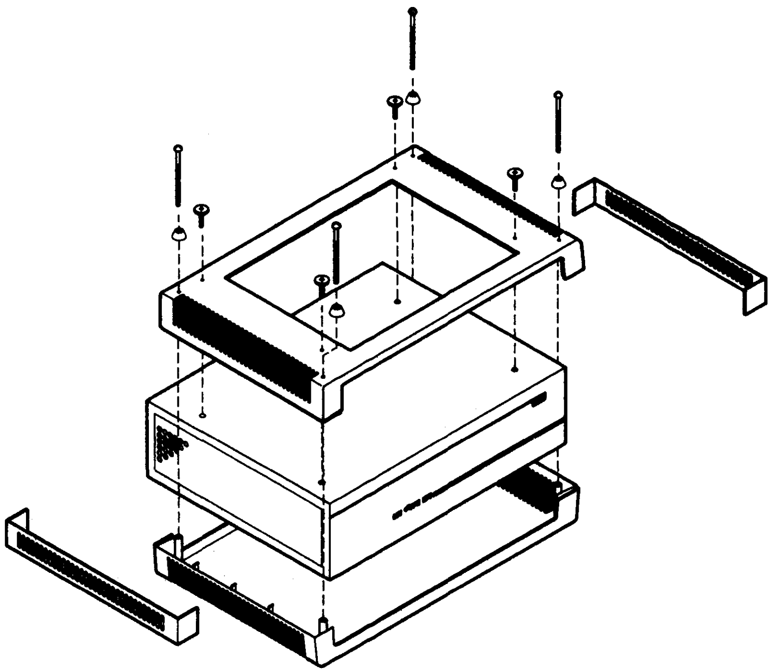


Figure 10 Removing the Plastic Covers

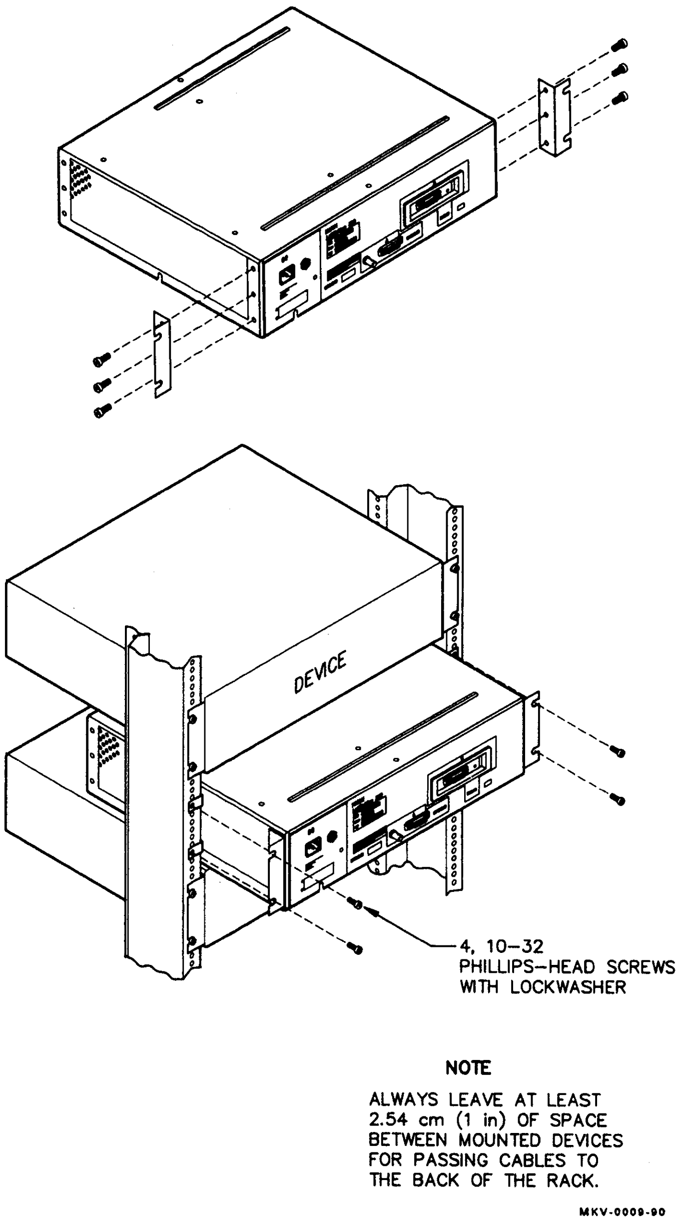


Figure 11 Rack Mounting the LAN Bridge 200.

LAN Bridge 200 Network Interface
The network interface for the LAN Bridge 200 consists of two ports: Port A and Port B. The ports are located on the bridge I/O panel (see Figure 12).

Port A supports both an AUI (15-pin standard) transceiver interface and a ThinWire interface. Either interface can be selected by setting configuration switch number 8 to the appropriate position (see Figure 7).

Port B supports a standard AUI transceiver interface for the local bridge (DEBAM-AA/AB) or a fiber optic interface for the remote bridges (DEBAM-RC/RD and DEBAM-RF/RG).

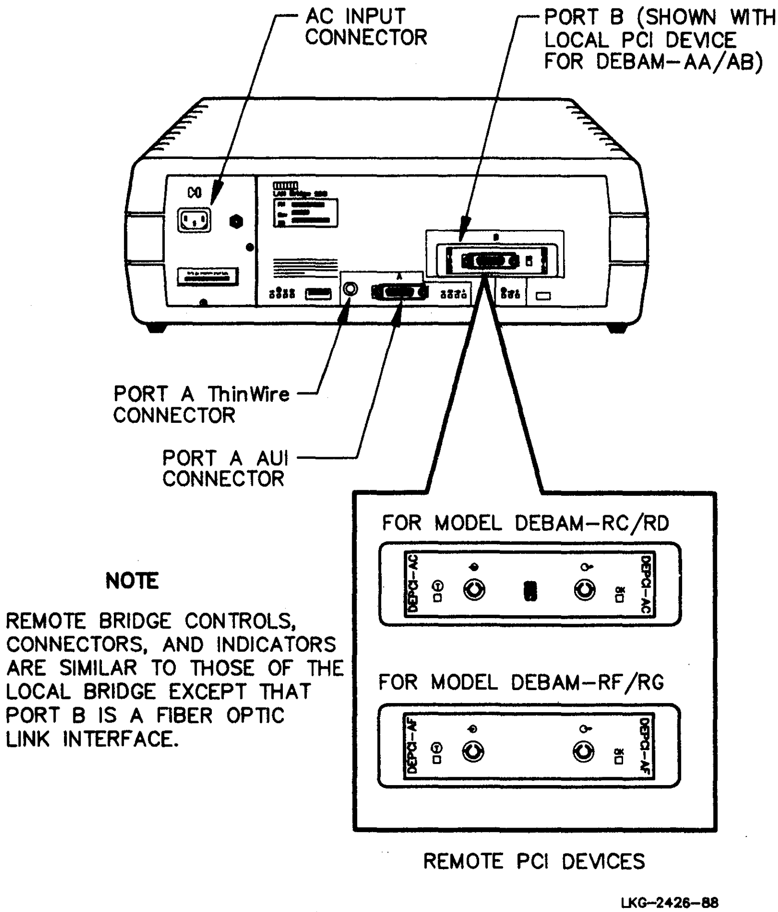


Figure 12 LAN Bridge 200 Ports and Connectors

Cable Configuration Rules

Ensure that the transceiver cables, fiber optic cables, and the bridge power cable do not exceed the maximum lengths described in Table 6 and the basic configuration rules that follow.

Table 6 Maximum Cable Lengths

From	To	Maximum Length	Cable Type
Transceiver	Bridge	50 m (164 ft), see rules 1 through 5	BNE3x-xx* transceiver cable
Transceiver	Bridge	12.5 m (41 ft), see rules 1 through 5	BNE4x-xx* office transceiver cable
DEBAM-RC/RD	DEBAM-RC/RD	3 km (1.9 miles), see rule 6	Fiber optic cable (see Table 7)
DEBAM-RF/RG	DEBAM-RF/RG	10 km (6.2 miles), see rule 6	Fiber optic cable (see Table 8)
DEBAM-RC/RD	802.3 repeater	1.5 km (0.93 miles), see rule 6	Fiber optic cable (see Table 9)
AC outlet	Bridge	1.8 m (6 ft)	Country-specific

* BNE3x-xx transceiver cable and BNE4x-xx office transceiver cable can be interconnected. However, the cable attenuation (signal loss) for the office transceiver cable is greater than that of the BNE3x-xx transceiver cable by a factor of four. For example; 2 m (6.6 ft) of office transceiver cable is electrically equivalent to 8 m (26.2 ft) of BNE3x-xx transceiver cable.

The basic cable configuration rules are as follows:

1. If the bridge connects to an IEEE 802.3 transceiver such as the H4005 or to a DESTA, the transceiver cable must be an IEEE 802.3 compliant transceiver cable (BNE3H/K/L/M or BNE4C/D).

2. If the bridge connects to a non-IEEE 802.3 transceiver such as the H4000, the transceiver cable can be either Ethernet or IEEE 802.3 compliant.

3. IEEE 802.3 transceiver cables and Ethernet transceiver cables cannot be interconnected.

4. Maximum length for the transceiver cable cannot exceed 50 m (164 ft). This maximum length can be reduced due to the internal cabling equivalence of a device (such as a DELNI) that is connected between the bridge and the transceiver, or due to the use of office transceiver cable. The cabling equivalence of such a device must be subtracted from the 50 m (164 ft) maximum.

   Cabling equivalence is a measure of the internal timing delay of a device, expressed in meters of transceiver cable. For device-specific information related to cabling equivalence, refer to the *DECconnect System Planning and Configuration Guide.*

5. When connecting the bridge to a configuration that includes a DELNI, allow a 5 m (16.4 ft) cabling equivalence loss for the DELNI.

6. If remote (fiber optic) bridges are used, they can be used in one of two ways:

   a. A Bridge-to-Bridge Link – The DEBAM-RF/RG provides 17 dB of usable optical power at 1300 nm. This option can achieve distances of up to 10 km (6.2 miles) when connecting two DEBAM-RF/RG units using 62.5/125 micron fiber. Connection to a remote repeater is *not* permitted.

      The DEBAM-RC/RD provides 14 dB of usable optical power at 850 nm. This option can achieve distances of up to 3 km (1.9 miles) when connecting two DEBAM-RC/RD units using 62.5/125 micron fiber. Connection to a remote 802.3 repeater is permitted, but remote repeater budget limitations apply.

   b. A Bridge-to-Repeater Link – When configured in this manner, the fiber path can be 500 m (1640 ft) in length plus any available fiber length not used under the 1000 m (3280 ft) limitation for remote repeaters. This allows a bridge-to-repeater link to reach up to 1500 m (4920 ft).

7. Remote versions of the LAN Bridge 200 are not compatible with remote versions of LAN Bridge 100, LAN Bridge 150, or with the DEREP remote repeater.

8. Digital Equipment Corporation recommends that networks be configured so that station-to-station paths contain no more than seven bridges in order to ensure acceptable packet transmit time between stations.

LAN Bridge 200 CABLING

Cable Connections

This section provides information on connecting the ThinWire Ethernet coaxial cable, the transceiver cable, and the fiber optic cable to the LAN Bridge 200.

Connecting ThinWire Ethernet Coaxial Cables – If Port A of the LAN Bridge 200 is being connected to the middle or end of a ThinWire segment, use the T-connector and terminators (if required) to make the connection. Refer to Figure 13 to connect the ThinWire segment to Port A of the LAN Bridge 200.

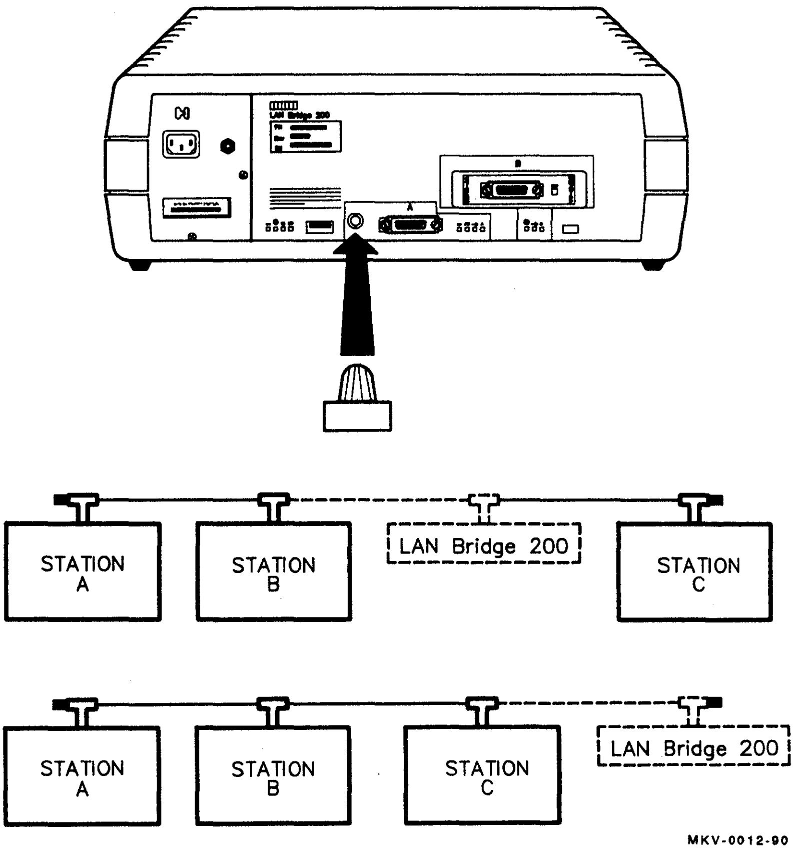


Figure 13 Connecting ThinWire Ethernet Coaxial Cables

Connecting Transceiver Cables - Transceiver cable is required for connecting Port B on the local LAN Bridge 200 (DEBAM-AA/AB), and can be used for connecting Port A on both the local and remote LAN Bridge 200 versions. Refer to Figure 14 for making the transceiver cable connections to the LAN Bridge 200.

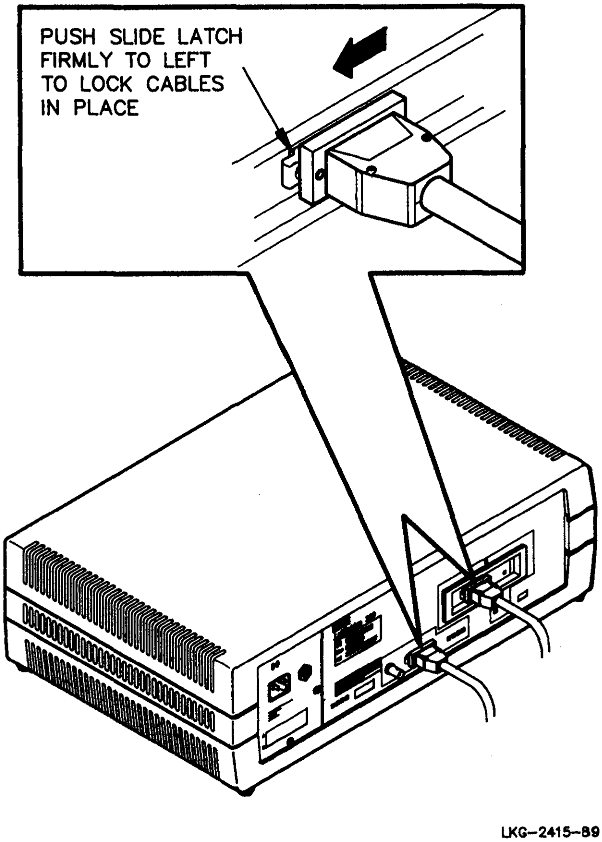


Figure 14 Connecting Transceiver Cables

Connecting Fiber Optic Cables – Fiber optic cable is required for connecting Port B on the remote versions of the LAN Bridge 200 (DEBAM-Rx). Refer to Figure 15 and the specific link information that follows to connect the fiber optic cable to Port B on the remote LAN Bridge 200.

Digital Equipment Corporation recommends the use of two fiber optic cables for indoor wiring. The BN25J-xx cable is a general purpose cable and the BN25K-xx cable can be used in a plenum.

These are dual-fiber cables with 62.5/125 micron fiber specified at both 850 nm and 1300 nm, in accordance with Digital Specification PS 171002-0-0 for 62.5/125 micron optical fiber. Both cables are terminated with 2.5 mm (0.10 in.) ST-type connectors and are available in a variety of lengths.

The two remote versions of the LAN Bridge 200 (DEBAM-RC/RD and DEBAM-RF/RG) differ in the fiber optic technology that they use, and in the maximum attainable distance that the fiber optics can span.

DEBAM-RC/RD-to-DEBAM-RC/RD Links
The DEBAM-RC/RD uses 850 nm wavelength LED transmitters and supports 50, 62.5, 85, and 100 micron core fiber types. A maximum distance of 3 km (1.9 miles) using 62.5 fiber is possible between two DEBAM-RC/RD models. Table 7 contains the maximum distance, loss budget, and minimum attenuation associated with each fiber type in a DEBAM-RC/RD-to-DEBAM-RC/RD link. If the fiber optic cable has an attenuation value that is LESS than the minimum attenuation listed in Table 7, an attenuator spacer (P/N: 12-30068-02) must be installed on the transmit connection at both ends of the link.

Table 7 DEBAM-RC/RD-to-DEBAM-RC/RD Fiber Specifications

Fiber Size	Maximum Distance	Loss Budget	Minimum Attenuation
50/125	2.0 km (1.3 miles)	9 dB	N/A
62.5/125	3.0 km (1.9 miles)	14 dB	N/A
85/125	2.8 km (1.7 miles)	15 dB	N/A
100/140	2.8 km (1.7 miles)	16 dB	4 dB

DEBAM-RF/RG-to-DEBAM-RF/RG Links
The DEBAM-RF/RG uses 1300 nm wavelength LED transmitters and supports 50, 62.5, 85, and 100 micron core fiber types. A maximum distance of 10 km (6.2 miles) using 62.5 fiber is possible between two DEBAM-RF/RG models. Table 8 contains the maximum distance, loss budget, and minimum attenuation associated with each fiber type in a DEBAM-RF/RG-to-DEBAM-RF/RG link. If the fiber optic cable has an attenuation value that is LESS than the minimum attenuation listed in Table 8, an attenuator spacer (P/N: 12-30068-02) must be installed on the transmit connection and the receive connection at both ends of the link.

Table 8 DEBAM-RF/RG-to-DEBAM-RF/RG Fiber Specifications

Fiber Size	Maximum Distance	Loss Budget	Minimum Attenuation
50/125	10.0 km (6.2 miles)	12 dB	3 dB
62.5/125	10.0 km (6.2 miles)	17 dB	7 dB
85/125	4.0 km (2.5 miles)	17 dB	9 dB
100/140	4.0 km (2.5 miles)	17 dB	9 dB

DEBAM-RC/RD-to-Remote Repeater (DEREN-RC/RD) Links
Ethernet timing requirements restrict distances between a bridge and a repeater to a maximum of 1.5 km (0.93 miles). Table 9 contains the maximum distance, loss budget, and minimum attenuation associated with each fiber type in a DEBAM-RC/RD-to- Remote Repeater (DEREN-RC/RD) link. If the fiber optic cable has an attenuation value that is LESS than the minimum attenuation listed in Table 9, an attenuator spacer (P/N: 12-30068-02) must be installed on the transmit connection at both ends of the link.

Table 9 DEBAM-RC/RD-to-Remote Repeater Fiber Specifications

Fiber Size	Maximum Distance	Loss Budget	Minimum Attenuation
50/125	1.5 km (0.93 miles)	9 dB	N/A
62.5/125	1.5 km (0.93 miles)	14 dB	N/A
85/125	1.5 km (0.93 miles)	15 dB	N/A
100/140	1.5 km (0.93 miles)	16 dB	4 dB

DEBAM-RC/RD Fiber Cable Measurement Correction
The values in Table 10 are used to correct the measured loss of an optical fiber when using the equipment and procedure specified in the *DECconnect System Facilities Cabling Installation Guide*. The correction is required to account for the difference in wavelength between the DEBAM-RC/RD transmitter and the test equipment transmitter.

Table 10 Measurement Correction

Wavelength	Correction Value
790 nm	–0.2 dB/km
795 nm	–0.1 dB/km
800 nm	0.0 dB/km
805 nm	0.1 dB/km
810 nm	0.2 dB/km
815 nm	0.3 dB/km
820 nm	0.4 dB/km
825 nm	0.5 dB/km
830 nm	0.6 dB/km
835 nm	0.65 dB/km
840 nm	0.7 dB/km
845 nm	0.8 dB/km
850 nm	0.9 dB/km

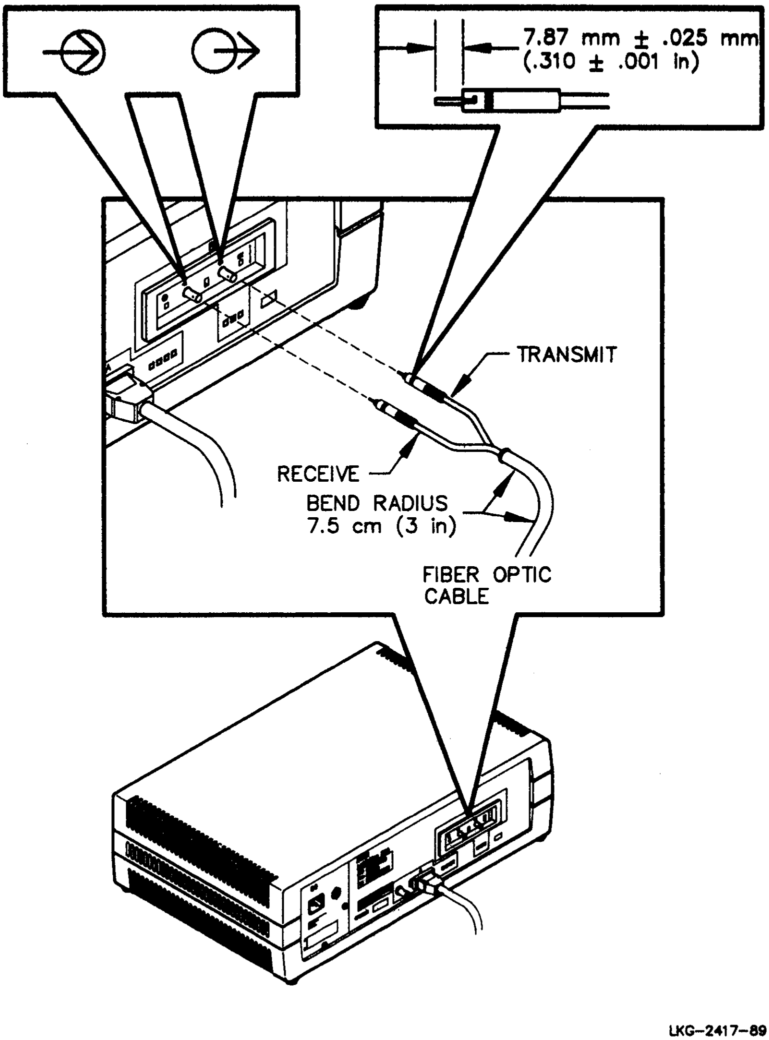


Figure 15 Connecting Fiber Optic Cables

For more information on cabling of the LAN Bridge 200, refer to the *DECconnect System Planning and Configuration Guide*, the *DECconnect System Facilities Cabling Installation Guide*, and the *DECconnect System Fiber Optic Network Installation Guide.*

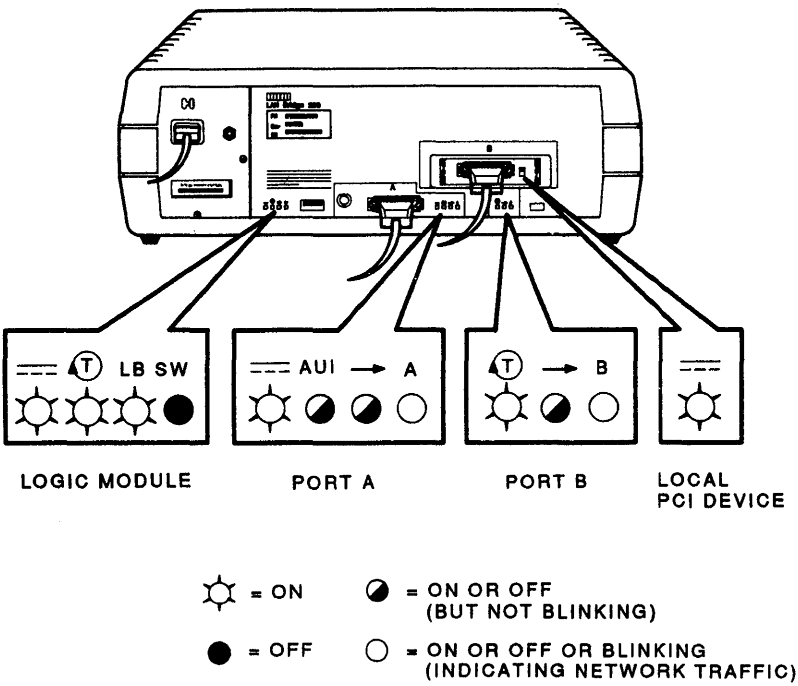
Diagnostic Self-Tests

The LAN Bridge 200 has two types of self-tests. The operational self-test (normal mode) is used as a quick check to ensure that the bridge is functioning properly as it is configured. If it is determined that an internal problem may exist in the bridge, the loopback self-test (factory mode) is used to detect a failing field replaceable unit (FRU).

Operational Self-Test (Normal Mode) – The LAN Bridge 200 executes a self-test when power is applied. Approximately 60 seconds after power is applied, the state of the status LEDs indicates whether a successful self-test has occurred. Figures 16 and 17 show the successful self-test state of the status LEDs for the local and remote LAN Bridge 200. Table 11 contains a list of the status LEDs and their definitions.

NOTE

Ensure that transceiver cables and fiber optic cables are securely connected at both ends. If a remote bridge is being tested, the bridge at the other end of the link must be powered up before the self-test will successfully complete.



IF:	THEN:
THE STATUS LEDs MATCH THOSE SHOWN HERE.	THE LAN Bridge 200 UNIT IS OPERATIONAL.
THE STATUS LEDs DO NOT MATCH THOSE SHOWN HERE.	GO TO LOOPBACK SELF-TEST.

MKV-0004-90

Figure 16 Local LAN Bridge 200 Self-Test

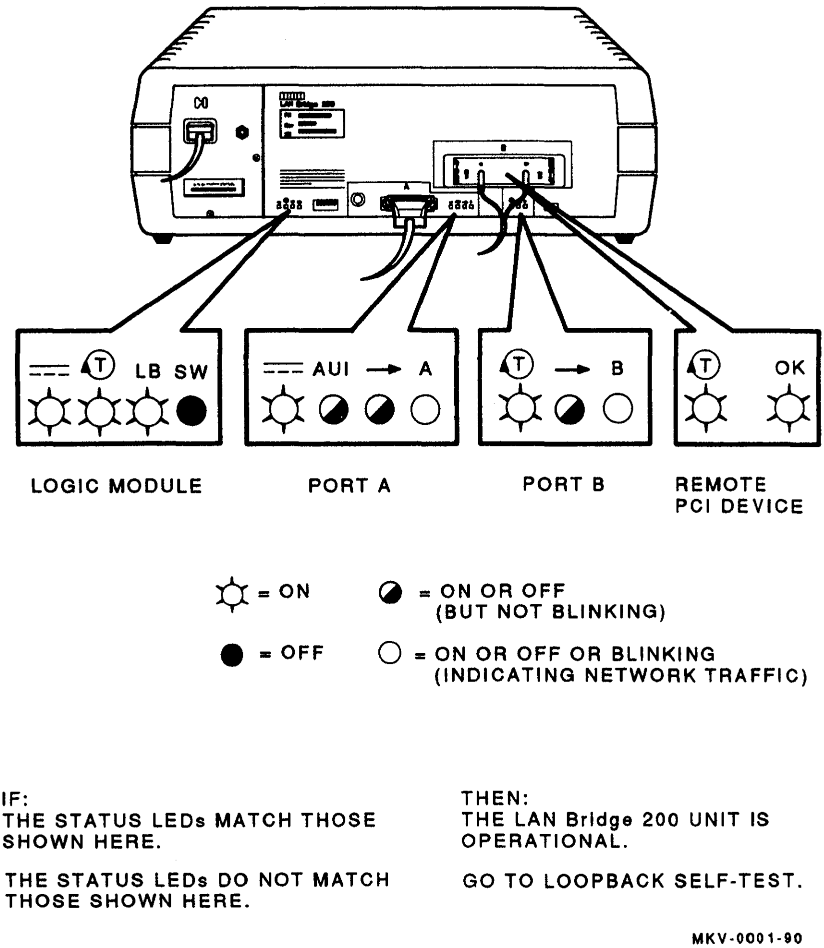


Figure 17 Remote LAN Bridge 200 Self-Test

Table 11 LAN Bridge 200 Status LEDs

Symbol	LED Name	ON Steady	OFF	Blinking
Logic Module LEDs				
⎓	DC OK	Logic module dc power valid	Logic module dc power failure	N/A
(T)	Self-Test OK	Logic module self-test passed	Logic module self-test failed	NVRAM failed (may require replacement)
LB	Bridge	Bridge code operational	Bridge code nonoperational	N/A
SW	Software	Nonbridge code operational	No valid nonbridge code	Down-line load in progress
Port A LEDs				
⎓	DC OK	Port A AUI transceiver power OK	Port A AUI transceiver power failure	N/A
AUI	AUI/TW Select	Port A AUI interface selected	Port A ThinWire interface selected	N/A
→	On-Line (FWD A)	Port A in forwarding state	Port A not in forwarding state	Fault indication
A	Port A Activity	Traffic present on network	Traffic not present on network	Traffic present on network
Port B LEDs				
(T)	Self-Test OK	PCI device self-test passed	PCI device self-test failed	N/A
→	On-Line (FWD B)	Port B in forwarding state	Port B not in forwarding state	Fault indication
B	Port B Activity	Traffic present on network	Traffic not present on network	Traffic present on network

Table 11 LAN Bridge 200 Status LEDs (Cont)

Symbol	LED Name	ON Steady	OFF	Blinking
Local PCI Device LED				
⎓	DC OK	Port B AUI transceiver power OK	Port B transsceiver power failure	N/A
Remote PCI Device LEDs				
Ⓣ	Self-Test OK	PCI device self-test passed	PCI device self-test failed	N/A
OK	Link OK	Fiber optic link OK	Fiber optic link failed	N/A

Loopback Self-Test (Factory Mode) – The following procedure can be helpful in determining if the bridge or the external cable is faulty.

1. Disconnect the LAN Bridge 200 power cord from the power source.
2. Disconnect all cables from Port A and Port B.
3. Set configuration switch 1 (Factory Mode Switch) to the ON position.
4. Install all loopback connectors:
   a. Port A – The AUI loopback connector (P/N: 12-22196-01) and the ThinWire T-connector (P/N: 00-H8223-00) and terminators (P/N: 00-H8225-00). Refer to Figure 18.
   b. Port B (Local Bridge) – AUI loopback connector (P/N: 12-22196-01). Refer to Figure 18.
   c. Port B (Remote Bridge) – Fiber optic loopback cable (P/N: 17-02372-01 for the DEBAM-RC/RD or P/N: 17-02372-02 for the DEBAM-RF/RG). Refer to Figure 19.
5. Reconnect the power cord.
6. Observe the 2-second lamp check for LED validation, then wait 60 seconds for the diagnostic self-test to complete.
7. Compare the state of the LEDs with those shown in Figure 20 (local) and Figure 21 (remote). If the LEDs match up, continue to the next step. If the LEDs do not match up, refer to Table 12 to help identify the problem.
8. Reset configuration switch 1 to the OFF position.
9. Remove all loopback connectors from Port A and Port B.
10. Reconnect the cables to Port A and Port B.
11. Cycle bridge power and ensure that the diagnostic self-test executes successfully.

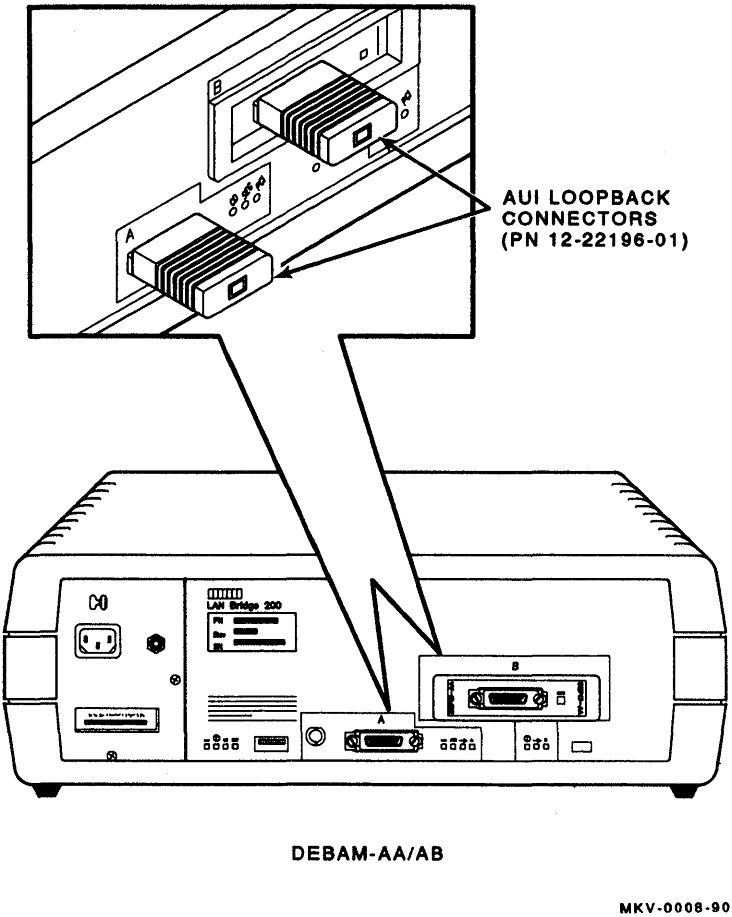


Figure 18 Local LAN Bridge 200 Loopback Connectors

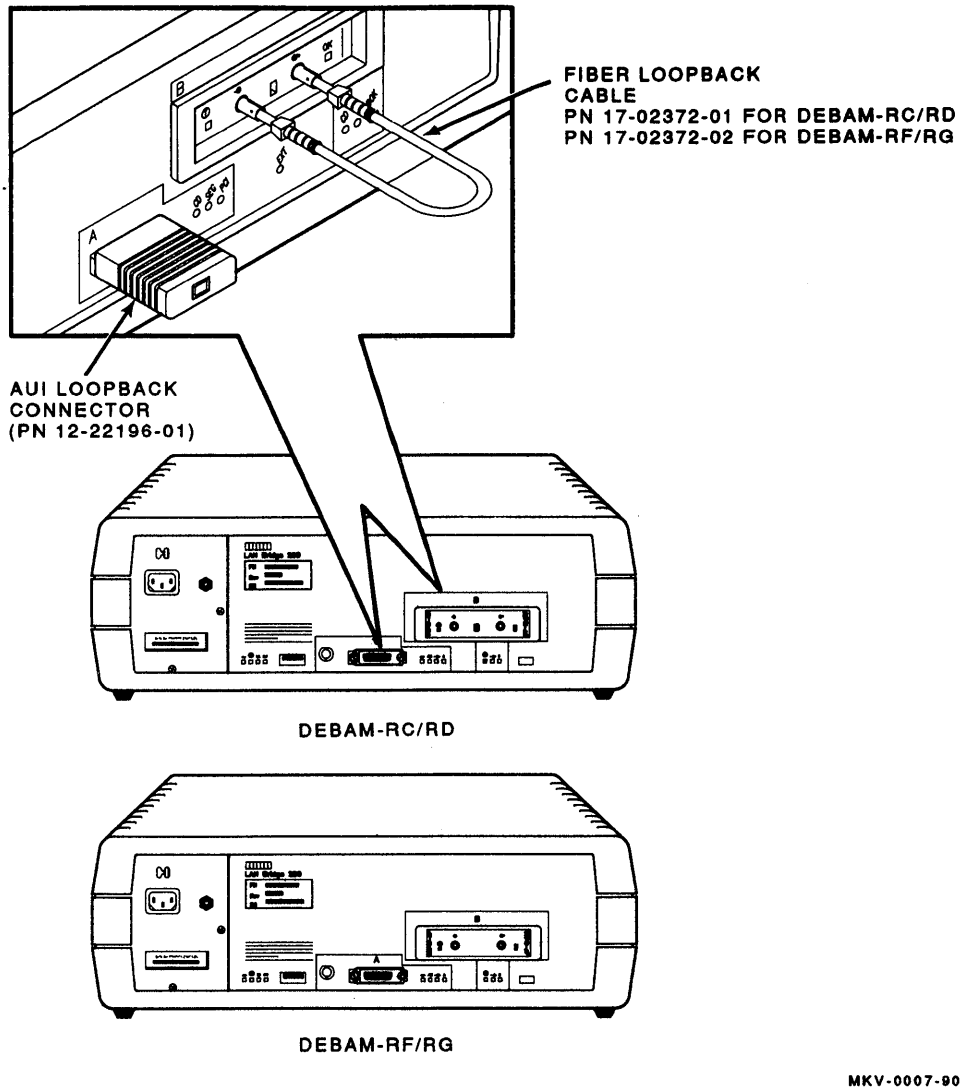


Figure 19 Remote LAN Bridge 200 Loopback Connectors

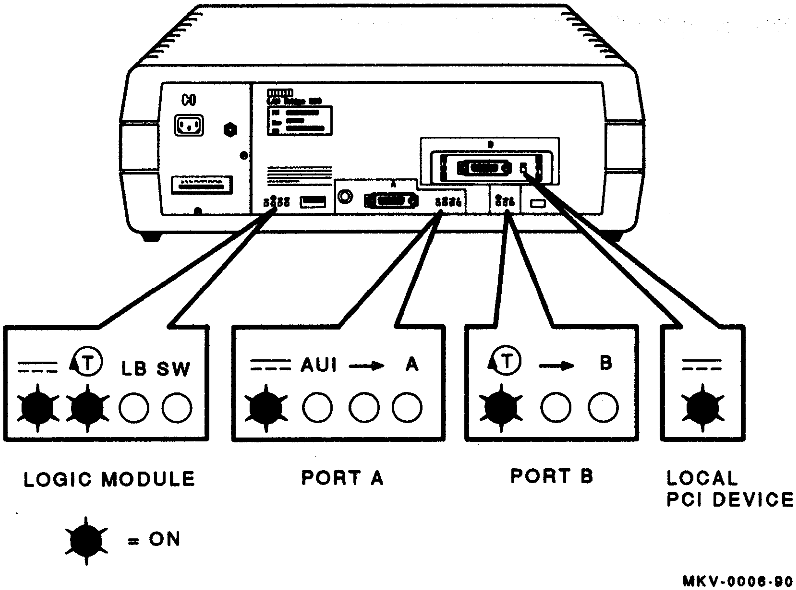


Figure 20 Local LAN Bridge 200 Loopback Test Status LEDs

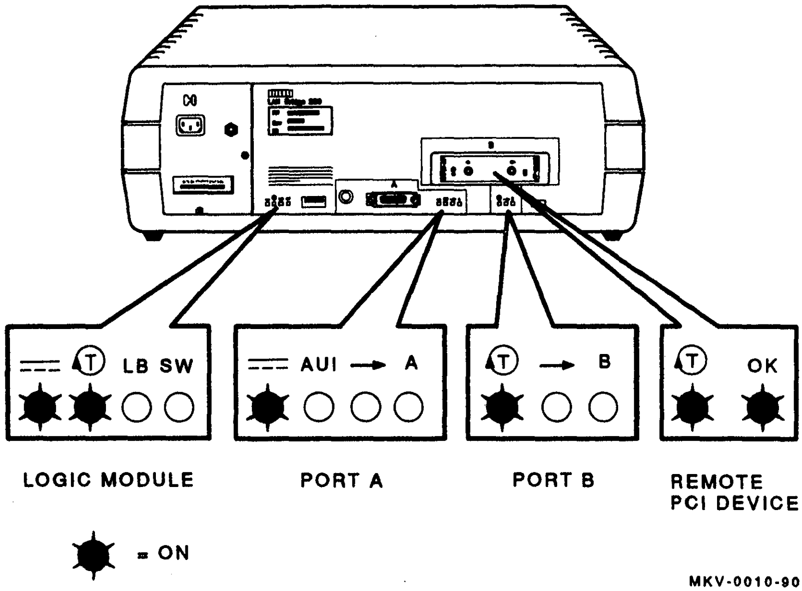


Figure 21 Remote LAN Bridge 200 Loopback Test Status LEDs

Troubleshooting

The troubleshooting procedures in Table 12 are symptom-oriented. The symptoms are presented in the order that they might occur during the loopback self-test.

Table 12 Problem Solving

Symptom	Suggested Corrective Action
All LEDs OFF	Ensure that the voltage select switch is set to the correct voltage range. Ensure that the power cord is securely connected at the bridge and at the wall outlet. Verify that the correct power is available at the wall outlet. Reset the circuit breaker, if tripped. If the circuit breaker trips again, disconnect the transceiver cables, reset the breaker, and apply power. If the circuit breaker does not trip, check for a bad transceiver cable. If the circuit breaker trips again, replace the power supply. Ensure that the power cable is good. If not, replace it.
DC OK (Logic Module) is OFF, any other LED ON	Replace the logic module.
Self-Test OK LED (Logic Module) remains OFF	Replace the logic module.
Self-Test OK LED (Logic Module) is blinking	Replace the NVRAM.
Self-Test OK LED (Port B) remains OFF	Reseat the PCI module and retest. If the problem remains, replace the PCI module. If the problem still remains, replace the logic module.
Self-Test OK LED (Remote PCI Device) remains OFF	Reseat the PCI module and retest. If the problem remains, replace the PCI module. If the problem still remains, replace the logic module.
On-Line LED (FWD A) or (FWD B) is blinking	Perform the loopback test as described in the DIAGNOSTICS section:
Bridge LED (Logic Module) remains OFF	This is NOT a hardware fault indication. Reset configuration switches 1 and 5 to the OFF position (up = OFF) and recycle the bridge power.

Table 12 Problem Solving (Cont)

Symptom	Suggested Corrective Action
The Software LED (Logic Module) is blinking	This is NOT a hardware fault indication. Reset configuration switch 5 to the OFF position (up = OFF) and recycle the bridge power.
Link OK LED (Remote PCI Device) Port B remains OFF	Ensure that the fiber optic cables are properly connected to the bridge and to the remote device at the other end of the link.
	Ensure that the device at the other end of the link is installed and powered up.
	Ensure that the optical idle switches (on the DEBAM-RC/RD) are set to the same setting on both ends of the link (normally DEC Idle).
	Check the cable plant for insufficient optical loss. Attenuator spacers may have to be installed if the attenuation value of the cable is LESS than the minimum attenuation listed in Tables 7, 8, or 9.
	Reseat the PCI module and retest. If the problem remains, replace the PCI module.
DC OK LED (Port A) is OFF, DC OK LED (Logic Module) is ON	Replace the logic module. If this indication occurs during the loop-back test, the loopback connector on Port A may be defective. Unplug the loopback connector at Port A, and if the DC OK LED (Port A) lights, the loopback connector is defective. If it does not light, replace the logic module.
DC OK LED (Local PCI Device) is OFF, DC OK LED (Logic Module) is ON	Reseat the PCI module and retest. If the problem remains, replace the PCI module. If the problem still remains, replace the logic module. If this indication occurs during the loopback test, the loopback connector on Port B may be defective. Unplug the loop-back connector at Port B, and if the DC OK LED (Local PCI Device) lights, the loopback connector is defective. If it does not light, take the following actions in the order listed until the problem is corrected.
	• Reseat the PCI module and retest • Replace the PCI module and retest • Replace the logic module and retest
Fans not running	Ensure that the fan source wire is connected properly.
	Replace the fan assembly.
	Replace the power supply.

FRU Removal and Replacement Procedures

Figure 22 shows the field replaceable units (FRUs) of the LAN Bridge 200.

WARNING

The procedures indicated should be performed by qualified service personnel only. DO NOT attempt to remove any FRUs while the LAN Bridge 200 is connected to a power source.

CAUTION

Modules in the bridge can be damaged by electrostatic discharges (ESD). Use a wriststrap, ground wire, and table pad which are included in the Field Service Kit (P/N: 29-11762-00) when accessing any internal components of the LAN Bridge 200.

The FRUs for the LAN Bridge 200 and their part numbers are listed below.

