

RELAYS - THERMAL TIME DELAY

CONTENTS

- |                         |                         |
|-------------------------|-------------------------|
| 1. INDEX                | 4. REQUIREMENTS         |
| 2. GENERAL              | 5. ADJUSTING PROCEDURES |
| 3. INSTALLING EQUIPMENT |                         |

1. INDEX

| Subject                                                                                                      | Figure  | Paragraph                          |
|--------------------------------------------------------------------------------------------------------------|---------|------------------------------------|
| General<br>Cautions<br>Description<br>Scope                                                                  | 1, 2, 3 | 2.31, 2.32<br>2.21 to 2.23<br>2.11 |
| Installing Equipment<br>Test Apparatus<br>Tools                                                              |         | 3.2<br>3.1                         |
| Requirements and Adjusting Procedures<br>Contact Clearance<br>Contact Pressure<br>Contact Surface<br>General |         | 4.5, 5.4<br>4.4, 5.3<br>4.3<br>5.1 |
| Magnetic Relay Requirements<br>Mounting<br>Temperature<br>Timing                                             |         | 4.6, 5.5<br>4.2<br>4.7<br>4.1, 5.2 |

2. GENERAL

2.1 Scope

2.11 This section covers the requirements and adjusting procedures to be used with the following thermal type time delay relays.

KS-5596  
KS-15518  
KS-15623  
KS-16022  
KS-16195  
KS-16388

2.12 There are a number of thermal type time delay relays which are contained in sealed envelopes like vacuum tubes and are not adjustable, therefore, they are not covered herein.

2.2 Description

2.21 KS-5596

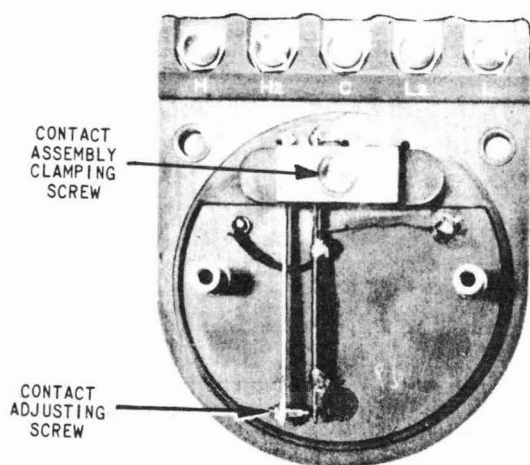
2.211 The KS-5596 relay consist of one or two heater elements which when energized, will cause a bimetallic strip to deflect and close a set of control contacts. Figure 1 shows a view

of this relay with the cover removed and also includes schematics for lists 01, 02 and 03.

2.22 KS-15518

2.221 The KS-15518 relay contains two bimetallic strips arranged to actuate a push-rod and lever mechanism and a specially designed contact spring which carries the movable contact at, and beneath, its center. When current flows thru the heaters they heat the bimetallic strips. (When heated, one side of a bimetallic strip expands more than the other side, causing the strip to bend or warp.) The movement of the bimetal strips is transmitted thru a push-rod mechanism to the free end of the contact spring causing this spring to close the contacts with a snap action. On removal of the heating current, the contacts remain closed until a latch is released manually. The latch may be removed to provide for automatic reset of the contacts, which will occur with a snap action as the strip cools. (See Figure 2.)

2.222 For some applications of the relay, only one heater and one bimetallic strip is provided instead of two, in which case the relay is actuated by the one bimetallic strip.



CONTROL CONTACT TERMS.-L AND L2  
HEATER TERMINALS C, H AND H2

DIAGRAM OF CONNECTIONS

(RP-13837-M)

FIG. 1 KS-5596 TIME-DELAY RELAY AND SCHEMATICS (PAR. 2.211, 4.22 & 5.221)

