CHAPTER 18

ETHERNET

18.1 INTRODUCTION

This article is by Barry Lowry. Any reactions welcomed.

This chapter is about communications options. It is not meant to be a replacement for the comms. manuals that already exist. If the information is available in the following manuals then it will probably not be included here unless further explanation seems necessary. If you have not already got the following manuals then I think you would find them very useful: EK-CMIV1-RM-003, EK-CMIV2-RM-003, EK-CMIV4-RM-003, EK-CMIV5-RM-003. These are also useful for Q-bus products: EK-LSIFS-SV-005 (three volumes). There is an excellent Networks and Buyers Guide issued quarterly and available from the Sales Library which lists all of DEC's comms. products and gives configuration guidelines.

18.2 GENERAL INTRODUCTION TO ETHERNET

A local area network is a privately owned data communication system used to connect data processing equipment (eg. computers) within a limited geographical area. Most computer manufacturers have a networking system and the ethernet is one that DEC have developed in collaboration with Xerox and Intel. One of the main features of the ethernet system is that every computer or other digital device in the network (ie. a station) can exchange data at a speed of up to 10 Mbits per second using phase-encoded signalling and a common coaxial cable channel. The maximum distance between stations using repeaters is 2.8 km. Any station can transmit to any other or group of others. Only one type of message is transmitted and it is called a frame.

18.2.1 Contention And Collision Detection

To avoid frame collision each station uses a channel access technique known as Carrier Sense Multiple Access with Collision Detection. Carrier Sense means that a station delays transmission until the channel is free. Multiple Access means that all users have equal access to a clear channel. Collision Detection is used when two stations start to transmit at the same time. If a station senses that a collision has occurred it allows the transmission to continue for a short time period, called jam time, to make sure that any other station involved will also notice the collision. It then stops transmitting and then automatically tries to retransmit after waiting for a randomly selected time period. If the station notices another collision when it tries to retransmit it will repeat the process up to a maximum of fifteen more times after which the transmission is aborted and a send failure counter is incremented. The frame has a minimum allowable length to be sure that collision fragments are not recognised by other stations as valid frames.

If a node begins to transmit and a collision is not detected within 51.2 usecs. then the node is said to have "acquired" the channel. This is the same as 512 bits. The 51.2 usecs. is called the slot time and is made up of the round trip propagation delay plus the minimum jam time.

18.2.2 Frame Format

This is the frame format:

```
<-preamble->(--destination--)(--source---)( type )(--data--)(--fcs--)

( 64 bits )(    48 bits    )( 48 bits )(16 bits)(variable)(32 bits)
```

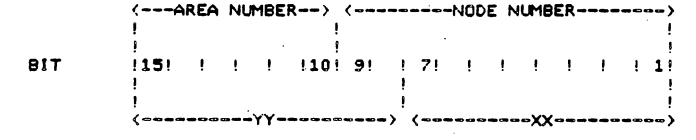
Each frame is preceded by a preamble pattern of 62 one-zeroes then 2 ones. This is used by receiving stations to sync. the receive clock to the frame. At the end of the frame there is a collision detect self test performed by the transceiver. This is called a heartbeat. Interframe spacing is 9.6 usecs. This is sometimes known as the IPG (inter-packet gap).

The destination address is 48 bits long. Every ethernet device in the world has a unique hardware address. These addresses are allocated by Rank Xerox. DEC's allocated ethernet addresses are...

```
AA-00-00-00-00-00  through to  AA-00-04-FF-BF-FF
08-00-2B-00-00-00  through to  08-00-2B-FF-FF-FF
```

A receiving station will accept frames that have the destination field equal to its own hardware address. It will also accept frames with a destination field equal to a previously agreed set of group addresses called multicast addresses, which are used by DEC for loopback testing, downline loading/dumping, routing update messages etc. If the frame destination field is all FF-FF-FF-FF-FF-FF then the frame is accepted by all stations. This is called a broadcast message. When Decnet is running on a station then the software loads a physical address into RAM on the ethernet interface:

The address becomes AA-00-04-00-XX-YY where xx-yy is calculated from the Decnet node number and area number. Decnet encodes the address in this way:



So for example if xx-yy is 03-04 then the decnet address is 1.3 and if the Decnet address is 63.171 then the physical address is AA-00-04-00-AB-FC. Some decnet error messages print out the frame header including the source and destination addresses so it is possible to see the source of a problem. Sometimes the source address is not in DEC's allocated address range which indicates that a problem frame may be coming from a non-DEC device.

The source address has the same format as the destination address.

The type field is used by higher level protocols to identify which protocol type is associated with the frame. These types could be Decnet, MOP, LAT etc.

The data field is a minimum of 46 bytes, to ensure reliable collision detection, and a maximum of 1500 bytes.

The frame check is used to check the accuracy of the information contained in each frame. It is a four bytes long.

Each station is connected to a segment of coaxial cable via a transceiver cable and a transceiver. A transceiver is clamped on to the coaxial ethernet cable and provides a signal interface to the transceiver cable which is used to connect the transceiver and the station.

18.3 BASIC CONFIGURATION RULES

18.3.1 Standard Ethernet Configuration

Standard Ethernet Coaxial Cable Segments

- A coaxial cable segment must be terminated with a 50-ohm resistor at each end. The segment must be grounded at a single point to the buildings ground system.

- A cable segment can be up to 500 metres long. There can be up to 100 transceivers on a cable segment. There must be at least 2.5 metres between transceivers.

Multiple-Segment Standard Ethernet Configurations

- 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 (fibre-optic) repeaters. (see DEREP section.)

- A local repeater can be used when two segments to be joined are no more than 100 meters apart.

- The total of all inter-repeater fibre optic links between any two stations can be up to 1000 metres.

- The total cable length between any two stations is 2800 metres.

Transceiver cables

Transceiver cables must be limited to 50 metres. This maximum length may be reduced due to an Internal Cable Equivalence (ICE) at the station. This ICE is a measure of the internal timing delay of the device expressed in metres of transceiver cable.

Product	Internal Cable Equivalence
DECNA, DELUA, DEQNA	5
DEUNA	10
DELNI	5
DEREP	0
DEMPR	0
LAN BRIDGE 100	0
DECSERVER 100	0
ETHERNET TERMINAL SERVER	10

This means, for example, that if you connect a DELUA to an H4000 the maximum transceiver cable length is 40 metres.

18.3.2 DELNI Configurations

Standalone DELNI Configuration

- Up to 8 stations can be attached to a Delni using transceiver drop cables which connect directly to the Delni.
- The standalone DELNI must operate in local mode.

Cascaded DELNI Configuration

- Up to 8 DELNIs can be connected to a central DELNI to form a cascaded DELNI network. When used in this manner the DELNI has no Internal cable equivalence. Only one level of cascading is allowed.
- The central DELNI must operate in LOCAL mode whilst the other DELNIs operate in GLOBAL mode.
- Cascaded Delni networks can NEVER be attached to a standard Ethernet Network.

*Connecting a DELNI to a standard Ethernet Coaxial Segment

- DELNI must operate in GLOBAL mode.
- When a DELNI is installed between a transceiver and a station the max. total length of all transceiver cables between the transceiver and the station must not exceed 45 metres.

18.4 H4000 TRANSCEIVER

18.4.1 General Description

The H4000 Ethernet transceiver provides an interface between network nodes and the ethernet coaxial cable. It sends signals to the coaxial cable, receives signals from the coaxial cable and detects message collisions. It clamps on to the cable without cutting it. A transceiver cable connects the H4000 to the network device. There is a variant of the H4000 called the H4000-BA which does not have a heartbeat and is not IEEE 802.3 compliant.

The transceiver cable consists of four twisted pairs and a screen. The connections are :

PIN 1	SHIELD
PIN 2	COLLISION PRESENCE +
PIN 9	COLLISION PRESENCE -
PIN 3	TRANSMIT +
PIN 10	TRANSMIT -
PIN 5	RECEIVE +
PIN 12	RECEIVE -
PIN 6	POWER RETURN
PIN 13	POWER

The H4000 gets its power from the interface in the network node. It needs the POWER input to be between +11.4 to +15.75 higher than POWER RETURN. It is possible to use a negative voltage from the interface by connecting it to POWER RETURN and connecting the interface ground to POWER. The power supplied from the interface always has a fuse or breaker at the interface end. The steady state current is about 330 milliamp. The surge current can be up to 20 amps however, so a surge current limiter is always fitted at the interface end. The power return is electrically isolated within the H4000 from the coaxial cable shield. The other three pairs in the transceiver cable are electrically isolated from the H4000 using isolation transformers.

18.4.2 Brief Technical Description

The H4000 has three circuits: transmit,receive and collision detector.

As well as transmitting signals from the node to the coaxial cable, the transmit circuit limits the duration of each transmission to eliminate faulty interfaces jamming the ethernet. It also initiates a test of the collision detector circuit at the end of each transmission.

As well as receiving signals from the coaxial cable, the receive circuit monitors the average DC level of the signal on the coaxial cable and does not pass the signal through to the transceiver cable if the level is invalid.

The collision detect circuit monitors outputs from the receive circuit. If the average DC level of the signal becomes more negative than a threshold level then the circuit sends a 10 Mhz periodic waveform to the interface on the collision presence pair to indicate a collision. The normal signal level of a coaxial cable signal is between about -0.25v and -2.5v. When there is a collision then the signal becomes more negative.

At the end of every transmission the collision detect circuit sends the 10Mhz waveform to the station for a maximum period of 2 usecs. This is known as collision presence test or heartbeat. Decnet indicates heartbeat failure by incrementing the Collision Detect Check Failure Counter.

18.4.3 Components List/Maintenance Philosophy

All these parts are in the ethernet kit:

54-14966-00	Logic board H4000
54-14966-01	Logic board H4000-BA
(This is a 54-14966-00 board without capacitor C3)	
29-24339	Braid contacts for old style H4000
12-24664-01	Coaxial tap kit
12-24664-04	Braid connectors

The following tools may be useful:

12-24664-02	Drilling tool for current H4000
H4090-KB	Drilling tool for old style H4000

Transceiver cable part numbers

BNE3x-Y where x=A for straight entry PVC,
x=B for right angle entry PVC
x=C for straight entri TEFLON
x=D for right angle entry TEFLON

Y=5,10,20 or 40 and is length in metres.

BNE4A-2 and 5 are office pvc cables with straight entry.
BNE4B-2 and 5 are office pvc cables with right angle entry.

