SWITCHES
304, 305, 306, 307, 308, 314, 315, AND 318 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 304-, 305-, 306-, 307-, 308-, 314-, 315-, and 318-type switches. It also covers approved procedures for replacing these parts.

1.02 This section is reissued to include a method of preparation of the KS-16832 L2 lubricant and to bring the section up to date. Since this reissue covers a general revision, the arrows ordinarily used to indicate changes have been omitted.

1.03 Part 2 of this section covers the piece-part numbers and the corresponding names of the piece parts which it is practicable to replace in the field in the maintenance of the switches. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the 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 Before making any replacement on the apparatus covered herein, make the associated circuit busy in accordance with the approved methods.

1.06 ***Preparation of KS-16832 L2 Lubricant:*** This lubricant is provided in 2-ounce and 1-pint containers. A small wide-mouth container, such as the 2-ounce jar in which the lubricant is available, should be used as a receptacle from which to dispense the lubricant. If allowed to stand more than 1 day without agitation, the lubricant ingredients tend to separate; therefore, before each day's use, shake the container of lubricant for approximately 30 seconds to insure mixing of the ingredients. The proper method of shaking the lubricant consists of repeated, rapid turning of the container to an upside down position and back to the upright position. If the lubricant from a 1-pint container is to be used, the lubricant must be mixed as just described before it is poured into the smaller container. Under storage conditions, the cover should be tight on the container.

2. PIECE-PART DATA

2.01 The figures included in this part show the various piece parts in their proper relation to other parts of the apparatus. Piece-part numbers are given together with the names of the parts as listed by the Western Electric Company Merchandise Department. Where these names differ from those in general use in the field, the latter names in some cases are shown in parentheses.

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, give both the number and the name of the piece part. For example, P-465427 Cover. Do not refer to the BSP number or to any information shown in parentheses following the piece-part numbers.

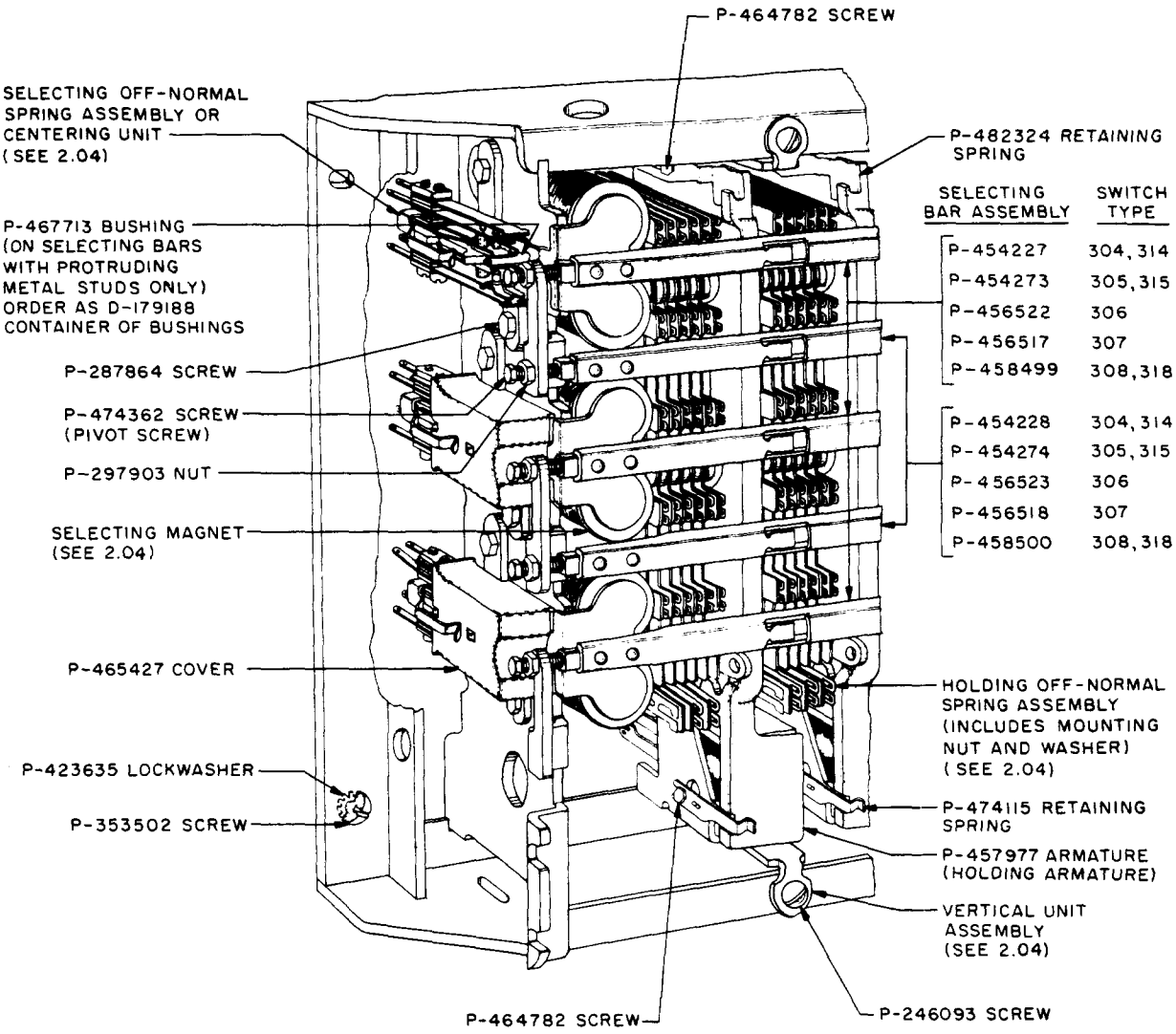

Fig. 1 – Front View of Switch

2.04 Table A is a list of numbers and corresponding names of piece parts which are not common to all 304-, 305-, 306-, 307-, 308-, 314-, 315-, and 318-type switches.

