10A RECORDER AND ASSOCIATED APPARATUS USED IN 2AA AND MODIFIED 2A TELEPHONE ANSWERING SETS 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 the 2AA and modified 2A telephone answering sets used in the 7A announcement system.

1.02 This section is reissued to change the title and to refer to the modified 2A instead of the 2A telephone answering set.

1.03 The 2AA and modified 2A telephone answering sets consist essentially of a recorder, an amplifier, and the control circuit apparatus mounted in a housing. The operating controls and indicating lamps are provided on the front panel. The recorder is primarily a motor-driven drum with a recording head and band for recording and reproducing the announcement. Amplification of the recording or reproduced signal is provided by the amplifier. The control circuit consisting of relays, switches, lamps, and other components necessary for the operation of the set is mounted on the base of the set. The modified 2A telephone answering set was formerly the 2A telephone answering set used on subscribers premises but changes were made in the strapping options on the internal terminal strip to permit its use in the 7A announcement system.

1.04 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 2AA and modified 2A telephone answering sets. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. However, parts such as relays may be replaced as units by ordering the unit by its code number. This information is called Piece-Part Data.

1.05 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.

General Information

1.06 ***Make Busy:*** Before performing any work on a set, remove the equipment from service in accordance with local instructions. Do not remove the equipment if running unless it runs continuously. When it is removed, substitute a new unit immediately.

1.07 ***A film of grease (or antiseize compound)*** for the purpose of this section is the amount of grease (or compound) deposited on the surface of a part after being brushed with a short, light stroke of the R-2966 brush which has been fully dipped into the material, rotated several times, and the end of the brush scraped against the edge of the container to remove the material extending from the end of the brush.

1.08 ***Rotation of the Drum:*** To rotate the drum, release the latch and turn the motor fan blades in the counterclockwise direction with the fingers. Take care not to bend the fan blades. The latch may be released by pressing the plunger into the L1 solenoid manually, or by electrically operating the L1 solenoid.

> ***Caution: Do not attempt to rotate the drum by turning the flywheel as this may result in damage to the fibre gear of the motor.***

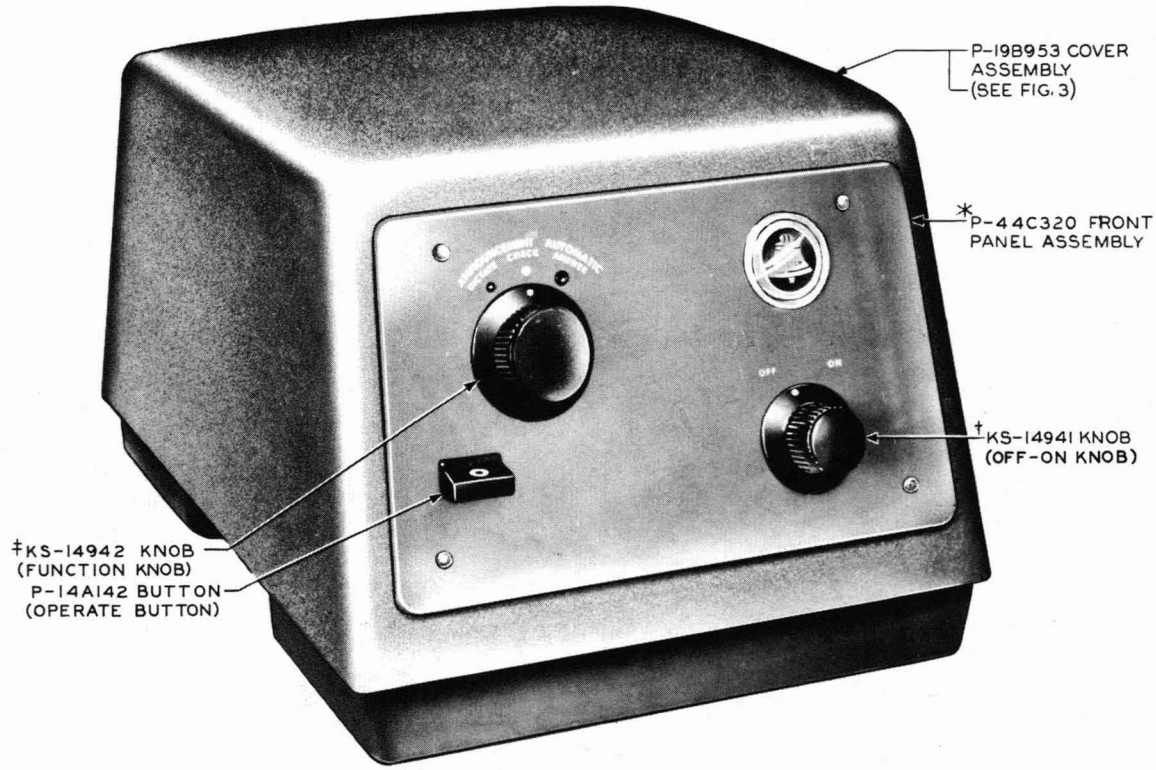
1.09 When necessary to electrically operate a solenoid during any of the replacement procedures specified herein, connect 48 volts dc across the terminals of the solenoid.

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 machine. The piece-part numbers of the various parts 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.

2.03 When ordering parts for replacement purposes, give both the piece-part number and the name of the piece part, for example, "P-210812 Screw." If a part identified by other than a piece-part number is required, order the part by the detail number and the part name, and specify the coded apparatus on which it is used, for example, "C7941-1032 Speednut for Modified 2A Telephone Answering Set" or "68NTM-62 Nut for 10A Recorder." Do not refer to the BSP number nor to any information shown in parentheses following the piece-part number.



*PART OF THE P-19B953 COVER ASSEMBLY
† KS-14941 KNOB SECURED BY TWO P-290875 SCREWS (PART OF KNOB-NOT SHOWN)
‡ KS-14942 KNOB SECURED BY TWO P-290878 SCREWS (PART OF KNOB-NOT SHOWN)

Fig. 1 — 2AA and Modified 2A Telephone Answering Set (front view)

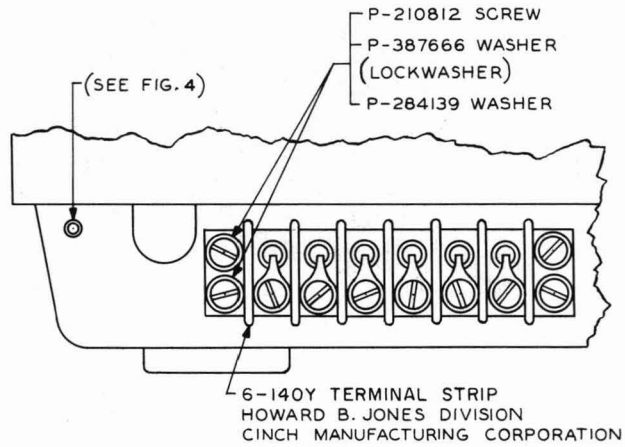


Fig. 2 — Rear Detail of 2AA Telephone Answering Set

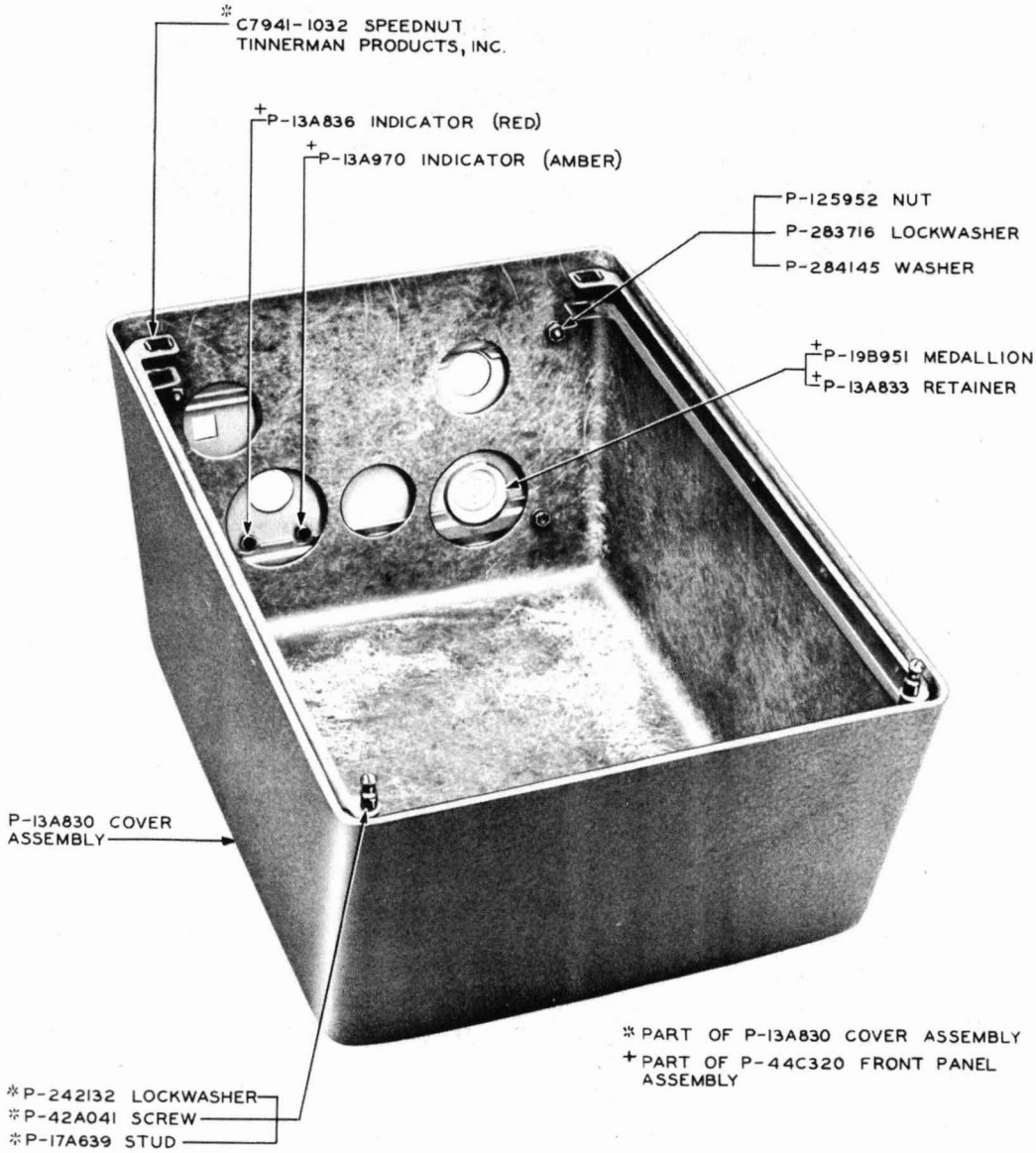


Fig. 3 — P-19B953 Cover Assembly

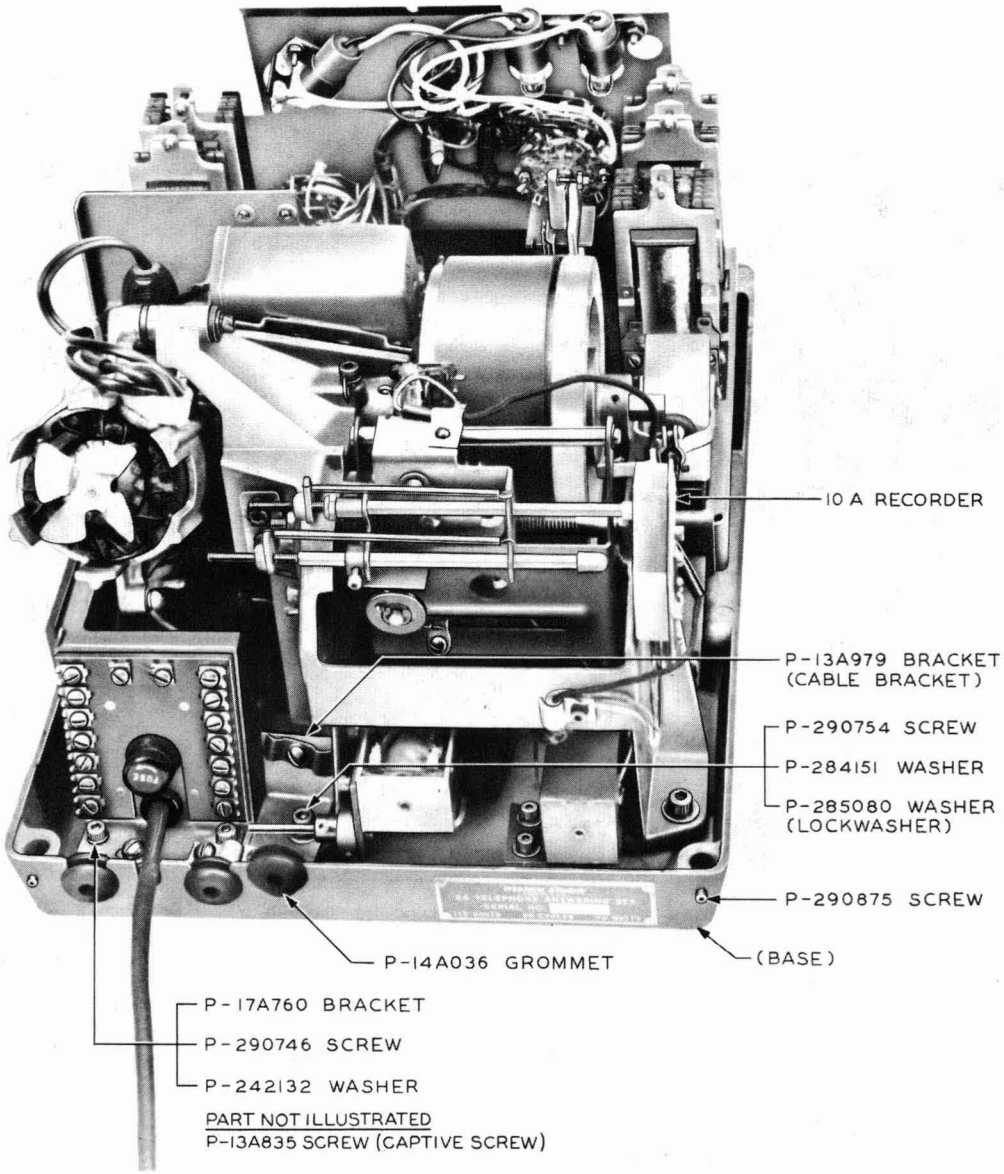


Fig. 4 — Modified 2A Telephone Answering Set (rear view with cover and amplifier removed)

