RECORDER

KS-16765 L3

PIECE-PART DATA AND REPLACEMENT PROCEDURES

CONTENTS PAGE

1. GENERAL

1.01 This section covers information necessary for ordering parts to be used in the maintenance of the KS-16765 L3 recorder, which is part of the KS-16765 L1 and L2 announcement set.

1.02 This section is reissued for the following reasons:

(a) To add a new motor and replacement procedure

(b) To add a voltage control module and replacement procedure

(c) To add a new Fig. 2 and renumber the remaining figures

(d) To include an addendum

(e) To make changes as required.

This reissue does not affect the Equipment Test List.

1.03 Part 2 covers ordering information for those parts of the recorder which it is practicable to replace in the field. No attempt should be made to replace parts not designated.

1.04 Part 3 covers the approved procedures for the replacement of the parts covered in Part 2.

1.05 ***Make Busy:*** Before performing any work on a set, the equipment is removed from service in accordance with local instructions. The equipment is not removed while running unless it runs continuously, indicating a trouble condition. When it is removed, a new unit is substituted immediately.

1.06 ***Antiseize Compound:*** Whenever any screws are removed which thread into the aluminum casting of the recorder, they shall have

a film of KS-19094 L1 antiseize compound, or equivalent, applied to the threads.

1.07 ***A film of antiseize compound,*** for the purposes of this section, is the amount of compound deposited on the surface of a part after being brushed with a short, light stroke of the R-2966 brush. The brush shall be 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 Drum:*** To rotate the drum, the belt is removed and the pulley is turned in a counterclockwise direction when looking at the pulley end.

Caution: Whenever the half nut and feed screw are engaged and the drum is turned by hand, the L2 solenoid is manually operated to permit the S1 limit switch to be moved to the extreme right-hand position.

1.09 When necessary to operate a solenoid electrically during any of the replacement procedures specified in this section, central office battery is connected across the terminals of the solenoid.

2. PIECE-PART DATA

2.01 The illustrations included in this part show the various parts in their proper relation to the other parts of the recorder. The 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 When ordering replacement parts, give the name of the part as shown in the illustrations, KS-number, serial number, and manufacturer's name as shown in the following example:

B-19101 Bail Assembly, Wilcox Electric Co., for KS-16765 L3 Recorder, Serial No. 999.

Do not refer to the section number or to any information shown in parentheses on the illustrations.

2.03 Information enclosed in parentheses is not ordering information. This information may be reference to notes, information pertaining to parts not considered replaceable, or part names in general use in the field if these names differ from those assigned.

2.04 ***Index:*** The following index lists field replaceable parts of the recorder other than mounting hardware. No text references are listed for operations where the procedures are obvious from an examination of the illustrations.

INDEX

PART	ORDERING INFORMATION (FIG. NO.)	REPLACEMENT PROCEDURE (COVERED IN PART 3)
KS-15914 L1 OR L2 MOTOR AND ASSOCIATED PARTS		
Motor	5	3.08
Pulley Assembly, Pulley, Spindle, Idler Arm, Spring, Nut	5,6	3.09
B-650418 MOTOR AND ASSOCIATED PARTS		
Motor	3	3.10
Idler Assembly, Idler Pulley, Idler Arm, Spring, Nut	4,11	3.11
2— or 3—Minute Drive Pulley, Screw, Round Drive Belts, Idler Spring	3,5,11	3.12
Capacitor	4	3.13

INDEX (Contd)

