



# NetTool™

Inline Network Tester

## Users Manual

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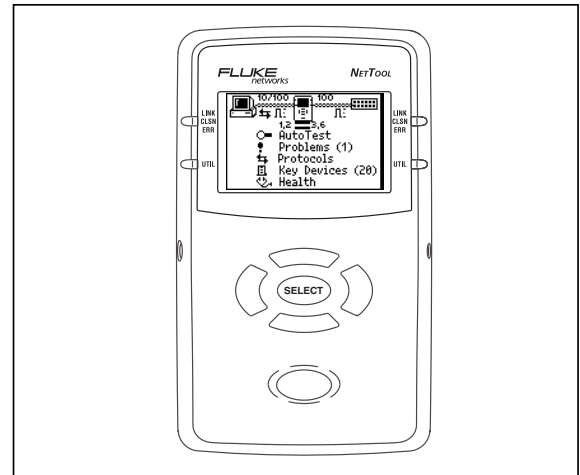
# Chapter 1 Introduction

## Using This Manual

This Users Manual is supplied with the NetTool™ Inline Network Tester (hereafter referred to as NetTool) to help you learn to use your new tester quickly and more efficiently. The manual introduces you to the key features and operation of NetTool and shows you how to set it up and use it to resolve troublesome desktop-to-network connectivity problems. Descriptions of test functions, along with illustrations of typical menus and result screens, are provided to assist you with the operation of the tester and interpretation of results.

## What is NetTool?

NetTool™ is a handheld tester that combines cable, network, and PC configuration testing into a single device. NetTool is specifically designed to speed your frontline network troubleshooting, “moves, adds & changes,” and desktop-to-network connectivity work.



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Figure 1-1. NetTool Front Panel

NetTool is available in the following models:

- NetTool Standard: provides single-ended testing of network devices. Also includes a Ping function and the capability to display VLAN traffic and CDP information.
- NetTool Pro: includes all of the features in the standard model plus the ability to do inline testing between two devices, such as a PC and the network switch. The Pro model also includes the **Reporter**, a function that enables you to create and save test reports.
- NetTool VoIP: includes all of the features available in NetTool Pro plus the ability to monitor VoIP (Voice over IP) service.

### **NetTool Features**

NetTool's features and functions enable you to do the following:

- Verify the reliability of cabling and cabling installations by testing for length, shorts, split pairs or opens, including pin-to-pin wiremapping
- Check a PC's configuration and identify its network
- Ping network devices to verify connectivity

- "Listen" to traffic between network devices to detect common connectivity problems (NetTool Pro and VoIP models only)
- Generate resource reports to document network and PC performance (NetTool Pro and VoIP models only).

### **Care and Maintenance**

Treat your NetTool tester with care to ensure the best performance. Clean the tester carefully by using a soft, slightly damp cloth. Never use harsh detergents, solvents, or abrasive cleaners.

Clean the LCD by gently wiping it with a soft cloth or tissue moistened with isopropyl alcohol.

### **Package Contents**

Take a moment to check the shipping container to make sure that the contents match the list below. If any item is missing, contact your place of purchase.

- Four (4) AA batteries
- Serial cable
- RJ-45 cable
- Wiremap adapter

- 
- This *NetTool Users Manual* and the *NetTool Quick Reference Guide*
  - CD-ROM, containing this *NetTool Users Manual*, NetTool Blaster! (updates software), and the NetTool Toolkit
  - CD-ROM, containing Key Device Watch.

### **Optional Accessories**

You can separately purchase the following accessories for NetTool from Fluke Networks or from your local distributor:

- A/C adapter
- Battery charger
- Rechargeable batteries.

### **Service and Adjustment**

Service and adjustment of NetTool should be performed by trained Fluke Networks service personnel only. If you experience a problem with the tester, visit the Fluke Networks website at <http://www.flukenetworks.com/NetTool>, send email to [support@flukenetworks.com](mailto:support@flukenetworks.com), or contact your nearest Fluke Networks Service Center to report the problem (see “Contacting Fluke Networks” for a list of telephone numbers).

If the tester requires repair, service center personnel will provide you with shipping information and repair prices. If the tester is covered under warranty, it will be promptly repaired or replaced (at Fluke Networks’ option) and returned to you, postage paid, at no charge. See the registration card for warranty terms. If the warranty has lapsed, Fluke Networks will repair the tester for a fixed fee and return it, postage paid, to you.

### **Registering NetTool**

Please take the time to register your NetTool. Go to the Fluke Networks website at <http://www.flukenetworks.com/registration> to register your tester online.

## Contacting Fluke Networks



[www.flukenetworks.com](http://www.flukenetworks.com)



[support@flukenetworks.com](mailto:support@flukenetworks.com)



+1-425-446-4519

- Australia: 61 (2) 8850-3333 or 61 (3) 9329 0244
- Beijing: 86 (10) 6512-3435
- Brazil: 11 3044 1277
- Canada: 1-800-363-5853
- Europe: +44 1923 281 300
- Hong Kong: 852 2721-3228
- Japan: +81-3-3434-0181
- Korea: 82 2 539-6311
- Singapore: +65-6738-5655
- Taiwan: (886) 2-227-83199
- USA: 1-800-283-5853

Visit our website for a complete list of phone numbers.

## PC/NetTool Link Utility Programs

The CD-ROM that is packaged with NetTool includes two PC-based software utility programs: NetTool Blaster and NetTool Toolkit. After you install and start these programs, select **Help** for instructions on how to use them.

### NetTool Blaster

NetTool Blaster enables you to do the following:

- Update NetTool (click the **Update** button)
- Get screen shots (download screens by clicking NetTool Blaster's **Capture** button)
- Add your own splash screen (click the **Personalize** button)
- Set the date and time
- Enter a key code if you have purchased options for NetTool (click **Options**)
- Change the language of NetTool's display screens (as translations become available)
- Set communication parameters.



## **NetTool Toolkit**

NetTool Toolkit enables you to:

- Generate reports
- Download reports
- Configure PING parameters and catalogs.

## **Installing and Running the Link Utilities**

To install the programs:

1. Insert the CD-ROM that comes packaged with NetTool into your PC.  
  
A navigation screen displays.
2. Run the setup program to install both programs.
3. Run the link utility programs from the **Start | Programs | Fluke Networks...menu.**

## **Getting Acquainted**

This section shows you how to turn NetTool on and off and acquaints you with the functions of the tester's buttons, navigation keys, and LEDs. You will also become familiar with NetTool's icon/menu-driven user interface.

### **Turning on NetTool**

To turn NetTool on, press the green **Power** button firmly for one second.

This initial screen is displayed:



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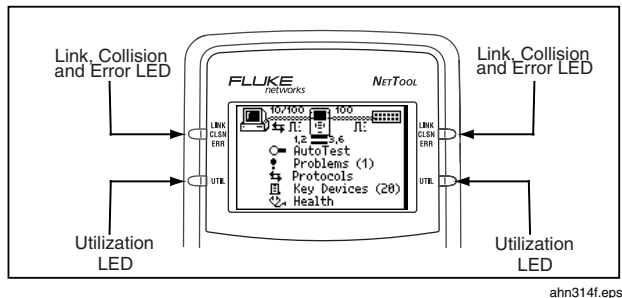
**Figure 1-2. Initial Screen**

### **Turning on the Backlight**

To turn on the display backlight, quickly press the **Power** button. Press it again quickly to turn the backlight off.

## Understanding the LEDs

On each side of the LCD, NetTool has a pair of LED indicators (Figure 1-3). These LEDs combine to give you immediate insight and at-a-glance information about your network environment. The top pair of LEDs provides link, collision, and error information while the bottom pair indicates utilization levels.



**Figure 1-3. NetTool LEDs**

## Link/Collision/Error LED

A tri-colored LED with these states:

- Green: a link pulse is present.
- Yellow: collisions are occurring.
- Red: errors (for example, FCS and jabbers) are being detected.

## Utilization LED

A tri-colored LED, with each color representing the following ranges of utilization:

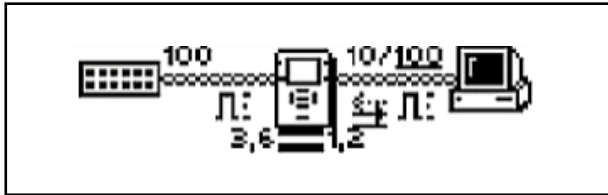
- Green: network utilization levels are below 40 %.
- Yellow: network utilization levels are between 40 % and 70 %.
- Red: network utilization levels are greater than 70 %.

## NetTool Menus

NetTool has an icon- and menu-driven user interface.

### Icons

The top area (Figure 1-4) contains a connection diagram. This diagram contains icons that show what type of device is connected to NetTool's RJ-45 jacks.



**Figure 1-4. NetTool Icons**

NetTool's device icons are listed in Table 1-1. By moving the cursor to an icon and then selecting it, you can drill down to find out more information about the device.

**Table 1-1. NetTool's Device Icons**

Icon		Menu
	⇒	<b>Network</b>
	⇒	<b>NetTool Setup</b>
	⇒	<b>Station</b>

### Main Menu

NetTool's **Main** menu is located under the connection diagram. From this menu, you can access the following:

#### Note

*To display these screens, move the cursor to the menu item, then press **SELECT**.*

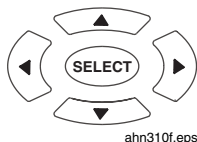
- **Problems:** displays the Problem Log, which lists all problems detected from the physical layer to the application layer. See Chapter 6, "Common Problems", for details.
- **Protocols:** displays all of the protocols that NetTool sees on the desktop or on the network.

- **Key Devices:** displays all of the servers, routers, and printers that NetTool finds on the network.
- **Toolkit** or **VoIP/Toolkit** (so named if the VoIP option is installed): displays the **Toolkit** menu where you can access the Ping utility, the Reporter function, and health statistics. If the **VoIP** (Voice over IP) option is installed, the **Toolkit** menu lists VoIP-related functions.

### Navigation Keys

The navigation keys are the four directional arrow keys that encircle the **SELECT** key (see the diagram on the right):

- **Up/Down** arrow keys: ▲ ▼
- **Left/Right** arrow keys: ◀ ▶



Use the arrow keys to navigate through the menu system. They control the on-screen cursor and, when pressed, move you to the icons and to different menu entries.

### Scrolling

To scroll through individual items on a menu, press the **Up** and **Down** arrow ▲ ▼ keys.

To scroll quickly through a menu, use the Scroll bar, which is located along the right side of a menu.

### Paging Up and Down

If a menu has several pages, press the **Left** or **Right** arrow key ◀ ▶, respectively, to display the preceding page or to advance to the next page.

### Closing the Current Screen

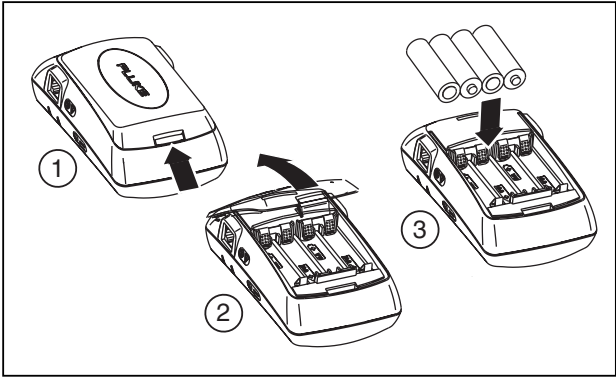
To close the current screen, press the **Up** arrow ▲ key to move the cursor to the ☒ (located in the top right corner) then press **SELECT**.

