

AUTOMATIC SWITCH COMPANY RELAYS HAVING NO KS DESIGNATIONS REQUIREMENTS AND ADJUSTING PROCEDURES

I. GENERAL

1.01 This section covers the following relays manufactured by the Automatic Switch Company and having no KS designations.

Bulletin 1054

Type 5406
Type 5412
Type 5420
Type 5421
Type 5426

Bulletin 1054-107

Type 107S11
Type 107S13

Bulletin 1054-161

Type 161S5

Bulletin 1255-166

Type 16620

Bulletin 1054-101

Type 101S7
Type 101S12
Type 101S15
Type 101S38
Type 101S39
Type 101S40
Type 101S72A
Type 101S73
Type 101S74
Type 101S75
Type 101S78
Type 101S94

1.02 Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for the proper applications of the requirements listed herein.

1.03 For the purpose of this section, contacts of magnetically-held relays are normally open (NO) or normally closed (NC) depending on their position when no operating current is flowing through the coil and not on their normal position for a particular application which may involve continuous operating current through the coil under normal circuit conditions.

1.04 Operate

(a) Magnetically-held relays are operated by an electromagnet which opens or closes electrical contacts when the electromagnet is energized. These relays are said to operate when the armature has moved sufficiently for NC contacts to open and NO contacts to close with reliable contact.

(b) The mechanically-held relay (type 16620) utilizes a single solenoid coil mechanism in which the solenoid coil is only momentarily energized during the instant of operation. By means of a mechanical movement consisting of a rotating weight controlled by the solenoid plunger, the contacts are positively locked in position. The relay is said to operate when the contact operating plate has moved sufficiently for NC contacts to open and NO contacts to close with reliable contact.

1.05 **Release:** A magnetically-held relay is said to release when the armature has moved sufficiently for NO contacts to open and NC contacts to close with reliable contact.

1.06 **Nonoperate:** A magnetically-held relay is said to nonoperate when, with current flowing through the coil, the armature has not moved sufficiently for NO contacts to close or to reduce the pressure of NC contacts enough to cause unreliable contact.

1.07 **Caution:** *If this type relay is in a circuit where 150 volts or more are applied across terminals on the relay, the voltage should be removed from the terminals before performing any work on the relay or checking requirements other than electrical requirements. In circuits where less than 150 volts are applied across terminals, service may be maintained while working on the relay by bridging and insulating the contacts as covered in 3.002. In some cases, it may be necessary to disconnect leads to maintain service.*

1.08 **Caution:** *If the relay operates in an automatic control circuit, before work is started on the relay, the automatic control should be made inoperative as described in the appropriate section covering the apparatus.*

1.09 Relays should not be handled by the contact springs.

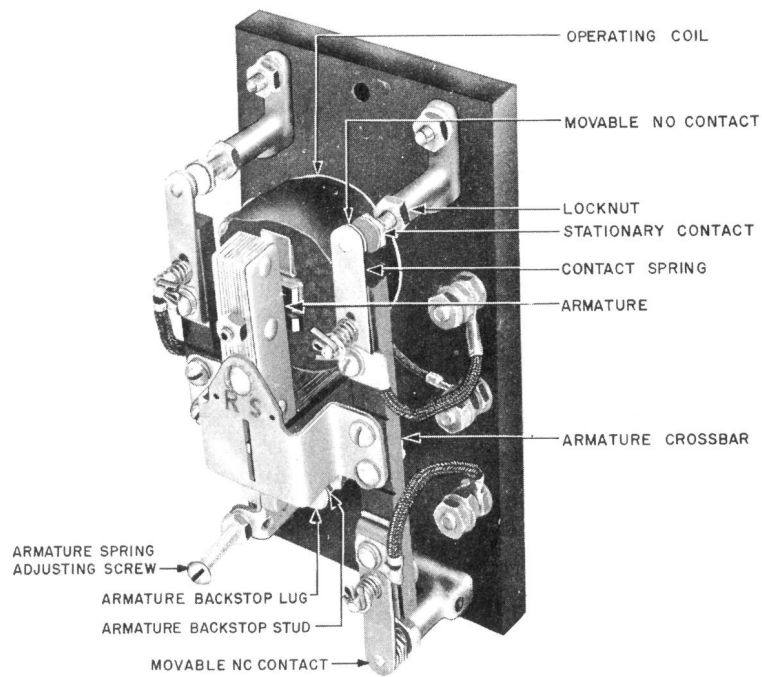


Fig. 1 – Typical Bulletin 1054 Relay (Type 5421 Shown)

