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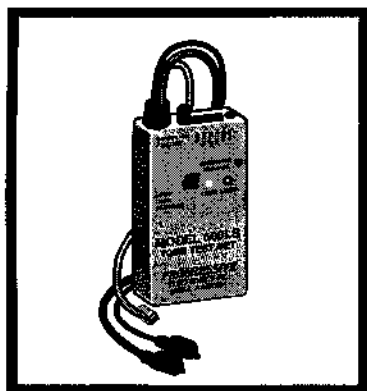


Figure 1 - Model 600LS Test Set

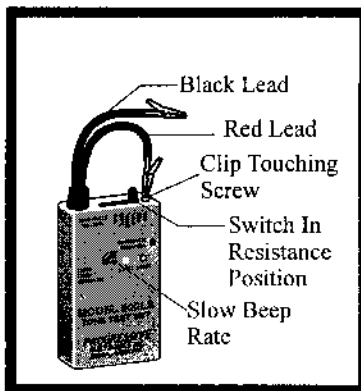


Figure 2 - Calibration Testing

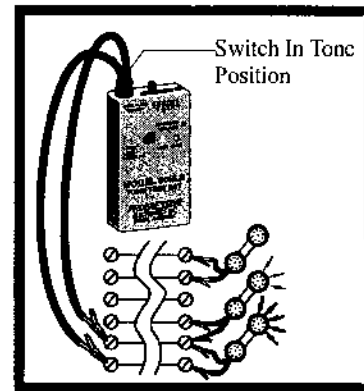


Figure 3 - Tone Operation

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1. DESCRIPTION AND FEATURES

The 600LS test set is housed in a grey and maroon plastic case, which measures approximately 1 inch thick, 2 3/8 inches wide and 5 7/8 inches long. (See Figure 1) Red and black test leads are provided, which are equipped with alligator clips and are permanently attached to the set. A four conductor modular plug and cord, plus two light emitting diodes (LEDs), provide a modular polarity test. A six position slide switch controls the modes of operation and there is a three-position slide switch for testing each line at the modular plug.

The tone, level, resistance and capacitance features are powered by one internal 9 volt battery. The addition of a second 9 volt battery increases talk battery supply over original designs.(See Figure 13) The polarity test feature is line powered.

The 600LS test set provides the following features:

- 1A. **Tone** - A dual tone audio trace signal is used to identify cable pairs, drop wires and I/O wire pairs and for proving continuity of single conductors. The signal will also radiate with sufficient strength to be detected by a lineman's test set or an inductive amplifier.
- 1B. **Level** - This position is for checking line condition. No tone indicates a dead line or reversed polarity (0V-2V). An alternating (Hi-lo) tone indicates an active line off-hook (2V-28V). A steady tone indicates an active line not in use (28V-48V).
- 1C. **Battery** - Approximately 18 volts of talk battery is provided for two way communication.

- 1D. **Resistance** - This feature provides an audible indication of various levels of circuit and insulation resistance. With the test leads connected to a low resistance circuit, a rapid series of beeps is produced by the test set. As the resistance of the circuit being tested increases, the time interval between beeps also increases.
- 1E. **Capacitance** - An audible indication of circuit capacitance is produced by the internal speaker. This test can be used to indicate the amount of capacitance on a line.
- 1F. **Polarity Test** - Two 2-color LEDs provide visible indication of central office battery polarity present at a modular connector. Alternating current is indicated by a red/green flickering LED (appears yellow). (See Polarity Testing, page 3)
- 1G. **Modular Test Selector Switch** - The above tests, except polarity, may be performed on Line 1 or Line 2 through the modular cord.(See Modular Line Testing, page 4)
- 1H. **Calibration** - In resistance mode, an internal resistor valued at 1 megohm is provided for comparison to the fault resistance of the circuit or facility being tested.

2. OPERATION

All tests and operations outlined in the following paragraphs are to be conducted with central office battery and any other source of electrical current disconnected from the facilities under test. This does not apply to level and line polarity tests.

Battery Check and Operational Test

To perform a battery check and operation test place the slide switch in the "capacitance" position. An audio tone should be heard at the speaker opening indicating a good battery. If the audio tone is not heard, continue. Short the test leads together and place the slide switch in the "resistance" position. This should produce a rapid series of beeps from the speaker. If no beeps are heard, replace the batteries as outlined in Maintenance, Section 3 and repeat.

A test set which fails to operate in any one of the modes after a new battery has been installed should be replaced.

