

RELAYS

286-, 287-, AND 288-TYPES

REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers 286-, 287-, and 288-type relays. These multicontact relays are referred to as wire-spring relays because the groups of make contact springs of which they are composed consist of wires having contacts welded at the front ends.

1.02 This section is reissued to:

- Revise 2.05(c)
- Revise 2.07 by adding 287J code
- Revise the List of Tools, Gauges, and Test Apparatus
- Revise 3.05.

1.03 Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for proper application of the requirements listed herein.

1.04 Do not remove contact covers unless necessary in connection with relay testing or maintenance. If necessary to remove a cover, remount it as soon as practicable.

1.05 The 286-type relay, shown in Fig. 1, has 30 make contacts arranged in two vertical rows of 15. These relays are intended for use instead of 263-type relays in new circuits but are not interchangeable with the 263 type. The terminals of the movable twin contact springs on 286-type relays are arranged for individual wiring, while the terminals of the fixed contact springs are arranged for horizontal strapping.

1.06 The 287- and 288-type, the D-179985 and D-180441 relays consist of an assembly of two units, each similar to the 286-type relay. These units are assembled one above the other on a bracket, and the relays mount interchangeably

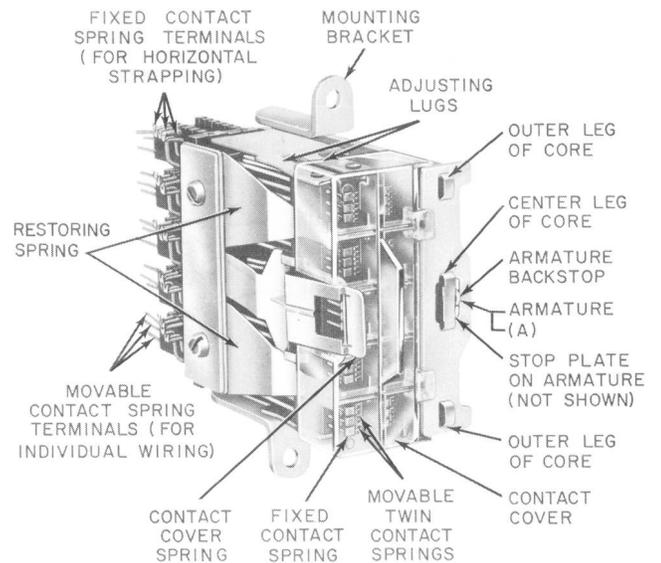


Fig. 1—General View of 286-Type Relay

with all 263- and 264-type relays. The 287-type relay, shown in Fig. 2, which replaces the 263-type, has movable twin contact spring terminals arranged for individual wiring and fixed contact spring terminals arranged for horizontal strapping. This arrangement of terminals is the reverse of that on 263-type relays. The D-179985 relay is a modified 287B relay. The D-180441 relay is a modified 287A relay. On 288-type relays, which replace the 264-type, the terminals of both fixed and movable contact springs are arranged for individual wiring, as in the case of the 264-type relay.

1.07 In some cases, the circuit requirements table has not been reissued to specify 287- or 288-type relays as superseding the 263 and 264 types. Where a 263- or 264-type relay is ordered as a replacement relay and a 287- or 288-type relay is received instead, see Section 040-273-711 for the necessary information for installing and checking the 287- or 288-type relay.

