BLACK BOX ®
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SOHO Tester

FEDERAL COMMUNICATIONS COMMISSION
AND
INDUSTRY CANADA
RADIO FREQUENCY INTERFERENCE STATEMENTS

This equipment generates, uses, and can radiate radio-frequency energy, and if not installed and used properly, that is, in strict accordance with the manufacturer's instructions, may cause interference to radio communication. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart B of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be necessary to correct the interference.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulation of Industry Canada.

SOHO TESTER

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe A prescrites dans le Règlement sur le brouillage radioélectrique publié par Industrie Canada.

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.

9. El aparato eléctrico debe ser situado de tal manera que su posición no interfiera su uso. La colocación del aparato eléctrico sobre una cama, sofá, alfombra o superficie similar puede bloquea la ventilación, no se debe colocar en libreros o gabinetes que impidan el flujo de aire por los orificios de ventilación.

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 connectado 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 fisica 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 lineas de energia.

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 objectos liquidos 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: Objectos 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.

TRADEMARKS USED IN THIS MANUAL

Any trademarks mentioned in this manual are acknowledged to be the property of the trademark owners.

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1. Specifications

Battery Life: 9V alkaline battery, typical;
Standby mode: 2.5 years;
Cable testing: 150 hours;
Tone generator: 250 hours

Cable Types: Shielded or unshielded,
CAT5e, CAT5, CAT4, CAT3, and coax

**Minimum Cable Length for Testing of Split
Pairs:** 3 ft. (0.9 m)

Coax Cable: 100 ohms maximum DC
resistance, center conductor plus shield

User Controls: (5) buttons: (1) TEL,
(1) COAX, (1) TONE, (1) NTWK,
(1) REMOTE UNIT

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Connectors: (1) F-connector female, (1) RJ-45 female, (1) 6-wire RJ-12 female

Indicators: (1) LCD display

Temperature Tolerance: Operating: 32 to 122°F (0 to 50°C); Storage: 14 to 140°F (-10 to +60°C)

Relative Humidity: Up to 90%, noncondensing

Power: (1) removable 9-volt battery

Size: 5.2"H x 2.9"W x 1.6"D (13.2 x 7.4 x 4.1 cm)

Weight (with battery and remote): 8.5 oz. (241 g)

2. Introduction

WARNING

Do not attach the tester to AC power. It may be damaged and cause a safety hazard.

CAUTION

Improperly crimped or damaged plugs can damage the tester's jacks. Inspect plugs for proper termination and crimping before inserting into the tester. Contacts should always be recessed into the plug's plastic grooves. Do not use 6-position plugs with the 8-position (network) jack.

2.1 Overview

The SOHO Tester is designed to test all common low-voltage cabling systems found in homes—telephone, network, or video. The tester has a large, bright LCD display and four buttons used to access each function. The remote attaches to the main unit for storage and patch cable testing.

SOHO TESTER

The tester tests network (8-wire), telephone (6-wire), and coax cabling systems. It supports eight network remotes and ten coax remotes.

Available in a 20-pack are Coax Remote Identifiers (TS591), RJ-45 Wire Mappers (TS592), or RJ-11 Wire Mappers (TS593). The numbered coax identifiers and the wire mappers attach to the coax or twisted-pair cable's end. To tell you which cables are being tested, the label numbers on the coax identifiers and wire mappers appear on the tester's LCD during the test.

The large, seven-segment LCD uses icons for clear cable test results that are displayed in wire map format. The tester checks for shorts, opens, miswires, reverse pairs (a type of miswire), and split pairs.

For correctly wired straight-through or crossover TS568A/B cables, the tester displays the PASS icon. For correctly wired straight-through or crossover 6-pin telephone cables, the tester also displays the PASS icon.

The tester features a tone generator mode for use with tone tracers. It automatically powers off in any mode and consumes low power for long battery life.

A convenient modular plug remote and coax test terminator store in the tester's case's bottom end.

2.2 The SOHO Tester Illustrated

Figure 2-1 shows the SOHO tester.

TEL (Telephone cable test): Press to power on and begin testing. Uses 3-pair USOC standard and 6-position RJ jack. Press for 2 seconds to turn off the split pair test.

COAX (Coax cable test): Press to power on and begin testing. Tests for shorts, opens, and identifies up to 10 unique remotes on the F-connector jack. Use with the test terminator stored in the back of the RJ remote on the tester's bottom.

TONE (Tone generator): Press a cable test button for the connector being used, then press the TONE button. Displays pins being driven in that connector's terms.