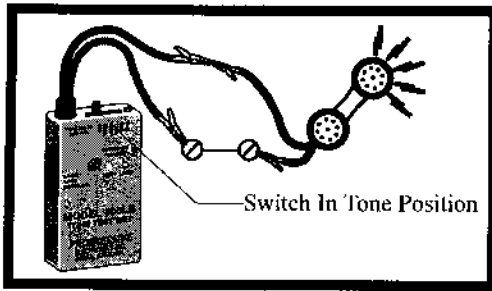


Figure 4 - Proving Continuity

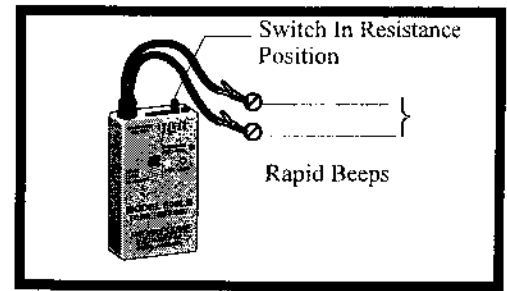


Figure 5 - Proving Continuity

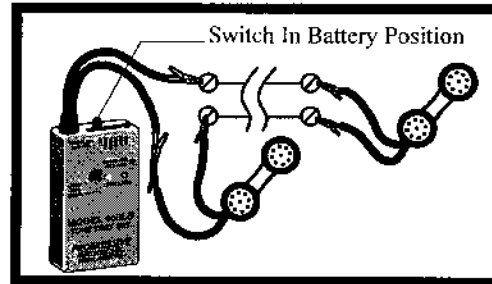


Figure 6 - Battery Operation

2B. Calibration

With the slide switch in the "resistance" position, touch the clip of the red test lead to the top plate or screw head next to the slide switch opening. This places a 1 megohm resistance on the test set leads through an internal resistor. The set should then produce a series of beeps approximately one per second. This beep rate will subsequently be referred to as the "calibration rate." This rate will vary between test sets due to the component differences and battery condition. (See Figure 2)

A circuit can be considered to be clear of insulation faults if, when tested with the resistance feature of the 600LS test set, it produces a series of beeps at a rate equal to or slower than the beep rate of 1 beep every 4 seconds, approximately 4 megohms.

2C. Tone Operation

The "tone" position is used to identify pairs of conductors and to prove continuity. The dual tone trace signal is detected with a standard telephone set or a lineman's test set with the talk-monitor switch in the monitor position. (See Figure 3)

Pair identification can be determined as follows: Before an attempt is made to identify a pair of conductors, the pair should first be tested for shorts and grounds. Either of these conditions will attenuate (lower) the signal and produce false indications. Proceed as outlined in Section 2F to ensure that the pair is "clear".

After the pair has been "cleared", place the slide switch in the "tone" position and connect the test leads to one end of the line under test and a lineman's test set to the other end of the line under test. A pair with an "open" conductor will produce a low tone similar to a "split" pair.

2D. Proving Continuity

1. To prove continuity of a single conductor, proceed as follows: Place slide switch on the 600LS test set in the "tone" position. Connect one test lead from the 600LS test set to one lead of the lineman's test set to provide a "series" connection. Connect the

remaining test lead from the 600LS to one end of the conductor being tested. Use the remaining lead on the lineman's test set as a "probe" and touch it to the other end of the conductor while listening for the tone to be produced in the receiver of the lineman's test set. (See Figure 4)

2. Continuity can also be proven by using the "resistance" feature of the 600LS test set. This is done by proving a relative lack of resistance in the conductor being tested. To do so, place the slide switch in the "resistance" position and connect one test lead to one end of the conductor to be tested. (See Figure 5)

Connect the remaining test lead to a good conductor which has been strapped to the other end of the conductor under test and listen for beeps to be emitted from the test set. A rapid series of beeps indicates continuity. Compare the results by alternately shorting the test leads and connecting the test set to the test conductor. No discernible difference should be noted in the beep rate.

2E. Battery Operation

If a source of "talk" battery is required, place the slide switch in the "batt" position. Then connect lineman's test sets or telephones in series with the test set lead. (See Figure 6)

1. Resistance Testing

To test relative resistance levels between two conductors, or between a single conductor and ground, place the slide switch in the "resistance" position. The test set will emit a series of beeps when the test set leads are shorted or connected to a resistance circuit. The time interval between beeps increases as the resistance of the circuit being tested is increased. Thus, a solid short produces a rapid series of beeps, and grasping the test lead clips with one in each hand produces beeps at a much slower rate.

