



Network Support Division

***TS[®] 22L and TS[®] 22AL Data Lockout
Series Craft Test Set
Description and Use***

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NOTICE





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TRADEMARKS

TS is a registered trademark of Harris Corporation.

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.

Declaration of Conformity	
Manufacturer: Harris Corporation Network Support Division 809 Calle Plano Camarillo, CA 93012 U.S.A.	Standards Used: FCC part 15 CISPR 22 EN300386-2:97 EMC, ESD Directives EN61010.1 (1993). Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use. CSA/CAN C22.2 No. 1010.1-92 Safety
Signature: _____ Print: Ed Zoiss, Director of Engineering	
Importer: _____ _____ _____	
Signature: _____ Print: _____	
Model: TS22L and TS22AL Data Lockout Series Test Sets	
Serial: _____	
Harris Corporation officially declares the test equipment listed above is in conformity with Electromagnetic Compatibility Directive 89/336/EEC and Low Voltage Directive 73/23/EEC based on test results performed in a typical configuration. This Conformity is indicated by the following symbols representing the European Community and compliance organizations:	
   	



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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.

The following IEC symbols are used either on the test set or throughout the manual:



See Manual for details



Earth Ground



Conformité Européenne



Industry Canada and U.S.
Safety Approval



WARNING:

Good safety practices prohibit the connection of the TS22L, TS22AL and similar test sets to 117 volts AC commercial electrical power. Should the TS22L or TS22AL Test Set be connected to commercial power, all warranties are immediately voided.

INFORMATION

The TS22L and TS22AL Data Lockout Series Test Sets have been designed with reasonable care against Radio Frequency Interference (RFI). If RFI is encountered during the operation of the test set, the following steps may be taken to minimize the effects:

- Reorient or relocate the line cord or the test set or both.
- Increase separation between the source of the interference and the test set.
- Try connecting to another working pair.

The TS22L and TS22AL Data Lockout Series Test Sets employ the latest in integrated circuit design to provide both DTMF and dial pulse output. They also provide last number redial and repertory memory (auto dial) for 9 individual numbers.

This test set (see [Figure 1](#)) often called a “butt-in,” is a self-contained, line-powered, combination handset used by installers, repair technicians, and other authorized personnel for line testing and temporary communications. The TS22AL Test Set provides all the features of the TS22L Test Set, as well as a Speakerphone. Specifications herein apply to TS22L and TS22AL Test Set models, unless otherwise noted.

Physical Characteristics

The housing (A) (see [Figure 1](#)) is injection molded of high impact polycarbonate which provides excellent insulating properties. The three-piece case is designed to give rugged service and withstand the rough handling and shocks normally associated with craft tools.

The back of the handgrip is contoured and has a non-slip pad (B), freeing both hands while the test set rests on the shoulder.

The keypad (C) has 16 buttons on a black plastic bezel that is recessed into the receiver end of the housing. The recessed bezel provides physical protection to the keypad and helps prevent accidental button operation.