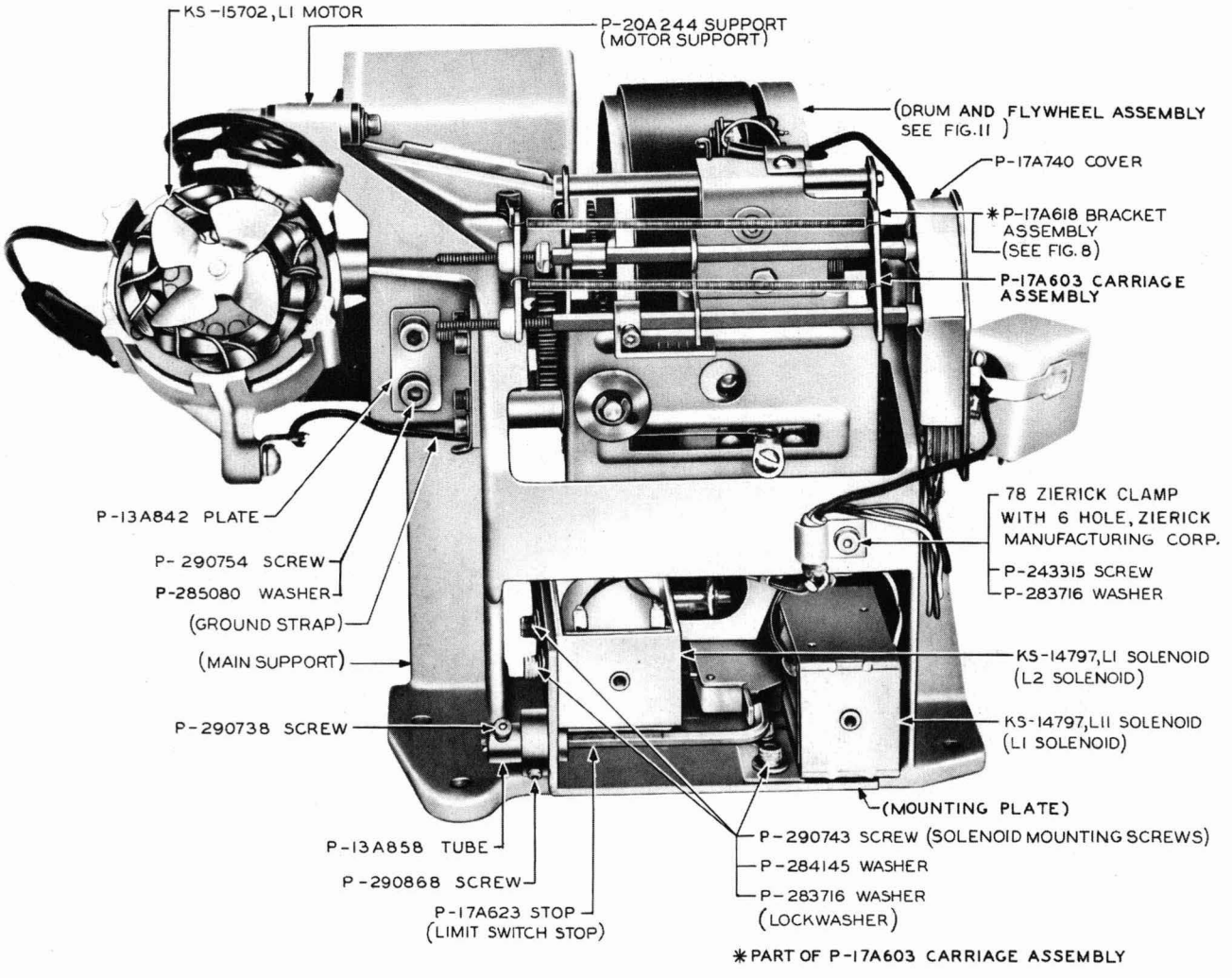


Fig. 5 — 10A Recorder (front view showing bail operated and carriage in maximum announcement position)

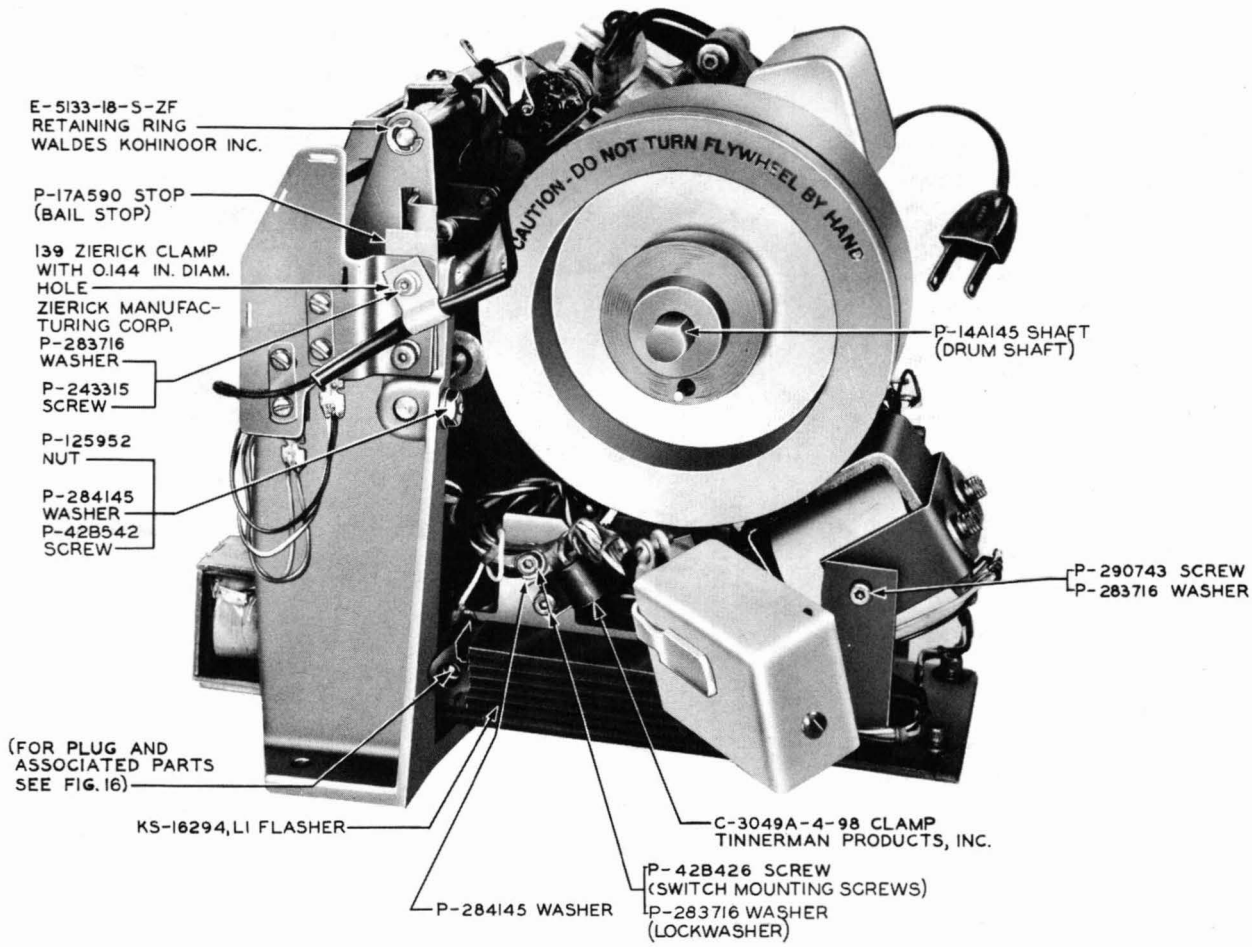
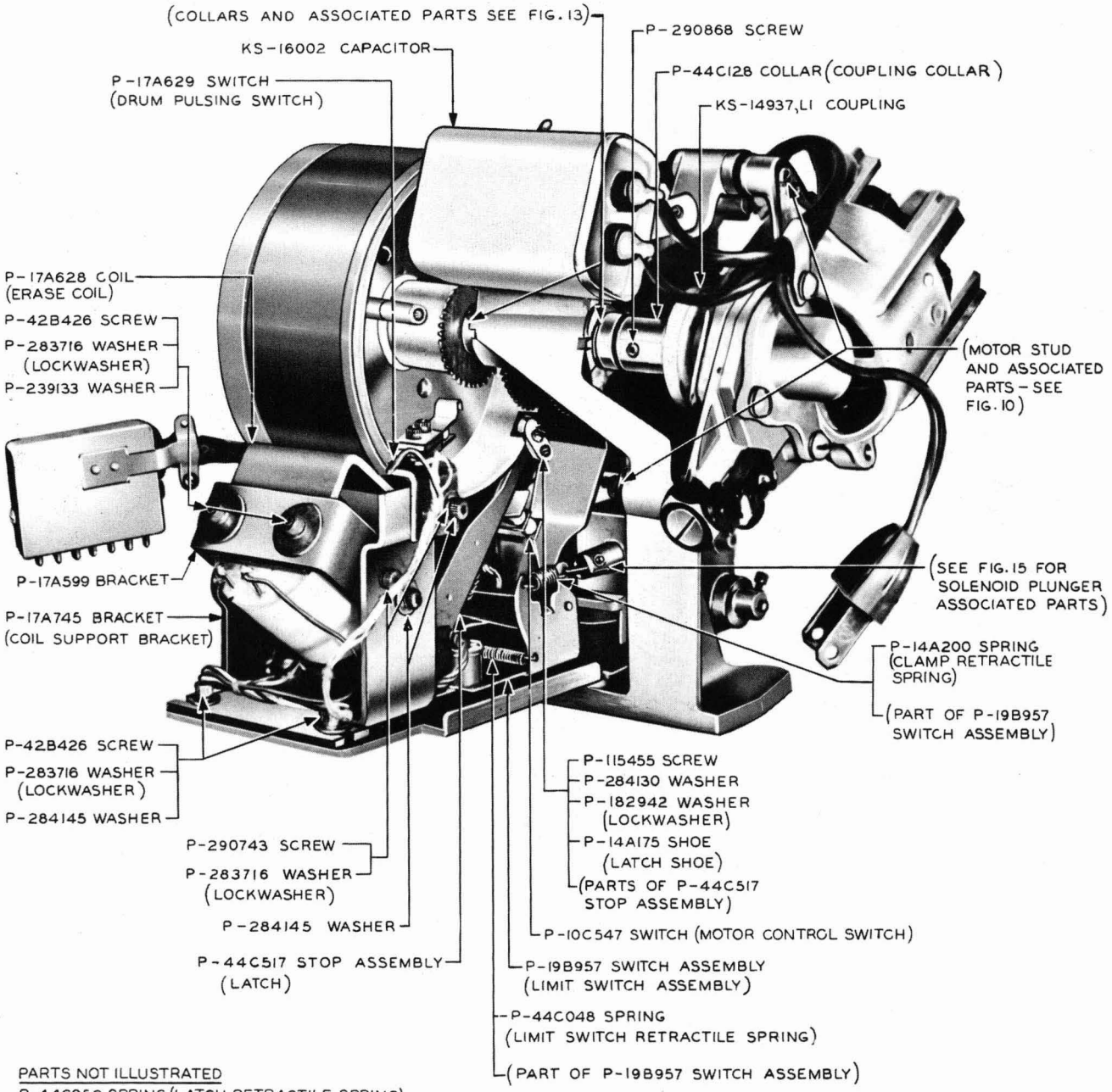


Fig. 6 — 10A Recorder (side view)



PARTS NOT ILLUSTRATED

P-44C052 SPRING (LATCH RETRACTILE SPRING)
5133-15-ZD RETAINING RING, WALDES KOHINOOR, INC. (MOUNTED ON THE STUD OF THE CONNECTING LINK)
MODEL M, IMDI-IA SWITCH, ACRO MANUFACTURING COMPANY (LIMIT SWITCH) (PART OF P-19B957 SWITCH ASSEMBLY)

Fig. 7 — 10A Recorder (rear view)