FRU	**Part Number**
Logic Module	54-18357-01
Power Supply Module	H7859-A
Power Supply Ribbon Cable	17-01843-01
Fan Assembly	70-25518-01
AUI PCI Module (DEBAM-AA/AB)	DEPCI-AA
850 nm Fiber PCI Module (DEBAM-RC/RD)	DEPCI-AC
1300 nm Fiber PCI Module (DEBAM-RF/RG)	DEPCI-AF

Miscellaneous Parts

ThinWire T-Connector	H8223
ThinWire 50-Ohm Terminator	H8225
AUI Loopback Connector	12-22196-01
850 nm Fiber Loopback Cable (DEBAM-RC/RD)	17-02372-01
1300 nm Fiber Loopback Cable (DEBAM-RF/RG)	17-02372-02
Fiber Optic Attenuator Spacer	12-30068-02

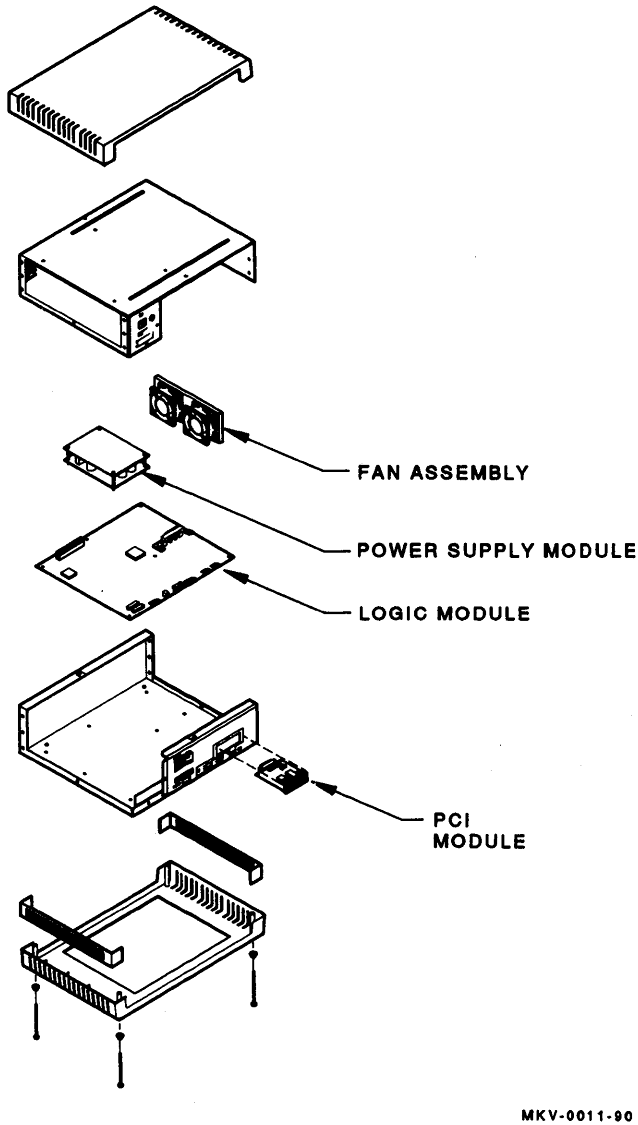


Figure 22 LAN Bridge 200 FRU Locations

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.

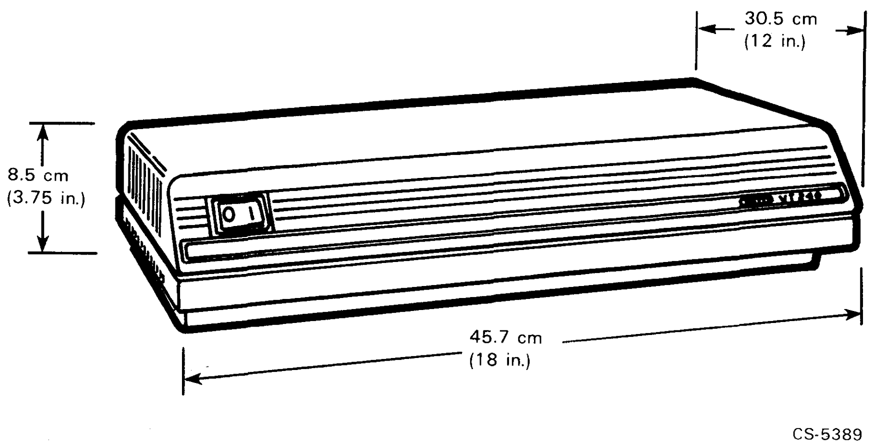


Figure 1 MUXserver 100 Remote Terminal Server

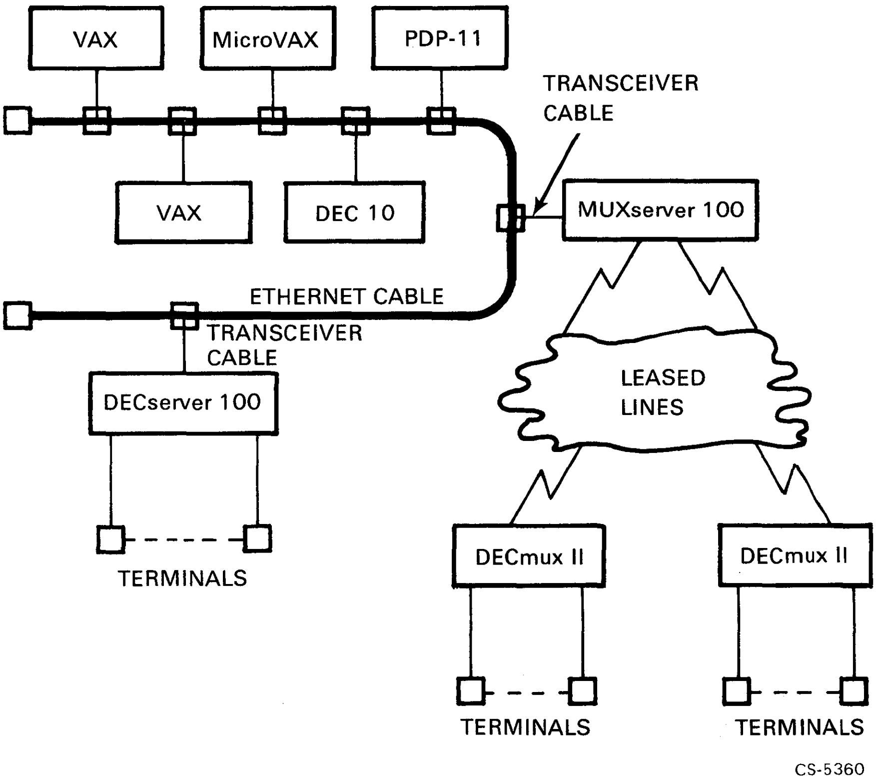


Figure 2 Local Area Network (LAN)

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.

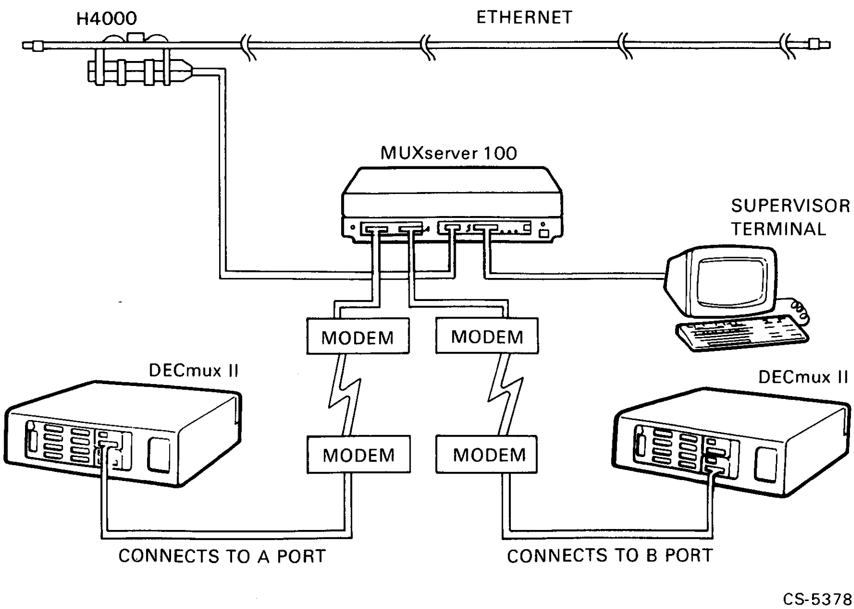


Figure 3 Default Multiplexer Configuration Number 1

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.

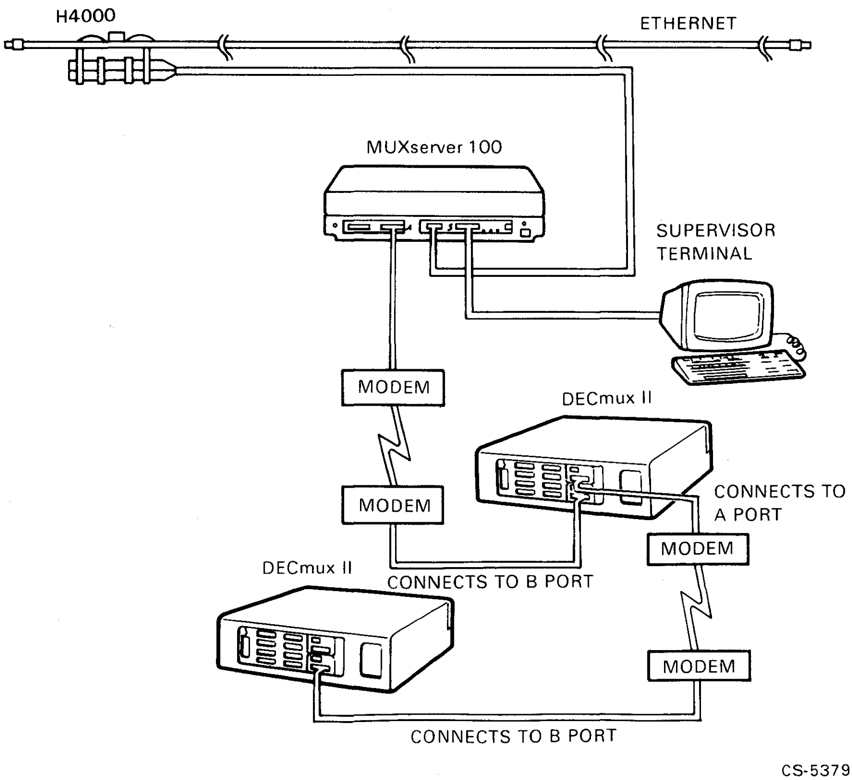


Figure 4 Default Multiplexer Configuration Number 2

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

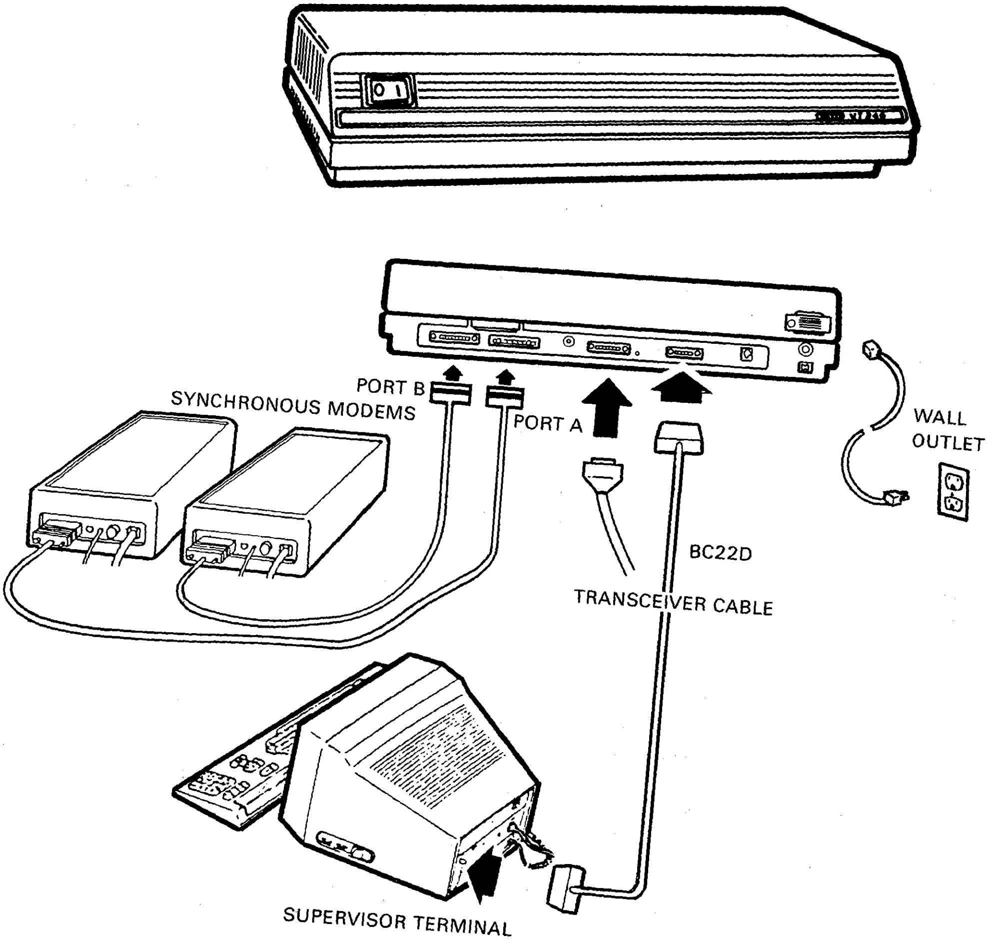


Figure 5 Front and Rear Panels of the MUXserver 100

Installation Flow Diagram

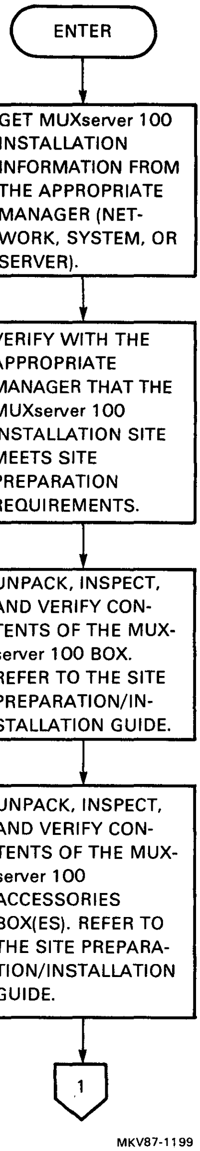


Figure 6 Installation Flow Diagram (Sheet 1 of 3)

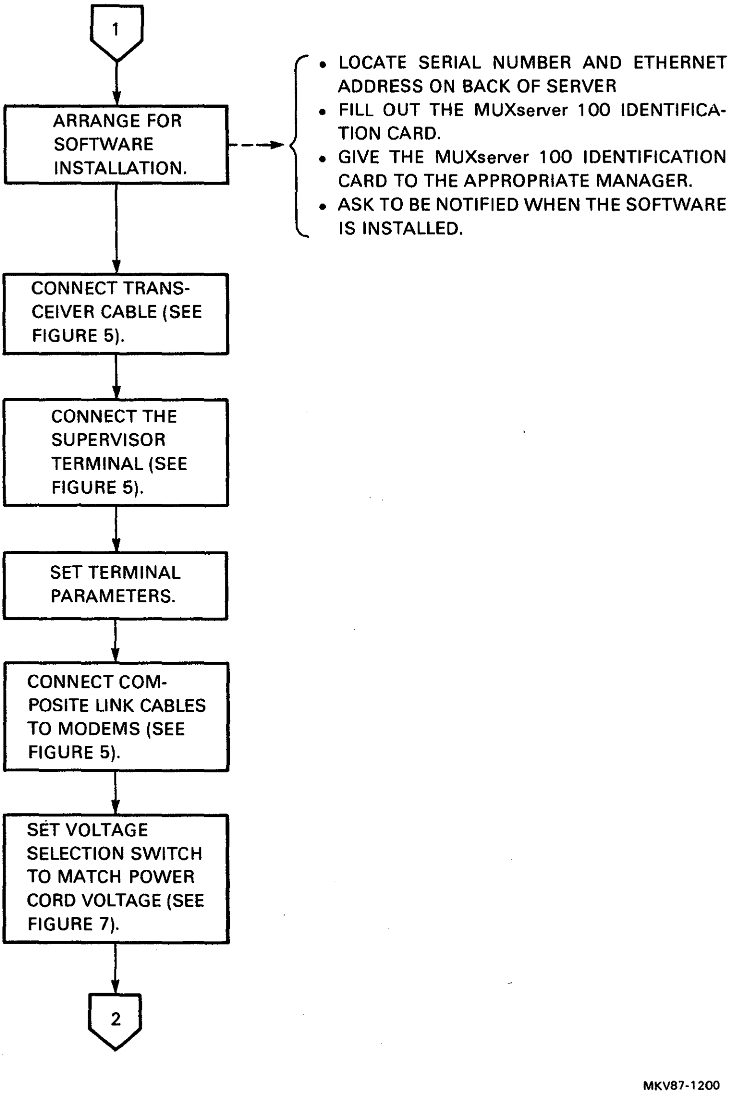


Figure 6 Installation Flow Diagram (Sheet 2 of 3)

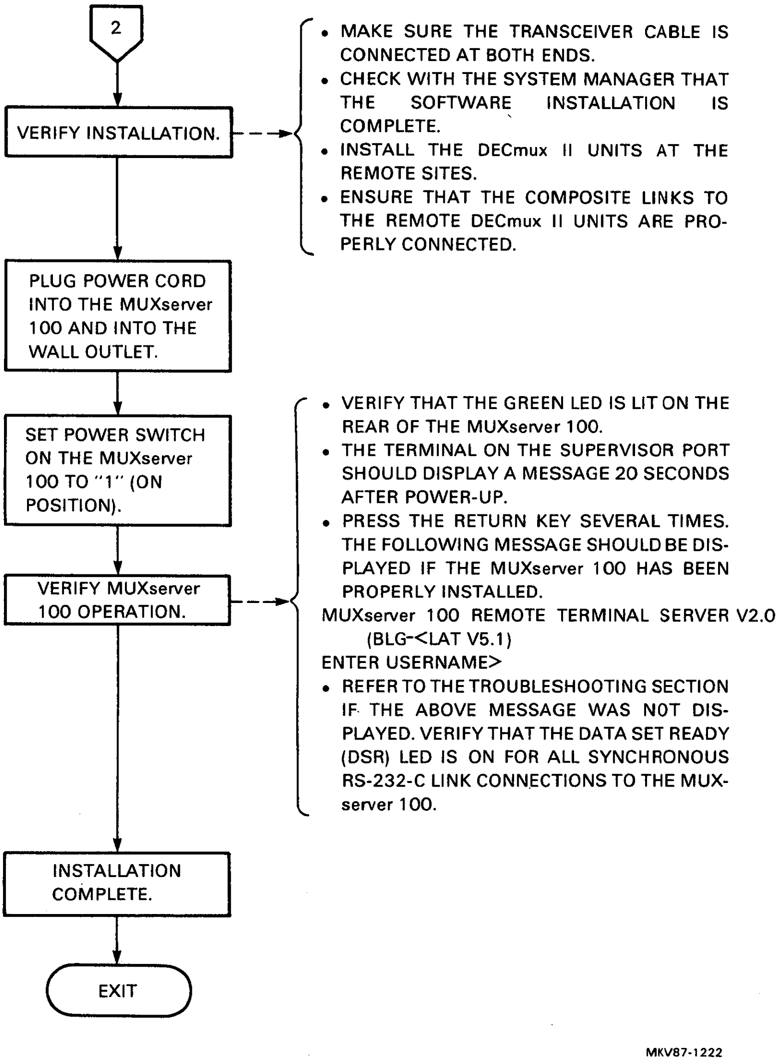


Figure 6 Installation Flow Diagram (Sheet 3 of 3)

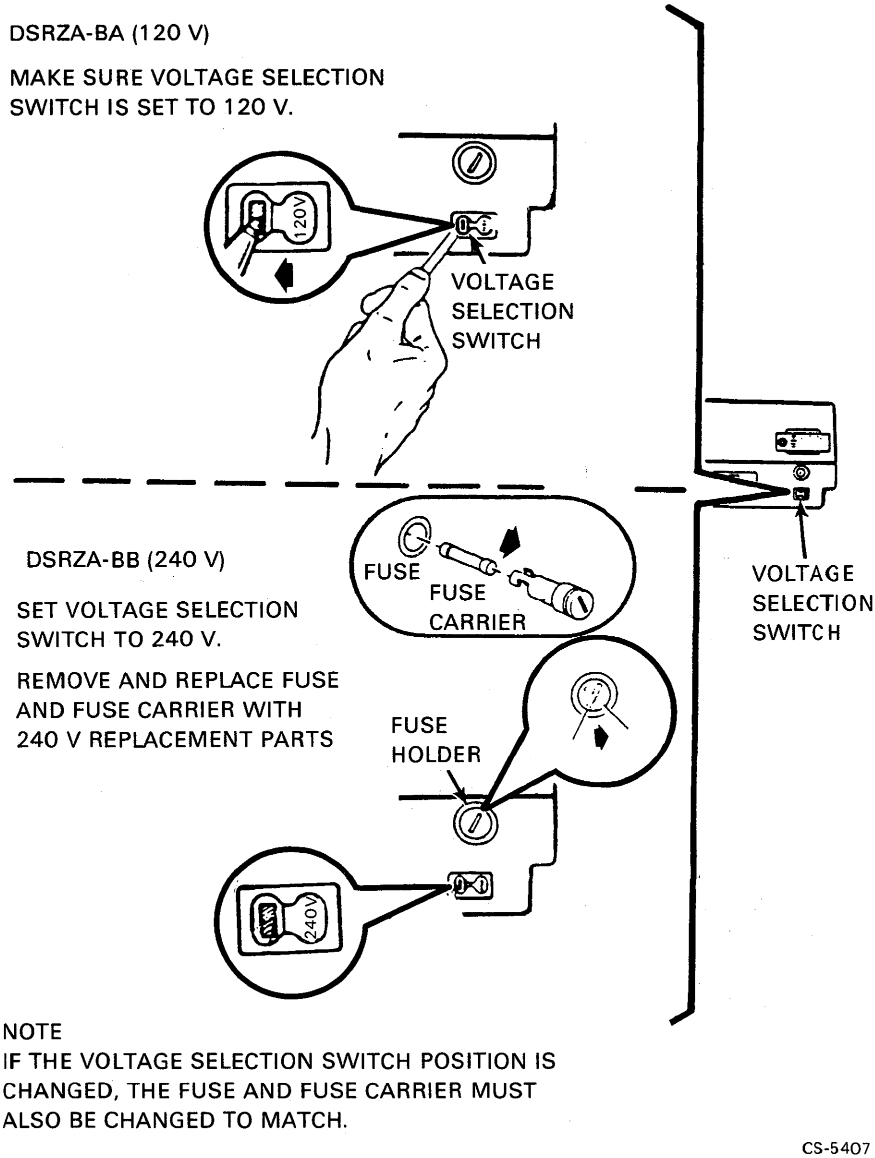


Figure 7 Voltage Selection Switch and Fuse Carrier

Cabling
Figure 8 illustrates how the MUXserver 100 is connected.

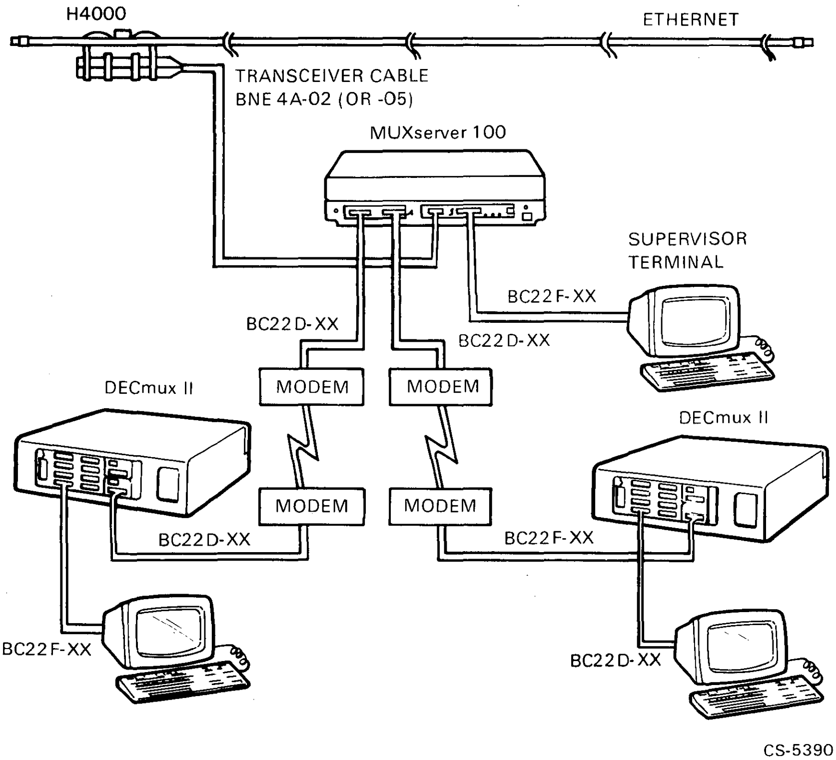


Figure 8 Cable Requirements for a Typical MUXserver 100 Installation

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

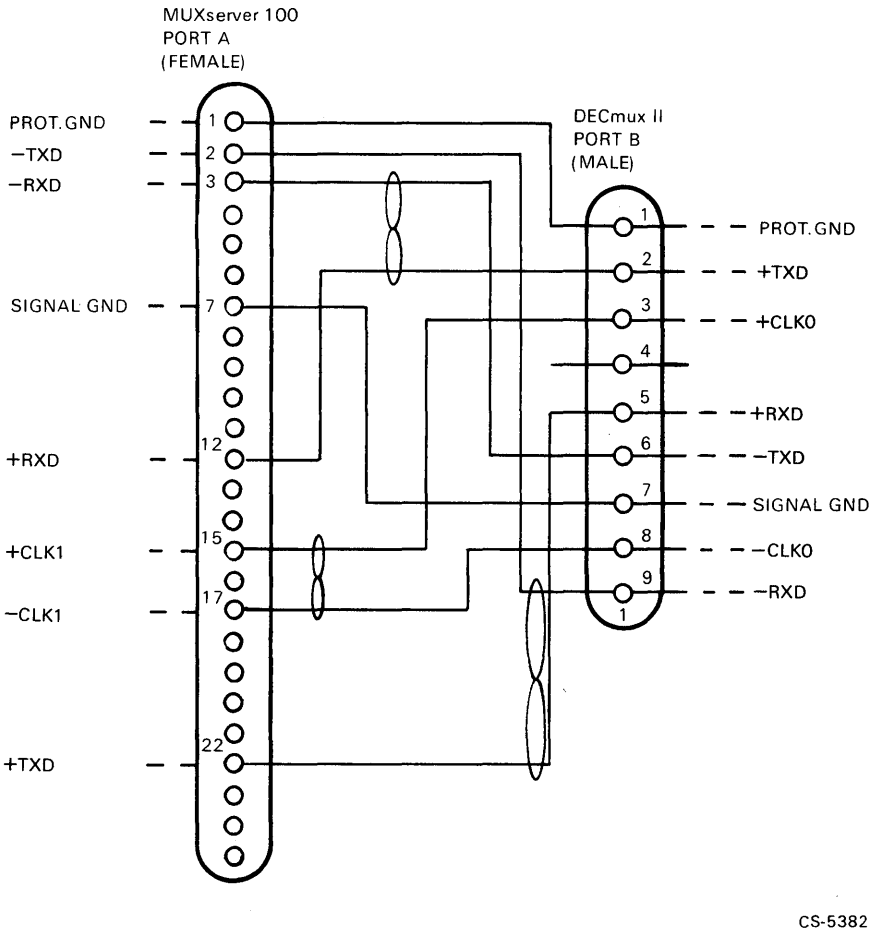


Figure 9 RS-422 DECmux II (Port B) to MUXserver 100 (Port A)

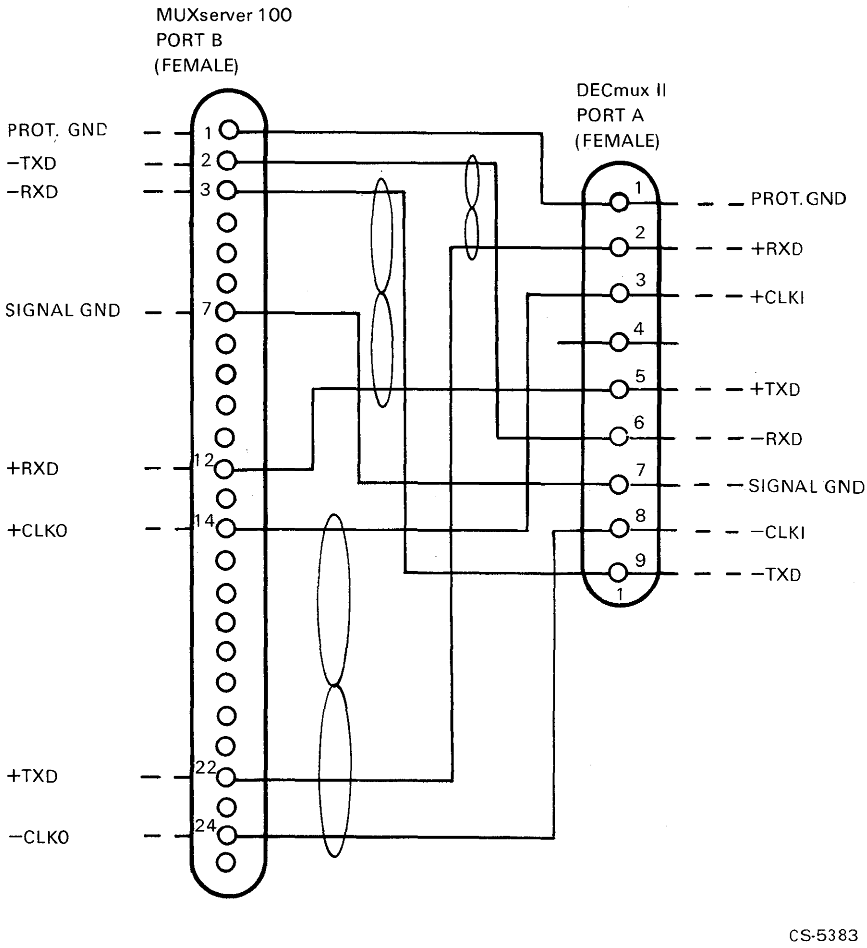


Figure 10 RS-422 DECmux II (Port A) to MUXserver 100 (Port B)

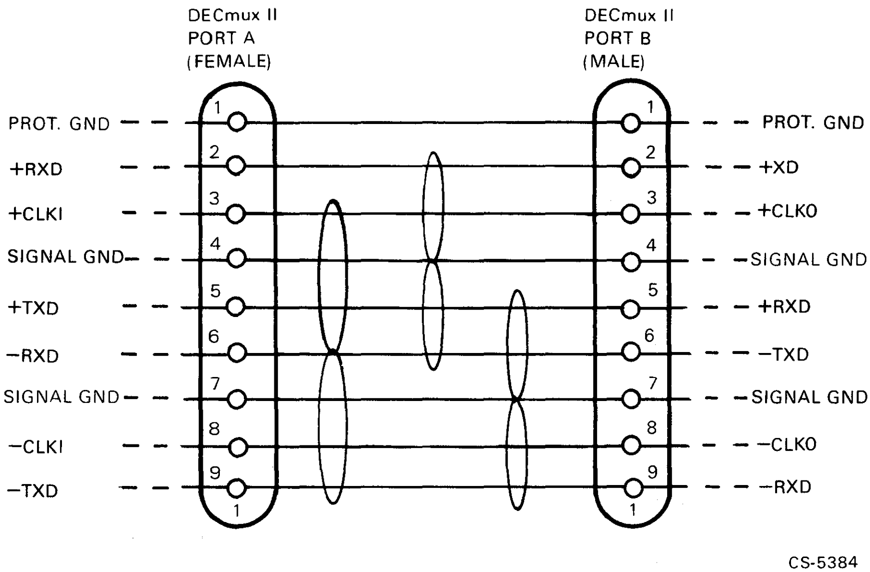


Figure 11 RS-422 Port A to Port B (DECmux II)

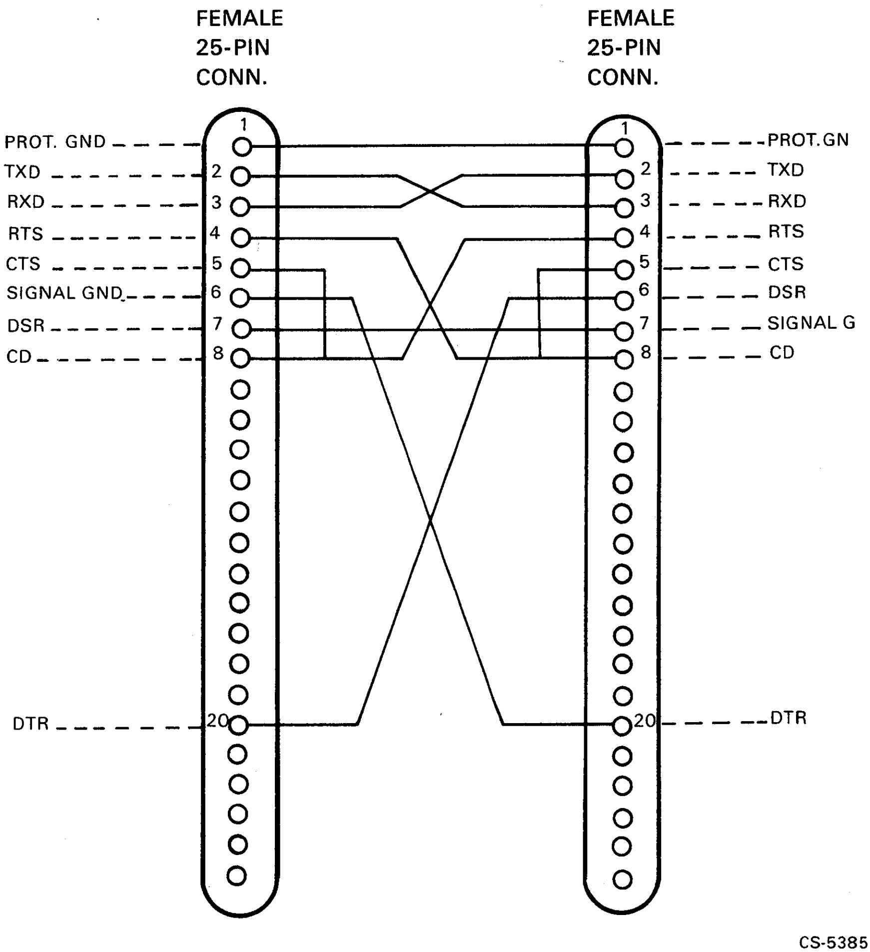


Figure 12 RS-232-C Asynchronous Null Modem Connection

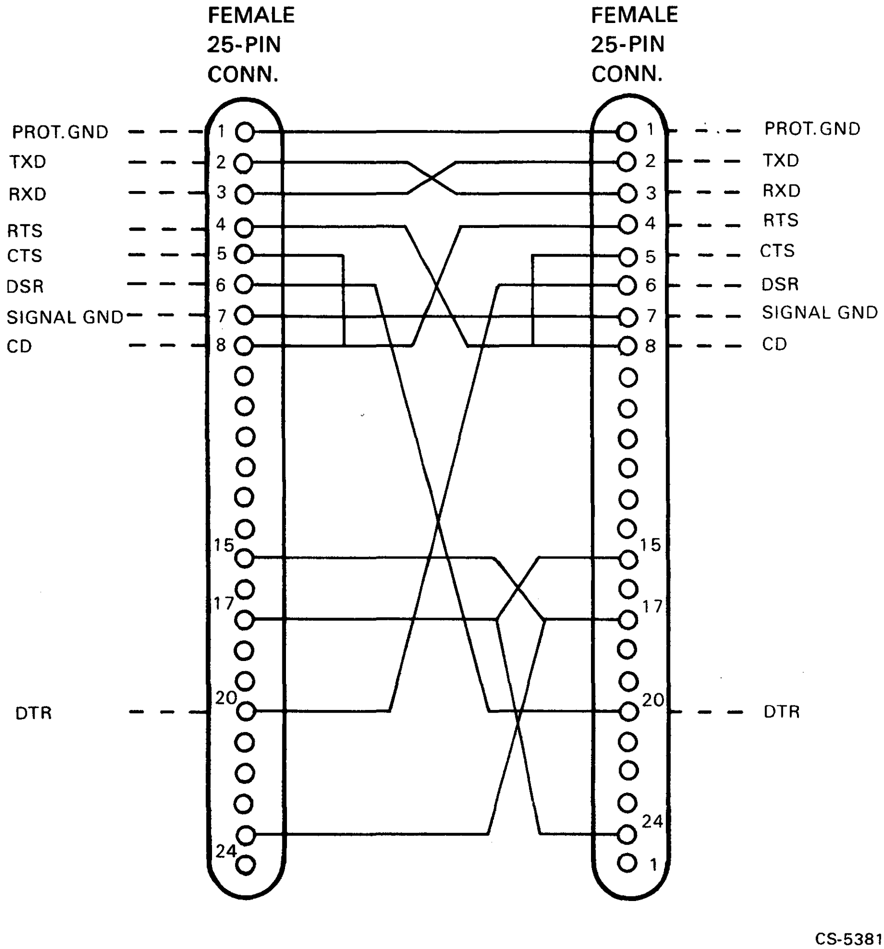


Figure 13 RS-232-C Synchronous Null Modem Connection

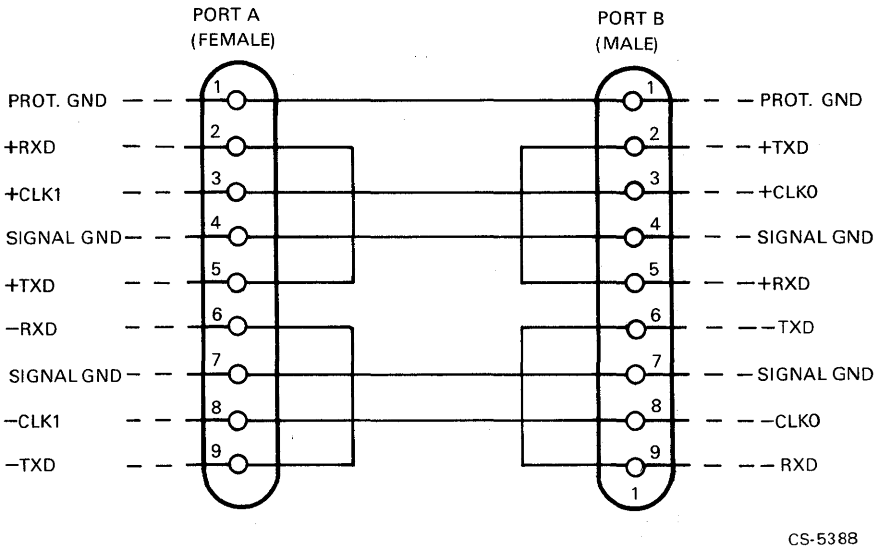


Figure 14 Cable RS-422 Test (DECmux II)

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).

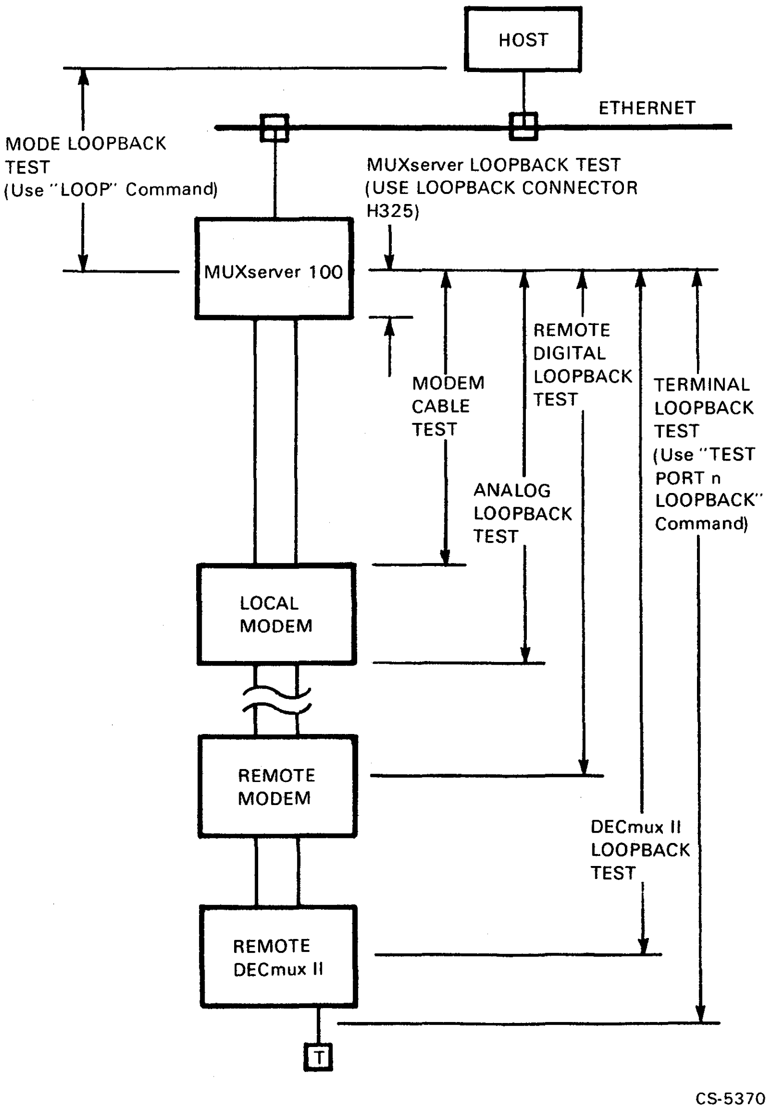


Figure 15 Diagnostic Test Loopback Points

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.

MUXserver 100 MAINTENANCE AIDS

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.

MUXserver 300 REMOTE TERMINAL SERVER

NOTE
This chapter has been updated to support both the MUXserver 300 and the later version MUXserver 310 products. Both the General Description section and Figure 1 have been revised, and a part number list for the MUXserver 310 has been added.

General Description

Both the MUXserver 300 and the MUXserver 310 (Figure 1) are high performance, low cost, remote terminal servers for use on Local Area Networks (LAN). Both MUXservers interface up to 192 (48 active for the MUXserver 300 and 16 active for the MUXserver 310) remote terminals to a LAN by way of wide area network (WAN) facilities as shown in Figure 2. The terminals are physically connected to DECmux 300 units that may be located at separate remote geographic locations. Each DECmux 300 communicates with the MUXserver either directly or indirectly (through another DECmux 300 unit) using statistical multiplexed synchronous links. These composite links are provided by synchronous modems and the leased lines of the public data networks, or local null-modem connections. Each terminal appears to have a direct connection to the computer systems and resources provided by the LAN.

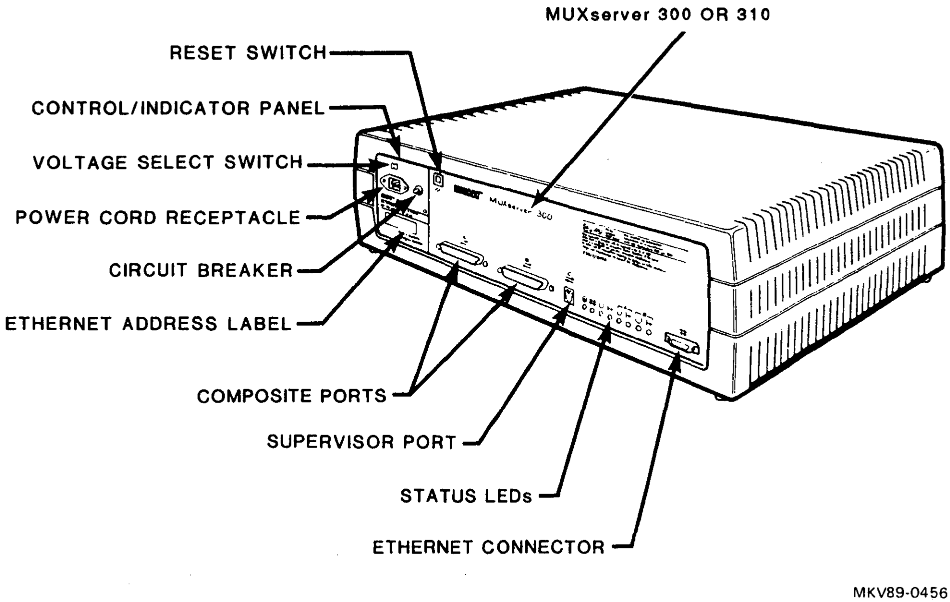


Figure 1 MUXserver 300 Remote Terminal Server

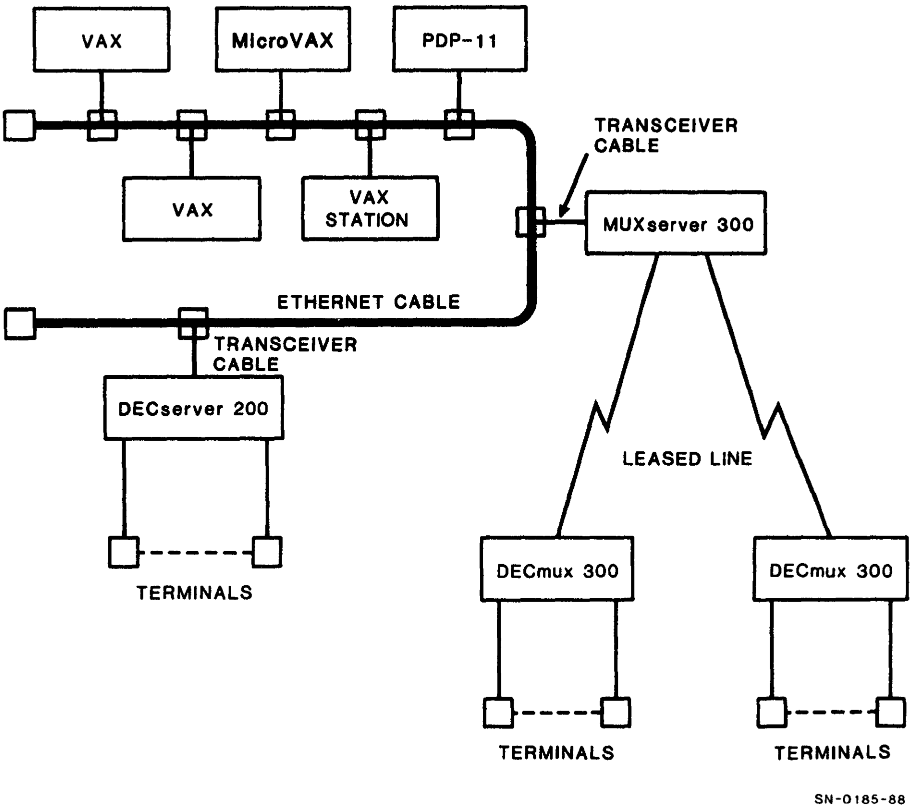


Figure 2 MUXserver/DECmux 300 Network

Features

The MUXserver/DECmux 300 remote terminal network offers the following features.

