

**RELAYS AND RELAY SETS**  
**SIGNAL TYPE**  
**PIECE-PART DATA AND REPLACEMENT PROCEDURES**

**1. GENERAL**

**1.01** This section covers the information necessary for ordering parts to be used in the maintenance of KS-3067, KS-5013, KS-5483, KS-5635, KS-6319, KS-6724, KS-8854, and KS-15601 relays and the relays in the KS-5381 relay sets. It also covers the approved procedures for replacing these parts.

**1.02** Part 2 of this section covers the piece-part numbers and the corresponding names of the parts which it is practicable to replace in the field in the maintenance of the above apparatus. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. This information is called Piece-Part Data.

**1.03** Part 3 of this section covers the approved procedures for the replacement of the parts covered in Part 2. This information is called Replacement Procedures.

**1.04** Abbreviation NO or NC contact signifies normally open or normally closed contact, respectively.

**2. PIECE-PART DATA**

**2.01** The figures included in this part show the various parts in their proper relation to other parts of the relay, together with the names

of the parts which it is practicable to replace in the field.

**2.02** When ordering a replacement part, give the part number, the name of the part, and also the complete nameplate data of the relay for which the part is ordered including the KS and list number and the manufacturer's name. For example: one P-51021 bracket for KS-5483 L37 relay, Wheelock Signals Inc, type C9, 125 to 160 volts dc coil, 115 volts ac 12-ampere contacts. Do not refer to the BSP number or to any information given in parentheses.

**2.03** Information enclosed in parentheses ( ) is not ordering information. This information may be references to notes, parts referred to in other portions of the section and not considered replaceable, or part names in general use in the field if these names differ from those assigned by the manufacturer.

**2.04** The figures included in this part cover the relays by type as designated by the outside manufacturer or by KS number and list number. Table A relates the relay type with the corresponding KS number and list number.

TABLE A

Relay	Type	Relay	Type
KS-3067	E4	KS-5483 L10	S9
KS-5013 L1	E1	KS-5483 L11	L2
KS-5013 L2	E4	KS-5483 L12	S9
KS-5013 L3	E1	KS-5483 L13	S9
KS-5381 L1	L5	KS-5483 L14	S9
KS-5381 L2	L5	KS-5483 L20	C7
KS-5381 L3	R1	KS-5483 L20A	A7
KS-5381 L4	R1	KS-5483 L21	C7
KS-5381 L5	C7	KS-5483 L22 (old)	C7
KS-5381 L6 (old)	B4	KS-5483 L22 (new)	A7
KS-5381 L6 (new)	A7	KS-5483 L23 (old)	C7
KS-5381 L7	R1	KS-5483 L23 (new)	A7
KS-5381 L8 (L)*	A9	KS-5483 L24 (old)	C7
(R)**	A49	KS-5483 L24 (new)	A7
KS-5381 L9 (L)*	S7	KS-5483 L25 (old)	C7
(R)**	S7	KS-5483 L25 (new)	A7
KS-5381 L10 (L)*	L2	KS-5483 L26 (old)	C7
(R)**	S7	KS-5483 L26 (new)	A7
KS-5381 L11	C8	KS-5483 L27 (old)	C7
KS-5381 L12 (L)*	A9	KS-5483 L27 (new)	A7
(R)**	A49	KS-5483 L28 (old)	C7
KS-5381 L13	C7	KS-5483 L28 (new)	A7
KS-5381 L14 (L)*	L2	KS-5483 L29 (old)	C7
(R)**	S7	KS-5483 L29 (new)	A7
KS-5381 L15 (old)	C7	KS-5483 L30	C7
KS-5381 L15 (new)	A7	KS-5483 L31	C9
KS-5483 L01	S7	KS-5483 L32	C9
KS-5483 L02	S7	KS-5483 L33	C9
KS-5483 L03	S7	KS-5483 L34 (old)	C9
KS-5483 L04	S7	KS-5483 L34 (new)	A9
KS-5483 L05	SC7	KS-5483 L35	C9
KS-5483 L06	SS7	KS-5483 L36 (old)	C9
KS-5483 L07	S7	KS-5483 L36 (new)	A9
KS-5483 L08	S7	KS-5483 L37 (old)	C9
KS-5483 L09	S9	KS-5483 L37 (new)	A9

\* Relay in the left position (POS 1)  
\*\* Relay in the right position (POS 2)

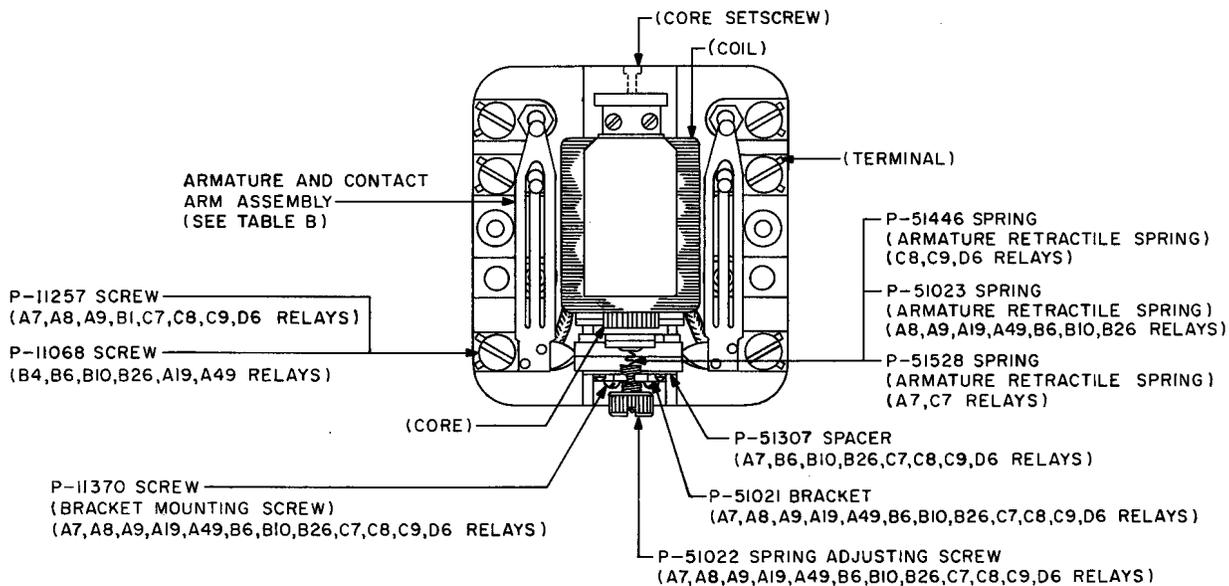
TABLE A (cont)

Relay	Type	Relay	Type
KS-5483 L38	C9	KS-5483 L74	A9
KS-5483 L39	C9	KS-5483 L75	A19
KS-5483 L40 (old)	C9	KS-5483 L80	D6
KS-5483 L40 (new)	A9	KS-5483 L81	D6
KS-5483 L41	A7	KS-5483 L82	D6
KS-5483 L42	A7	KS-5483 L83	D6
KS-5483 L43	A7	KS-5483 L85	D6
KS-5483 L44	A7	KS-5483 L86	D6
KS-5483 L51	A8	KS-5483 L91	B10
KS-5483 L52	A8	KS-5483 L92	B26
KS-5483 L53	A8	KS-5483 L93	B1
KS-5483 L54	A8	KS-5483 L94	B1
KS-5483 L55	A8	KS-5483 L95	B6
KS-5483 L56	A8	KS-5635 L01	—
KS-5483 L57	A8	KS-5635 L02	—
KS-5483 L58	A8	KS-5635 L03	—
KS-5483 L59	A8	KS-5635 L04	—
KS-5483 L61	C8	KS-6319	E4
KS-5483 L71	A9	KS-6724	R1
KS-5483 L72	A9	KS-8854	—
KS-5483 L73	A9	KS-15601 L1	—