2.05 ***Operating Cards:*** The piece-part data for the operating cards of all switches is as follows.

P-16A101 Operating Card (3-wire switches)

P-16A102 Operating Card (4-wire switches)

P-16A103 Operating Card (5-wire switches)

P-16A104 Operating Card (6-wire switches)

2.06 ***Horizontal Strapping:*** When ordering a complete switch for replacement purposes, order by switch code, and if strapping is wanted, specify the desired strapping in the order.

2.07 ***Holding magnets*** are available in three lengths to facilitate the selection of a magnet of the proper length to insure that the magnet is underflush with respect to the pole pieces by

Min 0.002 inch
Max 0.005 inch

Magnets of each length should be ordered so as to permit the selection of the proper magnet re-

quired for replacement. Holding magnets with or without front spool heads may be used interchangeably.

2.08 ***Vertical Units:*** If a vertical unit is required for a 304-, 305-, 306-, 307-, 308-, 314-, 315-, or 318-type switch and a suitable spare vertical unit is not available locally, replace the entire switch with one of a later design (324-, 325-, or 328-type switch), or under certain conditions, the switch can be modified as specified below. The later design switch will be supplied automatically when an order is received for a 304-, 305-, 306-, 307-, 308-, 314-, 315-, or 318-type switch. The vertical units of the replaced switch can then be used to fill future needs for spare parts on other 304-, 305-, 306-, 307-, 308-, 314-, 315-, and 318-type switches. Vertical units of the 304-, 305-, 306-, 307-, 308-, 314-, 315-, and 318-type switches of the same number of wires are interchangeable if the proper holding off-normal spring assembly or balancing spring and holding magnet are used. As stated above, a 304-, 305-, 306-, 307-, 308-, 314-, 315-, or 318-type switch vertical unit, equipped with a holding off-normal spring assembly, may be replaced with a vertical unit from the 0 position of the same switch (unit at the left end of the switch) and a new-type vertical unit (324-, 325-, or 328-type switch) installed in the 0 position. This procedure can be followed in most switches. The 304C, 304L, 304T, 314C, 314L, and 314T switches carry a 3-make holding off-normal assembly and either a 1-make 1-transfer or a 2-make 1-break holding off-normal assembly in various positions. Hence, if any of these vertical units are replaced, it may be necessary to replace the off-normals also. The 305H, 305W, 307A, 315H, and 315W switches carry 3-wire units on the left half and either 4- or 5-wire units on the right half. So the above procedure could not be followed if the replacement were required in the right half of the switch, unless all the vertical units in the left half of the switch were replaced. The 315AD switch carries balancing springs on the left half and 2-break holding off-normal assemblies on the right half. Hence, if a vertical unit from the 0 position is used in the right half of the switch, the balancing spring will have to be replaced by a 2-break holding off-normal assembly.

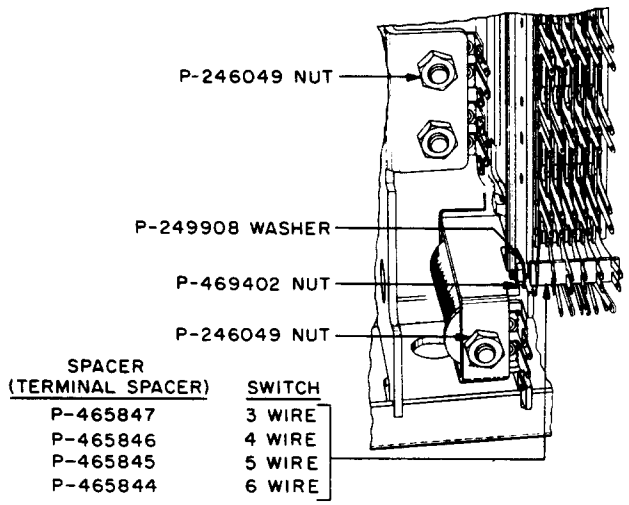

Fig. 2 – Partial Rear View of Switch Showing Magnet Mounting Part and Terminal Spacers