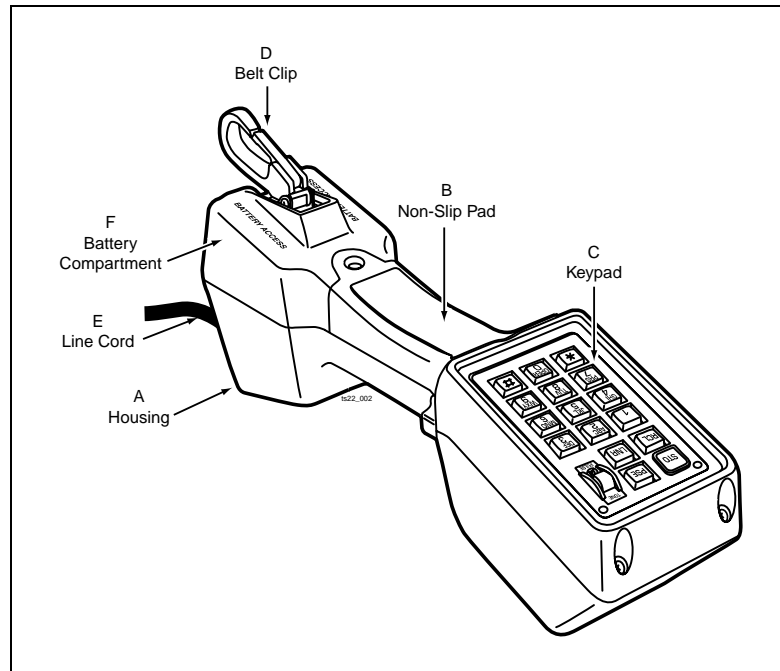


Figure 1. Physical Characteristics

The spring-loaded belt clip (D), located on the transmitter end of the housing, ensures a secure connection to a belt loop or D-ring. The belt clip may be replaced in the field. See [Replacing the Belt Clip](#).

The test sets are equipped with several different cord configurations (E). See [Power and Connections](#).

The test sets provide a dedicated battery compartment (F) which makes battery replacement a simple procedure. See [Warranty](#).

Controls and Indicators

Voice Controls

Talk/Monitor Switch

This slide switch is located on the side of the test set (see [Figure 2](#)). The T (TALK), position establishes an off-hook condition for dialing and talking as a common battery telephone. The M (MONITOR) position removes the transmitter from the circuit, and provides a high impedance coupling, which allows line monitoring without disrupting conversations or signaling. (See [Keypad Controls and Indicators](#), subsection [Data Detection](#)).

Mute Switch

This momentary and locking switch is located on the inside of the handgrip just above the transmitter (see [Figure 2](#)).

Speaker Button

This pushbutton is centered on the handgrip just below the receiver. It controls the built-in Speakerphone (TS22AL) and Amplified Speaker (TS22L) sound levels. See Amplified Speaker (TS22L), Speakerphone and Speaker (TS22AL), TS22AL Speakerphone Mode, and TS22AL Test Set Speaker Monitor Mode.

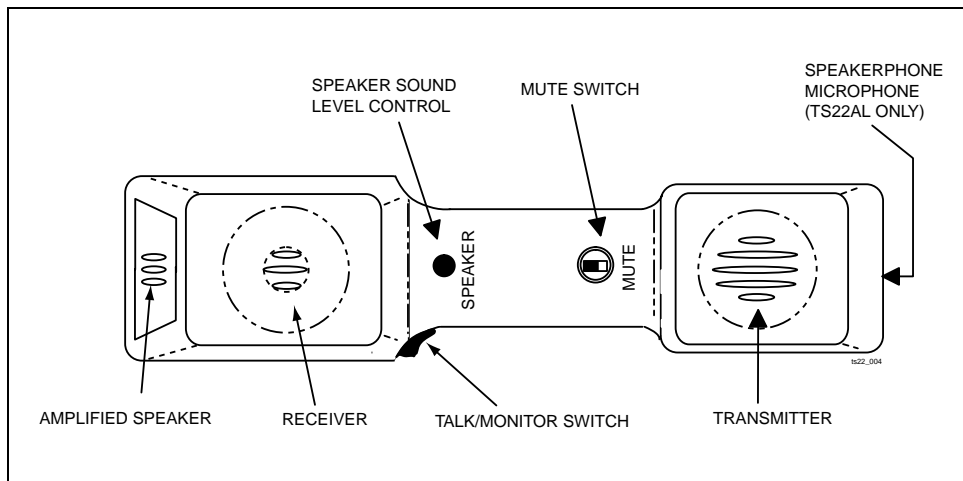


Figure 2. Controls and Indicators

Keypad Controls and Indicators

Keys

There are 12 standard keys and 4 special purpose keys (see [Figure 3](#)). The special purpose keys are STO, RCL, LNR, and PSE.

TONE/PULSE Switch

This toggle switch has a single function as a TONE/PULSE switch to select either tone or pulse dialing.

Polarity Light Emitting Diodes (LEDs)

Note: The TS22L and TS22AL Test Sets are not polarity sensitive, and will function in either polarity.

Located at the top of the keypad, these round LEDs illuminate automatically to indicate line polarity when off hook. The green 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 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. The LEDs will flash momentarily during pulse or tone dialing, and are turned off while in Speakerphone mode or Amplified Speaker mode.