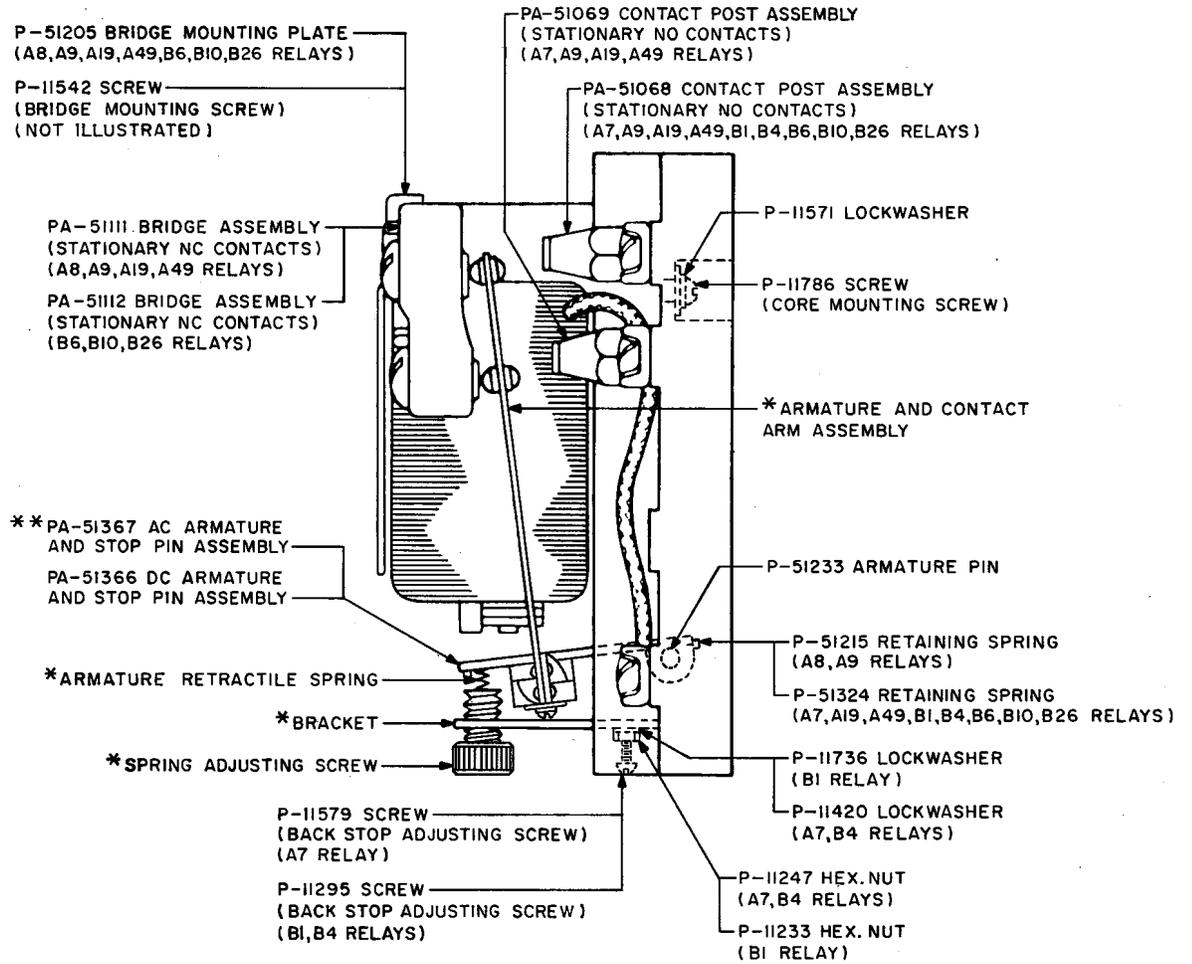
TABLE B

Relay Type	AC Armature and Contact Arm Assembly	DC Armature and Contact Arm Assembly
A7	PA-51403	PA-51118
A8	PA-51406	PA-51209
A9	PA-51043	PA-51404
A19	PA-51088	PA-51405
A49	*	**
B1	PA-51210	PA-51420
B4	PA-51108	PA-51423
B6	PA-51061	PA-51416
B10	PA-51061	PA-51416
B26	PA-51061	PA-51416
C7	PA-51044	PA-51408
C8	PA-51182	PA-51410
C9	PA-51182	PA-51410
D6	PA-51399	PA-51398

\* The same as PA-51088 except that the right pigtail is cut off.  
 \*\* The same as PA-51405 except that the right pigtail is cut off.



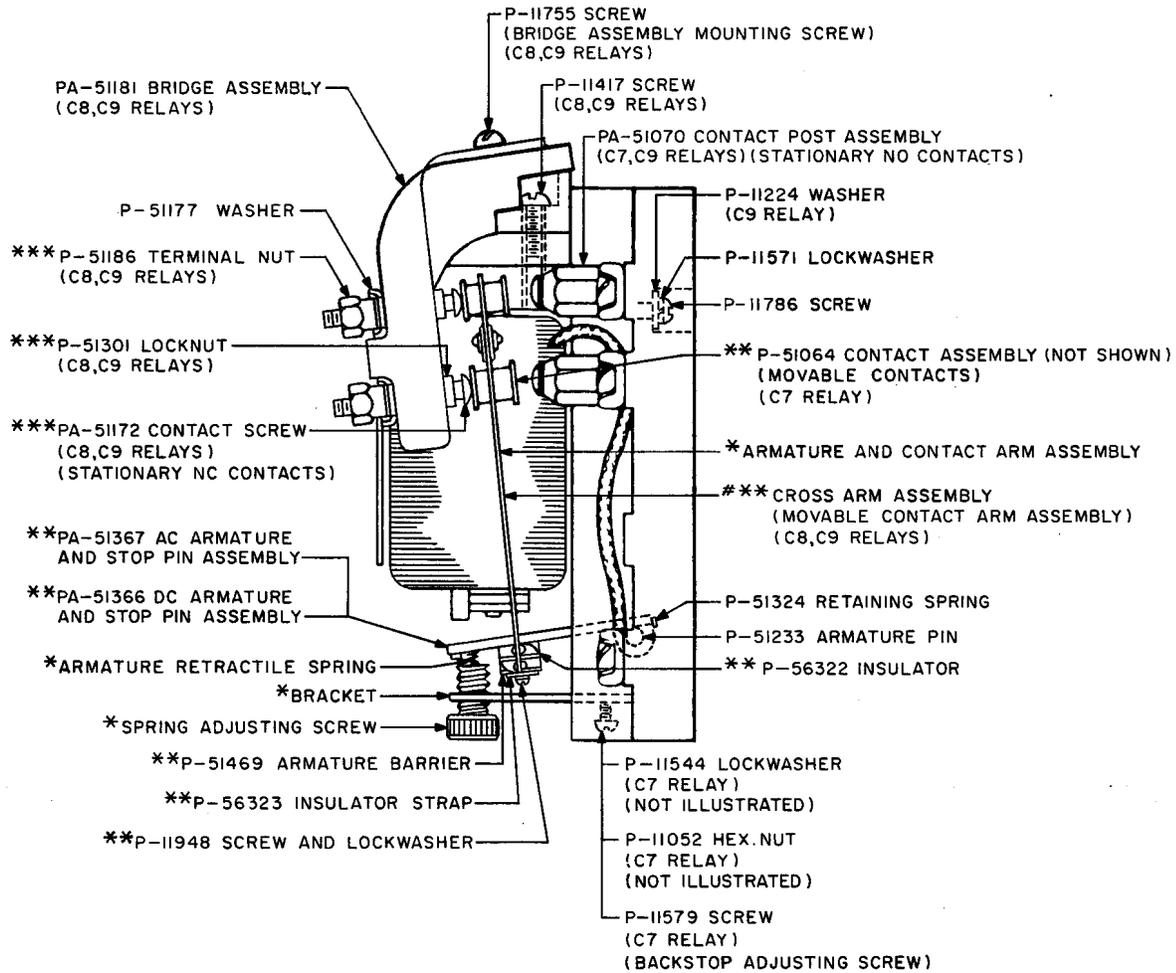
**Fig. 1 – Armature and Contact-Arm Assembly and Armature Retractable Spring Adjusting Screw for A-, B-, C-, and D-Type Relays (C7 relay illustrated)**



\* SEE FIG.1

\*\*PART OF ARMATURE AND CONTACT ARM ASSEMBLY (SEE FIG.1) ORDER PART AS REQUIRED.

