



User Guide

***TS<sup>®</sup> 22ALO and TS<sup>®</sup> 22LO  
Data Lockout Series, with  
Lockout Override,  
Craft Test Set***

***Description and Use***



No part of this publication may be reproduced, stored on a retrieval system, or transmitted, in any form or by any means electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of Harris Corporation. The use of trademarks or other designations is for reference purposes only.

**NOTICE**



Harris Corporation makes no warranties about this document. Harris Corporation reserves the right to make hardware and software changes to the product described within this document without prior notice and without obligation to notify any person of such revision or change.

**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.

<b>Declaration of Conformity</b>	
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: <u>Ed Zoiss</u>	
Print: Ed Zoiss, Director of Engineering	
Importer: _____ _____ _____	
Signature: _____	
Print: _____	
<b>Model:</b> TS22ALO and TS22LO Craft Test Sets	
<b>Serial:</b> _____	
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:	
 	



# 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 in the manual:



See Manual for details



Earth Ground



Conformité Européenne



Industry Canada and U.S,  
Safety Approval



This page intentionally left blank

---

## Contents

■ Safety Information	iii
■ Introduction	1
■ Physical Characteristics	1
■ Controls and Indicators	2
■ Voice Controls	2
■ Keypad Controls and Indicators	3
■ Amplified Speaker (TS22LO)	4
■ Two-Way Speakerphone (TS22ALO)	4
■ TS22ALO Two-Way Speakerphone Mode	5
■ TS22ALO Test Set Speaker Monitor Mode	5
■ Power and Connections	5
■ Battery	5
■ Line Cords	6
■ Operation	7
■ Select Dial Signal	7
■ Data Lockout	7
■ Data Safe Practices	8
■ Override Operation	8
■ Last Number Redial	9
■ Line Monitoring	10
■ Maintenance	10
■ Replacing the Monitor Speaker Battery	11
■ Replacing the Belt Clip	11
■ Warranty Information	12
■ Non-Warranty	12
■ Return or Repair of Equipment	12
■ Specifications	12

---

This page intentionally left blank

# Introduction

---



## WARNING

Good safety practices prohibit the connection of the TS22LO, TS22ALO and similar test sets to 117 volts AC commercial electrical power. Should the TS22LO or TS22ALO Test Set be connected to commercial power, all warranties are immediately voided.

The TS22ALO and TS22LO Data Lockout Series, with Lockout Override, Test Sets (hereafter referred to as TS22ALO and TS22LO 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.
- Use the override procedure to draw dial tone.

The TS22ALO and TS22LO 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, mutually powered (by line and 9 Volt battery once off hook) combination handset. It is used by installers, repair technicians, and other authorized personnel for line testing and temporary communications. The TS22ALO Test Set provides all the features of the TS22LO Test Set, as well as a Speakerphone. Specifications herein apply to TS22ALO and TS22LO Test Set models, unless otherwise noted.

## Physical Characteristics

---

The housing (A) (see [Figure 2](#)) 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.

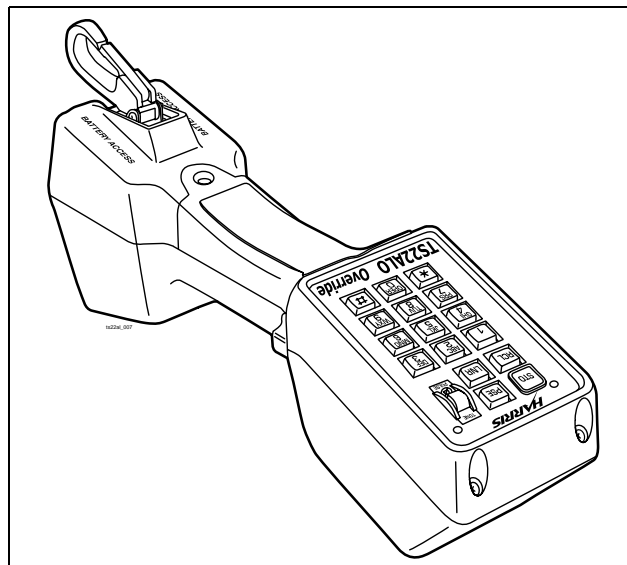


Figure 1. TS22ALO/TS22LO Test Set

---

## Controls and Indicators

---

### Voice Controls

---

#### Talk/Monitor Switch

This slide switch is located on the side of the test set (see [Figure 3](#)). 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 [Data Detection](#).