BNE3H, K, L, M IEEE 802.3 compatible cables will not work with an H4000 or H4000-BA

18.4.4 Installation And Configuration

The H4000 can be installed or removed without interrupting network operation. An H4000-BA should be used if a DEMPR is connected to an ethernet backbone through a DELNI. H4000's should be placed on the black rings on the ethernet coaxial cable. They must be at least 2.5 metres apart.

18.4.5 Testing

There are no diagnostics for the H4000. The H4000-TA is a transceiver tester. Basically its a box with two buttons and six leds on the front with a mains lead and a transceiver cable socket at the back.

To test one H4000 put the transceiver cable into the tester,put the tester into tx/rx mode. Press the reset button and look at the lights. Data pass should illuminate, collision should light intermittently and self test pass should also light intermittently.

To test the path between two H4000's connect an H4000-TA to each, put one into tx/rx mode, put the other into rx mode, press the reset button on the tester in rx/tx mode and watch the leds. On the rx only tester the data pass and self test pass should both illuminate. For any other indication refer to Comms options minireference volume 4.

Another good transceiver tester which is usually more easily available is a vax or a pdp with an ethernet interface installed.

18.4.6 Reference Documentation

MP-01369	H4000 Print Set
EK-H4000-TM-001	Technical Manual

18.4.7 Problems And Solutions

- If the H4000 does not work at all check the interface fuse or breaker.

- CHA is a cable manufacturing company sometimes used by Decsite. Some CHA transceiver cables have been found where the two black wires on pins 6 and 12 have been reversed. This means that cable continuity is ok but the internal twisted pairs are incorrect. The cable used by CHA is Belden 9892 which is blue. The wire which should be on pin 6 is thinner than the black wire which should be on pin 12. These cables cause all sorts of strange network problems.

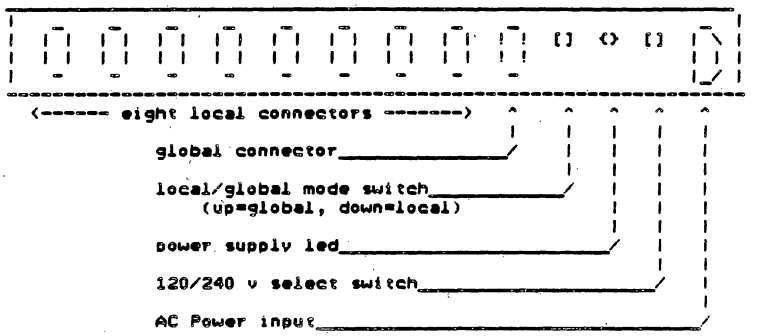
- If you change the H4000 logic and it still does not work try using a meter on the actual cable tap. You should measure about 25 ohms, between the centre pin and one of the two outside ones, if there is no power to any other device attached to the cable. If the Ethernet is in use then check that the measurement between the pins is neither zero ohms nor infinity.

18.5 DELNI- LOCAL NETWORK INTERCONNECT

18.5.1 General Description

A DELNI has eight local ports and one global port. A DELNI in global mode allows up to eight ethernet-compatible nodes to be connected to one H4000. A DELNI in local mode allows up to eight ethernet-compatible nodes to configured as a standalone LAN. It is possible to cascade DELNI's to create larger LAN's. Refer to the configuration section for possible DELNI configurations. One reason for using a DELNI could be that there are more than 100 nodes to be connected to the same ethernet segment.

Rear Panel of a DELNI



18.5.2 Brief Functional Description

Unlike the H4000, the DELNI does not use the power pair from the stations plugged into local connectors, because it has its own power supply. The DELNI supplies power to the H4000 via the global connector. Each local connector interface contains circuitry for the three signal pairs: receive, transmit and collision presence.

In a standalone DELNI application the DELNI is operated in local mode.

If a DELNI is connected to an H4000 or another DELNI then it is operated in global mode.

In local mode, valid data from one of the eight local stations, arriving on its transmit pair, is gated through to all of the eight local receive pairs.

In global mode, the valid data, from one of the eight local stations, is gated via the global transmit pair circuit to the

H4000. Data from the H4000 arriving on the global receive pair is sent to all of the local stations on their receive pairs.

The DELNI has its own collision detection circuitry. If a local collision is detected, in local mode, the DELNI asserts the collision signal to all eight local ports. In global mode the DELNI passes through the collision signal from the H4000 to all eight local ports. If a local collision occurs in global mode the DELNI substitutes the data to the H4000 with a 5Mhz square wave. When the 5mhz square wave returns to the DELNI from the H4000, it asserts the collision signal to all eight local ports.

In local mode, a circuit in the DELNI monitors each transmission. At the end of each transmission, it generates the collision presence test otherwise known as heartbeat. In global mode the heartbeat is generated by the H4000. In both modes the heartbeat is transmitted to all eight ports.

18.5.3 Components List/Maintenance Philosophy

DELNI-AA 120v DELNI
DELNI-AB 240v DELNI
The only difference between these is the position of the mains input select switch. Maintenance philosophy is option swap.

18.5.4 Installation And Configuration

If the DELNI is to connect eight nodes to an H4000 for example, then each node would be connected by a normal transceiver cable to one of the local connectors. The global connector would be used for the transceiver cable to the H4000. The global/local switch would be switched to global. This is the most common DELNI configuration. See the configuration section for variations.

18.5.5 Diagnostics And Maintenance Aids

There are no DELNI diagnostics. An H4000-TA transceiver tester may be used to test the DELNI. Host diagnostics are also often useful.

18.5.6 Reference Documentation

EK-DELNI-TM	DELNI Tech. Manual
MP-01656	DELNI Print Set

18.6 DEUNA- UNIBUS INTERFACE

18.6.1 General Description

The DEUNA is a two board unibus ethernet interface. I believe that DEUNA maintenance is well covered by the existing Comms. Options Minireference Volume Four so I do not intend to cover the DEUNA in great detail in this article.

18.6.2 Components List/Maintenance Philosophy

M7792	Port Module
M7793	Link Module
2 BC08R-1	Module Interconnect Cables
70-18798-**	Bulkhead Cable Assy.
70-18799-00	Bulkhead Interconnect Panel Assy.

18.6.3 Installation And Configuration

The DEUNA is a DMA device. 16 amps at +5 volts. 2 amps at -15v for the H4000.

18.6.4 Diagnostics And Maintenance Aids

EVDWA,EVDWB,EVDWC for VAX. ZUAA??, ZUAB??, XUAC??, ZUAC?? for PDP11.

18.6.5 Problems And Solutions

- The XEDRIVER for VMS 4.3 has lots of bugs and should not be used.
- If you see led code 72 this usually means the H4000 is not connected.

18.7 DELUA- UNIBUS INTERFACE

18.7.1 General Description

The DELUA is a single board unibus to ethernet interface. It is designed to eventually replace the DEUNA. The DELUA is IEEE 802.3 compliant. It uses an M68000 microprocessor and VLSI ethernet chip called a LANCE chip to give better performance than the DEUNA. The DELUA throughput is 4.0 Mbps compared with 1.4 Mbps for the DEUNA.

18.7.2 Components List/Maintenance Philosophy

M7521-AA	Module
70-18798-03	Cable Assy.
70-18799-00	Bulkhead Assy.
74-27292-01	Frame I/O Assy.

18.7.3 Installation And Configuration

The DELUA is 1 dcload and 4 acloads. It requires 8 amps at +5v and 1 amp at -15v for the transceiver. All of DEC's transceivers get their power via the transceiver cable. The DELUA is a dma device so the NPG jumper must be removed. The DELUA may use BNE3x or BNE4x transceiver cable.
SWITCHPACK E106 selects device address:

switch 10 off gives address 760010
switch 9 off gives address 760020
switch 8 off gives address 760040
switch 7 off gives address 760100
switch 6 off gives address 760200
switch 5 off gives address 760400
switch 4 off gives address 761000
switch 3 off gives address 762000
switch 2 off gives address 764000
switch 1 off gives address 770000

normal address is 774510 which is switches 1,2,5,7 and 10 off.

SWITCHPACK E69 selects vector address and boot function:

switch 10 off gives address 4
switch 9 off gives address 10
switch 8 off gives address 20
switch 7 off gives address 40
switch 6 off gives address 100
switch 5 off gives address 200
switch 4 off gives address 400

normal vector address is 120 which switches 6 and 8 off.

switch 2	switch 3	function
on	on	remote boot disabled.
on	off	remote boot from system boot rom.
off	on	remote boot and system load.
off	off	remote boot disabled. (vax,pdp)

E69 switch 1 should always be on.

18.7.4 Diagnostics And Maintenance Aids.

The DELUA performs a self test on power up and indicates the result of the test in the leds on the module. There are leds D2 through to D9. D2 is the furthest one away from you if you are standing in front of a BA11-K or the highest led if the Delua is mounted vertically. The led pattern cycles during self test and if it passes after about 15 seconds then only D8 should be on. D5 may flicker during normal usage. Any other pattern indicates an error. A common error code caused by having no transceiver connected is leds 3,5,7,8 and 9 on.

DIAGNOSTICS:		
	EVDYB	VAX Level 2R
	ZUAD??	PDP Functional
	XUAD??	DEC/X11 Test
	EVDWC	VAX NI Exerciser

The only test equipment required for a DELUA is an H4080 turn around connector.

Counter information is supplied by the DELUA to its device driver which may be read using DECNET NCP or using the LAT control program, LATCP. To start LATCP type MC LATCP, wait for the LCP> prompt and then type help.

18.7.5 Reference Documentation

EK-DELUA-UG	User Guide
EK-DELUA-TM	Tech Manual
MP-01787	Print Set

18.7.6 Software

The DELUA uses the XEDRIVER (same as the DEUNA) and requires a minimum of VMS 4.4. DECnet-VAX and DECnet-Ultrix support the DELUA. The version of XEDRIVER required is X-16. The DELUA controller loopback is not supported.

18.7.7 Problems And Solutions

- 8200 or 8800 may crash when UETP is run on a DELUA. This one is rare and will be fixed by an fco.
- Ultrix may not recognise a DELUA when it is booted on a 8200. This is caused by a bug in the driver not waiting for the self test to complete.
- Uetp errors when H4080 connector is used on a 8500/8550/8700/8800 caused by software bug.
- There is a problem at the moment where "circuit bounce" or lat disconnections are seen. There is an FCO pending to fix this problem, not yet available. FEB 88.

