# CONTINUITY AND CROSS TESTS USING ITE-4251 AND ITE-4261A

CONTENTS



## 1. GENERAL INFORMATION

1.1 Description: This section describes the basic functions of the Rapidohm and Whistler test sets ITE-4251 and ITE-4261A respectively. It also outlines in general the methods of using them and the testing techniques involved.

## 2. ITE-4251 RAPIDOHM TEST SET

2.1 This set consists of two units, one a center scale ohmmeter which reads ohms to 48 volts battery or ground and the other. a continuity test circuit (H and L relays of Figure 1) arranged to automatically detect an incorrect condition on any one of a group of similar leads.

2.2 Ohmmeter Unit

2.21 As shown in Figure 1. the conductor under test is connected thru the meter to the midpoint of resistance networks. The meter scale is calibrated to read directly in ohms with SEL switch in position R or 1/10 of resistance value when in position Rx10.

2.3 Continuity Test Unit

2.31 The lead under test is connected thru the P1 winding of each relay in series to battery or ground at TB or TG key.

2.32 The negative biasing current thru the P2 winding of relay L is adjusted using knob L until relay L remains nonoperated. The negative biasing current thru P2 winding of relay H is adjusted with knob H until the relay just operates.

2.33 Adjusting Procedure

(a) In order to verify that the lead under test has the correct condition (resistance to battery or ground). turn SEL switch to position R or Rx10. The resistance will be indicated in ohms. Turn

