

CONTROL RELAYS, KS-15516

1. GENERAL

- 1.01 This section covers control relays, KS-15516.
- 1.02 This apparatus is intended for use in the J86621 control cabinet associated with the 900-type engine-alternator plants.
- 1.03 Reference shall be made to Section A400.001 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 A relay is said to hold if, after it has operated and the voltage is reduced, it does not release.

2. REQUIREMENTS

- 2.01 Mounting: The relay shall be fastened securely to its mounting. The component parts shall be held together securely. Gauge by feel.

- 2.02 Contact surfaces shall be clean and free from build-ups which might interfere with reliable contact. Gauge by eye.

2.03 Contact Alignment

- (a) The alignment of each pair of NO contacts shall be such that when the contacts are completely closed the edge of one contact does not extend beyond the edge of the other by more than

Max. 1/32"

- (b) The alignment of each pair of NC contacts shall be such that when the contacts are completely closed the edge of the stationary contact does not extend beyond the edge of the movable contact. 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 gaps shall be

Min. 3/32"

Use scale

2.06 Contact pressure, with the contacts fully closed shall be

List No.	Contacts	Min. Grams.
1	NC	30
2	NC	20
3	NC	40
	NC	40
4	NC	30
	NC	40
5	NO	30
	NC	40
6	NO	40
	NC	20
7	NO	35
	NC	40
8	NO	40
	NC	40

Use gauge

- 2.07 Freedom of Operation: The armature shall move freely on its hinge. Gauge by feel.