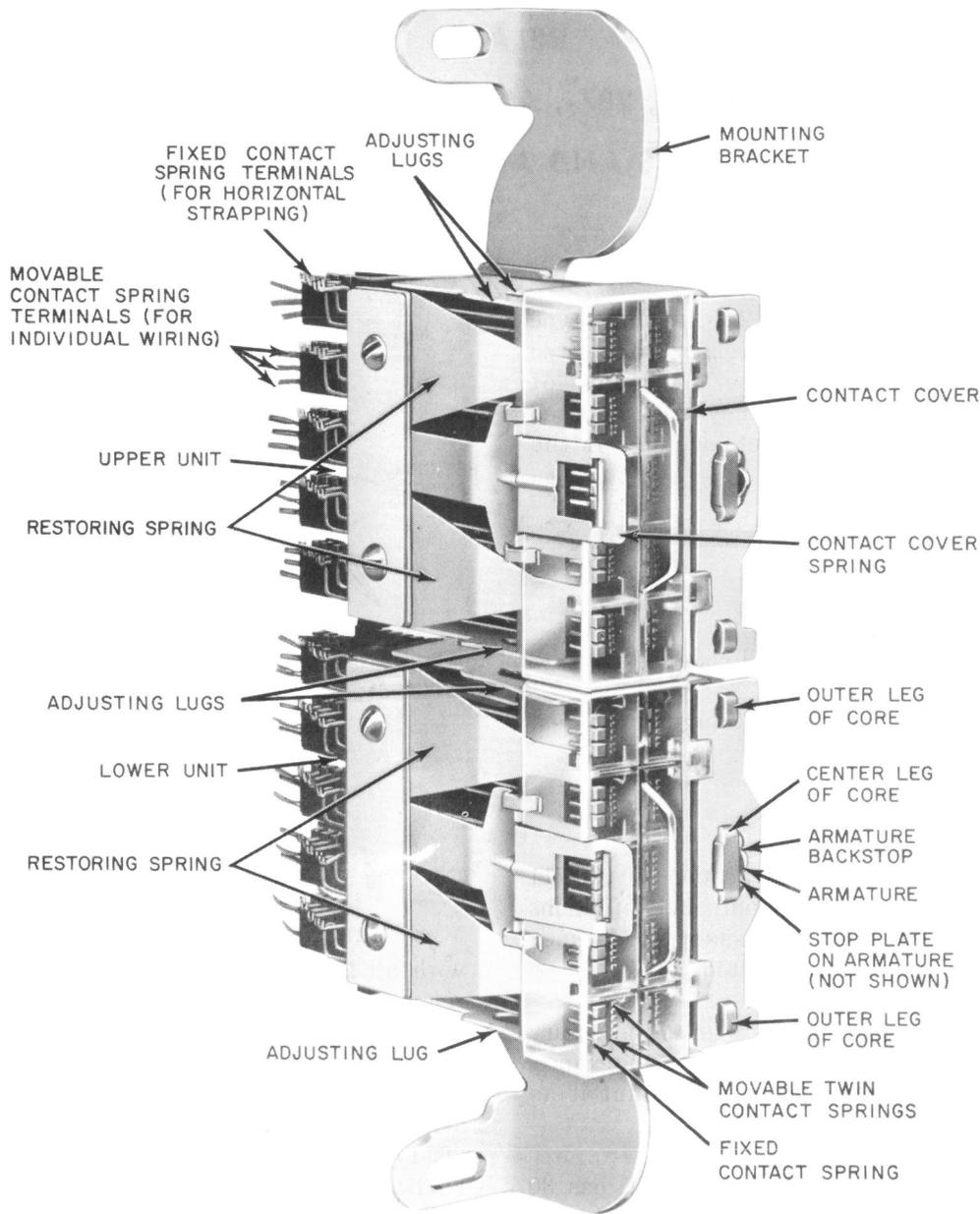


Fig. 2—General View of 287-Type Relay

1.08 All wire-spring multicontact relays are mounted with contact springs and terminals to the left of the core as viewed from the front of the relay. The lugs for making test connections to the winding terminals are accessible from the right front side of the relay.

1.09 Operate: A relay is said to operate if, when current is applied to its winding, the associated armature moves until the stop plate on

the armature rests against the center leg of the core and all contacts are closed.

1.10 Unoperated Position: A relay is said to be in its unoperated position when the card rests against the outer legs of the core, the armature rests against the card, and all contacts are open.

1.11 Armature gap is the gap between the center leg of the core and the stop plate on the

armature in any position the armature may assume between the operated and unoperated position.

1.12 A pair of contacts as referred to in this section consists of the contact on the fixed single spring and the contact on one of the associated movable twin springs.

