RELAYS

NOS. 209FA, 209FB, 209FC, 209FG, 209FH, 209FJ, 215A, 215H, 228A, 255A, AND MODIFIED NO. 228A PER D-160118 USING THE NO. 111A1 OR NO. 111A2 RELAY TEST PANEL

REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the electrical requirements for the Nos. 209FA, 209FB (D-91711), 209FC (D-92651), 209FG, 209FH, 209FJ, 215A or 215H, 228A, 255A, and modified No. 228A per D-160118 relays using the No. 111A1 or No. 111A2 relay test panel.

1.02 The section is reissued primarily to revise the contact requirement. Detailed reasons for reissue will be found at the end of the section.

1.03 Any adjustments due to failure to meet the requirements outlined in this section shall be made in accordance with the procedures covered in sections applicable to the relay.

1.04 When testing 209- and 215-type or modified No. 228A per D-160118 relays not equipped with tungsten contact screws, the contact test shall be made first in order that the low voltage used in this test can give a reliable indication of the contact condition. If other tests are made before the contact test, the higher voltage used on these tests may temporarily break down a poor or dirty contact condition. When testing 228-type relays, except the D-160118, the bias test shall be made before the contact test.

1.05 Only one relay shall be plugged into the test panel connecting blocks while test or adjustments are being made. All other relays shall be kept at least 12 inches from the relay under test or adjustment, if practical. All electrical test requirements shall be applied with the relay cover in place.

1.06 In order to prevent improper relay adjustment due to improper testing current, care should be taken that the correct relay selection key is operated and that only one of these keys is in the operated position at a time, except as specified in 2.02(b)(2) and 4.06.

1.07 The requirements and procedures given in this practice assume that the relay to be tested has been plugged into the connecting block on which the designation corresponds to the code of the relay and the operation of the selection key on which the designation corresponds to the code of the relay. Unless otherwise stated all other keys shall be normal.

Note: The Nos. 209FG, 209FH, 209FJ, and 215H relays are the same as the Nos. 209FA, 209FB, 209FC, and 215A relays, respectively, except that they are equipped with tungsten contacts. In the No. 111A1 test panel, 255-type relays are tested with the same key as the Nos. 209FB and 209FH relays.

1.08 In this section the requirements are specified in terms of meter scale readings. A reading of zero is midscale and a reading of 100 is full scale.

1.09 The modified No. 228A relay per D-160118 shall be tested and readjusted only in a No. 111A2 relay test panel.

2. REQUIREMENTS

2.01 Contact: When the keys on the test panel are operated as shown in Table A or B, the needle of the milliammeter shall indicate a value on the scale to the right of zero (midscale) and this value shall be equal to or less than the reading given in the table. Table A shall be used for relays equipped with tungsten contacts. Table B shall be used for all other relays.

TABLE A

† FOR RELAYS EQUIPPED WITH TUNGSTEN CONTACTS

Relay Under Test	Operated Position of Keys		†† Requirements in Meter Scale Readings Readj Only
	Test	Bat.	
209FG	CONT TEST	ON	††† 25
209FH	CONT TEST	ON	25
209FJ	CONT TEST	ON	25
215H	CONT TEST	ON	15
228A	CONT TEST	ON	20
255A	CONT TEST	ON	20
D-160118	CONT TEST	ON	20

† Where the contact screw is equipped with tungsten contact metal, the letter W or T is stamped on the head of the screw.
†† See 1.08.
††† In those cases where the No. 209FG relay has a 0.002-inch contact travel adjustment, such as multiple senders, the meter scale reading shall be 14 readjust.

TABLE B

FOR RELAYS NOT EQUIPPED WITH TUNGSTEN CONTACTS

Relay Under Test	Operated Position of Keys		† Requirements in Meter Scale Readings
	Test	Bat.	Test & Readj
209FA	CONT TEST	ON	†† 25
209FB	CONT TEST	ON	25
209FC	CONT TEST	ON	25
215A	CONT TEST	ON	15
228A	CONT TEST	ON	20
D-160118	CONT TEST	ON	20

† See 1.08.
†† In those cases where the No. 209FA relay has a 0.002-inch contact travel adjustment, such as multiple senders, the meter scale reading shall be 14 test and readjust.

2.02 Bias

(a) 209-, 215-, and 255-type and Modified No. 228A per D-160118 Relays: When the keys on the test panel are operated as shown in Table C, the needle of the milliammeter shall vibrate steadily and the center of vibration shall not exceed the readings given in Table C. On the No. 111A2 test panel, the vibration is barely perceptible.