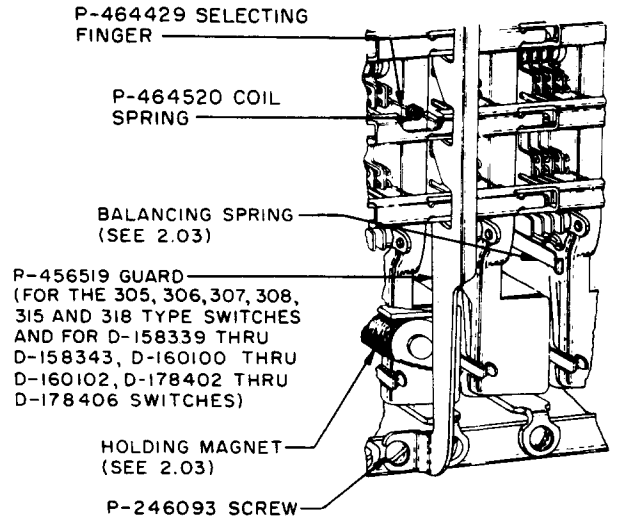

Fig. 3 – Partial Front View of Switch Showing Guard and Selecting Finger

TABLE A

SWITCH	HOLDING OFF-NORMAL SPG ASSEM	SEE NOTE	HOLDING MAGNET (see 2.07) SHORT	MEDIUM	LONG	RES (ohms)	SELECTING OFF-NORMAL SPG ASSEM	SELECTING MAGNET PART NO.	RES (ohms)
304B	P-458038		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
304C	P-458100	1	P-290318	P-290319	P-290320	330	P-454594	P-454602	240
	P-458140	2							
304D	P-458016		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
304E	P-458038		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
304F	P-458099		P-290312	P-290313	P-290314	1570	P-455481	P-454224	600
304G	P-458016		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
304H	P-458038		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
304J	P-458016		P-290321	P-290322	P-290323	1250	+ P-464444	P-454224	600
304K	#P-472751		P-290321	P-290322	P-290323	1250	P-455483	P-454224	600
304L	P-458033	3	P-290318	P-290319	P-290320	330	P-455482	P-454221	43
	P-458140	4							
304M	P-458035		P-290321	P-290322	P-290323	1250	P-455481	P-454224	600
304N	P-458041		P-290315	P-290316	P-290317	200	P-454075	P-454222	157
304P	P-458038		P-290321	P-290322	P-290323	1250	P-455481	P-454224	600
304R	P-458041		P-290315	P-290316	P-290317	200	P-455481	P-454222	157
304T	P-458033	5	P-290318	P-290319	P-290320	330	P-455482	P-454221	43
	P-458140	6							
304W	#P-472751		P-290312	P-290313	P-290314	1570	P-455482	P-454602	240
304Y	#P-472751		P-290321	P-290322	P-290323	1250	P-455482	P-454602	240
304AA	P-459148	9	P-290318	P-290319	P-290320	330	P-455482	P-454602	240
304AB	P-458038		P-290312	P-290313	P-290314	1570	P-455481	P-454224	600
304AC	P-458016		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
304AD	#P-476809		P-290321	P-290322	P-290323	1250	P-455482	P-454221	43
305A	P-458016		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
305B	#P-472751		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
305C	#P-472751		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
305D	P-458038		P-290312	P-290313	P-290314	1570	P-455481	P-454224	600
305E	P-458036		P-290312	P-290313	P-290314	1570	P-455483	P-454224	600
305F	P-458036		P-290312	P-290313	P-290314	1570	+ P-466075	P-454602	240
305G	P-458037		P-290312	P-290313	P-290314	1570	P-455483	P-454224	600
305H	P-458038	7	P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
	P-458038	8							
305J	P-458040		P-290312	P-290313	P-290314	1570	P-455481	P-454224	600
305L	P-458037		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
305N	P-458038		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	300
305S	P-458038		P-290312	P-290313	P-290314	1570	P-454075	P-454224	600
305T	P-458016		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
305U	P-458016		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
305W	P-458038	7	P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
	P-458038	8							
305Y	P-458099		P-290312	P-290313	P-290314	1570	P-455483	P-458498	34
305AA	#P-472751		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
305AB	#P-472751		P-290312	P-290313	P-290314	1570	P-455483	P-458498	34
306A	P-458016		P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
307A	P-458038	7	P-290312	P-290313	P-290314	1570	+ P-464444	P-454224	600
	P-458038	8							

TABLE A (Cont)

SWITCH	HOLDING OFF-NORMAL SPG ASSEM	SEE NOTE	HOLDING MAGNET (see 2.07) SHORT	MEDIUM	LONG	RES (ohms)	SELECTING OFF-NORMAL SPG ASSEM	SELECTING MAGNET PART NO.	RES (ohms)
308A	#P-476809		P-290321	P-290322	P-290323	1250	Note 10	Note 11	
308B	#P-472751		P-290321	P-290322	P-290323	1250	P-455483	P-454224	600
314C	P-458100	1	P-290318	P-290319	P-290320	330	P-454594	P-462047	240
	P-458140	2							
314D	P-458016		P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
314E	P-458038		P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
314F	P-458099		P-290312	P-290313	P-290314	1570	P-455481	P-462048	600
314G	P-458016		P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
314J	P-458016		P-290321	P-290322	P-290323	1250	+P-464444	P-462048	600
314K	#P-472751		P-290321	P-290322	P-290323	1250	P-455483	P-462048	600
314L	P-458033	3	P-290318	P-290319	P-290320	330	P-455482	P-462045	43
	P-458140	4							
314M	P-458035		P-290321	P-290322	P-290323	1250	P-455481	P-462048	600
314N	P-458041		P-290315	P-290316	P-290317	200	P-454075	P-462046	157
314P	P-458038		P-290321	P-290322	P-290323	1250	P-455481	P-462048	600
314R	P-458041		P-290315	P-290316	P-290317	200	P-455481	P-462046	157
314T	P-458033	5	P-290318	P-290319	P-290320	330	P-455482	P-462045	43
	P-458140	6							
314W	#P-472751		P-290312	P-290313	P-290314	1570	P-455482	P-462047	240
314Y	#P-472751		P-290321	P-290322	P-290323	1250	P-455482	P-462047	240
314AA	P-459148	9	P-290318	P-290319	P-290320	330	P-455482	P-462047	240
314AB	P-458038		P-290312	P-290313	P-290314	1570	P-455481	P-462048	600
314AC	P-458016		P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
314AD	#P-476809		P-290321	P-290322	P-290323	1250	P-455482	P-462045	43
315A	P-458016		P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
315B	#P-472751		P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
315C	#P-472751		P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
315D	P-458038		P-290312	P-290313	P-290314	1570	P-455481	P-462048	600
315E	P-458036		P-290312	P-290313	P-290314	1570	P-455483	P-462048	600
315F	P-458036		P-290312	P-290313	P-290314	1570	+P-466075	P-462047	240
315G	P-458037		P-290312	P-290313	P-290314	1570	P-455483	P-462048	600
315H	P-458038	7	P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
	P-458038	8							
315J	P-458040		P-290312	P-290313	P-290314	1570	P-455481	P-462048	600
315N	P-458038		P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
315T	P-458016		P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
315U	P-458016		P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
315W	P-458038	7	P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
	P-458038	8							
315Y	P-458099		P-290312	P-290313	P-290314	1570	P-455483	P-462055	34
315AA	#P-472751		P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
315AB	#P-472751		P-290312	P-290313	P-290314	1570	P-455483	P-462055	34
315AC	P-463413		P-290321	P-290322	P-290323	1250	P-455481	P-462048	600
315AD	#P-472751	7	P-290312	P-290313	P-290314	1570	+P-464444	P-462048	600
	P-458016	8							
318A	#P-476809		P-290321	P-290322	P-290323	1250	Note 10	Note 12	
318B	#P-472751		P-290321	P-290322	P-290323	1250	P-455483	P-462048	600
318D	#P-476809		P-290321	P-290322	P-290323	1250	Note 13	Note 12	