1.13 The term **contact make** means the closure of the electrical circuit between a pair of contacts.

1.14 Use of the 510C Test Lamp: The 510C lamp, equipped with a 561A straight tip and held so as to illuminate the contact springs adjacent to the contact, may be used to facilitate adjustment.

2. REQUIREMENTS

2.01 Cleaning: The contacts and other parts of the relay shall be cleaned when necessary in accordance with Section 069-306-801. After cleaning any contact, a check shall be made to see that requirements 2.04 and 2.06(a) are met on the contacts involved.

2.02 Relay Mounting: Relays shall be fastened securely to the framework.

Gauge by feel.

Check by pushing on each side of the center leg of the core with a KS-6320 orange stick.

2.03 Contact Cover Position: Fig. 3(a) and 4

(a) The contact cover shall be latched in place by the contact cover spring with the cover lugs against the core plate.

Gauge by feel.

(b) The contact cover may be held in place with a 5A clip used to supplement the holding action of the contact cover spring. With the 5A clip installed, as shown in Fig. 4, the force between the cover lugs and the core plate shall be:

Minimum—400 grams

Use the 79B gauge.

The 5A clip is intended for use on those 286-, 287-, and 288-type relays that show excessive contact cover wear by the presence of significant quantities of white powdered plastic wear products. This condition, which increases the probability of contact contamination, is normally the result of cover vibration associated with relays having high rates of operation. To check the 400-gram requirement, apply the 79B gauge to the center of the contact cover adjacent to the core plate. Attempt to disengage the cover lugs from the core plate by pulling with the gauge. Measure the force as the cover lugs start to move from their position against the core plate.

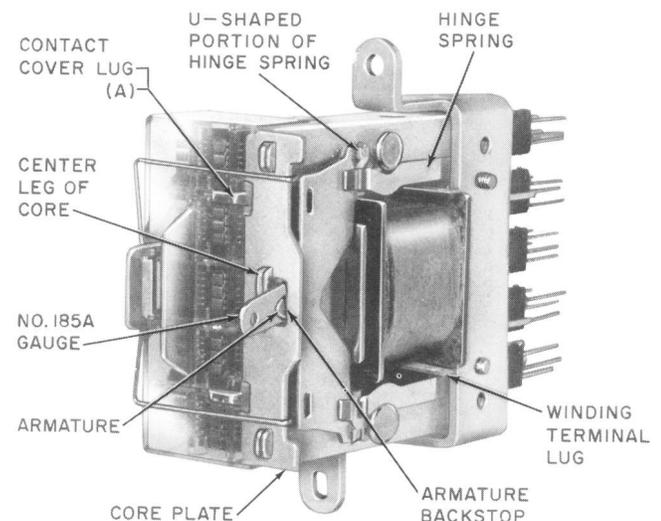


Fig. 3—Method of Checking Contact Make

2.04 Movable Twin Contact Spring Position:

Movable twin contact springs shall lie in the comb grooves which properly position their contacts with respect to the associated fixed contacts.

Gauge by eye.

If the spacing between any two movable contacts differs noticeably from that between other movable contacts, the springs of these two contacts may be crossed. Check for crossed springs visually using the 510C lamp. In doubtful cases lightly push the movable contacts in question, one at a time, toward the left. A spring which is crossed