PART	ORDERING INFORMATION (FIG. NO.)	REPLACEMENT PROCEDURE (COVERED IN PART 3)
→L-517092 MOTOR AND ASSOCIATED PARTS		
Motor	2	3.14
Voltage Control Module	2	3.15
Idler Assembly, Idler Pulley, Idler Arm	2,4,11	3.16
2— or 3—Minute Drive Pulley, Round Drive Belts, Screw	2,6,12	3.17
Capacitor	4	3.18←
DRIVE ASSEMBLY AND ASSOCIATED PARTS		
Drive Pulley, Flat Drive Belt, Roll Pin	4,5,6	3.19
Drive Gear, Drum Assembly, Recording Band, Shaft, Roll Pins	2,3,5,7	3.20
Idler Gear Assembly, Idler Gear, Spindle, Washers, Retaining Rings	7	3.21
ERASE COIL AND ASSOCIATED PARTS		
Erase Coil, Bracket	4,6,8	3.22
Switches (S2 and S3)	4,5	3.23
SOLENOIDS AND ASSOCIATED PLUNGERS		
Solenoids (L1 and L2), Solenoid Plungers	2,3,4,14	3.24
L1 Plunger Spring	8,14A	3.25
L2 Plunger Connecting Link	14B	3.26

INDEX (Contd)

PART	ORDERING INFORMATION (FIG. NO.)	REPLACEMENT PROCEDURE (COVERED IN PART 3)
CARRIAGE RETURN PULLEY AND ASSOCIATED PARTS		
Pulley, Coil Spring Washer, Retaining Ring	13	3.27
Nylon Line	13	3.28
BAIL AND CARRIAGE ASSEMBLY PARTS		
Magnetic Head, Screw	7,9	3.29
Magnetic Head Bracket Spring, Shaft	10	3.31
Magnetic Head Adjustment Screw, Locknut	2,3,5	3.32
FEED SCREW, SLIDE RODS, AND ASSOCIATED PARTS		
Feed Screw Retaining Plate, Bail Stop	7,8	3.33
Feed Screw, Feed Screw Gear, Steel Balls	7,10	3.34
Lower Slide Rod	2,3,5	3.35
Upper Slide Rod	10	3.36
BAIL AND CARRIAGE ASSEMBLIES		
Bail Assembly, Spring	2,3,5	3.37
Carriage Assembly	2,3,5	3.38
LIMIT SWITCH AND ASSOCIATED PARTS		
Limit Switch Assembly(S1)	2,3,5	3.39

INDEX (Contd)

3. REPLACEMENT PROCEDURES

3.01 *List of Tools, Materials, and Test Apparatus*

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
418A	5/16- and 7/32-Inch Open Double End Flat Wrench
474A	3/16- and 1/4-Inch Hex. Closed Double-End Offset Wrench
TOOLS	
485A	Smooth Jaw Pliers
541A	1/4-Inch 12 Point Double-End Box Wrench
KS-6320	Orange Stick
KS-6854	Screwdriver
KS-8511	Tweezers
KS-14440 L3	Soldering Copper
R-2670	3/32-Inch Allen Socket Screw Wrench
R-2958	5/64-Inch Allen Socket Screw Wrench
R-2966	Brush
R-2975	Adjustable Snap Ring Pliers
R-3415	7/64-Inch Allen Wrench
—	4-Inch B Screwdriver
—	6-Inch B Screwdriver