NTWK: (Network cable test): Press to power on and begin testing. Uses T568A/B standard and 8-position RJ jack.

Test terminator —

REMOTE UNIT: Squeeze the remote at the finger grip openings in the main unit to remove it. Use the same connector on the remote as on the main unit.

6-Position   8-Position (shielded)

Remote unit—front view

8-Position (shielded)   COAX (F-connector)   6-Position
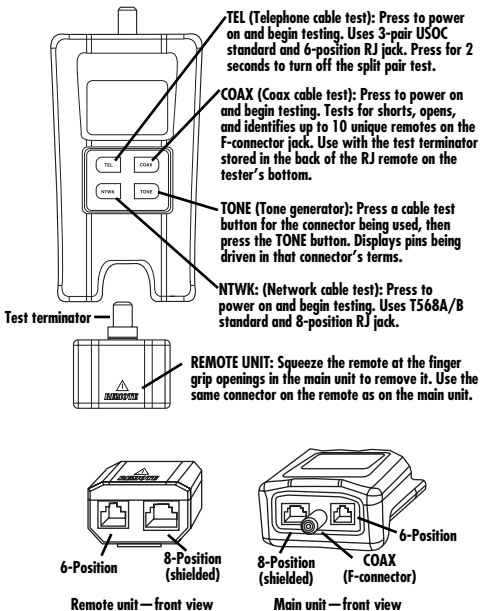
Main unit—front view

Figure 2-1. The SOHO tester's buttons.

3. Test Modes

3.1 Telephone (TEL) Cable Test Mode

The SOHO Tester assumes that the 6-position jack on the main unit and the remote will be used for connecting the tester to the cable run you want to test. This mode uses the 3-pair USOC standard to define the pairs. Connector pins 1–6, 2–5, and 3–4 are the pairs defined by this standard. The tester will display the PASS icon when all 6 pins are correctly wired in a one-to-one order. If all 6 pins are correctly wired in the reverse order, the PASS icon and a flashing REV icon will appear. Standard telephone cables used between a phone set and a wall jack are usually reverse-pinned.

After turning on the telephone cable test mode, subsequently pressing the **TEL** button for less than 2 seconds long forces a new test cycle to begin immediately when the button is released. Use this to begin a new test when attaching a new cable to the tester. Hold the button down for more than 2 seconds to turn the split pair test off. The SPLIT icon and the word OFF appear on the screen momentarily to indicate this. Another long press will toggle back to the split pair testing, and so on. When split pair testing is not required (as in the testing of flat satin cable), turn off the split pairs test. This way a cable may pass based on continuity only.

3.2 Network (NTWK) Cable Test Mode

The SOHO Tester assumes the 8-position jack on the main unit and the remote will be used for connecting the tester to the cable run to be tested. The TIA/EIA 568A/B standard is used to define the pairs. Connector pins 1–2, 3–6, 4–5, and 7–8 are the pairs defined by this standard. The A and B standards are the same except for color-coding and are indistinguishable from each other by electrical testing. The tester will display the PASS icon when all 8 pins are correctly wired in a one-to-one order. If all 8 pins are correctly wired with the 1–2 and 3–6 pairs crossed, the PASS icon will be displayed along with a flashing UPLINK icon. Uplink cables are also known as crossover or T568A-to-T568B cables and are commonly used to connect

two computers or two hub/switches directly together.

After turning on the network cable test mode, press the **NTWK** button for less than 2 seconds to force a new test cycle to begin immediately upon releasing the button. Use this to immediately begin a new test when attaching a new cable to the tester. Holding the NTWK button down for more than 2 seconds turns the split pair test off. The SPLIT icon and the word OFF appear on the screen momentarily to indicate this. Another long press will toggle back to the split pair testing, and so on. When split pair testing is not required (as in the testing of flat satin cable), the split pairs can be turned off. This way a cable may pass based on continuity only.

3.3 Tone Mode

The tone mode generates audio tones for use with tone tracers on all pairs, a selected pair, or a selected pin.

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. This yields a nominal 10 volts peak-to-peak across the pair.

A selected pin number or the letters P (for pin) and S (for shield), along with the currently selected tone pattern, are displayed on the screen. The TONE icon and the icon for the selected connector are also displayed. Once in the tone generator mode, when you press the **TONE** button for less than 2 seconds, the tester goes on to the next connector pin(s). When you

press the **TONE** button for longer than 2 seconds, you'll get either dual or warble tones of differing pattern duration. Pressing any button other than the TONE button turns off the SOHO Tester. The tone signal will turn off automatically after about 2 hours and 24 minutes.

