CONTROL RELAY, KS-15519

1. GENERAL

1.01 This section covers the close differential type control relay, KS-15519.

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 The relay assembly consists of a relay, rheostat, capacitor, and tapped reactor connected in series and mounted on a panel or insulated base. By using different taps on the reactor and adjusting the rheostat, the operate and release values of the relay can be set at values between 190 to 230 volts and 180 to 220 volts respectively, at 60 cycles. The relay assembly is arranged for mounting on a vertical metal panel, and is equipped with a cover switch which short-circuits the capacitor when the cover over the terminals is removed.

2. REQUIREMENTS

2.01 Relay 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 shall be such, that when the contacts are completely closed, the outer edge of one contact does not extend beyond the outer edge of the other by more than
Max. - 1/32"
Gauge by eye.

2.04 Contact gaps shall be:

Contacts	Min.
Main - NO or NC	1/16"
Cover switch	1/8"

Use scale.

2.05 Contact pressure shall be:

Contacts	Min.
Main - NO or NC	40 grams
Cover switch	30 grams

Use gauge.

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

2.07 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 specified, the relay shall be checked for operate at 94 per cent, ± 3 volts, of the nominal voltage of the power service and for release at 88 per cent, ± 3 volts, of the nominal.

(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 Requirements Table.

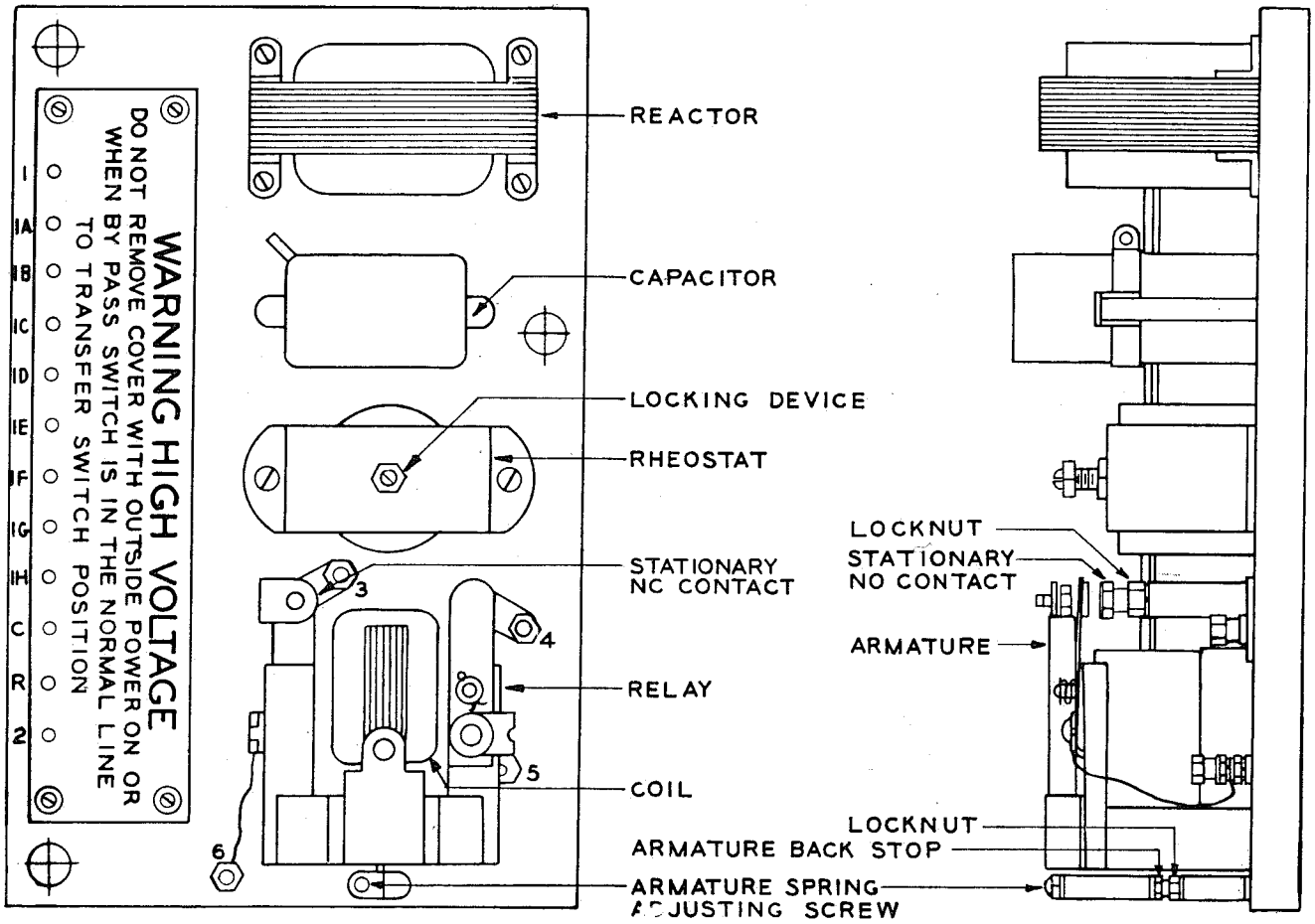

Fig. 1 - Relay, KS-15519 List 1

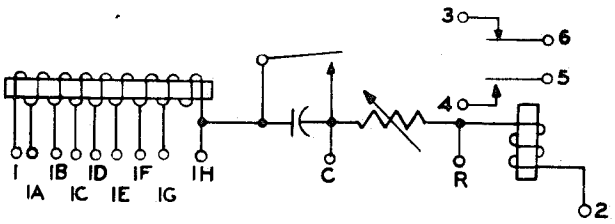

Fig. 2 - Schematic

(d) Where H is specified in the Circuit Requirements Table without heating instructions, the relay coil shall be energized at approximately 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.

*#2.08 Temperatures: The temperature shall not exceed

	Max.
Relay Coils	105C (221F)
Relay Contacts	115C (239F)
Reactor	90C (194F)
Rheostat	140C (284F)

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
Pliers, duck-bill, KS-6015, 6"
Pliers, P-long nose, 6-1/2"
Screwdriver, cabinet, 3"
Wrench, 11/32" Hex. single end socket, No. 33
Wrench, 1/4" and 3/8" hex. open double end flat, No. 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)

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

3.002 Because of the relatively high voltage on the terminals, all requirements except the electrical requirements should be checked, and all adjusting procedures carried out with the relay de-energized. 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. When checking the electrical requirements, see that the contacts are disconnected from the checking circuit.

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

3.01 Relay Mounting (Rq. 2.01)

(1) Tighten loose screws and terminal nuts.

3.02 Contact Surfaces (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 cloth moistened with petroleum spirits, followed by a dry cloth.

(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 armature against the pole-piece. Insert a burnishing tool or strip of abrasive cloth 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 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.

(2) If alignment cannot be obtained, install a new relay.

3.04 Contact Gaps (Rq. 2.04)

(1) To adjust a main contact gap, loosen the locknut and rotate the stationary contact as required. Tighten the locknut and recheck the gap. Use the 417A tool.