TABLE A (Cont)

SWITCH	HOLDING OFF-NORMAL SPG ASSEM	SEE NOTE	HOLDING MAGNET (see 2.07) SHORT	MEDIUM	LONG	RES (ohms)	SELECTING OFF-NORMAL SPG ASSEM	SELECTING MAGNET PART NO.	RES (ohms)
‡D-158339	#P-472751		P-290327	P-290328	P-290329	1940	+P-464444	P-454224	600
‡D-158340	#P-472751		P-290327	P-290328	P-290329	1940	+P-464444	P-454224	600
‡D-158341	P-458038		P-290327	P-290328	P-290329	1940	P-455481	P-454224	600
‡D-158342	P-458036		P-290327	P-290328	P-290329	1940	P-455483	P-454224	600
‡D-158343	P-458036		P-290327	P-290328	P-290329	1940	+P-466075	P-454602	240
§D-160100	P-458099		P-290312	P-290313	P-290314	1570	P-458726	P-458498	34
§D-160101	#P-472751		P-290312	P-290313	P-290314	1570	+P-464444	P-454224	600
§D-160102	#P-472751		P-290312	P-290313	P-290314	1570	P-458726	P-458498	34
†D-178402	#P-472751		P-290327	P-290328	P-290329	1940	+P-464444	P-462048	600
†D-178403	#P-472751		P-290327	P-290328	P-290329	1940	+P-464444	P-462048	600
†D-178404	P-458038		P-290327	P-290328	P-290329	1940	P-455481	P-462048	600
†D-178405	P-458036		P-290327	P-290328	P-290329	1940	P-455483	P-462048	600
†D-178406	P-458036		P-290327	P-290328	P-290329	1940	+P-466075	P-462047	240

Notes

1. For positions 0, 1, 2, 3, and 5.
2. For position 4.
3. For positions 0, 3, 4, 5, 6, and 7.
4. For positions 1, 2, 8, and 9.
5. For positions 0, 1, and 5.
6. For positions 2, 3, and 4.
7. For positions 0L through 9L.
8. For positions 0R through 9R.
9. For positions 0 through 7.
10. P-466075 centering unit for positions 0 and 1; P-455483 selecting off-normal spring assembly for positions 2 through 9.
11. P-454602 selecting magnet (240 ohms) for positions 0 and 1; P-454224 selecting magnet (600 ohms) for positions 2 through 9.
12. P-462047 selecting magnet (240 ohms) for positions 0 and 1; P-462048 selecting magnet (600 ohms) for positions 2 through 9.
13. P-466075 centering unit for positions 0 and 1; P-464444 centering unit for positions 2 through 9.

\# Order as balancing spring. Spring mounted with one P-294046 screw.

\+ Order as centering unit.

‡ 305-type switches.

§ 308-type switches.

† 315-type switches.

3. REPLACEMENT PROCEDURES

3.01 *List of Tools, Gauges, and Materials*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
43	3/16- and 1/4-Inch Hex. Open Double-End Flat Wrench
206	30-Degree Offset Screwdriver
207	90-Degree Offset Screwdriver
373D	Contact Burnisher Holder
418A	5/16- and 7/32-Inch Hex. Open Double-End Flat Wrench
485A	Smooth-Jaw Pliers

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
541A	1/4-Inch 12-Point Double-End Box Wrench
544A	1/4-Inch Hex. Offset Socket Wrench
D-170030	Spring Blocking Tool
D-170283	Tweezers
KS-6320	Orange Stick
KS-14220	Wrench Consisting Of:
L1	Sliding "T" Handle
L7	6-Inch Extension Bar
L14	7/16-Inch 12-Point Socket
*P-10A200	Sleeve
R-1051	File
—	P-Long-Nose Pliers
—	5-Inch Diagonal Pliers
—	4-Inch E Screwdriver
—	Combination Pliers
GAUGES	
131A	Thickness Gauge Nest
P-243664	0.002-Inch Feeler (part of KS-6909 thickness gauge nest)
P-243667	0.005-Inch Feeler (part of KS-6909 thickness gauge nest)
R-8550	6-Inch Steel Scale
MATERIALS	
KS-16832 L2	Lubricant
—	320 Aloxite Cloth
—	22-Gauge Bare Tinned Copper Wire
*P-467713	Bushing

*Part of D-179188 Container of Bushings

General

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

3.03 Soldering of strap leads, when necessary, shall be done in accordance with the section covering soldering on crossbar switch and 245-type relays.

3.04 After making any replacement of parts of 304- or similar-type switches, the part or parts replaced shall meet the readjust requirements involved as specified in Section 030-717-701 covering this apparatus. Other parts whose adjustments may have been disturbed by the replacing operations shall be checked to the readjust requirements and an overall operation check shall be made of the switch before restoring the circuit to service.

3.05 ***Selecting Bar***

(1) If the switch is equipped with a guard, remove it.