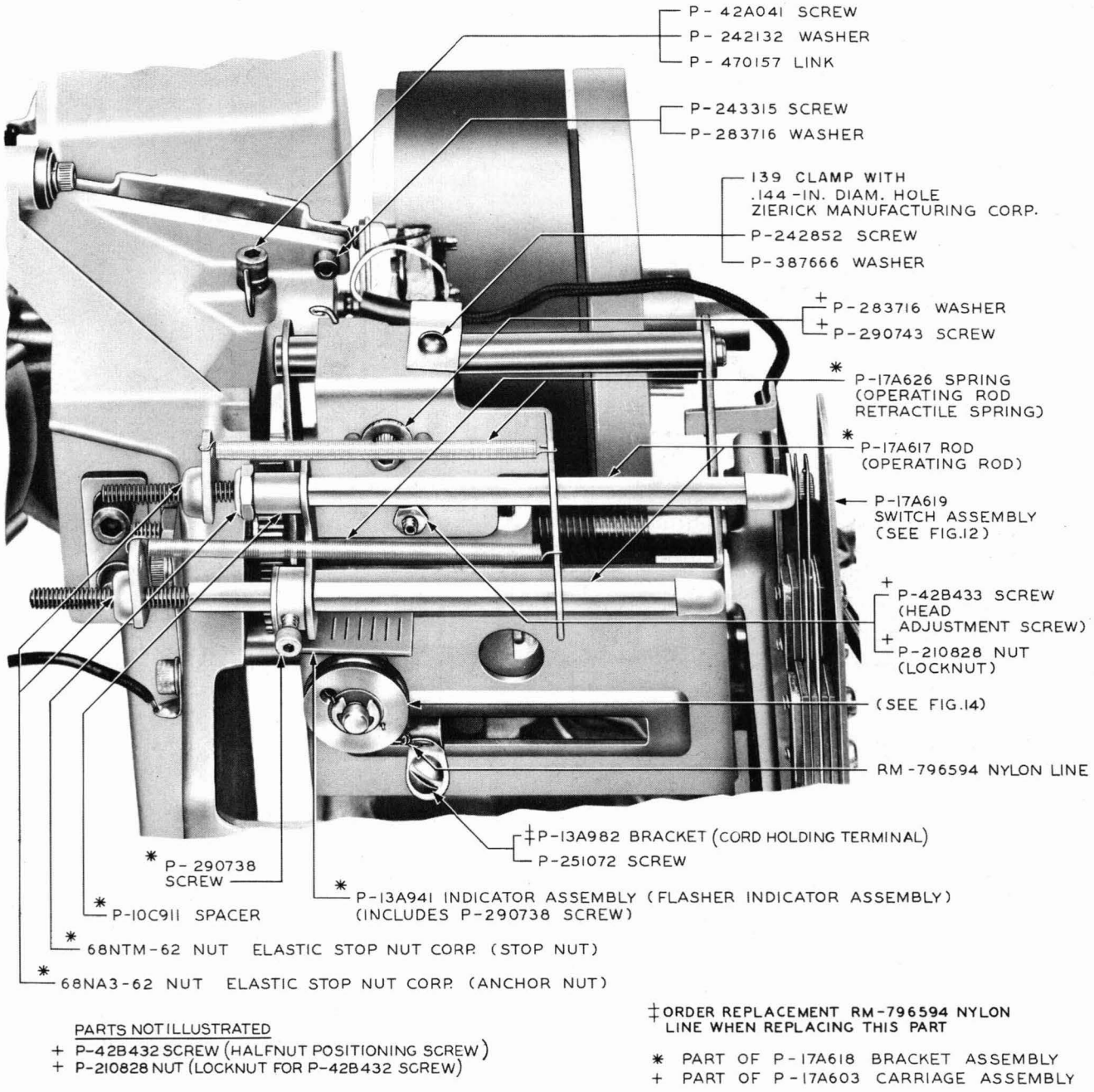


Fig. 8 — P-17A618 Bracket Assembly and Associated Parts

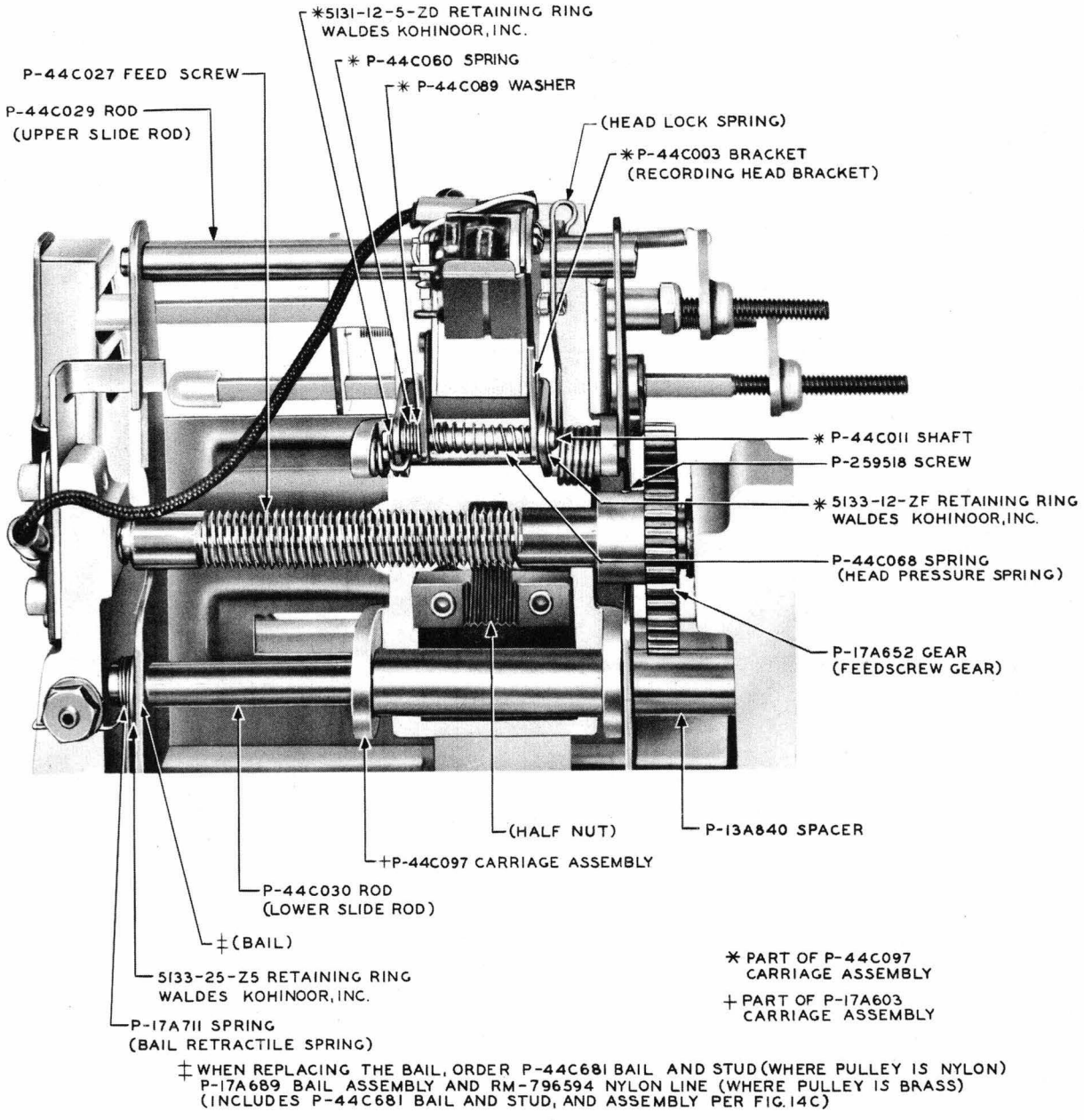
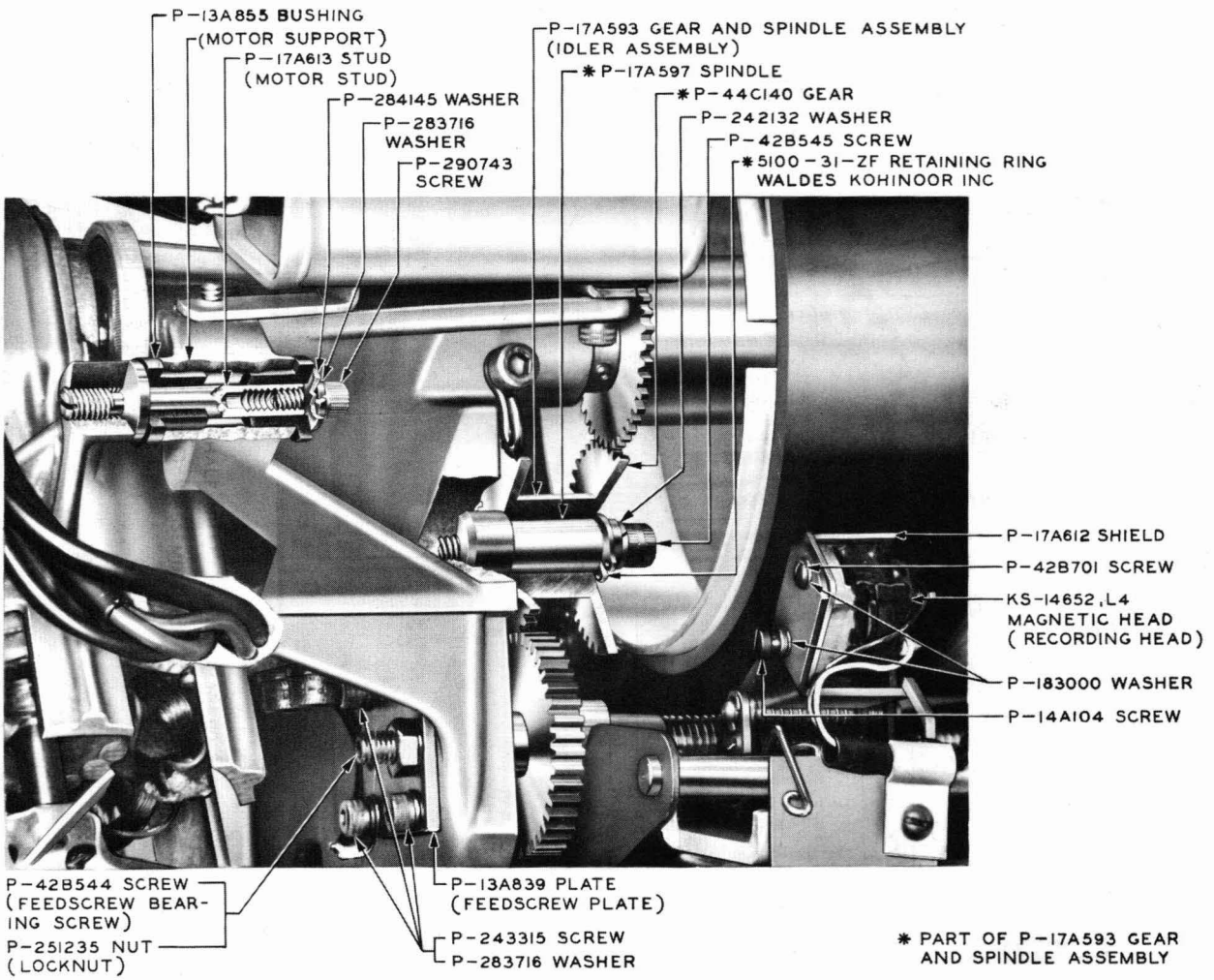
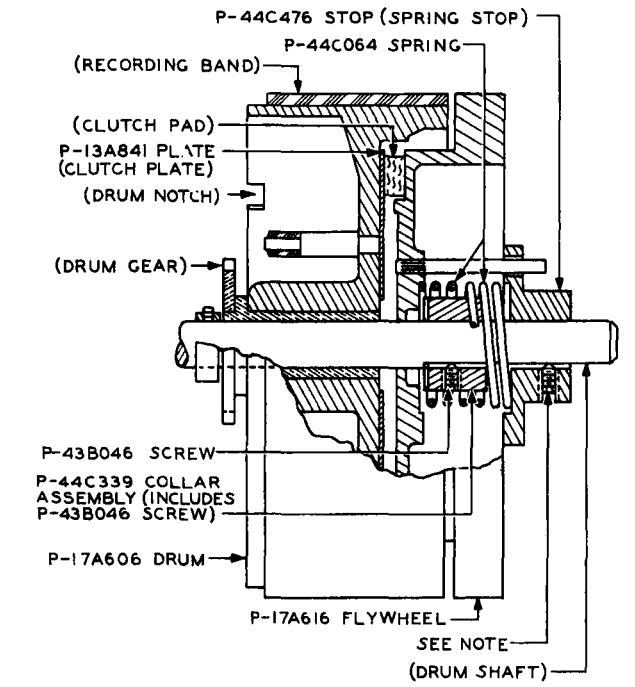


Fig. 9 — 10A Recorder (rear view with drum, motor, and motor support removed)



PARTS NOT ILLUSTRATED
RM–715651 BALL (FEEDSCREW THRUSTBALL)

Fig. 10 — Partial Top View of 10A Recorder



NOTE: IF THE R-2670 WRENCH FITS IN THE PRESENT SCREW, ORDER THE P-43B046 SCREW FOR REPLACEMENT. IF THE R-2959 WRENCH FITS, ORDER THE P-290869 SCREW.

Fig. 11 — Drum and Flywheel Assembly

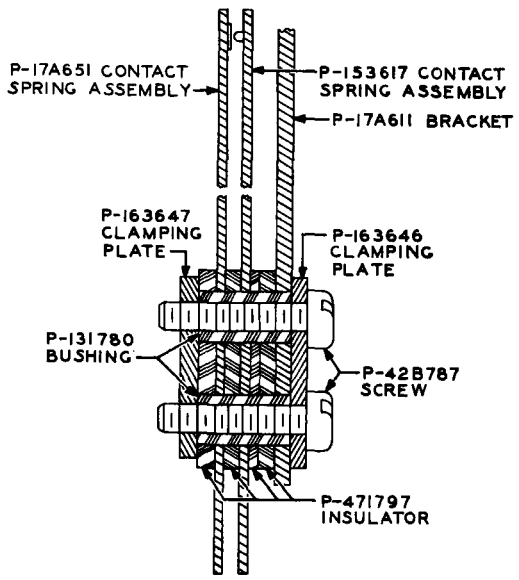


Fig. 12 — P-17A619 Switch Assembly

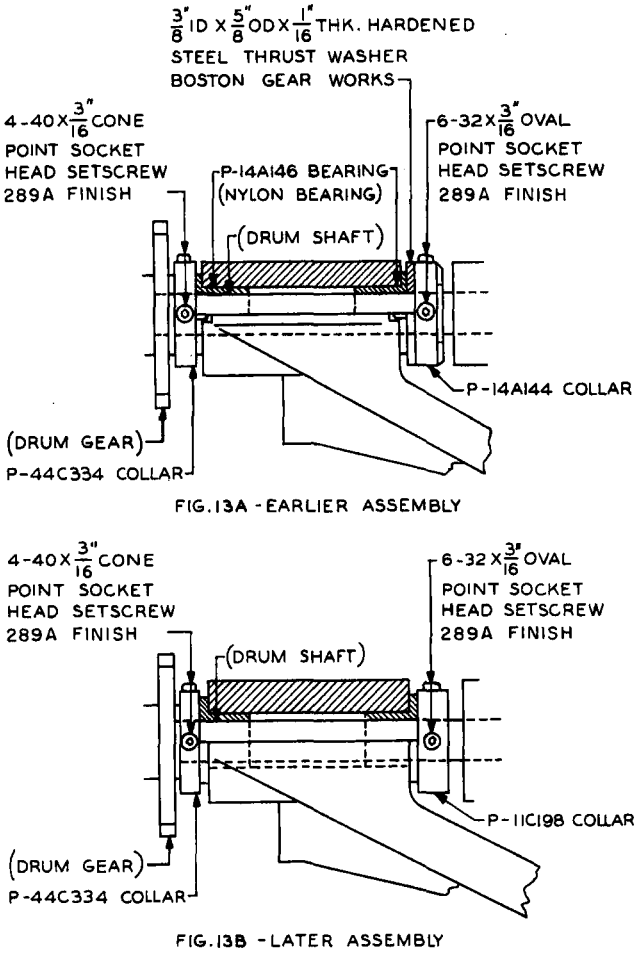
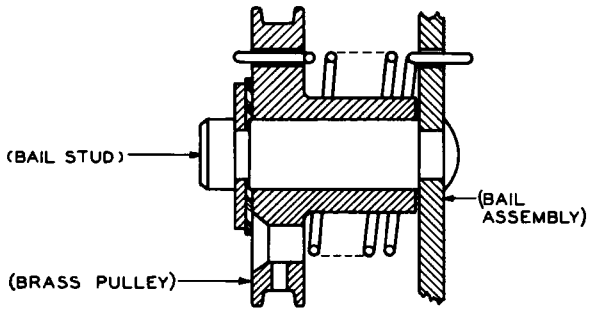


Fig. 13 — Collars and Associated Parts



NOTE: IF NECESSARY TO REPLACE THE PULLEY OR ASSOCIATED PARTS ORDER THE D-179647 CONVERSION KIT AND THE RM-796594 NYLON LINE.