(2) After any change in a main contact gap, check the gap of the other main contact of the relay and 2.03, 2.05, and 2.07.

(3) Adjust a cover switch contact gap by forming the springs with the duckbill pliers. Hold a straightedge across the terminal block to simulate the action of the cover in opening the switch. Recheck pressure after making any adjustment of gap.

3.05 Contact Pressure (Rq. 2.05)

(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. Either the fan-type gauge or the push-pull tension gauge may be used for measuring contact pressures. When access to the contact springs is impossible with the fan-type gauge, the push-pull gauge must be used. When one contact spring is adjusted or otherwise changed, or when the position of a stationary contact is changed, recheck the contact pressure on the other contact on the relay.

(2) Hum or chatter in a-c 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. This condition may also be the result of improper seating of the armature on the pole face due to obstruction in the pivot or foreign material in the armature gap. See 3.06.

(3) To measure the contact pressure of the NO contacts, hold the armature securely against the pole face manually. 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.

(4) To measure the contact pressure of the NC contact, 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 the NO contacts may be adjusted by relocating the stationary contact. See 3.04. That of the NC contact 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, loosen the locking nut on the armature spring adjusting screw with the 33 tool, rotate the screw as required, and retighten the nut. The armature back stop is similar in construction to a stationary NO contact and is adjusted in the same manner.

(7) Measure contact pressure of the cover switch as outlined for NO contacts. Adjust by forming with the duck-bill pliers. Recheck the gap after making any adjustment of pressure.

3.06 Freedom of Operation (Rq. 2.06)

(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.

3.07 Electrical Requirements (Rq. 2.07)

(1) With the relay cleared from the working circuit, connect its input terminals (2 and 1 or 1A, etc., as found) across the output of a continuously tapped autotransformer, together with the portable voltmeter. Connect the autotransformer input to the a-c supply through 2-1/2- or 3-ampere fuses. If there is no available autotransformer, in the case of the J86621 engine control panel, operate the BY-PASS switch as covered in 3.002 and connect the relay and voltmeter through the fuses to the alternator. Operate the engine under manual control and adjust the alternator voltage with the field rheostat. Increase the applied voltage until the relay operates. Reduce the voltage to the required release value and adjust the rheostat to obtain release at this value. Check the operate and, if incorrect, connect to another tap on the reactor. Again increase the voltage to operate the relay, reduce the voltage to the release value, and adjust the rheostat to obtain release. Increase the voltage and recheck the operate.

(2) In general, the operate value of the relay depends on the selection of a tap on the reactor, and the release, on the setting of the rheostat. The following table relates the taps to the voltage range with which they are designed to be used.

Service Voltage	Taps on Reactor
240	1, 1A, 1B
230	1A, 1B, 1C
220	1C, 1D, 1E
208	1E, 1F, 1G

*#3.08 Temperature (Rq. 2.08)

(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 2.05 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.