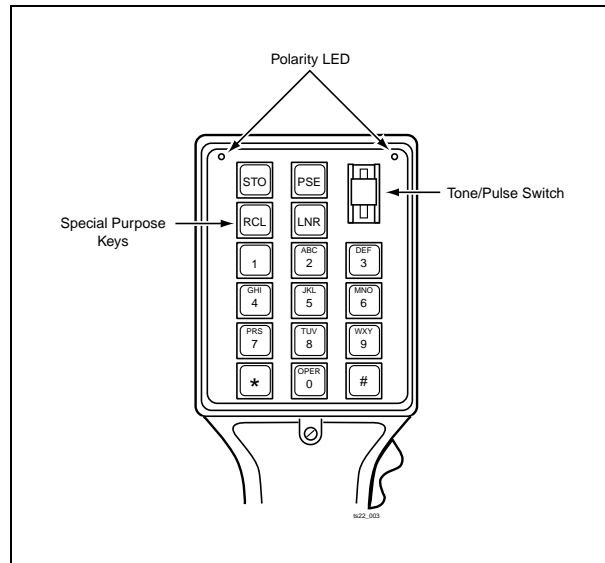


Figure 3. Keypad

Key to Figure 3.

Special Purpose Keys	Abbreviation	Function
STORE	STO	Stores the last number dialed into repertory memory (18 digits maximum).
RECALL	RCL	Recalls a number stored in repertory memory.
LAST NUMBER REDIAL	LNR	Redials the last number called. This feature works in either tone or pulse modes.
PAUSE	PSE	Places a four-second pause between numbers that are being entered into repertory memory. The pause will take place when the stored numbers are redialed, and is used to access second dial tone when dialing through a PBX.

Electronic Ringer

The electronic ringer is always enabled in the Monitor mode.

Data Detection

The TS22L and TS22AL models are equipped with a data detect feature. If data is on the line under test, data will not be disturbed when the test set has been switched to Talk or Monitor mode. When data is detected in the Talk mode, you will hear a data warning signal. Note that if the test set is in Talk mode, no loop current will be drawn by the test set.

Note: False data detection in Talk mode may occur if the test set is connected from Tip to Ground or Ring to Ground.



CAUTION:

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

Amplified Speaker (TS22L)

The TS22L Test Set is equipped with an Amplified Speaker that amplifies the receive signal in either the Talk or Monitor mode. This allows you to listen to the test set without holding it to your ear. The speaker control button is located on the inside of the handgrip, just below the receiver. There are three volume settings and an OFF position.

When the speaker is off, pressing the button once turns the speaker to low volume. Pressing the button again raises the volume to medium, pressing the button a third time raises the volume to loud, and pressing it again turns the speaker OFF.

Note: When the speaker is ON, the polarity LEDs go out. They will turn back on when the speaker timer elapses or is turned off via the speaker button.

When the speaker is on, the transmitter and receiver are automatically switched OFF to prevent acoustic feedback.

With no signal present, the speaker will automatically turn off after 5 minutes to conserve battery power. Any signal greater than a nominal -30 dBm will reset the timer and keep the speaker turned on.

Speakerphone and Speaker (TS22AL)

The TS22AL Speakerphone feature allows you to listen and talk back; in other words, to carry on a conversation handsfree. This feature helps free the user's hands to do other work related activities nearby. The handsfree capability of the Speakerphone provides for increased safety when working on CO ladders or in other congested areas where restriction of line cords may cause a hazard.

The Speakerphone speaker is located near the TS22AL Test Set receiver end. The Speakerphone microphone is located at the transmitter end of the TS22AL Test Set below the belt clip. The speaker button, located below the receiver, controls the volume levels of both the Speakerphone and the speaker. The Speakerphone mode and the speaker mode have three volume levels (low, medium, and high) and OFF.

The Speakerphone mode can only be used with the TS22AL Test Set TALK/MONITOR switch in Talk mode; with the Speakerphone on, depressing the mute button turns the Speakerphone microphone off for privacy. The speaker may be turned on in the Monitor mode just like the TS22L Test Set. A call may be initiated with the Speakerphone on or off by moving the TALK/ MONITOR switch to the Talk (off-hook) position. When making a call in Speakerphone mode, the number keys being dialed can be heard from the speaker. This feature gives an audible feedback to the user and assures that each number is being dialed out.

