



LAN Solution GB Network Tester Kit

Measures cable length and generates tone.

Works on virtually any single- or two-conductor cables for testing and troubleshooting.

Identifies, monitors, and corrects LAN issues caused by physical layer and link conditions in the network.



Customer Support Information

Order toll-free in the U.S.: Call 877-877-BBOX (outside U.S. call 724-746-5500) • FREE technical support 24 hours a day, 7 days a week: Call 724-746-5500 or fax 724-746-0746 • Mailing address: Black Box Corporation, 1000 Park Drive, Lawrence, PA 15055-1018 • Web site: www.blackbox.com • E-mail: info@blackbox.com

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Normas Oficiales Mexicanas (NOM) Electrical Safety Statement

INSTRUCCIONES DE SEGURIDAD

1. Todas las instrucciones de seguridad y operación deberán ser leídas antes de que el aparato eléctrico sea operado.
2. Las instrucciones de seguridad y operación deberán ser guardadas para referencia futura.
3. Todas las advertencias en el aparato eléctrico y en sus instrucciones de operación deben ser respetadas.
4. Todas las instrucciones de operación y uso deben ser seguidas.
5. El aparato eléctrico no deberá ser usado cerca del agua—por ejemplo, cerca de la tina de baño, lavabo, sótano mojado o cerca de una alberca, etc.
6. El aparato eléctrico debe ser usado únicamente con carritos o pedestales que sean recomendados por el fabricante.
7. El aparato eléctrico debe ser montado a la pared o al techo sólo como sea recomendado por el fabricante.
8. Servicio—El usuario no debe intentar dar servicio al equipo eléctrico más allá a lo descrito en las instrucciones de operación. Todo otro servicio deberá ser referido a personal de servicio calificado.
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10. El equipo eléctrico deber ser situado fuera del alcance de fuentes de calor como radiadores, registros de calor, estufas u otros aparatos (incluyendo amplificadores) que producen calor.
11. El aparato eléctrico deberá ser conectado a una fuente de poder sólo del tipo descrito en el instructivo de operación, o como se indique en el aparato.

12. Precaución debe ser tomada de tal manera que la tierra física y la polarización del equipo no sea eliminada.
13. Los cables de la fuente de poder deben ser guiados de tal manera que no sean pisados ni pellizcados por objetos colocados sobre o contra ellos, poniendo particular atención a los contactos y receptáculos donde salen del aparato.
14. El equipo eléctrico debe ser limpiado únicamente de acuerdo a las recomendaciones del fabricante.
15. En caso de existir, una antena externa deberá ser localizada lejos de las líneas de energía.
16. El cable de corriente deberá ser desconectado del cuando el equipo no sea usado por un largo periodo de tiempo.
17. Cuidado debe ser tomado de tal manera que objetos líquidos no sean derramados sobre la cubierta u orificios de ventilación.
18. Servicio por personal calificado deberá ser provisto cuando:
 - A: El cable de poder o el contacto ha sido dañado; u
 - B: Objetos han caído o líquido ha sido derramado dentro del aparato; o
 - C: El aparato ha sido expuesto a la lluvia; o
 - D: El aparato parece no operar normalmente o muestra un cambio en su desempeño; o
 - E: El aparato ha sido tirado o su cubierta ha sido dañada.

LAN Solution GB Network Tester Kit

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1. Specifications

Cable Types: Shielded or unshielded, CAT6, CAT5e, CAT5

Length Measurement Range (CAT5/6): 0 to 1500 ft. (0 to 457 m)

Minimum Cable Length for Single-Ended Cable Test: 4 ft. (1.22 m)

Minimum Cable Length for Testing for Split Pairs: 3 ft. (0.91 m)

Temperature Tolerance: Operating: 32 to 122° F (0 to 50° C);

Storage: +14 to +140°F (-10 to +60° C)

Humidity: 10 to 90%, noncondensing

Power: (4) AA batteries (not included)

Battery Life: Standby: 2 years;

Cable Testing: 70 hours (with backlighting off),

50 hours (with 50% backlighting on);

Network Testing: 7 hours (with backlighting off,

6.5 hours (with 50% backlighting on)

NOTE: Times are for the full capacity of the battery when used continuously.

Size: 1.8"H x 3.5"W x 7.3"D (4.5 x 8.9 x 18.6 cm)

Weight: With batteries: 14 oz. (397 g)

LAN Solution GB Network Tester Kit

2. Overview

2.1 Introduction

The LAN Solution GB Network Tester is a jack identifier, cable tester, Power over Ethernet (PoE) tester, and pinger in one tester. It combines the functions of a high-end cable tester and length measurement device with the capability to identify, monitor, and correct LAN issues caused by physical layer and link conditions in the network.

In network mode testing, the LAN Solution GB Network Tester enables quick identification at unknown RJ-45 jacks of active Ethernet devices, POTS, Token Ring, or other devices. It can also detect the presence of devices using PoE at the other end of the jack or cable being tested. Use it to ping network devices to verify connections and IP addresses. It automatically accesses DHCP hosts to obtain network information.

In cable mode testing, the LAN Solution GB Network Tester provides full cable testing, displaying a wire map, ID, and any faults. It identifies shorts, opens, miswires, split pairs, and reverses. The tester also measures cable length and generates tone levels for signal tracing and cable identification on all pairs, a selected pair, or a selected pin.

2.2 Features

- Detects and reports active Ethernet devices as well as POTS, ISDN, Token Ring, and other devices at the other end of a 10BASE-T or 100BASE-TX link.
- Identifies IEEE 802.3af PoE and legacy Cisco In-Line Power (ILP) at the other end of the jack or cable being tested, including the presence of raw DC power. Verifies wiring installation capability to provide PoE to the end device.
- Simultaneously pings three addresses at once: target, router, and DNS server. DHCP support allows for pinging of router and DNS server with no setup.
- Blinks a link indicator to identify hub or switch port and links to Cisco bridge or router ports using Cisco Discovery Protocol (CDP).
- Tests cabling configuration and verifies connectivity while conducting tests for opens, shorts, miswires, split pairs, reverses, and high-resistance faults.
- Displays length measurement for each pair in feet or meters. Displays wire maps and remote identifiers.
- Generates selectable tones on selected pins for use with tone tracers.

- Provides support for six languages, selectable from the setup options.
- Includes large backlit LCD that allows for clear display of setup information and test results.
- Preserves battery life through low power consumption and automatic turnoff in any mode.

2.3 Applications

- Full cable testing with display of wire map, ID, and any faults detected with pair-by-pair status message on shielded or unshielded network or coax cable.
- Remote mapping for up to 20 optional remote identifiers.
- Cable length measuring for each pair using patented cable capacitance method.
- Link testing to identify the PoE voltage, advertised speed, duplex mode, wiring mode, and polarity of the transmit pair on active Ethernet and other devices connected to unknown jacks.
- Auto MDI/MDI-X protocol instantly identifies hub, switch, or NIC ports with straight-through or crossover cable.
- Tests PoE to ensure adequate power is present for powered devices such as VoIP phones.

2.4 What's Included

Your LAN Solution GB Network Tester Kit should contain the following items. If anything is missing or damaged, contact Black Box Technical Support at 724-746-5500.

- (1) main unit
- (8) cable test remotes
- (2) 1-foot (0.3-m) patch cables
- (1) RJ-45 to alligator clip cable
- (2) “no-fault” RJ-12 cables
- (1) tone tracer
- (1) nylon carrying case

NOTE: The tester ships with a clear, protective coating covering the LCD. Remove it for a clear view of the display.

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2.5 Hardware Description

2.5.1 Front Panel

Figure 2-1 illustrates the LAN Solution GB Network Tester's front panel. Table 2-1 describes its components.

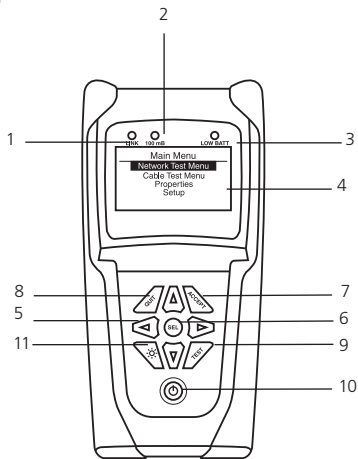


Figure 2-1. LAN Solution GB Network Tester front panel.

Table 2-1. Front-panel components.

Number	Description	Function
1	LINK indicator	This LED turns green when the tester detects a network link.
2	100 MB indicator	This LED turns green when the tester is connected or trying to connect at 100-Mbps speed.
3	LOW BATT indicator	This LED turns red when the battery charge is getting low.
4	Backlit LCD	The LED features a graphical display, 128 x 64 pixels. You can toggle the backlight on and off.
5	Navigation arrow keys	Use these keys to scroll through options, set addresses, and adjust values for changeable options.
6	SEL key	Select menu and submenu options and activate changeable options for value adjustment via the arrow keys and ACCPT key.
7	ACCPT key	Use to accept displayed values for changeable options selected with the arrow keys.
8	QUIT key	Use to back out from submenus and return to the previous (higher) menu level or to exit tests in progress.
9	TEST key	Use to initiate tests.
10	Power key	Use to power the tester on and off. Hold the key down for one second to turn the unit off.
11	Backlight key	Use to toggle the LCD backlight on or off.

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2.5.2 Top Panel

The LAN Solution GB Network Tester's top panel (shown in Figure 2-2) includes one RJ-45 jack/test port that's used to connect to the cable or jack you want to test.