FIG.14A - EARLIER STYLE ASSEMBLY

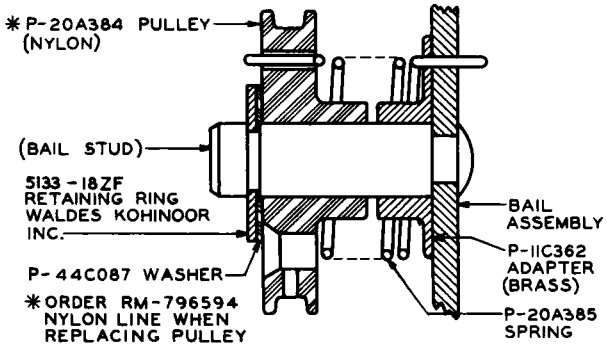


FIG.14B- INTERMEDIATE STYLE ASSEMBLY (USING THE D-179647 CONVERSION KIT)

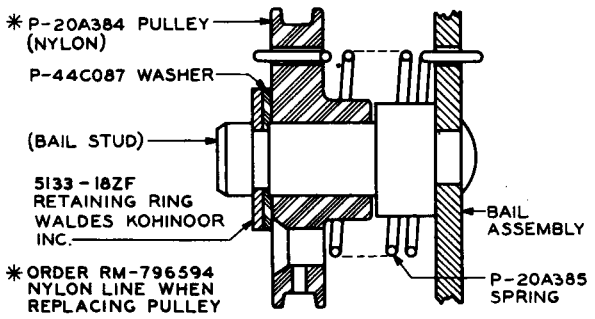


FIG.14C-LATER STYLE ASSEMBLY

Fig. 14 — Pulley and Associated Parts

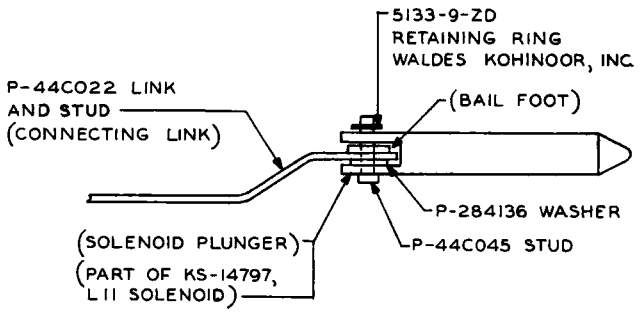


FIG.15A-L1 SOLENOID PLUNGER AND ASSOCIATED PARTS

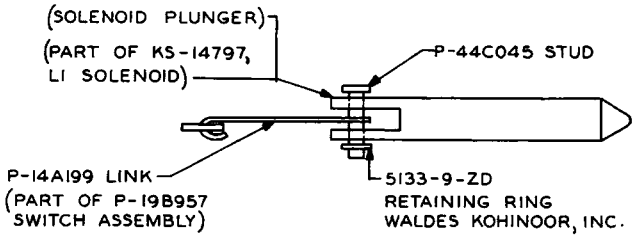


FIG.15B-L2 SOLENOID PLUNGER AND ASSOCIATED PARTS

Fig. 15 — Solenoid Plunger Associated Parts

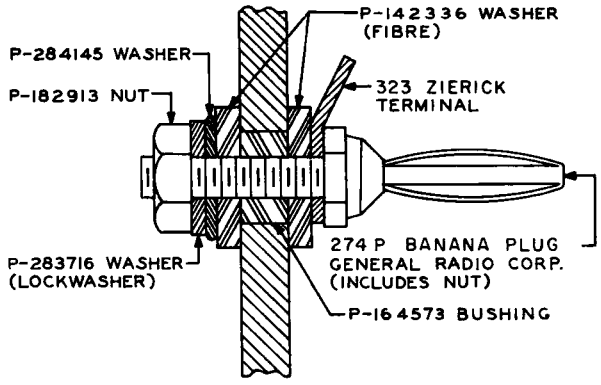


Fig. 16 — Flasher Plug and Associated Parts

3. REPLACEMENT PROCEDURES

3.01 *List of Tools, Gauges, and Materials*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
48	Combination 7/32- and 1/4-Inch Double-End Socket Wrench and Screwdriver (includes P-124547 wrench)
74	5/32- and 7/32-Inch Hex. Open Double-End Flat Wrench
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
485A	Smooth Jaw Pliers
541A	1/4-Inch 12-Point Double-End Box Wrench
565A	90° Offset Screwdriver
643B	5/64-Inch Wrench for Hex. Socket-Head Screws
KS-2631	4-1/2 Inch Screwdriver
KS-6854	3-1/2 Inch Screwdriver
KS-8511	4-1/2 Inch Bent Tweezers
R-1060	Putty Knife
R-2119	3/16-Inch Flat Brush
R-2485	5/32-Inch Allen Socket Screw Wrench
†R-2670	3/32-Inch Allen Socket Screw Wrench
†R-2671	1/8-Inch Allen Socket Screw Wrench
†R-2958	5/64-Inch Allen Socket Screw Wrench
†R-2959	1/16-Inch Allen Socket Screw Wrench
†R-2961	0.050-Inch Allen Socket Screw Wrench
R-2968	5/16-Inch Allen Straight Wrench
R-2975	Adjustable Snap-Ring Pliers
—	3/32-Inch Pin Punch, L. S. Starrett Co No. 565 (or equivalent)
—	4-Ounce Riveting Hammer
—	5-Inch Diagonal Pliers
—	6-Inch C Screwdriver
—	B Scissors
—	E-9 Truarc Applicator, Waldes Kohinoor Inc
—	E-12 Truarc Applicator, Waldes Kohinoor Inc
—	E-15 Truarc Applicator, Waldes Kohinoor Inc
—	E-18 Truarc Applicator, Waldes Kohinoor Inc
—	E-25 Truarc Applicator, Waldes Kohinoor Inc
—	Half Nut Adjusting Wrench [made locally — see 3.44(1)]

†***Note:*** Two new wrenches R-3415 and R-3416 may be required due to use of old and new style Allen screws. Use appropriate wrench in each case.

CODE OR SPEC NO.	DESCRIPTION
GAUGES	
KS-14510 L1	Volt-Ohm-Milliammeter
MATERIALS	
KS-2423	Cloth
KS-6320	Orange Stick
KS-7860	Petroleum Spirits
KS-8372	Trichloroethylene
KS-14614	Antiseize Compound
KS-14774 L1	Lubricating Grease
KS-16326 L1	Oil
—	EC-847 Adhesive, Minnesota Mining and Manufacturing Co, Inc
—	Acryloid B-72 Cement, Rohm and Hass Co

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

3.03 After making any replacement of parts of the 10A recorder, the parts or parts replaced shall meet the readjustment requirements involved as specified in Section 034-359-701. Other parts whose adjustment may have been directly disturbed by the replacement operations shall be checked to the readjustment requirement, and an over-all check shall be made of the machine before restoring it to service.

3.04 ***Removal and Replacement of Retaining Rings***

(1) The method used to remove a retaining ring is dependent upon the accessibility of the ring. Experience has shown the following methods of removal and replacement to be advantageous in the different locations encountered in the recorder.

(2) Where the retaining ring is small and the adjacent stud is long enough, the ring may be removed as follows. Lay the widest face of a screwdriver on the stud beside the ring and at a slight angle so that the corner of the blade is inserted into one of the openings between the ring and the stud. Keeping the corner of the screwdriver in this opening, twist the screwdriver so that the ring springs away from the stud. Exercise care to prevent the ring from flying or being lost. In some cases a cupped hand held over the ring may prevent its loss.

(3) Where the length of the adjacent stud is too short, or the accessibility limited, proceed as follows. Lay the screwdriver blade flat beside the ring so that its edge is against one, or both, points of the ring. Press the screwdriver toward the ring, causing the ring to spring off the stud. Take care not to slip over the ring and damage any adjacent parts. If the ring fails to spring completely away from the stud, press a corner of the screwdriver against one of the two points to remove the ring. It may be necessary to prevent the stud from rotating by grasping the opposite end with the 485A pliers or KS-8511 tweezers as required. In some cases the screwdriver may be applied to the ring end on.

(4) Any of the retaining rings may be replaced using the correct Truarc applicator as follows. Insert the ring in the recess of the applicator with the points outward. Mount the ring in the grooved portion of the stud by pushing it in place with the applicator. The ring will remain in place when the applicator is removed.

PANEL CONTROLS AND COVER ASSEMBLY

Panel Controls

3.05 ***Knob:*** To replace a knob, loosen the two setscrews in the knob enough to allow the knob to be slid off the shaft. Use the R-2958 wrench. Substitute the new knob on the shaft and tighten the setscrews. Operate the switch to ascertain the position of the white dot on the knob with respect to the functional designations on the panel. The function knob should be positioned on the shaft so that the white dot on the knob is opposite the white dot on the panel indicating the CHECK position when the switch is operated to its center position. To position the OFF-ON knob, proceed as follows. Operate the knob to the extreme counterclockwise position and note the distance between the white dot and the OFF designation. Similarly, note the distance between the dot and the ON designation when the knob is operated to the extreme clockwise position. Loosen the knob and reposition it as required so that these two distances are approximately equal. Check that there is a clearance of approximately 1/64 inch between each knob and the panel. Loosen the two setscrews in the knob and reposition the knob as required. Tighten the setscrews securely.

3.06 ***Button:*** To replace the button, loosen the screw under the button with the R-2958 wrench and remove the button. Slide the replacing button in place on the OPERATE lever allowing approximately 1/64-inch clearance between the button and the panel surface. The washer should fit under the lips of the button as shown in Fig. 17. Tighten the screw securely.

Cover Assembly

3.07 ***Cover Assembly:*** To replace the cover assembly, proceed as follows. Remove the two control knobs and the button from the set as covered in 3.05 and 3.06. Lift the front of the

set and, with the R-2485 wrench, back off the two screws located in the underside of the base until they are disengaged from the cover. Back off the two screws located at the rear of the base about three turns each using the R-2958 wrench. Remove the cover by lifting the rear and pivoting the cover on its front edge until the front panel is free of all controls. If the cover snags, check that the OPERATE lever screw is free of the panel opening. To assemble a new cover assembly to the set, proceed as follows. Place the set on a flat surface. Grasp the cover with two hands and with the front panel nearest the body. Tilt the cover so that the bottom edge of the rear is approximately 6 inches higher than the bottom edge of the front of the cover. Maintaining this position, engage the control shafts and lever at the front of the set with the associated holes in the cover assembly. The rear of the cover assembly may then be lowered into its proper position. Lift the front of the set and tighten the two screws in the underside of the base with the R-2485 wrench. Tighten the two setscrews at the rear of the base with the R-2958 wrench. Mount the knobs and button on the front of the set in accordance with 3.05 and 3.06.

3.08 ***Front Panel Assembly:*** Remove the cover assembly as covered in 3.07. Using the 418A wrench, remove the four nuts and the associated washers securing the front panel assembly to the cover. The panel may then be removed and the new one substituted in its place. Mount the new panel in place so that the Bell System medallion will appear right side up when the cover is placed over the set. Assemble the nuts and associated washers on the studs protruding inside the cover. The flatwasher should be on the bottom against the surface of the cover. Position the panel so that the bottom surface is parallel to the edge of the cover and is approximately centered on the face of the cover. Tighten the nuts securely taking care not to tighten to such extent that the panel surface becomes distorted. Remount the cover assembly as covered in 3.07.

3.09 ***Medallion:*** To replace the medallion, remove the cover assembly from the set as covered in 3.07. Remove the medallion by pushing it through the front panel from the inside and substitute the new one. Spread the retainer with the fingers and snap in place over the medallion. Turn the cover over and position the medallion so that the lettering on the medallion is right side up and parallel to the upper edge of the panel. Keeping it in this position will be facilitated if a drop of cement is applied to the retainer so that it adheres to the panel, the retainer, and the medallion. Reassemble the cover to the set as covered in 3.07.

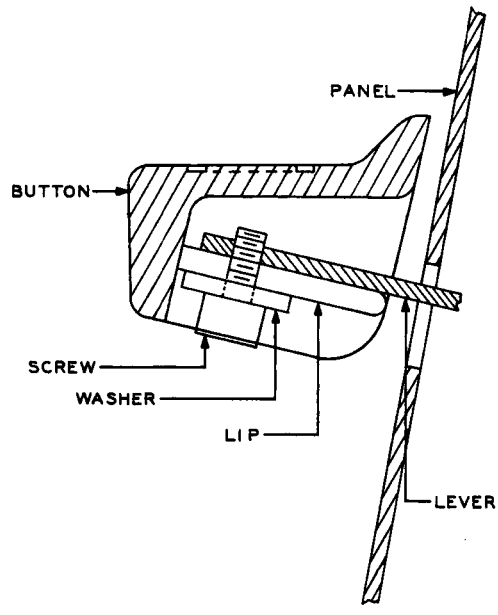


Fig. 17 — Assembly of Button and Lever

3.10 ***Indicators:*** To replace an indicator, proceed as follows. Remove the cover as covered in 3.07. Remove the dried cement from the panel area surrounding the indicator using the R-1060 knife to scrape off the hardened cement. Remove the indicator and clean the surrounding area thoroughly. Insert the new indicator into place and apply Acryloid B-72 cement to the side of the indicator and the adjacent surface of the panel with the R-2119 flat brush. After the cement has set, remount the cover as outlined in 3.07.

3.11 ***Speednut:*** To replace a speednut, proceed as follows. Using the 485A pliers, squeeze the two lips of the speednut together and push the speednut through the opening in the channel. Remove the speednut, substitute the new one, and proceed as follows. Insert the speednut between

the two walls of the channel with the lips of the speednut facing the hole in which it will be inserted. Hook one lip of the speednut into the hole and onto the side of the hole. Using the 485A pliers, squeeze the ends of the nut together to bring the two lips toward each other and insert in the hole. Snap the speednut into place by pressing it firmly against the channel using the pliers.

3.12 ***Stud:*** To replace the stud or associated parts, proceed as follows. Remove the screw and associated washer using the R-2671 wrench. Remove the stud. Substitute the new part and reassemble as follows. Assemble the screw and washer in place between the two walls of the channel with the screw protruding up through the hole. Insert the R-2671 wrench through the hole in the channel wall below the screw and engage the screw. Holding the screw and washer in this position, thread the stud onto the screw and tighten the assembly securely. The 6-inch screwdriver may be used to tighten the stud while the screw is held stationary.