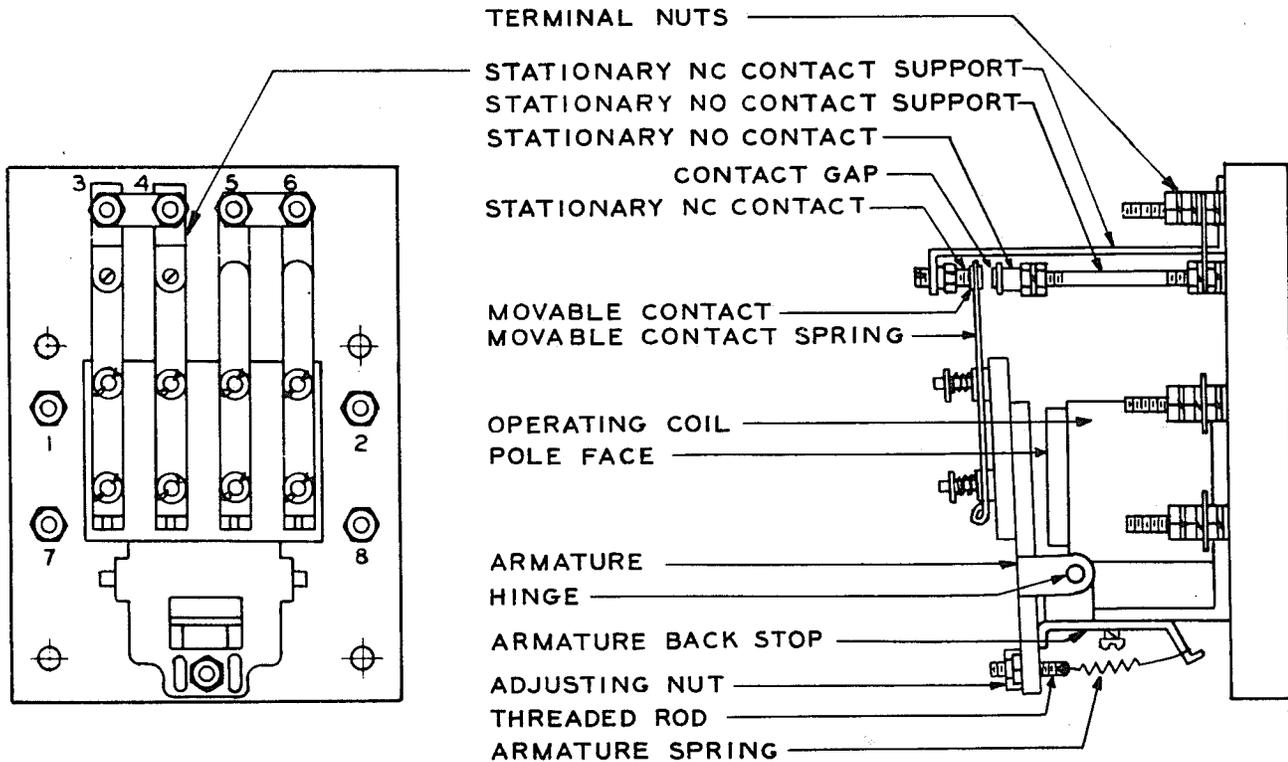


Fig. 1 - Relay KS-15516, List 3

2.08 Electrical Requirements

- (a) The relay shall meet the electrical requirements specified in the Circuit Requirements 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 made at the temperature at which the relay is found, unless H (hot) or C (cold) is specified in the Circuit Requirements Table.
- (d) Where H is specified in the Circuit Requirements Table without heating instructions, the relay coil shall be energized at rated voltage for at least one hour prior to the test.
- (e) Where C is specified in the Circuit Requirements 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

Max.

Coils	105C (221F)
Contacts	115C (239F)

If the temperature is thought to be excessive, measure with the thermometer.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, Materials, and Test Apparatus (Equivalents may be Substituted)

Tools

Burnisher, No. 265C
 Clip, No. 365 (2 req'd per cord)
 Cord, No. 1W13A
 Pliers, P-long nose, 6-1/2"
 Screwdriver, cabinet, 3"
 Test Set, 81A
 Wrench, 1/4" and 3/8" hex, open double end flat, 417A

Gauges

Gauge, gram, No. 70D, 50-0-50 grams
 Gauge, push-pull tension, No. 79C, 0-200 grams
 Scale, steel, 6", R8550
 Thermometer, 0-200C, R1032
 Voltmeter, a-c, Weston Model 528, ranges 300-150

Materials (See Sections A710.011 and A710.012)

Bond paper, KS-7187
 Cloth, abrasive, 150 grade
 Cloth, cleaning, twill jean, D-98063
 Pad, felt
 Spirits, petroleum

Test Apparatus

Autotransformer, continuously tapped (Variac, 2.5 amp. 230V input, Type V-5HMT or equivalent; General Radio Co., Cambridge, Mass., suggested)
 Clips, KS-6780
 Flexible cord, as used with electrical appliances
 Test Set, 35 type

3.002 Where relatively high voltage, for example 190 to 253 volts, is found on the terminals of these relays or on other apparatus mounted nearby, all requirements should be checked, and all adjusting procedures carried out with the high voltage removed from the panel. In the case of the J86621 engine control panel, this is accomplished by operating the BY PASS switch to its NORMAL LINE TO LOAD position, with the engine-driven alternator not running.

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

3.003 In applications where the voltage does not exceed 150 volts, 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. 1W13A cords (3'-0") or 1W13B cords (6'-0") with No. 365 clips at each end are suggested for strapping, as are also lengths of flexible cord of the type used with small electrical appliances, with KS-6780 clips at each end. For insulation between live parts, including open contacts, bond paper should be used, bent or shaped as required to provide protection with a minimum of interference with the work being done.

3.004 If there is doubt as to the exact instant of making and breaking of contacts which have been disconnected from power, the use of an 81A test set is suggested. The lamp signal in the 35-type test set can also be used to indicate contact closure, as outlined in Section A702.002. To close NO contacts, or open NC contacts, hold the armature against the pole face.

3.01 Mounting (Rq. 2.01)

- (1) Tighten loose mounting screws and terminals nuts.

3.02 Contact Surfaces (Rq. 2.02)

- (1) The purpose of cleaning contacts is to remove any gummy or dirty substances that would interfere with reliable contact. It is not necessary or desirable to keep contacts polished or shining. Clean contacts by wiping with a cloth moistened with 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 contacts closed manually. In the case of dead contacts, insert a contact burnisher or a 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 above.

- (3) Replace contacts which are badly worn. When replacing worn movable contacts, install a complete contact spring.

