

KS-5453 VOLTAGE RELAYS  
DIRECT CURRENT — SOLENOID TYPE  
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers a direct-current solenoid-type voltage relay per specification KS-5453.

1.02 This section is reissued to define nominal voltage, to add a note of caution on meeting the requirements, to reword the temperature requirement, to revise the list of tools, materials, and test apparatus, and to amplify the procedures for operating and holding effect. Detailed reasons for reissue will be found at the end of the section.

1.03 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.

1.04 Nominal voltage as referred to in this section is that voltage specified on the SD drawing for a particular installation and is the midvoltage value between the high and low contacts.

\*1.05 Requirements are marked with an asterisk (\*) when to check for them would necessitate the dismantling or disconnecting

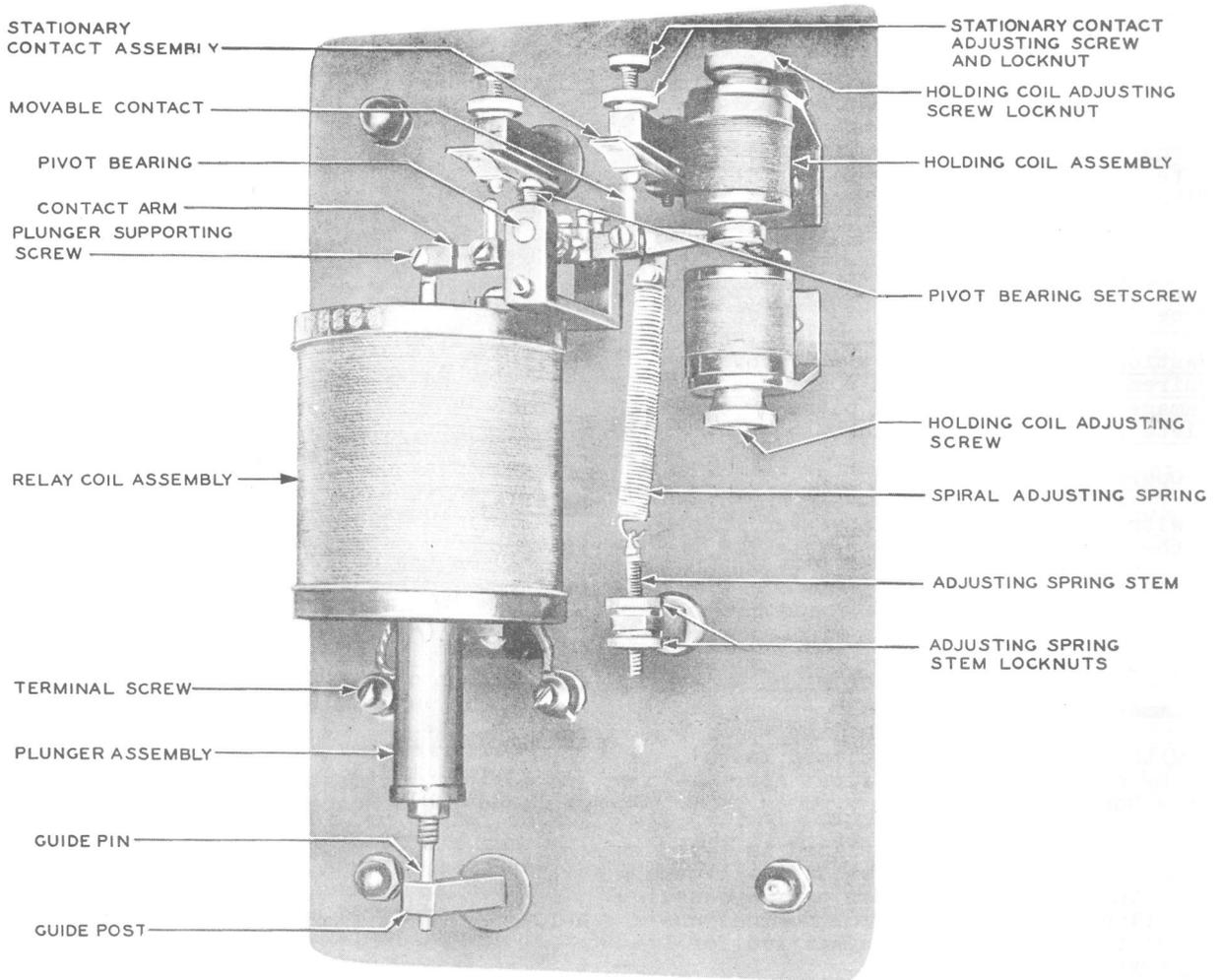


Fig. 1 - KS-5453 Voltage Relay

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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.