The TS22AL Test Set mutes the regular transmitter and receiver to prevent acoustic feedback from the speaker during Speakerphone mode and speaker mode. The polarity LEDs turn off when the TS22AL unit is switched from Talk mode to either the Speakerphone mode or the Speaker mode.

To prolong battery life, the TS22AL Test Set will automatically shut off the Speakerphone or speaker after approximately five minutes when there has been no signal greater than -30 dBm. Because of the automatic shut off feature, this function will have to be reactivated every 5 minutes if no signal greater than -30 dBm is detected.

TS22AL Speakerphone Mode

To put the TS22AL Test Set into Speakerphone mode, connect the TS22AL unit to a line, verify that the test set is in Talk mode, and press the speaker button once to put it in Speakerphone mode and low volume. Press it a second time for medium volume. Press it a third time for high volume. Press the speaker button a fourth time to turn the Speakerphone off or back to Talk mode.

Depressing the MUTE button while in Speakerphone operation mutes the transmit microphone for privacy.

TS22AL Test Set Speaker Monitor Mode

Put the TS22AL unit in Monitor mode, then press the speaker button once to put it into the Speaker mode with low volume. Press the speaker button a second time for medium volume. Press the button a third time for high volume. Press the button a fourth time for off or back to Monitor mode.

Power and Connections

Battery

The TS22L and TS22AL Test Sets have a replaceable 9V (Alkaline) battery that powers the speaker. If the 9V battery should run down during operation of the TS22L and TS22AL units, the test set will fail to operate in both the Talk mode and Amplified Monitor Mode. The Speakerphone will not function because the test set can not be in the Talk mode. You will still be able to monitor the line through the receiver.

When the speaker:

- Fails to operate at all.
- Operates intermittently.
- Sounds distorted.

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.

Replace the 9V battery with a similar battery. See [Replacing the Monitor Speaker Battery](#) for instructions on changing the battery.

If further assistance is required, please contact Professional Services at 1-800-437-2266.

Cords

Following is a description of the various available line cords for the TS22L and TS22AL Test Sets. The line cord on the TS22L and TS22AL Test Sets is replaceable; however, if the replacement cord is not installed properly, the warranty will be void. For information on availability of line cords, contact your Harris authorized distributor.

Note: When using the Ground Start Cord with the Data Lockout series of test sets, the red lead must be connected to the Tip side of the line in order to start the line properly. Some noise ground start lines will cause the test set to falsely indicate data detection.



WARNING:

Grounding either side of a high speed data line will cause disruption of service on that data line.

Standard Cord with Piercing Pin (STD)

This cord consists of one red and one black conductor, each approximately five feet long. Each conductor is fitted with an alligator clip offset 20° to minimize clip shorting. The clips have insulation piercing spikes and a neoprene boot. Cord Number: P3218-028 (see [Figure 4](#)).

Angled Bed-of-Nails Cord (ABN)

The Angled Bed-of-Nails cord is similar to the STD cord, except that each alligator clip is equipped with a “bed-of nails” in addition to the insulation piercing spike. Cord Number: P3218-234 (see [Figure 4](#)).

