HEWLETT PACKARD

IEEE 802.3
Coaxial Cable
LAN Link Troubleshooting

Customer Engineer Handbook

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Safety Considerations

Grounding

WARNING

An improperly grounded local area network (LAN) cable installation can present an electrical hazard to persons working with that cable or operating equipment connected to that cable. Before troubleshooting and correcting network failures, ensure that the cable installation is properly grounded. Information on properly grounded network cabling can be found in the *LAN Cable and Accessories Installation Manual* (5955-7680), and local building and electrical codes. If there are any doubts about the safety ground system in your building or buildings, consult a qualified electrician.

Cable Handling

WARNING

Persons handling the local area network (LAN) coaxial cable can be exposed to an electrical hazard. The following procedures MUST be followed when handling the LAN cable.

1) When exposing the shield of the LAN coaxial cable for any reason, care shall be exercised to ensure that the shield does not make electrical contact with any unintended conductors or grounds. Personnel performing the operation should not do so if dissipation of a high energy transient by the cabling system is likely during the time the shield is to be exposed. Inadvertent contact with the shield or any grounded conductor should be prevented.

2) Before breaking the LAN coaxial cable for any reason, a strap with ampacity equal to that of the shield of the coaxial cable shall be affixed to the cable shield in such a manner as to join the two pieces and to maintain continuity when the shield of the LAN cable is severed. This strap shall not be removed until after normal shield continuity has been restored.

3) At no time should the shield of any portion of the Backbone ("thick") LAN coaxial cable to which a MAU or MAUs are attached be permitted to float without an effective ground connection. If a section of floating cable is to be added to an existing cable system, such as a ThinLAN ("thin") cable, personnel shall take care not to complete the circuit between the shield of the floating cable section and the grounded cable section through body contact.

Preface

Purpose. If you are reading this manual, you are probably experiencing a problem with your *local area network* (LAN). This manual will help you find hardware faults associated with Hewlett-Packard equipment on an IEEE 802.3 coaxial cable LAN.

There are already several existing LAN product manuals from Hewlett-Packard that contain LAN troubleshooting information. However, these manuals are oriented toward homogeneous computer systems (such as HP 3000-to-3000, or HP 9000-to-9000) on a single LAN cable segment.

This manual incorporates LAN troubleshooting information for LANs that contain heterogeneous systems. As intersystem communications between dissimilar systems are supported by Hewlett-Packard, the appropriate troubleshooting information will be added to this manual.

In addition, this manual provides troubleshooting information for extended topology LANs where operationally independent LAN cables are joined together through devices such as repeaters.

We presume that you have or can be assisted by someone with knowledge at the System Manager level for each computer system covered by this manual. We presume that you can log on, run and terminate programs, and determine system status. In some cases, it may be necessary to terminate network services or shut-down the system.

CAUTION

If you do not have the knowledge to perform these tasks, get help.
Failure to do so may severely impact system users and applications.

CAUTION

The hardware tests and procedures described in this manual should be performed by authorized service personnel only. Failure to comply may invalidate any warrantees and support associated with HP hardware products.

Organization. The organization of this manual is presented below. You should read Chapters 1 and 2, and refer to the remaining chapters as needed. A brief description of each chapter is provided below.

Volume 1

Chapter 1: General Information. This chapter describes the scope and limitations of this manual. It provides some background information and things you might try prior to using the troubleshooting procedures in Chapter 2.

Chapter 2: Troubleshooting Procedures. This chapter is the heart of this manual. It contains the procedures (in flowchart format) for troubleshooting an IEEE 802.3 LAN as implemented by Hewlett-Packard. While a summary approach for experienced personnel is provided, this chapter focusses on the detailed set of procedures needed to find more difficult faults. The detailed procedures can be used by less experienced personnel.

Chapter 3: Node Hardware. This chapter describes methods to test the LAN hardware associated with nodes (computer or controller systems attached to a LAN cable). Refer to this chapter when the procedures in Chapter 2 ask you to perform node hardware tests.

Chapter 4: Intersegment Hardware. This chapter contains information on testing hardware that join LAN cables thereby extending the LAN. Refer to this chapter when the procedures in Chapter 2 ask you to check repeater or similar devices.

Chapter 5: LAN Cable. The procedures in Chapter 2 may call for tests of the LAN cable medium. Refer to Chapter 5 for information on various tests of the LAN cable.

During the troubleshooting process, the LAN diagnostic software available on various systems are used extensively to exercise the LAN hardware. The user interface to these diagnostic programs are system dependent. The remaining chapters, listed on the following page, describe the use of diagnostic software on each system covered by this manual.

Volume 2

CAUTION

These chapters provide only the basic information to run the diagnostic tests used in this manual. They are not intended to offer the complete capabilities of the software, nor act as substitutes for documentation that fully describe this software. Use the information contained in these chapters with caution. Where questions arise, refer to the applicable diagnostic software documents. Failure to do so may impact system users and applications.

Chapter 6: LAN/1000 (RTE-A) Link Diagnostic. This chapter provides LAN diagnostic software information on HP 1000 RTE-A systems.

Chapter 7: LAN/300 (HP-UX) Link Diagnostic. This chapter provides LAN diagnostic software information on HP 9000 Series 300 (and upgraded Series 200) HP-UX systems.

Chapter 8: LAN/500 (HP-UX) Link Diagnostic. This chapter provides LAN diagnostic software information on HP 9000 Series 500 HP-UX systems.

Chapter 9: LAN/3000 (MPE V) Link Diagnostic. This chapter provides LAN diagnostic software information on HP 3000 MPE V systems.

Chapter 10: LAN/800 (HP-UX) Link Diagnostic. This chapter provides LAN diagnostic software information on HP 9000 Series 800 HP-UX systems.

Chapter 11: PCs as Diagnostic Tools. This chapter describes how to use a PC for troubleshooting your network.

Chapter 12: The DTC in LAN/XL Environment. This chapter describes how to run troubleshooting tests on an HP 2345A Distributed Terminal Controller (DTC).

Chapter 13: The LAN/XL Link Diagnostic. This chapter describes how to run tests for troubleshooting procedures if your computer is an HP 3000 Series 900.

Preface (continued)

Appendices are provided in the back of the manual and provide supplemental information that you may find useful.

Appendix A: List of Tools and Replaceable Parts.

Appendix B: Topology Considerations.

Appendix C: Using a TDR.

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Contents

As you follow the troubleshooting procedures in Chapter 2 of this manual, you are instructed to run a number of tests on your computer or computers. This chapter tells you how to run those tests on an HP 1000 A-Series computer.

You can think of the bulk of this chapter as a collection of subroutines. If, for example, the troubleshooting procedures ask you to run an External Loopback test on an HP 1000, you would find the section on the External Loopback test later in this chapter, follow the instructions in that section, and then return to the troubleshooting procedures and go to the next step.

Note that this chapter is not a detailed description of the LAN diagostic software on the HP 1000; it just presents enough information to let you follow the troubleshooting procedures.

6.1 Reference and Background Information

6.1.1 System Requirements

The tests described in this chapter run on HP 1000 A-Series computers. The computer must be running the RTE-A operating system, revision A.85 (2540) or later. The Node Manager software (provided with the LAN/1000 link product) must be running on the system, along with the standard system utilities. It is presumed that the NS/1000 network services software is also present and running on the system.

For compatibility of the Node Manager and NS/1000 software with the RTE-A operating system, refer to the software and system installation manuals. (We'll list a bibliography shortly.)

6.1.2 Capability

An account in RTE-A either has Superuser capability or it doesn't. Under normal conditions Node Manager doesn't care whether it is being run from a Superuser account. In addition, IO and NSINF don't check for Superuser capability.

If you need to shut down or start up NS/1000, you will use the NSINIT and NRINIT programs; these programs require Superuser capability. Check with the system manager to get an account with Superuser capability.

6.1.3 References

For detailed information, you may want to have the following references available as you go through the troubleshooting procedures:

Installation Manuals:

Hardware and Link Software:

HP 12076A LAN/1000 Link LANIC Installation Manual, part number 12076-90001

Network Services Software:

NS/1000 Generation and Initialization Manual, part number 91750-90030

Cabling:

LAN Cable and Accessories Installation Manual, part number 5955-7680

Operating Manuals:

NS/1000 User/Programmer Reference Manual, part number 91750-90020
HP 12079A LAN/1000 Link Direct Driver Access Manual, part number 12079-90001

Diagnostic Manuals:

HP 12076A LAN/1000 Link Node Manager's Manual, part number 12076-90002
NS/1000 Maintenance and Principles of Operation Manual, part number 91750-90031
NS/1000 Error Message and Recovery Manual, part number 91750-90045
NS Message Formats Reference Manual, part number 5958-8523

6.2 Setting Up

There are a number of "housekeeping" tasks that you may have to perform in going through the diagnostic procedures in this chapter. Rather than clutter up those procedures with the details of the housekeeping tasks, we will gather those details in this section. The tasks are listed in roughly the same order that you would perform them.

Our examples show your input to the computer in `shaded letters`. The computer's response is shown in `unshaded letters in this typewriter-like type face.`

6.2.1 But first, a few words about RTE-A . . .

"RTE-A is a very powerful and flexible operating system." Statements like that usually mean that novices can get themselves into trouble at speeds approaching 3 MIPS. If you're used to working on some other type of computer system, but are required to walk over to an RTE system to do a little LAN troubleshooting, the following points may smooth your transition to this powerful, flexible operating system.

1) System managers are very important when you're dealing with RTE-A systems. They know a lot about the systems they put together, and can provide you with much useful information. They might also tend to be the slightest bit proprietary and protective about their systems, and some have occasionally been known to become edgy when newcomers go poking about in the system files. So it is wise to keep a few guidelines in mind:

    a) If you need to know anything about the system (say, the password for NS or the cartridge that contains the boot command file), ask the system manager.

    b) If you're thinking of doing **anything** to the system (such as shutting down network services), check with the system manager **first**.

    c) If you've done something to the system that you're afraid might not have been quite the right thing to do, let the system manager know **immediately**.

2) If you're new to RTE-A, we recommend that you use a terminal other than the system console for your LAN troubleshooting. If you should happen to press the BREAK key while you're on the system console, you can easily get lost in the depths of the operating system. (If you should find yourself in this unfortunate position, type "%R" to get back to the RTE-A environment and then notify the system manager.)

3) Though there are few hard-and-fast rules about naming system directories and files, a loose set of conventions has grown up through long-standing tradition and occasional embodiment in standard installation files. Some conventions to note are:

    – The system command prompt is usually "`CI>`".

    – The boot command file is usually the file named "`system`" on the first file manager cartridge.

    – Many user programs and some NS/1000 utilities are located in the `/programs` directory.

- NS/1000 subsystem programs are usually located in the /ns1000/run directory.

Note, however, that the system manager has a lot of flexibility in setting up the system, and is not bound by the above conventions; directories and files can be named anything the system manager likes. (You might be surprised at how many dogs, cats, and grandchildren have been immortalized in system file names.) So if you have any doubts or questions about directory names, file names, passwords, and the like, ask the system manager.

4) For those programs that reside in specific directories (such as the NS subsystem programs that reside in /ns1000/run), you can simplify your access to them by changing your working directory (as we have done in the examples in this chapter) or by setting up user-defined search paths (UDSPs) to search certain directories for those programs automatically. The system manager can make sure that you're using an account that is capable of setting up UDSPs. (We won't go into detail about UDSPs here; you can find full information in your system manuals.)

These caveats are meant to be useful, not to be intimidating. Combine them with a modicum of good sense and you should make your way through LAN troubleshooting on an RTE-A system with no trouble at all.

Now, let's get on with the details.

6.2.2 Logging On

Most programs that you use in troubleshooting your LAN/1000 link don't require you to have Superuser capability. This includes Node Manager, IO, and NSINF; you can run these programs if you log on as usual.

A couple of other programs, however, require that you have Superuser capability; these programs include NRINIT and NSINIT. If you are logged on to an account that has Superuser capability, these programs will execute normally. If not, you'll have to log off and log on to an account that does have Superuser capability. The system manager for the system you're using can give you the log-on sequence for an appropriate account.

(Note that if you're operating on a single-user system, you automatically have Superuser capability.)

Whatever account you use, the general log-on procedure is:

```
RETURN              (Press RETURN to get log-on prompt.)
<log-on name>       (Enter log-on name.)
<password>          (Enter password, if reqired.)
```

The system blanks out whatever password you type in, to keep others from reading the password from your terminal.

If you want to set up a user-defined search path (UDSP) to search for programs, this is a good time to do it. Use the path command, as described in the *RTE-A User's Manual (92077-90002)*.

Example: Here's a typical log-on sequence:

```
                              ┌────────System log-on prompt
[RETURN]                      ↓
DR. JEKYLL WILL SEE YOU NOW. > manager
Password?                     ←─────────────System blanks out password you type in
Using stack file CI.STK::MANAGER
CI>      ←─────────────System command prompt
```

End of example

6.2.3 Finding LANIC Card Information

To perform the tests required by the troubleshooting procedure, you will need to know the LANIC card's LU number and station address, and you will need to know the names of the initialization files for the nodal registry and for network services. To get this information, take the following steps.

1) Use NSINF and/or IO and Node Manager to get the LU number and station address of the LANIC card.

2) Look in the boot command file to find the name of the welcome file; then look in the welcome file to find the names of the initialization files for the nodal registry and for network services.

6.2.3.1 Getting the LANIC Card's LU Number and Station Address

To run the LANIC card Self-test and the External Loopback test, you will need to know the logical unit (LU) number of the LANIC card in your node. For a remote node in a Remote Node test, you will need to know the station address of that node. The best way to find this information is to look on an up-to-date network map.

If you don't have a current network map, how you go about getting that information depends on whether or not all your LAN activity is handled through the NS/1000 network services. If you use NS/1000 exclusively, you can get the LU and station address information you need through the network services information utility, NSINF; that approach is described in the paragraphs below entitled "If All of Your LAN Activity Uses NS". If some or all of your LAN activity uses direct driver access (DDA), NSINF won't tell you what you need to know. In that case, you can find the required information by using the IO command and the Node Manager utility; skip to the paragraphs entitled "If Some of Your LAN Activity Uses DDA".

6.2.3.1.1 If All of Your LAN Activity Uses NS. If all of your LAN traffic is handled by the NS/1000 networking software, you can use the NSINF utility to get the LU number and the station address of the card you're interested in. The general command sequence is:

```
nsinf        (Run NSINF.)
a            (Get LU numbers and station addresses for all LANIC cards.)
i            (List select codes for all LANIC cards.)
ex           (Exit NSINF.)
```

Examples of these commands are shown below.

When you enter the "a" command, NSINF will display information for all of the networking cards in the system. The LANIC cards will be listed as type "LAN". (Refer to the example, below.) The LU number and station address will be shown for each card.

If you have only one LANIC card in your system, you have the LU and station address information you need. But if you have more than one LANIC card – NS/1000 can handle up to three LANIC cards – you have to figure out which card is the right one. The following procedure will tell you.

1) Trace your LAN cable to find out which card is connected to the network you're troubleshooting. If you're unable to trace the cable, skip to step 5, below.

2) Note the select code of the LANIC card. Open the back of the computer and look at the select code switches on the card. You can see the switches without removing the card from the card cage; that means that you don't have to power down the computer to read the select code. The select code switches are located on the left side of the cable connector (assuming the component side of the card is facing up); there are six binary address bits (switches SW1-3 (bit 5) through SW1-8 (bit 0)), and the leftmost of these (bit 5) is the most significant bit. Convert this binary value to an octal value.

3) Now that you have the select code of the LANIC card, you can use the "i" command in NSINF to find its LU number. The "i" command lists the LU number, device type, and select code (octal) of each networking card in the system; just look at the command's output to match the select code to a card LU number. (Refer to the example, below.)

4) To get the station address of the card, look again at the information displayed by the "a" command; this will show you the station address that goes with the LU number for the LANIC card. That's all the information you need from NSINF; you're now finished with this procedure. (Don't go on to step 5; that covers the situation when you couldn't trace the LAN cable.)

5) Sometimes LAN cables can't be readily traced: they hide behind walls or bury themselves under floors. If you couldn't trace the LAN cable connection to a particular LANIC card in step 1, above, there is a trial-and-error alternative. For each LANIC card LU in your system, use a Remote Node test to try to bounce a TEST or XID packet off a known station on the network you're troubleshooting. (The Remote Node tests are described near the end of this chapter.) Go through the LANIC card LU numbers on your system, using each one in turn as the local source for the test; for the remote node, use the station address of a remote LANIC card that you know is connected to the network. If you get a successful response to the test, you know that the local LANIC card LU you used is the one you're interested in. (Note that only positive results are significant here; if you can't get any of your cards to communicate with a known station, that may simply mean that there is a fault somewhere on the network. That wouldn't be unusual on a network that needs troubleshooting.) Once you know the LU number, proceed to step 4.

Example: In this example, we know that the network we're interested in connects to the LANIC card that has a select code of 37 (octal). We use the "a" and "i" commands of NSINF to find the LU number and station address of the card.

```
CI> nsinf


 NSInf > a <------Get information on all networking cards

                          LOCAL NAME AND ADDRESSES


  Local Name: JEKYLL.RND.HP           Router Address 2023

 IP address         LU Status Type  Station address    Multicast addresses
 ---------------   --- ------ ----  -----------------  -------------------
 192.006.001.001    90   UP   ->LAN  08-00-09-00-02-1C  09-00-09-00-00-01
                                                        09-00-09-00-00-02
 192.006.002.001    92   UP   ->LAN  08-00-09-00-02-1A  09-00-09-00-00-01
                                                        09-00-09-00-00-02
 192.006.003.001    77          RTR
                    75          RTR
                     LANIC cards

                          NEIGHBOR GATEWAY TABLE


 Destination net    Neighbor Gateway   Down PID  Segment Size  Max Hops
 ---------------    ----------------   --------  ------------  --------
 192.006.001.000       local net       IEEE-802      1490          0
 192.006.002.000       local net       IEEE-802      1490          0
 192.006.003.000       local net         RTR         7987          0
 192.006.004.000    192.006.003.110      RTR         7987          4


 NSInf > i <------Match select code to LU number

 NS/1000 LU Summary:

 lu    device type     select code     availability

 75        66b             26b              up
 77        66b             25b              up
 90 <-     67b             37b <-           up
 92        67b             32b              up
                                  Select code
                                  Corresponding LU number
 NSInf > ex

 CI>
```

End of example

6.2.3.1.2 If Some of Your LAN Activity Uses DDA. If some of your LAN activity is handled through direct driver access (DDA) to the LAN link, then you can't use the NSINF utility to get all the information you need. Instead, you'll use the IO program to get the LU number and the Node Manager program to get the station address.

The IO program lists information for all I/O cards in the range of LU numbers that you specify. The form of the command string is:

```
IO[,start_lu,end_lu]        (List information for specified LU numbers.)
```

If you don't specify starting and ending LU numbers, the entire I/O structure will be listed.

LANIC cards will be identified as either `device type = 67b` or `IEEE 802.3 LAN Link`. (The latter identification occurs in RTE-A systems of revision 4.1 or later.) Note that there is a pair of LU numbers for each LANIC card. The even number is the one you will use.

If you have more than one LANIC LU, you can determine which one to use by noting the select code of the LANIC card that is attached to the LAN cable you're using, and then looking in the output of the IO program to find the LU that corresponds to that select code.

Example: The following example shows typical output from IO. (We've modified the output to show both formats of LANIC card identifiers. In reality, any system would display only one of the formats.)

```
CI> io
   lu  device name                 select  hpib    device status
                                    code  address

     .
     .
     .
    73  not assigned
    74  not assigned
    75  DS/1000 link                 26              up
    76  DS/1000 link                 26              up
    77  DS/1000 link                 25              up
    78  DS/1000 link                 25              up
    79  not assigned
    80  not assigned
    81  terminal                      0              up
    82  terminal                      0              up
    83  terminal                      0              up
    84  terminal                      0              up
    85  terminal                      0              up
    86  not assigned
    87  not assigned
    88  not assigned
    89  not assigned
    90  device type = 67b  <-┐       37              up
    91  device type = 67b    |       37              up
    92  IEEE 802.3 LAN Link <-|      32              up
    93  IEEE 802.3 LAN Link  |       32              up
                             |
CI>                          |
          Two possible formats for LANIC card identifiers
```

End of example

Once you've determined the LU number of your LANIC card, you can get the card's station address by going into the Node Manager program and executing any command; the output from the command will include the LANIC card's station address.

The command sequence for doing this is:

```
nm             (Run Node Manager.)
<command>      (Issue any Node Manager command.)
ex             (Exit Node Manager.)
```

Example: In the following example we use the "rc" (read card configuration and status) command in Node Manager to get the station address of a LANIC card. The last parameter of the "rc" command is the LU number of the card. (If you want more information on the "rc" command, refer to the section on "Status and Statistics", later in this chapter.)

Note that any Node Manager command would show the station address just as well as the "rc" command.

```
CI> nm
    ----- NETWORK LINK MANAGEMENT USER INTERFACE -----
           < for help on NM commands use "?" >
           < to exit from NM use "EX"        >

  NM> rc,,11,,92 <------LANIC card LU number
  Read 802.3 Link Config of node          08-00-09-00-02-1A.... [ok]
                                                    ^
  Card Status                             Station address

                    NVF LWS LWP UIP WTB RPA NRB MPF MME BME PME NV2
  +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
  | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
  +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

  NM> ex
    --- END NM ---

CI>
```

End of example

6.2.3.2 Getting the Initialization File Names

If you run tests on the LAN cable, you'll need to shut down LAN activity on your system (to prevent unwanted signals on the cable when you're testing it). To restart LAN activity after you have finished the cable tests, you'll need to know the names of the nodal registry initialization file and the network services initialization file. The best and easiest source for this information is the system manager. (The system manager may even perform the shutdown for you.) If the system manager isn't available, the information in the next few paragraphs will tell you how to find those names.

The nodal registry and network services initialization files are always called out in the system welcome file, and the name of the system welcome file is always indicated (though rather obliquely) in the system's boot command file. If the first bootable cartridge is a File Manager (FMGR) cartridge, the default name for the boot command file is "system"; if the first bootable cartridge is a File System (hierarchical) cartridge, the default name for the boot command file is "boot.cmd" on directory "/system". You might want to check with the system manager to make sure of the file's name and location on the system you're using.

Once you know the name of the boot command file, you can look at its contents with the "li" (list file) command:

```
li,<bootfile>        (List the boot command file.)
```

The information you're looking for is contained in the "ST" command line in the boot command file. That command has the form:

```
ST,,<n>
```

where "<n>" is a numerical value. The welcome file will have a name of:

```
/system/welcome<n>.cmd
```

Thus, for example, a command of "ST,,1" indicates that the welcome file is named "/system/welcome1.cmd".

Example: The following example shows how to list a typical boot command file and derive the name of the welcome file. Note that the boot command file is on a FMGR cartridge and the file specification is in the form `<filename>::<cartridge>`.

```
CI> ll,system::16            List the boot command file
EC
*                            First file manager cartridge
* DEFINE SYSTEM AND SNAP FILES
SY,SYns
SN,SNns
*
*
MC,-17
MC,-18
MC,-19
MC,-20
MC,-21
MC,-22
MC,-23
*
* DEFINE INITIALLY RP'ED PROGRAMS
RP,DRTR::PROGRAMS,D.RTR
RP,DERR::PROGRAMS,D.ERR
RP,FMGR::PROGRAMS,FMGR
*
RP,CI::PROGRAMS
*  The next line specifies the name of the welcome file
ST,,6                                   Welcome file is /system/welcome6.cmd
*
*
RP,CI::PROGRAMS,TIME
rp,readr::programs,read1
rp,readr::programs,read2
rp,/ns1000/run/queue
*
* END RP PHASE
END
as,read1
as,read2
as,queue
*
* DEFINE SWAP FILE
SW,SWAP.SWP::SWAP
*
END

CI>
```

End of example

Now that you know the name of the welcome file, the next step is to look in that file for the names of the nodal registry and network services initialization files. Again, use an "li" command:

```
li,<welcomefile>        (List the welcome file.)
```

This time you're looking for the file names that are specified in the "nsinit" and "nrinit" CI commands. These are the file names you'll use in re-starting LAN activity. Refer to the section on "Starting Up LAN Activity", later in this chapter, for details on that procedure.

Example: This example shows the listing of a typical welcome file and the location of the initialization file names.

```
CI> li,/system/welcome6.cmd <——List the welcome file
co,snns::-16,snap::-16 d
co,snns::-16,snap.snp::system d
*
*  This is the start-up file for a multi-user system with muxes.
*
tm may 1  1986 12:00:00
*
rp /programs/promt.run
*
*    start up LAN/1000
*
ru,read1
ru,read2
*
* Initialize the ifts for the LAN cards
*
cn,90,30b,20,0
cn,92,30b,20,0
rp,/programs/nm2
xq,/programs/nmgr
*
*   Start up NS/1000
*
ci /system/rp_ns.cmd
*
*  The following 3 lines start up NS/1000
*
wd,/ns1000/run
nsinit /system/jekyll.nsin <——————————NS initialization file
nrinit /system/network.nrin,,r
*                   ↑
.                   └———————————————NR initialization file
.
.
CI>
```

End of example

6.2.4 Logging Off

Logging off from an RTE-A system is easy; just type:

```
ex       (Log off.)
```

Example: The interaction looks like this:

```
CI> ex
Finished

Session 53   finished.  Tue May  6, 1986  4:52:28

                    Connect time                  CPU usage
Session:          0 hr  4 min 23 sec      0 hr  0 min  2 sec  20 msec
Cumulative:       0 hr  7 min 10 sec      0 hr  0 min  3 sec 670 msec
```

End of example

6.3 Shutting Down LAN Activity

If the troubleshooting procedures ask you to perform certain tests of the LAN cable, you must ensure that there is no signal traffic on the cable during the test. Alternatives for preventing LAN transmissions are identified in the paragraphs on "LAN Cable Isolation" in chapter 5 of this manual. Since some of the test procedures recommend that power be available to the MAU, you may not want to just unplug the AUI cable or turn off the computer.

How you stop a LANIC card from transmitting depends on whether the card is operating in the NS/1000 environment or the Direct Driver Access (DDA) environment. There's not much you can do in a DDA environment except to halt all programs that might send signal traffic across the LAN cable. In NS/1000, on the other hand, you can disable transmission using the NSINIT program. This section describes that procedure.

6.3.1 Prerequisites

To shut down NS/1000:

- You must have Superuser capability. If you don't have Superuser capability, check with the system manager to find an account with Superuser capability. If you don't know whether you have Superuser capability, you can always try running NSINIT; if you're not Superuser, NSINIT will tell you.

- You must know the directory where NSINIT resides and the NS password. On many systems NSINIT is in directory /ns1000/run; check with the system manager for the NS password.

6.3.2 Procedure

The commands you use to shut down NS/1000 are:

```
wd,<directory>      (Change working directory.)
nsinit              (Run NSINIT.)
4                   (Shut down NS.)
y                   (Really do it.)
<password>          (Supply the NS password.)
```

Note that if you try to shut down NS/1000 and the Current Active Statistics are not the same as shown in the example, below, then some program is currently trying to use some of the NS services on the LAN link. If you don't want to disrupt that activity, you can abort the shutdown by answering "n" instead of "y" in the command sequence.

6.3.3 Example

This example shows the typical interaction for shutting down NS/1000. On this system, NSINIT resides in the /ns1000/run directory and the NS password is "DS".

```
CI> wd,/ns1000/run
CI> nsinit
 NS Initialization Program.  Enter values as directed.
 To use the default value enter /D or <CR>. To abort enter /A or AB.

 * There are four options for NSINIT:
 *      1: Build Output File.
 *      2: Build Output File & Initialize NS.
 *      3: Initialize NS.
 *      4: Shut Down NS Subsystem.      Shut down
 * Enter an option number [(1)..4]:4
 *                                                  Statistics for a quiet node
 *+++ Current Active Statistics:  +++*
 * Transaction Control Blocks (TCB):                0
 * Process Number List Entries (PNL):               0
 * Remote Session Table (#POOL):                    0
 * Call Sockets:                                    1
 * VC Sockets:                                      0
 *                                                           Go ahead
 * Do you still want to shut down NS in this node [(Y)/N]?y
 * Enter the Network security code for this node [1..2char]:ds
 NS: Returned system resources, now de-allocating SMB and DSAM.
 Resources Returned. NSINIT completed.
CI>                                                         Password
```

End of example

6.4 Starting Up LAN Activity

If you've shut down NS/1000 on your node while performing certain LAN cable tests, you will need to restart NS after the cable testing is done. To do this, you will run the NSINIT and NRINIT programs.

6.4.1 Prerequisites

To start up NS/1000:

- You need Superuser capability. If you don't have Superuser capability, check with the system manager to find an account that has Superuser capability. If you don't know whether you have Superuser capability, you can try to run NSINIT; if you're not Superuser, NSINIT won't run.

- You need to know the directory that contains the NSINIT and NRINIT programs. On most systems this is directory `/ns1000/run`, but you should check with the system manager to be sure.

- You need to know the names of the initialization files for the nodal registry and for network services. (Check with the system manager or refer to the section "Setting Up", subsection "Finding LANIC Card Information", earlier in this chapter, for the procedure for finding these file names.)

- You might have to perform other initializations (such as DS and/or X.25); check with the system manager.

6.4.2 Procedure

The general structure of the commands for starting up NS/1000 is:

```
wd,<directory>                    (Change working directory.)
nsinit </dir/<nsinitfile>         (Initialize network services.)
nrinit </dir/<nrinitfile>,,r      (Initialize the nodal registry.)
```

NSINIT may report errors that are acceptable for your particular system configuration. Check with the system manager to see which errors are acceptable and which are not, or refer to the *NS/1000 Error Message and Recovery Manual* (91750-90045). The example below shows some typical errors of this type.

6.4.3 Example

The following example shows the start-up of NS/1000. The initialization file names are the ones we found in our example earlier in this chapter, in the section "Setting Up", subsection "Finding LANIC Card Information".

The SC05 scheduling errors reported below are acceptable for this system. The VCPMN, PROGL, and RDBAM programs are the monitors needed for booting up a memory-based system over a programmable serial interface (PSI) card. They aren't needed in our example system, but NSINIT expects to find them because we specified "all monitors" in our NSINIT file. When NSINIT couldn't find the program files, it issued the SC05 errors.

```
CI> wd,/ns1000/run
CI> nsinit /system/jekyll.nsin
 NS Initialization Program.  Enter values as directed.
 ** (138) NSINIT: Min. SHEMA needed is buffer space + table space of:27.**
 ** (209) NS: Error SC05 scheduling VCPMN (EXEC).** ]
 ** (209) NS: Error SC05 scheduling PROGL (EXEC).** |--Acceptable errors
 ** (209) NS: Error SC05 scheduling RDBAM (EXEC).** ]
 ** NS started successfully.  NSINIT Completed.**

CI> nrinit /system/network.nrin,,r
 ** Nodal Registry Configuration Program **

 Parameters:RU,NRINIT,/SYSTEM/RND.NRIN,,R
 <860507.1356>
 Tue May  6, 1986   5:02 pm Version 1.0 Mode:R
  At node JEKYLL.RND.HP
     15 entries were added
 There are    15 entries in the Nodal Registry
CI>
```

End of example

6.5 Status and Statistics

You can use either mode Manager or NSINF to read the network statistics for a particular LANIC card. Additionally, you can use Node Manager to read the card status and to zero the statistics registers on the card.

6.5.1 Prerequisites

To read or zero statistics using either Node Manager or NSINF:

- You need to know the LU number of the LANIC card for which you want to read or zero statistics. (Refer to the section "Setting Up", subsection "Finding LANIC Card Information", earlier in this chapter.)

6.5.2 Procedure

The command sequences in Node Manager look like this:

```
NM                  (Run Node Manager.)
rs,,<lu>            (Read card statistics from the specified LU.)
rc,,11,,<lu>        (Read card status from the specified LU.)
zs,,<lu>            (Zero card statistics on the specified LU.)
ex                  (Exit Node Manager.)
```

In NSINF, the command sequence looks like this:

```
NSINF        (Run NSINF.)
l            (List statistics.)
<lu>         (Specify the LU number.)
ex           (Exit NSINF.)
```

Note that both Node Manager and NSINF get their network statistics from the same set of registers on the LANIC card. Thus, if you zero the card statistics using Node Manager, that zeroing will also show up in statistics read by NSINF.

6.5.3 Examples

The following examples show typical Node Manager and NSINF sequences.

Example 1: This example shows the Node Manager sequences for reading statistics and card status.

```
CI> nm
    ----- NETWORK LINK MANAGEMENT USER INTERFACE -----
          < for help on NM commands use "?" >
          < to exit from NM use "EX"        >

 NM> rs,,92
 Read Statistics counters of node 08-00-09-00-02-1A....  [ok]

   1. Num of good bytes xmited              172
   2. Num of good bytes rcved                60
   3. Num of good pkts  xmited                2
   4. Num of good pkts  rcved                 1
   5. Num of errors on  xmit                  0
   6. Num of errors on  rcv                   0
   7. Num of babble errors                    0
   8. Num of heartbeat errors (xmit)          0
   9. Num of missed pkts--no rcv buf          0
  10. Num of memory errors                    0
  11. Num of framing errors                   0
  12. Num of pkts driver discarded            0
  13. Num of CRC errors on rcv                0
  14. 802.3 Length field errors               0
  15. Num of retry > 1 on xmit                0
  16. Num of retry = 1 on xmit                0
  17. Num of chip deferred on xmit            0
  18. Num of underflow error on xmit          0
  19. Num of late collisions                  0
  20. Num of loss of carrier                  0
  21. Num of xmit retry cnt exceeded          0
  22. TDR info from last TDR                  0
  23. Orphan messages received by NM          0
```

```
NM> rc,,11,,92
Read 802.3 Link Config of node          08-00-09-00-02-1A.... [ok]

Card Status

                 NVF LWS LWP UIP WTB RPA NRB MPF MME BME PME NV2
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

NM> ex
   --- END NM ---

CI>
```

The meanings of the status bits are:

```
NVF  NOVRAM failure.
LWS  Last write status (1 = successful).
LWP  Link write pending.
UIP  Unsolicited interrupt pending.
WTB  Waiting for transmit buffer.
RPA  Receive packet available.
NRB  No receive buffers.
MPF  MAU power failure.
MME  Multicast address mode enabled.
BME  Broadcast mode enabled.
PME  Promiscuous mode enabled.
NV2  NOVRAM bank #2 in use.
```

For more detail on the status bits, refer to the *HP 12076A LAN/1000 Link Node Manager's Manual.*

End of example

Example 2: This example shows the sequence for zeroing statistics.

```
CI> nm
    ----- NETWORK LINK MANAGEMENT USER INTERFACE -----
           < for help on NM commands use "?" >
           < to exit from NM use "EX"        >

 NM> zs,,92
 Zero Statistics counters of node 08-00-09-00-02-1A....  [ok]

 NM> ex
    --- END NM ---

CI>
```

End of example

Example 3: This example shows the use of NSINF to read statistics. (The attentive reader may observe that the results aren't the same as we got using Node Manager; those statistics were read from a different card.)

```
CI> nsinf


 NSInf > 1
       NSINF: Enter LU (cr for all LUs) >  90
********************************************************************

lu    device type     select code     availability

90         67b             37b            up

LAN Card, Firmware Revision:2547


        138096  Good Bytes Sent           2876   Good Bytes Rcvd
          1233  Good Packets Sent           43   Good Packets Rcvd
             0  Errors on Xmit               0   Errors on Recv
             0  Babble Errors                0   Heart Beat Errors
             0  Missed Packets               0   Memory Errors
             0  Framing Errors               4   Discarded Packets
             0  CRC Errors                   0   Length Errors
             0  Multiple Retries             0   Retries = 1
             0  Transmit Deferral            0   Underflows
             0  Late Collisions              0   Loss of Carrier
             0  Retry Exceeded               0   TDR Information

  0 Last Write Failed    0 Link Write Pending    0 Interrupt Pending
  0 Wait For TX Buffer   0 RCV Packet Available 0 No Receive Buffers
  0 MAU Power Failed     0 Lost NOVRAM data      0 NOVRAM Bank 2 Enable
  1 Multicast Mode       0 Broadcast Mode        0 Promiscuous Mode


 NSInf > ex

CI>
```

End of example

6.6 Self-Test

6.6.1 Prerequisites

To run the LANIC card self-test:

- You need to know the LU number of the LANIC card you want to test. (Refer to the section "Setting Up", subsection "Finding LANIC Card Information".)

6.6.2 Procedure

The sequence of commands for executing the LANIC card self-test is:

```
NM          (Run Node Manager.)
tc,,<lu>    (Run the card self-test on the specified LU.)
ex          (Exit Node Manager.)
```

Figure 6-1 shows the area covered by the self-test.

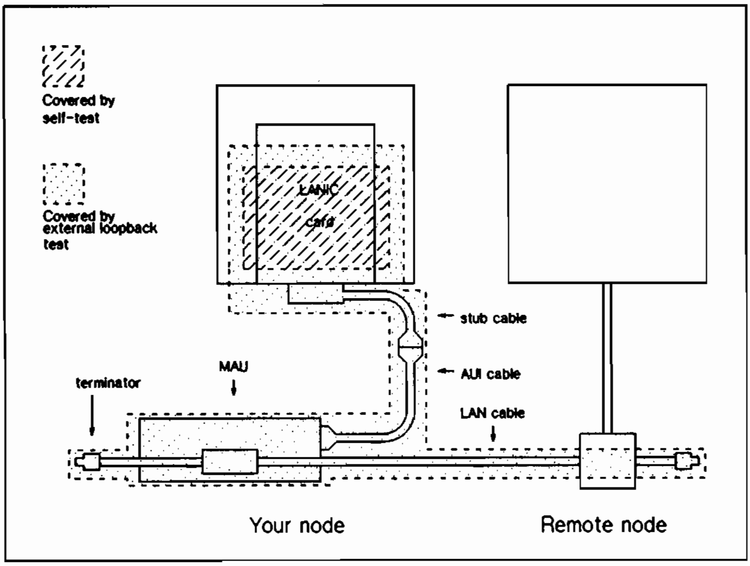

Figure 6-1. Test coverage

6.6.3 Examples

The following examples show two card self-tests.

Example 1: In this example, the card fails self-test due to an open MAU power fuse.

```
CI> nm
    ----- NETWORK LINK MANAGEMENT USER INTERFACE -----
          < for help on NM commands use "?" >
          < to exit from NM use "EX"        >

 NM> tc,,92
 Initiate 802.3 Card Self Test on node   00-00-00-00-00-00....  [failed]
 ERROR:  DE00C REPORTING NODE ADR:000000000000 SAP: F8
 Self-test failed

   1  1  1  1  0  0  0  0  0  0  0  0  1  0  0  1 <——Error indicators
                  R1 R0 R  P  D  I  L  M  N     S

 bit set to one      failure
 --------------      -------
      R1             RAM
      R0             RAM
      R              RAM
      P              PROM
      D              DMA controller
      I              Interrupt system
      L              Link controller
      M              MAU power fuse
      N              NOVRAM
      S              0 = only NOVRAM
                     1 = other failure

 NM> ex
    --- END NM ---

CI>
```

End of example

Example 2: After the fuse is replaced and the cause (if any) of the blown fuse is corrected, the card passes when the self-test is repeated.

```
CI> nm
    ----- NETWORK LINK MANAGEMENT USER INTERFACE -----
           < for help on NM commands use "?" >
           < to exit from NM use "EX"        >

 NM> tc,,92
 Initiate 802.3 Card Self Test on node   08-00-09-00-02-1A....  [ok]

 NM> ex
    --- END NM ---

CI>
```

End of example

6.6.4 Interpretation

The examples above show some typical test results as reported by Node Manager. How you use those results depends on whether you are using the simplified troubleshooting approach for experienced users (see the section on "Troubleshooting for Experienced Users" in chapter 2 of this manual) or whether you are adhering rigorously to the detailed procedures.

If you're using the simplified approach, the error information provided by the self-test should give you an idea where to look for the problem. If you need more information on interpreting the error bits, refer to the *HP 12076A LAN/1000 Link Node Manager's Manual.*

If you're following the detailed troubleshooting procedures, all you need to know is that any errors shown by the self-test (any error bits set to 1), are internal to the LANIC card.

<u>**MAU Power Failure**</u>. Indications of MAU power failure include:

MPF bit in the NM "rc" command is set (= 1).

M bit in the NM "tc" command is set (= 1).

MAU Power Failed bit in the NSInf "1" command is set (= 1).

6.7 External Loopback Test

6.7.1 Prerequisites

To run the External Loopback test on the LANIC card:

- You need to know the LU number of the LANIC card. (Refer to the section on "Setting Up", subsection "Finding LANIC Card Information", earlier in this chapter.

6.7.2 Procedure

The command sequence for executing the LANIC card External Loopback test is:

```
NM          (Run Node Manager.)
el,,<lu>    (Run the External Loopback test on the specified LU.)
ex          (Exit Node Manager.)
```

Figure 6-1, in the preceding section, shows the area covered by the External Loopback test.

6.7.3 Examples

The following examples show two External Loopback tests.

Example 1: In this example, the test fails because a terminator has been removed from the LAN cable.

```
CI> nm
    ----- NETWORK LINK MANAGEMENT USER INTERFACE -----
           < for help on NM commands use "?" >
           < to exit from NM use "EX"        >

 NM> el,,92
 Do External Loopback on node          08-00-09-00-02-1A....  [failed]
 ERROR:  DE009 REPORTING NODE ADR:08000900021A SAP: F8
 Ext. loopback failed

   0  0  1  0  0  0  0  0  0  0  0  1  0  0  0  0 <——Error indicators
         NR D  B  H  M  BT U  L  LC R  F  O  CR 8R

 bit set to one       failure
 --------------       -------
      NR              Not receive loopback pkt
      D               Deferred, can't loopback
      B               Transmit babble
      H               No Heartbeat from xceiver
      M               Card memory error
      BT              Buffer error on xmit
      U               Data Underflow
      L               Late collision
      LC              Loss of carrier on xmit
      R               Retry failure on xmit
      F               Framing error on rcv
      O               Overflow on xmit
      CR              CRC error
      BR              Rcv Buf err/data mismatch

 NM> ex
    --- END NM ---

CI>
```

End of example

Example 2: This example shows the External Loopback test passing after the terminator has been put back on the end of the LAN cable.

```
CI> nm
    ----- NETWORK LINK MANAGEMENT USER INTERFACE -----
           < for help on NM commands use "?" >
           < to exit from NM use "EX"        >

 NM> el,,92
 Do External Loopback on node           08-00-09-00-02-1A....  [ok]
 NM> ex                                                          ↑
    --- END NM ---
                                                           Test passes
CI>
```

End of example

6.7.4 Interpretation

The examples above show typical results from the External Loopback test. Interpretation of such results is pretty straightforward.

If you are using the simplified troubleshooting approach (see the section on "Troubleshooting for Experienced Users" in chapter 2 of this manual) as a general troubleshooting guide, the error bits returned by the test indicate where to look for the problem. For more detailed information on the meanings of those error bits, refer to the *HP 12076A LAN/1000 Link Node Manager's Manual.*

If you're following the detailed troubleshooting procedures step by step, the important thing to note about a failure is whether it is internal to the LANIC card or external to it. If the results show an error (error bit set to 1) for the M bit or the BT bit (card memory error or buffer error on transmit), then the card has an internal error. All other errors are external to the card.

Retry/Collision Error. If the troubleshooting procedure asked you to look for a retry or collision error, check the NR and R error lists. If NR and R are the only bits set to 1, you have a retry/collision error. If other bits are set, the error is not limited to a retry/collision error.

6.8 Remote Node Test

The Node Manager software is used to perform Remote Node testing. Node Manager transmits a test packet to a remote node over the LAN and, depending on the remote node's response, reports the results.

Node Manager allows you to specify a Destination Service Access Point (DSAP) address carried by the Remote Node test packet. This address identifies a routine at the remote node that is to respond to the test packet.

Node Manager provides for two types of Remote Node test packets that can be sent: XID packets and TEST packets. Under Node Manager, either type may contain user-defined DSAPs. The DSAP you specify depends on the type of computer system at the remote node. Table 6-1 shows the DSAPs that are allowed for each computer type.

Table 6-1. DSAP for a Given Remote Node Type

Remote Computer System	DSAP (in hexadecimal)	Comments
HP 3000 MPE V	00 (LANIC driver)	Driver must be open, that is, NS/3000 must be up, or Test 17 of diagnostic must be in the proper state.
HP 1000 RTE-A	00 (LANIC card firmware only) F8 (Node Manager software)	On DSAP = 00 hex, the driver (hence backplane) is not accessed. Assuming Node Manager is running, use DSAP = F8 hex to access the driver.
HP 9000 Series 300,500, and 800 HP-UX	00 (LANIC driver)	Other DSAPs are available, but for simplicity, not provided here.

The rule of thumb for choosing a DSAP is relatively simple:

If the remote node is not an HP 1000, use DSAP 00.

If the remote node is an HP 1000:
- use DSAP 00 if you want the LANIC card hardware to handle the packet;
- use DSAP F8 (hexadecimal) if you want the Node Manager software to handle the packet.

6.8.1 TEST Packet

6.8.1.1 Prerequisites

To do a Remote Node test using a TEST packet:

- You need to know the station address of the LANIC card in the remote system. (If you don't know the station address, you will have to go to the remote system to find it. If the remote system is an HP 1000 computer, log on to that remote system and use the procedure given in the section "Setting Up", subsection "Finding LANIC Card Information". If the remote system is not an HP 1000, log on to the remote system and use the procedure given in the chapter in this manual that describes that system; that procedure will be found in a similarly titled section and subsection. For instance, if your remote system is an HP 9000 Series 300 computer, you can find the procedure for finding the station address of its LANIC card by looking in the chapter "LAN/9000 Series 300 Link Diagnostic", section "Setting Up", subsection "Finding LANIC Card Information". In any event, **Node Manager can find the station address only on the system on which it is running. To find the station address of a remote system, you must be operating on that remote system.)**

- You need to know which DSAP to use. (Refer to table 6-1.)

- You need to know the LU number of the LANIC card in the local (source) system. (Refer to the section "Setting Up", subsection "Finding LANIC Card Information", earlier in this chapter.)

6.8.1.2 Procedure

When initiated by Node Manager with a DSAP of 0 specified, a TEST packet resembles Remote Node test packets issued by other systems. Except for remote HP 1000 systems, it is the normal Remote Node test used. When sending a TEST packet, the remote system's networking software returns data contained in the packet.

The command sequence for making a Remote Node test using a TEST packet is

```
NM                                                  (Run Node Manager.)
   test,<remote_addr>,<DSAP>,<size>,<LU>,<rep>      (Send TEST packet.)
   ex                                               (Exit Node Manager.)
```

where:

`remote_addr` = station address configured in the remote LANIC card. Use a format of `xx-xx-xx-xx-xx-xx`, where `x` represents a hexadecimal numeral.

`DSAP` = destination service access point identifying the responding routine on the remote node (see Table 6-1.)

`size` = size of packet (bytes), from "0" to "1497"

`LU` = logical unit number of the local card that transmits the packet and receives the response

`rep` = number of consecutive times this command is executed, from 1 to 9999. A "0" causes continuous repetition.

6.8.1.3 Example

The following example shows a typical TEST sequence.

```
CI> nm
    ----- NETWORK LINK MANAGEMENT USER INTERFACE -----
          < for help on NM commands use "?" >
          < to exit from NM use "EX"        >

  NM> test,08-00-09-00-02-30,00,500,92,5
  Perform Loopback Test through node 08-00-09-00-02-30....  [ok]

  Perform Loopback Test through node 08-00-09-00-02-30....  [ok]

  Perform Loopback Test through node 08-00-09-00-02-30....  [ok]

  Perform Loopback Test through node 08-00-09-00-02-30....  [ok]

  Perform Loopback Test through node 08-00-09-00-02-30....  [ok]

  NM> ex
    --- END NM ---

CI>
```

End of example

6.8.1.4 Interpretation

The results of a Remote Node test using a TEST packet are unambiguous and bear very little interpretation: either the test passes or it fails. Follow your troubleshooting procedure as appropriate.

6.8.2 XID Packet

6.8.2.1 Prerequisites

To do a Remote Node test using an XID packet:

- You need to know the station address of the LANIC card in the remote system. (If you don't know the station address, you will have to go to the remote system to find it. If the remote system is an HP 1000 computer, log on to that remote system and use the procedure given in the section "Setting Up", subsection "Finding LANIC Card Information". If the remote system is not an HP 1000, log on to the remote system and use the procedure given in the chapter in this manual that describes that system; that procedure will be found in a similarly titled section and subsection. For instance, if your remote system is an HP 9000 Series 300 computer, you can find the procedure for finding the station address of its LANIC card by looking in the chapter "LAN/9000 Series 300 Link Diagnostic", section "Setting Up", subsection "Finding LANIC Card Information". In any event, **Node Manager can find the station address only on the system on which it is running. To find the station address of a remote system, you must be operating on that remote system.**)

- You need to know which DSAP to use. (Refer to table 6-1.)

- You need to know the LU number of the LANIC card in the local (source) system. (Refer to the section "Setting Up", subsection "Finding LANIC Card Information", earlier in this chapter.)

6.8.2.2 Procedure

The command sequence for making a Remote Node test using an XID packet is:

```
NM                                        (Run Node Manager.)
xid,<remote_addr>,<DSAP>,<LU>,<rep>       (Send out an XID packet.)
EX                                        (Exit Node Manager.)
```

where:

`remote_addr`	=	station address configured in the remote LANIC card. Use a format of xx-xx-xx-xx-xx-xx, where x represents a hexadecimal numeral.
`DSAP`	=	destination service access point identifying the responding routine on the remote node (See Table 6-1.)
`LU`	=	logical unit number of the local card that transmits the packet and receives the response
`rep`	=	number of consecutive times this command is executed, from 1 to 9999. A "0" causes continuous repetition.

6.8.2.3 Example

The following example shows a typical XID test sequence.

```
CI> nm
    ----- NETWORK LINK MANAGEMENT USER INTERFACE -----
          < for help on NM commands use "?" >
          < to exit from NM use "EX"        >

 NM> xid,08-00-09-00-02-30,f8,92
 Perform Loopback Test through node 08-00-09-00-02-30....  [ok]
 802.3 Basic Format, Class 1 Station : connectionless

 NM> ex
    --- END NM ---

CI>
```

End of example

6.8.2.4 Interpretation

The results of a Remote Node test using an XID packet are straightforward and don't need much interpretation: either the test passes or it fails. Follow your troubleshooting procedure as appropriate.

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Contents

As you follow the troubleshooting flowcharts in Chapter 2 of this manual, you are instructed to run a number of tests on your computer or computers. This chapter tells you how to run those tests on an HP 9000 Series 300 computer.

