


# TS21 LINEMAN'S TEST SET

DIAL PULSE OR  
TOUCH TONE\* TESTING

FORM NO. 710125-020 (1/85)

 **HARRIS**

DRACON DIVISION

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## WARNING

Good safety procedures prohibit the use of this tool, and other ordinary telephone craft tools, with 110 VAC, 60 HZ power. Use of this tool with 110 VAC, 60 HZ power voids our warranty.

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# GENERAL

The new Dracon TS21 Lineman's Test Set employs the latest in integrated circuit design to provide either a DTMF (Touch Tone\*) or a dial pulse output. This Test Set, often referred to as 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 TS21 is two-tone blue in color and measures approximately 2-11/16 inches (6.82 cm) wide, 3-11/16 inches (9.36 cm) high and 9-11/16 inches (24.60 cm) long. It weighs approximately 21 ounces (600 g).

Table 1 lists the various models and their features.

\*Touch Tone is an ATT Trade Mark.

**TABLE 1**  
**TS21 MODELS**

<b>Model No.</b>	<b>Cord Type</b>	<b>Mute Switch</b>	<b>Ground Start Switch</b>
21800-020	STD	—	—
21800-021	STD	Yes	—
21800-023	SP	—	—
21800-024	SP	Yes	—
21800-025	SPR	—	—
21800-026	3W	—	Yes
21800-027	3W	Yes	Yes

STD: 5 Ft. Standard Two-Conductor Cord

SP: 1 Ft. Cord with Male Plug

SPR: 4 In. Cord with Male Plug and 1500 $\Omega$  Switchable Resistor

3W: 5 Ft. Three-Conductor Ground Start Cord

# SPECIFICATIONS

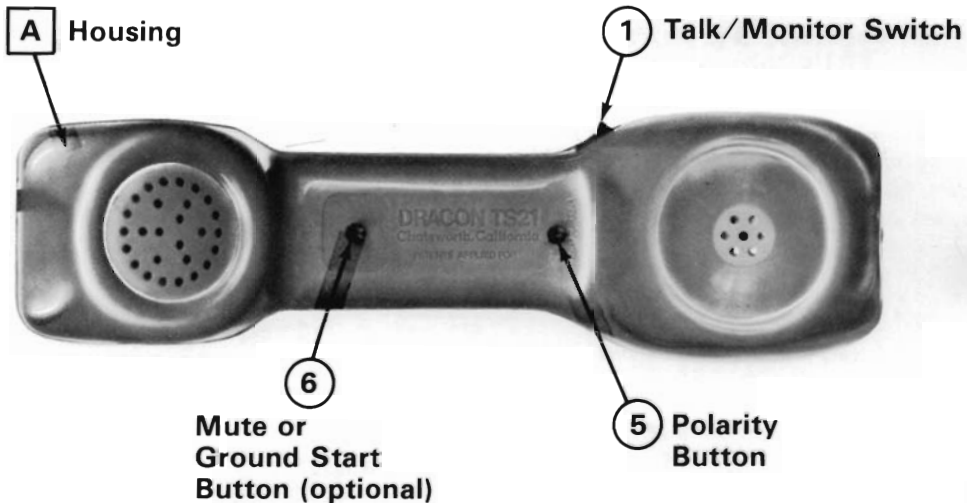
## ELECTRICAL

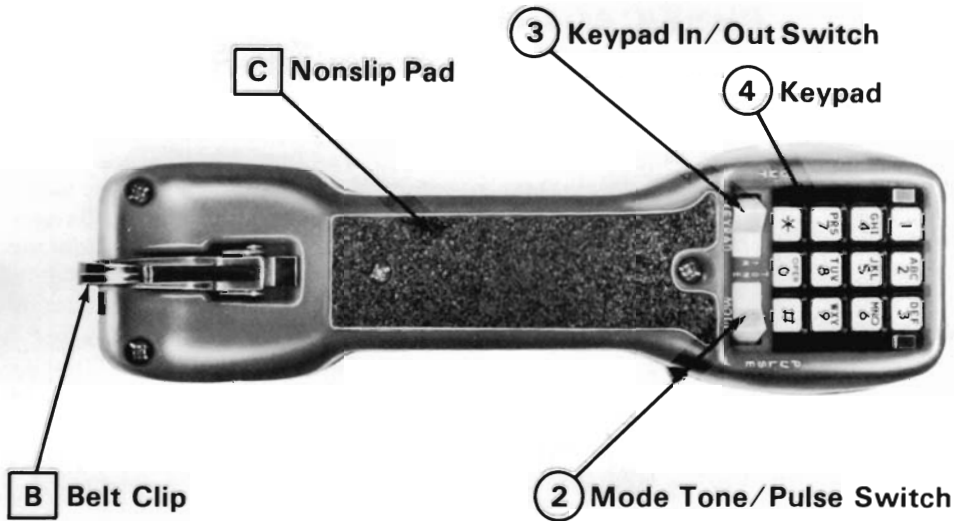
Loop Limit	1500 $\Omega$ maximum @ 48 VDC (22 mA minimum loop current)
Talk Impedance	150 $\Omega$ typical (similar to WECO 1013A & BECO 801)
Monitor Impedance	100K $\Omega$ minimum at 1 KHz
Rotary Dial Output	
Pulsing Rate	10 pps $\pm$ 1/2 pulse
Percent Break	61% $\pm$ 2%
Interdigit Interval	800 ms typical
Leakage During Break	400 $\mu$ A maximum at 54 VDC
DTMF Output	
Tone Frequency Error	$\pm$ 1% maximum
Level Per Tone Pair	+ 2 dBm maximum, -9 dBm Minimum
Low vs High Tone Difference	3 dBm maximum

