

186-TYPE RELAYS REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

- 1.01 This section covers 186-type relays.
- 1.02 This section is reissued to incorporate material from the addendum in its proper location.
- 1.03 Reference shall be made to Section 020-010-711, covering General Requirements and Definitions, for additional information necessary for the proper application of the requirements listed herein.
- *1.04 **Asterisk:** Requirements are marked with an asterisk (*) when to check for them would necessitate the dismantling or dismantling of apparatus, or would affect the adjustment involved or other adjustments. No check need be made for these requirements unless the apparatus or part is made accessible for other reasons, or its performance indicates that such a check is advisable.
- 1.05 **Operate:** A relay is said to operate if, when current is connected to its winding, the armature moves sufficiently to cause the contacts to make.
- 1.06 **Nonoperate:** A relay is said to nonoperate if, when current is connected to its winding, the armature does not move sufficiently to close the contacts.
- 1.07 **Release:** A relay is said to release if the armature moves from the operated position sufficiently to break the contact that had been closed.
- 1.08 **Removal of Cover:** To check the requirements and to make the adjustments specified in this section, it will be necessary to remove the cover of the relay and replace it after completion of the adjustments. Use the KS-6854 screwdriver to remove and replace the cover mounting screws.

2. REQUIREMENTS

- 2.01 **Cleaning:**
- The contacts shall be cleaned, when necessary, in accordance with Section 022-100-811.
 - Other parts shall be cleaned, when necessary, in accordance with approved procedures.

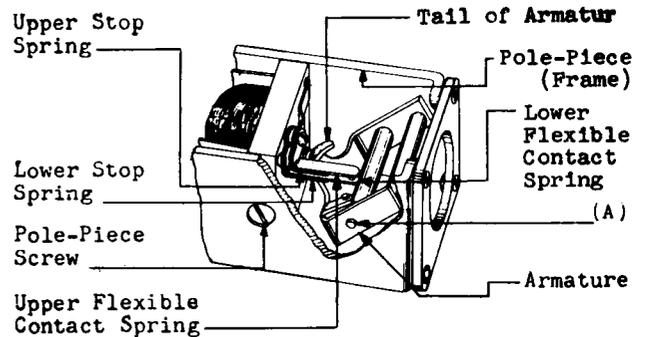


Fig. 1 - No. 186-type Relay

- 2.02 **Relay Mounting:** Relays shall be fastened securely to the mounting plate. This shall be checked by applying a vertical and a horizontal pressure to the relay and not by attempting to turn the relay.
Gauge by feel.
- 2.03 **Armature Movement:** Fig. 1(A) - The armature shall move freely in its bearings and shall not bind against any other part of the relay.
Gauge by feel.
- 2.04 **Contact Alignment:** Fig. 2(A) - The point of contact shall fall wholly within the boundary of the opposing contact.
Gauge by eye.



Fig. 2 - Alignment of Point and Disc Contacts

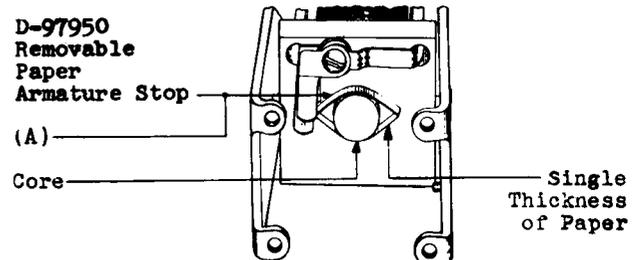


Fig. 3 - Armature Stop Position

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2.05 Application of D-97950 Removable Armature Stop:

Fig. 3(A) - The D-97950 armature stop, when applied in accordance with Section 040-014-811, shall be mounted so that the single layer of paper is on the side of the core next to the armature. The paper shall be held snugly against the core, and the front edge of the stop shall be approximately flush with the front end of the core.

Gauge by eye.

2.06 Flexible Contact Spring Position:

Fig. 4(A) - With the armature unoperated, the flexible contact spring shall rest on the stop spring, at least at the end of the stop spring that is nearest the contact.

Gauge by eye.

2.07 Armature Clearance: Fig. 1 - With the armature in its operated position, there shall be a clearance between the armature and the lower stop spring of minimum 0.008 inch.

Gauge by eye.

2.08 Contact Separation: The separation between normally open contacts shall be minimum 0.005 inch.

Gauge by eye.