### Power Supply

To supply power to the tester, you can use the four AA batteries (supplied) or the (optional) rechargeable batteries. Alternatively, you can use the (optional) AC adapter.

### Installing the Batteries

Figure 1-5 shows you how to insert the four AA batteries into the tester's battery compartment.



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Figure 1-5. Battery Compartment

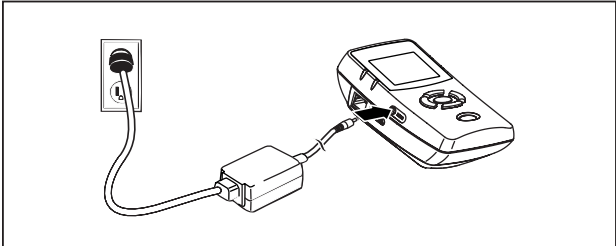
### Maximizing Battery Life

The life of batteries is strongly influenced by the care that they receive. The greatest enemy of batteries is heat. When using rechargeable batteries, avoid charging them when they are hot.

Battery life can also be shortened if you frequently leave NetTool in a hot place, such as a car on a warm day and then charge the batteries immediately upon returning to your office.

### Using the AC Adapter

The (optional) AC adapter plugs into the left side of NetTool, as shown in Figure 1-6 below:




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Figure 1-6. Powering NetTool with the AC Adapter

## **Updating NetTool's Software**

From time to time, updates to NetTool's software become available.

- Select the NetTool icon  then select **About NetTool** to find out what version of software is installed on the tester.
- To find out if there is a new software version available, go to [www.flukenetworks.com](http://www.flukenetworks.com). Select **NetTool** from the **Find your product** selection box. Click the **software** link to display the **Software** page. Check the version number to determine if it is later than the version installed on your tester.

To update NetTool:

1. Follow the web instructions to download the update file to your PC.
2. Connect the supplied serial cable between NetTool and the PC (see "Serial Port Connection" in Chapter 2) then transfer the files from the PC to the tester.

# Chapter 2


## Setting Up and Connecting NetTool

### Introduction

This chapter shows you how to set up NetTool. Among the tasks covered are how to set NetTool's date and time, how to configure its IP address information, and how to locate important information, such as the serial number.

This chapter also shows you how to make a single-ended connection and an inline connection between NetTool and a network device.

### Configuring NetTool

To configure NetTool, select the NetTool icon .

The **NetTool** menu is displayed:



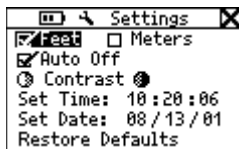
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Figure 2-1. NetTool Menu

Use this menu to access the tester's setup menus, which are described in the following sections.

## Changing the System Settings


Select  **Settings** to display the **Settings** menu:





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Figure 2-2. Settings Menu

On this menu, you can do the following:

- Check the battery level.  
If NetTool is running on battery power, the battery level indicator  is displayed at the top of every **Setup** screen.
- Select a unit of measurement (**Feet** or **Meters**).
- Enable/disable the **Auto Off** feature.  
When **Auto Off** is enabled, NetTool automatically turns itself off if no key is pressed after 10 minutes elapses. This helps to conserve the tester's battery power.

- Adjust the display contrast.  
Select **Contrast** and then select  to decrease the contrast or  to increase the contrast.

- Set the time and date.  
To supply a date and time:

1. In the first field, press the **Up ▲** or **Down ▼** arrow key to select the desired number.
2. Press the **Right ►** arrow key to advance to the next position.
3. After the desired time and date are displayed, press **SELECT**.

### Notes

*The format for time is hour:minutes:seconds. The format for the date is month:day:year.*

*The clock does not self adjust for local time zones changes. NetTool Blaster allows you to set the time for NetTool and even synchronize it with the PC clock (check NetTool Blaster's Help for details).*



- Restore factory default settings.  
 Select **Restore Defaults** to restore all of NetTool's factory default settings.

### Identifying Unwanted Protocols

Select **Unwanted Protocols** to display a screen that allows you to identify protocols on the network that you want NetTool to warn you about. This feature can be especially helpful to you during a network-wide migration away from certain protocols. If NetTool sees a particular protocol, it reports it to you in the Problem Log.

### Manually Assigning NetTool an IP Address

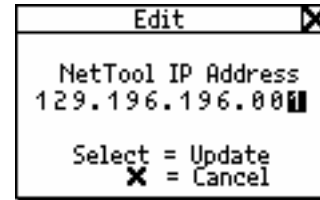
#### Notes

- By default, NetTool uses DHCP to obtain its IP address. If you have DHCP on your network, you can skip this section because no further configuration is required.
- For manual configuration, make sure any IP address you assign to your NetTool is correct for the subnet you are on.

To manually assign an IP address:

1. Select **IP Setup** to display the **IP Setup** screen.
2. Select **Manual**.

3. Press the **Down** ▼ arrow key to highlight the address you want to configure (in this case NetTool), then press **SELECT** to display the **Edit** screen (Figure 2-3).



afq47s.bmp

Figure 2-3. Edit Screen

4. Press the **Up** ▲ or **Down** ▼ arrow key to supply a number in the first field in the address. Then, press the **Right** ► arrow key to advance to the next position. Continue in this manner until the desired IP address is displayed.

5. Press **SELECT** to save the IP address for NetTool.

NetTool lists the updated address with the subnet and router IP addresses.

6. In like manner, configure the subnet mask and router addresses.

NetTool assists you by entering the first parts of those addresses based on common addressing rules.

### ***Creating a List of IP Addresses to Ping***

Select **Ping List Editor** to display a screen that lets you view, edit, or add to the lists of preset IP addresses that you previously downloaded using NetTool Toolkit.

You can add IP addresses to an existing list or edit an existing IP address within a list.

To add or edit an IP address:

1. Press an arrow key to move the cursor to the desired IP address.
2. Press **SELECT**.

3. Do one of the following:

- To add an IP address to the list, select **Add New Device** then add it to the list.
- To edit an existing address, select it then change any of the octets within the address.

### ***Selecting a Language for the Display Screens***

To select a language for your display screens:

1. Select **Language**.
2. Choose the desired language.

### ***Obtaining Information about Your NetTool***

To view information about your tester, such as the software version, serial number, and MAC address, select **About NetTool**.

Be sure to record the serial number and MAC address of your tester for future reference.

## **Connecting NetTool**

NetTool has two RJ-45 jacks, one on each side. Use the supplied RJ-45 cable to connect a patch cable to NetTool and to create a single-ended or inline connection.

NetTool also has a serial port, which enables you to directly connect the tester to a PC.

### **Connecting a Patch Cable**

You can use NetTool to test the quality of the patch cables you will use. If you also attach the (supplied) wiremap adapter, you can verify pin-to-pin connectivity from the near end to the far end of the cable.

To connect a patch cable:

1. Plug one end of the cable into either RJ-45 jack on NetTool.
2. Plug the other end of the cable into the other RJ-45 jack.

You can now run AutoTest (see “Running AutoTest” in Chapter 3).

To connect the wiremap adapter:

1. Plug one end of the cable into either RJ-45 jack on NetTool.
2. Attach the wiremap adapter (supplied) to the far end of the cable.

You can now run AutoTest (See “Running AutoTest” in Chapter 3).

### **Single-Ended Connection**

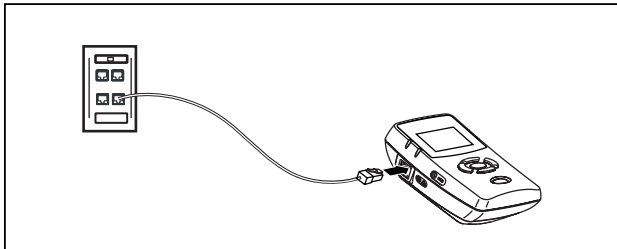
A single-ended connection entails plugging NetTool directly into a wall jack or into a network device, such as a printer, hub, or PC.

To connect, refer to Figures 2-4 and 2-5 and do the following:

1. Plug one end of an RJ-45 cable into a wall jack (Figure 2-4) or a single network device, such as a hub, PC, server, or printer.
2. Plug the other end of the cable into either RJ-45 jack on NetTool.

You can now run AutoTest (see “Running AutoTest” in Chapter 3).

Figure 2-4 shows a single-ended connection to a wall jack.

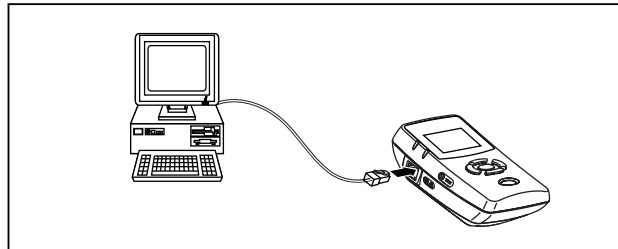


ahn308f.eps

**Figure 2-4. Single-Ended Connection into a Wall Jack.**

Use this type of connection when you need to check a network drop for activity and to find out what services lie on the other side. When connected in similar fashion to a hub or switch, NetTool can simulate a PC and perform tests like Ping.

Figure 2-5 shows NetTool connected to a PC.



ahn316f.eps

**Figure 2-5. Single-Ended Connection to a PC.**

Use this type of connection when you want to determine whether a PC is properly configured to take advantage of network resources.

### **Inline Connection**

An inline connection entails having NetTool simultaneously plugged in between two network devices, such between as a PC or a PoE-powered device and a network switch. Use this type of connection to verify whether the device can communicate properly with the network.

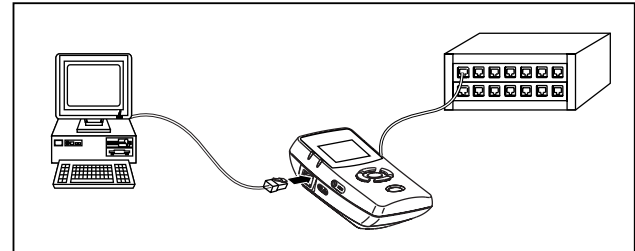
#### **Caution**

**When operating inline with a POE-powered device connected to NetTool, make sure that NetTool is not plugged into the AC adapter or into a serial device that is grounded or damage may occur to the equipment.**

To make an inline connection, refer to Figure 2-6 and do the following:

1. Plug one end of the supplied RJ-45 cable into the device. Plug the other end of the cable into either RJ-45 jack on NetTool.

2. Plug a second RJ-45 cable into the network. Plug the other end of the cable into the available RJ-45 jack on NetTool.



ahn312f.eps

**Figure 2-6. Inline Connection between a PC and the Network**

#### *Note*

*NetTool must sense traffic on the network or the device so that it can supply protocol or health information.*

You can now run AutoTest (see “Running AutoTest” in Chapter 3).