1.06 Measurements called for in this section may be made by sight or by feel unless otherwise specified.

2. REQUIREMENTS

2.01 Alignment: The pivot bearings shall be so adjusted that the plunger attached to the contact arm hangs vertically and has its vertical axis concentric with the axis of the voltage control coil.

2.02 Freedom of Contact Arm: The contact arm shall turn freely in the pivot bearings.

2.03 Freedom of Plunger: The voltage control coil plunger shall not touch the control coil, and its guide pin shall operate freely in its guide post.

2.04 Spiral Adjusting Spring: The spiral adjusting spring for the contact arm shall not be bent or distorted appreciably.

2.05 Position of Contacts: With the contact arm in its horizontal position, the fixed contacts shall be equidistant from the movable contacts.

2.06 Contact Surfaces: The fixed and movable contacts shall be clean, smooth, and free from pits.

Caution: Failure to meet the above requirements may result in considerable damage to the associated plant or complete loss of office power.

2.07 Operating Requirements

(a) With nominal voltage impressed across the coil and series rheostats and the solenoid coil hot, the current through the main solenoid coil shall be

Min 0.48 ampere  
Max 0.52 ampere

Use ammeter or test set.

(b) With the conditions outlined in (a), the contact arm shall float approximately horizontally.

(c) With the conditions outlined in (a), the right and left contacts shall make before the voltage decreases or increases, respectively, 1 per cent from nominal unless different limits are specified for the particular installation.

Use voltmeter.

\*2.08 Holding Effect: Each holding coil with its associated core shall provide a holding effect of 1 per cent of the nominal voltage unless otherwise specified.

Use voltmeter.

Note: It is necessary to check the holding effect only when the operation of the relay is unsatisfactory.

2.09 Coil Temperature: When in continuous operation, the temperature of the relay coils shall not exceed

105C (221F)

Use the R-1032 thermometer.

To check the requirement, hold the bulb of the thermometer against the coil as near as possible to the hottest part and cover with a piece of felt, or equivalent, that part of the bulb that does not touch the coil. Observe the reading of the thermometer.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Materials, and Test Apparatus

Code or Spec No.	Description
<u>Tools</u>	
63	5/16-, 3/8-, and 7/16-inch Hex Open-end Wrench
→ 265C (or replaced 265B)	Contact Burnisher
-	6-1/2-inch P-long-nose Pliers
→ -	3-inch Cabinet Screwdriver
<u>Material</u>	
→ KS-7860	Petroleum Spirits
→ KS-14666	Cloth
-	No. 0000 Sandpaper
-	Felt pad, or equivalent
<u>Test Apparatus</u>	
→ 35D (or replaced 35C)	Test Set, or Rheostat capable of carrying 1/2 ampere and Ammeter, DC, Weston, Model 1, range 0-0.6 ampere
R-1032	Thermometer, 0°-200C
→ -	Voltmeter, DC, Weston, Model 931, scale 300-150-75-30 volts

3.002 Before making any adjustments on the voltage relay be sure that there is no open window, fan, or other device in close proximity to the relay which might cause a draft of cold air to blow across the relay coil while the relay cover is removed. In making a final check the solenoid coil of the relay should be approximately at operating temperature. In new installations or installations where the relay has been out of service for any length of time the solenoid coil should be energized with the relay cover closed for at least twenty-four hours before making a final adjustment.

3.003 If the coil circuit is interrupted so that the solenoid plunger drops for any reason, the coil should be energized at operating voltage for at least a half hour to permit the magnetic circuit to return to normal before a final adjustment of the relay is made.