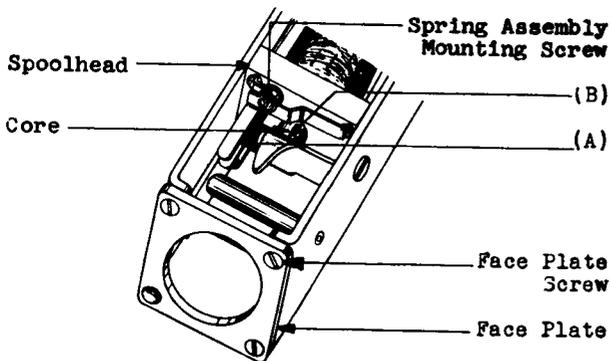


Fig. 4 - Armature Airgap

2.09 Contact Follow: Fig. 4(A) - With the armature operated, there shall be a perceptible clearance between the upper flexible contact spring and its stop spring, at least at the end of the stop spring that is nearest the contact.

Gauge by eye.

2.10 Armature Airgap: Fig. 4(B) - The armature shall not touch the face of the core as the relay operates electrically.

Gauge by eye.

2.11 Electrical Requirements:

(a) The relay shall meet the electrical requirements specified on the circuit requirement table.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Test Apparatus, and Materials

Code or Spec No.	Description
<u>Tools</u>	
102	3/8 In. Hex Single End Socket Wrench
371	Spring Adjuster
422A	90° Offset Screwdriver
423A	45° Offset Screwdriver
485A	Smooth-jaw Pliers
KS-6320	Orange Stick
KS-6854	3-1/2-In. Screwdriver
<u>Test Apparatus</u>	
35 Type	Test Set
<u>Materials</u>	
KS-7860	Petroleum Spirits
D-97950	Removable Paper Armature Stop
—	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 in accordance with Section 022-100-811.
- (2) Clean the armature bearings, the armature stop pin, and core, as outlined in 3.03.

3.02 Relay Mounting (Rq 2.02)

- (1) To tighten relays loose on the mounting plate, securely tighten the mounting nuts with the No. 102 wrench.

3.03 Armature Movement (Rq 2.03)

- (1) If the armature fails to move freely in its bearings, remove the three screws which hold the faceplate to the pole piece (frame) with the KS-6854 screwdriver. Loosen the two screws which hold the pole piece (frame) approximately 1-1/2 turns using the Nos. 422A and 423A offset screwdrivers. Spread the frame far enough to permit the bearing pins on the armature to disengage the holes in the frame, and remove the armature from the front of the relay. Clean the bearings and the armature pivots with KS-7860

petroleum spirits applied with a clean toothpick. Do not use the same toothpick for more than one operation.

- (2) Clean the core face and the entire armature assembly, except the hard-rubber stud thoroughly with KS-7860 petroleum spirits.
- (3) Exercise care when applying the petroleum spirits to prevent its coming in contact with the spoolhead, studs, and insulators.
- (4) At this time, check the relay for contact alignment, flexible contact spring position, and contact separation, and if necessary, adjust as outlined in 3.04, 3.06, 3.08, and 3.09.
- (5) Spread the pole piece (frame) apart and replace the armature in its bearings. Tighten the pole-piece screws. Replace the faceplate and faceplate screws, and tighten the screws securely.

3.04 Contact Alignment (Rq 2.04)

- (1) If the contacts do not line up properly, loosen the contact spring mounting screw and shift the spring to the desired position. With the spring held in this position by means of the KS-6320 orange stick, tighten the mounting screw securely, noting that the springs rest on their respective stop springs. Perform this operation with the faceplate in position unless more room is required, in which case, remove the faceplate using the KS-6854 screwdriver.
- (2) If the contacts cannot be lined up properly due to the springs being distorted, adjust the springs as covered in 3.06 and 3.08.

3.05 Application of D-97950 Removable Armature Stops (Rq 2.05)

Method "A" (for use where mounting permits access from above).

- (1) Press with the thumb and forefinger of one hand on the papered ends of the removable paper stop until the metal portion is bowed sufficiently so that when the pressure is released, there is approximately 1/8 inch clearance between one side of the bronze strip and the single thickness of the separator.
- (2) Grasp the right-hand end of the metal part of the separator in the tips of the jaws of the No. 485A pliers, and place the armature stop in position on top of the core, so that the bronze strip rests on the core and the single thickness of the separator extends below the top edge of the core.
- (3) Using the KS-6320 orange stick applied to the left-hand end of the stop, hold the stop in this position as shown in Fig. 5.