## **Serial Port Connection**

### *Note*

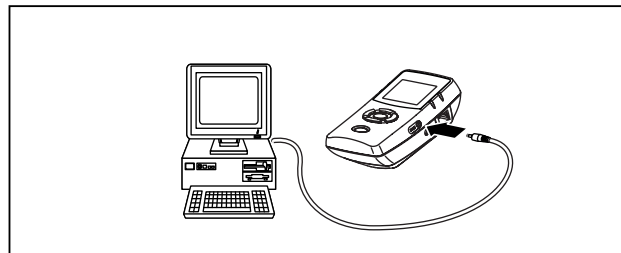
*The recommended speed setting for the serial port is 115200.*

A serial port connection enables you to:

- Download software (see “Updating the Software”)
- Enable options
- Save screens
- Upload and download PING catalogs
- Upload Report data.

Use the Link Utility programs supplied on the CD-ROM (see “PC/NetTool Link Utility Programs”).

To connect NetTool, use the supplied serial cable. As shown in Figure 2-7, connect one end of the cable to the serial port on the PC and the other end to the serial port on the right side of NetTool.



ahn019f.eps

**Figure 2-7. Connecting NetTool to the Serial Port**

# Chapter 3

## AutoTest

### Introduction

AutoTest provides a good starting point for trying to determine what devices are on your network and for making a quick assessment of your network's overall condition. Results from AutoTest can alert you to connectivity problems before they impact network performance. This chapter shows you how to run AutoTest and describes the results this test provides.

### Running AutoTest

To run AutoTest:

1. Connect NetTool, using one of the connection schemes documented under "Connecting NetTool" in Chapter 2.
2. Turn on the tester.

The **AutoTest** screen (Figure 3-1) is displayed. AutoTest flashes to indicate that the tester is ready to run a test:



ahn13s.bmp

Figure 3-1. AutoTest Screen


3. Press **SELECT**.

NetTool searches both RJ-45 connections to determine what it is connected to. Upon completion, a connection diagram is displayed.

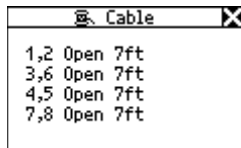
### **Cable Test Results**

If NetTool is connected to a patch cable, AutoTest evaluates the integrity of the cable and finds errors that might suggest a physical media problem. If a wiremap adapter is attached, NetTool performs deeper testing of the cable by additionally verifying pin-to-pin connectivity.

### **Cable Length, Opens, Shorts, and Splits**

To find out about the cable, move the cursor to the Spool  icon, then press **SELECT**.

The **Cable** screen is displayed, as shown in Figure 3-2:




afq32s.bmp

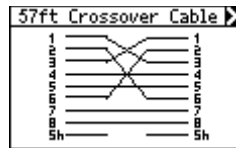
**Figure 3-2. Cable Status Screen**

On this screen, NetTool accurately measures wire lengths within the cable and indicates whether there are any opens, shorts, or split pairs present.

### **Wiremap**

If a wiremap is attached, select  (**Wiremap** icon).

The **Crossover Cable** screen (Figure 3-3) is displayed, which verifies the length of the cable and identifies the pinouts at each end:



afq34s.bmp

**Figure 3-3. Wiremap Details**



## Single-Ended AutoTest Results


AutoTest result screens vary depending on the device that NetTool is connected to.

### Note

*This results described in this section are provided as examples of what information NetTool provides.*

## Network Drop

If NetTool is connected to a network drop, it displays one of the following icons to identify the service that is active on the jack:

-  **Telco:** shows the tip and ring pins (in the case of voice being carried on an RJ-45 cable).

### Caution

**Although NetTool can detect Telco signals, it is not designed to be used on the public telephone network. Disconnect immediately. NetTool cannot reliably discover Telco information with the AC adapter or serial cable connected. It also detects ISDN signals but cannot reliably detect the S/T interface.**



-  **Token Ring:** indicates the presence of a Token Ring network.
- **Ethernet:** tells you if the jack is hot and what is on the other end (for example, a hub or a switch). It also provides the speed and duplex setting, level, polarity, and the segment ID so you can pick the right network to hook up to a PC (if there are multiple jacks).
-  **No Response:** A dangling, flashing power cord indicates that NetTool senses an Ethernet device but the device is not responding. This usually means that the device is powered off.

Table 3-1 lists the devices and services that NetTool discovers.

**Table 3-1. Services NetTool Discovers**

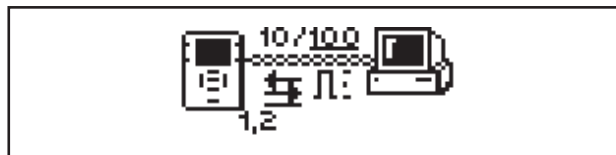
Device	Services
Servers	<p><b>IP Servers</b> (IP services discovered): DHCP, DNS, email (SMTP, POP, IMAP), Web (HTTP, HTTP proxy), WINS.</p> <p><b>NetWare Servers</b> (IPX service types): Nearest File Server, File Server, NetWare Access server, Time Synchronization Server, NetWare Directory Server (NDS), NetWare Management Server.</p> <p><b>NetBIOS Servers:</b> Primary Domain controllers, Backup Domain controllers, Master Browsers.</p>
Routers	<p><b>IP Routers:</b> RIP, IGRP, EIGRP, OSPF, IRDP, RIP2</p> <p><b>IPX routers:</b> RIP</p>
Printers	<p><b>IP Printers</b> – IP Printers, IP Print Spoolers</p> <p><b>IPX Printers</b> - IPX Print services</p> <p><b>DLC Printers</b> - Microsoft DLC, HP DLC</p>

**Network Device**

If NetTool is connected to a single network device (printer, hub, or a PC), a diagram similar to that shown in Figure 3-4 is displayed:


*Note*

*In the diagram below, the PC icon represents the single device be it a phone, printer, or PC.*



ahn317s.eps

**Figure 3-4. Diagram of NetTool Connected to a PC**

Select the PC icon  to find out more about the connected device. Go to Chapter 4 “Troubleshooting a Network Device”.

**Inline AutoTest Results**

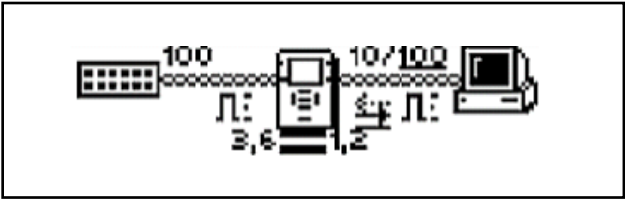
The diagrams at the top of the screen can give you a quick indication of what is going on with your network.

**Inline between a Device and the Network**

**Caution**

**When operating inline with a POE-powered device connected to NetTool, make sure that NetTool is not plugged into the AC adapter or into a serial device that is grounded or damage may occur to the equipment.**

If NetTool is connected inline between a device and the network, a diagram similar to that shown in Figure 3-5 is displayed at the top of the screen:



ahn020s.eps

**Figure 3-5. Diagram of an Inline Connection**

This screen reflects NetTool’s connection to devices.

Note that the duplex settings and link speeds are underscored. The underscore signifies a determined or negotiated result while the non-underlined value signifies the advertised value.





The diagram also indicates the duplex settings (see Table 3-2) for each device. Duplex mismatches can cause communication between devices to be impeded.


**Table 3-2. Duplex Settings**

Symbol	Meaning
↔	Full Duplex
↔ ⋯	Half Duplex

Polarity information is also given. The waveform-shaped icons used in the diagram are listed in Table 3-3.

**Table 3-3. Link and Polarity Level**

Indicator	Definition
	Normal level, normal polarity
	Normal level, reverse polarity
	Low level, normal polarity
	Low level, reverse polarity. Link level is displayed by the height of the waveform.

Under the NetTool icon , you can also obtain status information for the cables connected to NetTool. For example:





ahn235f.eps

The tester detects whether the cables are straight or swapped. If it sees a swap cable problem, it swaps the cables internally, allowing you to troubleshoot past a simple swap cable problem.

The LEDs on either side of NetTool indicate the status and utilization of the link and whether NetTool discovers any errors.

To get detailed results, move the cursor to one of the following icons then press **SELECT**:

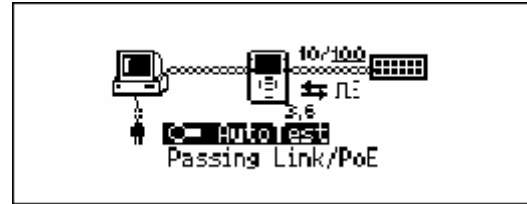
- PC icon : enables you to view results for the device. Go to Chapter 4 “Troubleshooting a Network Device” for details.
- Network icon : enables you to view network results. Go to Chapter 5 “Troubleshooting Networks” for details.

You can view additional results by selecting items from the **Main** menu below the diagram.

### *Inline between a PoE Powered Device and the Network*

During AutoTest, NetTool checks for a network on one side and an Ethernet termination on the other. If this configuration is found, the sides are connected together for up to 20 seconds while NetTool searches for a link pulse. This enables an Ethernet-powered device to power up and source link to complete the connection.


If NetTool is connected between a PoE-powered device and the network, a diagram similar to the one shown in Figure 3-6 is displayed.



ahn311s.bmp

**Figure 3-6. Inline Connection Between a PoE-Powered Device and the Network**

The diagram in Figure 3-6 also shows the speed of the link. Icons represent duplex settings (see Table 3-2) and link and polarity levels (see Table 3-3). Status information is displayed in the area below “AutoTest”.

To get detailed results on the network, select the Network icon  .

For VoIP-specific information, see Chapter 7 “Verifying Voice over IP Service”.



# Chapter 4

## Troubleshooting a Network Device


### Introduction

NetTool can provide information that you can use to determine whether a device is configured properly for your network. After you have confidence that all of the stations and devices on your network are configured correctly, you can move on to evaluate the entire network. This chapter shows you how to resolve device and configuration problems.

### Verifying a Device's Configuration

To find out whether a device is properly configured:

1. Connect NetTool (see “Setting Up and Connecting NetTool” in Chapter 2).
2. Run AutoTest (see “Running AutoTest” in Chapter 3 for details).

3. To get information about the device, press  (PC icon) in the connection diagram at the top of the screen.

The **Station** menu (Figure 4-1) is displayed:



afq16s.bmp

**Figure 4-1. Station Menu**

Five basic types of information about the device or network can be selected from this menu:

- **Link Config:** provides link pulse information. If the VoIP option is installed, you can also find out PoE voltage and pair information.
  - **Health:** lets you monitor frames and view errors that may indicate problems on the device or network.
  - **Protocols:** displays the protocols running on the device or network.
  - **Addresses Used:** enables you to verify a devices' IP address information, find out what VLAN a device belongs to, and obtain CDP (Cisco Discovery Protocol) information.
  - **Servers Used:** lists the servers that the device is using.
4. To select an item, move the cursor to its name, then press **SELECT**.

The following sections describe the detailed information you can obtain about your network.

### **Viewing Link Status Information**

To view information about the cable and status of the connection, display the **Link Config** screen (Figure 4-2):



ahn23s.bmp

**Figure 4-2. Link Configuration Details**

On this screen, NetTool identifies the wire pair it is connected to and reports the duplex, level, and polarity of the signal (see Table 3-3 for descriptions of the icons used). This information can help you troubleshoot poor quality in a connection.

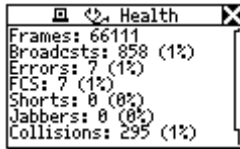
The actual and advertised speeds of the link are also given. Monitoring this information can help you anticipate possible performance and connectivity problems.