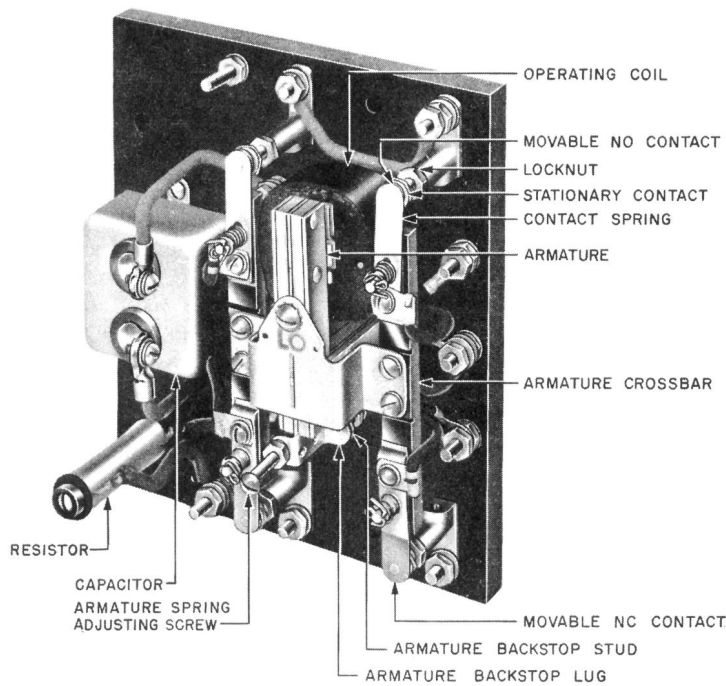


Fig. 2 – Typical Bulletin 1054-101 Relay (Type 101539 Shown)