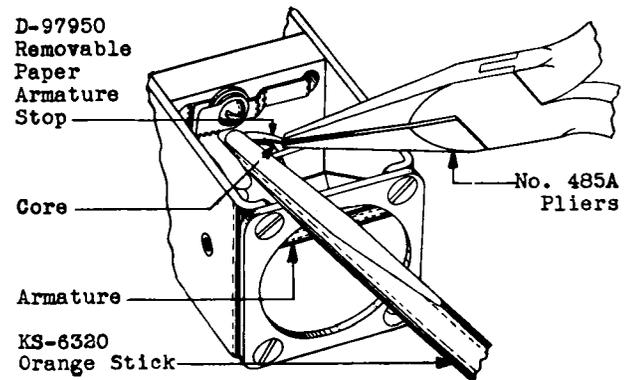


Fig. 5 - Placing Armature Stop on Core

Then release the pliers. Press down on the top right-hand end of the paper stop with the pliers and on the left-hand end of the stop with the KS-6320 orange stick. This will cause the single thickness of the separator to slide between the core and the armature and fit in position around the core. Press the front edge of the stop with the flat side of the orange stick moving it toward the spoolhead until all parts are slightly beyond the outer edge of the core. Check all electrical and mechanical adjustments.

Method "B" (for use where mounting does not permit access from above).

- (4) Remove the armature as covered in 3.03(1). Place a D-97950 removable paper armature stop between the tips of the jaws of the No. 485A pliers in such a position that it can be readily inserted within the frame of the relay. Then, exerting a slight pressure, bow the bronze strip so as to form an opening between the single thickness of the paper and the bronze strip, sufficiently wide to permit the removable stop to be slipped on the core of the relay as indicated in Fig. 6.

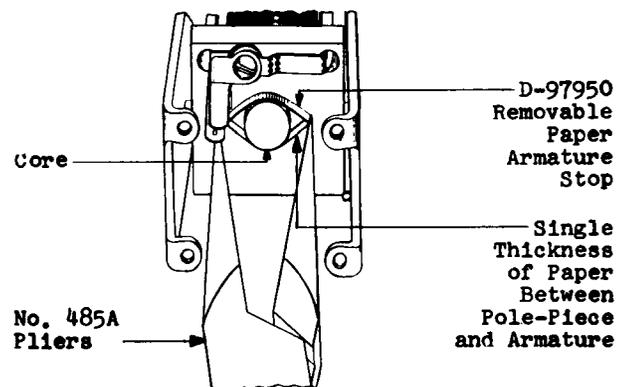


Fig. 6 - Method of Applying Armature Stop

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Place the stop in position with the bronze strip on the top surface of the core, directly opposite the armature tang, thus leaving the single thickness of paper between the core and the armature. Exercise care to avoid placing an excessive bend in the bronze strip as a result of exerting too much pressure with the pliers.

(5) If necessary, adjust the removable paper armature stop so that it rests snugly against the spoolhead in the position shown in Fig. 6.

(6) Replace the armature in position and tighten the screws holding the pole piece (frame) to the spoolhead. Remount the faceplate on the relay.

(7) Check all mechanical and electrical requirements and make adjustments as required. Then remount the cover on the relay.

3.06 Flexible Contact Spring Position (Rq 2.06)

(1) If the flexible contact springs do not rest on their respective stop springs at the end nearest the contacts, remove the relay from its mounting, as outlined in 3.002. Remove the faceplate using the KS-6854 screwdriver and proceed to make adjustments as follows:

(a) If the upper flexible contact spring does not rest on the upper stop spring, loosen the spring assembly mounting screw with the KS-6854 screwdriver, turn the flexible spring in a clockwise direction through an angle of 180 degrees, and adjust it with the No. 485A pliers as shown in Fig. 7. It will be satisfactory to have a slight kink in the flexible contact spring close to the base of the spring. After resetting the spring in position, tighten the spring assembly mounting screw securely, noting that the contacts are in proper alignment.