If the **VoIP** (Voice over IP) option is installed, this screen gives you PoE (Power over Ethernet) measurements. It displays the output power and line voltage information for the wire pairs.



### Checking Frames for Errors

To find out how many frames have been transmitted and whether any errors were discovered in those frames, display the **Health** screen (Figure 4-3):



afq35s.bmp

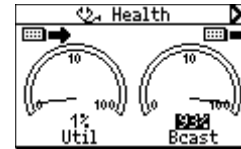
**Figure 4-3. Health Details**

This screen enables you to look at the status of frames transmitted across the link since **AutoTest** began. As you can see, NetTool provides a breakout of the types of errors it discovers. These detailed error statistics can help you isolate device- and network-related problems.

The **Health** screen shown in Figure 4-3 displays cumulative activity since you last ran **AutoTest**. You may also want take a look at what is going on now and simultaneously view the health of frames on both sides of a connection.

To do this:

1. Select **Toolkit** from the **Main** menu.
2. From the **Toolkit** menu, select **Health** to display the screen shown in Figure 4-4:



afq08s.bmp

**Figure 4-4. Health Statistics**

3. To change the view, move the cursor to **Util** or **Bcast**, then press **SELECT**.

For example, selecting **Util** changes the view to broadcast traffic, collision levels, or errors coming from either device to which NetTool is connected.

4. To change what NetTool is viewing in real-time and to change the direction (that is, “to/from Network” or “to/from PC”), move the cursor to the desired device icon (located in the upper right or left). Then press **SELECT**.

Use this information to make comparisons. For example, you may see a high percentage of network utilization and observe that the PC is also registering high utilization.

5. To segment what the PC is doing to contribute to a high utilization statistic (for example, broadcasts), move the cursor to **Util** then press **SELECT**.

6. To change how the data is expressed (in “per seconds” or as a percentage of current activity), move the cursor to the reading below a meter then press **SELECT**

*Note*

*If you exit the **Health** screen and return later without powering off the tester, NetTool displays the last-saved settings. If you power off NetTool while viewing the **Health** screen, readings are not saved. Display the **Setup** screen and select **Restore Defaults** to restore the factory settings.*

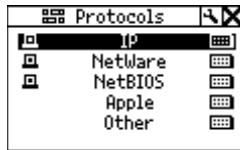
## Tracking Protocols

### Note

You can also view protocol information by selecting **Protocols** from the **Main** menu.

To find out what protocols are associated with a device or running on the network, do the following:



1. Display the **Protocols** screen (Figure 4-5):



afq20s.bmp

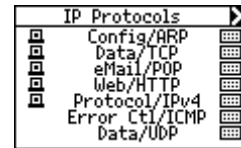
**Figure 4-5. Protocols Screen**

The **Protocols** screen lists groups of protocols present on the network. This information can help you find out if there are any protocol configuration mismatches. See Table 3-1 for a list of the protocols that NetTool can discover.

The network icon  appears next to the name of a protocol group to indicate that there are protocols of that type running on the network. Note that some protocols also display the PC icon , which means that NetTool sees them on both the PC and the network sides.

2. To view detailed information for a particular protocol group, move the cursor to its name, then press **SELECT**.

For example, if you select **IP Protocols**, the **IP Protocols** screen (Figure 4-6) is displayed:



ahn15s.bmp

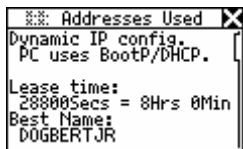
**Figure 4-6. IP Protocols Screen**

All of the IP protocols NetTool sees are listed on this screen.

## Obtaining a Device's IP Address Information

To obtain IP address information for a device, do the following:

1. Select **Addresses Used** to display the following:



ahn25s.bmp

Figure 4-7. Addresses Used Screen

The **Addresses Used** screen enables you to verify a devices' IP address information. This screen also displays the best-discovered name for the device as well as its IP, IPX, and MAC address.

2. CDP (Cisco Discovery Protocol) information, if found, is also given on this screen. Press the **Down** ▼ arrow key to locate the **CDP** section, as shown in Figure 4-8:



ahn323s.bmp

Figure 4-8. CDP Information

CDP information is reported for the most recently received CDP advertisement on that side. This information is updated every two seconds.

When plugged into a switch VLAN port, information for **Native VLAN** and **Appliance** (phone) **VLAN** are also given.

- You can also find out what VLAN a device belongs to. Press the **Down** ▼ arrow key to locate VLAN statistics, as shown in Figure 4-9:

VLAN	Pri	FrmCnt
196	0	5547
196	0	11434
196	37	
Native	-	0

ahn322s.bmp

**Figure 4-9. VLAN Information**

NetTool can provide information for up to five discovered VLANs. This screen shows the VLAN's ID, its priority, frame counts, and the untagged frame count. This information is updated every two seconds.

You can monitor VLANs during a VoIP call to see which ones are being used (see entries in the "VoIP Logs" in Appendix B).

### Identifying Network Resources

To find out what network resources are being used, select **Servers Used** to display the **Servers Used** screen (Figure 4-10):

```

Servers Used
-----
First Resp:
Best: 10:00a0c96b77b2
Encap: 802.3
MAC: 00a0c96b77b2(Intel)
Default Router:
Best: DBINDER-DELL
    
```

ahn14s.bmp

**Figure 4-10. Servers Used Screen**

This screen lists all servers, routers and printers that are attached to the network by name or IP address, along with MAC (Media Access Control) address, services provided and encapsulation methods used.

Network resources can include the following: HTTP, SMTP, POP, WINS, Nearest NetWare, DHCP and DNS servers, CDP and VLAN, as well as the router gateway.



# Chapter 5

## Troubleshooting Networks


### Introduction

The information documented in this chapter can help you evaluate the health of your network and assist you with troubleshooting network problems.

NetTool features a Ping test, which is described in this chapter. Use this test to verify connectivity between devices on the network.

### Finding Out About Your Network

To obtain information about the network NetTool is plugged into, do the following:

1. Run Autotest (see “AutoTest” in Chapter 3 for details).
2. To view details about the network, press  (Network icon).

The **Network** menu (Figure 5-1) is displayed:



ahn200s.bmp

Figure 5-1. Network Menu

Four basic functional groups of information about the network are listed on this menu:

- **Link Config:** provides link pulse information about the network. See “Viewing Link Status Information” in Chapter 4 for details.
  - **Health:** lets you monitor frames and view errors that indicate problems on the link. See “Checking Frames for Errors” in Chapter 4 for details.
  - **Protocols:** displays the protocols running on the network. See “Tracking Protocols” in Chapter 4 for details.
  - **Segment ID:** tells you what type of network you are plugged into. If there are multiple Ethernet drops, this screen can help you decide which jack to use for the correct configuration. See “Identifying the Network Type” in this chapter.
3. To select an item, move the cursor to its name, then press **SELECT**.

### **Identifying the Network Type**

To identify the type of network you are connected to, select **Segment ID** to display the **Segment ID** screen (Figure 5-2):



ahn319s.bmp

**Figure 5-2. Segment ID Screen**

This screen gives you specific details about the connection. It not only tells you the type of network NetTool is plugged into but also identifies the port number. Because not all wall plate connectors are labeled, this information can be especially useful for troubleshooting; that is, when a plate includes multiple jacks and you need to find out which connection is which.



This screen also tells you which VLAN NetTool is connected to. If CDP information is found, it is also reported on this screen.

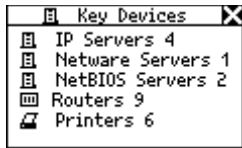
*Note*

*The **Segment ID** screen is identical to the **Addresses Used** screen documented in Chapter 4. For information on VLANs and CDP, see “Obtaining a Device’s IP Address Information” in Chapter 4.*

### Identifying Key Devices

To find out what servers, routers, and printers are available on the network segment, do the following:

1. From the **Main** menu, select **Key Devices** to display the **Key Devices** screen (Figure 5-3):



afq13s.bmp

**Figure 5-3. Key Devices Screen**

Use this information to verify whether a device is seen on the network. If there is a configuration problem, this list can help you pinpoint where the problem exists.

NetTool always attempts to display the highest level address possible for a device, be it a NetBIOS name, DNS name, IP address or Mac address. This helps you determine which services or servers exist on the network.


2. Select any key device to view specific information (for example, its IP address and subnet mask).

## Ping

NetTool can automatically ping any single device on your network or a group consisting of up to 10 devices.

Ping provides instant information about how a network device is connected and how it is acting on your local segment, making it easier for you to pinpoint connectivity problems. This section shows you how to set up and use the Ping utility.

### Notes

- *The Ping option only works in single-ended mode. If you want to ping and are in inline mode, the following symbol is displayed:*  
 **Ping** . Disconnect one of the RJ-45 cables from NetTool and then rerun AutoTest.
- *To use all of the functions of Ping, make sure that you install NetTool Toolkit on your PC so that NetTool can communicate with your PC through the serial port connection.*

## Assigning an IP Address to NetTool

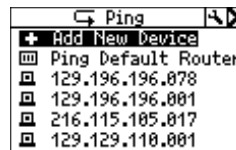
To run Ping, your NetTool must have a valid IP address. By default, NetTool uses DHCP to configure itself. Therefore, if you have DHCP on your network, you do not need to configure NetTool's IP address.

If you need to manually assign an IP address, go to “Manually Assigning NetTool an IP Address” in Chapter 2 for instructions. When manually configuring the tester's IP address, make sure that the address you assign is correct for the subnet you are in.

## Pinging a Single Device

To ping one device, do the following:

1. From the **Main** menu select **Toolkit**.
2. Select **Ping** to display the **Ping** screen (Figure 5-4):



afq41s.bmp

**Figure 5-4. Ping Screen**

3. Do one of the following:
- Select the IP address of the device from the list.
- OR
- Select **Add New Device** to display the **Edit** screen. On this screen, supply the IP address of the device then select **Update**.

NetTool pings the device and automatically adds its address to a running list (up to 10) of recently pinged devices. If there are more than 10 addresses in the list, the oldest address is deleted to make room for the most recent addition.

**Pinging Multiple Devices**

**Ping Catalog** lets you create groups of IP addresses that reflect your network configurations. For example, you can make a group of IP addresses that reflect your Marketing group or Customer Support group. After you create a group, you can simultaneously ping all of the devices in the group.

To create the groups, you need to use NetTool Toolkit, the PC-based software located on the CD-ROM that comes with NetTool. See the online Help for the NetTool Toolkit to learn how to set up and upload your groups of IP addresses.

After your lists are uploaded, NetTool displays them in the **Ping Catalog** under the group names you assigned.

To ping a group, do the following:

1. Select **Ping Catalog** from the **Toolkit** menu to display the **Ping Catalog** screen.
2. Move the cursor to the desired catalog, as illustrated in Figure 5-5, then press **SELECT**.



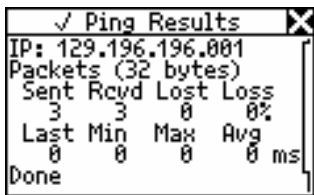
afq45s.bmp

**Figure 5-5. Ping Catalog Screen**

The list of IP addresses in the selected group is displayed. A status icon (see Table 5-1 for descriptions) appears to the left of the catalog's name.

- To view results for a particular IP address, move the cursor to the address, then press **SELECT**.