- Provides remote terminal access to a LAN.
- Permits fast, easy connections between devices attached to the remote terminal network and devices on the LAN.
- Manages device traffic and leaves computer systems with more time for application tasks.
- Reduces and simplifies the cabling required for connecting devices to the network.
- Supports dial-in and dial-out modems.
- Provides access to Digital and non-Digital host systems on the LAT network.
- Allows connection between devices on the LAN.

MUXserver/DECmux 300 Configurations

Many different configurations of MUXserver/DECmux 300 networks are possible with the following constraints.

- There can be only one MUXserver 300 in a MUXserver/DECmux 300 network.
- The maximum number of DECmux 300 units in a MUXserver/DECmux 300 network is six.
- The DECmux 300 units must be connected to the MUXserver 300 by composite links either directly or indirectly (by daisy-chaining the DECmux 300 units).
- A maximum of three DECmux 300 units can be daisy-chained together.
- The MUXserver/DECmux 300 network must be a linear network; that is, it must not contain circular composite link paths. As a result, there can be only one composite link path between any DECmux 300 and the MUXserver 300, and there can be only one composite link path between any two DECmux 300 units.

Figures 3 and 4 show two typical configurations of the MUXserver/DECmux 300 remote terminal network.

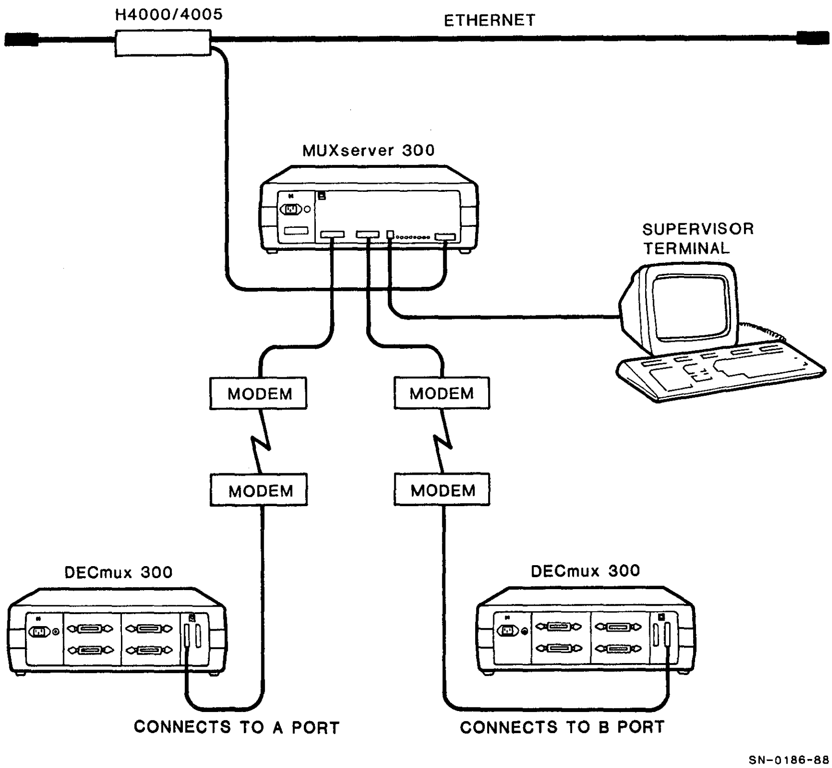


Figure 3 MUXserver/DECmux 300 Network Configuration 1

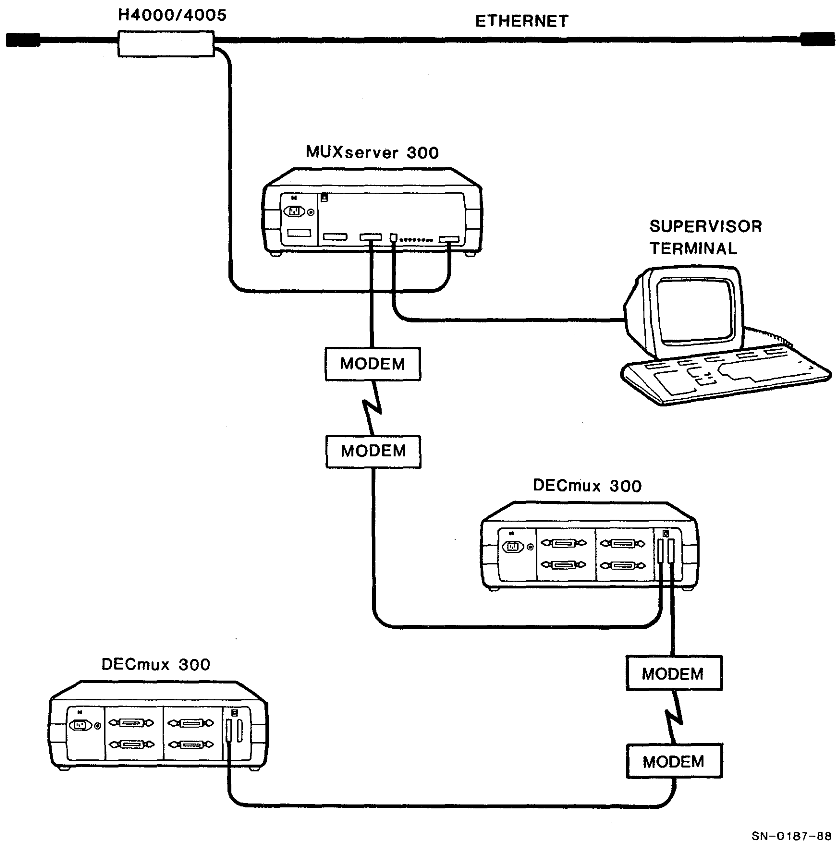


Figure 4 MUXserver/DECmux 300 Network Configuration 2

MUXserver 300 Versions
The MUXserver 300 is available in two versions. They are as follows:

Model	Input Voltage	Digital Part Number
DSRZC-AA	100 – 120 Vac	70-24790-01
DSRZC-AB	220 – 240 Vac	70-24790-02

MUXserver 310 Versions
The MUXserver 310 is available in two versions. They are as follows:

Model	Input Voltage	Digital Part Number
DSRZC-BA	100–120 Vac	70-24790-03
DSRZC-BB	220–240 Vac	70-24790-04

Reference Documentation
Refer to the following documents for more information on the MUXserver 300 remote terminal server.

- *MUXserver/DECmux 300 Software Installation Guide for VMS* — AA-MJ78A-TE
- *MUXserver/DECmux 300 Software Installation Guide for ULTRIX/ULTRIX-32m* — AA-MJ92A-TE
- *MUXserver/DECmux 300 Network Reference Manual* — EK-DSRZC-RM
- *MUXserver/DECmux 300 Network Installation Manual* — EK-DSRZC-IM
- *MUXserver/DECmux 300 User's Guide* — EK-DSRZC-UG
- *MUXserver 300 Technical Manual* — EK-DSRZC-TM
- *DECmux 300 Technical Manual* — EK-DSRZC-DM

Hardware Components
The following hardware is required for a MUXserver 300 installation.

- MUXserver 300 remote terminal server (order number DSRZC-Ax) which contains:
  - MUXserver 300 unit
  - Ethernet loopback connector (P/N: 12-22196-01)
  - Synchronous port loopback connector (P/N: H3199)
  - Rack mounting kit (P/N: H041-AC)
  - *MUXserver/DECmux 300 Network Installation Manual*
  - *MUXserver/DECmux 300 Network Reference Manual*
  - *MUXserver/DECmux 300 Network Identification Card*
  - USA/Canada country kit (P/N: DSRZA-KA)
- Country kit with power cord suitable for the country
- Transceiver cable (P/N: BNE3x-xx or BNE4x-xx)
- Adapter cable and extension cable (if required) for each synchronous composite port to be connected
- DEC OFFICE cable (P/N: BC16E with appropriate H8571-x adapter, if necessary) for supervisor port connection
- If not already installed, *either*:
  - Standard Ethernet transceiver
  - BNC TEE-connector and DESTA for ThinWire Ethernet

Software Components
MUXserver 300 operation requires the following three software packages:

1. MUXserver 300 distribution 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 – Required on *all* LAT service nodes that communicate with MUXserver 300 devices.

The distribution software must be installed on a load host that runs DECnet Phase IV software. The distribution software includes a server image file that is down-line loaded to the MUXserver 300. The server image constitutes the server software that enables the server to perform its functions.

Table 1 Minimum Operating System Version

Operating System	Version
VMS	4.6 or later
ULTRIX	2.0

Equipment Placement
The MUXserver 300 can be located in a variety of environments, including offices and computer rooms. The MUXserver 300 can be rack or wall mounted or placed on a desk or shelf.

Environmental Requirements

Temperature	5° to 50°C (41° to 122°F)
Relative Humidity	10% to 90% (noncondensing)

Physical Description (Desktop or Wall Mount Configuration)

Length	49.4 cm (19.4 in)
Height	16.2 cm (6.4 in)
Depth	31.3 cm (12.3 in)
Weight (unpacked)	6.0 kg (13.2 lb)

Power Requirements
The operating power range of the MUXserver 300 is provided in Table 2.

Table 2 DSRZC Power Requirements

Version	Nominal Voltage	Voltage Range	Current	Frequency
DSRZC-AA	120 Vac	100 - 120	0.5 A	50/60 Hz
DSRZC-AB	240 Vac	220 - 240	0.3 A	50/60 Hz

Installation Flow Diagram

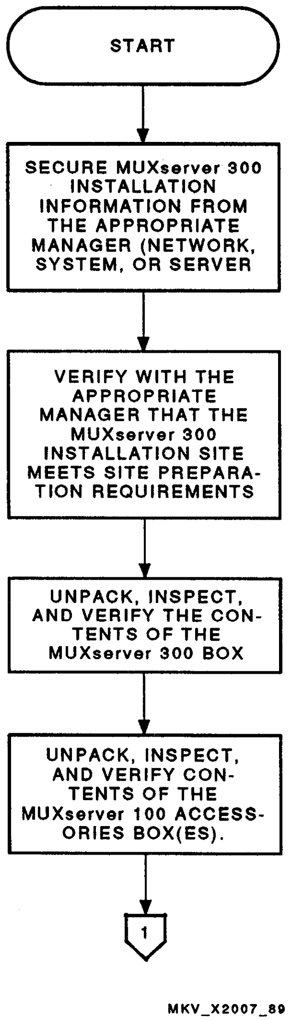


Figure 5 Installation Flow Diagram (Sheet 1 of 4)

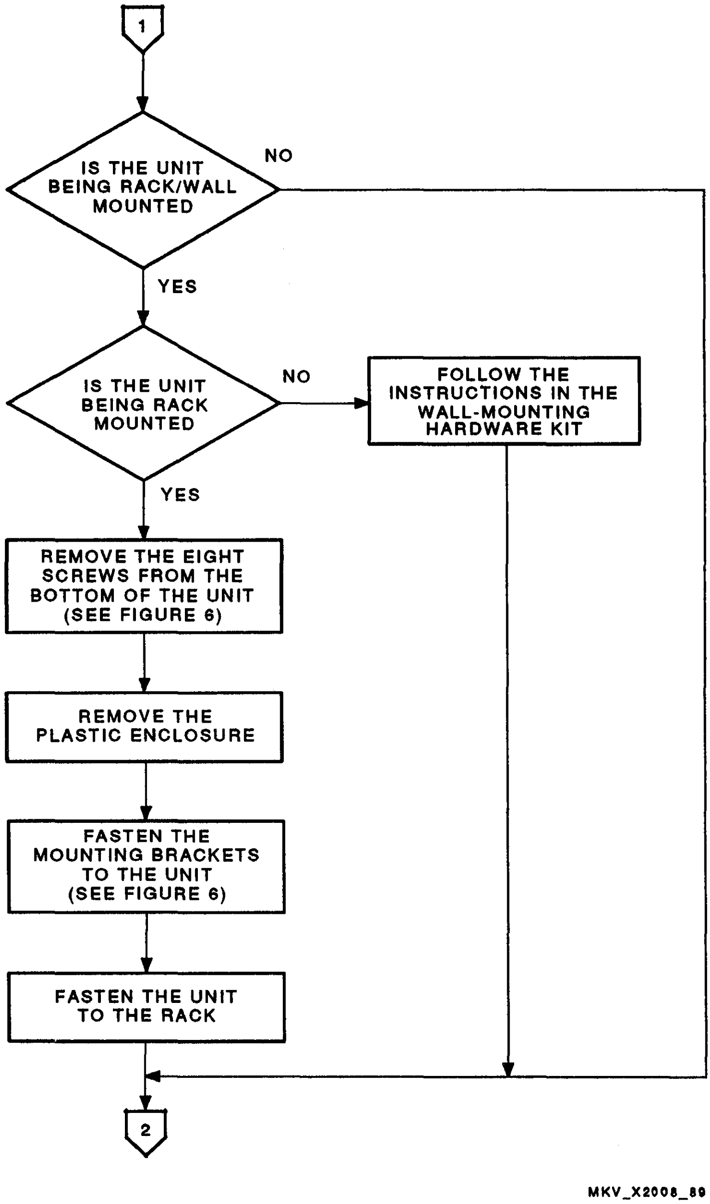


Figure 5 Installation Flow Diagram (Sheet 2 of 4)

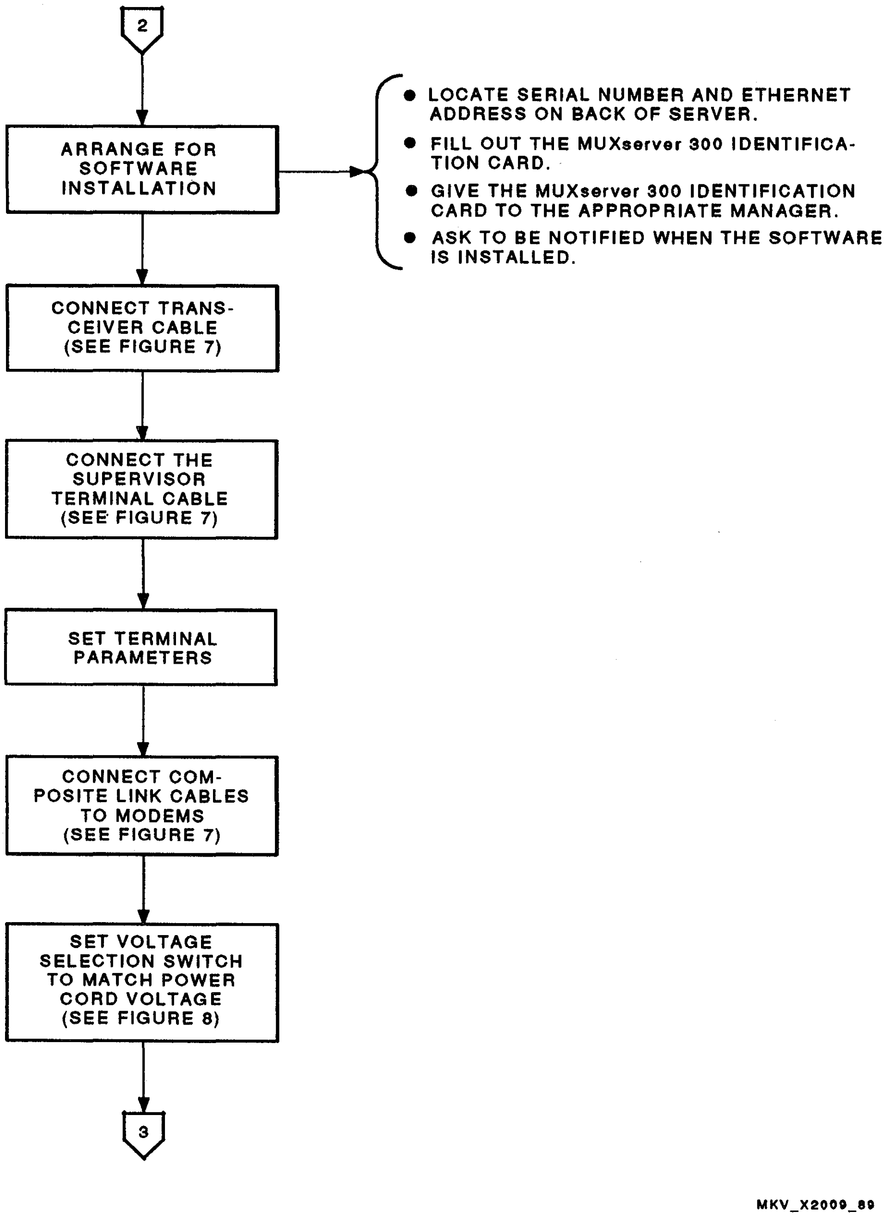


Figure 5 Installation Flow Diagram (Sheet 3 of 4)

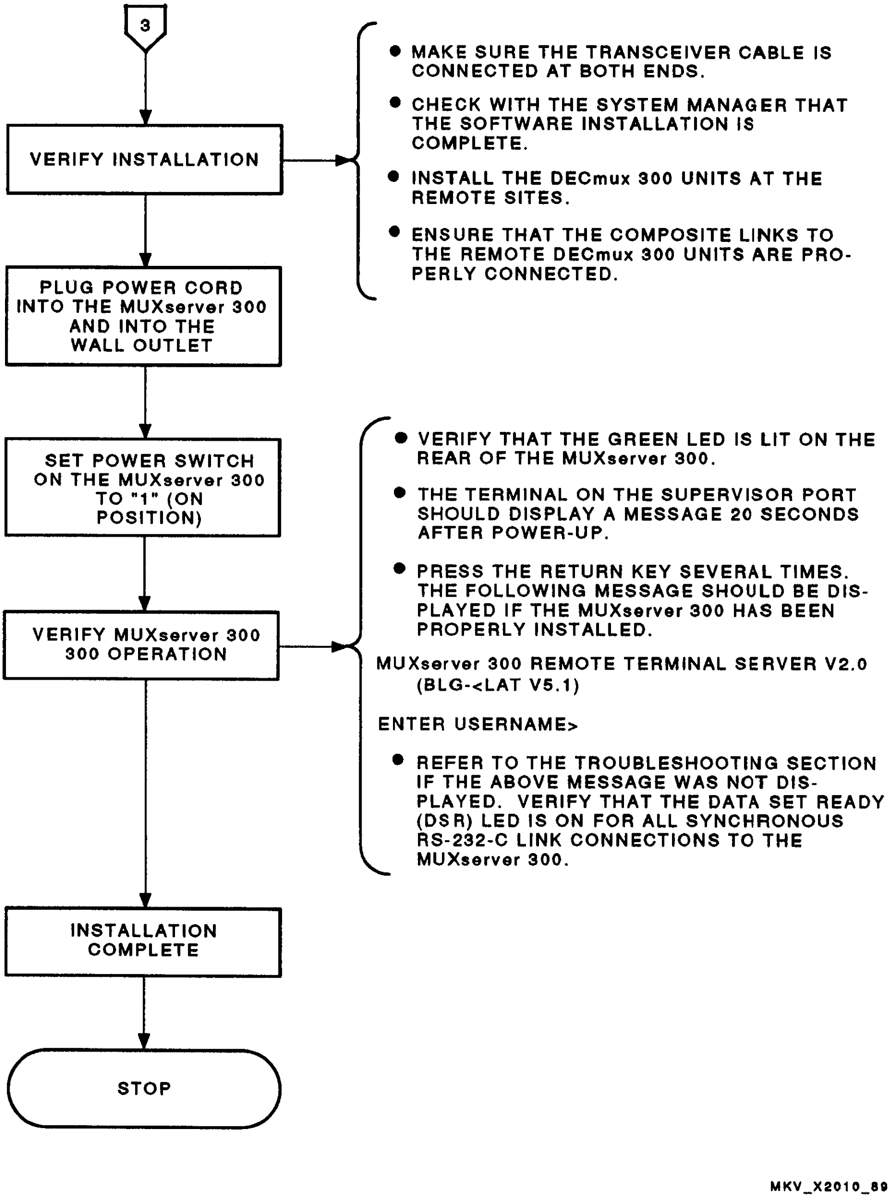


Figure 5 Installation Flow Diagram (Sheet 4 of 4)

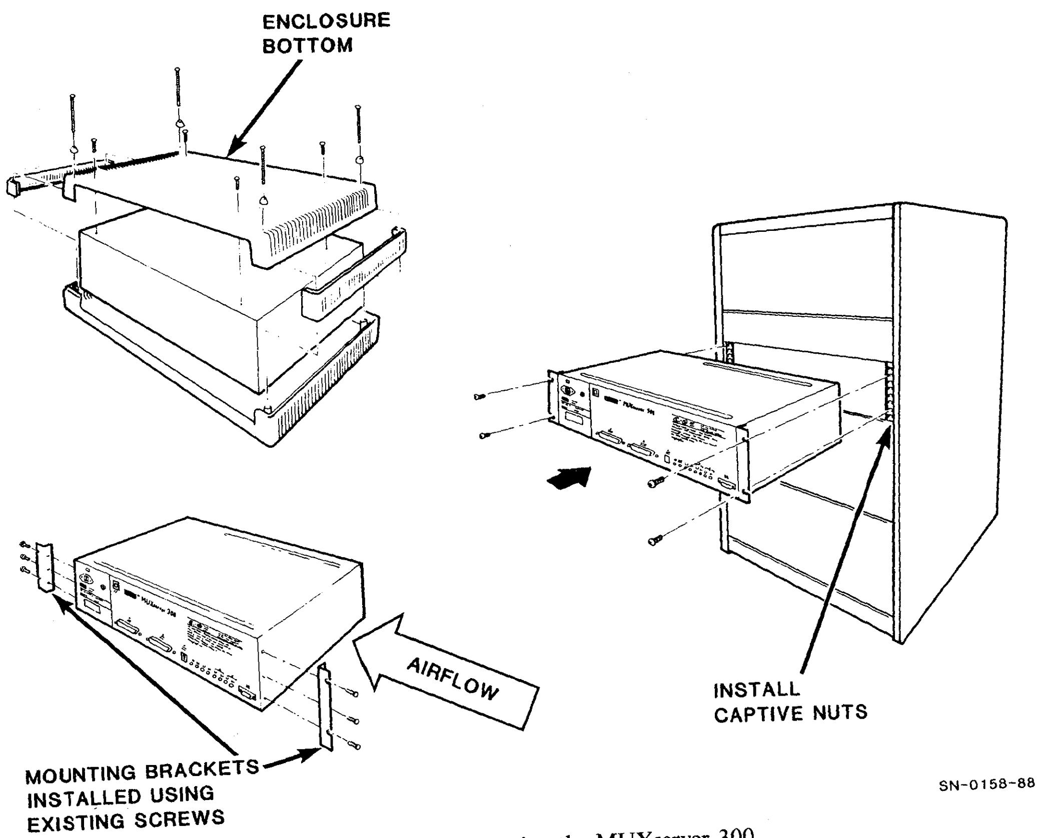


Figure 6 Rack Mounting the MUXserver 300

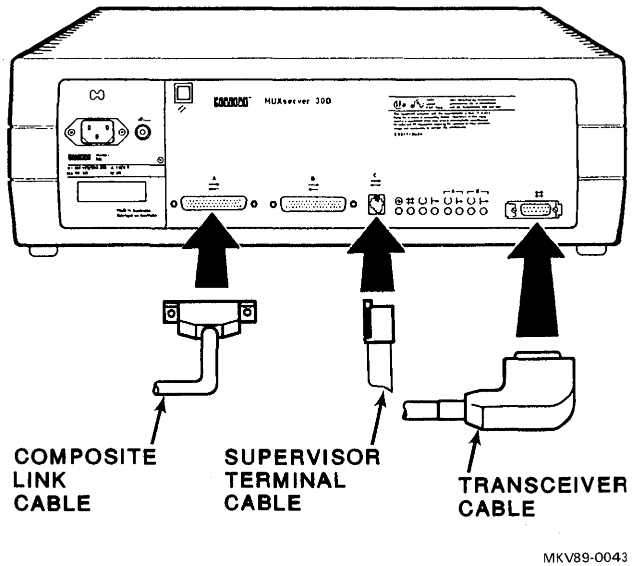


Figure 7 Connecting Cables

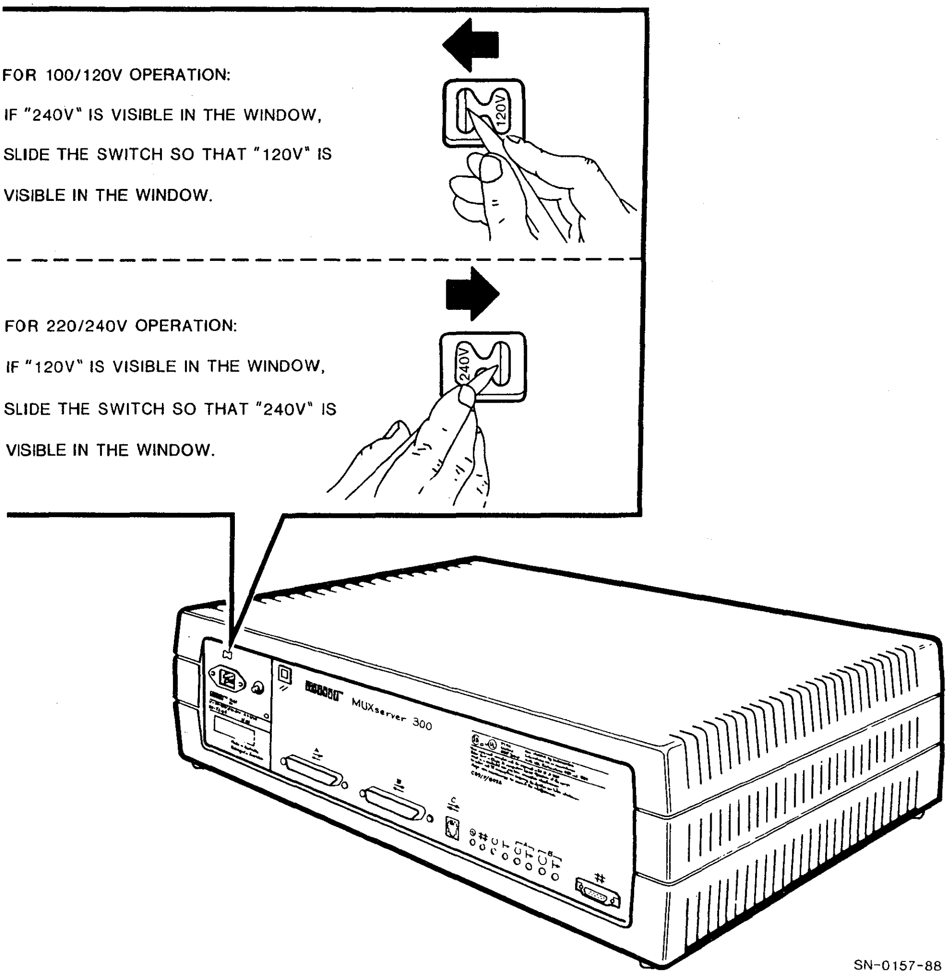


Figure 8 Selecting Operating Voltage

Cabling
The MUXserver 300 has the following three types of data ports.

- An Ethernet port
- Two synchronous composite ports
- A supervisor port

The Ethernet Port – The Ethernet port is connected to the network by a transceiver cable. The transceiver cable can be connected to one of the following items.

- Another transceiver cable section. This cable can be secured in an Etherjack junction box.
- A DELNI local network interconnect.
- A transceiver on a standard Ethernet coaxial cable for Digital baseband networks, or a DECOM for Digital broadband networks.
- A ThinWire Ethernet station adapter (DESTA) on a ThinWire Ethernet coaxial cable.
- A standard rack cabinet in a satellite equipment room (SER) for DECconnect systems.

Figures 9 and 10 show how the Ethernet port can be cabled.

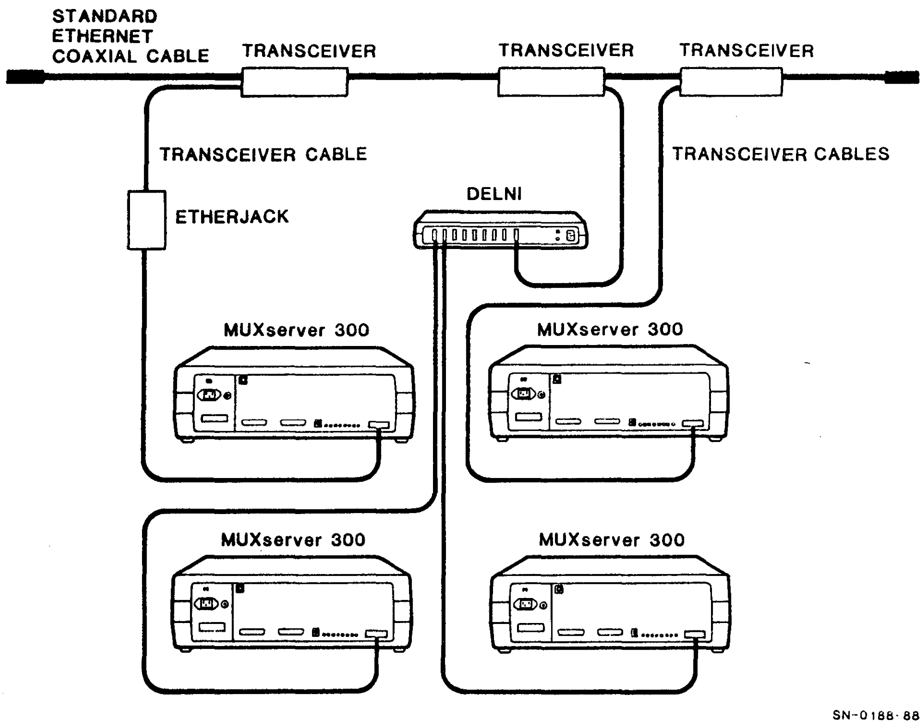


Figure 9 Standard Ethernet Coaxial Cable Connection

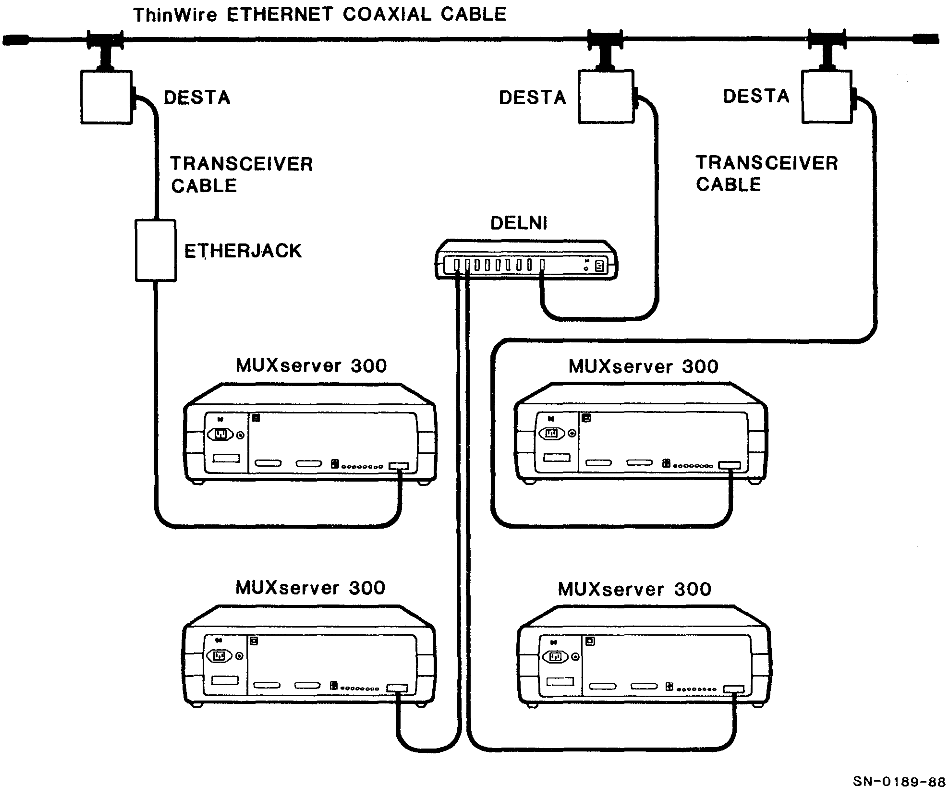


Figure 10 ThinWire Ethernet Coaxial Cable Connection

The Two Synchronous Composite Ports – A composite link (Figure 11) on the MUXserver/DECmux 300 network typically includes the following components.

- An adapter cable which connects the synchronous composite port to a synchronous modem via an extension cable.
- A synchronous modem for interfacing between the adapter cable and the leased communications line. Modems are required at each end of the communications line.
- A leased communications line which provides the physical communications path between the two MUXserver/DECmux 300 units on each end of the composite link.

The synchronous composite ports can be connected to external devices that are compatible with various interface standards. Selecting a particular interface standard for a composite port is done by using the appropriate adapter cable and extension cable if needed. Table 3 shows the various interface standards and their associated cables.

Link speeds supported for the various interfaces are shown in Table 4.

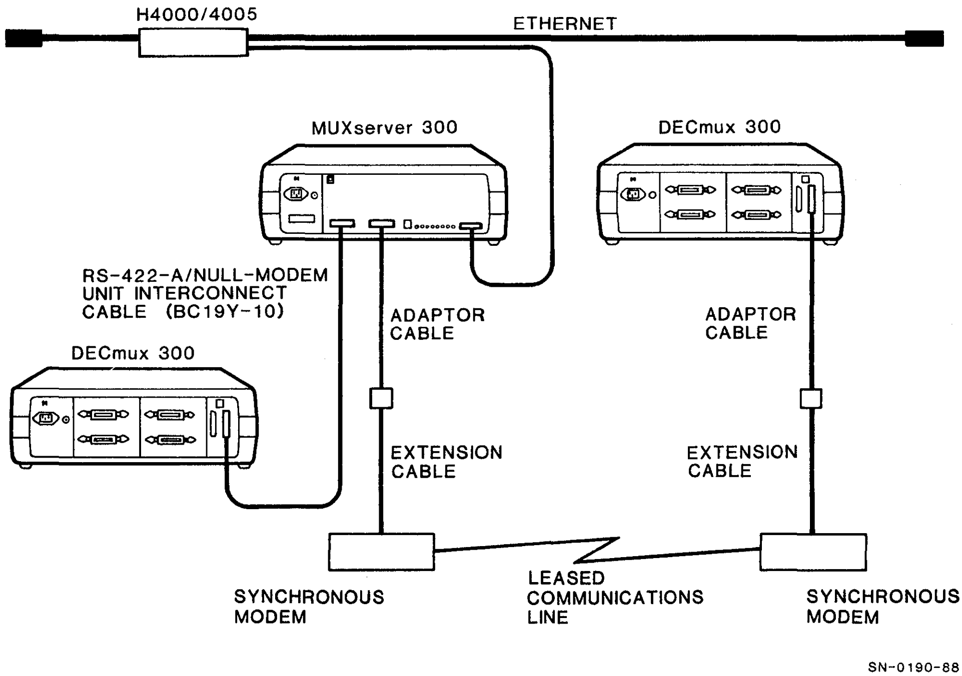


Figure 11 Composite Link Connections

Table 3 Composite Port Interface Standards and Associated Cables

Interface	Adapter Cable	Extension Cable	Loopback Connector	Cable Code
V.24/V.28/EIA-232-D[1]	BC19D-02	BC22F-xx	H3248	1101[3]
V.35	BC19F-02	BC19L-xx	H3250	1110
V.36/RS-449/RS-423-A[2]	BC19E-02	BC55D-xx	H3198	1101[3]
V.36/RS-449/RS-422-A	BC19B-02	BC55D-xx	H3198	1011[4]
X.21	BC19C-02	BC19U-xx	H3047	1100
X.21 Data Leads Only	BC22X-02	BC19U-xx	H3047	1011[4]
RS-422-A/Null-Modem[5]	BC19Y-10	–	–	1001

[1]The BC19D-02 adapter cable interfaces directly with V.24/V.28 devices. The V.24/EIA-232-D adapter connector (12-27591-01) may be needed to be used together with the adapter cable for interfacing with EIA-232-D devices. BS19D-02 is an EIA-232-D interface kit which consists of a BC19D-02 adapter cable and a V.24/EIA-232-D adapter connector.

[2]The V.36/RS-449/RS-423-A interface is not directly supported by the MUXserver/DECmux 300. However, in most applications, it will work with the appropriate adapter cable.

[3]The V.24/V.28 adapter cable has an identical cable code to the RS-449/RS-423-A adapter cable.

[4]The V.36/RS-449/RS-422-A adapter cable has an identical cable code as the X.21/Data Leads Only adapter cable.

[5]The null-modem unit interconnect cable is not an adapter cable. It interconnects two synchronous composite ports directly without intervening modems and communications lines.

Table 4 Link Speeds for Synchronous Composite Ports

Interface Standard	Speed Range
V.24/V.28/EIA-232-D	9.6 Kbits/s, 14.4 Kbits/s, 19.2 Kbits/s
V.35	48 Kbits/s, 56 Kbits/s, 64 Kbits/s
V.36/RS-449	9.6 Kbits/s, 14.4 Kbits/s, 19.2 Kbits/s, 48 Kbits/s, 56 Kbits/s, 64 Kbits/s
RS-422-A/Null-Modem	9.6 Kbits/s, 14.4 Kbits/s, 19.2 Kbits/s, 48 Kbits/s, 56 Kbits/s, 64 Kbits/s
X.21	9.6 Kbits/s, 14.4 Kbits/s, 19.2 Kbits/s, 48 Kbits/s, 56 Kbits/s, 64 Kbits/s
X.21/Data Leads Only	9.6 Kbits/s, 14.4 Kbits/s, 19.2 Kbits/s, 48 Kbits/s, 56 Kbits/s, 64 Kbits/s

The Supervisor Port – A DEC OFFICE cable (BC16E) connects an asynchronous terminal to the MUXserver 300 (Figure 12).

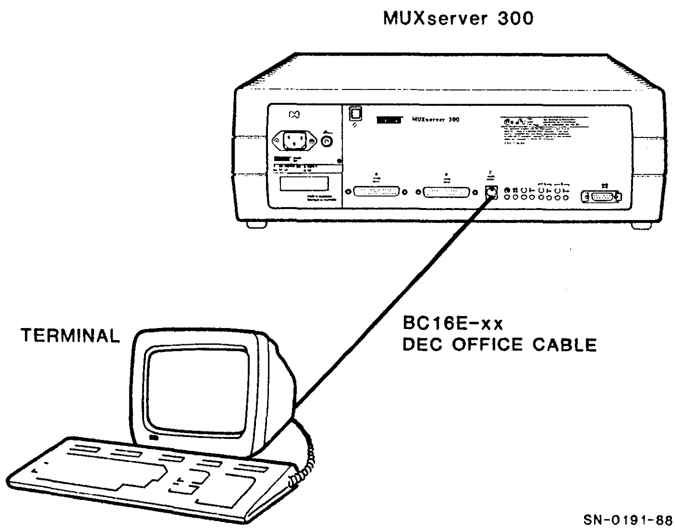


Figure 12 Supervisor Port Connection

Self-Test Diagnostics

When power is applied to the MUXserver 300, it performs a diagnostic self-test and initiates a request for a down-line load of the MUXserver 300 image from a load host. The self-test normally takes about 60 seconds to complete, but may take longer if the network is busy.

Informational messages are displayed on the supervisor terminal when self-test is complete and the image down-line load proceeds.

Allow a minimum of 3 minutes for the self-test and down-line loading of the MUXserver 300 image to complete, then compare the state of the four green status LEDs on the MUXserver 300 with Figure 13.

For definitions of the status LEDs see Table 5. For additional information see the Troubleshooting section in this document.

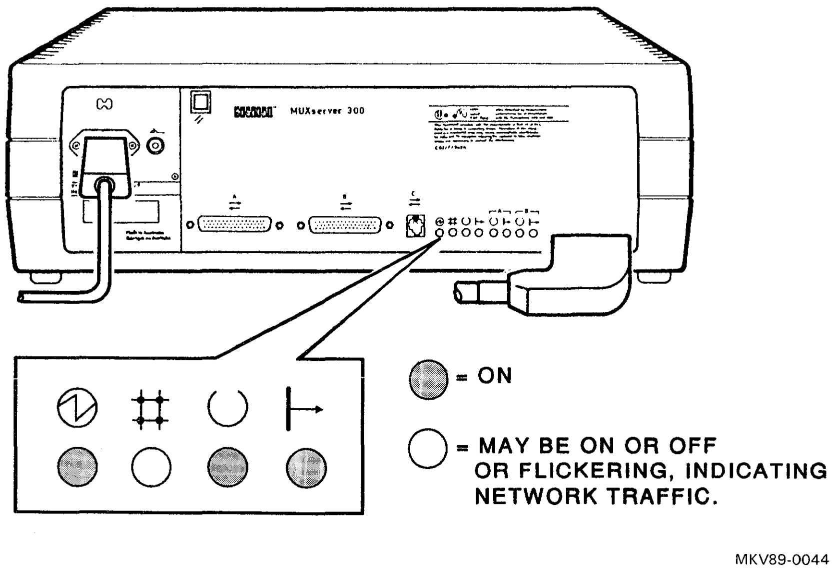
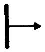


Figure 13 MUXserver 300 Status LEDs

Table 5 MUXserver 300 Status Indicator LEDs

LED Name	Symbol	Color	State	Symptom
Power Indicator		Green	ON	MUXserver 300 internal dc supply voltages are correct
			OFF	MUXserver 300 internal dc supply voltages are incorrect
Ethernet Traffic		Green	ON, OFF, or Flashing	Indicates activity on the host Ethernet network
Server Ready		Green	ON	Self-test passed
			OFF	1. Self-test in progress 2. Fatal error detected
			Flashing	Nonfatal error detected
Server On-Line		Green	ON	MUXserver 300 image successfully down-line loaded
			OFF	Down-line loading in progress
			Flashing	Multiple-load failure detected
Composite Link A Ready		Yellow	ON	Modem connected to Composite Link A is ready
			OFF	Modem connected to Composite Link A is not ready
Composite Link A On-Line		Yellow	ON	MUXserver 300 has established communications with the associated DECmux 300 on Composite Link A
			OFF	MUXserver 300 has not established communications with the associated DECmux 300 on Composite Link A
Composite Link B Ready		Yellow	ON	Modem connected to Composite Link B is ready
			OFF	Modem connected to Composite Link B is not ready
Composite Link B On-Line		Yellow	ON	MUXserver 300 has established communications with the associated DECmux 300 on Composite Link B
			OFF	MUXserver 300 has not established communications with the associated DECmux 300 on Composite Link B

Troubleshooting

What to do First –

1. Check the MUXserver 300 and DECmux 300 Status LEDs.
   a. Table 6 will help in interpreting these LEDs.
2. Check the console error messages.
   a. Examples 1 through 3 list the console error messages.
   b. Configure the console terminal for 9600 bits/s, no parity, and 8-bit characters.

Table 6 MUXserver 300 and DECmux 300 LED Indications

Symptom	Problem	Correction
Power indicator LED OFF	No dc voltage	Verify that ac power is applied to the unit. Ensure that the voltage select switch is set to the correct country voltage. Reset the circuit breaker. Replace the unit.
Ready LED remains OFF for more than 60 seconds	Fatal hardware error	Replace the unit.
Ready LED blinking	Nonfatal hardware error	See Example 1.
On-line LED blinking for more than 3 minutes	Telephone data link failure	Verify the software installation on the load host. Look at messages on supervisor port for more details.

Example 1: Error Messages

Local -920- Parameter checksum error on port n
Local -921- Factory-set parameters applied to port n

Local -922- Port hardware error on port n
Local -923- Port n has been disabled

Local -930- Server parameters checksum error
Local -931- Factory-set server parameters applied

Local -932- Hardware revision level checksum error

Local -933- Station parameter checksum error
Local -934- Factory-set station parameters applied

Local -935- Service parameter checksum error
Local -936- Service has been disabled

Local -937- Link characteristics checksum error
Local -938- Factory-set link parameters applied

Local -941- Transceiver loopback error
Local -942- Image load not attempted
Local -950- Troubleshooting procedures should be followed

Local -943- Transceiver heartbeat error
Local -944- Check transceiver type for heartbeat support

Example 2: Image Fails to Load

Local -901- Initializing DECserver xx-xx-xx-xx-xx-xx - ROM
Bln, H/W Rev x.x
Local -902- Waiting for image to load
Local -903- Loading from host xx-xx-xx-xx-xx-xx
Local -912- Load failure, timeout

Local -902- Waiting for image to load
Local -912- Load failure, timeout

Example 3: Fatal Bugcheck

Local -913- Fatal Bugcheck PC=n, SP=n, SR=n, MEM=n, CODE=n

3. Use the SHOW LINK COUNTERS command to view the link counters for both link A and link B. The line statistics might indicate a problem area. Example 4 provides a sample of the link A counters obtained by using the SHOW LINK A COUNTERS command. A definition of the counters is also provided.