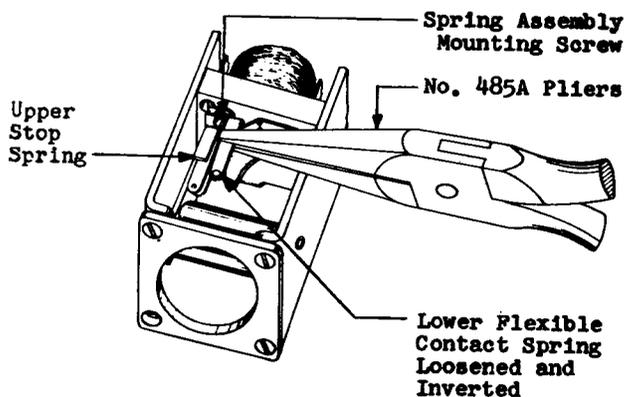


Fig. 7 - Method of Straightening Upper Flexible Contact Spring

(b) If the lower flexible contact spring does not rest on the lower stop spring remove the armature as outlined in 3.03(1) and then, grasping both springs (flexible and stop spring) with the No. 485A pliers as close to the base as possible, first bend both springs downward and then upward again. If the flexible spring cannot be adjusted in this manner, it will be necessary to remove it from the spring pileup and adjust it with the No. 485A pliers as required.

Note: Recheck for contact separation and follow after this adjustment has been made.

3.07 Armature Clearance: (Rq 2.07) - If there is insufficient clearance between the armature in its fully operated position and the lower stop spring, apply the blade of the KS-6854 screwdriver near the base of the lower stop spring and exert an upward pressure. Check the contact separation after making this adjustment and, if necessary, readjust as covered in 3.08 and 3.09.

3.08 Contact Separation (Rq 2.08)

3.09 Contact Follow (Rq 2.09)

(1) The adjustments for contact separation and contact follow may be made with the relay mounted. Make these adjustments with the faceplate in position, unless more room is required, in which case, remove the faceplate. Use the KS-6854 screwdriver to remove faceplate screws.

(2) Contact Separation: To increase the contact separation or to decrease the contact follow, apply the blade of the screwdriver between the upper stop spring and the lower flexible contact spring as shown in Fig. 8 and exert a slight upward pressure on the screwdriver. To decrease the contact separation or to increase the contact follow, apply the blade of the screwdriver near the base of the upper flexible contact spring and exert a downward pressure, or apply the blade near the base of the lower stop spring and exert an upward pressure. When readjusting for contact separation, it is advisable to make this separation as near the minimum value as is consistent with meeting all the other requirements.

(3) Contact Follow: If the contact follow is insufficient, it may be due to excessive contact separation; in which case, increase the follow or decrease the separation as outlined in (2). The contact follow will be satisfactory when, with the armature manually operated to its fully operated position, there is a perceptible clearance between the upper stop spring and the upper flexible contact spring at the contact end.

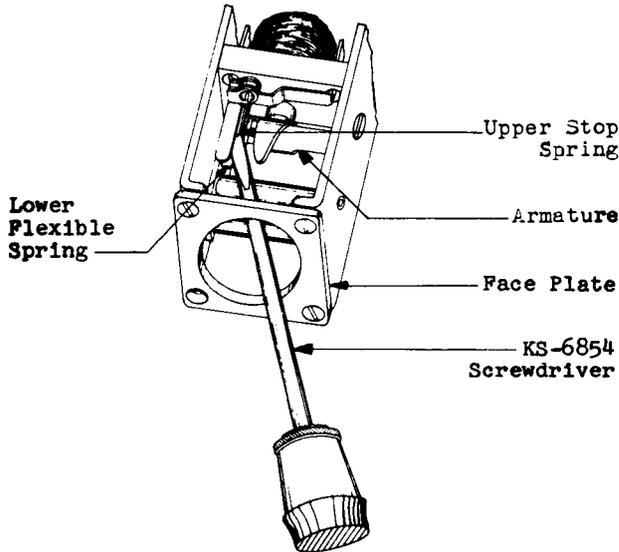


Fig. 8 - Method of Adjusting for Contact Separation and Contact Follow

3.10 Armature Airgap: (Rq 2.10) - If the armature touches the face of the core, remove the relay from its mounting as covered in 3.002. Then adjust the armature slightly away from the core with the No. 485A pliers applied to each side of the offset portion as shown in Fig. 9. An increase in the separation between the armature and the core will have a direct effect on the electrical performance of the relay. Care must therefore be exercised in making this adjustment that the gap between the armature and core will not be so great as to prevent the armature from fully operating when the operate current is applied.