3.4 Coax Mode

The SOHO Tester assumes that the coax jack on the main unit and the remote will be used for connecting the tester to the coax cable run to be tested.

Press the **COAX** button to test the cable. The tester will display the PASS icon when the coax cable is correctly wired. The PASS icon and a flashing UPLINK icon will appear.

3.5 Volts Mode

The SOHO Tester monitors voltages present on the jacks during each test cycle. This test is automatically executed when the cable is connected; you don't need to press a button. If voltage is found, the VOLTS icon is displayed and testing stops until the voltage is removed.

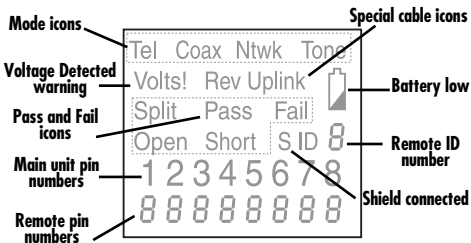Figure 3-1 shows the tester's available parameters that appear on its LCD display.

Mode icons
Voltage Detected warning
Pass and Fail icons
Main unit pin numbers
Remote pin numbers

Special cable icons
Battery low
Remote ID number
Shield connected

Tel Coax Ntwk Tone
Volts! Rev Uplink
Split Pass Fail
Open Short S ID 8
1 2 3 4 5 6 7 8
8 8 8 8 8 8 8 8

Figure 3-1. The SOHO Tester's LCD testing options.

NOTE

The SOHO Tester powers off automatically 9 minutes after the last button is pressed in cable testing modes and after approximately 2 hours and 24 minutes in tone mode. If you're using the tester for the first time, install a battery.

4. Cable Testing

4.1 To Test a Patch Cable

1. Plug one end of the patch cable into the main unit.

2. Plug the other end of the cable into the remote unit.

3. Press **TEL** or **NTWK** as appropriate for the jack the patch cable is connected to. The SOHO Tester will power on and begin testing. If the tester was already on, press **TEL** or **NTWK** to initiate a new test. Results are invalid if a cable is attached during a test in progress.

4. To turn the tester off, press the **COAX** button.

4.2 To Test a Coax Cable

1. Attach one end of the coax cable to be tested to the F-connector on the main unit.

2. The remote unit is installed in an opening at the bottom of the main unit. Remove the remote unit from the main unit by squeezing the remote lightly between your thumb and forefinger and pulling it out. Remove the coax identifier (which is installed in a storage pocket on the back of the remote) and attach it to the other end of the cable to be tested.

3. Press the **COAX** button to power on the unit and begin testing. The results are updated about once a second.

4. To turn the SOHO Tester off, press either the **TEL** or **NTWK** button.

4.3 To Place a Tone on a Cable

1. Connect the cable to be traced to a main unit jack. For the best signal, do not connect a remote to the other end. Due to 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. For coax, tone is best applied to the shield and the shield cannot be grounded.

2. Power on the tester by pressing the button associated with the connector to be used (for example, press **TEL** or **COAX**), then press the **TONE** button. Briefly pressing the **TONE**

button will select a different pin. Holding down the TONE button for more than 2 seconds will select a different tone pattern.

3. To power off the tester, press any button except TONE. The tone signal will turn off automatically after about 2 hours and 24 minutes.

5. Interpreting Cable Test Results

The PASS icon will be on if the cable has all pins properly connected per T568A/B for network cables or per 3-pair USOC for telephone cables. The FAIL, SHORT, OPEN, or SPLIT icon will be on if there is a wiring error. The wire map will display the end-to-end connections measured whenever possible.

The PASS icon (see Figure 5-1) will also be on with a flashing UPLINK icon if a network cable has the 1–2 and 3–6 pairs transposed. This indicates a properly wired uplink (crossover) cable. In telephone mode, the REV icon will flash if all connected pins are in reverse order. The PASS icon will also be on if all 6

connections are present. Telephone modular plug cables used between the wall jack and a phone set are usually reverse pinned.
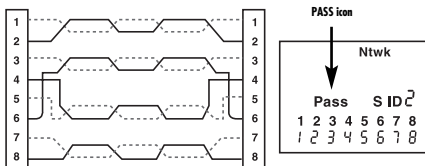

Figure 5-1. T568A/B wiring diagram (shown at left) and the tester's LCD display (shown at right) for a passing cable.