TABLE C

Relay Under Test	Operated Position of Keys		† Requirements in Meter Scale Readings	
	Bat.	Test	Test	Readj
209FA	ON	BIAS	2	ZERO
209FB	ON	BIAS	2	ZERO
209FC	ON	BIAS	2	ZERO
209FG	ON	BIAS	2	ZERO
209FH	ON	BIAS	2	ZERO
209FJ	ON	BIAS	2	ZERO
215A	ON	BIAS	4	ZERO
215H	ON	BIAS	4	ZERO
255A	ON	BIAS	2	ZERO
D-160118	ON	BIAS	2	ZERO

† See 1.08.

(b) 228-type Relays Except D-160118

(1) When the keys on the test panel are operated to the ON and BIAS positions, it shall be possible by means of the biasing screw, where provided, to obtain a continuously increasing deflection of the milliammeter needle toward the left when the biasing screw is turned toward SPACE and toward the right when the biasing screw is turned toward MARK. This adjustment shall permit a deflection up to a meter scale reading of 20 (test) and 25 (readjust) on both sides of zero. After this test, the biasing screw shall be returned to its central position so that the milliammeter needle vibrates at zero.

(2) Pole-piece Screw Clearance (Readjust Only): With the keys marked 215A and 228A operated together with the keys operated in (1), the armature shall not strike against either pole-piece screw as determined audibly when the bias test is zero with the 228A key alone operated.

2.03 Sensitivity (Readjust Only): With the keys operated as shown in Table D, the relay shall meet the operate and the non-operate requirements imposed by the test panel. Gauge by the electrical indications shown on the milliammeter as covered in Table D. Sensitivity requirements are waived for 228-type relays, except the modified No. 228A per D-160118.

TABLE D

Sequence of Check	Operated Position of Keys		† Requirements in Meter Scale Readings
	Bat.	Adj	
1	ON	SPACE	FULL SCALE - RIGHT
2	ON	SPACE	
	OPR		FULL SCALE - LEFT
3	ON	SPACE	FULL SCALE - RIGHT
4	ON	SPACE	
	NON OPR		†† FULL SCALE - RIGHT
5	ON	MARK	FULL SCALE - LEFT
6	ON	MARK	
	OPR		FULL SCALE - RIGHT
7	ON	MARK	FULL SCALE - LEFT
8	ON	MARK	
	NON OPR		†† FULL SCALE - LEFT

† See 1.08.
†† With a No. 215A or No. 215H relay the reading for checks 4 and 8 may be zero.

3. PROCEDURES FOR APPLYING TEST REQUIREMENTS

3.01 Before applying the following electrical test requirements the relay shall have passed a visual contact inspection as covered in the section applicable to the relay under adjustment. All electrical tests shall be made with the cover in place.

3.02 The procedures covered below should be followed to determine whether the relay is satisfactory for service. The test requirements covered in 2.01 and 2.02 are associated with these procedures.

3.03 All keys on the test panel should be in their normal positions before plugging the relay into the test panel connecting block and starting the tests.

209-, 215-, and 255-type and Modified No. 228A per D-160118 Relays

3.04 Plug the relay to be tested, without removing the cover, into the connecting block on which the designation corresponds to the code of the relay under test.

3.05 Operate the key on which the designation corresponds to the code of the relay.

Contact

3.06 Operate the CONT TEST key. Operate the BAT key to the ON position and observe the milliammeter. The milliammeter needle should indicate a value on the scale and should meet the test requirements covered in 2.01, Table B.

Note: It is important that the keys should be operated in the sequence given above. If the BAT key is operated first the higher voltage impressed on the contacts may temporarily break down a poor or dirty contact condition.

3.07 Upon completion of the contact test restore the CONT TEST key to normal.

Bias

3.08 Operate the BAT key to the ON position if not already operated. Operate the BIAS key. The milliammeter needle should vibrate steadily and should meet the test requirements covered in 2.02. On the No. 111A2 test panel, the vibration is barely perceptible. The meter indicates SPACING bias when the needle deflection is to the left of zero and MARKING bias when the deflection is to the right of zero.

3.09 Tap the relay cover lightly with the handle of a screwdriver and note any change in the reading of the meter. If a change in reading is observed it may be due to magnetic particles on the pole pieces or to loose assembly of the relay.

