

## RELAYS

### 59, 105, AND 108 TYPES

### REQUIREMENTS AND ADJUSTING PROCEDURES

#### 1. GENERAL

- 1.01 This section covers 59-, 105-, and 108-type relays.
- 1.02 This section is reissued to add the 59-type relay, to add information covering the effect of covers on requirements, and to bring the text and the list of tools and gauges up to date.
- 1.03 Reference shall be made to Section 020-010-711 for additional information necessary for the proper application of the requirements listed herein.
- 1.04 Operate: A relay is said to operate if, when the operate current is applied, the armature moves sufficiently to break the back contact and make the front contact reliably.
- 1.05 Nonoperate: A relay is said to non-operate if, when the specified non-operate current is applied, the armature does not break the back contact or make the front contact.
- 1.06 Hold: A relay is said to hold if, when the current is reduced abruptly from the operate to the hold value, the armature does not move from its operated position sufficiently to break the contact which has been made or to make the contact which has been broken.
- 1.07 Release: A relay is said to release if, when the current is reduced from the soak, operate, or hold value to the release value, the armature moves from the operated position sufficiently to break the contact that has been made, and reliably make the contact that has been broken.

#### 2. REQUIREMENTS

- 2.01 Cleaning: The contacts and other parts shall be cleaned, when necessary, in accordance with Section 069-306-801.
- 2.02 Relay Mounting: Relays shall be mounted securely and approximately level.
- Gauge by eye and feel.
- This shall be checked by applying a vertical and a horizontal pressure to the relay and not by attempting to turn the relay.
- 2.03 Tightness of Relay Cover: The cover shall be easily removable with the fingers.
- Gauge by feel.

#### 2.04 Front Contact Spring Position:

- ← Fig. 1 (A) - The front contact spring shall rest firmly against the spoolhead at least near the contact end.

Gauge by feel.

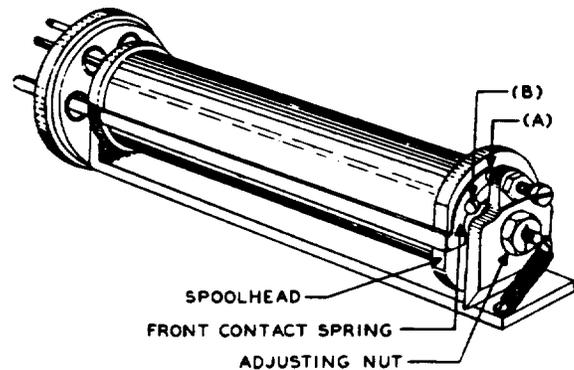


Fig. 1 - 59-, 105- and 108-type Relays  
(Cover removed)

#### 2.05 Tightness of Front Contact Spring Screw:

- Fig. 1 (B) - The front contact spring screw shall be sufficiently tight to hold the front contact spring in the adjusted position.

Gauge by feel.

- 2.06 Contact Alignment: Fig. 2 (A) - Contacts shall line up so that the point of contact falls wholly within the circumference of the opposing contact disc.

Gauge by eye.

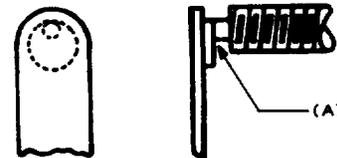


Fig. 2 - Alignment of Point and Disc Contacts

- 2.07 Armature Movement: The armature shall not bind or ride on the top of the pin in the armature slot and shall clear the adjusting stud and the tangs of the armature backstop bracket.

Gauge by eye and feel.

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2.08 Tightness of Locknuts: Figs. 3 (C) - The locknuts shall be sufficiently tight to hold the screws in the adjusted position.

Gauge by feel.

2.09 Tightness of Adjusting Nut: Fig. 3 (B) - The adjusting nut shall be sufficiently tight to hold the armature in any adjusted position.

Gauge by feel.

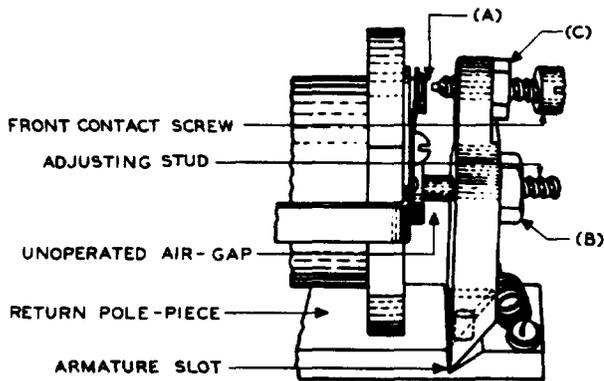


Fig.3 - Relay With Feather Contact Spring

2.11 Feather Contact Spring Position: (108-A Relay Only) - Fig. 5 (A) - The feather contact spring shall rest against the turned over portion of the front contact when it is not engaged by the front contact screw.

