

## SELECTORS

### KS-16201, KS-16202, KS-16203, KS-16563, AND KS-19086 TYPES 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-16201, KS-16202, KS-16203, KS-16563, and KS-19086 type selectors. It also covers approved procedures for replacing these parts.

1.02 This section is reissued to add information, piece-part data, and replacement procedures covering molded banks. Detailed reasons for reissue will be found at the end of the section.

1.03 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 these selectors. 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.

1.04 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.

1.05 KS-16201, KS-16202, KS-16203, KS-16563, and KS-19086 selectors manufactured before 1964 were furnished with phenolic banks. However, only molded banks are provided as replacements. If bank replacement is necessary, it is preferable in most cases to replace the entire selector, especially if wear is evident on the armature assembly and rotor.

1.06 Replacement parts and procedures for bank assemblies and selector mechanisms vary according to the type of bank mounted on the selector. Before replacing these parts, it is necessary to determine whether the bank of the selector is phenolic or molded as covered in 1.07.

1.07 The type of bank may be determined by checking the associated bank clamp plates as follows. On a KS-16201, KS-16202, or KS-16203 selector, a phenolic bank assembly has clamp plates with alignment holes (see Fig. 1), whereas a molded bank assembly does not have alignment holes. On a KS-16563 or KS-19086 selector, a phenolic bank assembly has nine clamping screws extending through its clamp plates, whereas a molded bank assembly has only five clamping screws (see Fig. 4).

#### 2. PIECE-PART DATA

2.01 The figures included in Part 2 of this section show the various piece parts in their proper relation to other parts of the apparatus. The piece-part numbers of the replaceable parts are given together with the names of the parts. If the names of parts differ from those in general use in the field, the latter names are shown in parentheses. Numbers prefixed by "P" are WECO piece-part numbers; numbers prefixed by "D", "F", "PD", "PH", "PP", or "RY" are AECOPart numbers.

2.02 Information enclosed by 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.

2.03 When ordering piece parts for replacement purposes, both the number and the name of the piece part should be given. If the part is an AECOPart (see 2.01), the order should so state. For example, AECOPart D-71574-A Armature. Do not refer to the section number or any information shown in parentheses. If a subassembly such as a selector mechanism (adjusted selector, less bank) or wiper assembly (rotor) is to be ordered, specify the name of the sub-

assembly and the number of the selector on which the subassembly is used; for example, AECO Off-Normal Spring Assembly — for KS-16201 L1 Selector. In addition, when ordering a selector mechanism for a KS-16201 or KS-16202 selector, also specify whether the mechanism will be used with a phenolic or a molded bank; see 1.05, 1.06, and 1.07.

**2.04** Screws and bushings for mounting the shaft support bracket on KS-16201 and KS-16202 selectors are determined according to the type bank and associated parts used on the selector. Table A specifies certain parts which identify the type selector being used and lists the proper associated screws and bushings.

**2.05** If a molded bank assembly is being substituted for a phenolic bank assembly on a KS-16201 or KS-16202 selector, order the PH-88824-1 replacement kit which includes the following.

- 1 — D-750190-A cap bushing (to mount on the rotor shaft) (see 2.06)
- 2 — PD-7517-D bushings (to support the shaft support bracket)
- 2 — F-7083-D screws (to fasten the shaft support bracket)

**2.06** On KS-16201 and KS-16202 selectors, the rotor shaft used with phenolic banks is longer than the rotor shaft for molded banks; therefore, when a molded bank is substituted for a phenolic bank on these selectors, it is neces-

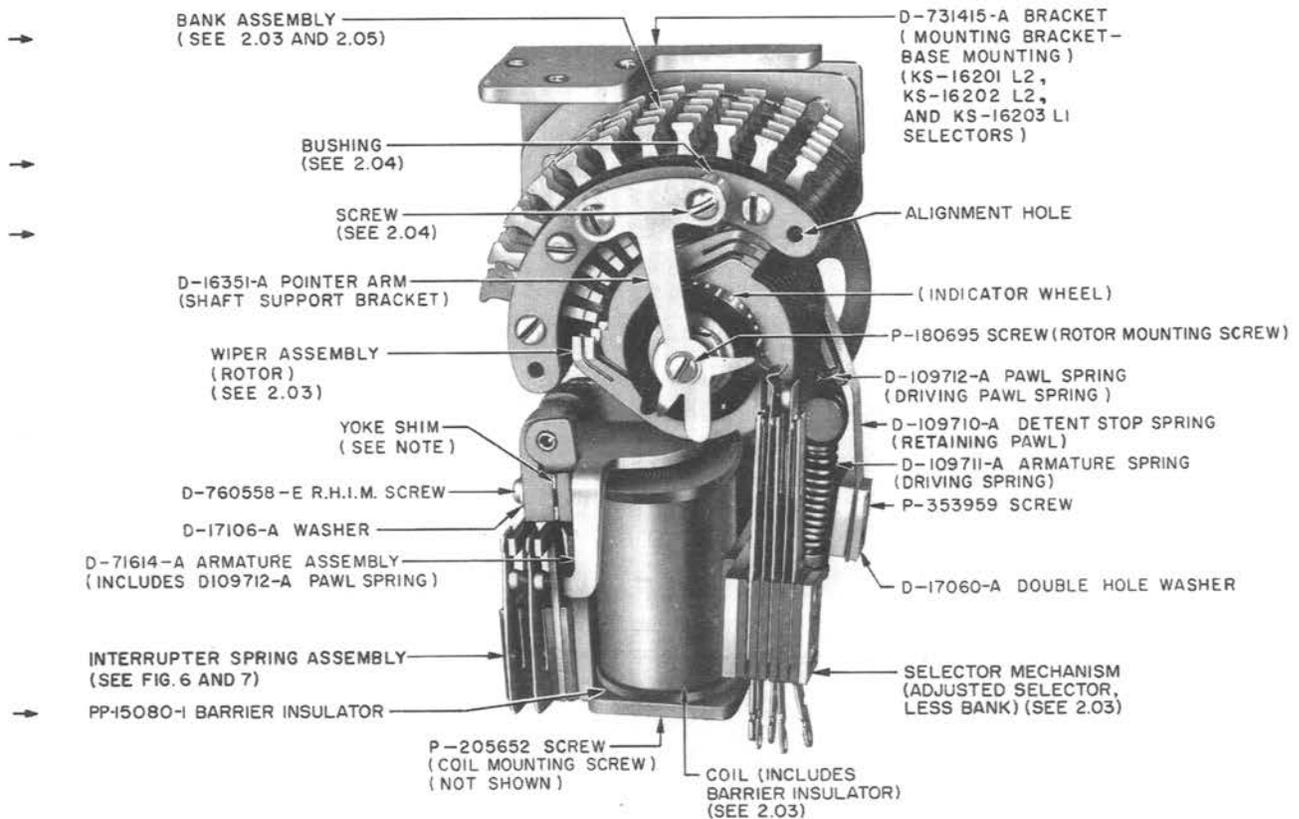
**Table A — Mounting Screws and Bushings for Shaft Support Bracket on KS-16201 and KS-16202 Selectors (see 2.04)**