The **Ping Results** screen (Figure 5-6) for your selection is displayed:



afq50s.bmp

**Figure 5-6. Ping Results Screen**

- To ping the list of IP addresses again, move the cursor to the name of the catalog, then select **Restart**.

*Note*

*If you need to edit a list of IP addresses, see “Creating a List of IP Addresses to Ping” in Chapter 2.*

**Table 5-1. Ping Status Icons**

Status Icon	Meaning
⌘	Running
✓	Ping Complete
!	Problem with the ping. Corresponds with the severity level of problems.
!	Low severity: one packet lost.
!!	Medium severity: two packets lost.
!!!	High severity: three packets lost or the device was not found.

# Chapter 6

## Common Problems

### Introduction

The Problem Log includes a listing of all problems that NetTool detected from the physical layer to application layer. Not every problem contained in this log is at the same level of severity; therefore, just because a problem is listed here does not imply that it is a catastrophic one. For example, Unwanted Protocols are included in this log, but they are not a major impediment to the operation of a PC on the network.

This chapter shows you how to access the Problem Log and lists the problems that NetTool detects. Possible causes and remedies for the problems are provided.

### Displaying the Problem Log

To display the Problem Log:

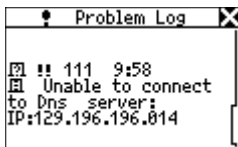
From the **Main** menu, select **Problems** as shown in Figure 6-1:



afq18s.bmp

Figure 6-1. Main Menu Showing Problems Selected


The **Problem Log** (Figure 6-2) is displayed:



afq60s.bmp

**Figure 6-2. Problem Log**

### **Understanding the Problem Log Display**










There are nine types of problems listed in the Problem Log. Each type of problem has an icon associated with it. For example, a stethoscope  is used to identify health-related problems. As you become more familiar with using the log, you will learn which icon is associated with a particular type of problem.

Problems are also categorized by severity. A single exclamation mark (!) indicates a low level of severity, while two (!! ) and three (!!! ) exclamation marks indicate a moderate and high level of severity, respectively.

Each problem listed has a unique problem ID and a short description of the problem that was found.

Table 6-1 lists the types of problems you can see and their associated icons.

**Table 6-1. Elements of the Problem Log**

Element	Description	
<b>Type of Problem</b>	 Naming	 Connectivity
	 Health	 Link
	 Server	 Configuration
	 Host	 Network
	 Cable	
<b>Problem Severity</b>	Categorized by three levels of severity: ! Low !! Medium !!! High	
<b>Problem ID</b>	A unique identifier that enables you to reference the problem.	
<b>Problem Text</b>	Provides a short description of the problem.	

### **Things to Consider**

You can think of problems fitting into one of two categories: link connectivity or network. Link connectivity problems relate to cabling or cabling properties while network problems involve PC/network configuration settings or PC-to-server interactions.

Generally, you encounter network problems while setting up or changing a PC's connection to the network. These types of problems can often be resolved by checking the network settings on the PC.

With a single-ended connection, NetTool can only report **Unwanted Protocols** and link connectivity level problems. An inline connection is required for all other problems. The different types of connections are discussed in Chapter 2.

NetTool enables you to see on which side the problem exists; that is, whether it is a problem between the PC and NetTool or whether it is between NetTool and the network itself. Whether it is a cabling problem or a protocol mismatch, NetTool helps you isolate a problem and keep things running.

### **Problems NetTool Detects**

This section lists by category the problems that NetTool can detect. For each problem, an explanation (if needed) is given and possible corrective steps are provided.

Every network is complex and the solutions given are meant to assist you with troubleshooting. This is not an exhaustive troubleshooting guide.

#### **Link Connectivity Problems**

The problems listed in this section involve cabling or cabling properties.

- **Problem:** *Speed mismatch*

**Explanation:** The network is running at 10 Mbps and the PC is running at 100 Mbps (or vice versa). This speed mismatch prevents connection to the network.

**Remedy:** Correct the speed mismatch by making sure both devices are running at the same speed.

- **Problem:** *Pair mismatch*

**Explanation:** The link pulse is being sourced on the same wire pair by both sides. This problem does not prevent connection to the network. NetTool automatically swaps the pairs to correct this problem.

**Remedy:** Check the cabling. It may be plugged into an uplink port. Also, there may be a crossover cable between NetTool and the device.

- **Problem:** *Duplex mismatch*

**Explanation:** One side is running at half duplex and the other side is running at full duplex. This mismatch prevents connection to the network.

**Remedy:** Reconfigure the devices so the duplex settings match.

- **Problem:** *Polarity reversed*

**Explanation:** The polarity of the detected link pulse is reversed.

**Remedy:** This is most likely due to a reversed pair. Check cabling to ensure that the pairing is correct.

- **Problem:** *Level low*

**Explanation:** The link pulse detected from a device is low. This can negatively affect performance.

**Remedy:** Replace the NIC card or change the hub/switch ports. This problem can also be caused by excessive cable attenuation.

- **Problem:** *Transmit pair open*

**Explanation:** The wire pair used to transmit (1,2 or 3,6) has an open. This problem prevents connection to the network.

**Remedy:** Isolate the cable and replace it.



## Network Problems

This section lists all of the network problems. Keep in mind that this is not an exhaustive list of troubleshooting steps. If you know what you need, the network administrator for the network you are troubleshooting can provide you with a lot of information to correct these problems.

### Health Problems

- **Problem:** *Short Frames received (also jabber/FCS).*

**Explanation:** A short frame is a frame that is smaller than the minimum legal size (less than 64 bytes after the preamble) with a good frame check sequence. Jabber is defined as frames longer than the maximum legal size (greater than 1518 bytes). Frame Check Sequence (FCS) Bad means that the header information is probably correct, but the checksum calculated by the receiving station does not match the checksum appended to the end of the frame.

**Remedy:** Check the NIC card or NIC driver file. This problem can also be caused by cabling or grounding problems.

- **Problem:** *Excessive utilization seen (also collisions).*

**Explanation:** Excessive utilization/collisions is defined as a collision rate of greater than 5 percent or a utilization rate of greater than 70 percent.

**Remedy:** If this problem exists everywhere on the network, it is most likely caused by excessive traffic. If it is isolated to a single PC, you can suspect cabling.

For collisions, suspect excessive traffic. Reduce traffic on the network. Check cabling. Change the NIC card or switch/hub port.

For utilization, reduce the number of stations in the collision domain. Install a switch. Use a tool like the OptiView™ Network Analyzer, Etherscope™ Network Assistant, or OptiView™ Console to determine the top contributors to further segment this network.

## NetWare

- **Problem:** *Ethernet frame-type mismatches.*

**Explanation:** For the PC and network to communicate, they both must be configured for the same frame type (802.3-raw, 802.2, Ethernet II, and SNAP). You can configure a client for a single frame type. A server can optionally be configured to recognize some or all frame types.

**Remedy:** Use NetTool to determine the frame types used. If the client is suspected, determine the frame type of the client. Determine the frame types enabled on the server.

- **Problem:** *No nearest server replies seen on network.*

**Explanation:** After a PC boots up, it sends a broadcast to initiate a connection with the closest server. If after three attempts there is no response, this problem is listed in the log.

**Remedy:** Ensure that GNS (Get Nearest Server) is enabled on the server and check connectivity to routers by doing an IPX ping. Check the Key Devices list. If the routers are listed, NetTool is seeing the routers, but the PC is not. You might suspect a bad NIC card or NIC card configuration file.

- **Problem:** *No first responder seen on network. Unable to configure PC network number.*

**Explanation:** During boot up, a PC running IPX sends a query to the router asking for its network number. If there is no response after three queries, this problem is listed in the log.

**Remedy:** Check connectivity from the PC to the network drop.

## TCP/IP

- **Problem:** *PC using incorrect IP subnet mask.*

**Explanation:** NetTool has determined that the PC is not properly configured.

**Remedy:** Access PC network properties and correct the IP subnet mask.

- **Problem:** *Router issued ICMP redirect. Hosts or devices using incorrect gateway/routers.*

**Explanation:** NetTool has determined that the PC is not properly configured.

**Remedy:** Access PC network properties and correct the IP address. You should also make sure that the DHCP server is giving the correct addresses.

- **Problem:** *Duplicate IP detected.*

**Explanation:** NetTool has detected a duplicate IP address configured on a remote device. You should never have duplicate IPs running on the network. This problem prevents the PC from connecting to the network until it is resolved.

**Remedy:** Identify at least one of the devices and change its address to a valid one that is not being used.

## Host Configuration

- **Problem:** *BootP/DHCP server not responding.*

**Explanation:** The PC is dynamically configured to find DHCP servers and none are found.

**Remedy:** Check the router and the DHCP server itself to make sure that they are running. Either could be misconfigured. Check connectivity to the DHCP server.

- **Problem:** *DHCP server issuing IP address that causes duplicate IP on network.*

**Explanation:** The DHCP server in question is not detecting an address and is provisioning a duplicate.

**Remedy:** This problem can be caused by a statically configured PC. Find the statically configured PC on the network and changes its IP address to a valid and unique IP address. Merging two unique networks into one can lead to this type of problem. The problem can also point to an issue with a DHCP server or an implementation bug.

### **Name Resolution**

- **Problem:** *No DNS server found on network to resolve names.*

**Explanation:** The PC is configured to use DNS (Domain Name Server) and none can be found.

**Remedy:** Make sure that the DNS server is up and running. Access the PC's network properties and make sure that the settings are correct.

- **Problem:** *DNS resolution failed.*

**Explanation:** There are multiple DNS servers on the network and the PC is configured for the wrong one.

**Remedy:** Find out the correct DNS information. Access the PC's network properties and configure the PC with that information.

- **Problem:** *WINS resolution failed.*

**Explanation:** The DNS server cannot determine the NetBIOS names.

**Remedy:** You can manually fix this problem in the DNS configuration section of network properties.

- **Problem:** *Incorrect WINS server xxx.xxx.xxx.xxx configured on PC.*

**Explanation:** There are multiple WINS servers on the network and the PC is configured for the wrong one.

**Remedy:** Find out the correct WINS information. Access the PC's network properties and configure the PC with that information.

- **Problem:** *No WINS server found on network to resolve names.*

**Explanation:** The PC is configured to use WINS (Windows Internet Name Service) and none can be found.

**Remedy:** Make sure the WINS server is up and running. Access the PC's network properties.

- **Problem:** *PC WINS incorrect.*

**Explanation:** NetTool sees a WINS server on the network but it is not the one configured on the PC in question.

**Remedy:** View the details of the WINS server by accessing the **Key Devices** list. Change the PC's configuration to match.

## NetBIOS

- **Problem:** *Incorrect Workgroup or Domain configured on PC.*

**Explanation:** There are specific names and privileges needed for access to domains or workgroups. The name is not correctly configured or privileges are not set up.

**Remedy:** Determine what domain names and privileges are required and correct the PC's configuration.

- **Problem:** *Unable to find Primary Domain Controller (PDC) for network.*

**Explanation:** These domain controllers act as gatekeepers for domain access. If one of them is not found on the network, no access can be granted.

**Remedy:** Various

- **Problem:** *xxx.xxx.xxx.xxx causing duplicate NetBIOS name.*

**Explanation:** Only one unique NetBIOS name is allowed on a domain.

**Remedy:** The name specified on the PC needs to be changed to eliminate duplication.

- **Problem:** *PC involved in MB elections.*

**Explanation:** NetTool sees packets from the PC that are generating master browser elections on the network. This problem can be the source of excessive traffic and slow performance.