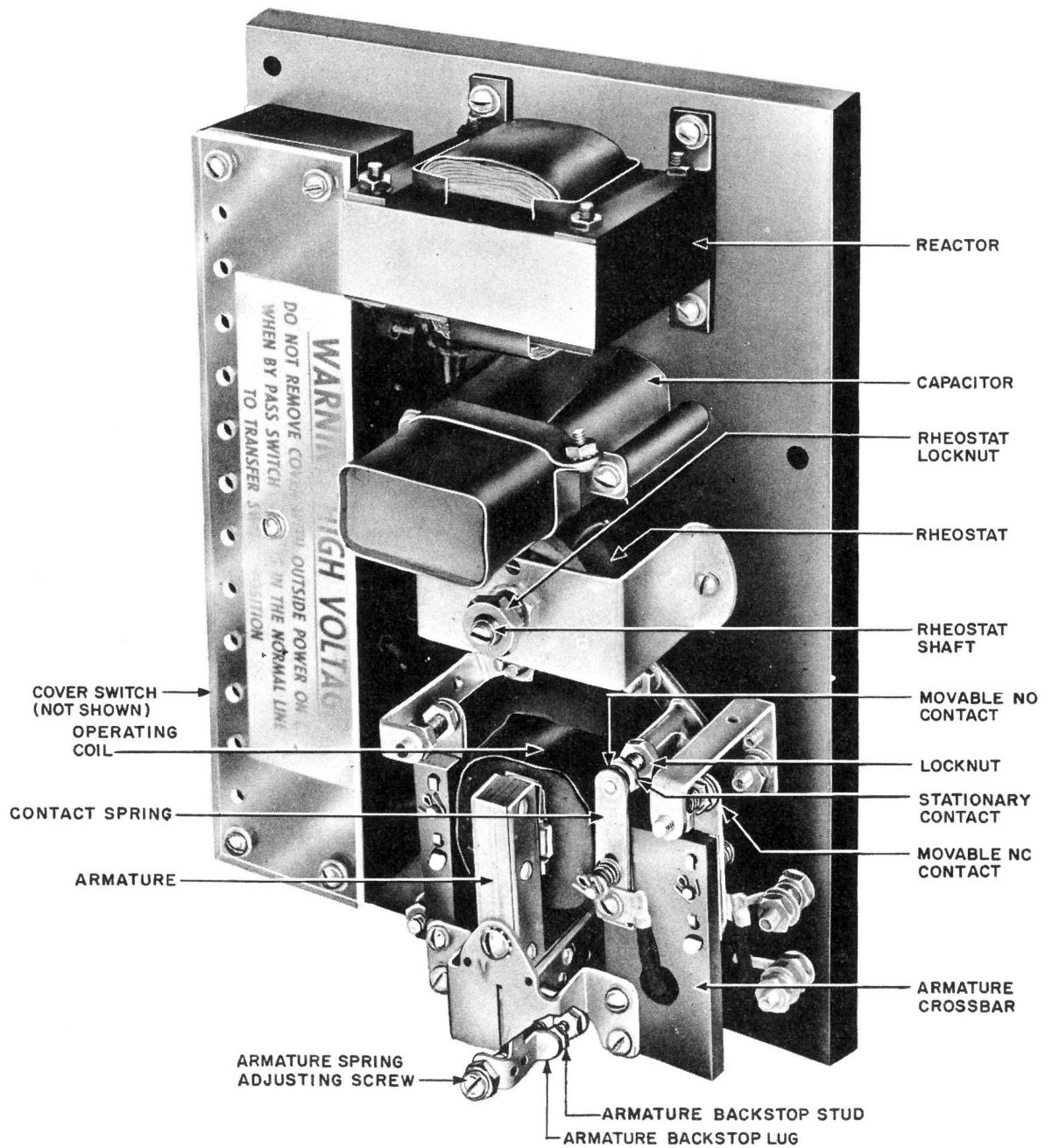


Fig. 3 – Typical Bulletin 1054-107 Relay (Type 107S11 Shown)

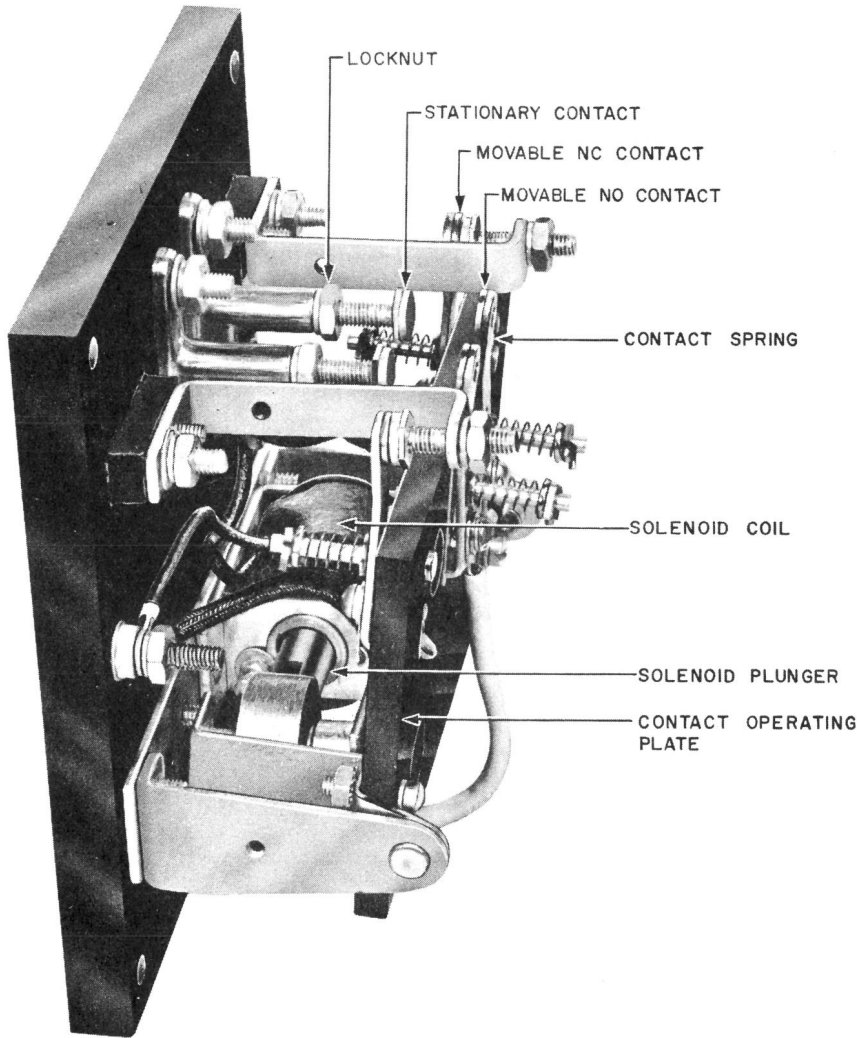


Fig. 4 – Bulletin 1255-166 Relay (Type 16620 Shown)

2. REQUIREMENTS

2.01 *Cleaning Contacts and Removing Build-Ups:* Contacts shall be clean and free from build-ups which might interfere with reliable contact.

Gauge by eye.

2.02 *Relay Mounting and Tightness of Component Parts*

- (a) The relay shall be securely mounted.
- (b) The component parts shall be held together securely.

Gauge by feel.

Caution: *Do not touch or short-circuit live terminals or parts.*

2.03 *Contact Alignment:* Contacts shall be so aligned that, when the contacts are closed, the outer edge of one contact does not extend over the outer edge of the other by more than 1/32 inch

Gauge by eye.