#### Mute Switch

This momentary and locking switch is located on the inside of the handgrip just above the transmitter (see [Figure 3](#)).

#### Speaker Button

This pushbutton is centered on the handgrip just below the receiver. It controls the built-in Two-Way Speakerphone (TS22ALO) and Amplified Speaker (TS22LO) sound levels. (See [Amplified Speaker \[TS22LO\]](#), [Two-Way Speakerphone \[TS22ALO\]](#), [TS22ALO Speakerphone Mode](#), and [TS22ALO Test Set Speaker Monitor Mode](#).)

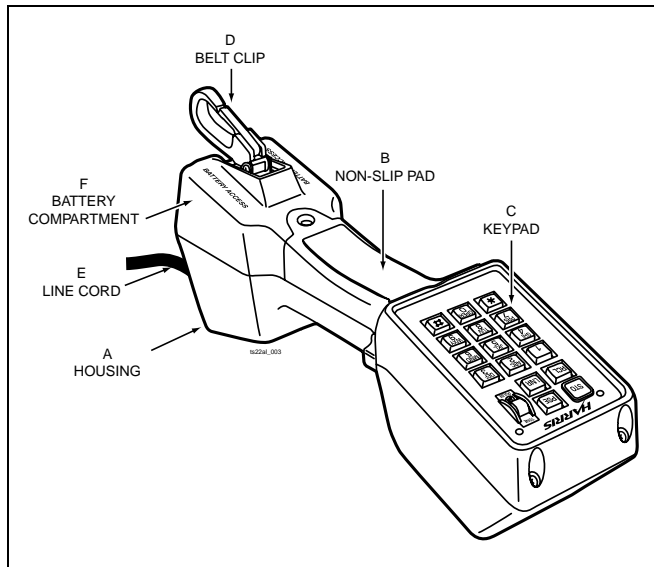


Figure 2. Physical Characteristics

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 Information](#).

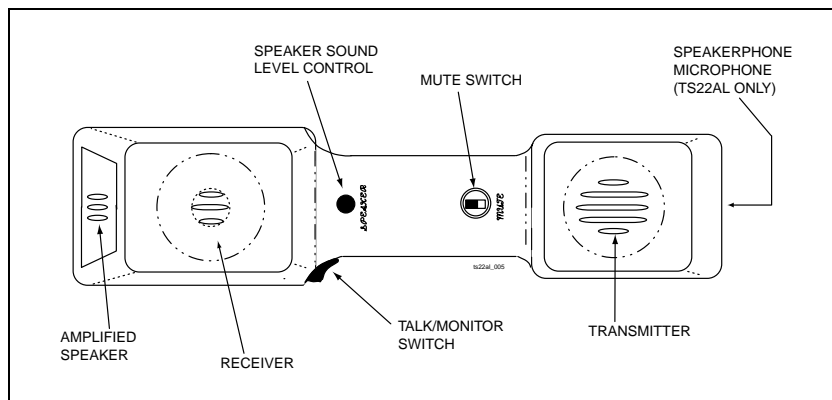


Figure 3. Controls and Indicators



# Keypad Controls and Indicators

## Keys

There are 12 standard keys and 5 special purpose keys (see Figure 4). The special purpose keys are STO, RCL, LNR, PSE, and pound (#). Table 1 is a key to Figure 4.

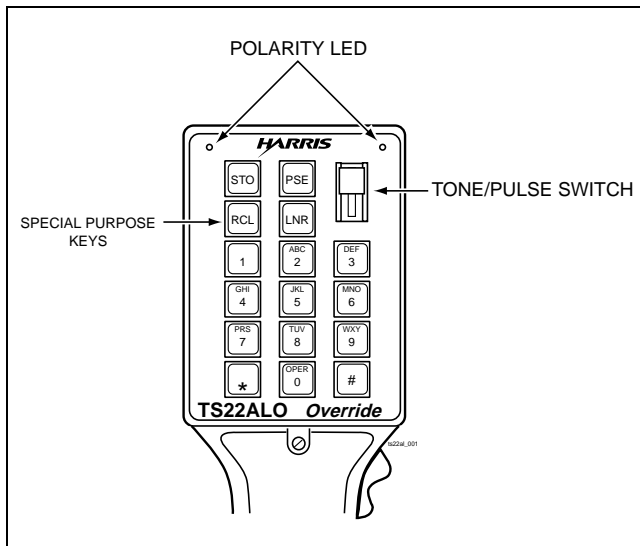


Figure 4. Keypad and Overlay

Table 1. Figure 4 Key (Cont'd)

Special Purpose Keys	Abbreviation	Function
<b>PAUSE</b>	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.
Pound	#	While in TALK mode, if a data alert signal is sounded, pressing the pound key for 1½ seconds will disable the lockout feature for two seconds, and allow the test set to draw line current. This will also allow you to remain off-hook for two seconds, thus making it possible to draw dial tone on a ground start line. Refer to Table 2 for the full procedure. If the test set does not detect data, the pound (#) key will function normally.