- 3.01 Alignment (Rq 2.01)
- 3.02 Freedom of Contact Arm (Rq 2.02)
- 3.03 Freedom of Plunger (Rq 2.03)

(1) Make sure that all mounting bolts and screws are firm and tighten with a wrench or screwdriver if necessary. Should the contact arm not operate freely in its pivot bearings, or the position of the contact arm in the bearing be such that the voltage control coil plunger does not operate concentrically in the coil, move the contact arm sidewise by loosening the two pivot bearing setscrews with a 3-inch cabinet screwdriver and shift the pivot bearings as necessary. The pivot bearings shall be set to give sufficient play to allow free movement of the contact arm. Tighten the setscrews after the adjustment is completed.

(2) Should it be found after adjusting the pivot bearings that the contact arm still binds, see that the coil plunger swings freely on the plunger supporting screw and that the guide pin is not binding in its guide post. Clean and adjust as necessary but do not lubricate.

(3) If the guide pin is bent, the control coil plunger may be removed from the coil and the guide pin straightened. To take out the control coil plunger the plunger supporting screw at the end of the contact arm should be removed first and the plunger let down until it rests against the guide post. With a pair of P-long-nose pliers, unhook the spiral adjusting spring from the contact arm and disconnect the flexible lead to the contact arm. Hold the contact arm with one hand and loosen the outer pivot bearing setscrews with a 3-inch cabinet screwdriver and pull the contact arm away from the panel pushing out the pivot bearing. The contact arm may now be lifted out of position, care being taken not to injure

the arm or associated contacts. The control coil plunger and guide pin may now be removed by drawing upward through the voltage coil and should then be straightened as necessary. Before replacing, clean with a piece of KS-14666 cloth, wet with KS-7860 petroleum spirits. If rough, smooth with No. 0000 sandpaper. Replace in reverse order from that in which it was taken out.

### 3.04 Spiral Adjusting Spring (Rq 2.04)

(1) If the spiral adjusting spring attached to the contact arm is considerably distorted or broken, it shall be replaced with a new spring. This spring is adjusted at the factory to carry part of the weight of the coil plunger such that the contact arm will float approximately horizontal when nominal voltage is applied to the plunger coil and associated rheostats. This spring should require very little tension. In adjusting the spring, push upward on the adjusting spring stem so that the spring does not carry the weight of the stem and locknuts. Tighten the upper stem locknut before releasing the upward push on the stem.

### 3.05 Position of Contacts (Rq 2.05)

(1) Hold the contact arm in a horizontal position manually and adjust the position of the fixed contacts, as required, by loosening the locknut and turning the contact adjusting screw as necessary. A piece of white paper slid behind the contacts between them and the panel will greatly assist in seeing when the contacts are in the proper position. After an adjustment is completed, tighten the locknut.

### 3.06 Contact Surfaces (Rq 2.06)

(1) To clean the movable or stationary contacts associated with the contact arm, wipe with a clean KS-14666 cloth wet with KS-7860 petroleum spirits or use a No. 265C contact burnisher, if necessary. If the contacts are in bad condition, or if the contact springs are badly bent, they should be replaced.

### 3.07 Operating Requirements (Rq 2.07)

(1) Unregulated Chargers (See Fig. 2): With the coil hot, adjust the test set or rheostat to obtain nominal voltage and then adjust the float rheostat to give 0.5 amperes on ammeter or test set. Change of the float rheostat changes the voltmeter reading requiring alternate adjustment of the two rheostats to give correct current at nominal voltage.

(2) Regulated Chargers, Such as in the 302A Plant (See Fig. 3): Regulated charging units may be adjusted to maintain nominal voltage while EM rheostat is adjusted to correct current as specified in requirement 2.07(a).