You can think of the bulk of this chapter as a collection of subroutines. If, for example, a troubleshooting flowchart asks you to run an External Loopback test on a Series 300 computer, you would find the section on the External Loopback test later in this chapter, follow the instructions in that section, and then return to the troubleshooting flowchart and go to the next step.

Note that this chapter is not a detailed description of the LAN diagostic software on the Series 300; it just presents enough information to let you follow the troubleshooting flowcharts.

7.1 Reference and Background Information

7.1.1 System Requirements

The tests described in this chapter run on an HP 9000 Series 300 computer. The computer must be running the HP-UX operating system, revision 5.0 or later. The NS/9000 software, revision 5.1 or later, must be installed and running on the system.

7.1.2 Capability

An account in HP-UX either has Superuser capability or it doesn't. In general, commands that display information do not require Superuser capability. Commands that clear or reset require you to be Superuser, and you have to be Superuser to reboot the system.

7.1.3 References

For detailed information, you may want to have the following references available as you go through the troubleshooting procedures:

Installation Manuals:

Hardware:

HP 98643A LAN/300 Link LANIC Installation Manual, part number 98643-90001

Software:

NS/9000 Node Manager's Guide, part number 50951-90010

Cabling:

LAN Cable and Accessories Installation Manual, part number 5955-7680

Operating Manuals:

NS/9000 LAN User's Guide, part number 50951-90000

Diagnostic Manuals:

NS/9000 Node Manager's Guide, part number 50951-90010
NS Message Formats Reference Manual, part number 5958-8523

7.2 Setting Up

There are a number of housekeeping tasks that you may have to perform in going through the diagnostic procedures in this chapter. Rather than load up those procedures with the details of the housekeeping tasks, we will gather those details in this section.

Note that HP-UX is case-sensitive. That is, it doesn't let you substitute corresponding upper case letters ("A") and lower case letters ("a") for each other. All commands and file names should be entered in lower case, unless otherwise specified.

The examples in this chapter show your input to the computer in `shaded letters`. The computer's response is shown in `unshaded letters in this typewriter-like type face.`

7.2.1 Logging In

The log-in on a Series 300 HP-UX machine takes the following form:

```
login: <account name>
Password: <password>
.
.
TERM = (hp2622) <terminal type> or RETURN
```

Note that backspaces are not accepted when you type in the account name and password. Also note that the system does not echo the password that you type in; that's to keep others from reading your password from the screen. Remember that HP-UX is case-sensitive: you must match upper case and lower case letters exactly when you type in the password.

Example: A typical system manager's log-in might look like this:

```
login: root
Password:            <------System blanks out the password you type in

TERM = (hp2622)  RETURN  <------Use default terminal type


WARNING:  YOU ARE SUPERUSER !!

#   <------Superuser command prompt
```

End of example

7.2.2 Finding LANIC Card Information

To perform the tests required by the troubleshooting procedure, you commonly need to know the name of the LANIC card's device file and the station address of the LANIC card. The steps you must take to find the device file and station address of your LANIC card are:

1) Get the device file name for the LANIC card.

2) Use the device file name to get the LANIC card's station address.

We will discuss these steps in detail in the paragraphs that follow.

7.2.2.1 Getting the Device File Name

You can get the device file name for your LANIC card by doing a long listing of the device directory. The command is:

```
ll /dev        (Do a long listing of the device directory.)
```

The information shown by the `ll /dev` command includes driver numbers, select codes, and device file names. If you know the select code of your card, you can use the select code to locate the device file name. Alternatively, you can use the driver number (18 or 19) to locate the device file name. Note that there may be more than one device file for a LANIC card. For NS/9000 applications, the correct device file will be associated with driver 18.

Example: The example below shows the results of a long listing of the device directory. Note that there is one LANIC card in the system, and that it has two device files. The fifth column of the listing shows the driver numbers; driver numbers 18 (IEEE 802.3) and 19 (Ethernet) indicate LANIC cards. The sixth column gives the select code; it is in the form 0xsc0000, where sc is the select code in hexadecimal. The last column shows the device file name.

```
                                     Drivers   Select codes        Device files
# ll /dev
total 18
crw--w--w-   3 root   other       0 0x000000 May 21 09:48 console
crw-rw-rw-   2 root   root       12 0x000000 May  9 14:35 crt
crw-rw-rw-   1 root   root       12 0x000000 May  9 14:35 crt9837
crw-rw-rw-   2 root   root       12 0x000000 May  9 14:35 crt98700
brw-r--r--   1 root   other       0 0x0e0010 Jan 10 11:53 ct
crw-r--r--   1 root   other       1 0x0b0001 May 13 10:41 cul50
crw-r--r--   1 root   other      19 0x150000 Jan 10 13:53 ether <-LANIC
crw-rw-rw-   1 root   other      12 0x000100 Jan  3 15:22 graphics
crw-rw-rw-   1 root   root       24 0x000010 May  9 14:34 hil1
crw-rw-rw-   2 root   root       24 0x000020 May  9 14:34 hil2
crw-rw-rw-   1 root   root       24 0x000030 May  9 14:35 hil3
crw-rw-rw-   1 root   root       24 0x000040 May  9 14:35 hil4
crw-rw-rw-   1 root   root       24 0x000050 May  9 14:35 hil5
crw-rw-rw-   1 root   root       24 0x000060 May  9 14:35 hil6
crw-rw-rw-   1 root   root       24 0x000070 May  9 14:35 hil7
crw-rw-rw-   1 root   root       25 0x000080 May  9 14:34 hilkbd
crw-rw-rw-   1 root   other      18 0x150000 May 15 18:03 ieee <--LANIC
crw-------   1 root   root        3 0x000001 Aug  1  1985 kmem
crw-r--r--   1 lp     bin         3 0x000002 Feb 20 10:21 laser
crw-------   1 lp     bin        26 0x070200 Jan  2 08:22 lp
  .
  .
  .
```

End of example

7.2.2.2 Getting the LANIC Card's Station Address

To perform a Remote Node test you must have the station address of the remote system's LANIC card. (Note that you must be at that remote system to get the station name. For instance, if you're trying to send a remote test packet from an HP 1000 computer to an HP 9000 Series 300 computer, you'll have to go to the latter computer to get the station address. These paragraphs describe that procedure for the Series 300 computer.)

Once you have the device file name for your LANIC card, you can use the LANDIAG program to get the card's station address. The "d" command in LANDIAG displays the card status information, including the station address.

The general sequence for finding the station address is:

```
landiag        (Run LANDIAG.)
l              (Enter the LANIC test section.)
n              (Name a LANIC device file.)
<devicefile>   (Enter the device file name.)
d              (Display LANIC status.)
q              (Quit LANDIAG.)
```

LANDIAG assumes that the device file name of your LANIC card is /dev/lan. If your card's device file name is anything else, you must use the "n" (name device) command to enter that name. (These are the third and fourth steps in the above command sequence.) For a system using NS/9000, the LANIC card's device file name will usually be /dev/ieee or /dev/ether.

The "d" command displays the station address as the fourth line of its output. The number is in hexadecimal notation.

Example: Following is a typical example of getting the LANIC card's station address. Note that in this example we use a "t" command to set terse mode and avoid displaying the command menu each time. (If you want to see the command menus, leave LANDIAG in verbose mode.)

```
# landiag <———Enter LANDIAG


            LOCAL AREA NETWORK ONLINE DIAGNOSTIC, Version 1.0
                        Wed,May 21,1986      09:52:44

                Copyright 1985 Hewlett Packard Company.
                        All rights are reserved.

Test Selection mode.

     lan      = LAN Interface Diagnostic
     menu     = Display this menu
     quit     = Terminate the Diagnostic
     remote   = Remote Node Communications Diagnostic
     terse    = Do not display command menu
     verbose  = Display command menu
```

```
Enter command: t ←——Set terse mode
Do not display command menu.

Test Selection mode.

Enter command: l ←——Enter LANIC test

LAN Interface test mode. LAN Interface device file = /dev/lan

Enter command: n ←——Name device file

Enter LAN Interface device file name. Currently /dev/lan: /dev/ieee

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: d ←——Display device information

                      LAN INTERFACE STATUS DISPLAY
                       Wed,May 21,1986     09:58:02

Device file                     = /dev/ieee
Select code                     = 21
Current state                   = active
LAN Interface address, hex      = 0x0800090076F6 ←——Station address
Number of multicast addresses   = 2
Frames received                 = 3
Frames transmitted              = 1
Undelivered received frames     = 0
Untransmitted frames            = 0
CRC errors received             = 0
Transmit collisions             = 0
One transmit collision          = 0
More transmit collisions        = 0
Excess retries                  = 0
Deferred transmissions          = 0
Carrier lost when transmitting  = 0
No heartbeat after transmission = 0
Frame alignment errors          = 0
Late transmit collisions        = 0
Frames lost                     = 0
Unknown protocol                = 0
Bad control field               = 0

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: q ←——Quit the diagnostic
Diagnostic terminated by operator

#
```

End of example

7.2.3 Logging Off

To log off from a Series 300 computer, you can usually enter a "control-d" character at a system command prompt. If that doesn't work on your system, use "logout".

Example: Here's a typical example of how it works:

```
# <ctrl-d>

login:
```

End of example

7.3 Shutting Down LAN Activity

If you're going to test the LAN cable itself, you will have to halt the activity on the cable to some extent. The extent to which you have to halt the LAN activity depends on what tests you are running. The tests and their required environments are specified in the chapter on the "LAN Cable" earlier in this manual. Some tests require that there be no signal traffic on the LAN cable; others require that the computers connected to the cable be fully powered down.

The remainder of this section explains how to put your system into the appropriate state. Given the flexible nature of the HP-UX operating system, there are several valid ways you can attain your ends. We'll describe the easiest and/or most common ways in this section. If you're experienced enough with HP-UX to know a different way that you prefer to use, by all means use it. In any case, consult with the system manager before you shut down the system.

If you need to power your computer down completely, you must first shut down the HP-UX operating system and halt the computer. The next subsection ("Leaving the System Halted") contains the procedure for doing that. If, on the other hand, you merely want to stop LAN activity on your system, it is possible to shut down the NS/9000 subsystem but still leave the computer available for other uses. We'll describe how to do that in a later subsection ("Leaving the System Running").

7.3.1 Leaving the System Halted

Two common reasons for halting your system are:

1) You want to power the computer down completely. By going through the halt procedure, you make sure that the system goes down cleanly and does not leave files or devices in corrupted states.

2) You want to stop all LAN activity but leave the computer powered up. It's easier to halt the entire system than to shut down just the network services (NS/9000). That works well if there aren't users that need to keep using the computer while you're running your tests. If it isn't feasible to halt the computer, the following subsection ("Leaving the System Running") describes how to shut down NS/9000 but leave the computer available for other users.

7.3.1.1 Prerequisites

To take your system to the halted state:

- You need to know the HP-UX init level of your system, so that later you can bring the system back to the same init level. If you don't know the proper init level, check with the system manager.

- You need Superuser capability.

7.3.1.2 Procedure

The steps you take in halting your system are:

1) Terminate all active processes and bring the system to single-user mode. (Use the SHUTDOWN utility.)

2) Halt the system. (Use the `reboot -h` command.)

The general sequence of commands is:

```
cd /                (Change to root directory.)
shutdown <nn>       (Shut down in <nn> seconds.)
y                   (Yes, do it.)
reboot -h           (Halt the computer.)
```

You must be in the root directory to invoke the SHUTDOWN utility. When you use SHUTDOWN you specify a number of seconds. The utility broadcasts a warning message to all active users, and terminates all active processes after the specified time; then it puts the system into single-user mode. To halt the system, you use the `reboot command with the -h` option. At that point you can power down the computer, if that is appropriate.

As you follow this procedure, there will be long periods when the system appears to be doing nothing. Be patient! If you start pounding on the keyboard in an attempt to get a system prompt, the type-ahead buffer will store your inputs and try to execute them later as commands, probably with results you did not intend. Wait for the prompts: you'll get better results.

Example: The following example shows the typical sequence for halting a Series 300 HP-UX system.

```
login: root ◄────Log in
Password:

WARNING:  YOU ARE SUPERUSER !!

# cd / ◄──────────Change to root directory
# shutdown 10 ◄────Shut down in 10 seconds

SHUTDOWN PROGRAM
Mon Jun 19 17:45:52 PDT 2006
Broadcast Message from root (console) Mon Jun 19 17:45:54...
SYSTEM BEING BROUGHT DOWN NOW ! ! !

Do you want to continue? (y or n):   y ◄────Do it!
Entering init run-level s

****    SYSCON CHANGED TO /dev/console  ****
All currently running processes will now be killed.
All volumes in checklist will now be unmounted.
WARNING: SOME FILE SYSTEMS WERE NOT UMOUNTED
PLEASE WAIT FOR RUN-LEVEL S
....
INIT: New run level: S

INIT: SINGLE USER MODE

FINISHED


WARNING:  YOU ARE SUPERUSER !!

# reboot -h ◄──────Halt the system
syncing disks...done
halted
```

End of example

Bringing the computer back up is covered in the section on "Starting Up LAN Activity", later in this chapter.

7.3.2 Leaving the System Running

NOTE

This procedure requires that the system be re-booted. **All processes running on the system will be disrupted.** You can minimize the disruption by notifying users before you re-boot and allowing them time to shut down their processes cleanly. After you re-boot, users will be able to re-start their process, as long as those processes don't involve LAN activity on the network.

If you want to stop LAN activity on your system but still leave the system available for other uses, this subsection describes how to do it.

7.3.2.1 Prerequisites

To stop LAN activity but still leave the system running:

- You need to know the HP-UX init level of the system, so that later you can bring the system back to the same init level. If you don't know the proper init level, ask the system manager.
- You need Superuser capability.
- You need to be able to edit system script files.

7.3.2.2 Procedure

The steps you take to shut down LAN activity while leaving your system running are:

1) Modify the `/etc/rc` file to disable network services. (Use a text editor.)
2) Terminate active processes and take the system to single-user mode. (Use the `SHUTDOWN` utility.)
3) Disable link level access, if appropriate. (Use the `chmod` command.)
4) Re-boot the system. (Use the `reboot -r` command.)
5) Take the system to multi-user mode, if appropriate. (Use the `init` command.)

We'll explain those steps in detail in the paragraphs that follow.

7.3.2.2.1 Modifying the /etc/rc File. Before you start modifying any files, be aware that most system managers tend to get pretty uncomfortable when other people start messing about with important system files. Be sure that you check with the system manager before you modify the `/etc/rc` file.

HP-UX executes the commands in the `/etc/rc` file as part of its boot-up sequence. The commands that enable network services (NS/9000) are included in that file. To disable network services, you need to modify one of the commands (the `npowerup` command) so that it is not executed during boot-up. The best way to modify that command is to use a text editor, such as `vi`, to change that line in the file to a comment line; do this by putting a "#" symbol at the beginning of the line. Since the boot-up sequence ignores comment lines, the command will be ignored when the system is booted up, and network services won't be enabled.

(When you are ready to re-enable network services, it will be a simple matter to take out the "#" symbol and make the line a command again. We'll deal with that in the section on "Starting Up LAN Activity", later in this chapter.)

Example: The example below shows part of a typical `/etc/rc` file and notes the location of the line to be modified.

```
# UNISRC_ID:    @(#)rc  27.5

# Where to find commands:

        PATH=/bin:/usr/bin:/usr/lib:/etc:/usr/contrib/lib

# Set timezone for children of rc (can't set for whole system).

        TZ=PST8PDT
        export TZ

# Set termio configuration for output device.

        stty 9600 clocal icanon echo opost onlcr ienqak ixon icrnl ignpar

# Announce start of rc script

        echo "\n/etc/rc $*"
        date

# Only for state 2, first entry:

        set  who -r
        if [ $7 = 2  -a  $8 = 0 ]
        then
```

```
# Set the system's uucp nodename:
                hostname hprndtt

# Set up pseudo-mounted devices:
                /etc/devnm / | grep -v swap | grep -v root | /etc/setmnt

# Mount volumes:

                # mount /dev/xxx /xxx

# Start cron daemon:

                cron
                echo cron started

# Start up LAN                                                  Modify this line

               ptydaemon
               echo "Starting up pty daemon."

               echo "Starting up LAN (NS/9000)"
               npowerup -m200000 -nTT.RND.HP -i0xc0060101 /dev/ieee <-
               rfadaemon
               nftdaemon

               vtdaemon
               echo "Starting up virtual terminal daemon."

               rlbdaemon
               echo "Starting up remote loopback daemon."

               inetd
               echo "Starting up internet daemon."

.
.
.
```

In the above file, you would modify the line that contains the npowerup command from:

```
               npowerup -m200000 -nTT.RND.HP -i0xc0060101 /dev/ieee
```

to:

```
#              npowerup -m200000 -nTT.RND.HP -i0xc0060101 /dev/ieee
```

End of example

7.3.2.2.2 Terminating Processes and Taking the System to Single-User Mode. The SHUTDOWN utility will terminate all but the bare minimum of active processes and then put the system into single-user mode. The command sequence for SHUTDOWN is:

```
cd /                  (Change to root directory.)
shutdown <nn>         (Shut down in <nn> seconds.)
y                     (Yes, do it.)
```

Note that SHUTDOWN must be run from the root directory. When you run the utility you furnish as a parameter the number of seconds of delay until the system shuts down.

Example: The following example shows a typical shutdown procedure.

```
# cd / ←——————————Change to root directory

# shutdown 10 ←————Shut down in 10 seconds

SHUTDOWN PROGRAM
Mon Jun 19 17:45:52 PDT 2006
Broadcast Message from root (console) Mon Jun 19 17:45:54...
SYSTEM BEING BROUGHT DOWN NOW ! ! !

Do you want to continue? (y or n):    y ←————Do it!
Entering init run-level s

****    SYSCON CHANGED TO /dev/console  ****
All currently running processes will now be killed.
All volumes in checklist will now be unmounted.
WARNING: SOME FILE SYSTEMS WERE NOT UMOUNTED
PLEASE WAIT FOR RUN-LEVEL S
....
INIT: New run level: S

INIT: SINGLE USER MODE

FINISHED

WARNING:  YOU ARE SUPERUSER !!

#
```

End of example

7.3.2.2.3 Disabling Link Level Access. If your system has any applications that use link level access to the network, you should disable that access. If the manuals for those applications have instructions for disabling link level access, follow those instructions. Otherwise, use the chmod command with a parameter of 000 to modify all LANIC device files in the system. The form of the command is:

```
chmod 000 <devicefile>        (Disable link level access.)
```

Note that a single LANIC card will frequently have two device files. In such a case, you must modify both device files to disable link level access.

Example: The following example shows the disabling of LAN activity for a system with two LANIC device files.

```
# chmod 000 /dev/ether

# chmod 000 /dev/ieee

#
```

End of example

7.3.2.2.4 Re-booting the System. Use the `reboot` command with a `-r` parameter to re-boot the system. The form of the command is:

```
reboot -r        (Reboot the system.)
```

Example: The following example shows the re-booting of a typical system.

```
# reboot -r ←———Re-boot the system
syncing disks...done
as soon as power is restored.
SELF-TEST MODE
CONSOLE is 98644 at sc 9
ITE + 9 port(s)
MC68020 processor
MC68881 coprocessor
HP-IB at select code 7
HP98644 at select code 9
HP98642 at select code 11
HP98642 at select code 12
HP98625A at select code 14
HP98643 at select code 21
Bit Mapped Display at 0x560000
HP98620B
real mem  = 4182016
using 102 buffers containing 417792 bytes of memory
Root device major is 0
avail mem = 2932736
lockable mem = 2830336
(c) Copyright 1983, 1984, 1985 Hewlett-Packard
INIT: SINGLE USER MODE

WARNING:  YOU ARE SUPERUSER !!


#
```

End of example

7.3.2.2.5 Taking the System to Multi-User Mode. If your system normally operates in multi-user mode, and if it doesn't go into multi-user mode automatically, you will have to take it to multi-user mode manually. Use the `init` command, and supply a parameter that's appropriate for your system. The general form of the command is:

```
init <n>        (Take the system to init level n.)
```

Example: Following is an example of taking the system to init level 2 (a common multi-user mode).

```
# init 2 ←——Take system to multi-user mode

INIT: New run level: 2
/etc/bcheckrc:

File system is OK, not running fsck
started syncer

/etc/rc
Mon Jun 19 17:42:53 PDT 2006
cron started
Starting up pty daemon.
Starting up virtual terminal daemon.
Starting up remote loopback daemon.
Starting up internet daemon.
line printer scheduler started
preserving editor files (if any)
cleaning up uucp
NOTE:  Files in /tmp:
total 0

NOTE:  Files in /usr/tmp:
total 0

login:
```

End of example

7.4 Starting Up LAN Activity

How you start up LAN activity on your node depends on how you shut it down. If you did a system halt to shut down LAN activity, the start-up procedure involves re-booting the system and taking it to multi-user mode (if appropriate). If you kept your system running after you shut down LAN activity, the start-up procedure is very similar to the shut-down procedure; the only differences are that you restore the edits you made to the `/etc/rc` file and you enter the chmod command (if appropriate) using different parameters. Details follow.

7.4.1 From a Halted System

7.4.1.1 Prerequisites

To bring your system back up from a halt:

- You must know the init level that the system normally runs at, so that you can bring the system back to that level. If you don't know the normal init level, check with the system manager.

- You may need Superuser capability. You won't need Superuser capability if you system normally runs in single-user mode, or if your system automatically takes itself to the appropriate multi-user mode. But if you have to take the system to multi-user mode manually, you'll need Superuser capability to do it.

7.4.1.2 Procedure

is:

1) Re-boot the system.

2) Take the system to multi-user mode, if appropriate.

The commands to do that take this form:

```
<cycle power>        (Boot up the system.)
init <n>             (Take the system to init level n.)
```

The Series 300 computer re-boots whenever the power is turned on. If you left the system with the power off, all you have to do is turn the power on and the system will re-boot. If you left the system halted with the power on, re-boot the system by turning the power off and then on.

If your system normally operates as a multi-user system, and if it doesn't go into multi-user mode automatically, you will have to take it to multi-user mode manually. Use the `init` command with the appropriate parameter.

Example: The following example shows the typical output you might see when you boot up your system and take it to init level 2 (one of the multi-user modes).

```
<cycle power> <———Boot up the system
SELF-TEST MODE
CONSOLE is 98644 at sc 9
ITE + 9 port(s)
MC68020 processor
MC68881 coprocessor
HP-IB at select code 7
HP98644 at select code 9
HP98642 at select code 11
HP98642 at select code 12
HP98625A at select code 14
HP98643 at select code 21
Bit Mapped Display at 0x560000
HP98620B
real mem  = 4182016
using 102 buffers containing 417792 bytes of memory
Root device major is 0, m-- BATTERY BACKED REAL TIME CLOCK
avail mem = 2932736
lockable mem = 2830336
(c) Copyright 1983, 1984, 1985 Hewlett-Packard
INIT: SINGLE USER MODE


WARNING:  YOU ARE SUPERUSER !!

# init 2 <———Take system to multi-user mode

INIT: New run level: 2
/etc/bcheckrc:

File system is OK, not running fsck
started syncer

/etc/rc
Mon Jun 19 17:42:53 PDT 2006
cron started
Starting up pty daemon.
Starting up LAN (NS/9000)
Starting up virtual terminal daemon.
Starting up remote loopback daemon.
```

```
Starting up internet daemon.
line printer scheduler started
preserving editor files (if any)
cleaning up uucp
NOTE:  Files in /tmp:
total 0

NOTE:  Files in /usr/tmp:
total 0

login:
```

End of example

7.4.2 From a Running System

7.4.2.1 Prerequisites

To re-enable LAN activity and bring the system back to its normal operating mode:

- You need to know the normal init level of the system. If you don't know the normal init level, ask the system manager.
- You need Superuser capability.
- You need to be able to edit system script files.

7.4.2.2 Procedure

The steps in re-starting LAN activity and bringing the system back to normal operation are:

1) Modify the `/etc/rc` file.
2) Terminate active processes and take the system to single-user mode (using the SHUTDOWN utility).
3) Re-enable link level access, if appropriate.
4) Re-boot the system.
5) Take the system to multi-user mode, if appropriate.

If you previously shut down LAN activity on your system, but otherwise left the system operating normally, then you will find the procedure for re-starting LAN activity very familiar. Re-starting LAN activity follows almost exactly the same procedure as shutting down LAN activity; the differences are:

1) In the /etc/rc file you undo the editing that disabled the npowerup command line. This puts the npowerup command back into effect and causes LAN activity to start up when the system boots up.

2) If you used chmod commands to shut down link level access, you will need to re-issue those commands – with a different parameter -- to restore link level access.

We will cover these differences in detail in the paragraphs that follow. Since the remainder of the LAN startup procedure is exactly the same as the LAN shutdown procedure that we described above (in the section "Shutting Down LAN Activity", subsection "Leaving the System Running"), we won't repeat all that information. We will, however, briefly list the steps in that procedure, and give a detailed description of any differences.

7.4.2.2.1 Modifying the /etc/rc File. When you shut down LAN activity, you went into the /etc/rc file and modified the line that contained the npowerup command: you inserted a "#" symbol at the beginning of the line to change it to a comment line. Now you need to delete the "#" symbol; this changes it back to a command line and allows the npowerup command to be executed when the system boots up.

Example: In the example /etc/rc file we showed before, you would simply change the npowerup line from:

```
#           npowerup -m200000 -nTT.RND.HP -i0xc0060101 /dev/ieee
```

to:

```
            npowerup -m200000 -nTT.RND.HP -i0xc0060101 /dev/ieee
```

End of example

7.4.2.2.2 Terminating Processes and Taking the System to Single-User Mode. Same as for LAN shutdown procedure.

7.4.2.2.3 Re-enabling Link Level Access. If you previously disabled link level access, you will need to re-enable that access. If your applications that use link level access have specific instructions for re-enabling the link level access, follow those instructions. If, on the other hand, you previously used chmod commands to disable link level access, you will need to use chmod commands here to re-enable that access. The chmod commands use a different parameter (666) for enabling link level access. The form of the command is:

```
chmod 666 <devicefile>        (Enable link level access.)
```

Use chmod to modify all LANIC device files in the system.

Example: For the example system we used earlier, the commands would be:

```
# chmod 666 /dev/ether

# chmod 666 /dev/ieee

#
```

End of example

7.4.2.2.4 Re-booting the System. Same as for LAN shutdown procedure.

7.4.2.2.5 Taking the System to Multi-User Mode. Same as for LAN shutdown procedure.

At this point you have finished bringing the system back to its normal state. NS/9000 and link level access are operating normally, and the system is fully available for users.

7.5 Status and Statistics

The LANDIAG program lets you read the status of the LANIC card. You can also clear the card's statistics registers using LANDIAG.

7.5.1 Prerequisites

To read the status of the LANIC card:

- You need to know the LANIC card's device file name. (Refer to the section on "Setting Up", the subsection on "Finding LANIC Card Information", earlier in this chapter.)

To clear the LANIC card's statistics registers:

- You need to know the LANIC card's device file name.
- You need Superuser capability.

7.5.2 Procedure

The general command sequence for reading card status is:

```
landiag          (Run LANDIAG.)
l                (Enter the LANIC test section.)
n                (Name a LANIC device file.)
<devicefile>     (Enter the device file name.)
d                (Display LANIC status.)
q                (Quit LANDIAG.)
```

LANDIAG assumes that the device file name of your LANIC card is /dev/lan. If your card's device file name is anything else, you must use the "n" (name device) command to enter that name, as shown in the above sequence.

The command sequence for clearing the LANIC card's statistics registers is similar:

```
landiag          (Run LANDIAG.)
l                (Enter the LANIC test section.)
n                (Name a LANIC device file.)
<devicefile>     (Enter the device file name.)
c                (Clear LANIC statistics.)
q                (Quit LANDIAG.)
```

Example: The following example shows the reading of LANIC card status and the clearing of the statistics registers on the LANIC card. Note that in the example we have used the t (terse) command to avoid displaying the menu at each command prompt.

```
# landiag <——— Enter LANDIAG

          LOCAL AREA NETWORK ONLINE DIAGNOSTIC, Version 1.0
                      Wed,May 21,1986     09:52:44

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                      All rights are reserved.

Test Selection mode.

     lan      = LAN Interface Diagnostic
     menu     = Display this menu
     quit     = Terminate the Diagnostic
     remote   = Remote Node Communications Diagnostic
     terse    = Do not display command menu
     verbose  = Display command menu

Enter command: t <——— Set terse mode
Do not display command menu.

Test Selection mode.

Enter command: l <——— Enter LANIC test

LAN Interface test mode. LAN Interface device file = /dev/lan

Enter command: n <——— Name device file

Enter LAN Interface device file name. Currently /dev/lan: /dev/ieee

LAN Interface test mode. LAN Interface device file = /dev/ieee
```

```
Enter command: d ←———Display device information

                          LAN INTERFACE STATUS DISPLAY
                           Wed,May 21,1986     09:59:02

Device file                       = /dev/ieee
Select code                       = 21
Current state                     = active
LAN Interface address, hex        = 0x0800090076F6
Number of multicast addresses     = 2
Frames received                   = 3
Frames transmitted                = 1
Undelivered received frames       = 0
Untransmitted frames              = 0
CRC errors received               = 0
Transmit collisions               = 0
One transmit collision            = 0
More transmit collisions          = 0
Excess retries                    = 0
Deferred transmissions            = 0
Carrier lost when transmitting    = 0
No heartbeat after transmission   = 0
Frame alignment errors            = 0
Late transmit collisions          = 0
Frames lost                       = 0
Unknown protocol                  = 0
Bad control field                 = 0

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: c ←———Clear statistics registers
Clearing LAN Interface statistics registers.

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: q ←———Quit the diagnostic
Diagnostic terminated by operator.

#
```

End of example

7.6 Self-Test

The LANIC card self-test executes when the card is reset. An External Loopback test is also performed.

7.6.1 Prerequisites

To run the self-test:

- You need to know the name of the LANIC card's device file. (Refer to the section on "Setting Up", the subsection on "Finding LANIC Card Information", earlier in this chapter.
- You need Superuser capability.

7.6.2 Procedure

The general command sequence for executing the card self-test is:

```
landiag        (Run LANDIAG.)
l              (Enter the LANIC test section.)
n              (Name a LANIC device file.)
<devicefile>   (Enter the device file name.)
r              (Reset LANIC, run self-test and External Loopback test.)
d              (Display LANIC status.)
q              (Quit LANDIAG.)
```

LANDIAG assumes that the LANIC card's device file name is /dev/lan. If you LANIC card has a different device file name, you must use the "n" (name device) command to specify that name, as shown in the command sequence above.

If a failure occurs during the test (r command), a message will appear on the screen. This message indicates only that there was a failure; it doesn't say what failed. That information is shown by the d command, as the selftest completion code (fourth line of output). The meanings of these codes are listed below in the subsection on "Interpretation".

Figure 7-1 shows the area covered by the self-test.

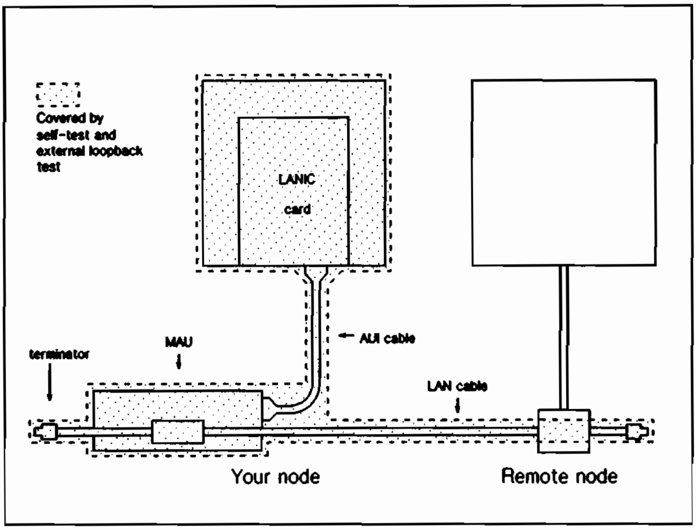

Figure 7-1. Test coverage

7.6.3 Examples

The following examples show two LANIC card self-tests.

Example 1: In the first example the self-test fails because the AUI cable has been disconnected from the MAU. Note that in this example we have used the "t" comnmand to put LANDIAG into terse mode; this stops LANDIAG from showing a complete menu before every command prompt.

```
# landiag <-----Run LANDIAG

          LOCAL AREA NETWORK ONLINE DIAGNOSTIC, Version 1.0
                   Wed,May 21,1986     09:52:44

             Copyright 1985 Hewlett Packard Company.
                   All rights are reserved.
```

```
Test Selection mode.

     lan     = LAN Interface Diagnostic
     menu    = Display this menu
     quit    = Terminate the Diagnostic
     remote  = Remote Node Communications Diagnostic
     terse   = Do not display command menu
     verbose = Display command menu

Enter command: t <------Set terse mode
Do not display command menu.

Test Selection mode.

Enter command: l <------Enter LANIC test

LAN Interface test mode. LAN Interface device file = /dev/lan

Enter command: n <------Name device file ---------------+
                                                        |
Enter LAN Interface device file name. Currently /dev/lan: /dev/ieee

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: r <------Reset LANIC and run self-test
Resetting LAN Interface to run selftest.
Unable to reset LAN Interface.
errno = 5 <------Some error has occurred

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: d <------Display status

                      LAN INTERFACE STATUS DISPLAY
                       Wed,May 21,1986     09:54:57

Device file                     = /dev/ieee
Select code                     = 21
Current state                   = FAILED !!!!
Selftest completion code        = 37 <------------------This is the error code
* * * *  LAN INTERFACE SELFTEST FAILURE  * * * *

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: q <------Quit the diagnostic
Diagnostic terminated by operator.

#
```

End of example

Example 2: The next example shows the results after the problem has been fixed.

```
.
.
.
Enter command: r <———Reset LANIC and run self-test
Resetting LAN Interface to run selftest.
                                    <——————————————No error message
LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: d <———Display status

                      LAN INTERFACE STATUS DISPLAY
                       Wed,May 21,1986     09:58:02

Device file                      = /dev/ieee
Select code                      = 21
Current state                    = active <———No error
LAN Interface address, hex       = 0x0800090076F6
Number of multicast addresses    = 2
Frames received                  = 3
Frames transmitted               = 1
Undelivered received frames      = 0
Untransmitted frames             = 0
CRC errors received              = 0
Transmit collisions              = 0
One transmit collision           = 0
More transmit collisions         = 0
Excess retries                   = 0
Deferred transmissions           = 0
Carrier lost when transmitting   = 0
No heartbeat after transmission  = 0
Frame alignment errors           = 0
Late transmit collisions         = 0
Frames lost                      = 0
Unknown protocol                 = 0
Bad control field                = 0

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command:
.
.
.
```

End of example

7.6.4 Interpretation

The above examples show typical test results as reported by LANDIAG. How you use those results depends on whether you are using the simplified troubleshooting approach for experienced users (refer to "Troubleshooting for Experienced Users" in chapter 2 of this manual), or whether you are adhering rigorously to the detailed procedures.

If you're using the simplified approach as a general guide for troubleshooting, the error information provided by the self-test should give you an idea where to look for the problem. The meanings of the codes are:

Code	Meaning
-2	Check the priority on the LANIC card. It should be set to 5 or 6. If it is set below 5, HP-UX ignores the card.
1 - 34	LANIC card internal failure
35	Retry failure on transmit
36	Timeout waiting to transmit packet
37	Loss of carrier on transmit
38	A remote computer is trying to transmit to the local computer while the local computer is performing its loopback test.
39 - 42	LANIC card internal failure
43, 44	LANIC card or system failure

If you're following the detailed troubleshooting procedures, note that:

- Errors with negative numbers are hardware configuration errors.
- Errors 1 - 34 and 39 - 42 are internal to the LANIC card.
- Errors 35 - 38 are external to the LANIC card. These indicate link errors.
- Error 35 is the only error that indicates a retry/collision error.
- Errors 43 and 44 are internal either to the card or to the system. Run the system diagnostics to qualify these errors further.

MAU Power Failure. Note that the error codes will not indicate a MAU power failure. If the troubleshooting procedures ask you to determine whether a MAU power failure has occurred, you'll have to check the MAU power fuse on the LANIC card.

Retry/Collision Error. A retry/collision error is indicated by a "`Selftest completion code`" value 35.

7.7 External Loopback Test

There is no separate External Loopback test for the Series 300 LANIC card; it is included with the self-test. For full information on that test, refer to the "Self-Test" section, above.

If the self-test passes (`current state` equals `active` after the test) then the External Loopback test has also passed.

7.8 Remote Node Test

You can use the `LINKLOOP` program to send a TEST packet to a remote node. The `LINKLOOP` program notifies you whether the remote node received the packet and returned it successfully.

7.8.1 Prerequisites

To run a Remote Node test:

- You need to know the device file name of the LANIC card in the local system. (Refer to the section on "Setting Up", the subsection on "Finding LANIC Card Information", earlier in this chapter.)
- You need to know the station address of the LANIC card in the remote system. (Refer to the section on "Setting Up", the subsection on "Finding LANIC Card Information", in the diagnostic chapter for the computer that is used at the remote node. For instance, if the remote node uses an HP 1000 computer, look in the chapter on the "LAN/1000 (RTE-A) Link Diagnostic".)

7.8.2 Procedure

The LINKLOOP program has several parameters that allow you to specify number of TEST packets, timeout values, and so on. All parameters are optional, except that you must specify the station address of the remote node. Note, however, that you must also specify the name of your local LANIC card's device file if it isn't either /dev/lan or /dev/ieee. (LINKLOOP tries to find /dev/lan first. If your system contains both /dev/lan and /lan/ieee and you want to use /dev/ieee, you must specify it.)

Note that LINKLOOP does not support remote node tests over an Ethernet link unless an 802.3 device file is also present on the local system. If your system has only an Ethernet device file, all you have to do to satisfy this requirement is to create the 802.3 device file. (You can use the mknod command, as described in your HP-UX system documentation.)

The LINKLOOP command sequence has the general form:

```
linkloop [-n <count>] [-f <file>] [-t <timeout>] [-s<size>] [-v] <linkaddr>
```

where:

count = number of TEST packets to send. The default value is "1". A "0" causes test packets to be sent indefinitely, until you interrupt the transmission by pressing the BREAK key.

file = name of the device file for the LANIC card in your system. You can omit this parameter if the device file name is /dev/lan or /dev/ieee. (Note, however, that if your system contains both /dev/lan and /dev/ieee, and you want to use /dev/ieee, you must specify it.)

timeout = timeout interval, in seconds. If the packet is not returned to the sending station within the timeout interval, a timeout failure occurs. The default value for this parameter is 2 seconds.

size = size of the TEST packet, in bytes. This value can range from 0 to 1497; the default value is 1497.

linkaddr = station address of the remote station. This must be a hexadecimal number that begins with 0x (to indicate hexadecimal notation) and followed immediately by twelve hexadecimal numerals. There can be no delimiters, such as spaces or dashes, between the numerals (for example: 0x0800090077cd).

-v = "verbose" mode. This causes LINKLOOP to report more information if a failure occurs. The default mode is "terse".

7.8.3 Examples

Following are two examples that show the use of LINKLOOP.

Example 1: The first example shows a test that sends out 10 TEST packets. This test fails because the specified node is currently powered down.

```
# linkloop -n 10 0x08000900021b
Loopback to LAN station: 0x08000900021b -- FAILED
    frames sent              : 10
    frames received correctly : 0
    reads that timed out     : 10
#
```

End of example

Example 2: The second example shows a test that sends out 10 TEST packets and recieves them all back successfully.

```
# linkloop -n 10 0x08000900021c
Loopback to LAN station: 0x08000900021c -- OK
#
```

End of example

7.8.4 Interpretation

The principal results of the Remote Node test are simple and unambiguous: pass or fail. If you're following the detailed troubleshooting procedure, that should provide you with enough information to continue on to the next step. If you're an experienced troubleshooter using the simplified approach, you may be able to get additional useful information by specifying the -v (verbose) parameter when you run LINKLOOP.

LAN/500 (HP-UX) Link Diagnostic 8

Contents

As you follow the troubleshooting trees in chapter 2 of this manual, you are instructed to run a number of tests on your computer or computers. This chapter tells you how to run those tests on an HP 9000 Series 500 computer.

You can think of the bulk of this chapter as a collection of subroutines. If, for example, the troubleshooting tree asks you to run an External Loopback test on a Series 500 computer, you would find the section on the External Loopback test later in this chapter, follow the instructions in that section, and then return to the troubleshooting tree and go to the next step.

Note that this chapter is not a detailed description of the LAN diagnostic software on the Series 500; it just presents enough information to let you follow the troubleshooting trees.

8.1 Reference and Background Information

8.1.1 System Requirements

The tests described in this chapter run on an HP 9000 Series 500 computer. The computer must be running the HP-UX operating system, revision 5.1 or later. The NS/9000 software, revision 5.01 or later, must be installed and running on the system.

8.1.2 Capability

An account in HP-UX either has Superuser capability or it doesn't. In general, commands that display information do not require Superuser capability. Commands that clear or reset require you to be Superuser, and you have to be Superuser to re-boot the system.

8.1.3 References

For detailed information, you may want to have the following references available as you go through the troubleshooting procedures:

Installation Manuals:

Hardware:

HP 27125B LAN/500 Link LANIC Installation Manual, part number 27125-90002

Software:

NS/9000 Node Manager's Guide, part number 50951-90010

Cabling:

LAN Cable and Accessories Installation Manual, part number 5955-7680

Operating Manuals:

NS/9000 LAN User's Guide, part number 50951-90000

Diagnostic Manuals:

NS/9000 Node Manager's Guide, part number 50951-90010
NS Message Formats Reference Manual, part number 5958-8523

8.2 Setting Up

There are a number of housekeeping tasks that you may have to perform in going through the diagnostic procedures in this chapter. Rather than load up those procedures with the details of the housekeeping tasks, we will gather those details in this section.

Note that HP-UX is case-sensitive. That is, it doesn't let you substitute corresponding upper case letters ("A") and lower case letters ("a") for each other. All commands and file names should be entered in lower case, unless otherwise specified.

The examples in this chapter show your input to the computer in `shaded letters`. The computer's response is shown in `unshaded letters in this typewriter-like type face`.

8.2.1 Logging In

The log-in on a Series 500 HP-UX machine takes the following form:

```
login: <account name>
Password: <password>
.
.
TERM = (hp2622) <terminal type> or RETURN
```

Backspaces are not accepted when you type in the account name and password. The system will not echo the password that you type in; that keeps other people from reading your password from the screen. Remember that HP-UX is case-sensitive: you must match upper case and lower case letters exactly when you type in the password. (System managers frequently mix lower and upper case characters in passwords, just to make it more difficult for unauthorized users to gain access to the system.)

Depending on how the system is set up, it may ask for your terminal type when you log in. If it does, you can either enter a specific terminal type or just press RETURN to accept the default type (HP 2622).

Example: This example shows how a typical system manager's log-in might look.

```
login: root
Password:              ←——System blanks out the password you type in

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(c) Copyright 1979 The Regents of the University of Colorado, a body corporate
(c) Copyright 1979, 1980, 1983 The Regents of the University of California
(c) Copyright 1980, 1984 AT&T Technologies.  All Rights Reserved.

Welcome to Hewlett-Packard System 9000 HP-UX

TERM = (hp2622) RETURN ←——Use default terminal type


WARNING:  YOU ARE SUPERUSER !!

# ←————Superuser command prompt
```

End of example

8.2.2 Finding LANIC Card Information

To perform the tests required by the troubleshooting procedure, you commonly need to know the name of the LANIC card's device file and the station address of the LANIC card. The steps you must take to find the device file and station address of your LANIC card are:

1) Determine the select code of your LANIC card.

2) Use the select code to get the device file name for the LANIC card.

3) Use the device file name to get the LANIC card's station address.

We will discuss these steps in detail in the paragraphs that follow.

8.2.2.1 Getting the LANIC Card's Select Code

Getting the LANIC card's select code is not an end in itself; it is merely a means to get the card's device file name. If your system has only a single LANIC card, you don't even need to know its select code, since you can determine the device file name without it. If you have a single-card system, you may as well skip these paragraphs and go on to the paragraphs on "Getting the Device File Name".

If you have more than one LANIC card in your system, however, it's difficult to know which of those cards connects to the network that you're testing. As soon as you can determine which card is physically connected to a particular network, you can easily tell what its select code is; given the select code, you can find the device file name, which allows you to access the card for diagnostic testing.

There are three general ways of determining that a particular LANIC card is connected to the network you're testing:

- Look on the network map. If you have a complete and up-to-date network map, it will show all the LANIC card information you need to know, including the card's select code, device file name, and station address.

- Trace the cables. If your network is in an open area, such as a factory floor, you may be able to trace the cables physically and determine which LANIC card is connected to the network you're interested in. If your network cabling runs in walls and under floors, you may be able to find labels on the cables that tell you which card is connected to which network. Once you have found the right card, its position in the card cage will tell you its select code. (Note that if you open the card cage door to look for the select code number, you will power down the computer. Make sure that you have halted the operating system before you power down the computer, or you may leave the system in a strange state. Instructions for halting the operating system are presented in the section on "Shutting Down LAN Activity", subsection "Leaving the System Halted", later in this chapter.)

- Try to run a Remote Node test from each of the LANIC cards to a station address known to be on the network you're interested in. If you can complete such a test successfully, then you have found the right LANIC card. (Note that only positive results are significant here; if you can't get any of your cards to communicate with a known station, that may simply mean that there is a fault somewhere on the network. That wouldn't be a surprising result on a network that needs troubleshooting.) To run those Remote Node tests, you will need the device file names for all the LANIC cards in the system; the paragraphs below will tell you how to get them. The Remote Node tests themselves are described at the end of this chapter.

8.2.2.2 Getting the Device File Name

You can get the device file name for your LANIC card by doing a long listing of the device directory. The command is:

```
ll /dev        (Do a long listing of the device directory.)
```

The information shown by the ll /dev command includes driver numbers, select codes, and device file names. If you know the select code of your card, you can use the select code to locate the device file name. If you have only a single LANIC card in your system, you can use the driver number (38 or 39) to locate the device file name. Note that there may be more than one device file for each card.

Example: The example below shows the results of a long listing of the device directory. Note that there are two LANIC cards, and that each of them has two device files. The fifth column of the listing shows the driver numbers; driver numbers 38 (Ethernet) and 39 (IEEE 802.3) indicate LANIC cards. The sixth column gives the select code; it is in the form 0xsc0000, where sc is the select code in hexadecimal. The last column shows the device file name.

```
                                      Drivers  Select codes       Device files
# ll /dev
total 4
crw--w--w-   3 root     other     31 0x000000 May  8 09:43 console
brw-rw-rw-   1 root     other      1 0x050010 Mar 31 17:42 ct
crw-rw-rw-   1 root     other     38 0x030000 Apr  1 14:15 ether  ]LANICs
crw-rw-rw-   1 root     other     38 0x020000 Jun  2 09:11 ether1 ]
brw-rw-rw-   1 root     other      1 0x050000 Mar 31 17:29 hd
crw-rw-rw-   1 root     other     39 0x030000 Apr  1 14:16 ieee   ]LANICs
crw-rw-rw-   1 root     other     39 0x020000 Jun  2 09:12 ieee1  ]
crw-------   1 lp       bin       14 0x060210 May 20 15:56 lp
crw-rw-rw-   1 root     other     15 0x000000 May 21 10:15 null
drwxrwxrwx   1 root     other        96 Apr  3 14:41 pty
drwxrwxrwx   1 root     other        96 Apr  3 14:43 ptym
crw-rw-rw-   1 root     other      1 0x050010 Mar 31 17:42 rct
crw-rw-rw-   1 root     other      1 0x050000 Mar 31 17:30 rhd
crw-------   1 lp       bin       14 0x060200 May 14 13:48 rlp
crw--w--w-   3 root     other     31 0x000000 May  8 09:43 syscon
crw--w--w-   3 root     other     31 0x000000 May  8 09:43 systty
crw-rw-rw-   1 root     other     20 0x010000 Aug  5  1985 tty
crw--w--w-   1 root     other     31 0x000200 May  8 09:28 tty09
```

End of example

8.2.2.3 Getting the LANIC Card's Station Address

To perform a Remote Node test you must have the station address of the remote system's LANIC card. (Note that you must be at that remote system to get the station name. For instance, if you're trying to send a remote test packet from an HP 1000 computer to an HP 9000 Series 500 computer, you'll have to go to the latter computer to get the station address. That's what these paragraphs describe.)

Once you have the device file name for your LANIC card, you can use the LANDIAG program to get the card's station address. The "d" command in LANDIAG displays the card status information, including the station address.

The general sequence for finding the station address is:

```
landiag          (Run LANDIAG.)
l                (Enter the LANIC test section.)
n                (Name a LANIC device file.)
<devicefile>     (Enter the device file name.)
d                (Display LANIC status.)
q                (Quit LANDIAG.)
```

LANDIAG assumes that the device file name of your LANIC card is /dev/lan. If your card's device file name is anything else, you must use the "n" (name device) command to enter that name, as shown in the above command sequence. (For LANIC cards used in NS/9000 applications, the device file name is frequently /dev/ieee or /dev/ether.)

The "d" command displays the station address as the fourth status line of its output. The number is in hexadecimal notation.

Example: The following is a typical example of getting the LANIC card's station address. Note that in this example we use a "t" command to set terse mode and avoid seeing the entire command menu before each command prompt.

```
# landiag <------Run LANDIAG

            LOCAL AREA NETWORK ONLINE DIAGNOSTIC, Version 2.0
                        Thu May  8 09:45:06 1986

                Copyright 1985 Hewlett-Packard Company.
                        All rights are reserved.

Test Selection mode.

     lan     = LAN Interface Diagnostic
     menu    = Display this menu
     quit    = Terminate the Diagnostic
     remote  = Remote Node Communications Diagnostic
     terse   = Do not display command menu
     verbose = Display command menu

Enter command: t <------Set terse mode
Do not display command menu.

Test Selection mode.

Enter command: l <------Enter LANIC test

LAN Interface test mode. LAN Interface device file = /dev/lan

Enter command: n <------Name device file

Enter LAN Interface device file name. Currently /dev/lan: /dev/ieee

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: d <------Display status

                      LAN INTERFACE STATUS DISPLAY
                       Thu May  8 09:53:25 1986

Device file                      = /dev/ieee
Select code                      = 1
Current state                    = active
LAN Interface address, hex       = 0x080009004E26 <------Station address
Number of multicast addresses    = 2
Frames received                  = 0
Frames transmitted               = 0
Undelivered received frames      = 0
Untransmitted frames             = 0
CRC errors received              = 0
One transmit collision           = 0
```

```
More transmit collisions        = 0
Excess retries                  = 0
Deferred transmissions          = 0
Carrier lost when transmitting  = 0
No heartbeat after transmission = 0
Frame alignment errors          = 0
Late transmit collisions        = 0
Frames lost                     = 0
Unknown protocol                = 0
Bad control field               = 0
XID frames received             = 0
TEST frames received            = 0
XID/TEST frames dropped         = 0
Receive errors                  = 0
No buffer for transmit frames   = 0
Few or no receive buffers       = 0
Time domain reflectometry       = 0
Illegal frame size on receive   = 0

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: q <------Quit the diagnostic
Diagnostic terminated by operator.

#
```

End of example

8.2.3 Logging Off

To log off from a Series 500 computer, you can usually enter a "control-d" character at a system command prompt. If that doesn't work on your system, use "logout".

