

## Errata

**Document Title:** PC Network Connectivity with the 16500L Interface Module  
(AN 1245)

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### HP References in this Application Note

This application note may contain references to HP or Hewlett-Packard. Please note that Hewlett-Packard's former test and measurement, semiconductor products and chemical analysis businesses are now part of Agilent Technologies. We have made no changes to this application note copy. The HP XXXX referred to in this document is now the Agilent XXXX. For example, model number HP8648A is now model number Agilent 8648A.

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# PC Network Connectivity with the HP 16500L Interface Module

Application Note 1245



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Test instrument connectivity to Local Area Networks (LANs) is a recent development in the test and measurement industry. The ability to control instruments over high-bandwidth network connections is a significant improvement over traditional HP-IB and serial-based connections. The HP 16500L LAN Interface Module enables you to remotely control and obtain test results from an HP 16500B Logic Analysis System. This application note describes how you can connect to and control the HP 16500B from a PC.

### HP 16500L Networked File System Support Matrix

Features	HP Modules		
	HP 16517A, 16518A, 16550A, 16542A	HP 16532A	HP 16500B, 16501A and all other 16500 measurement modules
ASCII Data Files	State per label Timing per label	Digitized Analog Data	NA
Binary Data	Yes	Yes	Yes
Screen Image Files	All menus: TIFF (BW, Color) PCX (color)		
Status Files	Yes	Yes	Yes
Program Files	Yes	Yes	Yes

### 16500L Characteristics

<b>Physical Connection</b>	15 Pin Access Unit Interface (AUI)
<b>Supports</b>	IEEE 802.3 type 10Base-T network and StarLan 10 networks; requires HP 28685B EtherTwist Transceiver (MAU) or equivalent  IEEE 802.3 ThinLan (10Base-2) networks; requires the HP 28641B ThinLan transceiver (MAU) or equivalent
<b>Supported Protocols</b>	Transmission Control Protocol (TCP)/Internet Protocol (IP)  Networked File System (NFS) File Transfer Protocol (FTP)

<b>Program Interfaces</b>	Instrument settings and operating modes may be remotely programmed through data files transmitted via the NFS protocol
<b>Data Files</b>	ASCII formatted data is available from popular measurement modules Binary file format data is available from all measurement modules. Screen images are available in TIFF and PCX file formats.
<b>File Structures</b>	File structures for binary ASCII data are documented in the User's Programming Reference
<b>Network Management</b>	The HP 16500L supports the Simple Network Management Protocol (SNMP) MIB II.

### Network Connection Alternatives

The HP 16500B supports the NFS (Network File System) protocol over TCP/IP (Transmission Control Protocol/Internet Protocol) running on an Ethernet network. The Ethernet specification covers many different methods of connecting hardware. Ethernet is the most commonly used LAN technology for interconnecting personal computers and workstations.

Both NFS and TCP/IP are software protocols for defining standard ways of communicating across the network. Although NFS and TCP/IP are standard on workstations, PCs require optional software packages to provide client-side connectivity. By providing NFS client services, these packages make the remote logic analyzer appear as another disk drive. Configuration information, measurement data, and screen images are all available as files on the network drive. The HP 16500B can be controlled remotely by

writing commands to a specific file on the network drive. Vendors of TCP/IP packages for the PC support MS-DOS and MS-Windows; many also provide products compatible with OS/2 and PC-based UNIX systems.

Although the HP 16500B connects to the network through Ethernet, the TCP/IP protocols are designed to connect widely distributed heterogeneous networks. The HP 16500B can be controlled remotely from anywhere a network connection can be established. If the HP 16500B is attached to a network connected to the Internet, world-wide access and control of the logic analyzer is possible using standard applications such as FTP and PING. This application note will address connecting the HP 16500B to an IBM-compatible PC using one of the commonly available TCP/IP software packages, PC-NFS, from Sun Select.

This Application Note highlights a point-to-point installation. See appendix A, or PC-NFS documentation, for information on installing PC-NFS on a PC that is also connected to other networks.

#### Equipment Used

- (1) HP 16500B Logic Analysis Mainframe with HP 16500L LAN Interface Card
- (1) Thin Ethernet MAU
- (2) BNC tee connectors
- (2) 50- $\Omega$  BNC terminations
- (1) Coaxial cable with BNC connectors
- (1) IBM-PC compatible computer with network interface card
- (1) PC-NFS 5.0 software from SunSelect

#### Connecting the HP 16500B to the PC via Ethernet

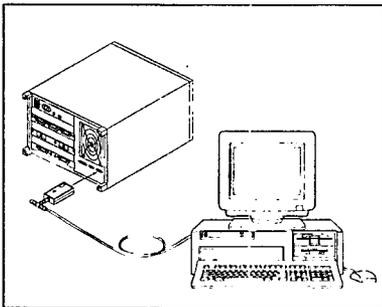


Figure 1.

Before a network connection can be established, the HP 16500B and the PC must have a physical connection between them. The IEEE 802.3 document specifies several connection methods, such as thick coax, thin coax, and twisted pair. For this example thin coax will be illustrated.

The HP 16500L interface card cannot be directly connected to a thin Ethernet network. The 15-pin AUI (Attachment Unit Interface) connector on the rear panel must first be connected to a MAU (Media Access Unit). The MAU is an inexpensive unit that has a 15-pin AUI connector on one side and a BNC connector on the other. The MAU is connected to the HP 16500L card as shown in figure 1.

The PC must also be equipped with an interface to the network. Many PC-compatible cards are available that have the MAU built in and thus already have an Ethernet-ready BNC connector.

The Ethernet communications path consists of a coaxial cable with 50- $\Omega$  terminations at each end. Although it is tempting to simply connect the HP 16500B directly to the PC with a short length of coax, this would not provide the proper endpoint terminations required by Ethernet. Instead, 50- $\Omega$  terminations must appear at both ends of a short length of coax. Devices that wish to tap into the coax, such as an HP 16500B or a PC, do so through a tee connector. The Ethernet signals travel down the "backbone" of the coax, and can be received by any of the devices that are tied to one of the tee connectors. The Ethernet specification does not allow signals to travel very far down a branch created by a tee connector, on the order of four inches or less. To meet this requirement, it is best to connect the BNC tee directly to the MAU or interface card.