(2) Loosen the pivot screw locknut at the armature end of the selecting bar with the 418A wrench. Turn the pivot screw out sufficiently with the 43 wrench to free the selecting bar and remove the selecting bar.

(3) Before mounting the new selecting bar, make sure the container of lubricant has been shaken as covered in 1.06. Then dip a piece of 22-gauge bare tinned copper wire into KS-16832 L2 lubricant to a depth of approximately 3/8-inch and quickly remove the wire. Apply the drop of lubricant retained on the wire in the bearing hole at one end of the selecting bar and another drop of lubricant in the bearing hole at the other end of the selecting bar.

(4) Hold the selecting bar so that each selecting finger will enter between the proper operating cards and holding armature. Gently move the selecting bar toward the switch until in position, taking care that the selecting armature stud enters between the centering springs. Turn the pivot screw into the selecting bar and when the selecting bar is properly positioned, securely tighten the pivot screw locknut. If guard was removed, remount it.

3.06 ***Selecting Finger***

(1) Remove the selecting bar as covered in 3.05.

(2) Remove the old selecting finger by pulling it off with the P-long-nose pliers.

(3) Use the 373D contact burnisher holder to aid in installing the new selecting finger as follows. Loosen the check adjusting nut of the burnisher holder. Place the selecting finger in the chuck of the contact burnisher holder so that the straight portion of the finger enters the handle of the holder and the coil portion of the finger will be engaged by the chuck. Press the coil portion of the finger into the chuck as far as it will go. About 1/4 inch of the coil will project outside the chuck. Then lightly tighten the nut, taking care not to crush the coil portion of the selecting finger inside the chuck.

(4) Screw the selecting finger onto the selecting finger mounting stud and turn the finger until the end turn of the coil bottoms firmly against the selecting bar. Loosen the chuck adjusting nut and remove the contact burnisher holder. Make sure that there are five to seven free turns of the coil portion of the selecting finger beyond the free end of the selecting finger mounting stud. If there are less than five or more than seven free turns of the coil, remove the selecting finger and install another finger as covered above.

(5) Determine the length of the adjacent selecting finger by means of the R-8550 steel scale and cut the tip of the new selecting finger off with the 5-inch diagonal pliers so that the new finger is the same length as the adjacent finger. Remove any burrs from the tip of the selecting finger by looping a piece of 320 Aloxite cloth over the finger and drawing it over the tip several times until the burrs are removed.

(6) Thread the loop end of a new coil spring onto the selecting finger, taking care to place the proper side of the loop toward the coil portion of the finger as illustrated in Fig. 4. Force the coil spring over the tip of the selecting finger and push the spring onto the selecting finger, being careful to avoid personal injury due to the sharp tip of the selecting finger. Push the coil spring on the selecting finger so that the tang at the loop end is just inside the coil portion of the selecting finger, and when the coil spring is in position, make sure it does not bind at the loop end.

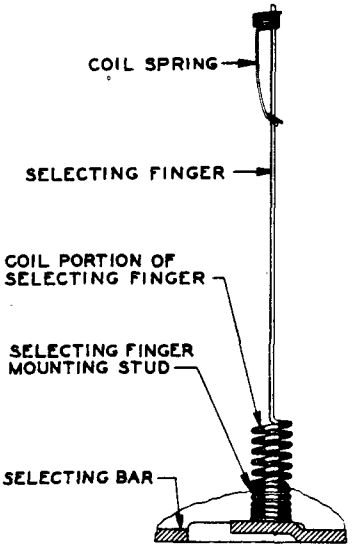

Fig. 4 – Method of Assembling Coil Spring of Selecting Finger

(7) Remount the selecting bar as covered in 3.05, except that no oil should be placed on the pivot screws.

3.07 ***Selecting Magnet:*** Remove the associated selecting bar as covered in 3.05. Unsolder the leads connected to the magnet to be replaced. Remove the magnet clamping nut with the KS-14220 wrench and remove the magnet. Substitute the new magnet and reassemble the magnet clamping nut. Securely tighten the magnet clamping nut, exercising care to align the coil so that there is a clearance between the frame and the winding terminals. Resolder the leads to the proper terminals of the magnet. Remount the selecting bar as covered in 3.05, except that no oil should be placed on the pivot screws.

3.08 ***Selecting Off-Normal Spring Assembly or Centering Unit:*** Unsolder the leads, if any. Remove the selecting off-normal spring assembly or centering unit bracket mounting

screws with the 544A wrench and remove the spring assembly. Mount the new spring assembly on the switch. When the spring assembly is properly positioned, securely tighten the mounting screws. Resolder the leads, if any, to their proper terminals.

3.09 ***Holding Off-Normal Spring Assembly:*** Unsolder the leads to the holding off-normal spring assembly. From the terminal side of the switch, loosen the spring assembly bracket mounting screw with the 541A wrench. Mount the new spring assembly. Securely tighten the mounting screw. Resolder the leads to their proper terminals.

3.10 ***Balancing Spring:*** Where a balancing spring is provided in place of a holding off-normal spring assembly, remove the balancing spring mounting screw with the 206 and 207 offset screwdrivers. Substitute the new part, securely tightening the mounting screw.

3.11 ***Vertical Unit***

(1) Remove the selecting bars as covered in 3.05.

(2) Unsolder the necessary crosspoint strap wires as described in the section covering soldering on crossbar switch and 245-type relays. Unsolder the holding magnet leads. Unsolder the wiring to the holding off-normal spring assembly if it is to be replaced. If a holding off-normal spring assembly is provided and it is not to be replaced, loosen the holding off-normal spring assembly bracket mounting screw as covered in 3.09 and dismount the spring assembly, taking care not to damage the wiring to the spring assembly.

(3) Remove the vertical unit mounting screws with the 4-inch E screwdriver and then remove the vertical unit.