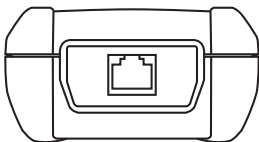


Figure 2-2. Top panel.

2.5.3 Bottom Panel

The LAN Solution GB Network Tester's back panel (shown in Figure 2-3) includes a battery compartment with a cover secured by two screws. See Section 3.1 for instructions about installing or replacing the battery.

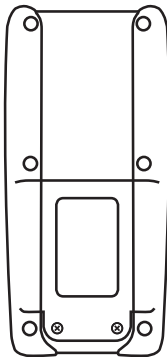


Figure 2-3. Back panel.

3. Operation

3.1 Installing or Replacing the Batteries

To run the LAN Solution GB Network Tester, you must first install four new AA batteries in the battery compartment.

NOTE: Batteries are not included with the unit; you must supply your own.

To install or replace the batteries:

1. Disconnect the tester from any external connection before opening it to replace the batteries.
2. Using a screwdriver, remove the two screws holding the battery compartment cover. Remove the cover.
3. If you are replacing old batteries, pull them out of the battery compartment and dispose of them according to local regulations.
4. Insert four new AA batteries.
5. Replace the cover and screws.

3.2 Safety Warnings and Cautions

Read the following warnings and cautions carefully before attempting to use the LAN Solution GB Network Tester.

WARNING: Do not use with standard 6-position plugs (RJ-11/RJ-12) or the LAN Solution GB Network Tester's jack may be damaged. Use the included "no fault" (green transparent plugs) 6-position RJ cable, which can be connected to 6- or 8-position jacks without causing any damage.

WARNING: Do not attach the LAN Solution GB Network Tester to primary power lines. It might be damaged and cause a safety hazard. When connecting to an unknown jack or plug, the tester should be off. Once it's connected, press the power key to turn the unit on and then run the Port Discovery test to ID the connection.

WARNING: The LAN Solution GB Network Tester is not intended to connect to "hazardously live" circuits (more than 42.4 VAC or 60 VDC). There is a danger of electrical shock or fire if connected to a hazardous live circuit.

CAUTION: Improperly crimped, damaged, or uncrimped plugs can damage the jack on the LAN Solution GB Network Tester. Inspect the plugs for proper termination and crimping before inserting them into the tester. Contacts on a plug should always be recessed into the plastic grooves.

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3.3 Powering the Unit On and Off

Read the Section 3.2, Safety Warnings and Cautions, before turning on the unit for the first time.

3.3.1 Turning On the Unit

To turn on the unit, press the power key. When the unit powers on, text appears in the LCD, and the LCD backlight lights up. The first time you power on the unit, it will default to the main menu. On subsequent powerups, the unit will turn on in the last mode used before it was turned off.

If the LOW BATT indicator light comes on when you power on the tester, replace the batteries as soon as is practical. See Section 3.1, Installing or Replacing the Batteries. If the light turns on but the unit does not, you must replace the batteries before using the unit.

3.3.2 Turning Off the Unit

To turn off the unit, press the power key and hold it down until the LCD goes blank. The unit will turn off automatically after about 15 minutes in all modes except Tone Generator (60 minutes) and Hub Flash (30 minutes).

3.4 Turning the Backlight On and Off

The backlight comes on when the unit is started and turns off automatically about five minutes after the last press of any key. You can turn the backlight on or off at any time while the unit is on by pressing the backlight key. Using the backlight increases power consumption by 20-50%, depending on the operation mode of the tester.

3.5 Overview of Modes and Functions

The LAN Solution GB Network Tester features nine test modes (five network, four cable), four properties functions, and three setup modes, as described in the following sections. See Section 3.6 to learn how to access these features.

3.5.1 Network Test Modes

- **Port Discovery:** Detects and reports active Ethernet devices, and identifies many possible connections using an RJ-45 jack.
- **Ping Test:** Simultaneously pings three addresses at once: a target, a router, and a DNS server. DHCP protocol support allows for pinging of a router and DNS server with no setup.
- **Hub Flash:** Blinks a link indicator to help identify a hub or switch port.

- **Cisco Discovery:** Links to a Cisco bridge or router port, detects and displays the Cisco Discovery Protocol (CDP) messages broadcast over the network to inform each other that they exist.
- **PoE Test:** Power over Ethernet (PoE) detection identifies IEEE 802.3af and legacy Cisco In Line Power (ILP) modes and displays pins used to carry the power. It also verifies the wiring installation capability to provide power to the end device without excessive loss.

See Chapter 4 for more information on network testing modes.

3.5.2 Cable Test Modes

- **Cable Test:** Single-ended (no remote) testing of cables for shorts, opens, and split pairs. Full cable test finds all wiring faults including split pairs with a remote connected. Results display in a wire map format with a pair-by-pair status message. Displays PASS for T568A/B passing cables.
- **Remote Mapping:** Displays the number of the remote identifier (wire mapper) attached to the end of the cable under test.
- **Cable Length:** Displays measurements for each pair in feet or meters using the cable capacitance method.
- **Tone Generator:** Generates selectable tones on selected pins for use with tone tracers.

See Chapter 5 for more information on cable test modes.

3.5.3 Properties Functions

- **Last DHCP Values:** Displays the results of the most recent DHCP negotiation between the unit and a DHCP server.
- **MAC Address:** Displays the tester's factory-set Media Access Control (MAC) number.
- **Product Version:** Displays the firmware version of the two microcomputers in the unit.
- **Charge Remaining:** Displays the approximate charge remaining in the tester's installed batteries.

See Section 6.1, Viewing Unit Properties for more information on properties' functions.

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3.5.4 Setup Modes

- **Change Language:** Allows users to select a different language.
- **Calibrate Length:** Calibrates the unit to compensate for variations in the measurement of cable length.
- **Find Length Constant:** Enables measurement of the length constant of an attached known length of cable.

See Section 6.2, Modifying Unit Settings for more information on user setup modes.

3.6 Navigating in the User Interface

When you first power on the LAN Solution GB Network Tester, the main menu appears on the LCD as shown in Figure 3-1.

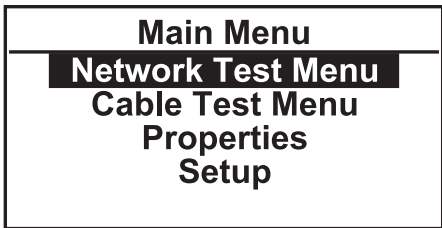


Figure 3-1. The LAN Solution GB Network Tester's main menu.

To navigate through menus and submenus in the LCD, select changeable options, and set values for changeable options, and use the keys on the keypad as described below:

- Use the up and down arrow keys to move the highlight to the desired selection on the screen.
- Use the **SEL** key to select the highlighted option on the screen. When moving down through the menu matrix, the next submenu level will be displayed.
- Use the **QUIT** key to move back to a previous menu or to exit test setup or result screens.

NOTE: Pressing the **QUIT** key for a sufficient number of times will always eventually return you to the main menu.

- When a changeable option is selected (via the **SEL** key), the highlight will flash. To adjust the value for the selected option:
 - Use the up and down arrow keys to scroll through the possible values for the option.
 - Use the **ACCPY** key to accept the currently displayed value for the option.
 - Use the **QUIT** key to exit change mode for the option and revert to the previously selected value for the option.

Setting options for some tests and unit settings requires a somewhat more complex value selection method. Full details are provided in the relevant sections in later chapters of this guide.

3.7 Network Connectivity

The LAN Solution GB Network Tester recognizes auto-negotiation using fast link pulses to report advertised Ethernet capability. The unit also supports Auto MDI/MDI-X protocol to allow for connection to a hub, switch, or NIC with a straight-through or crossover cable. The LAN Solution GB Network Tester operates using 10BASE-T or 10BASE-TX for all network transmissions.

3.8 Notes About Voltage Checking

All tests start with a check for voltages on the pins on the tester's jack. If found, the message: `-Voltage Found-Press Test to run PoE Test` appears. Press the **TEST** key to start the PoE test to determine what type of interface or what voltages are present on the jack. The exception to this behavior is in the Port Discovery mode, in that some voltages on specific pins will be identified as potential non-Ethernet devices.

NOTE: If a Cable Test is started while connected to a PoE source device, the discovery voltage put on the cable may not be detected by the LAN Solution GB Network Tester and can cause erroneous test results.

4. Performing Network Tests

4.1 Network Testing Overview

The LAN Solution GB Network Tester features five network test modes, as described in the following sections:

- Section 4.3, Port Discovery Tests
- Section 4.4, Ping Tests
- Section 4.6, Hub Flash Tests
- Section 4.7, Cisco Discovery Protocol Tests
- Section 4.8, PoE Tests

4.2 Accessing the Network Test Menu

Network tests are performed via the Network Test Menu.

To access the Network Test Menu:

1. Scroll through the LAN Solution GB Network Tester's Main Menu (see Figure 3-1) using the arrow keys until Network Test Menu is highlighted.
2. Press the **SEL** key. The Network Test Menu appears, as shown in Figure 4-1.



Figure 4-1. Network Test menu.

4.3 Port Discovery Tests

The Port Discovery test identifies what type of Ethernet equipment, if any, is connected to the other end of the jack or cable being tested.

To perform a Port Discovery test:

1. Connect the LAN Solution GB Network Tester to the unknown jack or cable to be tested. Connect to jacks via a patch cord; for cables, plug the cable directly into the tester.
2. Access the Network Test Menu. (See Section 4.2, “Accessing the Network Test Menu.”)
3. Scroll through the menu options using the arrow keys until **Port Discovery** is highlighted.
4. Press the **SEL** key.