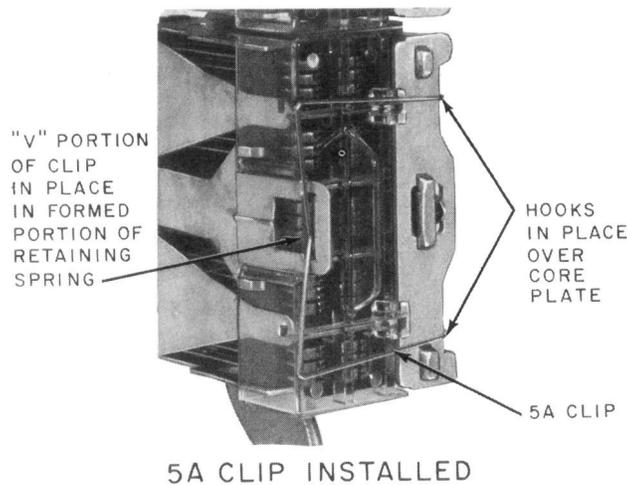
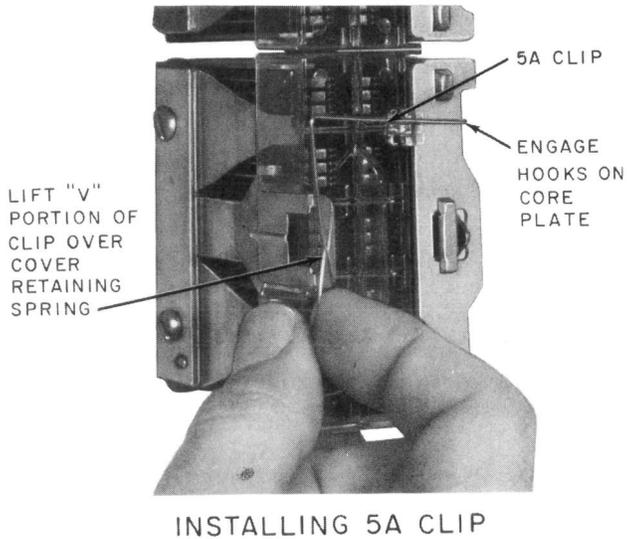


Fig. 4—Installing 5A Clip on 287-Type Relay

over another spring will usually move to the right when the contact on the other spring is pushed to the left.

2.05 Armature Position: Fig. 1(A)

(a) With the relay in the unoperated position, there shall be a clearance between the armature and the backstop.

(b) **All Relays Except the 286N Relays:** When the relay is electrically operated and released, the armature shall return to its unoperated position against the card.

Gauge by eye and feel after electrical operation and release of the relay.

Note: This requirement may be checked manually instead of electrically by pushing the armature against the backstop with the KS-6320 orange stick, removing the orange stick, and noting whether the armature returns to its unoperated position. If the required condition is not obtained with the manual check but is obtained with the electrical check, the requirement is considered met.

(c) **286N Relays:** When the armature is operated electrically five times and then manually moved against the backstop and then released, the armature shall return to its unoperated position against the card.

Gauge by eye and feel.

Check by pushing the armature against the backstop with the KS-6320 orange stick, removing the orange stick, and noting whether the armature returns to its unoperated position.

2.06 Contact Make

(a) Both contacts of the movable twin springs shall make with their associated single contact on the fixed springs in the electrically operated position of the relay.

Gauge by eye and feel.

(b) With the relay electrically energized against a gauge inserted in the armature gap, the following conditions shall be met.

(1) Neither one of the contacts of the movable twin springs shall make with its associated single contact on the fixed springs.

	BEFORE TURNOVER (Inch)	AFTER TURNOVER (Inch)
Test	0.022	—
Readjust	0.020	0.020

(2) At least one contact of each of the movable twin springs shall make with its associated single contact on the fixed springs.

	BEFORE TURNOVER (Inch)	AFTER TURNOVER (Inch)
Test	0.006	0.003
Readjust	0.008	0.008

Use the 185A gauge.

To check this requirement, first operate the relay electrically. Release the relay and insert the proper 185A gauge into the armature gap. Take care that the gauge is inserted so the shoulders of the gauge rest against the core plate of the relay as shown in Fig. 3. Electrically energize the relay and note whether the contacts are open or closed as required. In case of doubt, remove the cover and apply the KS-6320 orange stick to the tips of the twin contact springs. Attempt to move them toward their mating contact as shown in Fig. 5. Observable movement of either twin contact indicates that the contact is not closed. While making this check on the left-hand row of contacts, hold the contact cover spring clear of the adjacent molded block on the fixed contact springs if it touches this block.

