

CONTROL RELAYS

KS-15528 AND KS-15756

REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers control relays KS-15528 and KS-15756.

1.02 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.

1.03 Asterisk: Requirements are marked with an asterisk () when to check for them would necessitate the dismantling or dismounting 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.

1.04 For the purpose of this section, whether contacts are said to be normally open (NO) or normally closed (NC) depends on the position of these contacts when no operating current is flowing in the coil and not on the position the contact may normally be in for a particular application. NO contacts and NC contacts are sometimes known as front and back contacts, respectively.

1.05 A relay is said to operate when the armature has moved sufficiently for NC contacts to open and NO contacts to close with reliable contact.

1.06 A relay is said to release when the armature has moved sufficiently for NO contacts to open and NC contacts to close with reliable contact.

1.07 A relay, except one whose coil is rated in amperes alternating current, is said to be nonoperate when, at the specified value, the armature has not moved sufficiently for NO contacts to close or for reliable contact on NC contacts to be interrupted.

1.08 When checking requirements or making adjustments, disconnect the relay from the power supply, if practicable. Where it is not practicable, bridge around and insulate the contacts as covered in 3.002. Disconnect the leads as necessary to maintain circuit conditions unchanged.

1.09 When work is being done on a relay in an operating circuit, see that service is maintained.

2. REQUIREMENTS

2.01 Relay Mounting and Tightness of Assemblies

(a) The relay shall be fastened securely to its mounting.

(b) The component parts shall be held together securely.

Gauge by feel.

2.02 Cleaning Contacts: Contacts shall be clean and free from build-ups which might interfere with reliable contact.

Gauge by eye.

2.03 Contact Alignment: Contacts shall be aligned so that, when the contacts are completely closed, the outer edge of one contact does not extend over the outer edge of the other by

Max $1/32$ inch

If contacts are of different sizes, the smaller shall not extend beyond the periphery of the larger.

Gauge by eye.

2.04 Contact Sequence

(a) All NO contacts shall make and break simultaneously.

(b) All NC contacts shall break and make simultaneously.

Gauge by eye.

2.05 Contact Separation: The separation between movable and stationary contacts shall be

Min 0.030 inch

Use KS-6938 gauge.

To check this requirement the contacts must be disconnected from the power supply.

2.06 Contact Pressure: The pressure between closed contacts shall be

Min 35 grams

Use the No. 79C gauge.

To measure the contact pressure of the NO contacts, energize the operating coil, or hold the armature securely against the pole face with a screwdriver taking care not to press on any part of the contact spring which supports the moving contact. Place the gauge against the contact spring as near to the moving contact as possible and exert a pressure with the gauge away from the stationary contact. Read the gauge as the moving contact leaves the stationary contact.

To measure the contact pressure of the NC contacts, proceed in a manner similar to that outlined above but allow the armature to be held in its unoperated position by the pull of its spring.

2.07 Freedom of Operation: The armature shall move freely on its fulcrum or hinge.

Gauge by feel.

2.08 Electrical Requirements

- (a) The relay shall meet the electrical requirements specified in the circuit requirement table or other job information.
- (b) Where electrical requirements are not so specified, operation of a relay shall be checked at the minimum coil voltage specified on the nameplate.
- (c) Check of electrical requirements may be at the temperature at which the relay is found, unless H (hot) or C (cold) is specified in the circuit requirement table.
- (d) Where H is specified in the circuit requirement table without heating instructions, the relay coil shall be energized for at least one hour prior to the test.
- (e) Where C is specified in the circuit requirement table without cooling instructions, the relay shall be de-energized for at least 2 hours prior to the test.

2.09 Temperature: The temperature shall not exceed

	<u>Max</u>
Coils	95C (203F)
Contacts	115C (239F)

Use the thermometer.

If the temperature is thought to be excessive, check as follows. Hold the bulb of the thermometer against the hottest spot in question, covering that part of the bulb not in contact with the apparatus by a piece of felt, or the equivalent.