TYPE SELECTOR (identifying parts)	SCREWS	BUSHINGS
T-Shape Shaft Support Bracket (phenolic bank) (Fig. 1)	*D-760558-D Pointer Arm Mounting Screws	*D-750191-A Pointer Arm Screw Bushings
L-Shape Shaft Support Bracket, Without Cap Bushing (molded bank) (Fig. 2)	*F-7083A Screws	*D-750288A Bushings
L-Shape Shaft Support Bracket, With Cap Bushing (molded bank) (Fig. 2)	F-7083-D Screws	PD-7517-D Bushings

\* Part of Bank Assembly

sary to mount a cap bushing on the rotor shaft to reduce endplay of the rotor on the shaft (see 2.05).

**2.07** When replacing a selector mechanism having a cap bushing on its rotor shaft, discard the cap bushing and order F-7083A screws and D-750288A bushings for mounting the shaft support bracket.



NOTE: D-65466-A YOKE SHIM (0.010 INCH)  
 D-65466-B YOKE SHIM (0.014 INCH)  
 D-65466-C YOKE SHIM (0.016 INCH)  
 THESE YOKE SHIMS MAY BE REQUIRED  
 WHEN REPLACING D-71614-A ARMATURE  
 ASSEMBLY - SEE 3.12

**Fig. 1 - KS-16201, KS-16202, and KS-16203 Type Selectors With Phenolic Bank  
 (KS-16201 L2 selector shown)**

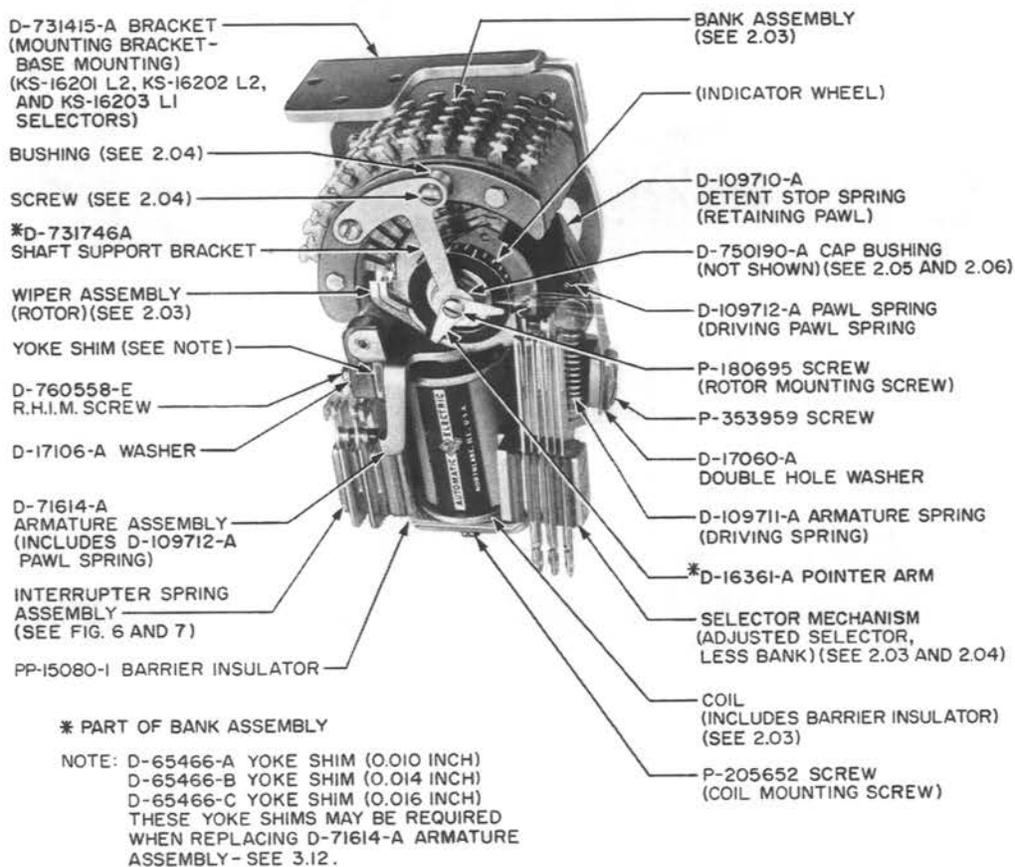
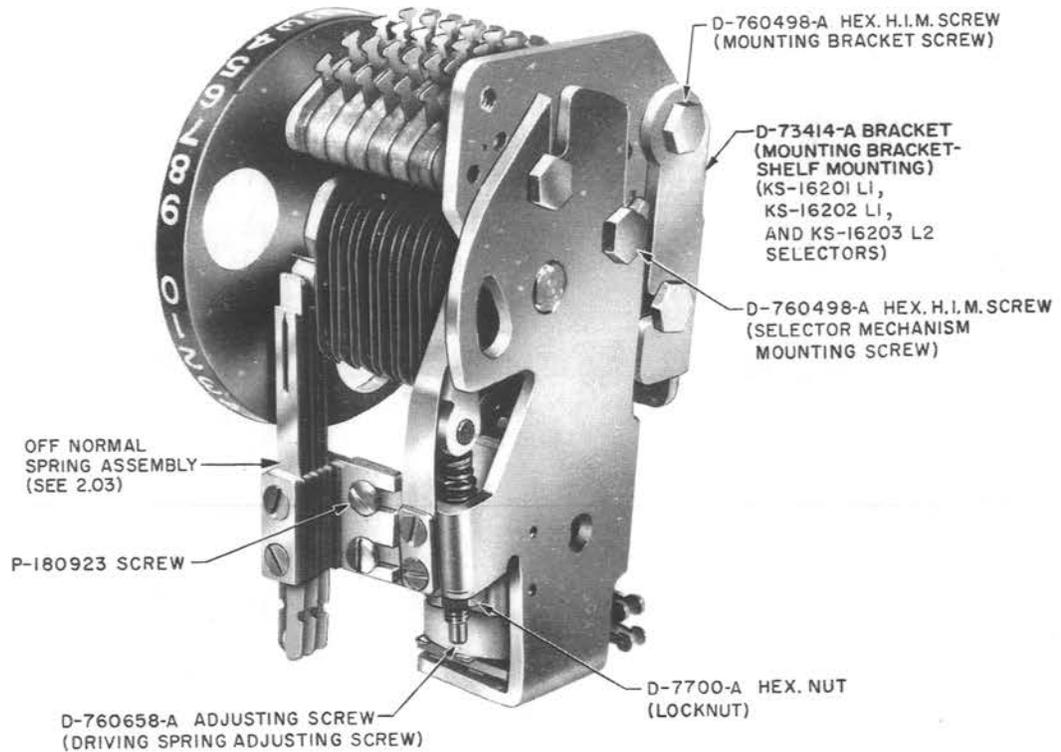
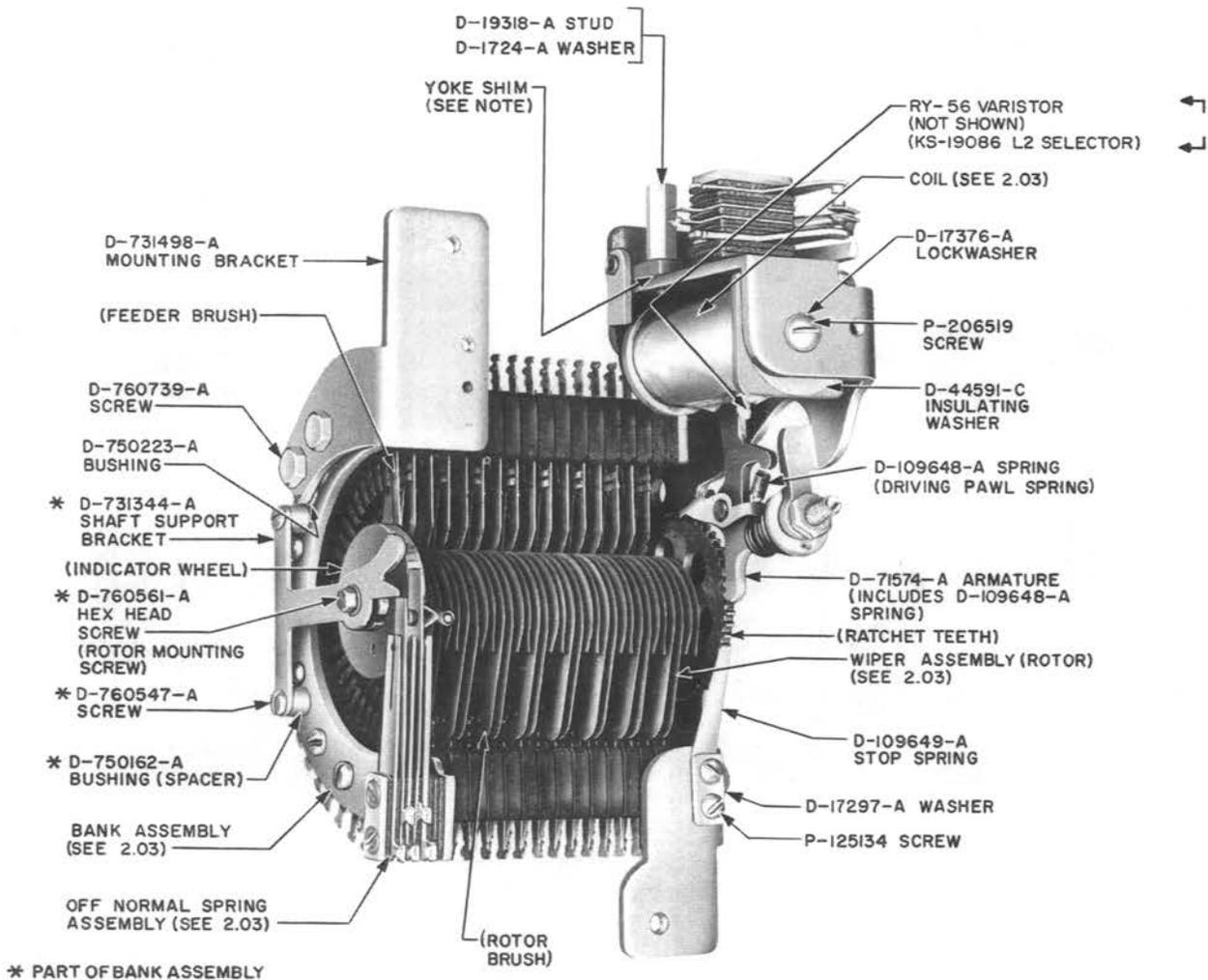