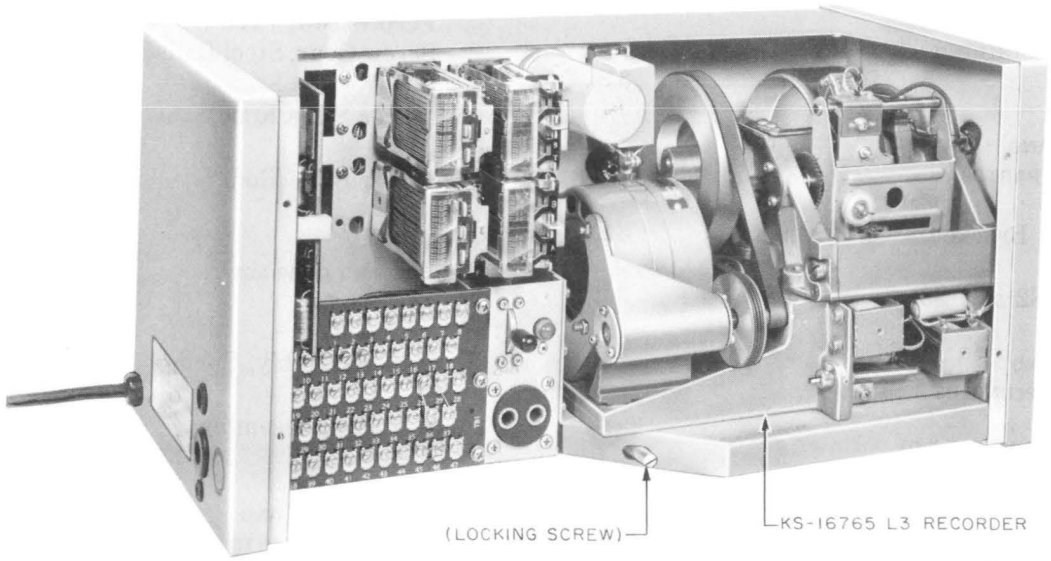


Fig. 1—KS-16765 L3 Recorder Mounted in Announcement Set—Front Cover Removed (Later Type Shown)