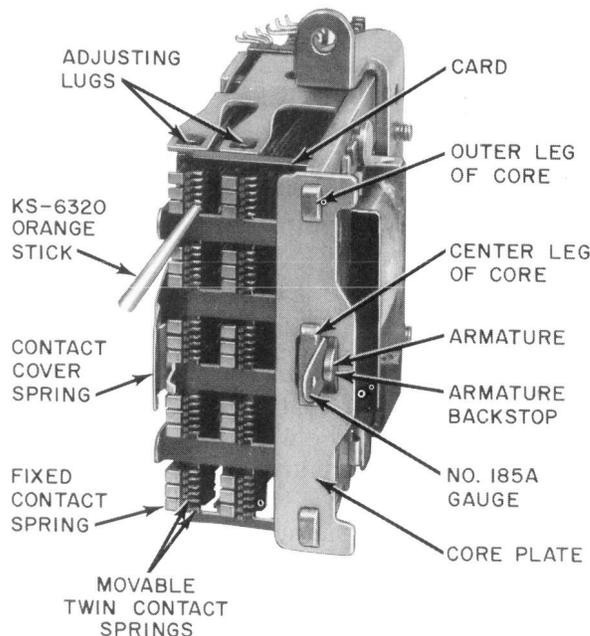


Fig. 5—Method of Checking for Open or Closed Contacts

2.07 Contact Separation: Unless otherwise specified on the circuit requirements table, the separation between each pair of contacts with the relay in the unoperated position shall be:

286A, B, E, F, G, H, L, M, and N; and 287C, D, G, and H; D-179985 and D-180441;	Min 0.005 inch
286C, D, J, and K; 287A, B, E, F, and →J←; and 288-type	Min 0.010 inch

Gauge by eye.

2.08 Electrical Requirements: The relay shall meet the electrical requirements specified on the circuit requirements table.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, and Test Apparatus

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
270	Spring adjuster
506A	Spring adjuster
510C	Test lamp [equipped with 561A straight tip and W2CB (24V) or W2BL (48V) cord]
662A	Adjuster
R-2753	Spring adjuster
KS-6320	Orange stick
—	5-inch E screwdriver
GAUGES	
70D	50-0-50 gram gauge
70J	0-150 gram gauge
79B	Tension gauge, 0-1000 gram, push-pull

SECTION 040-272-701

CODE OR

SPEC NO.

DESCRIPTION

GAUGES

185A Thickness gauge nest (consists of a nest of 186-type gauges)

TEST APPARATUS

35-type Test set

3.01 Cleaning: (Reqt 2.01)—Clean the contacts and other parts of the relay in accordance with Section 069-306-801.

3.02 Relay Mounting: (Reqt 2.02)—To tighten the mounting screws, use the 5-inch E screwdriver.

3.03 Contact Cover Position: (Reqt 2.03)

(1) If the requirement is not met because of a damaged cover, replace the cover. If the requirement is not met because of insufficient pressure of the cover spring, bend the front end of the spring as required to increase spring pressure. Avoid excessive bending as this may affect remounting of the cover. If the spring will not hold the cover in place, refer the matter to the supervisor.

(2) If the 5A clip does not hold the cover in place with a force of 400 grams, replace the clip.

3.04 Movable Twin Contact Spring Position:

(Reqt 2.04)—Where one of the twin springs overlies together, position the springs in their respective grooves using the KS-6320 orange stick applied to the tip of the spring. If the spring cannot be properly positioned, refer the matter to the supervisor.

3.05 Armature Position: (Reqt 2.05)

(1) **Card** (Fig. 5)

(a) Remove the card as covered in Section 040-272-801 and remove cavity number from flat side with a file.

(b) Place flat side of card on a flat surface. If one of the four projections (two for armature and two for restoring spring) clears the surface more than 0.010 inch, indicating warp, replace with a new card as covered in Section 040-272-801.

(c) Recheck the requirement. If not met, continue.

(2) **Hinge Spring** (Fig. 3)

(a) Check tension of spring against armature: 15 gram minimum, 45 gram maximum, at tip of spring, using 70D gauge. Adjust only if necessary by bending behind stud with thin slot of R-2753 tool.

(b) Determine whether binding of armature takes place on top or bottom card tabs or both.