Fig. 2 - KS-16201, KS-16202, and KS-16203 Type Selectors With Molded Bank  
(KS-16201 L2 selector shown)



**Fig. 3 – KS-16201, KS-16202, and KS-16203 Type Selectors  
(KS-16203 L2 selector shown)**



NOTE: D-65449-A YOKE SHIM (0.010 INCH)  
D-65449-B YOKE SHIM (0.014 INCH)  
D-65449-C YOKE SHIM (0.016 INCH)

THESE YOKE SHIMS MAY BE REQUIRED WHEN REPLACING D-71574-A ARMATURE - SEE 3.11

Fig. 4 - KS-16563 and KS-19086 Type Selectors (KS-16563 L2 selector shown)

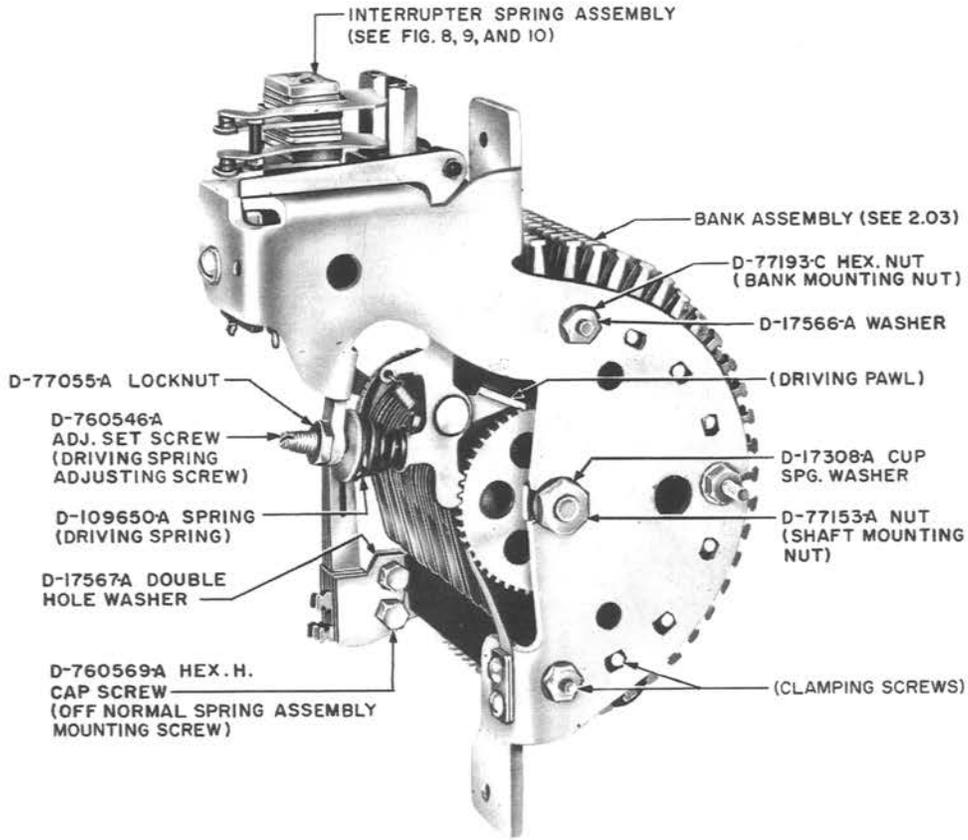


Fig. 5 - KS-16563 and KS-19086 Type Selectors (KS-16563 L1 selector shown)