Fig. 2 - A- or B-Type Relay



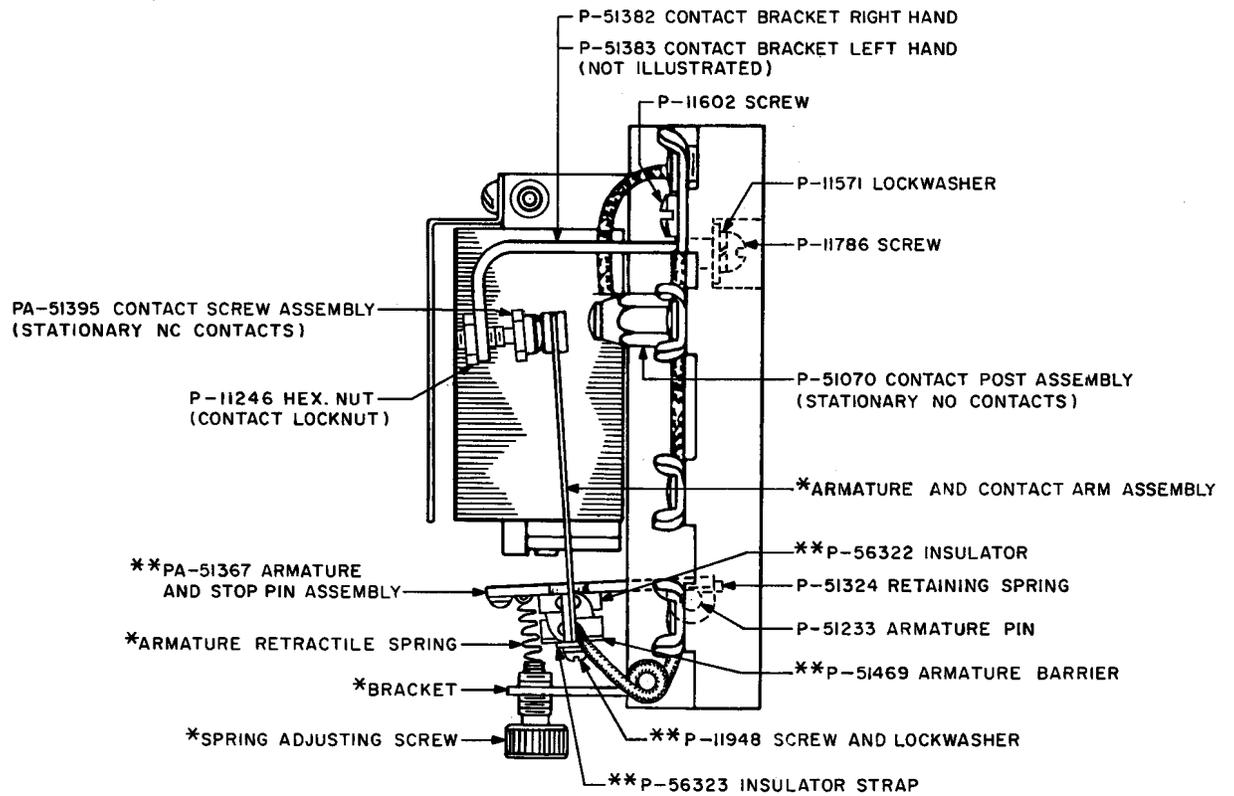
\* SEE FIG. 1

\*\*PART OF THE ARMATURE AND CONTACT ARM ASSEMBLY (SEE FIG. 1) ORDER INDIVIDUAL PART AS REQUIRED.

\*\*\*PART OF PA-51181 BRIDGE ASSEMBLY. ORDER INDIVIDUAL PART AS REQUIRED.

# PA-51309 CROSS ARM ASSEMBLY CUT FOR A TWO-CIRCUIT RELAY.

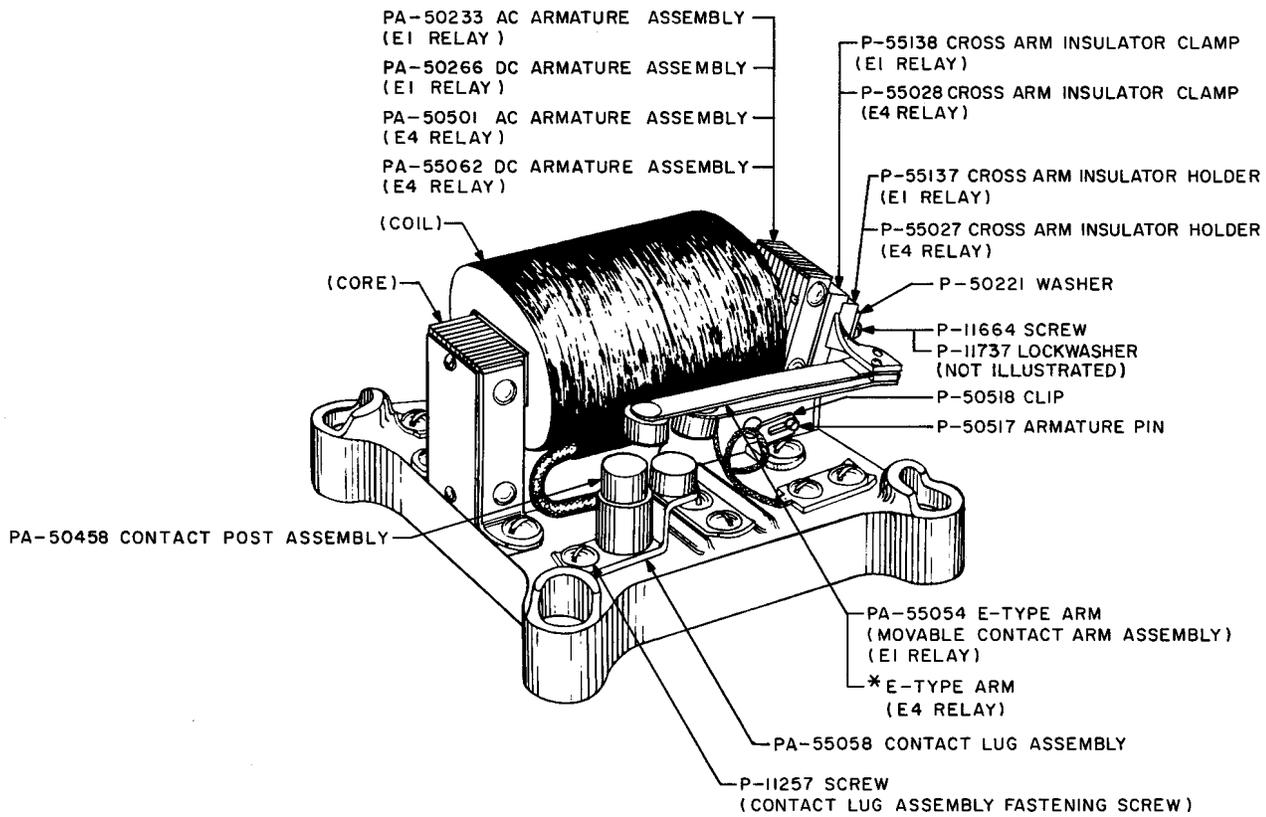
Fig. 3 - C-Type Relay



\* SEE FIG.1

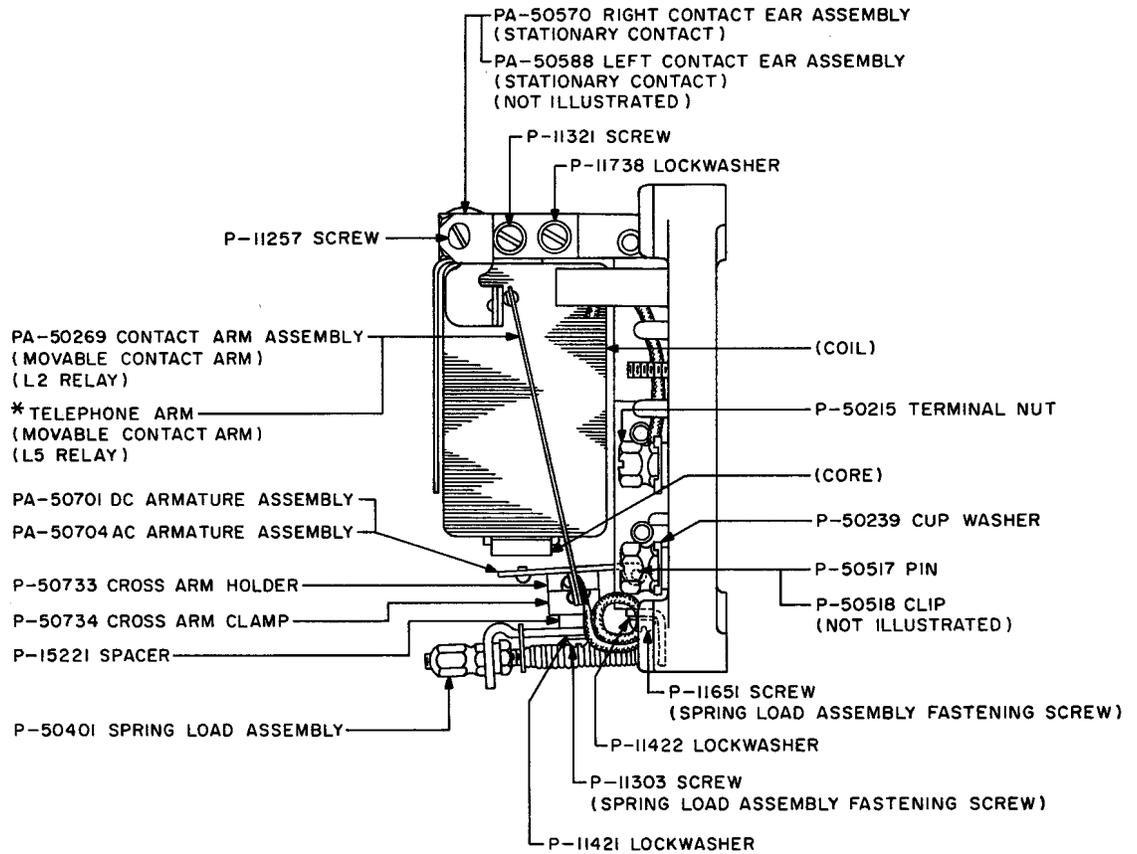
\*\*PART OF ARMATURE AND CONTACT ARM ASSEMBLY (SEE FIG.1) ORDER PART AS REQUIRED.