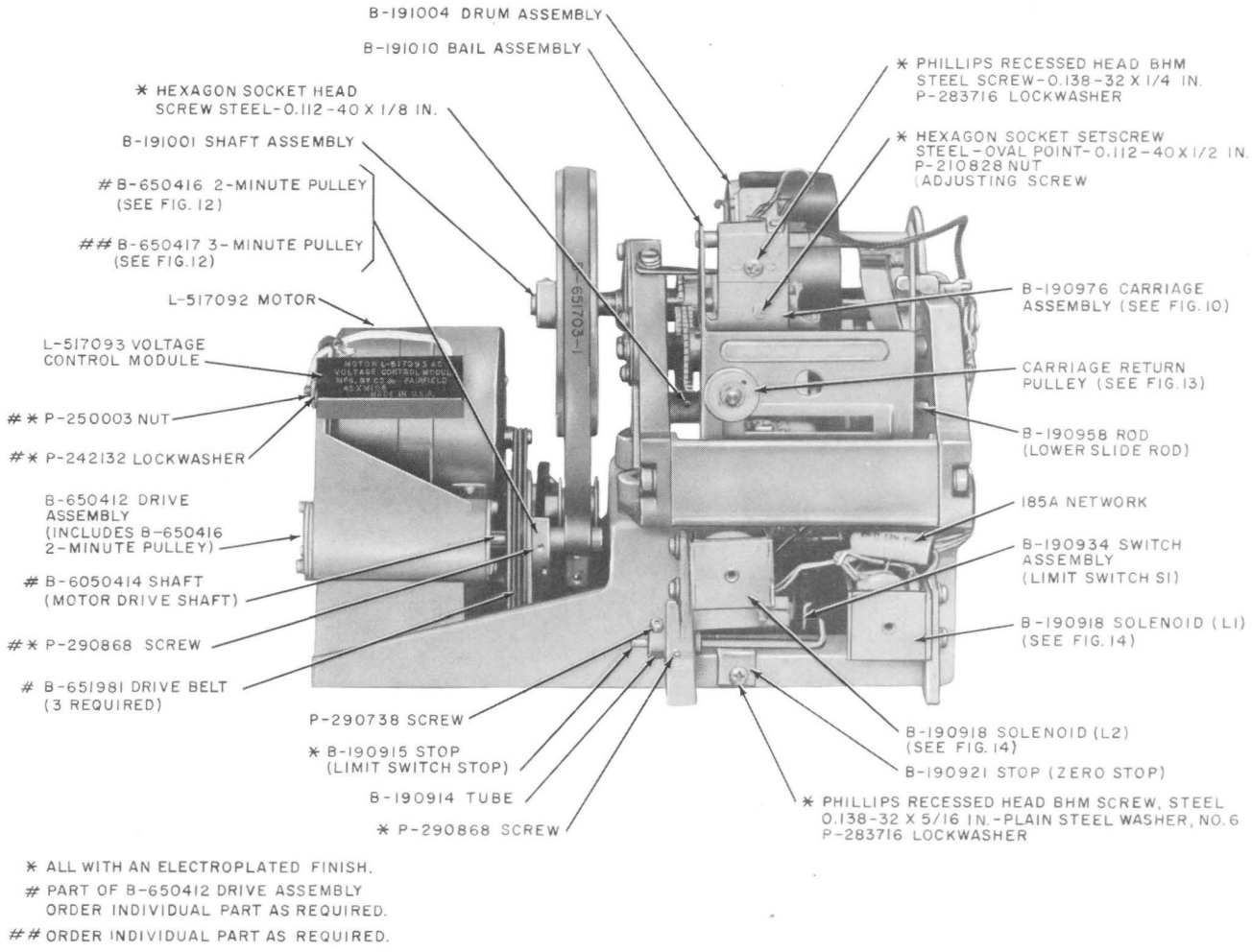
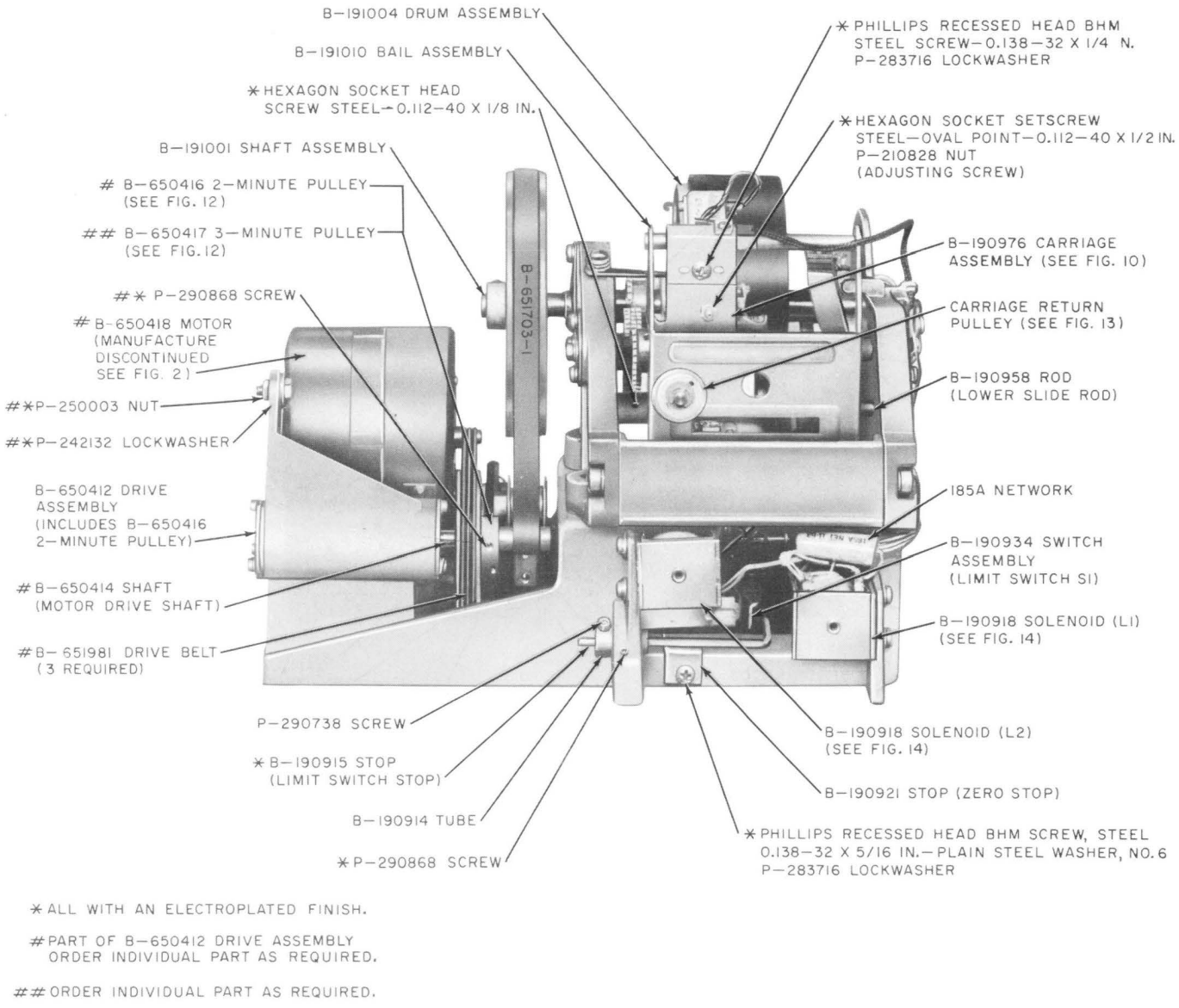