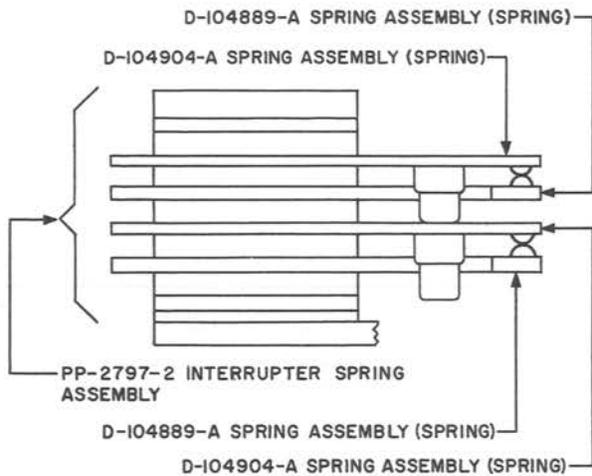


Fig. 6 - Interrupter Spring Assembly - KS-16201 L1 and L2 Selectors and KS-16203 L1 and L2 Selectors

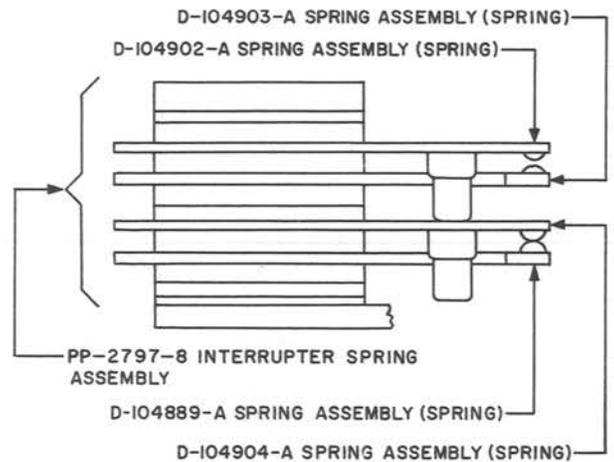


Fig. 7 - Interrupter Spring Assembly - KS-16202 L1 and L2 Selectors

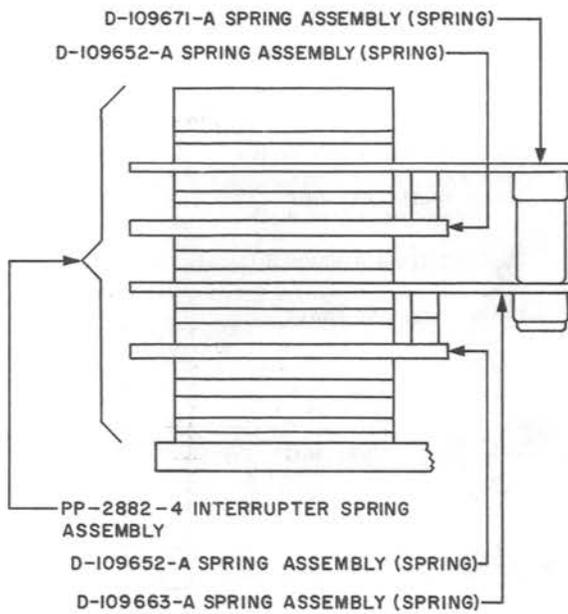


Fig. 8 - Interrupter Spring Assembly —  
KS-16563 L1 and L3 Selectors

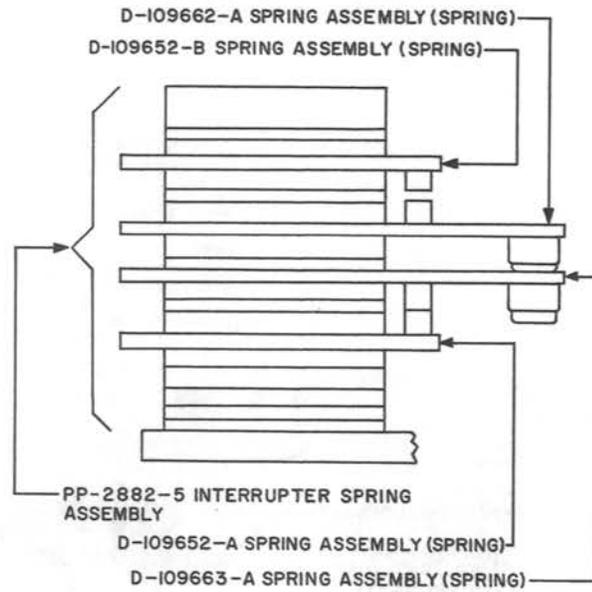


Fig. 10 - Interrupter Spring Assembly —  
KS-19086 L1 Selectors

### 3. REPLACEMENT PROCEDURES

#### 3.01 List of Tools and Materials

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
206	Offset Screwdriver
207	Offset Screwdriver
245	3/8- and 7/16-Inch Hex. Open Double-End Flat Wrench
344	Offset Screwdriver
417A	1/4- and 3/8-Inch Hex. Open Double-End Flat Wrench
418A	5/16- and 7/32-Inch Hex. Open Double-End Flat Wrench
563A	Offset Screwdriver
KS-6015	Pliers
KS-6320	Orange Stick
KS-8511	Tweezers
—	3-Inch C Screwdriver
—	4-Inch E Screwdriver
<b>MATERIALS</b>	
KS-2423	Cloth