The Port Discovery screen appears, as shown in Figure 4-2.

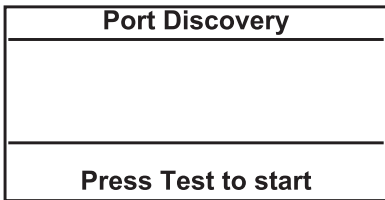


Figure 4-2. The Port Discovery screen.

5. Press the **TEST** key to begin the test.

If a voltage is detected, the test terminates, and the system prompts you to press the **TEST** key to run the PoE test to try to identify the voltage found. (See Section 4.6, PoE Tests.)

If no voltages are found, the test for active Ethernet devices begins. If the remote device is running in Auto-Negotiation mode, the LAN Solution GB Network Tester detects and decodes the Fast Link Pulses (FLP). The advertised Ethernet speeds, duplex mode, wiring mode, and polarity of the transmit pair appears. The wiring mode is indicated by reference to the type of device that would normally transmit on that pair—the hub/switch or NIC— assuming straight through cabling. With a

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cross-over cable present, a NIC would be labeled as a hub, etc. The AUTO indication appears if the device connected is capable of Auto MDI / MDI-X transmit/receive pair swapping.

If no Auto-Negotiation pulses are detected, the LAN Solution GB Network Tester attempts to wake a “sleeping” port by sending out FLP bursts for a short time. Some Ethernet ports are inactive while not connected to save power. These are known as “sleeping” ports and depend on the incoming FLP bursts to wake them into active mode. If the port responds, the advertised Ethernet speeds, duplex mode, wiring mode, and polarity of the transmit pair appears.

If no active Ethernet port has been detected, the LAN Solution GB Network Tester attempts to connect in both 100- and 10-Mbps modes in non-auto-negotiation mode. If successful, the tester reports the connection speed and wiring mode.

NOTE: The duplex mode of the remote device cannot be detected without auto-negotiation.

If no active Ethernet devices are found, the LAN Solution GB Network Tester checks the cable for the typical signatures of inactive Ethernet, Token Ring, or ISDN devices. If found, the LAN Solution GB Network Tester will report what it detects. If none of the above is found, the LAN Solution GB Network Tester invokes a Cable Test and displays the results. (See Chapter 5, “Performing Cable Tests.”)

To exit Port Discovery mode, press the **QUIT** key.

4.4 Ping Tests

The Ping test is used to request an echo back from an addressed device (target) and verify IP connectivity between the tester and another device.

To perform a Ping test:

1. If the jack or plug is unknown, run a Port Discovery test to verify that an active Ethernet port is connected. (See Section 4.3, “Port Discovery Tests.”)
2. Connect the LAN Solution GB Network Tester to the network.
3. Access the Network Test Menu. (See Section 4.2, “Accessing the Network Test Menu.”)
4. Scroll through the menu options using the arrow keys until Ping Test is highlighted.
5. Press the **SEL** key.

The Ping mode screen appears, as shown in Figure 4-3.

Ping Mode	DHCP ON
Tg1:	192.168.2.100
MyIP:	0.0.0.0
Rtr:	0.0.0.0
DNS:	0.0.0.0
Press Test to start	

Figure 4-3. The Ping mode screen.

6. (Optional) Select the DHCP mode to use (DHCP ON or DHCP OFF) by doing the following:
 - a. Highlight the DHCP field using the arrow keys.
 - b. Press the **SEL** key. The DHCP field starts flashing.
 - c. Use the arrow keys to change the on/off setting.
 - d. To accept the new value, press the **ACCPT** key.

For more information on the DHCP ON and DHCP OFF modes, see Section 5, “Understanding DHCP ON/DHCP OFF modes.”

7. (Optional) Select a different IP target to be used by doing the following:
 - a. Highlight the Tg (target number) selection field using the arrow keys.
 - b. Press the **SEL** key. The Tg field starts flashing.
 - c. Scroll through the available targets using the arrow keys.

NOTE: While you are scrolling, the IP address of the target currently visible in the Tg field appears in the target IP address field to the right of the Tg field.

- d. When the desired target is displayed in the Tg field, press **ACCPT** to select it. There are four target numbers available (Tg1–Tg4), plus a Tg option that will leave the target disabled.
8. (Optional) Modify the IP address for the selected target by doing the following:
 - a. Highlight the IP address for the target selected (to the right of the Tg field) using the arrow keys.
 - b. Press the **SEL** key.

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The Edit Target IP screen appears, as shown in Figure 4-4.

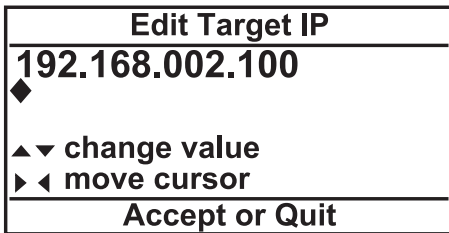


Figure 4-4. The Edit Target IP screen.

- c. Modify the IP address by using the left and right arrow keys to select the digit you want to change and the up and down arrow keys to change the value of the selected digit. Note that the IP address appears in typical decimal dot format. Each of the four decimal numbers separated by periods represents one hexadecimal byte of the four byte IP address and can only have values from 0–255. In addition, each digit in the decimal number can only be set to a value valid for that position. For example, the high order digit in any of the decimal numbers can only be set to 0, 1, or 2. Each digit can also only be set to a valid value in relation to the low-order digits in that number. For example, the high order digit can only be set to 2 if the low order digits are less than 55. You may have to enter the desired IP address from right to left to allow the low order digits to be set prior to the high order digit. You can enter any IP address for a target, either on or off the LAN segment, even “reserved” IP addresses.
 - d. When complete, press **ACCPT** to save the new target IP address value or press **QUIT** to revert to the previous target IP address.
9. If DHCP OFF mode was selected, you must manually enter an IP address for MyIP (the IP address for the LAN Solution GB Network Tester). To enter or modify this address, complete the following steps:
- a. Highlight the IP address to the right of the MyIP field using the arrow keys.
 - b. Press the **SEL** key.

The Edit My IP screen appears, as shown in Figure 4-5.

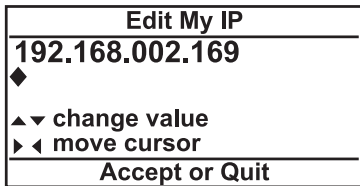


Figure 4-5. Edit My IP screen.

- c. Modify the IP address by using the left and right arrow keys to select the digit to be changed and the up and down arrow keys to change the value of the selected digit.
 - d. When complete, press **ACCPT** to save the new target IP address value or press **QUIT** to revert to the to the previous MyIP address.
10. If you selected DHCP OFF mode, you must manually enter an IP address for Rtr (the IP address of the router on the LAN). To enter or modify this address, complete the following steps:
- a. Highlight the IP address to the right of the Rtr field using the arrow keys.
 - b. Press the **SEL** key.

The Edit Router IP screen appears, as shown in Figure 4-6.

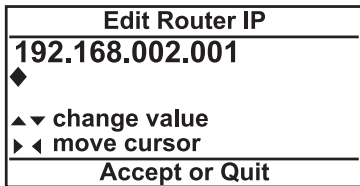


Figure 4-6. Edit Router IP screen.

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- c. Modify the IP address by using the left and right arrow keys to select the digit to be changed and the up and down arrow keys to change the value of the selected digit.
 - d. When complete, press **ACCT** to save the new target IP address value or press **QUIT** to revert to the to the previous Rtr IP address.
11. If DHCP OFF mode was selected, an IP address must be manually entered for Mask (the Netmask to be used). To modify this address, complete the following steps:
 - a. Highlight the IP address to the right of the Rtr field using the arrow keys.
 - b. Press the **SEL** key.

The Edit Netmask screen appears, as shown in Figure 4-7.

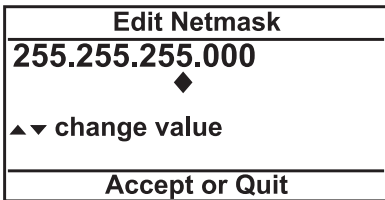


Figure 4-7. Edit Netmask screen.

- c. Select the Netmask you want to use by using the up and down arrow keys to scroll through the available values. Notice that a limited number of values are possible.
 - d. When complete, press **ACCT** to save the new target IP address value or press **QUIT** to revert to the previous Rtr IP address.
 12. Press the **TEST** key to begin the test.
- Status messages are displayed at the bottom of the screen while the LAN Solution GB Network Tester establishes a link and negotiates the DHCP configuration. Once pinging begins, ping status messages are displayed, showing acronyms for each active conversation. See Chapter 5 for more information.

As part of the ping test, the LAN Solution GB Network Tester checks for voltages and then searches for link pulses on its jack, automatically configuring the interface to connect to a hub, switch, or NIC in either 100- or 10-Mbps mode. Once an active link is found, the tester configures its IP address parameters as selected by the user. Once the parameters are set, the tester starts sending out ping packets to the selected target, the router, and (in DHCP ON mode) the DNS server. The pings continue for 15 minutes after the last key press, after which the LAN Solution Test automatically turns off.

13. To view information about a specific device once the test is complete, do the following:
 - a. Highlight a device acronym using the left and right arrow keys.
 - b. Press the **SEL** key. One of two detailed status messages is displayed.
 - c. Press the **SEL** key again to advance to the next screen and view the second status message. (The screen will auto-advance in 10 seconds.)
14. Press the **QUIT** key once to exit the active Ping Test and again to move back to the Network Test Menu.