**Remedy:** Take preventive measures within the PC's configuration to stop the PC from generating Master Browser elections.

### Web

- **Problem:** *Unable to connect to HTTP/proxy server*

**Explanation:** The standard proxy port is 1080. The HTTP port is 80 on the server.

**Remedy:** Correct the naming or port assignments in the setup area of the web browser software.

### Email

- **Problem:** *Unable to connect to SMTP mail server*

**Explanation:** The Simple Mail Transfer Protocol (SMTP) server information is either not configured or is not correctly configured on the PC. The server itself may be down as well.

**Remedy:** Access NetTool's **Key Devices** list to view information about this server and then make corrections within the mail setup area of the PC.

- **Problem:** *Unable to connect to POP2 server*

**Explanation:** The PC cannot find the POP2 server it is configured to find. The server itself may be down as well.

**Remedy:** Access NetTool's **Key Devices** list to view information about this server and then make corrections within the mail setup area of the PC.

- **Problem:** *Unable to connect to POP3 server*

**Explanation:** The PC cannot find the POP3 server it is configured to find. The server itself may be down as well.

**Remedy:** Access NetTool's **Key Devices** list to view information about this server and then make corrections within the mail setup area of the PC.

- **Problem:** *Unable to connect to IMAP server*

**Explanation:** The PC cannot find the IMAP server it is configured to find. The server itself may be down as well.

**Remedy:** The IMAP server information is either not configured or is not correctly configured on the PC. Access NetTool's **Key Devices** list to view information about this server.

### *Printer*

- **Problem:** *Unable to connect to IP print spool server*

**Explanation:** NetTool is detecting that the PC is not able to connect to the configured IP printer server. The server itself may be down as well.

**Remedy:** Access NetTool's **Key Devices** list to view a list of IP printers and correct the problem in the printer setup area on the PC.

- **Problem:** *Unable to connect to IP print spooler*

**Explanation:** The print spooler configuration on the PC is either not correct or the spooler itself is down or offline.

**Remedy:** Check the spooler itself and then access NetTool's **Key Devices** list to view a list of IP devices and correct the problem in the printer setup area on the PC.

### *Unwanted protocols (when enabled)*

The purpose of the Unwanted Protocols feature is to enable you to find protocols that you do not want on the network. For example, if you have migrated away from NetWare on the network, NetTool will flag a device that still has NetWare configured on it.

- **Problem:** *NetBEUI detected*
- **Problem:** *WINs detected*
- **Problem:** *NetWare detected*
- **Problem:** *MB (master browser) election detected*



# Chapter 7

## Verifying Voice over IP Service

### Introduction

With the VoIP (Voice over IP) option enabled, you can use NetTool to verify VoIP service on a link. NetTool can track SCCP/SIP call control and measure RTP quality of service. The VoIP Log and VoIP Monitor capture call transactions, providing you with a step-by-step record of major events so that you can troubleshoot problems with VoIP service.

#### Note

*Keeping your NetTool updated ensures that you have access to new call control protocols as they become available. For update instructions, see “Updating NetTool’s Software” in Chapter 1.*

### Running AutoTest

To begin testing, do the following:

1. Connect NetTool inline between the network and a PoE-powered device (see “Inline Connection” in Chapter 2).

#### Caution

**When operating inline with a POE-powered device connected to NetTool, make sure that NetTool is not plugged into the AC adapter or into a serial device that is grounded or damage may occur to the equipment.**

2. Run AutoTest (see “Running AutoTest” in Chapter 3).

## Viewing PoE Voltage and Pair Information

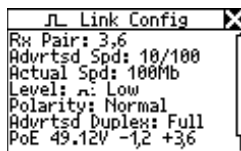
After you run AutoTest, you can obtain PoE voltage and pair information for the network or phone side. Do the following:

1. Depending on which side you want to look at, select one of the following icons:

- PC icon:  .
- Network icon:  .

The **Station** menu (PC icon) or **Network** menu (Network icon) is displayed.

2. Select **Link Config** to display this screen:





ahn201s.bmp

**Figure 7-1. Link Configuration Screen**

PoE voltage and pair information are displayed. This information is updated every two seconds.

## Viewing VLAN and CDP Information

NetTool reports VLAN information and CDP information (if found) for both the phone side and the network side.

- To look at the phone side, select the PC icon  . Then on the **Station** menu, select **Addresses Used**.
- To look at the network side, select the Network icon  . Then, on the **Network** menu, select **Segment ID**.

The **Addresses Used** and **Segment ID** screens show the same VLAN and CDP information. See “Obtaining a Device’s IP Address Information” in Chapter 4 for a description of the information on these screens.

Both VLAN and CDP information is updated every two seconds. You can monitor VLANs during a call to see which ones are being used (see entries in the “VoIP Logs” in Appendix B).

When plugged into a switch VLAN port, the native and appliance (phone) VLANs are also displayed along with the CDP information, as shown in Figure 7-2:



ahn320s.bmp

**Figure 7-2. VLAN Port Information**

## The VoIP Log

The VoIP Log is a per-call event log that records major SCCP/SIP and RTP events and measurements.

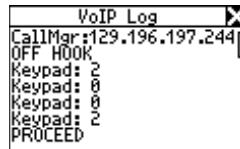
To access the log, do the following:

1. From the **Main** menu, select **VoIP/Toolkit**.
2. On the **VoIP/Toolkit** menu, select **VoIP Log** to display the **VoIP Log** screen.

You can use the VoIP Log to watch events that occur as the phone boots up and subsequently to monitor a call that is in progress.

During the boot process, the log captures the exchanges between the phone and the network. When the phone goes “off hook”, the boot information is cleared and transactions between the parties are recorded. Call quality and QoS statistics are logged for both sides.

Figure 7-3 shows an example of a VoIP Log entry. Depending on the length of a call, the **VoIP Log** may have several pages of screens. To page up or down, press the **Up** or **Down** **▲▼** arrow keys.



ahn321s.bmp

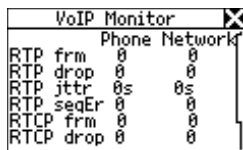
**Figure 7-3. VoIP Log**

Appendix C contains sample SCCP and SIP boot and call logs. The logs are fully commented to give you idea of what happens during the boot process and while a call is in progress. You can also look at the parameters that are tracked from the start of a call until the far-end phone goes “on hook”.

## Viewing Call Quality Measurements

The **VoIP Monitor** tracks call quality (RTP data). To display the **VoIP Monitor**, do the following:

1. From the **Main** menu, select **VoIP/Toolkit**.
2. On the **VoIP/Toolkit** menu, select **VoIP Monitor** to display the screen shown in Figure 7-4:



ahn309s.bmp

Figure 7-4. VoIP Monitor

The **VoIP Monitor** includes RTP statistics and RTCP information (when present) for both the phone side and the network side. You can view this data while a call is in progress. Table 7-1 defines the RTP and RTCP statistics seen on this screen.

Table 7-1. VoIP Monitor RTP/RTCP Statistics

Statistic	Meaning
<b>RTP frm</b>	The number of RTP frames.
<b>RTP drop</b>	The number of dropped RTP frames. An RTP frame is considered dropped when it does not arrive within 16 frames.
<b>RTP jttr</b>	The difference between the maximum and minimum frame inter-arrival time. This is an unbuffered measurement of the raw packet arrival times.
<b>RTP seqEr</b>	The number of frames that arrived out of sequence but within the 16-frame-drop window.
<b>RTCP<sup>1</sup> frm</b>	The number of RTP frames.
<b>RTCP<sup>1</sup> drop</b>	The number of dropped packets as measured, post buffer, by the endpoint.
<b>RTCP<sup>1</sup> jttr</b>	The amount of jitter as reported by the endpoint.

<sup>1</sup> RTCP is an optional control protocol that is sent from the RTP endpoints. It contains call quality information as reported by the two RTP endpoints involved in the conversation.

# Chapter 8

## ***Creating and Managing Reports***

### ***Introduction***

NetTool's Reporter feature enables you to capture device and network configuration data and save that information in a report. You can create and save up to 10 reports.

Reporter helps you do the following:

- Document configurations for groups of users (for example, Customer Service, Marketing, and Technical Support)
- Escalate trouble tickets by documenting a problem device
- View and print data you gather related to setups, moves, adds, or changes.

This chapter shows you how to create and manage your reports.

### ***Before You Begin***

To take full advantage of Reporter, the PC you are using must be enabled to communicate properly with NetTool. Before you begin, make sure that you install and start NetTool Blaster and NetTool Toolkit. These programs are found on the CD that is packaged with NetTool. See "Installing and Running the Link Utilities" in Chapter 1 for instructions.

## Creating a Report

Reporter enables you to create a report that reflects what NetTool currently detects on the PC (or another device) and/or the network.

To create a report:

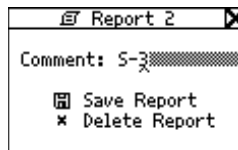
1. Connect NetTool to the device you want to check and run AutoTest.
2. From the **Main** menu, select **ToolKit**.
3. Move the cursor to **Reporter**, then press **SELECT** to display the **Reporter Menu**.



Figure 8-1. Reporter Menu

afq52s.bmp

4. Move the cursor to an **<empty>** slot. Then, press **SELECT** to display a screen similar to that shown in Figure 8-2.



afq53s.bmp

Figure 8-2. Save Report Screen

5. To supply a name for the report:

### Note

You can use up to 20 alphanumeric characters for the report name. Characters include spaces and special symbols, such as the period (.) and pound sign (#).

- a. Move the cursor to the **Comment** field. Press the **Up** or **Down** **▲ ▼** arrow key to supply value in the first position.
- b. Press the **Right** **▶** arrow key to move to the next position and supply a value there. Continue in this manner until the desired name of the report is displayed.

- c. Move the cursor to **Save Report**. Then, press **SELECT** to save.

If you inadvertently give two reports the same name on NetTool, check the date/time stamp when you view the reports to differentiate between them.

After you save a report, you can use NetTool Toolkit to upload, view, and print it. See the online Help for instructions.

### ***Deleting or Overwriting a Report***

To delete or overwrite a report:

1. From the **Main** menu, select **ToolKit**.
2. Move the cursor to **Reporter**, then press **SELECT** to display the **Reporter Menu**.

3. Do *one* of the following;

- To delete all reports in the list, select **Delete All Reports**.
- To delete a single report, select the desired report from the list. Then, select **Delete Report**.
- To overwrite a report, select the desired report. Then, select **Overwrite Report**.





# ***Appendices***

<b>Appendix</b>	<b>Title</b>	<b>Page</b>
	Specifications .....	A-1
	VoIP Logs .....	B-1
	Glossary .....	C-1



# Appendix A Specifications

## **General Specifications**

<b>Media Access</b>	10Base-T and 100Base-TX.
<b>Cable Tests</b>	Internal wiremap, cable length, opens, shorts, and split pairs
<b>Ports</b>	Shielded Hub/NIC connector (RJ-45). Serial port – customized 2.5mm “stereo” input jack.
<b>Interface</b>	Push button navigation of icon/menu-driven view.
<b>Battery</b>	Removable alkaline batteries or optional rechargeable NiMH batteries.
<b>Dimensions</b>	12.5 cm x 7.8 cm x 4.3 cm
<b>Weight</b>	0.21 kg (0.46 lbs).
<b>Warranty</b>	One year. (Extended warranty available).
<b>LED Indicators (4)</b>	2 on each side (Link, Utilization, Collision, and Error).