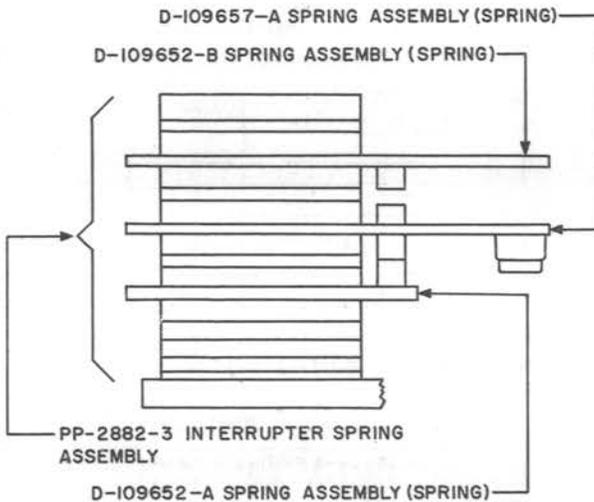


Fig. 9 - Interrupter Spring Assembly —  
KS-16563 L2 and KS-19086 L2 Selectors

**3.02** Before replacing any parts of a selector, make the associated circuit busy in the approved manner and block the necessary relays operated or nonoperated to isolate the selector circuit.

**3.03** In order to replace parts under some selector mounting conditions, it is necessary to remove the selector from its mounting. If this is done, take care to avoid damaging the wiring and if necessary provide a support for the selector while working on it. When the selector is mounted in the control panel of a substation equipment cabinet, it may be desirable to loosen the lower and remove the upper shock mounting screws and to swing the mounting bar to a position which provides better access to parts of the selector.

**3.04** No replacement procedures are specified for screws or other parts where the procedure consists of a simple operation.

**3.05** After replacing any parts of a selector, the part or parts replaced shall meet the readjust requirements as specified in Section 026-720-701. Other parts whose adjustments have been directly disturbed by the replacing operations shall be checked to the readjust requirements and an overall operation check shall be made of the selector before restoring the circuit to service.

### **3.06 Removing Selector Mechanism From Bank**

(1) **KS-16201, KS-16202, and KS-16203 Selectors:** Remove the selector mechanism from the bank as follows. To facilitate removing the selector mechanism from the bank without snagging the rotor brushes, step the selector so that the tips of one set of rotor brushes are in a position one step before passing the tip of the retaining pawl. Place a KS-2423 cloth directly below the selector to catch parts which may be dropped. Using the 206 and 207 offset screwdrivers, loosen the screws holding the off-normal spring assembly bracket on the frame. Remove the spring assembly from the frame and support it by the leads. Tag and disconnect the leads to the coil and interrupter springs. If the selector is equipped with a shaft support bracket, remove the bracket mounting screws and bushings using the offset screwdrivers. Remove the

screws mounting the selector mechanism on the bank frame using the 418A wrench. Carefully separate the selector mechanism from the bank and remove the assembly.

(2) **KS-16563 and KS-19086 Selectors:** Remove the selector mechanism from the bank as follows. Step the selector so that one set of rotor brushes is one step in front of the feeder brushes. Loosen the off-normal spring assembly mounting screws with the 417A wrench and remove the spring assembly. Tag and disconnect the leads to the coil and interrupter springs. Remove the shaft support bracket screws with the 3-inch C screwdriver or the 206 and 207 offset screwdrivers. Remove the shaft support bracket and associated spacers. Using the 245 wrench, remove the shaft mounting nut at the right side of the selector. Using the 418A wrench, remove the two frame mounting nuts toward the front of the frame and loosen the third nut near the rear of the frame. Remove the frame from the bank. Carefully disengage the upper portion of the rotor from the bank and remove the rotor.

### **3.07 Mounting Selector Mechanism on Bank**

(1) **KS-16201, KS-16202, and KS-16203 Selectors:** Mount the selector mechanism on the bank as follows. To facilitate mounting the selector mechanism on the bank without snagging the rotor brushes, step the selector so that the tips of one set of rotor brushes are in a position four steps beyond the tip of the retaining pawl. With the selector mechanism frame against the outside of the bank frame and in approximately its correct position with respect to the bank, carefully engage the rotor brushes with the bank feeder brushes so that each pair of rotor brushes straddles its associated pair of feeder brushes. Position the selector mechanism with reference to the bank so that the requirement covering position of rotor brushes on bank contacts in Section 026-720-701 is met and securely tighten the mounting screws using the 418A wrench. Mount the off-normal spring assembly and securely tighten the mounting screws using the 206 and 207 offset screwdrivers. Remount the screws and bushings that mount the shaft support bracket on the bank using the offset screwdrivers. Check that the requirement is

- met for indicator pointer position as covered
- in Section 026-720-701. Reconnect the leads to the coil and interrupter springs.

(2) **KS-16563 and KS-19086 Selectors:** Mount the selector mechanism on the bank as follows. Hold the rotor in front of the bank with the indicator wheel at the left and the off-normal actuating arm toward the bank. Align the brush at the right end of the rotor with the second feeder brush from the right side of the bank and the other brushes in this group with their associated feeder brushes. Carefully engage these rotor brushes with the feeder brushes so that each pair of rotor brushes straddles its associated pair of feeder brushes. Move the rotor toward the bank so that the rotor brushes engage the bank contacts and then engage the remaining feeder brushes with the rotor as follows. Carefully move the rotor so that the remaining pairs of feeder brushes lie between the associated rotor brushes. Moving the rotor slightly from side to side will facilitate properly engaging the feeder brushes. Then rotate and move the rotor to its proper radial position with respect to the bank. Position the frame against the right side of the bank with the rotor shaft in the frame notch and with the driving pawl and armature stopping teeth engaging the rotor ratchet wheel teeth. Place the washers and nuts on the bank screws and the nut on the rotor shaft and tighten the nuts with the 418A and 245 wrenches. Mount the shaft support bracket on the spacers and secure the support to the shaft using the 3-inch C screwdriver or the 206 and 207 offset screwdrivers. Mount the off-normal spring assembly using the 417A wrench. Reconnect the leads to the coil and interrupter springs.