4.5 Understanding DHCP ON/ DHCP OFF Modes

The LAN Solution GB Network Tester ping function operates in two modes: DHCP ON and DHCP OFF (Manual Mode). DHCP is a protocol negotiation used to automatically configure the IP parameters of the LAN Solution GB Network Tester on a specific LAN segment.

With DHCP on, the next time the ping test is started, the tester will request the IP parameters it needs for LAN communication from a DHCP server on that LAN segment. If the tester receives a response from a server, the tester will configure itself with the acquired parameters and start the ping. (Note that the only IP parameter not received from the host is the Target IP address, which is always manually entered.) If the tester receives no response, it cannot do any pinging on that LAN. In that case, you must select the DHCP off state and manually enter all of the ping setup parameters. The next ping test will then attempt to communicate with those parameters.

4.6 Hub Flash Tests

The Hub Flash test helps identify a hub or switch port.

1. Connect the LAN Solution GB Network Tester to a jack or plug where you want to place the Ethernet device.

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2. Access the Network Test Menu.
3. Scroll through the menu options using the arrow keys until **Hub Flash** is highlighted.
4. Press the **SEL** key.

The Hub Flash screen appears, as shown in Figure 4-8.

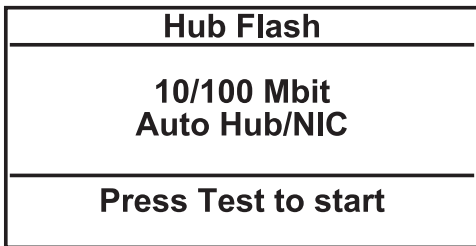


Figure 4-8. The Hub Flash screen.

5. Press the **TEST** key to begin the test.

The test starts with a voltage check test (see Section 3.8, “Notes About Voltage Checking”), then attempts to link at 100- or 10-Mbps speeds in the hub wiring mode. If the hub wiring mode fails, the LAN Solution GB Network Tester switches the wiring mode to NIC, and tries the two speeds again. Each attempt to link at speed and wiring mode takes 3 seconds, so it takes 12 seconds to test all modes.

If no link is found, the tester sends an audio tone signal down the cable so the cable can be located at the other end with a tone tracer. The audio tone alternates with the 12-second link test until a link is found, or the test is stopped by timeout or the user.

Once a link is established, the LINK LED on the LAN Solution GB Network Tester will light, and the link will be held up for 3 seconds, then dropped for 3 seconds to blink the link indicator on the device at the other end. The tester will automatically turn off in 30 minutes.

While the tester is searching for an active link partner, it displays the message Find Active Link. Once a link is made, the tester displays Link Active and the LINK LED flashes. Check the link's speed by viewing whether or not the 100 MB LED is lit. If the tester loses the link, it reports Lost Link for several seconds, then returns to the search for a link partner.

NOTE: Some modes of a full-duplex, non-autonegotiating Ethernet connection will not link properly with the LAN Solution GB Network Tester, and the Hub Flash function will not work.

4.7 Cisco Discovery Protocol Tests

This test detects Cisco Delivery Protocol (CDP) messages broadcast by Cisco bridges and routers over the network to inform each other that they exist. Using CDP, network devices periodically advertise their own information to a multicast address on the network, making it available to any device or application that wishes to listen and collect it. A direct connection to the port of interest is required, because the CDP packets are not IP addressed and are not forwarded through other switches. They are intended to identify the specific port which they are transmitted from and are not designed to be propagated through a network.

To run a Cisco Discovery Protocol test:

1. Connect the LAN Solution GB Network Tester to a jack or plug at the workstation location where the Cisco Discovery Protocol (CDP) will be displayed.
2. Access the Network Test Menu.
3. Scroll through the menu options using the arrow keys until Cisco discovery is highlighted.
4. Press the **SEL** key.
5. Press the **TEST** key to connect to the Ethernet port and capture the CDP information.

Once a CDP packet is collected, the messages are displayed, along with headings for each of the fields in the message, as shown in Figure 4-9.

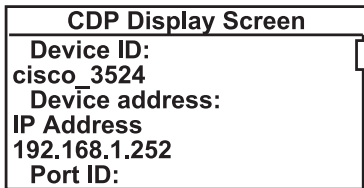


Figure 4-9. The CDP Display Screen, post-test.

6. Use the up and down arrow keys to scroll through the information.
7. Repeat steps 5 and 6 as needed.
8. Press the **QUIT** key to exit Cisco Discovery mode.

4.8 PoE Tests

The Power over Ethernet (PoE) test identifies what power-providing equipment, if any, is connected to the other end of the jack or cable being tested.

To perform a PoE test:

1. Connect a patch cable to the unknown jack or connect the cable plug directly to the tester.
2. Access the Network Test Menu.
3. Scroll through the menu options using the arrow keys until **PoE Test** is highlighted.
4. Press the **SEL** key.

The PoE Test screen appears, as shown in Figure 4-10.

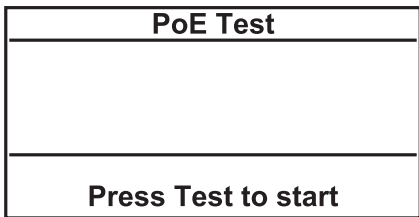


Figure 4-10. The PoE Test screen.

5. Press the **TEST** key to begin the test.

The test first looks for the presence of voltages on the connector pins. (See Section 3.8, “Notes About Voltage Checking.”) If the tester finds voltages in typical telephone or ISDN locations, the LAN Solution GB Network Tester reports that it may be connected to a phone or ISDN line. This is raw DC power that may be connected to the center taps of the Ethernet transformers and appear on the 1-2, 3-6 pairs or the 4-5, 7-8 pairs. This type of power was designed into systems before the IEEE 802.3af specification was implemented. The LAN Solution GB Network Tester detects and reports this voltage and then can continue to test for active Ethernet.

If no other voltages are present, the LAN Solution GB Network Tester tests for PoE. Four different PoE modes/connections are tested for:

- Cisco legacy In-Line Power (ILP), connected in the End Span (1-2, 3-6 pairs) configuration
- Cisco legacy In-Line Power (ILP), connected in the Mid Span (4-5, 7-8 pairs) configuration
- IEEE 802.3af (IEEE) modes, connected in the End Span (1-2, 3-6 pairs) configuration
- IEEE 802.3af (IEEE) modes, connected in the Mid Span (4-5, 7-8 pairs) configuration

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If one of these PoE sources is detected, the tester determines and displays the PoE mode, the pairs carrying the power, and the polarity of the voltage. As part of the process, the tester verifies that the voltage and current meet the IEEE specifications.

Once the test is complete and the results displayed, the tester prompts you to press the **SEL** key to display the Network Test Menu and run any network tests without retesting for voltages. (Once a valid PoE is determined, it is safe to run the LAN Solution GB Network Tester network tests on the system.)

If you do not want to run a network test at this point, you can change the jack connection and press the **TEST** key to run another PoE test or press the **QUIT** key to exit the PoE test mode.

NOTE: Some other non-standard legacy PoE protocols may not be detected by the LAN Solution GB Network Tester and can cause erroneous test results.

5. Performing Cable Tests

This chapter describes how to perform different types of cabling tests using the LAN Solution GB Network Tester.

Topics discussed in this chapter include:

- Section 5.1, “Cable Testing Overview”
- Section 5.2, “Cable Tests”
- Section 5.3, “Remote Mapping Tests”
- Section 5.4, “Cable Length Tests”
- Section 5.5, “Tone Generator Tests”

5.1 Cable Testing Overview

The LAN Solution GB Network Tester features four cable test modes: cable tests, remote mapping tests, cable length tests, and tone generator tests.

5.1.1 Special Notes and Cautions

Read the following notes and cautions before proceeding with cable testing.

NOTE: If the connection to the unit is changed while a test is in progress, the results are unreliable.

CAUTION: The LAN Solution GB Network Tester attempts to protect its more sensitive circuitry by testing for dangerous voltages on the pins before running a test. (Note that some non-standard legacy PoE protocols may not be detected by the LAN Solution GB Network Tester and can cause erroneous test results.) Changing the connections while a test is in process bypasses this automatic protection and may cause the tester to be damaged.

5.1.2 Accessing the Cable Test Menu

Cable tests are performed via the Cable Test Menu.

To access the Cable Test Menu:

1. Scroll through the Main Menu using the arrow keys and highlight **Cable Test Menu** in the LCD.
2. Press the **SEL** key.

The Cable Test Menu appears, as shown in Figure 5-1.

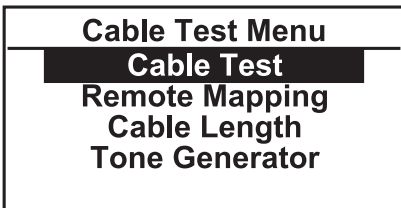


Figure 5-1. The Cable Test menu.

5.2 Cable Tests

The cable tests provide support for both single-ended (no remote) testing of cables for shorts, opens, and split pairs and full cable (with a remote connected) testing that finds all wiring faults, including split pairs. Results are displayed in wiremap format with a pair-by-pair status message, and PASS is displayed for T568A/B passing cables.