To check the contacts of the type 107S11 or 107S13 relay cover switch, remove the terminal block cover using the 4-inch E screwdriver. If the requirement is met, remount the cover.

2.04 *Contact Sequence*

- (a) All NO contacts shall make at approximately the same time.

Gauge by eye.

- (b) All NC contacts shall break at approximately the same time.

Gauge by eye.

2.05 Contact Separation

- (a) The minimum separation between mating contacts when open shall be as specified in the circuit requirement table. Unless specified in the circuit requirement table, contact separations of type 107S11 or 107S13 relay shall be as follows.

Main Contacts	Min 1/16 inch
Terminal Block Cover	
Switch Contacts	Min 1/8 inch

When checking main contacts, use the gauges as follows.

SEPARATION	GAUGE
1/16 inch	No. 89
3/32 inch	No. 161A
1/8 inch	R-2310
9/16 inch	R-8550 scale

Gauge by eye for cover switch contacts.

Before checking these requirements, disconnect the contacts from the power supply.

- (b) Contact measurement shall be as follows.

Magnetically-Held Relays

- (1) **Single-Throw Contacts:** To check the separation between NC contacts, manually operate the armature with the KS-6320 orange stick. NO contacts should be measured with the relay in its unoperated position without any flexing of the contact pressure spring. (See Fig. 5.)

- (2) **Double-Throw (Transfer) Contacts:** The separation of each contact should be measured while its associated contact is just made, without any follow or flexing of the contact pressure spring. Move the armature manually as required with the KS-6320 orange stick.

- (3) **Cover Switch Contacts:** The cover switch contacts of the type 107S11 or 107S13 relay are in the terminal block at the inner end of position C. To check the requirement for these contacts, use the P-220366 dental mirror.

Mechanically-Held Relays

- (4) When necessary to open contacts to check the requirement, manually operate the relay by actuating the solenoid plunger. Contact separation should be measured without any flexing of the contact pressure spring. (See Fig. 5.)
- (c) If the contact separation is not specified, like contacts on the same relay shall have approximately the same separation. In no case shall the separation be so small that the arc formed at the opening of the circuit is not readily extinguished.

Gauge by eye.

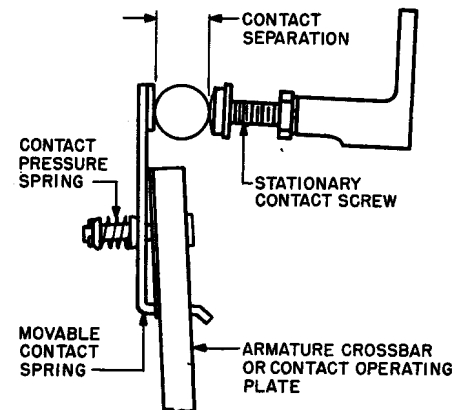


Fig. 5 – Position of Contacts for Contact Separation Measurement

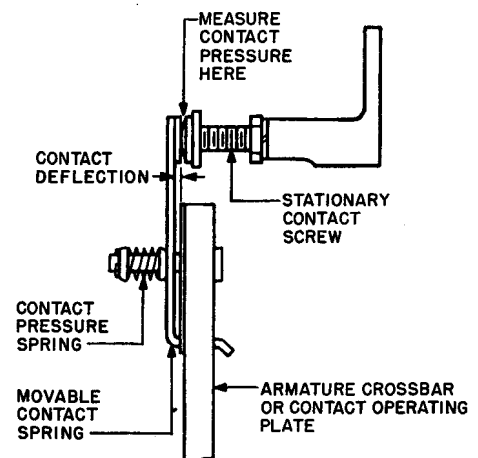


Fig. 6 – Position of Contacts for Contact Pressure Measurement

2.06 Contact Pressure

(a) Contact pressure measured with a gap (contact deflection) between the contact spring and associated armature crossbar or contact operating plate (see Fig. 6) shall be as specified in the circuit requirement table. Unless otherwise specified in the circuit requirement table, the contact pressure between the cover switch contacts of the type 107S11 and 107S13 relays shall be

Min 30 grams

When checking the requirements use the No. 79C gauge.

Before checking the requirements for contact pressure, disconnect the contacts from the power supply.

(b) **Magnetically-Held Relays:** To check the requirements for NO contacts, hold the armature firmly against the pole face with the KS-6320 orange stick, taking care not to touch the contact springs. Apply the tip of the gauge to the movable contact spring as near to the contact as practicable and pull the gauge to lift the spring. Read the gauge when the movable contact just leaves the stationary contact. Check the requirement for NC contacts similarly with the armature held in the unoperated position by the armature spring.