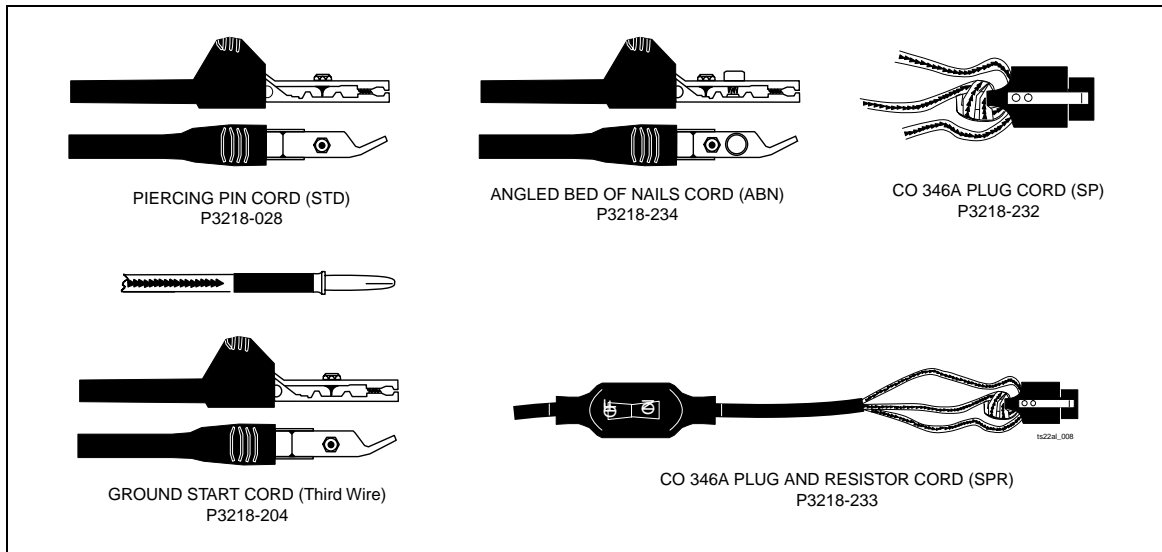


Figure 4. Cords

Central Office Plug Cord (SP)

This one foot long cord is fitted with a type 346A female plug. The plug allows the use of a variety of different test cords equipped with the matching 471A male connector. Cord Number: P3218-232 (see [Figure 4](#)).

Central Office Plug and Resistor Cord (SPR)

This cord is fitted with a type 346A female plug and switchable 1500 ohm resistor, and is approximately 18 inches long. When switched on, the resistor is inserted in series with the ring side of the cord to simulate a long loop condition. The plug allows the use of a variety of different test cords equipped with the matching 471A male connector. Cord Number: P3218-233 (see [Figure 4](#)).

Ground Start Cord (3W)

This cord consists of two conductors with alligator clips. In addition, the red (ring) conductor has a banana jack connected to it. This jack is located six inches below the test set, and is partially covered by the outer fabric of the cord. Cord Number: P3218-204. A separate green cord is also included. This cord is 36 inches long and has a banana plug on one end and a straight piercing pin clip on the other end. Cord Number: P2280-063. The complete 3W Cord Assembly is available as Number P2280-062 (see [Figure 4](#)).

Operation

Select the type of dial signaling required, DTMF or dial pulse, with the TONE/PULSE switch. Place the TALK/MONITOR switch in the M position, and connect test set to the line; listen to verify that the line is idle.

Note: If the test set is in Talk Mode and is connected to a POTS line (during dial tone or during a conversation), the technician should return to Monitor mode or wait at least 2 seconds after disconnecting before connecting the clips of the test set to a new line. This allows the test set to prepare to detect data on the next line.

Connect the test set leads across the line. Set the TALK/MONITOR switch to T, and verify that dial tone is received. If beeping is heard from the speaker, the test set had detected the presence of high speed data and you should disconnect from that line. If no beeping is heard, enter the desired number to be called on the keypad. If DTMF signaling has been selected, the tones associated with each digit will be generated as its respective button is pressed. If rotary dial pulse signaling has been selected, the desired number may be entered at any rate on the keypad; digits will automatically be pulsed out at the correct rate. To terminate the call, either during or after dialing, return the TALK/MONITOR switch to the M position.

Data Lockout

The Harris Data Lockout Test Set is designed to be used by the Outside Plant and Central Office technician to perform their normal duties while greatly reducing the possibility of inadvertently disrupting service on inaudible data signals like T1 or higher. With the increase in high capacity data lines in the distribution system, comes the greater risk of disrupting data service when working on troubles in analog lines. Accidentally going into Talk mode 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.

Data can be transmitted in two forms:

- Analog Modems.
- True Data.

Analog modems switch between two voice band frequencies (mark and space) to transfer data down the line. True data signals are pulses. At the higher data rates, such as T1 and above, there may be no component of this signal that is audible. If a technician connects a lineman's test set, in Monitor mode, across one of these lines, the technician may only hear a very faint hiss, whine, or nothing at all, giving the indication that it may be an idle line.