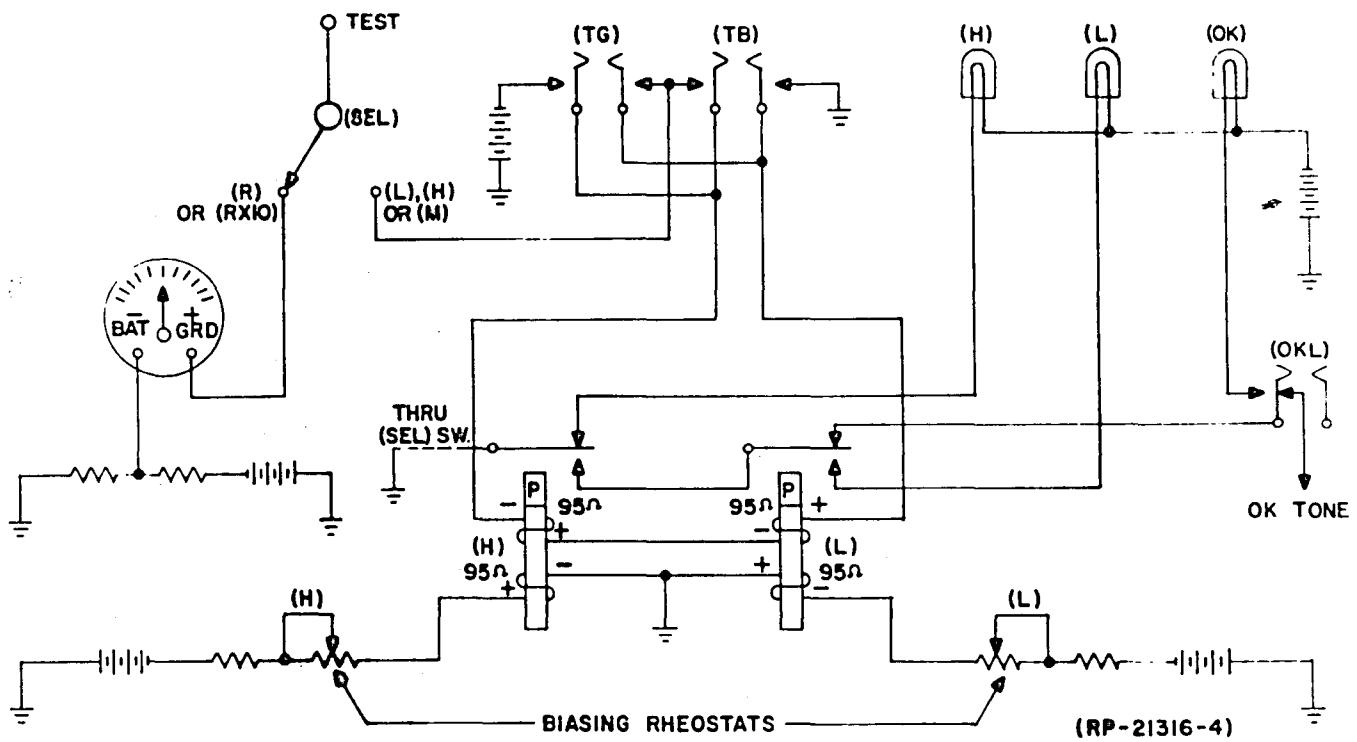


FIG. 1 SIMPLIFIED SCHEMATIC - RAPIDOHM TEST SET

SEL switch to position L, M or H. (Pos L for resistance up to 1500$^{W}$, M for 1500$^{W}$ to 2500$^{W}$, or H for 2500$^{W}$ to 3500$^{W}$) and proceed as follows:

(b) Turn knobs L and H to their extreme clockwise position. This sets the resistance at maximum or the biasing current at minimum. Lamp L will be lit. Turn L counterclockwise until L lamp goes out, OK lamp lights and OK buzzer is heard. (See Figure 1).

(c) Turn knob H counterclockwise until lamp H lights. Turn knob H clockwise until lamp H goes out and buzzer is again heard and OK lamp lights.

(d) Ordinarily the set is used to test circuits consisting of relay windings and resistances which vary ±5% or more. Therefore, the above adjustments should not be made too fine or the set will indicate trouble when the variations in similar leads is within the allowable limits.

(e) When lamp L or H lights during test. indicating a high or low resistance trouble. turn switch SEL to pos. R or Rx10 before looking for trouble. If the resistance is within limits, as indicated in the detailed test instruction, the negative bias circuits should be readjusted as described above.

(f) Special Notice: When testing circuits of less then 200 ohms, the negative biasing current in the P2 windings and the test current in the P1 windings of H and L relays will be very high so that the heat generated will increase the internal resistance. It will probably be necessary to readjust the set after about five minutes of testing.

## 3. ITE-4261A WHISTLER TEST SET

3.1 Description: This set is essentially an oscillator in which capacity to ground at the test terminal composes one leg of the circuit. The circuit starts oscillating when a probe attached to the whistler unit is connected to ground through a very low capacity, and the tone produced by the oscillator is reproduced in a small loud speaker. The pitch of the tone will vary with the capacity to ground, the higher the capacity the higher the pitch and vice versa.

3.11 All wiring and cable in a telephone office will have a certain amount of distributed capacity to ground and all wires of the same length and terminating on the same piece of equipment will have almost the same capacity. This factor is taken advantage of in the use of the Whistler Set, for when the set is connected successively to a number of similar leads the same tone will be produced in the loud speaker by each. If two of the leads are crossed, the capacity to ground will be doubled and a tone of much lower tone will be produced. If a wire is not terminated at one end (broken wire or loose connection), the capacity to ground will be less and a tone of higher pitch will result.

### 3.2 Pitfalls to be Avoided When Using Whistler Set

3.21 General: In any group of similar leads there may be slightly different conditions on some leads than on others. Therefore, in using the Whistler Set it is important that the operator becomes familiar with its operation. Before starting test of a group of similar circuits. make preliminary tests of several similar leads in more than one circuit so as to become familiar with the tone pitches on various leads where there are small variations in tone. Trouble conditions should also be simulated before starting the test. In all cases of actual trouble. such as a cross between leads, there will be a wide variation in tone that is readily detected. The following are a few of the circuits or conditions which will produce varying tones or will stop the tone entirely.