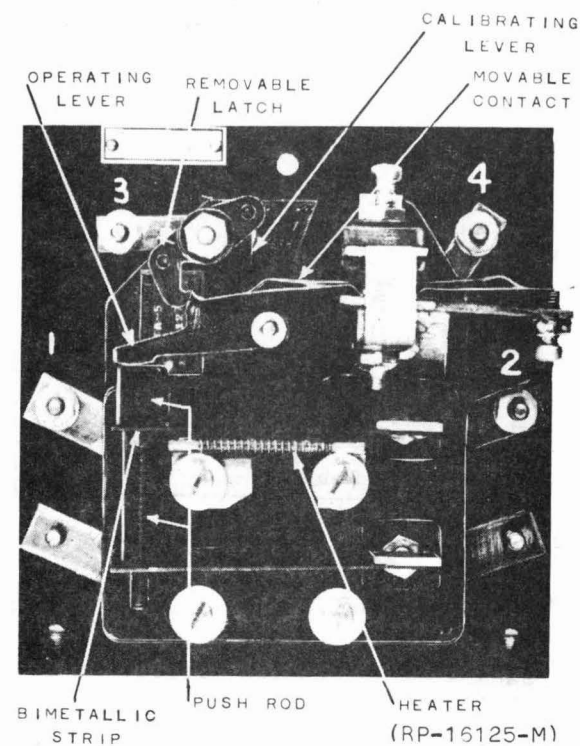


FIG. 2 KS-15518 LIST 1 - THERMAL TIME-DELAY RELAY (PAR. 2.221, 5.231)

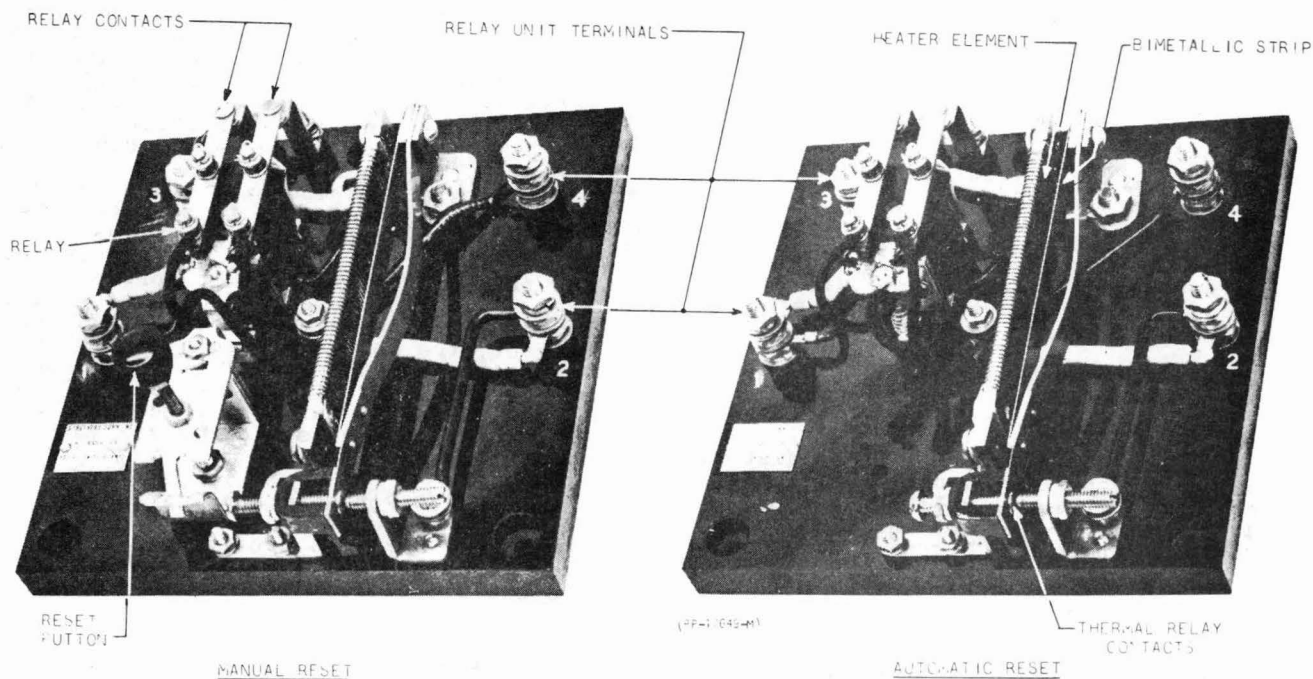


FIG. 3 TYPICAL KS-15623 RELAYS (PAR. 2.231)

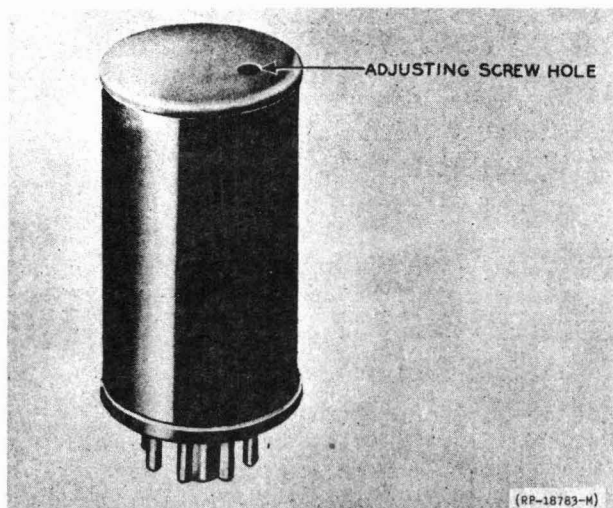


FIG. 4 KS-16022 TYPE RELAY SHOWN. ALSO TYPICAL OF KS-16195 AND KS-16388 (PAR. 4.12, 5.251)