Example: Here's a typical example of how it works:

```
# <ctrl-d>

login:
```

End of example

8.3 Shutting Down LAN Activity

If you're going to test the LAN cable itself, you will have to halt the activity on the cable to some extent. The extent to which you have to halt the LAN activity depends on what tests you are running. The tests and their required environments are specified in the chapter on the "LAN Cable" earlier in this manual. Some tests require that there be no signal traffic on the LAN cable; others require that the computers connected to the cable be fully powered down.

The remainder of this section explains how to put your system into the appropriate state. Given the flexible nature of the HP-UX operating system, there are several valid ways you can attain your ends. We'll describe the easiest ways in this section. If you're experienced enough with HP-UX to know a different way that you prefer to use, by all means use it.

If you need to power your computer down completely, you must first shut down the HP-UX operating system and halt the computer. The next subsection ("Leaving the System Halted") contains the procedure for doing that. If, on the other hand, you merely want to stop LAN activity on your system, it is possible to shut down the NS/9000 subsystem but still leave the computer available for other uses. We'll describe how to do that in a later subsection ("Leaving the System Running").

8.3.1 Leaving the System Halted

Two common reasons for halting your system are:

1) You want to power the computer down completely. By going through the halt procedure, you make sure that the system goes down cleanly and does not leave files or devices in corrupted states.

2) You want to stop all LAN activity but leave the computer powered up. It's easier to halt the entire system than to shut down just the network services (NS/9000). That works well if there aren't users that need to keep using the computer while you're running your tests. (If it isn't feasible to halt the computer, the subsection on "Leaving the System Running" describes how to shut down NS/9000 but leave the computer available for other users.)

8.3.1.1 Prerequisites

To take your system to the halted state:

- You need to know the init level of your system, so that later you can bring the system back to the same init level. If you don't know the proper init level, check with the system manager.

- You need Superuser capability.

8.3.1.2 Procedure

The steps you take in halting your system are:

1) Take the system to single-user mode, kill processes, and halt the system.

2) If appropriate, power the system down.

We will describe these steps in detail in the paragraphs that follow.

The SHUTDOWN program will take the system to single-user mode, kill active processes, and halt the system. You must be in the root directory to run SHUTDOWN. The general command sequence is:

```
cd /                       (Change to root directory.)
/etc/shutdown <nn>         (Shut down in nn seconds and re-boot.)
<y or n>                   (Send own message or use standard message.)
y                          (Kill processes and go to single-user mode.)
<y or n>                   (Do file system check, or not.)
y                          (Halt system.)
```

At the end of this sequence, the system is halted. You can turn off the power now, if that is appropriate for your testing.

When you're ready to start your system back up again, refer to the section "Starting Up LAN Activity", later in this chapter.

It takes the system quite a while to process these commands, so be patient. (The file system check, in particular is very time-consuming.) If you start banging on the keyboard in an attempt to get the system's attention, the type-ahead buffer will capture your "input" and the system will eventually try to process that input as a string of commands. You could end up with some results that you didn't intend.

Example: The following example shows a typical SHUTDOWN procedure.

```
# cd / <-------------------Change to root directory
# /etc/shutdown 0 <--------Shut down now

SHUTDOWN PROGRAM

Mon Jun  2 09:55:26 MDT 1986


Do you want to send your own message? (y or n):  n <------Use standard message
Broadcast Message from adm
PLEASE LOG OFF NOW ! ! !
System maintenance about to begin.
All processes will be killed in 0 seconds.
Broadcast Message from root
SYSTEM BEING BROUGHT DOWN NOW ! ! !

Busy out (push down) the appropriate
phone lines for this system.
```

```
Do you want to continue? (y or n):   y <------Kill processes

All currently running processes will now be killed.


INIT: New run level: 6

/etc/rc
Mon Jun  2 08:57:08 PDT 1986
System:   HP-UX
Release:  05.01
Version:  B
Machine:  9050X
Identity: HP-UX 25?2A0077
Nodename: hprndli
     UID   PID  PPID  C   STIME TTY   TIME COMMAND
    root   235   151  0 09:58:23 co   0:00 ps -eaf
    root   234   216  0 09:58:22  ?   0:00 sh -c  /usr/local/bin/scip_dmn
    root   216   214  0 09:58:01  ?   0:02 sh -c  /usr/local/bin/scip_dmn
    root   214    81  0 09:58:00  ?   0:00 sh -c  /usr/local/bin/scip_dmn
    root   151    56  0 09:55:23 co   0:02 -sh
    root    81     1  0 09:49:48  ?   0:02 cron
    root    78     1  0 09:49:46  ?   0:00 vtdaemon
    root    76     1  0 09:49:45  ?   0:00 nftdaemon
    root    72     1  0 09:49:40  ?   0:00 ptydaemon
    root    56     1  0 09:48:06 co   0:04 -sh
    root     1     0  0 09:32:17  ?   0:04 /etc/init

Will a file system check be done at this time?
Type either ( y or n ) :   n <------Skip file check

Are you ready to stop the system? (y or n):  y <------Yes, halt the system


            The system can now be powered down
```

End of example

8.3.2 Leaving the System Running

NOTE

This Procedure requires you to re-boot the system. **This will disrupt all processes running on the system.** You can minimize the disruption by notifying users before you re-boot and allowing them time to shut down their processes gracefully. After you re-boot, users will be able to re-start their processes, as long as those processes don't require LAN activity on the network.

If you want to stop LAN activity on your system but still leave the system available for other uses, this subsection describes how to do it.

8.3.2.1 Prerequisites

To stop LAN activity but still leave the system running:

- You need to know the init level of your system, so that later you can bring the system back to the same init level. If you don't know the proper init level, check with the system manager.
- You need Superuser capability.
- You need to be able to edit system script files.

8.3.2.2 Procedure

The steps you take to shut down LAN activity while leaving your system running are:

1) Modify the /etc/rc file.
2) Disable link level access.
3) Re-boot the system.
4) Take the system to multi-user mode.

We will describe these steps in detail in the paragraphs that follow.

8.3.2.2.1 Modifying the /etc/rc File. Before you start modifying any files, be aware that most system managers feel rather protective about their systems. They tend to get nervous, if not downright irritable, when people start messing about with important system files. Be sure that you check with the system manager before you modify the `/etc/rc` file.

HP-UX executes the commands in the `/etc/rc` file as part of its boot-up sequence. Usually, the commands that enable network services (NS/9000) are included in that file. (If they're not there, check with the system manager to see where they are located.) To disable network services, you need to modify two of the commands so that they are not executed during boot-up. The best way to modify those commands is to use a text editor, such as `vi`, to change the lines in the file to comment lines; do this by putting a "#" symbol at the beginning of each line. Since the boot-up sequence ignores comment lines, the commands will be ignored when the system is booted up, and network services won't be enabled.

(When you are ready to re-enable network services, it will be a simple matter to take out the "#" symbols and make the lines commands again. We'll deal with that in the section on "Starting Up LAN Activity", later in this chapter.)

Example: The example below shows a typical /etc/rc file and notes the location of the lines to be modified.

```
# cat /etc/rc
# UNISRC_ID: @(#)rc     27.2    85/03/25

# Where to find commands:

       PATH=/bin:/usr/bin:/usr/local/bin:/usr/contrib/bin:/usr/lib:/usr/contrib

# Set timezone for children of rc (can't set for whole system, unfortunately):

       TZ=MST7MDT
       export TZ

# Set termio configuration for output device.

       stty 9600 clocal icanon echo opost onlcr ienqak ixon icrnl ignpar

# Announce start of rc script

       echo "\n/etc/rc $*"
       date

# Only for state 2, first entry:

       set  who -r
       if [ $7 = 2  -a  $8 = 0 ]
       then

# Set the system's uucp nodename:

                hostname hprndli

# Start Lan

                ptydaemon
                npowerup /etc/netdir ]
                vtdaemon             ]------Edit these lines

# Set up pseudo-mounted devices:

                # Put lines of "special directory" in the here-document, for
                # use by df, where "special" == basename of special file and
                # "directory" is where it's mounted:

                setmnt <<-!
                       hd /
.
.
.
```

To modify the file for shutting down LAN activity, just change the two lines of NS/9000 commands from:

```
npowerup /etc/netdir
vtdaemon
```

to:

```
#                  npowerup /etc/netdir
#                  vtdaemon
```

In this form, the NS/9000 startup commands will not be executed when the system is booted up.

End of example

8.3.2.2.2 **Disabling Link Level** Access. If your system has any applications that bypass NS/9000 and use link level access to the network, you should disable that access. If the manuals for those applications have instructions for disabling link level access, follow those instructions. Otherwise, use the chmod command with a parameter of 000 to modify all LANIC device files in the system. The form of the command is:

```
chmod 000 <devicefile>       (Modify device file.)
```

Example: The following example shows those commands for the example system used earlier in this chapter. That system has two LANIC cards, each with two device files. The chmod commands would be:

```
# chmod 000 /dev/ether

# chmod 000 /dev/ether1

# chmod 000 /dev/ieee

# chmod 000 /dev/ieee1

#
```

End of example

8.3.2.2.3 Re-booting the System. Use the SHUTDOWN program to take the system to single-user mode and kill all active processes. Then use the stopsys -r command to re-boot the system. The command sequence is:

```
cd /                     (Change to root directory.)
/etc/shutdown <nn>       (Shut down in nn seconds.)
<y or n>                 (Send own message or use standard message.)
y                        (Kill processes and go to single-user mode.)
<y or n>                 (Do file system check, or not.)
n                        (Don't halt system; leave it running.)
stopsys -r               (Re-boot the system.)
```

Example: The following example shows a typical re-boot procedure.

```
# cd / <-------------------Change to root directory
# /etc/shutdown 0 <--------Shut down now

SHUTDOWN PROGRAM

Mon Jun  2 09:55:26 MDT 1986


Do you want to send your own message? (y or n):   n <----Use standard message
Broadcast Message from adm
PLEASE LOG OFF NOW ! ! !
System maintenance about to begin.
All processes will be killed in 0 seconds.
Broadcast Message from root
SYSTEM BEING BROUGHT DOWN NOW ! ! !

Busy out (push down) the appropriate
phone lines for this system.

Do you want to continue? (y or n):   y <-----Kill processes

All currently running processes will now be killed.


INIT: New run level: 6

/etc/rc
Mon Jun  2 08:57:08 PDT 1986
System:   HP-UX
Release:  05.01
Version:  B
Machine:  9050X
Identity: HP-UX 2512A0077
Nodename: hprndli
     UID   PID  PPID  C   STIME TTY  TIME COMMAND
    root   235   151  0 09:58:23 co  0:00 ps -eaf
```

```
    root   234   216  0 09:58:22  ?  0:00 sh -c  /usr/local/bin/scip_dmn
    root   216   214  0 09:58:01  ?  0:02 sh -c  /usr/local/bin/scip_dmn
    root   214    81  0 09:58:00  ?  0:00 sh -c  /usr/local/bin/scip_dmn
    root   151    56  0 09:55:23 co  0:02 -sh
    root    81     1  0 09:49:48  ?  0:02 cron
    root    78     1  0 09:49:46  ?  0:00 vtdaemon
    root    76     1  0 09:49:45  ?  0:00 nftdaemon
    root    72     1  0 09:49:40  ?  0:00 ptydaemon
    root    56     1  0 09:48:06 co  0:04 -sh
    root     1     0  0 09:32:17  ?  0:04 /etc/init

Will a file system check be done at this time?
Type either ( y or n ) :   n ←——Skip file check

Are you ready to stop the system? (y or n):  n ←——Leave system running

# stopsys -r ←——Re-boot system

Loader Rev 4.1
Testing Memory...
Looking for System...
HP-UX Model 530/540/550 Release 05.01 (97089C)
Load done.
(c) Copyright 1983, 1984, 1985 Hewlett-Packard Company,  All rights reserved.
(c) Copyright 1979 The Regents of the University of Colorado, a body corporate
(c) Copyright 1979, 1980, 1983 The Regents of the University of California
(c) Copyright 1980, 1984 AT&T Technologies. All Rights Reserved.

INIT: SINGLE USER MODE

WARNING:  YOU ARE SUPERUSER !!

#
```

End of example

If the system normally operates in multi-user mode, but does not go to multi-user mode automatically, you'll have to take it to multi-user mode manually.

8.3.2.2.4 Taking the System to Multi-User Mode. Use the `init` command to take the system to multi-user mode. The form of the `init` command is:

```
init <n>        (Take system to init level n.)
```

If you don't know the appropriate init level for your system, check with the system manager.

Example: Following is an example of taking a system from single-user mode to multi-user mode at init level 2.

```
# init 2 <------Take system to multi-user mode
INIT: New run level: 2

/etc/rc
Mon Jun  2 09:01:55 PDT 1986
cron started
line printer scheduler started
preserving editor files (if any)
cleaning up uucp
System:   HP-UX
Release:  05.01
Version:  B
Machine:  9050X
Identity: HP-UX 2512A0077
Nodename: hprndli

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login:
```

End of example

At this point you have finished shutting down LAN activity on the system. The system is now ready for normal use (minus LAN activity).

8.4 Starting Up LAN Activity

How you start up LAN activity on your node depends on how you shut it down. If you did a system halt to shut down LAN activity, the start-up procedure involves re-booting the system and taking it to multi-user mode (if appropriate). If you kept your system running after you shut down LAN activity, the start-up procedure is very similar to the shut-down procedure; the only differences are that you restore the edits you made to the `/etc/rc` file and you enter the `chmod` command (if appropriate) using different parameters. Details follow.

8.4.1 From a Halted System

8.4.1.1 Prerequisites

To bring your system back up from a halt:

- You must know the init level that the system normally runs at, so that you can bring the system back to that level. If you don't know the normal init level, check with the system manager.

- You may need Superuser capability. If the system normally operates in multi-user mode and does not automatically go to multi-user mode as part of the boot-up process, you will have to take it to multi-user mode manually; that takes Superuser capability.

8.4.1.2 Procedure

The general procedure for bringing the system back from a halted state is:

1) Re-boot the system.

2) Take the system to multi-user mode, if appropriate.

The Series 500 computer re-boots whenever the power is turned on. If you left the system with the power off, all you have to do is turn the power on and the system will re-boot. If you left the system halted with the power on, re-boot the system by turning the power off and then on.

If the system normally operates in multi-user mode, but came up in single-user mode when it re-booted, you will have to take it to multi-user mode manually. Do that with an `init` command, supplying the appropriate init level as a parameter to the command.

The command sequence for accomplishing all this is:

```
<cycle power>      (Re-boot the system.)
init <n>           (Take the system to init level n.)
```

Example: Following is an example of the sequence for re-booting the system and taking it to init level 2.

```
<cycle power> ←——Re-boot the system
Loader Rev 4.1
Testing Memory...
Looking for System...
HP-UX Model 530/540/550 Release 05.01 (97089C)
Load done.
(c) Copyright 1983, 1984, 1985 Hewlett-Packard Company,  All rights reserved.
(c) Copyright 1979 The Regents of the University of Colorado, a body corporate
(c) Copyright 1979, 1980, 1983 The Regents of the University of California
(c) Copyright 1980, 1984 AT&T Technologies. All Rights Reserved.

INIT: SINGLE USER MODE

WARNING:  YOU ARE SUPERUSER !!

# init 2 ←——Take system to multi-user mode
INIT: New run level: 2

/etc/rc
Mon Jun  2 09:01:55 PDT 1986
cron started
line printer scheduler started
preserving editor files (if any)
cleaning up uucp
System:   HP-UX
Release:  05.01
Version:  B
Machine:  9050X
Identity: HP-UX 2512A0077
Nodename: hprndli

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login:
```

End of example

8.4.2 From a Running System

8.4.2.1 Prerequisites

To re-enable LAN activity and bring the system back to its normal operating mode:

- You need to know the normal init level of the system. If you don't know the normal init level, ask the system manager.

- You need Superuser capability.

8.4.2.2 Procedure

The steps in re-starting LAN activity and bringing the system back to normal operation are:

1) Modify the /etc/rc file.

2) Enable link level access.

3) Start up LAN activity.

4) Take the system to multi-user mode

If you previously shut down LAN activity on your system, but otherwise left the system operating normally, then you will find the procedure for re-starting LAN activity very familiar. Re-starting LAN activity follows almost the same procedure as shutting down LAN activity; the differences are:

1) In the `/etc/rc` file you undo the editing that disabled the NS/9000 command lines. This puts the NS/9000 commands back into effect and causes LAN activity to start up when the system is booted up.

2) If you used `chmod` commands to shut down link level access, you will need to re-issue those commands -- with a different parameter -- to restore link level access.

3) To start up LAN activity you can either re-boot your system (causing the system to execute the commands in the `/etc/rc` file) or you can manually enter the LAN startup commands that you previously deleted from the `/etc/rc` file.

We will cover these differences in detail in the paragraphs that follow. Since the remainder of the LAN startup procedure is the same as the LAN shutdown procedure that we described above (in the section "Shutting Down LAN Activity", subsection "Leaving the System Running"), we won't repeat all that information. We will, however, briefly list the steps in that procedure, and give a full description of any differences.

8.4.2.2.1 Modifying the /etc/rc File. When you shut down LAN activity, you went into the /etc/rc file and modified the two lines that contained the NS/9000 startup commands: you inserted a "#" symbol at the beginning of each line to change them to comment lines. Now you need to delete the "#" symbols; this changes the lines back to command lines and allows the NS/9000 startup commands to be executed when the system boots up.

Example: In the example /etc/rc file we showed before, you would simply change the two NS/9000 lines from:

```
#                npowerup /etc/netdir
#                vtdaemon
```

to:

```
                 npowerup /etc/netdir
                 vtdaemon
```

End of example

8.4.2.2.2 Enabling Link Level Access. If you previously disabled link level access, you will need to re-enable that access. If your applications that use link level access have specific instructions for re-enabling the link level access, follow those instructions. If, on the other hand, you previously used chmod commands to disable link level access, you will need to use chmod commands here to re-enable that access. The chmod commands use a different parameter (666) for enabling link level access. Use chmod to modify all LANIC device files in the system. The form of the command is:

```
chmod 666 <devicefile>      (Enable LAN activity for the specified device.)
```

Example: For our example system, the commands would be:

```
# chmod 666 /dev/ether

# chmod 666 /dev/ether1

# chmod 666 /dev/ieee

# chmod 666 /dev/ieee1

#
```

End of example

8.4.2.2.3 Starting Up LAN Activity. You can start up LAN activity on the system either by re-booting the system or by typing in the LAN startup commands that you originally removed from the /etc/rc file.

Re-booting causes the system to execute the commands in the /etc/rc file, including the LAN startup commands that you just restored to that file. Re-booting has the disadvantage that it disrupts users who are active on the system. If you do re-boot, use the shutdown -r command and follow the procedure that you used when shutting down LAN activity.

Alternatively, you can type in manually the commands that you originally deleted from the /etc/rc file.

Example: In our example system discussed above, the commands you would type in are npowerup and vtdaemon. The interaction with the system would look like this:

```
# npowerup /etc/netdir
# vtdaemon
#
```

End of example

8.4.2.2.4 Taking the System Multi-User Mode. To take the system to multi-user mode, use the init <n> command. Follow the procedure that you used when shutting down LAN activity.

At this point you have finished bringing the system back to its normal state. NS/9000 and link level access are operating normally, and the system is fully available for users.

8.5 Status and Statistics

The LANDIAG program lets you read the status of the LANIC card. You can also clear the card's statistics registers using LANDIAG.

8.5.1 Prerequisites

To read the status of the LANIC card:

- You need to know the LANIC card's device file name. (Refer to the section on "Setting Up", the subsection on "Finding LANIC Card Information", earlier in this chapter.)

To clear the LANIC card's statistics registers:

- You need to know the LANIC card's device file name.

- You need Superuser capability.

8.5.2 Procedure

The general command sequence for reading card status is:

```
landiag          (Run LANDIAG.)
l                (Enter the LANIC test section.)
n                (Name a LANIC device file.)
<devicefile>     (Enter the device file name.)
d                (Display LANIC status.)
q                (Quit LANDIAG.)
```

LANDIAG assumes that the device file name of your LANIC card is /dev/lan. If your card's device file name is anything else, you must use the "n" (name device) command to enter that name, as shown in the above sequence.

The command sequence for clearing the LANIC card's statistics registers is similar:

```
landiag          (Run LANDIAG.)
l                (Enter the LANIC test section.)
n                (Name a LANIC device file.)
<devicefile>     (Enter the device file name.)
c                (Clear statistics registers.)
q                (Quit LANDIAG.)
```

8.5.3 Example

The following is a typical example of reading LANIC card status and clearing the statistics registers. Note that in this example we use a "t" command to set terse mode and avoid seeing the entire command menu before each command prompt.

```
# landiag ←———Run LANDIAG

             LOCAL AREA NETWORK ONLINE DIAGNOSTIC, Version 2.0
                         Thu May  8 10:00:39 1986


                 Copyright 1985 Hewlett-Packard Company.
                         All rights are reserved.


Test Selection mode.

     lan       = LAN Interface Diagnostic
     menu      = Display this menu

     quit      = Terminate the Diagnostic
     remote    = Remote Node Communications Diagnostic
     terse     = Do not display command menu
     verbose   = Display command menu

Enter command: t ←———Set terse mode
Do not display command menu.

Test Selection mode.

Enter command: l ←———Enter LANIC test

LAN Interface test mode. LAN Interface device file = /dev/lan

Enter command: n ←———Name device file

Enter LAN Interface device file name. Currently /dev/lan: /dev/ieee

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: d ←———Display status
```

```
                    LAN INTERFACE STATUS DISPLAY
                     Thu May  8 10:01:38 1986

Device file                        = /dev/ieee
Select code                        = 1
Current state                      = active
LAN Interface address, hex         = 0x080009004E26
Number of multlcast addresses      = 2
Frames received                    = 12
Frames transmitted                 = 12
Undelivered received frames        = 0
Untransmitted frames               = 1
CRC errors received                = 0
One transmit collision             = 0
More transmit collisions           = 0
Excess retries                     = 1
Deferred transmissions             = 0
Carrier lost when transmitting     = 0
No heartbeat after transmission    = 0
Frame alignment errors             = 0
Late transmit collisions           = 0
Frames lost                        = 0
Unknown protocol                   = 0
Bad control field                  = 0
XID frames received                = 0
TEST frames received               = 11
XID/TEST frames dropped            = 0
Receive errors                     = 0
No buffer for transmit frames      = 0
Few or no receive buffers          = 0
Time domain reflectometry          = 0
Illegal frame size on receive      = 0

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: c <------Clear statistics registers
Clearing LAN Interface statistics reglsters.

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: q <------Quit the diagnostic
Diagnostic terminated by operator.
#
```

End of example

8.6 Self-Test

The LANIC card self-test executes when the card is reset. An External Loopback test is also performed. [Note that in early versions of LANDIAG (version 2.0 and eariler) the external loopback test did not function properly. If you are using version 2.0 or eariler of LANDIAG, refer to the next section of this chapter ("External Loopback Test") for full information on the test and an alternative procedure.]

8.6.1 Prerequisites

To run the self-test:

- You need to know the name of the LANIC card's device file. (Refer to the section on "Setting Up", the subsection on "Finding LANIC Card Information", earlier in this chapter.)
- You need Superuser capability.

8.6.2 Procedure

The general command sequence for executing the card self-test is:

```
landiag         (Run LANDIAG.)
l               (Enter the LANIC test section.)
n               (Name a LANIC device file.)
<devicefile>    (Enter the device file name.)
r               (Reset LANIC, run self-test and External Loopback test.)
d               (Display LANIC status.)
q               (Quit LANDIAG.)
```

LANDIAG assumes that the LANIC card's device file name is /dev/lan. If your LANIC card has a different device file name, you must use the "n" (name) command to specify that name.

If a failure occurs during the test ("r" command), a message will appear on the screen. This message indicates only that there was a failure; it doesn't say what failed. That information is shown by the "d" command, as the selftest completion code (fourth line of output). The meanings of these codes are listed below in the subsection on "Interpretation".

Figure 8-1 shows the area covered by the self-test.

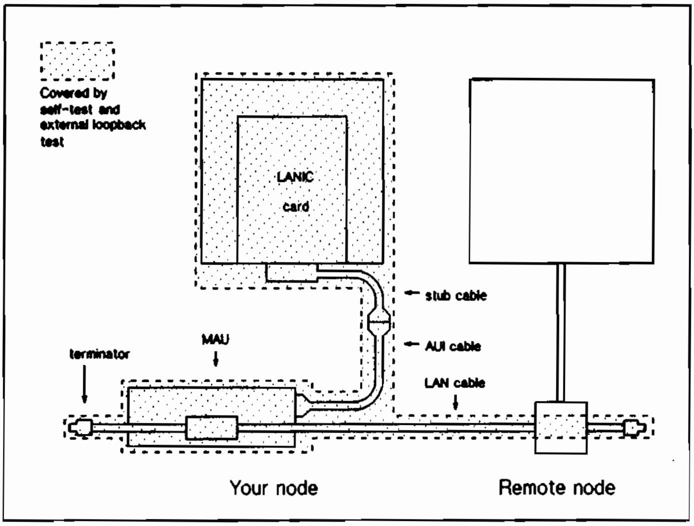


Figure 8-1. Test coverage

8.6.3 Examples

The following examples show two LANIC card self-tests.

Example 1: In the first example the test fails because there was no MAU connected to the AUI cable. Note that in this example we have used the "t" command to put LANDIAG into terse mode; this stops LANDIAG from showing a complete menu before every command prompt.

```
# landiag <------Run LANDIAG


             LOCAL AREA NETWORK ONLINE DIAGNOSTIC, Version 2.0
                           Thu May  8 09:45:06 1986

                 Copyright 1985 Hewlett-Packard Company.
                          All rights are reserved.
```

```
Test Selection mode.

     lan      = LAN Interface Diagnostic
     menu     = Display this menu
     quit     = Terminate the Diagnostic
     remote   = Remote Node Communications Diagnostic
     terse    = Do not display command menu
     verbose  = Display command menu

Enter command: t <------Set terse mode
Do not display command menu.

Test Selection mode.

Enter command: l <------Enter LANIC test

LAN Interface test mode. LAN Interface device file = /dev/lan

Enter command: n <------Name device file

Enter LAN Interface device file name. Currently /dev/lan: /dev/ieee

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: r <------Reset LANIC and run self-test
Resetting LAN Interface to run selftest.
Unable to reset LAN Interface: I/O error <------An error has occurred

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: d <------Display status

                     LAN INTERFACE STATUS DISPLAY
                      Thu May  8 09:49:13 1986

Device file                    = /dev/ieee
Select code                    = 1                  This is the error code
Current state                  = FAILED !!!!
Selftest completion code       = 0x1420;  binary = 0001 0100 0010 0000
* * * *  LAN INTERFACE SELFTEST FAILURE  * * * *

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: q <------Quit the diagnostic
Diagnostic terminated by operator.

#
```

End of example

Example 2: The next example shows the results after the problem has been fixed.

```
.
.
Enter command: r ←——Reset LANIC and run self-test
Resetting LAN Interface to run selftest.
                                   ←————————No error message
LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: d ←——Display status

                      LAN INTERFACE STATUS DISPLAY
                       Thu May  8 09:53:25 1986

Device file                       = /dev/ieee
Select code                       = 1
Current state                     = active ←——No error
LAN Interface address, hex        = 0x080009004E26
Number of multicast addresses     = 2
Frames received                   = 0
Frames transmitted                = 0
Undelivered received frames       = 0
Untransmitted frames              = 0
CRC errors received               = 0
One transmit collision            = 0
More transmit collisions          = 0
Excess retries                    = 0
Deferred transmissions            = 0
Carrier lost when transmitting    = 0
No heartbeat after transmission   = 0
Frame alignment errors            = 0
Late transmit collisions          = 0
Frames lost                       = 0
Unknown protocol                  = 0
Bad control field                 = 0
XID frames received               = 0
TEST frames received              = 0
XID/TEST frames dropped           = 0
Receive errors                    = 0
No buffer for transmit frames     = 0
Few or no receive buffers         = 0
Time domain reflectometry         = 0
Illegal frame size on receive     = 0

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command:
.
.
.
```

End of example

8.6.4 Interpretation

The above examples show typical test results as reported by LANDIAG. How you use those results depends on whether you are using the simplified troubleshooting approach for experienced users (refer to "Troubleshooting for Experiences Users" in chapter 2 of this manual), or whether you are adhering rigorously to the detailed procedures.

If you're using the simplified approach as a general guide for troubleshooting, the `selftest completion code` (as provided by the "d" command after a self-test failure) should give you an idea where to look for the problem. The `selftest completion code` is displayed as a four-digit hexadecimal number and a 16-bit binary number. The meanings of the binary bits are given in the following table. (Bit 15 is the most significant bit; bit 0 is the least significant bit.)

Bit	Meaning
15	= 1 if the internal self-test failed.
14	= 1 if the 10-millisecond timer self-test failed.
13	= 1 if both NOVRAM banks failed recall test.
12	= 1 if the External Loopback test failed.
11	= 1 if a babble error was detected.
10	= 1 if no transceiver heartbeat was sensed.
9	= 1 if the shared data structures could not be accessed.
8	= 1 if the transmit packet could not be accessed.
7	= 1 if underflow occurred.
6	= 1 if a late collision was detected.
5	= 1 if the carrier was lost.
4	= 1 if a retry failure occurred on transmit.
3	= 1 if a framing error occurred.
2	= 1 if an overflow error occurred on receive.
1	= 1 if a CRC error occurred.
0	= 1 if the receive buffer could not be accessed.

If you're following the detailed troubleshooting procedures, note that:

- If bit 15 = 1, the error is internal to the LANIC card.
- If bit 12 = 1, the error is external to the LANIC card.
- All other bits give additional explanation of the specific cause of the malfunction. (Refer to the table above.)
- A retry/collision error is indicated by a failure code of 0x1010 (binary 0001 0000 0001 0000).

Consider the situation in the first example, above. The AUI cable was not connected to the MAU, and the resulting self-test completion code was:

```
Selftest completion code        = 0x1420;  binary = 0001 0100 0010 0000
                                                    ^  ^
                                             Bit 15-+  |
                                                Bit 12-+
```

Since Bit 12 was set to 1, it indicated an error external to the LANIC card. Bits 10 and 5 indicated that no heartbeat was sensed and that the carrier was lost.

MAU Power Failure. Note that the error codes will not indicate a MAU power failure. If the troubleshooting trees ask you to determine whether a MAU power failure has occurred, you will have to check the MAU power fuse or LED on the LANIC card. The MAU power LED is the green LED at the frontplane of the card; when the LED is off, MAU power has failed.

Retry/Collision Error. As noted above, a retry/collision error is indicated by a "Selftest completion code" of 0x1010 (binary 0001 0000 0001 0000).

An indication of such an error is also provided by the "Excess retries" statistic from the LANDIAG "d" command.

8.7 External Loopback Test

Normally there is no separate External Loopback test for the Series 500 LANIC card; it is included with the self-test. At one time, however, a temporary malfunction in the LANDIAG code caused External Loopback test results to be reported incorrectly. This malfunction occurred in early versions of LANDIAG (version 2.0 or earlier), and the work-around procedure for those early versions is given below.

If you have version 2.0 or earlier of LANDIAG, use the work-around procedure given below ("Alternative Test") to get correct results with the troubleshooting trees. If you have a later version of LANDIAG, the following paragraphs ("Standard Test") will point you in the right direction.

8.7.1 Standard Test

The self-test procedure for the LANIC card includes a complete External Loopback test. For correct External Loopback test results using the later versions of LANDIAG, just follow the self-test procedure. Refer to the previous section ("Self-Test") for a description of how to run the self-test and interpret the results.

The bits returned in the `selftest completion` code will indicate whether a failure was internal or external to the LANIC card. If bit 12 is set to 1, the failure was external to the card, and the cause of the failure is reflected in the setting of bits 0 through 11. The meanings of the bits are given in the "Self-Test" section, in the subsection on "Interpretation".

8.7.2 Alternative Test

If you are using an early version (version 2.0 or earlier) of LANDIAG, the following alternative test procedure will indicate failures that are external to the LANIC card.

8.7.2.1 Prerequisites

To run the alternative tests:

- You need to know the LANIC card's device file name.

- You need Superuser capability.

8.7.2.2 Procedure

In its essentials, this procedure consists of clearing the LANIC card's statistics registers, bouncing a TEST packet off the local node, and then reading and interpreting the statistics registers. This involves a lot of commands, because it uses two different sections of the LANDIAG program, but the procedure is really quite straightforward.

The important part of all this is the interpretation of results. Generally, successful completion of the test is indicated by a significant number of transmitted frames (7 or more) and no untransmitted frames; failure is indicated by a significant number of untransmitted frames (4 or more) and no transmitted frames. There are additional inferences you can draw, which we will discuss in the subsection on "Interpretation", below.

The command sequence is:

```
landiag          (Run LANDIAG.)
l                (Enter the LANIC test section.)
n                (Name a LANIC device file.)
<devicefile>     (Enter the device file name.)
c                (Clear statistics registers.)
e                (Exit LANIC test section; back to main menu.)
r                (Enter the Remote Node test section.)
b                (Bounce test packet off local node.)
e                (Exit Remote Node test section; back to main menu.)
l                (Enter the LANIC test section.)
d                (Display LANIC status.)
q                (Quit LANDIAG.)
```

8.7.2.3 Examples

Here are two examples of running the alternative External Loopback test. Note that we have used the "t" (terse) command to avoid showing the entire command menu before each command prompt.

Example 1: In the first example, we show a test that failed.

```
# landiag <------Run LANDIAG


          LOCAL AREA NETWORK ONLINE DIAGNOSTIC, Version 2.0
                       Wed Aug  6 16:12:46 1986

              Copyright 1985 Hewlett-Packard Company.
                       All rights are reserved.

Test Selection mode.

     lan       = LAN Interface Diagnostic
     menu      = Display this menu
     quit      = Terminate the Diagnostic
     remote    = Remote Node Communications Diagnostic
     terse     = Do not display command menu
     verbose   = Display command menu

Enter command: t <------Set terse mode
Do not display command menu.

Test Selection mode.

Enter command: l <------Enter LANIC test
```

```
LAN Interface test mode. LAN Interface device file = /dev/lan

Enter command: n <———Name device file————————————┐
                                                  ↓
Enter LAN Interface device file name. Currently /dev/lan: /dev/ieee

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: c <———Clear statistics registers
Clearing LAN Interface statistics registers.

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: e <———Exit to main menu
End of LAN Interface test mode.

Test Selection mode.

Enter command: r <———Enter Remote Node test

Remote Communications mode.
   Message length = 100, Number of messages to exchange = 1,
   Timeout = 10 seconds, Display round trip time = off.

Enter command: b <———Bounce test packet off local node

                        BOUNCE COMMUNICATION
                      Wed Aug  6 16:16:13 1986

Connection response error. Network connection pending ┐
INCOMPLETE EXCHANGE with node: MA.RND.HP               ├———Error
ONLY 0 of 1 messages were exchanged.                   ┘

Remote Communications mode.
   Message length = 100, Number of messages to exchange = 1,
   Timeout = 10 seconds, Display round trip time = off.

Enter command: e <———Exit to main menu
End of Remote Communications mode.

Test Selection mode.

Enter command: l <———Enter LANIC test

LAN Interface test mode. LAN Interface device file = /dev/ieee
```

```
Enter command: d <———Display status

                         LAN INTERFACE STATUS DISPLAY
                          Wed Aug  6 16:16:35 1986

Device file                        = /dev/ieee
Select code                        = 2
Current state                      = active
LAN Interface address, hex         = 0x080009006E6D
Number of multicast addresses      = 1
Frames received                    = 0
Frames transmitted                 = 0 <┐
Undelivered received frames        = 0  ├———Failure indicators
Untransmitted frames               = 4 <┘
CRC errors received                = 0
One transmit collision             = 0
More transmit collisions           = 0
Excess retries                     = 4
Deferred transmissions             = 0
Carrier lost when transmitting     = 0
No heartbeat after transmission    = 0
Frame alignment errors             = 0
Late transmit collisions           = 0
Frames lost                        = 0
Unknown protocol                   = 0
Bad control field                  = 0
XID frames received                = 0
TEST frames received               = 0
XID/TEST frames dropped            = 0
Receive errors                     = 0
No buffer for transmit frames      = 0
Few or no receive buffers          = 0
Time domain reflectometry          = 0
Illegal frame size on receive      = 0

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: q <———Quit LANDIAG
Diagnostic terminated by operator.
#
```

End of example

Example 2: In the second example, we show a test that passes.

```
.
.
.
Enter command: r ←———Enter Remote Node test

Remote Communications mode
   Message length = 100, Number of messages to exchange = 1,
   Timeout = 10 seconds, Display round trip time = off.

Enter command: b ←———Bounce test packet off local node

                        BOUNCE COMMUNICATION
                     Wed Aug  6 16:14:53 1986

Exchanged 1 messages with node: MA.RND.HP.

Remote Communications mode.
   Message length = 100, Number of messages to exchange = 1,
   Timeout = 10 seconds, Display round trip time = off.

Enter command: e ←———Exit to main menu
End of Remote Communications mode.

Test Selection mode.

Enter command: l ←———Enter LANIC test

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command: d ←———Display status

                    LAN INTERFACE STATUS DISPLAY
                     Wed Aug  6 16:15:04 1986

Device file                      = /dev/ieee
Select code                      = 2
Current state                    = active
LAN Interface address, hex       = 0x080009006E6D
Number of multicast addresses    = 1
Frames received                  = 7
Frames transmitted               = 7 ←┐
Undelivered received frames      = 0  ├———Success indicators
Untransmitted frames             = 0 ←┘
CRC errors received              = 0
One transmit collision           = 0
More transmit collisions         = 0
Excess retries                   = 0
Deferred transmissions           = 0
Carrier lost when transmitting   = 0
No heartbeat after transmission  = 0
Frame alignment errors           = 0
```

```
Late transmit collisions        = 0
Frames lost                     = 0
Unknown protocol                = 0
Bad control field               = 0
XID frames received             = 0
TEST frames received            = 0
XID/TEST frames dropped         = 0
Receive errors                  = 0
No buffer for transmit frames   = 0
Few or no receive buffers       = 0
Time domain reflectometry       = 0
Illegal frame size on receive   = 0

LAN Interface test mode. LAN Interface device file = /dev/ieee

Enter command:
.
.
.
```

End of example

8.7.2.4 Interpretation

The statistics that are useful for interpreting the results are:

```
Frames transmitted
Untransmitted frames
Excess retries
Carrier lost when transmitting
No heartbeat after transmission
Late transmit collisions
```

The test passes if "frames transmitted" is 7 or greater and "untransmitted frames" is 0. The test fails if "untransmitted frames" is 4 or greater and "frames transmitted" is 0. If you are following the detailed troubleshooting procedures rigorously, that's all the information you should need.

If, on the other hand, you are using the simplified approach for experienced users (refer to "Troubleshooting for Experienced Users" in Chapter 2 of this manual), you may be able to glean additional information from the other statistics listed above. Note that if you are doing a transmit collision detection test, you should see a retry error for the test to pass.

Retry/Collision Error. If the troubleshooting procedures instructed you to look for a retry/collision error, check the number of "excess retries" as reported by the display ("d") command: 4 excess retries indicate a retry/collision error. (Example 1, above, shows a retry/collision error.)

8.8 Remote Node Test

You can use the LINKLOOP program to send a TEST packet to a remote node. The LINKLOOP program notifies you whether the remote node received the packet and returned it successfully.

8.8.1 Prerequisites

To run a Remote Node test:

- You need to know the device file name of the LANIC card in the local system. (Refer to the section on "Setting Up", the subsection on "Finding LANIC Card Information", earlier in this chapter.)

- You need to know the station address of the LANIC card in the remote system. (Refer to the section on "Setting Up", the subsection on "Finding LANIC Card Information", in the diagnostic chapter for the computer that is used at the remote node. For instance, if the remote node uses an HP 1000 computer, look in the chapter on the "LAN/1000 Link Diagnostic".)

8.8.2 Procedure

The LINKLOOP program has several parameters that allow you to specify number of TEST packets, timeout values, and so on. All parameters are optional, except that you must specify the station address of the remote node. Note, however, that you must also specify the name of your local LANIC card's device file if it is not /dev/lan or /dev/ieee. (You will even have to specify the device file name for /lan/ieee under certain conditions. If no device file is specified, LINKLOOP looks first for /dev/lan; if your system contains both /dev/lan and /dev/ieee, LINKLOOP won't get to /dev/ieee unless you specify the file name.)

The LINKLOOP command sequence has the general form:

```
linkloop [-n <count>] [-f <file>] [-t <timeout>] [-s<size>] [-v] <linkaddr>
```

where:

count = number of TEST packets to send. The default value is "1". A "0" causes test packets to be sent indefinitely, until you interrupt the transmission by pressing the BREAK key.

file = name of the device file for the LANIC card in your system. You can omit this parameter if the device file name is /dev/lan or /dev/ieee. (Note, however, that if you want to use /dev/ieee and your system contains both /dev/lan and /dev/ieee, then you must specify /dev/ieee explicitly.)

timeout = timeout interval, in seconds. If the packet is not returned to the sending station within the timeout interval, a timeout failure occurs. The default value for this parameter is 2 seconds.

size = size of the TEST packet, in bytes. This value can range from 0 to 1497; the default value is 1497.

linkaddr = station address of the remote station. This must be a hexidecimal number that begins with 0x (to indicate hexidecimal notation) and followed immediately by twelve hexadecimal numerals. There can be no delimiters, such as spaces or dashes, between the numerals (for example: 0x0800090088ab).

-v = "verbose" mode. This causes LINKLOOP to report more information if a failure occurs. The default mode is "terse".

8.8.3 Examples

Following are two examples that show the use of LINKLOOP.

Example 1: The first example shows a test that sends out 10 TEST packets. This test fails because the specified station address does not exist on the network.

```
# linkloop -n 10 0x08000900021b
Loopback to LAN station: 0x08000900021b -- FAILED
    frames sent              : 10
    frames received correctly : 0
    reads that timed out     : 10
#
```

End of example

Example 2: The second example shows a test that sends out 10 TEST packets and receives them all back successfully.

```
# linkloop -n 10 0x08000900021c
Loopback to LAN station: 0x08000900021c -- OK
#
```

End of example

8.8.4 Interpretation

The principal results of the Remote Node test are simple and unambiguous: pass or fail. If you're following the detailed troubleshooting procedure, that should provide you with enough information to continue on to the next step. If you're an experienced troubleshooter using the simplified approach, you may be able to get additional useful information by specifying the -v (verbose) parameter when you run LINKLOOP.

LAN/3000 (MPE-V) Link Diagnostic 9

Contents

As you follow the troubleshooting procedures in chapter 2 of this manual, you are instructed to execute a variety of tests on your computer or computers. This chapter tells you how to run those tests if your computer is an HP 3000 MPE V system.

You can think of most of this chapter as a collection of subroutines. If, for instance, you're working on an HP 3000 and the troubleshooting procedures ask you to run a LANIC card self-test, you would follow the self-test instructions given later in this chapter and then return to the procedures to find the next step.

Note that this chapter is not a detailed description of the LAN diagnostic software on the HP 3000; it just presents enough information to let you follow the troubleshooting procedures.

9.1 Reference and Background Information

9.1.1 System Requirements

The tests described in this chapter run on an HP 3000 computer, Series 37 to 70. The computer must be running the MPE-V operating system, version G.02.00 or later. The NS/3000 network services software, version A.00.00 or later, must be installed and running on the system. Network transport software, version A.00.00 or later, must also be installed and running.

You can find the version of your operating system by executing a showme command. If you don't know what versions of NS/3000 software your system uses, you can find out by running NMMAINT.PUB.SYS.

9.1.2 Capability

The commands you will issue as part of these procedures require that you have the following capabilities:

NM or NA (Node Manager or Network Administrator)

and

OP, SM, or DI (OPerator, System Manager, or DIagnostician)

and

CS (Communications Support)

Most of the time the MANAGER.SYS account has all of these capabilities.

9.1.3 References

For detailed information, you may want to have the following references available as you go through these procedures:

Installation Manuals:

Hardware:

HP 30242A LANIC/3000 Installation and Service Manual, part number 30242-90001
HP 30242A LANIC/3000 Installation and Service Manual (for Series 37), part number 30242-90100
HP 30240A OfficeShare LANIC/3000 Installation and Service Manual, part number 30240-90001
HP 30240A OfficeShare LANIC/3000 Installation and Service Manual (for Series 37), part number 30240-90100

Software:

NS/3000 Network Manager Reference Manual, part number 32344-90002
NS/3000 Error Message and Recovery Manual, part number 32344-90005

Cabling:

LAN Cable and Accessories Installation Manual, part number 5955-7680

Operating Manuals:

NS/3000 User/Programmer Reference Manual, part number 32344-90002

Diagnostic Manuals:

LAN/3000 Diagnostic and Troubleshooting Guide, part number 30242-90003
NS Message Formats Reference Manual, part number 5958-8523

9.2 Setting Up

There are a number of "housekeeping" tasks that you may perform repeatedly as you go through the diagnostic procedures. Rather than clutter up those procedures with the details of the housekeeping tasks, we will gather those details in this section. The tasks are listed in roughly the order that you would perform them.

Note that our examples show your input to the computer in shaded lower case letters, and the computer's response in UNSHADED UPPER CASE LETTERS.

9.2.1 Logging On

The commands that you will issue require the following capabilities:

NM or NA (Node Manager or Network Administrator)

and

OP, SM, or DI (OPerator, System Manager, or DIagnostician)

and

CS (Communications Support)

If your normal account has these capabilities, log on as usual. If not, the MANAGER.SYS account usually has these capabilities. (If it doesn't, check with your system manager for an account that does.)

The general structure of the log-on sequence is:

```
RETURN                                      (Press RETURN to get ":" prompt.)
:hello <user>.<account>                     (Log on.)
ENTER ACCOUNT PASSWORD:<password1>          (Enter account password.)
ENTER USER PASSWORD:<password2>             (Enter user password.)
```

The system may ask you for zero, one, or two passwords, depending on how the system's security is set up. The system blanks out whatever password you type in, to prevent others from reading the passwords from you terminal screen.

Example: The following example shows a typical log-on sequence for the MANAGER.SYS account.

```
RETURN
:hello manager.sys
ENTER ACCOUNT PASSWORD:          <----
                                       System blanks out passwords
ENTER USER PASSWORD:             <----

HP3000 / MPE V  G.A2.00 (BASE G.A2.00).  WED, APR 23, 1986, 10:04 AM
:
```

End of example

9.2.2 Finding Your Capabilities

If you are unsure whether you have the necessary capabilities, you can run LISTDIR5 to find out what capabilities you have. The command sequence is:

```
run listdir5.pub.sys      (Run LISTDIR5.)
listuser                  (List user information.)
e                         (Exit LISTDIR5.)
```

You capabilities are listed in the user information, on the line that begins with "CAP:".

Example: The following example shows how to run LISTDIR5.

```
:run listdir5.pub.sys

LISTDIR5 G.02.00 (C) HEWLETT-PACKARD CO., 1983
TYPE 'HELP' FOR AID

>listuser
********************
USER: MANAGER.SYS

HOME GROUP: PUB          PASSWORD: **
MAX PRI: 150             LOC ATTR: %0
LOGON CNT: 4
CAP: SM,AM,AL,GL,DI,OP,CV,UV,LG,NA,NM,CS,ND,SF,IA,BA,PH,DS,MR,PM
     ^           ^  ^           ^  ^  ^
LOGON GROUP: PUB         SESSION #: S12
LOGON DEV #: 27                              Capabilities of interest
>e

END OF PROGRAM
:
```

End of example

9.2.3 Finding LANIC Card Information

To perform the tests required by the troubleshooting procedure, you commonly need to know the name of the network, the LANIC card's LDEV number, the card's availability, and it's station address. You will need to take the following steps to get all this information:

1) Use `netcontrol status` to get the network name.

2) Use `sysdump $null` to get the LANIC card's device class and LDEV number.

3) Use the LANIC card's device class to get its LDEV number and availability.

4) Use the LANIC card's LDEV number to run LANDIAG.

5) Use LANDIAG to get the LANIC card's station address.

We'll explain all this and more in the paragraphs that follow.

9.2.3.1 Getting the Network Name

You'll need to know the network name before you shut down LAN activity on your system. You must shut down LAN activity before you run a segment test on your LAN cable; shutting down LAN activity is also one of the prerequisites for running the LANDIAG diagnostic program.

You will use the `netcontrol status` command to get the name of your LANIC card's network. The network name shows up as the "HOME NETWORK" in the listing. The form of the command is:

```
netcontrol status       (Get network information.)
```

Example: Here's an example of using `netcontrol status` to get the network name:

```
:netcontrol status

GENERAL TRANSPORT STATUS : WED, APR 23, 1986, 10:09 AM

TRANSPORT STARTED        : WED, APR 23, 1986,  9:59 AM

FLAGS                    : %020000
MAX NETWORK INTERFACES   : 2
PATH DESCRIPTORS         : INIT 100 MAX 100
MAX NODE NAMES           : 10
MAX INBOUND DESTINATIONS: 10

HOME NETWORK             : LAN1<-----------------------Network name
CONFIGURATION FILE       : NSCONF.NET.SYS
TRACE MASK               :

NODE NAME                : SPYGLASS.RND.HP

:
```

End of example

9.2.3.2 Getting the LANIC Card's Device Class and LDEV Number.

You'll need the LANIC card's device class to get the card's LDEV number. You can use the sysdump $null command to get the device class. (The default device class for a LANIC card is "LANIC". The system manager has the option of assigning a different name, but on many systems the default is used. To see whether the default name for the device class is used on your system, you can try doing a showdev lanic command. (Refer to the paragraphs on "Getting the LANIC Card's LDEV Number and Device Availability", below.) If you get back an LDEV number and an availability, you have the information you need and you can skip the sysdump step. If you don't get back that result, continue on with this procedure.)

