KS-5721 MERCURY RELAYS
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the KS-5721 mercury relays.

1.02 It is reissued to add information on normally closed relays and to bring the section generally up to date. Fig. 1 has been changed and Fig. 2 has been added. Additions and significant changes are marked with arrows.

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 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 of a relay are normally open (NO) or normally closed (NC) depends on the relative position of the plunger and mercury pool when no operating current is flowing in the coil and not on the relative position the plunger and mercury pool normally assumes for a particular application.

1.07 Description: These relays have a single operating coil surrounding one or more sealed glass or metal tubes in each of which is enclosed a plunger of magnetic material with a ceramic lining, two electrodes, an inert gas, and a small quantity of mercury. These component parts and the necessary coil and line terminals are assembled on a metal and phenolic composition base for panel mounting and front-of-board connecting. On relays with normally open contacts and with the coil de-energized, the plunger floats on the mercury and the two electrodes are insulated from each other by ceramic elements. When the coil is energized, the plunger is depressed sufficiently to raise the mercury level and complete an electrical circuit by means of a mercury-to-mercury contact between the two electrodes, acting as the contact or switch terminals. In this manner, the relay functions as an electrically controlled normally open switch suitable for controlling small motors and similar loads. On relays with normally closed contacts and with the coil de-energized, the plunger is weighted in such a way as to allow the mercury to maintain contact between the two electrodes until the plunger is magnetically raised. After the plunger is raised, the level of the mercury falls to a point where the circuit between the two electrodes is broken.

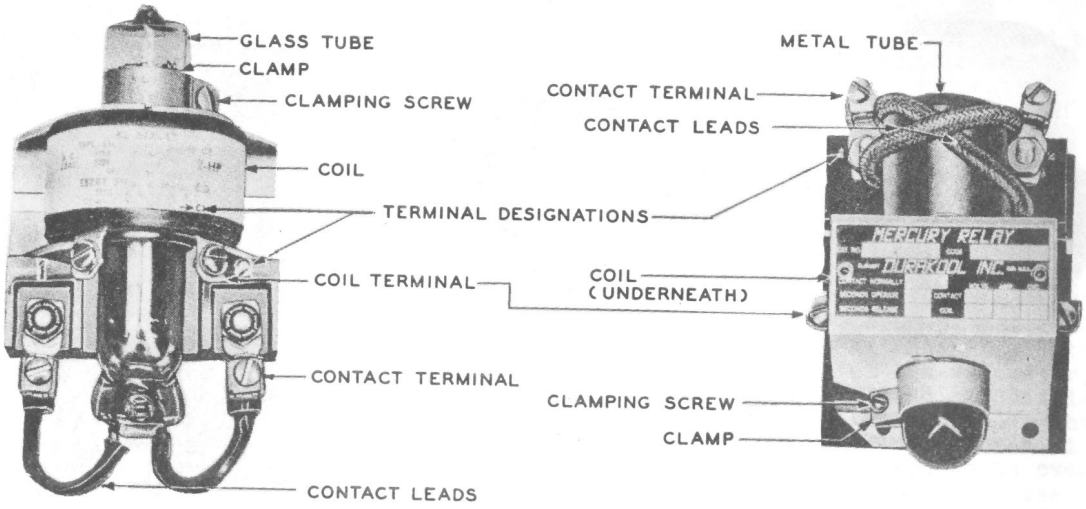

FIG. 1 - KS - 5721 RELAYS

1.08 A NO relay is said to operate when the plunger has moved sufficiently for the circuit through the mercury to close. A NC relay is said to operate when the plunger has moved sufficiently for the circuit through the mercury to open.

1.09 A NO relay is said to release when the plunger has moved sufficiently for the circuit through the mercury to open. A NC relay is said to release when the plunger has moved sufficiently for the circuit through the mercury to close.

1.10 When work is done on a relay in an operating circuit, see that service is maintained. Do not touch or short circuit live terminals or parts.