Gauge by eye.

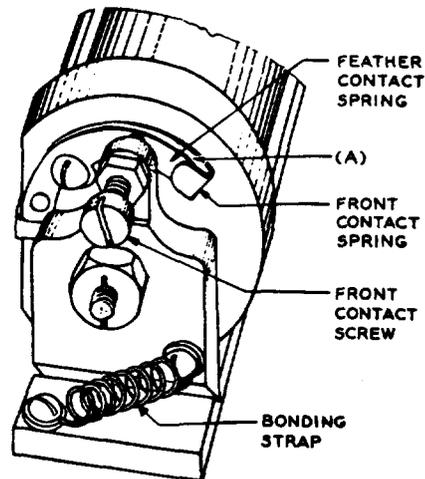


Fig. 5 - Relay With Feather Contact Spring

2.10 Contact Separation: Fig. 3 (A)

(a) The separation between any pair of contacts normally open or between any pair of contacts that are opened when the relay is operated shall be

Min 0.003 in.

Use the No. 67G gauge (part of 66D thickness gauge nest).

(b) It is desirable in readjusting to work to this limit.

(b) The electrical requirements shall be met with the cover either on or off since the cover has only a slight effect on the adjustment. However, if it is checked and the requirements are not met with the cover on, the relay shall not be considered as failing to meet the requirements unless it also fails with the cover off.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, Test Apparatus, and Material

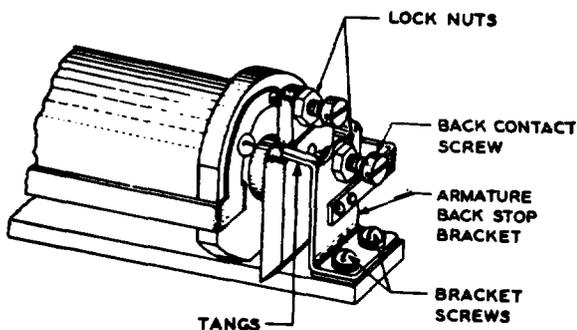


Fig. 4 - Relay With Armature Backstop Bracket

Code or Spec No.	Description
<u>Tools</u>	
102	3/8-in Hex. Single-end Socket Wrench
221	Combination 3/16-in. and 5/16-in. Hex. Single-end Socket Wrenches and 3-1/2-in. Screw-driver
350	Spring Adjuster
-	6-1/2-in P-long-nose Pliers
<u>Gauges</u>	
→66D	Thickness Gauge Nest

Code or  
Spec No.                      Description

Test Apparatus

35-type                      Test Set

Material

-                              Hardwood Toothpicks, flat at one end and pointed at the other.

3.002 In order to make some of the adjustments contained herein, it may be necessary to remove the relay from the frame. Use the No. 102 wrench to remove the relay mounting nut. ↗

3.01 Cleaning (Rq 2.01)

(1) Clean the contacts and other parts in accordance with Section 069-306-801. ↘

3.02 Relay Mounting (Rq 2.02)

(1) To tighten loose mounting nuts, use the No. 102 wrench. Do not fasten the mounting nut too tightly as otherwise undue pressure will be exerted on the fiber insulators and the threads of the mounting stud may be stripped. It is particularly important that these relays be mounted approximately level (as regards the armature knife edge).

(2) If the mounting nut is tight but the coil is loose, remove the relay from the mounting plate. Then tighten the nut on the mounting stud, which holds the pole piece to the core at the rear of the relay, with the No. 102 wrench. At the same time align the contacts by shifting the coil and pole piece.

3.03 Tightness of Relay Cover (Rq 2.03)

(1) Since failure of the relay to function properly may be due to the cover being on too tight, thereby twisting the relay structure, exercise care in replacing the cover not to put it on so tight that it cannot be easily removed with the fingers. Do not use any tool to tighten the cover.