Example 4: SHOW LINK A COUNTERS

Link A: HDLC/LAPB   Station: NSG_SYDNEY

Seconds Since Zeroed:	1234567890	Receive Failures:	1234567890
Bytes Received:	1234567890	Receive_CRC Errors:	1234567890
Bytes Sent:	1234567890	Receive_Size Errors:	1234567890
Frames Received:	1234567890	Receive_Sequence Errors:	1234567890
Frames Sent:	1234567890	Send Failures (REJ Rcv'd):	1234567890
Invalid Frames Rcv'd:	1234567890	Polls Received:	1234567890
FRMR Frames Rcv'd:	1234567890	Remote Reply Timeouts:	1234567890
Receive Overrun:	1234567890	RNR Frames Received:	1234567890
Transmit Underrun:	1234567890	Local Buffer Errors:	1234567890

Counter Definitions:

Seconds Since Zeroed:	Seconds since counts last zeroed.
Bytes Received:	Total number of bytes received.
Bytes Sent:	Total number of bytes transmitted successfully.
Frames Received:	Total number of I frames received.
Frames Sent:	Total number of I frames transmitted successfully.
Invalid Frames Rcv'd:	Count of frames received with invalid address or control field.
FRMR Frames Rcv'd:	Count of FRMR frames received. A frame with a nonrecoverable error has been received at the other end. The link is reset on receiving an FRMR frame.
Receive Overrun:	Count of USART Rx overrun errors.
Transmit Underrun:	Count of Tx underrun errors during DMA.
Receive Failures:	Sum of Receive_CRC/Size/Sequence error counts.
Receive_CRC Errors:	Count of CRC errors in frames received.
Receive_Size Errors:	Count of frames that are too long or too short.
Receive_Sequence Errors:	Count of sequence errors in frames received. Frames have been corrupted and discarded.

Send Failures (REJ Rcv'd):	Count of REJ frames received. Frames transmitted have been corrupted and discarded. The receiver is requesting retransmission of frames.
Polls Received:	Count of frames received with the P· bit set. Start link requests or idle messages are received when count is incrementing.
Remote Reply Timeouts:	Count of number of T1 timeouts. Receiver has not acknowledged the transmitted frames within the period of the retransmit timeout.
RNR Frames Received:	Count of RNR frames received. The receiver is not ready to receive because the number of frames for forwarding increases above limit.
Local Buffer Errors:	This station has temporarily run out of buffer.

Problems With the Composite Link – Use the following procedure when troubleshooting the composite link from either the MUXserver 300 or DECmux 300.

1. Connect a console terminal to the local unit.
2. Press the <RETURN> key a few times and log into the Local mode. If the DECmux 300 has not established communications with the MUXserver 300, the Standalone mode will be entered instead of the Normal mode. Under the Standalone mode, only the following commands are allowed.

   SET/DEFINE/SHOW/LIST [LINK | PORT | STATION]
   TEST [LINK | PORT]
   SET/DEFINE PRIVILEGED PASSWORD
   SET PRIVILEGED

3. Use the SET PRIVILEGED command, then continue with the next step.
4. Enable broadcast on the console port by using the SET PORT BROADCAST ENABLED command. It may be necessary to reset the unit parameters to the factory defaults. If so, press and hold the Reset button while removing and reinserting the ac power cord.

After verifying the power and interface connections to the MUXserver 300, DECmux 300, and modems, proceed with Table 7.

Table 7 Composite Link Problem Checklist

Item	Action
Communication line incorrect	Verify that the leased line (for X.21 only leased line operation is supported) has been arranged with the common carrier or Public Telephone & Telegraph (PTT) authorities.
Network incorrectly configured	Verify that the network is correctly installed.
Link state OFF	Use the SHOW LINK command to verify that the link state is ON. If the link state is OFF, use the SET/DEFINE LINK command to set the link state ON.
Link address incorrect	Use the SHOW LINK CHARACTERISTICS command to verify the link address. Use the SET/DEFINE LINK ADDRESS command to set the link address to DTE, DCE, or DYNAMIC. When one end of the composite link is addressed DTE, then the other end must be addressed DCE. Both ends of the link can be addressed DYNAMIC. **NOTE: DYNAMIC is the recommended setting.**
Synchronous modem speeds and interface standards incompatible	Check speeds and interface standards on both sides of the composite link. The two ends of the composite link will normally use the same standard, but not always. The speed will almost always be the same at each end.
Interface type and link speed incorrect	If the parameters stored in the dynamic link database are different from those detected at link start-up time: • A warning message will be generated when the cable type detected is different from the cable type stored. • A warning message will be generated when the modem clock speed detected is different from the modem clock speed stored. **NOTE: This will not prevent proper operation of the MUXserver/DECmux 300 network.**
Link status disconnecting or connecting	Use the SHOW LINK command to verify that the modem is providing the correct modem signals.
Station cannot transmit frames	Ensure that the modem is providing transmit and receive clock signals. Use the SHOW LINK CHARACTERISTICS command and compare the actual values stored with the mode speed and interface cable type.

Table 8 Composite Link Status LEDs

Ready	On-Line	Problem and Correction
ON	OFF	**Problem:** Modem not on-line **Correction:** Use the SHOW LINK command to display the link status. If the link status is Running, and the On-Line LED is OFF, replace the unit. If the link status is other than Running, verify that the link state is ON and the output signals are DTR and RTS. Use the SET LINK STATE ON command if the link state is OFF. If the output signals are not DTR and RTS, wait a few seconds and then try again. If the input signals are not DSR, DCD, and CTS, go to the **Fault Isolation Procedure for Composite Link Problems** section that immediately follows this table.
		Problem: Composite link not ready (on the other end of the link). **Correction:** Check the composite link ready at the other end of the link. Using this table, perform the indicated corrective action on the other end of the link.
OFF	N/A	**Problem:** Modem is not activating the carrier detect circuit. **Correction:** Check the modems on both ends of the link. Some modems like to see data terminal ready (CCITT 108/2) ON before asserting data carrier detect (DCD). Use the SHOW LINK command to check that the link state is ON and that the DTR status is ON.
		Problem: Network terminating unit (NTU) is not activating the indicate (I) circuit in an X.21 network. **Correction:** Check the NTU at both ends of the link. Some NTUs like to see CTRL C before asserting the indicate (I) signal. Use the SHOW LINK command to check that the link state is ON.

Table 8 Composite Link Status LEDs (Cont)

Ready	On-Line	Problem and Correction
		Problem: Receive clock is not detected when the RS-422-A/null-modem interconnect cable is used. **Correction:** Check the units at both ends of the link. Use the SHOW LINK command to check that the link state is ON. Check that the composite link cable is properly connected.

Fault Isolation Procedure for Composite Link Problems – The procedure below is used to test the composite link.

1. Use the SET LINK STATE SERVICE command to set the link into the Service state.
2. Use the SET LINK command to set the interface type and link speed.
3. Use the TEST LINK LOOPBACK INTERNAL command to execute an internal loopback test.
4. When the test completes, if an error is found, the hardware is faulty. Replace the unit under test.
5. Disconnect the adapter cable from the composite link and connect the H3199 loopback connector to the unit under test.
6. Use the TEST LINK LOOPBACK EXTERNAL command to execute an external loopback test. If an error occurs, replace the unit under test.
7. When the test completes, if an error is found, the hardware is faulty. Replace the unit under test.
8. If the RS-422-A/null-modem interconnect cable is not used, skip the next step.
9. Repeat all of the above steps for the unit at the other end of the RS-422-A/null-modem interconnect cable. If the other unit is not faulty, replace the interconnect cable.
10. Connect and secure the adapter cable to the composite port.
11. Disconnect the extension cable (or modem) from the other end of the adapter cable.
12. Connect a loopback connector to the extension cable (see Table 3). Refer to the *MUXserver/DECmux 300 Network Reference Manual* for more information on loopback connectors.
13. Use the TEST LINK LOOPBACK EXTERNAL command to execute an external loopback test. If an error occurs, replace the cable under test.
14. Connect the extension cable back to the adapter at the local end.

15. Disconnect the extension cable at the remote (far) end. Connect an appropriate loopback connector to the remote end.

16. Use the TEST LINK LOOPBACK EXTERNAL command to execute an external loopback test. If an error occurs, replace the cable under test.

17. Repeat the above steps to test other extension cable segments if more then one is used.

18. Put the modem into the Local Loopback mode.

19. Use the TEST LINK LOOPBACK EXTERNAL MODEM LOCAL command to execute an external loopback test. If an error occurs, replace the modem under test.

20. Put the local modem into the Normal Operation mode, and the remote modem into the Remote Loopback mode.

21. Use the TEST LINK LOOPBACK EXTERNAL MODEM REMOTE command to execute an external loopback test. If an error occurs, repeat this procedure at the remote end of the composite link. The remote site would then become the local site. Ask the PTT authorities or common carrier to verify the telephone data link between modems.

22. Return the modems to the normal modes after fault isolation.

TPENET TWISTED-PAIR ETHERNET ADAPTER

General Description

The TPENET is an unshielded, twisted-pair (TP), Ethernet adapter that allows the use of unshielded TP cable from the Ethernet wiring closet to the desktop. TPENET meets IEEE 802.3 specifications and delivers 10 Mbits/s performance to desktop and local systems. This level of performance is designed for up to 70 m (229.7 ft) of unshielded TP building cable.

A DEMPR, normally located in the wiring closet, connects Ethernet to the TPENET. Characterized TP cable connects the TPENET to a desktop device. A desktop device can be a VAXmate, a VAXstation 2000, or a PC with a DEPCA, DELUA, or DELQA Ethernet controller. TP cable is used in addition to ThinWire Ethernet cable to provide flexibility in the office.

Product Configuration

Figure 1 shows a typical configuration. The TP adapters interface with the DEMPR on the Ethernet end and with the user's device on the other end. Figure 2 shows a typical SER-to-office TP setup.

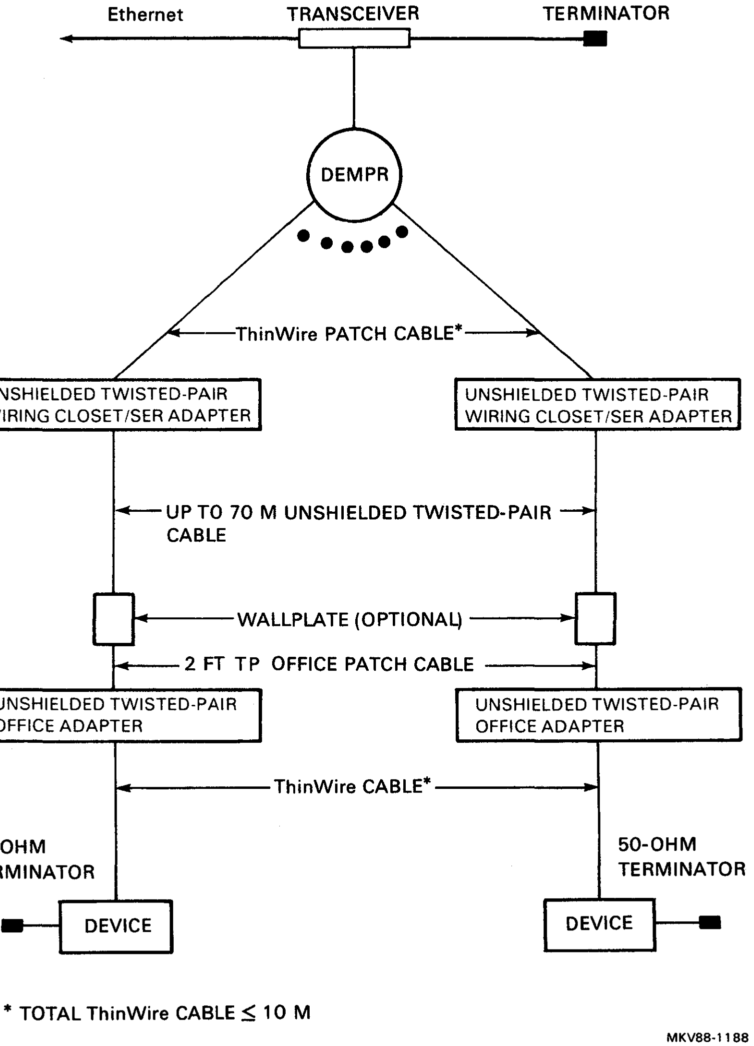


Figure 1 Unshielded Twisted-Pair Ethernet Configuration

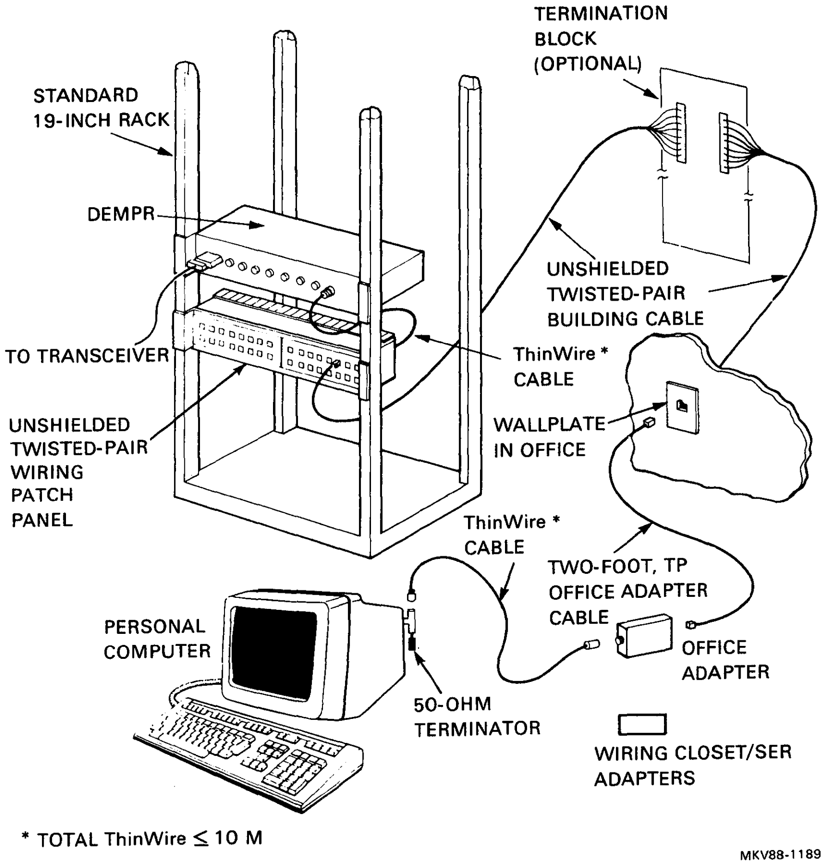


Figure 2 Typical Wiring Closet Installation

Reference Documentation

Refer to the following documents for more information on the TPENET adapter:

- *Unshielded Twisted-Pair Ethernet Adapter Installation Guide* EK-TPEIG-IN-001
- *Unshielded Twisted-Pair Ethernet Wiring Installation and Characterization* EK-TPEWC-IN-001

Hardware Components

Table 1 lists the major hardware components of TPENET.

Table 1 Hardware Components

Component	Part No.	Purpose
Rack Installation Kit	H3120	Provides 32-line rack-mount capability in the SER.
SER Adapter	H3330	A passive dual adapter board that allows the TP connections to a DEMPR. Switches located on the SER adapter allow matching to the TP line impedance (see Figure 3). The adapter retainer clips are attached for slot mounting (see Figures 4 and 5).
Office Adapter	H3310	A passive device that connects a single workstation to the TP cable. It also has an impedance matching switch (see Figure 6). The office adapter can be mounted using adhesive-backed tape or a magnetic strip (see Figures 7 and 8).

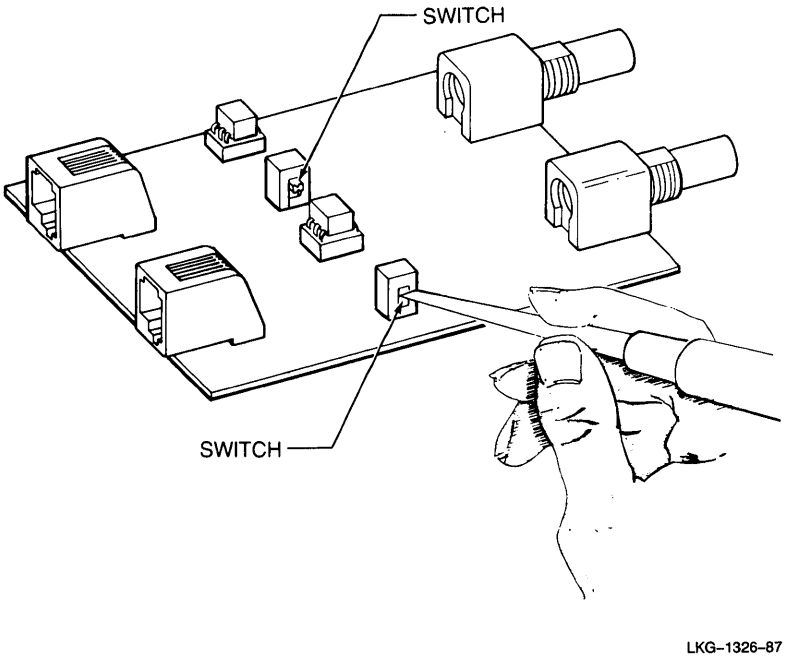


Figure 3 Setting the SER Adapter Switch

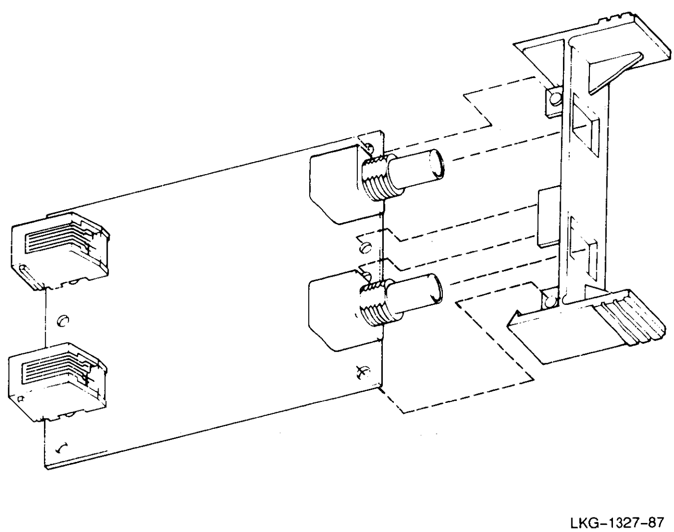


Figure 4 Attaching the Retainer Clip

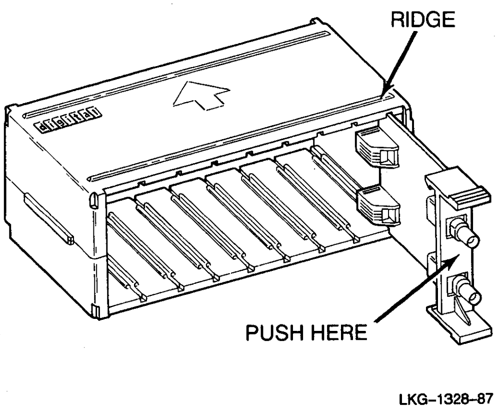


Figure 5 Inserting Adapter in Card Cage

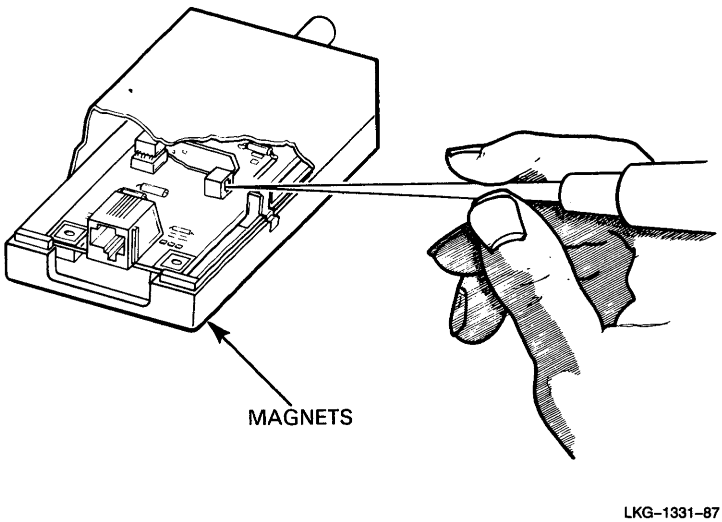


Figure 6 Setting the Office Adapter Switch

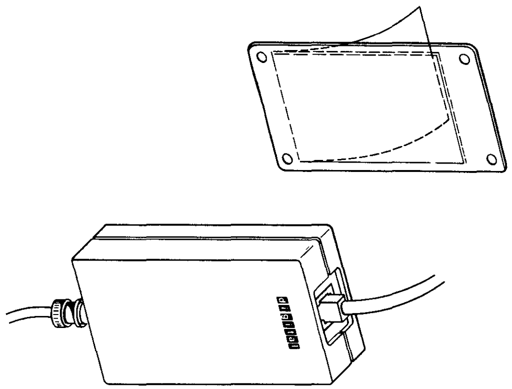


Figure 7 Adhesive Mounting

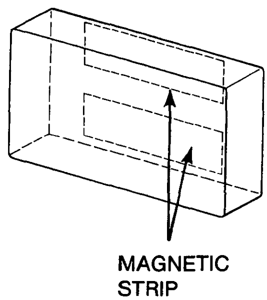


Figure 8 Magnetic Mounting

Figure 9 shows the basic SER-to-office connections.

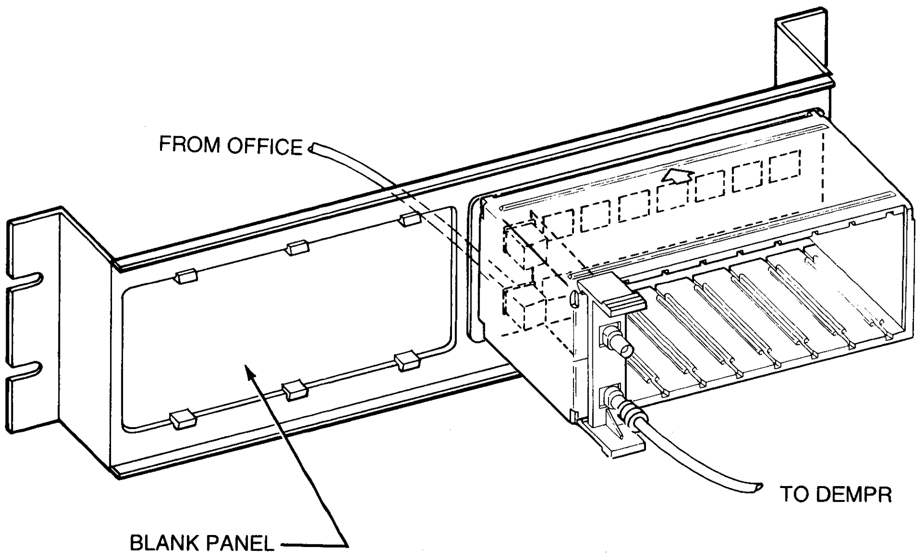


Figure 9 Wiring Closet Cabling

Environmental Considerations
Table 2 lists TPENET operational and storage limitations:

Table 2 Operational and Storage Specifications

Specification	Operating	Stored
Temperature	0°C to 60°C (32°F to 141°F)	–40°C to 66°C (–40°F to 150°F)
Relative Humidity (Noncondensing)	10% to 95%	10% to 95%
Maximum Altitude	2,400 m (8,000 ft)	12,100 m (40,000 ft)

Cabling
This section provides cabling information for the TPENET adapter.

Twisted-Pair Adapters
Unshielded TP adapters connect to both ends of the TP wire. The SER adapter connects to the TP cable located in the Closet/SER. The office adapter connects to the TP end located in the office. The adapter switches are set to match the impedance for each TP cable connection. This achieves the characterization match needed for the up to 70 m (229.7 ft) of unshielded TP cable used to connect the TPENET to an office device.

Configuration Guidelines
Unshielded TP Ethernet adapters are subject to the guidelines and restrictions listed in Table 3. For more information, refer to the Site Evaluation Worksheet in Appendix A of the *Unshielded Twisted-Pair Wiring Installation and Characterization Guide.*

Table 3 TP Cabling Guidelines

Cable	Specification
24-AWG TP Wire	Up to 70 m (229.7 ft). The sheath must contain two TP-wire pairs with a minimum of four twists per foot.
ThinWire	Connect only one device to a ThinWire segment that is attached to an office adapter cable. No additional splices are allowed.
Cable Runs	Allow at least 1 foot spacing from adjacent ac power lines, buses, transformers, fluorescent lamps, and any high-voltage devices along the entire TP cable route. Avoid all RF interference and EMI coupling.
	Allow no other signals to share the adapter signal TP cable sheath, including: EIA, DEC423, token ring, telephone, data, or other TP signals.
	Allow no line taps in the TP cable run from the wiring closet to the office.
Punchdowns	Use no more than two punchdown blocks. If a punchdown pair is used, building cable and patching must be the same type of TP wire.
	No length limitation is required between punchdowns used within up to 70 m (229.7 feet), however, the maximum dc aging resistance allowed is 100 milliohms.

Twisted-Pair Cables
The TP adapters accommodate the following types of TP cables that meet the characterization requirments.

- AT&T-C plenum
- AT&T-D nonplenum
- Northern Telecom (NT) 3-pair
- IBM type 3
- DECconnect plenum
- DECconnect nonplenum

MMP Connections
Figures 10 through 13 show the four types of MMP cables.

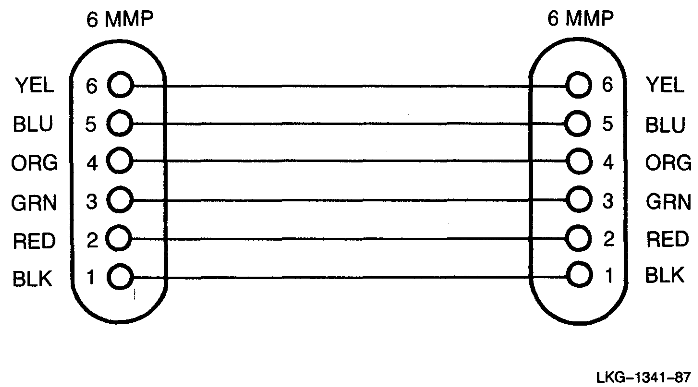


Figure 10 6MMP-to-6MMP Pin Diagram (DIGITAL/2 Foot)

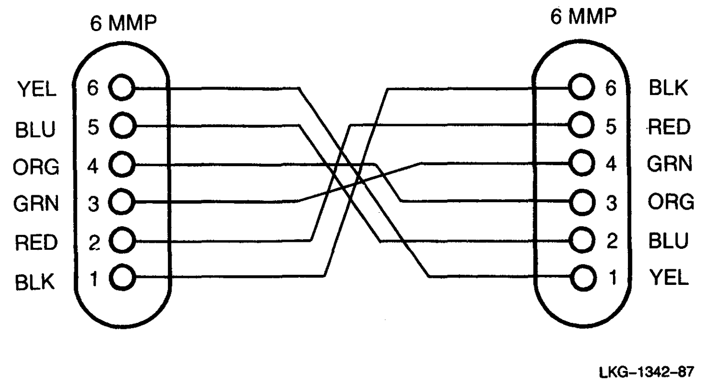


Figure 11 6MMP-to-6MMP Pin Diagram (DIGITAL/3 Foot)

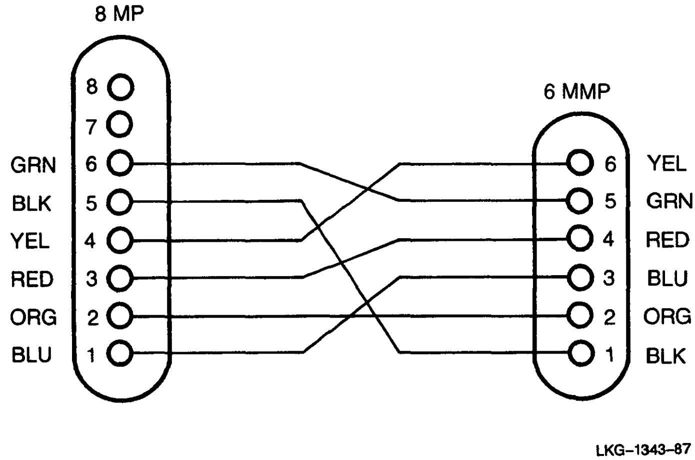


Figure 12 8MP-to-6MMP Pin Diagram (AT&T)

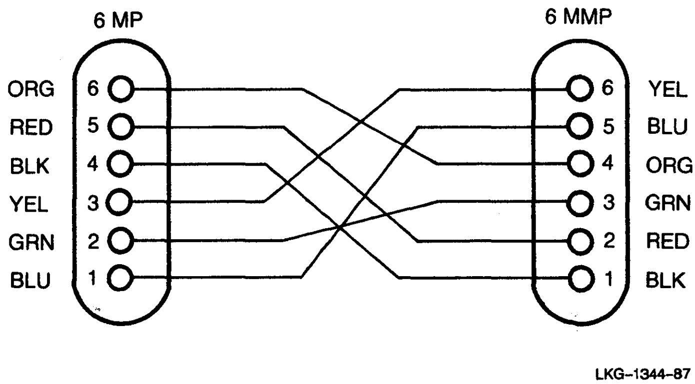
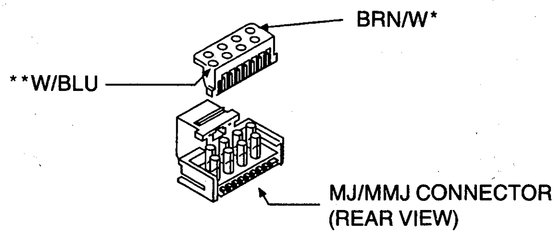


Figure 13 6MP-to-6MMP Pin Diagram (Northern Telecom)

MJ/MMJ Connections

Figures 14 and 15 show the connector and punchdown.



* BRN/W DENOTES A BROWN OUTER RING WITH A WHITE CENTER DOT.

** W/BLU DENOTES A WHITE WIRE WITH A BLUE TRACER.

LKG-1426-87

Figure 14   H3112-A Connector for TP Use

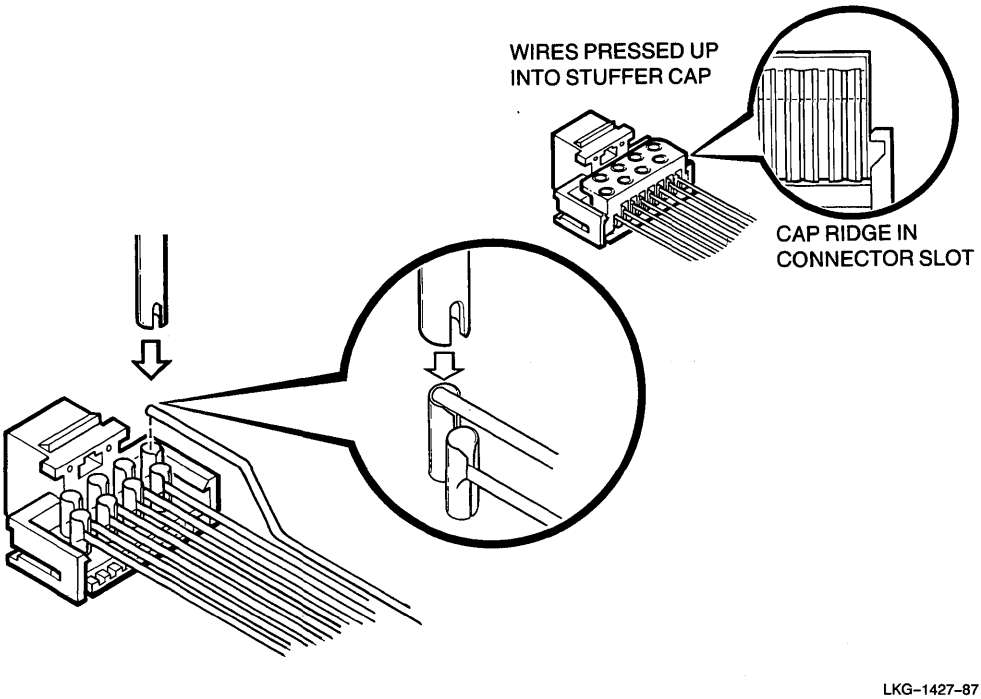


Figure 15 Punchdown Connections

Connectors and Connections
Figure 16 shows an AT&T connection. Figure 17 shows a Northern Telecom connection.

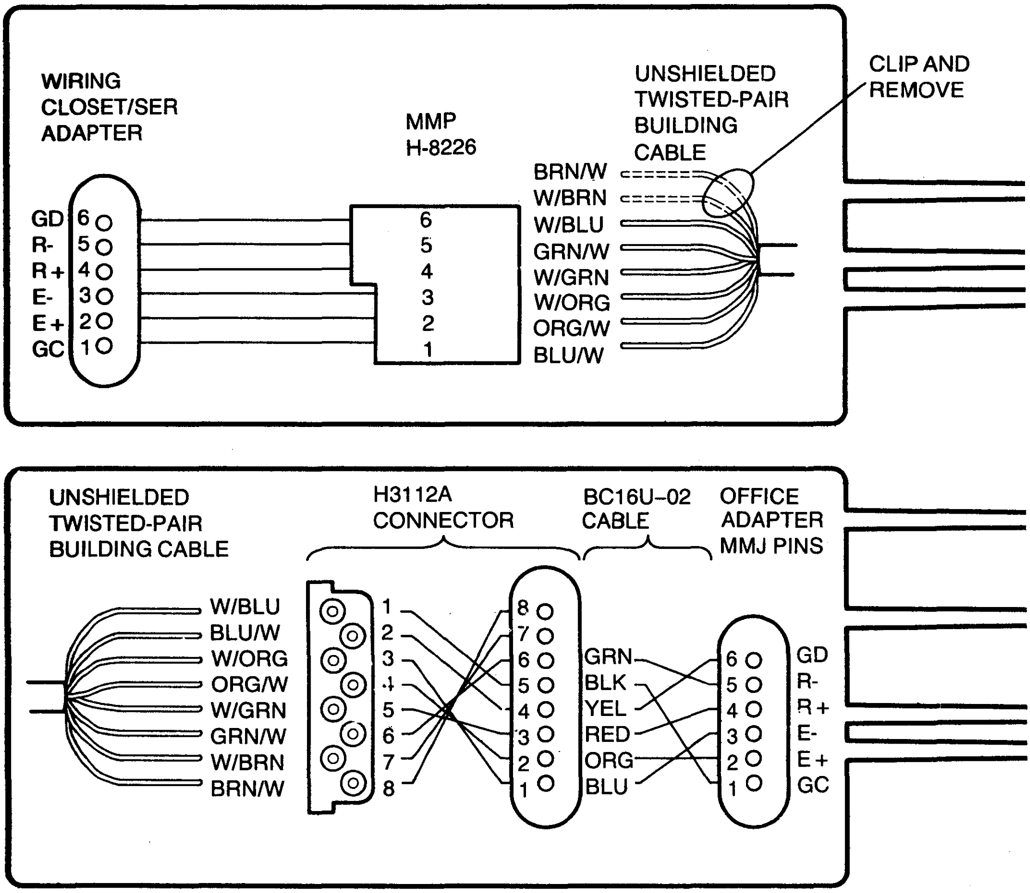


Figure 16 AT&T Unshielded TP Connections (Sheet 1 of 2)

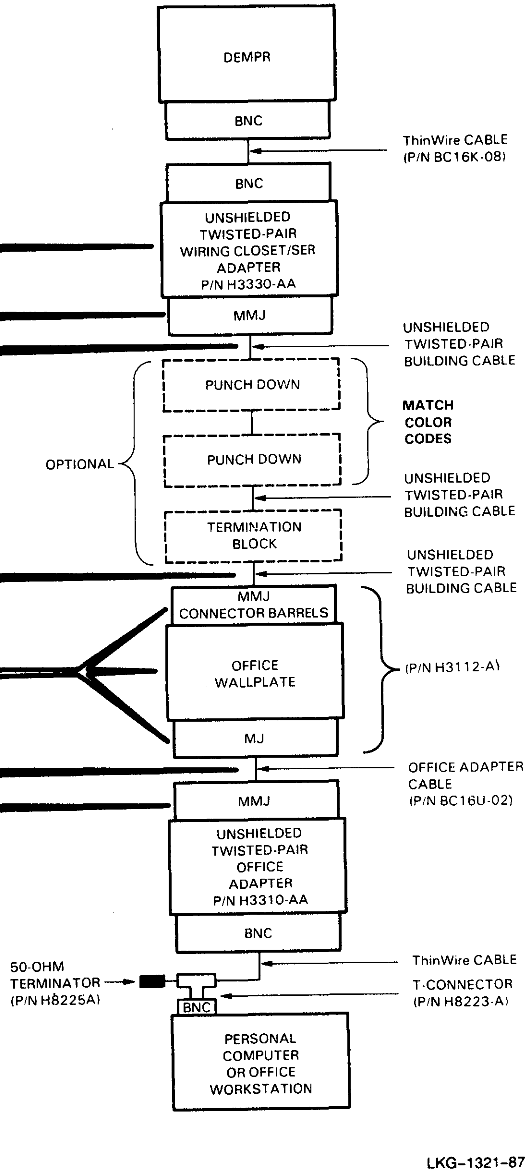
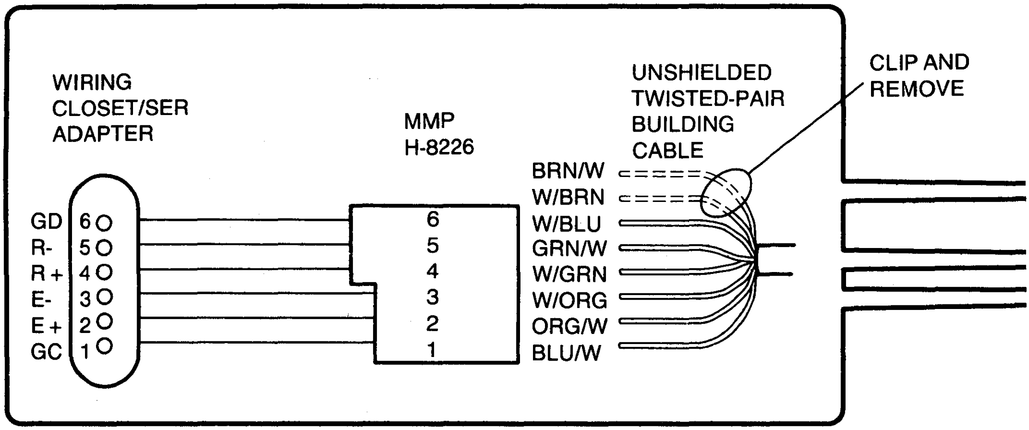


Figure 16 AT&T Unshielded TP Connections (Sheet 2 of 2)



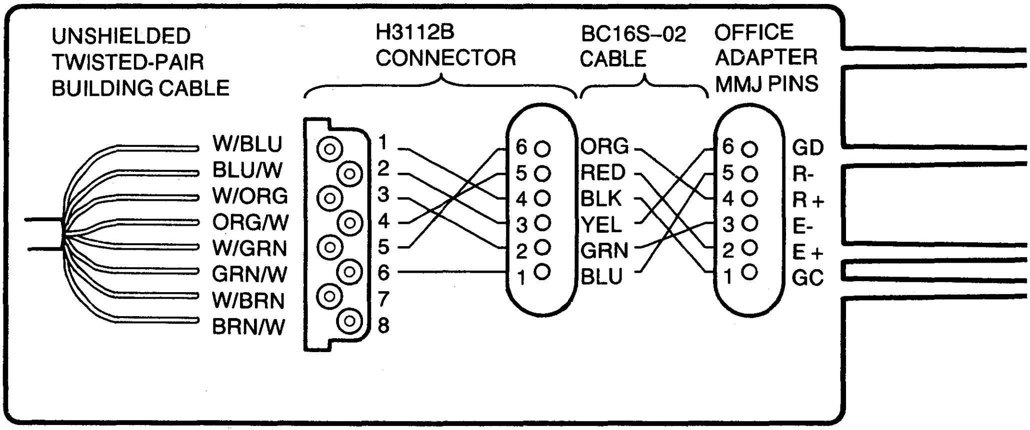


Figure 17 Northern Telecom Unshielded TP Connections (Sheet 1 of 2)

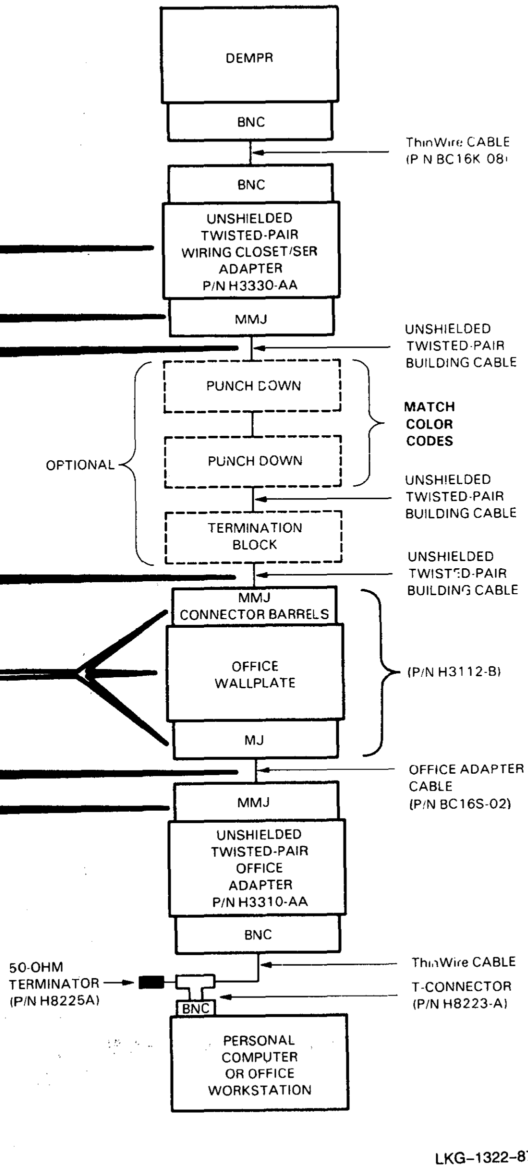


Figure 17 Northern Telecom Unshielded TP Connections (Sheet 2 of 2)

TPENET CABLING

The overall connections are shown in Figure 18.

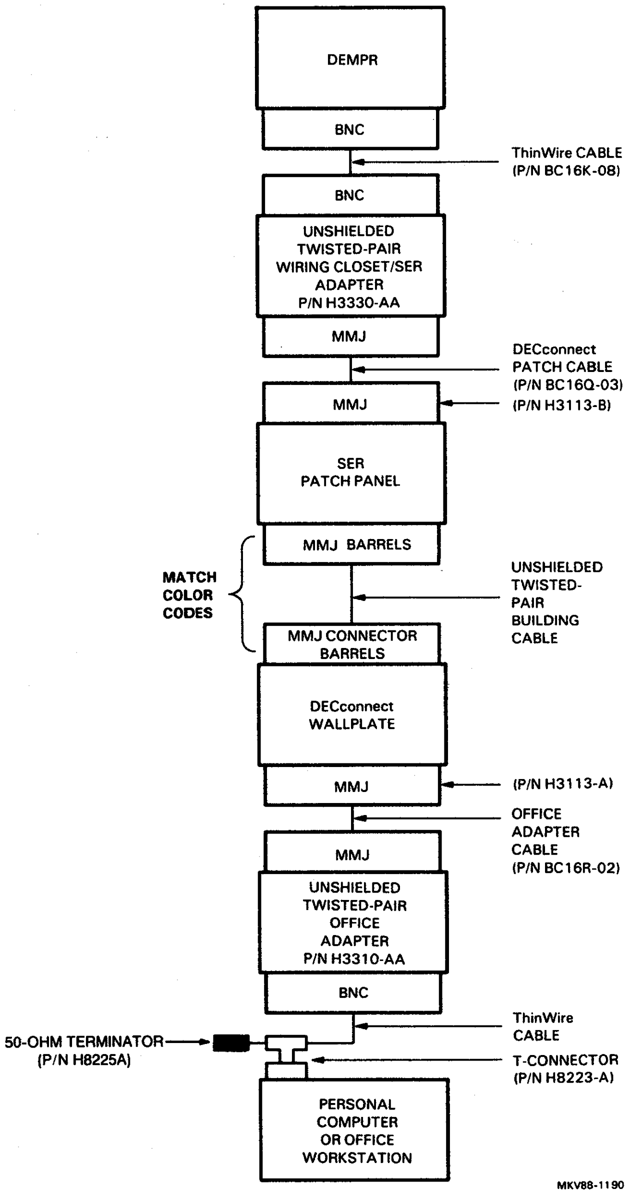


Figure 18 DECconnect Installation Overview

Self-Test Diagnostics
TPENET devices are passive and have no indicators. There are no self-tests, debug exercises, or associated system diagnostics. Use standard ThinWire, Thickwire, system diagnostics, tools, and associated Ethernet device indicators to troubleshoot TPENET.

Maintenance Aids

The wire-characterization test equipment can be used as maintenance and troubleshooting aids for the TP adapter and TP Ethernet cables.

Wire Characterization

Section 3 of the *Unshielded Twisted-Pair Wiring Installation and Characterization Guide* contains detailed discussion of wire characterization testing. Highlights of that section follow.