**Fig. 4 - D6-Type Relay**



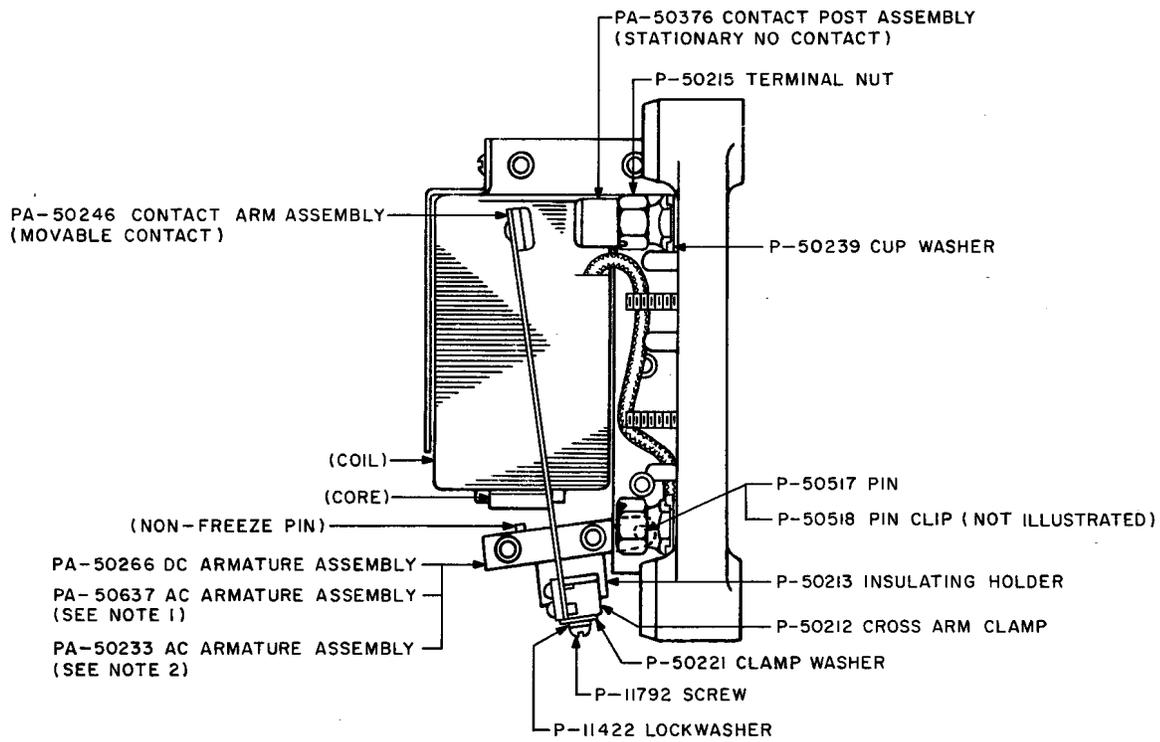
\* PA-55054 E-TYPE ARM CUT FOR TWO-CIRCUIT RELAY, RIGHT HAND CONTACT ARM ASSEMBLY EQUIPPED WITH P-50258 RIGHT PIGTAIL, AND LEFT HAND CONTACT ARM ASSEMBLY EQUIPPED WITH P-50257 LEFT PIGTAIL.

Fig. 5 - E-Type Relay



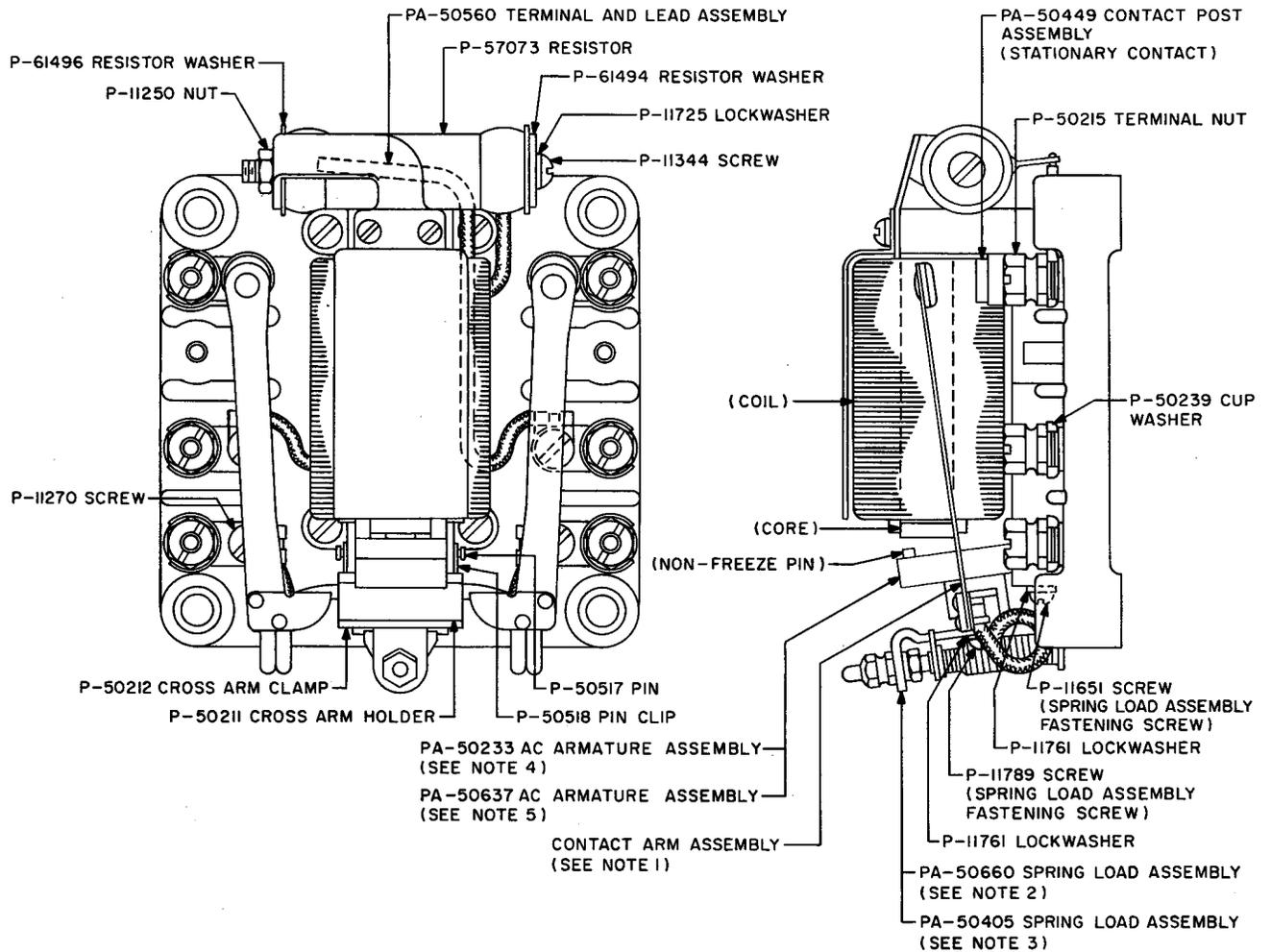
\*PA-50205 TELEPHONE ARM CUT FOR A TWO CIRCUIT RELAY

Fig. 6 - L-Type Relay



NOTES: 1. ORDER PA-50637 AC ARMATURE ASSEMBLY TO REPLACE AC ARMATURE PROVIDED WITH NON-FREEZE PINS.  
2. ORDER PA-50233 AC ARMATURE ASSEMBLY TO REPLACE AC ARMATURE NOT PROVIDED WITH NON-FREEZE PINS.