3.22 High Capacity to Ground: The Whistler is arranged to operate at a capacity which is well within the limits of the distributed capacity to ground of the shortest and longest wire or cable run to be tested in any installation. If. due to some abnormal condition. there is a high capacity on a lead. the Whistler set will fail to oscillate and no tone will be produced. Unless the capacity is too high. tone may be produced by turning up the volume control.

3.23 High Resistance Battery or Ground: The Whistler is a high impedance circuit and will not whistle if connected to battery or ground through resistance of several megohms. When high resistance leads occur. the set either produces a lower pitched tone than when connected to an OK lead or will stop whistling entirely. Only through practice with the instrument will the operator distinguish this condition from crossed leads.

NOTE: Crossed leads usually occur in pairs. Therefore. the most practical way to verify a group of leads is to test the entire group. indicate the leads showing trouble and then clear all trouble. An analysis of the trouble usually indicates pairs which are crossed.

3.24 Individual Leads of Varying Length: Ordinarily it is not practicable to use the Whistler set to detect crosses between leads which vary in length to the extent that the tone produced on the different leads varies greatly in pitch. However, when the tones produced by longest and shortest lead in the group are almost the same. a few preliminary tests during which troubles are simulated will enable the operator to recognize crossed leads.

3.25 Groups of Leads of Varying Length: In a crossbar office there are several groups of similar leads in which all or some leads of each group will be the same length whereas the different groups of leads may be of different lengths. For example, the junctors in a No. 5 office consist of 3 wires and the junctors from one line link frame are distributed over all trunk frames. The 3 wires of each junctor will be the same length and all wires of the same junctor, except the sleeve which is connected to battery thru hold magnets, should whistle at almost the same tone (see below). The junctors, however, will vary in length and, therefore, each group of leads will vary in tone, but crossed leads (of the same junctor or between junctors) produce such a great change in tone that the trouble is readily detected. Again the operator should make trial tests using several different junctors and should simulate trouble conditions to become familiar with OK and trouble tones before starting the test.

3.26 Variation of Tone in a Group of Similar Leads: In a group of wires connected to a switch vertical (for example links or junctors) or similar apparatus, the No. 0 wire which is nearest the framework may whistle at a slightly lower pitch than the other wires. After a few preliminary tests, the operator will become familiar with this condition. The variation in tone is very slight and crossed leads are readily detected.

3.27 Paired Conductors: When testing paired conductors and one of the pair is connected to resistance battery or ground, the mate conductor will produce a tone of lower pitch than other conductors of same length in same cable.

## 4. TESTING TECHNIQUES

### 4.1 Whistler Set

4.11 Plug Whistler Set cord into 110V AC outlet. Use 3-way adapter plug and connector clip to ground. Plug test pick cord into W-T jack and operate toggle switch to W.

NOTE: Set of early design coded ITE-4261 is not equipped with toggle switch and but one test terminal, T, is furnished.

4.12 Touch test pick to a terminal designated for test, and adjust tone to desired volume. Touch pick to each terminal, in turn. On all similar leads the tone should be at approximately the same pitch. However, the tone may vary between different groups of leads. A few practice tests will familiarize the operator with characteristic tone. Crossed leads of false continuity thru a relay contact will cause tone of much lower pitch than results from clear lead.

### 4.2 Rapidohm Set

4.21 Patch jack A of ITE-4251 to frame 48V jack. Patch test pick cord into jack TEST. Proceed as in (a) or (b).

(a) Testing Groups of Similar Leads: When several terminals have like potential and resistance terminations such as ±400 ohms, operate SEL switch to L, M or H and adjust bias as described in Paragraph 2.33. Touch pick to each lead, in turn, and observe audible buzzer. Operate toggle switch TB-TG to TB when testing leads connected to battery or to TG when testing leads connected to ground.

(b) Conditions Vary on Different Leads: Set SEL switch in position R. Touch test pick to each terminal, in turn, and observe meter reading.

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