(1) Push top of card toward rear of armature slot and note if this releases armature to its normal unoperated position.

(2) Push bottom of card toward rear of armature slot and note if this releases armature to its normal unoperated position.

(c) Bend the armature hinge spring to allow the armature to move forward approximately 0.005 inch.

(1) Use R-2753 tool on bottom of "U" of U-shaped portion of hinge spring or

(2) If armature binds on U-shaped portion of hinge spring, bend the rear prong of the "U" forward using 270 tool.

(d) Recheck the requirement. If still not met, continue.

(3) **Restoring Spring** (Fig. 1 and 2)

(a) Bend tip of restoring spring to tilt card away from front edge of armature slot. Use 506A tool behind card and bend just enough to free the armature.

(1) Check armature back tension, normally 75 to 125 grams, before and after bending restoring spring. Do not increase back tension more than 25 grams. The 70J gauge may be used.

(b) Recheck the requirement. If still not met, refer the matter to the supervisor.◆

3.06 Contact Make: (Reqt 2.06)

3.07 Contact Separation: (Reqt 2.07)

(1) The molded section on the front portion of the fixed contact springs in each vertical row is held in place by an adjusting lug at the top and bottom of the relay unit. If the contact make or contact separation requirements are not met, reposition the fixed contacts involved by bending to the right or left one or both of the associated adjusting lugs as described below.

(2) **286-Type Relay:** Fig. 6—With the cover on the relay, place the slot at the offset end of the 662A adjuster over the rear narrow portion of the associated adjusting lug nearer the contacts which do not meet the requirements. Draw the adjuster forward as far as possible. Holding the adjuster horizontally, bend the adjusting lug slightly to the left to increase the contact separation or to the right to decrease the separation. If the contacts being repositioned are in the middle third of the relay, bend both top and bottom adjusting lugs as described above. If the contacts are in the upper or lower thirds, bending the nearer adjusting lug only may be sufficient. However, take care in making the adjustments that the separation of all contacts is kept approximately the same, bending both lugs slightly if necessary.

(3) 287- and 288-Type, D-179985 and D-180441

Relays: These relays are adjusted in a manner similar to that described for the 286-type relay in (2). When adjusting a top lug of an upper unit or a bottom lug of a lower unit, leave the covers in place and adjust the same as for the 286-type relay. When adjusting a top lug of a lower unit or a bottom lug of an upper unit, remove the cover from the unit needing adjusting, use the straight end of the adjuster, and insert the adjuster from the left side. Apply the adjuster to the adjusting lug and bend the lug in the same manner as described for the 286-type relay in (2).

3.08 Electrical Requirements: (Reqt 2.08)

(1) If the electrical requirements are not met, increase the contact separation toward the maximum value consistent with meeting the contact make requirements. If the requirements cannot be met in this way, refer the matter to the supervisor.

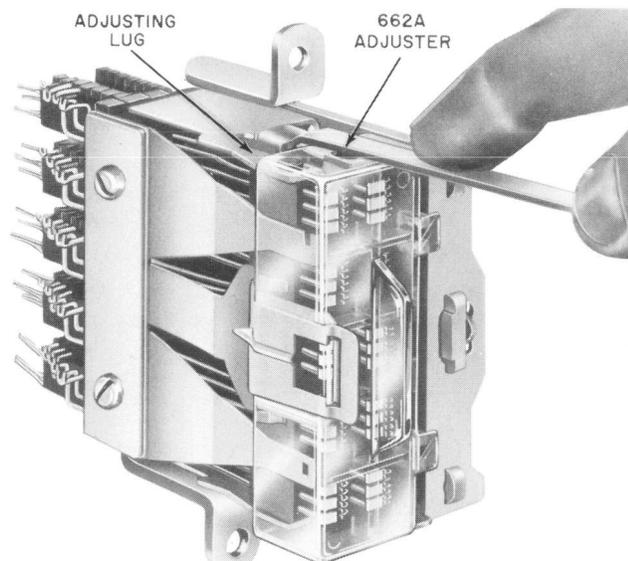


Fig. 6—Method of Adjusting for Contact Make