The four classes of faults discussed next are in order of severity (higher to lower). The severity has to do with the ability of a more severe error to mask less severe errors. For example, if there is a short in the cable, miswires and split pairs may not be detected for the pairs involved in the short fault.

SHORT

The pair has a low-resistance connection from one wire of the pair to the other wire of the pair or to any other wire in the cable or the shield. A short is indicated by the SHORT icon being on and flashing S in the appropriate pin positions on the second line. See Figure 5-2.
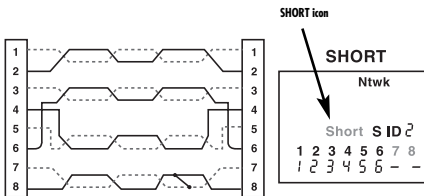
Figure 5-2. Wiring diagram (shown at left) and the tester's LCD display (shown at right) for a short.

MISWIRE

When a miswire exists, a wire or both wires of a pair are not connected to the correct pins at the cable's other end. The wire map shows the pin numbers from line 1 (main) to line 2 (remote). A reverse pair is a special case of a miswire where the pair is wired to the correct pair of pins or to

another designated pair of pins, but the two leads are reversed. The SOHO Tester is able to test for miswires as long as the wiring errors are in pairs. The FAIL icon and the pin numbers, which are miswired, will be flashing. See Figure 5-3.
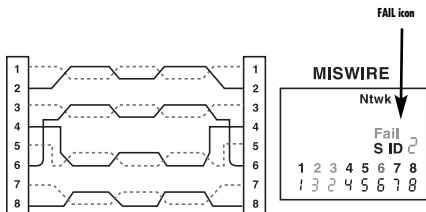

Figure 5-3. Wiring diagram (shown at left) and the tester's LCD display (shown at right) for a miswire.

SPLIT PAIR

A split pair is an error in the twisting of the wires together within the cable. The cables are generally 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. 1&2, 3&6, 4&5, and 7&8 are the pairs designated by T568A/B for an 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. 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. The SPLIT icon and the pin numbers on

the first and second line of the wire map with split pairs flash when there is a split pair error. See Figure 5-4.

The SOHO Tester has the ability to turn off the split pair error testing. Pressing the button for the current cable test mode more than two seconds turns off the split pair testing. The SPLIT icon and the word OFF appear on the screen momentarily to indicate this. The split pair testing will resume the next time the tester is turned on, or it may be toggled back on by another two-second press of the current test mode button.

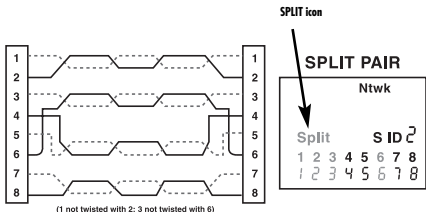**Figure 5-4. Wiring diagram (shown at left) and the tester's LCD display (shown at right) for a split pair.**

OPEN

When an OPEN exists, some conductors in the cable you're testing aren't terminated. The pin numbers of the unterminated conductors will flash on the tester's LCD display. See Figure 5-5.
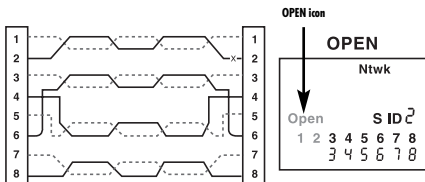
Figure 5-5. Wiring diagram (shown at left) and the tester's LCD display (shown at right) for an open.

6. Replacing the Battery

When the BATTERY icon is on, the battery should be replaced as soon as is practical. The cable test results become unreliable when the battery reaches approximately 4.5 volts. Follow the steps below to replace the battery.

1. Use a Phillips screwdriver to remove the screw from the battery door on the back of the unit.

2. Pull the battery out of the cavity and remove the battery snap.

3. Connect a new 9-volt alkaline battery to the battery snaps. Place the battery back into the tester's body with the battery snaps at the front end of the compartment.

4. Replace the battery door and screw, being careful not to overtighten the screw.

7. Troubleshooting

7.1 Calling Black Box

If you determine that your SOHO Tester is malfunctioning, do not attempt to alter or repair the unit. It contains no user-serviceable parts. Contact Black Box 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.

7.2 Shipping and Packaging

If you need to transport or ship your SOHO Tester:

- Package it carefully. We recommend that you use the original container.

- If you are shipping the SOHO Tester for repair, make sure you include everything that came in the original package. Before you ship, contact Black Box to get a Return Authorization (RA) number.