10A RECORDER

3.13 ***10A Recorder:*** To remove the recorder, proceed as follows. Disconnect the multicontact plug from its associated J1 jack. Disconnect the power plug located above and behind the motor from its associated J4 jack. Remove the three recorder mounting screws, their associated washers, and the cable bracket using the R-2485 and R-2968 wrenches. Grasping the recorder on both sides of the main support, lift it out of the surrounding apparatus. Exercise care not to snag the recorder on the surrounding wiring and apparatus when removing. To replace the recorder, grasp it with both hands and tilt the rear of the recorder slightly downward. The rear of the recorder may then be entered into the space provided under the cabling near J1 jack. Exercise care in this operation not to snag the wiring or apparatus. When the rear portion of the recorder contacts the base, the recorder may then be lowered until its entire weight rests on the base. Align the holes in the recorder with the associated holes in the base. Place the washers on recorder mounting screws and insert the screws. The lockwasher should be in contact with the screwhead. Position the cable bracket over the forward hole on the motor side of the recorder. Tighten all three screws securely with the R-2485 and R-2968 wrenches. Insert the two plugs in their J1 and J4 associated jacks. Check that the two terminals of the erase coil do not contact or short across the adjacent chassis.

Motor Support and Associated Parts

Drum Assembly and Associated Parts

3.14 ***Spring Stop:*** To replace the spring stop, proceed as follows. Loosen the setscrew in the stop using the R-2670 or R-2959 wrench and remove the stop. Take care not to exert any twisting force on the shaft. Substitute the new stop and assemble as follows. Position the flywheel so that the pin is on the opposite side of the shaft from the flat of the shaft. While holding the flywheel in this position, slide the stop on the shaft so that the setscrew will rest against the flat surface of the shaft and the flywheel pin is in the hole in the stop. The position of the stop governs the drum clutch pressure. Adjust the position of the stop as covered in Section 034-359-701 and tighten the setscrew securely.

3.15 ***Spring:*** To replace the spring, remove the stop as covered in 3.14. Remove the spring and substitute a new one. Remount the stop and position it as covered in 3.14.

3.16 ***Collar Assembly:*** To replace the collar assembly, remove the stop and spring as covered in 3.14 and 3.15, respectively. Taking care not to exert any twisting force on the shaft, loosen the setscrew in the collar assembly with the R-2670 wrench and slide the assembly off the shaft. Substitute the new collar assembly on the shaft with the composition facing toward the flywheel and the setscrew against the flat surface of the shaft. Press the flywheel firmly against the drum and position the collar assembly so that there is a clearance of approximately 0.010 inch between the composition facing and the surface of the flywheel. Taking care not to twist the shaft, tighten the screw securely. Remount the parts that were removed as covered in 3.14 and 3.15.

3.17 ***Flywheel and Plate:*** To replace either part, proceed as follows. Remove the associated parts as covered in 3.14 through 3.16. Remove the flywheel by sliding it off the shaft, taking care not to disengage the drum gear from

its associated idler gear. The clutch plate may then be removed if it is to be replaced and a new one substituted. The plate may adhere to the clutch pad because of the grease present. Position the plate so that the metal tangs are inserted in the associated holes of the drum. Slide the flywheel into place on the shaft and reassemble the associated parts as covered in 3.14 through 3.16.

3.18 *Drum:* To replace the drum, proceed as follows. Remove the associated parts as covered in 3.14 through 3.17. Slide the drum from the shaft and mount the new drum in its place. Lubricate the new drum as follows. Apply a thin film of KS-14774 L1 lubricating grease to the metal surface of the drum on which the drum latch rides. Apply two drops of KS-16326 L1 oil to the inside surface of the drum bearing and a thin film on the tooth surfaces of the gear. Before engaging the drum and idler gears, align the carriage assembly as follows. Move the carriage assembly away from the zero position and move the bail assembly to the operated position. Rotate the feed screw until the carriage assembly is in the zero position by rotating the top of the feed screw gear towards the idler gear. Release the bail assembly from the operated position. Start from the position where the latch would normally engage the drum notch but with the drum gear disengaged from the idler gear. Rotate the drum approximately two to four teeth from the latched position by turning the top of the drum away from the bail assembly and then engage the drum and idler gears. It will be necessary to hold the latch away from the drum in order to engage the two gears. When the gears are engaged, the drum should then be turned until the latch drops into the notch. Reassemble the parts as covered in 3.14 through 3.17. Clean the recording band as covered in Section 034-359-701.

Motor and Associated Parts

3.19 ***Motor, Coupling, Coupling Collar, and Associated Parts***

(1) To replace these parts, proceed as follows. Unsolder the wires connected to the capacitor if the motor is being replaced. Remove the two screws securing the studs to the motor support using the R-2670 wrench. Remove the two setscrews securing the coupling collar to the shaft using the R-2959 wrench. Remove the screw and washer securing the ground terminal to the motor using the 565A screwdriver. Remove the motor by working it out of the motor support. Remove the coupling from the motor by turning it in a clockwise direction. Both ends of the coupling have left-hand threads. If the coupling collar or coupling is to be replaced, disassemble the parts. If the motor is to be replaced, remove the two studs using the KS-6854 screwdriver.

(2) Substitute the new part and proceed as follows. Assemble the coupling collar to the coupling. Mount the two screws in the coupling collar, but do not allow them to extend beyond the inside surface of the coupling collar. Mount the coupling collar on the motor. Apply a film of KS-14614 antiseize compound to the threads of the studs and mount the studs in the motor. Tighten the studs securely in place. Position the motor against the support so that the studs enter the rubber bushings. Push the motor into place taking care to obtain engagement between the coupling collar and the drum shaft. Mounting the motor will be facilitated by wetting the motor studs with water to reduce the friction between the studs and the rubber bushings. Mount the two screws and associated washers on the opposite end of the studs and tighten them securely. Position the coupling collar by sliding it toward the motor until solid contact is made. Then back off the collar approximately 1/64 inch and tighten the two setscrews securely. Solder the two leads to the capacitor terminals. Mount the ground terminal to the motor and tighten the screw and washer securely.

3.20 ***Motor Studs and Rubber Bushings:*** To replace any of these parts, proceed as follows. If the bushing to be replaced is secured by the screw and washer, remove the screw using the R-2670 wrench and work the bushing out by twisting and pulling. Substitute the new bushing and work it into place. Wetting the inside surface of the bushing will facilitate assembly by reducing the friction between parts. Reassemble the screw and washers in place with the flat washer against the bushing and tighten the screw securely. If any of the other parts are to be replaced, remove the motor as covered in 3.19,

without unsoldering the capacitor leads. Remove the bushing as required. Substitute the replacing part and reassemble as follows. Insert the bushing into the support so that it is properly seated. Remount the motor as covered in 3.19.

3.21 ***Drum Shaft, Collars, and Nylon Bearings***

(1) To replace the drum shaft or the associated collars, washer, or bearings proceed as follows. Remove the drum as covered in 3.18. Remove the two setscrews securing the coupling collar to the shaft using the R-2959 wrench. Remove two setscrews from each collar with the R-2959 wrench. Remove the shaft from the recorder taking care not to lose the collars or thrust washer if present. If the nylon bearings are to be replaced, remove the bearings.

(2) Substitute the new part and reassemble as follows. Insert the nylon bearing in the drum side of the support and position it so that the flange is flat against the metal surface. Apply a thin film of KS-16326 L1 oil to the surface of the shaft before assembling the shaft in place. Remove the collar from the replaced shaft and slide it in position over the narrow groove of the new shaft. The smoother face of this collar should face the nearer end of the shaft. Tighten the two setscrews in the collar securely. Insert the grooved end of the shaft into the support sliding it toward the motor. Place the thrust washer, if present, on the shaft and against the bearing. Mount the thrust collar on the shaft with the beveled edge toward the motor. Slide the shaft toward the motor to engage the coupling collar. Position the thrust collar on the shaft so that the shaft has perceptible endplay in its bearings and tighten the setscrews securely using the R-2959 wrench. Slide the coupling collar toward the motor until stopped, then back off the coupling collar approximately 1/64 inch, and tighten the setscrews securely with the R-2959 wrench. Remount the drum and associated parts as covered in 3.18.

Motor Support and Idler Assembly

3.22 ***Idler Assembly:*** To replace any of the parts of the idler assembly, proceed as follows. Remove the drum assembly and associated parts as covered in 3.18. Remove the idler assembly mounting screw and washer using the R-2671 wrench. Insert the points of the R-2975 pliers in the two holes of the retaining ring and spread the ring so that it can be slipped off the spindle. Substitute the replacing part and proceed as follows. Apply a thin film of KS-14774 L1 lubricating grease to the spindle surface between the retaining ring groove and the shoulder. Insert the spindle in the idler and remount the retaining ring by spreading the ring with the R-2975 pliers and sliding it over the end of the spindle. Position the larger end of the spindle in the hole and reassemble the mounting screw and washer in place. Tighten the screw securely using the R-2671 wrench. Apply a thin film of KS-16326 L1 oil to the tooth surfaces of the idler gears. Remount the drum assembly and associated parts as covered in 3.18.

3.23 ***Motor Support***

(1) To replace the motor support, proceed as follows. Remove the ground strap using the R-2670 wrench. If the motor support is secured to the main support by means of a rollpin, remove the rollpin as follows. Drive the rollpin through using the 3/32-inch pin punch and the 4-ounce riveting hammer. Remove the two screws and the plate securing the motor support using the R-2485 wrench. Remove the drum and flywheel assembly as covered in 3.18, the motor and associated parts as covered in 3.19 and 3.20, and the shaft and associated parts as covered in 3.21 Do not unsolder the motor connections from the capacitor. Remove the two screws securing the capacitor using the R-2670 wrench. Remove the idler assembly and associated parts as covered in 3.22.

(2) Substitute the new support and mount the capacitor and associated screws using the R-2670 wrench. Remount the motor and associated parts as covered in 3.19 and 3.20, and the shaft and associated parts as covered in 3.21. The new support contains metal bearings and the nylon bearings, if present, are not required in the assembly. Remount the idler assembly as covered in 3.22. Mount the motor support so that it rests squarely on the step in the main support. Position the motor support so that when the carriage is in the zero position and the L1 solenoid is

operated, the recording head pole pieces will contact the recording band at a point approximately 3/64 inch from the edge of the band. Temporarily mount the drum to make this adjustment. Apply a film of KS-14614 antiseize compound to the threads of the two motor support mounting screws. Mount the screws and the associated parts in place and tighten securely using the R-2485 wrench. Check that the feed-screw gear engages at least half the thickness of the associated idler gear. If necessary, reposition the feed-screw gear as covered in 3.26. Mount the drum as covered in 3.18. The rollpin is not required in reassembly.

Feed Screw, Lower Slide Rod, and Associated Parts

Feed Screw and Associated Parts

3.24 ***Feed-Screw, Bearing Screw, and Locknut:*** To replace any of these parts, proceed as follows. Using the R-2670 wrench, remove one of the plate mounting screws adjacent to the locknut. On later plates having only three mounting screws, removal of an adjacent mounting screw to make the locknut accessible may not be necessary. Remove the locknut using the 417A wrench and the bearing screw using the R-2670 wrench. Substitute the new part and reassemble. Insert and turn the bearing screw into the hole until it is against the feed-screw thrust ball. Assemble the locknut on the screw so that the locknut contacts the plate but do not tighten. Position the bearing screw so that the feed screw turns freely with no perceptible end-play. Tighten the locknut securely using the 417A wrench. Remount the plate mounting screw and associated washer, if removed, using the R-2670 wrench.

3.25 ***Feed-Screw Plate and Associated Mounting Screw***

(1) To replace the plate or the two screws or washers nearest the motor support, proceed as follows. On earlier-type plates having four mounting screws, make the rear screws accessible by temporarily removing the motor support mounting screws as follows. Use the R-2485 wrench and remove the upper of the two screws securing the motor support. Remove the plate mounting screw and associated washer adjacent to the feed screw bearing screw using the R-2670 wrench. Insert the motor support mounting screw and washer and tighten it securely. Repeat this procedure removing the lower screw to make the other plate mounting screw accessible. If the plate is the later type having only three mounting screws, the rear mounting screw may be readily removed. Remove the feed-screw bearing screw and locknut as covered in 3.24. Remove the plate and the two front mounting screws using the R-2670 wrench.

(2) Substitute the new part and reassemble as follows. Apply a film of KS-14614 antiseize compound to the threads of the plate mounting screws. Align the mounting screw holes in the plate with those in the main support. The threaded center hole should be uppermost. Mount the two front mounting screws, associated washers, and the ground strap terminal in the two front holes. Tighten the screws securely using the R-2670 wrench. Mount the lower rear plate mounting screw and tighten securely with the R-2670 wrench. If the earlier-type plate was present, insert the lower motor support mounting screw and tighten it securely using the R-2485 wrench. Mount one of the plate mounting screws and associated washer in the upper hole nearest the corner and tighten it securely. Remount the upper motor support mounting screw and washer using the R-2485 wrench and tighten it securely. If a later-type plate is being replaced, insert the rear plate mounting screw in the hole and tighten securely using the R-2670 wrench. Remount the feed-screw bearing screw, locknut, and adjacent plate mounting screw as covered in 3.24.

3.26 ***Feed Screw, Associated Gear, and Steel Balls***

(1) To replace the feed screw, a steel ball, or the feed-screw gear, proceed as follows. Remove the motor support from the main support as covered in 3.23. Remove feed-screw plate as covered in 3.25. Remove the setscrews from the feed-screw gear hub using the R-2959 wrench. Manually rotate the drum to make both screws accessible. Slide the feed screw out of the bearing and remove the gear. Take care not to lose the steel balls.

(2) Substitute the new part and reassemble as follows. Clean the steel balls and the feed screw with a KS-2433 cloth, moistened with KS-7860 petroleum spirits. Apply a thin film of KS-16326 L1 oil to the feed screw threads and gear teeth. Cover the steel balls and fill the countersunk ends of the feed screw with KS-14774 L1 lubricating grease. Insert the balls in the countersunk holes of the feed screw. Slide the smaller end of the feed screw into the bearing. Position the gear between the main support and the bail assembly with the hub toward the bail assembly and slide the feed screw through the gear to the opposite bearing. Remount the feed-screw plate as covered in 3.25 and the motor support as covered in 3.23. Position the gear on the feed screw with the setscrew against the flat portion of the feed screw so that at least half the thickness of the mating gear is engaged. Tighten the setscrew securely using the R-2959 wrench. Align the carriage assembly as covered in 3.18.