## Installing PC-NFS

The first step in installing PC-NFS is to review the installation manual that comes with the network interface card in the PC. Every model of interface card is slightly different, so a software driver is required to allow the hardware to communicate with a standard software interface. PC-NFS supports six cards directly: the EtherLink II (3C503), EtherLink Plus (3C505), and EtherLink/MC (3C523) cards manufactured by 3COM; the PC NIC card by Ungermann-Bass; the NI5010 by Racal-Interlan; and the EtherCard Plus (WD8003E) from Western Digital.

It is important to know which adapter card and what driver will be used before beginning the PC-NFS installation procedure. The install program will ask several questions about the adapter card to be used. If this information is not at hand, it may be necessary to abort the installation procedure in order to remove and examine the adapter card.

If the available interface card is not one of the six mentioned above, then the card must have NDIS, ODI, or custom drivers available. Most card manufacturers distribute NDIS and ODI drivers for their hardware on a floppy disk included with the interface card. Some specialized adapters that connect to the PC's parallel port include custom drivers that are designed to interface with most of the major software packages. The installation manual that comes with the adapter card will describe which driver is required for installation with PC-NFS.

Some adapter cards do not supply drivers, but instead mimic the behavior of other well-known adapter cards. The Novell NE1000 and NE2000 cards are probably the most frequently imitated. If this is the case, then select "NDIS Driver" during the PC-NFS installation process and proceed as if the adapter card is actually an NE1000 or NE2000.

Two other pieces of information will be needed to complete the PC-NFS installation: the I/O address and interrupt number of the adapter card. Most cards have jumpers that allow you to relocate both the I/O addresses and interrupt to avoid conflicts with other interface cards. The I/O address is a three-digit number normally expressed in hexadecimal notation. The most common base address for Ethernet adapter cards is 300h (the "h" is a reminder that the number is in hexadecimal). Hardware jumpers on the card often allow you to change this to one of several values, such as 300h, 320h, 360h, or 380h. Unless the PC has an unusual configuration, the value of 300h is acceptable.

The interrupt number, or IRQ, is a common problem point with adapter card installation. The PC has very few interrupts available to be shared among many pieces of hardware. The most common IRQ assignments are shown below:

IRQ 3	COM2 or COM4 (often used by modem)
IRQ 4	COM1 or COM3 (usually used by mouse)
IRQ 5	LPT2 (second printer, used for hard drive on PC/XT)
IRQ 7	LPT1 (first printer)

Although IRQ 3 is the default setting for most adapter cards, this interrupt is often used by COM2 or an internal modem. Although the selection of interrupts is very system dependent, IRQ 5 is usually the safest since few systems have more than one printer.<sup>1</sup>

If either the I/O address or interrupt number is changed, it is wise to record the changes on the inside cover of the user's manual that came with the adapter card.

Once these preliminary steps have been completed, it is time to begin installing PC-NFS. The full installation instructions are in the Installation Guide that is included with PC-NFS. This application note will briefly outline some of the major points regarding the installation process.

The opening screen for the PC-NFS installation program asks whether the DOS utilities should be installed (figure 2). Although these utilities are not required to communicate with the HP 16500L, they are useful for troubleshooting and gathering network statistics. This screen also reminds you that an additional program, WINSTALL, must be run to install the software extensions for MS-Windows.

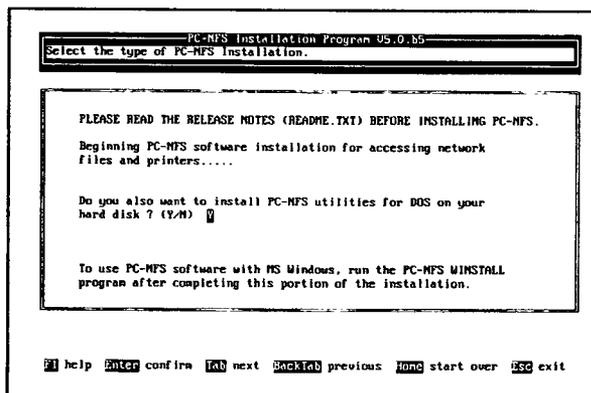


Figure 2.

The menu for selecting the network adapter card is shown in figure 3. For this example it is assumed that an NE2000 work-alike card is available, so the "NDIS Driver" option is selected (see appendix A for information on installation of other LAN cards). The installation program then continues to install the NFS client software from the floppies. Once the software has been installed, the install program

1. For PC/XT systems, IRQ 3 must be used since IRQ 5 is allocated to the hard disk drive.

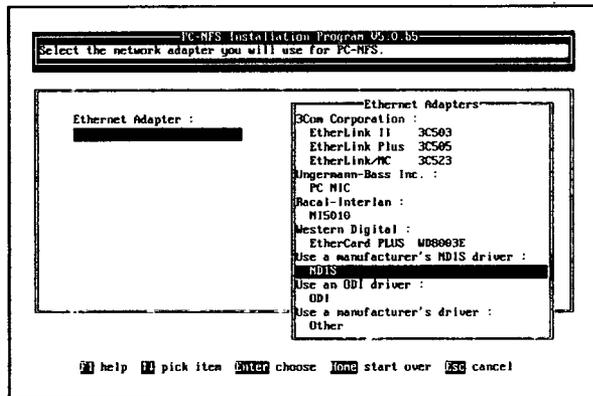


Figure 3.

executes the NFS configuration program, NFSCONF. The configuration program builds files required for initialization of PC-NFS and requires some basic information about your system and network. The files created by NFSCONF are required for proper operation of PC-NFS, so the installation program jumps directly to NFSCONF as illustrated in figure 4.

