



Network Support Division

## ***TS<sup>®</sup> 44 Deluxe Test Set***

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## **REGULATORY INFORMATION**

**WARNING:** This equipment generates, uses, and can radiate radio frequency energy, and, if not installed and used in accordance with the installation manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15, Subpart J of the FCC rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of the 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 required to correct the interference.

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## Safety Information

### Read First Before Use



#### **WARNING:**

*Means conditions and hazards may pose risk to user.*



#### **CAUTION:**

*Means conditions and hazards may damage the test set.*

## Introduction

The TS44 Deluxe Test Set is an analog test telephone used by installers, repair technicians and other authorized personnel for the testing of copper wire, voice subscriber lines. In addition to providing standard off-hook operations, such as dialing and voice communications, the TS44 Deluxe model has an on-hook Monitor Mode, which allows the operator to clip on and listen to the line without disturbing voice or data signals that may be on the line. The test set has a loud speaker for hands-free listening. The test set also has a speaker-telephone that allows two way conversations while freeing up the operator's hands for other tasks.

In today's telecommunications environment, a large number of subscriber lines carry data services. The data services are in the same distribution facilities as voice services. It is not always easy to tell the difference between data and voice services. The TS44 Deluxe Test Set incorporates unique patented circuitry which prevents disruption of digital data services to which the test set may have been unintentionally connected.

## Design Features

Design features of the TS44 Deluxe Test Set include:

- Data Detection in Monitor Mode
- DataSafe™ in Monitor Mode
- Data Detection and Lockout in Talk Mode
- Data Lockout Override
- High Impedance Monitor
- High Voltage Protection
- Last Number Redial up to 23 digits
- Microphone Mute
- PBX Pause Key
- Continuous Polarity Indication in Talk Mode
- Two-Way Speakerphone
- Receive-Only Loud Speaker
- Speed Dialing for ten 23 digit numbers
- Tone and Pulse Dialing
- Hook Flash
- Line Voltage Test
- Low Loop Current Test
- Low Battery Indication
- Relocatable Belt Clip
- Field Replaceable Belt Clip
- Field Replaceable Battery
- Field Replaceable Line Cord
- Weatherproof Case
- High Voltage Lockout in Talk Mode
- Software Upgradable

## Physical Characteristics

### Housing

The housing for the TS44 Deluxe Test Set is made of high-impact plastic (see [Figure 1](#)). The test set is designed to provide rugged service and withstand the rough handling and shocks normally associated with field use. The housing is designed to permit operation of the test set in bad weather (e.g., in heavy rain and dust storms).

### Belt Clips

The belt clip (see [Figure 1](#)) can be located at either or both ends of the housing. It has a spring-loaded, locking clip that assures a secure connection to belt loops and D-rings. Both forward folding and backwards folding versions of the belt clip may be installed on the test set. The test set can be hung by the belt clip in one of two ways: (1) with keypad and speakerphone facing the user for convenient access or (2) with the transmitter facing the user. The belt clips may be replaced or relocated in the field. See [Maintenance](#), [Replacing or Relocating the Belt Clip](#).

[Table 1](#) lists the TS44 Deluxe Test Set models and the belt clips associated with each. For information on availability of belt clips, contact your local Harris authorized distributor.

### Line Cords

The test set is equipped with a field replaceable line cord. The line cord is attached to the test set through a rubber strain relief at the transmitter end of the test set (see [Figure 1](#)). Several different configurations of line cords are available.

[Table 2](#) lists the TS44 Deluxe Test Set models and the line cords associated with each. For information on availability of line cords, contact your local Harris authorized distributor.

Table 1. TS44 Deluxe Models and Belt Clip Types

Model Number	Belt Clip Part Number	Belt Clip Description
44801-001	P4080-248	TS40 Series Replacement Belt Clip, lock/unlock version (both ends), Standard
	P4080-249	TS40 Series Replacement Belt Clip, standard version (both ends).
44801-004	P4080-248	TS40 Series Replacement Belt Clip, lock/unlock version (both ends), Standard
	P4080-249	TS40 Series Replacement Belt Clip, non-lock version (both ends).
44801-009	P4080-248	TS40 Series Replacement Belt Clip, lock/unlock version (both ends), Standard
	P4080-249	TS40 Series Replacement Belt Clip, non-lock version (both ends).

Table 2. TS44 Deluxe Models and Line Cord Types

Model Number	Line Cord Part Number	Line Cord Description
44801-001	P4480-001	Standard Line Cord (STD) with Piercing Pin Clips
44801-004	P4480-004	Central Office Line Cord with 346A Plug
44801-009	P4480-009	Angled Bed-of-Nails Cord (ABN) and Piercing Pin Clips

### Battery



#### CAUTION:

*Handling batteries should be done with care. Do not allow the terminals to be shorted together. Dispose of battery properly to ensure contacts cannot short. Disposal may be restricted by local laws.*

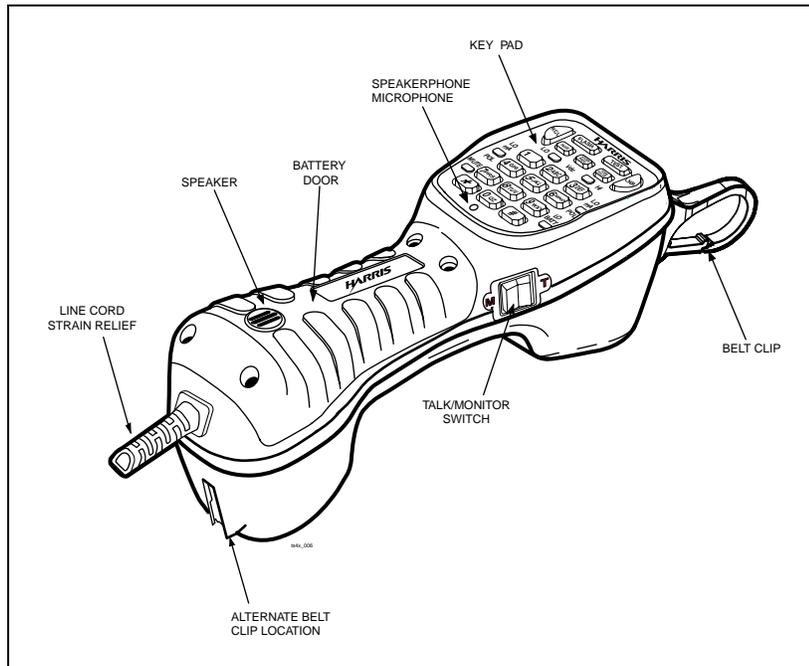


Figure 1. Physical Characteristics

The test set provides a battery compartment (see [Figure 1](#)) which makes battery replacement a simple procedure. See Maintenance, [Replacing the Battery](#).

*Note: If the test set fails to operate properly at any time, first replace the battery and retest before sending the test set in for repair.*

A 9V Alkaline battery must be installed for the test set to operate. Do not use rechargeable batteries. The battery performs two main functions:

- It powers the test set when on-hook.
- It supplies supplementary current to the loud speaker (if on) when the test set is off-hook.