To check the requirement for cover switch contacts of the type 107S11 and 107S13 relays, remove the terminal block cover using the 4-inch E screwdriver.

(c) **Mechanically-Held Relays:** When necessary to close contacts to check the requirement, manually operate the relay by actuating the solenoid plunger. To measure contact pressure, apply the tip of the gauge to the movable contact spring as near to the contact as practicable and pull the gauge to lift the spring. Read the gauge when the movable contact just leaves the stationary contact.

2.07 Freedom of Operation

(a) **Magnetically-Held Relays:** The armature shall move freely throughout its travel.

Gauge by feel.

To check the requirement, slowly operate the armature manually with the KS-6320 orange stick.

(b) **Mechanically-Held Relays:** The contact operating plate shall move freely throughout its travel.

Gauge by feel.

To check this requirement, slowly operate the contact operating plate by actuating the solenoid plunger.

2.08 Electrical Requirements

(a) The relay shall meet the electrical requirements specified in the circuit requirement table or other job information.

(b) 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 requirement table.

(c) Where H is specified in the circuit requirement table without heating instructions, the relay coil shall be energized for at least 1 hour prior to the test.

(d) Where C is specified in the circuit requirement table without cooling instructions, the relay coil shall be de-energized for at least 2 hours prior to the test.

3. ADJUSTING PROCEDURES**3.001 List of Tools, Gauges, Materials, and Test Apparatus**

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
373D	Contact Burnisher Holder
374A	Contact Burnisher Blade
374B	Contact Burnisher Blade
417A (2 reqd)	1/4- and 3/8-inch Open Double-end Flat Wrench
418A	5/16- and 7/32-inch Open Double-end Flat Wrench
KS-2662	File
KS-6015	Duckbill Pliers

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
KS-6278 (As reqd)	Connecting Clip (jaws insulated with No. 108 cord tip)
KS-6320	Orange Stick
KS-6780 (As reqd)	Connecting Clip (jaws insulated with No. 108 cord tip)
KS-14208 (2 reqd)	Brush
R-1542	6-inch Adjustable Wrench
P-220366	Dental Mirror
—	5/32-inch Drive Pin Punch (No. 565 L. S. Starrett Co or equivalent)
—	3-inch C Screwdriver
—	4-inch E Screwdriver
—	1-pound Ball Peen Hammer
GAUGES	
79C	0-200 Gram Push-Pull Tension Gauge
89	1/16- and 1/64-inch Round Thickness Gauge
161A	0.050- and 0.094-inch Thickness Gauge
R-2310	0.105- and 0.125-inch Thickness Gauge
R-8550	6-inch Steel Scale
—	Voltmeter, AC, Weston Model No. 528, Ranges 0-150-300 (or equivalent)
MATERIALS	
KS-2423	Cotton Twill Cloth
KS-7187	Bond Paper
KS-8372	Stabilized Trichloroethylene
—	Abrasive Cloth, 150 grade
—	No. 14 Gauge Insulated Wire
—	1-ounce Bottle
TEST APPARATUS	
35 Type	Test Set

CODE OR SPEC NO.	DESCRIPTION
TEST APPARATUS	
—	893 Cord, 3 feet long, each end equipped with a No. 360A tool (No. 1W13A cord) and a No. 365 or KS-6278 connecting clip
—	893 Cord, 6 feet long, each end equipped with a No. 360A tool (No. 1W13B cord) and a No. 365 or KS-6278 connecting clip
—	Autotransformer, Continuous Tap (Variac, 2.5-amp, 230-volt input, type V-5HMT, General Radio Co, or equivalent)

3.002 *Maintaining Service While Working on Relay*

(1) **General:** If less than 150 volts are applied across terminals and it is not practicable to disconnect the relay from the power supply (see 1.07 and 1.08), bridge the current-carrying contacts and insulate live parts as covered in (2) and (3), respectively.

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

(2) **Bridging Contacts:** To maintain service while work is being done affecting closed contacts carrying current in working circuits, bridge the contacts at the most convenient points in the circuit other than at the relay, if practicable. No. 1W13A cords (3 feet long) or No. 1W13B cords (6 feet long) with KS-6278 connecting clips (jaws insulated with No. 108 cord tips) are satisfactory for strapping purposes. Lengths of No. 14 gauge insulated wire, or flexible cord such as is commonly used in lighting circuits, with KS-6780 connecting clips (jaws insulated with No. 108 cord tips) are equally satisfactory.

(3) **Insulating Contacts and Parts:** KS-7187 bond paper should be used for insulating live parts and should be shaped or bent as necessary to provide protection with minimum interference to the work being done. To prevent closure of open contacts in a live circuit, place bond paper as required around the fixed contact or disconnect the lead to the contact spring.