## 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)

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 Two-Way Speakerphone mode or Amplified Speaker mode.

Table 1. Figure 4 Key

Special Purpose Keys	Abbreviation	Function
<b>STO</b> RE	STO	Stores the last number dialed into repertory memory (18 digits maximum).
<b>ReCALL</b>	RCL	Recalls a number stored in repertory memory.
<b>LAST NUMBER REDIAL</b>	LNR	Redials the last number called. This feature works in either tone or pulse modes.

---

**NOTE**

*The TS22ALO and TS22LO Test Sets are not polarity sensitive, and will function in either polarity.*

## Electronic Ringer

The electronic ringer is always enabled in the Monitor mode.

## Data Detection

The TS22ALO and TS22LO 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 (TS22LO)

The TS22LO 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.

---

## Two-Way Speakerphone (TS22ALO)

The TS22ALO Two-Way Speakerphone feature allows you to listen and talk back; in other words, to carry on a conversation hands free. This feature helps free the user's hands to do other work related activities nearby. The hands free 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 TS22ALO Test Set receiver end. The Speakerphone microphone is located at the transmitter end of the TS22ALO 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 TS22ALO 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 TS22LO 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 TS22ALO 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 TS22ALO unit is switched from TALK mode to either the Speakerphone mode or the Speaker mode.

To prolong battery life, the TS22ALO 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.

## TS22ALO Two-Way Speakerphone Mode

---

To put the TS22ALO Test Set into Two-Way Speakerphone mode, connect the TS22ALO unit to a line, verify that the test set is in TALK mode, and press the speaker button once to put it in Two-Way 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 Two-Way Speakerphone off or back to TALK mode.

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

## TS22ALO Test Set Speaker Monitor Mode

---

Put the TS22ALO 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

---



#### **WARNING**

- *When not in use, the 9-Volt battery in the TS22ALO and TS22LO Test Sets should be changed once a year to prevent the 3-Volt lithium battery from draining.*
- *When your 9-Volt battery is low your speakerphone will no longer work. You should replace your 9-Volt battery with a new battery immediately as to not drain the 3-Volt lithium battery.*

The TS22ALO and TS22LO Test Sets have a replaceable 9 Volt (Alkaline) battery (a minimum of 12 Volts and 20 mA of line current) that powers the speaker. If the 9 Volt battery should run down during operation of the TS22LO and TS22ALO units, the test set will fail to operate in both the TALK mode and Amplified Monitor Mode. The Two-Way Speakerphone will not function because the test set cannot 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 9 Volt battery with a good 9V 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.

## Line Cords

Following is a description of the various available line cords for the TS22ALO and TS22LO Test Sets. The line cord on the TS22ALO and TS22LO 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 5](#)).