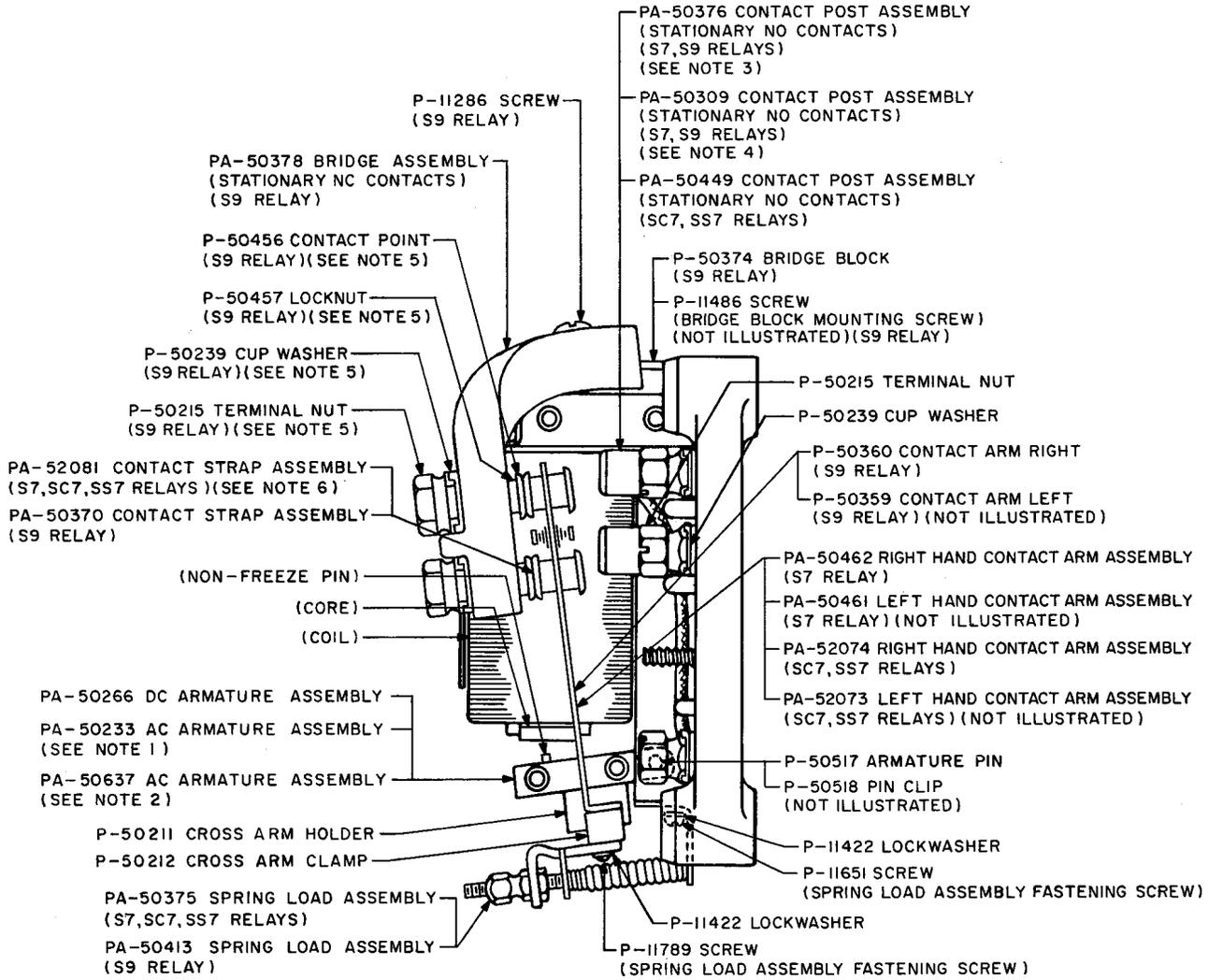
Fig. 7 - R1-Type Relay



NOTES :

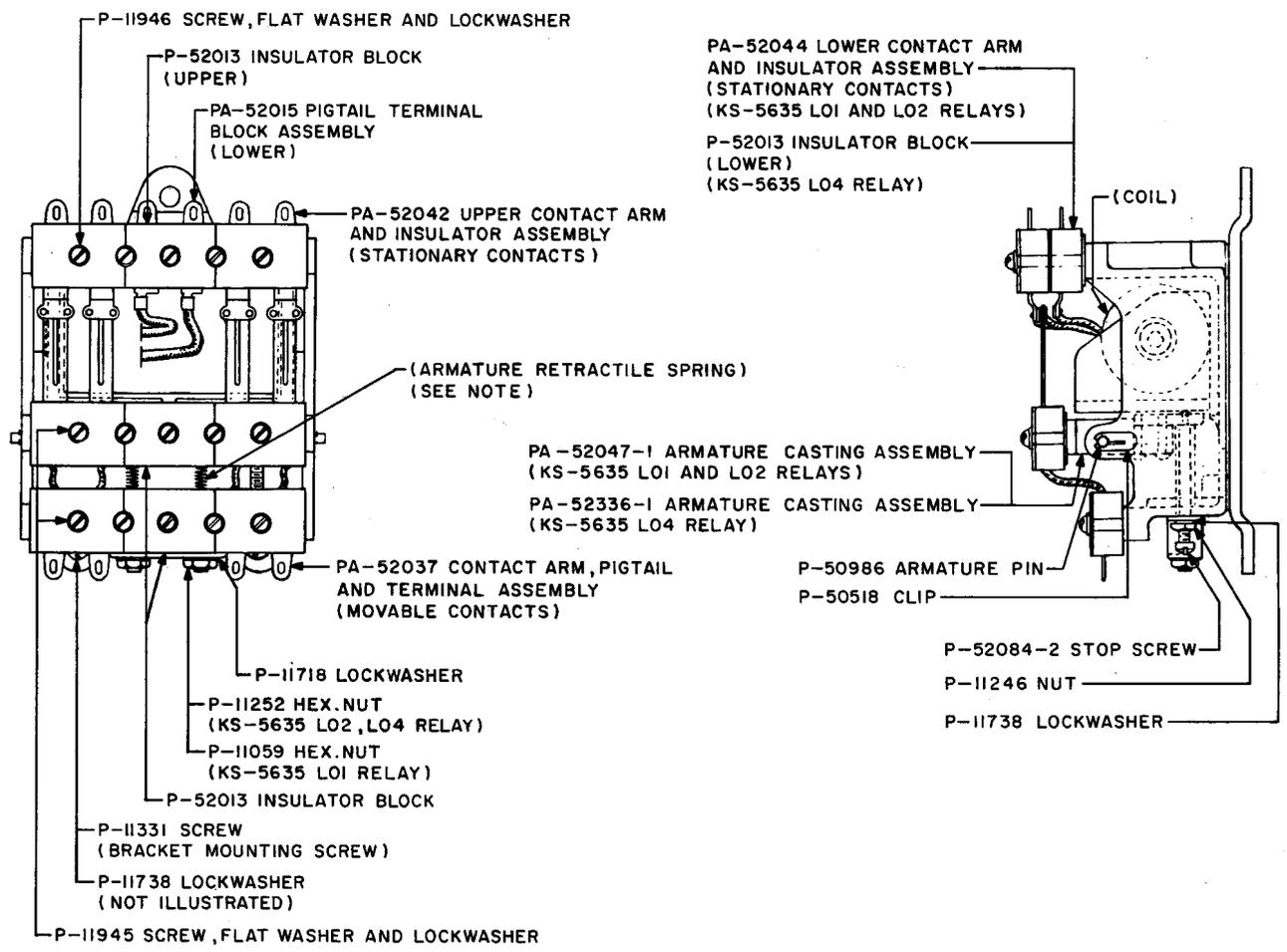
1. PA-50246 CONTACT ARM ASSEMBLY CUT FOR A TWO-CIRCUIT RELAY, RIGHT HAND CONTACT ARM EQUIPPED WITH PA-50258 RIGHT HAND PIGTAIL AND LEFT HAND CONTACT ARM EQUIPPED WITH PA-50257 LEFT HAND PIGTAIL.
2. ORDER PA-50660 SPRING LOAD ASSEMBLY FOR RELAY PROVIDED WITH ARMATURE NOT EQUIPPED WITH NON-FREEZE PINS.
3. ORDER PA-50405 SPRING LOAD ASSEMBLY FOR RELAY PROVIDED WITH ARMATURE EQUIPPED WITH NON-FREEZE PINS.
4. ORDER PA-50233 TO REPLACE AC ARMATURE NOT EQUIPPED WITH NON-FREEZE PINS.
5. ORDER PA-50637 TO REPLACE AC ARMATURE EQUIPPED WITH NON-FREEZE PINS.

Fig. 8 - KS-8854 Relay



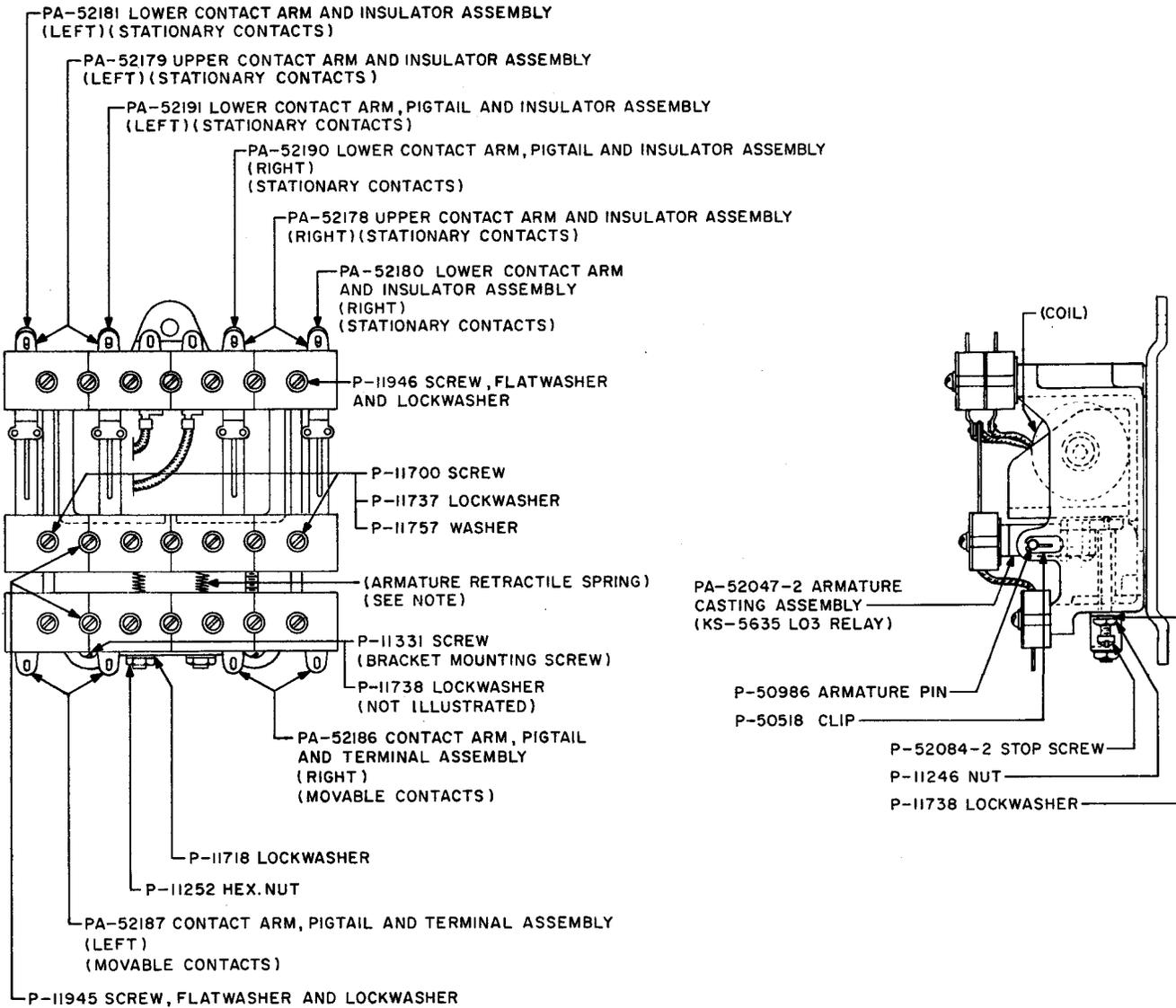
- NOTES: 1. ORDER PA-50233 TO REPLACE AC ARMATURE NOT EQUIPPED WITH NON-FREEZE PINS.  
 2. ORDER PA-50637 TO REPLACE AC ARMATURE EQUIPPED WITH NON-FREEZE PINS.  
 3. ORDER PA-50376 TO REPLACE CONTACT POST ASSEMBLY FOR S7 OR S9 RELAY PROVIDED WITH AC ARMATURE NOT EQUIPPED WITH NON-FREEZE PINS OR PROVIDED WITH DC ARMATURE.  
 4. ORDER PA-50309 TO REPLACE CONTACT POST ASSEMBLY FOR S7 OR S9 RELAY PROVIDED WITH AC ARMATURE EQUIPPED WITH NON-FREEZE PINS.  
 5. PART OF PA-50378 BRIDGE ASSEMBLY .ORDER INDIVIDUAL PART AS REQUIRED.  
 6. PART OF PA-50461 AND PA-52073 LEFT HAND CONTACT ARM ASSEMBLY OR PA-50462 AND PA-52074 RIGHT HAND CONTACT ARM ASSEMBLY. ORDER INDIVIDUAL PART AS REQUIRED.