To perform a cable test:

1. Connect the LAN Solution GB Network Tester to the unknown jack or cable you want to test. Connect to jacks via a patch cord; for cables, plug the cable directly into the tester.
2. Access the Cable Test Menu. (See Section 5.1.2, “Accessing the Cable Test Menu.”)
3. Scroll through the menu options using the arrow keys until **Cable Test** is highlighted.
4. Press the **SEL** key.

The pre-test Cable Test Results screen appears with two areas showing at the top: the cable pairs status area on the left and the wire map area on the right, as shown in Figure 5-2.

Cable Test Results	
1-2:	12 36 45 78 S
3-6:	
4-5:	
7-8:	
Press Test to start	

Figure 5-2. The Cable Test Results screen, pretest.

5. Press the **TEST** key to begin the test.

Two new areas appear at the bottom of the screen: the test status area on the left and the Remote ID area on the right. A bar moving across the Remote ID area indicates that the test is in progress.

If no remote is attached to the far end of the cable, the tester runs a single-ended test for shorts, opens, and split pairs.

If a remote is connected to the other end of the cable prior to starting the test, the tester runs a complete cable test.

When the test is complete, the cable pairs status, wire map, test result, and remote ID are displayed on the Cable Test Results screen, as shown in Figure 5-3.

Cable Test Results	
1-2: Open	12 36 45 78 S
3-6: Split	
4-5: Short	
7-8: Revrs	12 36 45 78 S
FAIL	Rem ID: 3

Figure 5-3. The Cable Test Results screen after a complete cable test.

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Below is a guide to interpreting the test results by area, left to right and top to bottom:

- **Cable Pairs Status Area:** Displays the status for each pair in the cable. Possible values include: Split, Short, Open, Revrs (Reverse), and High R (High Resistance).
- **Wire map Area:** The top row of numbers in the wire map area represents the connector pins on the main unit, while the second row represents those on the remote. Lines that connect the top row to the second row show the connections detected. If there is a miswire, the lines cross, indicating that the connections are not straight-through. If no connection is detected for some of the pins, there are no lines between the rows. If a short is detected, the lines connect between the shorted pin numbers on the top row. If multiple pins are shorted together, lines connect all the shorted pins. If there are multiple shorts, the horizontal lines connecting the pins are separate.
- **Test Result Area:** Displays the results of the test. Possible values are PASS and FAIL.
- **Remote ID Area:** Displays the ID found for the remote. If no remote is found, No Remote is displayed.

For more information, see Chapter 7, “Interpreting Test Results.”

Once the test is complete, you can run another test or press the **QUIT** key to exit Cable Test mode and return to the previous menu.

NOTE: If a cable is removed or connected while the test is in process, errors will result.

NOTE: Any patch cables used to connect the tester and remote to a cable run must be short compared to the cable run for accurate open and split pair indication (no more than 10% of the total run length or 3 feet, whichever is less). A cable must be at least 4 feet long for a single-ended test to work properly.

5.3 Remote Mapping Tests

The Remote Mapping test finds and displays the number of the remote identifier (wire mapper) attached to the end of the cable under test. This test assumes that a remote identifier is connected at the terminal end of each cable to be mapped.

To perform remote mapping tests:

1. Place a remote identifier at the terminal end of each cable you want to map. (Multiple cables can be mapped in one operation by first attaching one remote identifier to the terminal end of each cable and then testing each cable one at a time at the central location to identify the unique ID of each attached identifier.)

- At the central location (equipment closet) where the cables to be mapped come together, connect the cable to be mapped to the connector on the LAN Solution GB Network Tester.
- Access the Cable Test Menu. (See Section 5.1.2.)
- Scroll through the menu options using the arrow keys until **Remote Mapping** is highlighted.
- Press the **SEL** key.

The pre-test Mapping Test Results screen appears with two areas showing at the top: the cable pairs status area on the left and the wire map area on the right, as shown in Figure 5-4.

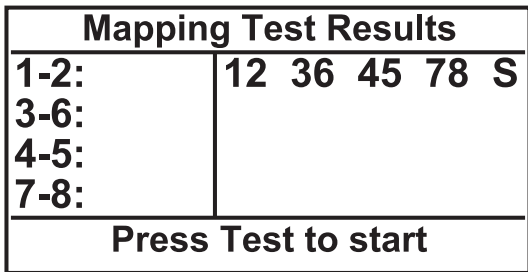


Figure 5-4. The Mapping Test Results screen, pre-test.

- Press the **TEST** key to begin the test.

A new area appears at the bottom of the screen: the Remote ID area on the right. A bar moving across the Remote ID area indicates the test is in progress.

When the test completes, the number of the attached remote identifier displays on the Mapping Test Results screen. In addition, the results of the open-ended cable test display to provide status on all pairs found in the cable. (For more information on cable test results, look under Section 5.2, Step 5. Any cable faults found that prevented detection of the identifier are displayed rather than the number.)

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7. Disconnect the cable just tested from the tester.
8. Repeat Steps 2-7 until mapping of all cables to be mapped is complete.

5.4 Cable Length Tests

The Cable Length test finds and displays measurements for each pair in feet or meters using the cable capacitance method. The test measures the length of a cable by measuring its capacitance and using the capacitance per unit length (length constant) to calculate the length.

To perform a cable length test:

1. Connect the cable to the LAN Solution GB Network Tester. (The other end may be connected to a remote.)
2. Access the Cable Test Menu. (See Section 5.1.2.)
3. Scroll through the menu options using the arrow keys until Cable Length is highlighted.
4. Press the **SEL** key.

The pre-test Cable Length screen appears, as shown in Figure 5-5.

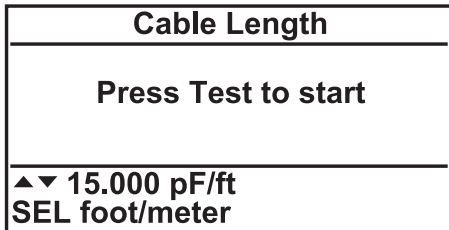


Figure 5-5. The Cable Length screen, pre-test.

5. (Optional) Use the **SEL** key to change the length display between feet and meters.
6. (Optional) Adjust the length constant by using the up and down arrow keys, if necessary.

NOTE: The length constant can also be adjusted in the Setup menu before starting a cable length test.

7. Press the **TEST** key to begin the test.

A bar moving across the bottom of the screen indicates that the test is in progress. When the test completes, the length of each pair that has no faults appears on the Cable Length screen, along with the current value of the length constant. If a pair has a fault, a fault message appears for that pair instead of a length measurement, as shown in Figure 5-6.

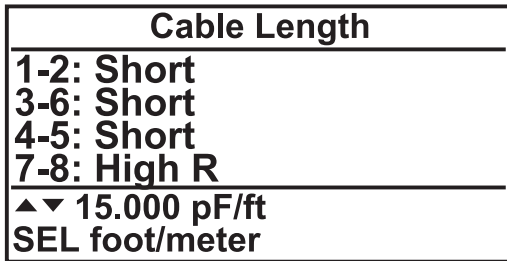


Figure 5-6. Cable Length test results.

5.5 Tone Generator Tests

The Tone Generator test generates selectable tones for use with tone tracers on either all pairs, a selected pair, or a selected pin, depending on user selection. The signal generated on a pair has the signal on one pin and the complement of the signal on the other pin of the pair, yielding a nominal 10 volts peak to peak across the pair.

To perform a tone generator test:

1. Connect the cable to be traced to the tester.
2. Access the Cable Test Menu. (See Section 5.1.2.)
3. Scroll through the menu options using the arrow keys until “**Tone Generator**” is highlighted.
4. Press the **SEL** key.

The pre-test Tone Generator screen appears, as shown in Figure 5-7.

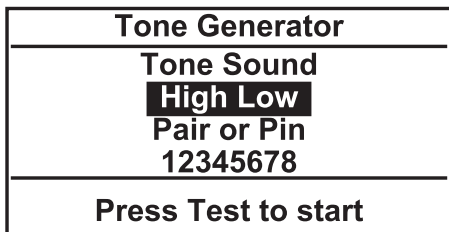


Figure 5-7. The Tone Generator screen, pre-test.

Select from one of four tone sounds and one of fourteen pair or pin options. All pins not used are held at tester ground.

5. (Optional) Change to the tone sound you want to use by doing the following:
 - a. Using the arrow keys, highlight the value under Tone Sound.
 - b. Press **SEL**. The value starts flashing.
 - c. Scroll through the available tone values using the arrow keys.
 - d. Press **ACCPT** when the desired tone value is displayed to select it.
6. (Optional) Change the cable pair or pin you want to use by doing the following:
 - a. Using the arrow keys, highlight the value under Pair or Pin.
 - b. Press **SEL**. The value starts flashing.
 - c. Scroll through the available tone values using the arrow keys.
 - d. Press **ACCPT** when the desired tone value is displayed to select it.

NOTE: To exit Pair or Pin change mode without changing the setting, press the **QUIT** key.

7. Press the **TEST** key to begin generating the tone.

If the tone is generated successfully, Tone is active is displayed at the bottom of the screen.

8. To change tone options, press the **QUIT** key to stop the tone. Press **QUIT** again to exit this mode.

Chapter 5: Performing Cable Tests

NOTE: For the strongest signal, do not connect to a remote. Because of the shielding effect of twisted pairs, the strongest signal is obtained by having one wire of a pair carry tone. Selecting a single pin instead of a pair will do this.