When the Battery Low LED begins flashing, the battery, and thus the test set has anywhere from several hours to several days of life remaining depending on how often the loud speaker is used.

See [Maintenance, Replacing the Battery](#) for instructions on changing the battery.

If the test set ever stops working, remove the 9V battery, wait at least 20 seconds, then replace the battery. Use the same battery if you know it is good or use a new battery if you are not sure. This will reset the test set. If it still doesn't work, contact Harris Professional Services at (800) 437-2266.

## Speaker and Speakerphone Microphone

The loud speaker and speakerphone microphone (see [Figure 1](#)) are located on the keypad side of the test set. The loud speaker draws more current than any other circuit in the test set. It follows that the battery will last longer if the loud speaker is used in moderation.

## Audio Controls

The three audio control keys are located on the inside handle of the test set between the handset receiver and the handset microphone (see [Figure 2](#)). These controls allow the operator to switch between the handset and speakerphone, to mute the active microphone, and to control the volume of the received audio signal. Table 3 describes the audio control keys for the TS44 Deluxe Test Set.

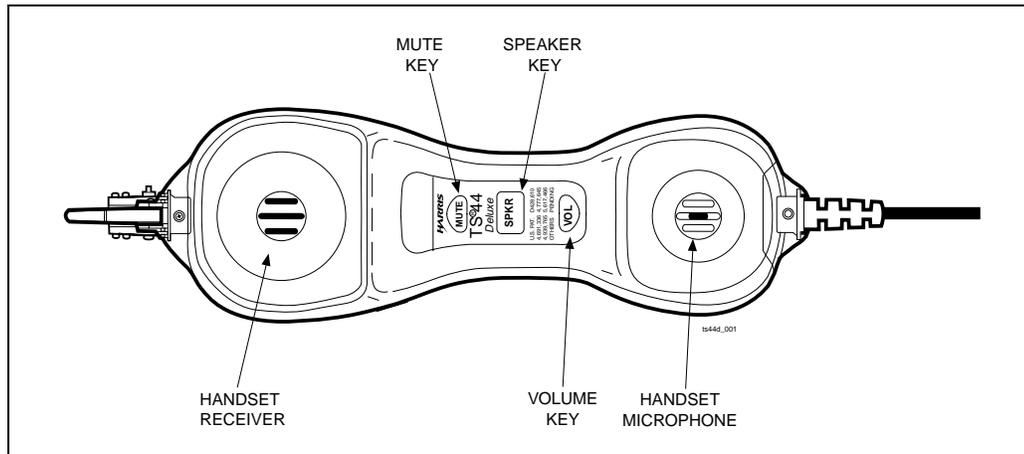


Figure 2. Audio Control Keys



**WARNING:**

*Never hold the loud speaker up against your ear when it is on, or when turning it on or off. Sounds emitted by the loud speaker can achieve levels that are damaging to the ear.*

Table 3. Test Set Audio Controls

Key	Description
<p><b>MUTE Key</b></p>	<p>The MUTE key (see <a href="#">Figure 2</a>) is functional only when the test set is off-hook; it has no function when the unit is on-hook. When the test set is off-hook and is being used as a handset, pressing the MUTE key will shut off the handset's microphone. This is useful when using the test set in noisy environments such as near a street with a lot of traffic. With the mute on, ambient noise is not picked up by the test set's microphone and therefore does not end up in the operator's ear. When the mute is on, it is easier for the operator to hear the person at the other end of the line and easier to hear static or noise on the line. Pressing the MUTE key again will turn the microphone on.</p> <p>When the test set is off-hook and is in Speakerphone mode, pressing the MUTE key will shut off the speakerphone's microphone and will put the test set into a Receive-Only Loud Speaker mode. This is a better mode for troubleshooting than Speakerphone mode. Pressing the MUTE key again will turn the speakerphone microphone on.</p> <p>The test set may be configured to operate exclusively in Receive Only Loud Speaker mode. When in this mode, the MUTE key has no effect on test set operation while in loudspeaker mode. See <a href="#">Configuring Your Test Set</a>.</p> <p>When the mute is on, the MUTE LED will flash.</p>

<b>Volume Key</b>	The Volume key (see <a href="#">Figure 2</a> ) is labeled VOL. Pressing the VOL key switches the sound level of the test set's active receiver between Normal and High volume. This is true in Monitor mode as well as Talk mode. The state of the VOL key is preserved when the active receiver is changed. For example, assume the handset receiver is set to high volume, if you switch to the loud speaker, it will also be set to high volume. The VOL key only affects the volume of received signals. It does not affect the volume of transmitted signals.
<b>Speaker Key</b>	<p>The Speaker key (see <a href="#">Figure 2</a>) is labeled SPKR. The SPKR key is used to turn the test set's loud speaker on and off. It functions in both Talk and Monitor modes.</p> <p>In Monitor mode, if the test set is being used as a handset, pressing the SPKR key will turn on the loud speaker. This allows a user to monitor a line while working at a distance from the test set.</p> <p>If the test set is off-hook and is being used as a handset, pressing the SPKR key will turn on the Speakerphone. The handset microphone and receiver are shut off and the speakerphone microphone and speaker are enabled. This mode is intended for two-way, hands-free conversation.</p> <p>It is also possible to configure the test set to operate exclusively in Receive Only Loud Speaker mode (see <a href="#">Configuring Your Test Set</a>). For test sets configured as Receive Only Loud Speaker; if the test set is off-hook and is being used as a handset, pressing the SPKR key will turn on the Receive Only Loud Speaker. This mode is intended for listening to the line, hands free.</p>

## Keypad Controls and Indicators

The keypad (see [Figure 3](#)) has 19 keys that are recessed into the receiver end of the housing. The recessed bezel provides physical protection for the keypad and helps prevent accidental key press. [Table 4](#) describes the keys on the keypad and other indicators on the test set.



### CAUTION:

*Shorting the Tip and Ring leads together while connected to a data line will cause disruption to the data.*

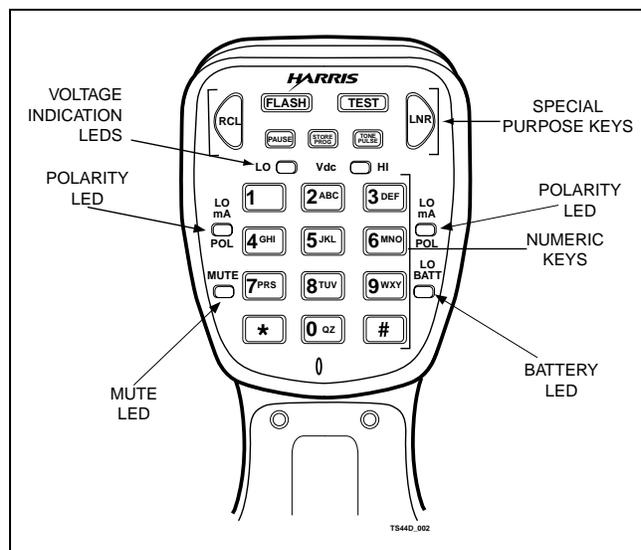


Figure 3. TS44 Deluxe Keypad and Overlay

Table 4. Test Set Keypad Controls and Indicators

Key	Description
<b>Numeric Keypad</b>	The numeric keypad (see <a href="#">Figure 3</a> ) is used to dial telephone numbers and make function selections. The numeric keypad includes 12 standard dialing keys including the asterisk (*) and the pound (#) keys. The seven special purpose keys are labeled STORE/PROG, TONE/PULSE, RCL, LNR, PAUSE, FLASH, and TEST.