Equipment Required – Table 4 lists the test equipment needed to characterize wiring. Test equipment outlined in this table is shown in Figures 19 through 27.

Table 4 Wire Characterization Test Equipment

Equipment	Qty	Part Number
Office adapter cables		
8MP – 6MMP	8	DIGITAL BS16U-02
6MP – 6MMP	8	DIGITAL BS16S-02
6MMP – 6MMP	8	DIGITAL BS16R-02
Wiring closet identifier		
6MMP – 6MMP	1	DIGITAL BS16Q-02
Office loopback identifier	8	DIGITAL 54-17331-01
Wiring closet test connector	1	DIGITAL 70-25414-01
Balun	1	DIGITAL 16-28983-01
Digital multimeter	1	Fluke Model 8060A
Accessories:		
• High-frequency probe	1	Fluke 85RF
• BNC-to-probe adapter	1	Fluke 574756
• Banana plug-to-BNC connector	1	Locally available
Time-domain reflectometer (TDR)	1	Tektronix 1502 TDR
Accessories:		
• TDR static suppressor	1	Tektronix 011-0132-00
• Precision 50-ohm calibrated coaxial cable	1	Tektronix 012-0482-00

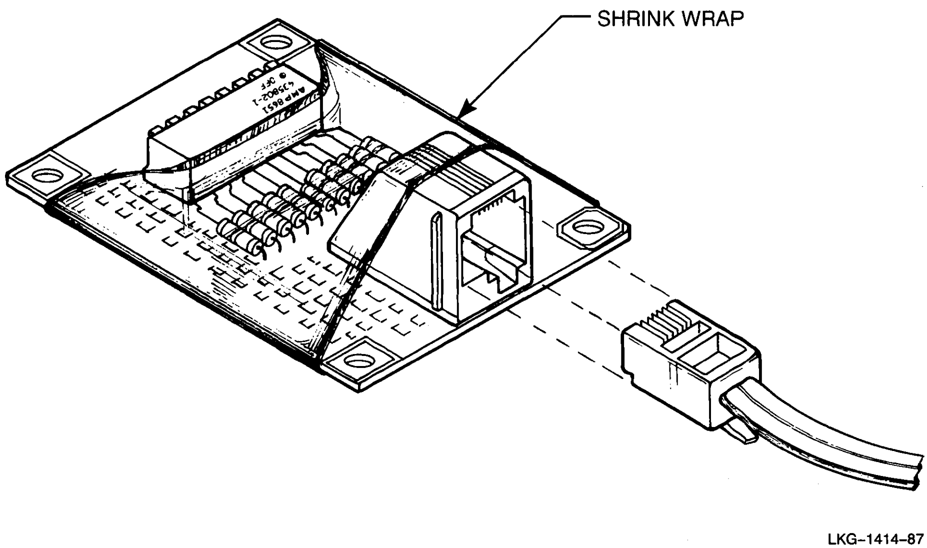


Figure 19 Office Loopback Identifier

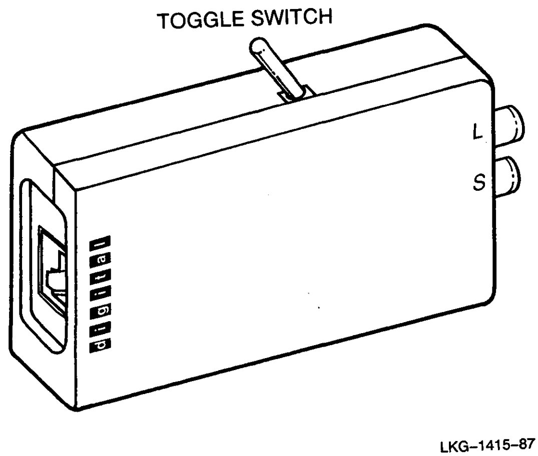


Figure 20 Wiring Closet Test Connector

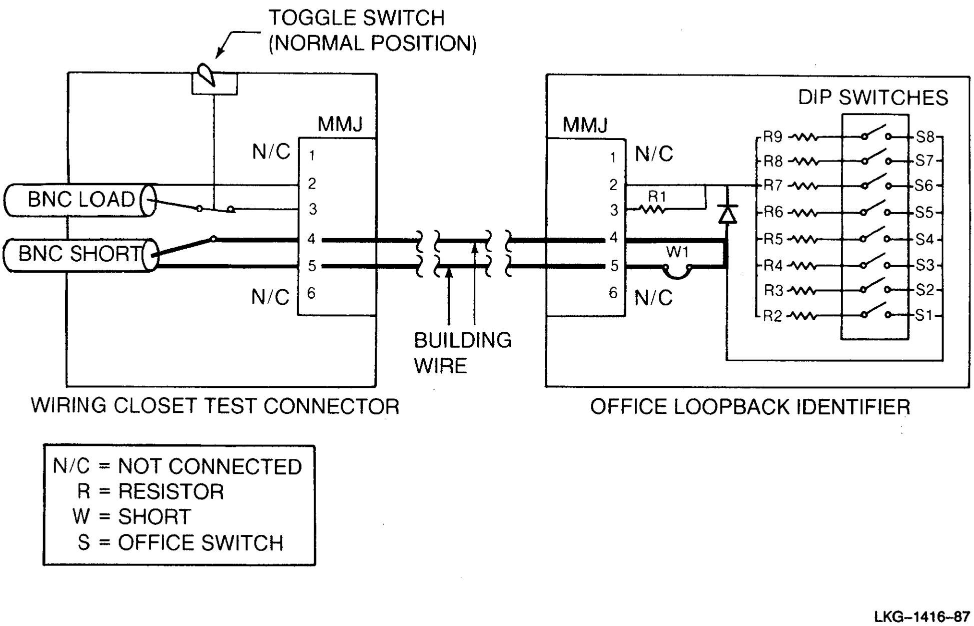
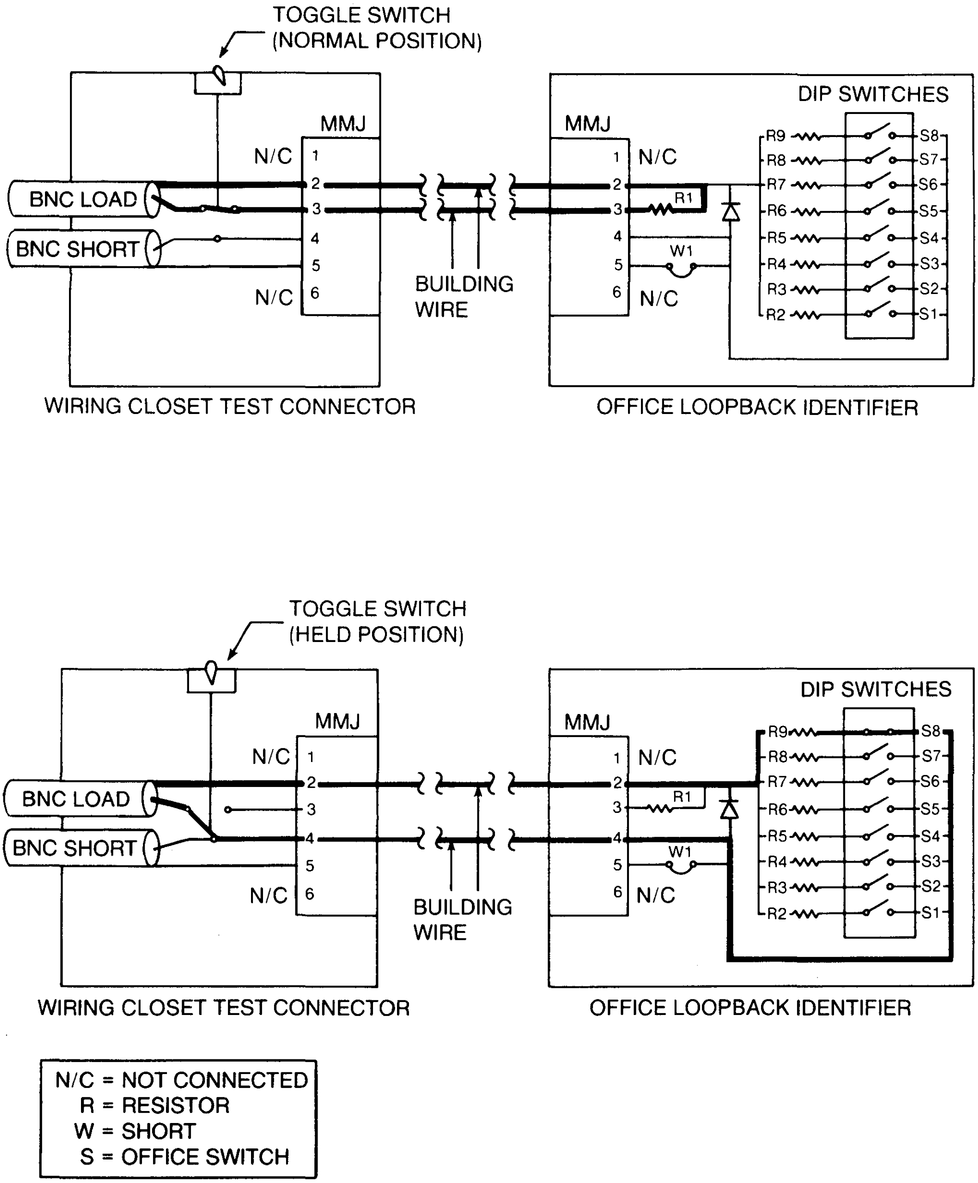


Figure 21 DEC Resistance Test



LKG-1417-87

Figure 22 Noise and Impedance Tests

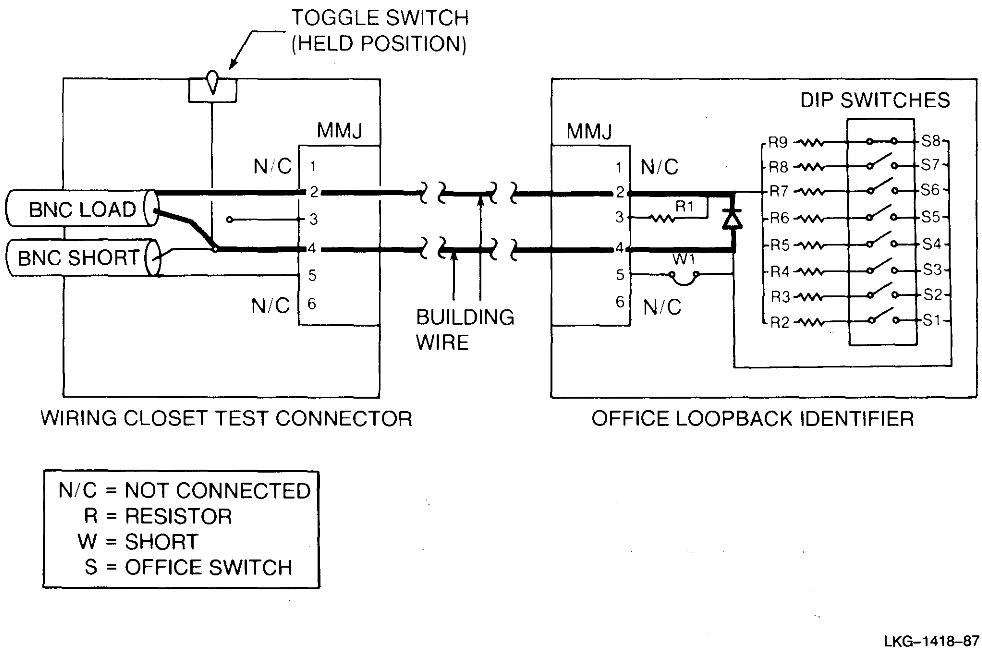


Figure 23 Diode Test

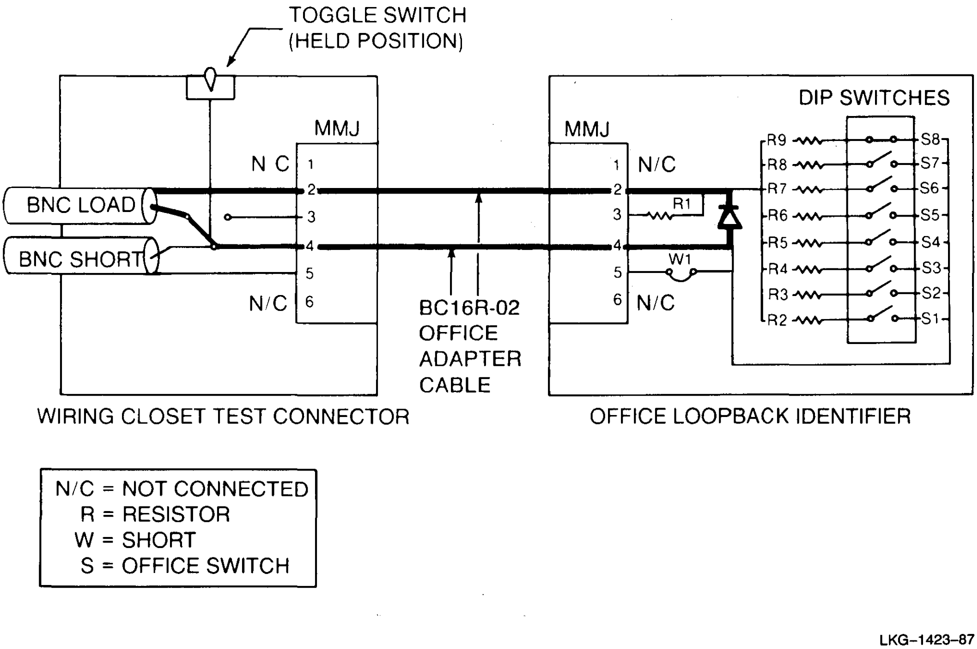


Figure 24 Measuring Diode Breakdown Voltage

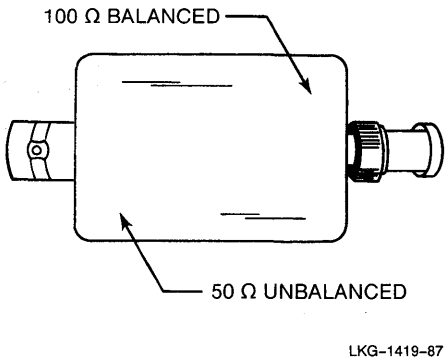


Figure 25 Balun

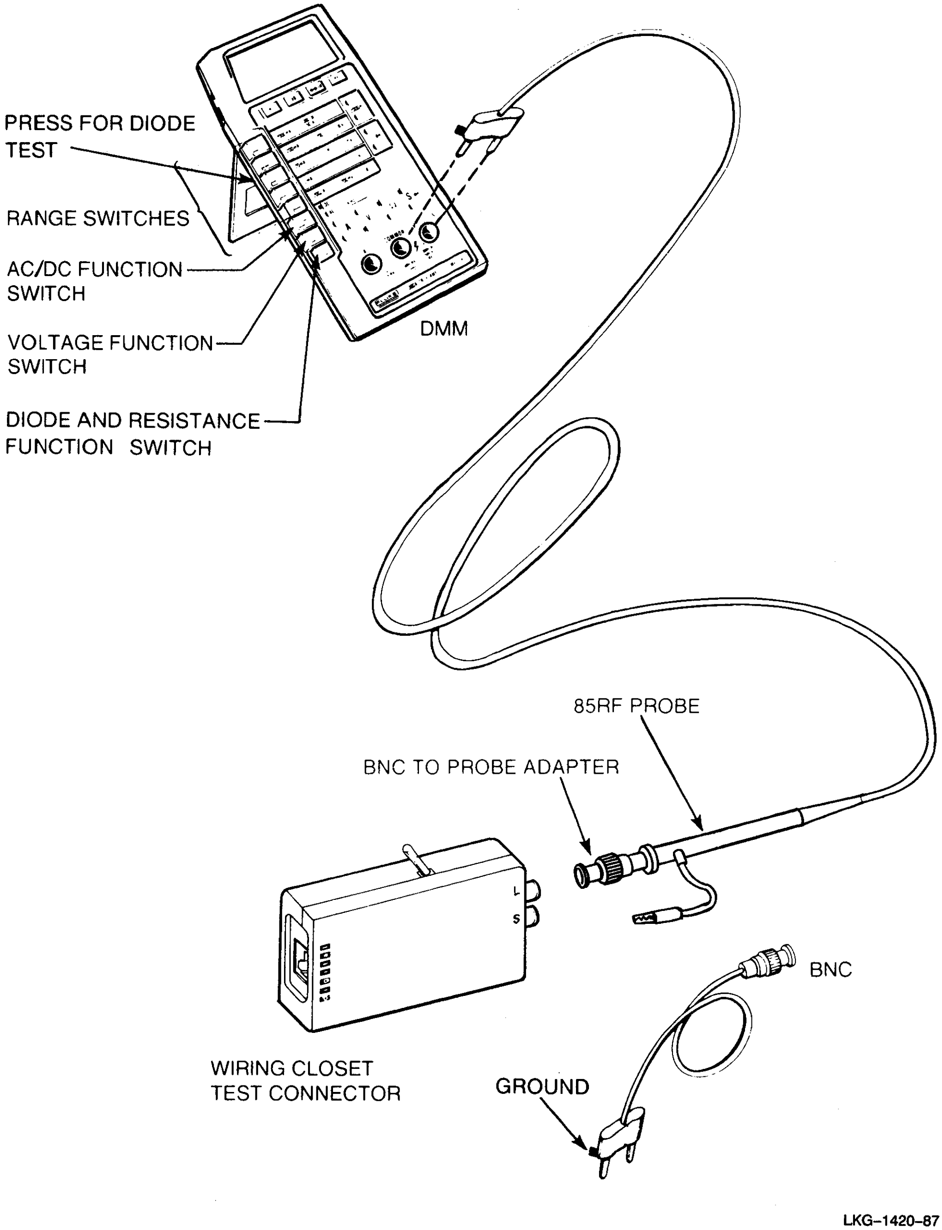


Figure 26 8060A Fluke DMM and Accessories

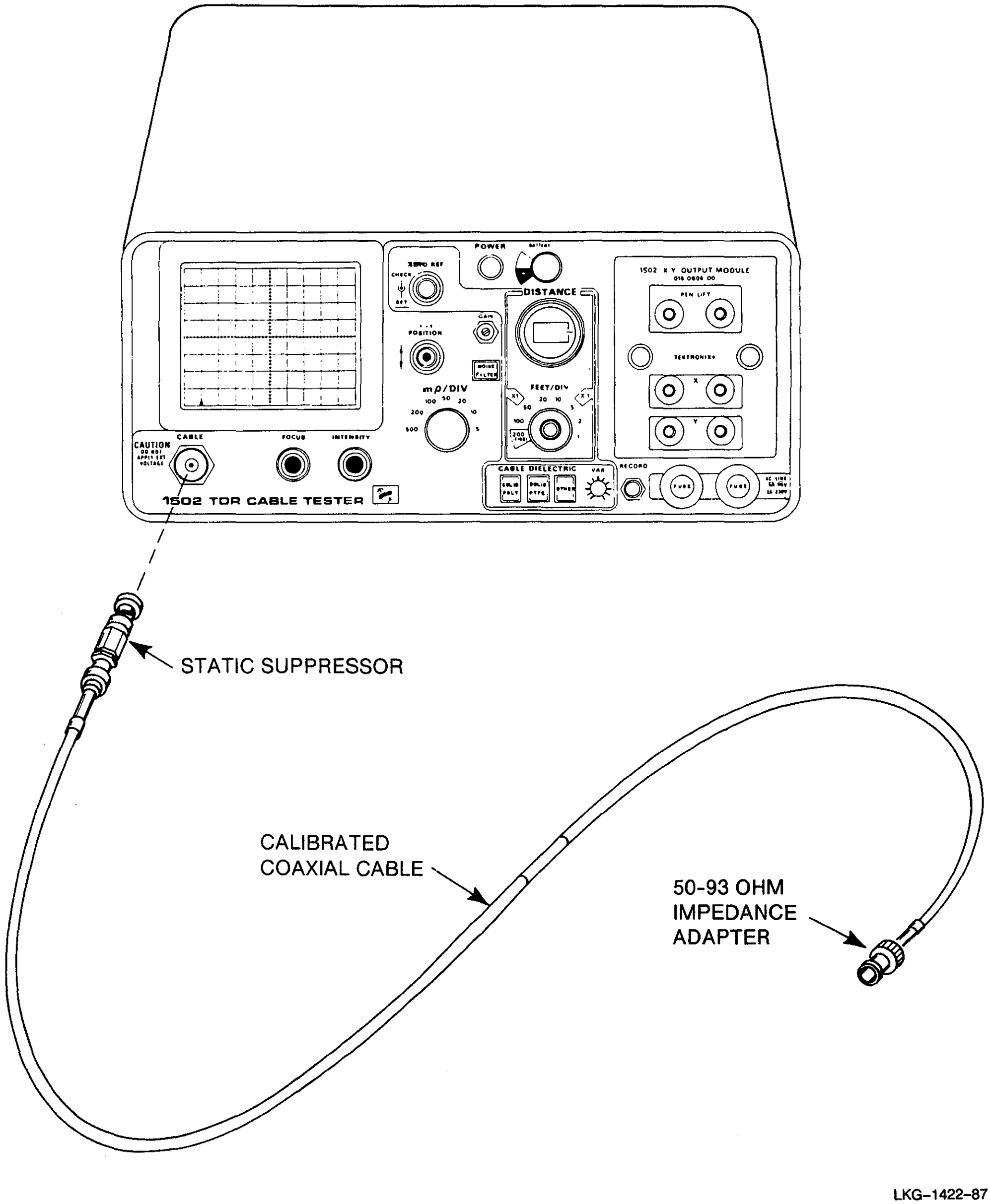


Figure 27 Tektronix TDR 1502 and Accessories.

TPENET MAINTENANCE AIDS

Wire Characterization Tests – Detailed test procedures are contained in Section 3.3 of the *Unshielded Twisted-Pair Wiring Installation and Characterization Guide.* These test procedures include:

- Preparing the Office, Section 3.3.1
- Verifying Office and Data Pairs, 3.3.2
- Measuring DC Resistance, 3.3.3
- Measuring Low-Frequency Noise (RMS), 3.3.4
- Measuring High-Frequency Noise, 3.3.5
- Measuring Cable Length, 3.3.7
- Measuring Balanced Impedance, 3.3.8

Section 3.3 in the Guide also explains TDR calibration.

Wire Characterization Worksheet – A Wire Characterization Worksheet (Figure 28) is provided to record test results.

Presale Characterization Date: ____________

Preinstallation Characterization Date: ____________

Completed By: ____________

Location: ____________

Page ______ Of ______ Pages

← WIRE CHARACTERIZATION TESTS →

Office Line ID	Office Loop - Back Identifier Switch No. 1-8	Diode Breakdown Voltage	Office Adapter Switch (Up or Down)	OK	DC Resistance	Lo Freq Noise			High Freq Noise	Impedance	Length
					Use BNC Short DMM 16.8-ohms Max	Use BNC Load DDM TDR .3 mVac Max 120 mVac Max	Transient Noise? Yes	Transient Noise? No	Use BNC Load DMM Probe 50 mVdc Max	Use BNC Load TDR 90-120 ohms	Use BNC Short TDR 230 ft Max

Number of Lines Checked: ____________

Number of Lines Within Spec: ____________

Wire Type: ____________

Wire Manufacturer: ____________

Notes: (Identify by Office Line ID) ____________

LKG-1424-87

Figure 28 Wire Characterization Worksheet

Tools

The punchdown tool and crimper shown in Figure 29 may be useful during maintenance as well as during installation.

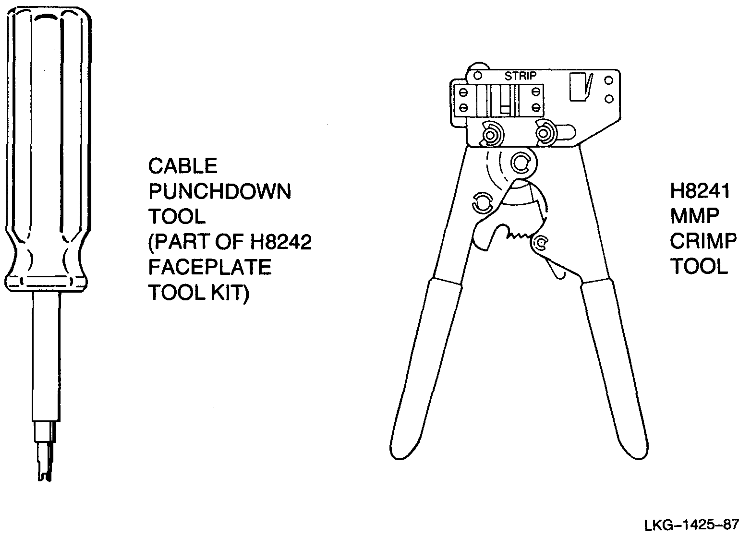


Figure 29 Special Tools for Cabling

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
BNE2B-xx	MA,MB,MC,MD	PVC composition
BNE2A-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

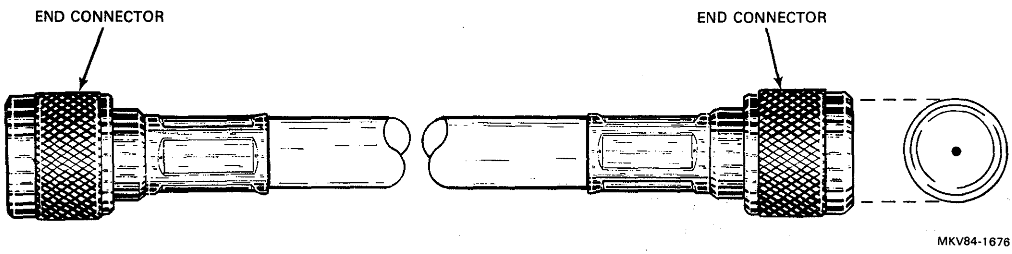


Figure 1 BNE2x-xx Coaxial Cable

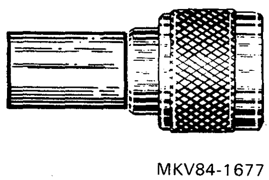


Figure 2 H4060 (End) Connector

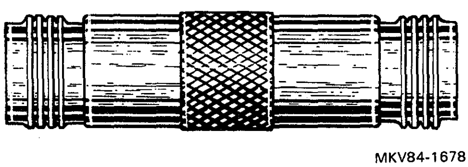


Figure 3 12-19817-01 Barrel Connector

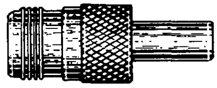


Figure 4 12-19816-01 Terminator

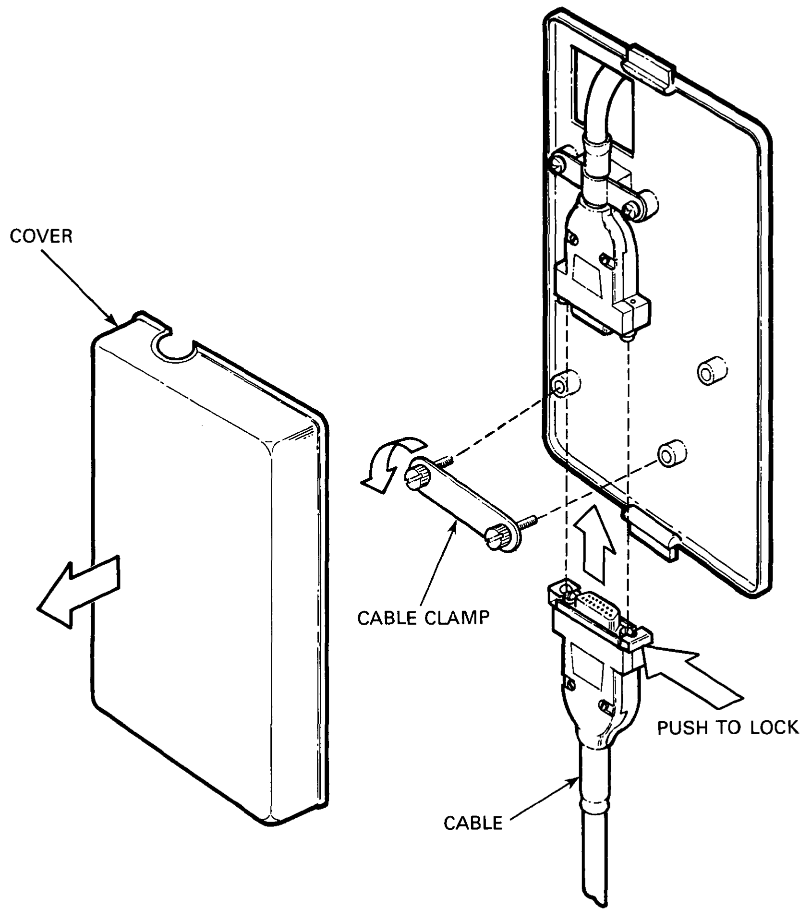


Figure 5 DEXJK Etherjack Connector

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)

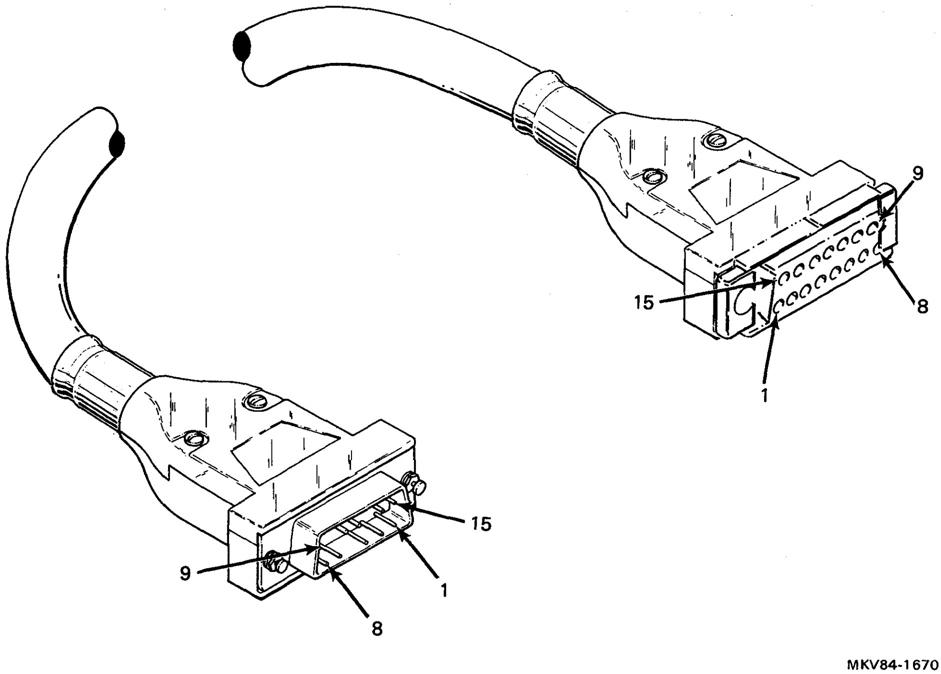


Figure 6 BNE3A-xx/BNE4A-xx and BNE3B-xx/BNE4B-xx Transceiver Cables

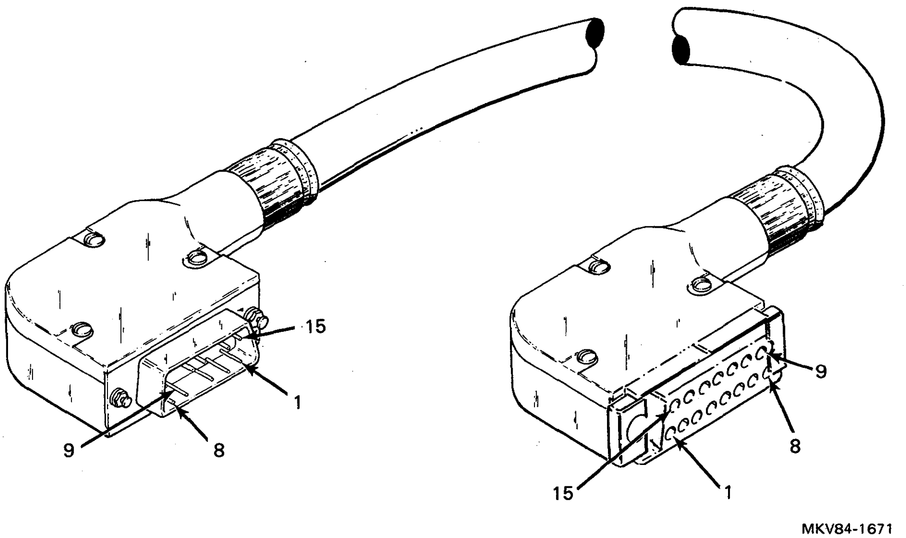


Figure 7 BNE3C-xx/BNE4C-xx and BNE3D-xx/BNE4D-xx Transceiver Cables

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).

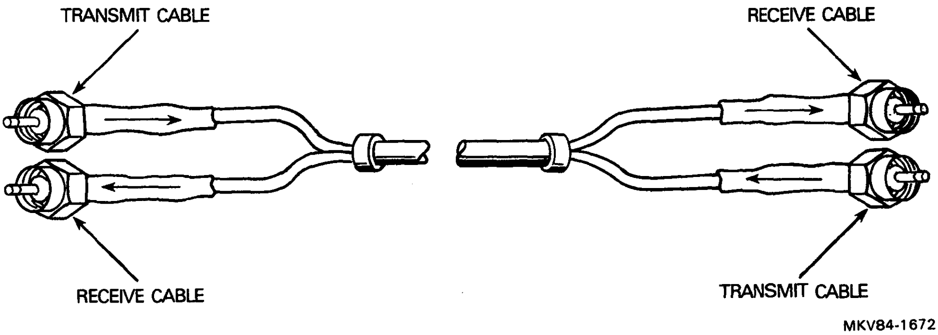


Figure 8 Duplex Fiber-Optic Cable

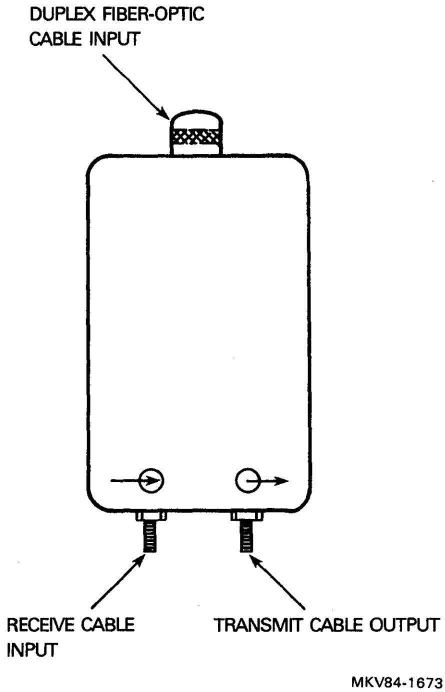


Figure 9 DEXJB Fiber-Optic Junction Box

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.

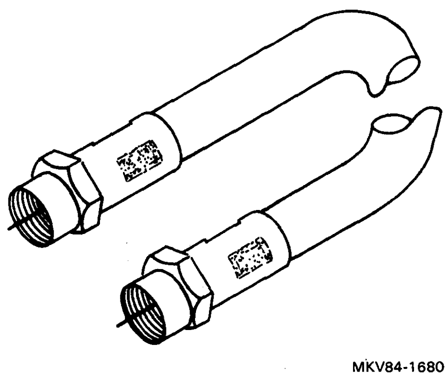


Figure 10 CAB-6 Broadband Office Cable

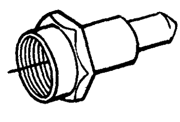
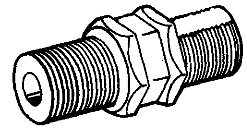


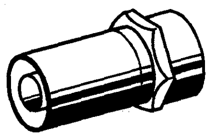
Figure 11 TR-75F Terminator

*Manufactured by Jerrold Div., General Instrument Corp.



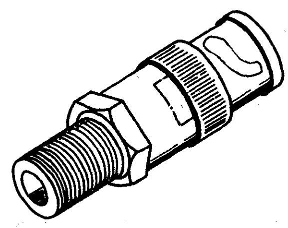
MKV84-1682

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.

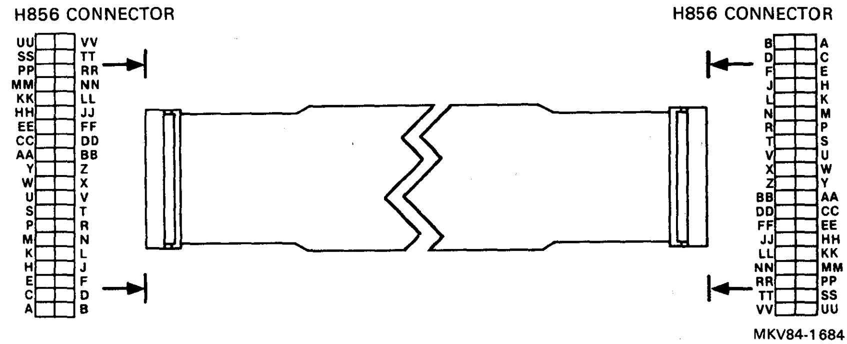


Figure 15 BC08R-1 Ribbon Cable

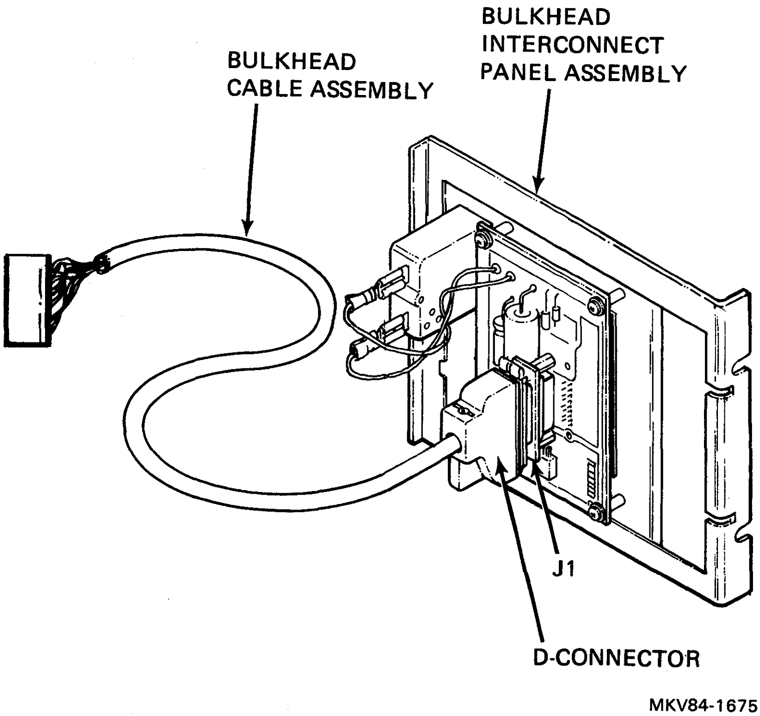


Figure 16 70-18798-xx Bulkhead Assembly and 70-18799-00 Bulkhead Interconnect Panel Assembly

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

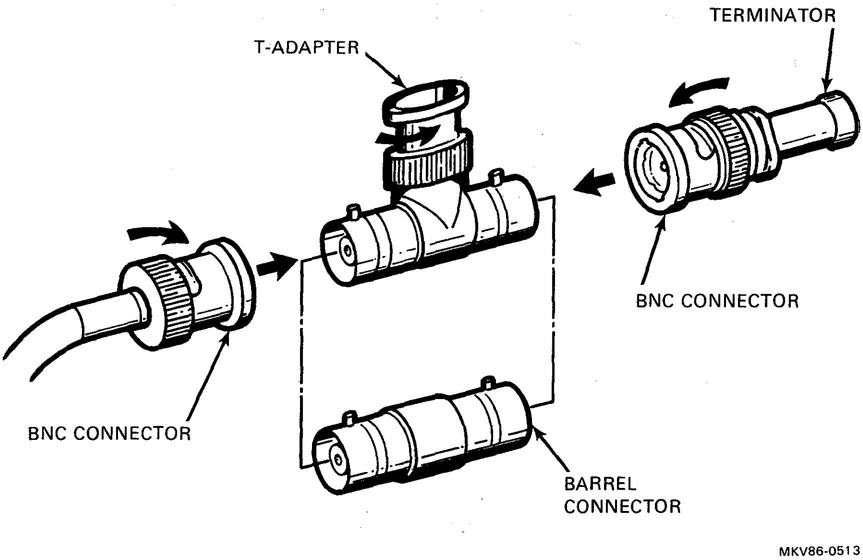


Figure 17 T-Adapters, Barrel Connectors, and Terminators

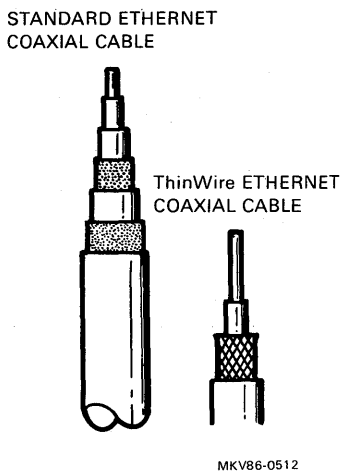


Figure 18 Cable Differences

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.

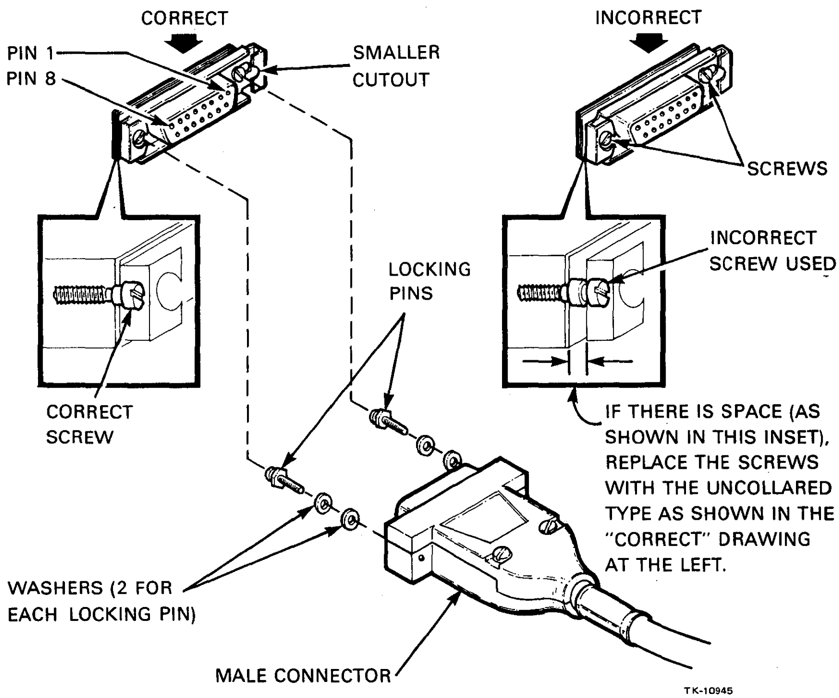


Figure 19 Proper Slide-Latch Configuration

3.4 ThinWire Ethernet COAXIAL CABLE TERMINATION

3.4.1 Installing Male Bulkhead Connectors on ThinWire Cables

There are two ThinWire stripping tools: the H8100-A for stripping FEP-jacketed ThinWire, and the H8100-B for stripping PVC-jacketed ThinWire.

Make sure you have the correct tool by referring to Figure 20, and perform the following steps.

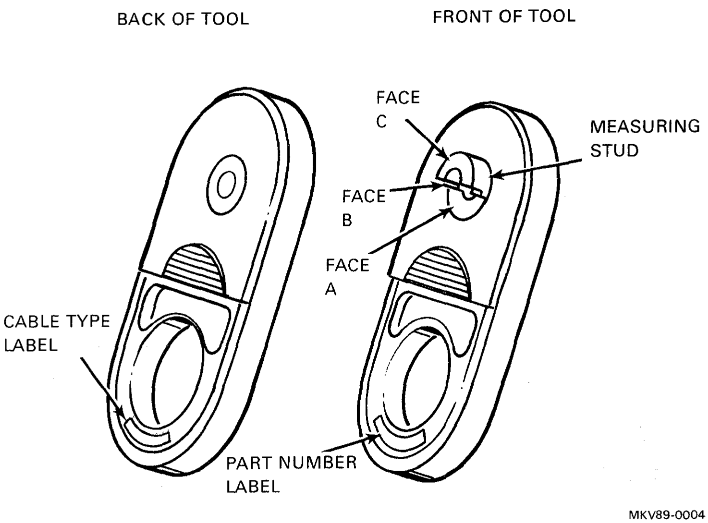
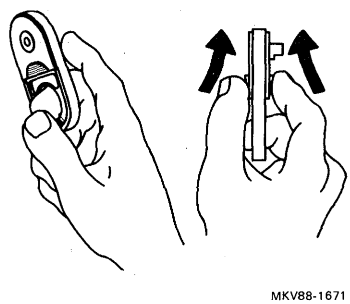
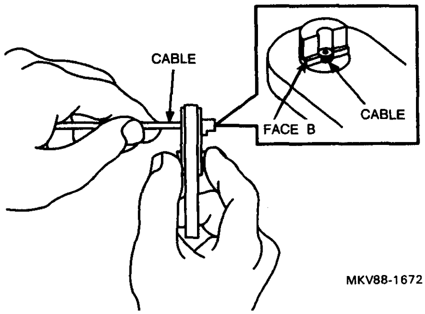


Figure 20 ThinWire Stripping Tool

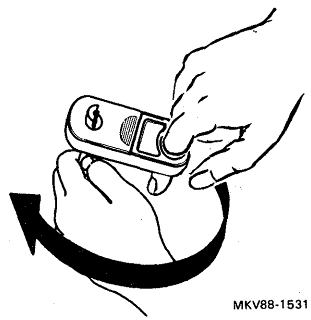
1. Work with one cable at a time.
2. Use diagonal cutters to cut the cable flush.
3. Grasp the stripping tool and retract the blade.