18.8 DEQNA- Q-BUS INTERFACE

18.8.1 General Description

The DEQNA is a Q-bus to ethernet interface for use with PDP11 or Q-bus VAX systems. The DEQNA is not IEEE 802.3 compliant. It is a double height module. It connects to ethernet via a transceiver or a DELNI. It is a DMA device. It contains on board Rom-based diagnostics for power up and boot. The host can be booted via the DEQNA. The host can down line-line load to other nodes in the network using the DEQNA. The DEQNA has a sanity timer which can be used to cause a system reboot. The sanity timer is enabled by software and regularly reset unless system performance degrades. If the sanity timer expires, the DEQNA negates DCOK to cause a system to execute its bootstrap code. The DEQNA q-bus interface uses a hold off timer of 5 microseconds to allow other DMA devices to use the bus, but this is disabled if the fifo is half full or if W2 is removed. The DEQNA also uses a 10 microsecond bus time-out timer to cause a NXM interrupt if the bus slave fails to respond.

18.8.2 Components List/Maintenance Philosophy

M7504	Module
CK-DEQNA-KA	Cable/bulkhead for PDP-11/23
CK-DEQNA-KB	Cable/bulkhead for MICRO PDP-11
CK-DEQNA-KC	Cable/bulkhead for PDP-11/23-PLUS
70-21489-01	Loopback connector
12-22196-01	Loopback connector

Maintenance philosophy is option swap the module.

18.8.3 Installation And Configuration

The DEQNA :

- is 2.2 acloads.
- is 0.5 dcloads.
- requires 3.5 amps at +5v
- 0.5 amps at +12v.
- should be the highest priority device on the Q-bus so it must be the dma device nearest to the cpu.

There are three jempers on the module:

W1 This jumper is just below the test point.
W1 in sets DEQNA address to 17774440 (first DEQNA)
W1 out sets DEQNA address to 17774460 (second DEQNA)

W2 W2 is next to the square chip near the edge connector. It is rarely removed. Removing W2 disables a 5usec bus hold off timer.

W3 W3 is just below the large BDROM chip near the handle. W3 removed enables the sanity timer at initialisation.

All three jumpers are installed during manufacturing.

18.8.4 Diagnostics And Maintenance Aids

18.8.4.1 Self Test -

The Deqna has a boot/diagnostic rom , BDROM, which contains pdp-11 code executed by the cpu to test the Deqna. This is called a Citizenship test. There are three leds used to indicate the results of the test. All the leds come on one second after power up. The 1st led goes off when the test starts ie BDROM contents loaded, bootstrap executing and first set up packet prefill loaded ok. The second led goes off if the internal loop tests are ok. The third led goes off if the external loop tests are ok. The third test actually sends two frames onto the ethernet, one of minimum length followed by one of maximum length. If the test fails then register 0 in the cpu is used to indicate the reason for the failure. The user guide explains all the bit meanings if you can't work it out from the leds.

To run this test just try and boot the system from the DEQNA. This means that the cpu must have DEQNA boot roms installed. If the cpu does not boot from the DEQNA then it could run this test when it initialises the DEQNA during normal system startup. In practice, I have found that the DEQNA usually works quite happily with all three leds illuminated.

18.8.4.2 ZQNA?? For PDP-11. -

This diagnostic attempts to locate the following fru's :

DEQNA, bulkhead, bulkhead fuse, transceiver cable or transceiver.

It is ok to run this diagnostic on a live ethernet. If the DEQNA is not connected to the ethernet then the diagnostic should be run in internal extended loopback mode.

To run ZQNA?? 1) boot xxdp+ , 2) r zqna?? , 3) start
The diagnostic ask questions:

CHANGE HW (L) ?	Y
# OF DEVICES (D)?	1 or 2
DEQNA I/O PAGE ADR (O) 174440?	174440 for 1st Deqna 174460 for 2nd Deqna
INTERRUPT VECTOR ADR (O) 700?	700 for 1st Deqna 704 for 2nd Deqna
CHANGE SW (L)?	Y
DO YOU WANT TO TEST THE SANITY TIMER (L)?	Y or N
IS SANITY TIMER JUMPER ENABLED/CUT (L)?	N or Y (remove W3)
SANITY TIMER TIME-OUT VALUE (O) ?	0= 1/4 second,1= 1 sec., 2= 4 secs., 3=16 secs., 4= 1 minute, 5= 4 mins., 6= 16 mins., 7= 64 mins.
EXECUTE TESTS IN INTERNAL/EXTENDED LOOPBACK MODE (L)?	Y = internal extended N = internal and external
SYSTEM HAS BLOCK MODE MEMORY (L)? (Q-bus memories "after" MSV11-L have block mode capability)	Y or N

18.8.4.3 DEC/X11 Exerciser (XQNA) -

The default parameters are :

Device address : 174440
Vector : 700
BR Level : 5
Number of DEQNA's : 1
W2 must be out, W3 must be in.
Software register 1 is used to control internal extended loopback/external loopback and print/noprint errors. Bit 0=0 means internal extended loopback. Bit0=1 means external loopback so a transceiver or loopback connector is needed. Bit 1=0 means print error messages. Bit 1=1 means do not.

To change this register type:
MOD QNAA0 16 <CR>
1 <CR>
To test a second DEQNA
MOD QNAA0 6 <CR>
177460 <LF>
704 <CR>

18.8.4.4 NIE Network Interconnect Exerciser -

This program is VNIA?? and runs under XXDP+. It can be used to loop test a DEQNA on a live ethernet system and also loop other nodes and identify other nodes. There are too many details to put into this document but if you load the diagnostic ,get to the NIE> prompt and type HELP it will tell you everything you need to know (and some things you didn't want to know). This diagnostic is very similar to EVDWC on a DELNA.

18.8.5 Reference Documentation

EK-DEQNA-UG-001	User Guide
MP-01885	Print Set
MP-01811	DEQNA Cabinet Kit Print Set

18.8.6 Software

The BDROM not only includes onboard diagnostics but also MOP protocol code used for downline loading and loop testing. When a system boots via the DEQNA it must contain the correct boot roms. These boot roms will load the contents of the BDROM into the cpu memory then execute the program which runs the DEQNA citizenship test and then, if the test passes, requests a down line load from a suitable host on the ethernet. To request this load the cpu uses MOP protocol which is an ethernet frame with the frame type set to "MOP" ,the source address equal to the rom on the DEQNA, a multicast destination address and a data field indicating "mop 8 load request". All other systems on the ethernet will receive this message. If any of them have been set up to respond then they will send the appropriate primary loader etc. and the boot will continue. Please note that lavc's need minimum rev 1.13 cpu roms and the fco EQ-1418-01.

18.8.7 Problems And Solutions

- If a DEQNA is changed and the system is booted via the DEQNA then the rom containing the physical ethernet address must be removed from the old module and fitted into the new module. If this is not done then the new address will not be recognised by the load host.

- Multiple DEQNA's in the same cabinet exceeds fcc emission guidelines.

- Circuit up/down problems in VMS 4.3 caused by bugs in XQDRIVER. Go back to VMS 4.2 driver or upgrade to VMS 4.4. This VMS 4.3 driver also reports lots of false "frame too long errors".

- No downline load possible using broadband ethernet because signal latency causes CO test to fail with loss of carrier.

- When connected to broadband error counters always report "short circuit" errors for each transmit.

- Diagnostic ZQNAC0 or D0 fail with "bad station address checksum". This is a bug.

- In a LAVC environment running vms 4.6 it is advised to set sysgen parameter PE5 to a value of 2.

- If an ultrix v1.2 system has a hanging DEQNA and a "qerestart" message is generated then there is a patch available.

- There is a bug in XQDRIVER for vms4.5 which causes an access violation at XQDRIVER+0F0C. It is fixed in vms 5.6.

18.8.8 Revision Levels And Fco's

DEQNA should be revision E1/E2. The latest FCO is M7504-R-005. The part number is EQ-01418-01. Although it is only coded "R" it is important that this FCO is done on every system and it has been treated as a mandatory FCO on all contract customer sites. This FCO involves a module swap and test and takes one hour.

18.9 DELQA - Q-BUS INTERFACE

18.9.1 General Description

The DELQA is similar in functionality to the DEQNA. It is IEEE 802.3 compliant. It is also a double height module. The DELQA has some extra features including a power-up self test and extra bits in the registers to allow the software to see if the test passed. The DELQA can also accept remote trigger commands to allow the system to be rebooted remotely. The DELQA has a fuse for the power to the transceiver.

18.9.2 Components List

M7516	Module
CK-DELQA-YA	Cable/bulkhead for BA123
CK-DELQA-YB	Cable/bulkhead for BA23
CK-DELQA-YC	Cable/bulkhead for H9642
70-21489-01	Loopback connector
12-22196-02	Loopback connector

Maintenance philosophy is option swap the module.

18.9.3 Installation And Configuration

The DELQA is 2.2 acloads and 0.5 dcloads. It requires 2.5 amps at +5v and 0.5 amps at +12v. The DELQA should be the highest priority device on the Q-bus so it must be the dma device nearest to the cpu.

There is a switchpack on the module:

SW1 on selects base address 17774440 , off selects 17774460.

SW3	SW4	
on	on	normal mode, remote trigger disabled.
on	off	normal mode, remote trigger enabled.
off	on	DEQNA mode, sanity timer disabled.
off	off	DEQNA mode, sanity t mer enabled.

The default switch setting is all on (closed). These switches only affect the state of the DELQA immediately following power-up. Normal mode allows the DELQA to use its extra features but the DEQNA device driver always changes the mode to DEQNA mode when it uses the DELQA. The software can also enable/disable the sanity timer.

18.9.4 Diagnostics And Maintenance Aids

The citizenship test is the same as for the DEQNA, and only occurs during an ethernet boot or if the software initiates it. Refer to the DEQNA section for led meanings.

The DELQA will also perform a power up self test if it is set to "normal" mode. In this case all leds illuminate immediately after power up, then led 1 stays on to indicate internal test in progress, led 2 comes on aswell to indicate external test in progress and then all three leds come on if the tests pass.

ZQNA?? must be rev G. or later.

The DEC/X11 Exerciser is the same as for the DEQNA. Switches 3 and 4 should both be off (open).

The NIE Network Interconnect Exerciser is the same VNIA?? used for the DEQNA.

18.9.5 Reference Documentation

EK-DELQA-UG-001	User's Guide
EK-DELQA-MC-001	Maintenance Card
EK-DELQA-TD-001	Technical Description

18.9.6 Software

The DELQA will use the same driver as the DEQNA. I have no information regarding versions.