As you interact with sysdump, you will work your way through a series of questions until you tell sysdump to list the I/O devices on the system. As sysdump lists the devices, look in the next-to-last column for a driver named IOLANO. When you find it, the LDEV number is listed in the first column and the device class is listed next to the driver (in the last column); that's the information you want. After you've got it, you can abort sysdump. The command sequence is:

```
sysdump $null       (Read system information.)
y                   (Make system changes.)
[RETURN]            (Leave system I.D. unchanged.)
[RETURN]            (Leave memory size unchanged.)
y                   (Make I/O configuration changes.)
y                   (List I/O devices.)
[BREAK]             (Break sysdump; do not continue.)
abort               (Abort sysdump; return to system prompt.)
```

Example: Here's an example of a typical interaction with sysdump to get the LANIC card's device class.

```
:sysdump $null

ANY CHANGES? y
SYSTEM ID = HP32033G.UB.13.? RETURN
MEMORY SIZE = 3072 (MIN=256, MAX=8192)? RETURN
I/O CONFIGURATION CHANGES? y
LIST I/O DEVICES? y

LOG DRT U  C T SUB              REC   OUTPUT  MODE    DRIVER   DEVICE
DEV  #  N  H Y TYPE  TERMINAL   WIDTH  DEV             NAME    CLASSES
 #      I  A P      TYPE SPEED
        T  N E
1   89  0  0 0  9                128    0              HIOMDSC1 DISC
                                                                SPOOL
                                                                SYSDISC
2   89  1  0 0  9                128    0              HIOMDSC1 DISC
                                                                SPOOL
6   100 0  0 32 4                40     0          S   HIOLPRTO LP
7   73  0  0 24 0                128    0              HIOTAPEO TAPE
.
.
.
38  16  10 0 16 0   10    960    66     38     JAID    HIOTERM1 ATPTERM
39  16  11 0 16 0   10    960    66     39     JAID    HIOTERM1 ATPTERM
40  48  0  0 17 9                0      0              IOLANO   LANIC
.↑                                                        ↑        ↑
.LDEV number                                      LANIC driver     |
.                                                   LANIC device class
.
.
72  24  22 0 16 1   10    960    40     72     JAID    HIOTERM1 DMITERM
73  24  23 0 16 1   10    960    40     73     JAID    HIOTERM1 DMITERM
100 96  0  0 17 3                0      0              IOINPO   INP
101#100 0  0 41 0                128    0        I     IODSO    TAHOE

LIST CS DEVICES? y
LDN PM PRT LCL TC  RCV   LCL   CON   MODE   TRANSMIT  TM BUFFER D DRIVER
           MOD     TMOUT TMOUT TMOUT          SPEED       SIZE  C OPTIONS
40  0  X    X  X   0     0     0            0         0  0      N  0
100 0  X    X  X   20    60    900          7000      0  1024   N  0

LIST DEVICE DEFAULTS? BREAK
:abort

PROGRAM ABORTED PER USER REQUEST.  (CIERR 989)
:
```

End of example

9.2.3.3 Getting the LANIC Card's LDEV Number and Availability

You can get the LANIC card's LDEV number using the showdev command. This command will also give you information about the LANIC card's availability.

You will use the LANIC card's LDEV number for most of the tests in the troubleshooting procedure. You'll need to supply it to run LANDIAG, which in turn is used to run the self-test, the External Loopback test, and the Remote Node test. In addition, the LANIC card availability status tells you whether the card is available for running LANDIAG.

Once you have used sysdump to get the LANIC card's device class, it is easy to get its LDEV number; just use the showdev command. The command format is:

```
showdev <deviceclass>        (Show information for the specified device.)
```

The first column of information shows the LDEV number. The second column shows whether or not the device is available. If the LANIC card is available, LAN activity (network services) is shut down and you can run LANDIAG. If the LANIC card is unavailable and is owned by SYS #1, then NS/3000 (network services) is active; you can't run LANDIAG, but you can use the LANIC card as the remote node in a Remote Node test.

Example 1: This example shows the LDEV number and availability for the LANIC card when neither NS/3000 nor LANDIAG is running.

```
:showdev lanic
LDEV  AVAIL         OWNERSHIP        VOLID        DEN   ASSOCIATION

 40   AVAIL
:
```

End of example

Example 2: This example shows the LDEV number and availability for the LANIC card when NS/3000 is up and running.

```
:showdev lanic
LDEV  AVAIL         OWNERSHIP        VOLID        DEN   ASSOCIATION

 40   UNAVAIL       SYS #1
:
```

End of example

9.2.3.4 Running LANDIAG

LANDIAG is the utility from which you run the self-test, the External Loopback test, and the Remote Node test. You also use LANDIAG to get the LANIC card's station address.

In these paragraphs we will show how to get into LANDIAG and how to get out of it. We will not show how to run the various tests; that information is described in detail later in later sections of this chapter.

9.2.3.4.1 Prerequisites. To run LANDIAG:

- You need to know the LDEV number of the LANIC card. (Refer to the paragraphs on "Finding the LANIC Card's LDEV Number and Availability", above.)

- Either:

  1) The LANIC card must be AVAILABLE. Refer to the paragraphs on "Finding the LANIC Card's LDEV Number and Availability", above.)

  or:

  2) You must shut down LAN activity before running LANDIAG. (Refer to the section on "Shutting Down LAN Activity", later in this chapter.)

9.2.3.4.2 Procedure. The general command sequence for running LANDIAG is:

```
sysdump $null                 (Search for LANIC card's device class.)
.
.                             (Respond to sysdump prompts as appropriate.)
.
showdev <deviceclass>         (Get the LDEV number of the LANIC card.)
netcontrol status             (Get the network name.)
nscontrol stop                (Shut down network services.)
netcontrol stop               (Shut down the network interface.)
run landiag.pub.sys           (Run LANDIAG.)
<ldev>                        (Specify LDEV of LANIC card.)
.
.                             (Execute LANDIAG commands.)
.
exit                          (Exit LANDIAG.)
netcontrol net=loop;start     (Start up loopback server for transport.)
netcontrol net=<name>;start   (Start up the network interface.)
nscontrol start               (Start up network services.)
```

That's the complete command sequence for running LANDIAG, including the commands for getting the prerequisite information and for shutting down and starting up LAN activity on your node. The procedures for getting the prerequisite information are covered in detail earlier in this subsection ("Finding LANIC Card Information") and the commands for shutting down and starting up LAN activity are covered later in this chapter in the sections entitled (appropriately enough) "Shutting Down LAN Activity" and "Starting Up LAN Activity".

In the command sequence above we have assumed that you will shut down LAN activity before you run LANDIAG, and that you will restart LAN activity afterward. Those steps are accomplished by the `netcontrol` and `nscontrol` commands. You can bypass those steps if the LANIC card is `AVAILABLE`, as indicated by the `showdev` command.

Once you are actually running LANDIAG and have supplied the LDEV number of the LANIC card, LANDIAG will give you a ">" prompt. The most common responses to that prompt are:

`test <nn>` This command specifies the number of the test that you want to run; it can be any number between 1 and 17. Alternatively, you can type **`test all`** to specify tests 1 through 15. (These are equivalent to the self-test and the External Loopback test.) The default value is **`all`**. The **`help`** command, described shortly, gives you a list of the tests and their numbers.

The value you specify remains in effect until you change it.

`go` This command executes the currently specified test or tests. If you enter the **`go`** command again without changing your test specification, it will execute the same test(s) again.

`help` This command displays a list of all LANDIAG commands, a list of the LANDIAG tests you can run, and the station address of your LANIC card.

`exit` This command terminates LANDIAG and returns to MPE.

Note that this is not an exhaustive description of LANDIAG. For full information, refer to the *LAN/3000 Diagnostic and Troubleshooting Manual*, part number 30242-90003.

9.2.3.4.3 Example. In the following example we show a simple LANDIAG session that executes the default series of diagnostic tests (self-test and External Loopback test, tests 1 through 15) and then exits back to MPE. We omit all the steps to find prerequisite information and to shut down and start up LAN activity.

```
:run landiag.pub.sys

LAN Node Diagnostic, version A.55.27.000  HP1984 (c).
Please enter ldev number of LANIC to be tested.
40
Enter 'H' for help.
> go

  1 *
  2 *
  3 ***
  4 ***
  5 ****
  6 ***
  7 ******
  8 **
  9 *****
  10 *************
  11 *****
  12 *****
  13 *****
  14 ******
  15 ***  End of Pass

> exit
End of LAN Node Diagnosis.

END OF PROGRAM
:
```

End of example

9.2.3.5 Getting the LANIC Card's Station Address

If you intend to do a Remote Node test to another node in your network, you will need to know the station address of the LANIC card at that node. If that remote node is an HP 3000, there are two ways to find the station address of the LANIC card.

The Right Way. Look on your network map. If you have kept your network map current, it will show the correct station address of the remote node. If your network map is out of date or (perish the thought!) non-existent, you might be lucky enough to find that someone has noted the station address on the back of your computer. Failing that, you'll have to resort to the second method.

The Ordinary Way. You can get the information by running LANDIAG. (LANDIAG and all its prerequisites are explained in detail in the paragraphs immediately above – "Running LANDIAG" – so we won't explain that information again here.) Of course, to get the station address for a remote HP 3000 node, you need to run LANDIAG **from that remote node.**

To get the station address from LANDIAG, use the HELP command. That command produces valid results only after you have run the self-test. Thus, the command sequence for finding the station address, once you have gotten through all the preliminaries, is:

```
run landiag.pub.sys     (Run LANDIAG.)
<ldev>                  (Specify the LDEV number of the LANIC card.)
go                      (Run the self-test and External Loopback test.)
help                    (Show commands, tests, and station address.)
exit                    (Exit LANDIAG.)
```

The station address of the LANIC card on your system shows up as the last item of information provided by the help command.

Example: A typical procedure for finding the station address might look like this:

```
:run landiag.pub.sys

LAN Node Diagnostic, version A.55.27.000  HP1984 (c).
Please enter ldev number of LANIC to be tested.
40
Enter 'H' for help.
> go <-----------Run self-test and External Loopback test

  1 *
  2 *
  3 ***
  4 ***
  5 ****
  6 ***
  7 ******
  8 **
  9 *****
  10 *************
  11 *****
  12 *****
  13 *****
  14 ******
  15 ***  End of Pass

> help
        Node Diagnostic Commands and Tests

EXIT     terminates this program and returns to MPE.
GO       initiates execution of the test set.
HELP     displays this screen.
LOOP [N] chooses the number of times the test set is
         executed.  (Initially 1, Default = forever)
NOPRINT  suppresses terminal and file output.
PRINT    resumes generation of output.  (Default)
TEST < n / ALL > selects a single test or tests 1 - 15.
                (Default = All)
```

```
Type < control-y > to discontinue testing.

#1 Roll Call Test        #7 CR SR Loop Test          #13 Coprocessor Test
#2 Channel ID Test       #8 Bus Conflict Test        #14 MAU Loopback Test
#3 Initialization Test   #9 Address Offset Test      #15 Date Code Test
#4 Self Test            #10 Extended Address Test    #16 Hood Loopback Test
#5 Interrupt Test       #11 Fifo Write Test          #17 Remote Node Test
#6 Soft Reset Test      #12 F/P Conflict Test

Local station address is 0800 0900 28F0          <——LANIC station address

> exit
End of LAN Node Diagnosis

END OF PROGRAM
:
```

End of example

9.2.4 Logging Off

To log off from the system, use the bye command. The form is:

```
bye        (Log off.)
```

Example: A typical log-off looks like this:

```
:bye
CPU=64. CONNECT=28. WED, APR 23, 1986, 10:31 AM
```

End of example

9.3 Shutting Down LAN Activity

You must shut down LAN activity on your node before you run LANDIAG or before you run a segment test on the LAN cable.

9.3.1 Prerequisites

To shut down LAN activity on your node:

- You need to know the name of the network you system is attached to. (Refer to the section "Setting Up", the subsection "Finding LANIC Card Information", earlier in this chapter, for details on finding the network name.) You don't actually need the network name to shut down LAN activity; but you do need it to bring LAN activity back up, and you can't easily get it once LAN activity has been shut down.

9.3.2 Procedure

The command sequence for shutting down LAN activity on a node is:

```
nscontrol stop       (Shut down network services.)
netcontrol stop      (Shut down the network interface.)
```

If you are using the system console, or if logging is enabled for your user.account, you will see several status messages. These are shown in the examples, below. If you are using an ordinary terminal with logging not enabled, you won't see any additional information when you shut down LAN activity.

9.3.3 Examples

Example 1: If you are using an ordinary terminal, the interaction is not very exciting.

```
:nscontrol stop
:netcontrol stop
:
```

End of example

Example 2: If you're operating from the system console, or if logging is enabled for your user.account, you see the status messages:

```
:nscontrol stop
RPM NETWORK SERVICE STOPPED.
PTOP NETWORK SERVICE STOPPED.
RFA NETWORK SERVICE STOPPED.
VTR NETWORK SERVICE STOPPED.
VT NETWORK SERVICE STOPPED.
NFT NETWORK SERVICE STOPPED.
RPML NETWORK SERVICE STOPPED.
PTOPL NETWORK SERVICE STOPPED.
RFAL NETWORK SERVICE STOPPED.
VTRL NETWORK SERVICE STOPPED.
VTL NETWORK SERVICE STOPPED.
NFTL NETWORK SERVICE STOPPED.
:netcontrol stop
```

9.4 Starting Up LAN Activity

Once you have finished using LANDIAG or running a segment test, you will want to re-start LAN activity at your node.

9.4.1 Prerequisites

To start up LAN activity at your node:

- You need to know the name of the network that your LANIC card is connected to. (You get this information with the `netcontrol status` command. Refer to the section "Setting Up", subsection "Finding LANIC Card Information", earlier in this chapter.)

9.4.2 Procedure

Once you know the network name, the commands you use to bring up your node are:

```
netcontrol net=loop;start        (Start internal transfer of NFT and RPM.)
netcontrol net=<name>;start      (Start up the network interface.)
nscontrol start                  (Start up network services.)
```

Be sure to type in all parameters as indicated. If you leave out the `net=<name>` parameter, no error message will be displayed; NS/3000 will not work.

If you are using the system console, or if logging is enabled for your user.account, you will see several status messages. These are shown in the examples, below. If you are using an ordinary terminal with logging not enabled, you won't see any additional information when you start up LAN activity.

9.4.3 Examples

Example 1: If you are using an ordinary terminal, the display looks like this:

```
:netcontrol net=loop;start
:netcontrol net=lan1;start
:necontrol start     ^
:                    |________________________Network name
```

End of example

Example 2: If If your terminal is the system console, or if logging is enabled for your user.account, you will see the status messages:

```
:netcontrol net=loop;start
:netcontrol net=lan1;start
---> VALIDATION OF NETXPORT SUBSYSTEM STARTED  <---
---> VALIDATION OF NETXPORT SUBSYSTEM FINISHED <---
:necontrol start
RPM NETWORK SERVICE STARTED.
PTOP NETWORK SERVICE STARTED.
RFA NETWORK SERVICE STARTED.
VTR NETWORK SERVICE STARTED.
VT NETWORK SERVICE STARTED.
NFT NETWORK SERVICE STARTED.
RPML NETWORK SERVICE STARTED.
PTOPL NETWORK SERVICE STARTED.
RFAL NETWORK SERVICE STARTED.
VTRL NETWORK SERVICE STARTED.
VTL NETWORK SERVICE STARTED.
NFTL NETWORK SERVICE STARTED.
```

End of example

9.5 Statistics

You can read the LANIC card's statistics using the showcom command; you can also reset the card's statistics counters using showcom.

9.5.1 Prerequisites

To read and/or reset statistics from the LANIC card:

- You must know the LDEV number of the LANIC card. (Refer to the section "Setting Up", subsection "Finding LANIC Card Information", earlier in this chapter.)

- You must have access to the system console.

To use the showcom command, you must either issue it from the system console or be allowed permission (using the allow command) to issue it from your terminal. The allow command can be issued only from the system console; it must be issued while you are logged on to the system, and is valid only as long as you remain logged on.

9.5.2 Procedure

There are two procedures for finding LANIC card statistics; which one you use depends on whether you are doing your troubleshooting from the system console or from an ordinary terminal. The procedures are:

If you're troubleshooting from the system console:

```
showcom <ldev>;errors[;reset]        (Show statistics.)
```

If you're troubleshooting from an ordinary terminal:

From your terminal:
```
<log on>                                  (You must be logged on.)
```
From the system console:
```
allow <user.account>;commands=showcom     (Allow use of showcom.)
```
From your terminal:
```
showcom <ldev>;errors[;reset]             (Show statistics.)
```

Resetting the LANIC card's statistics counters is optional; you see the same display of statistics whether or not you reset them.

9.5.3 Example

The following example shows the reading of statistics from an ordinary terminal. In this example the statistics are reset after they are read.

```
From your terminal:
<log on>
:
From the system console:
:allow manager.sys;commands=showcom
:
From your terminal:
:showcom 40;errors;reset
   TRANSMIT          LDN - 40          RECEIVE
MESSAGES SENT       11          MESSAGES RECVD 19
COLLISIONS          0           BCC/CRC ERRORS 0
EXC COLLISION ERRS  0           BUFF OVERFLOWS 0
UNDERRUNS           0           OVERRUNS       0
CLR TO SEND LOSSES  0           LENGTH ERRORS  0
            # OF RECOVERABLE ERRORS   0
            LAST RECOVERABLE ERROR    0
            # OF IRRECOVERABLE ERRORS 0
            LAST IRRECOVERABLE ERROR  0
            LINE IS CONNECTED

:
```

End of example

9.6 Self-Test

9.6.1 Prerequisites

To run the LANIC card self-test:

- You must know the LDEV number of the LANIC card. (Refer to the section "Setting Up", subsection "Finding LANIC Card Information", earlier in this chapter.)

- You must be able to access the LANIC card. This requires that LAN activity be shut down (refer to the section on "Shutting Down LAN Activity", earlier in this chapter; this will further require that you know the name of the network). When LAN activity is shut down, the LANIC card will be AVAILABLE, as indicated by the showdev command (refer to the section "Setting Up', subsection "Finding LANIC Card Information", earlier in this chapter)

The self-test is part of the LANDIAG diagnostic. The above requirements are the prerequisites for running LANDIAG.

9.6.2 Procedure

After you have satisfied the prerequisites given above, the command sequence for running the LANIC card self-test is:

```
run landiag.pub.sys     (Run LANDIAG.)
<ldev>                  (Specify the LDEV number of the LANIC card.)

go                      (Run the default tests (1 through 15).)
.
.                       (Optionally, additional LANDIAG commands.)
.
exit                    (Exit LANDIAG.)
```

Strictly speaking, the LANIC card self-test is only test 4 of LANDIAG. For best results, however, we recommend that you use the default series of tests, tests 1 through 15. These tests perform a number of checks of system integrity before allowing the self-test to be run; this prevents a failure in the card self-test from interfering with the normal operation of the computer system. (For a full description of the LANDIAG tests, refer to the *LAN/3000 Diagnostic and Troubleshooting Guide*.) To execute tests 1 through 15, simply type

```
go
```

when you see the first LANDIAG prompt (">"), as indicated in the command sequence above. After you have run through tests 1 through 15 at least once, and while you are still in LANDIAG, you can choose to execute just test 4 (the card self-test) by typing:

```
test 4     (This specifies test 4 as the test to execute.)
go         (This executes the specified test.)
```

From here on, you can repeat the card self-test by typing "go", until you specify some other test with the `test` command.

Figure 9-1 shows the areas covered by the self-test and by tests 1 through 15. Note that a rudimentary External Loopback test is included in test 4; a thorough External Loopback test is included in the larger set of tests (tests 1 - 15) as test 14.

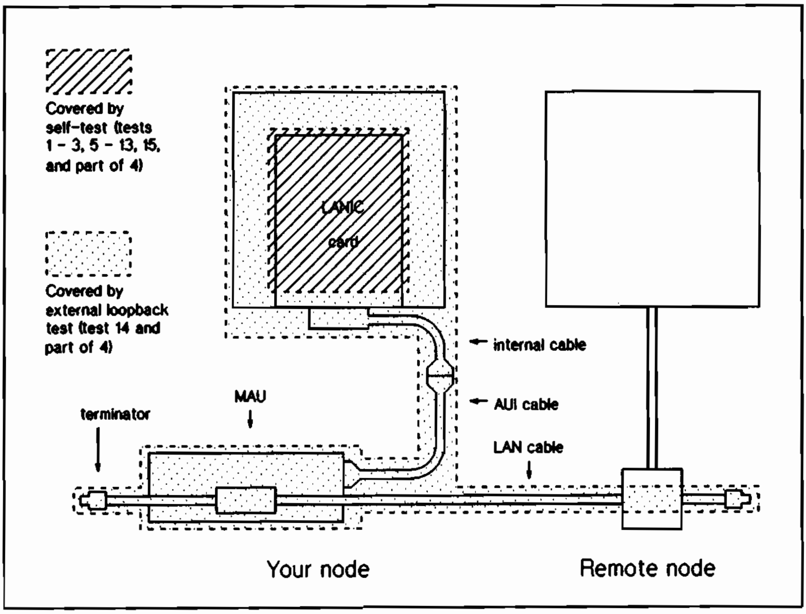


Figure 9-1. Test coverage

9.6.3 Examples

Example 1: In this example we ran the default series of tests (1 through 15); thus we did not have to use the `test` command to specify the tests to be run. The tests failed because of a short circuit in the LAN co-processor. Note that there was also a failure of the External Loopback test (test 14), even though the problem was internal to the LANIC card. The self-test step number reported by the diagnostic gives useful error information, as discussed below in the "Interpretation" paragraphs.

```
:run landiag.pub.sys

LAN Node Diagnostic, version A.55.26.002  HP1984 (c).
Please enter ldev number of LANIC to be tested.
40
Enter 'H' for Help.
> go

  1 *
  2 *
  3 ***
  4 ***
 Error in test  4, step  3 (Self Test)          WED, APR 23, 1986, 10:19 AM
Self test step number is   44
                            ^
  5 ****                    |
  6 ***                     └--------Useful information
  7 ******
  8 **
  9 *****
  10 *************
  11 *****
  12 *****
  13 **
 Error in test 13, step  2 (LAN Coprocessor)    WED, APR 23, 1986, 10:20 PM

  14 ****
 Error in test 14, step  4 (Loopback on MAU)    WED, APR 23, 1986, 10:20 PM

The following was detected:
Number of collisions experienced = 0
**
  15 ***  End of Pass

> exit
End of LAN Node Diagnosis.

END OF PROGRAM
:
```

End of example

Example 2: After the problem has been fixed, re-running the tests yields these results:

```
:run landiag.pub.sys

LAN Node Diagnostic, version A.55.26.002  HP1984 (c).
Please enter ldev number of LANIC to be tested.
40
Enter 'H' for Help.
> go

  1 *
  2 *
  3 ***
  4 ***
  5 ****
  6 ***
  7 ******
  8 **
  9 *****
  10 *************
  11 *****
  12 *****
  13 *****
  14 ******
  15 ***  End of Pass

> exit
End of LAN Node Diagnosis.

END OF PROGRAM
:
```

End of example

9.6.4 Interpretation

The examples above show some typical self-test results as reported by LANDIAG. How you use those results depends on whether you are using the simplified troubleshooting tree as a general guide for troubleshooting (refer to the section on "Troubleshooting for Experienced Users" in chapter 2), or whether you are adhering rigorously to the detailed troubleshooting procedures.

If you're just using the simplified tree as a general guide, we're pretty much going to let you fend for yourself. You can take all the error information that LANDIAG provides and go off searching for the cause of your network's problems. That's perfectly appropriate if you're using the troubleshooting tree as a general guide, since you can probably draw more useful inferences from those error messages and their context than we can provide in a general procedure description.

If, on the other hand, you're trying to follow the detailed troubleshooting procedures step by step, we'll try to give you the specific information you need. You're probably here because a box in the procedures said something like: "Run the self-test on node A." You're looking for a result that will direct you to take the "pass" or "fail" branch from that box. Here's what we can tell you about the results.

Pass. If you run tests 1 through 15 and get no error messages (as in the second example, above), then the self-test has passed. That's all you need to know to continue the troubleshooting flowcharts.

Fail test 4. Test 4 is the actual LANIC card self-test. It executes in 46 steps. If there is a failure in steps 1 through 35 or in steps 37 through 45, you have a problem with the LANIC card; take the appropriate branch to the next box in the troubleshooting flowcharts and do whatever is called for – most likely, repair or replace the LANIC card.

Step 46 of test 4 is an External Loopback test. If only step 46 fails, you can still consider that the card itself passed self-test; the problem is external to the card. The results of test 14 (the MAU loopback test) will illuminate the problem further; the troubleshooting flowcharts will instruct you to consider those results either now or sometime soon.

That leaves step 36. Step 36 is a bit tricky. It tests the switching of power to the MAU, and is partly internal to the card and partly external. For our purposes here, treat a failure of step 36 as an external failure, and go on to the appropriate box in the flowcharts.

Fail test 14. Test 14 is the complete MAU Loopback test (otherwise known as an External Loopback test). This test will give full details of any external failure ecountered in step 46 of test 4. A failure in step 1, 2, or 9 indicates a problem with the LANIC card. A failure in step 3 - 8 indicates a problem outside the LANIC card. Take appropriate action as directed by the troubleshooting flowcharts.

Fail some other test. The remainder of the tests in the standard LANDIAG test set (1 - 3, 5 - 13, and 15) indicate failures in the communication between the computer and the LANIC card. Generally speaking, the troubleshooting procedures won't isolate these kinds of problems. So if you get a failure in one of these tests, you should probably depart from the flowcharts and fix the failure; then return to the top of the flowchart. The *LAN/3000 Diagnostic and Troubleshooting Guide* can help you to find and fix such failures.

MAU Power Failure. If the troubleshooting procedures instructed you to identify a MAU/ThinMAU power failure, it will be indicated by a failure in step 36 of test 4.

9.7 External Loopback Test

The steps for running the External Loopback test are very similar to those for running the self-test; in fact, they don't really differ until you get down to analyzing the results. Like the self-test, the External Loopback test is one of the tests in the default selection of tests (tests 1 through 15) of LANDIAG. The External Loopback test is test 14; it is a more complete test than the loopback step of test 4 (the self-test).

The paragraphs below give the complete prerequisites and procedures for running the External Loopback test. If you have recently run the self-test, most of this information should be familiar to you; you can skim through it, paying some attention to the examples, and concentrate on the paragraphs on "Interpretation" of the test.

9.7.1 Prerequisites

To run the LANIC card External Loopback test:

- You must know the LDEV number of the LANIC card. (Refer to the section "Setting Up", subsection "Finding LANIC Card Information", earlier in this chapter.)

- You must be able to access the LANIC card. This requires that LAN activity be shut down (refer to the section on "Shutting Down LAN Activity", earlier in this chapter; this will further require that you know the name of the network). When LAN activity is shut down, the LANIC card will be AVAILABLE, as indicated by the showdev command (refer to the section "Setting Up', subsection "Finding LANIC Card Information", earlier in this chapter)

The External Loopback test is part of the LANDIAG diagnostic. The above requirements are the prerequisites for running LANDIAG.

9.7.2 Procedure

After you have satisfied the prerequisites given above, the command sequence for running the LANIC card External Loopback test is:

```
run landiag.pub.sys     (Run LANDIAG.)
<ldev>                  (Specify the LDEV number of the LANIC card.)
go                      (Run the default tests (1 through 15).)
.
.                       (Optionally, additional LANDIAG commands.)
.
exit                    (Exit LANDIAG.)
```

Strictly speaking, the LANIC card External Loopback test is only part of test 4 plus test 14 of LANDIAG. For best results, however, we recommend that you use the default series of tests, tests 1 through 15. These tests perform a number of checks of system integrity before allowing the self-test and External Loopback test to be run; this prevents a failure in the card self-test from interfering with the normal operation of the computer system. (For a full description of the LANDIAG tests, refer to the *LAN/3000 Diagnostic and Troubleshooting Guide*.) To execute tests 1 through 15, simply type

```
go
```

when you see the first LANDIAG prompt (">"), as indicated in the command sequence above. After you have run through tests 1 through 15 at least once, and while you are still in LANDIAG, you can choose to execute just test 14 (the full External Loopback test) by typing:

```
test 14      (This specifies test 14 as the test to execute.)
go           (This executes the specified test.)
```

From here on, you can repeat the External Loopback test by typing "go", until you specify some other test with the `test` command.

Figure 9-1, in the section on the "Self-Test", above, shows the areas covered by the External Loopback test.

9.7.3 Examples

Example 1: In the first example we ran the default tests (1 through 15); they failed because the AUI cable was not connected to the MAU. The test step numbers reported by the diagnostic give useful error information, as discussed below in the "Interpretation" paragraphs.

```
:run landiag.pub.sys

LAN Node Diagnostic, version A.55.26.002  HP1984 (c).
Please enter ldev number of LANIC to be tested.
40
Enter 'H' for Help.
> go

  1 *
  2 *
  3 ***
  4 ***
 Error in test  4, step  3 (Self Test)           WED, APR 23, 1986, 10:19 AM
Self test step number is   46

  5 ****
  6 ***
  7 ******
  8 **
  9 *****
  10 *************
  11 *****                        Useful information
  12 *****
  13 *****
  14 ****
 Error in test 14, step  4 (Loopback on MAU)     WED, APR 23, 1986, 10:20 AM

The following was detected:
Transmit quit 2 time(s) due to excessive collisions
Number of collisions experienced = 32
**
 Error in test 14, step  7 (Loopback on MAU)     WED, APR 23, 1986, 10:20 AM

  15 ***  End of Pass
                                  Useful information

> exit
End of LAN Node Diagnosis.

END OF PROGRAM
:
```

End of example

Example 2: After the problem has been fixed, re-running the tests yields these results:

```
:run landiag.pub.sys

LAN Node Diagnostic, version A.55.26.002  HP1984 (c).
Please enter ldev number of LANIC to be tested.
40
Enter 'H' for Help.
> go

  1 *
  2 *
  3 ***
  4 ***
  5 ****
  6 ***
  7 ******
  8 **
  9 *****
  10 *************
  11 *****
  12 *****
  13 *****
  14 ******
  15 ***  End of Pass

> exit
End of LAN Node Diagnosis.

END OF PROGRAM
:
```

End of example

9.7.4 Interpretation

The results you're really interested in here are those for test 14, the External Loopback test. As was the case with the self-test results, how you use the External Loopback test results depends on your approach to troubleshooting. If you are using the simplified tree as a general guide (refer to the section on "Troubleshooting for Experienced Users" in chapter 2), we'll just let you take the information supplied in the error messages to test 14 and use it to isolate the problem in the way that seems best to you.

If, however, you are following the detailed troubleshooting procedures rigorously, the following information about the results of test 14 should be useful to you.

Pass. If you run test 14 and get no error messages (as in the second example, above), then the External Loopback test has passed. That's all you need to know to continue following the flowcharts.

Fail step 1, 2, or 9. A failure in one of these tests indicates a problem in the LANIC card itself. Take the appropriate action as indicated by the troubleshooting flowcharts. (This usually means repairing or replacing the LANIC card.)

Fail step 3 - 8. A failure in one of these tests indicates a problem that is outside the LANIC card. The troubleshooting flowcharts will direct you to take the appropriate action.

For more information on the test results and possible causes of failures, refer to the *LAN/3000 Diagnostic and Troubleshooting Guide.*

Retry/Collision Error. If the troubleshooting procedures instruct you to look for a retry/collision error, you can find that error by looking at the results of the default series of tests (tests 1-15). If a retry/collision error occurs, tests 4 and 14 will fail.

Test 4 will fail at step 3 (self test step number 46) and test 14 will fail at step 4 and step 7.

In addition, if a retry error occurred, the testing must show that transmit quit 8 times due to excess collisions and that 176 collisions were experienced.

9.8 Remote Node Test

The Remote Node test sends TEST packets to a remote node and reports whether they were looped back successfully.

9.8.1 Prerequisites

To run the Remote Node test:

- You must know the LDEV number of the LANIC card. (Refer to the section "Setting Up", subsection "Finding LANIC Card Information", earlier in this chapter.)

- You must be able to access the LANIC card. This requires that LAN activity be shut down (refer to the section on "Shutting Down LAN Activity", earlier in this chapter; this will further require that you know the name of the network). When LAN activity is shut down, the LANIC card will be AVAILABLE, as indicated by the showdev command (refer to the section "Setting Up', subsection "Finding LANIC Card Information", earlier in this chapter)

- You must know the station address of the LANIC card at the remote node. (The easiest way to get the station address is to look on an up-to-date and accurate network map. If you don't have such a map, the task becomes somewhat more involved. If the remote node is an HP 3000 computer running the MPE-V operating system, you can go to that computer and use the procedure for finding the station address that is given in the section "Setting Up", subsection "Finding LANIC Card Information", earlier in this chapter. If the remote node is any other type of computer, go to the chapter in this manual that describes that computer and look in the same section and subsection. For instance, if the remote node is an HP 1000, you would find the information on finding the station address in the chapter "LAN/1000 (RTE-A) Link Diagnostic", section "Setting Up", subsection "Finding LANIC Card Information". Note that, in any case, **the diagnostics can't tell you a node's station address remotely; you must go to the remote node to find its station address.**

- You must run the default series of tests (tests 1-15) before you run the Remote Node test. The default tests must be run sometime in the same LANDIAG session.

- The remote node must be ready to receive packets and transmit them back to the sending node. This requires that:

  - if the remote node is an HP 1000, it must have a LANIC card installed and the system must be powered up

  - if the remote node is an HP 3000, it must have NS/3000 up and running or it must be running LANDIAG and sitting at the prompt in test 17 that says:

    ```
    Hit return to initiate looping of test frames (1000 max),
    use <control-y> to stop.
    ```

    The sequence of commands at the remote node to get to that point would be:

    ```
    run landiag.pub.sys     (Run LANDIAG.)
    <ldev>                  (Enter LDEV.)
    go                      (Run the default tests (1 through 15).)
    test 17                 (Specify Remote Node test.)
    go                      (Run the test.)
    <station address>       (Specify a remote station address.)
    (Wait for prompt.)
    ```

  - if the remote node is an HP 9000 (either Series 300 or Series 500), the LANIC card must be configured into the system

9.8.2 Procedure

After you have satisfied the prerequisites given above, the command sequence for running the Remote Node test is:

```
run landiag.pub.sys        (Run LANDIAG.)
<ldev>                     (Specify the LDEV number of the LANIC card.)
go                         (Run the default tests (1 through 15).)
test 17                    (Specify the Remote Node test.)
go                         (Run the test.)
<station address>          (Enter station address of remote node.)
RETURN                     (Start looping of TEST frames.)
exit                       (Exit LANDIAG.)
```

The Remote Node test is test 17 of LANDIAG. Before you run test 17, you must run tests 1 through 15 (the default series of tests, including the self-test and the External Loopback test).

When LANDIAG asks for the station address of the remote node, enter the station address either as a single hexadecimal number that is 12 digits wide (xxxxxxxxxxxx) or as three sets of 4-digit hexadecimal numbers, with the sets separated by blanks (xxxx xxxx xxxx).

The Remote Node test sends TEST packets to the remote node, receives them back from the remote node, and compares the packets to make sure that the incoming packets are the same as the outgoing packets. LANDIAG writes a "!" to your terminal for each returned packet that is the same, or a "#" for each returned packet that is different.

The Remote Node test keeps looping TEST packets until it has sent and received 1000 packets, or until you abort the test by entering a control-y from the keyboard.

9.8.3 Example

The following example shows the running of the Remote Node test.

```
:run landiag.pub.sys

LAN Node Diagnostic, version A.55.26.002  HP1984 (c).
Please enter ldev number of LANIC to be tested.
40
Enter 'H' for Help.
> go <-------------Run self-test and External Loopback test

   1 *
   2 *
   3 ***
   4 ***
   5 ****
   6 ***
   7 ******
   8 **
```

```
    9 *****
    10 *************
    11 *****
    12 *****
    13 *****
    14 ******
    15 ***  End of Pass        Tests pass

  > test 17                     Go on to Remote Node test
  > go
  Please enter the station address of the destination node.
  0800 0900 0228
  Attempting of open LANIC driver ... please wait
  Driver now ready to echo link level packets.

  ! is displayed for each test packet looped back successfully.
  # is displayed for each failure to loop back a test packet.

  Hit return to initiate looping of test frames (1000 max),
  use <control-y> to stop. RETURN          Start TEST frames

  !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
  !!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

  100% of the test frames were acknowledged.  (1000/1000)
  The average response time was 16 milliseconds.
    End of Pass                                         Results

  > exit
  End of LAN Node Diagnosis

  END OF PROGRAM
  :
```

End of example

9.8.4 Interpretation

If you see all !!!!!!!!!!!!!!!!! returned by the Remote Node test, then that test has passed. If you see any "#" in the results, then that test has failed and there is a problem in communicating with that remote node.

LAN/800 (HP-UX) Link Diagnostic 10

Contents

As you follow the troubleshooting procedures in chapter 2 of this manual, you are instructed to run a number of tests on your computer or computers. This chapter tells you how to run those tests on an HP 9000 Series 800 Model 840 computer.

The tests described in this chapter are part of the Online Diagnostic Subsystem. Tests specifically defined for your computer system are made using a series of programs collectively referred to as Sysdiag. There are two programs in Sysdiag that are mentioned frequently in this chapter: LANDAD and DUI. LANDAD is the LAN Device Adapter Diagnostic program. DUI stands for Diagnostic User Interface which is a shell (command interpreter) for handling your exchanges with the computer. DUI uses a simplified syntax.

This chapter shows examples of how to run the tests. If, for example, the troubleshooting procedure asks you to run an External Loopback test on a Series 800 computer, you would start Sysdiag, find the the heading in this chapter for External Loopback test, follow the instructions under that heading, and then return to the troubleshooting procedure and go to the next step. This chapter is not a detailed description of the LAN diagnostic software on the HP 9000 Series 800. It just presents enough information to let you follow the troubleshooting procedures.

10.1 Reference and Background Information

10.1.1 System Requirements

The system must be an HP 9000 Series 800 computer with HP 98194A LAN Link. The software required is the HP-UX operating system, version B.1 or later, for HP 9000 Series 800 computers and the On-line Diagnostic Subsystem which includes LANDAD.

The HP 98194A LAN Link must be correctly installed in order for you to make any tests. If you have any trouble running LANDAD or it does not respond correctly, ask the System Administrator to verify the LAN Link installation.

None of the tests described in this chapter can be made unless the system you are trying to troubleshoot has the LAN Link installed.

10.1.2 Capability

To perform the tests described in this chapter you will need an account that has `/usr/diag/security` set to 0 (zero). An account in HP-UX can be either a normal user account or a superuser account. LANDAD can be run from either type of account.

For some LAN related faults, the entire computer may have to be shutdown to permit repairs and tests. In other cases, only Network Services (NS) may have to be halted. In either case, superuser capability is required.

NOTE

The System Administrator must be consulted before Network Services (NS) are terminated or a computer system is turned-off. He or she must consider the impact of these actions on users.

10.1.3 References

For detailed information, you may want to have the following references available as you go through the troubleshooting procedures:

Installation Manuals:

Hardware:

HP 98194A LAN/9000 Series 800 Link LANIC Hardware Reference Manual, part number 98194-90001.

Software:

NS/9000 Series 800 Node Manager Reference Manual, part number 98195-61001.

Cabling:

LAN Cable and Accessories Installation Manual, part number 5955-7680

Operating Manuals:

NS/9000 Series 800 User/Programmer Reference Manual, part number 98195-61000.

Diagnostic Manuals:

Online Diagnostics Subsystem Manual - Series 3000/930 and 9000/840, part number 09740-90020.
Online Diagnostics Subsystem Utilities Manual, part number 09740-90021.

10.2 Setting Up

There are a number of "housekeeping" tasks that you may have to perform in going through the diagnostic procedures in this chapter. Those tasks which cannot be executed easily (or at all) from the Diagnostic's User Interface (DUI) are gathered here first. Then we explain the basics of using the DUI. The tasks are listed in roughly the order that you would perform them.

10.2.1 Conventions

Our examples show your input to the computer in `shaded letters`. In examples, the computer's response is shown in `unshaded letters in this typewriter-like type face.`

When your input is shown between shaded angle brackets and parentheses', `<(abcd efg)>`, you are being asked to enter what is described by the text between the angle brackets and parentheses. For instance, `<(filename)>` means to enter the name of a file.

A key sequence which may not print on a display is represented by shaded angle brackets. For example, to indicate your terminal may not be able to show anything when you enter control-D it would be printed below as <CTRL-D>. Note that these characters mean, "hold down the control key, press the 'D' key once, then release the control key."

In the explanations of procedures or processes that are included in this chapter, the following general outline is used:

Prerequisites

Procedures

Example(s)

Interpretation

Where a particular heading does not apply in a particular explanation, it has been omitted.

10.2.2 Type-ahead Buffer

The HP-UX operating system uses a type-ahead buffer. Normally such a buffer is a convenience since certain applications may seem to pause. The buffer allows you to continue to enter data. However, if the pause in the application seems long you might assume the computer has stopped and try to "get it going" by entering commands. If the application has not stopped, all those buffered commands will be executed as soon as the pause is over.

We recommend you check with the System Administrator before assuming an application has stopped. In the sections of this chapter describing tests, we note those that take a long time to run.

10.2.3 Logging In

Most programs that you use in troubleshooting your LAN/9000 link do not require you to have superuser capability. Superuser capability is assumed in the examples for consistency. Your System Administrator should be consulted for the exact syntax to use with your account since he or she may set up your account in various ways.

The system will not echo the password that you type in; that keeps other people from reading your password from the screen. Remember that HP-UX is case-sensitive: you must match upper case and lower case letters exactly whenever you type in commands, passwords, and file names. (System managers frequently mix lower and upper case characters in passwords, just to make it more difficult for unauthorized users to gain access to the system.)

Prerequisites

- You need an account with `/usr/diag/security` set to "0".

- You need the exact syntax to use for logging into the account.

Procedure
This is the general command sequence to login to a system as a superuser.

```
<RETURN>            (To obtain a fresh prompt.)
<(account name)>    (Type in your account name.)
<(password)>        (Type your password.  It will not be displayed)
                    (system responds with a login message and then a prompt)
```

Example
We are using a superuser login in the example below but, the basic sequence is the same for all users.

Example: In the example below we show a login to the account "root" along with the computer response.

```
<RETURN>

login: root
Password:  <————————Password not echoed

(c) Copyright 1983, 1984, 1985, 1986 Hewlett-Packard Co.
(c) Copyright 1979 The Regents of the University of Colorado, a body corporate
(c) Copyright 1979, 1980, 1983 The Regents of the University of California
(c) Copyright 1980, 1984 AT&T Technologies.  All Rights Reserved.

Welcome to HP-UX on the HP 9000/840

WARNING:  YOU ARE SUPERUSER !!

# <————————superuser prompt
```

End of example

10.2.4 Stopping a Listing

The computer may respond to commands with more information than can be held in the display memory of your terminal. As information is received from the computer, your terminal begins scrolling the information up the screen and out of sight. Information that has scrolled out of sight is kept in display memory so you can scroll the screen down to read it. If there is too much information, the display memory overflows and some information is lost before you can read it.

You can manually stop and start the transmission of information with a series of keystrokes that send special characters to the computer. Halt information output to your Hewlett-Packard terminal by sending X-OFF (control-S). Restart the output by sending X-ON (control-Q).

10.2.5 Finding LANIC Card Information

To perform the tests required by the troubleshooting procedures, you need to know the PDEV (physical-device location name) and the station address of the LANIC card. You need to take the following steps to get the information:

1) Determine the PDEV for the LANIC card.

2) Start Sysdiag.

3) Run the Identify section of LANDAD to get the station address.

In the process of getting this information you will learn to start and stop Sysdiag. You will need to run Sysdiag to perform many of the troubleshooting procedures.

10.2.5.1 Getting the Physical-Device Location Name (PDEV)

The PDEV (physical device-location name) for a LANIC card is its system slot location. For example, in HP 9000 model 840 computers the LANIC card must be located in the Channel I/O Backplane (referred to as "8") at slot number 4 (referred to as ".4"). Therefore the PDEV is " 8.4 ".

NOTE

> If the System I/O configuration has been changed from the default, check with the System Administrator for the current PDEV.

NOTE

> The LDEV (logical-device file name) is not required to run any tests on the HP 9000 model 840. Sysdiag will accept either LDEV or PDEV as the device to be tested. For simplicity, we will always use PDEV.

10.2.5.2 Getting a LANIC Card Station Address

To perform a Remote Node test you must have the station address of the remote system's LANIC card. You must go to that remote system to get the station address. For instance, if you are trying to send a remote test packet from an HP 1000 computer to an HP 9000 Series 800 computer, you may have to go to the latter computer to get the station address. That's what these paragraphs describe.

Finding the station address cannot be done directly from HP-UX on a Series 800 computer. If you know the PDEV (see the heading "Getting the Physical-Device Location Name (PDEV)), you can use the DUI to query the LANIC card for its station address.

10.2.5.2.1 Starting Sysdiag.
When you start Sysdiag you also activate a different shell (command interpreter) known as the Diagnostic User Interface (DUI). It is designed to simplify your use of the diagnostics. When the DUI is operating in an HP-UX environment a counting prompt is displayed.

Prerequisites

- You need to be at a system prompt.

Procedure
The general command sequence to start Sysdiag is:

```
/usr/diag/bin/sysdiag              (Start Sysdiag.)
```

Example
The example below shows the start-up of Sysdiag. You may notice the system prompt is different than in other examples. The System Administrator can set the system prompt to be almost any character. You should make a mental note of the system prompt on your system so the examples given here will not confuse you.

Example: Starting Sysdiag.

```
$ /usr/diag/bin/sysdiag
******************************************************************
******                                                      ******
******             SHERLOCK DIAGNOSTIC SYSTEM               ******
******                                                      ******
******           (C) Hewlett Packard Corporation            ******
******                                                      ******
******                  DUI version 1.0                     ******
******                                                      ******
******************************************************************
DUI 1>
```

End of Example

10.2.5.2.2 DUI Syntax.
The simplified syntax available when DUI is running takes the form:

```
<(command)> <(diagnostic program name)> <(device to test)> <(sections)>
```

`command =`	This word tells DUI what to do with the with the program that is named next.
`diagnostic program name =`	This is the name of the diagnostic program which contains the test or tests you need.
`device to test =`	This is the name, a decimal number, of the device that will be acted on by the diagnostic program.
`section(s) =`	This is the name, an integer, or series of names of specific tests in the diagnostic program. If more than one test is specified, a comma must be placed between each name.

10.2.5.2.3 Finding the Station Address.
The section of the LAN Device Adapter Diagnostic (LANDAD) program that checks a LANIC for its station address is called Section 3 (labeled "`Identify`" as you will see in the example below).

Prerequisites

- You must be at a DUI prompt (see the heading "Starting Sysdiag).

Procedure
The general command sequence to get the station address is:

```
run landad pdev=8.4 sec=3          (Run section 3, Identify).
```

The station address is displayed on the line that begins, "RAM (Currently ..." .

Example
In the next example, we have the results of running "`Identify`" (section 3) on a particular machine. Each node on the LAN normally has a unique station address.

Example: Getting the station address.

```
DUI 2> run landad pdev=8.4 sec=3
*****************************************************************
******                                                     ******
******      LANDAD LAN Device Adapter Diagnostic           ******
******                                                     ******
******   (c) Copyright Hewlett-Packard Company 1986        ******
******                Version  A.00                        ******
******                                                     ******
*****************************************************************

Welcome, Today is Fri, Jun 27, 1986 12:12:14 PM

    Section 3 -- Identify

    CIO card ID byte  = $06 (LANIC)
    Hardware Datecode = 2620
    Hardware Revcode  = B
    Firmware Datecode = 2620
    CIO Firmware ID   = 1
    NOVRAM (Permanent) Station Address        = $08-00-09-00-3E-E9
    RAM (Currently Active) Station Address = $08-00-09-00-3E-E9

    End of Section 3 -- Identify

landad terminated (pid 3233).  Exit status = 0.
DUI 3>
```

End of example

NOTE

For any testing requiring the station address, be sure you use the RAM (Currently Active) Station Address.

10.2.6 Exiting Sysdiag

The return to HP-UX is simple. When you exit the DUI you will be returned to the system prompt you were using before you started Sysdiag.

Prerequisites

- You need to be at the DUI prompt.

Procedure
The command sequence to leave Sysdiag a single word:

```
exit
```

Example
The example below shows an exit from Sysdiag to HP-UX.

Example: Return to HP-UX

```
DUI 3> exit
$
```

End of example

10.2.7 Logging Off

Logging off the system is very simple.

Prerequisites

- You need to be at a system prompt. If you are at a DUI prompt see the heading "Exiting Sysdiag".

Procedure
The general command sequence to logoff is:

```
<CTRL-D>            (Command to exit HP-UX.  The system may
                    prompt for a logon.)
```

Example
Below is an the example of logging-off the system.

Example: Logging off a superuser account.

```
# <CTRL-D>
# logout root

HP-UX version X.Y
login:
```
The system prompts for a login

End of example

10.3 Shutting Down LAN Activity

If you're going to test the LAN cable itself, you will have to halt the activity on the cable to some extent. The extent to which you have to halt the LAN activity depends on what tests you are running. The tests and their required environments are specified in the chapter on the "LAN Cable" earlier in this manual. Some tests require that there be no signal traffic on the LAN cable; others require that the access devices connected to the cable be fully powered down.

Rather than turning off a Series 800 because you need to run voltage and Time Domain Reflectrometry tests on the cable, you can unplug the AUI cable from the stub cable of a LANIC. If you are using a Thin MAU, unplug the AUI pigtail from the LANIC. Be careful not to short-circuit the LANIC side of the connection you opened because it carries the power for the MAU. Before such a disconnection is made both NS/9000 Series 800 and link level access to the network must be halted.

If you want to stop LAN activity on your system but still leave the system available for other uses, this subsection describes how to do it. The procedure described below halts all activity by the system on the LAN. Both NS/9000 and link level access will be terminated.

10.3.1 Prerequisites

To stop LAN activity but still leave the system running:

- You need permission from the System Administrator since both NS/9000 Series 800 and link level access to the LAN will be cutoff.
- You need superuser capability.
- You need to be at the system prompt.

10.3.2 Procedure

The steps you take to shut down LAN activity while leaving your system running are:

```
ifconfig lan0 down     (This command halts LAN activity on the system.)
```

10.3.3 Example

We shut down all LAN activity on a system with a short command line. It is important for the System Administrator to know this command will terminate all activities by this computer on the LAN.

Example: Shutting down LAN activity.

```
# ifconfig lan0 down
#
```

End of example

10.4 Starting Up LAN Activity

Restarting LAN activity on the system requires a simple command if you have not disconnected the AUI cable or AUI pigtail. If you have disconnected the AUI, you must first reconnect it and then send the command to the computer to resume LAN activities and link level access to the LAN.

