

116A1 RELAY TEST PANEL FOR POLAR RELAYS DESCRIPTION AND APPLICATION

1. GENERAL

1.01 This section describes the 116A1 relay test panel used for applying electrical test and readjust requirements to the following types of polar relays:

209FB	215A
209FC	215H
209FH	255A
209FJ	

1.02 This section is reissued to add the following relays to the list which may be tested by this panel: 209FH, 209FJ, 215H and 255A. The new issue also covers a change in designations for the test panel keys and brings them in line with the designations used for other types of relay test panels.

1.03 The test circuit is so arranged, that by operating the various keys, the proper conditions are set up for applying the testing and adjusting procedures for a bias test, a sensitivity test and a contact test.

2. EQUIPMENT FEATURES

2.01 The testing equipment, consisting principally of lever type keys, a Weston Model 269 milliammeter per KS-7419, connecting block, and a number of resistances, is assembled on a steel panel and arranged to mount on a standard 23-inch relay rack bay. Fig. 1 shows the front of the panel.

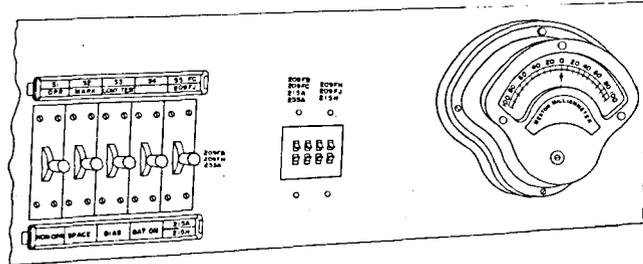


Fig. 1 - Front of 116A1 Panel

2.02 The No. 18B connecting block is provided to accommodate the relays to be tested or adjusted on the relay test panel.

3. OPERATING FEATURES

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

3.02 The lever type keys are operated in various combinations as required by the tests to be applied. The functions of these keys as indicated by their designations are as follows:

(a) Key S5 is operated to set up the proper circuit for the particular relay to be tested. The position designations are:

Up - 209FC	Normal - 209FB	Down - 215A
209FJ	209FH	215H
	255A	

as indicated in Fig. 1.

(b) Key S4 applies 48-volt battery to the test circuit when operated to the BAT ON position.

(c) Key S3 is used for making the bias test and the contact test. (Figs. 2 and 4) When operated to the BIAS position this key connects 20-cycle current to the windings of the relay causing the relay armature to vibrate at approximately 20 cycles per second. A circuit containing a zero-center meter is connected to the contacts of the relay to indicate the per cent bias. If the needle vibrates either on the right (marking) or left (spacing) side of zero, there is bias in the relay. When operated to the CONT TEST position this key connects 20-cycle current to vibrate the armature as in the bias test, but the meter circuit is rearranged so that the relay contacts short-circuit the meter when either the S or M contact is made. The meter indication is to the right side always and it shows the relative portion of the time during

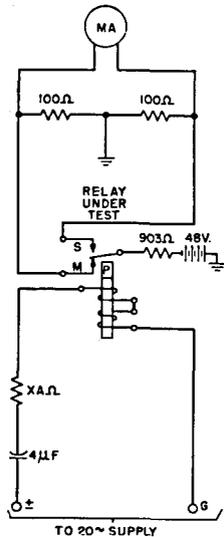
which neither contact is closed because of travel time, dirty or poor contacts and contact chatter.

(d) Key S2 is simply a reversing switch for the sensitivity test (Fig. 3). In the sensitivity test "soak", "operate" and "non-operate" values of current are furnished to the relay windings which are connected series-aiding. When key S2 is operated to MARK the "operate" current tends to move the relay armature to the M contact. When key S2 is operated to SPACE the relay windings are reversed so that the same current tends to move the relay armature to the S contact. With key S2 in the normal position the circuit to the relay windings is open.

(e) Key S1 is used to set up the circuits to provide the proper values and direction of current for the "soak" "operate" and "non-operate" tests (Fig. 3). When key S1 is normal (and key S2 operated, to SPACE, for example), "soak" current is applied in a direction to move the relay armature to contact M. When key S1 is held to the OPR position, the polarity of the connections to the relay is reversed and a much weaker "operate" current is applied which should move the relay armature to contact S. When key S1 is held to the NON-OPR position a still weaker "non-operate" current is applied to the relay windings. The armature should not be operated and should remain on contact M.

3.03 Generally the bias test, sensitivity test and contact test should be made in this order although alternate bias and sensitivity tests are often desirable.

CIRCUIT FEATURES
100-U-100



RELAY	XAΩ	CURRENT * MA
209FC 209FJ	8600Ω	16.51
209FB 209FH 255A	28,600Ω	5.13
215A 215H	8600Ω	16.51

* PEAK VALUES

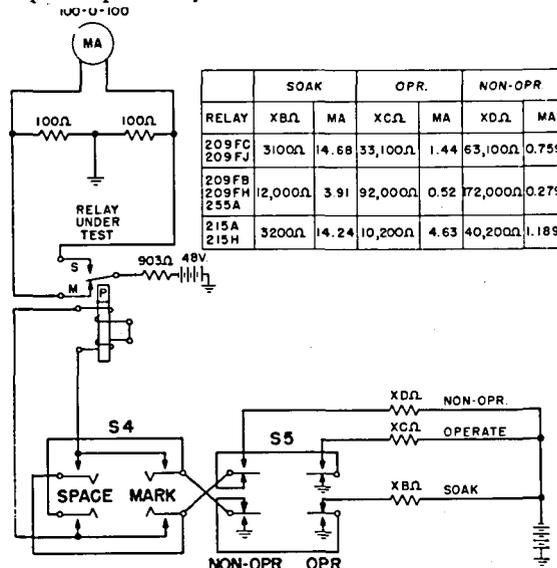
Fig. 2 - Bias Test

4.01 Bias Test

(a) Position of Keys

Key S5 to code of relay under test.
Key S4 to BAT ON.
Key S3 to BIAS.
Key S2 Normal.
Key S1 Normal.