2. REQUIREMENTS

2.01 Relay Mounting: The relay shall be fastened securely to its mounting. Gauge by feel.

2.02 Alignment: The mercury tube shall be vertical. The horizontal black line which appears on the front of the glass tube shall register with the upper

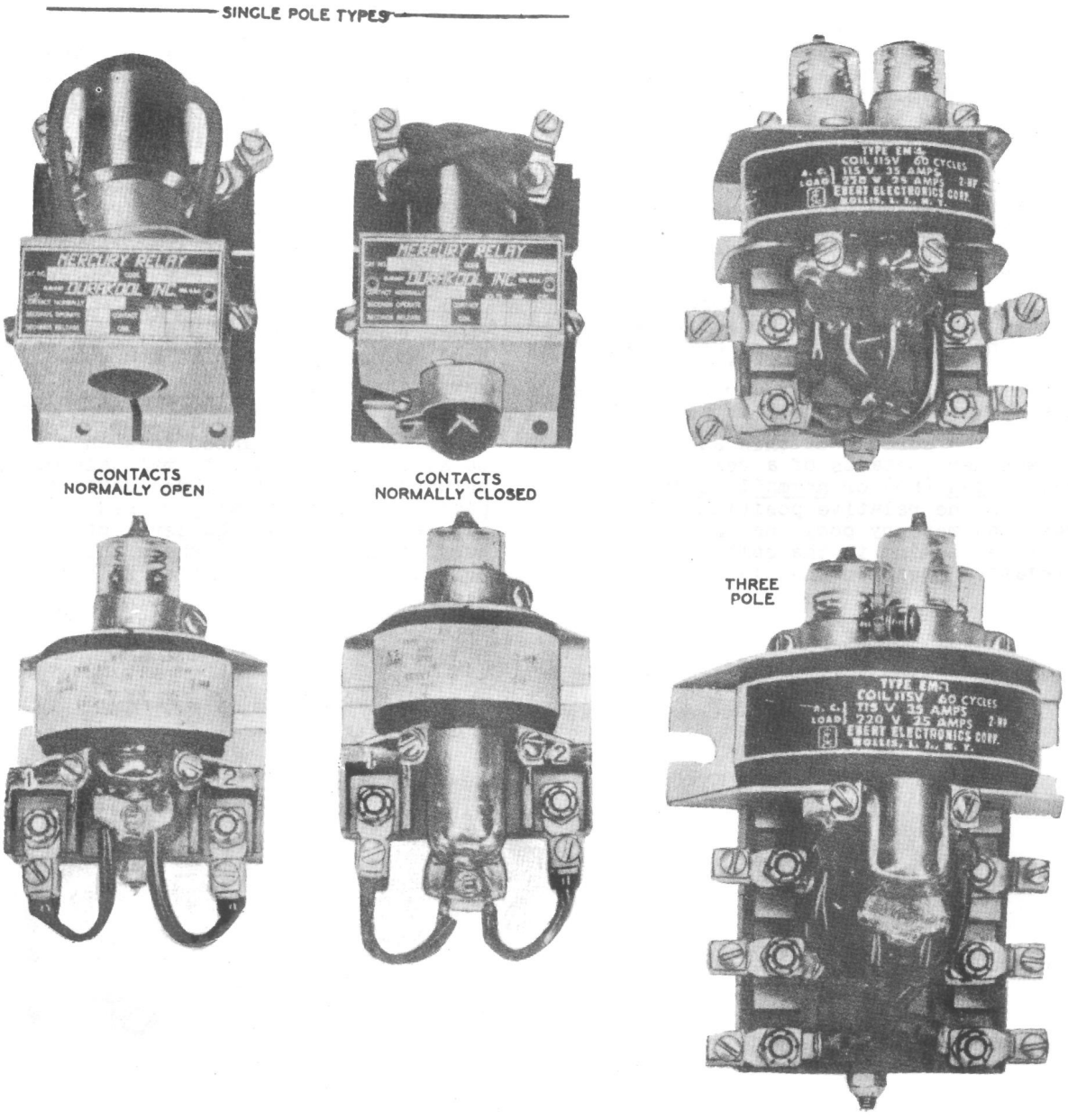

FIG. 2 - TYPICAL KS-5721 RELAYS

edge of the clamp which holds it in place. The metal tube shall be seated firmly in the supporting bracket or on the supporting spacer. Gauge by eye and feel.

2.03 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 in the circuit requirements table, operation of the relay shall be checked at the minimum coil voltage specified on the relay nameplate.

