

## NO. 2-A RELAY TEST TABLE FOR POLAR RELAYS DESCRIPTION AND APPLICATION

### 1. GENERAL

1.01 This section describes the No. 2-A relay test table which is used for applying the electrical requirements to the following types of polar relays.

No. 209-FA Relay.  
No. 215-A Relay.  
No. 228-A Relay.

1.02 The test circuit is so arranged, that by operating the various keys the proper conditions are set up for applying certain testing and adjusting procedures.

### 2. EQUIPMENT FEATURES

2.01 The testing equipment, consisting of keys, milliammeter, sounder, resistances, condensers and connecting blocks, is assembled on the relay test table. The table is shown in Figure 1.

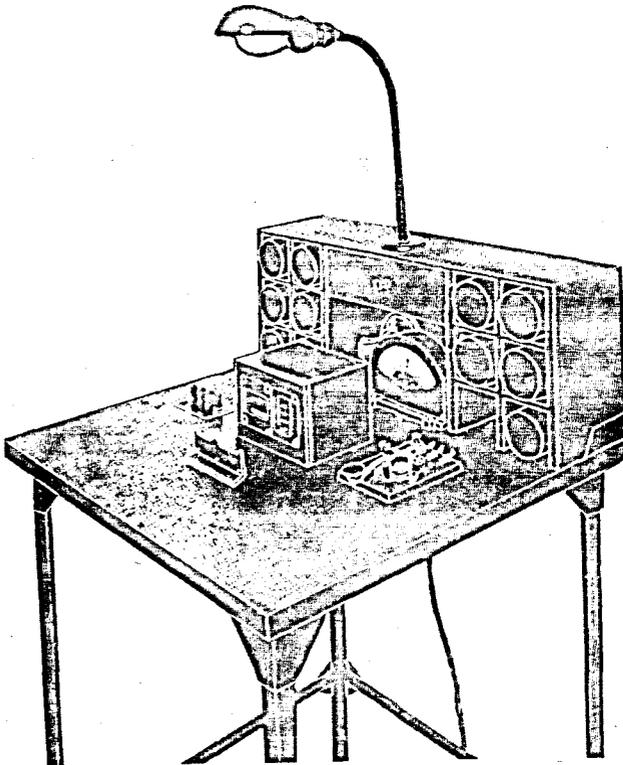


Fig. 1 - No. 2-A Relay Test Table.

2.02 A cabinet fastened on the rear of the table top is provided with storage space

for twelve relays, and has an adjustable lamp and a tool drawer.

2.03 Two connecting blocks mounted in a small cabinet on the table top are provided to accommodate the terminal blocks of the particular relays to be tested. The right-hand connecting block is used for the No. 209-FA relay, and the left-hand connecting block is used for the No. 215-A relay. For testing or adjusting a No. 228-A relay, at the relay test table, an adapter is required. Such an adapter is shown on American Telephone and Telegraph Company's Drawing 38-Y-2596. One side of the adapter fits into the left-hand connecting block provided on the table for No. 215-A relays and the other side is arranged to receive the No. 228-A relay.

2.04 The relay test table is provided with a support for the 209 and 215 type relays. This support is hinged so that it may be raised up under the relay after the relay has been inserted in the connecting block.

2.05 Four lever type keys and one pole changing key (telegraph key) for controlling the tests are mounted on the top of the test table.

2.06 A polarized sounder mounted on the table top, is provided to indicate the operation of the armature of the relay under test. The sounder is connected to the armature of the relay and responds to battery on the contacts of the relays.

2.07 A Weston Model 264 milliammeter with a 50-0-50 scale is provided to indicate whether the relay under test is in proper adjustment.

2.08 Spark killer circuits are provided across the contacts of the relays to protect the relay contacts from arcing and burning.

### 3. OPERATING FEATURES

3.01 When using the relay test table, the relay to be tested or adjusted is inserted into the proper connecting block.

3.02 The four lever type keys are operated to set up the proper circuit arrangement for the different relay tests and are arranged to function as follows:

(a) LINE key connects the line windings of the relay under test to the test circuit.

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(b) VIB key connects the vibrating windings of the relay under test to the test circuit and is used only for testing the No. 209-FA relays.

(c) SEN key connects the line windings of the relay under test together in series aiding for sensitivity test.

(d) DIFF key connects the line windings of the relay under test together in series opposing.

(e) KEY key connects 130 volt battery to the line windings of the relay under test through the pole changer key.

(f) REV key connects 20 cycle current to the line windings of the relay under test. When in the non-operated position, 20 cycle current is disconnected from the test circuit.

(g) BATT key controls the 130 volt battery to the test circuit. When in the non-operated position the 130 volt battery is disconnected from the test circuit.

3.03 The pole changer key (telegraph key with a switch) reverses the polarity of the 130 volt battery applied to the windings of the relay.

### 4. CIRCUIT FEATURES

4.01 The test circuit provides a sensitivity test for the Nos. 209-FA and 215-A relays only, a bias test for the various relays, and a vibrating test for the No. 209-FA relay only.

#### Sensitivity Test (Nos. 209-FA and 215-A Relays Only)

4.02 The sensitivity test, the circuit for which is shown in Figure 2, is employed to determine whether the pole-pieces are too close or too far from the armature. When the LINE, SEN, KEY and BATT keys are operated, a small current just sufficient to operate the relay is applied to the relay line windings in series aiding by operation of the pole changer key. With the pole changer key switch thrown to the right and the key unoperated, the needle of the milliammeter should show a deflection to the left. With the pole changer key depressed, the needle of the milliammeter should show a deflection to the right. If the pole-pieces are adjusted correctly, the relay will respond to the operation of the pole changer key.