10.4.1 Prerequisites

To re-enable LAN activity and bring the system back to its normal operating mode:

- Advise the System Administrator of your intentions. There may be users waiting for the network to become available.
- You need superuser capability.
- You must be at the system prompt

10.4.2 Procedure

It takes only a single command line to restore both NS/9000 and link level access to the LAN:

```
ifconfig lan0 up          (Start network activities)
```

10.4.3 Example

This command is shown in the following example:

Example: Bringing up the LAN and NS.

```
# ifconfig lan0 up
#
```

End of example

10.5 Status and Statistics

The LANDAD program lets you read the status of the LANIC card. While interpretation of this data is beyond the scope of this manual, a person with thorough LAN knowledge can use this data to advantage.

10.5.1 Prerequisites

To read the status of the LANIC card:

- You need to know the PDEV of your LANIC card. If you know the PDEV, see the heading "Finding the Physical-Device Location Name (PDEV)" in this chapter.

- You need to be at a DUI prompt. If you are at a system prompt, see the heading "Starting Sysdiag" (Paragraph 10.2.5.2.1) in this chapter.

10.5.2 Procedure

The general command sequence for reading card status and statistics is:

```
run landad pdev=8.4 section=6,7      (Status=section 6, Statistics=section 7)
```

10.5.3 Example

In this example two sections of LANDAD are started by a single command line. A comma is used to separate the section names (6 and 7).

Example: Requesting the Status and Statistics of a LANIC.

```
DUI 1> run landad pdev=8.4 section=6,7
****************************************************************
******                                                    ******
******       LANDAD LAN Device Adapter Diagnostic         ******
******                                                    ******
******    (c) Copyright Hewlett-Packard Company 1986      ******
******                  Version  A.00                     ******
******                                                    ******
****************************************************************

Welcome, Today is Fri, Jun 27, 1986 11:40:48 AM

    Section 6 -- Status

    LANIC status has been read successfully.
    LANIC Passed selftest.
    LANIC is online.
    MAU power fuse is OK.
    Free transmit buffers =     4; Maximum =     4.
    Full receive buffers  =     0; Maximum =    16.
    Read data ARQ Frame threshold =     1.
    Read data ARQ timeout limit   =     1.
                              RAM value           NOVRAM value
    ==========================(Current)===========(Default)=========
    Station address           $08-00-09-00-3E-E9  $08-00-09-00-3E-E9
    Receive bad frames        Disabled            Disabled
    Receive multicast frames  Enabled             Disabled
    Receive broadcast frames  Enabled             Enabled
    Receive all frames        Disabled            Disabled
    ================================================================
    The following multicast addresses are recognized:
    $09-00-09-00-00-01

    End of Section 6 -- Status
```

(Continued on the next page)

```
Section 7 -- Link Statistics

   Step 71 - Read and Display Link Statistics
   Link level statistics have been read successfully.

   Transmit Statistics=======================================
     TOTAL frames transmitted without error.................0
       First time transmits.................................0
       Deferred transmits...................................0
       One collision transmits..............................0
       More than one collision transmits....................0
     TOTAL frames NOT transmitted...........................0
       Retry errors.........................................0
       Late collisions......................................0
       Loss of carrier during transmit......................0
     No heartbeat detected after transmission...............0
     No free transmit buffers...............................0
     TDR of last retry error................................0
     LANCE restarts.........................................0
   Receive Statistics========================================
     TOTAL frames received without error....................0
     Frames rejected by address filter......................0
     Frames rejected due to CRC errors......................0
     Frames rejected due to alignment errors................0
     Frames rejected due to oversize length.................0
     LANCE indicated one or more frames lost................0
     No free receive buffers................................0
   End of Step 71 - Read and Display Link Statistics

End of Section 7 -- Link Statistics

landad terminated (pid 3208).  Exit status = 0.
DUI 2>
```

End of example

10.6 Self-Test

The LANIC card self-test executes when the card is reset from LANDAD. An External Loopback test is also performed. Figure 10-1 shows the area covered by the self-test.

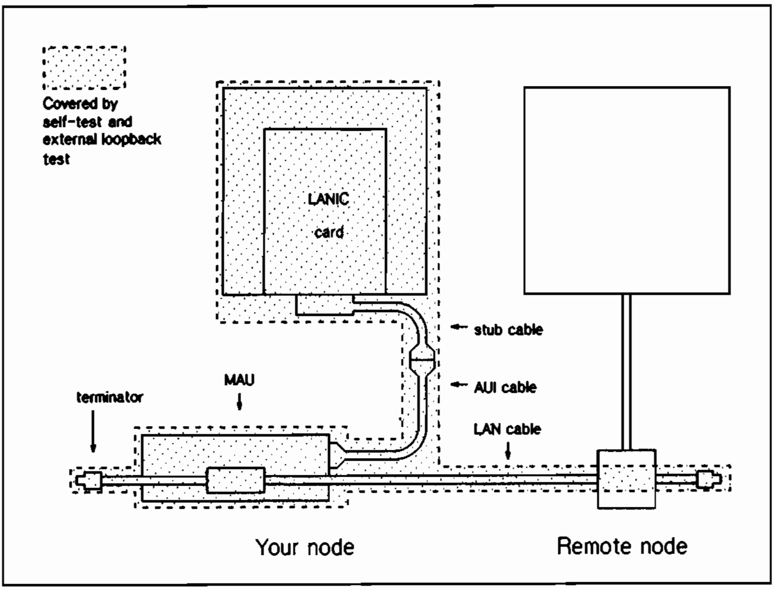


Figure 10-1. Test coverage

10.6.1 Prerequisites

To run the self-test:

- You need to know the PDEV of your LANIC. If you do not know the PDEV for your LANIC see the heading "Getting the Physical-Device Location Name (PDEV)" in this chapter.
- You need to be at the DUI prompt. If you are at a system prompt, see the heading "Starting Sysdiag" (Paragraph 10.2.5.2.1) in this chapter.

10.6.2 Procedure

The general command sequence for initiating self-test is:

```
run landad  pdev=8.4 sec=5                  (Section 5 = Self-test)
```

10.6.3 Examples

The following examples show two LANIC card self-tests. In the first example, self-test passes. In the second example, self-test fails for the reason indicated.

Example 1:

```
DUI 1> run landad pdev=8.4 sec=5
******************************************************************
******                                                     ******
******         LANDAD LAN Device Adapter Diagnostic        ******
******                                                     ******
******      (c) Copyright Hewlett-Packard Company 1986     ******
******                  Version  A.00                      ******
******                                                     ******
******************************************************************

Welcome, Today is Fri, Jun 27, 1986 11:42:05 AM.

    Section 5 -- Selftest

    Selftest Completed Successfully.
    The LANIC is functional.

    End of Section 5 -- Selftest

landad terminated (pid 3209).  Exit status = 0.
DUI 2>
```

End of example

Example 2: Here the self-test fails because the MAU was not attached to the AUI cable.

```
DUI 3> run landad pdev=8.4 section=5
*****************************************************************
******                                                     ******
******       LANDAD LAN Device Adapter Diagnostic          ******
******                                                     ******
******     (c) Copyright Hewlett-Packard Company 1986      ******
******                  Version  A.00                      ******
******                                                     ******
*****************************************************************

Welcome, Today is Fri, Jun 27, 1986 11:42:42 AM.

    Section 5 -- Selftest

*** ERROR -- LOSS OF CARRIER DETECTED DURING TRANSMIT (LANDADERR 5010)
*** If you are using an HP30241A MAU, check the following:
***   A1) Stub cable not connected to frontplane connector.
***   A2) AUI cable not connected to stub cable.
***   A3) AUI cable not connected to MAU.
***   A4) Broken MAU.
***   A5) Broken AUI cable.
***   A6) NETWORK CABLE shorted.
***   A7) LANIC broken.
*** If you are using an HP28641A MAU, check the following:
***   B1) Stub cable not connected to frontplane connector.
***   B2) HP28641A Cable not connected to stub cable.
***   B3) Broken HP28641A.
***   B4) LANIC broken.

*** The above message was printed on Fri, Jun 27, 1986 11:42:47 AM.
                              ************
                              *** NOTE ***
                              ************
   The above error message(s) are from the most recent external loopback
   test.  They will continue to be displayed (even after the problem has
   been fixed) until you run another EXTERNAL LOOPBACK (section 8) or any
   destructive test (sections 2,5,8,11,12).

*** The above message was printed on Fri, Jun 27, 1986 11:42:49 AM.

    End of Section 5 -- Selftest

landad terminated (pid 3210).  Exit status = 0.
DUI 4>
```

End of example

10.6.4 Interpretation

The examples above show typical test results reported by LANDAD. How you use the results you get depends on whether you are using the simplified troubleshooting approach for experienced users (refer to "Troubleshooting for Experienced Users" in chapter 2 of this manual), or are adhering rigorously to the detailed troubleshooting procedures.

If you're using the simplified approach as a general guide for troubleshooting, the results of the tests should give you an idea where to look for the problem.

If you are following the detailed procedures and any external failure is reported by the test, assume the failure is external to the LANIC. If only the LANIC is listed as a possible source of the problem, assume the problem is with the LANIC.

MAU Power Failure. During Section 5 testing, the state of the MAU power fuse is sensed. If the fuse is blown, the diagnostic returns an error message:

```
*** ERROR -- MAU POWER FUSE BLOWN ON LANIC. (LANDADERR 5006)
*** Replace Fuse on the LANIC.
*** Beware of these other possible problems:
*** 1) Broken MAU.
*** 2) Shorted power lines in AUI cable.
*** 3) Broken LANIC.
```

In addition, LANDAD section 6 (Status) reports the status of the MAU power fuse.

10.7 External Loopback Test

An External Loopback test will cause the LANIC to send a special test frame to the LAN cable and receive it from the LAN cable. This test is primarily used to check operation of the node hardware and the LAN cable.

10.7.1 Prerequisites

To initiate the External Loopback test:

- You need to be at a DUI prompt. If you are not, see the heading "Starting Sysdiag" (Paragraph 10.2.5.2.1) in this chapter.

10.7.2 Procedure

The general command sequence for starting an External Loopback Test is:

`run landad pdev=8.4 sec=8` (External Loopback Test = section 8)

10.7.3 Examples

Following are two examples of running the External Loopback Test. In the first example the test is successful. In the second example the test fails. The condition that caused the failure is given at the beginning of the second example.

Example 1: In the first example, we show a test that passes.

```
DUI 11> run landad pdev=8.4 sec=8
****************************************************************
******                                                    ******
******         LANDAD LAN Device Adapter Diagnostic       ******
******                                                    ******
******      (c) Copyright Hewlett-Packard Company 1986    ******
******                   Version  A.00                    ******
******                                                    ******
****************************************************************

Welcome, Today is Fri, Jun 27, 1986 11:44:16 AM.

    Section 8 -- External Loopback

    A link frame has been successfully transmitted
    and received from the NETWORK CABLE.

    End of Section 8 -- External Loopback

landad terminated (pid 3212).  Exit status = 0.
DUI 12>
```

End of example

Example 2: This example illustrates the response when an External Loopback test fails (perhaps because of a disconnected stub or AUI cable).

```
DUI 12> run landad pdev=8.4 sec=8
****************************************************************
******                                                    ******
******        LANDAD LAN Device Adapter Diagnostic        ******
******                                                    ******
******     (c) Copyright Hewlett-Packard Company 1986     ******
******                  Version  A.00                     ******
******                                                    ******
****************************************************************

Welcome, Today is Fri, Jun 27, 1986 11:44:43 AM.

    Section 8 -- External Loopback

*** ERROR -- LOSS OF CARRIER DETECTED DURING TRANSMIT (LANDADERR 5010)
*** If you are using an HP30241A MAU, check the following:
***   A1) Stub cable not connected to frontplane connector.
***   A2) AUI cable not connected to stub cable.
***   A3) AUI cable not connected to MAU.
***   A4) Broken MAU.
***   A5) Broken AUI cable.
***   A6) NETWORK CABLE shorted.
***   A7) LANIC broken.
*** If you are using an HP28641A MAU, check the following:
***   B1) Stub cable not connected to frontplane connector.
***   B2) HP28641A Cable not connected to stub cable.
***   B3) Broken HP28641A.
***   B4) LANIC broken.

*** The above message was printed on Fri, Jun 27, 1986 11:44:47 AM.
                              ************
                              *** NOTE ***
                              ************
   The above error message(s) are from the most recent external loopback
   test.  They will continue to be displayed (even after the problem has
   been fixed) until you run another EXTERNAL LOOPBACK (section 8) or any
   destructive test (sections 2,5,8,11,12).

*** The above message was printed on Fri, Jun 27, 1986 11:44:49 AM.

    End of Section 8 -- External Loopback

landad terminated (pid 3213).  Exit status = 0.
DUI 13>
```

End of example

In Example 2 above, pay special attention to the note in the sample error message. Unless you run a test which clears the error message from memory it will continue to be displayed.

10.7.4 Interpretation

If the test passes and you are following the detailed troubleshooting procedures rigorously, that's all the information you should need.

If, on the other hand, you are using the simplified approach for experienced users (refer to "Troubleshooting for Experienced Users" in chapter 2 of this manual), you will find the information displayed useful.

MAU Power Failure. During Section 8 testing, the state of the MAU power fuse is sensed. If the fuse is blown, the diagnostic returns an error message:

```
*** ERROR -- MAU POWER FUSE BLOWN ON LANIC. (LANDADERR 5006)
*** Replace Fuse on the LANIC.
*** Beware of these other possible problems:
*** 1) Broken MAU.
*** 2) Shorted power lines in AUI cable.
*** 3) Broken LANIC.
```

In addition, LANDAD section 6 (Status) reports the status of the MAU power fuse.

Retry/Collision Error. During Section 8 testing, the occurrence of a retry error is sensed (a retry error occurs when a predetermined number of attempts to transmit a packet fail). If the External Loopback test packet failed to gain access onto the LAN cable, the diagnostic returns an error message:

```
*** ERROR -- RETRY FAULT DURING TRANSMIT. (LANDADERR 5008)
*** Time Domain Reflectometer (TDR) = 0.
*** If you are using an HP 30241A MAU, check the following:
***   A1) Unterminated NETWORK CABLE; check terminators.
***   A2) Open terminator; check terminator resistance.
***   A3) MAU not connected to NETWORK CABLE; check MAU tap.
***   A4) NETWORK CABLE open.
***   A5) Faulty MAU.
*** If you are using an HP28641A MAU, check the following:
***   B1) Unterminated NETWORK CABLE; check terminators.
***   B2) Open or shorted terminator; check terminator resistance.
***   B3) MAU not connected to NETWORK CABLE; check MAU tee.
***   B4) NETWORK CABLE open or shorted.
***   B5) Faulty MAU.
```

10.8 Remote Node Tests

The Remote Node test exchanges a packet with a remote node and reports the results. There are two types of Remote Node test packets that can be initiated with LANDAD: TEST packets and XID packets.

When the destination for the test is an HP 1000 computer and the procedures instruct you to use DSAP F8 hexadecimal, you must use XID packets. LANDAD allows user-specified DSAPs when XID-packet tests are initiated.

When the destination for the test is some other computer type, the TEST-packet Remote Node test will suffice.

NOTE

The LANIC card for HP 1000 computers contains intelligence to return Remote Node test packets without accessing the system. This will occur when the Remote Node test packet contains a DSAP of 00 hexadecimal. Packets with DSAP of F8 hexadecimal access the software driver and are routed to the LAN/1000 link diagnostic (Node Manager).

From LANDAD, TEST packets automatically contain a DSAP of 00 hex. However, DSAPs for XID packets can be user-specified. Therefore, you should use an XID packet (with DSAP "F8" hex) for a Remote Node test to an HP 1000 computer. The test will fail if system-to-card problems exist, including lack of applicable software on the HP 1000.

NOTE

With early versions of software, Remote Node tests from LANDAD to a remote HP 1000 (using XID packets with DSAP "F8" hex) may result in an error despite proper link operation. Because the error is uniquely specified, you can interpret this error message to indicate a successful Remote Node test:

```
*** ERROR IN SECTION 10
 ** ERROR -- REMOTE RESPONDED, BUT LENGTH FIELD IS WRONG. (LANDADERR 1022)
      .
      .
      .
```

Later versions of software will explicitly indicate a successful Remote Node (XID) test on DSAP "F8" hex.

10.8.1 Prerequisites for Sending TEST Packets

To run a Remote Node test using TEST packets:

- You need to start from a DUI prompt. If you are at a system prompt, see the heading "Starting Sysdiag" (Paragraph 10.2.5.2.1) in this chapter.
- You need to know the station address of the LANIC card in the remote system. (Refer to "Finding LANIC Card Information" in the diagnostic chapter for the computer that is used at the remote node. For instance, if the remote node is an HP 1000 computer, look in the chapter on the "LAN/1000 (RTE-A) Link Diagnostic".)

10.8.2 Procedure for Sending TEST Packets

The general command sequence for sending TEST Packets is:

```
run landad pdev=8.4 sec=9       (Remote Node Test = section 9.)
<(station address)>             (enter address)
<RETURN>                        (selects default number of passes)
<RETURN>                        (selects default frame length)
```

NOTE

When you are prompted for the station address, enter only hexadecimal digits (zero through F). Hyphens or spaces may be used to break the address into groups of two or four digits. The "0x" prefix for hexadecimal numbers, a convention of the HP-UX operating system, should not be used since it will not be recognized.

The following are acceptable ways to enter the station address:

080909000222
08-09-09-00-02-22
08 09 09 00 02 22
0809-0900-0222
0809 0900 0222

10.8.3 Example of Sending TEST Packets

Following are two examples that show the use of TEST Packets. In the first example the test is successful. In the second, the test fails.

Example 1: The TEST Packet is successfully transmitted and received.

```
DUI 14> run landad pdev=8.4 sec=9
****************************************************************
******                                                    ******
******        LANDAD LAN Device Adapter Diagnostic        ******
******                                                    ******
******     (c) Copyright Hewlett-Packard Company 1986     ******
******                  Version  A.00                     ******
******                                                    ******
****************************************************************

Welcome, Today is Fri, Jun 27, 1986 11:46:10 AM.

    Section 9 -- Remote Node Test
    This section sends a TEST frame and waits for a response from
    a specified remote node for a specified number of iterations.

    The following success/failure indicators are used:
    "." = The test frame bounced successfully.
    "#" = The test frame was not received before the timeout period.

    Remote Node Address (Six HEX bytes) =>0800 0900 0180
    Number of test frames to send ("0" for infinite) [10] =><RETURN>
    Length of test frames in bytes (60..1514) [500] =><RETURN>

    Press the interrupt character (usually <control-C>)
    to prematurely stop the test.

    ..........
    10 out of 10 TEST frames echoed successfully (100%).


    End of Section 9 -- Remote Node Test

landad terminated (pid 3217).  Exit status = 0.
DUI 15>
```

End of example

Example 2: This Remote Node test fails (perhaps the remote node addressed was not on the link or was unable to respond). is present.

```
DUI 15> run landad pdev=8.4 sec=9
******************************************************************
******                                                     ******
******        LANDAD LAN Device Adapter Diagnostic         ******
******                                                     ******
******     (c) Copyright Hewlett-Packard Company 1986      ******
******                  Version  A.00                      ******
******                                                     ******
******************************************************************

Welcome, Today is Fri, Jun 27, 1986 11:47:21 AM.

    Section 9 -- Remote Node Test

    This section sends a TEST frame and waits for a response from
    a specified remote node for a specified number of iterations.

    The following success/failure indicators are used:
    "." = The test frame bounced successfully.
    "#" = The test frame was not received before the timeout period.


    Remote Node Address (Six HEX bytes) =>08-00-09-00-02-00
    Number of test frames to send ("0" for infinite) [10] =><RETURN>
    Length of test frames in bytes (60..1514) [500] =><RETURN>

    Press the interrupt character (usually <control-C>)
    to prematurely stop the test.

    ##########
    0 out of 10 TEST frames echoed successfully (0%).


    End of Section 9 -- Remote Node Test

landad terminated (pid 3218).  Exit status = 0.
DUI 16>
```

End of Example

10.8.4 Prerequisites for Sending XID Packets

- You need to start from a DUI prompt. If you are at a system prompt, see the heading "Starting Sysdiag" (Paragraph 10.2.5.2.1) in this chapter.
- You need to know the station address of the LANIC card in the remote system. Refer to "Finding LANIC Card Information" in the chapter for "LAN/1000 (RTE-A) Link Diagnostic".

10.8.5 Procedure for Sending XID Packets

The general command sequence to send XID Packets is:

```
run landad pdev=8.4 sec=10         (Remote XID Test = section 10.)
<(station address)>                (enter the station address)
$F8                                (DSAP for HP 1000 Node Manager)
```

NOTE

The $F8 entry is used if the remote node is an HP 1000 computer (the "$" specifies a hexadecimal value). The "Node Manager" mentioned in parentheses is a program which must be installed in the HP 1000 computer for the system to correctly respond to a received XID packet.

NOTE

With early versions of software, Remote Node tests from LANDAD to a remote HP 1000 (using XID packets with DSAP "F8" hex) may result in an error despite proper link operation. Because the error is uniquely specified, you can interpret this error message to indicate a successful Remote Node test:

```
*** ERROR IN SECTION 10
 ** ERROR -- REMOTE RESPONDED, BUT LENGTH FIELD IS WRONG. (LANDADERR 1022)
      .
      .
      .
```

Later versions of software will explicitly indicate a successful Remote Node (XID) test on DSAP "F8" hex, similar to the next example.

10.8.6 Examples, XID Packets

Two examples follow that show the use of XID Packets. Note that the test prompts for a DSAP. When an HP 1000 is the remote node, specify DSAP "$F8". Otherwise, you can use the null DSAP (zero), which is the default.

Both examples presume an HP 1000 as the remote node. In the first example the test is successful. In the second example, the test fails.

Example 1: This test passes.

```
DUI 19> run landad pdev=8.4 sec=10
****************************************************************
******                                                    ******
******        LANDAD LAN Device Adapter Diagnostic        ******
******                                                    ******
******     (c) Copyright Hewlett-Packard Company 1986     ******
******                  Version  A.00                     ******
******                                                    ******
****************************************************************

Welcome, Today is Fri, Jun 27, 1986 12:01:02 AM.

    Section 10 -- Remote XID Test

    This section sends an IEEE 802.2 XID frame to a user specified
    remote node and waits for an IEEE 802.2 XID response frame from
    that remote node.

    Remote Node Address (Six HEX bytes) => <(station address)>
    Remote DSAP Address (one even hex byte between $00 and $FE) [$00] => $F8
    Sending XID command frame...
    Received XID response frame...

    Remote DSAP $F8 has class I service.

    End of Section 10 -- Remote XID Test

landad terminated (pid 3224).  Exit status = 0.
DUI 20>
```

End of example

Example 2: The following indicates a failure of the Remote Node test (XID packet using DSAP $F8).

```
DUI 20> run landad pdev=8.4 sec=10
******************************************************************
******                                                      ******
******        LANDAD LAN Device Adapter Diagnostic          ******
******                                                      ******
******     (c) Copyright Hewlett-Packard Company 1986       ******
******                  Version  A.00                       ******
******                                                      ******
******************************************************************

Welcome, Today is Fri, Jun 27, 1986 11:50:23 AM.

    Section 10 -- Remote XID Test

    This section sends an IEEE 802.2 XID frame to a user specified
    remote node and waits for an IEEE 802.2 XID response frame from
    that remote node.

    Remote Node Address (Six HEX bytes) => 0800 0900 0225
    Remote DSAP Address (one even hex byte between $00 and $FE) [$00] => $F8
    Sending XID command frame...
    *** ERROR IN SECTION 10
     ** No response received from remote node.
    *** The above message was printed on Fri, Jun 27, 1986 11:51:25 AM.

    End of Section 10 -- Remote XID Test

landad terminated (pid 3219).  Exit status = 0.
DUI 21>
```

End of example

10.8.7 Interpretation

The principal results of the Remote Node test are simple and unambiguous : pass or fail. If you're following the detailed troubleshooting procedure, that should provide you with enough information to continue on to the next step. If you're an experienced troubleshooter using the simplified approach, you may be able to get additional useful information from other tests you have performed.

PCs as Diagnostic Tools 11

Contents

The disk-based operating system used by personal computers described in this chapter will be referred to as DOS. The commands for the MS-DOS and PC-DOS operating systems are the same. MS-DOS and Microsoft are trademarks of Microsoft, Inc. PC-DOS and IBM are trademarks of International Business Machines.

The tests described in this chapter are performed from a personal computer which may happen to be attached directly to a ThinLAN portion of a local area network. The personal computer is actually a node on an OfficeShare Network which happens to share some of the same cables with the rest of the LAN. However, because of its ThinLAN connection, the personal computer may be used to perform tests like those in the troubleshooting procedure.

In this chapter we explain what the OfficeShare Network manager or personal computer user must do before you can run a DOS program called DIAGLINK. Then we explain how you will use DIAGLINK to run the tests called for in the troubleshooting procedures.

For example, if the troubleshooting procedure asks you to run an External Loopback test, you would find the heading in this chapter for External Loopback test, follow the instructions under that heading, and then return to the troubleshooting procedure and go to the next step. This chapter is not a detailed description of the DIAGLINK diagnostic software or DOS programming. It just presents enough information to let you follow the troubleshooting procedures.

11.1 Reference and Background Information

Hewlett-Packard supports personal computers in networks with its OfficeShare Network. Since these personal computer networks may span different media and topologies, specialized troubleshooting procedures are available. If your personal computers cannot communicate with each other or with their network servers, see the *Troubleshooting Guide for LAN–HP OfficeShare Networks.* Additional information about that manual is listed below under the heading "References."

Some personal computers that are part of an OfficeShare Network may be directly attached to a ThinLAN portion of the network you are troubleshooting. In that case, the personal computer may be useful for testing the network you are fixing. A link-level diagnostic program, DIAGLINK, is available for supported personal computers.

NOTE

> DIAGLINK can locate many faults but it produces less detailed reports than diagnostics used with larger systems. Where we believe a particular DIAGLINK test report is not directly usable with particular procedures, we have included a note under the "Prerequisites" heading for a test. Supplementary test procedures may also be mentioned.

11.1.1 System Requirements

In this chapter we have assumed that the personal computer on which you will run the diagnostic has actually worked when installed on the OfficeShare Network. This means that the personal computer is capable running DOS version 3.1 or higher and that a copy of the correct version of DOS is loaded on the computer. Check with the OfficeShare Network manager if you have doubts.

The OfficeShare Network manager must provide the *HP ThinLAN Diagnostics Utility Master Disc* for the personal computer you will use for troubleshooting. The disks for all supported personal computers are included with the *HP ThinLAN for PCs Configuration and Diagnostics Software and License for PCs,* product number 50909A. This product is required with each ThinLAN server. For the HP 150 personal computer, a 3.5 inch disk contains the diagnostic while the compatible version, for the Vectra and compatible computers, is on a 5.25 inch disk.

The OfficeShare Network manager must also provide specific information about the configuration of the ThinLAN Interface Card in the computer which you have chosen to run the diagnostic program. You need the Interrupt Channel and I/O Address of the card. If the personal computer you have chosen is an HP 150, the OfficeShare Network manager must tell you the number of the slot where the card is installed. In either case, ask the manager if those numbers are the default values for that card. The I/O Address is a hexadecimal number.

The tests described in this chapter can only be run on the following personal computers:

HP 150 (TOUCHSCREEN PC)

HP 150 (22.8 centimeter (9 inch) diagonally measured display)
HP 150 II (30.5 centimeter (12 inch) diagonally measured display)

VECTRA COMPATIBLE

HP Vectra Personal Computer
IBM PC/XT/AT Personal Computers

NOTE

Check with the PC LAN manager or the network map to determine if the personal computer is attached to a ThinLAN segment of the coaxial cable network your are trying to troubleshoot. The connection must be direct, that is, the computer must have a BNC tee on the ThinLAN attached to its ThinLAN interface card. If the connection is through a StarLAN, choose some other personal computer for the link-level tests.

If the personal computer you are using is not on this list, Hewlett-Packard does not provide support for it when connected to a ThinLAN network.

11.1.2 Capability

This chapter provides just enough information for you to run the diagnostic program DIAGLINK from DOS. If you have chosen a personal computer that is an OfficeShare Network server, you will need to have the OfficeShare Network manager assist you. He or she will have to halt the network and bring the personal computer to a known state. An ordinary personal computer on the network can be brought to the correct state by the manager or a user who is very familiar with DOS.

Under the heading "DOS Basics" we provide enough information for you to run the diagnostic software. Even if you are proficient with personal computers, both DOS and the OfficeShare Network may be configured in many different ways. You can save considerable time by allowing those familiar with the OfficeShare Network at the site to bring the personal computer you have chosen to a state you can use.

A usable state for our purposes actually involves stopping applications programs. Then, the personal computer you have chosen must be left on in the root directory of the boot disk drive. DOS must be running and a cursor should be at the DOS prompt. A work copy of DOS must be in the boot drive.

The preparation of the personal computer is described in more detail under the heading "Shutting Down the Network" in this chapter. We explain more about DOS terminology under the heading "DOS Basics" later in this chapter.

You will need to modify some files in the boot disk drive, restart the computer, run tests, and then restore the modified files to their original state. Do not attempt to restart OfficeShare functions on a personal computer or bring up a server. The individual user will need to restart their computer. The OfficeShare network manager will need to restart any server you used for tests.

NOTE

In order to maintain service on the OfficeShare Network, the network manager may ask that you run tests at off-peak times unless all or most of the network has failed. It is possible the OfficeShare Network has not been affected by the problem you are trying to find.

11.1.3 References

For detailed information, you may want to have the following references available as you go through these procedures:

Installation Manuals:

Hardware:
HP ThinLAN Planning and Hardware Guide for PCs, part number 50909-90020
HP 27208A ThinLAN Interface Card Installation Instructions, part number 27208-90001
HP 27210A ThinLAN Interface Card Installation Instructions , part number 27210-90001.

Software:
HP OfficeShare Network Server Operation Manual, part number 50902-90020
HP OfficeShare Network User's Guide, part number 50903-90000
HP OfficeShare Network Installation & Configuration Manual, part number 50902-90030

Cabling:
LAN Cable and Accessories Installation Manual, part number 5955-7680

Operating Manuals:

HP ThinLAN User's Guide for PCs, part number 50908-90000

Diagnostic Manuals:
HP ThinLAN Diagnostics and Troubleshooting Manual for PCs, part number 50909-90060

11.2 Setting Up

There are a number of tasks that you may have to perform as you follow the diagnostic procedures in this chapter. Since you may not work with personal computers every day we first explain just enough about the supported computers for you to start the diagnostic program called DIAGLINK. Then we explain the basics of using DIAGLINK. The tasks are listed in roughly the order that you would perform them.

11.2.1 Conventions

Our examples show your input to the computer in shaded letters. In examples, the computer's response is shown in unshaded letters in this typewriter-like type face.

When your input is shown between shaded angle brackets and parentheses, <(abcd efg)>, you are being asked to enter what is described by the text between the angle brackets and parentheses. For instance, <(filename)> means to enter the name of a file.

Square brackets [ ] surround options that you may use or leave out. Where we show an option we will explain why you may or may not wish to use it.

A key sequence which may not print on a display is represented by shaded angle brackets. For example, to indicate the computer will not be able to show anything when you enter control-D it would be printed below as <CTRL-D>. Note that these characters mean, "hold down the control key, press the 'D' key once, then release the control key."

In the explanations of procedures or processes that are included in this chapter, the following general outline is used:

- Prerequisites
- Procedures
- Example(s)
- Interpretation

Where a particular heading does not apply in a particular explanation, it has been omitted.

NOTE

Individual tests provided by some diagnostic program are frequently referred to as "sections." Do not interpret a reference to a section of the diagnostic as a reference to a section of text in a manual.

11.2.2 Machine Basics

If you commonly work on large computers, you may find the the greatest difference between the larger machines and personal computers is the amount of detail you must know about the disk drives. We have provided just enough information for you to use DOS to run the diagnostic.

The supported personal computers can be divided into two main types. The first type is the HP 150 series. The second type includes the HP Vectra and the IBM PC/XT/ATs. The significant difference between the types is where you will find the microprocessor and disk drives.

In an HP 150, the microprocessor and the display are in the same tall, narrow box. As a result, there are no disk drives built-in to the HP 150. An HP 150 usually rests on top of, or near, its disk drive(s). The disk drive(s) are connected to the computer by an HP-IB cable.

The HP Vectra and the IBM computers have a low, wide box which can accommodate the microprocessor and a few disk drives. The display is separate unit which users either rest atop or near the box. The disk drives in the box are connected to the computer by an internal cable. The display is connected to the computer by a coaxial cable.

11.2.2.1 Disk Drive Designator

The disk drives have a name, or designator, that DOS will use when referring to a particular file. The designator is a letter. Later in the procedures you will ask the OfficeShare Network manager to tell you the designators for the disk drives of the personal computer you have chosen to run the diagnostic.

11.2.2.2 Disk Activity Light

Ask the OfficeShare Network manager to point-out the drive activity indicator on the disk drives associated with the computer you have chosen for testing. It is usually a light. A drive-fault indicator light may be located near the activities light so make note of which is which. The fault light may come on briefly during a reset (warm-start) which you will perform later in the procedures.

If the disk activity indicator is on you must not attempt to remove the floppy disk. If you should accidentally eject the disk after the computer begins to perform a command that causes data to be written to the disk, immediately reinsert the disk and close the drive door or turn the eject lever to the vertical position. DOS will display an error message and offer you the options `Abort, Retry, Ignore.` Type R for retry. Also, advise the OfficeShare Network manager if you have such a problem and you continue to get error messages after attempting to execute a RETRY command.

NOTE

The **RENAME** command, which you will learn about later, causes a write to the disk.

11.2.2.3 The Boot-up Disk Drive

Later in the procedures you will need to know what are the designators for the disk drives and and if one of them is a hard disk drive. The next few paragraphs should help you understand why that is important.

A common configuration for a personal computer is one floppy disk drive and one hard disk drive. There are no fixed designators for the HP Vectra or IBM computers. The most common arrangement is to assign the floppy disk drive the designator "A" and the hard disk drive the designator "C". At boot-up, those computers scan their disk drives looking for a loaded disk drive that contains DOS. In this case, the boot-up disk drive will be the one containing DOS.

The compatible computers only recognize that a disk is loaded in a floppy drive when the disk-drive door is closed, or the eject lever is turned so it points down, depending on the particular brand of drive. If a non-DOS disk is encountered, the computer will print an error message and instruct you to put in a DOS disk. If DOS is in another drive, just open the drive door or turn the eject lever to the horizontal position and then follow the additional instructions on the display.

The HP 150 is different. An HP 150 will check drive A to find DOS. Therefore, it is common to find an HP 150 with a hard disk drive, called "A", and a microfloppy (three and one-half inch) disk drive called "B".

The boot-up drive is the hard disk drive in this case. The hard disk drive and microfloppy disk drive used with the HP 150 are contained in a separate box from the computer.

If the personal computer is equipped with two floppy-disk drives, the same rules apply. The designators are usually A and B.

If DOS boots-up from the hard disk, you must change to the the floppy disk drive so you can load the diagnostic. When the the personal computer is only equipped with a single floppy drive, you may remove the boot disc as soon as DOS has loaded. See the headings "DOS Basics" and "Shutting Down LAN Activity" for more information on using the disk drives.

11.2.2.4 Keyboards

The keyboards on all of the supported machines are different. However, the general locations of the three keys needed to reset (warm-start) the computers are in the same location based on type.

For the HP 150, the three keys are on the left side of the keyboard. On the HP Vectra and IBM computers, two keys are on the left side near the shift key and one key is on the right side near the numeric-key group.

NOTE

> If you need to know the exact keystrokes to cause a reset (warm-start) for your computer, see the heading "Resetting DOS" in this chapter. Never reset the computer while a disk access is in progress. See the heading "Disk Activity Light" in this chapter for more information.

11.2.3 DOS Basics

Since whole books have been written on DOS, this section cannot give you enough information to make you an expert on DOS. The concepts and terms we do explain should be enough for you to run the diagnostic program called DIAGLINK.

DOS is capable of self-configuration when booted-up. DOS can also look for a specific file containing a user-selected configuration. Once boot-up is completed, DOS can cause the computer to look for a command file. The commands in that file can cause the computer to further alter its configuration or start an application program or both. DOS uses a hierarchical file structure which we describe next.

We will also explain enough about files and DOS commands so you can alter the names of certain files on the boot disk. The files to be altered are discussed under the heading "Start-up files" in this chapter.

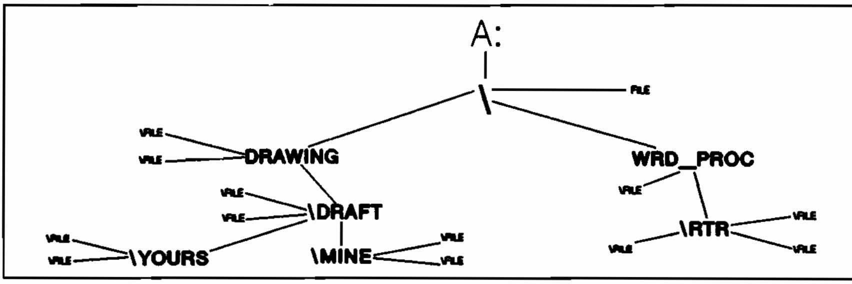


Figure 11-1. DOS has a hierarchical or tree-like file structure.

11.2.3.1 File Structure

The hierarchical file structure used by DOS has been described as tree-like. The typical drawing of this tree (see figure 11-1) usually includes a disk drive designator at the top. This tree is only a little unusual because, the root is at the top below the disk drive designator and, instead of a trunk, all the "supporting" branches terminate at a single root. This root can only sustain a limited number of "supporting" branches but those branches can support an almost unlimited number of other branches. The user must name a branch or leaf whenever he or she adds one. A leaf can be attached anywhere on this tree, but every leaf attached directly to the root decreases the number of "supporting" branches the root can sustain by one.

The tree metaphor is used to make explaining another concept a bit easier. Before we do that, we need to define the parts of the tree in terms that relate them to computers. The leaves represent programs (application files) or data files. The branches are special data files used by DOS which are called directories. The "supporting" branches are just directories that are more directly attached to the root. The root is called the root directory. A directory is a list of all files and other directories which are directly connected to it.

The tree metaphor for the file structure correctly implies you can get to any file (leaf) by going along the tree from the root, and then through the branches that lead directly to the leaf. You could get from any leaf to any other leaf by following branches toward the root until you find a branch that could provide a path to either leaf. From that branch, go to the desired leaf.

The sequential list of which directories you must go through to reach a file is called a **pathname**. If you see a pathname you will notice a backslash (\ ) at the beginning and then after each directory name. The backslash serves as both a name and a command depending on the context in which it is used. The backslash is the name of the root directory. We will briefly discuss its use as a command under the heading "Commands."

NOTE

For our purposes you will only be working on files in the root directory.

11.2.3.2 The DOS Prompt

The DOS prompt is user configurable so it may look different than other prompts you have seen. For example, the prompt could display the pathname to make it easy for the user to keep track of where they are on the disk.

```
                              end of prompt indicator
A:\DRAWING\DRAFT\file>_
                              The cursor flashes
```

One change that will occur when you rename the start-up files (as described later in this chapter) is, the default DOS prompt will be displayed when the system is rebooted. The default prompt looks about as follows:

```
        The Active Drive Designator
A>_
        The cursor flashes
```

You will need to know which disk drive is active since you may have to switch from one drive to another. For our purposes, you will only need to check the active drive designator to insure that you are working on a disk in the disk drive from which DOS will be booted, or to load the diagnostic DIAGLINK. Also see the heading "Machine Basics" in this chapter.

When you are working at the DOS prompt you can use the backspace key to move the cursor backwards so you can correct any typing errors. As the cursor steps backwards it will erase any characters it moves across.

11.2.3.3 Commands

First, we will briefly describe the syntax of DOS commands. Then we present a list and briefly describe the DOS commands you will need to know to complete testing.

NOTE

DOS is not case sensitive so you do not have to capitalize filenames or commands. Filenames can be up to eight characters long. A filename may be followed by an extension of up to three characters as long as a period separates the extension from the filename.

Here is a sample command line typed in at a DOS prompt:

```
C>A:\DIAGLINK /P
```

In this example our DOS prompt indicates we are using the C disk drive. This command line is similar to those you will use except in this case the Command Keyword to load is implied. There is no explicit load command in DOS. What the line says in plain language is, "select the A disk drive, look in the root directory of the disk in that drive for the file named DIAGLINK and load it with the P option (or switch) of the file enabled."

The parts of the line are:

```
A:\DIAGLINK = the file specification.

         A: = the drive identifier.

          \ = the pathname.  Often it is longer.

   DIAGLINK = the filename.

 /P = the option or switch specification.

          / = the command modifier to add a switch or option (slash).

          P = the switch or option identifier.  Here it is a P.
```

Portions this command line could have been omitted depending on the context in which you issued the command. For example, if you were already using the A drive you would only have to specify the pathname and the filename. If you were in the root directory of the disk in the A disk drive you would only have to type the name of the file and press the enter key to cause the file to be loaded into the memory of the personal computer.

A: - is a drive identifier with a change command. When the command is typed by itself at a DOS prompt it means, "change from the currently selected disk drive to the drive specified," (in this case the A drive). When you change disk drives you will be at the root directory of the disk in that disk drive. That directory and the disk drive are said to be active.

CHDIR and CD - mean change directory. Thus, CHDIR \ or CD \, when typed at a DOS prompt, means, "change to the root directory on the active disk drive."

DIR - stands for Directory. It gives you a listing of all the files in a directory. The /P option means, "pause at the end of each page" (so the information does not scroll off the screen). Not all programs files support options.

NOTE

The personal computer is not a terminal. At the DOS prompt there is only one page (screen) of display memory. Any information which scrolls off the top of the screen is discarded from the display memory. The P option causes DOS to limit the amount of information to one page at a time. DOS instructs you how to go on to the next page when you are ready.

Though an HP 150 has built-in terminal emulation software, in our discussion we treat it like any other personal computer.

CAUTION

The DOS command DEL deletes files. If you are used to working on other computer systems you may find it easy to type this command when you had intended to type DIR. You will not need to delete any files if you are following the troubleshooting procedures in this manual.

RENAME - renames a file. You will need to rename the start-up files to prevent DOS from finding them. Later you will change the name back. For example, `rename MY_file.sys my_file.sav` changes the name of `my_file.sys` to `my_file.sav`.

\ - When used in a pathname, after the first appearance, \ means, "the file or directory name that follows can be found in the directory that is named just before the slash."

11.2.3.4 Start-up Files

When DOS is booting-up, a series of files are loaded into memory. Two of the files that DOS will automatically look for in the root directory of the disk it is booting from are CONFIG.SYS and AUTOEXEC.BAT. These files can be accessed and altered by the user once DOS is running. We want to prevent DOS from finding those files because they may start the network software which interferes with the diagnostic called DIAGLINK.

The CONFIG.SYS file performs the general configuration of the computer for file transfers to disks and peripherals. It also names any special hardware driver programs that must be active before the AUTOEXEC.BAT file is called.

If CONFIG.SYS is not found, default configurations for disk operations, the prompt, and peripherals are loaded. Then the system will request the current date and time. We explain how to respond under the heading, "Shutting Down LAN Activity."

The AUTOEXEC.BAT file is a batch file that allows the user to have DOS execute a series of commands. AUTOEXEC.BAT is generally used to make the computer start a particular program every time the computer is turned on or reset. Frequently, The OfficeShare Network manager will have the AUTOEXEC.BAT file start network software.

DOS can complete its boot-up without the AUTOEXEC.BAT file. When the boot-up is complete, the DOS prompt will appear.

11.2.4 Finding ThinLAN Interface Card Information

To perform the tests required by the troubleshooting procedure, you commonly need to know the station (link-level) address of the ThinLAN interface card. You will need to take the following steps to get all this information:

1) Obtain the slot number the ThinLAN interface occupies if your computer is an HP 150. If your computer is an HP Vectra or compatible, obtain the Interrupt Channel and I/O address of the interface card. For convenience we will refer to this information about the interface card as the I/O option of the personal computer for the ThinLAN interface card.

2) After the OfficeShare Network manager halts the network and brings the personal computer to a known state, you must modify the boot disk then reset the computer and load DOS from the modified boot disk. See the heading "Shutting Down LAN Activity" in this Chapter for more information on preparing the disk.

3) Start DIAGLINK and choose the Display option – This will give you the station address of the ThinLAN interface card in the personal computer.

We'll explain all this and more in the paragraphs that follow.

11.2.4.1 I/O Options for the ThinLAN Interface Card

When you load DIAGLINK you will need to add a command modifier (a forward slash) and specify the I/O options, unless the defaults were used when the network was set-up. Consult the network map or the OfficeShare Network manager for the I/O options.

For the HP 150, the I/O option is the number of the backplane slot in which the ThinLAN interface card is installed. The interface card can only be in slot two of a two-slot backplane. The card could be in slot two or three of a four-slot backplane.

The I/O options for the IBM compatible machines are the I/O address (a three-place hexadecimal number) and the I/O channel (a number between 2 and 7).

NOTE

If the options are unrecorded the OfficeShare Network manager can elect to let you attempt to start DIAGLINK with the default options. If the attempt fails, the manager must obtain the I/O information. See below.

The OfficeShare Network manager can use the USRCONFG utility to obtain the I/O options if the particular personal computer has actually been used successfully on the network before.

If all else fails, the OfficeShare Network manager can obtain the options by inspection. This inspection will require opening the card cage of either type of computer. For the HP 150, the manager must note the number of the slot where the ThinLAN interface card is installed.

For IBM-compatible personal computers, the process is more complicated. First the interface card will have to removed from the card cage. Then, the jumper settings must be decoded. Finally, the computer will have to be put back together.

The OfficeShare Network manager will find information on this process in the *HP ThinLAN Planning and Hardware Guide for PCs*, part number 50909-90020. The manager should look in the section covering ThinLAN interface installation and the appendix describing Interface Options.

11.2.4.2 Starting DIAGLINK

Under this heading we only explain how to start the diagnostic program DIAGLINK. If you have been following this chapter sequentially you may be expecting an explanation of how to reconfigure DOS and then restart it. That information is under the heading "Shutting Down LAN Activity" because the changes required are related to the shutdown of LAN activity.

Prerequisites

- You must be at the default DOS prompt that you reached by resetting the personal computer. See the heading, "Shutting Down LAN Activity" if you need more information.
- The OfficeShare Network manager must have furnished you with the ThinLAN Diagnostics Utility Master Disc for the personal computer you will be using. IBM compatibles use the 5.25 inch version while the 3.5 inch version is used with an HP 150.
- You must know I/O interface options for the ThinLAN interface card in the computer you will be using. If you do not know the option information, see the heading, "I/O Options for the ThinLAN Interface card," in this chapter.

Procedure

The general command sequence to start DIAGLINK is:

```
(Insert diagnostic disk in disk drive)
<(drive name)>:                          (Activate drive.)
DIAGLINK [/L<(I/O slot or address)> [/I<(interrupt channel)>]]
```

NOTE

See the heading "Conventions" in this chapter if the notation used is unclear. If non-default options were used you must specify them. For the HP 150, you only need the "L" option. For the HP Vectra and compatibles, specify both the "L" and "I" options.

NOTE

If the default options for the ThinLAN Interface were used when the network was set-up, just type the name of the diagnostic programs at the DOS prompt. If DOS reports you omitted the options, retype the name of the diagnostic and include the options.

Examples
The first example below shows a successful start-up of DIAGLINK from a system prompt. Notice that the first example is for an HP 150. The second example assumes default values for the I/O options. In the second example DIAGLINK fails to start because a fault at the link level of the system was detected.

Example 1: Successful start of DIAGLINK.

```
C>A:
A>DIAGLINK /L3

              HP ThinLAN - DIAGLINK (A.03.00) HP50909A
     Copyright 1986 by Hewlett-Packard Company.  All rights reserved.
              (C) Copyright Microsoft Corp 1984 1985

DIAGLINK Initialization and Interface Selftest completed,
no errors detected.

Commands: Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of Example

Example 2: Here default values were used for the options so they do not have to be specified. This load fails when the self-test, which runs automatically, detects a fault. DIAGLINK stops and the personal computer is returned to you at a DOS prompt.

```
C>A:
A>DIAGLINK

              HP ThinLAN - DIAGLINK (A.03.00) HP50909A
     Copyright 1986 by Hewlett-Packard Company.  All rights reserved.
              (C) Copyright Microsoft Corp 1984 1985

Loopback error on Interface Selftest - Check cabling or Interface

A>
```

End of Example

NOTE

If the DIAGLINK fails to load due to a selftest error, proceed to Paragraph 11.6 which describes selftest. Since you will need to determine why the selftest failed, perform the steps under the heading "Interpretation" that deal with identifying internal and external faults.

11.2.4.2.1 DIAGLINK OPTIONS.
DIAGLINK provides a short menu of operations or aids you may select for it to perform or produce. The selections available are called options. You call an option by typing the keyword or its abbreviation at the DIAGLINK prompt. Other than the abbreviations, though some tests can be halted by entering control characters, DIAGLINK has no command syntax.

The options available are:

```
Help - Displays a menu similar to this one.

Display - Displays the ThinLAN Interface link address, the last selftest status
and statistics.

Link - Tests the communication between the local workstation and a destination
node.  Asks for the destination station/link address.  Up to 1000 frames are
exchanged.

Timeout - Changes the packet exchange timeout.  The default timeout is 1 second.

Reset - Resets the previous previous ThinLAN Interface statistics to zero.

Selftest - Executes the selftest of the ThinLAN Interface and displays the
result.

Quit - Terminates DIAGLINK, returns to DOS.
```

These options may not seem to match the tests called for in Chapter 2, but we will describe how to use the options to get the information you need.

11.2.4.3 Getting a ThinLAN Interface Card Station-Address

This particular section deals with finding the station address (link-level address) of a ThinLAN interface card in a personal computer. If you need the station address of some other computer system see, the chapter for that system elsewhere in this manual. There is only one reliable way to get the station address for the personal computer:

Use the Display option of DIAGLINK to get link-level address.

It is possible that the link-level address has been noted on the OfficeShare Network map, but it is not likely since only the Interprocess (IP) address is required when that network is set-up. In the ISO network model the Interprocess level is well above the link-level (hardware level) at which this manual attempts to deal with the problem.

11.2.4.3.1 Use DISPLAY to get Station Address.

Prerequisites
- You should be at a DIAGLINK prompt. See the heading "Starting DIAGLINK" if you are not.

Procedure
The general command sequence to get the station address is:

```
d                                   (you may type "display").
```

Example
In the example below note that the address is a hexadecimal number. The hexadecimal numerals are zero through 9 and A through F.

Example: Getting the station address.

NOTE

The station address is displayed on the line that reads, "ThinLAN Interface Address."

```
A>diaglink

              HP ThinLAN - DIAGLINK (A.03.00) HP50909A
      Copyright 1986 by Hewlett-Packard Company.  All rights reserved.
               (C) Copyright Microsoft Corp 1984 1985

DIAGLINK initialization and Interface Selftest completed,
no errors detected.