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3.003 Closing Open Contacts: To close NO contacts, hold the armature against the pole face with the KS-6320 orange stick. To close NC contacts which are open and operating in a working circuit, open one connection to the coil, after first bridging or insulating the other contacts as necessary.

3.004 Removing Relay From Mounting: If it is necessary to remove the relay, patch the working circuit around the relay. Disconnect all power supply from the winding and contact circuits of the relay by opening switches, if provided, or by removing fuses. Then, disconnect the leads from the relay terminals using the 4-inch E screwdriver or No. 417A wrench. Remove the mounting screws with the screwdriver.

3.005 Armature Hum and Chatter: Armature hum generally indicates the necessity of cleaning the armature and pole face. In such cases, clean the parts as covered in 3.07. Armature chatter may be due to excessive NO contact pressure or unsatisfactory seating of the armature on the pole face. Check requirement 2.06 covering contact pressure and readjust if necessary. To improve the seating of the armature on the pole face, draw a piece of 150 grade abrasive cloth across the armature and pole face with the armature held against the pole face with the KS-6320 orange stick.

3.006 Caution: *Unless otherwise stated in the procedures, do not make adjustments or perform work on live contacts or parts.*

3.01 Cleaning Contacts and Removing Build-Ups (Reqt 2.01)

(1) **General:** The purpose of cleaning contacts is to remove any gummy or dirty substance that would interfere with reliable contact. The oxide which forms on silver contacts is not objectionable and does not interfere with the contact. It is not necessary or desirable to keep contacts polished or shining.

(a) Before cleaning contacts or removing build-ups, disconnect the power supply from the contacts as covered in 1.07 and 1.08.

(b) If necessary to clean or remove build-ups from the cover switch contacts of the type 107S11 or 107S13 relay, remove the screws holding the terminal block cover using the 4-inch E screwdriver and remove the cover.

(c) If contacts are badly worn, replace the contact finger, stationary contact, or cover switch contact as covered in Section 040-804-801.

(2) **Cleaning Contacts:** To clean the contacts proceed as follows.

(a) Pour a small quantity of trichloroethylene into a 1-ounce bottle. It is important to avoid the use of contaminated trichloroethylene in cleaning the contacts. Therefore, discard the trichloroethylene as soon as it appears slightly dirty.

(b) Dip the hairs of a clean KS-14208 brush their full length in the trichloroethylene. Remove excess fluid by wiping the brush on the edge of the bottle. Then, with the pair of contacts open, brush the entire surface of the contact to be cleaned with the moist brush.

(c) Brush the contacts with a dry, clean KS-14208 brush. If necessary, burnish the contacts as covered in (d) or (e). After cleaning and burnishing as required, re-mount parts removed.

(d) To burnish the cover switch contacts of the type 107S11 or 107S13 relay, insert between the contacts the No. 374B contact burnisher blade held in the No. 373D contact burnisher holder. Move the burnisher blade back and forth until the contacts are clean as determined by visual inspection. Then, brush the contacts as covered in (c).

(e) To burnish contacts other than those of the cover switch covered in (d), insert between the contacts the No. 374A or No. 374B contact burnisher blade held in the No. 373D contact burnisher holder. If the contacts are normally open, press them together by holding the armature firmly against the pole face. In the case of the type 16620 relay, manually close the con-

tacts (if open) by actuating the solenoid plunger. Move the burnisher blade back and forth until the contacts are clean as determined by visual inspection. After burnishing, brush the contacts as covered in (c).

(3) *Removing Build-Ups*

(a) To remove build-ups from the cover switch contacts of the type 107S11 or 107S13 relay, use a strip of 150 grade abrasive cloth or the No. 374B contact burnisher blade held in the No. 373D contact burnisher holder. For contacts other than those of the cover switch, use a strip of 150 grade abrasive cloth, the KS-2662 file, or the No. 374A or No. 374B contact burnisher blade held in the No. 373D contact burnisher holder.

(b) Insert the abrasive cloth, file, or burnisher blade between the contacts. If the contacts are normally open, press them together by holding the armature firmly against the pole face. In the case of the type 16620 relay, manually close the contacts (if open) by actuating the solenoid plunger. Move the abrasive cloth, file, or burnisher blade back and forth until the build-ups are removed. Exercise care to avoid reducing the height of the contact. After removing the build-ups, brush the contacts with a dry KS-14208 brush and remount parts removed.

3.02 *Relay Mounting and Tightness of Component Parts* (Reqt 2.02)

- (1) Tighten loose mounting screws and other screws with the 4-inch E screwdriver.
- (2) Tighten loose terminal nuts with the No. 417A wrench.