#### Bias Test

4.03 When the LINE, SEN, REV, and BATT keys are operated, a 20 cycle current is applied to the line windings of the relay in series aiding, thus causing the armature to vibrate at this frequency. The armature is connected to the

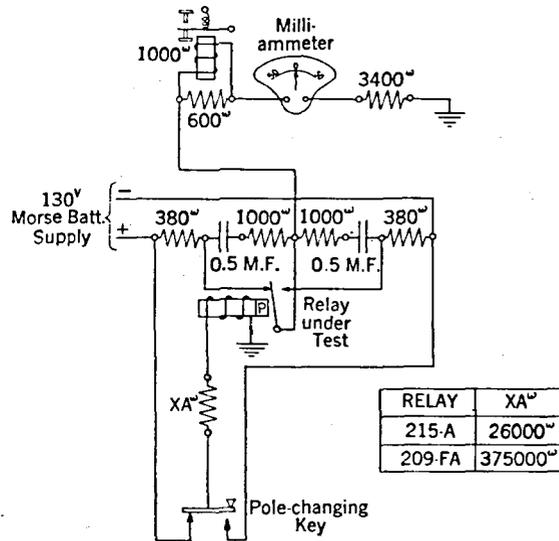


Fig. 2 - Sensitivity Test.

meter circuit in such a manner that when the armature remains on each contact for exactly the same length of time, the needle of the meter vibrates about mid-scale (zero). The circuit for this test is illustrated in Figure 3. If the needle vibrates either on the right or left of the mid-scale (zero) there is a bias in the relay due to improperly adjusted pole-pieces, contacts or armature.

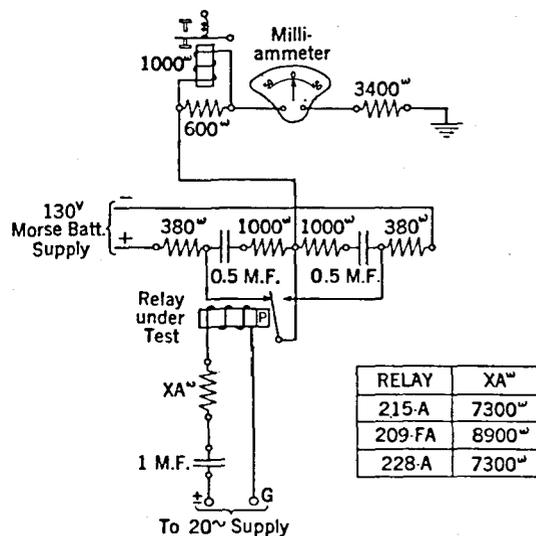


Fig. 3 - Bias Test.

#### Vibrating Test (No. 209-FA Relay Only)

4.04 The vibrating test, the circuit for which is shown in Figure 4, serves as a means for checking the position of the pole-pieces and contact travel. When the VIB, SEN, REV and BATT keys are operated, one of the vibrating windings

is connected through a 0.75 mf. condenser to ground and the other winding through a 12,000 ohm resistance is also connected to ground. The other ends of the windings are connected together and are connected to the relay armature through a 12,000 ohm resistance. When the armature is resting against a contact, a current is set up in the vibrating winding which is in series with the resistance in such a direction as to tend to move the armature from this contact. When the relay armature leaves the contact the condenser, which has been previously charged, discharges through both vibrating windings and resistance in series and tends to operate the armature towards the opposite contact. When the relay armature closes on the opposite contact, a charging current will flow through the windings in series with the condenser in such a direction as to tend to hold the relay operated in the new position and thus reduce contact chatter. When the current in the condenser branch is reduced to a value where the current in the resistance branch exceeds that in the condenser branch by an amount equal to the operating current, the relay armature should return to its initial position. If the pole-pieces of the relay are properly adjusted, the armature of the relay should continue to vibrate in this way at a frequency of approximately 20 cycles per second. The needle of the milliammeter should vibrate steadily and the center of vibration should coincide approximately with the center of vibration obtained during the bias test. The speed of vibration may be compared to the 20 cycle current

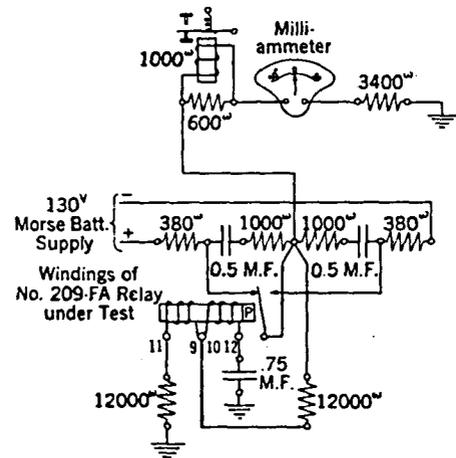


Fig. 4 - Vibrating Test.

by operating the LINE key, which causes the relay to operate by 20 cycle current, the settings of the other keys remaining unchanged. The sounder provides an audible means for comparing the speeds of vibration of the armature when operated by the vibrating current and 20 cycle current.

4.05 Drawing SD-63481-01 shows the complete circuit arrangement of the No. 2-A relay test table. Detailed circuit description will be found in the associated CD sheet.