## **Environmental Requirements**

<b>Operating Temperature</b>	10 °C to 30 °C with up to 95 % Relative Humidity 10 °C to 40 °C with up to 75 % Relative Humidity
<b>Non-Operating Temperature</b>	-20 °C to +60 °C
<b>Approvals</b>	The Fluke NetTool has the following approvals: European Standard EN 60950, CSA/CAN C22.2 No. 950, and UL 1950.
<b>Approvals (Accessories)</b>	The optional Universal AC Adapter for NetTool has UL, CSA, and TÜV approvals or other approvals valid in the USA, Canada, and Europe.
<b>Electromagnetic Interference</b>	The Fluke NetTool complies with European standard EN 61326 Class B.
<b>Certifications</b>	Complies with European CE directive: EMC directive 89/336/EEC and low voltage directive 73/23/EEC.
<b>Connection to public telephone network</b>	NetTool should never be connected to the public telephone network.

# ***Appendix B***

## ***Sample VoIP Call Logs***

### ***Introduction***

This appendix contains sample SCCP and SIP call logs. All of the logs contain running commentaries to familiarize you with the messaging and information that is exchanged during a call.

### **Typical Cisco Skinny (SCCP) Phone Bootup**

```
>DHCP DISCOVER           // the phone broadcasts an IP address request
00c017a00079             // the MAC address of the phone
>DHCP OFFER              // the DHCP server offers an address
129.196.197.016         // the offered IP address
>DHCP REQUEST            // the phone requests the offered address
003094c4426f
>DHCP ACK                //the server acknowledges the request
129.196.197.016

>DNS req:003094c4426f    // the phone requests the Call Manager IP
CiscoCM1.danahertm.com
<DNS response           // the DNS server responds with the Call Manager's address
129.196.197.244
>TFTP file request      // the phone uses TFTP to get operating files
OS79XX.TXT
>TFTP file request
SEP003094C4426F.cnf.xml

>ALARM TO CM            // the phone signals the Call Manager
25: Name=SEP003094C4426F
>REGISTER WITH CM       // and registers with the Call Manager
ip:129.196.197.016
name:SEP003094C4426F
```

**Typical Cisco Skinny (SCCP) Phone Bootup (continued)**

```

<REGISTER_ACK // the Call Manager acknowledges the registration
>CAPABILITY_REQUEST // the phone asks about its capabilities
<CAPABILITY_RESULT // the Call Manager replies
>TFTP file request // the phone TFTP's down three more files
SEP003094C4426F.cnf.xml
>TFTP file request
RINGLIST.XML
>TFTP file request
DISTINCTIVERINGLIST.XML
>CDP // the phone sends out CDP packets periodically
SEP003094C4426F
Cisco IP Phone 7960
  
```

### **Typical Cisco Skinny (SCCP) Call Log**

Following is a sample SCCP call log. Events in the exchange are shown on the left. Commentary appears on the right to help you follow the sequencing of the exchange. The log captures an entire phone transaction, starting with the phone going OFF HOOK:

```
CallMgr:129.196.197.244      // Call manager IP address
OFF HOOK                    // Phone goes off hook
Keypad: 2                   // x2002 is dialed
Keypad: 0
Keypad: 0
Keypad: 2

PROCEED                     // Call manager acknowledges
>2000,Blade Lab            / /the two parties in the call
<2002,

RING OUT                    // far end is ringing
CONNECTED                  // far end has picked up

>2000,Blade Lab
<2002,

START MEDIA XMIT           // media transmission is to start
G711 Ulaw64k              // the CODEC being used
Call Setup: 104ms         // the time from CONNECTED to RTP
```



**Typical Cisco Skinny (SCCP) Call Log (continued)**

RTP streaming...	// the conversation has started
129.196.197.023:30142	// phone 1 IP address and port number
VLAN:untag TOS:0xb8	// phone 1 VLAN and TOS being used
129.196.197.016:20828	// phone 2 IP address and port number
VLAN:untag TOS:0xb8	// phone 2 VLAN and TOS being used
Call Duration:9.51s	// the length of the call
ON HOOK	// the phone is hung up
>RTP cnt:475frms	// phone 1 stats—the number of RTP frames
Jitter:994us	// the inter-frame arrival jitter
Arrival Avg:19ms	// the average arrival of the frames
Min:19ms Max:20ms	// the minimum and maximum inter-arrival time
Drop:3fr	// the number of dropped frames
DropBurst:61ms	// the longest dropout

**Typical Cisco Skinny (SCCP) Call Log (continued)**

```
<RTP cnt:476fr           // phone 2 stats
Jitter:1ms
Arrival Avg:20ms
Min:19ms Max:20ms
Drop:0fr
DropBurst:0s
Call Complete
```

**Typical SIP Phone Bootup Log**

```

>DHCP DISCOVER                                // the phone broadcasts an IP address request
000f66fc9e72                                  // the MAC address of the phone
>DHCP OFFER                                    // the DHCP server offers an address
129.196.196.202                               // the offered IP address
>DHCP REQUEST                                  // the phone requests the offered address
000f66fc9e72                                  // the server acknowledges the request
>DHCP ACK
129.196.196.202                               // the phone uses DNS to look up the gateway
>DNS req:000f66fc9e72
atlas4.atlas.vonage.net                       // the DNS server responds with the IP address
<DNS response
216.115.025.056
REGISTER sip:atlas4.atla                      // the phone registers
200 OK

>DNS req:000f66fc9e72                         // the phone looks up the time server
time.vonage.net
<DNS response
216.115.031.140
REGISTER sip:atlas4.atla                      // the phone does a periodic heartbeat register
200 OK

```

**Typical SIP Phone Bootup Log (continued)**

```
>DNS req:000f66fc9e72           // the phone looks up the FTP file server
ls.tftp.vonage.net
<DNS response
192.015.192.015                 // the DNS server responds with the IP address
>TFTP file request              // the phone downloads its operating file
/uObE8NkRvq/spa000F66FC9
REGISTER sip:atlas4.atla       // the phone sends periodic heartbeat registration
200 OK                          // the gateway responds
REGISTER sip:atlas4.atla
200 OK
```

**Typical SIP Call Log**

INVITE sip:5983842@atlas	// the phone invites the other party
407 Proxy Authentication	
ACK sip:5983842@atlas4.a	// the gateway acknowledges the number
INVITE sip:5983842@atlas	
100 Trying	// the gateway tries connecting
180 Ringing	// the far end is ringing
180 Ringing	
200 OK	// we have a connection
SIP RTP port 12436	// the RTP port number to be used
ACK sip:17195983842@216.	
Call Setup:213ms	// the call setup time
RTP streaming...	// the conversation has started
129.196.196.202:10106	// phone 1 IP address and port number
VLAN:untag TOS:0xb8	// phone 1 VLAN and TOS being used
216.115.023.031:12436	// phone 2 IP address and port number
VLAN:untag TOS:0x0	// phone 2 VLAN and TOS being used
BYE sip:17195983842@216.	// the phone goes back on hook

**Typical SIP Call Log (continued)**

```
>RTP cnt:2186fr           // phone 1 stats—the number of RTP frames
Jitter:21ms              // the inter-frame arrival jitter
Arrival Avg:19ms         // the average arrival of the frames
Min:7ms Max:29ms        // the minimum and maximum inter-arrival time
Drop:23fr                // the number of dropped frames
DropBurst:21ms          // the longest dropout

<RTP cnt:2233fr         // phone 2 stats
Jitter:162ms
Arrival Avg:19ms
Min:830us Max:163ms
Drop:0fr
DropBurst:0s
Call Complete
```

## ***Appendix C*** ***Glossary***

### **10BASE2**

Sometimes called ThinLAN or CheaperNet, 10BASE2 is the implementation of the IEEE 802.3 Ethernet standard on thin coaxial cable. The maximum segment length is 185 meters.

### **10BASE5**

Sometimes called ThickLAN, 10BASE5 is the implementation of the IEEE 802.3 Ethernet standard on thick coaxial cable. The maximum segment length is 500 meters.

## **10BASEF**

A point-to-point fiber link. This is the draft specification for IEEE 802.3 Ethernet over fiber optic cable.

## **10BASE-T**

10BASE-T is the implementation of the IEEE 802.3 Ethernet standard on unshielded twisted-pair wiring. It is a star topology, with stations directly connected to a multi-port Hub, and it has a maximum cable length of 100 meters.

## **100BASE-TX**

100BASE-TX is the implementation of the IEEE 802.3u Ethernet standard on two pairs of unshielded twisted-pair wiring. It is a star topology with a maximum cable length of 100 meters. The maximum network diameter is 205 meters with two class II repeaters.

## **802.2**

This IEEE standard specifies Logical Link Control (LLC), which defines services for the transmission of data between two stations at the data-link layer of the OSI model.

## **802.3**

Often called Ethernet, this IEEE standard governs the Carrier Sense Multiple Access/Collision Detection (CSMA/CD) networks. Typical cabling standards are 10BASE-T, 10BASE2, and 10BASE5.

### **Access Method**

The set of rules by which the network determines what node has access to the network. The two most popular access methods are Carrier Sense Multiple Access/Collision Detection (Ethernet) and token passing (Token Ring and ARCNET).

### **Anomaly**

An impedance discontinuity causing an undesired signal reflection on a transmission cable.

### **AppleTalk**

AppleTalk is a networking protocol primarily used for communications between Macintosh computers and Apple printers. The AppleTalk network is segmented into zones.



**ARP (Address Resolution Protocol)**

A member of the TCP/IP protocol suite, ARP is the method by which a station's MAC address is determined given a station's IP (Internet Protocol) address.

**Attenuation**

A reduction in the strength of a signal; the opposite of gain.

**Bandwidth**

Bandwidth is the rate at which data can be transmitted over a channel, measured in bits per second. For example, Ethernet has a 10 Mbps bandwidth and FDDI has a 100 Mbps bandwidth. Actual throughput is almost always less than the theoretical maximum.

**BPS**

Bits per second. A measure of speed or raw data rate. Often combined with metric prefixes as in kbps (for thousands of bits per second) or Mbps (for millions of bits per second).

**Bridge (Switch)**

A device that links two or more networks that use the same OSI Data Link protocol. A bridge evaluates source and destination addresses to pass only frames that have a destination on the connecting network.

**Broadcast**

A message that is addressed to all stations on a network. For Ethernet networks, the MAC broadcast address is FFFFFFFF.

**Broadcast Storm**

A situation in which a large number of stations are transmitting broadcast packets. This typically results in severe network congestion. This problem is usually a result of a misconfiguration.

**Bus Topology**

A bus topology is a network architecture in which all of the nodes simultaneously receive network traffic. Ethernet is a bus topology.

**Byte**

A collection of bits. A byte usually contains 8 bits.

**Characteristic impedance**

Characteristic impedance is the opposition (resistance and reactance) to signal propagation on a cable. It depends on the physical properties of a cable, which are determined at the time of manufacture. Manufacturing variations can cause slight differences in characteristic impedance for the same cable type.

### **Client**

A client is a computer that makes requests of a server. A client has only one user; a server is shared by many users.