3.03 *Contact Alignment* (Reqt 2.03)

Magnetically-Held Relays

(1) If main contacts do not meet the requirement, shift the position of the contact finger as follows. Loosen the associated armature bar mounting screws, using the 4-inch E screwdriver and the No. 418A wrench. Shift the bar as required to align the contacts and securely tighten the screws. If satisfactory contact alignment cannot be obtained, replace the relay.

(2) If the cover switch contacts of the type 107S11 or 107S13 relay do not meet the requirement, shift the fixed or movable contact springs, as required, to align the contacts. Use the 4-inch E screwdriver to loosen the screw holding the fixed contact spring and the 3-inch C screwdriver to loosen the movable contact spring screw. If the cover switch movable contact spring is distorted, reshape it with the KS-6015 pliers, if practicable, or otherwise replace the spring as covered in Section 040-804-801. After repositioning the springs, tighten the screws and remount the cover.

Mechanically-Held Relays

(3) *Type 16620 Relays:* If the contacts do not meet the requirement, replace the relay.

3.04 *Contact Sequence* (Reqt 2.04)

(1) If the requirement is not met, check the stationary and movable contacts in the group of NO or NC contacts. Adjust the height of stationary contacts using two No. 417A wrenches. Recheck the requirement and also check requirements 2.03, 2.05, 2.06, and 2.08.

3.05 *Contact Separation* (Reqt 2.05)

(1) *Main Contacts:* To adjust the separation between main contacts, loosen the locknut of the stationary contact using two No. 417A wrenches. Turn the stationary contact screw as required and tighten the locknut. While adjusting the separation between main NC contacts, block the armature operated by inserting the KS-6320 orange stick between the armature backstop stud and lug without forcing the orange stick.

(2) *Cover Switch Contacts:* To adjust the separation between the cover switch contacts of the type 107S11 or 107S13 relay, remove the screws holding the terminal block cover using the 4-inch E screwdriver and remove the cover. Bend the movable contact spring as required with the KS-6015 pliers. To check the contact separation with the cover removed, hold the cover across the terminal block and movable contact spring to open the contacts.

- (3) After any change in contact separation, recheck the requirement and check requirements 2.03, 2.04, 2.06, and 2.08. Remount parts removed.

3.06 *Contact Pressure* (Reqt 2.06)

- (1) The contact pressure of main contacts is specified on a minimum basis and has a direct bearing on the electrical requirements. After changing contact pressure, check requirements 2.03, 2.04, 2.05 and 2.08.
- (2) To change the contact pressure of main contacts, adjust the height of the stationary contacts using two No. 417A wrenches.
- (3) To change the contact pressure of the type 107S11 or 107S13 relay cover switch contacts, remove the cover using the 4-inch E screwdriver. Bend the movable contact spring as required with the KS-6015 pliers. Remount the cover.

3.07 *Freedom of Operation* (Reqt 2.07)

Magnetically-Held Relays

- (1) Remove any foreign matter which may have lodged between the armature and pole face of the coil, using the KS-6320 orange stick. In some cases, the armature or pole face may require cleaning with KS-8372 trichloroethylene on a KS-2423 cloth wrapped around the orange stick.
- (2) If the armature is binding on the armature pin, clean the pin as follows. Remove the screw securing the bracket to the armature, using the 4-inch E screwdriver. Position the bracket to gain access to the pin. Remove the armature pin by tapping it with the 5/32-inch drive pin punch and the ball peen hammer. Clean the armature pin and the armature bearings with a KS-2423 cloth moistened with trichloroethylene and wipe the parts with a dry cloth. Remount the pin, using the drive pin punch and hammer. Center the pin with respect to the armature in order to insure clearance with the armature bracket. Remount the bracket and securely tighten the screw. Check requirement 2.03.

Mechanically-Held Relays

- (3) Examine the surface of the solenoid plunger and the brass sleeve in which it operates and, if found dirty, clean the surface as required using a KS-2423 cloth moistened with trichloroethylene followed by a dry cloth.

3.08 *Electrical Requirements* (Reqt 2.08)

Magnetically-Held Relays

- (1) A check of the operation of a voltage-rated relay, excepting the Automatic Switch Company type 107S11 and 107S13, is made as follows.

- (a) **AC Relays:** With power removed from the relays as covered in 1.07 and 1.08, connect the coil of the relay to be tested across the output of a continuous tap autotransformer. Connect the Weston Model 528 voltmeter across the output of the autotransformer. Connect the input of the autotransformer to the ac supply through 3-ampere fuses. Adjust the output of the autotransformer to the values specified in the circuit requirement table.