## PHYSICAL

Length	9-11/16 in. (24.60 cm)
Width	2-11/16 in. (6.82) cm)
Height	3-11/16 in. (9.36 cm)
Weight	21 oz (600 g) maximum

Specifications subject to change without notice.





# PHYSICAL CHARACTERISTICS

**A** The housing is injection molded of high impact polycarbonate which provides excellent insulating properties. The two-piece case is designed to give rugged service and withstand the rough handling and shocks normally associated with craft tools.

**B** The Belt Clip, located on the transmitter end of the housing is equipped with a spring-loaded clip, ensuring a secure connection to belt loops and D-rings.

**C** The Nonslip Pad on the back of the Test Set is a special contoured design, making it easy to work with and freeing both hands while the TS21 rests on the shoulder.

**D** TS21 Test Sets are equipped with several different cord configurations. See TABLE 1 and DESCRIPTION OF CORDS.



# CONTROLS AND INDICATORS

## ① TALK / MONITOR SWITCH.

Located on the side of the Test Set, this black rocker switch when placed in the T (talk) position, establishes an off-hook condition for dialing and talking. In this mode the Test Set performs as a common battery telephone. The M (monitor) position removes the transmitter from the circuit and provides a high impedance coupling to the line. This allows line monitoring without disrupting conversations, data or signaling.

## ② MODE TONE / PULSE SWITCH.

Located on the keypad bezel (see Figure 1) this white rocker switch

selects the signaling output. TONE for DTMF output and PULSE for dial pulse output.

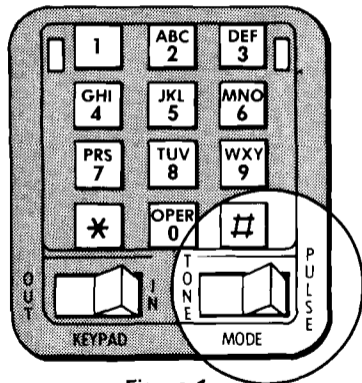


Figure 1

**3 KEYPAD IN/OUT SWITCH.** Located on the keypad bezel (see Figure 2), this white rocker switch selects either of two operating modes. When set to the IN position, the Test Set operates as a modern electronic telephone set. This mode is used for all normal communication functions. The OUT position bypasses the Test Set electronics, including the keypad. In this mode signaling is not possible, but the Test Set will operate at very low voltages, much like standard test sets currently in use. Line testing is possible in either switch position. The OUT position is recommended when testing at or near the loop limit ( $1500\ \Omega$  @ 48 VDC) or

when testing on dry circuits. The OUT position must be used when the circuit voltage is 6V or less, such as when using "tones" or other test devices as a source of talk battery.

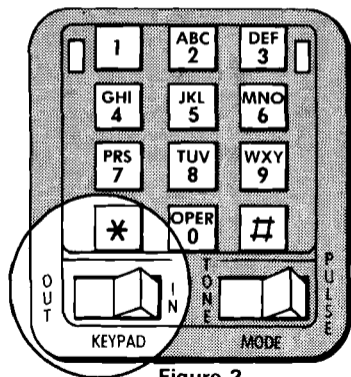


Figure 2

**4 KEYPAD.** Has 12 buttons on a black plastic bezel which is recessed into the receiver end of the housing. This provides both physical protection to the keypad and prevents accidental button operation.