### **Collision**

A collision is the result of two or more nodes transmitting at the same time. Excessive collisions are most often caused by a problem with the physical media.

### **Crossed Pair**

A wiring error in twisted pair cabling in which a pair on one connector of the cable is wired to a different pair on the other end of the cable.

### **Crosstalk**

Crosstalk is electrical interference generated by signal coupling between wires in a multiwire cable.

### **CSMA/CD (Carrier Sense, Multiple Access with Collision Detection)**

In CSMA/CD, each node or station has equal access to the network. Before transmitting, each station waits until the network is not busy. Since each node has equal access to the network, a collision (two stations transmitting at the same time) can occur. If a collision occurs, the affected nodes will wait a random time to retransmit. Ethernet uses the CSMA/CD access method.

### **dBm**

Decibels below 1 mW (1 milliwatt). The logarithmic measure of the ratio of the output power of a signal to an input signal of 1 mW.

### **DECnet**

Digital Equipment Corporation's set of communication protocols for networking computers.

**Destination Address**

The address of the station receiving a frame.

**DNS**

Domain Name Services provides a mechanism that allows users to remember logical machine names rather than IP addresses. DNS provides mapping between a machine name (e.g., www.fluke.com) and its IP address (e.g., xxx.xxx.xxx.xxx).

**EIA568**

Electronic Industries Association Commercial Building Telecommunications Wiring Standard. Specifies maximum cable lengths, installation practices, and performance specifications for generic building wiring.

**Encapsulation**

Encapsulation is the method of placing one protocol into another protocol's format. For example, in a Novell Ethernet environment there are four different methods to encapsulate IPX in Ethernet/802.3 frames: 802.3 raw, 802.2, Ethernet II, and SNAP.

**Ethernet**

Ethernet is a 10 Mbps topology that runs over thick coax, thin coax, twisted-pair, and fiber-optic cabling systems.

**EtherTalk**

EtherTalk is the AppleTalk network protocol running over the Ethernet network transport.

**Fast Ethernet**

Industry standard terminology for 100Base-T. Industry groups do not agree on using the term to refer to 100VG-AnyLAN; some call 100VG-AnyLAN a Fast Ethernet technology while others do not.

**FCS (Frame Check Sequence)**

A field transmitted in LAN frames that encodes error checking information.

**Frame**

A frame is a unit of data transmission divided into groups of bits. The header and a check sequence form the frame.

### **Full-Duplex**

10Base-T and 100Base-TX network operation using a switching Hub to establish a point-to-point connection between LAN nodes that allows simultaneous sending and receiving of data packets. Full-duplex performance is twice that of half-duplex performance. A 10Base-T full-duplex network is capable of 20 Mb/s data throughput, while a full-duplex 100Base-TX network is capable of 200 Mb/s throughput.

### **Half-Duplex**

Network operation is one direction at a time only; either sending or receiving data packets, but not both at the same time.

### **Hops**

Most commonly defined as the number of routers traveled by a frame to reach its destination.

### **Hub (Repeater)**

Today, most often referred to in 10BASE-T networks. A 10BASE-T Hub is essentially a multiport repeater Hub with each segment dedicated to a single 10BASE-T connection.

### **ICMP (Internet Control and Message Protocol)**

A communication protocol used by every device that uses IP. ICMP reports errors that occur during the delivery of packets on the network.

### **IP (Internet Protocol)**

IP is the network layer protocol for the TCP/IP suite.

### **IP Address**

An IP address is a series of four numbers separated by dots ("."), each of which is between 0 and 255. An IP address must be unique to a machine or the network will not be able to properly deliver network information to that machine. The address is made up of a network number, a subnet number, and a node number.

### **IP Network Number**

The network number consists of the first two numbers of a device IP address on a network.

### **IPX (Internetwork Packet Exchange)**

IPX is the network layer protocol for Novell's NetWare protocol suite.

**Jabber**

A frame greater than the maximum legal size (greater than 1518 bytes) with a good or bad frame check sequence. In general, you should not see jabbers. The most likely causes of jabbers are a faulty NIC/driver or perhaps a cabling problem.

**Jitter**

Variability in latency, or delay. If a network provides varying levels of latency (i.e., different waiting times) for different packets or cells, it introduces jitter, which is particularly disruptive to audio communications because it can cause audible pops and clicks.

**LAN (Local Area Network)**

A physical network technology used over short distances (up to a few thousand meters) to connect many workstations and network devices using a communication standard (Token Ring or Ethernet, for example).

**Late Collision**

A collision that occurs after the first 64 bytes in a frame. In 10BASE-T networks, late collisions will be seen as frames with a bad FCS. Causes of Late Collisions are a faulty NIC or a network that is too long. A too-long network is one in which the end-to-end signal propagation time is greater than the minimum legal sized frame.

**Layer**

One of seven levels in the Open Systems Interconnection (OSI) reference model. See OSI.

**Link Pulse**

A single-bit test pulse that is transmitted at least every 150 milliseconds during idle periods on 10BASE-T link segments to verify link integrity.

**Manufacturer Prefix**

The standard partial address used to identify a particular manufacturer. The prefix of the address is predefined uniquely for each manufacturer, while the remainder of the address uniquely identifies the station.

**Master Browser**

The Master Browser maintains the browse list, a list of all servers in the master browser's domain or workgroup.

**MBPS**

Millions of bits per second. See BPS.

**Multicast**

Packets that are directed to a group of nodes rather than to a single node or all nodes. This is contrasted to a broadcast packet, which is directed to all nodes.

## **NEXT**

Near-end crosstalk; crosstalk between two twisted pairs measured at the same end of the cable as the disturbing signal source.

## **NIC (Network Interface Card)**

A network interface card is the adapter card that plugs into a computer to provide a network connection.

## **Node Number**

Node number identifies the device of interest.

## **NVP (Nominal Velocity of Propagation)**

The speed that a pulse travels along a cable, expressed as a percentage of the speed of light in a vacuum.

## **Packet**

A group of bits in a defined format, containing a data message that is sent over a network.

## **Ping**

Packet Internet Groper (ping) is a common method of accessing devices on a network to see if they are active. Ping sends a packet from one device, attempts to “bounce” it off another device, and “listens” for a reply. A successful ping indicates that the network path to that device (including the routers in between) are up and functioning.

## **Protocol**

A “language” that a device uses to communicate on a network. Examples of protocols are: TCP/IP or AppleTalk.

## **Primary Domain Controller**

A device that manages the common security policy and user account databases for a group of NetBIOS servers. The election protocols are such that the primary domain controller has a tendency to become the master browser.

**Remote Collision**

A collision that occurs on the other side of a repeater. Since a 10BASE-T Hub is a multi-port repeater with a "segment" dedicated to each station, 10BASE-T collisions are remote collisions.

**Repeater**

A repeater is a layer-1 device that regenerates and retimes frames.

**Router or Gateway**

A router is a device that connects subnets together. Any packets destined for a device on a different subnet are given the subnet's router. Routing between subnets can involve multiple routers. A user's machine must be configured to know the IP address of the router for its subnet in order to communicate with machines on other subnets. Mis-identified gateways are a common problem for manually configured IP settings.

**RJ-45 Connector**

A modular connector used for UTP wiring. The RJ-45 connector has eight conductors to accommodate four pairs of wires, and it has become the dominant connector used in Ethernet and Token Ring UTP installations.

**Router**

A router is a network-layer device that connects networks using like network-layer protocols. Routers can span different network topologies. For example, a router can interconnect two IP subnets. For a router to pass traffic, unlike a bridge, it must be configured for the desired protocol. Routers are more difficult to configure but offer greater security.

**RTP (Real-time Transport Protocol)**

The protocol used for actual Voice data transmission.

### **RTCP (Real-time Transport Control Protocol)**

A protocol that provides insight on the performance and behavior of the RTP media stream.

### **Runts**

Typically defined as an Ethernet frame which is less than 64 bytes. Depending on what device is counting the runts, the frame check sequence may be good or bad.

### **SAP (Service Advertising Protocol)**

A NetWare protocol used to request and broadcast information about file servers, print servers, and other services on a network.

### **SCCP (Skinny Client Control Protocol)**

A Cisco proprietary VoIP control protocol that is used for control communications with the Cisco Call Manager.

### **Short Frame**

A frame less than the minimum legal size (less than 64 bytes) with a good frame check sequence. In general, you should not see Short Frames. The mostly likely cause of a Short Frame is a faulty adapter card or driver.

### **Signal/Noise Ratio**

The ratio of worst-case received signal level to noise level measured at the receiver input (expressed in dB). The S/N ratio may be expressed as NEXT(dB) - Attenuation(dB), provided idle channel background noise is low. Higher S/N ratios provide better channel performance.

### **SIP (Session Initiation Protocol)**

A text-based, IP-based protocol that is used for initiating a unicast session or for initiating and controlling a multicast session.



**SNAP (Subnetwork Access Protocol)**

An IP protocol that is an extended version of the IEEE LAN logical link control (LLC) frame. SNAP provides access to additional protocols and allows vendors to create their own protocol sub-types.

**SNMP (Simple Network Management Protocol)**

Designed by the Department of Defense and commercial TCP/IP implementors, SNMP is part of the TCP/IP protocol suite. SNMP operates on top of the Internet Protocol and can manage virtually any network type.

**Source Address**

The address of the station originating a frame.

**Split Pair**

The error of using wires from two different twisted pairs. This error cancels the crosstalk elimination characteristics of twisted pair wiring and produces crosstalk. Use a single twisted pair for Transmit and another twisted pair for Receive to minimize crosstalk.

**Subnet**

A subnet is a section of the TCP/IP network. Each subnet has a unique subnet number and is connected to a router which enables connection to other subnets.

**Subnet Number**

The subnet number is programmed into the subnet router and follows the network number in an IP address.

**TCP/IP (Transmission Control Protocol/Internet Protocol)**

TCP/IP is the protocol suite originally developed by the Advanced Research Projects Agency (ARPA) to interconnect a research network. It later evolved into the Internet. The TCP/IP is an open standard not owned by any particular organization. The term TCP/IP is often used to refer to the entire suite of related protocols that includes IP, FTP, Telnet, RIP.

## **Topology**

Topology is the organization of network components. The topology of Token Ring network components is a ring.

## **Transport**

Transport refers to the physical method by which data is transmitted (e.g., Ethernet, Token Ring, etc.). Different physical network hardware and cable layout are required for different transports.

## **Transceiver**

In Ethernet networks, a transceiver is used to couple electrical signals to and from an adapter to the transmission media. In ThinLAN and 10BASE-T networks, the transceiver is integrated directly onto the network adapter card.

## **Twisted Pair**

A pair of wires that is twisted together to minimize crosstalk. Crosstalk is minimized with twisted pair wiring by canceling the magnetic fields generated in each of the twisted wires. Twisted pair cable (UTP or STP) is typically made up of several twisted pairs of wires.

## **Uptime**

The amount of uninterrupted time that a resource (such as a print server) has been available.

## **UTP (Unshielded Twisted Pair)**

Cable that is twisted by pairs but not shielded. This minimizes crosstalk by canceling the magnetic fields generated in each of the twisted wires, but only when a single twisted pair is used for Transmit or Receive.

## **VoIP (Voice over Internet Protocol)**

The technology used to transmit voice conversations over a data network using the Internet Protocol.

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