2.223 The time required for operation depends on the magnitude of the heating current and is adjustable over a limited range by means of the calibrating lever. This calibrating lever moves the position of the pivot of the operating lever which in turn regulates the distance over which the end of the moving contact must travel before it snaps and closes. The list 2 relay also has an externally mounted variable resistor in series with the heater for heater current adjustment.

#### 2.23 KS-15623

2.231 The KS-15623 relay unit (shown in Figure 3) consists of a heater element, a bimetallic strip with a set of contacts, and a magnetic relay. After the heater element has been energized for a prescribed time interval, the bimetallic strip snaps away from the holding magnet and makes contact with the stationary thermal relay contact. When these two contacts close, the relay coil is energized thus actuating the relay armature. The relays are arranged for either automatic or manual reset. On relays arranged for manual reset, a latch with a reset button is provided. The time required for the bimetallic strip contacts to close varies inversely with the heater current and is adjustable over a limited range. The relay contacts are of the double-pole, single throw, normally open type.

#### 2.3 Cautions

2.31 Before beginning work on any relay in service, consider the section in Handbook 0 which covers the following:

2.311 Cooperation with the telephone company.

2.312 Precautions and safeguards to prevent service interruptions.

2.313 General protection of working equipment.

2.32 Use care when working in close quarters with live parts.

### 3. INSTALLING EQUIPMENT

#### 3.1 Tools

| Number  | Description                         | In Kit No.  |
|---------|-------------------------------------|-------------|
| 265C    | Burnisher, Contact                  | 197,270,505 |
| 70H     | Gauge, Gram Ten. 0-30               | 197         |
| 132U    | Gauge, Feeler, .056" (Part of 131A) | 197         |
| 485A    | Pliers, Smooth Jaw                  | 197X,505    |
| KS-6854 | Screwdriver, 3 1/2"                 | 197         |

#### 3.2 Test Apparatus

| Number   | Description         |
|----------|---------------------|
| ITE-4040 | Adjusting Set, (DC) |

### 4. REQUIREMENTS

NOTE: Only requirement 4.1 need be checked and 4.2 where it applies, before turnover to the telephone company. All other requirements may be assumed to have been met if the relay performs satisfactorily.

#### 4.1 Timing

4.11 The relays shall operate within the time limits and under the circuit conditions specified in the Circuit Requirement Table. Where no requirements are given, the relays shall be considered satisfactory if the circuit functions as described in the Circuit Description. If a relay fails to meet its timing requirements after readjustment or if the circuit fails to function as described in the Circuit Description, the relay should be replaced. See Figure 4.

4.12 Use the second hand of an ordinary watch to time the interval between the closing of the heater circuit and the operation of the relay contacts. Allow 5 minutes for the heater to cool between operating tests.

#### 4.2 Mounting

4.21 All mounting and contact assembly screws as well as the screws which hold the heater shall be tight. Gauge by eye and feel.

4.22 On KS-5596 relays the contact clamping screw is considered tight when it puts a slight bow in the metal clamping strips, thus holding the composition cylinders against the contact arms with a spring like pressure. (See Figure 1).

#### 4.3 Contact Surfaces

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

#### 4.4 Contact Pressure (KS-15623)

4.41 For KS-15623 magnetic relays, the contact pressure, measured adjacent to the contact with the armature held against the pole piece, shall be min. 20 grams. Use 70H gauge.

#### 4.5 Contact Clearance (KS-15623)

4.51 The clearance of the magnetic relay contacts shall be adjustable and shall be no less than .056". Use 132U gauge.

4.52 The clearance of the thermal relay contacts shall be set at such a distance that the circuit requirements of the associated circuit or plant are satisfied.