### 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 5](#)).

### 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 5](#)).

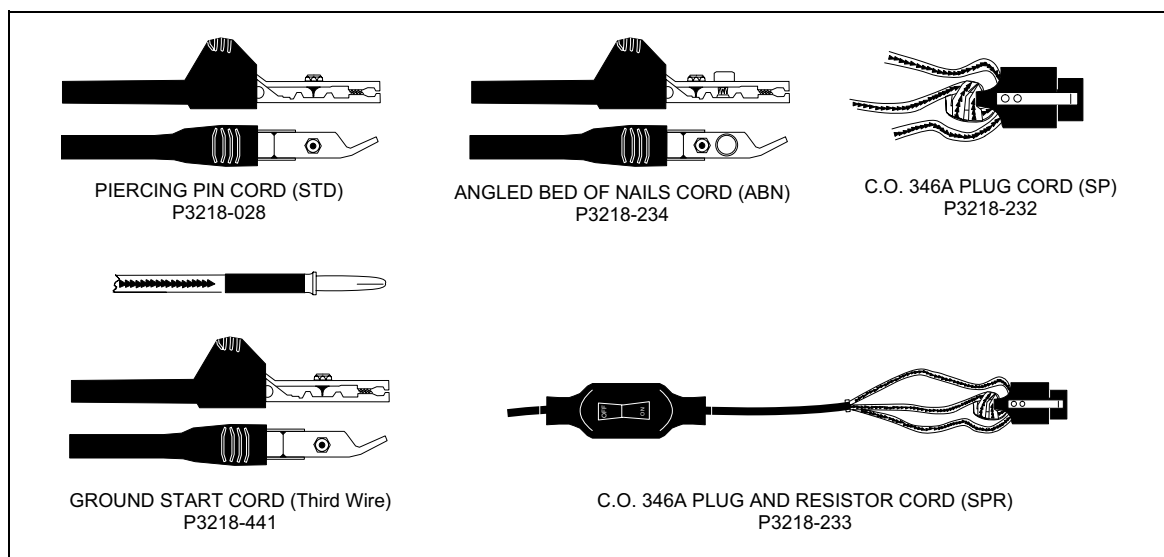


Figure 5. Line Cords

---

## 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 5).

## Ground Start Cord (3 Wire)

This cord consists of two conductors with alligator clips. In addition, the black (Tip) conductor has a banana jack connected to it. The complete Cord Assembly is available as Number P3218-441 (see Figure 5).

---

## Operation

---

### Select Dial Signal

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 two 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 TS22ALO and TS22LO Test Sets are 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 TS22ALO and TS22LO 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 TS22LO and TS22ALO 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.
- Fresh 9 Volt batteries, a minimum of 12 Volts, and 20mA are required.
- Noise from an imbalanced pair can cause false data alerts.
- Tone generators can mimic the type of signal found in a data transmission, causing the test set to beep (data alert) in TALK mode. To avoid this, always use the TS22ALO and TS22LO Test Set in MONITOR Mode when used to trace tone from a tone generator.
- When moving from pair to pair or switching from TALK mode to MONITOR mode, take a two second pause. This allows the data lockout and alerting circuit to reset.

## Override Operation

---

Table 2 lists some of the situations that may cause the Lockout Test Set Series to detect data, thus not allowing the technician to draw line current or working analog services with the TS22ALO and TS22LO Test Sets.

### ATTENTION

*This test set is designed to protect traffic against inadvertent connection to high speed data lines. It should always be connected across Tip and Ring. Any other connection could disrupt data flow or cause false data detection.*

Table 2. Situations with TS22LO and TS22ALO Test Sets

Very Noisy Imbalanced Line	Very Noisy Imbalanced Ground Start Line
1. Test Set will not go off hook and will only give data alert tone in TALK mode.	1. Test set will not go off hook and will only give data alert tone in TALK mode.
2. Verify that the connection is made to the correct pair and confirm the configuration of that pair. If line verification is OK, then proceed.	2. Verify that the connection is made to the correct pair and confirm the configuration of that pair. If line verification is OK, then proceed.
3. While in TALK mode, press the pound (#) key for 1½ seconds.	3. While in TALK mode, press the pound (#) key for 1½ seconds.
4. The test set will be lockout disabled for two seconds and will terminate the line.	4. The test set will be lockout disabled for two seconds and will terminate the line.
5. If there is valid battery and current available on the line, the test set will go off hook and receive dial tone from the switch.	5. There is a two second interval after the beeping stops in which you will be able to monetarily ground the <b>TIP</b> side of the line. This starts current flow through the test set and signals the switch to close the contacts on the Tip side relay. <b>After two seconds, the Data Lockout circuit is reactivated.</b>
	6. If there is valid battery and current available on the line, the test set will go off hook and receive dial tone from the switch

## 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 TS22ALO and TS22LO 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. Change the position of the TALK/MONITOR Switch.
2. Press STO (STORE).
3. Enter the number to be stored.

### 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.*

4. Press STO (STORE).
5. Press the number key for the chosen memory location (1-9).

---

## To Store a Number You Are Calling

1. Connect the test set to the line, throw the TALK/MONITOR Switch to TALK, and receive dial tone.
2. Dial the number.

### NOTE

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

3. Press STO (STORE).
4. Press a number key for the desired memory location (1-9).

## To Put a Pause in a Stored Number

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 an outside line. 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.

## To Dial a Stored Number

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 TS22ALO and TS22LO 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 TS22ALO and TS22LO Test Sets prevents the spiking of data traffic.