3.04 Front Contact Spring Position (Rq 2.04)

3.05 Tightness of Front Contact Spring Screw (Rq 2.05)

(1) Front Contact Spring: To position the front contact spring against the spoolhead, first tighten the contact spring screw, if loose, with the KS-6854 3-1/2-inch screwdriver (part of the 221 combination tool). If this does not correct the trouble, loosen the screw sufficiently to permit the insertion of the No. 350 spring adjuster between the front contact spring and the spoolhead so that its forked end spans the screw. Tighten the screw and then force the front contact spring towards the spool-

head by applying pressure to the end of the spring with the KS-6854 screwdriver applied as shown in Fig. 6. Exercise care to place the screwdriver on the tip of the spring and not on the contact so as to prevent marring the contact. Loosen the screw, remove the spring adjuster, and then tighten the screw securely. In tightening this screw, press the front contact spring against the spoolhead adjacent to the head of the screw, in order to relieve the tension against the screwhead, while tightening, to prevent stripping of the threads in the spoolhead.

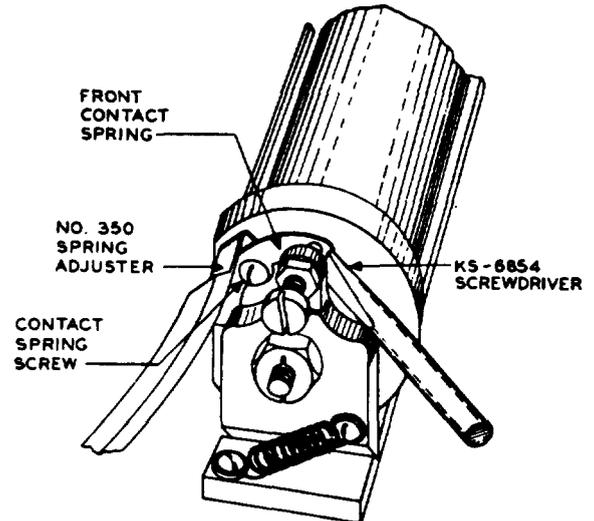


Fig. 6 - Method of Adjusting the Front Contact Spring

(2) Tightness of Front Contact Spring Screw: To tighten this screw, use the KS-6854 screwdriver, and at the same time, align the front contacts as outlined in 3.06.

3.06 Contact Alignment (Rq 2.06)

(1) Front Contacts: To align the front contacts, loosen the front contact spring screw with the KS-6854 screwdriver and shift the spring. Tighten the screw securely.

(2) Back Contacts: To align the back contacts, loosen the armature backstop bracket screws with the KS-6854 screwdriver and shift the bracket. Tighten the screws securely.

(3) An attempt should be made to center the contacts.

3.07 Armature Movement (Rq 2.07)

(1) Tangs: If the armature does not clear the tangs of the armature backstop bracket, adjust them with the 6-1/2-inch P-long-nose pliers until the armature moves freely.

(2) Centering Pin and Armature Slot: If the armature clears the tangs but still does not move freely, it may be due to the centering pin located in the armature slot being bent, or to burrs in the slot in the armature. Ordinarily, it will not be necessary to remove the armature to inspect the knife edge. If it is defective, proceed as follows. If the relay is equipped with a bonding strap, remove the screw which fastens it to the armature, using the KS-6854 screwdriver. Then remove the adjusting nut with the No. 219 socket wrench (part of the 221 combination tool) or swing the armature backstop bracket out of the way by removing one of the armature backstop bracket screws, using the KS-6854 screwdriver.

(3) If the centering pin is bent, straighten it with the long-nose pliers. Note that the slot in the armature that clears the pin and the knife edge of the armature is not burred. Do not remove burrs by filing or other means as this injures the finish which protects the parts from corrosion.

(4) It is advisable at this time to thoroughly clean the armature and armature slot as outlined in 3.01.

(5) Reassemble the parts and tighten all screws securely. Align the back contacts at the same time as outlined in procedure 3.06.

(6) Adjusting Stud: If the armature does not clear the adjusting stud, straighten it by grasping the adjusting nut with the long-nose pliers and then twisting as required.

### 3.08 Tightness of Locknuts (Rq 2.08)

(1) To tighten loose locknuts, use the No. 220 wrench (part of 221 combination tool), holding the screw in position with the KS-6854 screwdriver.

### 3.09 Tightness of Adjusting Nut (Rq 2.09)

(1) If the adjusting nut is too loose, remove it, using the No. 219 wrench and then close up the slot in the nut with the long-nose pliers. Replace the nut on the stud.

### 3.10 Contact Separation (Rq 2.10)

### 3.11 Feather Contact Spring Position (Rq 2.11)

### 3.12 Electrical Requirements (Rq 2.12)

(1) If the relay fails to meet the electrical requirements, proceed as follows.