#### 4.6 Magnetic Relay Requirement (KS-15623)

4.61 The coil shall actuate the relay positively without hesitation when the voltage shown below is applied to the relay winding terminals.

| <u>List No.</u> | <u>Volts dc</u> |
|-----------------|-----------------|
| 1               | 20              |
| 2               | 28              |

#### 4.7 Temperature (KS-15623)

4.71 The temperature of the KS-15623 magnetic relay parts in normal circuit operation shall not exceed:

| <u>Part</u> | <u>Max. Temperature</u> |
|-------------|-------------------------|
| Coils       | 105C (221F)             |
| Contacts    | 115C (239F)             |

### 5. ADJUSTING PROCEDURES

**NOTE:** For information on contact surface, mounting and temperature for the magnetic relay associated with the KS-15623 Thermal Time Delay relay, refer to the section in this handbook covering Magnetic Relays and Contactors.

#### 5.1 General

5.11 To assure correct voltage and to avoid use of a low voltage ac voltmeter, it is suggested that the leads be disconnected and dc voltage applied with B/G/V arrangement of the ITE-4040 test set.

#### 5.2 Timing (Rq. 4.1)

5.21 To meet readjust requirements allow at least 10 minutes between readings, for the heater and bimetallic strip to cool. If the relay fails to operate, it should be checked for an open circuit in the heater. Disconnect both external heater leads and check for heater continuity.

#### 5.22 KS-5596

5.221 To change the time required for relay operation, first see that the contact assembly clamping screw is tight; (see Paragraph 4.22 and Figure 1)

then loosen the locknut on the contact adjusting screw, turn the screw a fraction of a turn in to decrease the time or out to increase the time, and retighten the nut. The instant of operation of the relay may be determined by the operation of the associated circuit. Failure to operate will require replacement of the relay.

#### 5.23 KS-15518

5.231 Operating time is adjustable by means of a lever located on the base between the supports for the stationary contact and the latch. If the List 1 relay cannot be adjusted to meet the circuit requirement table, it should be replaced. If the List 2 relay cannot be adjusted to meet its time limits by means of the calibrating lever, the variable heater series resistor should be readjusted. First set the calibrating lever (see Figure 2) to its mid position, then loosen the screw on the sliding terminal of the adjustable resistor and adjust the sliding terminal until the proper relay operating time is obtained. Retighten the screw. Finer adjustment of the relay operating time can now be made by means of the operating lever on the relay. If this adjustment is insufficient, the relay should be replaced.

#### 5.24 KS-15623

5.241 A slight adjustment of the operating time can be made by loosening the locknut on the magnet support and changing the clearance between the magnet poles and the bimetallic strip. Tighten after adjustment. If the List 1 relay cannot be adjusted to meet the limits, it should be replaced. If the List 2 relay cannot be adjusted to meet the limits, the associated external rheostat may be readjusted. If this adjustment is insufficient the relay should be replaced.

#### 5.25 KS-16022 KS-16195 AND KS-16388

5.251 If the relay requires adjustment to meet timing requirements, insert the KS-6854 screwdriver through the adjusting screw hole in the top of the cover and turn the adjusting screw clockwise to decrease the operate time. To increase the operate time, turn the adjusting screw counterclockwise. If the relay cannot be adjusted to meet requirements, replace it. See Figure 4.

#### 5.3 Contact Pressure (KS-15623) (Rq. 4.4)

5.31 The contact pressure for the magnetic relay may be adjusted by relocating the stationary contacts or by shaping the movable contact spring. Check relay contact clearance after adjusting contact pressure.

#### 5.4 Contact Clearance (KS-15623) (Rq. 4.5)

5.41 Minor changes in the contact clearance of the magnetic relay contacts can be made by forming the stationary contacts with the 485 tool. Major changes in contact clearance should be made

by placing or removing spacing washers under the stationary contact arm of the relay. Check relay contact pressure after adjusting contact clearance.

5.42 The thermal contact clearance can be adjusted by loosening the lock nut on the stationary contact support and turning the set screw. When proper clearance has been obtained, tighten the lock nut.

→ Arrowed lines indicate new or changed information.

[ Vertical line at side of paragraphs indicates requirements.

#### 5.5 Magnetic Relay Requirements (KS-15623) (Rq. 4.6)

5.51 Apply test voltage to the relay coil terminals. Adjust the spring adjusting nut until the relay operates positively at the required voltage. On relay units using a reset button, it may be necessary to adjust the reset adjusting spring secure the positive action of the relay.

R. E. RAHMES

Engineer of Installation

#### Reason for Reissue:

- (1) To include requirements and adjusting procedure for KS-16022, KS-16195 and KS-16388.
- (2) To remove those relays having no adjustment.

Replaces Section 104 dated 4-2-53.