18.10 DESVA - VAXSTATION 2000 INTERFACE

18.10.1 General Description

The DESVA allows a Microvax 2000 or a Vaxstation 2000 to connect to thinwire ethernet. It comes as standard in a Vaxstation 2000 and is an option for the Microvax 2000. A DESTA is not required.

18.10.2 Components List

DESVA-AA Complete Option for Microvax 2000. 54-16804-01 DESVA pcb.

18.10.3 Installation And Configuration

Installed in one of the three "daughter board" slots on the motherboard between the system module and the power supply. The ethernet address rom actually sits on the system module.

18.10.4 Diagnostics And Maintenance Aids

There are rom resident self tests and extended tests. The extended tests will test the DESVA. A loopback connector is made up a T-connector and two thinwire terminators.

When the system is powered on, rom resident tests run and then generate a configuration table. Test 50 is used to display the configuration table. The tests are run from the console prompt >>>.

Type TEST 1 to run the self test, TEST 0 to run the system exerciser, or TEST 101 for field service mode exerciser. Wait for the console prompt. Then type TEST 50 to look at the configuration table and see the result of the test.

```
The configuration table will show several columns of numbers:
KA410-A V1.0                        cpu revision
ID  08-00-2B-02-AA-02               ethernet address
.
.
more lines
.
.
NI          0000.0001 V1.0          result of DESVA test.
>>>
The result of the DESVA test should be 0000.0001
A result of 00xx.0001 means test passed after retries on the ethernet.
A result of 0000.7000 or above usually an ethernet cabling problem.
A result of 0000.7004 means the thinwire cable is not connected.
A result of 0000.7008 means the thinwire cable is not terminated.
```

To do loopback testing using the DESVA run test 90. This puts the Microvax into loopback mode, it acts like a loopback connector, so that other nodes can do loop tests. Once the system goes into this mode it cannot do anything else. When the loopback tests are finished enter <CR> to get a report.
Here is an example of a console printout during loopback testing:

```
>>> TEST 90
_E_net$_util
ID 08-00-2B-04-AB-CD      <--- your own ethernet address
  Now do the loopback testing from another node
AA-00-04-00-04-01 <--- address of next node
  When testing finished type <CR>.
<CR>
req$num          - 0          sysid$_cnt      - 0
tx$_cnt          - 0
rx$_cnt    - 0
mxcat$_cnt       - 0          jnk$_pkts       - 0
r_err            - 0
r_fram           - 0          r_oflo          - 0
r_crc            - 0          r_buff          - 0
t_err            - 0          t_more          - 0
t_one            - 0          t_def           - 0
t_buff           - 0          t_uflo          - 0
t_lcol           - 0          t_lcar          - 0
t_rtry           - 0          hng$_tx         - 0
s_err            - 0
s_babl           - 0          s_cerr          - 0
s_miss           - 0          s_merr          - 0
```

Now enter control/c to exit test 90.
So, what does all this junk mean? Anything beginning with a T is a tranmit error, ie one collision, more than one collision, transmit deferred, no buffer, fifo underflow, late collision, lost carrier, maximum retry error or hng$_tx means transmit failed to complete. Anything beginning with an R is a receive error, ie framing error, fifo overflow, crc error, no receive buffer. Anything beginning with an S is a system error, ie. babble error, collision check (heartbeat error), missed packet no buffer, memory error. All of the others are totals which are unlikely to help fix any problems.

18.10.5 Reference Documentation

MP-02431-01 DESVA printset.

18.10.6 Software

The VMS name of a DESVA is ESA0:. The Decnet name is SVA-0. Microvms should be a minimum of 4.5B for standalone or 4.5C for LAVC. Ultrix should be 2.0.

18.10.7 Problems And Solutions

- On some Vaxstation 2000's the DESVA has a tie-wrapped daughter board on the module. Some of these modules have an extra capacitor fitted that causes the system to shut down intermittently with the power supply fan off. The rev is AX10, A1.B1 or C1. These boards should be replacdd with modules that do not have daughter boards held on by tie-wraps.

18.11 DEBNT,DEBNA - BI-BUS INTERFACES

18.11.1 General Description

The DEBNT is the ethernet interface for the BI-bus. It also contains a controller for a TK50 tape unit. I do not intend to cover the tape controller in this article. The DEBNA is the ethernet interface without the TK50 controller, which will eventually replace the DEBNT.

18.11.2 Brief Functional Description

The DEBNx has a microvax chip on board to run the resident control firmware. A LANCE chip (Local Area Network Controller for Ethernet) implements the ethernet interface data link layer. There is a PROM containing the ethernet address.

18.11.3 Components List/Maintenance Philosophy

T1032	DEBNT Module
T1034 or YA	DEBNA Module
12-22196-01	Ethernet Loopback Connector
17-01601-03	5' Internal cable for 8500/8700/8800
17-01601-02	8' Internal cable for 8200/8300
17-01601-04	15' Int. cable for 8500 etc exp. boxes

18.11.4 Installation And Configuration

The DEBNx's node id is determined by the node-id plug on the VAXBI backplane and is independent of its slot location. The node-id is used to determine which 8K-byte block in VAXBI node space is assigned to the DEBNx. The device register is directly accessible as a VAXBI address at address bb which is the base address of the assigned node space. Bits 15 to 0 indicate the device type and for a DEBNT or DEBNA it should be #410F. So by examining each bb in turn you can find out which node id is a DEBNx.

Power consumption is 27.58 watts at 5v typical, 44.1 worst case, 33.42 VAXBI standard power.

If there are several DEBNx on one system then VMS 4.6 is required. There is a maximum of 2 per BI/system for an 8200/8300. There is a maximum of 3 per BI and 4 per system for an 85/87/8800 system. A DEBNT and a DEBNA should not be configured on the same system. The power for the transceivers is obtained from the system power supply using pigtail cables. Two of these cables are available on an 85/87/8800 system, one on a BA32 box 82/8300 system and two on an ANTARES box 82/8350 system. This means that if there are more DEBNA's on a system than there are power pigtails, then the

additional DEBNA's have no power available for transceivers. They should be connected to a transceiver that needs no power or a DELNI.

If it is required to upgrade a 82/8300 system, replacing a DELNA with a DEBNA, then it is likely that no power pigtail will be factory fitted. Part number 17-00684-02 is required and the power supply needs to be dismantled. Alan Williams from Installations reports that this cable goes on J13 inside the power supply.

18.11.5 Diagnostics And Maintenance Aids

Self test
Ethernet rom based functional
EVDYC Ethernet Diagnostic Level 3
EVDYD Ethernet Exerciser Level 2R

18.11.5.1 Self Test -

The rom-based self test executes after power up or self test. There are up to two sets of leds on the module. All of the leds are off when the DEBNx is first powered on. The green leds illuminate if the tape tests pass. The yellow leds illuminate if all the tests pass. If the yellow led comes on for ten seconds and then goes out then TK50 logic is bad but the ethernet interface should still work.

18.11.5.2 Ethernet Rom Based Functional -

To run the ethernet rom based functional tests:

1) Use a VAXBI forward command from the processor console. eg on an 8200 type Z <num> where <num> is the node number of the DEBNx. This means that all further console commands are forwarded to the DEBNx.

2) Invoke the DEBNx's diagnostic parser by typing T/R

At this stage you should get a.RBDn> prompt where n is the node id.

Type D0 to run the DEBNx self test (same as power up test).

Two lines of printout will appear on the console. If the first line begins with P then it passed. If it begins with F then it failed. The second line shows the Power Up Diagnostic Register.

Type D1/T=1 to run the NI test with loopback connector. To run this test a standard ethernet loopback connector is connected to the DEBNT or to the end of the transceiver cable.

Type D1/T=2 to run the NI test without loopback connector. The DEBNT must be connected to a live ethernet system for this to work. Excessive traffic may cause it to fail.

Type EXIT to finish.

The DEBNT reports errors in the following format:

```
  F          4       410F  00000002
 SE         NI   00000000  00000000
 12   A5A5A5A5   00A5A5A5  00000000 00000010 1FF81020
```

```
F          = Fail or could be S=Status or P=Pass
4          = Node number
410F       = DEBNT or DEBNA module ( 410E = DEBNK )
      (A DEBNT microcode bug causes this to be 010F )
00000002 = Pass count
SE         = Soft error or could be HE=Hard error or FE=Fatal error
NI         = Ethernet interface. Could be rom, uvax, ram, tkctl, etc.
00000000 = Unit no.
00000000 = Test number.
12         = Error code (codes 60-68 are NI errors)
A5A5A5A5 = Expected data
00A5A5A5 = Received data
00000000 = SCB
00000010 = Address
1FF81020 = Program Counter.
```

Status report contain just the first two lines.
Pass reports contain just the first line.

18.11.5.3 EVDYC And EVDYD -

To test the DEBNA needs diagnostic supervisor 10.8 available on VAXPAX 29. To autosize the DEBNA requires EVSBA version 5.3 also from VAXPAX 29.
To attach a DEBNA use the following commands:

```
DS> ATTACH NBIA HUB NBIA0 0
DS> ATTACH NBIB NBIA0 NBIB0 0 2
DS> ATTACH DEBNA NBIB0 ETA D
DS> ATTACH LANCE ETA ETA0
```

- EVDYC version 1.2 does not support the DEBNA and gives the wrong error codes if the DEBNA has rev 2.38 roms.

- EVDYC version 1.3 does not support the DEBNA but gives the correct error codes.

- EVDYC version 1.4 supports the DEBNA. It is also available from VAXPAX 29.

- EVDYC test 2 will not work using a standard ethernet loopback connector. It is OK using a DELNI, H4080 or H4000 connected to a working ethernet.

- EVDYD rev 2.0 needs VMS 4.5 ETDRIVER.

18.11.6 Reference Documentation

EK-DEBNT-TM	Tech. Manual
EK-DEBNT-HB	Maintenance Handbook
EK-DEBNX-IN	DEBNA/DEBNK Installation Manual
EK-DEBNX-TM	DEBNA/DEBNK Tech. Manual

18.11.7 Software

The DEBNT is supported from VMS 4.4. Driver is ETDRIVER. Decnet circuit is called BNT-0. The DEBNA is supported from VMS 4.5.

18.11.8 Problems And Solutions

- There is a configuration restriction. The DEBNT must have a higher node id than any other tape controller on the same BI-bus. If there are separate BI-channels then the DEBNT must be on a higher channel than any other tape controller.