(4) If the vertical unit is equipped with a balancing spring instead of a holding off-normal spring assembly and it is desired to re-use the balancing spring, remove the balancing spring mounting screw with the 4-inch E screwdriver. Remove the balancing spring and transfer it to the new vertical unit.

(5) Mount the new vertical unit on the switch and in all cases, except the 305T, 305W, 305Y, 305AA, 305AB, 315T, 315W, 315Y, 315AA, and 315AB switches, locate it so that there is at least 1/32-inch clearance between the new vertical unit and all parts of adjacent vertical units. On the 305T, 305W, 305Y, 305AA, 305AB, 315T, 315W, 315Y, 315AA, and 315AB switches locate the switch so that the clearance between the pile-up screws and the operating cards of the adjacent vertical unit is at least 7/64 inch. When properly positioned, securely tighten the vertical unit mounting screws.

(6) Mount the holding off-normal spring assembly, if provided. Resolder the strap wires as covered in the section covering soldering on crossbar switch and 245-type relays. Resolder any other leads which were removed.

(7) Remount the selecting bars as covered in 3.05, except that no oil should be placed on the pivot screws. In remounting the selecting bars, take care that they are reassembled on the same horizontal positions from which they were removed.

3.12 ***Multiple Strip Terminal Spacer:*** Remove the old spacer with a pair of P-long nose pliers. Unsolder the wires from the multiple strip terminals and remove all excess solder from the terminals. Hold the new spacer so that the wide surfaces are horizontal, and carefully push the spacer into position between the two rows of terminals with a screwdriver blade so the spacer enters the rounded portions of the slots in the terminals. Rotate the spacer so the wide surfaces are vertical, taking care that the terminals enter the proper slots in the spacer. Resolder the wires to their proper terminals.

Holding Armature

3.13 In removing and mounting holding armatures, it will be necessary to exercise care to avoid damaging the operating cards.

3.14 In some cases where vertical units are mounted on close centers, difficulty may be experienced in removing and mounting the holding armature because of interference between operating cards on adjacent vertical units. In this case, with the 4-inch E screwdriver, loosen the mounting screws of the vertical unit in which the armature is being removed. Also loosen the mounting screws of the vertical unit to the right and move the vertical units away

from each other, after which the armature can be removed and a new one mounted as covered in 3.15 and 3.16. Then shift the vertical units back into position, taking care to leave the clearance between all parts of adjacent vertical units as specified in 3.11.

3.15 ***Removing Holding Armature:*** Grasp the armature in such a way as to keep it in an unoperated position. Taking care not to affect the lower retaining spring adjustment, press the spring to the left far enough to permit the armature to be pulled forward. In some cases, it may be necessary to rock the armature to free it as it is being pulled forward. After the armature has been pulled forward sufficiently to clear the armature support lug (about 3/32 inch), rotate the armature to the left to clear the operating cards before removing it from the vertical unit. Remove the armature from the vertical unit, making sure that it does not catch on the selecting fingers.

3.16 ***Mounting Holding Armature:*** Grasp the bottom right corner of the new armature and insert the top end of the armature under the upper retaining spring, making sure that the armature does not catch on the selecting fingers or operating cards. Then rotate the armature to the left so that it will clear the operating cards and place the armature against the tip of the lower retaining spring. Press the armature to the left, being careful to maintain the clearance between it and the operating cards. At the same time, position the armature on the armature support lug with the armature stud between the balancing spring and the backstop lug. If necessary, press the retaining spring to the left with the other hand to facilitate positioning the armature. If any of the requirements for the vertical unit specified in Section 030-717-701 covering this apparatus cannot be met, attempt to correct the condition by trying other holding armatures. Should it still be impossible to meet the requirements, replace the vertical unit.

Holding Magnet

3.17 ***Removing Holding Magnet:*** Remove the holding armature as covered in 3.15. Unsolder the leads connected to the magnet. Remove the magnet clamping nut with the KS-14220 wrench and remove the magnet.

3.18 ***Mounting Holding Magnet***

(1) Mount a new medium length magnet and securely tighten the clamping nut. Take care to align the coil so that there is sufficient clearance between the frame and the winding terminals.

(2) Place a blade of the 131A thickness gauge nest across the pole pieces so it can be used as a straightedge and, by means of the P-243664 and P-243667 feelers make sure that the core of the holding magnet is underflush of the pole pieces over the entire width of the core by

Min 0.002 inch
Max 0.005 inch

If these conditions are not met, remove the magnet as covered in 3.17 and substitute a longer or shorter magnet as required. It is desirable to have the underflush toward the minimum value to permit easier application of the electrical requirements.

(3) Remount the holding armature as covered in 3.16 and resolder the leads to the proper terminals of the magnet.

3.19 ***Retaining Spring:*** Loosen the retaining spring mounting screw with the 541A wrench and remove the spring taking care not to turn the screw out because difficulty may be experienced in reassembling the screw in the hole. Substitute the new spring and securely tighten the mounting screw. In some cases, it may be necessary to remove the top selecting bar as covered in 3.05 to obtain better movement of the wrench.

Caution: In tightening the retaining spring mounting screw, exercise extreme care not to twist the head off the screw.

3.20 ***Retaining Spring Mounting Screw (except bottom screw on 305-, 306-, 307-, and 315-type switches):*** Remove the retaining spring as covered in 3.19. Remove the retaining spring mounting screw with the 541A wrench. To start the new screw into position in the vertical unit, proceed as follows. Remove the holding armature as covered in 3.15. Hold the flat side of a clean R-1051 6-inch pillar file against the core of the holding magnet so that the pole piece contacts the file at a point about 1/2 inch from the end

of the file. Energize the holding magnet a few seconds so as to magnetize the file. Place the head of the screw on the magnetized file and carefully place the tip of the screw in the hole in the vertical unit. Tilt the file slightly so that it contacts the edge of the screwhead and push or pull on the file so as to rotate the screw in the direction necessary to start the screw. Turn the screw in a few turns. Reassemble the retaining spring as covered in 3.19. Remount the holding armature as covered in 3.16.