Table 4. Test Set Keypad Controls and Indicators (Cont'd)

Key	Description
<b>RCL Key</b>	The RCL (Recall) key is used for the storing and recalling of repertory dialing numbers. See the <a href="#">Program Speed Dialing Numbers</a> Section.
<b>FLASH Key</b>	The FLASH (Hook-Flash) key is used to interrupt loop current for a timed duration. The FLASH key only operates when the test set is off-hook. When pressed, the FLASH key will interrupt loop current for the programmed hook-flash duration. See the <a href="#">Hook Flash Duration</a> Section.
<b>LNR Key</b>	The LNR (Last Number Redial) key is used to redial the number most recently dialed. See the <a href="#">Last Number Redial</a> Section for more details.
<b>PAUSE Key</b>	The PAUSE key is used to insert a timed pause into a stream of dialed digits. The PAUSE key is commonly used in combination with speed dial numbers that will be dialed out through a PBX. The duration of the pause is user programmable. See the <a href="#">Pause Duration</a> Section.
<b>STORE/PROG KEY</b>	The STORE/PROG key is used for storing speed dialing numbers and for programming special test set functions.
<b>TONE/PULSE KEY</b>	The TONE/PULSE key is used to switch between tone and pulse dialing. The TONE/PULSE key is only active when the test set is off-hook. Any time the test set goes off-hook, it is automatically set to tone dialing. Once off-hook, pressing the TONE/PULSE key will change the dialing mode to pulse dialing. Pressing the key again will switch back to tone dialing.
<b>TEST Key</b>	<p>The TEST key (see <a href="#">Figure 3</a>) is used to perform three different tests. Two of the tests are performed when the test set is on-hook and one of the tests is performed when the test set is off-hook. The results of the tests are meaningful only if the unit's test leads are connected to tip and ring of a subscriber line.</p> <p>When the test set is on-hook, pressing the TEST key causes two tests to be executed. Both tests are performed simultaneously. When the TEST key is pressed, the test set will search for data on the telephone line. If the test set detects data, the data detect alarm sounds for about 5 seconds letting the user know there is data on that particular line. If there is no data, the test set sounds a brief confirmation tone indicating the test was run and no data was detected. Simultaneously, the test set will measure the DC voltage across Tip and Ring and will display, by LED, whether the voltage is high, low or normal. The indications provided by this test are described under HI/LO Voltage LEDs. The purpose of the test is to give the technician a rough idea of the DC voltage on the line. For example, the user runs the test, expecting a normal battery feed of -48 Vdc on a particular line, instead, the amber LED flashes indicating the dc voltage is lower than a normal CO battery. This tells the user that they may be connected to the wrong pair and should do some further investigation to find out why the pair's battery is not normal.</p> <p>The POL LEDs double as low loop current indicators. When off-hook and the TEST key is pressed, if the current reading is below 23 mA, the LED corresponding to the line polarity will flash for 5 seconds. If the loop current is normal, the LED will light solid. Low loop current may indicate a problem on the line.</p>
<b>Light Emitting Diodes (LEDs)</b>	All LED indicators are located on the keypad (see <a href="#">Figure 3</a> ) inside the recessed area.
<b>MUTE LED</b>	The MUTE LED flashes when the mute function is activated.
<b>LOW/LO Battery LED</b>	The LO BATT LED (low battery) (see <a href="#">Figure 3</a> ) flashes when the 9V battery is nearing the end of its life. The low battery LED will only become active in operating modes that use the battery.

Table 4. Test Set Keypad Controls and Indicators (Cont'd)

Key	Description												
<b>Polarity LED</b>	<p><b>Note:</b> 1. The TS44 Deluxe Test Set is not polarity sensitive, and will function in either polarity. 2. The POL LEDs will not light if the test set is on-hook or when the loud speaker is on.</p> <p>When the test set is off-hook, one of the two Polarity (POL) LEDs will illuminate automatically to indicate the DC polarity of the line. The green POL LED will light if the red test lead is connected to the Ring (negative) side of the line and the black test lead is connected to the Tip (positive) side of the line. The red POL LED will light if the test leads are reversed; that is, with the red test lead connected to the Tip (positive) side and with the black test lead connected to the Ring (negative) side.</p> <p><b>LO mA LED.</b> The POL LEDs double as low loop current indicators. When off-hook and the TEST key is pressed, if the current reading is below 23 mA, the LED corresponding to the line polarity will flash for 5 seconds. If the loop current is normal, the LED will light solid. Low loop current may indicate a problem on the line.</p>												
<b>Electronic Ringer</b>	The electronic ringer is enabled while the test set is on-hook.												
<b>HI/LO Voltage LEDs</b>	<p>When the test set is on-hook and TEST key is pressed, the unit measures the DC voltage across Tip and Ring and provide an indication of the voltage level as follows:</p> <table border="0"> <thead> <tr> <th><u>Voltage Range</u></th> <th><u>Indication</u></th> </tr> </thead> <tbody> <tr> <td>0-2 Volts</td> <td>LO Vdc LED will be lit solidly for 5 seconds.</td> </tr> <tr> <td>2-42 Volts</td> <td>LO Vdc LED will blink for 5 seconds.</td> </tr> <tr> <td>42-53 Volts (Normal CO battery voltage)</td> <td>Both the LO Vdc and HI Vdc LEDs will flash once.</td> </tr> <tr> <td>53-140 Volts</td> <td>HI Vdc LED will blink for 5 seconds.</td> </tr> <tr> <td>Above 140 Volts</td> <td>HI Vdc LED will be lit solidly for 5 seconds.</td> </tr> </tbody> </table> <p>If the indicated voltage causes either LED to light solidly for 5 seconds, the voltage has been measured at a level which the test set will not allow off-hook operation.</p> <p>If the test set is placed in Talk mode on a loop with more than 140 Vdc, the test set will lock out and the HI Vdc LED will remain lit until the test set is placed in Monitor mode or the voltage drops below 140 Volts.</p>	<u>Voltage Range</u>	<u>Indication</u>	0-2 Volts	LO Vdc LED will be lit solidly for 5 seconds.	2-42 Volts	LO Vdc LED will blink for 5 seconds.	42-53 Volts (Normal CO battery voltage)	Both the LO Vdc and HI Vdc LEDs will flash once.	53-140 Volts	HI Vdc LED will blink for 5 seconds.	Above 140 Volts	HI Vdc LED will be lit solidly for 5 seconds.
<u>Voltage Range</u>	<u>Indication</u>												
0-2 Volts	LO Vdc LED will be lit solidly for 5 seconds.												
2-42 Volts	LO Vdc LED will blink for 5 seconds.												
42-53 Volts (Normal CO battery voltage)	Both the LO Vdc and HI Vdc LEDs will flash once.												
53-140 Volts	HI Vdc LED will blink for 5 seconds.												
Above 140 Volts	HI Vdc LED will be lit solidly for 5 seconds.												