The TS22L and TS22AL Test Sets are designed with a high impedance Monitor mode that allows the technician to hear any voice band conversation or traffic on the line. While in Monitor mode, if there is audio traffic heard on the line (either conversation or data) the technician should not place the test set in Talk mode. When there are inaudible high speed data lines run to the same block or cable as analog pairs, the TS22L and TS22AL Test Sets will detect the inaudible signal. When the technician tries to go to Talk mode to draw dial tone, the test set will not put a termination on the line. The test set "locks out" on high frequency data signals, and gives the technician an audible beeping to indicate that the test set has detected high frequency on the line indicating a valid data circuit.

Data Safe Practices

- Always monitor the line for an audible signal before attempting to go off hook to draw dial tone.
 1. If modem traffic or conversation is heard, do not go off hook or to Talk mode.
 2. Once you have gone off hook on a line, return to monitor mode or wait 2 seconds after disconnecting before moving to the next pair. This allows the test set to prepare to detect data on the next line.
- Proper connection to the line is Tip and Ring. 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 clip onto tip or ring when trying to find tracer tone or dial tone on a block. This may create an imbalance on a data circuit that will disrupt service. Additionally, this imbalance may produce false data detection in the test set.
- Do not short the leads together if you are connected to a data line, as this could bring down the service.
- Place the test set in Monitor mode when troubleshooting a line searching for capacitance kicks, RF signals, craft provided tones, etc.

Last Number Redial

Note: When dialing out through a PBX, you may use the PSE key to insert a pause before initially dialing the number. See To Put a Pause in a Stored Number.

In the Tone or Pulse mode, the last number dialed can be automatically redialed by pressing the LNR key after going on-hook and then back off-hook.

Storing Numbers In Repertory Memory (Auto Dialer)

The TS22L and TS22AL Test Sets have 9 memory locations, which correspond to number keys 1 through 9. Each location will store up to 18 digits. If a nineteenth digit is entered, the previous digits will be cleared and the last digit (the nineteenth entered) starts a new string. If more than 18 digits are required, a second memory can be used.

Numbers can be placed in memory at any time. The test set may be either on-hook or off-hook, and does not need to be connected to the line.

To Store a Number When On-Hook Or Disconnected (Preferred Method)

1. Press STO (STORE).
2. Press the number key for the desired memory location (1-9). This clears all extraneous digits from memory and will prepare the memory for storing a new number.

*Note: When either on-hook or off-hook, a number in memory can be lost if the **STO** (STORE) key and then a number key are accidentally pressed. The “#” key can not be stored when in the on-hook mode. Use the off-hook mode method discussed below.*

To Store a Number You Are Calling

Note: In the PULSE mode, pressing STO will stop any further digits from being outpulsed, although all digits will be stored. Therefore, wait until all digits have been outpulsed before pressing STO.

To Put a Pause in a Stored Number

To Dial a Stored Number

3. Enter the number to be stored.
4. Press STO (STORE).
5. Press the number key for the chosen memory location (1-9).

1. Connect the test set to the line and receive dial tone.
2. Dial the number.
3. Press STO (STORE).
4. Press a number key for the desired memory location (1-9).

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 **9** to get out. You can do this by pressing the PSE (PAUSE) key at the point where the pause is required. For example, to store the number 9-647-5430, with a pause between the **9** and **6**, enter **9[PSE]6475430**. When the number is dialed out, there will be a four-second pause between the **9** and **6**. You can insert a longer pause by pressing PSE more than once.

After receiving dial tone, press RCL (RECALL) and then the number key (1-9) for the memory location. For example, to dial a number stored in location 5, press RCL and then **5**. The number will be automatically dialed.

Line Monitoring



CAUTION:

*When testing circuits which are relatively close to the battery source, the **CLICKS** may be loud enough to cause acoustical shock if the receiver is held tightly against the ear. The TS22L and TS22AL Test Sets are designed to rest comfortably on the shoulder with the receiver away from the ear. It should be used in this position when listening for **CLICKS**.*

Set the TALK/MONITOR switch to the M position and connect test leads to circuit under test. Monitoring may now be done without disrupting traffic. The high impedance of the TS22L and TS22AL Test Sets prevents the spiking of data traffic.