6. Viewing Properties and Modifying Settings

6.1 Viewing Unit Properties

The LAN Solution GB Network Tester features four viewable unit properties, as described in the following sections:

- Section 6.1.2, “Viewing Last DHCP Values”
- Section 6.1.3, “Viewing the Unit’s MAC Address”
- Section 6.1.4, “Viewing the Product Version”
- Section 6.1.5, “Viewing the Battery Charge Remaining”

6.1.1 Accessing the Properties Menu

You can view unit properties via the Properties Menu.

To access the Properties Menu:

1. Scroll through the LAN Solution GB Network Tester Main Menu using the arrow keys until **Properties** is highlighted.
2. Press the **SEL** key.

The Properties menu appears, as shown in Figure 6-1.

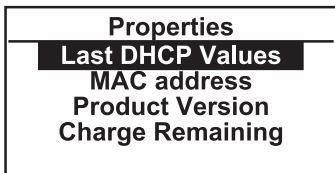


Figure 6-1. Properties menu.

Chapter 6: Viewing Properties and Modifying Settings

6.1.2 Viewing Last DHCP Values

The Last DHCP Values screen displays the results of the most recent DHCP negotiation between the LAN Solution GB Network Tester and a DHCP server. The values displayed cannot be modified, only viewed to determine the configuration of the LAN segment under test.

To view last DHCP values:

1. Access the Properties menu. (See Section 6.1.1, “Accessing the Properties menu”.)
2. Scroll through the menu options using the arrow keys until **Last DHCP Values** is highlighted.
3. Press the **SEL** key.

The Last DHCP Values screen appears, as shown in Figure 6-2.

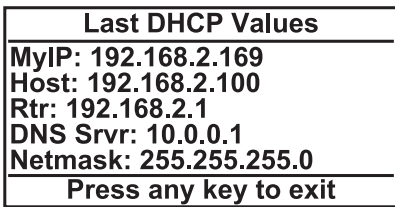


Figure 6-2. The Last DHCP Values screen.

The following last DHCP values are shown:

- **MyIP:** The IP address for the LAN Solution GB Network Tester.
- **Host:** The IP address of the DHCP server on the LAN.
- **Rtr:** The IP address of the router on the LAN.
- **DNS Srvr:** The IP address of the DNS server accessible from the LAN.
- **Netmask:** The Netmask in use.

Any 0.0.0.0 entries mean that the last DHCP server did not provide the requested information. If all entries are 0.0.0.0, the most likely cause is that DHCP ON mode was selected, but the LAN did not provide a DHCP server.

6.1.3 Viewing the Unit's MAC Address

The MAC address screen displays the factory-set Media Access Control (MAC) number for the specific LAN Solution GB Network Tester unit. Every Ethernet-interfaced device must have a universally unique identifier to be used as its address.

This information is provided as a convenience to the user.

To view the unit MAC address:

1. Access the Properties menu. (See Section 6.1.1, “Accessing the Properties Menu.”)
2. Scroll through the menu options using the arrow keys until **MAC address** is highlighted.
3. Press the **SEL** key.

The MAC address screen appears and displays the MAC address for the unit, as shown in Figure 6-3.

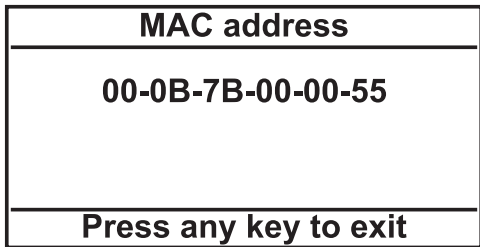


Figure 6-3. The MAC Address screen.

6.1.4 Viewing the Product Version

The Product Version screen displays the version of the firmware in the two micro-computers in the LAN Solution GB Network Tester unit. This firmware cannot be changed in the field. This information is provided to allow the user to report it to the product support representative if a problem arises.

For product support, go to www.blackbox.com or send an e-mail to info@blackbox.com.

Chapter 6: Viewing Properties and Modifying Settings

To view the product version:

1. Access the Properties menu. (See Section 6.1.1, “Accessing the Properties menu.”)
2. Scroll through the menu options using the arrow key until **Product Version** is highlighted.
3. Press the **SEL** key.

The Product Version screen appears and displays the firmware version installed in the unit, as shown in Figure 6-4.

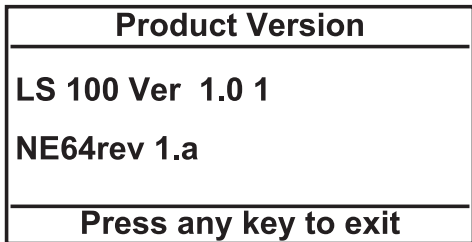


Figure 6-4. Product Version screen.

6.1.5 Viewing the Battery Charge Remaining

The Charge Remaining screen displays the approximate charge remaining in the batteries in the unit. Note that the percentages of charge remaining are calculated for alkaline cells at typical 70° F room temperature. Because of the temperature rise in the cells during active Ethernet activity, the charge remaining may read low (or the red LED may go on) and then recover after the unit is off and the batteries cool. If rechargeable batteries are used, the charge remaining levels will not be accurately represented. The red LED will warn when the batteries need to be recharged. Once the batteries have reached a discharge level too low to guarantee proper operation of the unit, the unit will shut itself off and not turn on until you install new batteries.

To view the battery charge remaining:

1. Access the Properties menu. (See Section 6.1.1, “Accessing the Properties menu.”)
2. Scroll through the menu options using the arrow keys until **Charge Remaining** is highlighted.

3. Press the **SEL** key.

The Charge Remaining screen appears and displays the percentage of battery charge remaining, as shown in Figure 6-5.

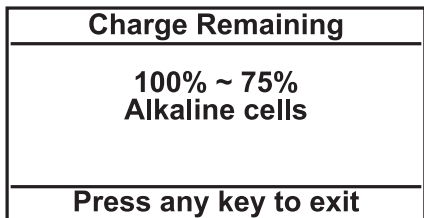


Figure 6-5. Charge Remaining screen.

6.2 Modifying Unit Settings

The LAN Solution GB Network Tester features three adjustable unit properties, as described in the following sections:

- Section 6.2.2, “Changing the Display Language”
- Section 6.2.3, “Calibrating the Cable Length”
- Section 6.2.4, “Finding a Length Constant”

6.2.1 Accessing the Setup Menu

Unit properties are modified via the Setup Menu.

To access the Setup menu:

1. Scroll through the LAN Solution GB Network Tester Main Menu using the arrow keys until **Properties** is highlighted.
2. Press the **SEL** key.

The Setup menu appears, as shown in Figure 6-6.

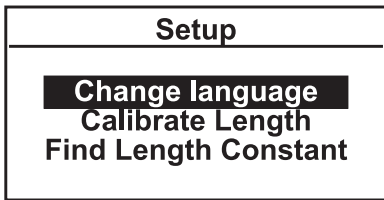


Figure 6-6. The Setup menu.

6.2.2 Changing the Display Language

The Change language screen allows users to select the language to be used for the display of messages on the LCD. Six display languages (English, Spanish, Portuguese, Italian, German, and French) are available.

To change the display language:

1. Access the Setup menu. (See Section 6.2.1.)
2. Scroll through the menu options using the arrow keys until **Change language** is highlighted.
3. Press the **SEL** key.

The Current Language screen appears and displays the current language selected, highlighted and flashing, as shown in Figure 6-7.

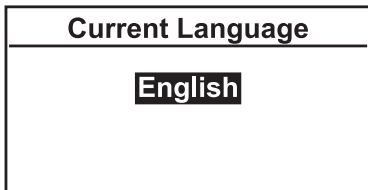


Figure 6-7. Current Language screen.

4. Scroll through the language choices using the arrow keys until the desired language is displayed.

5. Press the **ACCPT** key to accept the currently displayed language option.

The display language is changed, and the user is returned to the Setup menu.

NOTE: To exit the Change language screen without changing the display language, press the **QUIT** key.

6.2.3 Calibrating the Cable Length

The Calibrate Length screen allows the LAN Solution GB Network Tester to be calibrated to compensate for variations in measuring cable length.

To calibrate cable length:

1. Access the Setup menu. (See Section 6.2.1, “Accessing the Setup Menu.”)

2. Scroll through the menu options using the arrow keys until **Calibrate Length** is highlighted.

3. Press the **SEL** key.

The Calibrate Length screen appears, as shown in Figure 6-8.

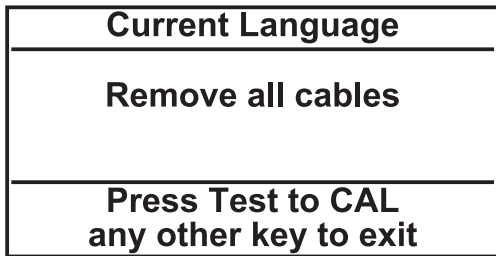


Figure 6-8. Calibrate Length screen.

4. Remove all cables from the tester, as directed by the screen.

5. Press the **TEST** key or press any other key to exit. If you press the **TEST** key, the tester runs the calibration routine, stores the value, and returns the user to the Setup menu.

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NOTE: The effect of a patch cable on the measured length of a cable run can be eliminated by leaving the patch cable attached to the tester.

6.2.4 Finding a Length Constant

The Find Length Constant screen allows for the measurement of the length constant of an attached known length of cable. We recommend that you use at least 50 feet of cable to minimize the resolution error. (1 foot in 50 = 2% uncertainty).

To find a length constant:

1. Access the Setup menu. (See Section 6.2.1, "Accessing the Setup menu.")
2. Scroll through the menu options using the arrow keys until **Find Length Constant** is highlighted.
3. Press the **SEL** key.