3.21 ***Bottom Retaining Spring Mounting Screw on 305-, 306-, 307- and 315-Type Switches:*** Proceed as covered in 3.20 except in replacing the screw, hold the tip of the screw in the hole in the vertical unit with the magnetized file and use the 418A wrench to turn the screw into the hole. If difficulty is experienced because of insufficient space between the vertical units, loosen the vertical unit mounting screws and shift the vertical units farther apart as covered in 3.14.

Operating Card

3.22 ***General:*** To facilitate the removal of the operating card, remove the selecting bar associated with the card to be replaced as covered in 3.05. If the selecting bar removed was in the uppermost or lowermost position, also remove the adjacent selecting bar. If the selecting bar removed was in any position other than that specified above, then also remove both the upper and lower adjacent selecting bars. If more than the two adjacent selecting bars are removed, label them so that they can be replaced in the positions from which they were removed.

3.23 Remove the holding armature associated with the unit on which the card is to be replaced as covered in 3.13, 3.14, and 3.15. Also, remove the holding armature in the position to the left of the one removed.

3.24 ***Removing Card***

(1) At the position of the card to be replaced, hold the D-170030 blocking tool with the lever at the right and the springs of the tool just in back of the springs of the vertical unit at which the card is to be replaced. Where the card is on a unit having less than six contacts per crosspoint, place the tool so that the lever is at the right and when in position, will operate the right-hand operating spring. Force the tool into position as shown in Fig. 5 and 6, exercising care not to damage the springs. Make sure that the tool is fully seated, that is, the front end of the tool strikes the ends of the springs as shown in Fig. 8 and all the associated contacts of the crosspoint are closed.

(2) Grasp one end of the card with the D-170283 tweezers as shown in Fig. 7, and rotate the card 90 degrees until it is lying flat. Withdraw the card from the spring assembly with the tweezers or the 485A pliers at the right-hand side of the unit unless the card is broken, in which case remove each part from the side of the vertical unit associated with the respective part. Removal of the card will be facilitated if it is moved slightly toward the rear of the switch as it is being withdrawn.

Caution: Do not use excessive force in removing a card since this may cause the card to become wedged or a spring to be bent.

3.25 ***Mounting Card***

(1) Never use a used card, since each insertion and removal of a card tends to round the edges thereby causing the card to fit loosely.

(2) Grasp a new card near the center with the 485A pliers with the armature end of the card toward the right and the long tang in a direction away from the pliers as shown in Fig. 8.

(3) Insert the card armature end first in the space between the unit on which the card is to be replaced, and the vertical unit at the right until the long tang end of the card is adjacent to the card opening in the vertical unit. Then while holding the card in this position, rotate the card in a horizontal direction so that the long tang end of the card enters the card opening as shown in Fig. 9. Use the orange stick to assist in this operation and to free the card if it wedges or binds on the springs. Gently slide the card to the left until the card lines up with those immediately above and below it. When the card is in this position, grasp the armature end of the card with the tweezers and rotate it 90 degrees, so that the pointed side of the card at the armature end will point toward the corresponding part of