When the "Direct Connect" menu is entered, the installation

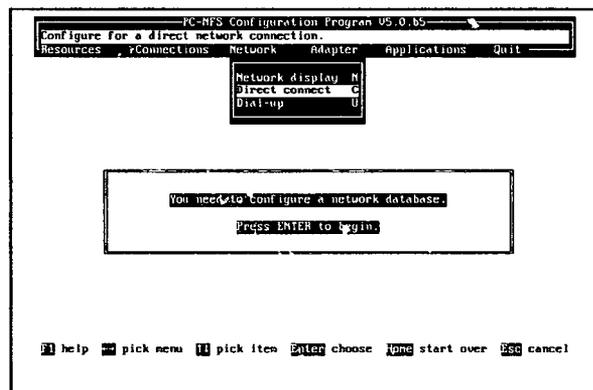


Figure 4.

program prompts for some basic information as shown in figure 5. The Last Drive parameter should be set to the same as the "last-drive=" line in the CONFIG.SYS file. In this example, the PC is not connected to another file network, so there is no Network Information Server available. RARP would only be set to "yes" if the PC was to boot from a network server. Answering the final question on the screen advances the program to screen two as shown in figure 6. An eight character (or less) name must be selected for the PC along with the IP address of the PC. (For more information about IP addresses, see the section "A Primer on IP Addresses.") For this example the IP address 192.0.2.100 is used for the PC. Since no server is available, both the server name and server IP address can be left blank. For most applications the advanced questions are not needed.

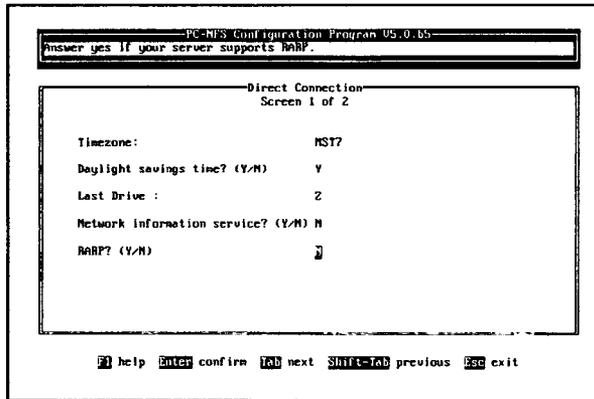


Figure 5.

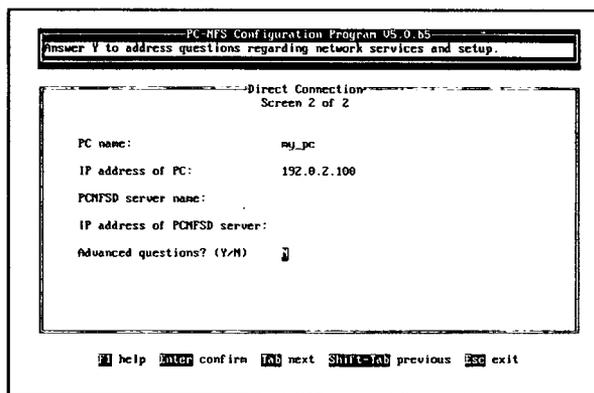


Figure 6.

Once the “Direct Connect” menu has been completed, the program returns to the top level screen. Since the installation program has passed control to the NFSCONF program, the installation program can no longer prompt the user for the next action. Although the NFSCONF program can configure many other network parameters, no others need to be addressed at this point. Use the arrow keys or mouse to select “Quit” as shown in figure 7.



Figure 7.

If one of the six directly supported adapter cards were selected at the beginning of the install program, then the installation is completed at this point. An NE2000 adapter card using NDIS drivers is assumed for this example, so the installation program will now invoke the QUIKNDIS program. The entry screen for the NDIS driver installation program shows a window with a number of common adapter cards listed alphabetically (figure 8).

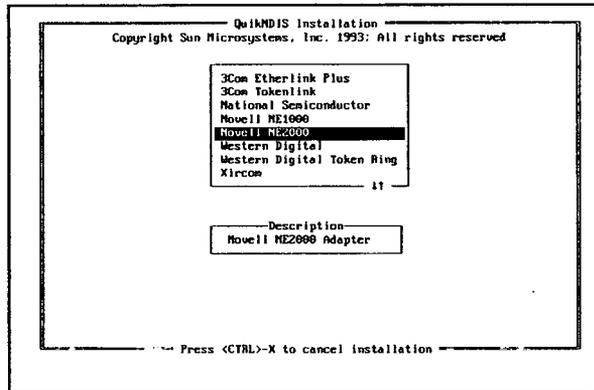


Figure 8.

Using the arrow keys to scroll down, the entry "Novell NE2000" appears. Once the highlighted bar rests on this selection, press Enter to select this driver. The QUIKNDIS program will prompt for the appropriate floppy disk, install the driver, and return to the PC-NFS install program.

At this point the installation process is complete. The PC must be rebooted now in order to activate the commands placed into the CONFIG.SYS and AUTOEXEC.BAT files. A typical CONFIG.SYS file is shown in figure 9 with the additions made by the PC-NFS installation program. Figure 10 shows the end of a typical AUTOEXEC.BAT file with the extra commands added by the install program. *Note that the install program appends these new lines to the end of each file.*

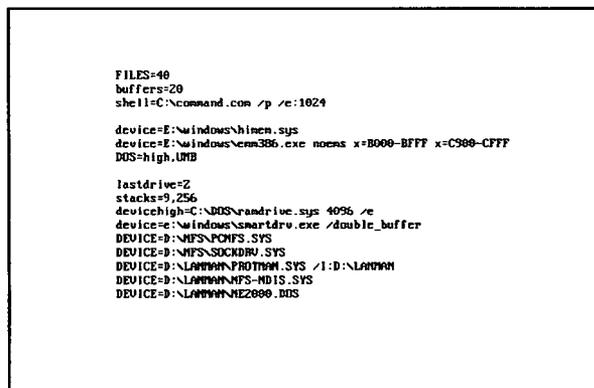


Figure 9.

```
E:\norton_dimage C: D: E: F:

REM Start Windows:
set CONFIG=WINDOWS
REM win
D:\LAPTOP\NETBIND
SET NFSDRIVE=D
SET NFSPATH=D:\NFS
SET TN_DIR=D:\NFS\TELNET
D:\NFS\FBI
D:\NFS\NET INIT

**** HYDROGRCS 3.9 ( ) == autoexec.bat == File: autoexec.bat ****
```

Figure 10.

### Testing the PC-NFS Installation

One of the simplest tests to determine if the network is operating is to use a "ping" command. Ping sends a simple message from a client to a server. When the server sees a ping packet, it sends the same data in return. Ping operates at a low level in the software hierarchy, so it is a good test of network functionality.