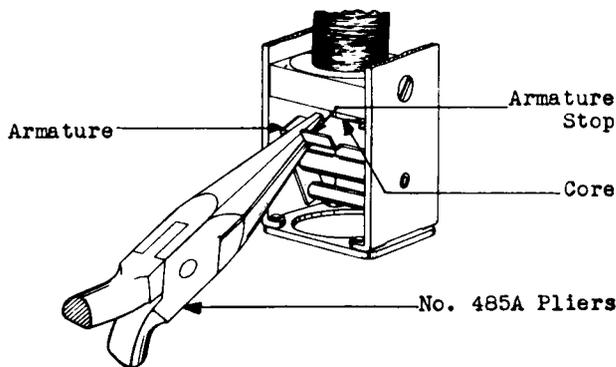


Fig. 9 - Method of Adjusting Armature

3.11 Electrical Requirements (Rq 2.11)

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

Operate

(2) If the relay fails to meet its operate requirement, adjust the contact separation and contact follow as covered in 3.08 and 3.09.

(3) If the contact separation and contact follow are close to their respective minimum values and the relay fails to meet its operate requirement, it may be due to the tail of the armature being distorted so that the armature gap does not decrease uniformly as the relay operates, or due to an excessive gap between armature and core when the armature is in its operated position.

(4) If the tail of the armature is distorted, remove the relay from the mounting as described in 3.002 and operate the armature manually, noting that the separation between the armature and core is least when the armature is in the fully operated position. Should this separation be less at any other point, adjust the tail of the armature with the No. 371 spring adjuster applied as shown in Fig. 10. Hold the armature in the operated position and adjust the required portion of the tail of the armature by exerting a slight pulling force on the spring adjuster (toward the front of the relay). Exercise care when adjusting the tail of the armature since the slightest deformation may affect the correct operation of the relay. After each adjustment of the tail of the armature, operate the armature manually and recheck the separation between each point on the armature and the core as the armature is being operated.

(5) If the gap between the armature and core is excessive when the armature is in the operated position, reduce the gap using the procedure outlined in 3.10 for increasing the gap, except that in reducing the gap, adjust the armature on both sides of the offset portion in a direction toward the core.

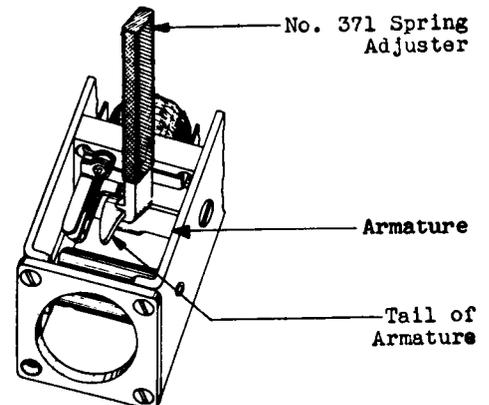


Fig. 10 - Method of Adjusting Tail of Armature

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(6) Failure to operate may also be due to the armature binding or to its striking the face of the core as the relay is operated electrically. Correct these conditions as covered in 3.03 and 3.10.

Nonoperate

(7) If the relay fails to meet its nonoperate requirement, force the lower contact spring and stop spring downward with the KS-6854 screwdriver. After making this adjustment, check the armature clearance and, if necessary, readjust as covered in 3.07.

Release

(8) If the relay fails to release, increase the contact follow by adjusting the springs as outlined in 3.08 and 3.09. Check that the contact separation requirement is still met and that the flexible springs rest on their respective stop springs.

(9) Failure to release may also be due to an accumulation of dirt on the armature stop pin, on the bottom surface of the core, or may be due to dirty bearings. In this case,

clean the bearings, core face, and armature assembly, as covered in 3.03.

(10) If the relay still fails to release, examine the armature to determine whether there is sufficient clearance between it and the core when the relay is energized. Correct for insufficient clearance by widening the armature airgap as covered in 3.10.

(11) If the relay fails to release due to a sticking condition between the armature and the core, clean the relay as covered in 3.01. If sticking persists, the D-97950 removable armature stop may be applied in accordance with 2.05.

Note: Old-style relays were equipped with flexible contact springs having a nickel-silver disc welded to the under side of the lower contact spring. On these relays, failure to release may be due to the disc catching on the armature stud. In this case, replacing the contact springs with the new style having the disc on the upper side of the upperspring will relieve the difficulty.