↗ **3.08 Selector Mechanism:** To replace a selector mechanism, proceed as follows.

(1) Remove the selector mechanism from the bank as covered in 3.06. Using the 3-inch C screwdriver, remove the rotor mounting screw, pointer arm, and shaft support bracket if provided.

(2) **KS-16201 and KS-16202 Selectors Only:**

If the selector mechanism being replaced was used with a cap bushing on the rotor shaft, discard the cap bushing. Substitute F-7083A

↗ screws and D-750288A bushings in place of the screws and bushings which supported the shaft support bracket.

(3) Mount the shaft support bracket, pointer arm, and rotor mounting screw if provided. Mount the new selector mechanism on the bank as covered in 3.07.

↘ **3.09 Driving Pawl Spring:** On KS-16201, KS-16202, and KS-16203 selectors, loosen the lower mounting screw and remove the upper mounting screw of the retaining pawl using the 3-inch C screwdriver. Swing the retaining pawl aside to gain access to the driving pawl spring. Using the KS-8511 tweezers, unhook the spring at the pawl end and then disengage the other end from the armature. Hook one end of the new spring in the hole in the pawl and hook the other end of the spring in the armature. If the retaining pawl was moved, reposition it and securely tighten the mounting screws.

**3.10 Driving Spring:** Block the armature unoperated with the KS-6320 orange stick. Grasp one turn of the driving spring as near to the pawl end of the spring as possible, using the KS-6015 pliers. Compress the spring and remove it from the selector. Using the pliers in a similar manner, mount the new driving spring. Remove the orange stick.

**3.11 Driving Spring Adjusting Screw and Locknut:** Remove the driving spring as covered in 3.09. Remove the adjusting screw and locknut, using the 3-inch C screwdriver and 418A wrench (KS-16201, KS-16202, and KS-16203 type selectors) or the 4-inch E screwdriver and 417A wrench (KS-16563 and KS-19086 type selectors). Substitute the new parts and remount the driving spring.

**3.12 Armature Assembly**

(1) On KS-16201, KS-16202, and KS-16203 type selectors, remove the selector mechanism from the bank as covered in 3.06. This is generally not necessary on KS-16563 and KS-19086 type selectors.

(2) Step the rotor to a position providing sufficient clearance for removing the armature assembly. Remove the driving spring as covered in 3.09. Remove the armature bearing

screws with the 3-inch C screwdriver or the studs (KS-16563 and KS-19086 type selectors) with the 417A wrench, taking care not to lose the shim under the armature bearing. Remove the armature assembly, taking care not to snag the tips of the rotor brushes.

(3) Carefully place the new armature assembly in the selector. Insert the mounting screws with washers in the armature bearing holes and place the shim over the ends of the screws. Swing the bearing into position and partially tighten the mounting screws. Position the bearing so that the following requirements in Section 026-720-701 are met.

- (a) Position of driving pawl and armature stopping teeth.
- (b) Driving pawl and driving pawl spring clearance with adjacent rotor brush.
- (c) Interrupter arm position.

(4) With the armature in the unoperated position and the rotor play taken up in the direction opposite to rotation of the wipers, there should be clearance (maximum 0.008 inch) between the ratchet teeth and the stopping surface of the associated armature stopping teeth. On KS-16201, KS-16202, and KS-16203 type selectors, there should be clearance at all stopping teeth; on the KS-16563 and KS-19086 type selectors, clearance is essential at the top stopping tooth only. If this condition is not met after mounting the new armature assembly and meeting the requirements listed in (3), increase or decrease the height of the yoke shims as follows. If there is no clearance, add a yoke shim or substitute a thicker shim. See Fig. 1 and 3 for the available shims. If there is too much clearance, substitute a thinner shim. The total shim thickness should be kept as small as possible to obtain satisfactory clearance.

(5) When satisfactory clearance has been obtained, check the requirement in Section 026-720-701 covering clearance between armature and heelpiece. If the yoke shims were changed, also check the requirements listed in (3).

(6) If the selector mechanism was removed, remount it.

### 3.13 Rotor

(1) **KS-16201, KS-16202, and KS-16203 Type Selectors:** Remove the selector mechanism from the bank as covered in 3.06. Using the 3-inch C screwdriver, remove the rotor mounting screw, pointer arm, and shaft support bracket if provided. Remove the rotor from the rotor shaft. Lubricate the rotor shaft as covered in Section 026-720-701. Mount the new rotor and the pointer arm and shaft support bracket if provided and securely tighten the rotor mounting screw. Remount the selector mechanism as covered in 3.07.

(2) **KS-16563 and KS-19086 Type Selectors:** Remove the rotor from the bank by removing the selector mechanism as covered in 3.06. Mount the new rotor with the other parts of the selector mechanism as covered in 3.07.