Before a ping command can be executed, the logic analyzer must be configured with the proper IP address. For this example, the address 192.0.2.200 will be used (192.0.2.100 was used for the PC). The ping command, along with the normal response, is shown in figure 11. A successful ping means that the cables are properly connected, the hardware is functioning, and the basic software drivers are installed.

At this point the HP 16500B can be assigned to a drive letter. This process is often referred to as "mounting" the drive (derived from the UNIX mount command). PC-NFS uses the "net use" command to assign a drive letter to the server (figure 11). MS-DOS can only use as many drive letters as permitted by the LASTDRIVE= directive in CONFIG.SYS. In addition to this limit, PC-NFS reserves the last three letters for mounting printers. For example, if the PC has two logical hard drives, C: and D:, and LASTDRIVE has been set to K:, then the drive letters E:, F:, G:, and H: would be available for assignment to the HP 16500B. Once the logic analyzer has been mounted with the "net use" command, all of the ordinary DOS commands, such as DIR, COPY and CD, will work with the new drive.

```

C:\>ping 192.0.2.200
192.0.2.200 (192.0.2.200) is alive

C:\>net use h: 192.0.2.200:/control

C:\>dir h:

Volume in drive H is 192.0.2.200
Directory of H:\

STATUS <DIR> 01-30-83 1:10a
SYSTEM <DIR> 01-30-83 1:10a
3 file(s) 0 bytes
0 bytes free

C:\>

```

Figure 11.

The PC-NFS client software package has many features. Experimenting with them can provide both experience and valuable insight into the use of networks. The “net blip” command is a handy utility that displays a box (the blip) in the upper right hand corner of the screen. The box flickers with each packet sent over the network. The “net blip” command can be executed simply at the DOS prompt:

```

C:>net blip
C:>dir H:

```

The blip should flicker in the corner of the screen as the system performs a remote DIR command over the network. Another tool is the “netstat” command. This utility shows the number of good and bad packets received at the TCP, UDP, and IP levels of the software (figure 12). An illuminating exercise is to perform a “netstat,” do a simple command like DIR on the remote drive, then perform another “netstat” to see how many packets were required to execute the command.

```

C:\>netstat
TCP:
  0 bad header checksums
  0 packets received
UDP:
  0 bad header checksums
  24 packets received
  16 NFS packets received
IP:
  0 bad header checksums
  0 unrecognized packets
  0 dropped packets (no takers).
ARP:
  0 requests received
  0 responses sent
  10 requests sent
  1 response received
ICMP:
  6 packets received
  0 packets sent to unreachable networks

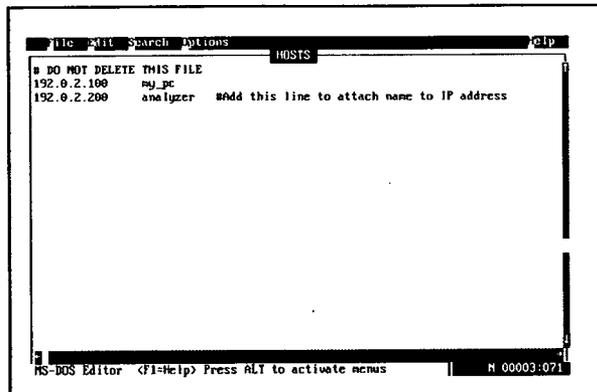
C:\>

```

Figure 12.

It is inconvenient to constantly type the IP address every time a ping, net use, or other network command is executed. It is also difficult to remember the IP address of the server, especially if several are available on the network.

PC-NFS allows you to assign a name to each IP address. To add a new entry to this table, the \\NFS\HOSTS file needs to be edited. Figure 13 shows the HOSTS file with a new line added: the HP 16500B can now be referred to as "analyzer." After editing and saving the file, remember that the PC must be rebooted for the changes to HOSTS to take effect.

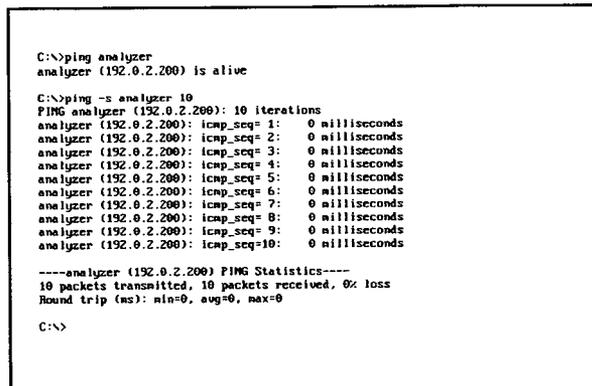


```
File Edit Search Options Help
-----
# DO NOT DELETE THIS FILE
192.0.2.180 mj_pc
192.0.2.200 analyzer #Add this line to attach name to IP address

MS-DOS Editor <F1=Help> Press ALT to activate menus M 00003:071
```

Figure 13.

Now the ping command can be repeated using the name "analyzer" rather than "192.0.2.200" (figure 14). Ping can be repeated a specified number of times by adding a number after the host name. The -s parameter prints the round-trip travel time for each ping. For a typical Ethernet connection, this time is much less than a millisecond.



```
C:\>ping analyzer
analyzer (192.0.2.200) is alive

C:\>ping -s analyzer 10
PING analyzer (192.0.2.200): 10 iterations
analyzer (192.0.2.200): icmp_seq= 1: 0 milliseconds
analyzer (192.0.2.200): icmp_seq= 2: 0 milliseconds
analyzer (192.0.2.200): icmp_seq= 3: 0 milliseconds
analyzer (192.0.2.200): icmp_seq= 4: 0 milliseconds
analyzer (192.0.2.200): icmp_seq= 5: 0 milliseconds
analyzer (192.0.2.200): icmp_seq= 6: 0 milliseconds
analyzer (192.0.2.200): icmp_seq= 7: 0 milliseconds
analyzer (192.0.2.200): icmp_seq= 8: 0 milliseconds
analyzer (192.0.2.200): icmp_seq= 9: 0 milliseconds
analyzer (192.0.2.200): icmp_seq=10: 0 milliseconds

----analyzer (192.0.2.200) PING Statistics----
10 packets transmitted, 10 packets received, 0% loss
Round trip (ms): min=0, avg=0, max=0

C:\>
```

Figure 14.