Lower Slide Rod and Associated Parts

3.27 ***Retaining Ring:*** To replace the retaining ring, proceed as follows. Use the screwdriver to lift one point of the ring as outlined in 3.04 (3). It is not necessary to push against both points of the ring to remove the ring. Substitute the new ring and proceed as follows. Insert the new ring through the front of the recorder and into the groove of the lower slide rod using the E-25 Truarc applicator. The ring should be positioned on the lower slide rod so that the two points face downward and the end of the bail foot is between the points. If the groove is partially obscured by the bail, press the bail toward the left. Check that the ring is securely seated by pressing the top downward.

3.28 ***Lower Slide Rod:*** To replace the lower slide rod, proceed as follows. Remove the retaining ring as covered in 3.27. Using the KS-6320 orange stick, disengage the bail retractile spring from the bail foot by pushing on the spring from the rear. Loosen the locknut and setscrew securing the lower slide rod using the 418A and R-2959 wrenches. Slide the rod out of the drum side of the main support by pushing against the opposite end of the rod with the orange stick. If the rod becomes stuck, check that the coils of the bail retractile spring are not snagged on the groove of the rod. Insert the new rod in place with the grooved end entering the bearing last. Work the rod from the drum side to the motor side of the main support, inserting it through the bail retractile spring coils, the bail assembly, the carriage bearing, and the spacer. Mount the retaining ring and adjust the bail endplay as covered in 3.27. Using the orange stick, hook the bail retractile spring behind the bail foot. Lubricate the carriage bearing by applying two drops of KS-16326 L1 oil to each side of the bearing. Check that the bail assembly meets the requirements of Section 034-359-701.

3.29 ***Bail Retractile Spring:*** To replace the spring, proceed as follows. Remove the lower slide rod as covered in 3.28. Loosen the locknut on the setscrew enough to remove the spring. Substitute the new spring and clamp the shorter end of the spring under the locknut. Remount the lower slide rod as covered in 3.28. Check that the bail assembly meets the requirements of Section 034-359-701.

3.30 ***Spacer:*** To replace the spacer, proceed as follows. Remove the feed screw plate as covered in 3.25. Push the bail assembly toward the spacer. Back the bail assembly off, insert a KS-6320 orange stick between the bail assembly and the spacer, and push the spacer out toward the left. Remove the spacer and substitute the new one. Insert the spacer into the left side of the support and press in place until it is flush with the surface of the main support. Remount the feed screw plate as covered in 3.25. Check that the endplay of the bail assembly meets the requirements of Section 034-359-701.

Switch Assembly, Bail Stop, and Associated Parts

3.31 ***Cover:*** To replace the cover, remove the cover by straightening the tabs with the 485A pliers, taking care not to break the tabs. Slide the operating rods away from the switch assembly to remove the cover and substitute the new one. Insert the cover tabs in the bracket slots and twist each tab with the pliers to secure the cover in place, taking care not to break the tabs.

3.32 ***Switch Parts:*** To replace any part of an individual switch, proceed as follows. Remove the cover as outlined in 3.31. If the part to

be replaced is a contact spring, unsolder the connecting wire. Remove the two mounting screws and the clamping plates using the KS-2631 screwdriver. If the part to be replaced is a contact spring, insulator, or bushing, disassemble the switch, remove the defective part, and substitute the new one. Assemble the switch parts with the holes aligned and insert the two bushings. Place the switch and clamping plate in position against the bracket. Align the screw holes and insert the mounting screws in place. Position the switch and contact springs so that the contacts are aligned and so that the point of contact between the operating rod and operating spring is midway between the center of the spring and the edge nearer the drum when the L1 solenoid is operated. Tighten the mounting screws securely. Remount the cover as outlined in 3.31.

3.33 ***Switch Assembly, Bail Stop, and Switch Bracket:*** To replace the switch assembly, bail stop, or switch bracket, proceed as follows. Remove the cover as outlined in 3.31 if the switch assembly or bracket is to be replaced. Remove the switch assembly and the associated parts by removing the mounting screws with the R-2670 wrench. Substitute the new part and assemble as follows. If the switch assembly is to be replaced, unsolder the leads and transfer them to the new assembly. If the bracket is to be replaced, remove the individual switches and mount them on the new bracket, proceeding as outlined in 3.32. Mount the switch assembly as follows. Align the screw holes in the bracket, the bail stop, and the main support and assemble the lower mounting screw and washer. Place the clamp over the cable and secure in place with the upper mounting screw and washer. Loosen the two mounting screws to permit movement of the switch assembly and stop. Press the bail assembly toward the drum to engage the half nut with the feed screw. Electrically operate the L1 solenoid to maintain engagement between the half nut and feed screw and position the switch assembly and stop as follows. Position the stop so that a clearance of approximately 0.015 inch exists between the stop surface furthest from the drum and the adjacent surface of the bail. Position the switch assembly so that the point of contact between the operating rod and the operating spring of each switch is below the contact and midway between the center of the spring and the edge toward the drum. If both switches cannot be lined up, position the individual switches as covered in 3.32. Tighten the mounting screws securely with the R-2670 wrench and remount the cover as outlined in 3.31.

Bail and Carriage Assembly Parts

Recording Head and Associated Parts

3.34 ***Recording Head and Shield:*** To replace either part, proceed as follows. If the recording head is to be replaced, unsolder and unwrap the connections to the recording head. Taking care not to drop the parts, remove the screw and the stud securing the head, using the KS-6854 screwdriver. Substitute the new part and reassemble as follows. Position the head and the shield so that the KS-designation on the head is uppermost and the shield covers the underside of the head. Mount the stud in the lower hole and tighten in place with the screwdriver. Mount the screw in the upper hole. Solder the two wires to the terminals of the recording head furthest from the recording band. Wrap one turn of the wire on each terminal after soldering. Take care to keep the heat applied to these terminals during soldering to a minimum. Take care not to place soldering copper in contact with the insulation of the wire. Adjust the position of the head as covered in 3.35.

3.35 ***Positioning the Recording Head***

(1) With the recording head securely mounted, operate the L1 solenoid to place the head pole pieces in contact with the recording band. Loosen the locknut securing the head adjustment screw using the 541A wrench. Using the R-2961 wrench, adjust the position of the head adjustment screw so that the magnetic gap between the pole pieces appears to rest directly on the recording band as shown in Fig. 18. Tighten the locknut and release the L1 solenoid.

(2) Mount the recorder in the set as covered in 3.13. Connect the TS1 terminal strip (TS1A terminal strip on 2AA sets) as shown in Fig. 19. Connect ac power to the set and turn the set on. Operate the function switch to the ANNOUNCEMENT DICTATE posi-

tion. Then depress the OPERATE button and, as soon as the DICTATE lamp lights, adjust the intensity of the 3000-cycle signal to yield a reading of 0.1 volt ac on the KS-14510 L1 meter. When the intensity has been properly adjusted, release the OPERATE button allowing the carriage to return to the zero position. Record the 3000-cycle signal by depressing the OPERATE button and holding it down until contact between the limit switch and the carriage foot terminates the announcement interval.

(3) Operate the function switch to the ANNOUNCEMENT CHECK position and depress the OPERATE button. Observe the meter reading and adjust the position of the head adjustment screw to produce the maximum reading.

Note: A 3000-cycle test signal is preferable. However, if a 3000-cycle signal is not available, a 1000-cycle signal may be used. If the 1000-cycle signal is used, the maximum reading may extend over a wide range of screw adjustment. Adjust the screw for the midposition of this range.

In case of a high level of background noise, use of the recording telephone set will aid in roughly locating the point of highest 3000-cycle output. If the output measured across R1 and T1 terminals is not of sufficient intensity, shift the meter connections and measure the 3000-cycle output across R and T terminals. When the proper setting has been obtained, lock the adjustment with the locknut taking care to prevent the head adjustment screw from turning. Disconnect all wiring and test apparatus provided in accordance with Fig. 19 which were not present prior to adjustment of the recording head position.

3.36 *Recording Head Bracket and Associated Parts*

(1) To replace any of these parts, proceed as follows. If the recording head bracket, head pressure spring, or shaft is to be replaced, remove the recording head and shield as covered in 3.34 without unsoldering leads. Disassemble the parts as follows until the part to be replaced is reached, then substitute the new part and reassemble. To make the parts accessible, remove the drum and associated parts as covered in 3.17.

(2) Remove the retaining ring furthest from the motor as covered in 3.04. Using the KS-6320 orange stick, push the end of the shaft through toward the opposite side removing the parts as encountered. The springs and washer may be removed using the KS-8511 tweezers. Moving the carriage assembly toward the switch assembly will permit complete withdrawal of the shaft. To facilitate removal and replacement of the parts, insert a KS-6320 orange stick between the bail assembly and the bail stop to block the bail assembly in the operated position and prevent the carriage from returning. Remove the retaining ring

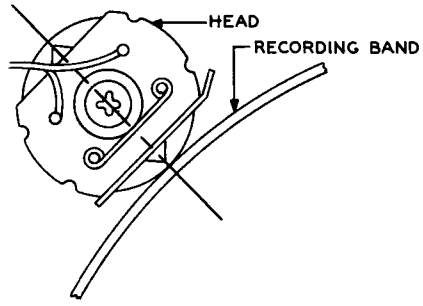


FIG.18A - CORRECT ALIGNMENT

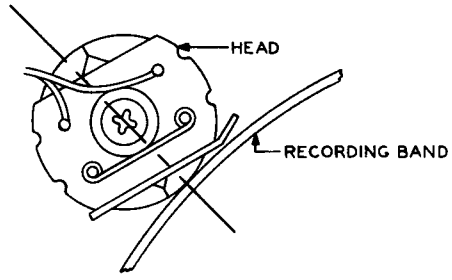


FIG.18 B - INCORRECT ALIGNMENT (HEAD ADJUSTMENT SCREW NOT TURNED IN FAR ENOUGH)

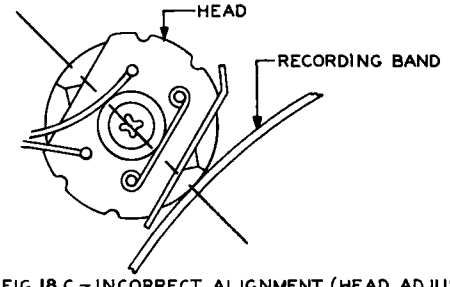


FIG. 18 C - INCORRECT ALIGNMENT (HEAD ADJUSTMENT SCREW TURNED IN TOO FAR)

Fig. 18 — Position of Magnetic Gap of Recording Head on Recording Band

from the stud by pushing against the points with the screwdriver as covered previously.

(3) Reassemble the parts as follows. Mount one of the retaining rings in either groove of the shaft using the E-9 Truarc applicator. Place the recording head bracket in position. Insert the shaft in the hole of the lower bracket from the motor side and through one leg of the recording head bracket. Before passing the shaft through the other leg of the recording head bracket, slide the head pressure spring on the shaft and insert the end in the smaller hole on the motor side of the bracket using the KS-8511 tweezers. Tension the spring by hooking the spring behind the recording head bracket or, on a later-style bracket, by hooking the end of the spring into one of the three holes in the side of the bracket. With the recording head bracket pressed toward the feed screw gear, push the shaft through the other leg of the recording head bracket until it protrudes

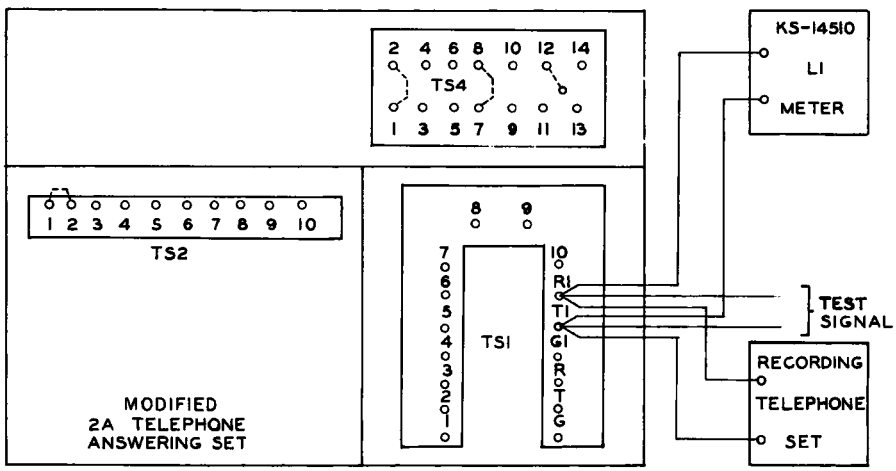


FIG. 19A - CONNECTION OF MODIFIED 2A TELEPHONE ANSWERING SET FOR ADJUSTMENT OF RECORDING HEAD TANGENCY

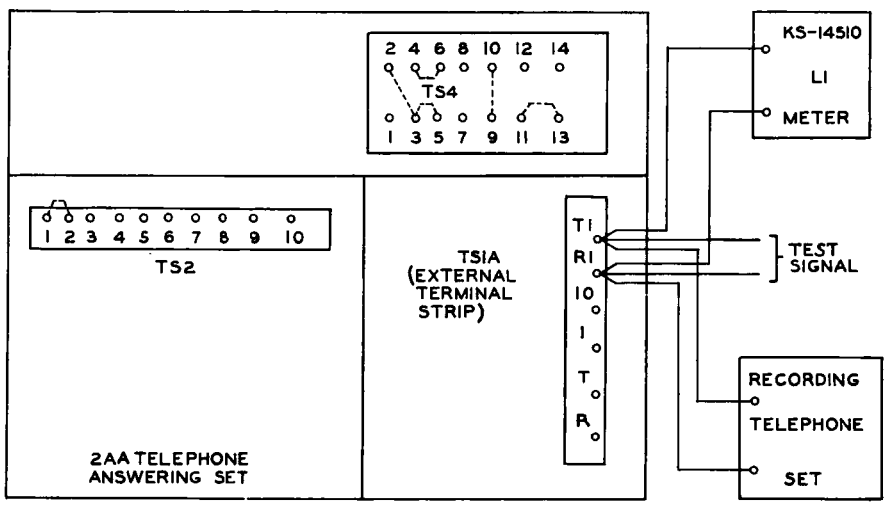


FIG. 19B - CONNECTION OF 2AA TELEPHONE ANSWERING SET FOR ADJUSTMENT OF RECORDING HEAD.

NOTE: BROKEN LINES INDICATE CONNECTIONS NORMALLY PROVIDED FOR "ANSWER ONLY" SERVICE. IF NOT ALREADY CONNECTED, MAKE THE CONNECTIONS FOR THE ADJUSTMENT OF THE RECORDING HEAD.