Fig. 2—KS-16765 L3 Recorder Equipped With L-517092 Motor and L-517093 Voltage Control Module

TOOLS	
—	3-Inch C Screwdriver
—	3/32-Inch Pin Punch Drive, L. S. Starrett Co, No. 565 (or equivalent)
—	1/8-Inch Pin Punch Drive, L. S. Starrett Co, No. 565 (or equivalent)
—	4-Ounce Riveting Hammer
—	B Scissors (or the replaced B Splicer's Scissors)

TOOLS	
—	12E Truarc Applicator, Waldes, Kohinoor, Inc
—	18E Truarc Applicator, Waldes, Kohinoor, Inc
—	25E Truarc Applicator, Waldes, Kohinoor, Inc
RS-18258	Holding Fixture



*ALL WITH AN ELECTROPLATED FINISH.

#PART OF B-650412 DRIVE ASSEMBLY ORDER INDIVIDUAL PART AS REQUIRED.

##ORDER INDIVIDUAL PART AS REQUIRED.

Fig. 3—KS-16765 L3 Recorder Equipped With B-650412 Drive Assembly

MATERIALS	
KS-2423	Twill Cloth
KS-7860	Petroleum Spirits
—	Oil, G. E. Silicone SF1147, 200CS
KS-16326 L1	Oil
KS-19094 L1	Antiseize Compound

MATERIALS	
KS-21154 L2	Fluorcarbon Polymer Solution
—	EC-847 Adhesive, Minnesota Mining & Mfg Co.
—	Back-up Material (small piece of wood or equivalent)

TEST APPARATUS	
81A	Test Set (or equivalent)