## Installing PC-NFS for MS-Windows

Once the core of PC-NFS has been installed and tested, the MS-Windows drivers and utilities can be installed. Inserting disk #3 of the PC-NFS install disk set, changing the default drive to the floppy (for example A:), and typing WINSTALL will begin the PC-NFS Windows install program (figure 15). The install program provides the option of performing either a full install or a custom install (figure 16).

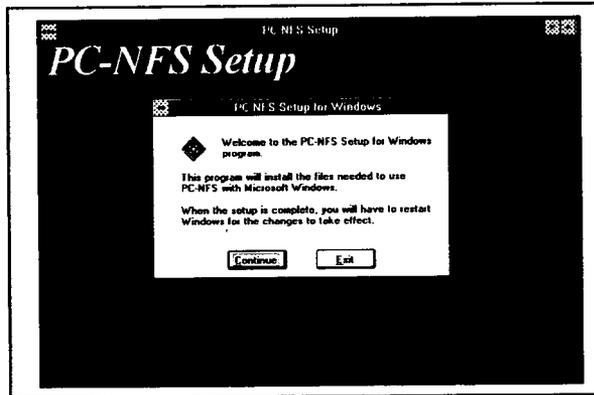


Figure 15.

A full install automatically loads all of the programs to the C:\NFS directory. If you wish to install to a different drive (for example D: instead of C:), to a different directory, or do not want all of the available programs installed, then select custom install. For this example custom install will be used.

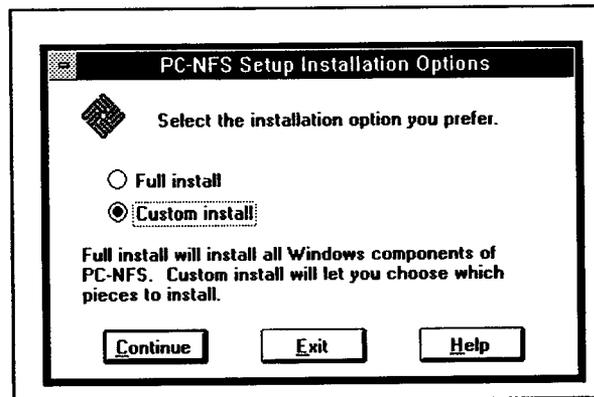


Figure 16.

The custom install dialog box appears next, providing a number of installation options. For this example, the installation location has been changed to D:\NFS. In the Installation Options box, there are three selections for installing software: Network Driver, Windows Telnet, and Windows Applications. The network drivers are required, and the Windows applications are strongly recommended. Since the HP 16500B does not support Telnet, the Windows Telnet box can be deselected as shown in figure 17. Selecting the Install button at the bottom of the screen continues with the installation, prompting you for the required floppy disks.

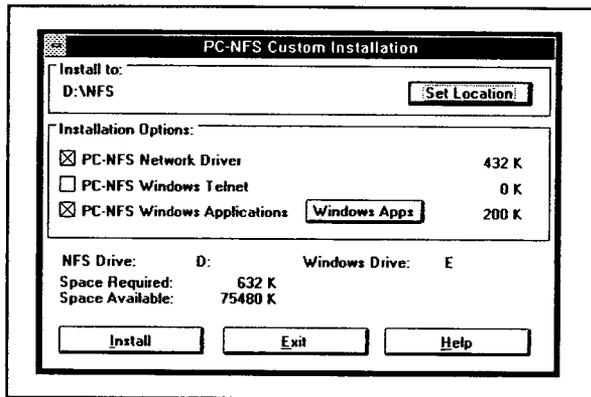


Figure 17.

After the installation is complete, the program will prompt you to either "Reboot to start PC-NFS" or "Exit Windows." There are still a few changes that need to be made to AUTOEXEC.BAT, so select "Exit Windows".

The installation program cannot easily examine the AUTOEXEC.BAT file to interpret its intent, so the installation program tends to make some assumptions that are not always valid. Figure 18 shows the end of a typical AUTOEXEC.BAT file being edited with the MS-DOS Editor. The lines added by the PC-NFS installation program have been added to the end of the file. Notice that these commands have been added after the "win" command. In its current form, the AUTOEXEC.BAT program will try to start MS-Windows before installing the PC-NFS network drivers. This will cause problems as MS-Windows will be unable to recognize or mount the HP 16500B.

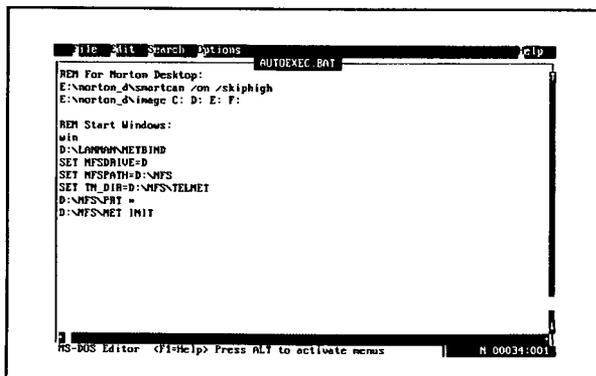


Figure 18.

The AUTOEXEC.BAT file needs to be modified in two ways, as illustrated in figure 19. First, move the "win" command to follow the newly added PC-NFS commands. Second, add the "rtm" command after the PC-NFS drivers, but before the "win" command. RTM is the Resident Transport Module. This module is a 40 Kbyte TSR that is needed by MS-Windows, but not by MS-DOS. Because 40 Kbytes is a significant amount of RAM to consume needlessly, the install program does not include the "rtm" command. If you are working exclusively in MS-Windows, then the "rtm" command should be placed in the AUTOEXEC.BAT file. If you occasionally leave MS-Windows to run programs in MS-DOS, some conventional memory can be freed by uninstalling RTM (type "rtm\_u" at the DOS prompt). RTM must be reinstalled before restarting MS-Windows.