**3.14 Shaft (KS-16563 and KS-19086 type selectors):** Remove the selector frame by following the procedures for removing the selector mechanism covered in 3.06 but do not remove the rotor from the bank. Remove the shaft, taking care not to move the rotor out of position. Substitute the new shaft and remount the frame as covered in 3.07.

**3.15 Barrier Insulator (KS-16201, KS-16202, and KS-16203 selectors)**

(1) Remove the coil mounting screw with the 4-inch E screwdriver. Then move the coil toward the armature to obtain clearance between the core and frame, taking care to avoid damage to the terminal connections. Carefully remove the old insulator from the core. Mount the new insulator, making sure that the corners of smaller radius are closer to the coil terminals. Mount and securely tighten the coil mounting screw.

**3.16 Coil:** Unsolder the leads from the coil and proceed as covered in (1) or (2).

(1) **KS-16201, KS-16202, and KS-16203 Type Selectors:** Remove the armature assembly as covered in 3.12. Remove the coil mounting screw with the 4-inch E screwdriver. Remove and discard the coil and the barrier insulator if provided. Mount the new barrier insulator on the core of the new coil in accordance with 3.15. Then mount the coil with the

insulator and securely tighten the coil mounting screw. Remount the armature assembly as covered in 3.12. Connect and solder the leads to the coil terminals, taking care to avoid melting the barrier insulator.

(2) **KS-16563 and KS-19086 Type Selectors:**

Remove the coil mounting screw with the 344 offset screwdriver. Remove the coil and insulating washer. Mount the new coil with a new insulating washer if necessary. Securely tighten the coil mounting screw making sure the lockwasher is under the head of the screw. Connect and solder the leads to the terminals.

**3.17 Interrupter Spring Assembly** (Fig. 6 through 10)

(1) To replace the complete interrupter spring assembly or an individual spring, loosen the interrupter spring clamping screws sufficiently to disengage them from the selector frame using the 207 offset screwdriver for KS-16201, KS-16202, and KS-16203 selectors or the 563A offset screwdriver for KS-16563 and KS-19086 selectors. In the case of KS-16563 selectors mounted in 83B teletype equipment, first remove the selector mounting screws using the 4-inch E screwdriver and swing the selector away from its mounting plate as far as the wiring permits, taking care not to damage the leads.

(2) If the complete interrupter spring assembly is to be replaced, loosen the clamping screws of the replacement assembly sufficiently to remove the clamping plate which held the assembly together during shipment. Take care not to disengage the screws from any parts of the assembly. Mount the assembly on the selector frame, align the springs to meet the requirement covering interrupter contact alignment in Section 026-720-701, and securely tighten the clamping screws.

(3) If individual springs in the assembly are to be replaced, remove insulators and springs as required to make the springs to be replaced accessible, noting the order in which the parts are removed. Substitute the new springs and position the parts on the clamping screws in the reverse order of removal. Make sure that embossed insulators, if provided, properly engage their adjacent parts. Mount

the assembly on the selector frame, align the springs to meet the requirement covering interrupter contact alignment in Section 026-720-701, and securely tighten the clamping screws.

(4) Check the requirements covering interrupter contact make and break, interrupter spring contact pressure, and interrupter contact test in Section 026-720-701.

**3.18 Bank Assembly** (see 1.07)

(1) To replace a bank assembly, proceed as follows. Remove the selector mechanism from the bank as covered in 3.06. Using the 418A wrench, remove the mounting bracket screws and remove the bank assembly from the bracket. Tag and unsolder the leads to the bank terminals. Substitute the new bank assembly. Mount the mounting bracket on the bank assembly and securely tighten the mounting screws. Then proceed as covered in (2) if substituting a molded in place of a phenolic bank assembly or as covered in (3) if replacing a molded bank assembly.

(2) If a molded bank assembly is being substituted for a phenolic bank assembly, discard the pointer arm screw bushings and pointer arm mounting screws furnished with the molded bank assembly. Substitute the bushings and screws furnished with the PH-88824-1 replacement kit to provide proper elevation for the shaft support bracket. Then remove the rotor mounting screw and shaft support bracket from the selector. Substitute the D-731746A shaft support bracket. Mount the cap bushing from the PH-88824-1 replacement kit on the rotor shaft. Mount the new shaft support bracket adjacent to the cap bushing on the rotor shaft. Position the D-16361A pointer arm on the shaft support bracket and temporarily tighten these parts on the shaft with the rotor mounting screw using the offset screwdrivers. Then proceed as covered in (3).

(3) Connect and solder the leads to the bank terminals. Remount the selector mechanism on the bank as covered in 3.07.

**REASONS FOR REISSUE**

1. To add information covering phenolic and molded banks (1.05, 1.06, and 1.07).
2. To revise data for ordering piece parts (2.03).
3. To add data for ordering piece parts (2.04, 2.05, 2.06, and 2.07).
4. To add Table A covering piece-part data for screws and bushings.
5. To revise Fig. 1, 4, 5, 8, and 9.
6. To add Fig. 2.
7. To revise procedures for removing and mounting selector mechanism on bank (3.06 and 3.07).
8. To add procedure for replacing selector mechanism (3.08).
9. To revise procedure for replacing rotor (3.13).
10. To add procedure for replacing barrier insulator (3.15).
11. To revise procedure for replacing coil (3.16).
12. To revise procedure for replacing bank assembly (3.18).