- It is not supported to have a DEBNT and a DELUA/DEUNA on the same system using VMS 4.4.

- There is a warning message generated by the DEBNT driver in VMS 4.5 which indicates that the microcode on the DEBNT is incompatible because it is not Rev 100. Please be aware that this is only a warning message. The Rev 100 microcode is not yet available and the driver cannot be patched so be ready to inform customers that no action is reluired if this message is seen.

- There are two FCO's for the DEBNT which fix a firmware problem concerning the LANCE chip which resulted in occasional out of sequence and duplicate packets. This means that the circuit goes down intermittently. The numbers are EQ-01444-01 for a set of four proms and EQ-01444-02 for an rx50 floppy containing Etdriver X-13C. The second FCO is for VMS 4.4 only and is not required from VMS 4.5. The proms are part 23-216E6 in location E48, part 23-217E6 in location E70, part 23-218E6 in location E71, part 23-219E6 in location E72. The board becomes rev F1/F2. All Debnt modules need this fco.

- The DEBNT has a microcode bug which puts #010F in the device type register instead of #410F.

- EQ-01500-01 is FCO DEBNA-R001 and consists of a rom change to change the DEBNA module revision to rev E. E79 is 23-280E5-00, E81 is 23-281E5-00, E2 is 23-250E6-00, E6 is 23-251E6-00, E8 is 23-252E6-00, E13 is 23-253E6-00. This is not yet available. FEB 88.

- EQ-01486-01 is FCO T0132-R001 and consists of a T1034 module rev F. All T1032 modules will be replaced using this fco (but not yet). Rev F modules have the same roms as above and also 23-215K3-00 in location E43.

- There is currently a severe shortage of these modules. See the factflash that lists all the information required before a request for parts can be screened. JAN 1988.

18.12 DECNA- PRO 300 INTERFACE

18.12.1 General Description

The DECNA is the ethernet interface for the Professional 300 series. I have included it here in case it causes network problems.

18.12.2 Components List

54-15987-01	DECNA Module
17-00612-01	5m PVC transceiver cable
12-22196-01	Standard loopback connector

18.12.3 Installation And Configuration

The DECNA is installed in any slot to the right of the memory module (0034). The system unit test is updated during installation. The power for the transceiver comes from the PRO 300. The only way to see if the power is ok is to use the led on a standard ethernet loopback connector plugged into the NET1 port.

18.12.4 Diagnostics And Maintenance Aids

The power up self test tests the entire system. If the self test passes then a DIGITAL logo appears on the screen. If it fails then a picture of the system appears highlighting the defective module. There is also a display like this:

XXYYYY XX = Slot YYYY = Error Number
ZZZZZZ ZZZZZZ = 42 for DECNA

If the error number is 110 or less then change the DECNA.
If the error number is 111 or more then the fault is external.
If the error number is 0000 then the transceiver cable is out.
Use the ethernet loopback connector to isolate the fault to one of the transceiver cable, transceiver or possibly DELNI.

18.12.5 Reference Documentation

EB-26165-55 PRO 300 Comms Handbook EK-DECNA-IN DECNA Installation Guide

18.12.6 Problems And Solutions

There is a seating problem so try another slot to fix problems.

18.13 DEPCA- IBM PC INTERFACE

18.13.1 General Description

A DEPCA is an interface to allow an IBM-PC to connect to thinwire ethernet. With the addition of a DEPCA-AU option it can connect to a normal transceiver cable. There is a mouse that plugs into the DEPCA. The board includes an IBM PC bus interface and a lance chip for the ethernet interface. There is a DLL rom which contains data link layer firmware used by the lance chip.

The DEPCA is customer installable and we do not perform on-site installation or maintenance unless the PC is on contract with DEC. The customer must diagnose faults and swap the option with off-site return. We will install this option on a per-call basis.

18.13.2 Components List

70-24252-01	DEPCA Module.
17-01491-01	IDC-DSUB cable assy.
17-00612-05	pc to ethernet cable.
17-01517-02	lk250 keybd cable.
12-22196-01	transceiver loopback connector.
12-25628-01	mouse loopback connector.

18.13.3 Installation And Configuration

The PC/AT and PC/XT are fitted with suitable power supplies. If a PC has only a 63.5w or 89w power supply, then it will need to be replaced with a 130w power supply.

The DEPCA has 17 jumpers:

W1 to W5 are used to select IRQ's on the IBM bus. An IRQ is a bit like a BR level on a unibus. On an IBM PC there must be only one device per IRQ line. The DEPCA module therefore needs two IRQ lines, one for the mouse and one for the ethernet. Therefore when installing this option care must be taken to avoid other devices.

W1 is a three position jumper used to select IRQ2. In the top position it means the mouse uses IRQ2. In the bottom position it means that the ethernet uses IRQ2. If it is removed it means that neither device uses IRQ2. Similarly W2 selects IRQ3, W3 selects IRQ4, W4 selects IRQ5 and W5 selects IRQ7.

W6 selects I/O address range. IN = 300-30F, OUT = 200-20F. No two devices can use the same address range.

W7 selects memory address range. IN = D0000-DFFFF, OUT= E0000-EFFFF. Avoid other devices. This jumper must be in on a PC/AT.

W8 should be in.

W9-W14 select the interface type. For thinwire ethernet they should all be in bottom position. For a normal transceiver cable they should ALL be in the top position.

W15 is only effective when a normal transceiver cable is used. Remove this jumper unless there is an 802.3 compliant transceiver and cable. (note: an H4000 or a DELNI is not compliant.)

W16 should be in.

W17 should be in for thinwire ethernet and out for a normal transeciver cable.

18.13.4 Diagnostics And Maintenance Aids

The DEPCA diagnostics consist of power-up rom test and also a menu driven diagnostic loaded from floppy.

There are two leds one red, the other yellow, both visible at the back of the PC. The yellow led flickers to indicate normal network activity. If it illuminates for 30 seconds there is a fault in the DEPCA causing the PC to hang. The red led illuminates during the power up self test which lasts about 30 seconds and then it goes off unless there is an error. If there is a self-test error then the screen displays DEPCA xx , where xx is an error code.

The error code probable causes are:

80,81,82,83	usually a jumper or bus/memory conflict.
84	jumpers W9-W14 or ethernet address rom.
85	network related problem.
86	check W6.
87	DEPCA faulty.
88	check W1-W5.
89-8C	network related problem.
71-74	mouse related problem.

These errors may also be displayed as part of a system message if a fault occurs during normal operation. The screen display will be "DEPCA diagnostic failure - Lance Subtest #xx (reason). The "xx" are the same errors as above. The following errors may occur during normal operation:

DEPCA Diag failure - Lance Subtest# xx (General Memory Error)
Check W7, run diagnostics, replace DEPCA

DEPCA Diag failure - Lance Subtest# xx (Unknown Subtest Error)
Check W1-W5, replace DEPCA

DEPCA Diag failure - Mouse Subtest# xx (Unknown Subtest Error)
Run Diagnostics, replace DEPCA.

To run the menu driven diagnostics you must boot the diagnostic floppy. The easiest way to do this is to power up with the floppy in drive A or B. The diagnostic expects a loopback connector to be installed on the ethernet port and the mouse port. Once it has booted it will produce a nice screen display showing the DEPCA configuration eg. addresses and IRQ's. If any of these are displayed as ? then there is probably a DEPCA problem or a clash of some sort. The main diagnostic menu selections are selected using the up/down arrow keys and carriage return. Basically we can test everything using the automatic test or select individual tests eg. lance tests test the network only.

To run the lance tests using a loopback connector:
1) Make sure that the top of the screen displays:
"Expected loopback connector yes"
If no, go to step 6
2) From the main menu select individual tests.
3) Make sure that a loopback connector is fitted.
A loopback connector is either a 12-22196-01 transceiver cable loopback or a thinwire T-connector with two terminators.
4) From the individual test menu select lance tests.

5) As the test runs a continuous display of errors appears on the screen At the end of the test any errors are reported as error codes.

The error code fru's are

Error	FRU
1	W7
2-5,9,13,21,24-27,29 or 30	Replace DEPCA
6	W9-W14,W17,Ethernet address rom,DEPCA
7	W8,DEPCA
8,28	W1-W5,DEPCA
10,11,14,15,22,23 or 31	Try packet passer test,W17,DEPCA
12	Loopback connector,W17,DEPCA
16	Rerun diagnostic, if it fails DEPCA
17,19,20	All jumpers,DEPCA
18	W6,DEPCA
32-36 Mouse errors	W1-W5,DEPCA

6) To change the configuration shown:

From the main menu select "set-up diagnostic configuration".
Then select "modify program setting".
Then select lance loopback and use return to toggle it.
Select "done" to exit.

The packet passer test is basically the same loopback test as above except another IBM/PC with a DEPCA installed is used as a loopback connector. The two PC's involved are connected using a thinwire ethernet cable. Both systems must have the menu driven diagnostics running. One system is set up to echo packets from the main menu. The other system runs the loopback test as above.

18.13.5 Reference Documentation

EK-DEPCA-OM-001	Owners Manual
EK-DEPCA-TM-001	Tech Manual
EK-DEPCA-UG-001	User Guide
EK-LBIBM-IN	LK250 Keyboard Cable Inst. Card
MP-02421-01	Print Set

18.13.6 Software

The PC must be running PC-DOS V3.1 . There is software loaded onto the PC and also on to a VAX. The PC becomes a client and the VAX becomes a server in a personal computing system environment, PCSA, allowing the PC to do file transfers, print etc using DECNET.

18.13.7 Problems And Solutions

There are three fuses on a DECSA. One of the fuses is used for the power that is supplied to an H4000.

18.14 DEREP- LOCAL/REMOTE REPEATER

18.14.1 General Description

The DEREP is now covered by the comms. mini. reference guide volume 5 so I will only cover it briefly here.