Troubleshooting

The following troubleshooting procedures are based largely on the CLICK that will be heard when the two test leads on the TS22L or TS22AL units are placed on battery and ground respectively, or across a charged capacitor. These CLICKS and other sounds from the receiver can greatly assist a craftsperson in locating open circuits, shorts, crosses, and grounds:

1. To locate a short circuit, open one side of the line and place the TS22L or TS22AL Test Set in the loop – one test lead to each side of the opened line. On the CO side of the fault, a loud CLICK will be heard; on the field side of the fault, NO CLICK will be heard. The TS22L and TS22AL units should be in the Monitor mode (with or without the Amplified Speaker on).
2. Locating an open circuit is accomplished by bridging the TS22L or TS22AL Test Set across the circuit – one test lead on tip, the other on ring. Moving away from the CO, the fault is located at the point the loud CLICK disappears.
3. Continuity of each side of the loop may be verified by placing one of the line leads on a local ground and the other on the conductor in question. On a good RING conductor, a CLICK will be heard; on a good TIP conductor, an inductive HUM will be heard (due to the difference in ground potential between the CO ground and the local ground).

Maintenance



WARNING:

Disconnect clips from any metallic connections before performing any maintenance. Read all instructions completely and understand possible hazards to end user if not performed by authorized service personnel.



CAUTION:

1. 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.

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

Replacing the Monitor Speaker Battery

Note: Be sure to replace the battery with a good 9 volt battery or the test set will not operate at all.

To replace the Monitor Speaker Battery (see [Figure 5](#)):

1. Remove the three screws from the battery compartment.
2. Remove the battery compartment cover.
3. Lift out the battery retainer.
4. Remove the battery from the battery boot and install an Alkaline or Lithium 9V battery.
5. Replace the battery boot, retainer, cover, and screws. Strain relief ring must be inside the case as shown. Avoid pinching battery wires.

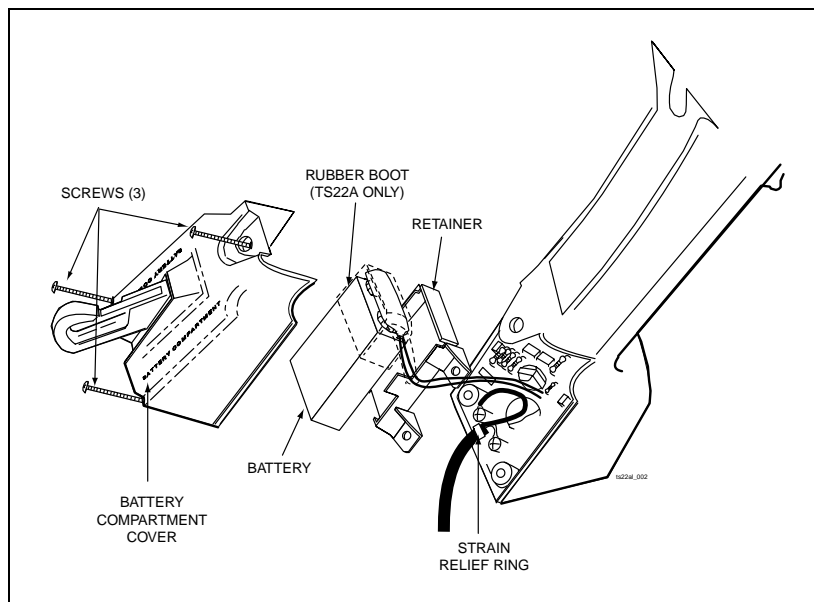


Figure 5. Replacing the Monitor Speaker Battery

Replacing the Belt Clip

The TS22L and TS22AL Belt Clip Assembly is field replaceable in the event of damage or prolonged wear. To order a replacement belt clip, contact Harris Corporation Customer Service Department at 1-800-437-2266.

To replace the belt clip assembly (see [Figure 6](#)):

1. Using a Phillips screwdriver, remove the two screws that secure the belt clip to the test set housing.
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 screws.