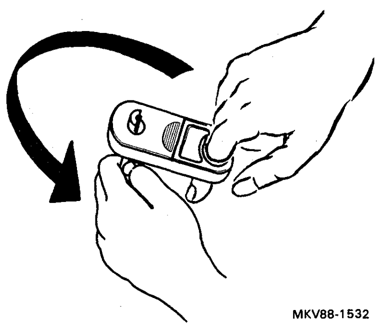
4. Insert the cable into the tool and align the end of the cable with face B (as shown).



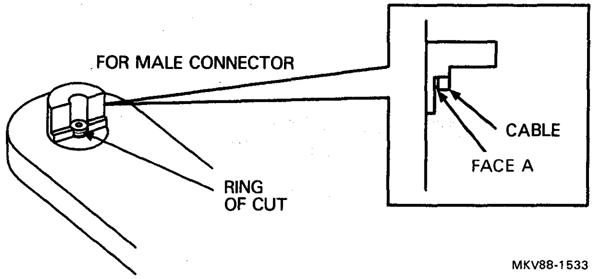
5. Rotate the tool clockwise until cutting stops.



6. Rotate the tool counterclockwise two (2) turns.

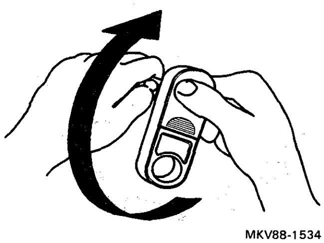


7. Align the ring of cut to face A (as shown).

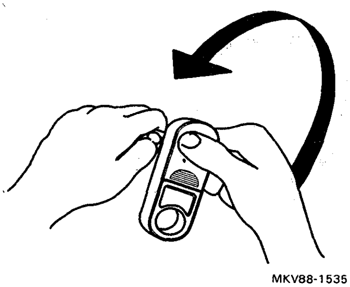


NOTE
For steps 8 and 9, hold the tool as shown below for steadier cutting.

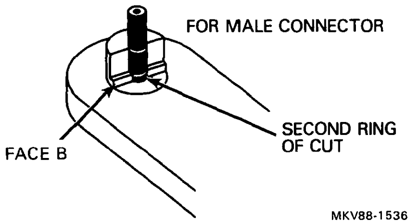
8. Rotate the tool clockwise until cutting stops.



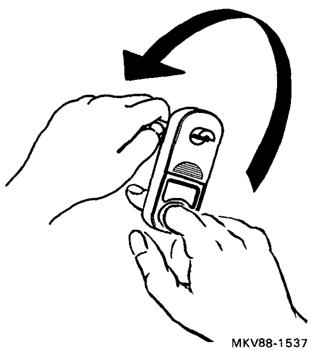
9. Rotate the tool counterclockwise two (2) turns.



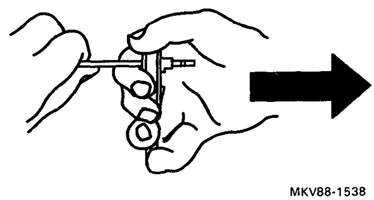
10. Align the second ring of cut to face B (as shown).



11. Rotate the tool counterclockwise at least six (6) turns.



12. Pull the tool off the cable and remove any debris that remains inside the hole.



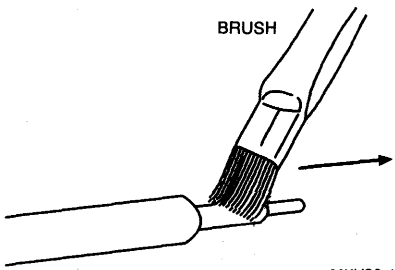
13. While firmly gripping the cable braid and dielectric, use diagonal cutters to pull the dielectric waste off the cable.

MKV88-1539

14. Compare your cable to the illustration below.

MKV88-1540

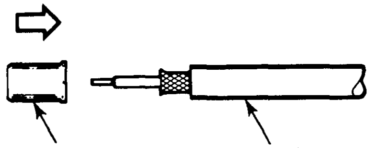
15. Brush metal debris from the cable.



MKV88-1541

16. Slip the ferrule onto the cable.

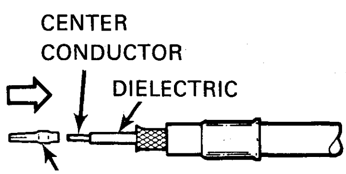
NOTE
Make sure that the braid or foil does not touch the center conductor.



MKV88-1542

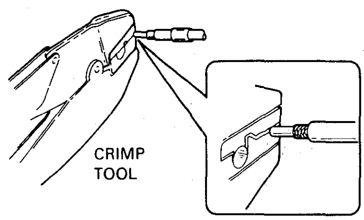
17. Slip the center contact onto the center conductor. The contact must butt against the dielectric.

NOTE
Make sure that the braid or foil does not touch the center contact.



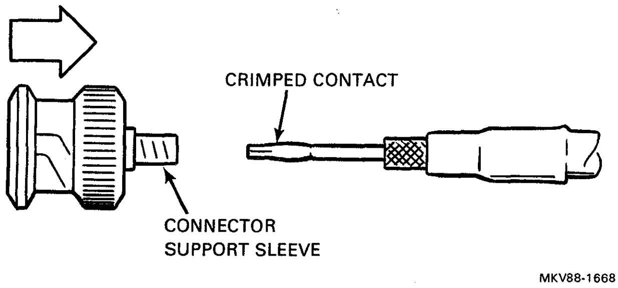
MKV88-1543

18. Crimp the center contact onto the cable.

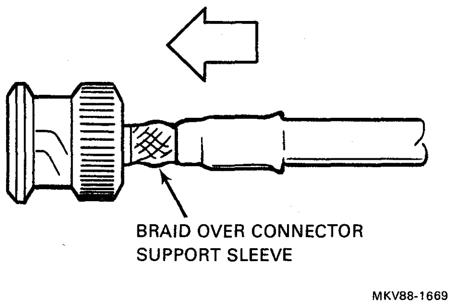


MKV88-1544

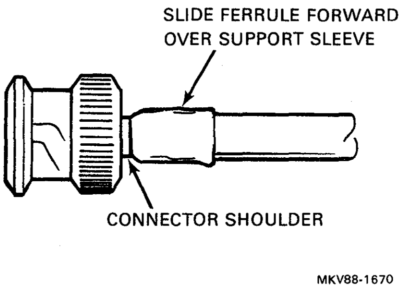
19. Insert the center contact through the connector.



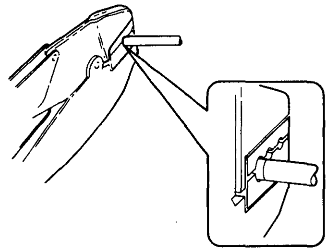
20. Slip the support sleeve under the braid and over the dielectric.



21. Slide the ferrule over the support sleeve to the back of the connector.

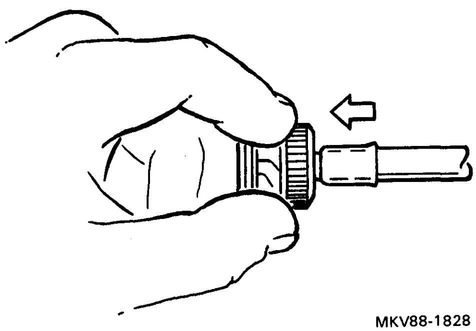


22. Crimp the ferrule onto the cable.



MKV88-1545

23. Tug gently on the connector to be sure it is firmly attached.



MKV88-1828

3.4.2 Installing Female Bulkhead Connectors on ThinWire Cables

There are two ThinWire stripping tools: the H8100-A for stripping FEP-jacketed ThinWire, and the H8100-B for stripping PVC-jacketed ThinWire.

Make sure you have the correct tool by referring to Figure 21, and perform the following steps.

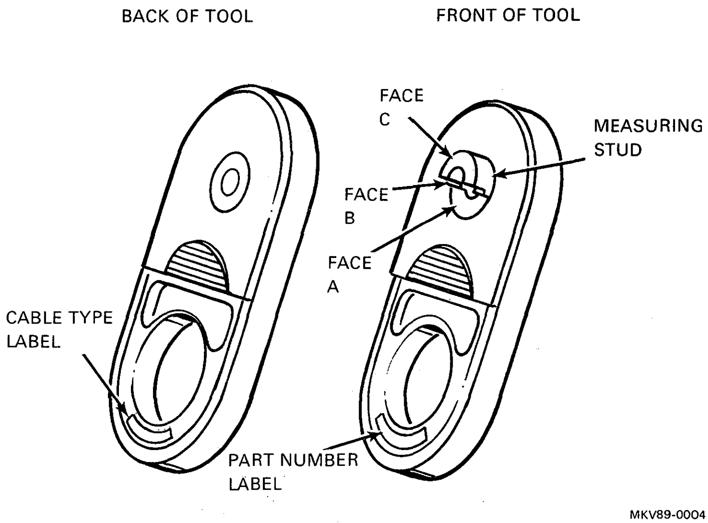
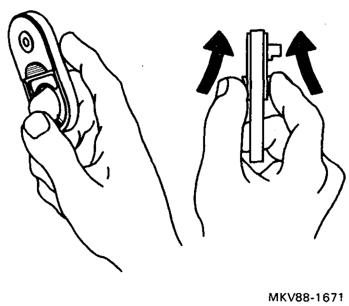
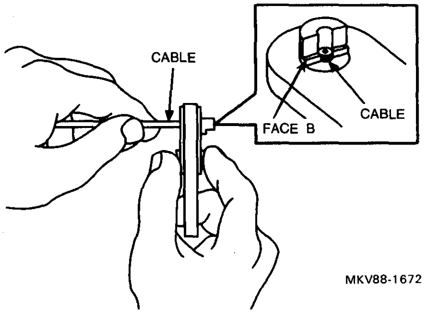


Figure 21 ThinWire Stripping Tool

1. Work with one cable at a time.
2. Use diagonal cutters to cut the cable flush.
3. Grasp the stripping tool and retract the blade.

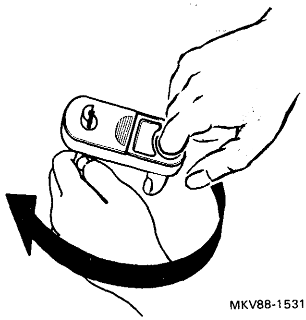


4. Insert the cable into the tool and align the end of the cable with face **B** (as shown).



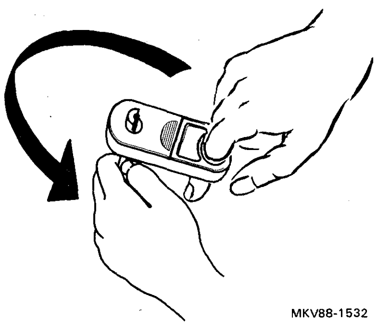
MKV88-1672

5. Rotate the tool clockwise until cutting stops.



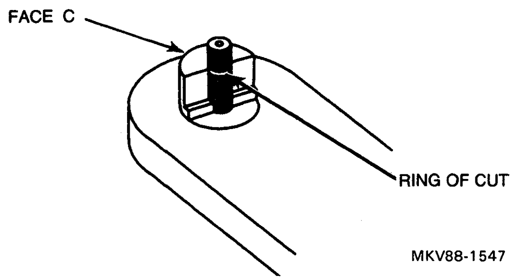
MKV88-1531

6. Rotate the tool counterclockwise two (2) turns.

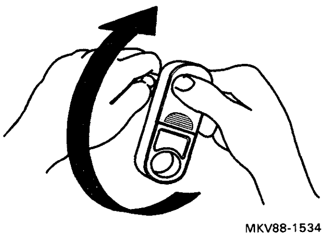


MKV88-1532

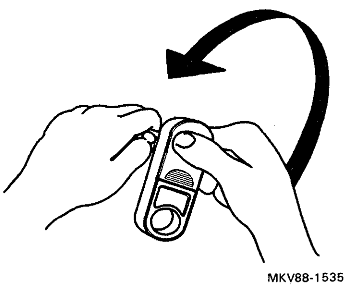
7. Align the ring of cut to face C (as shown).



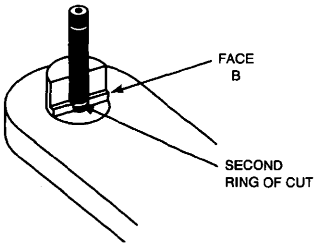
8. Rotate the tool clockwise until cutting stops.



9. Rotate the tool counterclockwise two (2) turns.

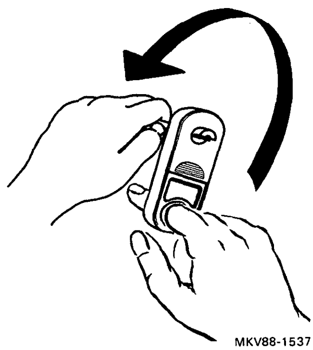


10. Align the second ring of cut to face B (as shown).



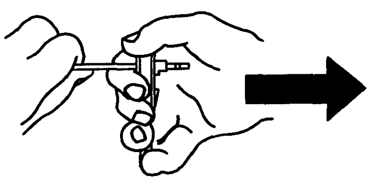
MKV88-1548

11. Rotate the tool counterclockwise at least six (6) turns.



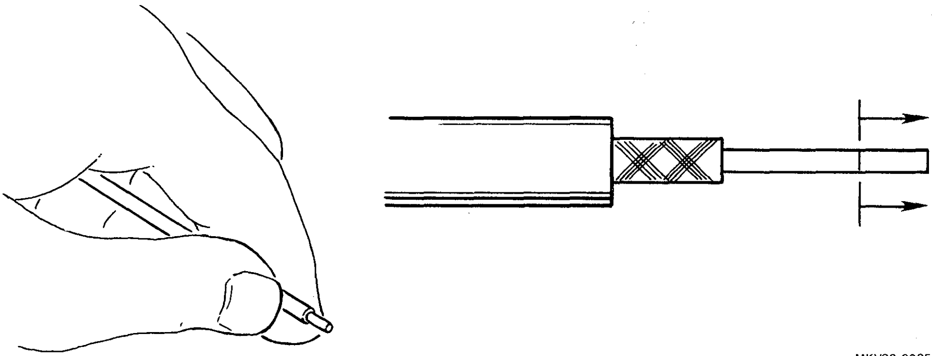
MKV88-1537

12. Pull the tool off the cable and remove any debris that remains inside the hole.



MKV88-1538

13. While firmly gripping the cable braid and dielectric, use diagonal cutters to pull the dielectric waste off the cable.

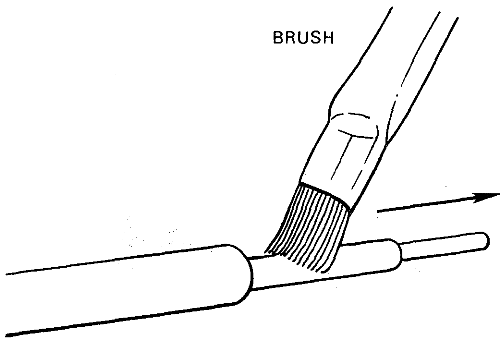


MKV89-0005

14. Compare your cable to the illustration below.

MKV88-1549

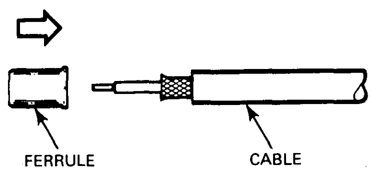
15. Brush metal debris from the cable.



MKV89-0006

16. Slip the ferrule onto the cable.

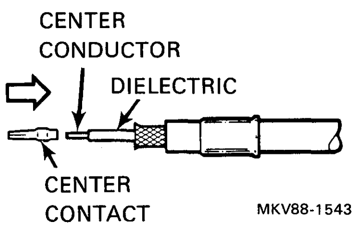
NOTE
Make sure that the braid or foil does not touch the center conductor.



MKV88-1542

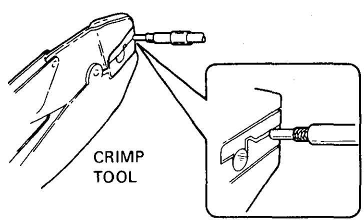
17. Slip the center contact onto the center conductor. The contact must butt against the dielectric.

NOTE
Make sure that the braid or foil does not touch the center contact.



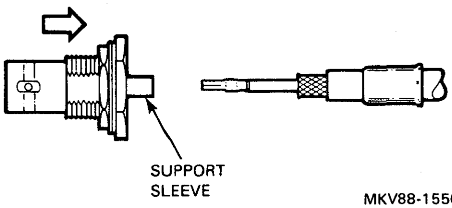
MKV88-1543

18. Crimp the center contact onto the center conductor.



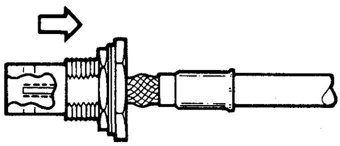
MKV88-1544

19. Insert the center contact through the connector.



MKV88-1550

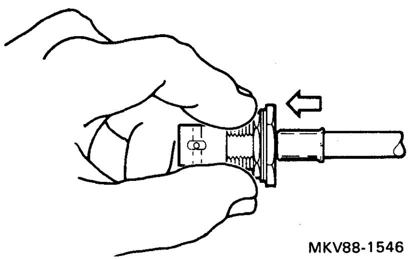
20. Slip the support sleeve under the braid and over the dielectric and foil shield. The center conductor must be flush or within 1/16 inch of the end of the connector.



MKV88-1651

21. Slide the ferrule to the rear of the connector and crimp it onto the cable.

22. Tug gently on the connector to be sure it is firmly attached.



MKV88-1546

3.4.3 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.

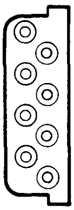
3. Use a stripper cutter to cut the cable jacket 3.16 cm (1.25 in) from the end of the cable and pull off the jacket.

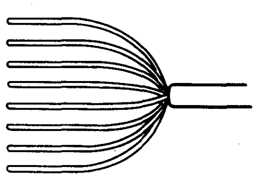
4. The *second* operation is to arrange the individual wires and install MMJ connectors. Starting on the left side with the white wire with the blue stripe, arrange the individual wires so that they are in the same order as indicated on the MMJ connector stuffer cap.

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 22 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.

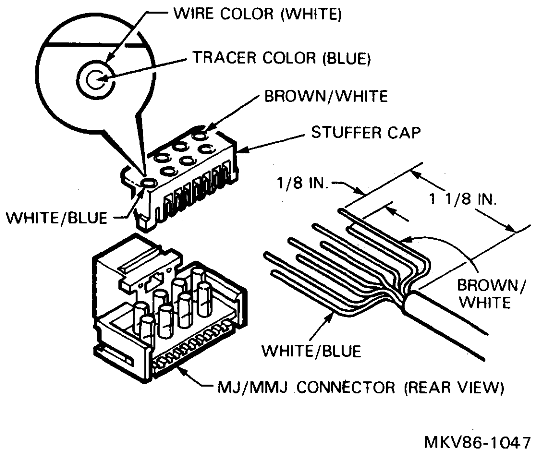


Figure 23 Placement of Wire over the Connector Barrels

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.

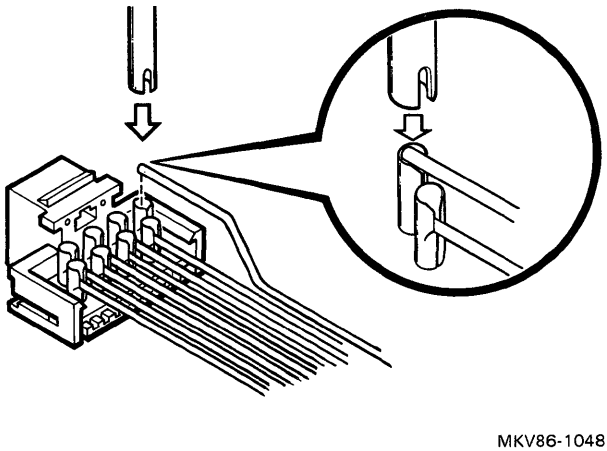


Figure 24 Using the Punchdown Tool

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.

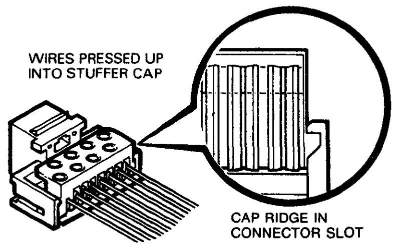


Figure 25 Cap Ridge in Connector Slot

3.6 INSTALLING MMP CONNECTORS ON TWISTED-PAIR CABLES

There are two type of twisted-pair cables: solid and stranded. It is important to know which type of cable you have because each type uses a different connector (Figure 26). In DECconnect, the cable that runs behind the wall from the faceplate to the SER, OCC, or RWE is the solid wire type. Cables that run within the office itself or patch cables are typically the stranded wire type. If the cable has some spring to it when bent, it is probably the stranded wire type. DIGITAL office flat cable is stranded wire.

Unfortunately, the connectors are not easily identified because they do not have a number stamped on them. If you are not sure which you have, carefully examine the connector using Figure 26 as a reference. Note that the 8225 connector has points for penetrating the stranded wire and the 8226 connector is designed to wrap around the solid wire.

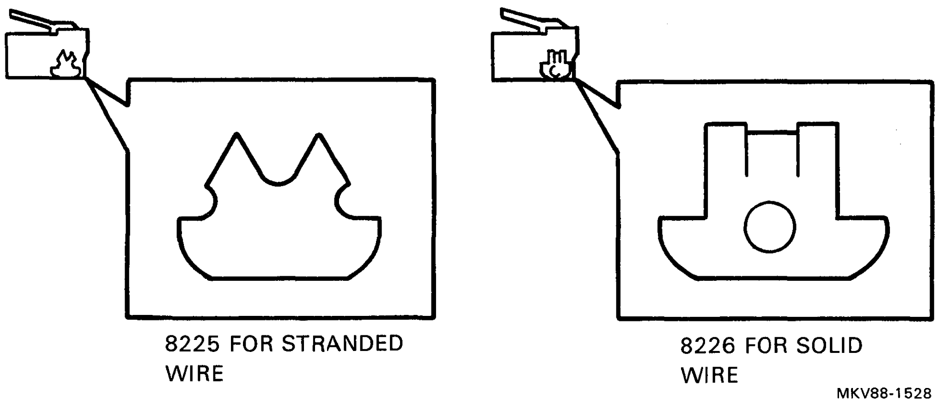


Figure 26 MMP Connectors for Stranded and Solid Wire

Preparing the Unshielded Twisted-Pair Cables for the MMP Connectors
Prepare both types of cable (FEP-jacketed and PVC-jacketed) in the same way.

1. Make sure the ends of the wires are flush. If necessary, use wire cutters to trim the end of the cable, but only trim what is absolutely necessary.

2. Use a knife to cut the cable jacket about one (1) inch from the end of the cable.

3. Remove the cut cable jacket.

4. Use the wire cutters to trim the white/brown and brown/white wires as close to the remaining cable jacket as possible. (These two wires are not used with the MMP.)

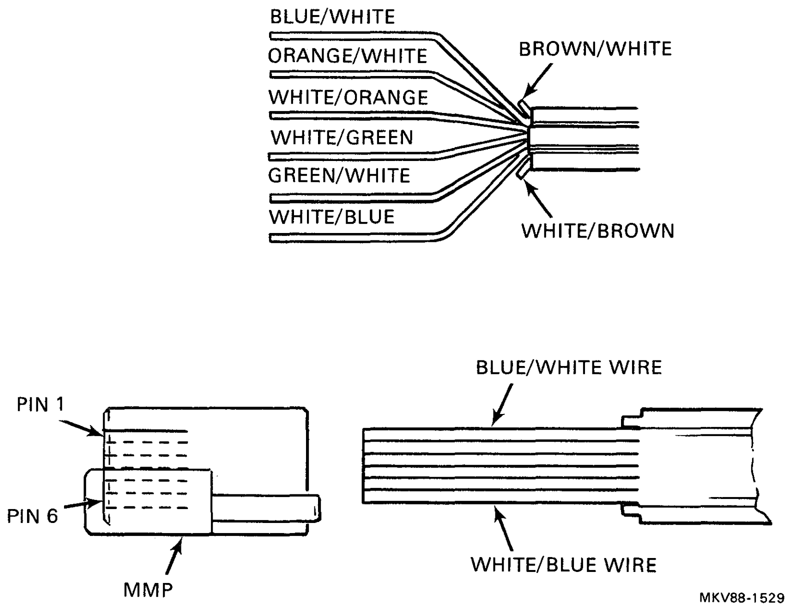
Attaching the MMP Connector to the Twisted-Pair Cable

1. Determine with which type of cable you are working (stranded or solid wire).

2. Select the correct MMP connector for the wire with which you are working (Figure 26).

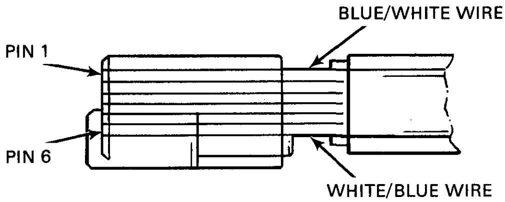
3. Arrange the wires side by side in the order shown below. (For stranded flat wire, this step is not necessary).

4. Align the cable with the MMP so that the wires will go to the pins in the order shown.



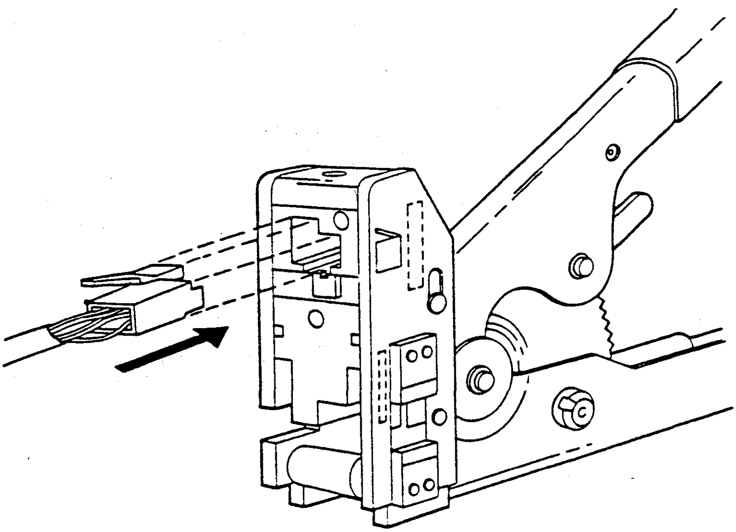
5. Insert the cable into the MMP connector and push it in as far as it will go (about 1/4 inch).

MMP PIN #	WIRE COLOR CODE
1	BLUE/WHITE
2	ORANGE/WHITE
3	WHITE/ORANGE
4	WHITE/GREEN
5	GREEN/WHITE
6	WHITE/BLUE



MKV88-1530

6. Insert the MMP connector into the die-cut mouth of the MMP terminating tool (H8241) until it locks in place.



MKV89-0009

7. Squeeze the handles together until the ratchet releases.

8. Remove the connector from MMP terminating tool.

3.7 TERMINATING THE 36-CONDUCTOR CABLE

The 36-conductor cable used to link the RWE to the OCC is termninted with 36-position plug on one end, and either a 36-position plug or a 36-position receptacle on the other end.

1. Select the correct connector.

   a. Always use the 36-position plug for the RWE end.

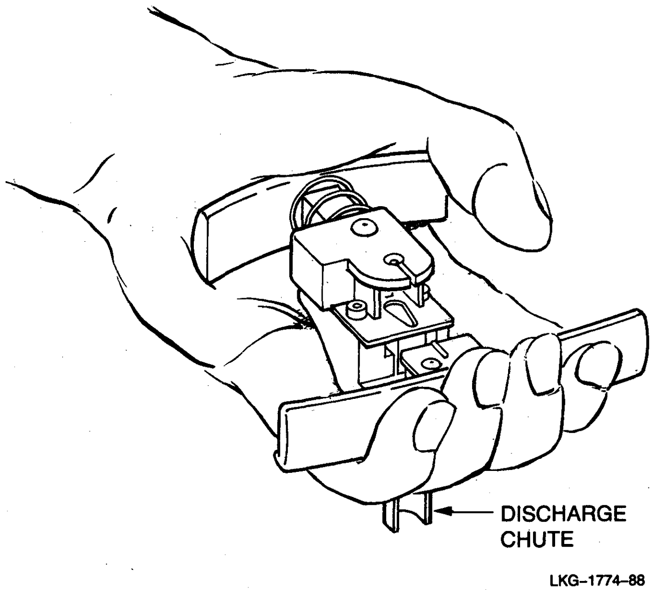
   b. Use a 36-position plug for connecting directly to a terminal server.

   c. Use a 36-position receptacle for connecting to an OCC.

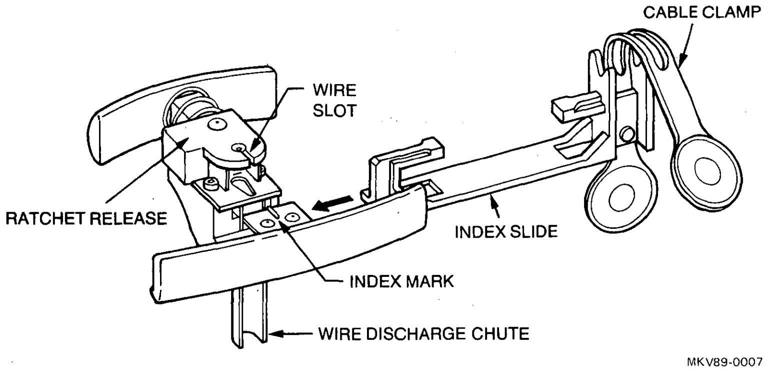
2. Leave 1 m (3.3 ft) of slack at each end of the cable and cut the cable with diagonal cutters. Make sure the cut is square.

3. Strip the outside jacket and braid back 6 cm (2 inches).

4. Hold the termination tool with the discharge chute facing down between your fingers (as shown).

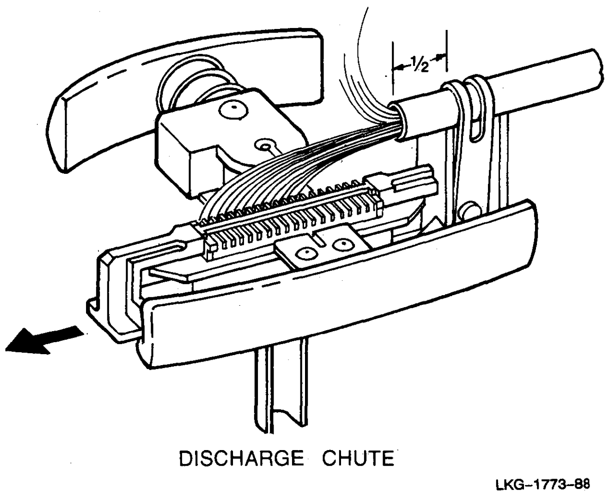


5. Place the connector in the index slide as shown.



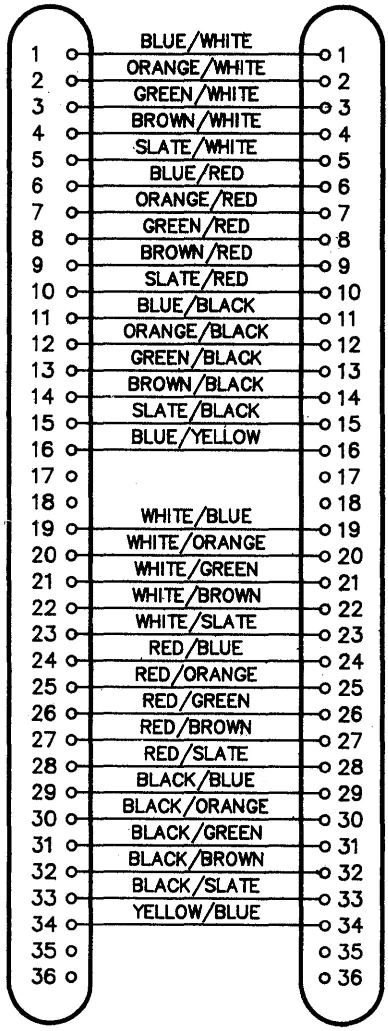
6. Place the cable in the index slide.

7. Pull the cable clamp down, and lock it into place to hold the cable firmly. Make sure the cable jacket extends approximately 1.5 cm (1/2 inch) beyond the clamp.



8. Starting at the connector end opposite the cable clamp, slide the index until the contact that is to be terminated aligns with the tool's wire slot.

9. Select the wire to be terminated at the first contact.



LKG-1789-88

10. Insert the wire through the wire slot until it goes into the discharge chute.

11. Make sure the contact and the wire are centered on the wire slot, and squeeze the termination tool until the wire is pressed all the way to the base of the contact.

12. Release the tool.

NOTE

If the tool jams, the rachet can be released by gently squeezing the tool to relieve the tension on the release pawl, and then rotating the ratchet release clockwise using the supplied hex wrench.

13. Remove the scrap wire from the discharge chute.

14. Move the index slide to the next contact, insert the next wire, and squeeze the tool.

15. Repeat steps 8 through 14 until all wires are terminated on the first side of the connector.

16. Remove the slide and reinsert it from the opposite side of the tool.

17. Repeat steps 8 through 14 until all wires are terminated on this side of the connector.

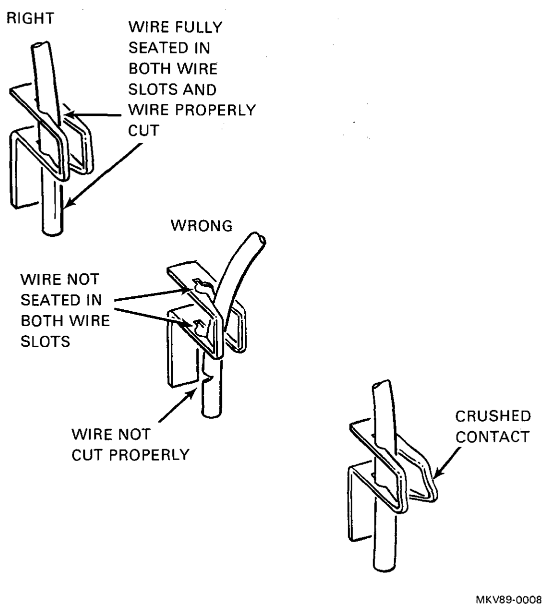
18. Inspect all terminations to ensure that each wire is properly inserted. Ensure that:

    a. Wires are cut off just beneath the contact, and no wire strands are visible.

    b. Insulation is not cut in area other than where it is held in the contact.

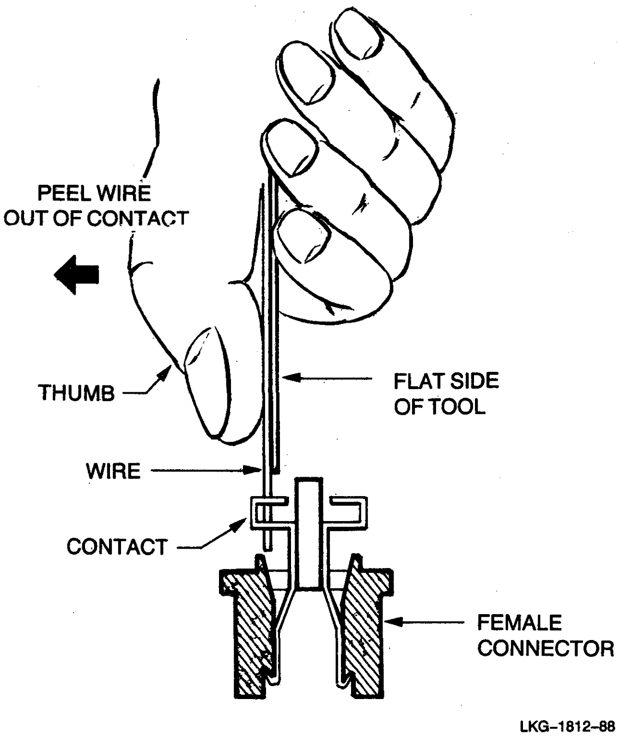
    c. Wires are held in both slots of the contacts.

    d. Contacts are not crushed or deformed.



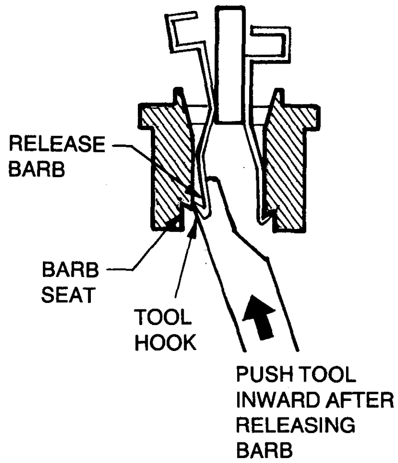
19. If a wire is improperly terminated, remove the wire and contact from the connector using the extraction/insertion tool:

 a. Hold the flat side of the extraction/insertion tool against the wire and gently pry the wire out of the contact as shown.



b. Place the hooked end of the tool over the contact barb and pry the barb off its seat.

c. With the tool still engaged with the barb, gently push the contact out of the connector housing (as shown).



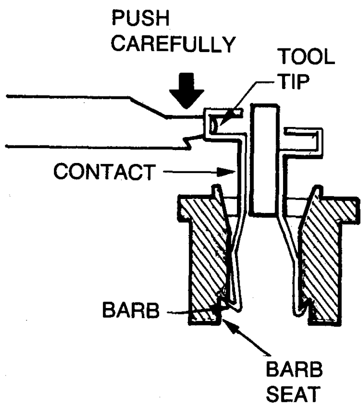
LKG-1813-88

d. Insert the tip of the tool into the wire slot and pull the contact all the way out of the connector.

20. Insert a new contact:

a. Remove an unused contact from the same type connector.

NOTE
Pins 17, 18, 35, and 36 are unused.



LKG-1814-88

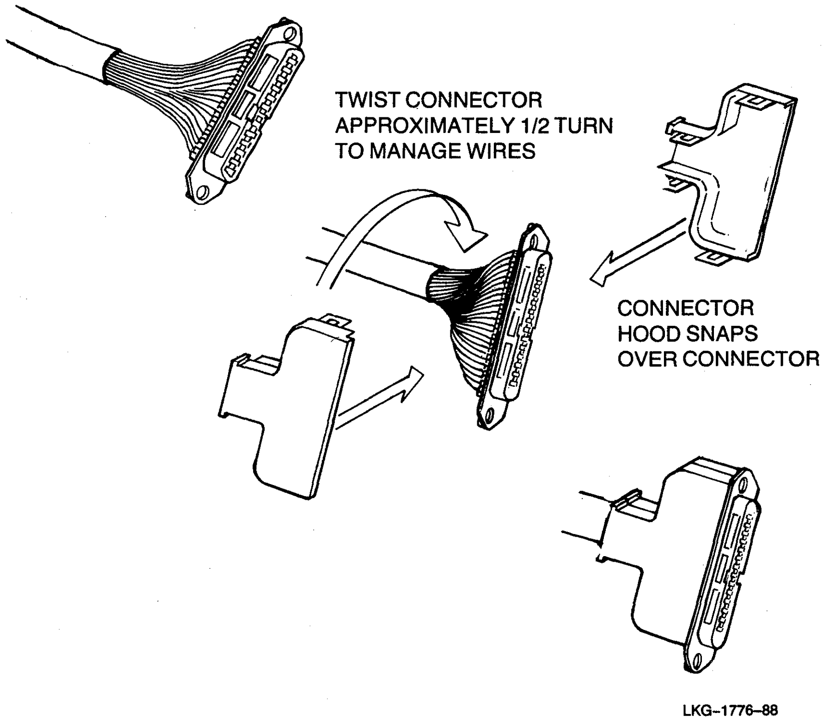
b. Carefully place this contact into the connector where the damaged one was removed.

c. Insert the tip of the extraction/insertion tool into the wire slot and push the contact into the connector (as shown).

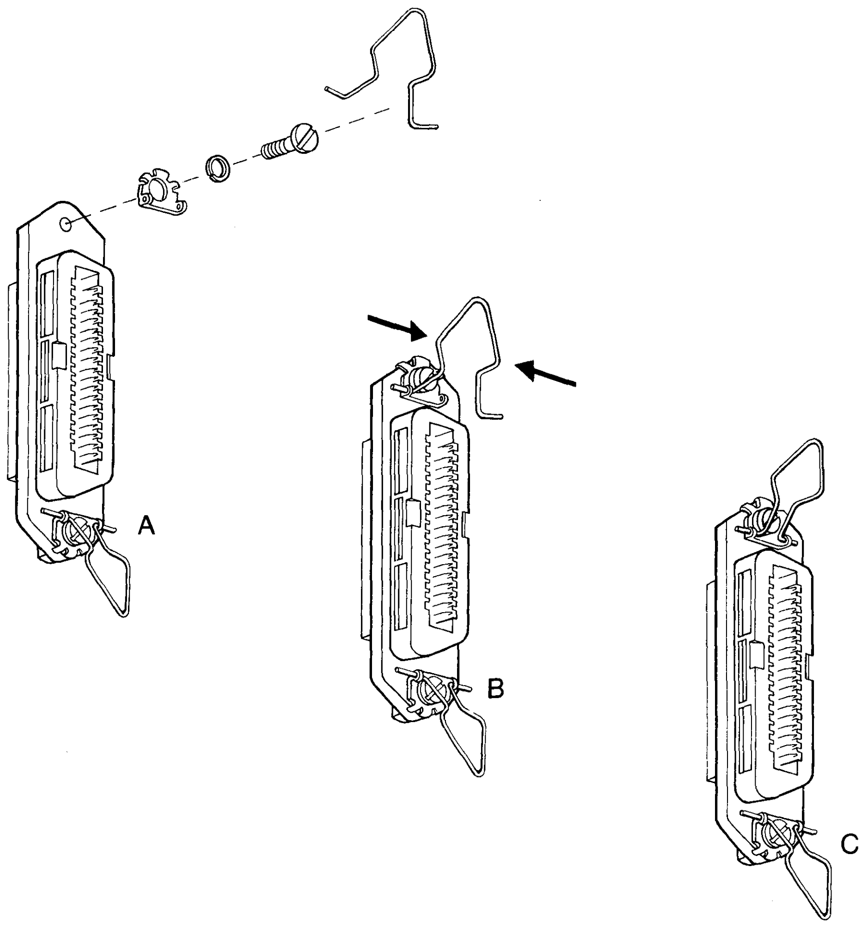
d. Ensure that the barb seats.

e. Replace the wire using the punchdown tool.

21. Install the connector hood (as shown).



22. Install the bail-locks.



MKV88-1653

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.