## Operation

The test set has two basic modes of operation: Talk mode and Monitor mode. Talk mode is used for off-hook operations (e.g., dialing verification, automatic number identification, and audio quality verification). Monitor mode is for audio monitoring of the Tip and Ring pair while on-hook. In Monitor mode, the test set has a high input impedance, which allows monitoring of the line without disrupting conversations or data signaling if present.



### CAUTION:

*When testing circuits which are close to a battery source, the pops in the handset receiver that result from clipping onto a line may be quite loud. Although there is protection against acoustic shock built into the test set, if the receiver is held tightly against the ear, acoustical shock may occur. The test set is designed to rest comfortably on the shoulder with some space between the receiver and the ear. It should be used in this position when working close to a battery source.*

## Talk/Monitor Switch

The TALK/MONITOR switch is a rocker switch located on the side of the test set (see Figure 1). Switching the TALK/MONITOR switch to the TALK (T) position puts the test set into Talk mode. Switching the TALK/MONITOR switch to the MONITOR (M) position puts the test set into Monitor mode.

- Listening for noise on the line.
- Hunting for tracer tones.
- Performing a test for the presence of high frequency data on the line using the TEST key.
- Performing a test for DC voltage on the line using the TEST key.

## Operating the Test Set in Monitor Mode

While in Monitor mode, the test set is always on-hook. The test set draws no direct current from the line and it transmits no signals to the line. In this mode, the test set has a high AC input impedance, which allows listening for audio signals without disrupting conversations or data signaling that might exist on the line. Either the handset receiver or the loud speaker can be used to monitor a line. In the Monitor mode, the test set is typically used to perform one or more of the following procedures:

- Verification that a line is idle when looking for a line to borrow.

## Operating the Test Set in Talk Mode

When switched to Talk mode, the test set performs a short test for high-speed data and talk battery on the line. If high-speed data is detected, the test set will generate an audio alarm and will remain on-hook. If high-speed data is not detected and talk battery is present, the test set will go off-hook. When off-hook, the test set operates like a standard telephone; it is typically used to verify the proper operation of a voice telephone line or to establish temporary communications on a “borrowed pair”.

<p><b>Originating a Call</b></p>	<ol style="list-style-type: none"> <li>1. Put the test set in <b>Monitor</b> mode.</li> <li>2. Clip the test set to Tip and Ring of a subscriber loop.</li> <li>3. Monitor (listen to) the line to verify it is idle.</li> <li>4. If not idle, disconnect the test set from the line.</li> <li>5. If the line is idle, move the TALK/MONITOR switch to <b>TALK</b> mode. The test set automatically tests for high-speed data and talk battery on the line.</li> <li>6. If data is detected, the test set will not go off-hook (will lockout) and will alarm indicating the presence of data. Try another line.</li> <li>7. If there is no data and talk battery is present, the test set will go off-hook and draw dial tone.</li> </ol> <p><b>Note:</b> The test set will not go off-hook if the line voltage exceeds 140 Vdc.</p> <ol style="list-style-type: none"> <li>8. Dial the desired number.</li> </ol>
<p><b>Disconnecting a Call</b></p>	<p>To disconnect a call, move the TALK/MONITOR switch to <b>Monitor</b> mode or remove the test leads from the line.</p>
<p><b>Answering a Call</b></p>	<ol style="list-style-type: none"> <li>1. If a ringing signal is received, move the TALK/MONITOR switch to <b>TALK</b> mode. The test set automatically tests for high-speed data on the line.</li> <li>2. If there is no data and talk battery is present, the test set will go off-hook and draw dial tone.</li> </ol> <p><b>Note:</b> The TS44 Deluxe will not go off-hook if the line voltage exceeds 140 Vdc.</p> <ol style="list-style-type: none"> <li>3. However, if data is detected, the test set will lockout and will alarm indicating data is present.</li> <li>4. To go off-hook with data present, press the Override key sequence (see <a href="#">Data Lockout Override Operation</a>).</li> </ol>

<b>Ground Start</b>	<p>Ground start lines are typically found on PBX installations. To activate an idle ground start telephone line, do the following:</p> <ol style="list-style-type: none"> <li>1. Put the test set in <b>Monitor</b> mode, and connect the test leads to Tip and Ring of the ground start line. With a third wire, temporarily short the Tip side of the line to earth ground. A wire with an alligator clip at each end is often used for this. Do not allow clips to short network connections.</li> <li>2. With the short-to-earth in place, move the TALK/MONITOR switch to <b>TALK</b>. When dial tone is received, remove the third wire from earth. The circuit is now ready for dialing.</li> </ol>
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## Data Lockout Operation

With the increase in high capacity data lines in the distribution system, comes the greater risk of disrupting data services when working on analog lines. The test set is designed to be used by Outside Plant and Central Office technicians to perform their normal duties while greatly reducing the possibility of accidentally disrupting service on data lines that exist in the same cables and distribution facilities as analog voice lines.

Accidentally going off-hook on a data line, while you are searching for talk battery or dial tone on an unmarked terminal block or cable splice could bring down one of these high capacity data lines. To prevent this from occurring, the test set provides an automatic data lockout function. When a test set, with its TALK/MONITOR switch in the TALK position, is connected to a Tip and Ring pair, it will automatically test the line for high-speed data (data signals that are above the human audio range) prior to going off-hook. If data is detected, the test set will lockout, preventing itself from going off-hook, and it will provide a continuous audio alarm indicating it has detected data.

When the test set is locked out, it remains on-hook, it does not draw direct current from the line and it presents a high AC impedance to the line to prevent glitching and loading down of data signals on the line under test. The test set can detect and protect the following data services: ISDN BRI, ISDN PRI, 56k DDS, SW56, T1 and E1, HDSL, IDSL, SDSL, ADSL DMT, ADSL CAP, and ADSL LITE.

## Data Safe Practices

Always monitor the line for an audible signal before attempting to go off-hook to draw dial tone. The data detect circuitry on the test set is designed to detect data signals above the human audio range. To detect data signals within the human audio range, such as produced by voiceband modems and subrate DDS transceivers, you must listen to the line using the test set's audio monitoring capability. If you hear the telltale hiss of a voice band modem or low frequency data transceiver, do not move the TALK/MONITOR switch to TALK. If you do switch to TALK, the test set will not lockout because it does not detect low frequency data. It will go off hook and it will interfere with the voice band modem or data transceiver. To avoid this, try another line or wait until the line is idle.

Data detection is a two part process. The first part requires listening to the line for audible data traffic in Monitor mode as described above. If the line is quiet, then the second part is to use the data detect capability of the test set to determine if there is data above the human audio range on the line. This can be done in one of two ways.