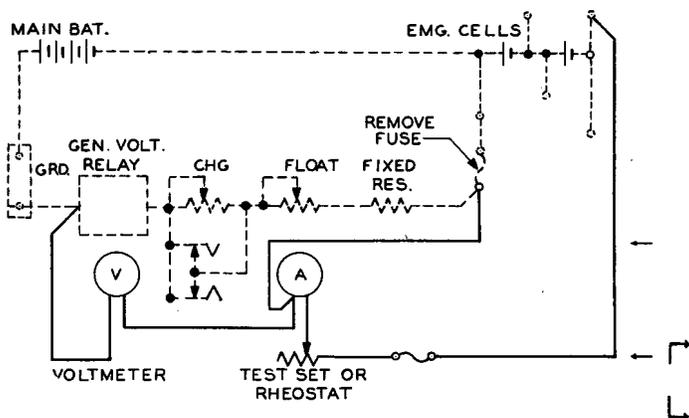


Fig. 2 - Connections for Voltage Relay Adjustment

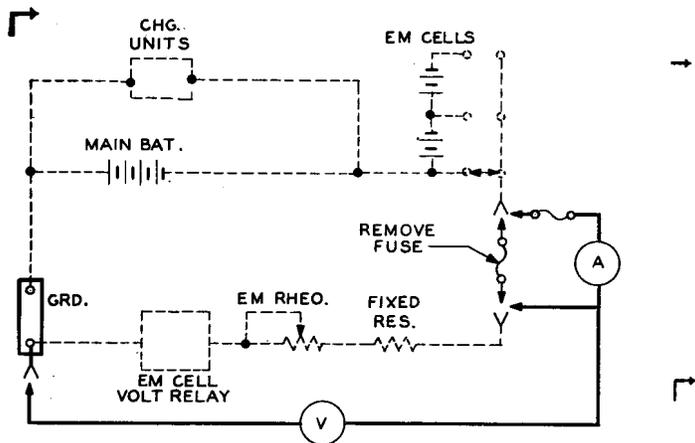


Fig. 3 - Connections for Voltage Relay Adjustment With Regulated Charging Units

(3) With the previous requirements of this section met, loosen the locknuts on the adjusting spring stem and increase or decrease the tension of the adjusting spring until the contact arm floats approximately horizontally. In making this adjustment be sure to push upward on the stem so that none of the weight of the stem and locknuts is carried by the spring. Tighten the locknuts after the adjustment is completed.

(4) Where plant voltmeter is used instead of an external voltmeter, the position of the arm will change when the fuse is reinserted. The correct position is horizontal, which can be obtained by adjusting the EM rheostat.

(5) If the contacts do not make within the desired change in voltage, loosen the locknut on the adjusting stud above the stationary contact affected and raise or lower the contact as required. Tighten the locknut after each adjustment.

### 3.08 Holding Effect (Rq 2.08)

(1) The holding effect of the contact arm in either position may be determined by noting the difference in voltage between the closing and opening values of the associated contacts. The connections for ascertaining this voltage are similar to those shown in Fig. 2 or 3. With Fig. 3, the voltage adjustments on the charging units may be used to vary the voltage. The closing or opening of the contact may be ascertained by noting the operation of the associated relays or, in the case of opening of the contact, a small quick movement of the contact arm may be noted as the contact arm moves away from the holding coil face. In making this test it will be necessary to strap out the associated voltage regulator interrupter or provide other means to insure that a stable battery potential is supplied to the contact arm for the duration of the test.

(2) The holding effect may be adjusted by loosening the associated holding coil adjusting screw locknut and turning the adjusting screw in or out of the holding coil. Turning the screw into the coil increases the holding effect; turning the screw out of the coil decreases the holding effect. Tighten the locking screw after each adjustment.

### 3.09 Coil Temperature (Rq 2.09)

(1) If the temperature exceeds the specified limits after the other requirements of this section are met, replace the coil or refer the matter to the supervisor.

#### REASONS FOR REISSUE

1. To define voltage as referred to in this section (1.04).
2. To add a caution note (2.06).
3. To reword the requirement on temperature (2.09).
4. To revise the list of tools, materials, and test apparatus (3.001).
5. To revise Fig. 2 and add Fig. 3.
6. To amplify the operating requirements. (3.07).
7. To amplify the holding effect (3.08).
8. To revise the procedure for temperature (3.09).