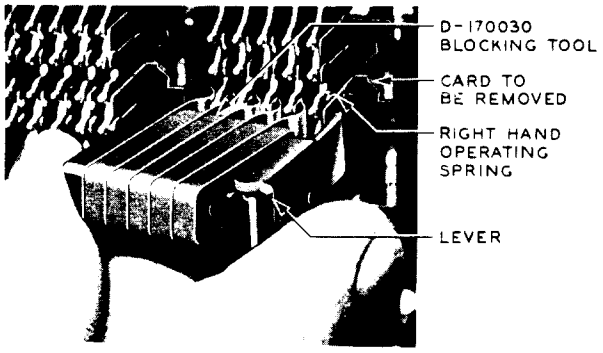

Fig. 5 – Applying Blocking Tool

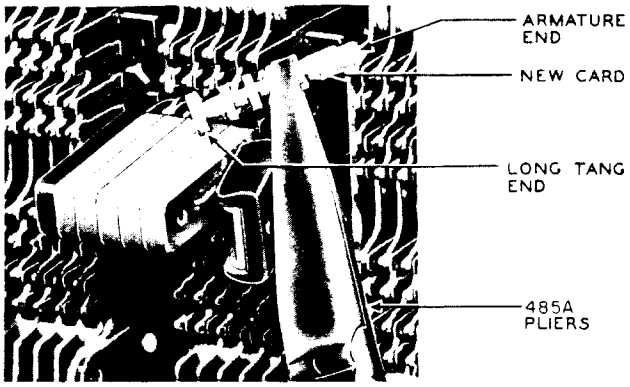

Fig. 8 – Grasping a New Card for Replacement

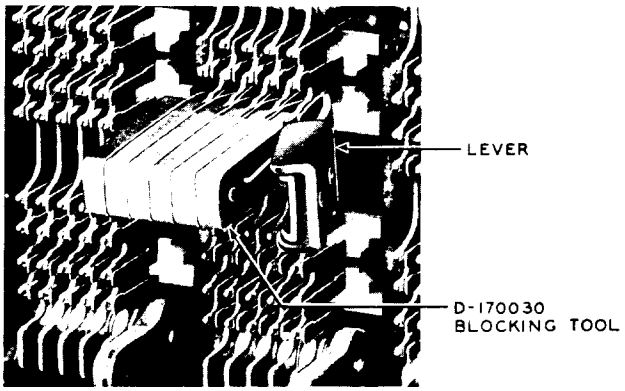

Fig. 6 – Blocking Tool in Position

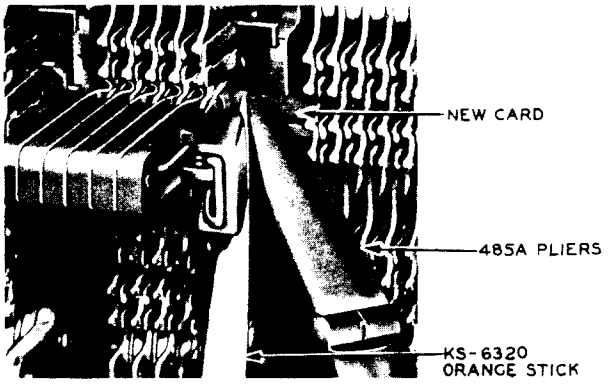

Fig. 9 – Inserting New Card in Spring Combination

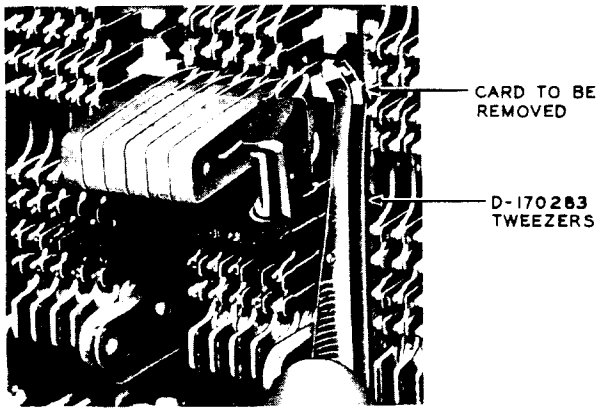

Fig. 7 – Rotating Card to a Flat Position With Tweezers

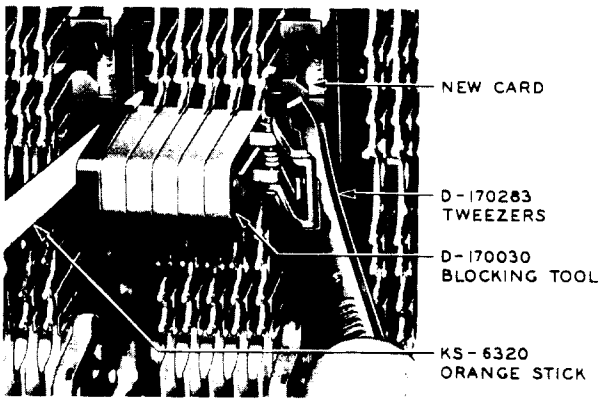

Fig. 10 – Final Positioning Operations of New Card

the card associated with the crosspoint directly above or below. During this turning operation, use the orange stick at the left side, as shown in Fig. 10, to guide the card both front and rear and right and left into the proper grooves.

Caution: If the card tends to bind, do not attempt to force it into position. Restore the card to its horizontal position and then shift it slightly to the right or left or front or rear as required, and then again attempt to rotate it into position. Excessive force used in positioning a card may cause it to break or may distort a spring.

(4) After the card has been positioned vertically, move the card lightly at each side, noting that it moves freely.

3.26 Remove the spring blocking tool from the springs. Remount the holding armatures as covered in 3.16, making sure that each armature is replaced in the same position from which it was removed. Remount the selecting bars as covered in 3.05 except do not lubricate the pivot screws. In remounting the selecting bars, take care that they are reassembled in the same horizontal positions from which they were removed.

3.27 ***Selecting Armature Bushing:*** Remove the selecting bar as covered in 3.05. Remove the bushing from the stud by crushing it with the P-long-nose pliers. Round off the crimped end of the stud with the P-long-nose pliers to permit pressing on the replacing bushing. Place a new bushing in position on the end of the stud as shown in Fig. 11. Place the P-10A200 sleeve (steel) over the bushing. Force the bushing on the stud and against the armature with the combination pliers, as shown in Fig. 12, being careful not to break the bushing. After the bushing is in place, flatten the tip of the stud with the P-long-nose pliers. Remount the selecting bar as covered in 3.05.

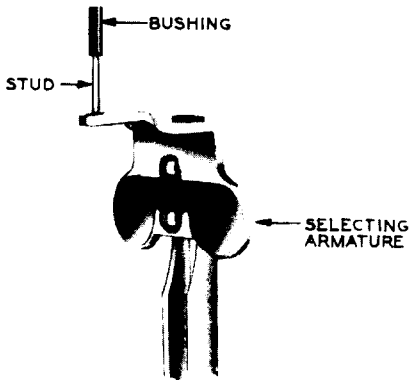

Fig. 11 – Bushing and Armature

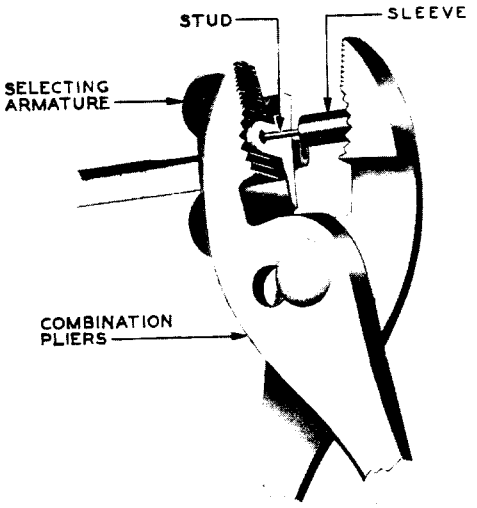

Fig. 12 – Method of Installing Bushing