

(8) It is important that the relay contacts be kept free from corrosion and pits. The relays should be inspected regularly and if the contacts have become corroded a burnishing tool should be used to remove the corrosion.

(9) The armature should not make contact with the core.

*c.* RELAY ADJUSTMENT.

(1) 405 2201 00 (Alternate) (K101)

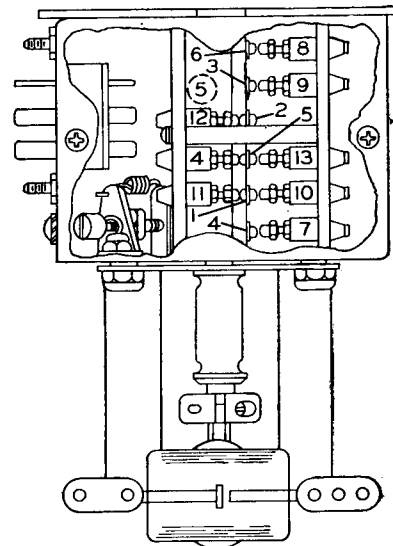
The contact should be adjusted so that when the relay is in the unoperated position the spacing between the movable contact and the stationary contact is between .040 inch and .050 inch. The armature should be adjusted so that the spacing between the armature and the top edge of the field pole is .040 inch. The tension of the armature spring should be adjusted so that the armature back tension is 7 ounces. This relay should operate with a minimum of 18 volts dc and a maximum of 32 volts dc. The dc resistance of the coil, measured at 20°C (68 degrees F.), should be 150 ohms.

(2) 410 0008 00 (K102)

This relay has been provided with three adjusting screws. Refer to figure 5-18. The two adjusting screws located on the side of the relay opposite the multiterminal connector plug control the position and tension of the relay armature when the relay is unoperated. The lower adjusting screw, item 5, determines the position of the armature and the upper screw, item 4, determines the tension of the armature return spring. The tension of the armature return spring, as measured at the top of the bakelite strip should be between 23 ounces and 24 ounces.

To set the armature position, leave the relay in the unoperated condition and rotate the lower adjusting screw in a clockwise direction until the movable contacts just begin to lift from the fixed contacts. Then rotate the adjusting screw approximately one-half revolution in a counterclockwise direction. The movable contacts should rest firmly against the fixed contacts. The position of each fixed contact is adjustable and may be set by loosening the locking nut and rotating the contact. Contacts are numbered according to the terminal number of the plug to which they are connected. The contacts operate in the following sequence when the coil is energized: Group number one, 1 and 11 open, 2 and 12 open, 5 and 4 (or 3 and 5) open, and vacuum contact (S116) opens. Group number two, vacuum contact (S116) closes, 4 and 7 close, 6 and 8 close.

Group number three, 3 and 9 close. Group number four, 5 and 13 close. Refer to figure 5-17. The contacts operate in a reverse order when the coil is de-energized. This sequence can be best checked by removing the relay from the transmitter and using two or more continuity indicating devices. Connect continuity indicators so that the operation sequence of one group of contacts can be compared to the operation sequence of another group. The operation sequence of contacts within a group can be checked in like manner. If improper sequence is observed, loosen the stationary contact locking nuts, screw the contacts in or out as necessary, and tighten the locking nuts. Check the adjustment of the remaining fixed contacts by applying between 22 volts dc and 28 volts dc to the relay coil (terminals 14 and 15 on the multiterminal connector plug) and observing the position of the movable contacts. The movable contacts should rest firmly against the corresponding fixed contact.



NOTE:  
ALTERNATE CONTACT ARRANGEMENT  
NORMALLY CLOSED STATIONARY CONTACT 4 MAY BE  
FOUND LOCATED IN POSITION 5; IN WHICH CASE  
IT WILL BE CONNECTED TO P102 TERMINAL NO. 5.

**Figure 5-17. Keying Relay (K102) Contact Arrangement**

The contacts of the relay should be adjusted so that the gap between the movable contacts and the fixed contacts, when the relay is unoperated, is .035 inch. The relay will operate with a minimum of 18 volts dc applied to the coil but will only follow keying of eight impulses per second with this voltage. With 24 volts dc applied to the relay coil the armature will follow keying at 16

impulses per second. With 28 volts dc applied to the relay coil, the armature will follow keying of 35 words-per-minute. The maximum voltage that should be applied to the relay coil is 28 volts dc.