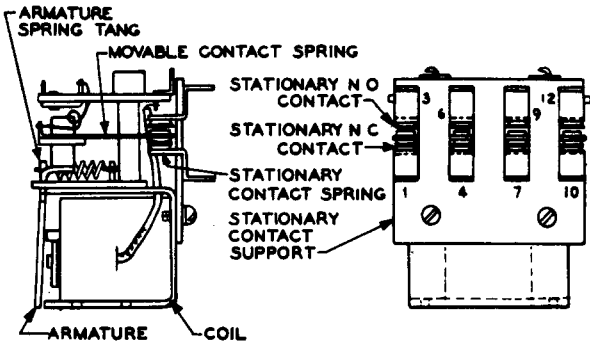


Fig. 1 - KS-15528 Relay

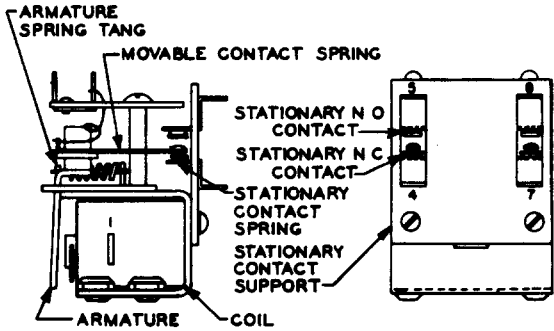


Fig. 2 - KS-15756 Relay

3. ADJUSTING PROCEDURES

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

<u>Code or Spec No.</u>	<u>Description</u>
<u>Tools</u>	
265C	Contact Burnisher Holder
365 (as required)	Connecting Clip
485A	Smooth-jaw Pliers
KS-6278 (as required)	Connecting Clip
KS-6780 (as required)	Connecting Clip
-	3-inch Cabinet Screwdriver
-	Soldering Copper

<u>Code or Spec No.</u>	<u>Description</u>
<u>Gauges</u>	
70D	50-0-50 Gram Gauge
79C	0-200 Gram Push-Pull Tension Gauge
KS-6938	Thickness Gauge
R-1032, Detail 1 or 2	Thermometer

Materials

KS-7187	Bond Paper
KS-7860	Petroleum Spirits
KS-14666 (or replaced D-98063)	Cloth
-	Abrasive Cloth 150 Grade
-	Felt Pad
- (as required)	No. 14 Insulated Wire

Test Apparatus

35 Type	Test Set
1W13A (as required)	Cord (each end equipped with a No. 365 connecting clip or KS-6278 connecting clip)
1W13B (as required)	Cord (each end equipped with a No. 365 connecting clip or KS-6278 connecting clip)
-	Voltmeter, dc Weston Model 931, ranges 300-150-75-30 (or replaced 281)

3.002 Strapping and Insulating: To maintain service while work is being done affecting closed contacts of working circuits, bridge the current-carrying contacts, making the connections at the most convenient points in the circuit other than at the relay, if practicable. For strapping where the voltage does not exceed 150 volts, 1W13A cords (3 feet, 0 inch) or 1W13B cords (6 feet, 0 inch) are suggested, with No. 365 connection clips or KS-6278 connecting clips at both ends. Lengths of No. 14 wire, or

of flexible cord, such as are commonly used in lighting circuits with KS-6780 connecting clips are required where the voltage exceeds 150 volts. Bond paper should be used for insulating live parts, including open contacts, and should be shaped or bent as necessary to provide protection with a minimum of interference with the work being done.

3.003 General Procedure

(1) Where it is not practicable to disconnect the relay from the power supply, bridge around contacts (see 3.002), insulate between contacts with a strip of bond paper, and disconnect leads, as necessary, in order to maintain circuit conditions unchanged. If it becomes necessary to remove the relay from its mounting in order to obtain access to the parts, proceed as follows. Patch through any working circuit and disconnect all power supply from the winding and contact circuits by opening switches, if provided, or by removing the fuse or fuses. Then disconnect the leads from the terminals using a soldering copper. Remove the mounting screws with the screwdriver.

Caution: Use care when working in close quarters with live parts.

(2) In working circuits, contacts which are found closed and carrying current which should not be interrupted should be bridged. (See 3.002.) In working circuits, contacts which are found open and should not be closed shall be kept separated by inserting a strip of bond paper between the movable and stationary contacts, or by disconnecting a lead. To close an NO contact, hold the armature against the pole face, taking care not to disturb the alignment of the armature. NC contacts of a relay which is found operated in a working circuit may be closed by opening one connection to the coil, after first bridging or insulating the other contacts, as necessary.

3.004 When using petroleum spirits for cleaning purposes in the power room, provide as much ventilation as practicable. After using the petroleum spirits, the commutators of all dc machines in the power room should be burnished in accordance with approved procedures for the machines involved, since the fumes from the petroleum spirits may soften commutator film and thus adversely affect commutation.