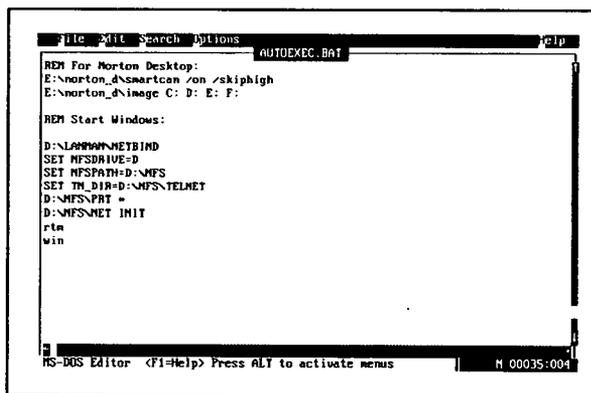


Figure 19.

### Using PC-NFS and the HP 16500B

After rebooting your PC, you will see that the Windows install program adds a new group to Program Manager: the PC-NFS group. Opening this group shows the tools and utilities provided by PC-NFS (figure 20). One of these is a Windows version of the now familiar "ping" program. Starting the Windows ping program displays a dialog box as shown in figure 21. Both "analyzer" and "my\_pc" appear in the machine selection box since these two devices are defined in the HOSTS file. Setting the number of pings to ten, and the ping frequency to one second, you can verify that the HP 16500B is operational and the network is properly connected.

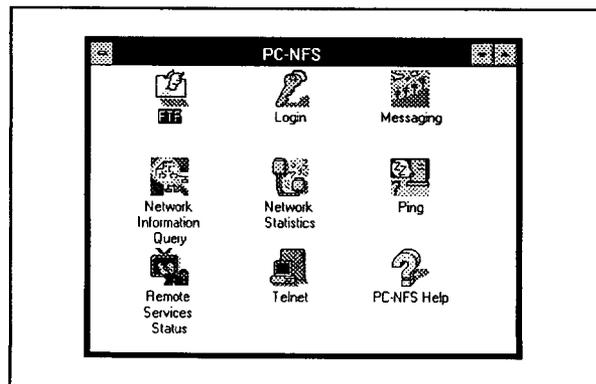


Figure 20.

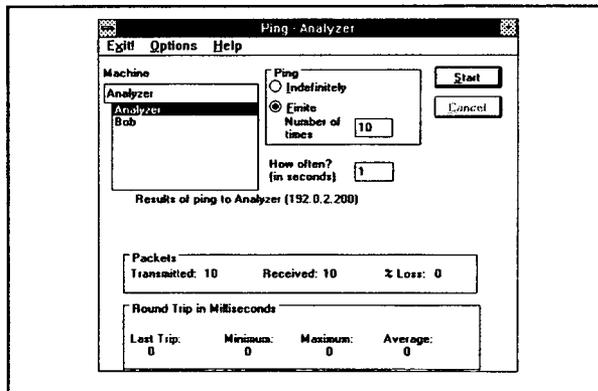


Figure 21.

The most convenient way to communicate with the HP 16500B is to mount it as a remote disk drive. The File Manager program controls the installation and removal of network drives. Opening File Manager and examining the “Disk” flyout menu shows a new entry: “Network Connections...” (figure 22). Selecting this option opens the “Network Drive Connections” dialog box as shown in figure 23.

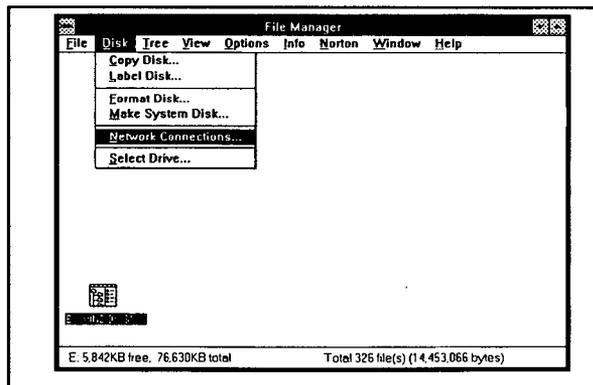


Figure 22.

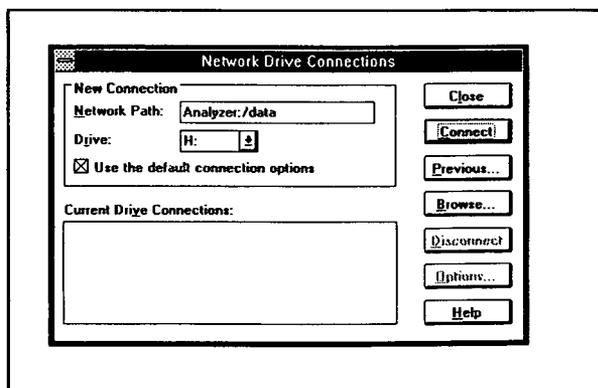


Figure 23.

The “New Connection” box contains two text entry boxes: one for “Network Path,” and the other for “Drive.” The “Network Path” text box needs the logical name (or IP address) of a remote device along

with the directory to be mounted. These two items are separated by a colon. The two valid directories that can be mounted on the HP 16500B are /CONTROL and /DATA. Only one user can mount the HP 16500B as /CONTROL at one time, but many users can mount it as /DATA. Since the HP 16500B has been defined as "analyzer" in the HOSTS file, the network path can be entered as "analyzer control".

Opening the flyout selection box for "Drive" will show the drive letters available. The highest letter available is controlled by the "LASTDRIVE=" directive in CONFIG.SYS, and the last three letters are reserved for printers by PC-NFS. For this example the H: drive will be assigned to the HP 16500B. Selecting the "Connect" button will assign the remote device to the selected drive letter and show the new connection in the "Current Drive Connections" display box. The network is now ready for use.

File Manager can now display the directories and files in the HP 16500B just as if they were a hard disk drive installed in the PC. From File Manager, select "Disk" and then "Select Drive..." from the flyout menu. The "Select Drive" dialog box will show the new H: drive along with the other drives installed in the system (figure 24).

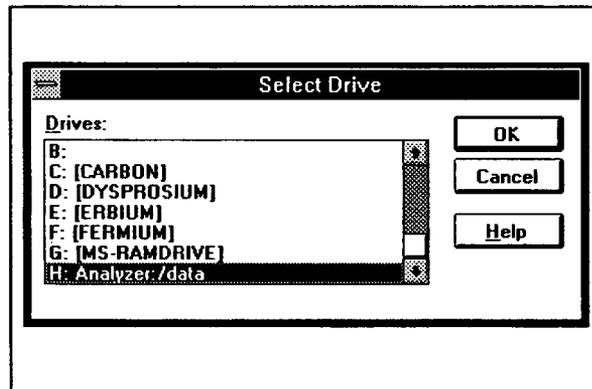


Figure 24.

directory where the network software is located. More complex problems, such as not being able to mount the logic analyzer from MS-Windows, often require detailed reading of the software manuals that are included with the networking software.