(3) 260 6010 00 (S116)

This vacuum contact is mounted on the keying relay K102. The vacuum contact must be adjusted to operate properly when the relay is adjusted as described in the preceding paragraphs. The vacuum contact make and break action must occur between the operation of contact groups one and two of keying relay K102. Refer to figure 5-18. A single adjusting screw, Item 2, near the multiterminal connector plug permits the adjustment of the mounting yoke so that the movable contact operating arm will operate the arm to close the contact but will not apply enough pressure to damage the vacuum tube. To adjust the mounting yoke, loosen the two hexagon head screws, Item 1, and with the relay unoperated, rotate the adjusting screw, Item 2, in a direction that allows the movable contact within the vacuum tube to rest firmly against the fixed contact that is ordinarily connected to the RECEIVER terminal of the transmitter. When this adjustment has been completed, tighten the two hexagon head screws, Item 1, and apply voltage to the relay coil (Terminals 14 and 15 on the multiterminal connector plug) and, with the relay operated, check the position of the movable contact within the vacuum tube. The movable contact arm should rest firmly against the fixed contact that is ordinarily connected to the COND. terminal on the transmitter. The contact should be firm but the movable arm should not apply enough pressure to the fixed arm to endanger the vacuum seal. The contact pressure must not exceed 23.45 ounces measured at a point  $\frac{3}{4}$  inch from the diaphragm. If the movable contact is applying too much pressure to the fixed contact when the relay is operated, readjust the lower adjusting screw, Item 5, on the side of keying relay K102, opposite the connector plug, to reduce the pressure. If the movable contact is applying too much pressure to the fixed contact when the relay is unoperated, readjust (Item 4).

(4) 410 1700 00 (K103)

The contacts of this relay should be adjusted so that when the relay is unoperated the gap between the fixed contact and the movable contact, Item 17 figure 5-20, page 5-50, is between .045 inch and 0.50 inch. The gap between the

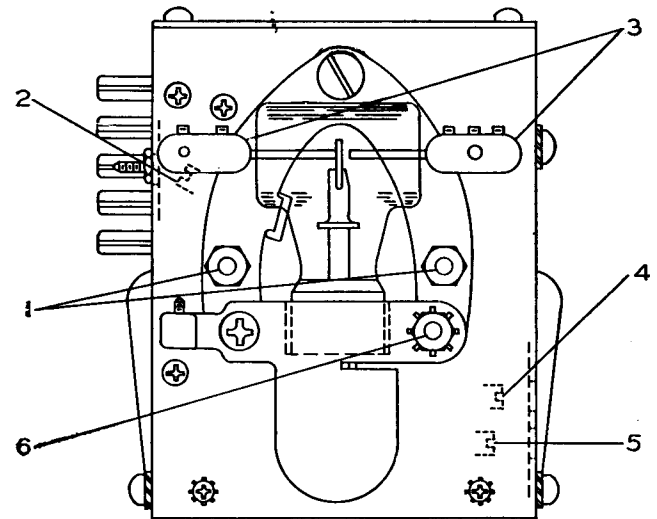


Figure 5-18. Keying Relay (K102) Adjustment

armature and the front edge of the field piece should be  $\frac{3}{32}$  inch.

The armature return spring, Item 8, should be adjusted so that the pressure against the top contacts when the relay is unoperated is between 75 and 80 grams. The pressure between the movable contacts and the fixed contacts when the relay is operated should be between 50 and 55 grams. The dc resistance of the coil is 125 ohms. The minimum voltage required for satisfactory operation is 18 volts dc. The voltage applied to the coil should never exceed 32 volts dc.

(5) 410 1600 00 (K104)

The contacts should be adjusted so that the air gap between the movable contacts, Item 3 figure 5-21, page 5-52, and the fixed contacts, Item 9, is .030 inch. The armature return spring, Item 6, should be adjusted so that the pressure between the movable contacts and the upper fixed contacts is 50 grams. When the relay is operated the pressure between the movable contacts and the lower fixed contacts should be 70 grams. The air gap between the field piece and the armature, as measured at the front edge of the field piece, should be .035 inch. The dc resistance of the coil measured at 20°C (68 degrees F.) is 150 ohms. The relay should operate with a minimum of 18 volts dc and the voltage applied to the coil should never exceed 32 volts dc.

(6) 410 0010 00 (K105)

The air gap between the armature contacts and the fixed contacts should be adjusted to .110 inch. The dc resistance of the coil is 60 ohms. The minimum voltage necessary for satisfactory operation is 22 volts dc. The maximum voltage

that should be applied to the relay coil is 30 volts dc continuous operation.