- First, you can test for high-speed data with the test set still in Monitor mode by pressing the TEST key. If there is high-speed data on the pair, the test set will generate a warning alarm for about 5 seconds. If there is no data on the line, the test set will generate a short confirmation tone. If the warning alarm is not sounded, then switch the test set to Talk mode, it will go off-hook.

- Secondly, you can test for data by switching the TALK/MONITOR switch to TALK. The test set will automatically perform a short test for high-speed data. If there is data on the line, the test set will lockout, (will remain on-hook) and will generate a data warning alarm. If there is no data on the line, the test set will go-off-hook.

When going from pair to pair searching for tracer tone or dial tone it is best to connect the test set to Tip and Ring of the pairs. Avoid the practice, either in Talk or Monitor mode, of clipping one lead of the test set to ground, and using the other lead to search for tracer tone or dial tone on a block. This may create an electrical imbalance on a data line that will disrupt service. Once you find the voice line you are searching for then it is OK to test Tip to ground or Ring to ground on that line.

Be careful not to short the test leads together if you are connecting to a data line (or any line for that matter), as this could bring down the service.

It is best to put the test set in Monitor mode when troubleshooting a line, searching for capacitance kicks, RF signals, craft provided tones, etc.

## Data Lockout Override Operation

Normally, when the test set detects data, it means the operator has accidentally connected to a high-speed data line and should immediately disconnect from the line to avoid disrupting the data service. But in some cases the operator knows that he needs to go off-hook on a specific line even though the test set is indicating that the line is a data line.

The following are scenarios where the operator may wish to override a data lockout:

- When there is false data detection due to RF pickup on a line that is near an AM radio broadcast antenna. The RF induced in the line may appear to be data.
- When performing a ground start, the test set may generate the data alarm when the TALK/MONITOR is switched to the TALK position. This is because ground start lines are unbalanced prior to startup and thus are prone to picking up a lot of noise which may appear to be data to the test set. If this occurs, use the override function to go off-hook on a ground start line.

Telephone lines near AM radio broadcast facilities, pick up the RF signals from the broadcast antennas. Normally this isn't a problem for the test set. If the line is well balanced, the test set will not see the RF signal because it is a common mode (longitudinal) signal. But if the line isn't well balanced, a portion of the RF signal will be converted to a differential (metallic) signal. If the signal amplitude is high enough, it may be detected as high-speed data by the test set. If you know for sure you are on such a line, use the unit's override capability to go off-hook.

The data lockout override can only be activated when the TALK/MONITOR switch is in the TALK position. To activate the override, press the STORE/PROG key then the TEST key. If DC voltage is present, the test set will go off-hook. To go back on-hook, simply unclip the test set's test leads from the line or put the unit into Monitor mode. The override key sequence must be executed each time the user wants to take a locked-out test set off-hook.

## High Voltage Lockout Operation

The TS44 Deluxe is designed for use by Outside Plant and Central Office technicians in environments where analog voice lines co-exist with lines that carry high DC voltage.

Accidentally going off-hook on a line carrying a high DC voltage can damage the power supply feeding the line. To prevent this from occurring, the TS44 Deluxe provides an automatic high voltage lockout function. When a TS44 Deluxe is connected to a Tip and Ring pair with its TALK/MONITOR switch in the TALK position, it will measure the voltage on the line prior to going off-hook. If the measured voltage exceeds 140 Vdc, the test set will lockout, preventing itself from going off-hook.

The high voltage lockout condition is indicated by a solidly lit HI Vdc LED. In the event of a high voltage lockout, the TALK/MONITOR switch should be placed back in the MONITOR position, and the test set leads should be carefully removed from the line.



### CAUTION:

*Do not short the test set leads to each other while it is connected to a line carrying high voltage.*

Unlike the data lockout, there is no way for the operator to override a high voltage lockout. Lines with voltages exceeding 140 Vdc do not carry analog voice services.

## Configuring Your Test Set

<p><b>Last Number Redial</b></p>	<p>In the Tone or Pulse dialing mode, the last number dialed can be automatically redialed by pressing the LNR key after going on-hook and then back off-hook. To redial a number, the LNR key should be the first key pressed after going back off-hook.</p> <p>If, after going off-hook, any dialing key is pressed, the LNR memory will be cleared and the value of the pressed key will be the first number stored in the cleared memory.</p> <p>The <b>PAUSE</b> key is considered a dialing key. If pressed, it is stored in the redial memory, taking up one of the 23 digit slots.</p> <p>In tone dialing mode, the dialing keys that are permitted to be stored in LNR memory include 1,2,3,4,5,6,7,8,9,0,*,# and PAUSE. If the star (*) and pound (#) keys are pressed in pulse mode they will be ignored. The star (*) and pound (#) keys will not be redialed when the test set is in pulse mode even if the redial memory includes star (*) and pound (#).</p>
<p><b>Program Speed Dialing Numbers</b></p>	<p>While in Monitor mode, the test set allows the storage of ten speed dialing numbers in ten memory locations (0 through 9). Each location will store up to 23 digits. If an attempt is made to store more than 23 digits, only the first 23 are stored. The PAUSE key is accepted as a dialing digit when storing numbers.</p>
<p><b>Storing a Number When in Monitor Mode (Preferred Method)</b></p>	<ol style="list-style-type: none"> <li>1. Make sure the TALK/MONITOR switch is in <b>Monitor</b> mode.</li> <li>2. Press <b>RCL</b>.</li> <li>3. Using the dialing keypad, enter the number to be stored.</li> <li>4. Press the <b>STORE/PROG</b> key.</li> <li>5. Press one of the number keys (0 through 9) to select the desired memory location.</li> <li>6. A confirmation tone will be issued by the test set.</li> </ol> <p><b>Note:</b> If a non-dialing key is pressed while programming a number sequence, it will be ignored. Pressing RCL a second time will exit the programming mode.</p>
<p><b>Storing the Last Number Dialed</b></p>	<p>If you dial a number then go on-hook and you decide you want to save that number in speed dialing memory, do the following:</p> <ol style="list-style-type: none"> <li>1. Make sure the TALK/MONITOR switch is in <b>MONITOR</b> mode.</li> <li>2. Press <b>RCL</b>.</li> <li>3. Press <b>LNR</b> (Last Number Redial).</li> <li>4. Press the <b>STORE/PROG</b> key.</li> <li>5. Press one of the number keys (0 through 9) to select the desired memory location.</li> <li>6. A confirmation tone will be issued by the test set.</li> </ol>
<p><b>Storing a Number You are Calling</b></p>	<ol style="list-style-type: none"> <li>1. Connect the test set to a working telephone line, set the TALK/MONITOR switch to <b>TALK</b>, and receive dial tone.</li> <li>2. Dial the number.</li> <li>3. Press the <b>STORE/PROG</b> key.</li> <li>4. Press one of the number keys (0 through 9) to select the desired memory location.</li> </ol>