(2) Operated Position of Armature: With the release current connected continuously to the proper winding or windings of the relay as specified on the circuit requirement table, apply the soak current or, if

no soak current is specified, apply the operate current. Loosen the locknut on the front contact (or stop) screw slightly with the No. 220 wrench and turn the front contact screw in a counterclockwise direction with the KS-6854 screwdriver to a point where the armature sticks when the soak or operate current is released. Again apply the soak or operate current and turn the front contact (or stop) screw slightly in a clockwise direction until it has reached a point where the armature just releases when the soak or operate current is released. Then turn the front contact (or stop) screw a very slight amount (approximately 1/16 of a turn) further in a clockwise direction and tighten the locknut.

### (3) Unoperated Position of Armature (Contact Separation): With the locknut on the

back contact (or stop) screw (when the relay is so equipped) slightly loosened with the No. 220 wrench, turn the back contact (or stop) screw in a clockwise direction with the KS-6854 screwdriver or the adjusting nut in a clockwise direction with the No. 219 wrench until the front contact screw just touches the front contact with the 0.003-inch blade of the 67G gauge inserted between the armature and the back contact (or stop) screw or adjusting nut. This should allow a clearance between the front contact and the screw of at least 0.003-inch. Retighten the locknut and check to make sure the relay meets all electrical requirements. This adjustment may also be made as follows. With the locknut on the back contact (or stop) screw (when the relay is so equipped) slightly loosened with the No. 220 wrench, turn the back contact (or stop) screw in a clockwise direction with the KS-6854 screwdriver or the adjusting nut in a clockwise direction with the No. 219 wrench until the front contact screw just touches the front contact. Then turn the back contact (or stop) screw or the adjusting nut in a counterclockwise direction approximately 1/8 turn, which should allow a clearance between the front contact and the screw of at least 0.003 inch. Retighten the locknut and check to make sure the relay meets all electrical requirements. If the relay fails to meet the electrical requirements after the operated and unoperated positions of the armature have been established, proceed as follows.

### (4) Operate and Nonoperate: Failure to meet

either of these current requirements is probably due to the airgap between the armature and core being incorrect, when the armature is in the unoperated position. If the relay fails to operate, decrease the unoperated armature airgap. To do this, loosen the locknut on the back contact (or stop) screw (when the relay is so equipped) with the No. 220 wrench and turn the screw in a clockwise direction with the KS-6854 screwdriver, noting that the contact sepa-

ration requirement is still met. Tighten the locknut securely. Where the relay is equipped with an adjusting nut, turn it in a clockwise direction with the No. 219 wrench. If the relay fails to meet the nonoperate requirement, increase the unoperated airgap. To do this, turn the back contact (or stop) screw or the adjusting nut in a counterclockwise direction. If it is impossible to meet the operate and nonoperate requirements by means of the adjustment of the unoperated airgap and still meet the contact separation requirement, slightly change the operated airgap as outlined under (5) consistent with meeting the release and hold requirements.

(5) Release and Hold: Failure to meet either of these current requirements is probably due to the airgap between the armature and core being incorrect, when the relay is in the operated position. If the relay fails to release, increase the operated armature airgap slightly. To do this, loosen the locknut on the front contact screw with the No. 220 wrench and turn this screw in a clockwise direction with the KS-6854 screwdriver, noting that the contact separation requirement is still met. Tighten the locknut securely. If the relay fails to meet the hold requirement, decrease the operated armature airgap. To do this, loosen the locknut on the front contact screw with the No. 220 wrench and turn this screw in a counterclockwise direction with the KS-6854 screwdriver. Note that the back contact separation requirement is still met. Tighten the locknut securely.

(6) On relays equipped with bonding straps, failure to meet the electrical requirements may be due to a defective bonding strap which should be replaced if the requirements cannot be obtained by a readjustment of the operated and unoperated airgaps.

(7) Feather Contact Spring Position: (108-A Relay Only) - The adjustment of the feather contact spring also affects the operation of the relay, and the tension of it against the turned-over portion of the front contact spring should be considered in adjusting to meet the electrical requirements. To increase the tension, insert the flat end of a toothpick between the spring and the front contact spring and slide the toothpick towards the contact spring screw until the spring will rest firmly against the inside of the front contact spring. Take care not to kink the spring or give it an excessive bow. In case the spring is bowed excessively, the bow may be reduced by rubbing the spring with the KS-6854 screwdriver adjacent to the front contact spring screw. In its final adjusted position, the spring should curve slightly outward toward the armature rather than inward toward the front spring so that the front contact screw in its travel will make contact as long as possible.

(8) Final Check: In all cases, after a relay has been adjusted, the cover should be replaced and a check made to insure that the relay meets its electrical requirements. This check can generally be made by observing the operation of associated apparatus in the circuit.