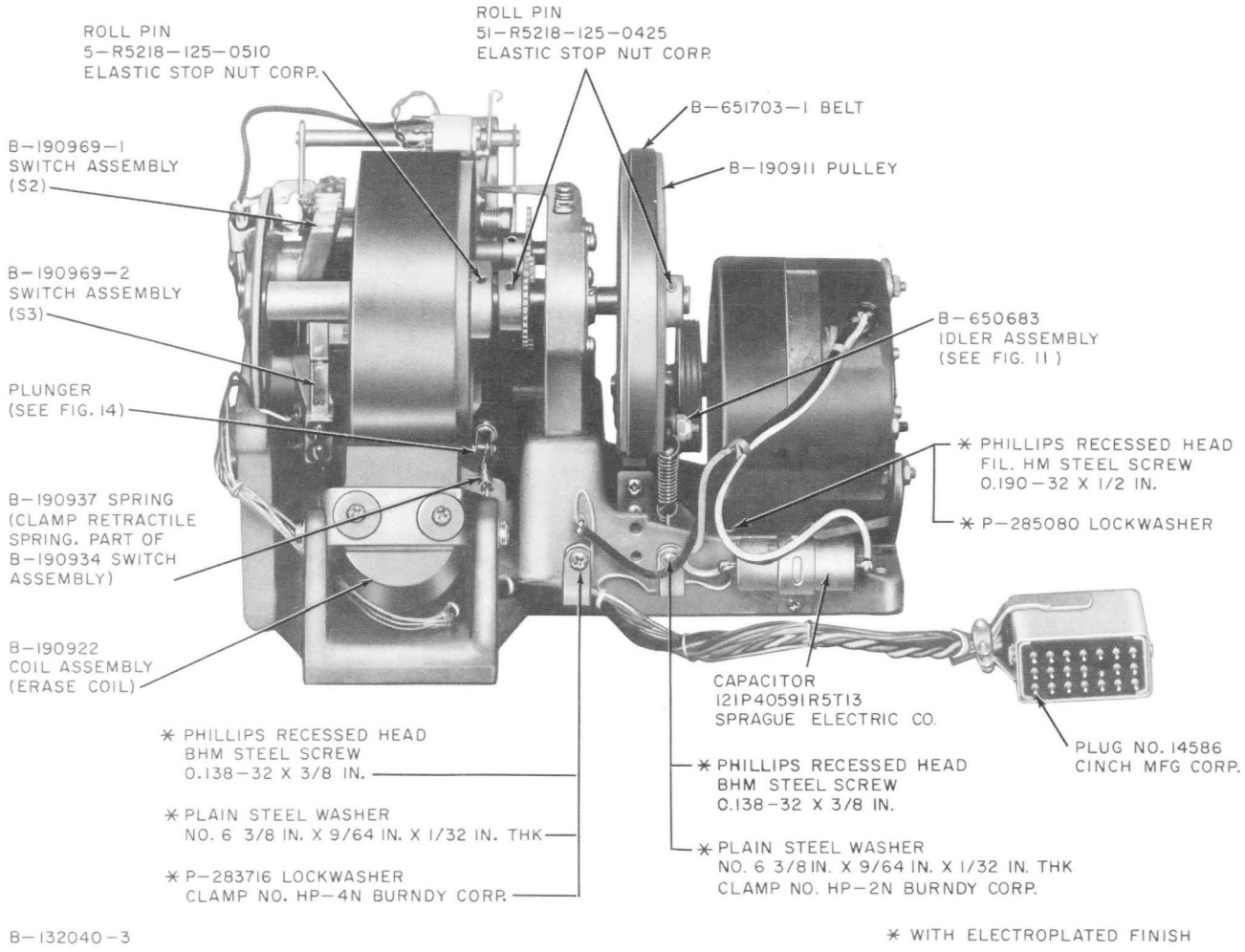


Fig. 4—KS-16765 L3 Recorder Equipped With B-650412 Drive Assembly—Rear View

TEST APPARATUS

—	Audio Oscillator
—	Voltmeter, Electronic Type
—	Dial Indicator, Universal Type, L. S. Starrett Co, No. 196A
—	Deviation Indicator, L. S. Starrett Co., No. 645