- (b) **DC Relays:** With power removed from the relay as covered in 1.07 and 1.08, connect the coil of the relay across the output of a 35-type test set equipped with voltmeter. Adjust the output of the 35-type test set to the value specified in the circuit requirement table.

- (2) If, when the operate voltage is applied to the coil, the armature moves only part way to the core, this is an indication of excessive contact pressure or binding of the armature. Check requirements 2.06(b) and 2.07(a).

Type 107S11 and 107S13 Relays

- (3) A check of the operation of the type 107S11 or 107S13 relay is made as follows. With the control circuit inoperative (see 1.07), note and disconnect the power supply leads to the relay terminal block. Connect the output of a continuous tap autotransformer to the same relay terminal block positions to which the power supply was connected in the working circuit. Connect the Weston Model 528 voltmeter across the output of the autotransformer. Connect the input of the au-

totransformer, protected by 3-ampere fuses, to a voltage supply equivalent to the working circuit power supply.

Caution: *To avoid injury and to insure correct adjustment, the cover must be in place over the terminals whenever the relay and its associated circuit elements are connected to any power supply.*

(4) By varying the voltage from the autotransformer, determine the voltages at which the relay operates and releases.

(5) In general, the release value of the relay depends on the setting of the relay rheostat while the operate value depends on the reactor tap selected which is determined by the nominal service voltage with which the relay is used. The following table shows the terminal block positions (reactor taps) which may be used with various nominal voltages. One side of the power supply is connected to one of these positions and the other side to the coil winding.

NOMINAL SERVICE VOLTAGE	TERMINAL BLOCK POSITIONS (REACTOR TAP)
240	1,1A,1B
230	1A,1B,1C
220	1C,1D,1E
208	1E,1F,1G
130	1,1A
125	1A,1B,1C
120	1B,1C,1D
115	1C,1D,1E
110	1E,1F,1G

(6) If the relay does not meet the release requirement, adjust the relay rheostat as follows. Loosen the rheostat shaft locknut with the 6-inch adjustable wrench and turn the shaft fully counterclockwise with the 4-inch E screwdriver. If the relay has released, operate it by increasing the applied voltage. Then, set the voltage to the nominal value specified in the release requirement. Turn the rheostat shaft clockwise until the relay releases. Securely tighten the shaft locknut and recheck the requirement.

(7) If the release requirement cannot be met by adjusting the rheostat as covered in (6), further adjustment may be obtained

by changing the NO contact pressure as covered in 3.06. Increasing or decreasing the contact pressure will cause the relay to release at higher or lower voltages, respectively. However, it is desirable to change these adjustments as little as practicable because of their effect on relay operate. If the relay fails to release, check whether the armature stop plates are worn or missing. If necessary, replace the parts as covered in Section 040-804-801.

(8) After adjusting the relay to meet the release requirement, check the operate requirement. If the relay fails to meet the operate requirement, shift the voltage lead connected to the reactor tap to another terminal block position in the group corresponding to the nominal voltage with which the relay is used as covered in (6). If the requirement cannot be met with the voltage lead connected to either of the remaining terminal block positions in the group, further adjustment may be obtained by changing the NC contact pressure as covered in 3.06.

(9) If the armature does not move when the operate voltage is applied across the coil and reactor and requirement 2.07 is met, the coil, rheostat, capacitor, or reactor may be defective. Check the circuit through these parts and make the necessary replacements as covered in Section 040-804-801.

(10) If, when the operate voltage is applied to the coil, the armature moves part way to the core, this is an indication of excessive contact pressure or binding of the armature. Check requirements 2.06 and 2.07.

(11) After readjusting any parts in connection with meeting the electrical requirements, check these parts for the applicable requirements.

Mechanically-Held Relays

(12) A check of the operation of the type 16620 relay is made as follows. With power removed from the relay as covered in 1.07 and 1.08, restore the relay to its normal position (see Fig. 4) by actuating the solenoid plunger. With the relay in its normal position, connect the solenoid coil across the output of a 35-type test set equipped with a

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voltmeter, making the connections at the normally closed contact terminals. Adjust the output of the 35-type test set to the value specified in the circuit requirement table. If the relay fails to operate, check requirements 2.01 and 2.07(b).

Caution: The solenoid coil is designed to operate when a momentary surge of power is applied to the coil terminals and for that

reason the relay should not be operated more than once per minute.

(13) If after checking requirements 2.01 and 2.07(b) the relay still fails to operate, increase the height of the stationary contact. To adjust the height of the stationary contact, loosen the locknut using two No. 417A wrenches. Turn the stationary contact as required and tighten the locknut.