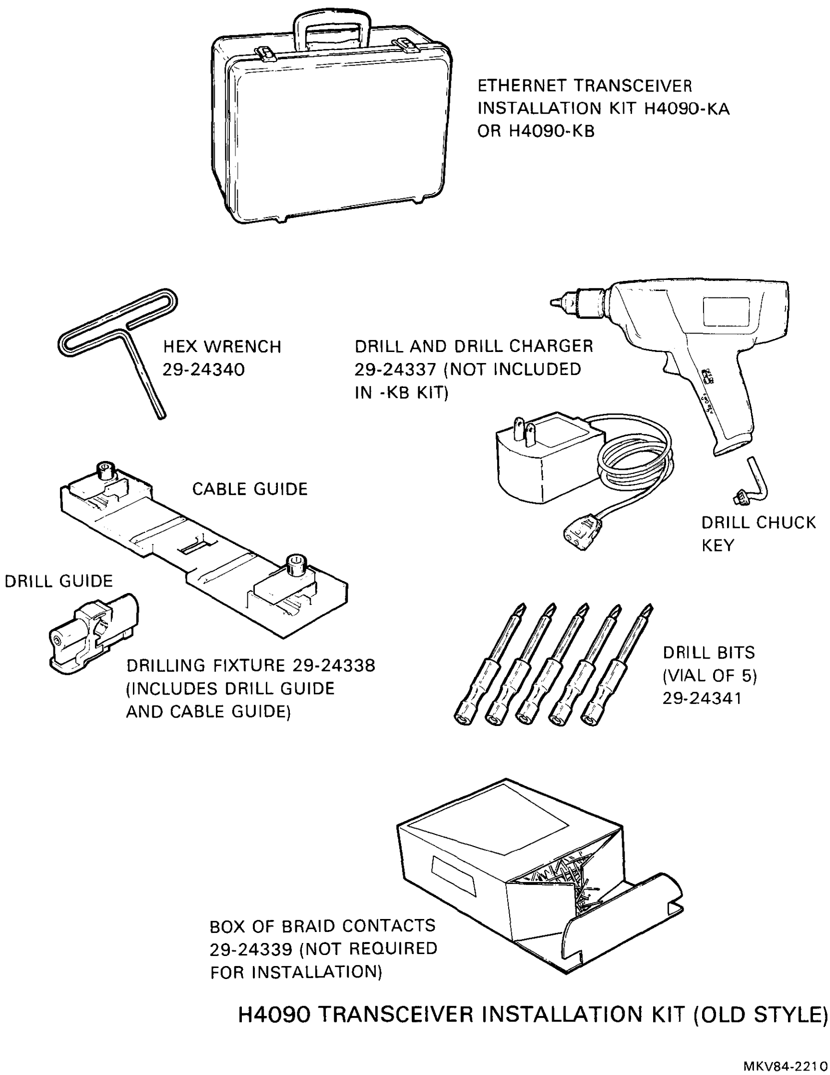


Figure 1 Transceiver Installation Kit Parts (Sheet 1 of 2)

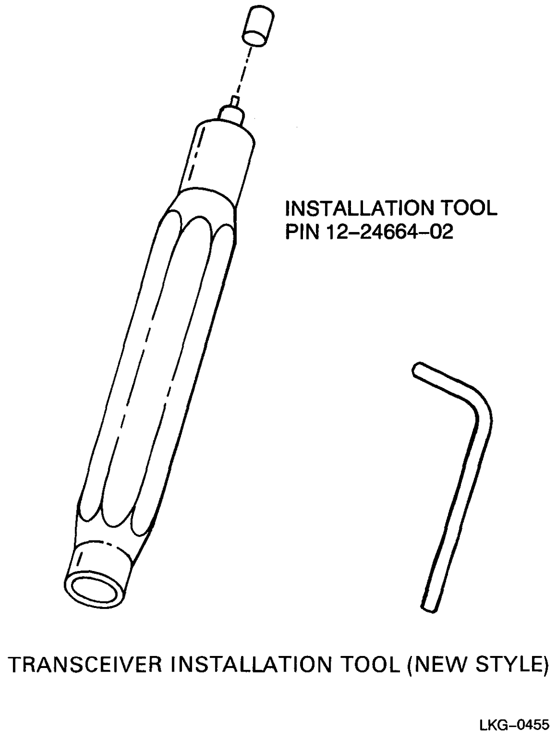


Figure 1 Transceiver Installation Kit Parts (Sheet 2 of 2)

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

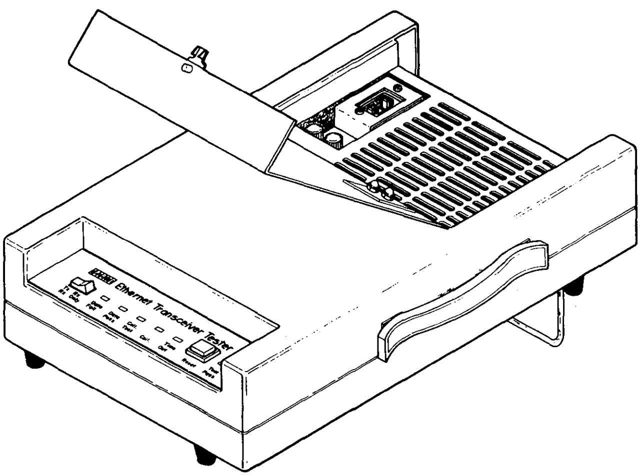
  In this mode, one tester is used to verify the transceiver to which it is connected. The tester transmits a packet to the transceiver, receives these data packets back from the transceiver, and verifies the data packets.

- 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.



MKV84-1658

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.

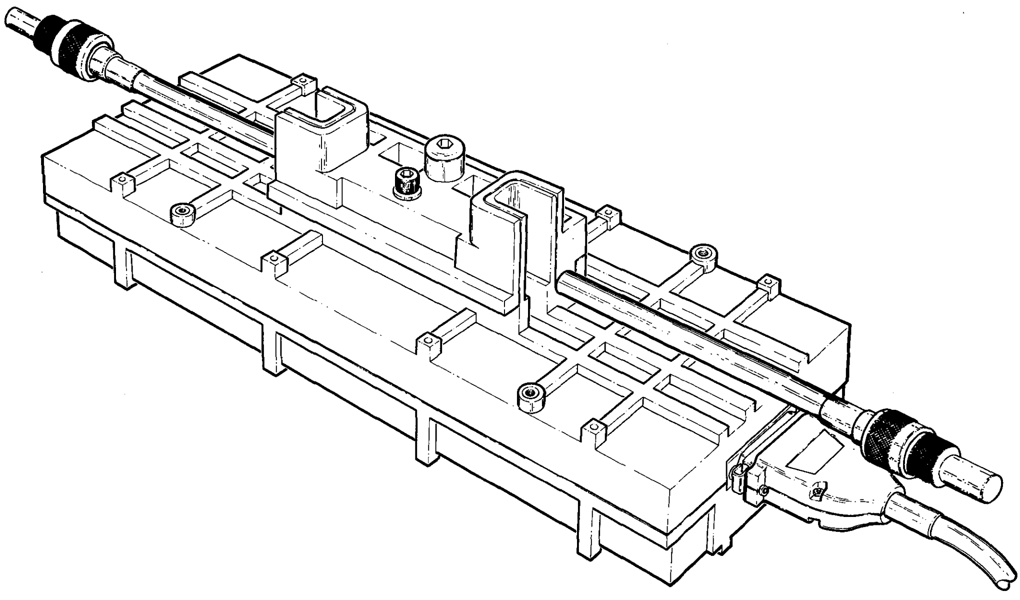


Figure 3 H4080 Loopback Test Connector

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.

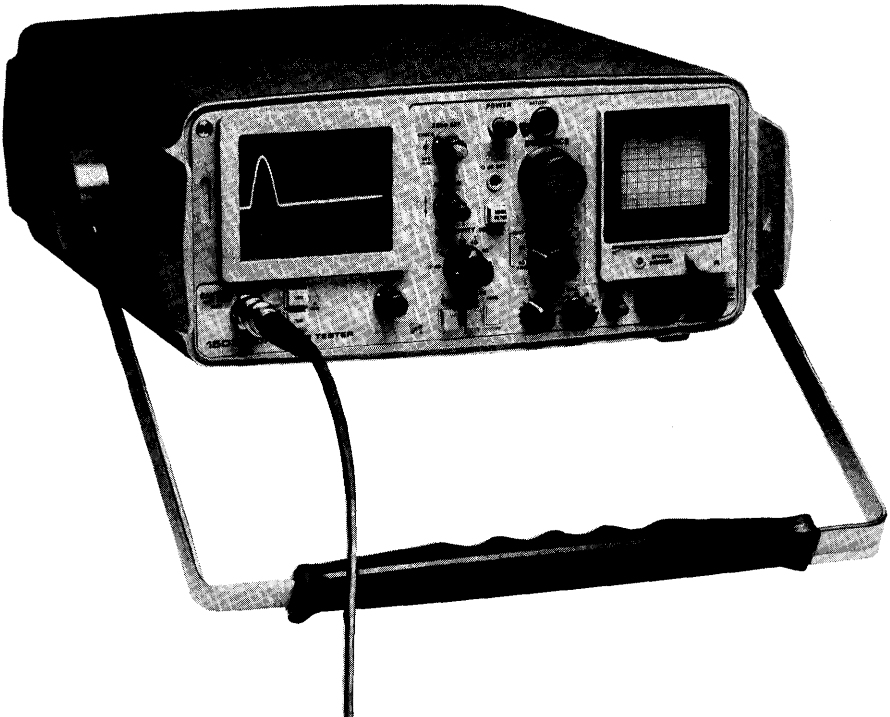


Figure 4 Tektronix Type 1503 TDR

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.

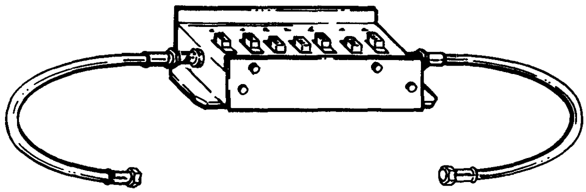


Figure 5 Blonder-Tongue Model SA-7U Variable Attenuator

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".

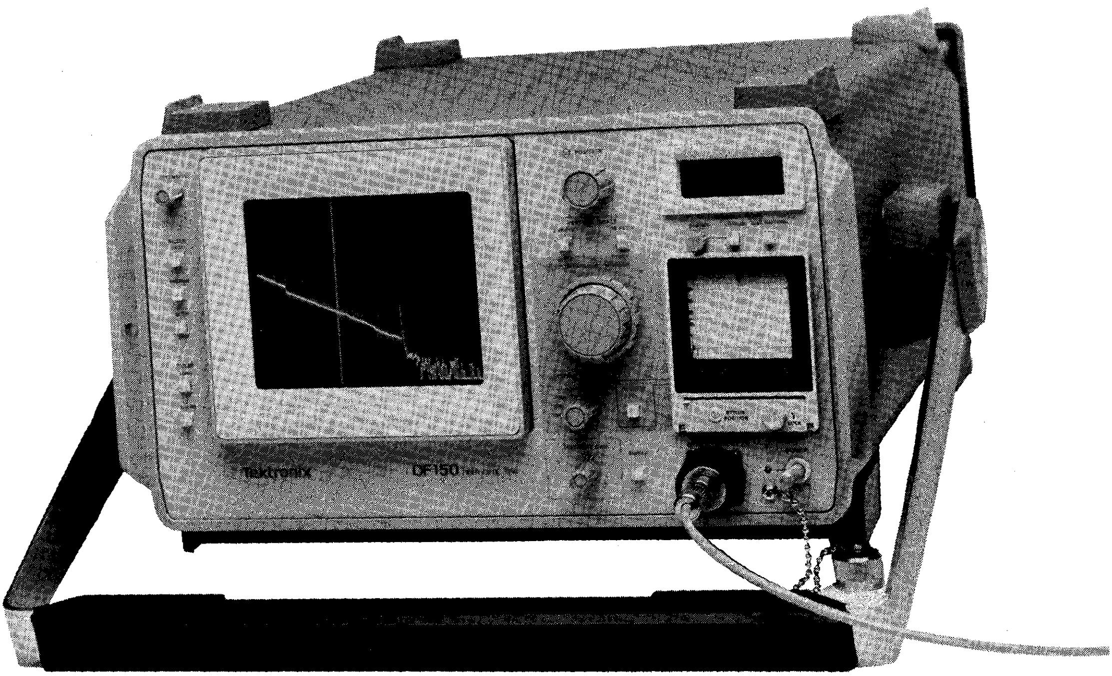
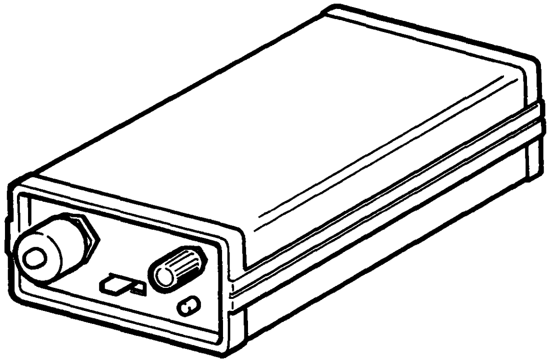


Figure 7 Tektronix Model OF-150 FOTDR

4.4.3 FOTEC Optical Test Set

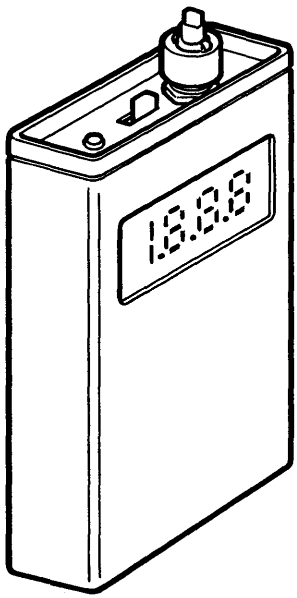
The FOTEC Optical Test Set is a portable test device used to measure and perform the following:

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



MKV86-0555

Figure 8 FOTEC S300 Signal Source



MKV86-0556

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.

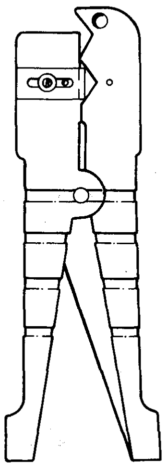
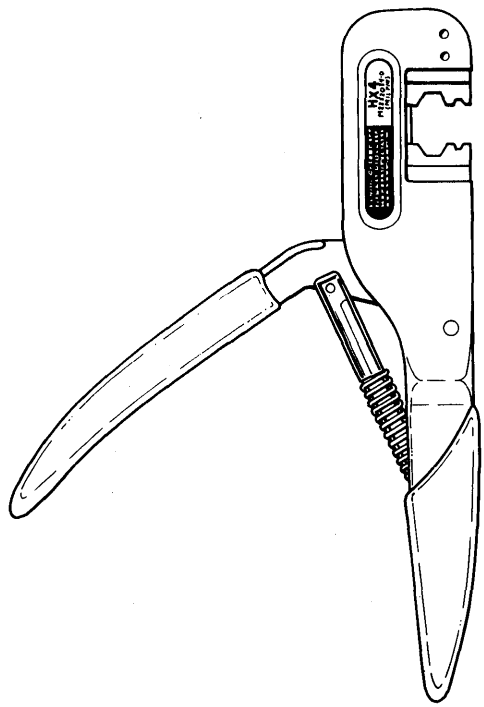


Figure 10 DIGITAL 29-24668 Coaxial Cable Stripper

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.

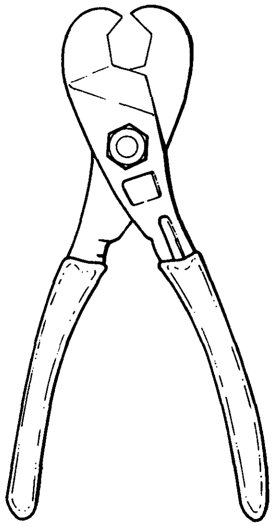


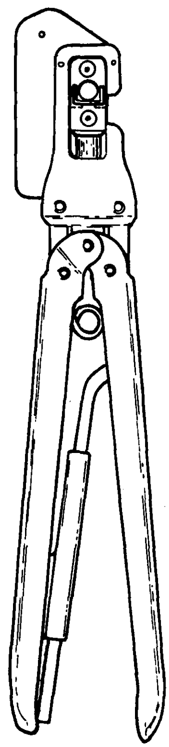
Figure 12 DIGITAL 29-24667 Coaxial Cable Cutter

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.

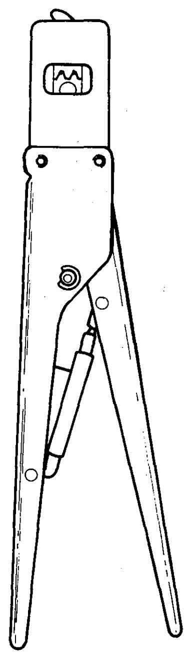


Figure 14 AMP 90302-1 D-Connector Pin Crimper

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.

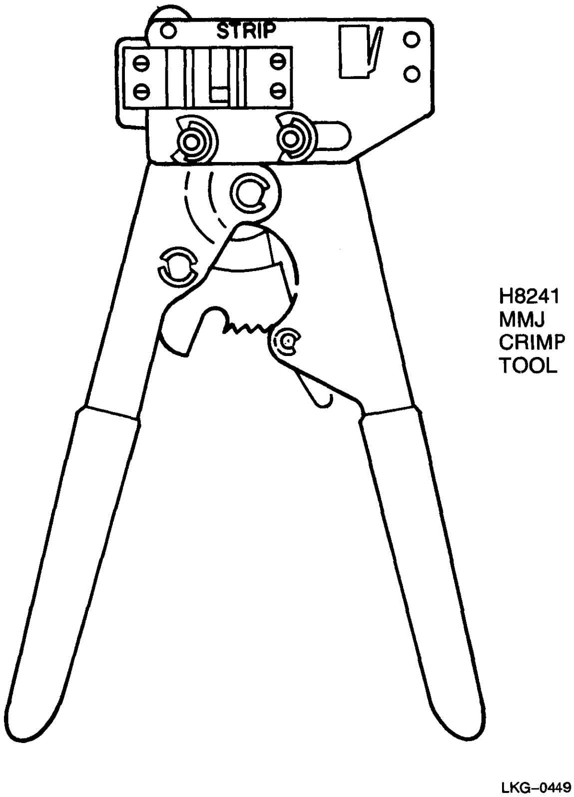


Figure 15 H8241 MMP Crimp Tool

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.

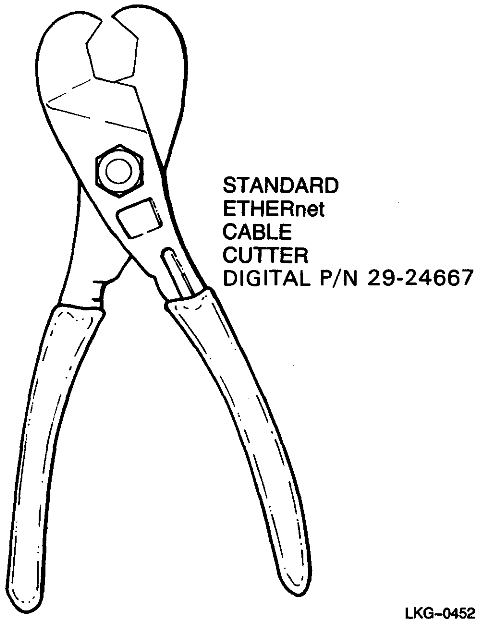


Figure 16 Standard Ethernet Cable Cutter

4.7.4 Standard Ethernet Cable Stripper

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

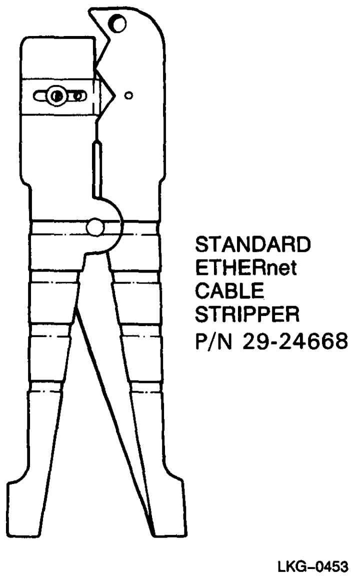


Figure 17 Standard Ethernet Cable Stripper

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.

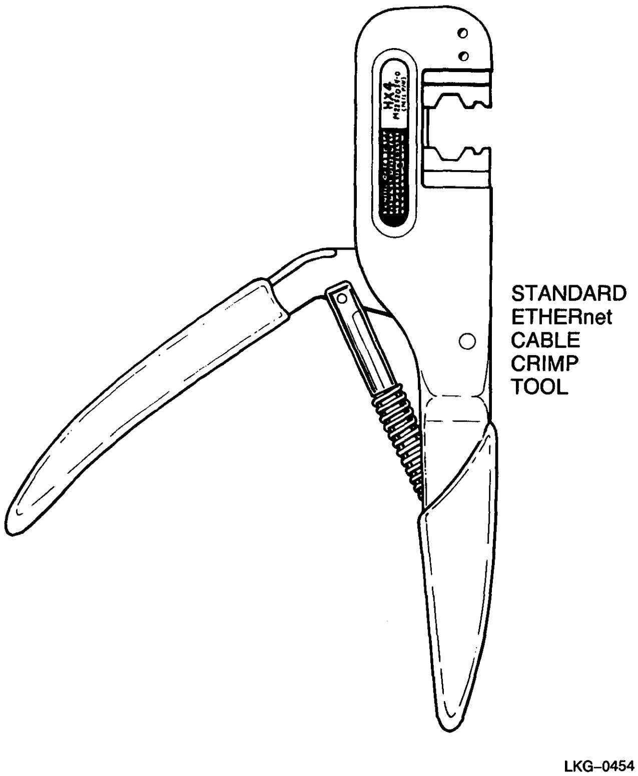


Figure 18 Standard Ethernet Cable Crimp Tool and Die Set

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.

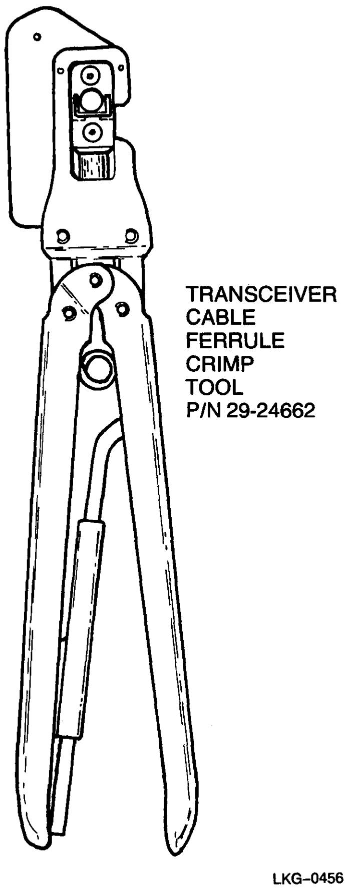


Figure 19 Transceiver Cable Ferrule Crimp Tool and Die Set

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.

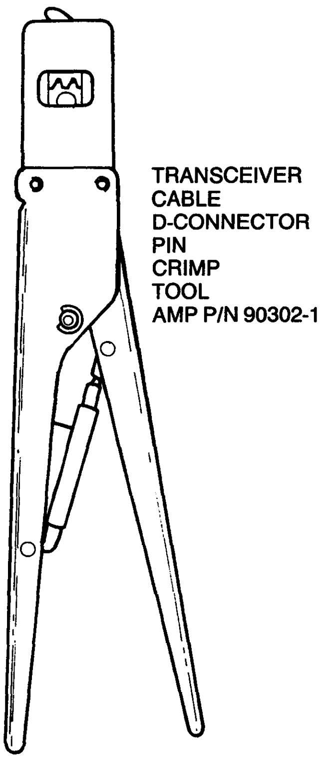


Figure 20 Transceiver Cable D-Connector Pin Crimp Tool

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.

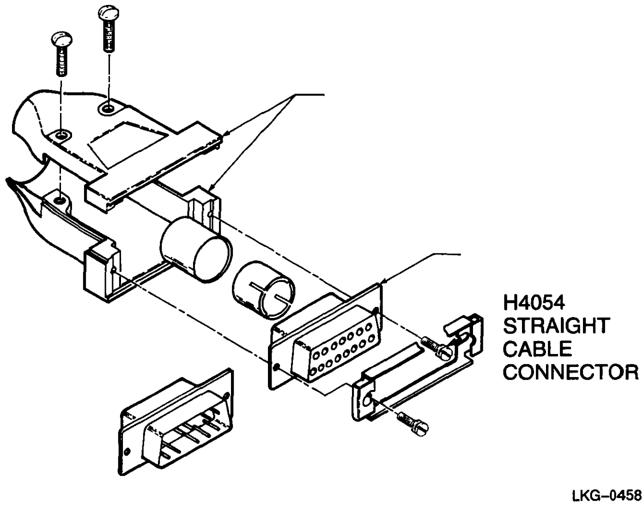


Figure 21 H4054 Transceiver Cable Straight Connector Kit

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.

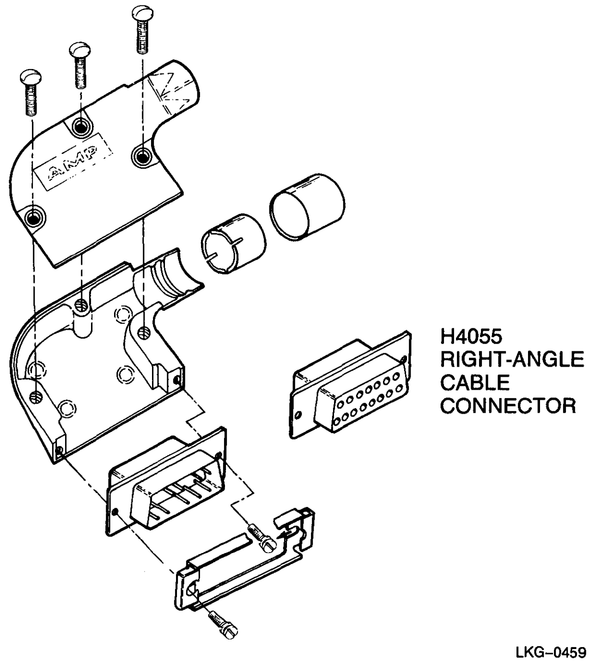


Figure 22 H4055 Transceiver Cable Right-Angle Connector Kit

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.

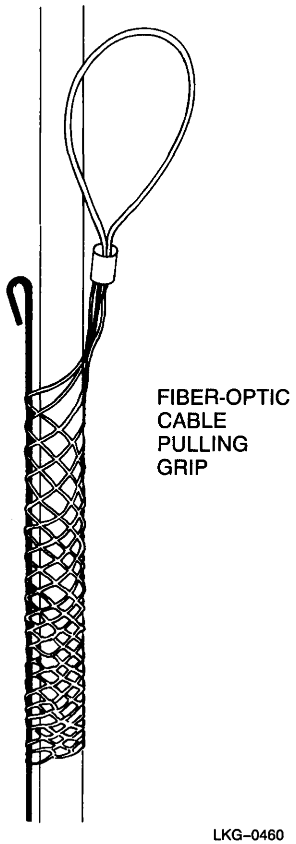


Figure 23 Fiber-Optic Pulling Device

4.7.12 Fiber-Optic Swivel

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

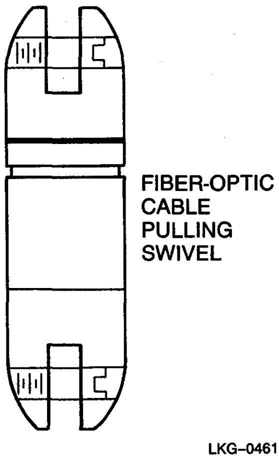


Figure 24 Fiber-Optic Swivel

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 [UNA11] DWO XEAO 774510 120
          [LUA11]

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 C0
- 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 NIE
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 PCSR0 ADDRESS (O) ? 174510?		ENTER THE ADDRESS
WHAT IS THE VECTOR ADDRESS (O)? 120?		ENTER VECTOR
WHAT IS THE PRIORITY LEVEL (O)? 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.

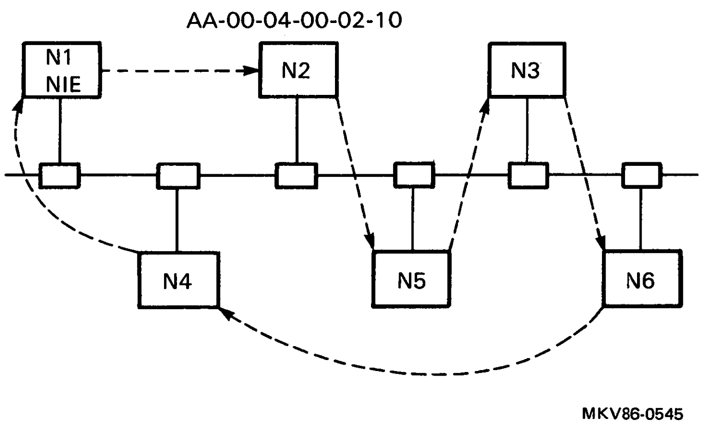


Figure 1 BOUNCE Command

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/N1,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

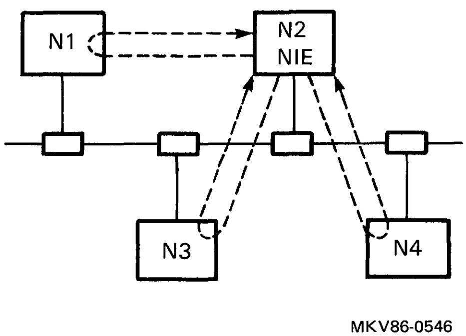


Figure 2 RUN DIRECT

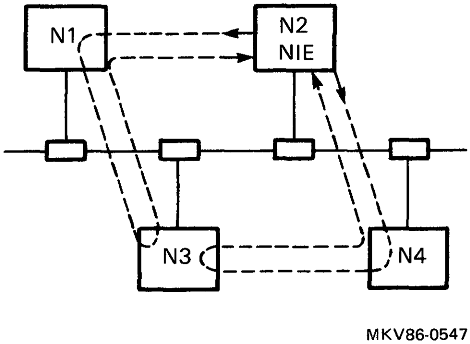


Figure 3 RUN LOOPPAIR

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>BOUNCE/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 XEA0: 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:XEA0
******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/O 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 UNA11 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 be disabled on the node running the NIE.

PROBLEM #1

Customer at Node N2 cannot communicate with Node N4.

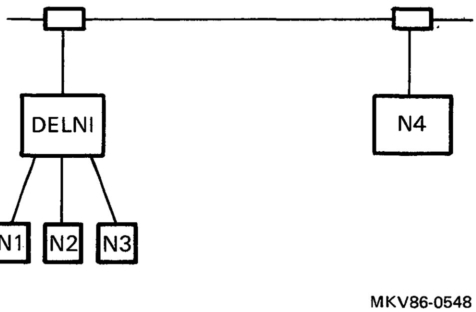


Figure 4 Network Configuration for Problem #1

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

NIE>UNSAVE (Loads "saved" node table)
NIE>BOUNCE/N1,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 XEA0: 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/N1,N3,N4
Starting bounce - 512 bytes, ASCII data pattern..Test ok

Problem solved.

PROBLEM #2

Customer at Node N1 cannot talk to Node N4.

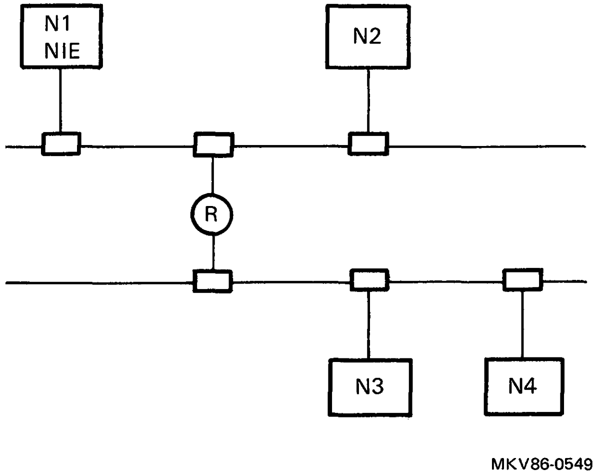


Figure 5 Network Configuration for Problem #2

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 XEA0: 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 XEA0: 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 = 1.

LENGTH
Specifies length (in bytes) of the blocks to be sent during loopback. Range = 1 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 = 1.

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)

CHAPTER 6
ETHERNET CONFIGURATION

6.1 INTRODUCTION

This chapter defines the local area network (LAN) configurations supported by the Ethernet and summarizes the guidelines for these configurations.

Ethernet configurations fall into one of five categories:

- Standard Ethernet configurations (see Section 6.3)
- ThinWire Ethernet configurations (see Section 6.4)
- Combined Standard/ThinWire Ethernet configurations (see Section 6.5)
- Extended LAN configurations (see Section 6.6)
- Broadband Ethernet configurations (see Section 6.7)

6.2 GENERAL GUIDELINES

All configurations must conform to the following guideline:

> The number of stations for a single Ethernet network must be limited to 1024. A station is any network-addressable device. Repeaters and DELNI network interconnects are not considered stations.

The various configurations are illustrated in figures and the rules are listed in conjunction with them. Figure 1 identifies the symbols used in the illustrations.

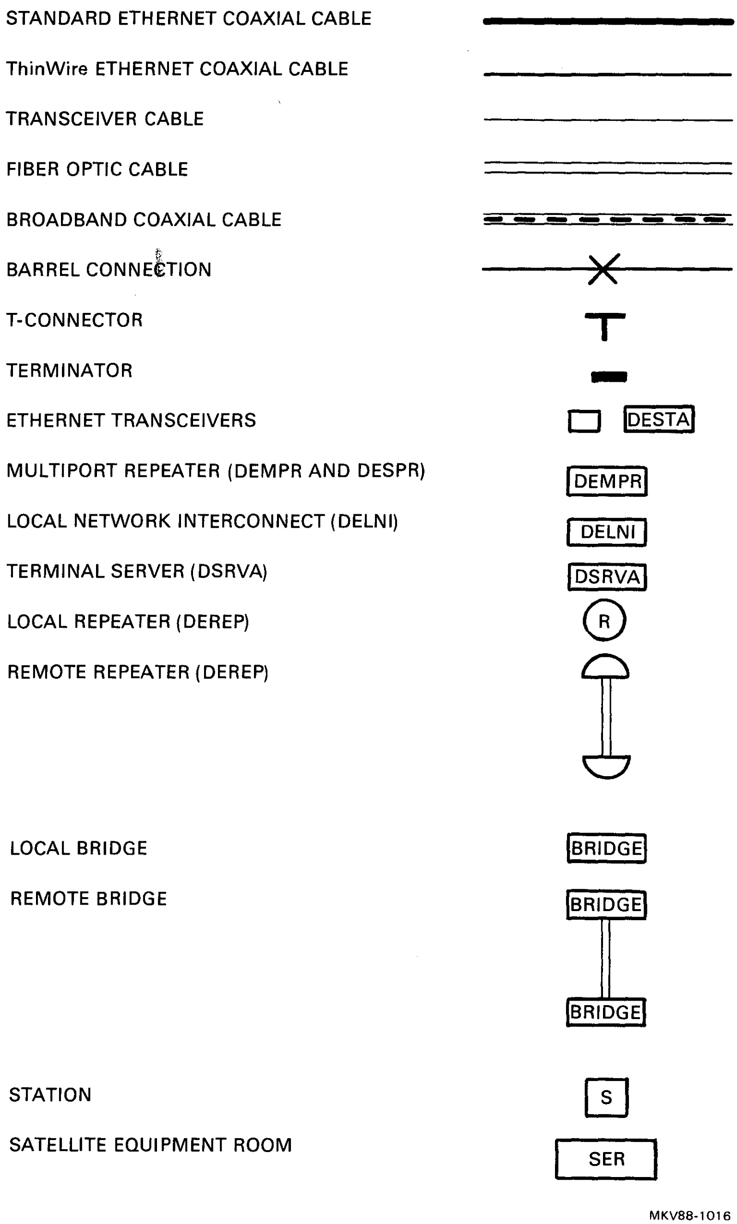


Figure 1 Ethernet Network Architectural Symbols

6.3 STANDARD ETHERNET CONFIGURATIONS

Standard Ethernet LANs are Digital Equipment Corporation's implementation of both the Ethernet and IEEE 802.3 "10base5" standards. Standard Ethernet LANs are Ethernets that are composed of one or more standard Ethernet coaxial cable segments. If the network consists of multiple segments, these segments are joined by the use of standard Ethernet repeaters (DEREP). Standard Ethernets are sometimes called IEEE 802.3 "10base5" networks. The 10 refers to the speed of the network (10 Mbits/s) and the 5 refers to the maximum length allowed for a single segment (500 meters or 1640.0 feet).

This section describes the rules for the following:

- Station attachments to standard Ethernet LANs (see Section 6.3.1)
- Standalone DELNI configurations (see Section 6.3.2)
- Cascaded DELNI configurations (see Section 6.3.3)
- Standard Ethernet coaxial cable segments (see Section 6.3.4)
- Multiple-segment standard Ethernet configurations (see Section 6.3.5)

6.3.1 Station Attachment to Standard Ethernet LANs

Basic configuration rules:

- Stations are attached to standard Ethernet LANs by means of a transceiver (also called a Medium Attachment Unit or MAU). The transceiver mounts on the standard Ethernet coaxial cable by means of a tap. The transceiver provides a connection point for a transceiver drop cable which is attached to the station.

- Transceiver drop cables must be limited to 50 meters (164.0 feet) in length. This maximum length may be reduced due to an internal cabling equivalency at the station or due to the use of high-loss transceiver cable:

  - Many stations have an internal cabling equivalency. This cabling equivalency is a measure of the internal timing delay of the device expressed in meters of transceiver cable. This cable equivalency must be subtracted from the 50-meter maximum (164.0 feet). For instance, if a station has a 5-meter (16.4 feet) internal cabling equivalency, then its maximum allowable transceiver cable length is 50−5 or 45 meters (147.6 feet). The internal cabling equivalencies for all DECconnect System Ethernet products are given in Table 1.

  - High-loss transceiver cable has a signal loss that is four times that of the regular transceiver cable. Therefore, if high-loss transceiver cable is used, the maximum transceiver cable distance must be divided by 4. This means the maximum high-loss transceiver cable length allowed is 12.5 meters (41.0 feet). If the station has any internal cabling equivalency, this should be subtracted from the 50-meter (164.0 feet) maximum before dividing by 4. For instance, if a station has a 10-meter (32.8 feet) internal cabling equivalency and is attached to its transceiver using high-loss transceiver cable, then its maximum allowable transceiver cable length is (50−10)/4 or 10 meters (32.8 feet).

- Table 2 shows which products and transceivers are compatible. When an H4005 transceiver is used, the transceiver cable must be an IEEE 802.3-compliant transceiver cable (BNE3H/K/L/M or BNE4C/D).

NOTE

When the DELNI is used with an H4005, H4000-BA, or DESTA with heartbeat disabled, any devices attached to the DELNI will show incrementing collision detect check failure counters.

Table 1 Internal Cable Equivalencies

Product	Cable Equivalency (in meters)
DECNA	5
DELUA	5
DEQNA	5
DEUNA	10
DELNI	5
DEREP	0
DEMPR/DESPR	0
LAN Bridge 100	0
DECserver 100	0
Ethernet Terminal Server	10
DELQA	5
DECserver 200	0
DECserver 500	5
DEBNA/DEBNK	5

Table 2 Transceiver and Product Matrix

Product	Transceiver
DECNA	H4000/H4005/DESTA
DELUA	H4000/H4005/DESTA
DEQNA	H4000/H4005/DESTA*
DEUNA	H4000/H4005/DESTA
DELNI	H4000/H4005/DESTA**
DEREP	H4000
DEMPR	H4000/H4005/DESTA†
LAN Bridge 100	H4000/H4005/DESTA
DECserver 100	H4000/H4005/DESTA
Ethernet Terminal Server	H4000/H4005/DESTA
DELQA	H4000/H4005/DESTA
DECserver 200	H4000/H4005/DESTA
DECserver 500	H4000/H4005/DESTA*
DEBNA/DEBNK	H4000

* Transceiver cable must be 20 m or greater.
** With heartbeat disabled if DEMPR is under DELNI.
† Heartbeat is disabled if DEMPR is to be operated in IEEE 802.3 – compliant mode.

6.3.2 Standalone DELNI Configurations

Standalone DELNI configurations (see Figure 2) are composed entirely of a single DELNI and its eight associated transceiver cables.

Basic configuration rules:

- Up to eight stations can be attached to a DELNI using transceiver drop cables. The transceiver drop cables must conform to the guidelines given in Section 6.3.1. Note that no transceivers are needed; the transceiver cables are connected directly to the DELNI.
- The standalone DELNI must operate in LOCAL mode.

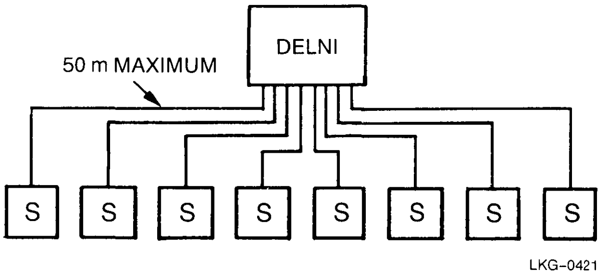


Figure 2 Standalone DELNI Configuration

6.3.3 Standalone Cascaded DELNI Configurations

Standalone cascaded DELNI configurations are composed entirely of DELNI interconnects and transceiver cables.

Basic configuration rules:

- Up to eight DELNI interconnects can be attached to a central DELNI to form a cascaded DELNI network (see Figure 3).
- The eight DELNI interconnects are attached using transceiver drop cables. The DELNI-to-DELNI transceiver drop cables must adhere to the guidelines given in Section 6.3.1. Note that the DELNI has no internal cabling equivalency when used in this manner.
- There can be only one level of cascading.
- The central DELNI must operate in LOCAL mode; the other DELNI interconnects must operate in GLOBAL mode.
- A cascaded DELNI network can never be attached to an Ethernet segment (ThinWire or standard).

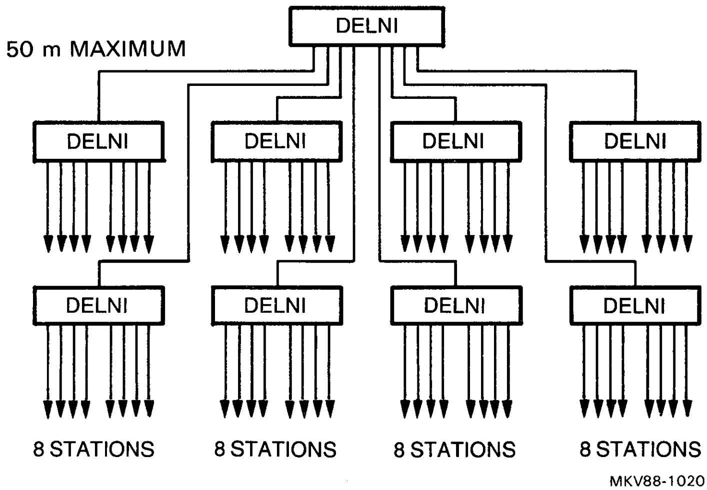


Figure 3 Standalone Cascaded DELNI Configuration

6.3.4 Standard Ethernet Coaxial Cable Segments

A standard Ethernet coaxial cable segment is composed of one or more standard cable sections (see Figure 4). The sections are joined using barrel connectors.

Basic configuration rules:

- A segment must be terminated with a 50-ohm terminator at each end of the segment.
- The segment must be grounded at a single point to the building's ground system.
- A cable segment can be up to 500 meters (1640.5 feet) long.
- There can be up to 100 transceivers on a cable segment.
- There must be at least 2.5 meters (8.2 feet) between transceivers.

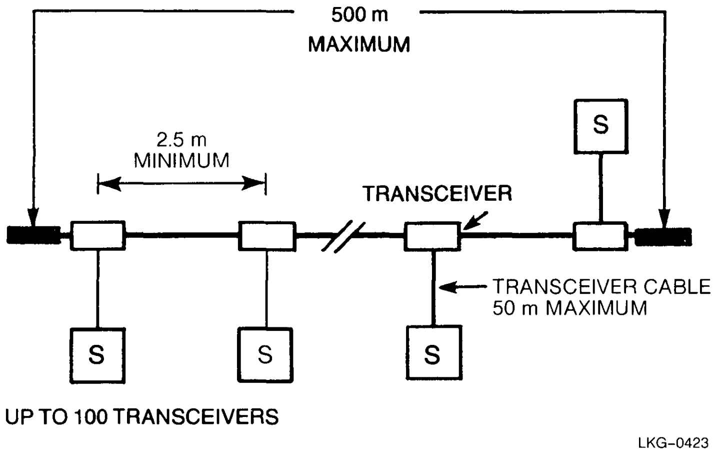


Figure 4 Standard Ethernet Coaxial Cable Segment

6.3.5 Connecting a DELNI to a Standard Ethernet Coaxial Cable Segment

A DELNI is connected to standard Ethernet cable using a transceiver and transceiver drop cable.

Basic configuration rules:

- The DELNI must operate in GLOBAL mode.
- When a DELNI is installed between a transceiver and a station (see Figure 5), the maximum *total* length of all transceiver cable between the transceiver and the station attached to the DELNI must not exceed 45 meters (147.6 feet). This is due to the DELNI interconnect's internal cabling equivalency of 5 meters (16.4 feet) when used in this manner. In addition, the maximum transceiver drop cable length is affected by the station's internal cabling equivalency or by the use of high-loss transceiver cable (see Section 6.3.1).
- A DELNI may be connected to a ThinWire segment with a DESTA. Care should be taken to ensure that all configuration guidelines are followed.

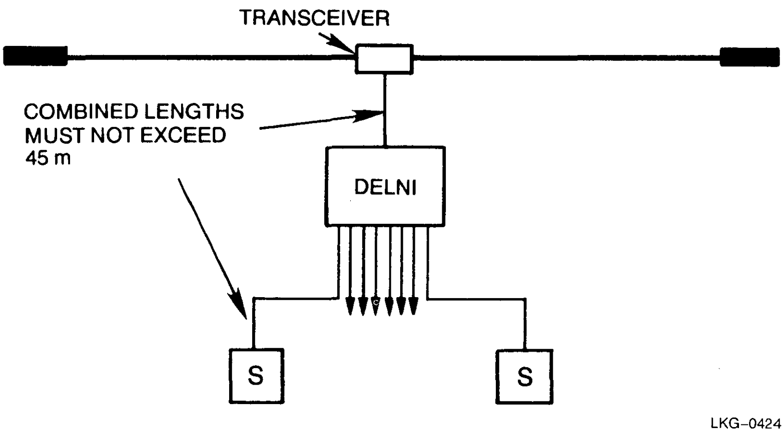


Figure 5 Connecting a DELNI to a Standard Ethernet Coaxial Cable Segment

6.3.6 Multiple-Segment Standard Ethernet Configurations

Multiple-segment standard Ethernets are composed of two or more standard Ethernet coaxial cable segments joined by the use of standard DEREP Ethernet repeaters. Each of the segments must follow the guidelines given in Section 6.3.4.

Basic configuration rules:

- There can be no more than two repeaters between any two stations. A repeater consists of a single local repeater or a pair of remote (fiber-optic) repeaters.

  - A local repeater can be used when the two segments to be joined are no more than 100 meters apart (328 feet) (see Figure 6). This length represents the length of the two transceiver drop cables used to attach the repeater to the segments.

  - A pair of DEREP-RC remote repeaters amplifies the signal between two standard Ethernet coaxial cables and transmits the signal over a fiber-optic link (see Figure 7).

    The total length of all interrepeater fiber-optic links between any two stations can be up to 1000 meters (3281.0 feet). Therefore, if multiple remote repeater pairs are used between stations, all the interrepeater fiber-optic links between stations must share this 1000-meter (3281.0-foot) allowance.