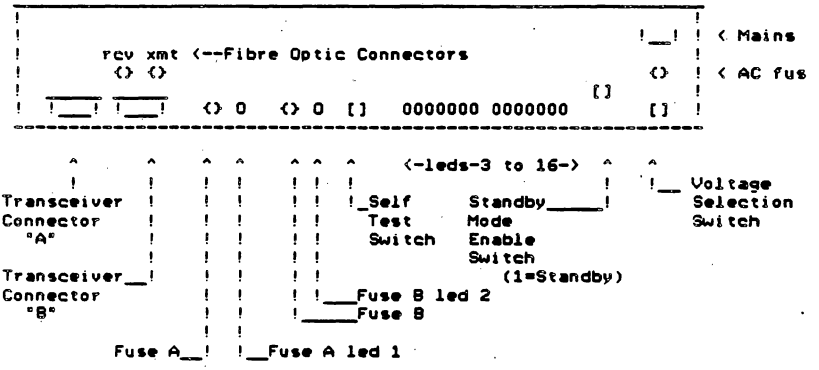
A DEREP is used to connect two coaxial segments thus allowing the ethernet to be extended. There are two varieties: local and remote. The local repeater can connect two segments if the distance between them is 100 metres or less. An H4000 is used on each segment and a transceiver cable from each H4000 is connected to the two ports on the DEREP. The remote repeater is made of two halves, each of which has a socket for a transceiver cable and a connection for a fibre-optic cable pair. The fibre-optic cable between the two remote repeaters can be up to 1000 metres in length.

A repeater consists of a box about 18"x12"x4" with four switches, three fuses, two transceiver cable connectors and 16 leds. A remote repeater has two additional fibre-optic connectors. The switches are

1. on/off
2. self test
3. standby mode
4. voltage selection

The leds are used to assist in diagnosing network and repeater faults.

Rear Panel of a Repeater.



Fibre-optic connectors are used on remote repeaters only. If a fibre-optic interface is fitted then transceiver connector 'B' is automatically disabled.

18.14.2 Brief Functional Description

18.14.2.1 Normal Data Flow -

When the ethernet is idle and the repeater detects a signal on one side it regenerates the preamble and then repeats the signal from the transmitting side to the the receiving side. The new data is retimed by oscillator within the DEREP.

18.14.2.2 Collisions -

Collisions occur if two nodes attempt to transmit at the same time. When a collision occurs on one side, the repeater jams the other side. It will not repeat until both sides are clear.

18.14.2.3 Autosegmentation -

If a DEREP detects 64 consecutive collisions when trying to transmit to a segment it

1. Ignores data and collisions from the bad side.
2. Illuminates the SEG(A or B) led.
3. Illuminates the fault led.
4. Continues to repeat from the good side to the bad side.
5. Waits for a successful transmission to the bad side after which it turns off the fault led and resumes normal operation.

So, if a SEG led only is on it means that a segment was segmented but is now ok (run the self test to clear it). If a SEG led and the FAULT led is on it means the segment is still segmented.

18.14.2.4 Standby Mode (Local Mode Only) -

Local repeaters may be installed in parallel to increase network availability. One repeater has standby mode enabled and is called the standby repeater. The other repeater is then known as the primary repeater. A DEREP in standby mode does not repeat data but monitors the primary repeater. If the primary repeater does not repeat data for a period of one slot time, the standby repeater becomes active and starts to repeat data. The ACTIVE led is illuminated. The standby repeater will return to a passive state after 56 consecutive collisions so when the primary repeater returns to normal service , both repeaters repeat the first 56 frames and then the primary repeater takes over.

18.14.3 Components List/Maintenance Philosophy

DEREP-AA or AC		Local Repeater
DEREP-RA or RB		Remote Repeater (both ends)
DEREP-RC or RD		Remote Repeater (one end)
54-15586-01	*	Logic Module
70-19499-01	*	Power Supply
54-16053-01	*	Fibre-optic Interface Board
17-00428-00	*	Power Supply Cable
29-25037-00		Fibre-optic loopback cable
12-22196-01		General Ethernet Loopback Connector
90-07215-00		Fuse (A and B)

The maintenance philosophy is to change one of the fru's marked with a * above. To find the failing fru the led indicators are used.

18.14.4 Installation And Configuration

Both types of repeater connect to the coaxial cable via a transceiver cable and an H4000. A DEREP cannot be connected to a DELNI. There should be 4 inches of clear space at either side of a DEREP to ensure proper ventilation. If a remote repeater is used then the transmit connector at one end should be connected to the receive connector at the other and vice versa. The transmit connector is marked O-> and the receive connector is marked -(->) . It is possible to convert a local repeater to a remote repeater by adding a fibre-optic interface board. When a fibre-optic interface board is fitted the "B" transceiver connector is automatically disabled.

Remote repeaters may not be installed in parallel.

18.14.5 Diagnostics And Maintenance Aids

The only test available is the self test. The self test is in two parts: (internal and external. Only the internal test is run whenever the DEREP is powered on. Both tests are run by momentarily pressing the self test button, which can be done whilst the DEREP is in service without disrupting normal network operation. If the internal test fails then the logic module is probably faulty. The external test sends some encoded data on both sides of the repeater and expects to see the same data returned either 1)via the H4000 or 2) via the other half of a remote repeater. Both halves of a remote repeater must be working for the test to work. If the self test works then the leds return to their normal state. If the test fails then look at the leds. The self test takes about one second.

18.14.5.1 Using Loopback Connectors -

The standard ethernet loopback connector plugs directly into the DEREP transceiver port. The fibre optic loopback connector plugs into the DEREP in place of the fibre-optic cable. The self test should pass using these loopbacks. One thing I have found is that if you leave the fibre-optic cable connected and use a standard ethernet loopback connector in side A the self test will pass but the leds show CPT errors for side A. I have asked for these loopback connectors to be included in the DEREP kit. If you cant get a loopback connector then an H4080 can be used to test the DEREP and transceiver cable. One obvious test of a local DEREP error is to swap the transceiver cables round between A and B and see if the fault moves.

18.14.5.2 Led Indicators - See previous diagram for led locations.

led no.	name	colour	meaning
1	A	GREEN	Fuse A OK
2	B	GREEN	Fuse B OK
3	CD(A)	GREEN	Carrier on B sent to A
4	SEG(A)	YELLOW	Repeater was segmented on side A
5	12v	GREEN	+12v OK
6	TST	RED	Self-test in progress
7	FLT	RED	Currently segmented
8	ERR(A)	RED	External self-test error side A
9	CPT(A)	RED	Collision presence test error side A
10	CD(B)	GREEN	Carrier on A sent to B
11	SEG(B)	YELLOW	Repeater was segmented on side B
12	5v	GREEN	+5v OK
13	INT	RED	Internal self-test in progress
14	ACT	RED	Standby active
15	ERR(B)	RED	External self-test error side B
16	CPT(B)	RED	Collision presence test error side B

The leds that are normally on are +5v,+12v,Fuse A,Fuse B. Both of the CD leds should flicker as normal ethernet traffic passes through the repeater. The SEG leds may be latched on if a problem on a segment has occurred at any time since the the last self-test or power on. If a SEG led is found to be illuminated then run the self-test. CPT leds are usually illuminated if there is transceiver or transceiver cable problem. TST should only be on for less than one second, if it stays on then there is an error. INT comes on for internal and external test failures. To just run the internal self test power the DEREP off for five seconds then power it on again. ERR leds indicate which side has failed the self test.

18.14.6 Reference Documentation

EK-DEREP-TM	DEREP Tech. Manual
EK-DEREP-IN	Local DEREP Installation Manual
EK-DERRP-IN	Remote DEREP Installation Manual
MP-01810-01	Print Set

18.14.7 Problems And Solutions

- A DEREP cannot be directly connected to a DELNI.
- A DEREP will not work on a transceiver which has no heartbeat.
- A remote DEREP cannot be a slave.

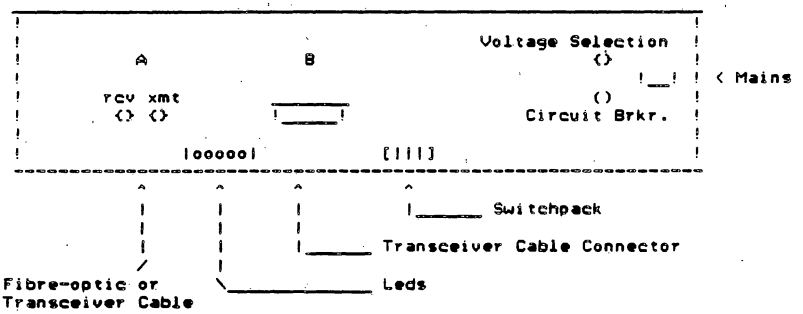
18.15 DEBET- LAN BRIDGE 100

18.15.1 General Description

The DEBET is a bridge that interconnects two LANs creating an extended LAN. There are two varieties: local and remote. The local bridge can connect two segments if the distance between them is 100 metres or less. An H4000 is used on each segment and a transceiver cable from each H4000 is connected to the two ports on the DEBET. The remote bridge has a socket for a transceiver cable and a connection for a fibre-optic cable pair. A remote bridge can be connected to the fibre optic side of a remote repeater in which case the fibre-optic cable between the two remote ends can be up to 1500 metres in length. Two remote bridges can be connected using a fibre-optic cable of up to 2000 metres.

A local DEBET consists of a box about 19"x12"x6" with a mains input, a voltage selection switch, a circuit breaker, two transceiver cable connectors, five leds and a switchpack of six switches. A remote bridge is the same except that one of the transceiver connections is replaced by a fibre-optic interface.

Rear Panel of a Remote Bridge.



Fibre-optic connectors are used on remote bridges only.
A local bridge has two transceiver connections.

18.15.1.1 Leds And Switches -

```
          leds                 switches (down=on)
   o   o   o   o   o           I  I  I  I  I  I
   A  -> ===  T   B           1  2  3  4  5  6
```

```
A    Port A activity              1= Loop Self Test
->   On line                      2= NVRAM Reset
===  DC ok                        3= Port A access
T    ON  Self test passed         4= Port B access
     OFF Self test in progress
B    Port B activity
```

45 seconds after power up DC ok and T should be on.
A and B will flicker. On line should be on unless
the bridge has entered BACKUP state.

```
SW1 ON  Run self test continually
    OFF Run self test once on power up
SW2 ON  Reset DEBET to factory settings on power up
    OFF Retain parameters set by RBMS before power down
SW3 ON  Allow RBMS to modify parameters using port A
SW4 ON  Allow RBMS to modify parameters using port B
SW5 and SW6 not used
```

18.15.2 Brief Functional Description

When the bridge is first turned on it runs a self test and then spends thirty seconds "learning" addresses by looking at source addresses within the packets, and configuring itself with other bridges in the network so that no loops are formed. After this, the bridge will receive, regenerate and transmit packets. The bridge looks at each packet and will not forward packets that have local destination addresses. The typical time taken for a frame to be forwarded is one millisecond.

