

## CONTROL RELAYS

### KS-15517 AND KS-15726

### REQUIREMENTS AND ADJUSTING PROCEDURES

#### 1. GENERAL

1.01 This section covers the KS-15517 and KS-15726 control relays. This apparatus is intended for use in the J86618 or J86621 control cabinet associated with the 900-type engine-alternator plants and is suitable for use in ambient temperatures between -29C and 50C (-20 F and 122F).

1.02 This section is reissued to add requirements and adjusting procedures for the KS-15726 relay and to rearrange the requirements and adjusting procedures. Since this is a general revision, the arrows ordinarily used to indicate changes have been omitted.

1.03 Reference shall be made to Section 020-010-701 covering general requirements and definitions for additional information necessary for the proper application of the requirements listed herein.

#1.04 Requirements and associated procedures marked with a number sign (#) need not be checked by the installer unless it is thought that the requirement is not being met or performance indicates that such a check is advisable.

\*1.05 Requirements and associated procedures marked with an asterisk (\*) need not be checked during maintenance unless the apparatus or part is made accessible for other reasons, or performance indicates that such a check is advisable.

1.06 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.

1.07 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.

1.08 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.

1.09 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.

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

Caution: Do not touch, at the same time, live terminals or parts which are at different potentials, or otherwise short-circuit them.

1.11 Relays must not be handled by the contact springs.

#### 2. REQUIREMENTS

##### 2.01 Relay Mounting and Tightness of Assemblies

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

(b) Coils and contact post assemblies shall be fastened securely to the relay. Fastenings holding the component parts together shall be secure.

Gauge by feel.

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

Gauge by feel.

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

Gauge by eye.

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

Max 1/32 inch

Gauge by eye.

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

<u>Relay</u>	<u>Min</u>
KS-15517 L1, L3, L6 and L7	1/8 inch
KS-15517 L2, L4 and L5	1/16 inch
KS-15726 L1 and L2	1/8 inch
KS-15726 L3	1/16 inch

Use the R-8550 scale.

To check this requirement, proceed as follows. Disconnect the power supply, if connected, to the contacts to be checked.

##### 2.06 Contact Sequence

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

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

Gauge by eye.

When in doubt, use the No. 81A test set or, as covered in Section 100-101-101, the lamp of the 35-type test set. When contacts are paralleled, insulate those not being checked.

2.07 Contact Pressure: The pressure between closed contacts shall be

Min 40 grams

Use the No. 70D or 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.

2.08 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 Temperatures: The temperature shall not exceed:

<u>KS-15517 Relay</u>		<u>Max</u>
Coils		105C (221F)
Contacts		115C (239F)
<u>KS-15726 Rela.</u>		
Coils		105C (221F)
Contacts		115C (239F)
Resistor		140C (284F)

If the temperature is thought to be excessive, check as follows. Hold the bulb of the R-1032 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.