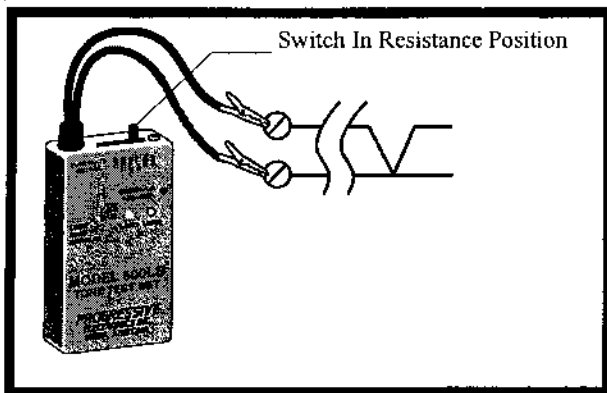


Figure 7 - Testing for Shorts

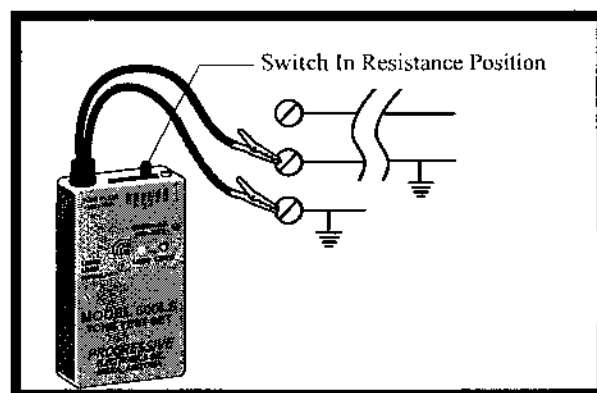


Figure 8 - Testing for Ground

2. Testing for Shorts

To test a pair of conductors for shorts, connect the 600LS test set to the pair. Place the slide switch in the "resistance" position and listen for "beeps" to be emitted from the test set. A rapid series of beeps indicates a solid short. (See Figure 7)

3. Testing for a Ground

A "ground" is similar to a short in that it is caused by an insulation breakdown between two conductors. In this case, the breakdown is between the facilities and ground. To test a circuit or pair for "grounds", proceed as follows. Place the slide switch in the "resistance" position and listen for beeps to be emitted from the test set. A rapid series of beeps indicates a low resistance path to ground. (See Figure 8)

4. Testing for Crosses

A cross is basically a short between a conductor of another pair. To test for crosses in a given group of pairs, place the slide switch in the "resistance" position and connect one test lead to a conductor of the first pair in the group. Connect the other test lead to the remaining conductors, one at a time. A cross will be indicated when the test set emits a series of beeps. Proceed by moving the initial test lead to each conductor in turn and testing it against the remaining conductors. (See Figure 9)

2F. Capacitance (See Figure 10)

The "cap" position is used to estimate the number of ringers on a line.

Before attempting this test, the line should be tested for C.O. battery, shorts and grounds. Any of these conditions will produce false indications.

After the line (pair) has been "cleared", connect the leads of the test set to the line and place the slide switch in the "cap" position.

A continuous tone indicates no ringers on the line. A beeping tone at approximately one per second indicates the line is terminated by one ringer. Each additional ringer will decrease the beep rate by one second; therefore:

1 ringer = 1 (second per beep)

2 ringers = 2 (seconds per beep), etc.

This test will also indicate the capacitance (related to the length) of a line not terminated by a ringer. The line length must be at least 100 feet or longer. If the line length is approximately 30,000 feet, or six miles long, the beep rate will be similar to a one ringer load.

2G. Level Testing

To test the relative level of voltage on line, do the following: Place the slide switch in the "level" position. Connect red lead to ring of the line under test. (See Figure 11) Connect black lead to tip of the line under test. Check for the following conditions:

1. No tone emitted from the test set means the voltage is less than 2VDC.
2. An alternating tone being emitted indicates a voltage of 2V to 28V DC on the line, resulting from a busy or talking line.
3. A single solid tone being emitted indicates a voltage of 28V to 48V DC on the line, indicating a line not in use (or office battery).
4. An alternating tone accompanied by a hum or buzz being emitted indicates voltage of 2V to 28V AC on the line.
5. A single solid tone accompanied by a hum or buzz being emitted indicates a voltage of 28V to 48V AC on the line.

If the line is suspected to be good but this test results in no tone, the polarity may be reversed. Reverse the test leads and repeat test.

See modular polarity test for additional test of line reversal.

2H. Polarity Testing

Polarity of the first and second lines on a modular connector can be determined by the use of the modular cord and plug provided and by observing the two LEDs. Place three-position switch in modular position.