18.15.3 Components List/Maintenance Philosophy

The maintenance philosophy is option swap.

```
DEBET-AA or AB     Local Bridge
DEBET-RA or RB     Remote Bridge
12-22196-01        General Ethernet Loopback Connector
29-25037-00        Fibre-optic Loopback Connector
```

The fibre-optic interface is the same board as used in the remote DEREP.

18.15.4 Installation And Configuration

When an extended LAN is configured there must be no more than seven bridges between any two stations. Bridges may be configured to make loops as they automatically detect loops and enter backup state, so that only one path ever exists between LANs. If the online bridge fails then the backup bridge takes over. Bridges may be configured in loops with repeaters and will automatically go into backup state until the repeater fails. A bridge should never be installed in parallel with a router. A local bridge connects to two H4000's (or DELNI, DECOM, DESTA, etc.) using transceiver cables. A remote DEBET uses a fibre-optic cable. The transmit connector at one end should be connected to the receive connector at the other and vice versa. The transmit connector is marked O-> and the receive connector is marked -(=)) . The DEBET should always be installed so as to allow sufficient clearance around the bridges air inlets and outlets.

When a remote DEBET is connected to a remote repeater via the fibre-optic cable then the length of the fibre-optic cable is included in the "budget" for the LAN connected to the repeater (ie. a maximium of 1000 metres of fibre-optic cable between any two points in the LAN).

18.15.5 Diagnostics And Maintenance Aids

The self test is run after power up. The self test requires both sides to be connected to functional transceivers to pass. An H4080 could be useful if you have not got a standard ethernet loopback connector. It is not possible to use a H4000-TA transceiver tester across a bridge because all the the testers have the same ethernet address. To test a bridge in a live network try to set host from a node on one side to a node on the other side.

18.15.6 Reference Documentation

EK-DEBET-I-001	Tech. Manual
EK-DEBET-UG-001	User Guide
MP01785-01	Print Set
AA-FY93A-TE	RBMS Guide

18.15.7 Software

RBMS is Remote Bridge Management Software and allows individual bridges to be observed and controlled. It allows the system manager to:

1. Read, modify or write the forwarding database.
2. Set flags in the status words to prevent address "ageing".
3. Set certain parameters to affect the spanning tree algorithm.
4. Read bridge counters.

Parameter changes are loaded into the NVRAM and are retained if the bridge is powered off and on.

18.15.8 Problems And Solutions

- If the DC ok led is not on, try disconnecting the transceivers because they get their power from the DEBET.
- LTM is a software product using a bridge to monitor the network. For LTM to work the bridge must be at rev E . Fco eq-01479-01 is a rom set to upgrade the bridge to rev E .

18.16 THINWIRE ETHERNET

18.16.1 Brief Description

Thinwire ethernet works at the same speed as ordinary ethernet but uses thinner cable. The maximum allowable cable length is less.

A DESTA ,a thinwire station adapter, is the thinwire transceiver, equivalent to an H4000. The thinwire cable is not drilled to attach the DESTA. Instead a T-connector is used. This means that a thinwire segment is made up of several short cable segments connected together using T-connectors. The cable segments and T-connectors have BNC connectors.

A DEMPR, a multiport repeater, allows eight thinwire segments to be joined together and, if required, to be connected to a standard ethernet.

18.16.2 Configuration Rules

- The maximum segment length is 185 metres and each segment is terminated at both ends with a 50 ohm terminator.
- The maximum number of stations connected to a segment is 30. A station is either a T-connector, a barrel connector, or a DEMPR.
- The minimum distance between stations is 0.5 metres.
- Up to eight segments can be connected to a DEMPR.
- A DEMPR acts as a terminator and therefore must be at the end of a segment.
- Cable segments must not be looped from one DEMPR port to another.
- A DEMPR connected to a standard ethernet can use an H4000 or an H4000-BA.
- A DEMPR may be connected to a thinwire segment, using a DESTA, to create a cascaded DEMPR configuration. Cascaded DEMPR configurations cannot be connected to a standard ethernet or a DELNI.

- Up to eight DEMPR's can be connected to a standalone DELNI. If this is done the DELNI is in global mode with an ethernet loopback connector used on the global port .
- Up to eight DEMPR's may be connected to a DELNI which is connected to a standard ethernet using an H4000-BA transceiver. This is known as a DELI/DEMPR combination. If a DELNI/DEMPR combination is used then the standard ethernet segment may be only 300 metres long.
- It is not possible to connect a DEREP to a DESTA.
- The DEMPR counts as a repeater in the ethernet configuration. No more than two repeaters are allowed between stations.
- The DESTA must connect directly to the T-connector. No cable is allowed between the T-connector and the DESTA.
- Thinwire segments must always be grounded at only one point. A DEMPR acts as a ground.
- Thinwire segments should never have any branches.

18.16.3 Components List

BC16M-X	PVC Cable with boots (length = x) x = 3,6,10,15 or 30.
H8243-A	1000 foot drum of thinwire pvc cable.
H8244-A	1000 foot drum of thinwire teflon cable.
H8222-A	Male coaxial connectors with boots.
12-25566-01	Same thing.
H8223-A	T-connectors and boots.
12-25534-01	Same thing.
H8224-A	Barrel Connectors and boots.
12-25567-01	Same thing.
H8225-A	Terminators and boots.
12-25535-01	Same thing.
H8242	Installation kit.
DESTA-AA	Thinwire Ethernet Station Adapter
DEMPR-AB	Thinwire Multiport Repeater. (240v)

All these parts (except the DEMPR) are included in the generic ethernet kit.

18.16.4 Problems

There have been some problems concerning other vendors cables. The cable we use is a special type of RG58 cable with a Belden catalogue number of 9907 or 89907. If this is not used then the maximum functional segment length is less than 185 metres.

18.17 DESTA - THINWIRE TRANSCEIVER

18.17.1 General Description

The DESTA is the thinwire equivalent of an H4000. It is a box about 3 inches square and about one and a half inches thick. It has two connectors, one green led and two switches. One connector is a bnc connector for a thinwire T-connector. The other connector is for a transceiver cable. This is exactly the same connector as is on an H4000. The green led indicates that power is being supplied by the interface over the transceiver cable. The two switches are on the opposite side to the transceiver cable connector and are used to enable/disable heartbeat. If they are both pushed towards the dimple then heartbeat is enabled. If they are both pushed away from the dimple then heartbeat is disabled. The factory setting is enabled.

18.17.2 Diagnostics And Maintenance Aids

Use the same tests as for the H4000. These are the H4000-TA testers which have recently been modified to be IEEE 802.3 compliant. Otherwise attach a network node to it and see if it works. Maintenance Philosophy is option swap.

18.17.3 Reference Documentation

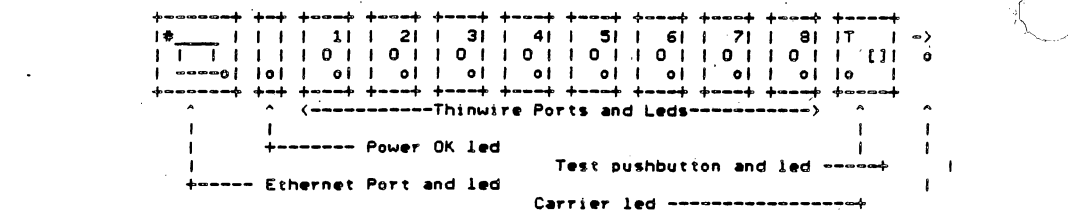
EK-DESTA-IN-001 Installation Card (shipped with every DESTA)
EK-DESTA-TM Thinwire Ethernet Adapter Tech. Manual

18.18 DEMPR - THINWIRE MULTIPORT REPEATER

18.18.1 General Description

The DEMPR is a multiport device that allows connection of eight thinwire segments and one connection to an H4000 transceiver or equivalent. The DEMPR serves as a repeater between each of its nine ports.

Rear Panel of a DEMPR.



18.18.2 Diagnostics And Maintenance Aids

The DEMPR performs a self test when it is powered up. This test only tests the DEMPR internally and not any external cabling. It should complete in less than ten seconds. During the test the self-test active led will glow. At the end of the test only the power led should be on.

The DEMPR self test pushbutton may be used to check the external capabilities of the ports. A loopback connector should be used on the ethernet port and a 50 ohm terminator on each of the thinwire ports. During the test each port led will illuminate and should go out if the port passes the test. A properly terminated thinwire segment should allow the DEMPR to pass this test, but this should not be used to verify thinwire segments. If the DEMPR passes its test it means the DEMPR is OK and DOES NOT mean that the segment is definitely OK!!

The segmentation leds associated with each port should normally be off. When the DEMPR finds that it cannot transmit successfully to a segment it illuminates the appropriate led and ignores any signal from the segment. In this state the segment is said to have been segmented. When DEMPR does manage to send a message to the faulty segment it resumes normal operation but leaves the appropriate led blinking to indicate that a fault has occurred and gone away.

The carrier led indicates any network traffic on any port.

18.18.3 Reference Documentation

EK-DEMPR-UG-001 DEMPR Installation and User Guide

18.18.4 Revision Levels And FO's

Revision levels below C1 can bring down the network if one of the thinwire segments is shorted. EQ-01491-02 is a revision C1 or D1 DEMPR.

18.19 DESPR - THINWIRE SINGLE PORT REPEATER

18.19.1 General Description

The DESPR is a single port version of the DEMPR. It is in the same size box as a DEMPR and uses the same logic board with just enough components for one thinwire port and one port to be connected to an H4000 or equivalent. The leds and switches perform the same functions as per the DEMPR.

18.19.2 Components List

DESPR-AB Single Port Repeater (240v)

18.20 TROUBLESHOOTING ETHERNET

18.20.1 How To Start NCP On Various Operating Systems

On a VMS system: type " MC NCP".

On an RSX system: type "NCP".

On a RSTS system: type "RUN $NCP" or "NCP". The first command should always work. The second command may not.

On an Ultrix system: type "ncp".

On a MS/DOS system only one program can run at a time. So, to start NCP , get the system manager to load it for you from a floppy. NCP can only be used for set and show type commands and does not show counters. There is another program called NTU (testing utility) which can do show, loop and mirror commands. Using NTU you can loop nodes, lines etc. and if the mirror command is used then the VAXMATE or IBM/PC will act as a loopback node so that other systems can run loopback tests to it.

18.20.2 NCP Line Counters

This section uses some information supplied by Kevin Butler, and presents an overview of the most important Ethernet line counters. Please note that the explanations are the MOST LIKELY cause of the errors and are not hard and fast rules. Most ethernet interfaces maintain line counters to assist in troubleshooting the network. Most operating systems can access these counters. Once NCP is started most of the commands are the same.