<p><b>Putting a Pause in a Stored Number</b></p>	<p><b>Note:</b> Each time the Pause key is pressed, it counts as one dialing digit.</p> <p>In some situations it may be necessary to put a pause between digits of a stored number, as when accessing a trunk through a PBX that requires a <b>9</b> to get an outside line. You can do this by pressing the <b>PAUSE</b> key at the point where the pause is required. For example, to store the number 9-555-1234, with a pause between the <b>9</b> and <b>5</b>, enter <b>9[PAUSE]5551234</b>. When the number is dialed out, there will be a pause between the <b>9</b> and <b>5</b>. The duration of a pause is user programmable (see <a href="#">Pause Duration</a>). You can insert a longer pause by pressing PAUSE more than once.</p>
<p><b>Dialing a Stored Number</b></p>	<ol style="list-style-type: none"> <li>1. Connect the test set to a working telephone line.</li> <li>2. Set the TALK/MONITOR switch to <b>TALK</b>.</li> <li>3. When the test set goes off-hook, press <b>RCL</b> (RECALL) and then the number key (0 through 9) for the memory location. For example, to dial a number stored in location 5, press <b>RCL</b> and then <b>5</b>. The number will be automatically dialed.</li> </ol>
<p><b>Hook Flash Duration</b></p>	<p>When the test set is off-hook, pressing the <b>FLASH</b> key causes a timed interruption of the loop current to occur. Some PBX setups or telephone office switches may use this signal to put a call on hold or to activate some special function. One flash is generated for each press of the key.</p> <p>To change the flash duration value:</p> <ol style="list-style-type: none"> <li>1. Make sure the Talk/Monitor switch is in <b>Monitor</b> mode.</li> <li>2. Press the <b>STORE/PROG</b> key.</li> <li>3. Press the <b>FLASH</b> key.</li> <li>4. Press one of the following number keys (0 through 9) to select the desired hook flash length. Invalid entries are ignored. The test set provides a confirmation tone when the entry is accepted.</li> </ol> <ul style="list-style-type: none"> <li>1 - 100 ms</li> <li>2 - 200 ms</li> <li>3 - 300 ms</li> <li>4 - 400 ms</li> <li>5 - 500 ms</li> <li>6 - 600 ms (default)</li> <li>7 - 700 ms</li> <li>8 - 800 ms</li> <li>9 - 900 ms</li> <li>0 - 1000 ms</li> </ul>
<p><b>Pause Duration</b></p>	<p>The PBX Pause feature allows the user to insert a delay into speed dialing numbers. This is required when dialing out through a system that provides a second dial tone (e.g., PBX). Different PBX devices may require different pause durations to allow enough time for the second dial tone to be returned. The pause duration can be programmed.</p> <p>To change the PBX Pause duration:</p> <ol style="list-style-type: none"> <li>1. Make sure the Talk/Monitor switch is in <b>Monitor</b> mode.</li> <li>2. Press the <b>STORE/PROG</b> key.</li> <li>3. Press the <b>PAUSE</b> key.</li> <li>4. Press one of the following number keys (1 through 4) to select the desired pause length. Invalid entries are ignored. The test set provides a confirmation tone when the entry is accepted.</li> </ol> <ul style="list-style-type: none"> <li>1 - 2 Seconds</li> <li>2 - 3 Seconds</li> <li>3 - 4 Seconds (default)</li> <li>4 - 5 Seconds</li> </ul>

<p><b>Exclusive Receive Only Loud Speaker</b></p>	<p>Under certain usage scenarios (e.g., hunting for dial tone), a test set operator may prefer to have the test set's speaker remain in Receive Only mode (muted) while transitioning in and out of Talk mode. To accommodate these procedures, the test set may be configured to operate with the speaker exclusively in a receive only mode.</p> <p>To enable/disable Exclusive Receive Only Loud Speaker mode:</p> <ol style="list-style-type: none"> <li>1. Put the test set in <b>Monitor</b> mode.</li> <li>2. Press the <b>STORE/PROG</b> key.</li> <li>3. Press the <b>MUTE</b> key. The test set will chime confirming the selection.</li> </ol>
<p><b>Speaker Timeout</b></p>	<p>The loud speaker draws more current from the battery than any other circuit on the test set. The battery will be drained quickly if the loud speaker is left on continuously. To extend battery life, the test set has a timeout function that automatically turns off the loud speaker when the test set is on-hook. A timer is started whenever the test set is put on-hook. As long as the test set is off-hook the timer will not start.</p> <p>If the test set is used as a handset in Monitor mode and if the test set's receiver has been set to high volume, the battery will be asked to deliver enough current to drain the battery sooner than desired. So the same timeout that is applied to the loud speaker is applied to the high volume state in Monitor mode. If the test set is in Monitor mode with the receiver's volume set to high volume, after the timeout the test set will revert to low volume. When the test set is in Monitor mode with the loud speaker off and with the receiver volume set to low, it draws very little current from the battery.</p> <p>The speaker timeout duration is programmable while on-hook and 240 minutes (4 hours) while off-hook. The off-hook timeout cannot be changed. Remember, the longer the selected timeout duration the shorter the battery life.</p> <p>To change the speaker timeout duration:</p> <ol style="list-style-type: none"> <li>1. Put the test set in <b>Monitor</b> mode.</li> <li>2. Press the <b>STORE/PROG</b> key.</li> <li>3. Press the <b>SPKR</b> key.</li> <li>4. Press the number keys (1 through 6) to select the desired duration. Invalid entries are ignored. The test set provides a confirmation tone when the entry is accepted. <ul style="list-style-type: none"> <li>1 - 2 Minutes (default)</li> <li>2 - 5 Minutes</li> <li>3 - 10 Minutes</li> <li>4 - 20 Minutes</li> <li>5 - 30 Minutes</li> <li>6 - 40 Minutes</li> </ul> </li> </ol>
<p><b>Factory Defaults</b></p>	<p>The Restore Defaults function allows the user to restore all programmable features to their original factory settings. Performing this function does not clear stored telephone numbers. The defaults are:</p> <p>Pause Duration — 4 seconds.  Hook Flash Duration — 600 ms.  Speaker Timeout — 2 minutes.  Exclusive Only Loud Speaker — Disabled.</p> <p>To restore the factory default values:</p> <ol style="list-style-type: none"> <li>1. Put the test set in <b>Monitor</b> mode.</li> <li>2. Press the <b>STORE/PROG</b> key.</li> <li>3. Press the <b>pound (#)</b> key. The test set provides a confirmation tone when the entry is accepted.</li> </ol>

## Maintenance



### WARNING:

1. Disconnect clips from any metallic connections before performing any maintenance. Read all instructions completely and understand possible hazards to end user if repairs are not performed properly.

2. Batteries are hazardous to handle. Do not allow the terminals to be shorted together. Severe burns or explosion can result if not handled properly. Dispose of battery properly to ensure contacts cannot short. Disposal may be restricted by local laws.



### CAUTION:

Do not use CRC Cable Clean® or any similar chlorinated solvent on the test set. Doing so will damage the test set.