Many obscure interactions can occur between networking software and application programs, particularly TSRs for remapping the keyboard or antivirus software. It is important to check the major functions of the PC, such as program operation and printing, after the networking software has been installed.

**Technical Information  
on Networking and  
TCP/IP Protocols**

Comer, Douglas E. *Internetworking with TCP/IP: Principles, Protocols, and Architecture*. Vol I. 2d ed. Englewood Cliffs, N.J.: Prentice-Hall Inc., 1991

Comer's work is considered by many to be the authoritative work on TCP/IP. Written in an easy to read and intuitive style, this book is most useful to the person with some networking experience but lacking the knowledge of TCP/IP specifics. Volumes II and III are also useful to those writing application programs or managing larger networks.

Tanenbaum, Andrew S. *Computer Networks*. 2d ed. Englewood Cliffs, N.J.: Prentice-Hall Inc., 1989.

Although not aimed specifically at TCP/IP protocols, this book thoroughly covers the theory of networks and distributed systems.

**Vendors of PC-based  
TCP/IP software**

The following software has been tested and found to be compatible with the HP 16500B:

SunSelect  
(508) 442-0000

The Wollongong Group, Inc.  
(415) 962-7100  
FAX: (415) 969-5547

The following software has been tested and found to be *incompatible* with the HP 16500B. Contact Hewlett Packard for more information.

Beame & Whiteside Software, Ltd.  
(BW-NFS)  
(919) 831-8989  
FAX: (919) 831-8990

NetManage Inc.  
(ChameleonNFS)  
(408) 973-7171  
FAX: (408) 257-6405

## A Primer on IP Addresses

Internet Protocol (IP) addresses were devised by a standards group as a means to uniquely identify every machine interface to a network. The scheme is designed to provide universal addressing: no two computers anywhere have the same address. The 32-bit address is divided into two parts: the network id and the host id. The question then becomes, how many bits do I allocate to the network part, and how many bits do I allocate to the host part? The designers chose a clever method of allocating these bits, as shown in figure 27.

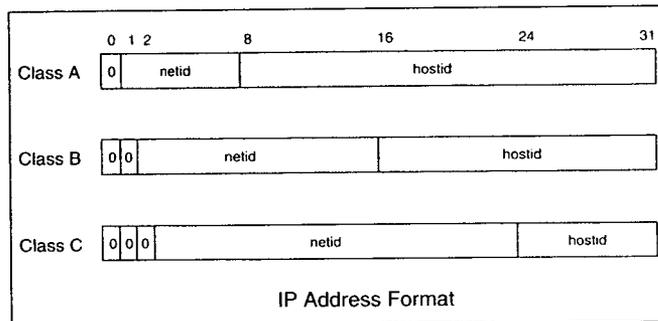


Figure 26.

Intuitively, it is reasonable to expect that few networks would be so large as to need all of the host ids provided by class A addresses, but there would be many networks that would have only 254 hosts as covered by class C addresses. Values of all ones or all zeros for either the network id or the host id have special meaning to the TCP/IP protocols, and so cannot be used in IP addresses.

IP addresses are traditionally written in dotted decimal notation. Each byte of the address is converted to decimal, resulting in a number between 0 and 255. The four bytes of the address are separated by decimal points.

If you have a tiny network consisting of only a single PC and an HP 16500B, it may appear that these standards for IP addresses are irrelevant. This is not the case. The network id is used by the client software on the PC (and in the logic analyzer) to determine how to route a given message. Suppose that the user arbitrarily selects the PC's address to be 1.2.3.4, and uses a default address in the logic analyzer of 191.0.2.1. If the PC attempts to send a message to the logic analyzer, it first looks at its network id and the network id of the desired target. The network id for the PC would be 1.X.X.X, and for the HP 16500B it would be 192.0.2.X. Seeing that the two machines were not on the same network (even though they really are), the software would send the message to the gateway to be forwarded to the appropriate network. Not finding a gateway present, the software reports "cannot send message." In order to allow the two machines to communicate, they both must think that they are on the same network, so the network ids must be the same. Changing the IP address of the PC to 192.0.2.254 (remember, you can't use all ones for the host id) fixes the problem.

The special network id 192.0.2.X has been allocated as a default address for systems that do not intend to connect to the world-wide Internet. TCP/IP gateways know that packets containing this network id are not to be forwarded. This makes this address safe to use for networks that will not be connected to the Internet, or are connected but do not wish to interfere with (or communicate with) outside systems.

## Appendix A

This appendix provides basic information on the installation of a PC lan card not directly supported by PC-NFS. The lan card detailed in this appendix is the HP 27252A PC LAN Adapter/16 Plus. This card is a 16 bit lan interface card with an BNC jack (ThinLan support) and an AUI port. The HP 27252A comes with a NDIS driver, which is required by PC-NFS.

The procedure for installing the lan card and linking it to PC-NFS is outlined below. It is recommended that you start with unaltered CONFIG.SYS and AUTOEXEC.BAT files. The order of commands in these files can prevent the lan card from working with PC-NFS; therefore, if your AUTOEXEC.BAT file contains other commands (the "win" command for starting windows, for example) you may have to re-order the PC-NFS commands in front of the other commands.

First, install the HP 27252A card in your PC. Execute the HPLANSET.BAT utility on the HP support disk to test the card and change the IRQ's if necessary (as outline below). Install PC-NFS only after you have installed the lan card.

### Running A:\HPLANSET

Choose MANUAL CONFIGURATION  
Change LAN CONNECTION to BNC  
(if you are using a ThinLan connection)  
Change IRQ if necessary (Default is IRQ 3)  
Choose CARD TEST  
(The message "Potential IRQ Conflicts Detected" should be ignored).  
Choose SAVE CONFIGURATION TO CARD  
  
EXIT

Install PC-NFS 5.0 software. Refer to main body of this application note for more information. When prompted to select an Ethernet Adapter, select :

Use a manufacturer's NDIS driver : NDIS

PC-NFS will state that "additional configuration will be required" and will state that the you may use the "QUIKNDIS" utility or configure the NDIS driver manually. You do not need to execute this utility, but if you do, select "Manual NDIS Config".