    For example, in Figure 7, there are two remote repeater pairs between stations A and B, and the combined lengths of interrepeater fiber-optic links X and Y (600 + 400) equal the maximum allowance of 1000 meters (3281.0 feet). There are also two remote repeater pairs between stations A and C. The combined lengths of these fiber-optic links is 900 meters (2952.9 feet).

    Note that the total length of all fiber-optic cable in the network can exceed 1000 meters (3281.0 feet) as long as each individual station-to-station path does not exceed this limit.

- The total cable length allowed between any two stations is 2800 meters (9186.8 feet). As previously outlined, this includes:

  - Three coaxial cable segments of 500 meters (1640.5 feet) each.

  - Two interrepeater fiber-optic links totalling a maximum of 1000 meters (3281.0 feet).

  - Four 50-meter (164.0-foot) transceiver cables; one for each of the four remote repeater components (for a total of two remote repeaters).

  - Two 50-meter (164.0-foot) transceiver cables, one for each station.

- Local repeaters can be placed in parallel for backup purposes (see Figure 6 repeaters R1 and R2). During normal operation one of the repeaters will be in standby mode. If the other repeater fails, the standby repeater will take over.

- DEREP repeaters cannot be connected to a DELNI or an H4005 transceiver.

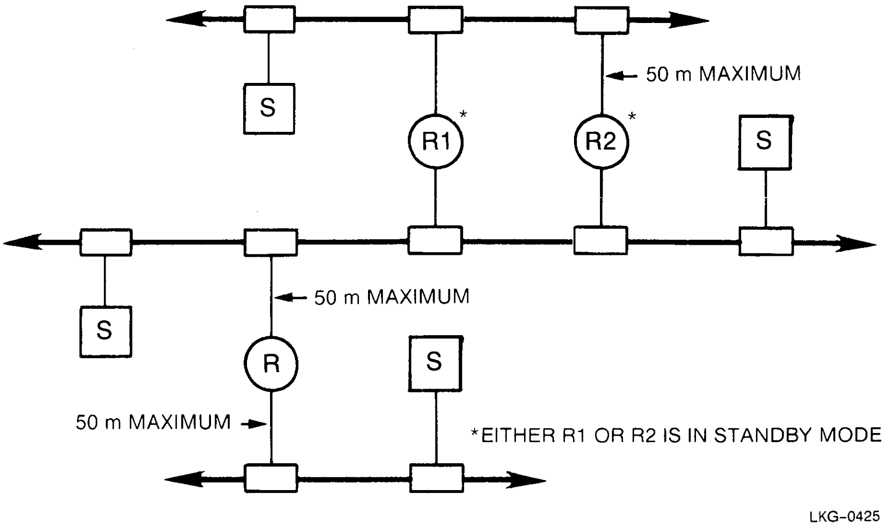


Figure 6 Multiple-Segment Ethernet with Local Repeaters

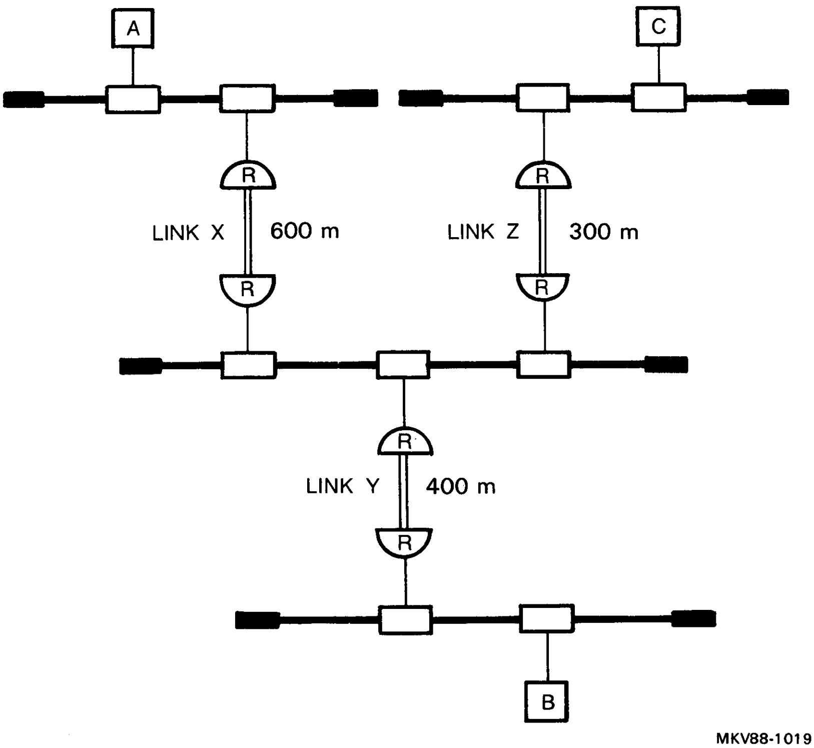


Figure 7 Multiple-Segment Ethernet with Remote Repeaters

6.4 ThinWire ETHERNET CONFIGURATIONS

ThinWire Ethernet configurations are Ethernets composed of one or more ThinWire coaxial cable segments. If the network consists of multiple segments, these segments are joined using ThinWire multiport repeaters (DEMPR). ThinWire Ethernets are sometimes called IEEE 802.3 "10base2" networks. The 10 refers to the speed of the network (10 Mbits/s) and the 2 refers to the maximum length allowed for a single segment (185 meters or 606.9 feet).

This section describes the rules for the following:

- ThinWire Ethernet coaxial cable segments (see Section 6.4.1)
- Standalone DEMPR networks (see Section 6.4.2)
- Cascaded DEMPR networks (see Section 6.4.3)

6.4.1 ThinWire Ethernet Coaxial Cable Segments

ThinWire coaxial cable segments can be standalone segments that are not attached to any DEMPR multiport repeaters (see Figure 8), or they can be part of a larger network, using DEMPR multiport repeaters (see Figure 9).

Basic configuration rules:

- ThinWire coaxial cable segments can be composed of multiple coaxial cable sections. These coaxial cable sections are joined by the use of barrel connectors or by the use of the T-connectors attached to the cable's stations.

- A cable segment can be up to 185 meters (606.9 feet) long.

- There must be a 50-ohm terminator at each end of the cable segment. If a DEMPR is attached to one end of the cable, the DEMPR provides the termination for that end; a terminator is still required for the other cable end.

- There must be one and only one ground per cable segment. Ensure that no other connectors contact the ground. If the segment is attached to a DEMPR, the DEMPR provides the ground and no other ground connections are allowed. Two DEMPR multiport repeaters cannot be connected with a single coaxial segment between two ports.

- Stations either attach directly to the cable using T-connectors or attach to an Ethernet station adapter (DESTA) by means of a transceiver cable. A DESTA is connected directly to the ThinWire by means of a T-connector. DESTA transceiver drops must meet the requirements outlined in Section 6.3.1.

NOTE
There can never be any cable between the T-connector and the attached station or DESTA.

- There must be at least 0.5 meters (19 inches) between T-connectors.

- Each cable segment can have a maximum of 30 stations between terminators. If the segment is attached to a DEMPR, the limit is 29 stations; if a satellite equipment room and faceplate are used, the limit is 28 stations.

These maximums are derived from a rule that limits the number of cable connections on a ThinWire segment to 60. Since each T-connector has two connections, there is a maximum of 30 stations allowed per cable, provided that terminators are attached to the T-connectors on the two end stations. Other connections reduce the allowable number of stations accordingly (for example; adding a barrel connector, which has two connections, would reduce the number of stations allowed by one). A DEMPR counts as one connection; a satellite equipment room and faceplate combination counts as three connections.

- ThinWire cable segments must never be configured in a loop.
- ThinWire cable segments must never have any branch segments. All T-connectors must attach directly to stations, not to other segments of ThinWire Ethernet coaxial cable.
- A DESPR can be configured anywhere a DEMPR can be used (providing only one port is needed).

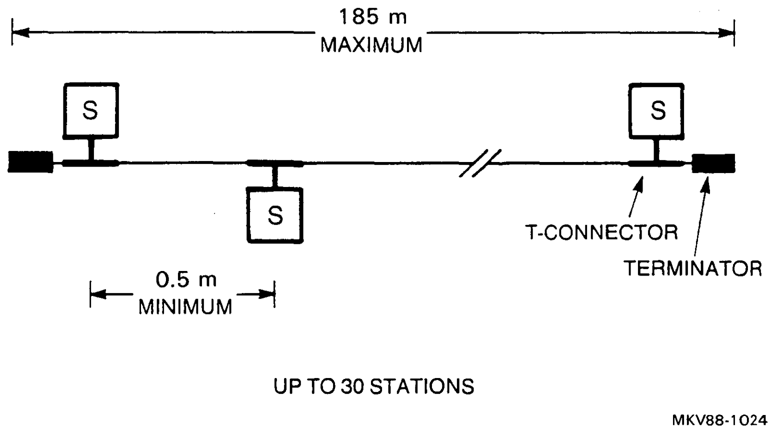


Figure 8 Standalone ThinWire Ethernet Coaxial Cable Segment

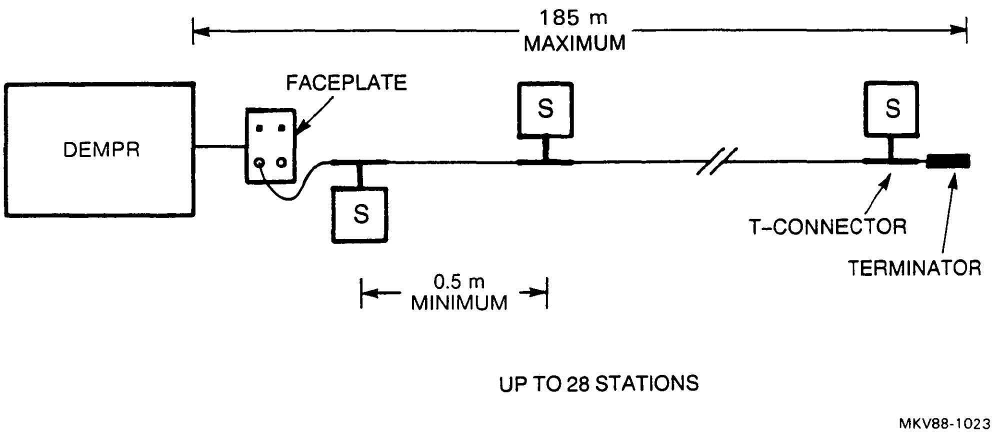


Figure 9 DEMPR ThinWire Ethernet Coaxial Cable Segment

6.4.2 Standalone DEMPR Configurations

Standalone DEMPR configurations are composed entirely of ThinWire coaxial cable segments and a single DEMPR multiport repeater.

Basic configuration rules:

- One to eight ThinWire cable segments can be attached to a DEMPR (see Figure 10).
- The attached ThinWire cable segments must adhere to all rules described in Section 6.4.1. Note that the DEMPR provides the grounding point for the segments and that the segments can have a maximum of 29 stations.
- A standalone DEMPR configuration can later be connected to a standard Ethernet using an H4005 transceiver.
- Cable segments must never be looped from one DEMPR port to another port on the same DEMPR.

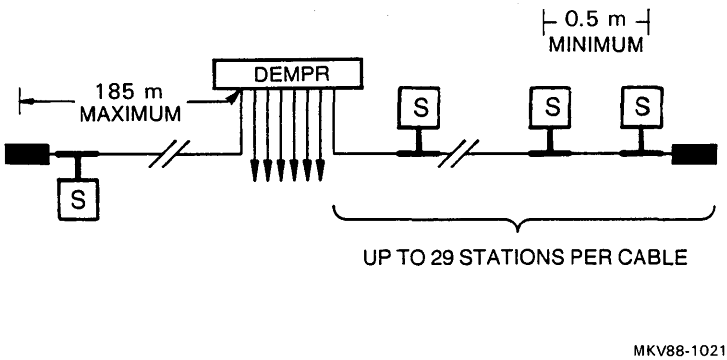


Figure 10 Standalone DEMPR Configuration

6.4.3 Standalone Cascading DEMPR Configurations

Cascaded DEMPR configurations are composed entirely of ThinWire coaxial cable segments and up to 30 multiport repeaters.

Basic configuration rules:

- There can be up to two DEMPR multiport repeaters between stations. Therefore, DEMPR multiport repeaters can be cascaded on only one of the ThinWire cables attached to a DEMPR (see Figure 11). This cascading segment can contain up to 29 cascaded DEMPR multiport repeaters. The cascaded DEMPR multiport repeaters are connected to the ThinWire cable segment using DESTA transceivers.
- All ThinWire segments in a cascaded DEMPR LAN must adhere to the guidelines for ThinWire segments given in Section 6.4.1. Note that the DEMPR multiport repeaters provide the grounding points for all segments and that each ThinWire segment in a cascaded DEMPR LAN is limited to 29 stations.
- Cascading DEMPR configurations can never be connected to a standard Ethernet LAN.

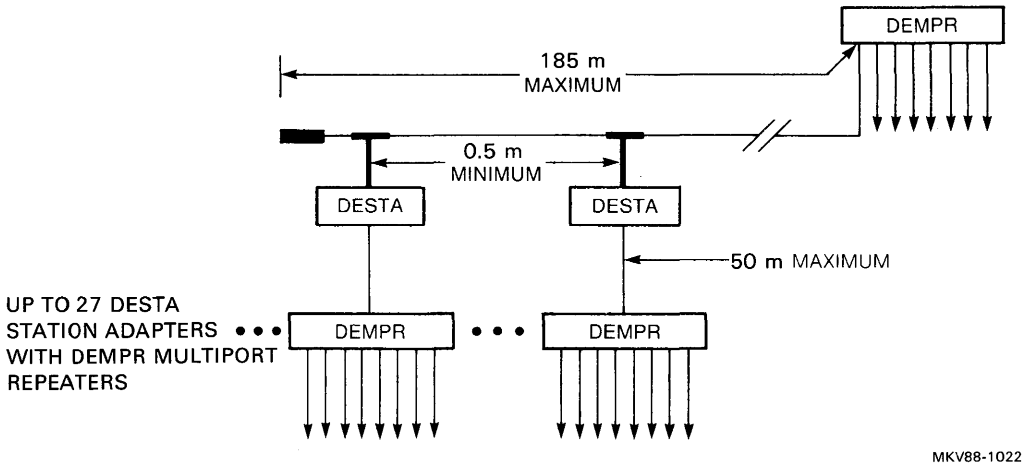


Figure 11 Standalone Cascading DEMPR Configuration

6.5 COMBINED STANDARD/ThinWire ETHERNET CONFIGURATIONS

ThinWire and standard Ethernet network components can be combined to create a combined standard/ThinWire LAN. Combined networks must adhere to both the rules that govern ThinWire networks and the rules that govern standard networks. In addition, there are some rules that are specific to combined networks. This section covers the configuration rules for the following networks:

- Standalone DELNI/DEMPR configurations (see Section 6.5.1)
- Connecting a DEMPR to a standard Ethernet coaxial cable segment (see Section 6.5.2)
- Connecting a DELNI/DEMPR combination to a standard Ethernet coaxial cable segment (see Section 6.5.3)

6.5.1 Standalone DELNI/DEMPR Configurations

Standalone DELNI/DEMPR configurations are composed entirely of a single DELNI and up to eight DEMPR multiport repeaters (see Figure 12).

Basic configuration rules:

- Up to eight DEMPR multiport repeaters can be connected to a standalone DELNI.
- The DELNI must be in GLOBAL mode and it must have a special loopback connector (DIGITAL P/N 12-22196-01) attached to the global transceiver connector.
- Cascaded DEMPR multiport repeaters are not allowed; that is, no other DEMPR can be attached to any of the 64 possible ThinWire segments.
- Rules for the ThinWire cable segments connected to the DEMPR multiport repeaters are the same as those defined for a standalone DEMPR (see Section 6.4.2).
- A DELNI/DEMPR combination can later be attached to a standard Ethernet coaxial cable segment. If this is done, however, the standard Ethernet coaxial cable segment must meet the guidelines given in Section 6.5.3.

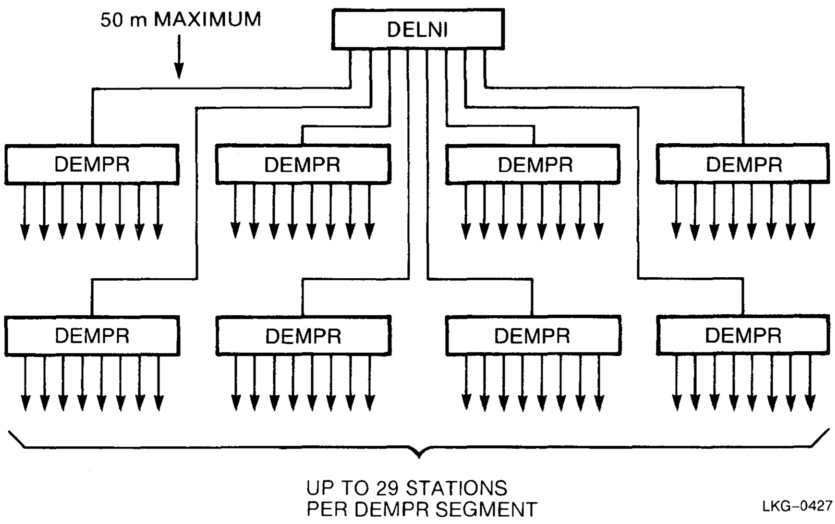


Figure 12 Standalone DELNI/DEMPR Configuration

6.5.2 Connecting a DEMPR to a Standard Ethernet Segment

Basic configuration rules:

- A DEMPR must be connected to a standard Ethernet coaxial cable using an H4000-BA or H4005 transceiver (see Figure 13). When using an H4005, the transceiver cable must be an IEEE 802.3-compliant transceiver cable (BNE3H/K/L/M or BNE4C/D).
- Up to eight ThinWire cable segments can be attached to the DEMPR.
- Cascaded DEMPR multiport repeaters are not allowed; that is, no other DEMPR can be attached to any of the eight ThinWire segments.
- All standard and ThinWire segments must adhere to rules given in Sections 6.3.4 and 6.4.2.

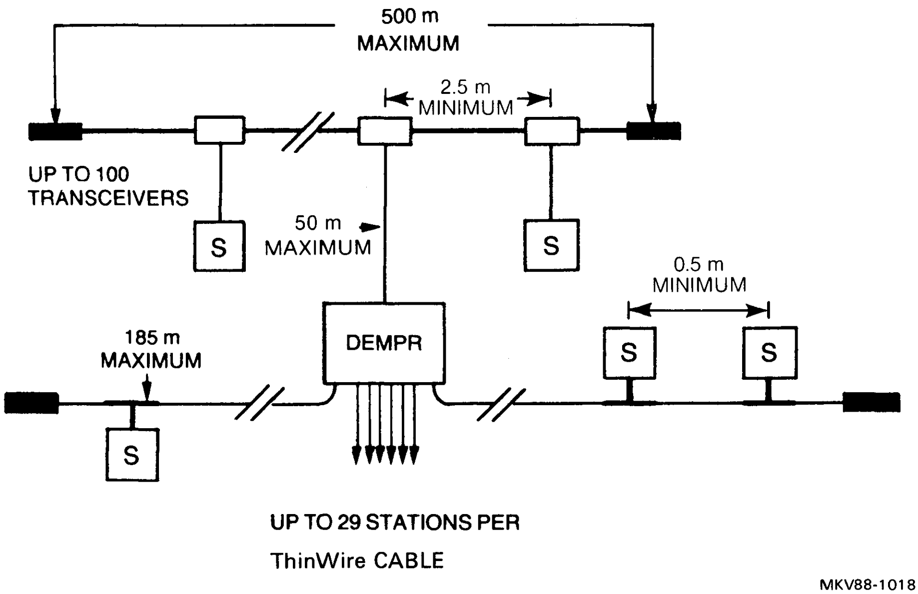


Figure 13 Connecting a DEMPR to a Standard Ethernet Coaxial Cable Segment

6.5.3 Connecting a DELNI/DEMPR Combination to a Standard Ethernet Segment

Basic configuration rules:

- The DELNI must be connected to the standard Ethernet cable using an H4000-BA or H4005 transceiver with heartbeat disabled. When using an H4005, the transceiver cable must be an IEEE 802.3-compliant transceiver cable (BNE3H/K/L/M or BNE4C/D).

  NOTE
  When this configuration is used, none of the devices attached to the DELNI receive heartbeat. This may cause the devices to report the lack of heartbeat as error counters or error messages.

- When a DELNI/DEMPR combination is used (see Figure 14), the standard Ethernet cable segment to which it is attached must not exceed 300 meters (984.3 feet).

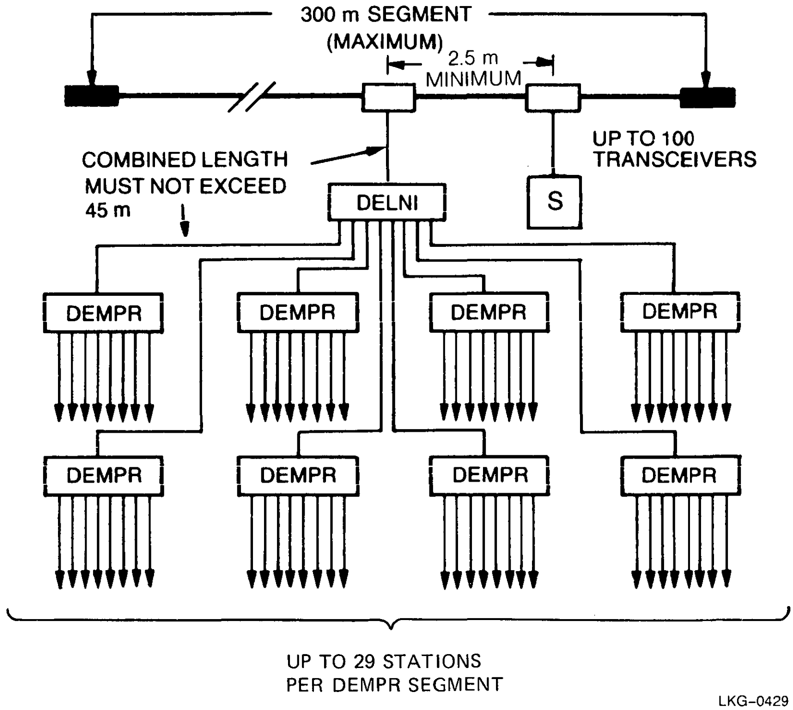


Figure 14 Connecting a DELNI/DEMPR Combination to a Standard Ethernet Segment

- When a DELNI/DEMPR combination is used, the total length of all transceiver cables between the DELNI interconnect's transceiver and each DEMPR must not exceed 45 meters (147.6 feet). [The DELNI consumes 5 meters (16.4 feet) of the usual cable allowance of 50 meters (164.0 feet)]. Only low-loss transceiver cable should be used.

- When a DELNI/DEMPR combination is used, DEREP repeaters may be connected to the same standard Ethernet segment.

- Up to eight DEMPR multiport repeaters can be attached to a DELNI that is connected to a standard Ethernet coaxial cable.

- One to eight ThinWire cables can be attached to each DEMPR.

- Cascaded DEMPR multiport repeaters are not allowed; that is, no other DEMPR can be attached to any of the 64 possible ThinWire segments.

- All ThinWire and standard Ethernet segments must adhere to the rules in Sections 6.3.4 and 6.4.2 respectively.

6.6 EXTENDED LAN CONFIGURATIONS

Two or more ThinWire Ethernet LANs, standard Ethernet LANs, or combined ThinWire/standard Ethernet LANs can be combined into an extended LAN by use of bridges. The configuration rules for the following extended networks are given:

- Extended networks with LAN Bridge 100 (DEBET) bridges (see Section 6.6.1)

- Extended networks with LAN Bridge 100/DEREP combinations (see Section 6.6.2)

- Extended networks with Vitalink TransLAN bridges (see Section 6.6.3)

- Extended networks with a METROWAVE (see Section 6.6.4)

It is important to note that bridges are designed to extend LANs transparently in terms of geographic distance, number of supported stations, and capacity. Bridges are not designed to address the general problem of building large, complex networks.

6.6.1 LAN Bridge 100 (DEBET) Bridge Configurations

Basic configuration rules:

- A local bridge joins two LANs by transmitting signals over connecting transceiver cables (see Figure 15). The networks can be up to 100 meters apart (328 feet; the maximum length of two transceiver cables).

- A pair of remote bridges joins two LANs by transmitting signals over a combination of transceiver cables and a fiber-optic link (see Figure 16). The fiber-optic link can be up to 2000 meters (6562 feet) long.

- There can be up to seven bridges between stations. Each remote bridge counts as one bridge (note that this rule differs from the rule for counting remote repeaters).

- The total number of stations in the extended network must be limited to 8000.

- Bridges can be placed in parallel for added availability. Bridges must be of the same type (LAN Bridge 100 or TransLAN).

- A bridge cannot be used when the two networks are already linked by a single DECnet router. If the networks are linked by two or more intervening routers a bridge can be used.

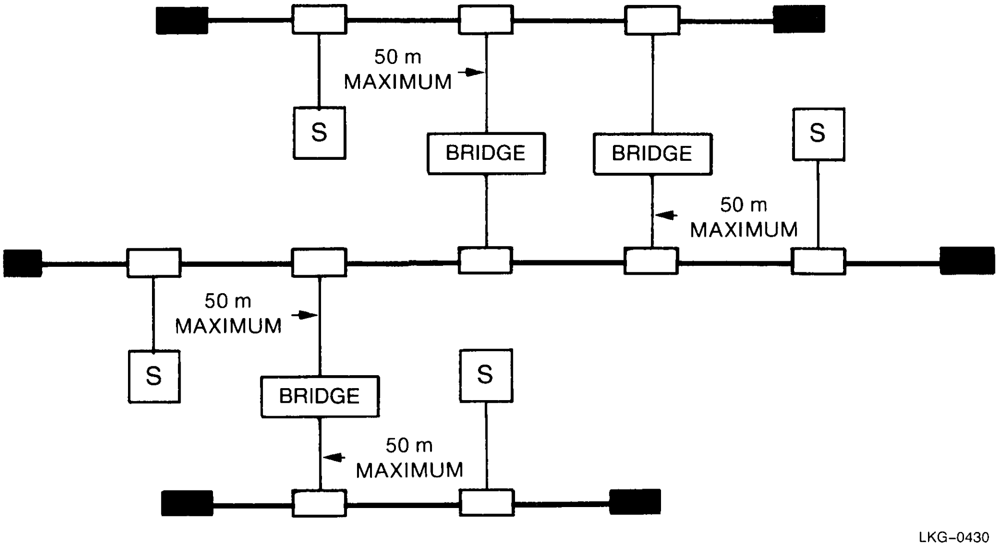


Figure 15 Extended Network with LAN Bridge 100 Local Bridges

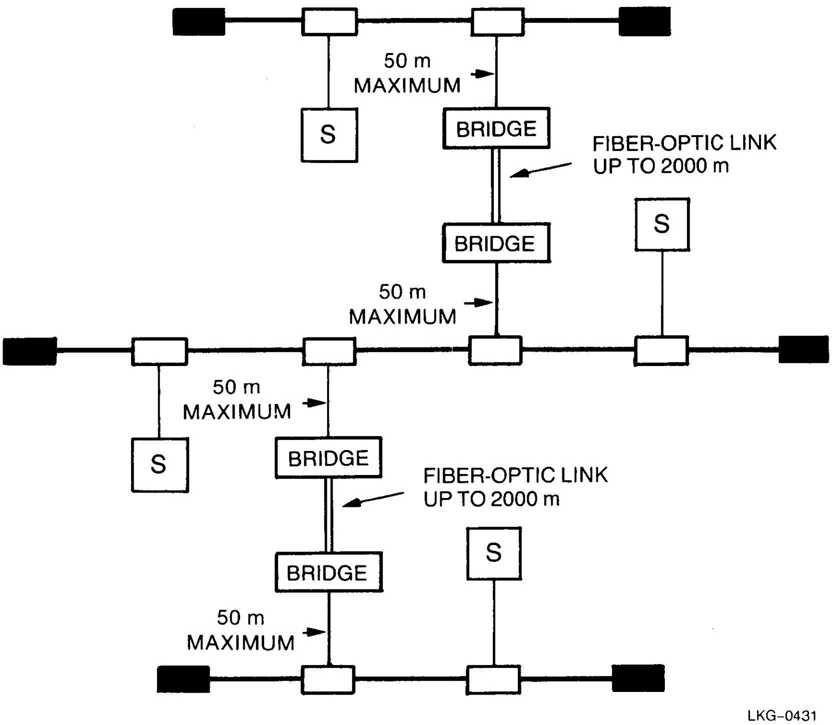


Figure 16 Extended Network with LAN Bridge 100 Remote Bridges

6.6.2 Remote LAN Bridge 100/Repeater Configurations

The remote bridge/repeater combination joins two LANs and amplifies the signal by transmitting over a combination of transceiver cables and a fiber-optic link.

Basic configuration rules:

- The extended network must adhere to all rules in Section 6.6.1.
- The maximum length allowed for the bridge-to-repeater fiber-optic link is calculated by adding 500 meters (1640.5 feet) to the maximum fiber-optic link allowed for repeater-to-repeater links (as described in Section 6.3.6).

  For example, in Figure 17, there are two remote repeaters between stations A and B; therefore, as described in Section 6.3.6, there can be a maximum fiber-optic link length of 1000 meters (3281 feet) between them (X + Y = 1000). To transmit to bridge B1, both of these stations must transmit over one remote repeater (either X or Y) fiber-optic link and the bridge/repeater fiber-optic link (Z). To determine the maximum length allowed for Z, subtract the greater of X or Y from the 1000 meters permitted for repeater fiber-optic links. Then add 500 meters to this value: (1000-600)+500=900 meters, or 2952.9 feet.

  When the bridge/repeater components are reversed (as done with bridge B2), the length permitted for the fiber-optic link (W) increases to 1500 meters (4921.5 feet). This occurs because there is no other fiber-optic link between the bridge and either of the stations (C and D) on the other side of the repeater in the bridge/repeater combination. The lengths of X and Y remain at the maximum allowed between stations.

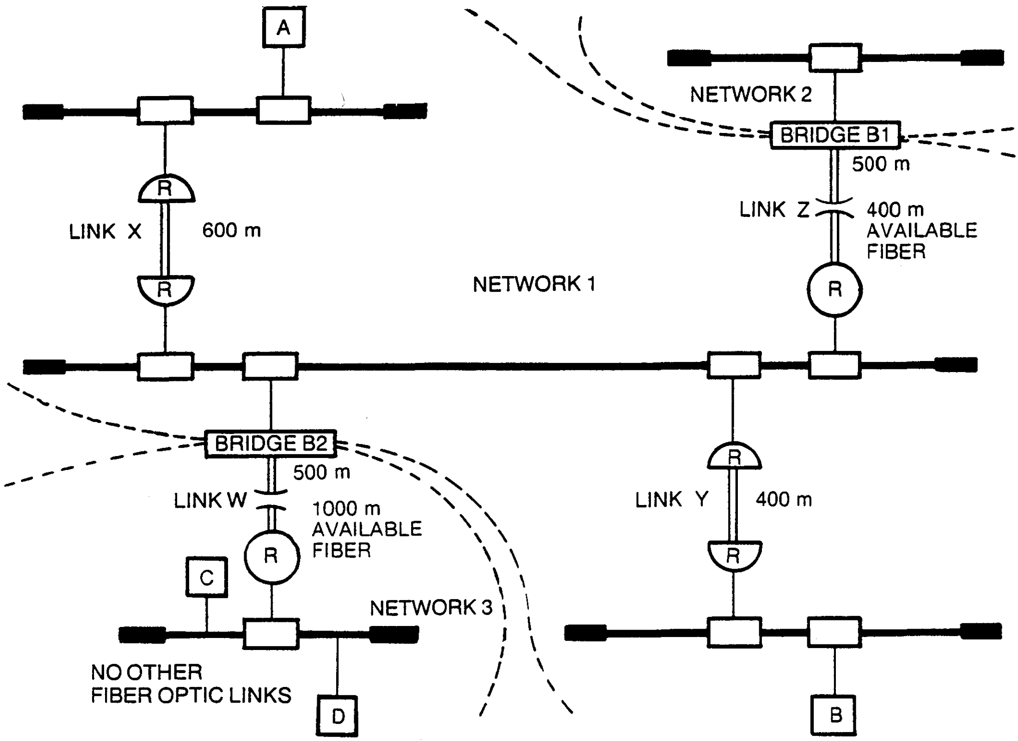


Figure 17 Remote Bridge/Repeater Configuration

6.6.3 Vitalink TransLAN Bridges

A pair of Vitalink TransLAN bridges joins two LANs by transmitting signals over a combination of transceiver cables and a terrestrial serial data link (see Figure 18).

Basic configuration rules:

- There can be up to two serial data links between stations.
- The serial data line's line speed must be a minimum of 56 Kbits/s.
- The number of stations must be limited to 6000.
- Bridges can be placed in parallel for added availability. Any parallel bridges must be of the same type (LAN Bridge 100 or TransLAN). In addition, TransLAN bridges placed in parallel for backup purposes must reside on the same physical LAN.
- A bridge cannot be used when the two networks are already linked by a single DECnet router. If the networks are linked by two or more intervening routers a bridge can be used.
- Satellite links cannot be used to interconnect TransLAN bridges.

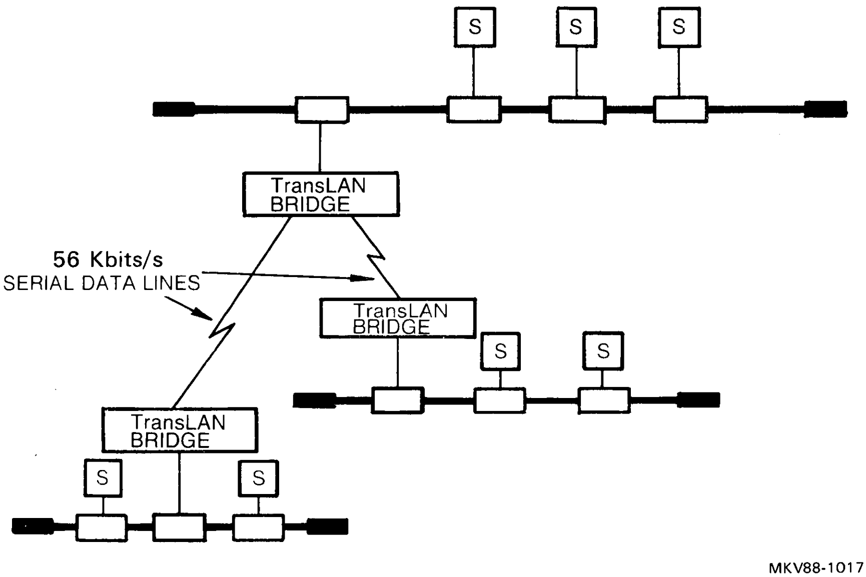


Figure 18 TransLAN Bridge Extended Network Configuration

6.6.4 METROWAVE Configuration

A local bridge is connected to the Ethernet on one side and to a DEMWA (DIGITAL Ethernet Microwave Adapter) on the other. The DEMWA connects to vendor-supplied microwave radio equipment and antennae. The same configuration is mirrored at the other end of the link.

Figure 19 depicts the configuration and distance guidelines for the standard LAN Bridge 100, the fiber-optic LAN Bridge 100, and the METROWAVE bridge in an extended baseband Ethernet LAN environment.

Basic configuration rules:

- The maximum distance between transmit and receive controllers and the antenna is 304.8 m (1000 ft).
- The maximum distance between controllers cannot exceed 4.5 miles including the cables connecting the controllers to the antennae.
- The METROWAVE configuration counts as two bridges (one for each end).
- Other guidelines as stated in Section 6.6.1 apply (if appropriate).

More information is available in the DEMWA option section of the *Communications Options Minireference Manual* or in the *METROWAVE Bridge Microwave Ethernet Link Sales Guide* from CSS.

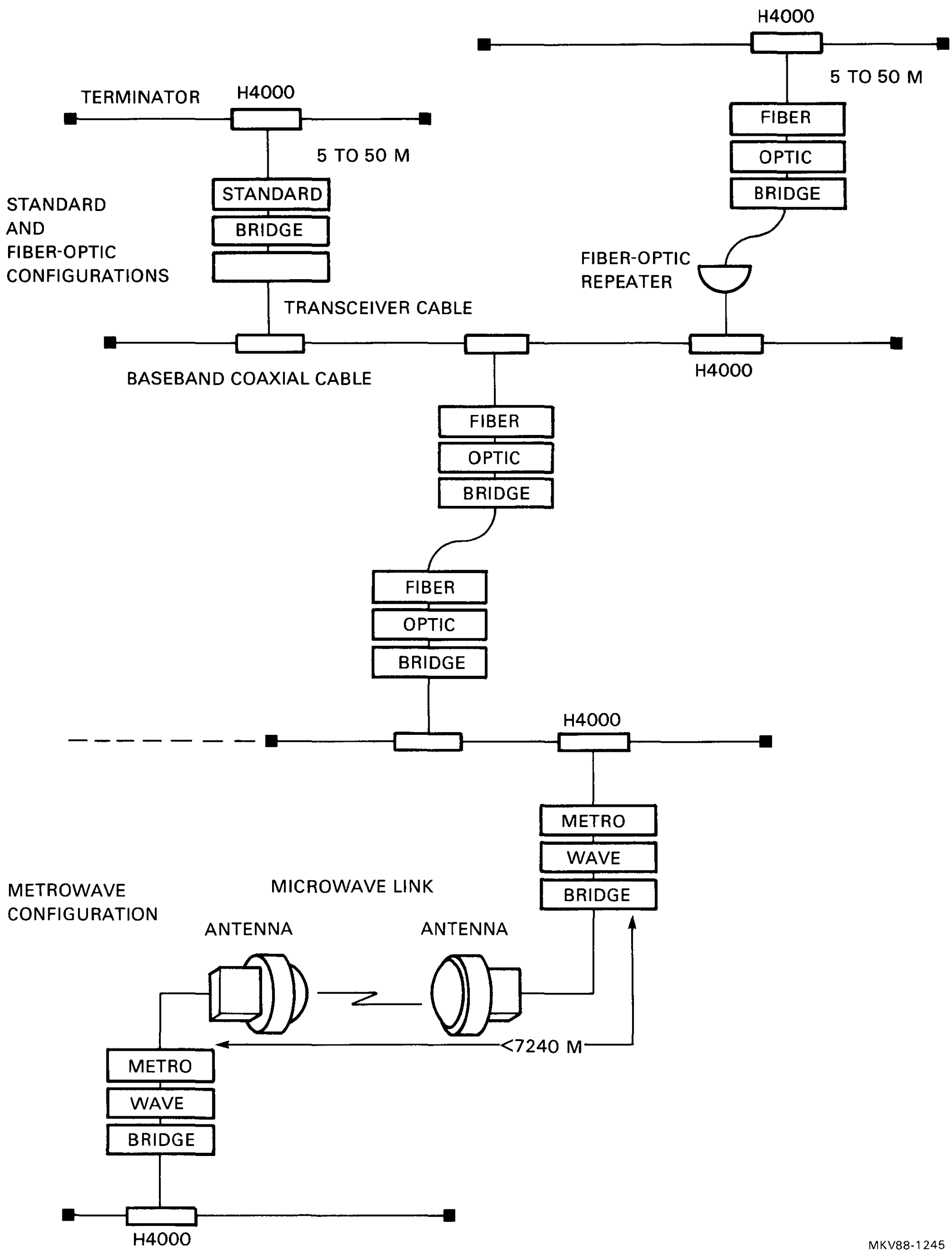


Figure 19 Extended Baseband LAN with METROWAVE Bridge

6.7 BROADBAND ETHERNET CONFIGURATIONS

Broadband networks can be single-cable (see Figure 20) or dual-cable (see Figure 21). In single-cable networks, distances are measured from the network's headend, where the DEFTR frequency translator is placed. There is no DEFTR on dual-cable networks; distances are measured from the point where the inbound cable turns to become the outbound cable (this turning point is considered the headend).

Basic configuration rules:

- Dual-cable broadband Ethernet systems use channels 2, 3, and 4 (54-72 MHz) for both transmission and reception. Single-cable systems use these same channels for transmission, but the frequency translator sends the information back on channels 13, J, and K (210-228 MHz). The frequency spectrums used by Ethernet cannot be shared with other services on the broadband cable.

- Digital Equipment Corporation must certify the broadband cable prior to network installation. The certification process is described in the *Broadband Ethernet Channel Specification.*

- The distance between any broadband transceiver and the cable's headend must not exceed 1900 meters (6233.9 feet).

- The maximum distance between any two stations is 3900 meters (12,795.9 feet). This limit can be reached if the network has at least two 1900-meter (6233.9-foot) branches.

- Ethernet imposes no limits on the number of branches in a broadband network.

- The maximum number of stations allowed is 1024.

- Stations are connected to the broadband cable using DECOM transceivers and RG-6 drop cables.

- The RG-6 drop cable from the broadband tap to the DECOM transceiver must not exceed 25 meters (82.0 feet).

- Repeaters (DEREP, DESPR, and DEMPR) are not allowed on broadband networks.

- Broadband networks can use either the LAN Bridge 100 or the Vitalink TransLAN Bridge to connect to baseband Ethernets or to other broadband networks.

- DELNI interconnect use on broadband networks follows the same rules described in Section 6.3.5.

- Broadband networks cannot be attached to a standard Satellite Equipment Room unless a bridge is used in the SER.

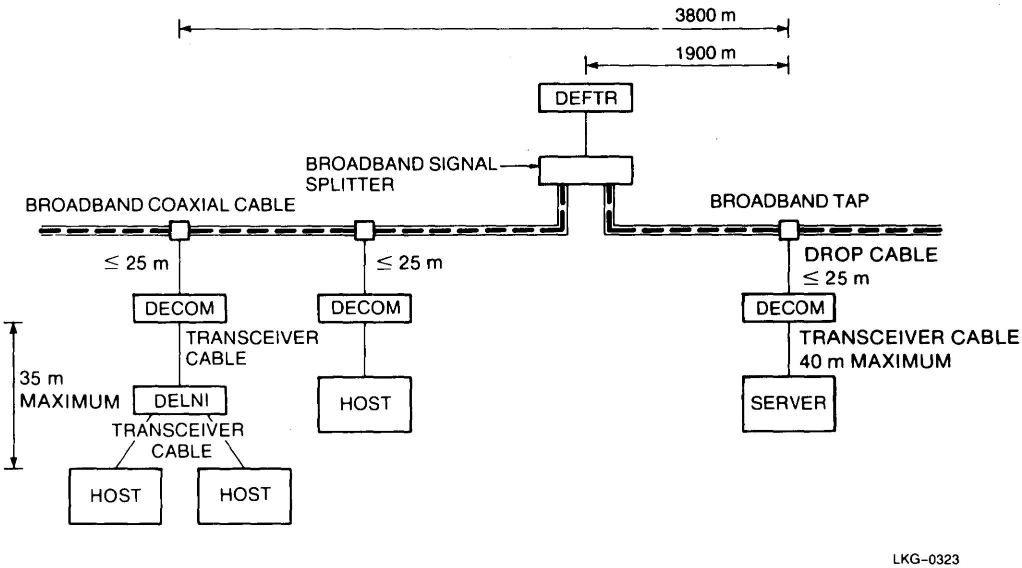


Figure 20 Single-Cable Broadband Ethernet Configuration

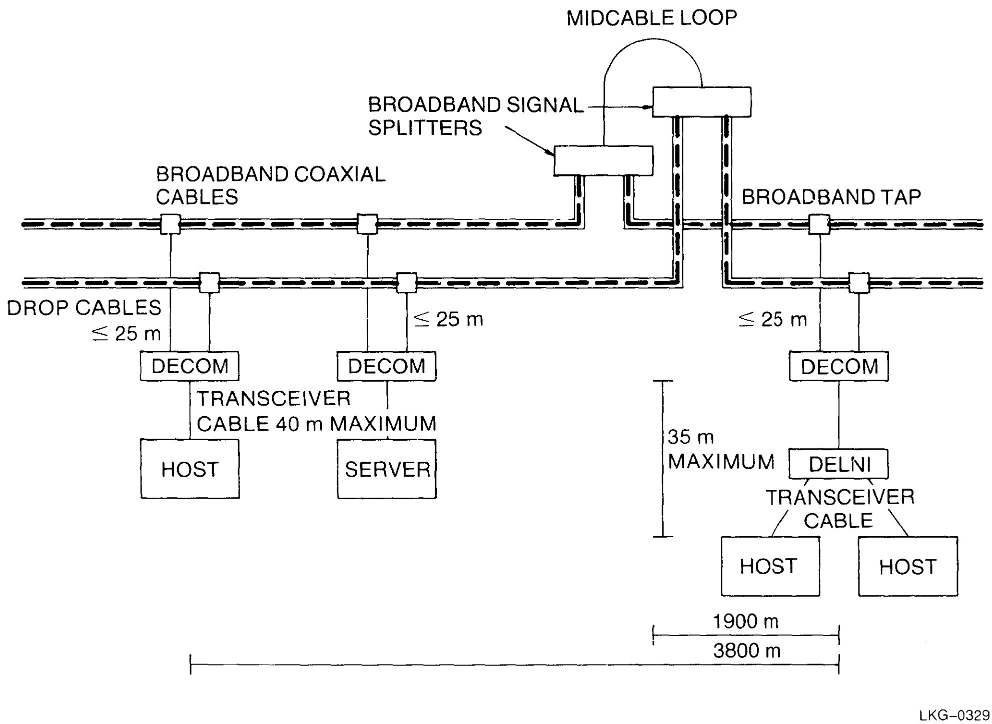


Figure 21 Dual-Cable Broadband Ethernet Configuration

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.

MKO

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.