Fig. 9 - S-Type Relay



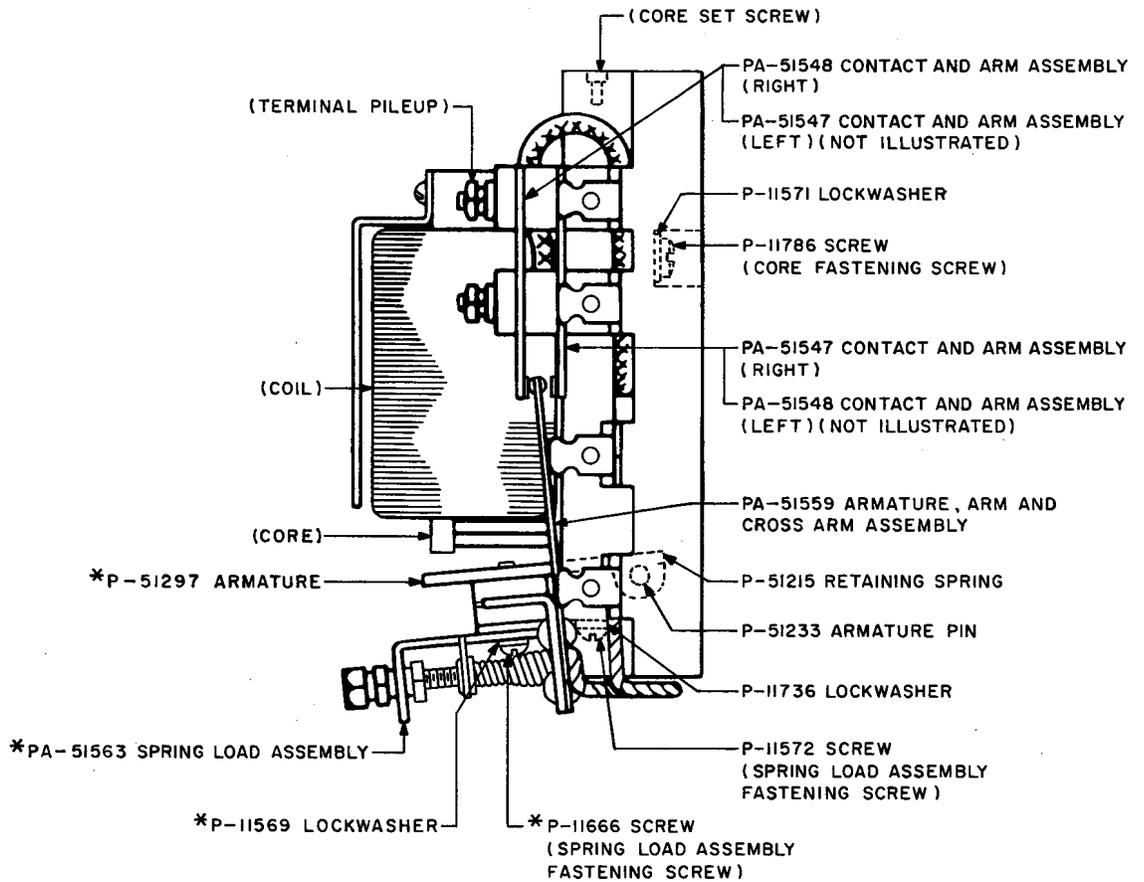
NOTE: PART OF PA-52047-1 ARMATURE CASTING ASSEMBLY (KS-5635 LO1 AND LO2 RELAYS) AND PART OF PA-52336-1 ARMATURE CASTING ASSEMBLY (KS-5635 LO4 RELAY)

Fig. 10 - KS-5635 LO1, LO2 or LO4 Relay (KS-5635 LO4 relay illustrated)



NOTE: PART OF PA-52047-2 ARMATURE CASTING ASSEMBLY

Fig. 11 - KS-5635 L03 Relay



\* PART OF PA-51559 ARMATURE, ARM AND CROSS ARM ASSEMBLY. ORDER INDIVIDUAL PART AS REQUIRED.

Fig. 12 - KS-15601 L01 Relay

**3. REPLACEMENT PROCEDURES****3.01 List of Tools, Materials, and Test Apparatus**

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
220	3/16-Inch Single-End Socket Wrench
365 (as reqd)	Connecting Clip
388A	3/16- and 1/4-Inch Hex. Open-End Offset Wrench
417A (2 reqd)	1/4- and 3/8-Inch Hex. Open Double-End Flat Wrench
KS-6278 (as reqd)	Connecting Clip
KS-6780 (as reqd)	Connecting Clip
KS-6854	Screwdriver
KS-7782	Parallel Jaw Pliers
KS-8511	4-1/2 Inch Bent Tweezers
R-1542	Wrench
R-2485	Allen Socket Screw Wrench
—	1/16-Inch Drive Pin Punch
—	P-Long-Nose Pliers
—	4-Ounce Riveting Hammer
—	3-Inch C Screwdriver
—	4-Inch E Screwdriver
—	5-Inch E Screwdriver
—	Jeweler's Screwdriver, L. S. Starrett Co No. 555E
<b>MATERIALS</b>	
—	0.093-Inch Diameter Drill Rod About 2 Inches Long
— (as reqd)	14-Gauge Insulated Copper Wire
<b>TEST APPARATUS</b>	
— (as reqd)	893 Cord, 3 Feet Long, Equipped With Two 360A Tools (1W13A cord) and Two 365 or KS-6278 Connecting Clips
— (as reqd)	893 Cord, 6 Feet Long, Equipped With Two 360A Tools (1W13B cord) and Two 365 or KS-6278 Connecting Clips

**3.02 Caution:** Exercise care when working in close quarters with live parts. Do not touch at the same time or short-circuit live terminals or parts which are at different potentials. Disconnect all power from the coils and contact circuits by opening switches, if provided, or by removing the fuse or fuses, or by otherwise making disconnections as required.

**3.03** Before making any replacements, be sure that service will be maintained by means of temporary wiring. To maintain service while work is being done affecting closed contacts of working circuits, bridge the current-carrying contacts, making the connections at the most convenient points in the circuit other than at the relay if practicable. For strapping where the voltage does not exceed 150 volts, 1W13A or 1W13B cords are suggested, with 365 connecting clips. Lengths of 14-gauge wire or of flexible cord, such as is commonly used in lighting circuits, with KS-6780 connecting clips, are required where the voltage exceeds 150 volts.

**3.04 Removal of Relay From Panel:** When it is necessary to remove a relay to gain access to the back of the base to facilitate the replacement of parts, tag the leads before disconnecting them to facilitate reconnecting them. Remove the apparatus from the panel using the proper wrench or screwdriver.

**3.05** After making any replacement of parts of a relay, the part or parts replaced shall meet the readjust requirements involved as specified in Section 040-816-701. Other parts whose adjustments may have been directly disturbed by the replacement operations shall be checked to the readjust requirements and an over-all operation check shall be made of the relay before restoring the circuit to service.