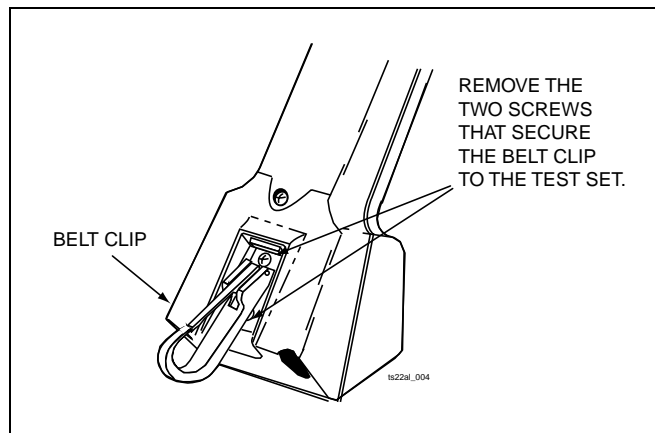


Figure 6. Belt Clip Replacement

Warranty

Harris Corporation warrants that its products are free from defects in material and workmanship for the following periods:

- Butt Sets and Test Sets — 18 months 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 of Equipment

To return the test set to Harris, first obtain a Return Authorization Number from our Customer Service by calling 1-800-437-2266. This Return Authorization number must be clearly marked on the shipping label, or the container will not be accepted by Harris. See the sample label below:

To: HARRIS CORPORATION
809 Calle Plano
Camarillo, California 93012-8516
Attention: Customer Service, RA XXXXXX

Specifications

[Table 1](#) lists the TS22L and TS22ALO Test Set specifications.

Table 1. Specifications

Parameter	Working Limits
ELECTRICAL	
Loop Limit	2 k Ω maximum at 48 VDC (nominal 20 mA minimum loop current)
DC Resistance (Talk Mode)	300 Ω typical
Data Lockout Mode	Draws less than 100 microamp at voltages up to 200 VDC

Table 1. Specifications (Continued)

Parameter	Working Limits
ELECTRICAL (Continued)	
Monitor Impedance	120 k Ω nominal at 1 kHz
Rotary Dial Output	
Pulsing Rate	10 pps + 0.5 pps
Percent Break	61% \pm 2%
Interdigit Interval	1000 ms typical
Leakage During Break	>50 k Ω
DTMF Output	
Tone Frequency Error	\pm 1% maximum
Tone Level	-3 dBm combined (typical)
High versus Low Tone Difference	4 dB maximum
Memory Dialing	
Memory Capacity	9 memories plus last number redial
Digit Capacity	18 digits per memory
PBX Pause	4 seconds
Monitor Amplifier Power Source	9V transistor battery; provides 25 hours continuous use, typical
Amplified Speaker Levels and Speakerphone Levels	Low, medium, high and off
Automatic Power Shut Off	After 5 min. of no audio signal
Power Source	Shared line and battery power
Data Detection and Lockout Capability	Twisted pair data services including: T1, E1, ISDN PRI, ISDN BRI, HDSL, SW56, and SRDL.
Ringer Equivalent (REN)	0.14
PHYSICAL	
Length	10-1/4 inches (26.0 cm)
Width	2-11/16 inches (6.83 cm)
Height	3-3/8 inches (8.57 cm)
Weight	TS22L: 21 ounces (.595 kg) TS22AL: 22 ounces (.624 kg) typical

Table 1. Specifications (Continued)

Parameter	Working Limits
ENVIRONMENTAL	
Temperature	Operating: -34 to 60° C Storage: -40 to 66° C
Altitude	To 10,000 feet
Relative Humidity	5 to 95%

Patents 4682346, 4691336, 4939765, and 5193107 apply. Other patents pending. Specifications subject to change without notice.

Standard TS22L and TS22AL Models:

Model Number		Cord Type*
TS22L	TS22AL	
28003-001	22804-001	Standard Cord (STD) with Piercing Pin
22803-004	22804-004	CO Plug (346A) Cord (SP)
22803-007	22804-007	Ground Start Cord (3W)
22803-008	22804-008	CO Plug (396A) and Resistor Cord (SPR)
22803-009	22804-009	Angled Bed-of-Nails Cord (ABN)
*See description of cords.		