(b) In the bias test a predetermined value of 20-cycle current is applied to the windings of the relay (all windings connected in series) thus causing the relay armature to vibrate at this frequency (Fig. 2). The meter, which indicates the bias of the relay, is connected between the contacts M and S so that, if the armature rests on contact M for the same length of time that it rests on contact S, the meter needle vibrates at mid-scale (zero). If the armature operates unsymmetricaly so as to rest longer on contact M, for example, the meter indicates to the right of zero or marking bias. For the opposite condition, the meter will indicate to the left of zero or spacing bias. The meter scale is 100-0-100 so that the readings indicate directly the per cent bias at 20 cycles per second. Any bias in the relay is generally due to causes such as improperly adjusted pole-pieces, contacts or armature.



RELAY	SOAK		OPR.		NON-OPR	
	XBΩ	MA	XCΩ	MA	XDΩ	MA
209FC 209FJ	3100Ω	14.68	33,100Ω	1.44	63,100Ω	0.759
209FB 209FH 255A	12,000Ω	3.91	92,000Ω	0.52	72,000Ω	0.279
215A 215H	3200Ω	14.24	10,200Ω	4.63	40,200Ω	1.189

Fig. 3 - Sensitivity Test

4.02 Sensitivity Test. The sensitivity test circuit shown by Fig. 3 is employed to determine if the mechanical adjustments of the pole-pieces and armature and contacts are such as to give the desired sensitivity of operation of the relay. To make this test "soak", "operate" and "non-operate" values of current are furnished to the relay windings which are connected series-aiding.

(a) Position of Keys

Key S5 to code of relay under test.
 Key S4 to BAT ON.
 Key S3 Normal.
 Key S2 to SPACE.
 Key S1 (Non-locking) held first to OPR and then to NON-OPR.

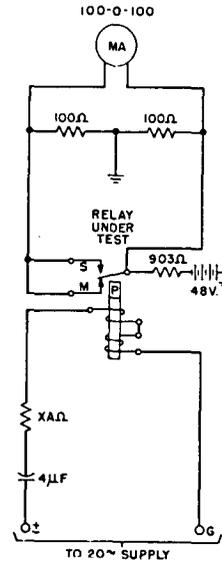
(b) With the keys set as above except for key S1 which is still normal, a "soak" current is applied to the relay windings which approximates the value experienced in normal use and holds the relay armature on its marking contact.

(c) When key S1 is held to the OPR position, a much lower value of current in the opposite direction to that of the "soak" current is applied to the relay windings which should move the armature from mark to space.

(d) When key S1 is held to the NON-OPR position, the previous value of "soak" current is again applied as the key passes through its normal position and then a value of current lower in value but in the same direction as the operate current is applied to the relay windings and this current should not move the armature.

(e) If the relay fails to respond when key S1 is operated to OPR, it is an indication that either or both of the pole-pieces are too close to the armature or that the armature travel is too large. If the relay responds when the key is operated to NON-OPR, either or both of the pole pieces are not close enough to the armature or the armature travel is too small. Since the armature travel is usually set mechanically to the proper value before this test is made, the test is essentially an indication of the proper setting of the pole-pieces.

(f) The above sensitivity tests (c), (d) and (e) should be repeated with key S2 operated to MARK. Conditions are the same as described above except that the directions of current flow in the relay windings has been reversed. The "soak" current will hold the armature to the S contact and the operate current will tend to move the armature from the S to the M contact.



RELAY	X A Ω	CURRENT * MA
209FC 209FJ	8600Ω	16.51
209FB 209FH 255A	28,600Ω	5.13
215A- 215H	8600Ω	16.51

* PEAK VALUES

Fig. 4 - Contact Test

4.03 Contact Test(a) Position of Keys

Key S5 to code of relay under test.
 Key S4 to BAT ON.
 Key S3 to CONT TEST.
 Key S2 Normal.
 Key S1 Normal.

(b) The circuit for the contact test is illustrated in Fig. 4. It will be seen from this figure, that if the armature remains on either contact, the meter is short-circuited and the needle of the meter will stand at mid-scale (zero). If the armature remains in the middle and does not touch either one of the contacts, ground and battery are connected to the meter with the proper amount of resistance to cause the needle of the meter to deflect full-scale. When 20-cycle current is applied to the windings of the relay the armature vibrates at this frequency. If the relay is properly adjusted as to pole-gap and contact separation and has no armature chatter nor dirty contacts, the needle should indicate a value which is within the maximum allowable deflection established for the type of relay being tested. If the indication of the needle of the meter exceeds the maximum allowable deflection the relay is not in proper condition.

4.04 Drawing SD-63605-01 shows the complete circuit arrangement of the 116A1 relay test panel. The corresponding equipment drawing is ED-61144-011 and 012.