Fig. 19 — Circuit for Adjustment of the Recording Head

enough to allow the washer to be mounted. Mount the washer on the shaft and position the compression spring so that the shaft will enter the coils. Press the other end of the shaft through until the retaining ring is against the surface of the bracket. Mount the retaining ring using the E-9 Truarc applicator. If this ring is an arched retaining ring, position the ring above the grooved portion of the shaft with the hollow side against the bracket. Using the E-9 applicator, press the ring downward until its snaps in place in the groove. Remove the orange stick. Remount the drum and associated parts as covered in 3.18 and the recording head and shield as covered in 3.34.

(4) Check that the recording head pressure meets the requirements of Section 034-359-701. Adjust the recording head position as covered in 3.35.

Pulley and Associated Parts

3.37 ***Retaining Ring and Washers:*** Remove the retaining ring as covered in 3.04. Remove the washers. Substitute the new part and reassemble as follows. Mount the washers on the stud against the pulley. Mount the retaining ring using the E-18 Truarc applicator. Holding the ring above the stud, press it against the washer and downward until it snaps in place. If the ring cannot be positioned in the groove, check that the spring coils are not wedged between the pulley and the bail assembly.

3.38 ***Nylon Line:*** To replace the line, proceed as follows. Remove the line using the scissors and the KS-8511 tweezers. Insert one end of the new line into the hole in the pulley rim and draw it out of the pulley face using the KS-8511 tweezers. Tie several knots in the line close to the end, one on top of the other to form a large knot. Tug on the opposite end of the line to make sure that the line is anchored securely in the pulley. If not satisfactory, tie a larger knot. Thread the free end of the line through the hole in the cord-holding terminal. Tie it to the terminal so that the length of the line between the terminal and the pulley is approximately 3-5/16 inches. Tie the line to the terminal with two half hitches. Turn the pulley two or three revolutions in a counterclockwise direction and wrap the line around the pulley in a counterclockwise direction. Check that the pulley operates properly by drawing the carriage assembly to the right. Release the carriage and note that it travels rapidly to the left. The operation of the pulley should also be checked, moving the carriage to a point near the zero position and releasing it. Secure the knots at both ends by applying one drop of EC-847 adhesive to each knot. Cut off the excess line taking care not to cut too close to the knot. Allow approximately 3/32 inch at each end.

3.39 ***Pulley (brass) and Associated Parts:*** If any part associated with the pulley requires replacement, use the D-179647 conversion kit removing the parts and substituting the kit as follows. Remove the retaining ring and washers as covered in 3.37. Remove the tension from the pulley by unwrapping several turns of the nylon line from the pulley. Using the KS-8511 tweezers, draw the knotted end of the line out of the face of the pulley and untie the knot. If the knot is cemented, replace the nylon line. Remove the pulley and spring from the bail stud. Substitute the kit parts and assemble as follows. Slide the adapter on the bail stud with the straight portion of the flange facing down. Align the hole in the adapter with the one in the bail. Slide the spring on the stud and the adapter hub so that the tip of the spring enters the lined-up holes. Assemble the pulley on the stud so that the hub enters the spring coils. Using the KS-8511 tweezers, insert the tip of the spring in the smaller of the two holes in the rear pulley face. Pressing the pulley toward the bail to expose the groove of the stud, mount the washer and retaining ring as covered in 3.37. The excess length of spring protruding from the pulley face should be bent over against the pulley in a clockwise direction. Assemble the nylon line to the pulley and tension it as covered in 3.38.

3.40 ***Pulley (nylon):*** Recorders equipped with nylon pulleys may be either those that have been converted in the field or the later type where the bail stud has a large shoulder. To replace a pulley, remove the retaining ring and washer as covered in 3.37. If the spring end is bent over, straighten it using the 485A pliers. Remove the tension on the pulley by unwrapping several turns of the nylon line from the pulley. Remove the pulley from the bail stud and, using the KS-8511 tweezers, draw the knotted end of

the line out of the pulley face. If not cemented, untie the knot and remove the line from the pulley. If the knots are cemented, replace the line. Slide the pulley on the bail stud inserting the hub into the spring coils. Mount the washer and retaining ring as covered in 3.37. Insert the end of the spring in the smaller hole in the rear face of the pulley. The excess length of spring protruding from the pulley face should be bent over against the pulley in a clockwise direction. Assemble the nylon line to the new pulley and tension it as covered in 3.38.

3.41 ***Spring and Adapter:*** To replace the spring or adapter, if present, proceed as follows. Remove the pulley, as covered in 3.40, without removing the nylon line from the pulley. Slide the spring and the adapter, if present, from the bail stud. Substitute the new part and assemble as follows. Slide the adapter on the bail stud with the straight portion of the flange facing down and the holes in the adapter and the bail aligned. Slide the spring on the bail stud and the adapter hub, if present, so that the tip of the spring enters the lined-up holes. Remount the pulley as covered in 3.40.

Bracket Assembly Associated Parts

3.42 ***Head Adjustment Screw and Locknut:*** To replace the screw or locknut, proceed as follows. Note the position of the screw and remove the locknut using the 541A wrench. Remove the screw using the R-2961 wrench. Substitute the replacing part and reassemble as follows. Lock the recording head against the lifting tab by engaging the grooved stud on the side of the recording head with the head lock spring. Insert the screw and turn it in until the approximate position held by the previous screw is obtained. Assemble the locknut on the screw. Adjust the position of the screw as covered in 3.35.

3.43 ***Half-Nut Positioning Screw and Locknut:*** To replace the screw or locknut, proceed as follows. To gain access to the screw and locknut, slide the carriage toward the right until the screw and locknut are accessible through the hole in the bail assembly. Electrically operate the L1 solenoid to hold the carriage locked in this position. Remove the locknut using the P-124547 wrench and, if the screw is to be replaced, using the R-2961 wrench. It may be necessary to hold the carriage in position manually as the screw is removed because the half nut will become completely disengaged from the feed screw. Substitute the new part and reassemble as follows. Place the locknut on the rear of the screw and insert the wrench into the hole of the screw. With the L1 solenoid operated and the screw hole in the carriage centered in the bail assembly hole, insert and tighten the screw until the half nut engages the feed screw. Adjust the position of the screw as covered in 3.44.

3.44 ***Adjustment of Half-Nut Position***

(1) ***General:*** In order to adjust the position of the half nut, a special wrench is required. This wrench may be made up on the job as follows and retained for future use. Obtain a piece of 1/8-inch diameter brass tubing approximately 6 inches long and an R-2961 wrench. Hold the wrench in a vise and break off the shorter end of the wrench using the 485A pliers. Insert the broken end of the longer piece into one end of the brass tubing to a depth of minimum 1/2 inch and solder it in place. Bend approximately 1-1/4 inches of the opposite end of the tubing at right angles to form a handle.

(2) To adjust the position of the half nut, proceed as follows. Slide the carriage toward the right until the screw and locknut are accessible through the hole in the bail assembly. Electrically operate the L1 solenoid and hold the carriage in this position. Insert the half nut adjusting wrench through the P-124547 wrench and engage the half nut positioning screw. Slide the P-124547 wrench forward and engage the locknut. If the bail stop has not been disturbed during the replacement of parts, adjust the screw to obtain a clearance of approximately 1/64 inch between the surface of the bail stop furthest from the drum and the bail assembly. Turn the screw in the clockwise direction to increase the clearance or in the counterclockwise direction to decrease the clearance. This position will provide a starting point from which to obtain the correct position of the half nut.

(3) Check the endplay of the carriage by attempting to move the carriage from side to side applying pressure with the finger to the carriage tab protruding from the bail slot. If endplay is present, turn the screw in a

counterclockwise direction until the endplay just disappears. If endplay is not present, turn the screw clockwise until the endplay just begins to be felt, then turn the screw slightly counterclockwise to remove the endplay. When the endplay is no longer present, tentatively tighten the locknut taking care to hold the adjusting screw stationary.

(4) Release the L1 solenoid and slide the carriage toward the right until stopped by engagement between the limit switch tab and stop. Operate the L1 solenoid to lock the carriage in place. Release the L1 solenoid and listen for any indications of scraping between the half nut and feed screw during the return of the carriage. If scraping is present, back off the half nut positioning screw as required until clearance between the half nut and feed screw is obtained as indicated by the absence of any scraping noise during the return of the carriage. In adjusting the half nut positioning screw, the requirements of lack of endplay and clearance represent minimum and maximum limits for the screw and should both be taken into consideration. When a satisfactory adjustment has been reached, tighten the locknut taking care to prevent the screw from turning.

(5) After the half nut positioning screw has been satisfactorily adjusted, check that the position of the bail stop, the engagement of the operating rods and their associated switches, and the recording head pressure meet the requirements of Section 034-359-701.

3.45 ***Operating Rod Retractile Spring:*** To replace the spring, proceed as follows. Disengage the spring from the anchor nut using the KS-8511 tweezers. Remove the other end of the spring from the hole in the operating rod bracket. Substitute the new spring and mount it as follows. Attach the spring to the bracket first and then to the anchor nut. Bend the ends of the spring, if required, to insure that the spring is securely fastened at both ends. Adjust the spring tension as covered in Section 034-359-701.

3.46 ***Anchor Nut:*** To replace the nut, proceed as follows. Remove the spring from the nut using the KS-8511 tweezers. Note the position of the nut and remove it from the rod by unscrewing it. Mount the new nut in place by screwing it onto the threaded portion of the rod, with the flat face of the nut toward the nylon tip of the rod. Position the nut on the rod in the same place held by the previous nut with the ear of the nut uppermost. Reassemble the spring to the nut and check that the spring tension meets the requirements of Section 034-359-701.

3.47 ***Spacer and Stop Nut:*** To replace either of these parts, proceed as follows. Remove the anchor nut as covered in 3.46. Note the position of the stop nut and unscrew it from the rod. Remove the spacer by sliding it off the rod. Substitute the new part and assemble as follows. Slide the spacer on the rod. Thread the stop nut onto the rod with the flat surface toward the spacer. The final position of the stop nut should be such that a clearance of approximately 0.010 inch is present between the nylon tip of the rod and the contact spring when the carriage is in the zero position. Assemble the anchor nut to the rod as covered in 3.46.

3.48 ***Indicator Assembly:*** To replace the indicator assembly, it will be necessary to remove the anchor nut as covered in 3.46. Loosen the screw in the indicator assembly using the R-2958 wrench. The indicator assembly may then be removed and the new one substituted. Adjust the position of the indicator assembly as covered in Section 034-359-701. Remount the anchor nut as covered in 3.46.

3.49 ***Operating Rod:*** To replace an operating rod, proceed as follows. Remove the switch assembly as covered in 3.33. To remove the upper operating rod, remove the spacer and associated parts as covered in 3.47. To remove the lower operating rod, remove the indicator assembly as covered in 3.48. Remove the operating rod by sliding it out of the bracket to the right and substitute the new one. Assemble the spacer or indicator assembly and associated parts as covered in 3.47 or 3.48. Remount the switch assembly as covered in 3.33. Check that the replacing operating rod meets the requirements of Section 034-359-701.

3.50 ***Cord-Holding Terminal:*** To replace the terminal, proceed as follows. Holding the pulley stationary, unwrap the nylon line from the pulley until the tension is removed from the pulley. Using the KS-8511 tweezers, untie the

nylon line from the terminal. Where the knot has been cemented to secure it in place, remove the line as covered in 3.38. Remove the terminal and screw using the KS-2631 screwdriver. Mount the new terminal on the carriage tab in a vertical position and tighten the mounting screw securely. Replace the nylon line as covered in 3.38.

3.51 ***Bracket Assembly:*** Remove the Zierick clamp using the 6-inch screwdriver. Remove the head adjustment screw and locknut as covered in 3.42. Remove the bracket from the carriage assembly by removing the mounting screw and washer with the R-2670 wrench. Remove the operating rods and the associated parts as covered in 3.49 without removing the switch assembly. Insert the operating rods in the new bracket and assemble the bracket to the carriage assembly as follows. Insert and tighten the mounting screw and washer with the R-2670 wrench. Reassemble the head adjustment screw and locknut as covered in 3.42 without making final adjustments. Adjust the position of the bracket assembly so that the operating rods are parallel to the upper slide rod and tighten the mounting screw securely. Assemble the associated parts of the operating rods as covered in 3.47 and 3.48. Remount the Zierick clamp over the recording head cable using the 6-inch screwdriver. Check that the operating rods meet the requirements of Section 034-359-701. Adjust the position of the head adjustment screw as covered in 3.35.

3.52 ***Upper Slide Rod and Associated Retaining Ring:*** To replace these parts, proceed as follows. Remove the retaining ring as covered in 3.04. Remove the rod by sliding it to the left. Substitute the new part and reassemble as follows. Insert the rod in the bail assembly from the left with the smaller end first. The groove in the small end of the rod will be exposed on the right side of the bail. Assemble the retaining ring on the rod using the E-18 Truarc applicator.

Bail and Carriage Assembly

3.53 ***Bail and Stud, Bail Assembly, and Carriage***

(1) To replace the bail and stud or the bail assembly, proceed as follows. Loosen the screw securing the limit switch stop using the R-2670 wrench. Rotate the stop so that the short end is toward the front and slide the stop to the extreme left. Mark the position of the L1 solenoid and remove the solenoid using the R-2670 wrench. Move the solenoid aside to the right of the main support taking care not to break the terminals or wires. Remove the drum and associated parts as covered in 3.18. Remove the retaining ring from the stud securing the solenoid plunger as covered in 3.04. Remove the stud and the washer using the KS-8511 tweezers. Remove the cable clamp at the top of the carriage using the 6-inch screwdriver. Remove the recording head and shield as covered in 3.34 without unsoldering the connecting wires. Taking care not to damage the recording head or connecting wires, set the head aside on the right side of the motor support. Unhook the end of the bail retractile spring from the bail foot.

(2) Remove the retaining ring from the lower rod as covered in 3.52. Loosen the locknut and setscrew securing the lower slide rod using the 418A and R-2959 wrenches. Push against the left end of the slide rod with a KS-6320 orange stick until the end protruding from the right side may be grasped by hand. Withdraw the rod from the right side. Removal of the lower slide rod will be facilitated if the carriage is held from shifting while the rod is being removed. Operate the L2 solenoid to unclamp the limit switch and slide the switch to the extreme right. Clamp the switch in this position by releasing the L2 solenoid. Slide the carriage toward the right and draw the two operating rods to the left to disengage them from the switch cover. Tilt the assembly to the left, disengage the bail from the bail stop, and lift the assembly out. Remove the upper slide rod from the bail as covered in 3.52. Remove the cord-holding terminal mounting screw using the KS-2631 screwdriver. Disengage the carriage assembly from the bail.