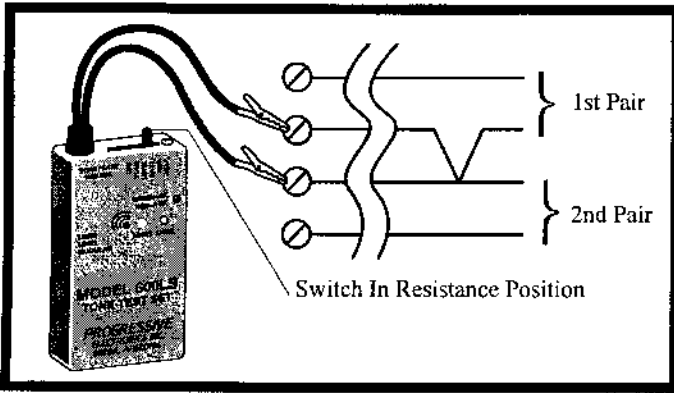


Figure 9 - Testing for Crosses

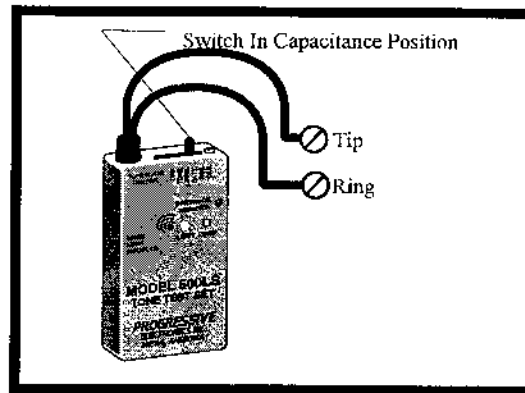


Figure 10 - Capacitance

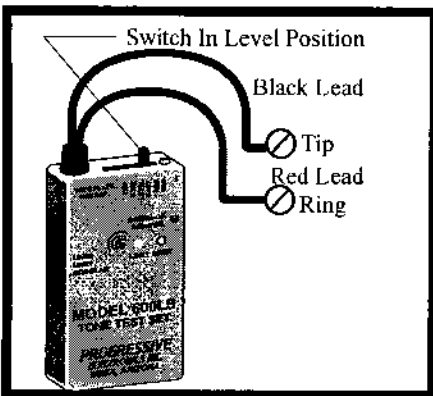


Figure 11 - Level Testing

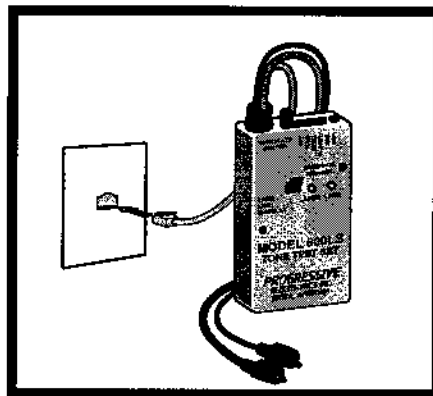


Figure 12 - Modular Line Testing

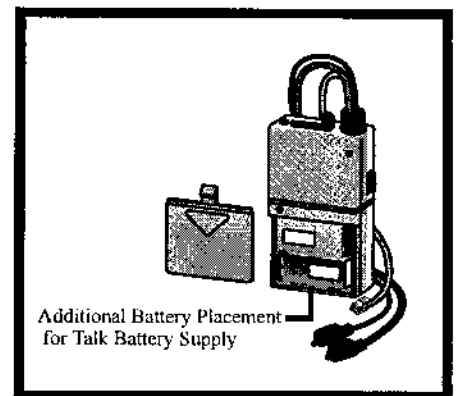


Figure 13 - Maintenance

When C.O. battery is applied to the contacts of the plug, the LEDs will glow red or green depending on the polarity of the applied voltage.

1. A green LED lighted on either line indicates correct polarity with negative battery on jack contacts 3 or 5, respectively.
2. A red LED lighted on either line indicates reversed polarity or the presence of positive battery on jack contacts 3 or 5, respectively.
3. The presence of AC voltage (approximately 9 volts or above) is indicated when both the red and green LEDs light and flicker (appearing yellow).

2I. Modular Line Testing

Lines terminated with a modular outlet can be tested for any or all tests provided by the 600LS test set. (See Figure 12)

Proceed by inserting the modular plug into the modular outlet to be tested. Select the line (1 or 2) to be tested with the three-position modular tester slide switch. Select the test function and proceed as described in the above paragraphs.

3. MAINTENANCE

Field maintenance is restricted to battery replacement only. This is done as follows: Slide back door off, remove battery and replace with a size 9 volt battery. When using talk battery supply, replace both size 9 volt batteries. (See Figure 13) If talk battery supply is not being used, only top battery is needed for all operations. A second, disconnected battery may be placed in the compartment as a spare.

Perform battery and operational test outlined in Section 2A.

NOTE: The polarity testing components of the 600LS test set require no field maintenance. No attempt should be made to replace faulty LEDs, cords, plugs or associated parts.

STATION GROUND TEST

The 600LS is capable of performing an additional special function for TESTING STATION GROUND providing CO battery is present at each outlet under test.

1. Place function switch in OFF position.
2. Place modular switch in Line 2 position (UP).
3. Insert modular cord in outlet.
4. Station Ground is present when red LED on Line 2 is lit.

NOTE: A positive test is verification of STATION GROUND present on the yellow conductor of standard four conductor wiring.