You will then install Discs 1,2,4.

The following 3 files are modified by the PC-NFS installation, and/or need to be modified by the user:

C:\AUTOEXEC.BAT  
C:\CONFIG.SYS  
C:\LANMAN\PROTOCOL.INI

### **The AUTOEXEC.BAT file**

The AUTOEXEC.BAT file should look like this after the PC-NFS installation:

```
SET TZ=EST5
SET PATH=C:\NFS;C:\;C:\DOS
C:\LANMAN\NETBIND
SET NFSDRIVE=C
SET NFSPATH=C:\NFS
SET TN_DIR=C:\NFS\TELNET
C:\NFS\PRT *
C:\NFS\NET INIT
```

The AUTOEXEC.BAT file is straight-forward since PC-NFS handles all the configuring here. You might wish to add:

```
PROMPT $P$G
C:\DOS\DOSKEY
```

for DOS ease of use.

### **Editing the CONFIG.SYS file**

The CONFIG.SYS file should look like this after installation and editing:

```
FILES=50
BUFFERS=20
device=c:\dos\ansi.sys
DEVICE=C:\LANMAN\PROTMAN.dos /I:C:\LANMAN
DEVICE=C:\LANMAN\NFS-NDIS.SYS
device=c:\lanman\hplanp.dos
DEVICE=C:\NFS\PCNFS.SYS
DEVICE=C:\NFS\SOCKDRV.SYS
LASTDRIVE=Z
```

Note that all words in uppercase were installed by PC-NFS 5.0, and all lowercase words were manually installed (upper/lower case is used here for illustration only; DOS is not case-sensitive).

It's important to note that the PC-NFS install program creates a subdirectory called

C:\LANMAN

This subdirectory must reside directly under the C: drive. It is important that the files to be installed FROM the HP 27252A support disc be installed in the same directory, and be referenced in the line containing "protman" in the CONFIG.SYS file.

Next, copy the following files from the HP 27252A support disk to the C:\LANMAN directory:

```
COPY A:\NDIS\DOS\PROTMAN.DOS C:\LANMAN
(FROM THE HP DISC)
COPY A:\NDIS\DOS\HPLANP.DOS C:\LANMAN
(FROM THE HP DISC)
COPY A:\NDIS\PROTOCOL.INI C:\LANMAN
(FROM THE HP DISC)
```

USE PROTMAN.SYS from the HP support disk. Don't use the PROTMAN.SYS file from the PC-NFS DISC.

The PC-NFS installation adds the following lines to CONFIG.SYS (as shown above in upper case):

```
DEVICE=C:\LANMAN\PROTMAN.SYS /I:C:\LANMAN
DEVICE=C:\LANMAN\NFS-NDIS.SYS
DEVICE=C:\NFS\PCNFS.SYS
DEVICE=C:\NFS\SOCKDRV.SYS
LASTDRIVE=Z
```

Be sure to change the first line above from PROTMAN.SYS to PROTMAN.dos and use the file from the HP Support disc. /I:C:\LANMAN is a pointer to where the files HPLANP.DOS and PROTOCOL.INI are installed. HPLANP.DOS is HP's NDIS Driver. The following line should be added to CONFIG.SYS after the NFS-NDIS line:

```
device=c:\lanman\hplanp.dos
```

#### Editing the PROTOCOL.INI file

The protocol.ini file can be copied from the HP 27252A support disk, or you can create a file that looks like this:

```
; HP PC LAN Adapter/16 Plus
[PROTOCOL MANAGER]
DRIVERNAME=PROTMAN$
[HPLANP]
drivename = HPLANP$
ioaddress = 0x300
interrupt = 3
maxhwtrans = 8
maxswtrans = 2
maxmulticast = 5
maxicast = 2
; The 'aui' parameter is used to force the card to use the AUI ; port
or the other port (twisted pair or thinlan depending on ; the
adapter).
aui = no
[NFS-NDIS]
DRIVERNAME=NFSLINK$
BINDINGS=HPLANP
```

The ";" acts to comment out the line.

This file is a combination of HP's PROTOCOL.INI and PC-NFS's PROTOCOL.NFS file. Note all lines between "ioaddress = 0x300" and "aui = no" could be commented out using a leading ";" if no changes to the default HP 27252A card were made during installation.



**For more information, call your local HP sales office listed in your telephone directory or an HP regional office listed below for the location of your nearest sales office.**

**United States:**

Hewlett-Packard Company  
4 Choke Cherry Road  
Rockville, MD 20850  
(301) 670-4300

Hewlett-Packard Company  
5201 Tollview Drive  
Rolling Meadows, IL 60008  
(708) 255-9800

Hewlett-Packard Company  
1421 S. Manhattan Ave.  
Fullerton, CA 92631  
(714) 999-6700

Hewlett-Packard Company  
2000 South Park Place  
Atlanta, GA 30339  
(404) 980-7351

**Canada:**

Hewlett-Packard Ltd.  
6877 Goreway Drive  
Mississauga, Ontario L4V 1M8  
(416) 678-9430

**Europe:**

Hewlett-Packard  
European Marketing Centre  
P.O. Box 999  
1180 AZ Amstelveen  
The Netherlands  
(31) 20 547 9999

**Japan:**

Yokogawa Hewlett-Packard Ltd.  
3-29-21 Takaido Higashi  
Suginami-ku  
Tokyo 168, Japan  
(813) 3335 8192

**Latin America:**

Latin American Region Headquarters  
Monte Pelvoux No. 111  
Lomas de Chapultepec  
11000 Mexico, D.F.  
(525) 202-0155

**Australia/New Zealand:**

Hewlett-Packard Australia Ltd.  
31-41 Joseph Street  
Blackburn, Victoria 3130  
Australia (A.C.N. 004 394 763)  
(03) 895-2895

**Far East:**

Hewlett-Packard Asia Ltd.  
22/F EIE Tower, Bond Centre  
89 Queensway, Central  
Hong Kong  
(852) 848-7070

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