Commands: Help Display Link Timeout Rest Selftest Quit
Enter command: d

               ThinLAN Interface address and statistics.

ThinLAN Interface Selftest Status = Driver is operating okay.
ThinLAN Interface address         = 02608C046133
Packets Transmitted               = 0
Transmit Collisions               = 0
All Packets received              = 0
Filtered Packets received         = 0
CRC Errors Received               = 0
Undeliverable packets             = 0
Unsendable Packets                = 0
```

End of example

11.2.5 Resetting DOS

If you are following this chapter sequentially you might expect an explanation of how to stop DIAGLINK. Since you should only need to halt DIAGLINK when you have finished testing, we have included the explanation of halting DIAGLINK under the heading "Starting Up LAN Activity." You must not leave the DOS boot disk with altered files.

In this section we will discuss how to reset, or warm-start, a personal computer. A cold-start involves turning the power off and then on. Cold-starts cause the computer to run any built-in hardware tests before booting DOS. A warm-start clears memory and registers and then reboots DOS. Warm starts take less time.

Procedures

Press the three keys specified below simultaneously to reset the listed personal computer.

For HP 150

CTRL-SHIFT-RESET

For HP Vectra

CTRL-ALT-SYSREQ

IBM PC/XT/AT Personal Computer

CTRL-ALT-DEL

NOTE

The reset for the IBM Personal Computer will work with the HP Vectra. We recommend doing the full Vectra reset, especially when you are done with DIAGLINK and have restored files you previously had to rename.

CAUTION

Resetting the computer while a disk-write is in progress can cause a loss of all data and programs on the disk by causing certain disk management files to be left open (incomplete). See the heading "Machine Basics" in this chapter if you are unsure of how to tell when a disk access, such as a write, is in progress.

11.3 Shutting Down LAN Activity

There are more reasons for halting LAN activity from a personal computer than a larger computer. The usual reasons have to do with electrical testing of the cable. An additional reason to halt the activity on a personal computer has to do with the diagnostic DIAGLINK. DIAGLINK will not run properly if the OfficeShare Network software is loaded on the same machine. Therefore, you will have to halt all network activity on the personal computer you have chosen to run DIAGLINK.

This chapter details halting a personal computer so you can run DIAGLINK. If you need to run cable tests, we have provided only enough information for you and the OfficeShare Network manager to plan your action to halt the network for those tests. You and the OfficeShare Network manager will have to work out the exact procedure for the LAN you are troubleshooting.

11.3.1 Halting for Cable Tests

When you need to make cable tests the LAN must be quiescent for best results. In other words, there must be no LAN activity.

The ThinLAN Interface in each personal computer can be prevented from transmitting in three main ways:

1. Turn off all the personal computers in the OfficeShare Network. Also halt the network software on the server. The server may be a personal computer or a larger computer system.

2. Have all users stop using the network and then reboot their computers without reloading the OfficeShare network software. The network software on the server would also have to be halted. While the users would be unable to use the network, they would be able to run application programs that are not network dependent. The OfficeShare Network manager will have to use the STOP command or equivalent to halt network activity on the server.

3. Bisect the network such that the segment containing the OfficeShare network is separate from the rest of the network. This choice assumes the OfficeShare network will return to normal operation as soon as it is separated from a segment containing a cable fault.

The first choice listed requires that you wait until OfficeShare users turn off their personal computer so the manager can halt the server. Usually it can be accomplished quickly since the personal computer users will be at their computers trying to find out why they are having problems accessing the network.

NOTE

Since halting a server can cause anyone using its services to lose data, the OfficeShare Network manager must either see that everyone stops using the OfficeShare Network or have you delay your troubleshooting until no one is using the OfficeShare Network.

CAUTION

Some applications automatically access the network. The OfficeShare Network manager must insure that users understand what applications must not be run when the server software is disabled. Halting the server while such a network-dependent application is running can cause a loss of data and the application program to crash.

The second choice is an extension of the first but it does permit individual OfficeShare users to do some work. While the personal computer users would be unable to access the network, they would be able to run application programs that are not network dependent. The OfficeShare Network manager would have to use the STOP command or equivalent to halt network activity on the server. He or she would also have to see that the personal computer users had AUTOEXEC.BAT files or CONFIG.SYS files that did not automatically cause network software to load.

The third choice can be be effective if the a current network map shows a suitable point for bisection, such as at a repeater, a bridge, or a node not on the OfficeShare network. This choice assumes the fault is not on the segment with the OfficeShare network and that each segment formed by the bisection is properly terminated.

Read the chapter on LAN Cable in this manual before selecting any of the three choices. Once you and the OfficeShare network manager have selected a choice, discuss how you will proceed to halt and restart the network. Then record your actions as you halt network activity. Once activity is halted you can proceed with the cable tests.

11.3.2 Configuring the DIAGLINK Host

You will need to have a personal computer to "host" the diagnostic DIAGLINK. DIAGLINK, provides driver software to control the ThinLAN Interface card during the tests. However, the driver conflicts with the OfficeShare Network software. So the OfficeShare network software loaded in the personal computer must be deleted.

Stopping the LAN activity of a node on an OfficeShare Network solely for the purpose of troubleshooting the larger network varies in complexity. The network manager will have to spend more time to prepare to halt a server. Even if the node is not the server, the manager's assistance is needed to place the personal computer in a state you can use. From that state you will force the computer to reboot DOS in a default configuration.

The OfficeShare Network manager is needed to perform whatever steps are necessary to make the computer display the DOS prompt. In addition, he or she must leave the computer on, and the root directory of the boot-disk drive active. A work copy of DOS must be in the active disk drive.

If the personal computer happens to be the server for the OfficeShare Network, all the personal computers that are served must halt OfficeShare Network activity. The manager must handle the shutdown of a server.

Here is a brief preview of the steps to follow to halt network activity on the personal computer. First, the manager will stop the application that is running on the computer you have chosen to run `DIAGLINK`. Halting the application will cause the computer to display the command prompt of the Shell (DOS manager) program or DOS itself. Once the DOS prompt is reached, the manager will change the active drive to the drive containing the work copy of DOS and you will begin to work.

Your first step will be to check the root directory of the disk to see if two file names are free. Then, you will rename two files and warm-start (reset) the computer to force it to reboot DOS. When DOS loads it will be a default configuration, so it will prompt you for the date and time. Finally, after you have answered the prompt, DOS will present a default prompt. From this prompt you can load DIAGLINK.

11.3.2.1 Prerequisites

We recommend that you and the OfficeShare Network manager look the next few subsections so that both of you understand what is needed.

- The OfficeShare Network manager must halt any programs that are running on the personal computer you have selected to run DIAGLINK. With the DOS command prompt displayed, the manager must select the root directory of the boot disk drive.
- The manager must insure that a work copy of DOS is in the boot disk drive.
- You must know the sequence of keys to press to cause a a reset of the personal computer. If you do not, see the heading "Resetting DOS" in this chapter for more information.
- You should see the heading "Machine Basics" if you have chosen a personal computer other than an HP Vectra with at least one built-in hard disk drive and floppy disk drive.
- You must note the drive designator of the boot disk drive and, if different, the designator of the disk drive from which you must load the diagnostic.

NOTE

Since halting a server can cause anyone using its services to lose data, the OfficeShare Network manager must either see that everyone stops using the OfficeShare Network or have you delay your troubleshooting until no one is using the OfficeShare Network. We recommend you run tests from a personal computer which is not a network server, if possible.

CAUTION

Some applications automatically access the network. The OfficeShare Network manager must insure that users understand exactly what applications must not be run when the server software is disabled. <u>Halting the server while such a network-dependent application is running can cause a loss of data and the application program to crash.</u>

NOTE

The OfficeShare Network manager should be aware of any programs that remain resident and have been "attached" to DOS, rather than loading through AUTOEXEC.BAT or CONFIG.SYS files. These programs are typically utilities sold by third partys. Some of these programs actually replace parts of DOS or are loaded because they look like parts of DOS. The work copy of DOS must not have "attached" programs because DIAGLINK may not operate properly with them resident.

11.3.2.2 Procedure

The exact procedure the OfficeShare Network manager must follow to get the personal computer ready for you is entirely dependent on how on the hardware and software are configured. When the machine is ready you should see the current DOS prompt. The drive designator in that prompt indicates the active drive. That drive must contain a work copy of DOS. You must be at the root directory.

NOTE

The command sequence and example that follow assume you are working with a computer that has a hard disk drive and a floppy disk drive. Additionally, the work copy of DOS is assumed to be on the hard disk and DIAGLINK is on a floppy disk. If the configuration is different, see the heading "Machine Basics" for more information on dealing with different combinations.

The general command sequence for you to modify the necessary files and reset the computer is:

```
dir autoexec.sav                        (does this file exist already?)
dir config.sav                          (does this file exist already?)
rename autoexec.bat autoexec.sav        (change filename)
rename config.sys config.sav            (change filename)
<[reset key sequence]>                  (reset the personal computer)
<[current date]>                        (just<RETURN> if correct)
<[current time]>                        (just<RETURN> if correct)
   (insert the disk containing DIAGLINK into the floppy disk drive.)
<[drive designator]>                    (activate drive for diagnostic)
```

NOTE

Certain file name extensions are restricted. If AUTOEXEC.SAV and CONFIG.SAV already exist, try the extension HPS. If AUTOEXEC.HPS and CONFIG.HPS also exist, consult with the OfficeShare Manager for a legal (available to the general user) filename extension. He or she will probably need to consult the DOS users guide.

You should now see a default DOS prompt: an active drive designator followed by a > (right angle-bracket) as an end of prompt indicator. The personal computer now has DOS loaded and configured with the default parameters for that computer.

11.3.2.3 Example

NOTE

The command sequence above and first example that follow assume you are working with a computer that has a hard disk drive and a floppy disk drive. Additionally, the work copy of DOS is assumed to be on the hard disk and DIAGLINK is on a floppy disk. If the configuration is different, see the heading "Machine Basics" for more information on dealing with different combinations.

In this first example, we will show the successful boot-up of DOS in the default configuration on an HP Vectra that has the hard disk drive designated "C" and a floppy disk drive designated "A". A work copy of DOS is on the hard disk in drive C. The DOS prompt at the start of the examples happens to show the current directory and time.

The second example shows an unsuccessful boot-up of a Vectra for the reason specified in the example.

Example 1: Resetting DOS to the defaults when the computer is an HP Vectra.

```
C\17:25> dir autoexec.sav

file not found

C\17:25> dir config.sav

file not found

C\17:25>rename autoexec.bat autoexec.sav
C\17:26>rename config.sys config.sav
C\17:26><CTRL-ALT-SYSREQ>
```

(The screen goes black and memory is checked. Then boot-up begins.)

```
ROM BIOS  (C)Copyright Hewlett-Packard 1985, 1986
Compatibility Software (C)Copyright 1985,1986 Phoenix Software Associates
Version A.01.05
RAM BIOS (C)Copyright Hewlett-Packard 1985, 1986
Compatibility Software (C)Copyright 1985, 1986 Phoenix Software Associates
Version A.01.04

MS-DOS version 3.10
(C)Copyright 1981,85 Microsoft Corp.

Command v. 3.10 (c)Copyright Microsoft Corp 1981, 1985

Current date is TUE  1-05-1988
Enter new date (mm-dd-yy):<ENTER>
Current time is 13:30:40.09
Enter new time:<ENTER>

C>A:

A>
```

End of example 1

In this example, the boot-up fails because the disk containing DIAGLINK was inserted in drive A and the drive door was closed before DOS was restarted. The start-up program checks the disk drives sequentially for DOS. If a non-system disk is loaded in any disk drive checked before DOS is found, the load will halt. Restart the load by removing the offending disk and pressing the three keys in the reset sequence.

Example 2: A DOS boot-up fails due to an encounter with non-DOS disk.

```
C\19:05> dir autoexec.sav

file not found

C\19:05> dir config.sav

file not found

C\19:05>rename autoexec.bat autoexec.sav
C\19:06>rename config.sys config.sav
C\19:06><CTRL-ALT-SYSREQ>
```

(screen goes black, a fast memory check occurs)

```
ROM BIOS  (C)Copyright Hewlett-Packard 1985, 1986
Compatibility Software (C)Copyright 1985,1986 Phoenix Software Associts.
Version A.01.05
RAM BIOS (C)Copyright Hewlett-Packard 1985, 1986
Compatibility Software (C)Copyright 1985, 1986 Phoenix Software Associates
Version A.01.04

Non-System disk or disk error.
Replace and strike any key when ready.
```

End of example 2

11.4 Starting Up LAN Activity

LAN activity on personal computers may have been halted to permit one personal computer to serve as a diagnostic tool, or all personal computers to be quiescent while testing is conducted, or both.

This section deals with resuming network activity on the personal computer you have been using for network testing. If that personal computer was the server for an OfficeShare Network, the OfficeShare Network Manager can restart that network.

11.4.1 Restarting the OfficeShare Network

If you had to perform cable testing you have probably already read the text under the heading "Halting for Cable Tests." If so, you and the OfficeShare network manager choose how you would shut down the OfficeShare network and planned how to restart it. Just follow your plan.

If you halted a personal computer to "host" the diagnostic program DIAGLINK, see the heading "Restoring the Test Node" in this chapter.

11.4.2 Restoring the Test Node

Once you have finished running tests with DIAGLINK, you must restore the work copy of DOS to the condition it was in when you got it from the OfficeShare Network Manager. The manager may want to immediately restart the personal computer you were using, especially if it is normally the server for the OfficeShare Network. Let him or her know you are nearly done with the computer before you actually halt DIAGLINK.

Before you leave the computer you must rename those DOS files whose names you changed when OfficeShare network activity was halted.

NOTE

> If you do not restore the DOS disk before you leave, the user and OfficeShare Manager will have to try to figure out what you did to DOS. Failing that, the manager might have to rebuild the work copy of DOS to be sure it includes all commands from AUTOEXEC.BAT and CONFIG.SYS files.

Here is a preview of what you will need to do. Since DIAGLINK is the current application program running on the personal computer, you will have to halt the program. Next, you will have to activate the boot disk drive and restore the names of the files whose names you had altered in the work copy of DOS. After that, the OfficeShare Network Manager can reboot DOS and take whatever actions are necessary to restart the OfficeShare Network.

11.4.2.1 Prerequisites

Restarting the OfficeShare network requires you and the OfficeShare Network Manager each perform certain tasks. We recommend that you and the OfficeShare Network manager look at the next few subsections so that both of you understand what is needed.

- You must be at the DIAGLINK command prompt.
- You must know what new names you gave the AUTOEXEC.BAT and CONFIG.SYS files when you changed their names with the RENAME command. The suggested new names were AUTOEXEC.SAV and CONFIG.SAV. These files are on the work copy of DOS.
- You need to know the disk drive designator of the disk drive where you will have the DOS work disk when you change the filenames.
- The OfficeShare Manager must decide if he or she needs to immediately restart the personal computer, turn it off, or accept the state in which you will leave it. You will leave the computer with the work copy of DOS in the boot drive, the boot drive active, and a default DOS prompt on the display.

NOTE

> The OfficeShare Network manager may need to substitute a different work copy of DOS if the personal computer normally runs programs which are "attached" to DOS rather than loading through the AUTOEXEC.BAT or CONFIG.SYS files, or by command from a DOS prompt. When the network was shutdown, the manager had to provide a work copy of DOS without any attached programs.

The programs that attach to DOS are third party utilities which are loaded by DOS because they appear to be part of DOS. In some cases, they even replace parts of DOS.

11.4.2.2 Procedure

The exact procedure the OfficeShare Network manager must follow to restart OfficeShare Network activity on the personal computer depends on how the hardware and software are configured on that computer. When the machine is ready for the OfficeShare Network Manager you will have left it with the restored work copy of DOS in the boot disk drive with that drive active and a default DOS prompt on the display.

NOTE

> The command sequence and example that follow assume you are working with a computer that has a hard disk drive and a floppy disk drive. Additionally, the work copy of DOS is assumed to be on the hard disk and DIAGLINK is on a floppy disk. If the configuration is different, see the heading "Machine Basics" for more information on dealing with different combinations.

The general command sequence for you to leave DIAGLINK and modify the necessary file names is:

```
q                                    (exit from DIAGLINK)
    (remove the disk containing DIAGLINK from the disk drive)
c:                                   (switch to the boot disk containing DOS)
cd \                                 (ensure you are in the root directory)
rename autoexec.sav autoexec.bat     (change filename)
rename config.sav config.sys         (change filename)
```

You should now return control of the personal computer to the OfficeShare Network Manager. He or she will have to take whatever steps are required to restore network activity. The manager will probably want to warm-start (reset) or cold-start (switch off the power for 2 seconds and then turn it back on) the computer to insure that DOS loads the AUTOEXEC.BAT and CONFIG.SYS files.

11.4.2.3 Example

We present only an example of preparing the personal computer to resume network operation by changing the names of certain files back to names DOS is programmed to load and execute automatically.

NOTE

> The command sequence above and example that follows assume you are working with a computer that has a hard disk drive and a floppy disk drive. Additionally, the work copy of DOS is assumed to be on the hard disk and DIAGLINK is on a floppy disk. If the configuration is different, see the heading "Machine Basics" for more information on dealing with different combinations.

In this example, we will show the successful restart of DOS in the default configuration on an HP Vectra that has the hard disk drive designated "C" and a floppy disk drive designated "A". A work copy of DOS is on the hard disk in drive C.

Example : Restoring DOS to its original state when the computer is an HP Vectra:

```
A>c:
C>cd \
C>rename autoexec.sav autoexec.bat
C>rename config.sav config.sys
```

End of example

11.5 Status and Statistics

The DIAGLINK lets you read the status and statistics maintained by the ThinLAN Interface card when you specify the Display option. Since DIAGLINK produces less detailed reports than diagnostics used with other computer systems, you will occasionally have to look at the statistics to deduce the exact fault you have discovered.

The detailed procedures for making such deductions can be found in some of the test specific sections of this chapter under the subheadings "Interpretation". This additional testing is not required with every troubleshooting procedure.

Many the statistics registers are cumulative, so you will have to zero (reset) them. Otherwise you will be dealing with data that has accumulated since the ThinLAN interface card was last reset or the personal computer was switched on. The Reset option of DIAGLINK clears these registers.

11.5.1 Prerequisites

To read the status and statistics of the ThinLAN interface card:

- You need to be at a DIAGLINK prompt. If you are at a system prompt, see the heading "Starting DIAGLINK" in this chapter.

To reset the status and statistics registers of the ThinLAN interface:

- You need to be at a DIAGLINK prompt. If you are at a system prompt, see the heading "Starting DIAGLINK" in this chapter.

11.5.2 Procedure

The general command sequence for reading card status and statistics is:

```
d                                    (you may type "display".)
```

The general command sequence to reset the status and statistics registers is:

```
r                                    (you may type "reset".)
```

11.5.3 Example

In the first example, we check the current status and statistics. This is the same as the procedure to find the station address in that the command "display" or "d" is used at the DIAGLINK prompt. In the second example, we reset the status and statistics registers.

Example 1: Requesting the Status and Statistics from a personal computer.

```
Commands: Help Display Link Timeout Reset Selftest Quit
Enter command: d

              ThinLAN Interface address and statistics.

ThinLAN Interface Selftest Status = Driver is operating okay.
ThinLAN Interface address         = 02608C219947
Packets Transmitted               = 0
Transmit Collisions               = 0
All Packets received              = 0
Filtered Packets received         = 0
CRC Errors Received               = 0
Undeliverable packets             = 0
Unsendable Packets                = 0


Commands: Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of example Example 2: Resetting the Status and Statistics registers of a ThinLAN interface in a personal computer.

```
Commands: Help Display Link Timeout Reset Selftest Quit
Enter command: r

ThinLAN Interface statistics reset to zero.


Commands: Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of example

11.6 Self-Test

The ThinLAN interface card self-test executes when DIAGLINK is loaded from the DOS prompt or you type "s" or "selftest" at the DIAGLINK prompt. An External Loopback test is also performed. Figure 11-2 shows the area covered by the self-test.

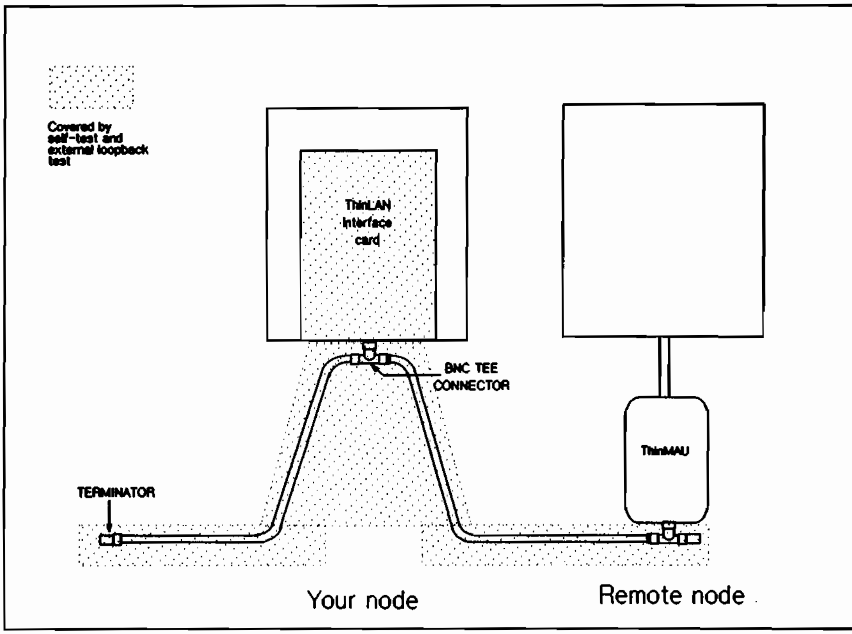


Figure 11-2. Test coverage

NOTE

A selftest is automatically performed every time you start DIAGLINK. If you cannot start DIAGLINK because it reports a selftest error, proceed to the heading "Interpretation" and read the material on internal and external faults.

11.6.1 Prerequisites

To run the self-test:

- Be aware of the limitations of the Selftest option of DIAGLINK:
  If you need to distinguish between internal and external faults, you will need a known-good ThinLAN Loopback hood. Then, if you detect a fault, see the heading "Interpretation" in this section for special procedures to identify the fault as internal or not.

- You need to be at the DIALINK prompt. If you are at a system prompt, see the heading "Starting DIAGLINK" in this chapter.

11.6.2 Procedure

The general command sequence for initiating self-test is:

```
s                    (you may type "selftest")
```

11.6.3 Examples

The following examples show two LANIC card self-tests. In the first example, self-test passes. In the second example, self-test fails and gives a standard error report. The standard report is not detailed.

Example 1:

```
Commands: Help Display Link Timeout Rest Selftest Quit
Enter command: s

ThinLAN Interface Selftest executed.
Driver is operating okay.

Commands: Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of example

Example 2: Here the self-test fails and DIAGLINK gives a standard error report.

```
Commands: Help Display Link Timeout Reset Selftest Quit
Enter command: s

ThinLAN Interface Selftest executed.
Loopback error on Interface Selftest - Check cabling or Interface.

Commands: Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of example

11.6.4 Interpretation

The examples above show test results reported by DIAGLINK. DIAGLINK produces a very simple report which says it executed. Then the report either identifies a general error or states, "Driver is operating okay."

If any error is identified, the ThinLAN Interface has failed at least one of the tests run by the selftest option of DIAGLINK. If the "Driver . . . okay" message is displayed, the ThinLAN Interface card has passed self-test.

If you're using the simplified approach as a general guide for troubleshooting, the results of the tests should give you an idea where to look for the problem. If you are following the detailed troubleshooting procedure, the procedure may require that you distinguish between internal and external faults. If so, see the heading "Internal/External Faults" below.

MAU Power Failure. There should not be anything attached to the AUI port of the ThinLAN Interface card. Therefore, we have omitted a check on the power for a MAU.

Internal/External Faults. No specific report of whether or not the error is internal to the ThinLAN interface is made. However, by performing the self-test with a loopback hood installed on the ThinLAN Interface card, you can determine if the fault is internal. If the fault is not internal to the ThinLAN Interface card, it must be external.

NOTE

> If DIAGLINK fails to load and reports a selftest error you can still determine if the fault is internal or external. Follow the instructions for internal/external error testing but where the procedure calls for you to start a selftest, attempt to load DIAGLINK as described under the heading "Starting DIAGLINK". If it loads successfully, selftest has passed.
>
> If DIAGLINK does not load and continues to report a selftest error, you can conclude the selftest was unsuccessful.

Internal/external error Testing: Prerequisites.
Before you can determine if the fault is internal:

- You should be at a DIAGLINK prompt, since you have just run the Selftest option. If you are not at the DIAGLINK prompt because DIAGLINK has failed to start, see the note above. You are trying to determine if the error detected is internal or external to the ThinLAN Interface card.
- Read the Safety Considerations at the front of this manual and the Warning and Caution at the beginning of Chapter 3, Node Hardware. Also in Chapter 3, see section 3.13.1 for an explanation of installing a ThinLAN Cable Loopback Hood. A ThinLAN Interface card is mechanically similar to a LANIC card with an onboard transceiver.
- You must install the known good loopback hood on the ThinLAN Interface card.

Internal/external error Testing: Procedures.

WARNING

> There maybe an electrical shock hazard. Read the warnings under the heading "Safety Considerations" at the front of this manual and the beginning of Chapter 3 before attaching or detaching the ThinLAN cable.

The correct method to physically disconnect a personal computer from the ThinLAN is by detaching the BNC tee from the ThinLAN Interface card. Detaching the network cable from the BNC tee will cause a new network fault. See section 3.3.3 in Chapter 3, "Node Hardware," if you are unfamiliar with removing a BNC tee connector.

Once you have the ThinLAN detached from the interface card you need to install the loopback hood.

The command sequence used to start the test to determine if a fault is internal or external is:

```
(see that loopback hood is attached)
s                  (you may type "selftest.")
```

Internal/external error Testing: Examples
The following examples show two ThinLAN Interface card self-tests performed with the Selftest option of DIAGLINK. In the first example, the fault is determined to be internal because the card fails Selftest even though a known good loopback hood is installed. In the second example Selftest is successful, therefore the error originally detected is external to the card.

Example 1: The test fails, indicating an internal fault.

```
Commands: Help Display Link Timeout Rest Selftest Quit
Enter command: s

ThinLAN Interface Selftest executed.
Loopback error on Interface Selftest - Check cabling or Interface.

Commands: Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of example

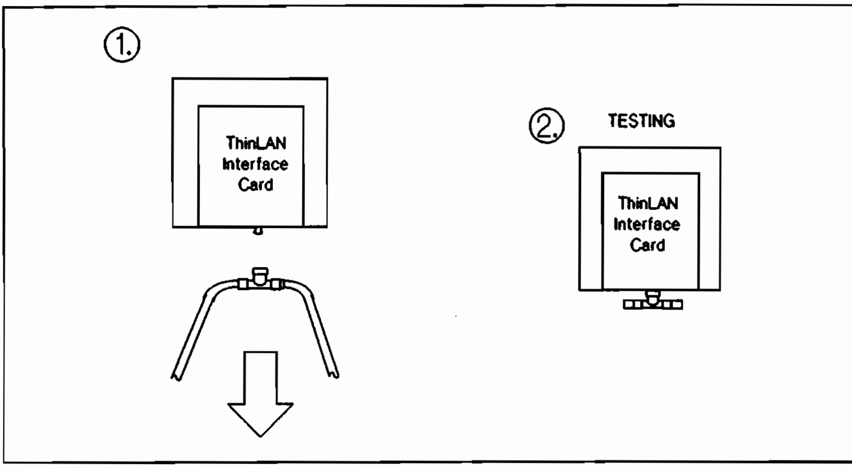


Figure 11-3. Internal – External error testing

Example 2: Here the self-test succeeds, indicating the fault originally detected must be external.

```
Commands: Help Display Link Timeout Reset Selftest Quit
Enter command: s

ThinLAN Interface Selftest executed.
Driver is operating okay.

Commands: Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of example

Internal/external error Testing: Recognition
After using the Selftest option of DIAGLINK with a loopback hood installed on the card you will be able to determine if the error is external or internal. If the "…operating okay" message is displayed, the fault originally detected is external. If the "…check cabling or Interface " message is displayed, the ThinLAN Interface card has an internal fault.

11.7 External Loopback Test

An External Loopback test will cause the ThinLAN interface card to send a special test frame to the LAN cable and receive it from the LAN cable. This test is primarily used to check operation of the node hardware and the LAN cable. DIAGLINK runs an external loopback test as part of the self-test

11.7.1 Prerequisites

To initiate the External Loopback test:

- Be aware of the limitations of the selftest option of DIAGLINK:
  If you need to distinguish between a retry/collision error and some other external or internal fault, you will need a known-good ThinLAN Loopback hood. Then, if you detect a fault, see the heading "Interpretation" in this section for special procedures to identify the fault as a retry/collision error or not.

- You need to be at the DIAGLINK prompt. If you are at a system prompt, see the heading "Starting DIAGLINK" in this chapter.

11.7.2 Procedure

Since an External Loopback test is part of the self-test sequence, the general command sequence for starting an External Loopback Test is the same as for a selftest:

```
s                        (you may type selftest)
```

11.7.3 Examples

Following are two examples of running the External Loopback Test. In the first example the test is successful. In the second example the test fails. The error report does not specify an exact fault.

Example 1: In the first example, we show a test that passes.

```
Commands: Help Display Link Timeout Rest Selftest Quit
Enter command: s

ThinLAN Interface Selftest executed.
Driver is operating okay.

Commands:  Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of example

Example 2: In this example some portion of test fails. The error message will only state only that there was a fault. By changing test hardware you can better identify the fault.

```
Commands: Help Display Link Timeout Rest Selftest Quit
Enter command: s

ThinLAN Interface Selftest executed.
Loopback error on Interface Selftest - Check cabling or Interface.

Commands:  Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of example

11.7.4 Interpretation

The examples above show test results reported by the Selftest option of DIAGLINK. An external loopback test is included in Selftest. DIAGLINK produces a very simple report which says the Selftest option has been executed. Then the report either identifies a general error or states, "Driver is operating okay."

If the "Driver . . . okay" message is displayed, the ThinLAN Interface card has passed the External Loopback test. If any error is identified, the ThinLAN Interface has has failed the External Loopback test for our purpose.

If you're using the simplified approach as a general guide for troubleshooting, the results of the tests should give you an idea where to look for the problem. If you are following the detailed troubleshooting procedure, the procedure may require that you distinguish between a Retry/Collision error and other faults. If so, see the heading "Retry/Collision Error" below.

MAU Power Failure. There should not be anything attached to the AUI port of the ThinLAN Interface card. Therefore, we have omitted a check on the power for a MAU.

Retry/Collision Errors. A retry/collision error is an external fault for our purpose. Since the test so far has not identified the fault as external or internal we must first determine if the fault is external or internal. By running the Selftest option of DIAGLINK with a loopback hood installed on the ThinLAN Interface card, you can determine if the fault is internal. If the fault is not internal to the ThinLAN Interface card, it must be external.

If the fault is internal, we cannot reliably detect any retry/collision error with this personal computer until the ThinLAN Interface care is replaced. If the fault is found to be external, you must use three DIAGLINK options to verify the fault is a retry /collision error.

There would probably be a loopback hood attached to the personal computer by now, so the next step is to run the *Reset* option of DIAGLINK which clears the address and statistics registers of the ThinLAN Interface card. Once the registers are reset, remove the test hood and reconnect the computer to the network.

When the cable is reconnected you can run the *Link* option using a legal station address of a node that is not on the network. The Link option will try to send a test packet to that address. As soon as the Link option reports an error, you can halt the testing and count the number of loopback tests that failed.

Finally, use the *Display* option of DIAGLINK to display the statistics the ThinLAN Interface card collected during tests by the Link option. The type and relationship of the faults reported will identify the cause as a retry/collision error.

NOTE

The above description of the process is somewhat abbreviated. See the exact procedure under the heading "Retry/Collision error Test Procedures" (below) for the exact steps to follow.

Retry/collision error Testing: Prerequisites.
Before you can determine if the fault is a retry/collision error:

- You must be at a DIAGLINK prompt, since you have just run the Selftest option. You are trying to determine if the error detected is a retry/collision error.

- Read the Safety Considerations at the front of this manual and the Warning and Caution at the beginning of Chapter 3, Node Hardware. Also in Chapter 3, see section 3.1.3.1 for an explanation of installing a ThinLAN Cable Loopback Hood. A ThinLAN Interface card is mechanically similar to a LANIC card with an onboard transceiver.

- You must install the loopback hood on the ThinLAN Interface card.

- You need to know the procedure we will follow roughly parallels the external loopback testing described in section 3.3 . For test purposes, the ThinLAN Interface card resembles a LANIC card with a ThinMAU built-in.

Retry/collision error Testing: Procedure.

WARNING

There maybe an electrical shock hazard. Read the warnings under the heading "Safety Considerations" at the front of this manual and the beginning of Chapter 3 before attaching or detaching the ThinLAN cable.

The correct method to physically disconnect a personal computer from the ThinLAN is by detaching the BNC tee from the ThinLAN Interface card. Detaching the network cable from the BNC tee will cause a new network fault. See section 3.3.3 in Chapter 3, "Node Hardware," if you are unfamiliar with removing a BNC tee connector.

NOTE

When you are prompted for the station address of the remote node, avoid the address of the personal computer you are using. Enter only hexadecimal numerals (zero through 9 and "A" through "F"). All 12 numerals in the station address must be typed without any spaces or other extraneous characters in between them. Letters used as numerals do not have to be capitalized. This method of address entry is different from that used with other diagnostics. A correctly entered address has the format:

02608c166562

If you need to use a dummy address for this test, any legal link-level station address will work, except for the computer's own. The address in the note above is a legal link-level station address.

The command sequence to identify a fault as a retry/collision error is:

```
s               (you may type "selftest.")
(responds "...operating okay." If not, no retry/collision error)
r               (you may type "reset.")
(responds "...reset to zero.")
l               (you may type "link.")
<(station address)>   (specify packet destination.)
<CTRL-c>           (Halt after a few loopback error indicator,#)
d               (you may type "display," shows statistics)
```

You will need to look at three lines in the report produced by the Display option. Those lines are titled Packets Transmitted, Transmit Collisions, and Unsendable Packets.

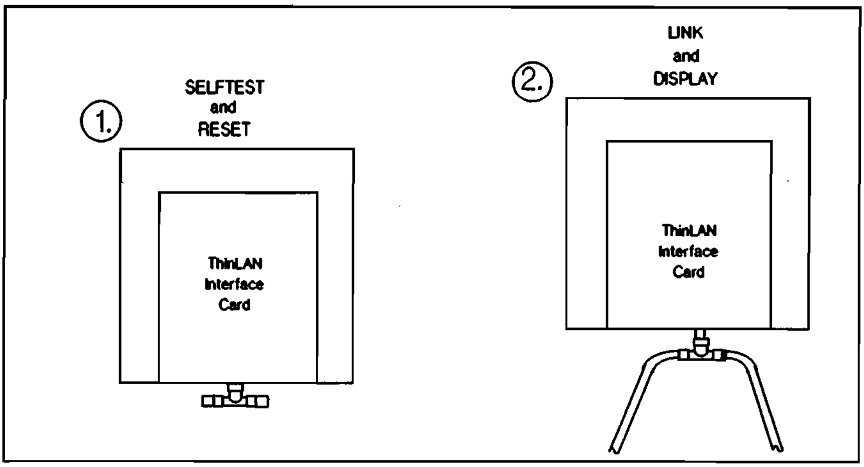


Figure 11-4. Internal – External error testing

Retry/collision error Testing: Examples

Following are two examples of attempts to isolate a retry/collision error. In the first example the error is successfully identified. In the second example, a different fault is found: The ThinLAN Interface card has an internal fault.

NOTE

Be sure a known good loopback hood is installed on the ThinLAN Interface card before starting.

Example 1: In the this example, we show the successful deduction that the fault is a retry/collision error.

```
Commands: Help Display Link Timeout Rest Selftest Quit
Enter command: s

ThinLAN Interface Selftest executed.
Driver is operating okay.


Commands:  Help Display Link Timeout Reset Selftest Quit
Enter command:r

ThinLAN Interface statistics reset to zero.
```

NOTE

At this point remove the loopback hood. Reconnect the ThinLAN Interface in the personal computer to the network.

(the example continues on the next page)

```
Commands: Help Display Link Timeout Reset Selftest Quit
Enter command: l

Current destination node station/link address not defined.
Enter the station/link address of the destination node or
enter = to keep current address or
press [ENTER] to abort the command: 02608c166562

                         Remote Communications Tests

Station/link address of the destination node = 02608C166562
Exchange timeout = 1 second(s).
Maximum number of test packet exchanges = 1000

! is displayed for each test packet looped back successfully.
# is displayed for each failure to loop back a test packet.

Use <Control-c> to stop.

####<CTRL-C>

0 % of the test frames were acknowledged. (0/4)
```

NOTE

Be sure to count the number of failures to loop back the test packet. The failures are indicated by the # symbol.

```
Commands: Help Display Link Timeout Reset Selftest Quit
Enter command: d

          ThinLAN Interface address and statistics.

ThinLAN Interface Selftest Status = Driver is operating okay.
ThinLAN Interface address         = 02608C219947
Packets Transmitted               = 0←check here
Transmit Collisions               = 64←check here
All Packets received              = 0
Filtered Packets received         = 0
CRC Errors Received               = 0
Undeliverable packets             = 0
Unsendable Packets                = 4←check here

Commands: Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of example

Example 2: In this example some portion of Selftest fails with a known good loopback hood installed on the ThinLAN Interface card. This failure means the card has an internal fault. Until the card is replaced, further troubleshooting from the personal computer is useless.

```
Commands: Help Display Link Timeout Rest Selftest Quit
Enter command: s

ThinLAN Interface Selftest executed.
Loopback error on Interface Selftest - Check cabling or Interface.


Commands:  Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of example

Retry/collision error Testing: Recognition
When you have run all three DIAGLINK options a retry/collision error is indicated if all of the following conditions are met:

In the statistics, there is a zero in the Packets Transmitted field, the number in the Transmit Collisions field is positive, and the number in the Unsendable Packets field is positive.

The difference between the number of loopback tests that failed (listed in the report generated by the Link option) and the number of unsendable packets (listed in the report generated by the Display option) is equal to 2, 1, or zero.

At this point, if any condition is not met the fault you detected is not a retry/collision error. However, there is clearly an external fault. In either case, return to the troubleshooting procedure in Chapter 2.

11.8 Remote Node Tests

The remote node test sends a test packet (frame) to a remote node and reports the results. The DIAGLINK program can send only TEST packets. DIAGLINK cannot initiate XID packets. The test packet DIAGLINK initiates can only be sent to a Destination Service Access Point (DSAP) address of zero. DIAGLINK and the ThinLAN interface for personal computers will respond properly only to a TEST packet sent to DSAP zero. To send a TEST packet, use the *link* option at a DIAGLINK prompt.

NOTE

If the remote node is another personal computer, the network software or DIAGLINK must be running on it. Otherwise, the node will not respond.

When the procedures instruct you to perform a remote node test which has a DSAP address other than zero, you must use an XID packet. Since DIAGLINK cannot transmit or properly respond to such a packet, choose a node other than a personal computer to send and receive XID packets. XID packets are sent to specific DSAPs on some devices to verify that a required operating program has been down loaded successfully.

NOTE

Always check the system specific chapter in this manual for the system to which you intend to send a Remote Node test. Under the heading "Remote Node Tests" any restrictions on the type of Remote Node test that a system can accept will be mentioned.

11.8.1 Prerequisites for Sending TEST Packets

To run a Remote Node test using TEST packets:

- You need to start from the DIAGLINK prompt. If you are at a system prompt, see the heading "Starting DIAGLINK" in this chapter.

- You need to know the station (nodal) address of the LAN Interface Controller (or equivalent part) of any link-level addressable device that is the remote node. If you do not know the station address, go to the system- or device- specific chapter in this manual for an explanation of how to find the station address. If the device is not listed specifically, see the owners manual of the device.

11.8.2 Procedure for Sending TEST Packets

The general command sequence to send TEST Packets is:

```
l                              (you may type link)
<(station address)>            (enter address)
<CTRL-C>                         (halts test series early)
```

NOTE

When you are prompted for the station address of the remote node, enter only hexadecimal numerals (zero through 9 and "A" through "F"). All 12 numerals in the station address must be typed without any spaces or other extraneous characters in between them. Letters used as numerals do not have to be capitalized. This method of address entry is different from that used with other diagnostics. A correctly entered address has the format:

02608c166562

The packet exchange timeout should be set to one second, the default setting. If there is a continuous lack of response from the remote node, DIAGLINK will take at least 1000 seconds (16 minutes 40 seconds) to try to send all 1000 packets. You may halt the test by pressing the "control" and "c" keys simultaneously. You can set the packet exchange timeout to any whole number of seconds from 1 to 10 with the Timeout option of DIAGLINK.

11.8.3 Examples of Sending TEST Packets

Following examples show the use of TEST Packets. DIAGLINK tracks each packet sent and indicates that the remote either has or has not returned the packet. An exclamation mark, "!," indicates a packet is successfully returned. A pound sign, "#," indicates the packet has not been returned.

The first example shows a successful test. The second example shows a test failed for the reasons specified at the beginning of the example. In both examples, the test was halted with "Control-c" before all 1000 packets are sent.

Example 1: TEST Packets are successfully transmitted and received.

```
Commands: Help Display Link Timeout Reset Selftest Quit
Enter command: l

Current destination node station/link address not defined.
Enter the station/link address of the destination node or
enter = to keep current address or
press [ENTER] to abort the command: 02608c166562

                          Remote Communications Tests

Station/link address of the destination node = 02608C166562
Exchange timeout = 1 second(s).
Maximum number of test packet exchanges = 1000

! is displayed for each test packet looped back successfully.
# is displayed for each failure to loop back a test packet.

Use <Control-c> to stop.

!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!<CTRL-C>

100 % of the test frames were acknowledged. (255/255)
The average response time was 14 milliseconds.


Commands:  Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of example

Example 2: This Remote Node Test fails because no remote node with the specified station address was present.

```
Commands: Help Display Link Timeout Reset Selftest Quit
Enter command: l

Current destination node station/link address not defined.
Enter the station/link address of the destination node or
enter = to keep current address or
press [ENTER] to abort the command: 02608c166562

                          Remote Communications Tests

Station/link address of the destination node = 02608C166562
Exchange timeout = 1 second(s).
Maximum number of test packet exchanges = 1000

! is displayed for each test packet looped back successfully.
# is displayed for each failure to loop back a test packet.

Use <Control-c> to stop.

#############<CTRL-C>

0 % of the test frames were acknowledged. (0/13)

Commands:  Help Display Link Timeout Reset Selftest Quit
Enter command:
```

End of Example

11.8.4 Interpretation

The results of the Remote Node test as reported by DIAGLINK are simple to interpret: Pass or fail. If you see any pound signs (#) in the report, the Remote Node test failed. If only exclamation marks (!) show in the report, the remote node test passed.

Once you have determined whether the test passed or failed, your next move depends on which procedure you are following. If you are following the detailed troubleshooting procedure, that should provide you with enough information to continue to the next step. If you're an experienced troubleshooter using the simplified approach, you may be able to get additional useful information from other tests you have performed.

The DTC in LAN/XL Environment 12

Contents

As you follow the troubleshooting procedures in chapter 2 of this manual, you are instructed to execute a variety of tests on your computer or computers. This chapter tells you how to run tests on an HP 2345A Distributed Terminal Controller (DTC) which only acts a bit like a computer.

DTCs are part of the Distributed Terminal Subsystem (DTS) on HP 3000 Series 900 computers. DTS allows terminals and modems to communicate with their host HP 3000 Series 900 computer system through an IEEE 802.3 LAN. The DTC and attached cables are an important portion of the DTS.

Like a computer system on a LAN, a DTC has a station address. However, a DTC has a limited ability to respond to certain LAN diagnostic tests. This chapter mentions any such limitations.

As an example of how to use this chapter, suppose the troubleshooting procedure asks that you run an External Loopback test. You would find the heading in this chapter for External Loopback test, follow the instructions under that heading, and then return to the troubleshooting procedure and go to the next step.

This chapter is not a detailed description of the diagnostic firmware in the HP 2345A Distributed Terminal Controller. We have presented just enough information to let you follow the troubleshooting procedures.

NOTE

> This chapter does not deal with communications problems between printers, modems, or terminals, and the Distributed Terminal Controller (DTC). See the heading "Reference and Background Information," in this chapter, for the name and part number of manuals on troubleshooting serial communications.

12.1 Reference and Background Information

12.1.1 Capability

Besides the capability required to troubleshoot the LAN at the host system level you may need to turn a DTC on or off.. You may also need to examine the display on the DTC. Therefore, you need access to both the front and rear of the DTC.

12.1.2 References

The following manual for the HP 2345 Distributed Terminal Controller may be useful:

Installation and Service

DTC, HP 2345A Distributed Terminal Controller Installation and Service Manual, part number 02345-90001

For terminals used with the Distributed Terminal Subsystem (DTS) a DTC is an essential piece of hardware. The following manuals will help you service the DTS if necessary:

Communication with Peripherals

Asynchronous Serial Communications System Administrator's Reference Manual, part number 32022-90001

Asynchronous Serial Communications Programmer's Manual, part number 32022-90002

Asynchronous Serial Communications Troubleshooting Manual, part number 32022-90004

Online Diagnostic Subsystem Manual, part number 09740-90020.

12.2 Setting Up

There are a number of "housekeeping" tasks that you have to perform in going through the diagnostic procedures in this chapter. Those tasks which are common to most tests or related to rudimentary understanding of a Distributed Terminal Controller (DTC) on a LAN are gathered here. Tasks are described in approximately the same order you will be performing them.

12.2.1 Conventions

In the explanations of procedures or processes in this chapter, the following general outline is used:

- Prerequisites
- Procedures
- Example(s)
- Interpretation

When a particular heading does not apply in a particular explanation, the heading will be omitted.

12.2.2 Power Switch Operation

Cables attached to the lower row of ports on the back of the DTC may block your view of the switch, especially if the DTC is located close to the floor. Therefore, you may have to determine if the switch is in the on or off position by feel. The external parts of a switch you can sense by feel are the switch frame and the rocker (external movable portion of the switch). Figure 12-1A shows the rear of a DTC.

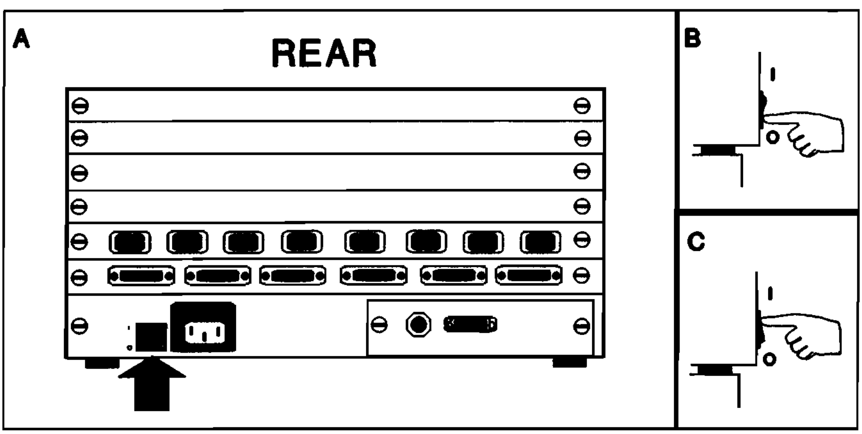


Figure 12-1. DTC Power Switch Operation

12.2.2.1 Switch Off

The switch is off when the concave portion of the rocker is flush with the lower half of the plastic frame surrounding the rocker. See Figure 12-1B, a sideview of the switch in off position. The off position is marked by an open circle on the label next to the switch.

12.2.2.2 Switch On

The switch is on when the concave portion of the rocker is flush with the upper half of the plastic frame surrounding the rocker. See Figure 12-1C, a sideview of the switch in the on position. The on position is marked by a thick vertical line on the label next to the switch.

12.2.3 Removing the DTC Front Panel

The front panel is held in place by four spring-clamped lugs. The springs are easily overcome if you position your hands correctly.

CAUTION

> Pay attention to any movement by the DTC while you are trying to remove the front panel. A DTC weighs 16 to 20 kilograms (32 to 44 pounds), depending on how it is configured. It may be damaged if you drop it. You may be injured if it falls on you or you are unprepared to support the weight.

Grasp the front panel at the top corners. Pull outward as if you were opening a door hinged at the bottom. STOP PULLING as soon as the top lugs disengage. Hold the panel in the partially open position. The top edge will be tilted slightly toward you.

NOTE

> If you tilt the panel at too extreme an angle, the lower lugs will be difficult to disengage. Hold the panel such that the top lugs almost touch their catches.

While you continue to support the front panel slide your fingers to the lower corners of the panel. Pull the panel straight back toward you until the lower lugs disengage.

12.2.4 Reinstalling the Front Panel

Align the front panel with the DTC. The window for the display should be on your left and the flanges should be lined up with the case. Push the panel forward until the lugs pop into their catches. You may find it easier to install the front panel if you engage the top lugs first and then tap the bottom into place with your hand.

12.2.5 Important Labels

Hidden by the front panel are two labels you will need to look at from time to time when you are troubleshooting a DTC attached to a LAN. The Identification (ID) label has the station address of the DTC. The Self-Test and Error Code label will help you decide if the DTC has passed the tests called for in the troubleshooting procedures.

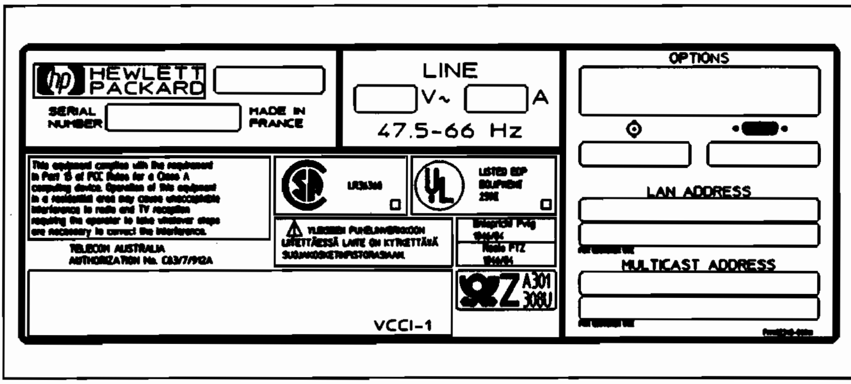


Figure 12-2. The Identification Label

12.2.5.1 Identification (ID) Label

The label with the serial number and country of origin is the Identification label. We will refer to it as the ID label in the remainder of this chapter. An ID label is attached to the inside face of the bottom of the case. You can see the label when you remove the front panel of the DTC. The LAN station address for the DTC is printed on the ID label.