Adjust contact shaft to have .001 to .005 of an inch end play. Adjust number 6B (*figure 5-22, page 5-54*) normally open contact for .8116 to .9469 ounces minimum pressure in energized position. Set gap at .130 of an inch by adjusting stop nut. Adjust Miniac Switch to make contact just before armature hits core and to break before armature hits stop nut. Adjust armature back pressure to 8 ounces. Adjust number 5 and 7 normally closed contacts for .130 of an inch gap with armature held against core. Adjust number 4 and 6A of double contacts for .111 of an inch minimum gap and .744 ounces minimum pressure. Equalize number 8 contact to match number 4 and 6A contacts. The gap between stop nut and armature should be .003 of an inch minimum. The maximum permissible variation on adjustments is .005 of an inch. The dc resistance of each coil is 30 ohms and the total resistance of the two coils is 60 ohms. The minimum dc voltage necessary for satisfactory operation is 22 volts and maximum voltage is 30 volts.

(7) 401 7900 00 (K2101)

The dc resistance of the coil is 80 ohms. The relay will operate with a minimum of 14 volts ds but will not operate satisfactorily with less than 18 volts dc applied to the coil. A voltage higher than 32 volts dc should not be applied to the coil. The spring, Item 9 *figure 5-23, page 5-55*, should be adjusted so that the minimum armature back tension is not less than 12 ounces. The air gap between the fixed and the movable contacts when the relay is unoperated should be between .035 inch and .045 inch.

(8) 405 2202 00 (K2102)

The contacts should be adjusted so that the air gap between the fixed contacts, Item 1 and 2 *figure 5-24, page 5-56*, and the movable contacts, Item 3, is between .050 inch and .060 inch. The minimum contact pressure should be 135 grams. The relay should operate with 12 volts dc applied to the coil but requires 18 volts dc for satisfactory operation. The maximum voltage that should be applied to the coil is 32 volts dc.

(9) 410 2000 00 (K2105)

The dc resistance of the coil is 125 ohms. The maximum voltage that should be applied to the relay is 32 volts dc. The relay should operate with 18 volts dc applied to the coil. The contacts should be adjusted so that the gap between the movable contact, Item 8 *figure 5-25, page 5-58*, and the fixed contact when the relay is unoperated

is between .045 inch and .050 inch. When the relay is operated the pressure between the fixed contacts and the movable contacts should be between 75 and 80 grams. When the relay is unoperated the pressure between the lower fixed contacts and the movable contacts should be between 50 and 55 grams. The gap between the armature and the front edge of the field piece should be  $\frac{3}{32}$  inch.

(10) RELAY ADJUSTMENT FOR  
ANTENNA LOADING COIL  
CU-32/ART-13A.

The following procedure for repair and maintenance of Vacuum Relay K-2501 is recommended:

a. Inspect relay armature. Proper alignment is obtained when armature is parallel to pole pieces, when depressed to energized position by pushing with finger at center of armature. If not correctly aligned, loosen screws. (No. 1 in *Figure 5-18A*) and align armature parallel to pole pieces. After alignment is made, tighten screws securely.

b. The phenolic push rod, which is the actuating arm between the vacuum switch center contact and relay armature, shall be checked with the relay energized, to make sure that the phenolic push rod centrally clears the feed-through hole in relay case and slotted hole in the cover which is mounted over end of vacuum switch. If necessary, adjustment can be made by loosening the two screws (No. 2 in *Figure 5-18A*) on top of relay armature, then move armature until proper clearance is accomplished. While holding this setting, tighten the two screws on top of armature which had been loosened previously.

c. Check for end play at armature pivot. Armature bearings should be snug with no play. If end play is present, loosen locknut (No. 4 in *Figure 5-18A*) and adjust screw (No. 3 in *Figure 5-18A*) until snug. Tighten locknut (No. 3 in *Figure 5-13*) on ball bearing pivot arm adjusting screw.

**CAUTION**

Adjusting screw (No. 3 in *Figure 5-18A*) should not be tightened against ball bearing. Armature must move freely.

Positive making of vacuum switch contacts is accomplished by having a 0.015 inch over-travel when contacts are closed. The following subparagraphs (*d*) and (*e*) describe the complete adjustments to accomplish 0.015 inch over-travel between: upper stationary and center moveable contacts, and lower stationary and center moveable contacts.