## Replacing the Battery

To replace the 9V battery (see [Figure 4](#)):

*Note: Be sure to account for all hardware removed. Loose or missing hardware could create a hazard for the end user. Be sure to replace the battery with a good 9V Alkaline or Lithium battery or the test set will not operate properly.*

1. Disconnect the test set from the line and place on a flat work surface with battery cover up.

*Note: Battery cover screws are retained in the cover and will not come all the way out of the battery cover.*

2. Using a Phillips screwdriver, loosen only the four screws attaching the battery door cover to the back of the test set.
3. Remove the battery door cover. Do not access or handle printed circuit or other areas of the test set other than the battery.
4. Remove the old battery from the test set and properly discard. Make sure the terminals cannot short.

5. Insert a new 9V battery into the test set. When inserting batteries, observe the proper polarity.
6. Check that all sealing surfaces are clean and mate properly for water resistant seal.
7. Place the battery door cover on the test set and fasten the four screws securely. Do not over tighten screws. The battery door screws should be torqued to a maximum of 0.904 N-m or 8 in-lb.

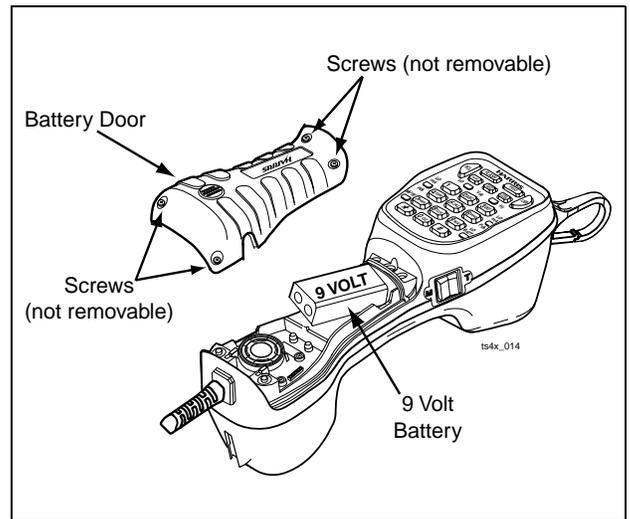


Figure 4. Battery Replacement

## Replacing or Relocating the Belt Clip

The belt clip assembly is field replaceable in the event of damage or prolonged wear. It also can be relocated to one of two locations. To order a replacement belt clip, contact your local Harris authorized distributor.

To replace or relocate the belt clip assembly (see [Figure 5](#)):

1. Using a Phillips screwdriver, remove the screw that secures the belt clip to the test set housing at the keypad end.
2. Remove the old belt clip and replace with a new one. Secure the belt clip assembly to the test set housing with the original screw.

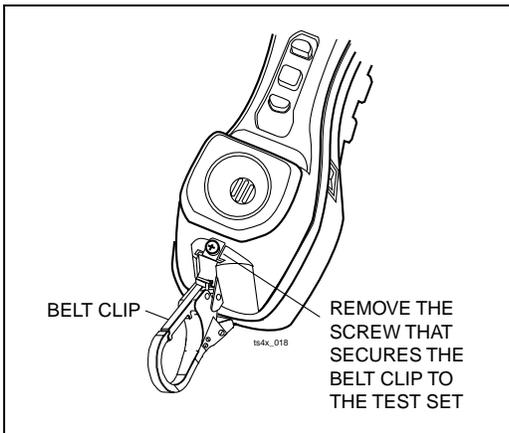


Figure 5. Belt Clip Replacement

3. To install a second belt clip:
  - a. Remove the blank insert from the test set.
  - b. Place the belt clip on the test set and secure with the screw supplied with the belt clip.
  - c. Place the blank insert in the belt clip slot that is not being used.

## Replacing the Line Cord

A worn out or damaged line cord can be replaced by the user. To obtain a replacement line cord contact your local distributor or Harris Corporation at the location listed in the Warranty Section.



### WARNING:

1. Read all instructions completely and understand possible hazards to end user if repairs are not performed properly.
2. Disconnect test set clips from any metallic connections before performing this maintenance.

## Removing Old Line Cord

To remove the old line cord:

*Notes: 1. Battery cover screws are retained in the cover and will not come all the way out of the battery cover.*

2. Be careful not to damage or pinch the speaker wires, printed circuit faces or insulating materials.
3. Be sure to account for all hardware removed. Loose or missing hardware could create a hazard for the end user.

1. Using a Phillips screwdriver, loosen only the four screws attaching the battery door cover to the back of the test set (see Figure 4).
2. Remove the battery door cover (see Figure 4) and battery from the test set.
3. Loosen the two screws that hold the line cord to the PCB (see Figure 6).
4. Using needle nose pliers or one of the line cord clips, remove the two screws and washers from the line cord connectors.
5. Using needle nose pliers, remove the plastic clip (see Figure 7) that holds the line cord strain relief in place.
6. Unplug the 7-pin plastic connector (see Figure 8) from the receptacle on the PCB board.
7. Slip the line cord screw lugs (see Figure 8) and 7-pin plastic connector out through the hole in the end of the housing.

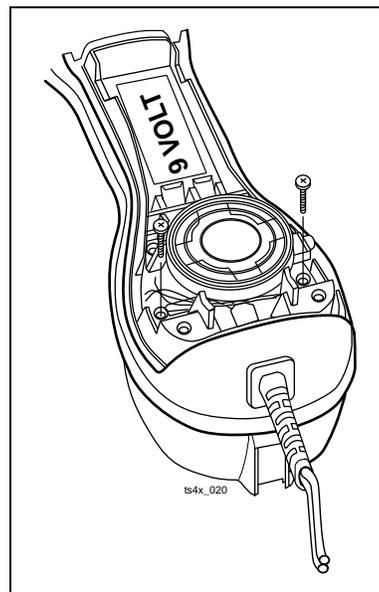


Figure 6. Removal/Installation of Line Cord Screws

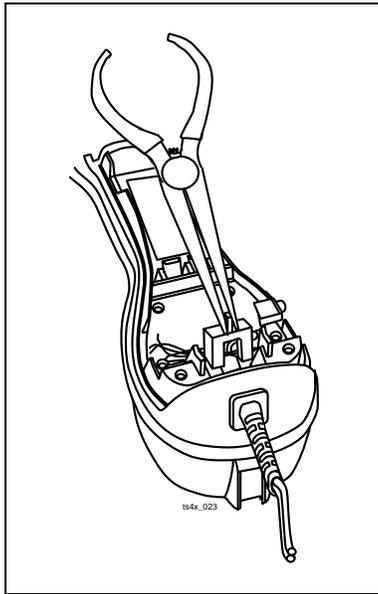


Figure 7. Removal/Installation of Plastic Clip

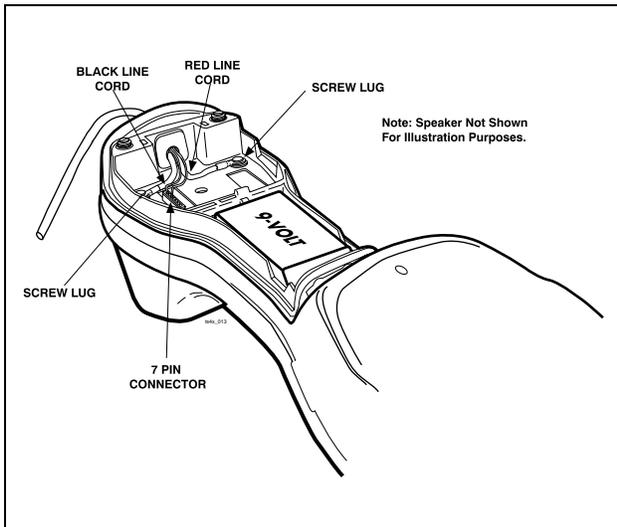


Figure 8. Removal/Installation of Line Cord Screw Lugs

## Installing a New Line Cord

To install a new line cord on either model:

1. From the outside of the housing, slide the screw lugs of a new line cord through the hole in the end of the test set housing. Make sure the crimp barrel offset side of the screw lugs is up (see Figure 9) and that the line cord screw lugs are flush against the circuit board.

*Note: Do not over tighten screws. Over tightening will strip the plastic.*

2. Fasten the red wire lug to the PCB (Ring) with screw and washer (see Figure 8).
3. Fasten the black wire lug to the PCB (Tip) with screw and washer (see Figure 8).
4. Plug the 7-pin plastic connector into the receptacle on the PCB board. Be careful not to damage or pinch the 7-pin connector wires.
5. Insert the plastic clip over the line cord strain relief at the base of the test set housing (see Figure 7) and press tightly into place. Inspect all work to ensure no pinched wires or areas where weather resistance and safe operation is affected. Reinstall the battery. Observe the proper polarity.
6. Place the battery door cover on the test set and fasten the four screws (see Figure 4). Tighten screws to a maximum torque of 0.904 N-m or 8 in-lb.

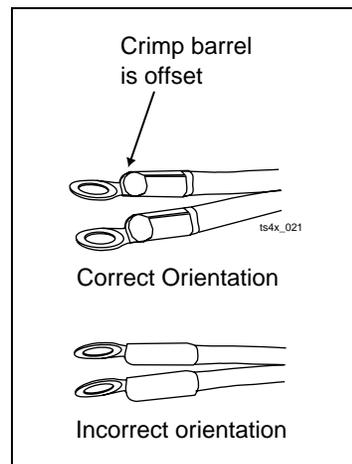


Figure 9. Orientation of Line Cord Screw Lugs

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## Software Upgrade

The software in the TS44 Deluxe Test Set can be upgraded. Refer to the Upgrade Instructions for the TS<sup>®</sup>40 Series Test Sets, Document Number 0II-729119-001, for instructions on upgrading the software. The document is located on the Harris Website and can be located as follows:

1. Type <http://download.harris.com>, then click Network Support.
2. Click Test Sets & Tools, then click Software Upgrade - TS40 Series Test Sets.

## Warranty

Harris Corporation agrees to warranty its products are free from defects in material and workmanship for the following periods:

- TS44 Deluxe Test Set – 3 years from date of manufacture.
- Line Cords and Accessories – 90 days from date of purchase.

**THIS WARRANTY CONSTITUTES THE SOLE AND EXCLUSIVE WARRANTY FOR PRODUCTS SOLD BY HARRIS CORPORATION, NETWORK SUPPORT DIVISION, AND IS IN LIEU OF ANY OTHER WARRANTY, EXPRESS, IMPLIED, OR STATUTORY, INCLUDING THE WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL HARRIS BE LIABLE FOR ANY SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF ANY PRODUCT OR FROM ANY OTHER CAUSE.**

**THIS WARRANTY SHALL NOT APPLY TO PRODUCTS WHICH HAVE BEEN SUBJECTED TO MISHANDLING, ABUSE, MISUSE, NEGLIGENCE, OR ACCIDENT, NOR TO PRODUCTS WHICH HAVE BEEN MODIFIED, ALTERED, OR REPAIRED BY PERSONNEL NOT AUTHORIZED BY HARRIS.**

## Non-Warranty

Out-of-warranty maintenance, service, or repair of products is available from the Harris Corporation, Network Support Division, on a time and materials basis. In addition, Harris offers for sale some replacement components. Harris Corporation recommends that out-of-warranty service and repair of electronic products be completed at its Harris Corporation Network Support Division, facility or authorized representative. Contact Harris Repairs for the location of the Harris authorized repair facility nearest you.

## Return or Repair of Equipment

The return of any products for credit, other than for warranty service, is done at the sole discretion of Harris Corporation. Before any product is returned, including for warranty service, a Return Authorization (“RA”) number must be obtained from the Customer Service Department by calling (800) 437-2266. If the RA number is not clearly marked on the shipping label, the package will not be accepted by Harris. All authorized returns must be shipped, with shipping charges prepaid, fob destination, and addressed as follows:

Harris Corporation  
Network Support Division  
809 Calle Plano  
Camarillo, California 93012-8516  
United States of America  
Attn: Customer Service, RA# xxxxx

## Specifications

Table 5 lists the specifications for the TS44 Deluxe Test Set.

Table 5. Specifications

Parameter	Working Limits
<b>ELECTRICAL</b>	
Current Range (Off-Hook)	10 to 100 mA
DC Resistance	
Off-Hook	150 Ω nominal
On-Hook	>3 MΩ
AC Impedance	
Off-Hook	600 Ω nominal; 300-3400 Hz
On-Hook	>120 kΩ; 300-3400 Hz
Rotary Dial Output	
Pulsing Rate	10 pps ±1 pps
Break/Make Ratio	60/40
Interdigit Interval	>300 ms
Resistance During Break	>100 kΩ
DTMF Output	
Tone Frequency Error	±1.5 % maximum
Tone Level	-3 dBm combined (typical)
High versus Low Tone Difference	2 dB ± 2 dB
Memory Dialing	
Memory Capacity	10 speed dial memories plus one last number redial memory
Digit Capacity	23 digits per memory
PBX Pause Duration	User programmable; default = 4 seconds

Parameter	Working Limits
<b>ELECTRICAL (Cont'd)</b>	
Hook Flash Duration	User programmable; default = 600 ms
Automatic Speaker Shut Off Duration	User programmable; default = 2 minutes
Battery	9 Volt Alkaline or Lithium battery
<b>PHYSICAL</b>	
Length	254 mm (10 inches)
Width	96 mm (3¾ inches)
Height	107 mm (4¼ inches )
Weight	Less than 0.68 kg (1.5 pounds) with one belt clip
Water Resistance	Designed to be rain and moisture resistant.
<b>ENVIRONMENTAL</b>	
Temperature Range	Operating: -34° to 60°C (29° to 140°F) Storage: -40 to 66°C (-40° to 150°F)
Altitude	To 3,000 meters (10,000 feet) max.
Drop	Designed to withstand two 20-foot drops and twelve 12-foot drops onto concrete.
<b>Note:</b> Specifications subject to change without notice.	