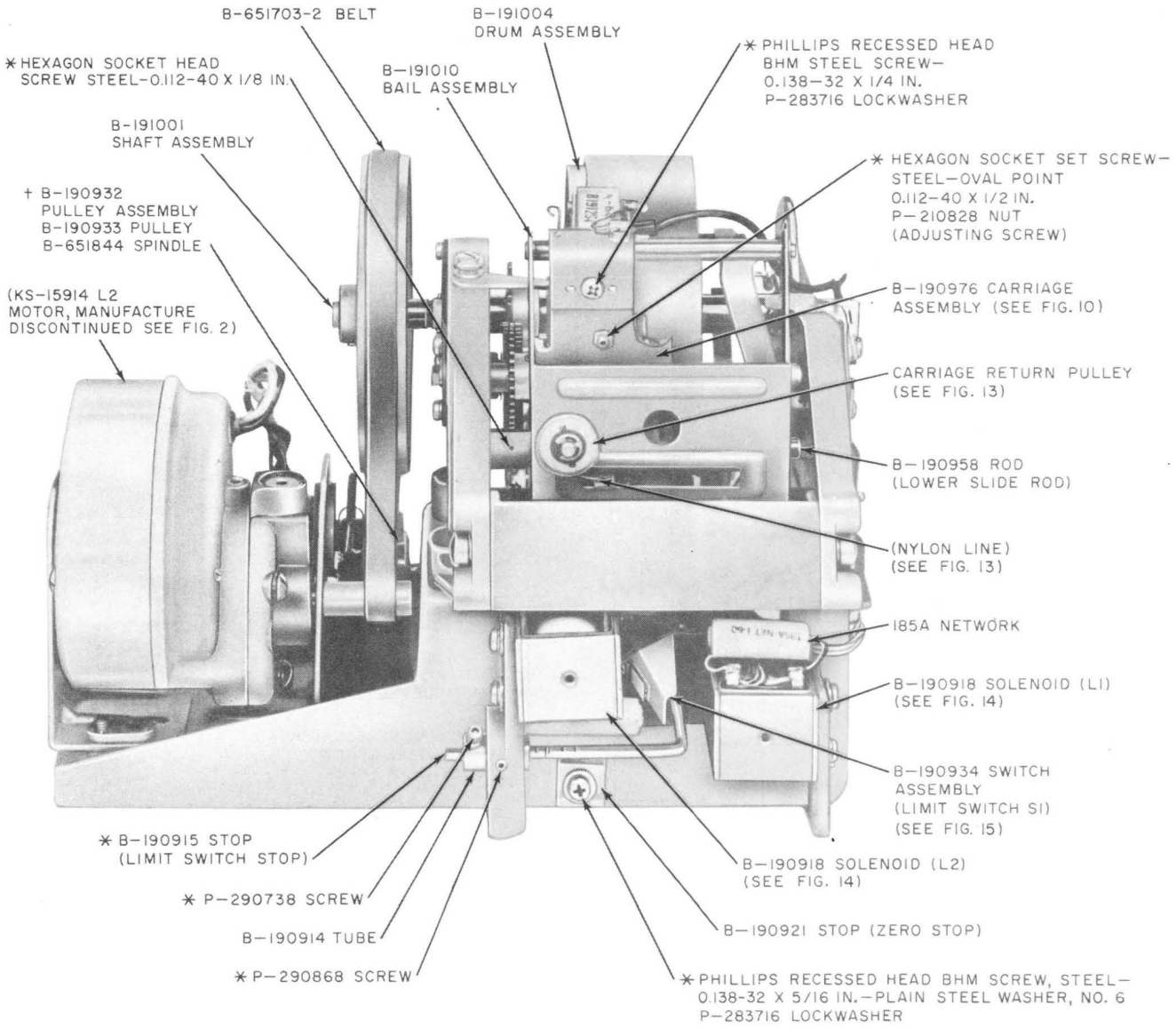
3.02 No replacement procedures are specified for screws or other parts where the replacement consists of a simple operation.

3.03 After making any replacement of parts of the KS-16765 L3 recorder, the part or parts replaced shall meet the requirements involved as described in Section 034-354-701. Other parts whose adjustments may have been directly disturbed by the replacing operations shall be checked against applicable requirements and shall be readjusted if necessary. An overall check of the recorder shall be made before restoring it to service.

3.04 *Removal and Remounting Announcement Set in Equipment Frame*

(1) Disconnect the ac supply plug from its associated socket.

(2) Using the 3-inch C screwdriver, loosen the four captive screws (two on each side) and remove the cover by sliding it forward.



* ALL WITH AN ELECTROPLATED FINISH.
*† SPRING STEEL LOCKWASHER NO. 10 (0.190) LIGHT NOT SHOWN.

Fig. 5—KS-16765 L3 Recorder Equipped With KS-15914 L2 Motor—Front View

(3) If the set is provided with a KS-16765 L8 cord, disconnect it by removing the plug (Fig. 4 and 6) from its associated connector.

(4) If the set is provided with a cord not equipped with a plug, tag each lead with its respective terminal board number and disconnect all leads from the TB1.

(5) Using the 3-inch C screwdriver, fully disengage the locking screw (Fig. 1) located just below the left end of the motor support. This screw locks the announcement set to the rear panel which is mounted on the mounting bracket.

(6) Grasp the set and lift upward by tilting the bottom edge slightly forward. This operation disengages the set from the top lip of the rear panel which is provided with small holes to engage the small projections on the set. The set is now free from the mounting bracket and may be removed from the frame.