The Find Length Constant screen appears, with the message Attach Measured Cable displayed, as shown in Figure 6-9.

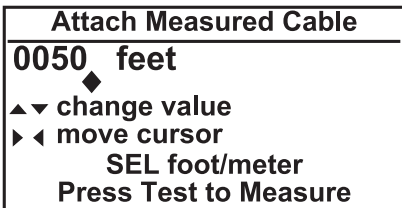


Figure 6-9. Find Length Constant screen

4. Connect a known length of cable to the tester.
5. (Optional) Change the unit of measure to feet or meters by pressing the **SEL** key.
6. Set the length of cable on the display by using the left and right arrow keys to select the digit to be changed and the up and down arrow keys to change the value of the selected digit. The maximum valid values are 1500 feet or 460 meters, and the user is not allowed to enter an invalid length.
7. Press the **TEST** key to measure the capacitance and calculate the length constant.

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The tester runs the cable test and selects a pair that has no faults for the measurement. The tester has a limited range of valid length constants and will not allow an invalid setting to be saved.

After the length constant is calculated, the value appears and the user is given the option to save the length constant.

8. Press the **ACCPT** key to save the length constant or press the **QUIT** key to revert to the previously set length constant.

7. Interpreting Test Results

7.1 Status and Error Messages for Network Tests

DHCP Request

In the ping test with DHCP on, the LAN Solution GB Network Tester displays this message on the first status line while it is trying to get the required information from a DHCP server. The DHCP request is repeated every 10 seconds when a response is not received, and the count is shown on the same line as the status.

Find Active Link

The tester is searching for incoming link pulses while waiting to start an active test. Hub Flash, Cisco Discovery, and Ping test modes need to be connected to an active network to run. In those modes, this status appears while the tester is searching both the 1-2 and 3-6 pairs for incoming Ethernet link pulses.

Link Found

Status displayed while searching for link pulses after an incoming signal has been detected.

Link Not Found

Status displayed while searching for link pulses and nothing has been detected.

Link word Err

The link word captured by the LAN Solution GB Network Tester during Port Discovery test from an attached Ethernet device was decoded improperly by the tester. May indicate a cable problem or a hardware problem with the connected device.

Lost Link

A test was active, after having found incoming link pulses, but they stopped being received, possibly because the cable was disconnected or the connected device was shut off.

NE64 no response

The Ethernet interface chip used in the LAN Solution GB Network Tester reported a problem to the CPU during internal communication. May be caused by a hardware problem inside the tester.

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No IP address

The DHCP server responded to the tester DHCP request, but did not provide an IP address for MyIP.

Packet Rcv Err

An Ethernet packet was received by the LAN Solution GB Network Tester with errors in the header or packet data. May be caused by excessive signal noise on the Ethernet cable or a hardware problem with the device transmitting to the tester.

Ping Test Detailed Status Messages

These messages may be displayed when the **SEL** key is used to access the status details during active pinging.

IP add = DNS add

The active target IP address is the same as the DNS Server IP address, so the target ping is automatically disabled.

IP add = Rtr add

The active target IP address is the same as the router IP address, so the target ping is automatically disabled.

No ARP Response

The IP address active for this conversation is being ARPed, but is not responding. The IP address may be unused, or the device may be powered off or not connected.

No Ping Response

The IP address active for this conversation is not responding to ping requests. If the addressed device is on the LAN segment, it may be powered off or not connected. If the addressed device is remote, it may be inaccessible because of WAN problems, it may be powered off, or the device at the router IP address may not be forwarding the ping packets.

No Rtr Response

The IP address is not on the LAN, requiring the ping to go through the router, but the router IP address is not responding to ARP.

No Router IP

The DHCP server did not provide an IP address for the router.

PoE Homebrew

Some devices designed before IEEE 802.3af PoE provide raw power for IP phones or wireless transceivers on the same wires that carry the Ethernet data signals without using the detection algorithms defined by the IEEE. They do this by connecting a voltage to the center taps of each transformer in their Ethernet interface. The LAN Solution GB Network Tester reports this and allows the network tests to continue.

Resistance Problem

The PoE load test determined that if the maximum 15-watt load was in place in a remote powered device, the voltage drop in the wiring system would cause the voltage supplied to the device to be below the IEEE-specified 36 volts.

Rtr must be on MyIP LAN segment

Displayed in Setup while setting the Manual Router IP address. The LAN Solution GB Network Tester requires that the router be at an IP address on the LAN segment as defined by the Netmask and MyIP addresses. Setup will not allow the router IP address to be set to an address that is not on the LAN.

Voltage Found, Press Test to Run PoE Test

The tester will not run tests when it finds voltage and possibly destructive power. It checks for voltages at the beginning of each test, and if found will terminate the test in progress. The only option is to run the PoE test (by pressing **TEST**).

7.2 Interpreting Cable Test Results

PASS

The PASS message will be displayed if the cable has all pins properly connected per T568A/B. The FAIL message will be displayed if there is any fault. A remote must be attached to the far end of the cable to allow the wiremap to be verified.

Definition of Errors

The classes of faults discussed on the following pages are listed in order of severity. Note that more severe errors can mask lower severity errors. For example, if there is a short in the cable, the tester might not detect miswires and split pairs for the pairs involved in the short fault. So, if a higher severity error is displayed, other errors of lower severity are not displayed. It is a good idea to retest cables after repairing faults.

Short

The pair has a low resistance connection from one wire of the pair to the other wire of the pair, to any other wire in the cable or the shield.

Miswire

A wire or both wires of a pair are not connected to the correct pins at the other end of the cable. While testing with a remote, the wiremap shows the connections between the upper line of pin numbers on Line 1 (main) to the lower row of pin numbers, Line 2 (remote). In single-ended test mode, the tester cannot detect this type of error.

Reverse Pair

A special case of a miswire in which the pair is wired to the correct pair of pins or to another designated pair of pins, but the two leads are reversed. In single-ended test mode, the tester cannot detect this type of error.

Split Pair

A split pair is an error in the twisting of the wires together within the cable. The cables generally are made up of eight wires twisted together in four pairs. These four pairs are designated as pairs by the wiring standards and are intended to carry a signal and its return. Pins 1&2, 3&6, 4&5, and 7&8 are the pairs designated by T568A/B for a RJ-45 jack or plug. A cable can be wired with correct continuity but not with correct pairing. This most often happens when the cable is terminated consistently at both ends but in the wrong order. A dynamic or AC test is required to detect this type of error. If the only error is a split pair error, the cable has correct continuity. If crosstalk is not a concern (as in flat satin cable), the cable is good if the only error is the split pair error.

High Resistance Fault

If the tester detects a resistance between pins while running the cable test, the number of the pin on the wiremap display will be replaced with the letter R. This type of fault is caused by some sort of connection between the pins that has some resistance and thus is not a short but is still a problem in the wiring. In some specific cases of pin connections, a short or resistance may cause the test results for a pin to be ambiguous, and a ? character will be displayed on the wire map for that pin.

8. Troubleshooting

8.1 Calling Black Box

If you determine that your LAN Solution GB Network Tester is malfunctioning, do not attempt to alter or repair the unit. It contains no user-serviceable parts. Contact Black Box Technical Support at 724-746-5500.

Before you do, make a record of the history of the problem. We will be able to provide more efficient and accurate assistance if you have a complete description, including:

- the nature and duration of the problem.
- when the problem occurs.
- the components involved in the problem.
- any particular application that, when used, appears to create the problem or make it worse.

8.2 Shipping and Packaging

If you need to transport or ship your LAN Solution GB Network Tester:

- Package it carefully. We recommend that you use the original container.
- If you are returning the unit, make sure you include everything you received with it. Before you ship for return or repair, contact Black Box to get a Return Authorization (RA) number.

Appendix. Glossary of Network Terms and Internet Protocols

A.1 Network Terms and Definitions

10BASE-T: The earliest definition of Ethernet was for 10 Million Bits per second, 10 Mbps. The Ethernet specification defined several different cabling schemes, including CAT5 (4-pairs of wire) and coax wiring. The 10 in 10BASE-T defines 10 Mbps and the BASE-T defines CAT5 cabling. 10BASE-2 defines 10 Mbps over coax.

100BASE-TX: A newer Ethernet specification that defines 100 Mbps data rate as an upgrade for higher network bandwidth. Several different cable schemes are defined for 100 Mbps. The 100 in 100BASE-TX defines the data rate as 100 Million Bits per second. The BASE-TX defines the cable scheme as 2-pairs of wires in a CAT5 cable.

1000BASE-T: The newest common Ethernet communication protocol, 1000BASE-T employs full-duplex baseband transmission over four pairs of CAT5 balanced cabling. The aggregate data rate of 1000 Mbps is achieved by transmission at a data rate of 250 Mbps over each wire pair. Using hybrids and cancellers enables full-duplex transmission by allowing symbols to be transmitted and received on the same wire pairs at the same time. Baseband signaling with a modulation rate of 125 MBd is used on each of the wire pairs. Note that the LAN Solution GB Network Tester active network modes work in 10BASE-T or 100BASE-TX modes. It relies on the legacy compatibility built into all 1000BASE-T equipment to communicate. The LAN Solution GB Network Tester can detect the 1000BASE-T advertised rate.

One other cable scheme defined as BASE-T4 uses 4 pairs of wires in the CAT5 cable. Very few Ethernet devices use this scheme, as the 2-pair scheme dominates the market. The LAN Solution GB Network Tester can recognize and report this capability in the Port Discovery mode, but it does not operate in that mode. The LAN Solution GB Network Tester reports this in Port Discovery mode as 1000BASE-T4.