**5 POLARITY BUTTON.** Located on the inside of the handgrip, this small black button is used in conjunction with two rectangular LEDs located in the keypad bezel (see Figure 3) to check line polarity. Pressing the POLARITY button with the Test Set in "monitor mode" and connected to a telephone line or battery source, will cause one of the LEDs to light. The amber LED will

light if the red test lead is connected to the ring (negative) side of the line and black test lead is connected to the tip (positive) side of the line. The

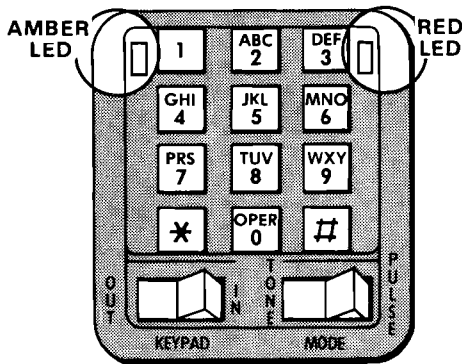


Figure 3

red LED will light if the test leads are reversed; that is, the red test lead connected to the tip (positive) and the black test lead connected to the ring (negative) side. In either case line polarity has been determined.

**CAUTION:** Operation of the POLARITY button on a busy circuit may cause annoying clicks or service interruptions.

**NOTE:** The Dracon TS21 is NOT polarity sensitive, allowing the Test Set to function normally when connected to the line in either polarity.

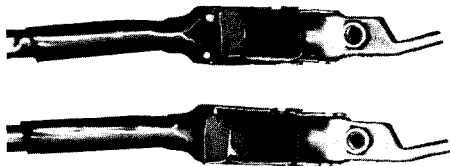
**6 MUTE BUTTON (optional).** Located on the inside of the handgrip just above the transmitter. When pressed, this small black button mutes the transmitter, eliminating sidetone and providing improved intelligibility in noisy locations.

**6 GROUND START BUTTON (optional).** Located in the same place as the optional MUTE button. When pressed, this small black button connects the ground (green) lead to the ring (red) lead of the special three-conductor ground start cord, initiating a ground start line seizure.

# DESCRIPTION OF CORDS

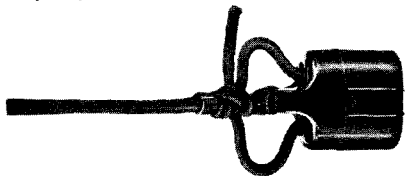
## STANDARD CORD (STD)

This cord consists of one red and one black fabric covered tinsel conductor approximately five feet long. Each conductor is fitted with an alligator clip offset 20° to minimize clip shorting. The thumb handle and heel of each clip is covered with an insulating material. The clips also have insulation piercing spikes.



## PLUG CORD (SP)

This cord is fitted with a type 346A male plug and is approximately one foot long. This allows the use of a variety of different test cords equipped with the matching type 471A female connector.



# DESCRIPTION OF CORDS (continued)

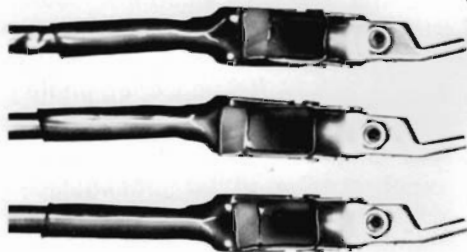
## PLUG AND RESISTOR CORD (SPR)

This cord is fitted with a type 346A male plug and switchable  $1500\ \Omega$  resistor and is approximately four inches long. When switched in, the resistor is inserted in series with the ring side of the cord to simulate a long loop condition.



## GROUND START CORD (3W)

This cord consists of one red, one black, and one green fabric covered tinsel conductor approximately five feet long, each fitted with an alligator clip of the type used on the standard cord. Pressing the GROUND START button connects the green (ground) conductor to the red (ring) conductor inside the Test Set.



# OPERATION

## SIGNALING

Place the TALK/MONITOR switch in the M position, and connect Test Set to the line; verify that the line is idle.

Set the KEYPAD switch to IN. Select the type of dial signaling required, touch tone or rotary dial pulses, with the MODE switch. Set the TALK/MONITOR switch to T, and verify that dial tone is received (when furnished). Enter the desired number to be called on the keypad. If touch tone 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.

## POLARITY CHECK

Set the TALK/MONITOR switch to M. Connect test leads to circuit under test; verify that circuit is idle. Press and hold in the POLARITY button. If the red LED lights, the red test lead is connected to the tip (+) side and the black test lead is connected to the ring (-) side; if the amber LED lights, the red test lead is connected to the

ring (-) side and the black test lead is connected to the tip (+) side.