3.03 Contact Alignment (Rq. 2.03)

- (1) Shape, with the pliers, a movable contact spring that is slightly bent or out of alignment. Any contact spring that becomes badly bent out of shape should be removed and reshaped or replaced with a new contact spring. Straighten stationary contact supports with the pliers, as required.

- (2) If alignment cannot be obtained, install a new 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 contacts, as a group, and if one contact is higher or lower than the others of the group, correct as required. After any change check 2.03, 2.05, 2.06, and 2.08.

3.05 Contact Gaps (Rq. 2.05)

- (1) The contacts must be disconnected from the power supply while checking the gap with the scale.

- (2) To adjust a NO contact gap, loosen the locknut and rotate the stationary contact as required. Tighten the locknut and recheck the gap. Use the 417A tool.

(3) To adjust an NC contact gap, loosen the locknut with the 417A tool and rotate the stationary contact with the screwdriver as required. Tighten the locknut and recheck the gap.

(4) After any change in contact gap, check the gap of the other contacts of the relay and 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 of the NC contacts is greatly in excess of the specified minimum limit, the relay may fail to meet its electrical requirements, in which case, it may be necessary to reduce the armature spring tension. In readjusting, it is desirable to have as much tension as possible on the various contacts consistent with meeting other requirements. Either the fan-type gauge or the push-pull tension gauge may be used for measuring contact pressures. When access to the contacts is impossible with the fan-type gauge, the push-pull gauge must be used. When the pressure of one contact 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 a-c relays, except when due to dirt or other obstruction which prevents proper seating of the armature against the pole face, 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) To measure the contact pressure of the NO contacts, energize the operating coil of a relay having a coil rated for less than 150 volts, 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 movable contact. It is recommended that the latter method be used for a relay having a coil rated for more than 150 volts. Place the gauge against the contact spring as near to the movable contact as possible and exert a pressure with the gauge away from the stationary contact. Read the gauge as the movable contact leaves the stationary contact.

(4) To measure the contact pressure of the NC contacts, proceed in a manner similar to that outlined in (3) but allow the armature to be held in its released position by the pull of its spring.

(5) Contact pressure of NO contacts may be adjusted by relocating the stationary contacts. See 3.05 (2). That of NC contacts may be adjusted by changing the tension of the armature spring or as a last resort by changing the position of the armature back stop.

(6) To change the tension of the armature spring, raise the threaded rod so that the adjusting nut clears the stops and turn the nut clockwise to increase, and counter-clockwise to decrease the tension.

(7) To change the position of the armature back stop, loosen the screw and, with the point of the screwdriver, move the back stop as required. Tighten the screw and recheck.

3.07 Freedom of Operation (Rq. 2.07)

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

3.08 Electrical Requirements (Rq. 2.08)

(1) A check of the operation of a relay may be 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 should be replaced.

Caution: In the case of a coil rated 190-253 volts, make the connections with the circuit disconnected from the power supply.

(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. In the case of a relay not connected in 190- to 253-volt circuits, 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 a-c 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 the specified values. If there is no available autotransformer, in the case of the J86621 engine control panel see 3.002, but operate the engine under manual control, using the alternator output, under control of its field rheostat, as a source of voltage. For the test connections, use lengths of flexible cord, of the type used with small electrical appliances, with KS-6780 clips at each end.

(4) Where requirements are expressed in volts, direct current is meant

unless otherwise specified, and a 35-type test set having a voltmeter should be used. For the connections, 1W13A cords are satisfactory.

(5) Operate, hold, and release adjustments are made, as far as possible, by changing contact pressures (3.06). In no case should the pressure be less than the specified minimum. Additional changes in these values are made by changing the air-gap between the armature and the pole face or by changing the tension in the armature spring. After any change in the air-gap, recheck 2.05 and 2.06.

*#3.09 Temperature (Rq. 2.09)

(1) Hold the bulb of the thermometer against the hottest spot in question, covering that part of the bulb not in contact with the relay by a piece of felt or the equivalent.

(2) 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 coil or the contacts may have to be replaced.

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