Crossover Cable: An Ethernet (CAT5/6) cable that connects the 1-2 pair on one end to the 3-6 pair on the other. This allows a NIC device to connect directly to another NIC device, or hub to a hub. These are often used to connect one hub (or switch) to another hub (or switch) to expand a LAN. Note that if one of the hubs has an "UPLINK" connector, that connector can be used with a straightthrough cable to connect a normal hub port to the "UPLINK" port.

Hub: Ethernet physical wiring is done on a point-point mechanism, but an Ethernet network is a star network, where any device can communicate directly with any other device on that network. A hub is physical device that has multiple Ethernet connectors (ports) on it. Inside, the hub receives incoming data from any of its ports and then transmits what it receives back out on all its ports. Thus, all communications between all devices are visible to all other devices on that LAN. The hub has no IP or MAC address of its own. It is a “transparent” device that merely enables multiple Ethernet devices to communicate between themselves.

Hubs are typically older Ethernet devices that comply with the 10BASE-T standard. Most 10/100 hub-like devices are now switches (see **Switch**). The LAN Solution GB Network Tester uses a hub as a definition for a specific Ethernet connection pin assignment that allows it to connect directly to a NIC using a straight-through cable.

MAC (Media Access Control): Protocol defined for addressing network interfaces on a unique basis. Each manufacturer of electronic devices that interface to a MAC-controlled mechanism (like Ethernet) must register with the IEEE and get a set of unique addresses. Each device that manufacturer builds is assigned a single address from that manufacturer’s set of addresses. Ethernet will not work properly if more than one device on the LAN has the same MAC address.

MDI/MDI-X (Medium Dependent Interface, X for Crossover): The physical cable interface defined in IEEE 802.3 is called MDI on one end and MDI-X on the other end. The LAN Solution GB Network Tester refers to these connectors as NIC and hub respectively. A recent development in Ethernet devices is the ability to determine what type of device is connected on the other end of the cable and adjust itself to communicate properly. The LAN Solution GB Network Tester will recognize and report this type of device as an auto hub/NIC device during port discovery.

NIC (Network Interface Card): Typically an option card plugged into a PC card slot that provides an Ethernet interface for that PC. The LAN Solution GB Network Tester uses the term NIC to define the connector pinout that allows for direct connection to a hub device using a straight-through cable.

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Polarity: Ethernet transmit and receive driver chips use differential voltages to improve noise immunity. Each direction of transmission uses a pair of wires, one for the positive (+) side and the other for the negative (-) side. Early Ethernet interface chips were not designed to recognize and compensate for reversed cable pairs, so a crossed (+) and (-) pair could cause problems. Modern Ethernet chips can compensate, so the wiring is not critical, but the LAN Solution GB Network Tester can determine the difference, and will report it.

Power over Ethernet (PoE): A method of providing power to remote devices such as IP telephones, Wi-Fi® access points, or IP cameras using the Ethernet cable. The IEEE has standardized a method for safely detecting compatible equipment and providing that power in their IEEE 802.3af specification. Cisco Systems developed a method of providing PoE prior to the IEEE specification and their method is called Cisco In-Line (ILP) power. The devices that provide the power are termed power source equipment (PSE) and the devices that use the power are called powered devices (PD). Both of these PoE methods can provide power using either the 1-2, 3-6 pairs or the 4-5, 7-8 pairs in an RJ-45 cable, depending on the location of the PSE. If the switch or router at the end of an Ethernet cable run is the PSE, it is called an end-span device, and it can safely use the 1-2, 3-6 pairs in the cable. Other PSE devices are designed to be added to an existing wiring installation, and are designed to be added mid-span and provide the power using the 4-5, 7-8 pairs. Because those pairs are not used by the Ethernet devices in 10- or 100-Mbps Ethernet installations, they can safely be used for power distribution.

The LAN Solution GB Network Tester detects, tests, and reports any PSE devices on the cable being tested that support either IEEE or ILP protocols in both the end-span and mid-span configurations.

Straight-through Cable: An Ethernet (CAT5/6) cable that connects all four pairs in the cable straight through to the corresponding pairs in the far-end connector. This allows a NIC device to connect directly to a hub device.

Switch: Similar to a hub, a switch is a multiple-port Ethernet connection device that enables multiple Ethernet devices to communicate between each other. Unlike a hub, a switch has internal logic that determines which port a specific MAC address is found on, and once it has determined that, it only forwards traffic destined for that address to that port. This allows for fewer collisions on the LAN since it doesn't re-transmit every packet on every port.

Multiple simultaneous point-to-point communications can pass through a switch at the same time, as long as each end-point is on a different port on the switch. Like a hub, a switch (in its primary mode) has no IP or MAC address of its own. Also like a hub, a switch uses “hub” pinout on its connectors to allow direct connections to NIC interfaces.

T568A/B: The EIA/TIA structured wiring standards for telecommunications wiring. A and B versions are electrically identical and can not be distinguished with a wiring test. The color codes and pair numbering is different, however, so make sure you use one version within a network. A cable wired to A on one end and B on the other results in a crossover cable.

UPLINK: A special connector or mechanical switch that changes the pinout of one connector on a hub or switch to a NIC pinout. This allows a straight-through cable to be used to connect one hub (or switch) to another while building a LAN.

A.2 Internet Protocol Definitions

ARP (Address Resolution Protocol): Used to determine the Ethernet (MAC) address when a device starts to communicate with another. The IP address is known and a broadcast is used to request the specific IP addressed device to respond with its MAC address so further communication can be specifically addressed between the two.

DHCP (Dynamic Host Configuration Protocol): Used when a new IP device is added to a LAN and it needs to get information about the IP addresses used on that LAN. One DHCP server must be present on the LAN to provide a response to a DHCP request transmitted to a broadcast address and inform the new device of several configuration details. A DHCP server is not required on a LAN, but if it does not exist, you must manually configure all the devices on the LAN. Much information can be provided by the DHCP server, the LAN Solution GB Network Tester requests and uses:

- an IP address for itself (My IP)
- the IP address of the DHCP server on the LAN
- the Netmask in use
- the IP address of the router on the LAN
- the IP address of the DNS server accessible from the LAN

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DNS (Domain Name Server): Translates URL addresses (like www.yahoo.com) to IP addresses so that access to the Internet devices can be requested using human-understandable identifiers. DNS servers are commonly found on the Internet and are of interest to the LAN Solution GB Network Tester, because accessing (pinging) the DNS server proves that the LAN Solution GB Network Tester can access a device on the WAN.

Gateway (Router): See “Router (Gateway).”

IP (Internet Protocol): Short for TCP/IP (Transmission Control Protocol/Internet Protocol). Communications addressing scheme defined by DARPA (Defense Advanced Research Projects Agency) to control the publicly accessed Internet network.

IP Address: Specific number assigned to a single device to allow it to be uniquely identified on the network to which it is connected. On a LAN, the IP address must be within the range of addresses defined for that LAN by the network mask in use. On the Internet, all IP addresses must be universally unique to allow addressing that specific device. IP addresses consist of four hexadecimal digits that are commonly written in “dotted decimal” format. 192.168.254.4 is an example. Note that each set of decimal numbers divided by the periods must be in the range of 0–255 because they represent hexadecimal values of 00–FF.

ISP (Internet Service Provider): Commercial supplier of access mechanisms for public access to the Internet.

LAN (Local Area Network): Connection mechanism for a business, home, school, or any group of devices to communicate with each other. In the LAN Solution GB Network Tester case, it is a group of computers, printers, routers, and possibly other devices connected by Ethernet. It’s distinct from a WAN because of the IP addressing in a “Subnet.”

Network Mask (Subnet Mask): IP addressing scheme that divides the entire IP address network into smaller sections (Subnets). In the LAN Solution GB Network Tester use, the Network mask identifies an IP address as located either on the LAN (local subnet) or on the Internet, and therefore accessed over the WAN.

PING (Packet Internet Groper): A simple communication protocol (ICMP Echo) used to request an echo back from an addressed device (target). The LAN Solution GB Network Tester uses this to verify IP connectivity between itself and another device.

Router (Gateway): If a device is attempting to communicate with an IP address, and finds that the target is not on its local network (by comparing the target address with its own address and the Netmask) the device must forward its request to a router. The router forwards the communication to the target device across the WAN. This typically puts the communications on the internet, but may also be another LAN subnet, or a private network of some other type. A router has an IP address and MAC address (on Ethernet) of its own for direct communications that differentiates it from a hub or switch. A hardware box sold as a router will usually include a hub or switch chip inside, providing a convenient connection point for multiple Ethernet devices.

Target: In the Ping protocol, an IP address must be selected to receive an echo request. This address is the “target” address for that Ping. In the LAN Solution GB Network Tester, a target must be selected manually on the Ping Mode screen. This target can be on the LAN, or anywhere else accessible through a router connected to the LAN. If the target is not on the LAN, the router IP address must be known so the Ping can be sent to the router which forwards it on toward the ultimate location.

TCP/IP (Transmission Control Protocol/Internet Protocol): See “IP (Internet Protocol).”

WAN (Wide Area Network): The “remote” interface on a router. The WAN may be accessed via a DSL line, broadband cable connection, ISDN, T1 line, or even a dialup modem line. This term is used to loosely define the hardware path used to communicate with any IP-addressed device not on the local LAN.

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