**CAUTION:** Operation of the POLARITY button on a busy circuit may cause annoying clicks or service interruptions. Operation of this switch on an idle circuit may cause line seizure.

### **LINE MONITORING**

Set the TALK/MONITOR switch to M (KEYPAD and MODE switches may be in either position), and connect test leads to circuit under test. Monitoring may now be done without disrupting traffic.

### **OPERATION ON LOW VOLTAGE OR DRY CIRCUITS**

Set KEYPAD switch to OUT and TALK/MONITOR switch to M. Connect test leads to circuit under test; verify that circuit is idle. Set the TALK/MONITOR switch to T for two-way communications.

Setting the KEYPAD switch to OUT bypasses the Test Set electronics, thereby increasing its loop limit. The Test Set signaling function will not operate in this mode, but all other functions operate normally.



## **GROUND START LINE SEIZURE (optional)**

Pressing the GROUND START button

connects together the ground (green) and ring (red) leads of the three-conductor test cord.

# **TROUBLESHOOTING PROCEDURES**

The following troubleshooting procedures are based largely on the CLICK that will be heard when the two TS21 test leads are placed on battery and ground respectively, or across a charged capacitor.

These CLICKS and other sounds from the receiver can greatly assist a skilled craftsperson in locating open circuits, shorts, crosses, and grounds.

1. To locate a short circuit, open one side of the line and place the TS21 in the loop—one test lead to each side of the opened line. On the C.O. side of the fault, a loud CLICK will be heard; on the field side of the fault, NO CLICK will be heard.

2. Locating an open circuit is accomplished by bridging the TS21 across the circuit—one test lead on

tip, the other on ring. Moving away from the C.O., the fault is located at the point the CLICK disappears.

3. Continuity of each side of the loop may be verified by placing one of the test 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 C.O. ground and the local ground).

For a full discussion on these troubleshooting procedures, you are referred to your company's practices

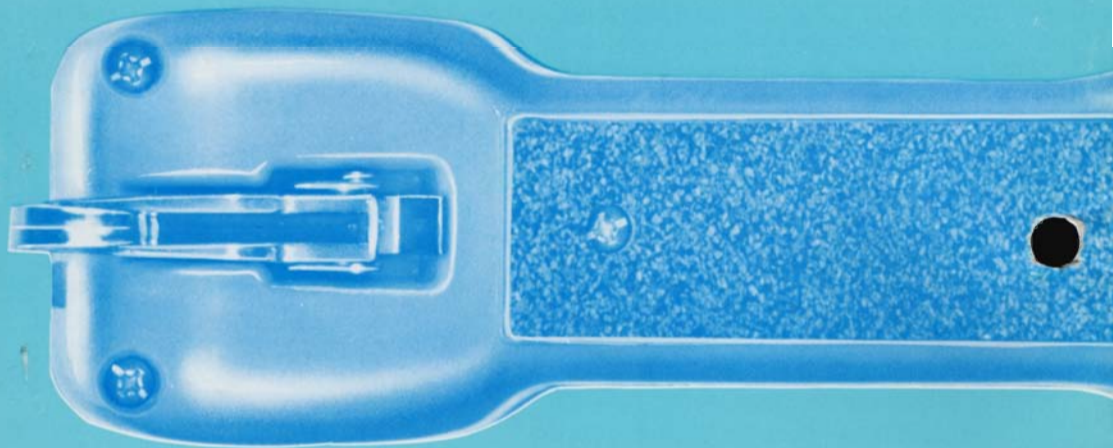
or to "Lee's ABC of the Telephone", Vol. 2, Chapters 13, 14, and 15.

**CAUTION:** When testing circuits which are relatively close to the battery source, the CLICKS in the receiver may be loud enough to cause acoustical shock if the receiver is held tightly against the ear. The TS21 is 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.

**WARRANTY:** Dracon guarantees equipment of its manufacture and each part or component thereof against all defects in material and/or workmanship and agrees to remedy any such defect at no charge provided that the defective unit is returned transportation prepaid to the Dracon factory from which shipment was made. This warranty extends for a period of one year from the date of installation or initial use, provided that this period shall not exceed 18 months from the date of shipment from factory. In no event will Dracon be liable for any incidental or consequential damages.

This warranty does not extend to products which have been subjected to neglect, accident or improper use, nor to units which have been altered by other than authorized Dracon personnel.

**RETURN OF EQUIPMENT:** To return Test Set to Dracon, first obtain a Return Authorization Number from a Dracon Representative. This number must be clearly marked on shipping container or container will not be accepted by Dracon.



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