To get the ethernet line counters use the NCP command:

NCP> SHOW LINE ethernet_device-0 COUNTERS

The ethernet device will be UNA-0 for DEUNA or DELUA, or BNT-0 for a DEBNT or DEBNA, or SVA-0 for a DESVA, or QNA-0 for a DEQNA or a DELQA.

Here is an example printout:

Line Counters as of 13-NOV-1987 13:42:41

Line = QNA-0

>65534	Seconds since last zeroed	(1)
119895	Data blocks received	
46993	Multicast blocks received	
0	Receive failure	(2)
69751411	Bytes received	
66001098	Multicast bytes received	
0	Data overrun	
0	Local buffer errors	
160753	Data blocks sent	
76786	Multicast blocks sent	
322	Blocks sent, multiple collision	
318	Blocks sent, single collision	
0	Blocks sent, initially deferred	
14208085	Bytes sent	
575879(	Multicast bytes sent	
9	Send failure, including:	(3)
	Excessive collisions	
	Carrier check failed	
	Short circuit	
2	Collision detect check failure	(4)
10052	Unrecognized frame destination	(5)
6599	System buffer unavailable	(6)
0	User buffer unavailable	(7)

This is what they mean:

(1) Seconds

This is the amount of time that has elapsed since the counters were last zeroed. Watch for the ">", as this means that the counter has overflowed. For measurement purposes, you will need to zero the counters, and wait for a period of time to collect new counters.

(2) Receive Failure

This counter indicates the number of data blocks received in error. You may get an indication of the error type: as below.

Block check error
Framing Error
Frame too long

This is usually due to some other system, having problems on it ethernet devices, eg Ethernet Interface (DEQNA, DEUNA etc) or Transceivers (H4000 or DELNI). It is possible, that the node does have an actual hardware problem, this should not be ruled out. If the problem is seen by several nodes, then it most likely is the sending node that has the problem. (It may show send errors, or none at all!) Remember Bridges could be involved, so check their counters as well, by using RBMS.

(3) Send Failure

This counter indicates the total number of times an attempt to transmit has failed. There may be an indication of the failure type, as listed below.

Excessive Collisions
  This indicates, either a very heavily loaded ethernet (VERY unlikely!) or some other device is jamming the network, such as a DEREP, DEMPR, etc.

Carrier Check failed
  If on broadband, this is just a warning message, but should not be causing any problems.

Short circuit
Open circuit
  Broke ethernet cable. Check if new H4000 has just been installed, or any other cable work near the ethernet cable. This is a serious problem, probably affecting all nodes on the segment.

Frame too long
  Data supplied for sending was too long

Remote failure to defer
  Usually another system has got it wrong, go find it! May be a broken Ethernet device, but this is rare. More often, this is a configuration problem, where the Ethernet segment is too long, eg longer than 500m, cascaded DELNI's, etc.

(4) Collision Detect Check failure

The heartbeat signal was not seen after a transmit. This could be due to using a H4000-BA,(or on a DELNI connected to an H4000-BA), in this case the number of data blocks transmitted, should be similar to the number of collision detect check fails. Where the two differ greatly, this tends to indicate, a broke H4000 (or transceiver cable).

(5) Unrecognised Frame Destinations

This is NOT anything broke! This usually means that there are UNIX/ULTRIX systems on the ethernet, using TCP/IP protocols. What happens, is that the address of the message indicates this node should handle the message, but that there are no users receiving the specified protocol type. Ie the message is received but not delivered to any user.

(6) System Buffer Unavailable (7) User Buffer unavailable

These counter indicates the total number of times no system buffer was available for an incoming frame. This can be any buffer, from the hardware up to the user buffers. Check VMS POOL (show mem/pool/full) for expansion, also check number of receive buffers on the ethernet line. Increase if it has a value less that 12 buffers.

In all cases the number of occurrences of the error counters, should be viewed, in relation to the total amount of data sent/received. Eg if there are 100 receive failures out of 200 packets, then this would be very bad, but say 10 errors in 1,000,000 packets, may not be something to worry about (unless the error was Open Circuit, where the number of errors should increase rapidly!)

18.20.3 Using Decnet Loop Tests

WARNING

Tests described in this section involve turning off the customers network. Make sure the customer has agreed to let you do this before proceeding.

END OF WARNING

It is often useful to use decnet to test the network using loopback tests. There are three types of NCP loopback test: LOOP EXEC, LOOP NODE and LOOP CIRCUIT. To try and find the cause of two systems not communicating on the ethernet use the following four tests:

1) NCP> LOOP EXEC

This command tests the capability of the cpu you are working on to perform loopback tests. It does not test any ethernet hardware, only DECNET software.

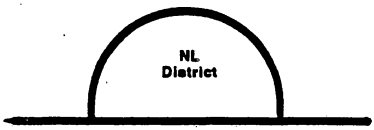
2) *** READ THE WARNING MESSAGE ABOVE ***
then
```
NCP> SET CIRCUIT UNA-0 STATE ON SERVICE ENABLED
NCP> SET LINE UNA-0 STATE OFF
NCP> SET LINE UNA-0 CONTROLLER LOOPBACK STATE ON
NCP> SET NODE TEST CIRCUIT UNA-0
NCP> LOOP NODE TEST
```
This sequence of commands puts a DEUNA into loopback mode and loops data. It tests the DEUNA but does not send any data on to the network.

When you have finished type:
```
NCP> SET LINE UNA-0 STATE OFF
NCP> SET LINE UNA-0 CONTROLLER NORMAL STATE ON
NCP> CLEAR NODE TEST
```

3) NCP> LOOP CIRCUIT UNA-0 PHYSICAL ADDRESS AA-00-04-00-AB-CD
This command cause data to be looped between your node and another ethernet interface on the network. It is obviously handy if you know the address of something else on the network before you try this one. If you know the node name of another system on the ethernet then use it eg:
```
NCP> LOOP CIRCUIT UNA-0 NODE XXXXXX
```

4) NCP> LOOP NODE xxxxxx

This command causes data to be looped between the decnet software on your node and node xxxxxx. It may test the ethernet although in a large network the route taken may vary. If you want to be sure that the ethernet is used then get the system manager to turn off any other lines.



F A C T F L A S H

Options Affected: Barclays MK 5 Controllers
Submitted By: Barry Lowry
Date: 13-FEB-1989
Filing Instructions: with your ethernet chapter

Barclays Bank Ethernet Testing.

I recently went to a Barclays MK 5 installation and made the following observations which might be useful when troubleshooting ethernet problems:

1. The DEQNA leds should all be on all the time. I tried a power up self test with the cable disconnected and there was no change.
2. ZQNA?? runs external loopback test with a loopback connector, or using the DESTA and the ethernet segment as a loopback connector. This is one way to test the DESTA. If the test fails then try a T-connector and two terminators connected directly to the DESTA.
3. With the system running I disconnected the transceiver cable from the DEQNA module. I then used the command NCP>SHOW LINE QNA-0 COUNT and found Collision Detect Check Failures and Send Failures with reasons of Carrier Check Failed and Short Circuit.
4. I reconnected the above and removed an ethernet terminator. Using the same command, I found Send Failures with a reason of Open Circuit.
5. I put an ethernet loopback connector on the DEQNA port and used the same command again. There were no send failures but there were Collision Detect Check Failures.
6. By using NCP I could find the Barclays Controller decnet node number and area number. The command to use is NCP>SHOW EXEC STA. This should match the details supplied on the customers commissioning details, usually left on site.
7. By using the command NCP>SHOW KNOWN NODES I could find the decnet addresses of the IBM PC's eg; 40.101 and also their names eg; TT145. This information was also available from RSX using the command PRI TT1:gpwdef.cfe.
8. Until the IBM PC's are booted they show as unreachable using the above command. When they are booted, the screen displays a horizontal band that shows the load status from 0% to 100%. If the ethernet connection to the Barclays controller is not working then it only gets as far as about 80% and then stops. If this happens, select offline, wait until it asks for decnet node number and then enter the Controller ID information attached to the front of the PC. Then wait for the opportunity to select WU and after you have entered WU, wait for it to fail. You now need to put a different disk into the IBM PC. There should be some IBM diagnostic/utility floppies on site. Use the one marked "WORKSTATION UTILITIES OFFLINE DISK. UTDISK BL26/UPD002" and press enter.

   There should now be a menu on the screen with the following options:

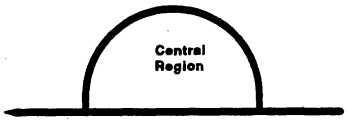
   - EC - Ethernet Loop to Controller
   - EW - Ethernet Loop to another Workstation
   - EM - Ethernet Loop to Multicast
   - DC - Decnet Loop to Controller

- DW - Decnet Loop to another Workstation
- DR - Decnet Loop Reflection

These two types of loopback tests use different protocols for loopback testing. I would expect the ethernet tests to work even if there was a decnet software problem. Both tests could fail if there is anything else using the ethernet at the same time as the two nodes being tested.

I used EW to loop test between two workstations.

By using DR in one workstation and DW in the other workstation I was able to loop data between two workstations. By using DR in a workstation, I was able to test it from the controller using the command NCP>LOOP NODE TT146. I got the name TT146 from my previous steps.



F A C T F L A S H

Options Affected: DELQA-PLUS
Submitted By: Jim Burnley
Date: 8-OCT-1990
Filing Instructions: file at end of ethernet chapter

New DELQA-PLUS option.

There has been a new version of the DELQA module released known as the DELQA-T or DELQA-PLUS. Although the Module appearance has not changed the part number is now M7516-YM. The DELQA-T is a go faster version and requires VMS 5.3 to fully utilise the PLUS capabilities. The module is supported on lower versions of VMS but will only function as per the old DELQA. There has also been a change to the switch setting as SW5 is now used.

Table 1: DELQA-T switch settings

switch	setting	meaning
S1	closed	First DELQA device bus addreess 17774440
	open	second DELQA device bus address 17774460
S2		Reserved
S3	closed	selects DELQA-normal mode
	open	selects DEQNA lock mode
S4	closed	host inactivity timer initialy disabled
	open	host inactivity timer initialy enabled
S5	closed	T-mode enabled (board can operate in as DELQA-normal or DELQA-T mode)
	open	T-mode disabled (board can operate only as a DELQA-normal or DEQNA board)