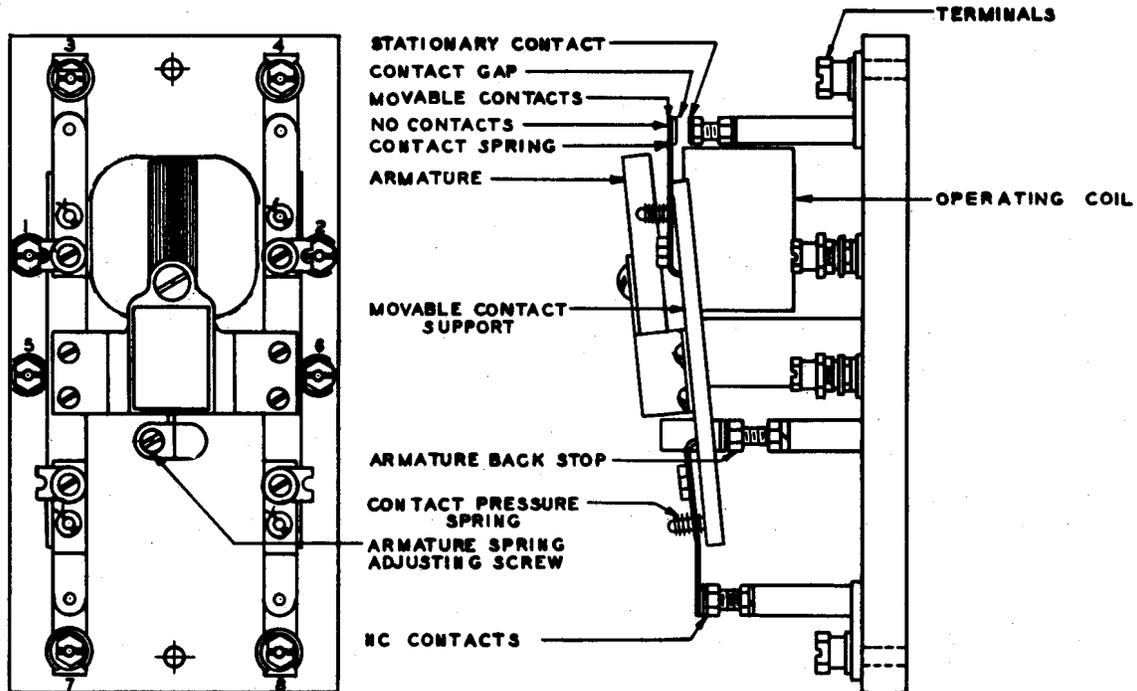


Fig. 1 - Relay, KS-15517, List 2

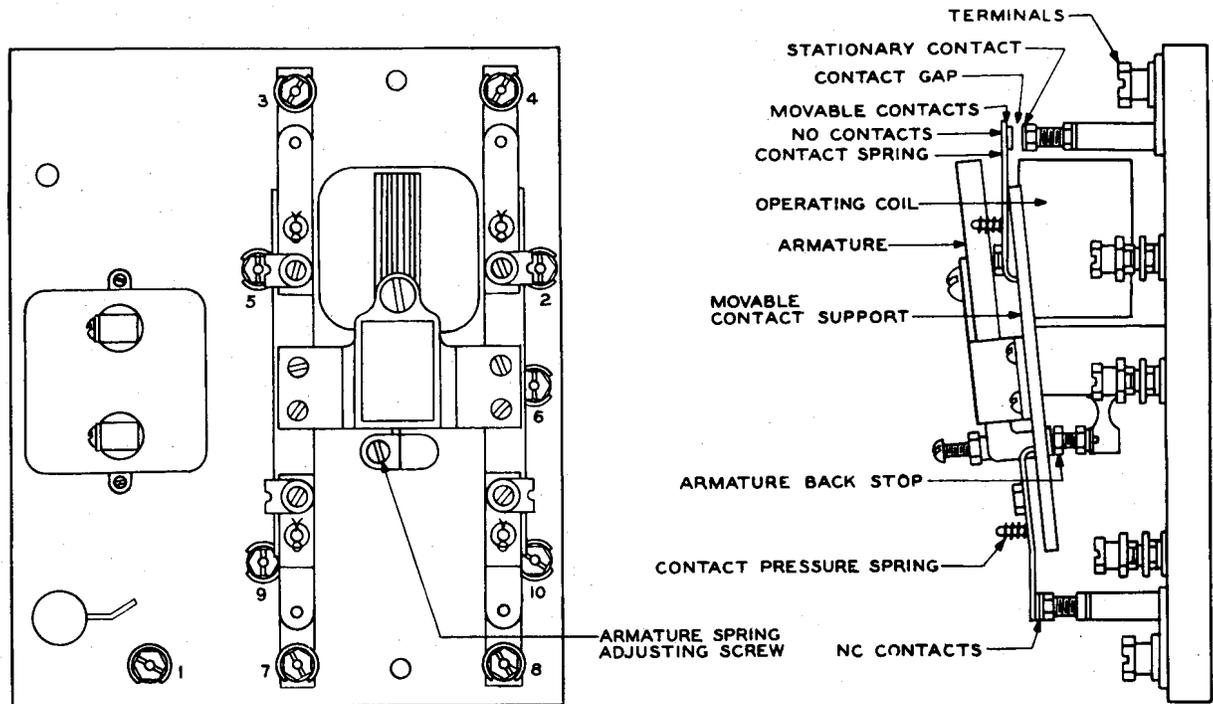


Fig. 2 - Relay, KS-15726, List 3

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, Materials, and Test Apparatus (Equivalents may be substituted if desired.)

<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	Connecting Clip
KS-6780 (as required)	Connecting Clip
-	3-inch Cabinet Screwdriver
- (as required)	Wrenches
<u>Gauges</u>	
70D	50-0-50 Gram Gauge
79C	0-200 Gram Push-Pull Tension Gauge
R-1032	Thermometer
Detail 1 or 2	
R-8550	6-inch Steel Scale

Materials

KS-2423	Cloth
KS-7187	Bond Paper
KS-7860	Petroleum Spirits
-	Abrasive Cloth 150 Grade
-	Felt Pad
-	No. 14 Wire
(as required)	

Test Apparatus

35 Type	Test Set
81A	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)
-	Autotransformer, continuously tapped, (variac, 2.5 amp, 230 volt input, Type V-5 HMT or equivalent; General Radio Co., Cambridge, Mass. suggested)
-	Voltmeter, ac, Weston Model 528, ranges 300-150
-	Voltmeter, dc, Weston Model 281, ranges 150-60-3 (or replaced 280)

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**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, LW13A cords (3 feet, 0 inch) or LW13B cords (6 feet, 0 inch) are suggested, with No. 365 connecting clips or KS-6278 connecting clips at both ends. Lengths of No. 14 wire, or of flexible cord, such as is 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 suitable screwdriver or wrench. 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 broken 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.