NOTE

The station address is referred to as the "LAN Address" on the ID label. This address may be changed by the user or if the DTC was serviced. See the heading "Finding the Station Address" in this chapter for more information.

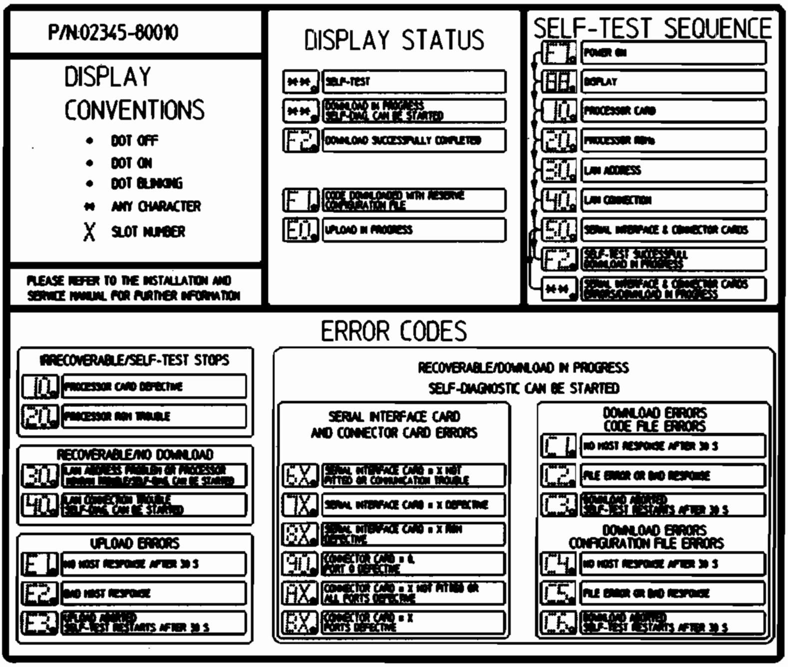


Figure 12-3. Self-Test and Error Code Label

12.2.5.2 Self-Test and Error Code Label

The Self-Test and Error Code label is attached to the front of the chassis. The Self-Test and Error Code label has a sequential list of the tests a DTC performs on itself. The label also gives a general description of the error codes that can appear on the display of a DTC. A copy of the Self-Test and Error Code Label is shown in figure 12-3.

12.2.6 Reading the DTC Display

If you face the front of a DTC, the display is on your left in the lower corner of the front panel. The display has two character positions and a dot position. The left character can be any hexadecimal numeral (zero through nine and "A" through "F") while the right character can be any decimal numeral (zero through nine). The dot position is located to the right of the characters. The dot can either be on, off, or flashing.

12.2.7 Interpreting Codes Displayed

The troubleshooting procedures in this manual are designed to find hardware problems within a LAN. Therefore, the interpretation of DTC test results is focused on whether or not any fault in a DTC is causing the LAN problems being experienced. Diagnosing problems between a DTC and the modems and terminals attached to that DTC are covered in other manuals. See the heading "References" for a listing of some other manuals about the DTC.

You need to watch the DTC display for a few important indications of how the start-up procedures are progressing. If the DTC starts successfully the display will show "F2." while a download of an alternate configuration file will cause "F1." to be displayed.

NOTE

> When switched on a DTC automatically runs a self-test which takes about one minute. It the self test is good, the download of the DTC configuration file starts. The download can take between ten seconds and five minutes. The dot blinks during a download.

If the display is stopped at some other number, or is going through a repeating series of numbers, or has the dot flashing you will need to refer to the Self-Test and Error Code label on the front chassis plate of the DTC or figure 12-3 in this chapter. To make repairs, you will have to refer to the DTC manuals. However, the following paragraphs will help you determine if your problem is LAN related.

12.2.7.1 Display Stopped

If the Display has stopped with a particular error code look it up on the Error Code label. Then look at the Self-Test sequence on the same label (or see figure 12-3). If the display has stopped at a number after the LAN Connection test then the physical connection to the LAN is good. See the heading "References" in this chapter where manuals about the DTC are listed. You will need more troubleshooting information than is provided here.

12.2.7.2 Display Cycling

If the dot starts flashing, then stops for a time and the numbers change continuously with a repeating pattern of error codes, the display is cycling. Cycling indicates the DTC is repeating tests or download attempts. You can identify what tests are being repeated or why the download is being attempted again by finding the error codes on the Self-Test and Error Code label.

NOTE

> If interface cards are not installed in all six slots of the DTC, it is not unusual to for "6X" to be cycling on the display during a download. The "X" represents a decimal number corresponding to any slot without a card. The dot blinks during a download attempt.

If error codes indicate a problem internal to the DTC such as a Serial Interface Card or Connector Card problem, see the heading "References" in this chapter for a listing of manuals about the DTC. If any download errors are displayed repeatedly, you will need to look under the heading "References" in this chapter and the system chapter for the HP 3000 Series 900. The system chapter is titled, "LAN/XL LINK Diagnostics." When the LAN connection is good, download errors are usually caused by software problems. Software troubleshooting is outside the scope of this manual. See the operator's manual for the host system.

12.2.8 Finding LAN-related DTC Information

To perform the tests required by the troubleshooting procedure, you need to know the station address of the DTC. You must also be able to go to the DTC, read its display, remove the front panel, and reach the power switch to turn the power for the DTC on and off. We'll explain all this and more in the paragraphs that follow.

12.2.8.1 Which Network?

The Distributed Terminal Subsystem (DTS) on a Series 930 manages Distributed Terminal Controllers (DTCs) through a single LANIC card. The conventional location for that card is the backplane slot that has the PDEV (physical device specifier) of 8.4. See the LAN/XL Link Diagnostic chapter in this manual for more information on PDEVs.

NOTE

> The network of DTCs attached to the DTS-dedicated LANIC card will continue to function even if you stop NS (network services) and the Network Transport software on your Series 900.

12.2.8.2 Finding the Station Address

This particular section deals with finding the station address of a Distributed Terminal Controller (DTC). If you need to obtain the station address of a computer system see the chapter for that system elsewhere in this manual. There are three ways to get the station address or addresses for your DTC:

The Easiest Way. Look on your network map. If the map has been kept current, it will show the correct station address of all network nodes. If your network map is out of date or non-existent, you might be lucky enough to find that someone has noted the station address on the back of your DTC. Failing that, you'll have to resort to the second method.

The Simple Way. You will need to read the address from a label inside the DTC.

The Most Accurate Way. You will need to halt the DTC and possibly reconfigure it.

The procedure for the **The Simple Way** is:

`(Find the DTC.)`	
`(Remove the front panel.)`	There is an explanation of removing the front panel in this under the heading "Removing the Front Panel".
`(Find the ID label.)`	The ID label has the serial number and country of origin. It is attached to the inside face of the bottom of the case. On the left side of the ID label are two lines for the "LAN Address". The LAN Address is the station address of the DTC.
`(Read the address.)`	

The upper line of the LAN Address label will have the factory set station address for the DTC. It is unique; all DTCs have a different station address when they leave the factory.

The second line of the LAN Address label is for users who change the station address. If the second line has been filled in use that station address for the DTC.

NOTE

> The station address set at the factory may have been changed by the user to accommodate the fixed or already existing station address of some non Hewlett-Packard equipment on the network. The address will have changed if the main printed circuit assembly (PCA) of the DTC has just been replaced. If the address change has not been documented, or you cannot find the station address any other way, you will have to use The Most Accurate Way.

To use **The Most Accurate Way**, you will need to run a utility built into the DTC. The utility allows the user to check the station address in the NOVRAM (non-volatile RAM) of the DTC. The Installation and Service Manual for the DTC describes the the process.

NOTE

In order for you to use the utility built into the DTC you must have access to the terminal connected to port 0, card 0 of the DTC. When the utility is run, all other terminals will be logically disconnected. Consult with the System Manager so that he or she may get other users of the DTC to log off.

12.3 Shutting Down the Node

If you are going to test the LAN cable itself, you will have to halt activity on the cable. Since, per the supported LAN design, all the DTCs for HP 3000 Series 900 computers are attached to the same LAN, all the DTCs will have to be switched off to test the entire cable segment.

12.3.1 Prerequisites

To stop all LAN activity originating from a Distributed System Controller (DTC):

- You need to notify the System Manager before switching off a DTC. He or she will want to send a message to any active user of that DTC to log off the system.
- You need to find the DTC and have access to the power switch.

12.3.2 Procedure

The general procedure to halt LAN activity originating from a DTC is:

`(Turn off the DTC.)`	If you cannot see the power switch on the DTC while you operate it see the instructions under the heading "Power Switch Operation" in this chapter.
`(Check the display.)`	The display should be off. It is located in the lower left corner of the front panel.

NOTE

When a DTC is switched off all serial devices attached to it are disconnected. Any user session that was active will still be active but the user will not be able to communicate with it. THERE IS NO WAY FOR THE USER TO RECONNECT WITH THE SESSION WHEN THE DTC IS SWITCHED ON. Be sure let the system manager know before you switch off a DTC.

12.4 Starting Up the Node

Getting the node going again is more complicated because a Distributed Terminal Controller (DTC) must be able to download files from the host.

12.4.1 Prerequisites

Before you can restart the DTC:

- You need to notify the system operator before switching on a DTC. He or she may want the host to have a specific download file available for the DTC.
- You need to find the DTC and have access to the power switch.
- You must be able to read the DTC display and make a general interpretation of the codes displayed. See the headings "Reading The DTC Display" and "Interpreting Codes Displayed," if you need help.

12.4.2 Procedure

The general procedure to resume LAN activity from a DTC is:

`(Switch on the DTC.)`	If you cannot see the power switch on the DTC while you operate it, read the instructions under the heading "Power Switch Operation" in this chapter.
`(Check the display.)`	The display should be going through a series of start-up activities with various hexadecimal numbers and the dot displayed. The display is located in the lower left corner of the front panel. If the download is successful, either "F2." or "F1." will appear on the display though it take up to six minutes for the self-test and download to finish.

NOTE

A DTC must successfully download its primary or alternate configuration file from the host before any terminal attached to the DTC can access the host.

12.5 Status and Statistics

Unlike a computer system, the DTC does not have a separate LAN Interface Controller (LANIC) card. The functions of a LANIC are an integral part of the DTC design.

A DTC cannot provide the status or statistics of its LAN operations. If you need status or statistical information on LAN operations you must go to the host computer system for the DTC. By convention, the host will have the LANIC card for its DTCs installed in a slot with the PDEV (physical device specifier) 8.4 . See chapter 13, LAN/XL Link Diagnostic, for an explanation of how to run Status and Statistics diagnostics on HP 3000 Series 900 computers (the host for DTCs).

12.6 Self-Test

The DTC automatically runs a self-test when the power is turned off and then on. The self-test includes two tests related to LAN, the LAN address test and the LAN connection test. We mention both under the heading interpretation. The LAN connection test is the external loopback test for a DTC so it is discussed some what differently under the heading "External Loopback Test" in this chapter.

Figure 12-4 shows the area covered by a self-test when a DTC is connected to a ThickLAN. Figure 12-5 shows the extent of self-test when the DTC is connected to a ThinLAN.

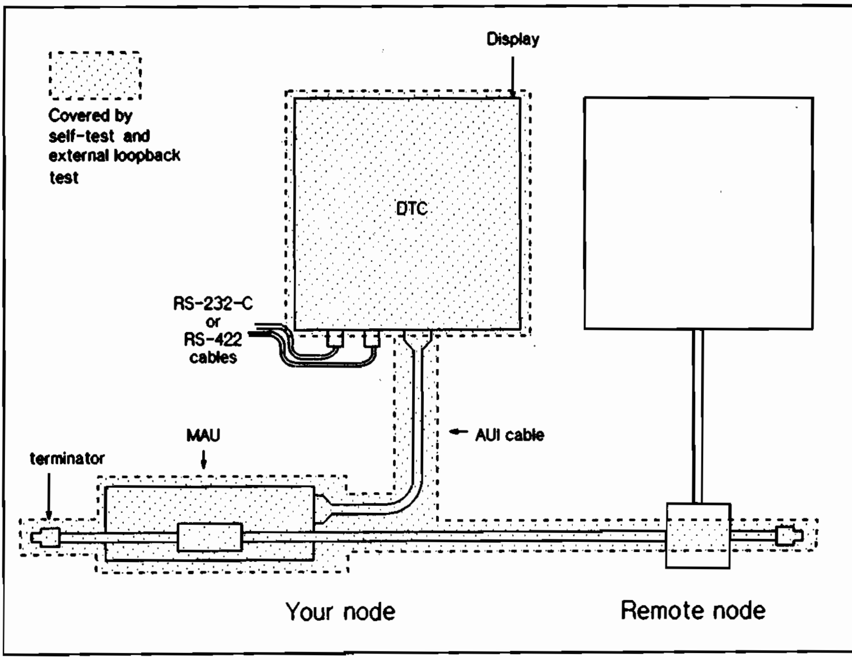


Figure 12-4. Self Test coverage on a ThickLAN

NOTE

Self-test is a destructive test. When the DTC is turned off all terminals attached to the DTC will lose contact with their sessions on the host. There is no way to reconnect these "orphaned" sessions with the terminals even when the DTC is turned on again. Be sure you have met the prerequisites before starting a destructive test.

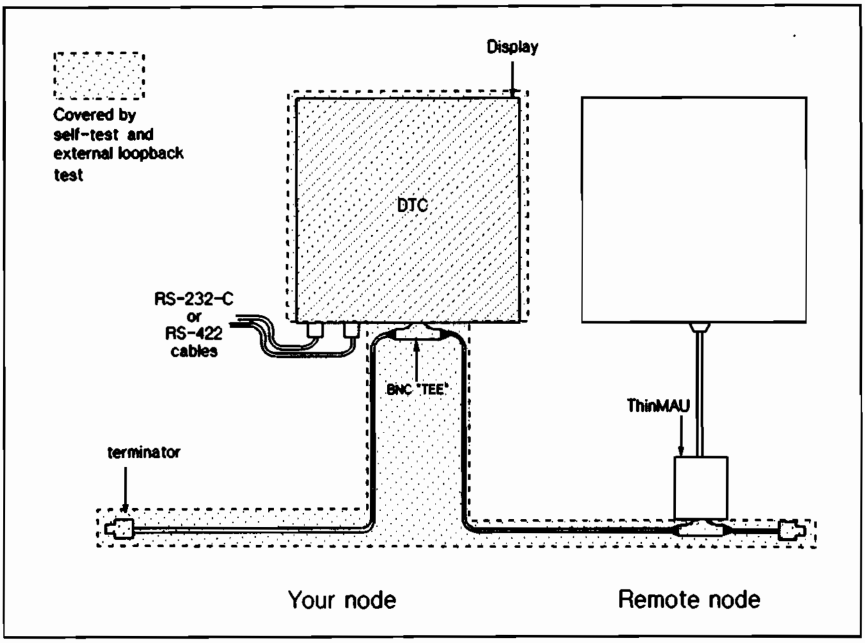


Figure 12-5. Self Test coverage on a ThinLAN

NOTE

If any device attached to the DTC is able to communicate with the host, the DTC passes Self-Test for the purpose of troubleshooting the LAN.

12.6.1 Prerequisites

You may run the self-test with the Distributed Terminal Subsystem (DTS) software on the host either shutdown or active. The prerequisites for starting the self-test are different in each case.

ACTIVE
To run the self-test when Distributed Terminal Subsystem (DTS) is active:

- You need to notify the system operator before switching a DTC off and on. He or she may want to have a specific download file available for the DTC.
- You need to find the DTC and have access to the power switch.
- If you are unfamiliar with the operation of the power switch on the DTC, see the heading "Power Switch Operation" in this chapter for an explanation.
- You must be able to read the DTC display and make a general interpretation of the codes displayed. See the headings "Reading The DTC Display" and "Interpreting Codes Displayed," if you need help.

INACTIVE
To run the self-test when the Distributed Terminal Subsystem (DTS) is inactive, no special preparation is required. No users will be able to communicate with the host anyway.

- You need to find the DTC and have access to the power switch.
- If you are unfamiliar with the operation of the power switch on the DTC, see the heading "Power Switch Operation" in this chapter for an explanation.
- You must be able to read the DTC display and make a general interpretation of the codes displayed. See the headings "Reading The DTC Display" and "Interpreting Codes Displayed," if you need help.

12.6.2 Procedure

To initiate a DTC self-test there are no commands to issue. Just turn the power DTC switch off, wait about two seconds, and then turn the power switch on. Among other activities the DTC performs when the power is turned on is a self-test. The results of the start-up activity are shown on the display.

```
(Turn DTC power switch off.)
(Wait two seconds.)
(Turn DTC power switch on.)
(Read the DTC display, make note of results.)
(Refer to the label on the internal plate at the front of the DTC.)
```

12.6.3 Interpretation

NOTE

During the self-test, if the LAN is operating at 50% of capacity for more than 10 seconds the LAN Connection test may halt and display an error code even if the DTC is working properly. Always repeat the self-test if you get a LAN Connection fault.

If the DTC does not download from the host, compare the codes on the DTC display with those on the Self-Test and Error Code label or figure 12-3. If the Self-test sequence has progressed beyond the LAN Connection test, then the DTC has passed Self-Test for the purpose of LAN troubleshooting. If the Self-test sequence has halted with the code for the connection test displayed, it will take a little more work to decide if the fault is internal or external

You can isolate the fault better by disconnecting the DTC from the LAN. Then attach a known good loopback hood to the DTC and repeat the self-test. If the connection test now passes, the fault is external to the DTC. In that case, the DTC has passed self-test but there is some external fault. If the connection test fails with a loopback hood, the DTC has an internal fault and has failed self-test. Refer to Paragraph 3.3 for additional information on using the loopback hood. Also see the remarks below regarding the MAU Power fuse.

If the Self-Test sequence has not progressed beyond the LAN Address test, the DTC has failed self-test with an internal fault. The LAN Address test only verifies the checksum of the LAN address. The validity of the address, according to Hewlett-Packard rules and IEEE 802.3, is not checked.

NOTE

Write down any error codes if the display stops with a fatal error indicated or begins cycling through error codes. You will need that information when the DTC is serviced.

If not all the slots in the DTC have interface cards installed, it is not unusual for the display to show "6X" occasionally during the self-test. Here the "X" stands for whatever slot(s) lack interface cards.

How you use the results depends on how you are using this manual. If you are using the troubleshooting approach for experienced users, described in chapter 2 of this manual under the heading "Troubleshooting for Experienced Users," interpret the results and decide on your next step.

If you are following the detailed procedures described under the heading "Detailed Troubleshooting Procedures" in chapter 2, return to the troubleshooting procedure with your results and proceed to the next step. If the fault is internal your DTC has failed the self-test. If the fault is external self-test has passed for our purpose but some fault has been indicated.

NOTE

The LAN Connection test is the equivalent of an external loopback test so if the self-test passes you may have already done the next step in some procedures.

<u>MAU Power Failure</u>. Unlike the self-test used with LANIC cards, the Self-Test used by the DTC cannot directly report an open ("blown") MAU power fuse. If the fuse is open ("blown"), a self-test will cause the DTC display to show the code for a LAN Connection fault. You can isolate the problem to a blown fuse during a node hardware electrical test. See Paragraph 3.4 for the test procedure.

12.7 External Loopback Test

A Distributed Terminal Controller (DTC) automatically runs a self-test, a series of several tests, when it is switched on. One test is the equivalent of an external loopback test. This test is a program called the LAN Connection test. It is in the permanent memory of the DTC. The whole series of tests will take about one minute then the DTC will attempt to download a configuration file from the host. The download may take up to 5 minutes.

An External Loopback test can be conducted with or without a Loopback hood or an external loopback test assembly. The results of a test with and without a hood can differ so be sure you understand what result the troubleshooting procedure is asking you to look for. The DTC can only indicate if the test passed or failed. It can not produce a report directly identifying the defective device.

12.7.1 Prerequisites

You may run the self-test sequence when the host Distributed Terminal Subsystem (DTS) software is either shutdown or active. The prerequisites for starting the self-test are different in each case.

NOTE

This test procedure is a destructive test. When the DTC is turned off all terminals attached to the DTC will lose contact with their sessions on the host. There is no way to reconnect these "orphaned" sessions with the terminals even when the DTC is turned on again. Be sure you have met the prerequisites before starting a destructive test.

ACTIVE

To run the external loopback test when the Distributed Terminal Subsystem is active:

- You need to notify the system operator before switching a DTC off and then on. He or she may want to send an order to log-off to anyone communicating with the host through the DTC. The operator may want to have a specific download file available for the DTC.

- You need to find the DTC and have access to the power switch.

- If you are unfamiliar with the operation of the power switch on the DTC, see the heading "Power Switch Operation" in this chapter for an explanation.

- You must be able to read the DTC display and make a general interpretation of the codes displayed. See the headings "Reading The DTC Display" and "Interpreting Codes Displayed," if you need help.

INACTIVE
To run the External Loopback test when the Distributed Terminal Subsystem (DTS) is inactive, no special preparation is required. No users will be able to communicate with the host anyway.

- You need to find the DTC and have access to the power switch.

- If you are unfamiliar with the operation of the power switch on the DTC, see the heading "Power Switch Operation" in this chapter for an explanation.

- You must be able to read the DTC display and make a general interpretation of the codes displayed. See the headings "Reading The DTC Display" and "Interpreting Codes Displayed," if you need help.

12.7.2 Procedure

To initiate a DTC external loopback test there are no commands to issue. Just switch off the DTC, wait about two seconds, and then turn the DTC back on. Among other activities the DTC performs when the power is turned-on is an external loopback test. The results of the start-up activity are shown on the display.

```
(Turn DTC power switch off.)
(Wait two seconds.)
(Turn DTC power switch on.)
(Read the DTC display, make note of results.)
(Refer to the label on the front of the DTC chassis.)
```

12.7.3 Interpretation

Compare the codes on the DTC display with those on the Self-Test and Error Code label. If the self-test sequence has progressed beyond the LAN Connection test, then the DTC has passed the external loopback test <u>for the purpose of LAN troubleshooting.</u>

If the Self-Test sequence has not progressed beyond the LAN Connection test, the DTC has failed the external loopback test.

NOTE

A MAU Power Failure due to an open (blown) MAU power fuse will also cause the LAN Connection test (External Loopback test of a DTC) to fail. If the fuse is open ("blown"), the DTC display will show the code for a LAN Connection fault. You can isolate the problem to a blown fuse during a node hardware electrical test. See Paragraph 3.4 for the test procedure.

NOTE

Write down any error codes if the display stops with a fatal error indicated or begins cycling through error codes. You will need that information when the DTC is serviced.

If not all the slots in the DTC have interface cards installed, it is not unusual for the display to show "6X" occasionally during the self-test. Here the "X" stands for whatever slot(s) lack interface cards.

How you use the results depends on how you are using this manual. If you are using the troubleshooting approach for experienced users, described in chapter 2 of this manual under the heading "Troubleshooting for Experienced Users," interpret the results and decide on your next step.

If you are following the detailed procedures described under the heading "Detailed Troubleshooting Procedures" in chapter 2, return to the troubleshooting procedure and go on to the next step. The External Loopback test has either passed or failed.

12.8 Remote Node Tests

A Distributed Terminal Controller (DTC) is not capable of originating any remote node test. When a configuration file is successfully downloaded, the DTC can respond properly to both XID and TEST packets sent by other devices on the network. It is also possible to send an XID packet to a specific DSAP (destination service access point) address in the DTC to check for a successful download.

If you need the station address of the DTC see the heading "Finding the Station Address" in this chapter for an explanation of how to get it.

NOTE

It is impossible to originate a Remote Node test from a DTC. Therefore, if you are following the detailed troubleshooting procedure, take the alternate path on the flow-chart to the next step.

Follow the instructions given in the system specific chapters for information on running Remote Node tests. The system specific chapter for the host of a DTC is chapter 13.

12.8.1 TEST and XID Packets

If the DTC is functional and attached to a good network, it will respond to all TEST packets and XID packets set to DSAP address 00 or F8 (hex) within the DTC. Once the DTC has been downloaded it will also correctly respond to an XID packet sent to DSAP FC (hex).

NOTE

If the DTC is functional and the network connection is good, the DTC will respond correctly to TEST or XID packets sent to the DSAPs 00 or F8 (hex) REGARDLESS OF THE STATE OF THE DOWNLOAD OPERATION. An XID packet sent to DSAP FC (hex) will get a correct response ONLY if the download has finished successfully.

LAN/XL Link Diagnostic 13

Contents

As you follow the troubleshooting procedures in chapter 2 of this manual, you are instructed to execute a variety of tests on your computer or computers. This chapter tells you how to run those tests if your computer is an HP 3000 Series 900.

The tests described in this chapter are part of the Online Diagnostic Subsystem. Tests specifically defined for your computer system are made using a series of programs collectively referred to as Sysdiag. There are two programs in Sysdiag that are mentioned frequently in this chapter: LANDAD and DUI. LANDAD is the LAN Device Adapter Diagnostic program. DUI stands for Diagnostic User Interface which is a command interpreter for handling your exchanges with the computer. DUI uses a simplified syntax.

This chapter shows examples of how to run the tests. If, for example, the troubleshooting procedure asks you to run an External Loopback test on a Series 900 computer, you would start Sysdiag, find the heading in this chapter for External Loopback test, follow the instructions under that heading, and then return to the troubleshooting procedure and go to the next step. This chapter is not a detailed description of the LAN diagnostic software on the HP 3000 Series 900. It just presents enough information to let you follow the troubleshooting procedures.

13.1 Reference and Background Information

13.1.1 System Requirements

The tests described in this chapter run on an HP 3000 computer, Series 900. The computer must be running the MPE XL operating system. The NS3000/XL network services software and Network Transport software must be running if you intend to use them. You do not need to have NS3000/XL or Network Transport if you only intend to use the LAN to carry traffic for your Distributed Terminal Subsystem.

The main hardware components of a Distributed Terminal Subsystem (DTS) are Distributed Terminal Controllers. A Distributed Terminal Controller (DTC) is unique because it has a station address and can respond to certain LAN diagnostic tests like a computer system. Troubleshooting a DTC on the LAN is described in Chapter 12. Also see Chapter 12 for a list of references if you are having problems with the terminals attached to a DTC.

If you need to find out which version of the operating system is running, execute a showme command once you have logged on to the system. You can determine the version of NS3000/XL is running by typing NMMAINT.PUB.SYS and pressing the return key.

13.1.2 Capability

The System Manager will need to set up or make available within an account a user for you. Be sure he or she gives you the exact log on to use.

The commands you will issue as part of these procedures require that you have the following capabilities:

NM *or* NA (Node Manager or Network Administrator), *AND*

OP, SM, *or* DI (OPerator, System Manager, or DIagnostician), *AND*

CS (Communications Subsystems)

Most of the time the MANAGER.SYS account has all of these capabilities.

NOTE

In order to maintain system security the System Manager may assign you a user which does not have all of the capabilities of MANAGER.SYS. As long as your user has the capabilities described above, you will be able to run the diagnostics.

13.1.3 References

For detailed information, you may want to have the following references available as you go through these procedures:

Installation Manuals:

Hardware:

HP 36921A LANIC/3000 Installation and Service Manual, part number 36921-90001

Software:

NS3000/XL Network Manager Reference Manual, part number 36920-90002
NS3000/XL Error Message and Recovery Manual, part number 36920-90004

Cabling:

LAN Cable and Accessories Installation Manual, part number 5955-7680

Operating Manuals:

NS3000/XL User/Programmer Reference Manual, part number 36920-90001
MPE XL Asynchronous Serial Communication Administrator's Manual, part number 32022-90001

Diagnostic Manuals:

Online Diagnostic Subsystem Manual - Series 3000/930 and 9000/840, part number 09740-90020
Online Diagnostic Subsystem Utilities Manual, part number 09740-90021

13.2 Setting Up

There are a number of "housekeeping" tasks that you may have to perform in going through the diagnostic procedures in this chapter. Those tasks which cannot be executed easily (or at all) from the Diagnostic User Interface (DUI) are gathered here first. Then we explain the basics of using the DUI. The tasks are listed in roughly the order that you would perform them.

13.2.1 Conventions

Our examples show your input to the computer in `shaded letters`. In examples, the computer's response is shown in `unshaded letters in this typewriter-like type face.`

When your input is shown between shaded angle brackets and parentheses, `<(abcd efg)>`, you are being asked to enter what is described by the text between the angle brackets and parentheses. For instance, `<(filename)>` means to enter the name of a file.

A key sequence which may not print on a display is represented by shaded angle brackets. For example, to indicate your terminal may not be able to show anything when you enter control-D it would be printed below as <CTRL-D>. Note that these characters mean, "hold down the control key, press the 'D' key once, then release the control key."

In the explanations of procedures or processes that are included in this chapter, the following general outline is used:

- Prerequisites
- Procedures
- Example(s)
- Interpretation

Where a particular heading does not apply in a particular explanation, it has been omitted.

NOTE

Individual tests provided by the diagnostic program are frequently referred to as "sections." For example if you run section 8 an external loopback test will be performed. Do not interpret a reference to a section of the diagnostic as a reference to a section of text in a manual.

13.2.2 Logging On

The commands that you will issue require the following capabilities:

NM *or* NA (Node Manager or Network Administrator), *AND*

OP, SM, *or* DI (OPerator, System Manager, or DIagnostician), *AND*

CS (Communications Subsystem)

If your normal account has these capabilities, log on as usual. If not, the MANAGER.SYS account usually has these capabilities. (If it doesn't, check with your system manager for an account that does.)

The general structure of the log-on sequence is:

```
RETURN                                         (Press RETURN to get ":" prompt.)
hello <(user name)>.<(account name)>           (Log on.)
<password1>                                    (Enter account password.)
<password2>                                    (Enter user password.)
```

The system may ask you for zero, one, or two passwords, depending on how the system's security is set up. The system blanks out whatever password you type in, to prevent others from reading the passwords from you terminal screen.

Example: The following example shows a typical log-on sequence for the MANAGER.SYS account.

```
RETURN
:hello manager.sys
ENTER ACCOUNT PASSWORD:                  <----
                                      System does not echo passwords
ENTER USER PASSWORD:                     <----

HP3000 / MPE XL G.02.00 (BASE 0.00.00).  WED, APR 23, 1986, 10:04 AM
:
```

End of example

NOTE

The line that begins, "HP3000 ..." is called the standard log-on message. The version number of MPE XL listed in that message will vary depending on which version is installed in that computer system at the time you log on. The version number will be different than that shown in the example above.

13.2.3 Finding Your Capabilities

If you are unsure whether you have the necessary capabilities, enter the command LISTUSER to find out what capabilities you have. The command sequence is:

```
listuser <(user name)>.<(account name)>   (List user information.)
```

You capabilities are listed in the user information, on the line that begins with "CAP:".

Example: The following example shows how to run LISTUSER. Here we have run the program from MANAGER.SYS account.

```
:listuser manager.sys
********************
USER: MANAGER.SYS

HOME GROUP: PUB                    PASSWORD: **
MAX PRI    : 150                   LOC ATTR: $00000000
LOGON CNT  : 1
CAP: SM,AM,AL,GL,DI,OP,CV,UV,LG,PS,NA,NM,CS,ND,SF,BA,IA,PM,MR,DS,PH

:                                          [Capabilities of interest]
```

End of example

NOTE

If listuser does not produce a report, your user lacks SM or AM capability. In that case, the MPE XL command showvar hpusercapf will produce a report of your user capabilities.

13.2.4 Finding LANIC Card Information

To perform the tests required by the troubleshooting procedure, you commonly need to know the name of the network, the physical-device specifier (PDEV) of the LANIC card, the card's availability, and its station address. You will need to take the following steps to get all this information:

1) Determine which network you intend to troubleshoot.

2) If Network Services (NS) is active on the network of interest, get the name of the network.

3) Get the PDEV (physical-device specifier) for the LANIC you intend to troubleshoot.

4) Start Sysdiag and run Section 3 – Identify to get the station address of the LANIC you are going to troubleshoot.

We'll explain all this and more in the paragraphs that follow.

13.2.4.1 Which Network?

If you are following either troubleshooting procedure described in Chapter 2 you will have to determine which network node A and node B are connected to. The Network Map should allow you to trace the connection between the nodes and identify the PDEV of the LANIC in the computer. If the map is not current you may be able to find labels on the LAN cable which will allow you to deduce which network the nodes are on. Or you may be able to deduce which network is involved by examining the backplane of the Series 900 involved.

In an HP 3000 Series 900 the conventional configuration requires that one LANIC card be installed in an I/O card slot with a certain PDEV (physical-device specifier). This particular LANIC card will be used by the Distributed Terminal Subsystem (DTS) of the computer to communicate with all the serial devices DTS controls. Put another way, any Distributed Terminal Controller (DTC) that is part of the DTS must be on the same LAN as the DTS-dedicated LANIC.

If a second LANIC card is present and Network Services has been installed, the second card is used for Network Services.

NOTE

See the heading "Getting the Physical-Device Specifier (PDEV)" for specific information on the PDEVs currently used by DTS and NS.

13.2.4.2 Getting the Network Name

You will need to know the network name before you shut down LAN activity on your system. You must shut down LAN activity before you run a segment test on your LAN cable.

You will use the **netcontrol status** command to get the name of your LANIC card's network. The network name shows up as the "HOME NETWORK" in the listing. The form of the command is:

```
netcontrol status       (Get network information.)
```

Example: Here's an example of using `netcontrol status` to get the network name:

```
:netcontrol status

GENERAL TRANSPORT STATUS : WED, APR 23, 1986, 10:09 AM

TRANSPORT STARTED        : WED, APR 23, 1986,  9:59 AM

FLAGS                    : %020000
MAX NETWORK INTERFACES   : 2
PATH DESCRIPTORS         : INIT 100 MAX 100
MAX NODE NAMES           : 10
MAX INBOUND DESTINATIONS: 10

HOME NETWORK             : LAN1<--------------------------[Network name]
CONFIGURATION FILE       : NMCONFIG.PUB.SYS
TRACE MASK               :

NODE NAME                :LKNGGLAS.AIR.RU
:
```

End of Example

13.2.4.3 Getting the Physical-Device Specifier (PDEV)

The PDEV (physical-device specifier) for a LANIC card takes the format "N.N" where N represents an integer, not a numeral, in decimal (base ten) notation. Therefore, 8.4 and 16.4 could be acceptable PDEVs.

The PDEV describes the route or I/O path through the computer to the LANIC card. The card resides in a specific slot of a backplane connected to a bus called the Channel I/O Bus (CIB). Each CIB is connected to a CIB adapter. The adapter resides in a slot on a high speed bus. In HP 3000 Series 900 computers this high speed bus is called Mid-Bus.

The number to the left of the decimal point in a PDEV was obtained by multiplying the Mid-Bus slot number of the CIB adapter by four. The number to the right of the decimal in a PDEV is the actual slot number in the CIB backplane where, in this case, a LANIC card is located. Each CIB adapter can control only one CIB backplane.

For example, by convention in HP 3000 Series 930 computers, the LANIC used by the Distributed Terminal Subsystem (DTS) is located at PDEV 8.4 . In the same system the LANIC card that supports NS (network services) will be in the second CIB backplane at PDEV 16.4.

If you have a different Series 900 computer, the system configuration manual will specify any CIB backplane slots that must contain specific interfaces such as the LANIC card. The configuration manual will also mention where the CIB adapters are located in the Mid-Bus and the CIB backplane to which each adapter is attached.

NOTE

> The LDEV (logical-device specifier) is not required to run tests through DUI on an HP 3000 Series 900. Sysdiag will accept either LDEV or PDEV (physical-device specifier) as the device to be tested (provided the physical device has an LDEV). For simplicity, we will always use the PDEV.

13.2.4.4 Getting a LANIC Card Station-Address

This particular section deals with finding the station address of an HP 3000 Series 900. If you need to get the station address of some other computer system see the chapter for that system elsewhere in this manual. There are two ways to get the station address or addresses for your system:

> **The Easy Way.** Look on the network map. If the map is current, it will show the correct station address of all network nodes. If your network map is out of date or missing, you might find that someone has noted the station address on the back of your computer. Failing that, you'll have to resort to the second method.

> **The Second Way.** You will have to run a program or series of programs to get the station address.

If you use **The Second Way**, you will need to have the PDEV of the LANIC you will be troubleshooting. See the heading "Getting the Physical Device-Specifier (PDEV)" if you are not sure of the PDEV.

Next, you must start Sysdiag. After that you will need to run Section 3 – Identify which will check the station address of the LANIC card whose PDEV you specified.

13.2.4.4.1 Starting Sysdiag.
When you start Sysdiag you activate a command interpreter known as the Diagnostic User Interface (DUI). It uses a simplified syntax. When the DUI is operating in an MPE XL environment the prompt is "DUI >".

Prerequisites

- You should be at a system prompt. In our examples the system prompt is a colon.

Procedure
The general command sequence to start Sysdiag is:

```
:sysdiag                                 (Start Sysdiag.)
```

Example
The example below shows the start-up of Sysdiag from a system prompt.

Example: Starting Sysdiag.

```
:sysdiag

******************************************************************
******                                                      ******
******            ON-LINE DIAGNOSTIC SUBSYSTEM              ******
******                                                      ******
******           (C) Hewlett-Packard Company                ******
******                                                      ******
******     DUI version 00.08      Monitor version 00.09     ******
******                                                      ******
******************************************************************

    Type "HELP" for assistance.
DUI >
```

End of Example

NOTE

The version numbers on the system you will be working on will different that those shown above.

13.2.4.4.2 DUI Syntax.
This discussion of the DUI syntax provides just enough information for you to run tests called for in the troubleshooting procedures. Since the On-Line Diagnostic Subsystem is designed to handle all diagnostic programs for the computer system, the syntax requires a separate manual to describe it in detail. If you need a detailed description of the syntax see the heading in this chapter "References". The diagnostic subsystem manual covers syntax.

If you have need for a detailed reminder about using DUI, type "help" when you are at a DUI prompt.

The command lines you will use to run the tests called for in the troubleshooting procedures take the form:

```
<command>  <module_name>  [PDEV=<pdev_specifier>]  [SECTIONS=<section_range_list>]
[STEPS=<steps_range_list>]
```

command	Use "run" for all the tests called for by the troubleshooting procedures.
module_name	The module you will run is "landad".
pdev_specifier	This is the PDEV you want tested. If the PDEV is 8.4 the correct form is "PDEV=8.4".
section_range_list	This is a list of sections to be run. If more than one section is specified place a comma between each name. If you wish to run 5 and 6 the correct form is "section=5,6".
step_range_list	If called for, this list specifies exact steps within a section to run. to run. For example, if steps 71 and 72 of section 7 are to be run, the correct form is "section=7 step=71,72". If more than one step is specified, a comma must be placed between each name.

13.2.4.4.3 Use Section 3 to get Station Address.
The section of the LAN Device Adapter Diagnostic (LANDAD) program that checks a LANIC for its station address is called, " Section 3 – Identify," as you will see in the example below.

Prerequisites

- You must know the PDEV (or LDEV) of the LANIC you will be troubleshooting. See the heading "Getting the Physical-Device Specifier (PDEV)" in this chapter if you need to find the PDEV.

- You must be at a DUI prompt (see the heading "Starting Sysdiag").

Procedure
The general command sequence to get the station address is:

```
run landad pdev=8.4 sec=3             (Run section 3, Identify).
```

The station address is displayed on the line that begins, "RAM (Currently . . .," etc.

Example
In the example below the "$" indicates the number following it is in hexadecimal notation. The hexadecimal numerals are zero through 9 and A through F.

Example: Getting the station address.

```
DUI >run landad pdev=8.4 section=3
******************************************************************
******                                                      ******
******        LANDAD LAN Device Adapter Diagnostic          ******
******                                                      ******
******     (c) Copyright Hewlett-Packard Company 1986       ******
******                 Version  A.00.07                     ******
******                                                      ******
******************************************************************


Welcome, Today is TUE, SEP 23, 1986 at 12:03 PM

    Section 3 -- Identify

    CIO card ID byte  = $06 (LANIC).
    Hardware revcode  = 2.
    Firmware datecode = 2620.
    CIO firmware ID   = 1.
    NOVRAM (permanent) station address     = $08-00-09-00-0E-A2.
    RAM (currently active) station address = $08-00-09-00-0E-A2.
    DAM revcode        = $A0400015.

    End of Section 3 -- Identify

LANDAD Exiting...
LANDAD (PIN 32) has just terminated.
DUI >
```

End of example

NOTE

The datecode and revcode in the example are not important in this context.

13.2.5 Exiting Sysdiag

A simple command returns you to MPE XL. You will be returned to the system prompt you were using before Sysdiag started. In the example the command has been shortened. As long the remaining letters are unique to that command, you may drop letters from the right-end of a command word.

Prerequisites

- You need to be at the DUI prompt.

Procedure
The command sequence to leave Sysdiag is a single syllable:

```
exit                    (command to exit Sysdiag)
```

Example
In the example below, the command to exit has been shortened by dropping letters.

Example: Return to MPE XL

```
DUI > ex
:
```

End of example

NOTE

Exiting Sysdiag will automatically cause an HP 3000 Series 900 computer to return to Multi User Mode (MUM). See the heading "Changing Operating Modes" in this chapter for more information on user modes.

13.2.6 Logging Off

To log off the system, use the bye command. The form is:

```
bye                          (Log off.)
```

Example: A typical log-off looks like this:

```
:bye
CPU=64. CONNECT=28. WED, APR 23, 1988, 10:31 AM
```

End of example

13.2.7 Changing Operating Mode

The reason you have to change the system operating mode is some tests cannot be run from Multi User Mode. Destructive tests must be performed from Single User Mode. If you are following the troubleshooting procedures in chapter 2, only two of the destructive tests are called for:

```
Section 5 -- Selftest
Section 8 -- External Loopback
```

Sysdiag will prevent you from running a destructive test if your HP 3000 Series 900 is in the wrong user mode. If you attempt to start a destructive test, Sysdiag will will stop the test and send an error message as in the following example.

Example: Mode error detected.

```
DUI >run landad pdev=8.4 section=5
*****************************************************************
******                                                     ******
******          LANDAD LAN Device Adapter Diagnostic       ******
******                                                     ******
******      (c) Copyright Hewlett-Packard Company 1986     ******
******                  Version  A.00.07                   ******
******                                                     ******
*****************************************************************


Welcome, Today is TUE, SEP 23, 1986 at 12:08 PM

*** SECTION 5 CANNOT BE RUN IN THE CURRENT MODE. (DSSERR 1802)
LANDAD Exiting...
LANDAD (PIN 32) has just terminated.
DUI >
```

End of example

13.2.7.1 Multi-user to Single-user

If you are planning to run any destructive test through Sysdiag you must place the system in Single User Mode.

NOTE

TAKING THE SYSTEM TO SINGLE USER MODE WILL ABORT OTHER USER SESSIONS. Check with the system manager before you take the system to Single User Mode. He or she will want to transmit a warning that the system will be unavailable.

Prerequisites

- You must be at a DUI prompt. If you are not, see the heading "Starting Sysdiag" earlier in this chapter.

Procedure
The general command sequence to switch to Single User Mode is:

```
mode sum                    (switch system to Single User Mode)
```

Example
Below are two examples of taking the system to Single User Mode. In the first example, the user is in a regular session on the the system. In the second example, the user is using the system console or has NS User Session Logging enabled. NS User Session Logging logs NS Console messages to a user session.

Example 1: Going to Single User Mode, no logging.

```
DUI >mode sum
Single User (SUM)
DUI >
```

End of example

Example 2: Going to Single User Mode, logging enabled or from console.

```
DUI >mode sum
System State:  Single User - No Logon Mode.
Single User (SUM)
DUI >
```

End of example

13.2.7.2 Single-user to Multi-user

There are two ways to return to Multi User Mode. One way to exit from Sysdiag to MPE XL (return to Multi User Mode by default). The other way is to issue a direct mode-switching command at a DUI prompt.

Prerequisites

- You need to be at a DUI prompt in either case

Procedure A - return to Multi User Mode by default
The general command sequence to exit sysdiag and return to Multi User Mode is:

```
exit                (exit will automatically switch to Multi User Mode)
```

Example
If you are using a regular terminal session, the return to MPE XL will look the same as the example under the heading "Exiting Sysdiag," above. No example of that exit is given below.

The example that follows is of an exit initiated at the system console or a terminal to which NS Console messages are being logged.

Example: Console view, returning to Multi User Mode by default.

```
DUI >exit
System State:  Multi User Mode.

END OF PROGRAM
:
```

End of example

Procedure B - return to Multi User Mode on command
The general command sequence to return to Multi User Mode without exiting Sysdiag is:

```
mode mum                              (forces a switch to Multi User Mode)
```

Examples
If you are using a regular terminal session, the return to Multi User Mode is shown in example one, below. Example two is the same command made from the system console or a terminal with logging enabled.

Example 1: Without logging, returning to Multi User Mode on command.

```
DUI >mode mum
Multi User (MUM)
DUI >
```

Example 2: Console view, returning to Multi User Mode on command.

```
DUI >mode mum
System State:  Multi User Mode.
Multi User (MUM)
DUI >
```

End of example 2

13.3 Shutting Down LAN Activity

You must shut down LAN activity on your node before you run a segment test on the LAN cable. Rather than turning off a Series 900 because you need to run voltage and time domain reflectometry tests on the cable, you can unplug the AUI cable from the stub cable of the computer system LANIC card. If your network connection uses a ThinMAU, unplug the AUI pigtail from the LANIC. Be careful not to short-circuit the LANIC side of the connection you opened because it carries power to the MAU. Before such a disconnection is made both NS3000/XL and link-level level access to the network should be halted.

NOTE

Do not disconnect the MAU/ThinMAU attached to a LANIC card used by the Distributed Terminal Subsystem (DTS) unless all users have logged off, otherwise their sessions will be "orphaned". There is no way to reconnect a user to his orphaned session.

13.3.1 Prerequisites

To shut down LAN activity on your node:

- You need to know the name of the network to which your system is attached. (Refer to the section "Setting Up", the subsection "Finding LANIC Card Information", earlier in this chapter, for details on finding the network name.) You actually only need the network name to bring LAN activity back up but you cannot easily get it once LAN activity has been shut down.

13.3.2 Procedure

The command sequence for shutting down LAN activity on a node is:

```
nscontrol stop        (Shut down network services.)
netcontrol stop       (Shut down the network interface.)
```

If you are using the system console, or if logging is enabled for your user.account, you will see several status messages. These are shown in the examples below. If you are using an ordinary terminal with logging not enabled, you won't see any additional information when you shut down LAN activity.

NOTE

The command `nscontrol stop` produces a graceful halt to NS by allowing any user session actually accessing NS to continue to have access until that user logs off. This is called a "quiescent shutdown". The command `netcontrol stop` immediately terminates the network interface. Any session accessing NS at the time of termination may lose data and will be unable to use the network. You or the System Manager may check for any user who still has access to NS with the the command `nscontrol status=all` before shutting down the network interface.

13.3.3 Examples

Example 1: If you are using an ordinary terminal, the interaction is not very exciting.

```
:nscontrol stop
:netcontrol stop
:
```

End of example

Example 2: If you're operating from the system console, or if logging is enabled for your user.account, you see the status messages:

```
:nscontrol stop
RPM NETWORK SERVICE STOPPED.
PTOP NETWORK SERVICE STOPPED.
RFA NETWORK SERVICE STOPPED.
VTR NETWORK SERVICE STOPPED.
VT NETWORK SERVICE STOPPED.
NFT NETWORK SERVICE STOPPED.
RPML NETWORK SERVICE STOPPED.
PTOPL NETWORK SERVICE STOPPED.
RFAL NETWORK SERVICE STOPPED.
VTRL NETWORK SERVICE STOPPED.
VTL NETWORK SERVICE STOPPED.
NFTL NETWORK SERVICE STOPPED.
:netcontrol stop
:
```

NOTE

The exact appearance of the display depends on what information was selected for display when logging was set up.

13.4 Starting Up LAN Activity

Once you have running a segment test, you will want to re-start LAN activity at your node.

13.4.1 Prerequisites

To start up LAN activity at your node:

- You must be at a System prompt. If you are in an application (including Sysdiag) you can usually exit by typing "exit". If that does not work, see the user's manual for the application.
- You MUST know the name of the network to which your LANIC card is connected. (You get this information with the `netcontrol status` command. Refer to the section "Setting Up", sub-section "Finding LANIC Card Information", earlier in this chapter.)

13.4.2 Procedure

Once you know the network name, the commands you use to bring up your node are:

```
netcontrol start ;net=<(network name)> (start Network Transport.)
netcontrol start;net=loop              (start Net. Trans. Loopback.)
nscontrol start                        (start NS.)
```

Be sure to type in all parameters indicated. If you leave out the `net=<(network name)>` parameter, no error message will be displayed but NS3000/XL will not work.

If you are using the system console, or if logging is enabled for your user account, you will see several status messages. These are shown in the examples below. If you are using an ordinary terminal with logging not enabled, you won't see any additional information when you start up LAN activity the prompt will return as it normally does after a command is entered.

13.4.3 Examples

Example 1: If you are using an ordinary terminal, the display looks like this:

```
                                  [Network name]
:netcontrol start;net=lan1
:netcontrol start;net=loop
:nscontrol start
:
```

End of example

Example 2: If your terminal is the system console, or if logging is enabled for your user account, you will see the status messages:

```
:netcontrol start;net=lan1
** NETXPORT Subsystem : VALIDATION STARTED
** NETXPORT Subsystem : VALIDATION COMPLETE
:netcontrol start;net=loop
:nscontrol start
RFA NETWORK SERVICE STARTED.
VTR NETWORK SERVICE STARTED.
VT NETWORK SERVICE STARTED.
NFT NETWORK SERVICE STARTED.
RFAL NETWORK SERVICE STARTED.
VTRL NETWORK SERVICE STARTED.
VTL NETWORK SERVICE STARTED.
NFTL NETWORK SERVICE STARTED.
:
```

End of example

13.5 Status and Statistics

The LANDAD program lets you read the status and statistics maintained by the LANIC card. While interpretation of this data is beyond the scope of this manual, a person with thorough LAN knowledge can use this data to their advantage.

Since many LANIC statistics registers are cumulative, you might want to zero them. Otherwise you will be dealing with data that has accumulated since the registers or LANIC card were last reset. The procedure is described below but no example is given.

NOTE

No example of a reset is given. After a reset you would see the same display you usually see on your terminal when you request link statistics, but all the counters would be zeroed.

13.5.1 Prerequisites

To read the status of the LANIC card:

- You need to know the PDEV of your LANIC card. To find the PDEV, see the heading "Finding the Physical-Device Specifier (PDEV)" in this chapter.
- You need to be at a DUI prompt. If you are at a system prompt, see the heading "Starting Sysdiag" in this chapter.