---

## 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

- 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.
- 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



### WARNING

- When not in use, the 9-Volt battery in the TS22ALO and TS22LO Test Sets should be changed once a year to prevent the 3-Volt lithium battery from draining.
- When your 9-Volt battery is low your speakerphone will no longer work. You should replace your 9-Volt battery with a new battery immediately as to not drain the 3-Volt lithium 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 6](#)):

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 and install a good Alkaline or Lithium 9 Volt battery.
5. Replace the retainer, cover, and screws. Strain relief ring must be inside the case as shown in [Figure 6](#). Avoid pinching battery wires.

## Replacing the Belt Clip

The TS22ALO and TS22LO Belt Clip Assembly is field replaceable in the event of damage or prolonged wear. To order a replacement belt clip, contact your local Harris authorized distributor for Part Number P3218-249.

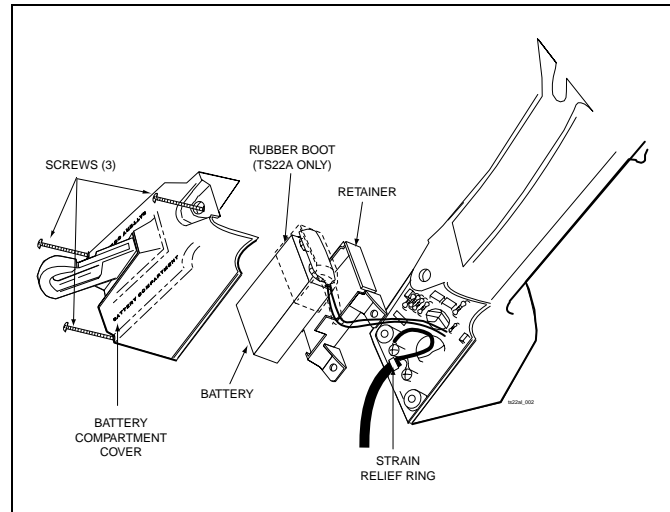


Figure 6. Replacing the Monitor Speaker Battery

To replace the belt clip assembly (see [Figure 7](#)):

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.

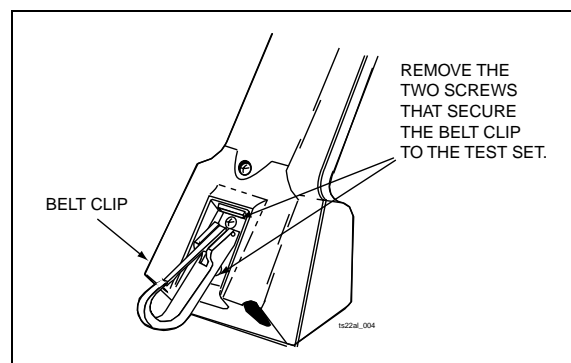


Figure 7. Belt Clip Replacement

## Warranty Information

---

Harris Corporation agrees to warranty 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's Network Support Systems 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 Systems 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 Systems 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 1-800-437-2266. The RA number must be clearly marked on the shipping label, or the package will not be accepted by Harris. See sample label below:

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

## Specifications

---

Table 3 lists the TS22ALO and TS22LO Test Set specifications.

Table 3. Specifications

Parameter	Working Limits
<b>ELECTRICAL</b>	
Loop Limit	2 k $\Omega$ maximum at 48 VDC (nominal 20 mA (12V) minimum loop current)
DC Resistance (TALK Mode)	300 $\Omega$ typical
Data Lockout Mode	Draws less than 100 microamp at voltages up to 200 VDC
Monitor Impedance	120 k $\Omega$ 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 $\Omega$
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

Table 3. Specifications (Cont'd)

Parameter	Working Limits
<b>ELECTRICAL - Cont'd</b>	
Monitor Amplifier Power Source	9 Volt 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
<b>PHYSICAL</b>	
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	TS22LO: 22 ounces (.62 kg) TS22ALO: 23 ounces (.66 kg) typical
<b>ENVIRONMENTAL</b>	
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 TS22ALO and TS22LO Models:

Model Number		Line Cord Type*
TS22LO	TS22ALO	
28005-001	22806-001	Standard Cord (STD) with Piercing Pin
22805-004	22806-004	CO Plug (346A) Cord (SP)
22805-007	22806-007	Ground Start Cord (Three Wire)
22805-009	22806-009	Angled Bed-of-Nails Cord (ABN)
*See description of <a href="#">Line Cords</a> .		



This page intentionally left blank



Network Support Division | 809 Calle Plano | Camarillo, CA 93012-8519 USA  
[www.harris.com](http://www.harris.com) 1-800-437-2266

©1998 Harris Corporation  
Written in USA/Printed in Taiwan. 01I-726997-003, Issue 4, December 2003