**3.06** No replacement procedures are specified for parts where the replacement consists of a simple operation.

**A- and B-Type Relays**

**3.07 Armature Retractable Spring:** Turn the spring adjusting screw fully outward. Unhook the end of the retractile spring from the armature and straighten out the other end using the KS-8511 tweezers. Remove the spring. Substitute a new spring. Hook the spring end of the

new spring to the armature, using the KS-8511 tweezers, and insert the straight end through the hole in the adjusting screw. Turn the spring adjusting screw fully inward so that the straight end of the spring extends out through the knurled head. Curl the straight end about two turns with the end of the long-nose pliers.

**3.08 Bridge Assembly (stationary NC contacts):** If it is necessary to replace a contact or the bridge, replace the entire bridge assembly. To do this, tag and remove the wires. Remove the bridge mounting screws using the KS-6854 screwdriver. Remove the bridge assembly and substitute the new assembly. Insert and securely tighten the mounting screws. Reconnect the wires to the proper terminals.

**3.09 Contact-Post Assembly (stationary NO contacts):** To replace the contact-post assembly, remove the bridge, if provided, as covered in 3.08. Remove the contact post from the relay base using the 417A wrench. Substitute the new contact-post assembly and reassemble in the reverse order.

**3.10 Armature and Contact-Arm Assembly (movable contacts):** To replace a movable contact or contact spring, replace the entire armature and contact-arm assembly which includes the armature, contact arms, contacts, and insulators. To replace an armature and contact arm assembly, proceed as follows.

(1) Unhook the armature retractile spring, if provided, from the armature with the KS-8511 tweezers. Remove the backstop adjusting screw and locknut, if provided, using the 220 wrench and the KS-6854 screwdriver. Remove the bracket mounting screws with the KS-6854 screwdriver. Remove the bracket and spacers if provided. Loosen the core setscrew, if provided, using the jeweler's screwdriver. Remove the core mounting screw using the C screwdriver.

(2) Remove the relay from the base. Disconnect the contact arm leads, where provided, and the coil leads from the terminals of the base. Remove the retaining spring from the central portion of the armature pin. Push the armature pin out of the bearing using the pin punch. If necessary, tap the pin punch lightly using the riveting hammer. Then pull the pin completely out. If necessary, grip the

pin, but not the bearing surface, with the P-long-nose pliers to remove the pin. Remove the armature and contact-arm assembly from the core.

(3) Substitute the new armature and contact-arm assembly. Insert the armature pin and retaining spring, securing the armature to the core. Connect the wires to the terminals. Remount the relay in the base. When the relay is reassembled in the base, make sure that the core is fully seated by first placing the locating pin of the core frame, at the open end of the core, into the indent of the base. Tighten the core setscrew when provided. Reassemble the parts that were removed in (1).

**3.11 Armature:** To replace the armature, proceed as covered in 3.10(1) and (2). Loosen the screws fastening the insulators and contact-arm assembly to the armature to free the armature using the KS-6854 screwdriver. Substitute the new armature and tighten the screws securely. Then proceed as covered in 3.10(3).

#### C-Type Relay

**3.12 Armature Retractable Spring:** To replace the spring, proceed as covered in 3.07.

**3.13 Stationary NC Contacts:** To replace the contacts, proceed as follows. Tag and remove the wires from the terminals of the bridge assembly. Remove the bridge-assembly mounting screws, using the KS-6854 screwdriver, and remove the bridge. To replace the individual contact, proceed as follows. Unlock the hexagonal locking nut using the 417A wrench. Unscrew and remove the contact screw and attached locknut by hand. Remove the locknut. Substitute the new contact point and bushing assembly and reassemble in the reverse order. Remount the bridge and mount securely in position. Where the locknut is not accessible or where all the contacts require replacement, substitute the new contact and bridge assembly and mount securely in position. Connect the wires to the terminals.

**3.14 Contact-Post Assembly (stationary NO contacts):** To replace the contact-post assembly, remove the bridge, if provided, as covered in 3.13. Remove the contact post from the relay base using the 417A wrench. Substitute the new contact-post assembly and reassemble in the reverse order.

**3.15 Movable Contacts — Relays Having Only NO Contacts:** To replace the contacts, depress the cup washer of the contact assembly and remove the C washer from the spring pin. Removal of the washer will separate the contact assembly from the contact arm. Substitute the new contact assembly and reassemble in the reverse order.

**3.16 Crossarm Assembly (movable contact arm and contacts) and Associated Parts — Relays Having NC Contacts:** To replace the crossarm assembly, insulator strap, armature barriers, or insulator, proceed as follows. Unhook the armature retractile spring from the armature with the KS-8511 tweezers. Remove the backstop adjusting screw and locknut using the 220 wrench and the KS-6854 screwdriver. Remove the bracket mounting screws with the KS-6854 screwdriver. Remove the bracket and spacer if provided. Remove the two screws fastening the crossarm insulators and contact arms to the armature using the KS-6854 screwdriver. Separate the crossarm insulators. Substitute the new part as required and reassemble in the reverse order.

**3.17 Armature:** To replace the armature, proceed as covered in 3.11.

**3.18 Armature and Contact-Arm Assembly (movable contacts):** Remove the armature and contact-arm assembly from the core as covered in 3.10(1) and (2). Substitute the new armature and contact-arm assembly and reassemble the parts as covered in 3.10(3).

#### D6-Type Relay

**3.19 Armature Retractable Spring:** To replace the spring, proceed as covered in 3.07.

**3.20 Stationary NC Contacts:** To replace a contact, remove the contact bracket from the relay base as follows. Disconnect the wire from the terminal. Remove the contact bracket mounting screws using the C screwdriver and remove the contact bracket. Remove the contact locknut using the 417A wrench. Remove the contact-screw assembly from the bracket using the 417A wrench. Substitute the new contact-screw assembly and reassemble in the reverse order. Connect the wire to the terminal.

**3.21 Contact-Post Assembly (stationary NO contacts):** To replace the contact-post assembly, remove the contact bracket as covered in 3.20. Remove the contact post from the relay base using the 417A wrench. Substitute the new contact-post assembly and reassemble in the reverse order.

**3.22 Armature and Contact-Arm Assembly (movable contacts):** Remove the armature and contact-arm assembly from the core as covered in 3.10(1) and (2). Substitute the new armature and contact-arm assembly and reassemble the parts as covered in 3.10(3).

**3.23 Armature:** To replace the armature, proceed as covered in 3.11.

#### E-Type Relay

**3.24 Contact-Post Assembly and Contact-Lug Assembly (stationary contacts):** To replace the contact-post or contact-lug assembly, proceed as follows. Disconnect the wire from the lug terminal. Remove the contact post using the drill rod inserted into the hole of the post. Substitute the new part as required and reassemble in the reverse order. Connect the wire to the lug terminal.

**3.25 E-Type Arm (movable contacts) and Associated Parts:** To replace the E-type arm, washer, insulator clamp, or insulator holder, proceed as follows. Remove the two screws fastening the crossarm insulators and the E-type arm to the armature using the C screwdriver. Separate the crossarm insulators and remove the arm, either as one piece or two pieces as the case may be. Disconnect the contact arm leads, when provided, from the terminals of the base. Substitute the new parts as required and reassemble in the reverse order.

**3.26 Armature:** To replace the armature, proceed as follows. Remove the armature pin clips. Push the armature pin out of the bearings using the pin punch. If necessary, tap the pin punch lightly using the riveting hammer. Then pull the pin completely out. If necessary, grip the pin, but not at the bearing surface, with the long-nose pliers to remove the pin. Remove the armature and the attached parts. Loosen the two screws fastening the crossarm holder, clamp, and the contact arms to the armature to free

the armature, using the C screwdriver, and remove the armature. Substitute the new armature and tighten the screws securely. Insert the bearing pin securing the armature to the core with the armature pin clips.

#### L-Type Relay

**3.27 Stationary Contacts:** To replace either of these contacts, disconnect the wiring from the terminal screw of the contact-ear assembly. Then remove the contact-ear fastening screw, using the C screwdriver, and remove the assembly. Substitute the new contact-ear assembly and reassemble in the reverse order.

**3.28 Spring-Load Assembly, Contact-Arm Assembly (movable contacts), and Associated Parts:** To replace the spring-load assembly, contact-arm assembly, spacer, insulating holder, or clamp, proceed as follows. Remove the four spring-load-assembly fastening screws, using the C screwdriver, and remove the spring-load assembly. If the spring-load assembly is to be replaced, substitute the new part. If the contact-arm assembly, spacer, crossarm holder, or clamp is to be replaced, proceed as follows. Disconnect the contact-arm leads, if provided, from the terminals at the base. Separate the crossarm holder and clamp, and remove the contact-arm assembly. Substitute the new part as required and reassemble in the reverse order. Connect the leads, when provided, to the terminals.

**3.29 Armature:** To replace the armature, remove the two spring-load-assembly fastening screws at the base of the relay, using the KS-6854 screwdriver, and proceed as covered in 3.26. Then tighten securely the two spring-load-assembly fastening screws.

#### R1-Type Relay

**3.30 Contact-Post Assembly (stationary contacts):** To replace the contact-post assembly, disconnect the wire from the terminal. Remove the contact post from the base using the 417A wrench. Substitute the new contact-post assembly and reassemble in the reverse order.