13.5.2 Procedure

The general command sequence for reading card status and statistics is:

```
run landad pdev=8.4 section=6,7      (Status=section 6, Statistics=section 7)
```

The general command sequence to reset the LANIC statistics registers is:

```
run landad pdev=8.4 section=7 step=71,72 (Statistics=7, Reset = step 72.)
```

13.5.3 Example

In this example two sections of LANDAD are started by a single command line. A comma is used to separate the section names (6 and 7).

Example: Requesting the Status and Statistics from a LANIC.

```
DUI > run landad pdev=8.4 section=6,7
**************************************************************
******                                                  ******
******        LANDAD LAN Device Adapter Diagnostic      ******
******                                                  ******
******     (c) Copyright Hewlett-Packard Company 1986   ******
******                Version  A.00.07                  ******
******                                                  ******
**************************************************************

Welcome, Today is FRI, JUN 27, 1986 at 11:40 AM.

    Section 6 -- Status

    LANIC status has been read successfully.
    LANIC passed selftest.
    LANIC is online.
    MAU power fuse is OK.
    Free transmit buffers =     4; Maximum =     4.
    Full receive buffers  =     0; Maximum =    16.
    Read data ARQ Frame threshold =     1.
    Read data ARQ timeout limit   =     1.
                              RAM value           NOVRAM value
    ==========================(Current)===========(Default)=========
    Station address           $08-00-09-00-3E-E9  $08-00-09-00-3E-E9
    Receive bad frames        Disabled            Disabled
    Receive multicast frames  Enabled             Disabled
    Receive broadcast frames  Enabled             Enabled
    Receive all frames        Disabled            Disabled
    ===============================================================
    The following multicast addresses are recognized:
    $09-00-09-00-00-01

    End of Section 6 -- Status
```

(Continued on the next page)

```
Section 7 -- Link Statistics

   Step 71 - Read and Display Link Statistics
   Link level statistics have been read successfully.

   Transmit Statistics=======================================
     TOTAL frames transmitted without error.................3
       Deferred transmits...................................0
       One collision transmits..............................0
       More than one colllsion transmits....................0
     TOTAL frames NOT transmitted...........................0
       Retry errors.........................................0
       Late collisions......................................0
       Loss of carrier during transmit......................0
     No heartbeat detected after transmission...............0
     No free transmit buffers...............................0
     TDR of last retry error................................0
     LANCE restarts.........................................0
   Receive Statistics========================================
     TOTAL frames received without error....................3
     Frames rejected by address filter......................0
     Frames rejected due to CRC errors......................0
     Frames rejected due to alignment errors................0
     Frames rejected due to oversize length.................0
     LANCE indicated one or more frames lost................0
     No free receive buffers................................0
   End of Step 71 - Read and Display Link Statistics

End of Section 7 -- Link Statistics

LANDAD Exiting...
LANDAD (PIN 32) has just terminated.
DUI >
```

End of example

13.6 Self-Test

The LANIC card self-test executes when the card is reset from LANDAD or the computer system is booted. An External Loopback test is also performed. Figure 11-1 shows the area covered by the self-test. Self-test is a destructive test. See the prerequisites.

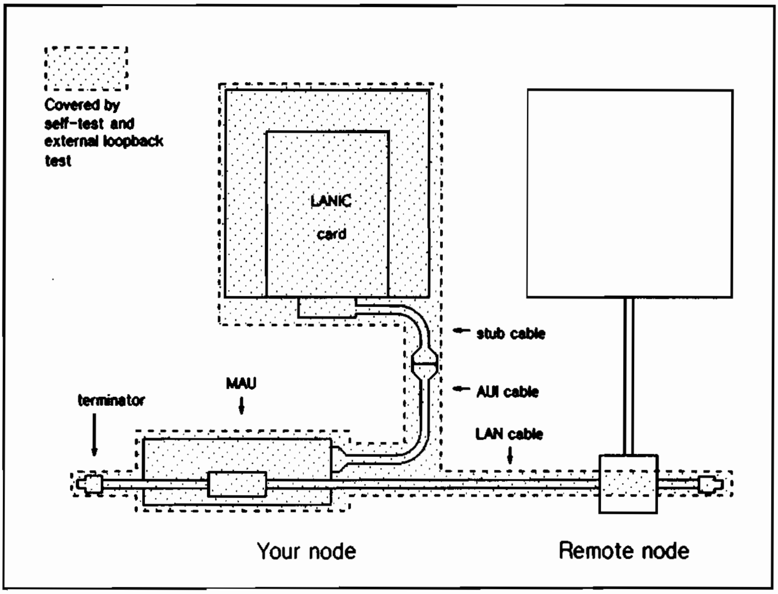


Figure 13-1. Test coverage

13.6.1 Prerequisites

To run the self-test:

- You must be in Single User Mode. If you are not, see the heading "Changing Operating Mode".
- You need to know the PDEV of your LANIC. If you do not know the PDEV for your LANIC see the heading "Getting the Physical-Device Specifier (PDEV)" in this chapter.
- You need to be at the DUI prompt. If you are at a system prompt, see the heading "Starting Sysdiag" in this chapter.

13.6.2 Procedure

The general command sequence for initiating self-test is:

```
run landad  pdev=8.4 sec=5             (Section 5 = Self-test)
y                                (continue test)
```

13.6.3 Examples

The following examples show two LANIC card self-tests. In the first example, self-test passes. In the second example, self-test fails for the reason indicated.

Example 1:

```
DUI > run landad pdev=8.4 sec=5
*******************************************************************
******                                                       ******
******         LANDAD LAN Device Adapter Diagnostic          ******
******                                                       ******
******      (c) Copyright Hewlett-Packard Company 1986       ******
******                 Version  A.00.07                      ******
******                                                       ******
*******************************************************************

Welcome, Today is FRI, JUN 27, 1986 at 11:42 AM.

    A destructive section has been selected.
    Do you wish to continue (Y/N) [N]?y

    Section 5 -- Selftest

    Selftest completed successfully.
    The LANIC is functional.

    End of Section 5 -- Selftest

LANDAD Exiting...
LANDAD (PIN 32) has just terminated.
DUI >
```

End of example

Example 2: Here the self-test fails because the MAU was not attached to the AUI cable.

```
DUI > run landad pdev=8.4 section=5
******************************************************************
******                                                      ******
******         LANDAD LAN Device Adapter Diagnostic         ******
******                                                      ******
******     (c) Copyright Hewlett-Packard Company 1986       ******
******                 Version  A.00.07                     ******
******                                                      ******
******************************************************************

Welcome, Today is FRI, JUN 27, 1986 at 11:42 AM.

    A destructive section has been selected.
    Do you wish to continue (Y/N) [N]?y

    Section 5 -- Selftest

*** ERROR IN SECTION 5
*** ERROR -- LOSS OF CARRIER DETECTED DURING TRANSMIT (LANDADERR 5010)
*** If you are using an HP30241A MAU, check the following:
***   A1) Stub cable not connected to frontplane connector.
***   A2) AUI cable not connected to stub cable.
***   A3) AUI cable not connected to MAU.
***   A4) Broken MAU.
***   A5) Broken AUI cable.
***   A6) Broken stub connector cable
***   A7) NETWORK CABLE shorted.
***   A8) LANIC broken.
*** If you are using an HP28641A MAU, check the following:
***   B1) Stub cable not connected to frontplane connector.
***   B2) HP28641A Cable not connected to stub cable.
***   B3) Broken HP28641A.
***   B4) Broken stub connector cable
***   B5) LANIC broken.
```

```
*** The above message was printed on FRI, Jun 27, 1986, 11:42 AM.
                                ************
                                *** NOTE ***
                                ************
   The above error message(s) are from the most recent external loopback
   test.  They will continue to be displayed (even after the problem has
   been fixed) until you run another EXTERNAL LOOPBACK (section 8) or any
   destructive test (sections 2,5,8,11,12).

*** The above message was printed on FRI, Jun 27, 1986, 11:42 AM.

    End of Section 5 -- Selftest

LANDAD Exiting...
LANDAD (PIN 32) has just terminated.
DUI >
```

End of example

13.6.4 Interpretation

The examples above show test results reported by LANDAD. How you use the results you get depends on whether you are using the simplified troubleshooting approach for experienced users (refer to "Troubleshooting for Experienced Users" in chapter 2 of this manual), or are adhering rigorously to the detailed troubleshooting procedures.

Which ever approach you are using you will need to note whether the card passed or failed the test. If the test report lists any fault that is external to the LANIC, such as a disconnected cable, then you should regard the test as having failed due to an external fault. In other words, treat the LANIC card as if it has passed the self-test. The external fault reported is suspected of causing the problem.

If only the LANIC card is listed as having a fault, the self-test failed due to an internal fault. In other words, the LANIC card has failed the test.

If you're using the simplified approach as a general guide for troubleshooting, the results of the tests should give you an idea where to look for the problem.

If you are following the detailed procedures and any external failure is reported by the test, assume the failure is external to the LANIC. If only the LANIC is listed as a possible source of the problem, assume the problem is with the LANIC.

MAU Power Failure. During Section 5 testing, the state of the MAU power fuse is sensed. If the fuse is blown, the diagnostic returns an error message:

```
*** ERROR -- MAU POWER FUSE BLOWN ON LANIC. (LANDADERR 5006)
*** Replace Fuse on the LANIC.
*** Beware of these other possible problems:
*** 1) Broken MAU.
*** 2) Shorted power lines in cabling to the MAU
       (AUI cable or stub connector cable).
*** 3) Broken LANIC.
```

In addition the following LANDAD sections will report the status of the MAU power fuse:

Section 3 – Identify
Section 4 – Local Loopback
Section 6 – Status
Section 8 – External Loopback
Section 9 – Remote Node Test
Section 10 – Remote XID Test

13.7 External Loopback Test

An External Loopback test will cause the LANIC to send a special test frame to the LAN cable and receive it from the LAN cable. This test is primarily used to check operation of the node hardware and the LAN cable. This is a destructive test. See the prerequisites.

13.7.1 Prerequisites

To initiate the External Loopback test:

- You must be in Single User Mode. If you are not, see the heading "Changing Operating Mode".
- You need to know the PDEV of your LANIC. If you do not know the PDEV for your LANIC see the heading "Getting the Physical-Device Specifier (PDEV)" in this chapter.
- You need to be at a DUI prompt. If you are not, see the heading "Starting Sysdiag" in this chapter.

13.7.2 Procedure

The general command sequence for starting an External Loopback Test is:

```
run landad pdev=8.4 sec=8          (External Loopback Test = section 8)
y
```

13.7.3 Examples

Following are two examples of running the External Loopback Test. In the first example the test is successful. In the second example the test fails. The condition that caused the failure is given at the beginning of the second example.

Example 1: In the first example, we show a test that passes.

```
DUI > run landad pdev=8.4 sec=8
*****************************************************************
******                                                    ******
******        LANDAD LAN Device Adapter Diagnostic        ******
******                                                    ******
******     (c) Copyright Hewlett-Packard Company 1986     ******
******                 Version  A.00.07                   ******
******                                                    ******
*****************************************************************

Welcome, Today is FRI, JUN 27, 1986 at 11:44 AM.

    A destructive section has been selected.
    Do you wish to continue (Y/N) [N]?y

    Section 8 -- External Loopback

    A link frame has been successfully transmitted
    and received from the NETWORK CABLE.

    End of Section 8 -- External Loopback

LANDAD Exiting...
LANDAD (PIN 32) has just terminated.
DUI >
```

End of example

Example 2: In this example The External Loopback Test fails because the STUB cable was not attached to the AUI or MAU.

```
DUI > run landad pdev=8.4 sec=8
*****************************************************************
******                                                     ******
******        LANDAD LAN Device Adapter Diagnostic         ******
******                                                     ******
******     (c) Copyright Hewlett-Packard Company 1986      ******
******                  Version  A.00.07                   ******
******                                                     ******
*****************************************************************

Welcome, Today is FRI, JUN 27, 1986 at 11:44 AM.

    A destructive section has been selected.
    Do you wish to continue (Y/N) [N]?y

    Section 8 -- External Loopback

*** ERROR IN SECTION 8
*** ERROR -- LOSS OF CARRIER DETECTED DURING TRANSMIT (LANDADERR 5010)
*** If you are using an HP30241A MAU, check the following:
***   A1) Stub cable not connected to frontplane connector.
***   A2) AUI cable not connected to stub cable.
***   A3) AUI cable not connected to MAU.
***   A4) Broken MAU.
***   A5) Broken AUI cable.
***   A6) Broken stub connector cable.
***   A7) NETWORK CABLE shorted.
***   A8) LANIC broken.
*** If you are using an HP28641A MAU, check the following:
***   B1) Stub cable not connected to frontplane connector.
***   B2) HP28641A Cable not connected to stub cable.
***   B3) Broken HP28641A.
***   B4) Broken stub connector cable.
***   B5) LANIC broken.
```

```
*** The above message was printed on FRI, Jun 27, 1986, 11:44 AM.
                                ************
                                *** NOTE ***
                                ************
   The above error message(s) are from the most recent external loopback
   test.  They will continue to be displayed (even after the problem has
   been fixed) until you run another EXTERNAL LOOPBACK (section 8) or any
   destructive test (sections 2,5,8,11,12).

*** The above message was printed on FRI, Jun 27, 1986, 11:44 AM.

    End of Section 8 -- External Loopback

LANDAD Exiting...
LANDAD (PIN 32) has just terminated.
DUI >
```

End of example

In Example 2 above, pay special attention to the note in the sample error message. Unless you run a test which clears the error message from memory it will continue to be displayed.

13.7.4 Interpretation

If the test passes and you are following the detailed troubleshooting procedures rigorously, that's all the information you should need.

If, on the other hand, you are using the simplified approach for experienced users (refer to "Troubleshooting for Experienced Users" in chapter 2 of this manual), you will find the information displayed useful.

MAU Power Failure. During Section 8 testing, the state of the MAU power fuse is sensed. If the fuse is blown, the diagnostic returns an error message:

```
*** ERROR -- MAU POWER FUSE BLOWN ON LANIC. (LANDADERR 5006)
*** Replace Fuse on the LANIC.
*** Beware of these other possible problems:
*** 1) Broken MAU.
*** 2) Shorted power lines in cabling to the MAU
       (AUI cable or stub connector cable).
*** 3) Broken LANIC.
```

In addition the following LANDAD sections will report the status of the MAU power fuse:

Section 3 – Identify
Section 4 – Local Loopback
Section 5 – Selftest
Section 6 – Status
Section 9 – Remote Node Test
Section 10 – Remote XID Test

Retry/Collision Error. During Section 8 testing, the occurrence of a retry error is sensed (a retry error occurs when a predetermined number of attempts to transmit a packet fail). If the External Loopback test packet failed to gain access onto the LAN cable, the diagnostic returns an error message:

```
*** ERROR -- RETRY FAULT DURING TRANSMIT. (LANDADERR 5008)
*** Time Domain Reflectometer (TDR) = 0.
*** If you are using an HP 30241A MAU, check the following:
***   A1) Unterminated NETWORK CABLE; check terminators.
***   A2) Open terminator; check terminator resistance.
***   A3) MAU not connected to NETWORK CABLE; check MAU tap.
***   A4) NETWORK CABLE open.
***   A5) Faulty MAU.
*** If you are using an HP28641A MAU, check the following:
***   B1) Unterminated NETWORK CABLE; check terminators.
***   B2) Open or shorted terminator; check terminator resistance.
***   B3) MAU not connected to NETWORK CABLE; check MAU tee.
***   B4) NETWORK CABLE open or shorted.
***   B5) Faulty MAU.
```

13.8 Remote Node Tests

The remote node test sends a test packet to a remote node and reports the results. There are two types of remote node test packets that can be initiated with LANDAD: TEST packets and XID packets.

When the procedures instruct you to perform a remote node test which has a Destination Service Access Point (DSAP) address other than zero, you must use the XID test. LANDAD allows the user to specify a DSAP address when an XID test is initiated.

NOTE

Because of their designs, an HP 2345A Distributed Terminal Controller (DTC) or the LANIC card for an HP 1000 computer can successfully handle a TEST packet even if these devices have not been successfully downloaded (or booted) with appropriate software. By sending an XID packet to a specific DSAP in these devices, you can determine if the download was successful.

The DSAP you should use for a DTC is FC (hex). For a LANIC card in an HP 1000 computer use a DSAP of F8 (hex). If the appropriate software has not been loaded, the XID test will fail.

13.8.1 Prerequisites for Sending TEST Packets

To run a Remote Node test using TEST packets:

- You need to start from a DUI prompt. If you are at a system prompt, see the heading "Starting Sysdiag" in this chapter.

- You need to know the station address of the LANIC card in the remote computer system or of the Distributed Terminal Controller (DTC) that is the remote node. Refer to the diagnostic chapter for the system or DTC under the heading "Finding LANIC Card Information" or "Finding LAN-related DTC Information." For example, if the remote node is an HP 1000, see Chapter 6 under the appropriate heading.

13.8.2 Procedure for Sending TEST Packets

The general command sequence for sending TEST Packets is:

```
run landad pdev=8.4 sec=9    (Remote Node Test = section 9.)
<(station address)>          (enter address)
<RETURN>                     (selects default number of repetitions)
<RETURN>                     (selects default frame length)
```

NOTE

When you are prompted for the station address of the remote node, enter only hexadecimal numerals (zero through 9 and "A" through "F"). Hyphens or spaces may be used to break the address in to groups of two or four numerals.

The following are acceptable ways to enter the station address:

080009000200
08-00-09-00-02-00
08 00 09 00 02 00
0800-0900-0200
0800 0900 0200

13.8.3 Example of Sending TEST Packets

Following are two examples that show the use of TEST Packets. In the first example the test is successful. In the second, the test fails. The condition that caused the failure is noted at the beginning of the second example.

Example 1: The TEST Packet is successfully transmitted and received.

```
DUI > run landad pdev=8.4 section=9
*****************************************************************
******                                                    ******
******        LANDAD LAN Device Adapter Diagnostic        ******
******                                                    ******
******     (c) Copyright Hewlett-Packard Company 1986     ******
******                Version  A.00.07                    ******
******                                                    ******
*****************************************************************


Welcome, Today is TUE, SEP 23, 1986 at 12:05 PM

    Section 9 -- Remote Node Test

    This section sends a TEST frame and waits for a response from
    a specified remote node for a specified number of iterations.

    The following success/failure indicators are used:
    "." = The test frame bounced successfully.
    "#" = The test frame was not received before the timeout period.

    Remote Node Address (Six HEX bytes) =>0800 0900 0200
    Number of test frames to send ("0" for infinite) [10] =><RETURN>
    Length of test frames in bytes (60..1514) [500] =><RETURN>

    Press <Control-Y> to prematurely stop the test.

    ..........
    10 out of 10 TEST frames echoed successfully (100%).


    End of Section 9 -- Remote Node Test

LANDAD Exiting...
LANDAD (PIN 32) has just terminated.
DUI >
```

End of example

Example 2: This Remote Node Test fails because no remote node with the specified station address was present.

```
DUI > run landad pdev=8.4 section=9
*****************************************************************
******                                                     ******
******        LANDAD LAN Device Adapter Diagnostic         ******
******                                                     ******
******     (c) Copyright Hewlett-Packard Company 1986      ******
******                Version  A.00.07                     ******
******                                                     ******
*****************************************************************


Welcome, Today is TUE, SEP 23, 1986 at 12:05 PM

    Section 9 -- Remote Node Test

    This section sends a TEST frame and waits for a response from
    a specified remote node for a specified number of iterations.

    The following success/failure indicators are used:
    "." = The test frame bounced successfully.
    "#" = The test frame was not received before the timeout period.

    Remote Node Address (Six HEX bytes) =>08-00-09-00-02-00
    Number of test frames to send ("0" for infinite) [10] =><RETURN>
    Length of test frames in bytes (60..1514) [500] =><RETURN>

    Press <Control-Y> to prematurely stop the test.

    ##########
    0 out of 10 TEST frames echoed successfully (0%).


    End of Section 9 -- Remote Node Test

LANDAD Exiting...
LANDAD (PIN 32) has just terminated.
DUI >
```

End of Example

13.8.4 Prerequisites for Sending XID Packets

- You need to start from a DUI prompt. If you are at a system prompt, see the heading "Starting Sysdiag" in this chapter.

- You need to know the station address of the LANIC card in the remote system or the DTC. Refer to the system specific chapters for HP 1000 or DTC under the headings "Finding LANIC Card Information" or "Finding LAN-related DTC information".

13.8.5 Procedure for Sending XID Packets

The general command sequence to send XID Packets is:

```
run landad pdev=8.4 sec=10        (Remote XID Test = section 10.)
<(station address)>               (enter the station address)
$<DSAP address>                   (two hexadecimal numerals)
```

NOTE

The "$" is used to identify the two characters that follow as a number expressed in hexadecimal notation. To check for the successful download (or boot) of the operational software, use the following DSAPs: For an HP 1000, F8; for a DTC, FC. A DTC can only correctly respond at DSAP FC when it has finished successfully downloading (about six minutes after it was turned on).

13.8.6 Examples, XID Packets

Two examples follow that show the use of XID Packets. The remote node in these examples is an HP 1000 A-Series computer. The section used prompts for a DSAP. Since an HP 1000 was used for this example, DSAP F8 was used.

In the first example the test is successful. In the second example, the test fails. The reason for the failure is given at the start of the example.

Example 1: This test passes.

```
DUI > run landad pdev=8.4 sec=10
*****************************************************************
******                                                     ******
******       LANDAD LAN Device Adapter Diagnostic          ******
******                                                     ******
******    (c) Copyright Hewlett-Packard Company 1986       ******
******                 Version  A.00.07                    ******
******                                                     ******
*****************************************************************

Welcome, Today is FRI, JUN 27, 1986 at 12:01 AM.

    Section 10 -- Remote XID Test

    This section sends an IEEE 802.2 XID frame to a user specified
    remote node and waits for an IEEE 802.2 XID response frame from
    that remote node.

    Remote Node Address (Six HEX bytes) => <(station address)>
    Remote DSAP Address (one even hex byte between $00 and $FE) [$00] => $F8
    Sending XID command frame...
    Received XID response frame...

    Remote DSAP $F8 has class I service.

    End of Section 10 -- Remote XID Test

LANDAD Exiting...
LANDAD (PIN 32) has just terminated.
DUI >
```

End of example

Example 2: This test fails because there was no remote node attached to the LAN with the Station Address specified or else the node was not successfully downloaded with the correct software.

```
DUI > run landad pdev=8.4 sec=10
******************************************************************
******                                                    ******
******         LANDAD LAN Device Adapter Diagnostic         ******
******                                                    ******
******      (c) Copyright Hewlett-Packard Company 1986      ******
******                   Version  A.00.07                  ******
******                                                    ******
******************************************************************

Welcome, Today is FRI, JUN 27, 1986 at 11:50 AM.

    Section 10 -- Remote XID Test

    This section sends an IEEE 802.2 XID frame to a user specified
    remote node and waits for an IEEE 802.2 XID response frame from
    that remote node.

    Remote Node Address (Six HEX bytes) => 0800 0900 0225
    Remote DSAP Address (one even hex byte between $00 and $FE) [$00] => $F8
    Sending XID command frame...
*** ERROR IN SECTION 10
*** No response received from remote node.
*** The above message was printed on FRI, Jun 27, 1986, 11:51 AM.

    End of Section 10 -- Remote XID Test

LANDAD Exiting...
LANDAD (PIN 32) has just terminated.
DUI >
```

End of example

13.8.7 Interpretation

The principal results of the Remote Node test are simple and unambiguous : pass or fail. If you're following the detailed troubleshooting procedure, that should provide you with enough information to continue to the next step. If you're an experienced troubleshooter using the simplified approach, you may be able to get additional useful information from other tests you have performed.

List of Tools and Replaceable Parts A

This appendix contains information on tools and field replaceable units (FRUs) for troubleshooting and repair of LAN hardware failures.

Table A-1 lists available FRUs that can be ordered from Hewlett-Packard.

Table A-2 lists various troubleshooting tools and accessories. When part numbers are indicated, they are available from Hewlett-Packard.

Table A-1. List of HP Field Replaceable Units

<table>
<tr><th>FRU
Category</th><th>IEEE 802.3
Type 10BASE2</th><th>IEEE 802.3
Type 10BASE5</th><th>Ethernet
Based Hardware</th></tr>
<tr><td>General
Network Cable
Hardware</td><td>Coaxial cable:
92227x series
Terminators:
92227P Kit
45695A Kit

BNC Connectors:
92227L Kit
BNC Insulator:
92227R
BNC Barrel:
45696A</td><td colspan="2">Coaxial cable: 92253x series

Terminators: 1250-1965 unthreaded
1250-1962 threaded
Terminator Insulator: 1250-1964

"N" Connectors: 92243J Kit
"N" Barrel Connectors: 92253K Kit
"N" Connector Insulator: 1250-1963

Terminator Ground Lug: 0362-0816

Surge Protector: 92256E</td></tr>
<tr><td>LAN Extension
Hardware</td><td>ThinLAN HUB:
28645-69001
AC power fuse:
*2110-0002
**2110-0700</td><td>(Consult HP)</td><td>Repeater Unit:
92223-69001
AC power fuse:
2110-0633
Transceiver
fuses:
2110-0002*
2110-0702**</td></tr>
<tr><td colspan="4">Notes: * US/Canada
** UK, European Continent, Australia/New Zealand</td></tr>
</table>

(continued on the next page)

Table A-1. List of HP Field Replaceable Units (continued)

<table>
<tr><th>FRU
Category</th><th>IEEE 802.3
Type 10BASE2</th><th>IEEE 802.3
Type 10BASE5</th><th>Ethernet
Based Hardware</th></tr>
<tr><td>Network Cable
Access Hardware</td><td>ThinMAU:
28641A
BNC "T":
92227N
"T" Insulator:
92227R</td><td>MAU:
30241A
Tap:
30241B</td><td>Repeater
Transceiver:
92223-60002
BNC-to-N
Adapter:
30241-60017</td></tr>
<tr><td rowspan="4">Node
Access Cables
(Stub, Internal
and AUI cables)</td><td colspan="2">HP 9000 HP-UX Systems
Series 300: (no stub cable)
Series 500: 27125-63001
Series 800: 27125-63003</td><td>(no stub cable)
27125-63002
27125-63004</td></tr>
<tr><td colspan="2">HP 3000 MPE V Systems
Series 37: (no internal cable)
Series 39,40,42: 30241-60002
Series 44,48,58,
64,68,70: 30241-60003
(Contact HP for similar systems.)</td><td>None
None

None</td></tr>
<tr><td colspan="2">HP 1000 RTE A Systems
All Series: 12076-63001</td><td>12076-63002</td></tr>
<tr><td>Not Used</td><td>AUI Cables:
92254x series
92255x series</td><td>Repeater Branch
Cables:
92223-60003 (5m)
92223C (20m)</td></tr>
</table>

(continued on the next page)

Table A-1. List of HP Field Replaceable Units (continued)

FRU Category	IEEE 802.3 Type 10BASE2	IEEE 802.3 Type 10BASE5	Ethernet Based Hardware
LANIC Cards & Related Hardware	HP 3000 MPE V Systems		
	Series 37:	30243-60001	None
	All Others:	30242-60001	None
	HP 9000 HP-UX Systems		
	Series 300/Upgraded 200:		98643-66501
	MAU/Transceiver power fuse:		2110-0520
	NOVRAM:		98643-81001
	Series 500 and Series 800		27125-60001
	MAU/Transceiver power fuse:		2110-0520
	NOVRAM:		27125-81001
	HP 1000 RTE-A Systems		
	All Series:		12076-60001
	MAU/Transceiver power fuse:		2110-0520
	NOVRAM:		12076-81006

Table A-2. Recommended Troubleshooting Tools and Accessories

Tool	HP Part Number	Description
Time Domain Reflectometer Hardware	NONE	TEK 1503* Option 4 & 5 TDR Cable Tester
	Network Adapter Set:	
	1250-1296	BNC to Banana adapter
	1250-1474	BNC to N-type adapter
	11001A	BNC - Banana cable (122 cm)
	Extender Cable Set:	
	45691A	BNC to BNC cable (7 meter)
	1250-0080	BNC barrel
Ohmmeter (or VOM)	Various (Consult HP)	Recommended accuracy: 1% of scale.
Voltmeter (or VOM)	Various (Consult HP)	Recommended accuracy: 1% of scale.
Terminators	92253L	Pair, N-type, for Backbone LAN.
	92227P	Pair, BNC-type for ThinLAN.
Loopback Hood	92257B	For Backbone LAN.
	92227Q	For ThinLAN.
Notes: * TEK is a registered trademark of Tektronix, Inc.		

Table A-2. Recommended Troubleshooting Tools and Accessories (continued)

Tool	HP Part Number	Description
LAN Hardware Installation Kits	92256A	LAN cable tool kit to install N connectors on Backbone cables. (Requires 92229B crimp tool.)
	92256B	AUI cable tool kit to install D connectors on AUI cables.
	92256C	Vampire Tap tool kit to install vampire taps on Backbone cables.
	Miscellaneous tools & supplies (electrically insulated where applicable)	Screwdrivers, slotted and Phillips in various sizes. Pliers, round nose. Wire cutter/stripper, 20 AWG. Cable cutter (for LAN cable). Grounding conductor. Electrical tape. Cable ties. Rubber gloves.

Topology Considerations B

This appendix provides a general summary of requirements for a legal network as specified by Hewlett-Packard. For more specific information, consult the *LAN Cable and Accessories Installation Manual*, 5955-7680.

B.1 LAN Cable Requirements

A LAN cable (or LAN cable segment) consists of a single linear run of cable, or multiple cable *sections* joined together, terminated at both ends with 50-Ohm terminators. Nodes or other devices may attach to this cable and communicate with each other. Table B-1 summarizes acceptable characteristics of this LAN.

Table B-1. LAN Cable Topology Requirements

Description	Backbone Cable	ThinLAN Cable
Cable type/diameter	IEEE 802.3 Type 10BASE5 coaxial / 10 mm nominal (PVC or FEP)	IEEE 802.3 Type 10BASE2 coaxial / 5 mm nominal (RG-58 A/U or C/U)
Length between Terminators	500 meters (max)	185 meters (max)
Number of Nodes	100 (max)	30 (max)
Spacing of Connections to the LAN cable	At 2.5 meter markings	Minimum 0.5 meters; not at multiples of 5 meters in the range from 5 meters to 25 meters
Method of attachment to the LAN cable	Vampire Tap on HP MAU or Repeater transceiver	BNC Tee connector to HP ThinMAU or directly to LANIC card
Maximum length of AUI or branch cable	48 meters (AUI) or 40 meters (branch), including card connector cables	Except for ThinMAU and card connector cables, no other cables allowed

B.2 Extended LAN Requirements

Multiple LAN cables may be joined together thereby extending the LAN. Following are limitations for extending LANs:

1. There should be no more than two (2) HP 92223A Repeater devices between any two nodes. A legal configuration is illustrated in Figure B-1.

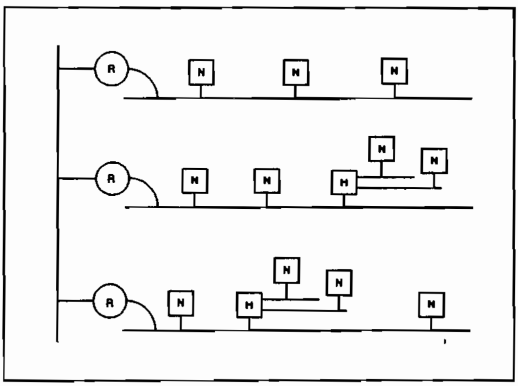


Figure B-1. Two HP 92223A's Max Between Nodes

2. A ThinLAN cable should not be used as an intermediary cable between two Backbone cables, two ThinLAN cables, or a Backbone and ThinLAN cable. See Figure B-2.

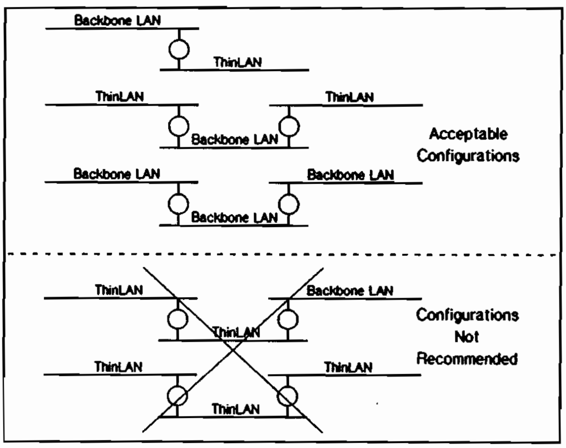


Figure B-2. ThinLAN Cable As Intermediary Cable

3. Cable splitters that form "Y" or "T" configurations to extend the LAN are not allowed. See Figure B-3.

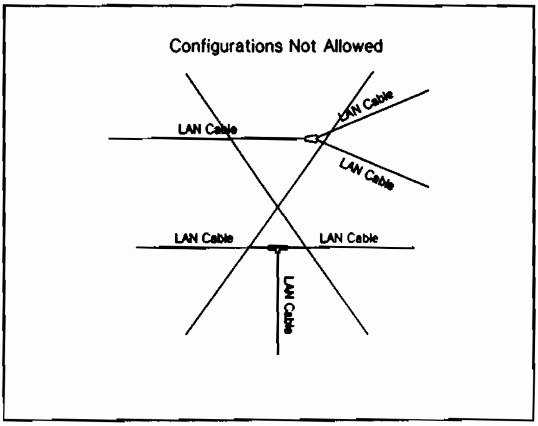


Figure B-3. LAN Cable Extensions Not Allowed

Using a TDR C

This appendix covers the rudiments of using a time domain reflectometer (TDR) to locate faults in a LAN cable. This is by no means a complete exposition of TDRs; you will get a better start at that from the documentation that came with your TDR. It is, however, a compendium of useful techniques for finding the most common faults in a LAN cable.

The figures we show in this appendix are for TDRs that send out 1/2-sine-shaped pulses, such as the TEK 1503.* For additional information on TDR waveforms, refer to "TDR for Cable Testing", TDR Cable Tester Application Note 25M1.0, published by Tektronix.

CAUTION

> Prior to TDR testing, ensure voltages on the LAN cable do not exceed limits of your TDR. Before using a TDR, check for excessive voltages. If signal levels (per IEEE 802.3 standard) can exceed this limit, steps should be taken to prevent any traffic on the LAN cable. Failure to do so may result in damage to your TDR.

C.1 General Information

A TDR connects to the end of the coaxial LAN cable. Typically, a 50 ohm terminator is installed on the other end of the cable.

A TDR operates by sending out a pulse onto the cable. The reflection of that pulse, as displayed on the screen of the TDR, shows the state of the cable. If the TDR is not connected to the cable, the screen displays only the outgoing pulse, as shown in Figure C-1.

*TEK is a registered trademark of Tektronix, Inc.

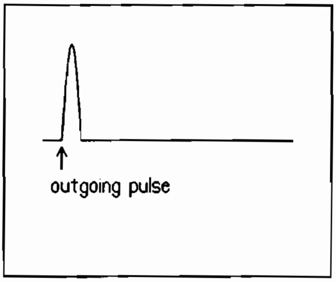


Figure C-1. No cable attached

If the TDR is connected to a terminated LAN cable that has nothing else attached to it, the display will look virtually the same as when nothing is connected to the TDR. (True, there will be some extra squiggles of noise on the display, particularly if you have the gain (sensitivity) turned up. That noise comes from a variety of imperfections in the cable and connectors and is not terribly significant for our purposes here. You can usually reduce the visible noise simply by turning down the gain of the TDR; in most cases that won't keep you from seeing the signals that are important for locating cable faults. We haven't shown any noise in our figures, since we want to concentrate on the signals.)

NOTE

Due to signal attenuation down the cable, readings close-in will be more pronounced than for several meters away. Noise will be more pronounced within the first few meters of cable.

A terminated LAN cable looks invisible to the TDR because it doesn't reflect the pulse that the TDR sends down the cable. Reflections that show up on the TDR screen are caused by impedance discontinuities in the cable; since the impedance of the terminator matches the impedance of the cable (both are 50 ohms), there is no discontinuity and, therefore, no reflection. The terminator absorbs all of the energy sent out by the TDR, and the cable looks to the TDR as though it were infinitely long.

Things look very different if there is a fault in the cable, such as a short or open circuit. An open circuit might be caused by a broken cable or by failing to put a terminator on the end of the cable. An open circuit makes a positive reflection of the outgoing pulse, as shown in Figure C-2.

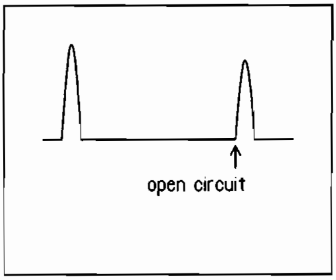


Figure C-2. Open circuit

A short circuit is caused whenever the center conductor of the LAN cable becomes connected to the shield conductor. A short circuit makes a negative reflection of the outgoing pulse, as shown in Figure C-3.

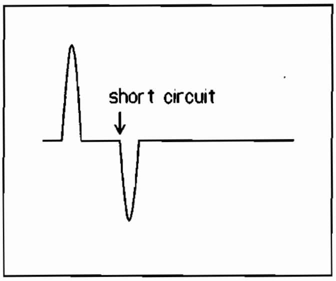


Figure C-3. Short circuit

The polarity of the signal sent out by the TDR is not important for showing open and short circuits; they show up whether the polarity of the signal is normal or reversed. Polarity is important, however, when you're looking at MAUs (or ThinMAUs or Ethernet transceivers or repeater transceivers). MAUs have differing reflection patterns depending on whether the TDR signal polarity is normal or reversed. That's because a MAU looks to the TDR like a diode connected between the center and shield conductors of the LAN cable. For a normal polarity signal, that "diode" conducts current and looks like a short circuit. Figure C-4 shows two MAUs as seen by a TDR sending out a normal polarity signal. (The amplitude of the reflection is generally smaller for a MAU than for a short circuit. Note also that the amplitude of the reflection decreases with the number of MAUs and with distance along the cable. That's because the MAUs and the cable absorb some of the energy of the pulse.)

NOTE

> Due to signal attenuation, reflections may become difficult to see beyond a few hundred meters. Thus, for long LAN cables (500 meters), you should perform TDR tests at each end of the cable.

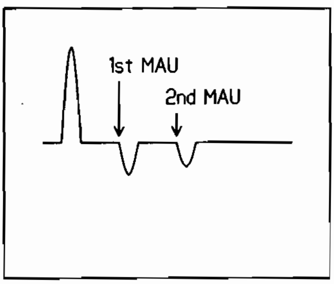


Figure C-4. MAUs, normal polarity

For a reversed polarity signal, on the other hand,.the "diode" does not conduct. That makes the MAUs look like they're not there; they disappear, as shown in Figure C-5. (Well, you might see some noise where the MAUs are connected. But it doesn't look anything like a MAU under a normal polarity signal.)

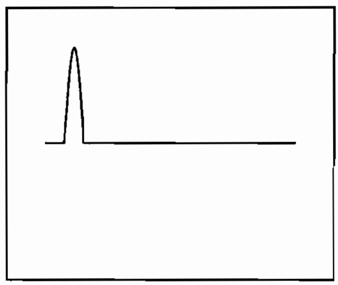


Figure C-5. MAUs, reversed polarity

In the fault location procedure given below we will make use of the behavior of MAUs under a reversed polarity signal to distinguish them from shorts circuits on the cable.

As an aside, you can see a lot of other things on the cable besides shorts, opens, and MAUs. If you turn up the gain enough, you can usually distinguish the various connectors that attach to the LAN cable. The attachments to the cable are never electrically perfect, so each one reflects a slight amount of energy. These show up on the TDR screen, and frequently they are large enough and regular enough that you can distinguish them from the noise.

In additon to showing the presence of faults and MAUs on the cable, the TDR can show you their locations. Because the TDR knows the speed of propogation along the cable (you set that with switches or knobs on the front of the instrument), it can calculate the distance down the cable to any point on the waveform. Here's how you can read the distance:

1) Rotate the DISTANCE knob on the TDR counterclockwise until the distance dial reads 000.

2) Note the vertical grid line on the left side of the screen that is marked with an upward-pointing arrow. Adjust the ZERO REF knob until the leading edge of the outgoing pulse is lined up on that vertical grid line. Figure C-6 shows such an alignment for a cable that has a short circuit.

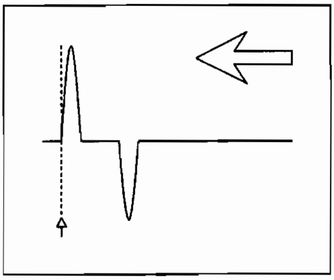


Figure C-6. Lining up the outgoing pulse

3) Rotate the DISTANCE knob clockwise until the leading edge of the waveform of interest is lined up on the same vertical grid line. Figure C-7 shows the leading edge of the short circuit reflection lined up on the grid line. (The first part of the display, including the outgoing pulse, has disappeared off the left side of the screen.)

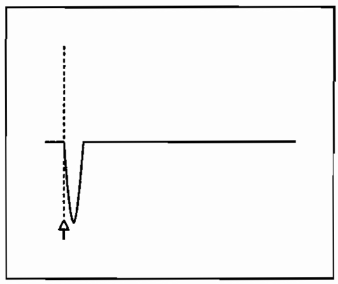


Figure C-7. Lining up the waveform of interest

4) Read the distance from the TDR to the waveform of interest directly from the distance dial in the center of the DISTANCE knob. The units of distance depend on the units of the knob directly below the DISTANCE knob. If the label on that knob says METERS/DIV, the distance reading is in meters. If the label says FEET/DIV, the distance reading is in feet.

C.2 Cable With Improper Impedance

Due to similar appearance, cabling with improper impedance characteristics may inadvertently be used on the LAN.

Figure C-8 illustrates what the TDR indicates with a piece of 75 Ohm cable placed between 50 Ohm cables, for example between two Tee or barrel connectors. Due to the increased impedance, it appears as an "open".

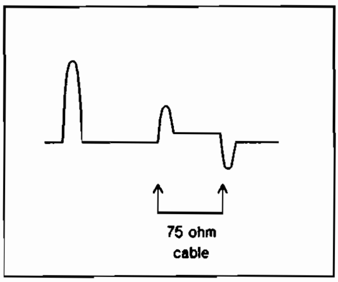


Figure C-8. 75 Ohm Cable Between 50 Ohm Cable, Without MAUs/ThinMAUs

If a MAU/ThinMAU were placed on each side of the 75 Ohm cable, the fault may be more difficult to see. The capacitive effects a MAU/ThinMAU hides the impedance mismatch of the 75 Ohm cable, and you may need a trained eye to find this fault. This is illustrated in Figure C-9.

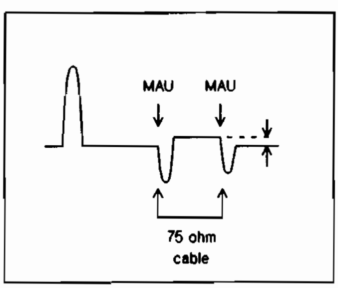


Figure C-9. 75 Ohm Cable With MAUs/ThinMAUs Installed on Each End

NOTE

As evident by the figures, sections of 75 Ohm cable in the 50 Ohm network are difficult to see with a pulse function TDR. This fault may be more easily detected with a step function TDR. The caution at the beginning of this appendix still applies.

C.3 TDR Test Procedure

The TDR test procedure we describe is a general procedure for finding common faults in a LAN cable. It is, however, specifically intended to be used in conjunction with the LAN cable voltage and resistance fault isolation procedures presented in Chapter 5 of this manual.

The test procedure is:

1) Set up the switches and knobs on the TDR. For a Tektronix 1503 TDR the settings are as follows:

   Set the impedance to 50 ohms.

   Set IMPLS WIDTH to 10 ns or set TEST PULSE to SHORT.

   Set CABLE DIELECTRIC to SOLID POLY or set DISTANCE CAL to:

   `Backbone LAN cable:` .7 and .07

   `ThinLAN cable:` .6 and .06

   Set the remaining knobs and switches to whatever you're comfortable with. We recommend for starters that you set RET LOSS or SENSITIVITY to 0 dB; METERS/DIV or FEET/DIV to 10; and DISTANCE to 000.

2) Set up your cable connections to allow for reversing the polarity of the signal. For a ThinLAN cable you can use a BNC-to-banana-to-BNC connection; this lets you reverse the polarity by reversing the banana plugs. For a Backbone LAN cable you can use a BNC-to-banana-to-BNC-to-N connection.

3) Leave the LAN cable unconnected from the TDR and turn the TDR power ON. You should see just the outgoing pulse, as in Figure C-10.

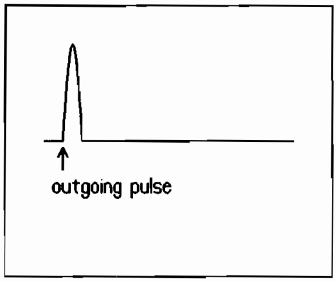


Figure C-10. LAN cable unconnected

4) Connect the LAN cable to the TDR using a normal polarity configuration and check the display for open circuits. If there are no open circuits, the display should look something like Figure C-11.

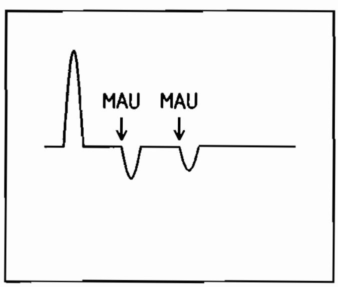


Figure C-11. No open circuits

If there is an open circuit, it would look something like Figure C-12.

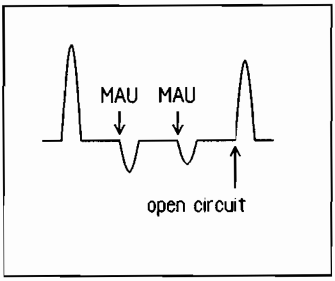


Figure C-12. Open circuit

If you do find an open circuit, note its location along the length of the cable. Go to and isolate the fault. If you do not find an open circuit, continue with step 5 of this procedure.

5) Reverse the polarity of the TDR signal and check the display for short circuits. (You shouldn't see any MAUs with the polarity reversed.) A short circuit would look something like Figure C-13.

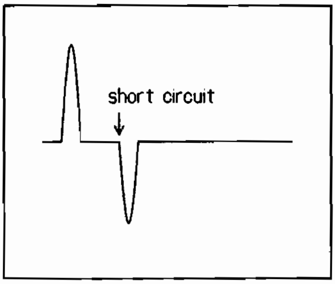


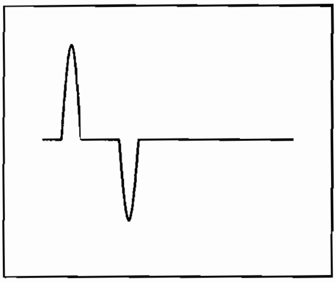
Figure C-13. Short circuit

If you do find a short circuit, note its location along the length of the cable. Go to and isolate the fault.

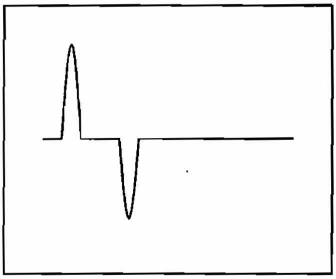
C.4 Example TDR Test

The following example shows how the TDR test procedure might work for a short LAN cable with two faults. The cable has two MAUs attached to it; the first of these MAUs has a short circuit. In addition, the connector that attaches to the terminator on the far end of the cable has a faulty center contact, causing an open circuit. (For simplicity, assume no voltage faults were present.)

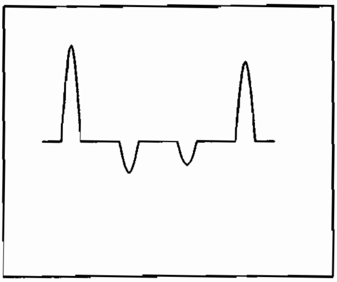
The ohmmeter measurement on the LAN cable showed a resistance of approximately 2 ohms. That indicates a short circuit on the cable. Accordingly, we run a TDR test on the cable using a normal polarity signal. We see this display. Since it gives a negative pulse reflection, it must be either a MAU or a short circuit. The distance to the negative pulse puts it at the location of the first MAU. We feel that it is probably a short circuit at the first MAU, since we would probably have seen both MAUs if the negative pulse had been caused by the presence of the first MAU.



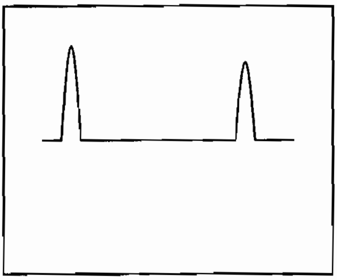
We reverse the polarity and test the cable again. Suspicions confirmed: it is a short circuit at the location of the first MAU. (If the negative pulse had been caused by the MAU, the pulse would have disappeared when we reversed the polarity.) We do a continuity test on the first MAU and find a short circuit, so we replace the MAU. Subsequently, the cable is retested in accordance with the procedures.



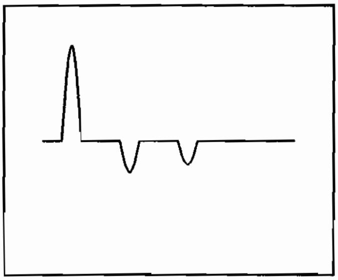
This time resistance measurements indicate a very large resistance, indicating an open circuit on the LAN cable. So we run another TDR test, using a normal polarity signal. The display shows what are probably two MAUs, as well as an open circuit at the end of the cable.



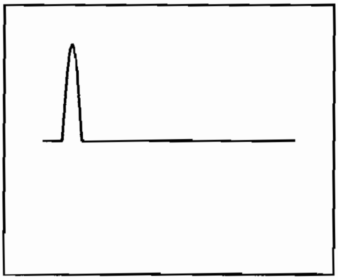
Just to be sure, we reverse the polarity and check the cable again. Sure enough, the negative pulses disappear (indicating that they were indeed MAUs) and the open circuit remains. We check the resistance of the terminator and find that it is 50 ohms. The only other possible cause of an open circuit at that location is the N connector that attaches to the terminator, so we check that and find a loose center contact. We replace the connector. Subsequently, the cable is retested in accordance with the procedures.



This time the LAN cable passes the re-test. Now we use the TDR to make a record of the functional cable. A normal polarity TDR test shows just what we expect to see: negative pulses at the locations of the two MAUs. We use the strip chart recorder of our TDR to make a permanent record of the state of the LAN cable.



A test with the polarity reversed also shows what we expected: the negative pulses disappear, indicating that they were caused by MAUs. Everything looks O.K., so we make a strip chart record of this display, too. We store both strip charts in the file with the other records for this LAN cable; that gives us a base record for comparison if we have problems with this LAN cable at some later time.



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