3.10 Upon completion of the bias test restore all test set keys to normal.

228-type Relays Except D-160118

Bias

3.11 Plug the relay to be tested, without removing the cover, into the connecting block on which the designation corresponds to the code of the relay under test.

3.12 Operate the key on which the designation corresponds to the code of the relay.

3.13 Operate the BIAS key and operate the BAT key to the ON position. The milliammeter needle should vibrate steadily and should meet the test requirements covered in 2.02(a). On the No. 111A2 test panel, the vibration is barely perceptible. The meter indicates SPACING bias when the needle deflection is to the left of zero and MARKING bias when the deflection is to the right of zero.

3.14 Tap the relay cover lightly with the handle of a screwdriver and note any change in the reading of the meter. If a change in reading is observed it may be due to magnetic particles on the pole pieces or to loose assembly of the relay.

3.15 Upon completion of the bias test restore the BIAS key to normal.

Contact

3.16 Operate the CONT TEST key. The milliammeter needle should indicate a value on the scale and should meet the test requirements covered in 2.01, Table B.

3.17 Upon completion of the contact test restore all test set keys to normal.

4. PROCEDURES FOR APPLYING READJUST REQUIREMENTS

4.01 The procedures covered below should be followed only when the relay fails to meet its test requirements.

4.02 Check to see that the mechanical requirements as covered in sections applicable to the relay under adjustment are met.

4.03 All keys on the test panel should be in their normal position before checking readjust requirements.

4.04 Operate the key on which the designation corresponds to the code of the relay. Where there is no designation for the D-160118 relay, the key for the 228-type relay shall be used.

Bias

4.05 Operate the BIAS key. Operate the BAT key to the ON position. The milliammeter needle should vibrate steadily and should meet the readjust requirements covered in 2.02(a) or (b)(1). On the No. 111A2 test panel, the vibration is barely perceptible.

4.06 Pole-piece Screw Clearance: When readjusting 228-type relays except the D-160118, operate the Nos. 215A and 228A keys. The armature shall not strike either pole-piece screw as specified in 2.02(b)(2) when the regular bias test, made with the No. 228A key alone operated, is zero.

4.07 Upon completion of the bias adjustment restore the BIAS key to normal. Also restore the No. 215A key to normal, if operated in 4.06.

Sensitivity

4.08 Operate the MARK SPACE key to the SPACE position. The meter needle should show a deflection of approximately full scale to the right.

4.09 Operate the OPR NON-OPR key to the OPR position and hold it operated. The meter needle should show a deflection of approximately full scale to the left.

4.10 Release the OPR NON-OPR key. The meter needle should show a deflection of approximately full scale to the right.

4.11 Operate the OPR NON-OPR key to the NON-OPR position and hold it operated. The meter needle deflection to the right should not change when a 209- or 255-type or D-160118 relay is being tested. In the case of a 215-type relay with the correct mechanical adjustments, the meter needle should show a deflection of approximately full scale to the right or zero (midscale). Release the OPR NON-OPR key.

4.12 Operate the MARK SPACE key from the SPACE position to the MARK position. The meter needle should show a deflection of approximately full scale to the left. Repeat the tests described in 4.09 to 4.11. The meter needle deflections for this series of tests will be in the opposite direction from those given in the paragraphs above. Adjustments should be made, as required, until the relay meets the requirements in 2.03.

4.13 Upon the completion of the sensitivity adjustment, restore the MARK SPACE key to normal.

4.14 If adjustments have been made to meet the sensitivity requirements, repeat the check for bias as covered in 4.05 to 4.07 inclusive and if necessary make further adjustments. If further adjustments are made repeat the check for sensitivity as covered in 4.08 to 4.13.

Contact

4.15 Operate the CONT TEST key. The milliammeter needle should indicate a value on the scale and should meet the readjust requirements covered in 2.01. Release the CONT TEST key.

Final Check

4.16 Upon the completion of readjustments remount the relay cover and check that all readjust requirements are met.

4.17 Upon completion of the final check restore all test set keys to normal.

REASONS FOR REISSUE

1. To amplify the selection key information for 255-type relays when using the No. 111A1 relay test panel (1.07).
2. To revise the information regarding requirements being specified in terms of meter scale readings (1.08).
3. To revise the contact requirement (2.01).
4. To amplify a procedure for applying test requirements for bias (3.08).
5. To amplify a procedure for applying readjust requirements (4.04).