3.01 Relay Mounting and Tightness of Assemblies (Rq 2.01)

(1) Tighten loose screws with the screwdriver.

3.02 Cleaning Contacts (Rq 2.02)

(1) The purpose of cleaning contacts is to remove any gummy or dirty substance that would interfere with reliable contact. It is not necessary or desirable to keep contacts polished or shining. Clean contacts by wiping with a KS-14666 cloth moistened with KS-7860 petroleum spirits, followed by a dry cloth. The contacts should be disconnected from the power supply during the cleaning operation.

(2) There shall be as little smoothing of contacts as is consistent with satisfactory operation. Contacts should be smoothed while closed. To close NO contacts, hold the relay operated manually or electrically. In the case of contacts not connected to the power supply, insert a No. 265C burnishing tool or strip of abrasive cloth (with contacts connected to the power supply, abrasive cloth only) between the contacts to be cleaned, and draw it back and forth until the build-ups are removed entirely or are reduced sufficiently to insure reliable contact. Then clean the contacts as outlined in (1) above.

(3) If contacts become badly worn, replace the relay.

3.03 Contact Alignment (Rq 2.03)

(1) Using the No. 485A pliers, adjust a contact spring that is slightly bent or out of alignment.

(2) If alignment still cannot be obtained, replace the relay.

(3) To obtain access to the two contacts next to the center of the KS-15528 relay, it will be necessary, first, to remove the stationary contact support from the relay, using the screwdriver to remove the screws which attach it to the relay.

3.04 Contact Sequence (Rq 2.04)

(1) If associated contacts do not make or break simultaneously, inspect the movable contacts or the stationary NO or NC contacts as a group. If one contact is out of line with the others, correct by adjusting with the No. 485A pliers. After any change, check requirements 2.03, 2.05, 2.06, and 2.08.

3.05 Contact Separation (Rq 2.05)

(1) To adjust for contact separation adjust the stationary contact, as required, using the No. 485A pliers.

(2) After making any adjustments as covered above, check that the other

contacts of the relay meet the requirement and all contacts meet requirements 2.03, 2.04, 2.06, and 2.08.

3.06 Contact Pressure (Rq 2.06)

(1) Contact pressures are specified on a minimum basis and have a direct bearing on the electrical requirements. If the pressure is greatly in excess of the specified minimum limit, the relay may fail to meet its electrical requirements. If requirement is not met, replace the relay.

3.07 Freedom of Operation (Rq 2.07)

(1) To check an armature for freedom of operation, see that the service is maintained and operate the armature by hand, observing its action. Remove dirt or other obstruction.

3.08 Electrical Requirements (Rq 2.08)

(1) A check of the operation of a voltage rated relay is made by connecting a voltmeter across the coil terminals. If there is no indication on the voltmeter, a study of the associated circuit is necessary to determine whether the absence of voltage indicates a circuit fault or is a condition to be overcome by blocking a relay or otherwise changing circuit conditions. Failure to operate with rated voltage at the coil terminals may sometimes be corrected by readjustment, but in some cases it may be due to an open coil. To check for an open coil, connect the voltmeter in series with the operating voltage and the coil. If no indication appears on the voltmeter, the coil is open and the relay should be replaced.

(2) For checking electrical requirements, a 35-type test set having a voltmeter should be used. Where test set preparation has not been specified in the circuit requirement table, it is suggested that both relay coil terminals be disconnected and both battery and ground be furnished through the test set with B/G or B/G/V preparation.

(3) If the armature moves toward the core as the electrical operate current is applied, but fails to pull all the way up to the core, it is an indication of excessive NO contact pressure, a bind in the hinge structure, an obstruction in the armature gap, or excessive armature spring tension. If the armature spring tension is excessive, replace the relay.

(4) If the relay does not release, check the armature for binding, and clean. Check the armature spring to see that it has sufficient tension to return the

armature to the open position. If tension is not sufficient, replace the relay.

(5) After meeting the electrical requirements, check that the other requirements are still met. If necessary readjust making sure that the electrical requirements are still met.

3.09 Temperature (Rq 2.09)

(1) If the temperature exceeds the specified limit, see that requirements 2.02, 2.03, and 2.06 are met. If these requirements are met and the temperature is still above the specified limit, with nameplate rated voltage not exceeded, refer the matter to the supervisor as the relay may have to be replaced.