(3) Substitute the new part and reassemble as follows. Assemble the carriage in place, engaging the carriage tab in the bail slot. Mount the upper slide rod as covered in 3.52. Insert the assembly in the recorder with the bail engaging the bail stop. It will be necessary to hold the carriage to the right with the

operating rods drawn to the left during this operation. Take care not to damage the wiring with the bail foot. Assemble the lower slide rod in place as covered in 3.28. Hook the bail retractile spring behind the bail foot. Slide the carriage to the extreme left and momentarily operate the L2 solenoid to permit the limit switch to return to the extreme left. Assemble the L1 solenoid plunger and associated parts as covered in 3.55.

(4) Mount the L1 solenoid in place as covered in 3.54. Remount the recording head and shield as covered in 3.34. Remount the cable clamp using the 6-inch screwdriver. If the replacing part is a bail and stud, remove the pulley and associated parts from the replaced bail and stud and assemble to the new stud as covered in 3.40. If the replacing part is a bail assembly, remove the nylon line from the cord-holding terminal using the scissors. Mount the cord-holding terminal as covered in 3.50 and the nylon line as covered in 3.38. Align the carriage as covered in 3.18. Adjust the position of the recording head as covered in 3.35. Restore the limit switch to its previous position. Reposition the limit switch stop as covered in 3.66. The pulley adapter, if present, will not be required in the assembly. Check that the recorder meets the requirements of Section 034-359-701.

(5) To replace the carriage assembly, proceed as follows. Remove the bail assembly and separate the carriage as covered in (1) and (2). If the carriage assembly being replaced does not include the bracket assembly, remove the bracket assembly from the carriage assembly as follows. Using the 541A and R-2961 wrenches, remove the head adjustment screw and locknut and, using the R-2670 wrench, the screw and locknut. Mount the bracket assembly on the new carriage assembly and insert the head adjustment screw. Insert and tentatively tighten the mounting screw and washer. Mount the carriage to the bail, engaging the carriage tab in the bail slot. Assemble the bail and associated parts in place as covered in (3). Loosen the bracket assembly mounting screw and position the bracket so that the operating rods are parallel to the upper slide rod. Tighten the mounting screw securely. Mount the remaining parts as covered in (4).

Mounting Plate Parts

Solenoids and Associated Plungers

3.54 ***L1 and L2 Solenoids:*** To replace either solenoid, proceed as follows. Tag and remove the connecting leads. Remove the solenoid mounting screws using the R-2670 wrench. Remove and replace the plunger as covered in 3.55 or 3.56. Slide the new solenoid into position so that the plunger enters the solenoid. Insert the mounting screws and associated washers in place but do not tighten. Solder the solenoid leads to the terminals. Position the solenoid to meet the requirements of Section 034-359-701 and tighten the mounting screws securely.

3.55 ***L1 Solenoid Plunger:*** To replace the plunger, proceed as follows. Remove the L1 solenoid as covered in 3.54 without disconnecting the leads. Position the solenoid to the right of the main support taking care not to break the terminal or connecting wires. Remove the retaining ring from the stud connecting the plunger as covered in 3.04. Remove the stud, washer, and the plunger using the KS-8511 tweezers. Substitute the new plunger and assemble as follows. Pass the stud through one leg of the plunger and hang the washer on the tip of the stud. Holding these parts together with the tweezers, engage the end of the connecting link between the legs of the plunger. Tap the end of the stud so that it enters the hole in the connecting link, but leave space between the end of the stud and the opposite leg of the plunger so the bail foot may be engaged. Engage the bail foot and push the stud through until it protrudes from the opposite side of the plunger. Movement of the connecting link toward the bail foot may be done, where necessary, by manually pushing the latch toward the motor control switch. Mount the retaining ring on the stud using the E-9 Truarc applicator. Remount the solenoid as covered in 3.54 taking care not to break the connecting leads or solenoid terminals.

3.56 ***L2 Solenoid Plunger:*** To replace the plunger or the associated parts, proceed as follows. Remove the retaining ring securing the stud as covered in 3.04. The retaining ring is accessible from the rear. Remove the stud using

the KS-8511 tweezers. Loosen the solenoid mounting screws and tilt the front of the solenoid downward so that the plunger can be removed without interference from the limit switch assembly. Remove the plunger. If the connecting link is to be replaced, disconnect it from the tab of the limit switch clamp using the 485A pliers. Hook the new connecting link onto the clamp tab and bend the hooked end closed with the pliers. Insert the plunger in the solenoid. Using the KS-8511 tweezers, insert the stud through the leg of the plunger closer to the drum. Engage the loop of the connecting link between the legs of the plunger and pass the stud through until it protrudes from the opposite side of the plunger. Mount the retaining ring using the E-9 Truarc applicator. Position the L2 solenoid to meet the requirements of Section 034-359-701 and tighten the mounting screws securely.

Latch Assembly and Motor Control Switch

3.57 ***Latch Assembly and Latch Retractile Spring***

(1) Removal of these parts will be facilitated by the removal of the drum as covered in 3.18. If the latch assembly is to be replaced, remove the three erase coil support bracket mounting screws using the R-2670 wrench and move the assembly to one side. Remove the latch retractile spring using the KS-8511 tweezers. If the latch assembly or connecting link is to be replaced, remove the retaining ring from the connecting link as covered in 3.04. Disengage the link from the latch assembly. Remove the latch assembly mounting screws, the associated washers, and the cable clamp using the R-2670 wrench. Remove the latch assembly.

(2) Substitute the new part and reassemble as follows. Place the latch assembly in position and assemble the mounting screws, washers, and clamp in place. Position the latch assembly so that the latch engages the motor control switch button but clears the end of the upper contact spring by minimum 0.015 inch. Temporarily tighten the mounting screws. Engage the connecting link stud with the latch assembly and remount the retaining ring using the E-12 Truarc applicator. Mount the latch retractile spring using the KS-8511 tweezers. Temporarily slide the drum on the shaft so that the gears engage. The latch should rest on the metal surface of the drum without contacting the recording band or extending over the side of the drum. Loosen the mounting screws and position the latch assembly as required. Tighten the mounting screw on the motor side securely. Assemble the coil support bracket in place and insert the mounting screws and associated washers. Position the erase coil bracket to meet the requirements of Section 034-359-701 and tighten the mounting screws securely. Remove the drum from the shaft. Insert the limit switch cable under the clamp on the latch assembly and tighten the mounting screw securely. Remount the drum and associated parts as covered in 3.18. Check that the positions of the latch, the erase coil, and the drum pulsing switch meet the requirements of Section 034-359-701.

3.58 ***Latch Shoe:*** To replace the latch shoe, proceed as follows. Remove the two screws and associated washers securing the shoe to the latch using the KS-6854 screwdriver. Remove the shoe and substitute the new one. Assemble the screw and associated washer in place with the flat washer against the shoe. Position the shoe on the latch so that the step of the shoe is against the latch and tighten the screws securely. Check that the latch meets the requirements of Section 034-359-701.

3.59 ***Motor Control Switch and Associated Parts:*** To replace any of these parts, proceed as follows. Remove the drum assembly as covered in 3.18 to make the parts accessible. Remove the switch mounting screws and associated washers using the R-2670 wrench. If the switch is to be replaced, transfer the leads to the new switch. Substitute the new part and assemble as follows. Position the switch against the mounting plate and insert the mounting screws and associated washers in place with the flat washer against the larger opening in the base. Allow the switch to drop to its lowest position. Reassemble the drum as covered in 3.18. Position the switch so that, when the latch is in the drum notch, the two pairs of contacts nearest the latch are made and the pair of contacts furthest from the latch is open. Tighten

the bracket mounting screws and check that the recorder meets the requirements of Section 034-359-701.

Limit Switch and Associated Parts

3.60 ***Limit Switch Assembly***

(1) Remove the drum assembly as covered in 3.18 to make the assembly mounting screws accessible. Remove the limit switch assembly mounting screws using the 643B wrench. A touch of grease applied to the tip of the wrench will help to keep the screw on the wrench while being removed or replaced. The front mounting screw may be made more accessible by sliding the carriage to the maximum announcement position. Work the limit switch assembly and connecting solenoid plunger out from the motor side taking care not to damage the connecting wires. To replace the limit switch, remove the limit switch mounting screws using the KS-6854 screwdriver and unsolder the leads.

(2) Connect and solder the leads to the new switch. Insert the longer screw in the hole nearer the tab, the shorter one in the rear hole. The rear screw should be flush with the surface of the movable plate. If the limit switch assembly is being replaced, transfer the plunger and its connecting link to the new assembly using the 485A pliers as required. Transfer and solder the leads to the new assembly. Mount the assembly in position as follows. Lift the front end of the switch assembly toward the idler assembly and center it in the opening. Similarly lift the solenoid plunger and move it into place toward the solenoid. Insert the solenoid plunger into the solenoid while moving the limit switch assembly into position. Insert the assembly mounting screws in place and tighten them securely. Remount the drum assembly as covered in 3.18. Check that the limit switch meets the requirements of Section 034-359-701.

3.61 ***Limit Switch Retractile Spring:*** To replace this spring, reduce the tension on the spring by operating the L2 solenoid to allow the limit switch to assume the zero position. Using the KS-8511 tweezers, unhook the stationary end of the spring. Work the other end loose from the stud and substitute the new spring, hooking it onto the stud first. Hook the other end of the spring into the hole.

3.62 ***Clamp Retractile Spring:*** Remove the end of the spring furthest from the solenoid plunger using the 485A pliers. The other end of the spring may then be worked free of the limit switch clamp. Substituting the new spring, hook one end into the hole in the limit switch clamp. Insert the other end in the hole of the upright tab.

Erase Coil, Drum Pulsing Switch, and Associated Parts

3.63 ***Erase Coil and Associated Bracket:*** To replace the erase coil, the bracket, or any of the associated screws and washers, proceed as follows. Remove the two screws securing the erase coil to the bracket using the R-2670 wrench. Remove the three screws and associated washers securing the bracket to the coil support bracket and remove the bracket. If the erase coil is to be replaced, unsolder the leads and solder them to the new coil. Substituting the new part, reassemble as follows. Mount the bracket to the coil support bracket, placing the flat washer over the large hole. Use the R-2670 wrench. Mount the erase coil on the bracket so that the distance between the surface of the erase coil pole piece and the recording band is uniform across the width of the band. Tighten the two screws securing the erase coil to the bracket. Loosen the three screws securing the bracket and position the bracket so that the pole pieces are tangent to the recording band and the gap is closest to the band. Secure the bracket in this position by tightening the three screws securely. Loosen the two screws securing the erase coil and shift the coil as required to obtain a uniform clearance as covered in Section 034-359-701. Tighten the two screws securely.

3.64 ***Drum Pulsing Switch:*** To replace the switch, proceed as follows. Remove the drum pulsing switch and the associated screw and washers using the R-2670 wrench. Transfer the leads to the new switch. Reassemble the parts as follows. Mount the switch on the coil support bracket, assembling the screw and washers in place with the flat washer on the bottom. Tighten the mounting screw securely with the R-2670 wrench. Loosen the two screws securing the switch to the switch bracket using

the R-2958 wrench or the KS-2631 screwdriver as required. Position the switch so that the rounded portion of the contact spring makes contact only with the nylon portion of the operating stud. Tighten the screws securely. Loosen the switch mounting screw and position the bracket so that the contact springs make with a follow of approximately 0.015 inch. Tighten the screw securely.

3.65 ***Coil Support Bracket:*** Remove the drum pulsing switch as covered in 3.64 and the erase coil and associated bracket as covered in 3.63. Remove the three screws and associated washers securing the coil support bracket to the base using the R-2670 wrench. Loosening the cable clamp may aid in removing the bracket. Substitute the new bracket, insert and tighten the mounting screws securely. The flat washers should be at the bottom. Remount the erase coil as covered in 3.63 and the drum pulsing switch as covered in 3.64.

Miscellaneous

3.66 ***Limit Switch Stop, Tube, and Associated Screws:*** To replace any of these parts, remove the part as follows. Make sure that the limit switch is in its zero position. Remove the screw securing the stop using the R-2670 wrench. Remove the setscrew securing the tube, using the R-2959 wrench. Slide the parts to the left removing the tube first and the stop last. Substitute the new part and reassemble as follows. Insert the screw in the tube, but do not allow the end of the screw to protrude into opening. Enter the short end of the stop into the hole in the mounting plate normally occupied by the tube. Place the tube on the longer end of the stop and slide the tube into place. Remount the setscrew and tentatively tighten it. Position the stop in the tube so that the mark nearest the bent end is flush with the left face of the tube. Tighten the screw securely. Loosen the setscrew. Rotate the tube and shift as required so that the stop is in contact with the limit switch tab and fully engages the tab. Tighten the setscrew securely. Loosen the screw securing the stop and position the stop in accordance with local instructions.

3.67 ***Flasher Plugs and Associated Parts:*** Remove the flasher by pulling it away from the plugs. The plug nearest the L1 solenoid or its associated parts may be made accessible by removing the L1 solenoid as covered in 3.54. In either case, loosen the nut securing the plug using the 417A wrench. Remove the plug by holding the nut stationary with the wrench and turning the plug with the fingers. Take care not to lose the nut or washers. Remove the bushing using the KS-8511 tweezers. If the terminal is to be replaced, unsolder the wire and solder it to the new terminal. Substitute the new part and reassemble as follows. While holding the plug in position for insertion in the hole, mount the terminal, the fiber washer, and the bushing on the threaded end in that order. Insert the end into the hole so that the bushing enters the hole and the fiber washer is flat against the mounting plate. Mount the fiber washer, the flat washer, the lockwasher, and the nut on the threaded end in the order specified. Assemble the nut and tighten it using the 417A wrench. Remount the flasher. If the L1 solenoid was removed to make the plug accessible, replace the L1 solenoid as outlined in 3.54.

BASE ASSEMBLY PARTS

3.68 ***Captive Screw:*** To remove the screw, proceed as follows. Press against the point of the screw so that the head of the screw is flush with the surface of the base. Insert the R-2485 wrench in the screw and turn the screw in the counterclockwise direction until it engages the threads and turns out. Substitute the new screw and turn it until it is past the threaded part of the base.

3.69 ***Setscrew:*** Remove the setscrews using the R-2958 wrench. Before assembling the new screw in place, cover the threads of the screw with a thin coat of KS-14615 antiseize compound. Insert and turn the screw in place.

3.70 ***Terminal Strip*** (2AA telephone answering set): To replace the terminal strip, proceed as follows. Tag and disconnect the leads connected to the terminal strip. Remove the four screws and the associated washers using the KS-2631 screwdriver. Substitute the new terminal strip and reassemble as follows. Insert the four screws and the associated washers in place and tighten securely. Connect the leads to the terminals and solder. Stamp the top of the terminal strip as required.