### **3.01 Relay Mounting and Tightness of Assemblies (Rq 2.01)**

(1) Tighten loose screws with a screwdriver and loose terminal nuts with a wrench.

### **3.02 Freedom of Operation (Rq 2.02)**

(1) To check an armature for freedom of operation, operate the armature by hand, observing its action. Remove dirt or other obstructions.

### **3.03 Cleaning Contacts (Rq 2.03)**

(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-2423 cloth moistened with KS-7860 petroleum spirits, followed by wiping with 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 operate the mechanical latch, if provided. Otherwise hold the contacts closed manually. In the case of dead contacts, insert a No. 265C burnisher or strip of abrasive cloth (with live contacts, 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) Replace contacts which are badly worn. When replacing worn movable contacts, install a complete contact spring, which includes the lead.

### **3.04 Contact Alignment (Rq 2.04)**

(1) Using the No. 485A pliers, adjust a contact spring that is slightly bent or out of alignment. Any contact spring that becomes badly bent out of shape should be removed and straightened or replaced with a new contact spring.

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

### **3.05 Contact Separation (Rq 2.05)**

(1) Double-throw contacts or transfer contacts shall be checked when the contact on the opposite throw is just breaking.

(2) To adjust, loosen the locknut with a wrench and rotate the stationary contact as required. Tighten the locknut and recheck the separation.

(3) After making any adjustment, check the separation of the other contacts of the relay and requirements 2.04, 2.06, 2.07, and 2.08.

### **3.06 Contact Sequence (Rq 2.06)**

(1) If associated contacts do not make or break simultaneously, inspect the movable contacts, or the stationary contacts as a group, and if one contact is higher or lower than the others of the group, correct by reshaping the springs of movable contacts or by raising or lowering stationary contacts on studs, as applicable. After any change, check requirements 2.04, 2.05, 2.07, and 2.08.

3.07 Contact Pressure (Rq 2.07)

(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, in which case, it will be necessary to reduce the spring tension. In readjusting, it is desirable to have as much tension as possible on the various springs consistent with meeting other requirements. In adjusting the contact springs, tension the corresponding springs of the assemblies on both sides of the armature so that the tensions are approximately equal unless difference is necessary to meet other requirements. When one contact spring is adjusted or otherwise changed, or when the position of a stationary contact is changed, recheck the contact pressure on all the contacts on the relay.

(2) Hum or chatter in ac relays is usually due to too much tension in the armature spring. This tension may be reduced as required, but not to an extent that would interfere with meeting other requirements. Hum or chatter may also be due to too much pressure on the NO contacts. As a last resort, the contact pressure may be reduced, but not below the specified minimum.

(3) Contact pressure may be adjusted by relocating stationary contacts (3.05) or by changing the adjustment of the armature back stop. In the case of NC contacts, resort to this only after getting all the adjustment that can be had by changing the tension of the armature spring as outlined below.

(4) The armature back stop is similar in construction to a stationary contact and is adjusted in the same manner.

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 re-adjustment 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 should be replaced.

(2) When readjusting or when checking for any electrical requirement except the check of operation discussed in (1) above, the relay should be disconnected from the working circuit if practicable. Where this is not practicable, bridge around contacts and insulate between contacts, as necessary, in order to maintain circuit conditions unchanged. Use caution when working in close quarters with live parts.

(3) Where electrical requirements are expressed in volts alternating current, connect the ac supply to the input of a continuously tapped autotransformer protected by a 2-1/2- or 3-ampere fuse. Connect the relay coil and a voltmeter across the output of the autotransformer and adjust to specified values.

(4) Operate, nonoperate, and release adjustments are made, as far as possible, by changing contact pressures (3.07). In no case should the pressure be less than the specified minimum. Additional changes in these values may be made by changing the position of the armature back stop or by changing the tension in the armature spring. After any change in the contact separation, recheck requirements 2.05 and 2.07.

3.09 Temperature (Rq 2.09)

(1) If the temperature exceeds the specified limit, see that requirements 2.03, 2.04, and 2.07 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 coil or the contacts may have to be replaced.