(c) Check of electrical requirements may be at the temperature at which the relay is found by the test man, 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 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 two hours prior to the test.

*#2.04 Temperature: The temperature of the coil shall not exceed

Max. 105C (221F)

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

Caution: Under trouble conditions the temperature of the relay may exceed that shown above. Never estimate temperature with the fingers.

3. ADJUSTING PROCEDURES

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

Autotransformer, continuously tapped (Variac, 5-ampere, 115-volt input, Type V-5 MT, or equivalent; General Radio Co., Cambridge, Mass. suggested)
Clip, No. 365 tool (2 required per cord for strapping)
Clips, KS-6780
Cord, No. 1 W13A
Cord, No. 1 W13B
Pad, Felt
Screwdriver, 3-1/2", KS-6854
Set, Test, 35 type
Thermometer, R-1032, Detail 1 or 2
Volt-ohm-milliammeter, KS-14510 or replaced M9B meter
Wrench, Socket, 3/8" hex. opening, No. 46 tool

3.002 Strapping and Insulating: To maintain service while work is being done on the relay, bridge the live contacts with wire of suitable gauge, making the connections at the most convenient points in the circuit other than at the relay, if practicable. For the coil connections, No. 1 W13A cords (3'0" long) with No. 365 clips at each end are suggested for strapping. No. 1 W13B cords (6'0" long) are equally satisfactory. Suitable lengths of No. 14 wire with KS-6780 clips are also satisfactory.

3.003 General Procedure: When doing mechanical work on the relay it should be disconnected from the working circuit. It may also prove desirable to remove it from the panel.

3.01 Relay Mounting (Rq. 2.01)

(a) Tighten loose mounting screws with the screwdriver. On relays which use a bolt and nut to hold the assembly together, the nut should be tightened with the wrench. Use the wrench to tighten the nuts at the contact terminals.

3.02 Alignment (Rq. 2.02)

(a) The glass tube is held in a nonrigid clamp and its alignment can be corrected by shaping the contact leads with the fingers, as required. To bring the line on the tube into register with the upper edge of the clamp loosen the clamping screw with the screwdriver and raise or lower the tube as required.

(b) The metal tube is supported by the bracket or spacer and the nonrigid clamp holds the tube in place. It can be tightened with a screwdriver.

3.03 Electrical Requirements (Rq. 2.03)

(a) A rough check of the operation of a voltage-rated relay in service is made by connecting a voltmeter across the coil terminals, to indicate the presence of operating potential, and applying the potential. 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 be due to an open coil. To check for an open coil, connect the voltmeter in series with the coil and the supply. If no indication appears on the voltmeter, the coil is open and should be replaced. A new coil and mounting, less the tube, may be obtained, and the old tube inserted.

(b) If the relay fails to operate after the coil is known to be undamaged, or if it fails to release, tap the tube with the finger to determine whether the mechanism is stuck. This difficulty may result from damage sustained from overload due to some trouble condition in the circuit. If the mechanism is sticking, the tube should be replaced.

(c) When checking for any electrical requirement except the rough check of operation discussed in (a) and (b) above, the relay should be disconnected from the working circuit if possible. Where this is not possible, bridge or open the contacts, as necessary, in order to maintain circuit conditions unchanged. Disconnect one or both coil terminals before making the test connections discussed below.

(d) Where requirements are in volts, direct current is meant, unless alternating current is specified, and a 35D test set, or a 35C test set supplemented by the d-c voltmeter, should be used. Where test set preparation has not been specified in the circuit requirements table, disconnect both relay coil terminals and furnish both battery and ground through the test set with B/G or B/G/V preparation.

(e) Where requirements are specified in volts a-c, use the a-c voltmeter together with a continuously tapped autotransformer protected by a 2-1/2- or 3-ampere fuse. Connect the relay and the voltmeter across the output of the autotransformer and adjust it to the specified values.

(f) Adjustments are not feasible and if the relay fails to meet its requirements, it should be replaced.

*#3.04 Temperature (Rq. 2.04)

(a) Hold the bulb of the thermometer against the hottest spot on the coil, covering that part of the bulb which is not in contact with the coil with a piece of felt or the equivalent. If the temperature exceeds the requirements, the relay should be replaced.