**3.31 Contact-Arm Assembly (movable contacts) and Associated Parts:** To replace the contact-arm assembly, clamp washer, crossarm clamp, or crossarm holder, proceed as fol-

lows. Remove the two screws and lockwashers fastening these parts to the armature using the C screwdriver. Separate the insulators and remove the contact arm. Substitute the parts as required and reassemble in the reverse order.

**3.32 Armature:** To replace the armature, proceed as covered in 3.26.

#### KS-8854 Relay

**3.33 Contact-Post Assembly (stationary contacts):** To replace the contact-post assembly, disconnect the wire from the terminal. Remove the contact post using the drill rod inserted in the hole of the post. Substitute the new contact-post assembly and reassemble in the reverse order.

**3.34 Spring-Load Assembly, Contact-Arm Assembly (movable contacts), and Associated Parts:** To replace the spring load assembly, contact-arm assembly, crossarm clamp, or holder, proceed as covered in 3.28.

**3.35 Armature:** To replace the armature, proceed as covered in 3.29.

**3.36 Resistor:** To replace the resistor, proceed as follows. Unsolder the leads from the resistor lugs. Remove the resistor mounting screw and nut from the bracket using the 4-inch E screwdriver and the R-1542 wrench. Substitute the new resistor. Remount the screw, lockwasher, washers, new resistor, and nut. Solder the leads to the terminal lugs of the new resistor.

#### S-Type Relay

**3.37 Bridge Assembly and Stationary NC Contacts:** To replace the contacts, proceed as follows. Tag and remove the wires from the contact terminals on the bridge assembly. Remove the bridge-assembly mounting screws, using the C screwdriver, and remove the bridge. When all contacts are to be replaced, replace the bridge assembly. Substitute the new bridge assembly and mount it securely in position. To replace the individual contact, proceed as follows. Unscrew the hexagonal nut which locks the contact point to the underside of the bridge using the 417A wrench. Unscrew and remove the contact point and the attached locknut by hand. Remove the locknut. Substitute the new contact point and reassemble in the reverse order.

**3.38 Contact-Post Assembly (stationary NO contacts):** To remove the contact, remove the bridge assembly, if provided, as covered in 3.37. Remove the contact-post assembly using the 417A wrench or drill rod in the hole of the post as required. Substitute the new contact-post assembly and reassemble in the reverse order.

**3.39 Contact-Strap Assembly (relays having movable NO contacts only):** To replace the contact-strap assembly, depress the cup washer at the contact-strap assembly and remove the C washer from the pin. Removal of the washer will separate the contact-strap assembly from the contact arm. Substitute the new contact-strap assembly and reassemble in the reverse order.

**3.40 Contact-Strap Assembly (relays having movable NC contacts only):** To replace the contact-strap assembly, remove the bridge as covered in 3.37. Then separate the prongs of the bifurcated contact spring by bending the prongs oppositely against the plane of the contact arm, with the thumb and forefinger, at the end of the contact-strap assembly which is toward the back of the prongs. Do not attempt to spread the prongs apart along the plane of the contact arm. Pull the contact-strap assembly out of the open end of the prongs by holding the top and bottom of the forward contact with the thumb and forefinger of the other hand. A slight extra tilt to the already acquired tilt of the contact-strap assembly will facilitate removal. Substitute the new contact-strap assembly and reassemble in the reverse order and as follows. Place the new contact-strap assembly in the contact arm with the riveted side of the pin toward the stationary normally open contacts of the relay. Make sure that both edges of the prongs pass between the two washers of the conical springs. Do not force the contact-strap assembly into position. If done properly, the contact-strap assembly should slide easily into position. After assembly of the bridge, make sure that the contact-strap assembly does not bind in the contact arm when the contacts are pressed alternately against the normally open and normally closed contacts of the relay by manual operation of the contact arm.

**3.41 Spring-Load Assembly, Contact-Arm Assembly (movable contacts), and Associated Parts:** To replace the spring-load assembly, contact-arm assembly, crossarm clamp, or holder, proceed as covered in 3.28.

**3.42 Armature:** To replace the armature, proceed as covered in 3.29.

#### KS-5635 Relays

**3.43 Contact-Arm and Insulator Assembly (stationary NO and NC contacts) and Associated Parts:**

(1) **List 1, 2, and 4 Relays:** Replace the upper or the lower contact-arm and insulator assembly as a unit in each case in replacing any of the contacts. To do this, unsolder the external wires from the associated terminals. Then remove the associated mounting screw and loosen the adjacent screw using the C screwdriver. Remove the assembly, substitute the new assembly, and reassemble in the reverse order, making sure that the screws are tight. Reconnect the wires.

(2) **List 3 Relay:** Replace the right or left upper contact arm and insulator assembly, or the right or left lower contact-arm and insulator assembly, or the right or left lower contact-arm, pigtail, and insulator assembly as a unit in each case in replacing any of the contacts. To do this, unsolder the external wires from the associated terminals. If the right or left lower contact-arm, pigtail, and insulator assembly is to be replaced, unsolder the pigtail wires at the coil terminals. Then, using the C screwdriver, remove the associated mounting screw and loosen or remove the adjacent screws as necessary to remove the assembly. Remove the assembly, substitute the new assembly, and reassemble in the reverse order, making sure that the mounting screws are tight. Reconnect the wires. When reconnecting the wires to the coil, exercise care not to damage the coil.

**3.44 Contact-Arm, Pigtail, and Terminal Assembly (movable contacts)**

(1) **List 1, 2, and 4 Relays:** Replace the contact-arm, pigtail, and terminal assembly as a unit in replacing any of the contacts. To do this, unsolder the external wires from the associated terminals. Then remove the two associated mounting screws and loosen the two adjacent screws using the C screwdriver. Remove the assembly, substitute the new assembly, and reassemble in the reverse order, making sure that the mounting screws are tight. Reconnect the wires.

(2) **List 3 Relay:** Replace the right or left contact arm, pigtail, and terminal assembly as a unit in replacing any of the contacts. To do this, unsolder the external wires from the associated terminals. Then, using the C screwdriver, remove the two associated mounting screws and loosen the two adjacent screws in the case where there are only two adjacent screws, or remove the four adjacent screws in the case where there are four adjacent screws. Remove the assembly, substitute the new assembly, and reassemble in the reverse order, making sure that the mounting screws are tight. Reconnect the wires.

**3.45 Armature Casting Assembly:** To replace the armature and retractile springs, proceed as follows. Remove each of the contact-arm, pigtail, and terminal assemblies as covered in 3.44(1) or (2) as applicable. Remove the retractile spring adjusting nuts and lockwashers from the stud using the 417A wrench. Remove the bracket mounting screw and the stop screw, using the C screwdriver, and remove the bracket. Remove the other nuts and lockwashers from the stud of the retractile springs using the 417A wrench. Pull out the clip from either end of the armature pin using the P-long-nose pliers. Push the pin out of its bearing. After being started, the armature pin may be gripped at its end, but not on the bearing surface, by the long-nose pliers and thus pulled out of its bearing. Pull out the armature casting assembly from the relay. Substitute the new part and reassemble in the reverse order.

#### **KS-15601 Relay**

**3.46 Contact-and-Arm Assembly (stationary NC and NO contacts):** To replace the contact or the contact arm, it is necessary to replace the contact-and-arm assembly as a unit. To remove the arm, remove the two terminal pile-up nuts using the 388A wrench. Dismantle the terminal pile-up to remove the contact-and-arm assembly which is to be replaced. Substitute the new contact-and-arm assembly and reassemble in the reverse order.

**3.47 Armature, Arm, and Crossarm Assembly (movable contacts):** To replace a movable contact or contact spring, replace the entire armature, arm, and crossarm assembly which also includes the contacts, insulators, pigtail assemblies, and spring-load assembly. To replace these parts, proceed as follows. Remove the two spring-load-assembly fastening screws at the base of the relay using the KS-6854 screwdriver. Then remove the relay from the base as follows. Loosen the core setscrew, when provided, using the jeweler's screwdriver. Remove the core fastening screw using the C screwdriver. Remove the relay from the base. Disconnect the movable contact leads and the coil leads from the terminals of the base. Then remove the armature, arm, and crossarm assembly as follows. Unclip and remove the retaining spring, when provided, from the central portion of the armature pin. Push the armature pin out of the bearings using the pin punch. If necessary, tap the pin punch lightly using the riveting hammer. Then pull the pin completely out. If necessary, grip the pin, but not at the bearing surface, with the long-nose pliers to remove the pin. Remove the armature, arm, and crossarm assembly. Substitute the new armature, arm, and crossarm assembly and reassemble in the reverse order. When the relay is reassembled in the base, make sure that the core is fully seated by first placing the locating pin of the core frame, at the open end of the core, into the indent of the base.

**3.48 Spring-Load Assembly:** To replace the spring-load assembly, remove the spring-load-assembly fastening screws using the KS-6854 screwdriver. Substitute the new part and fasten the screws securely.

**3.49 Armature:** To replace the armature, remove the armature, arm, and crossarm assembly from the relay as covered in 3.47. Loosen the screws fastening the insulators and contact-arm assembly to the armature using the KS-6854 screwdriver. Substitute the new armature and tighten the screws securely. Reassemble the parts that were removed in 3.47.