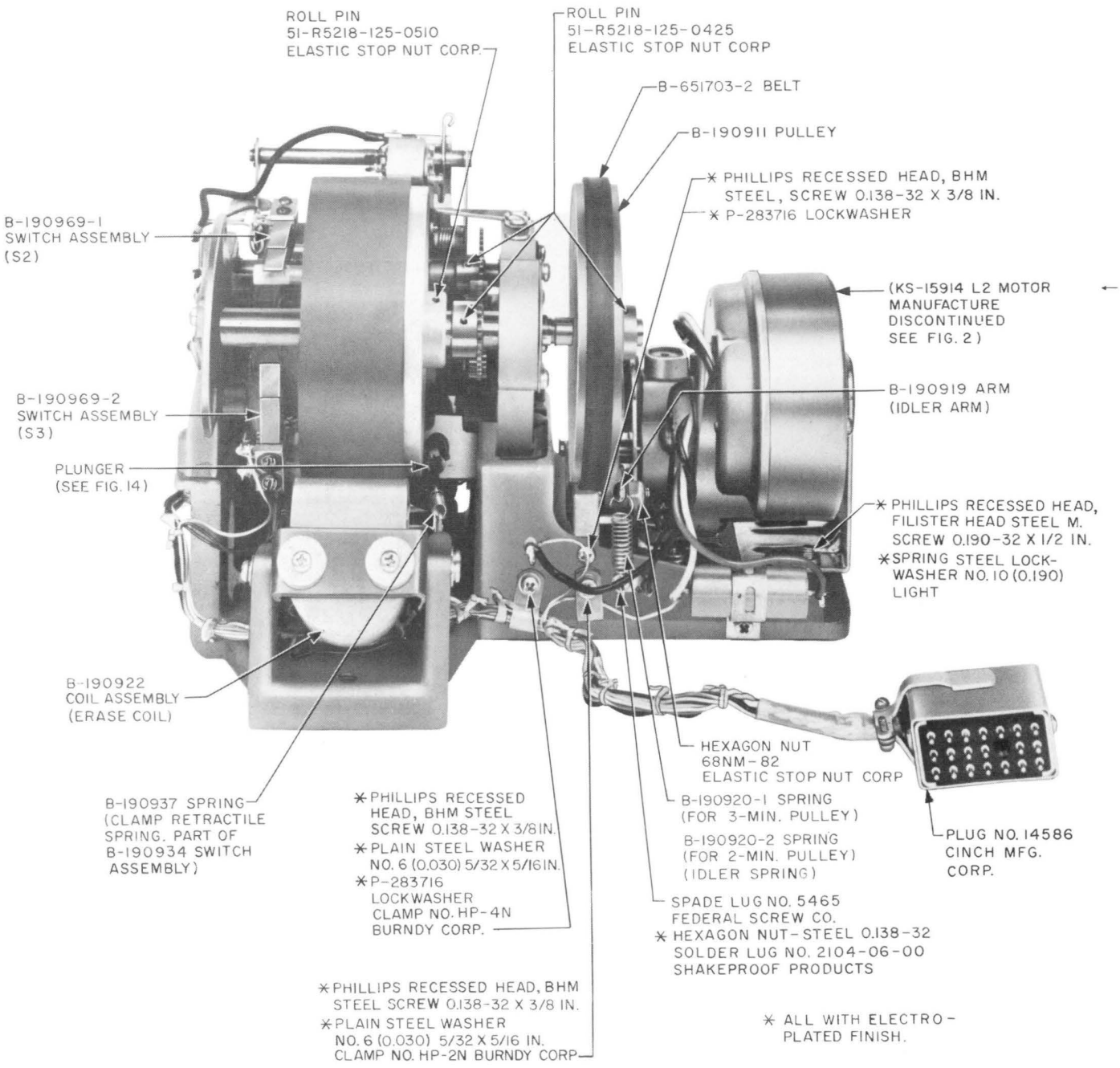


Fig. 6—KS-16765 L3 Recorder Equipped With KS-15914 L2 Motor—Rear View

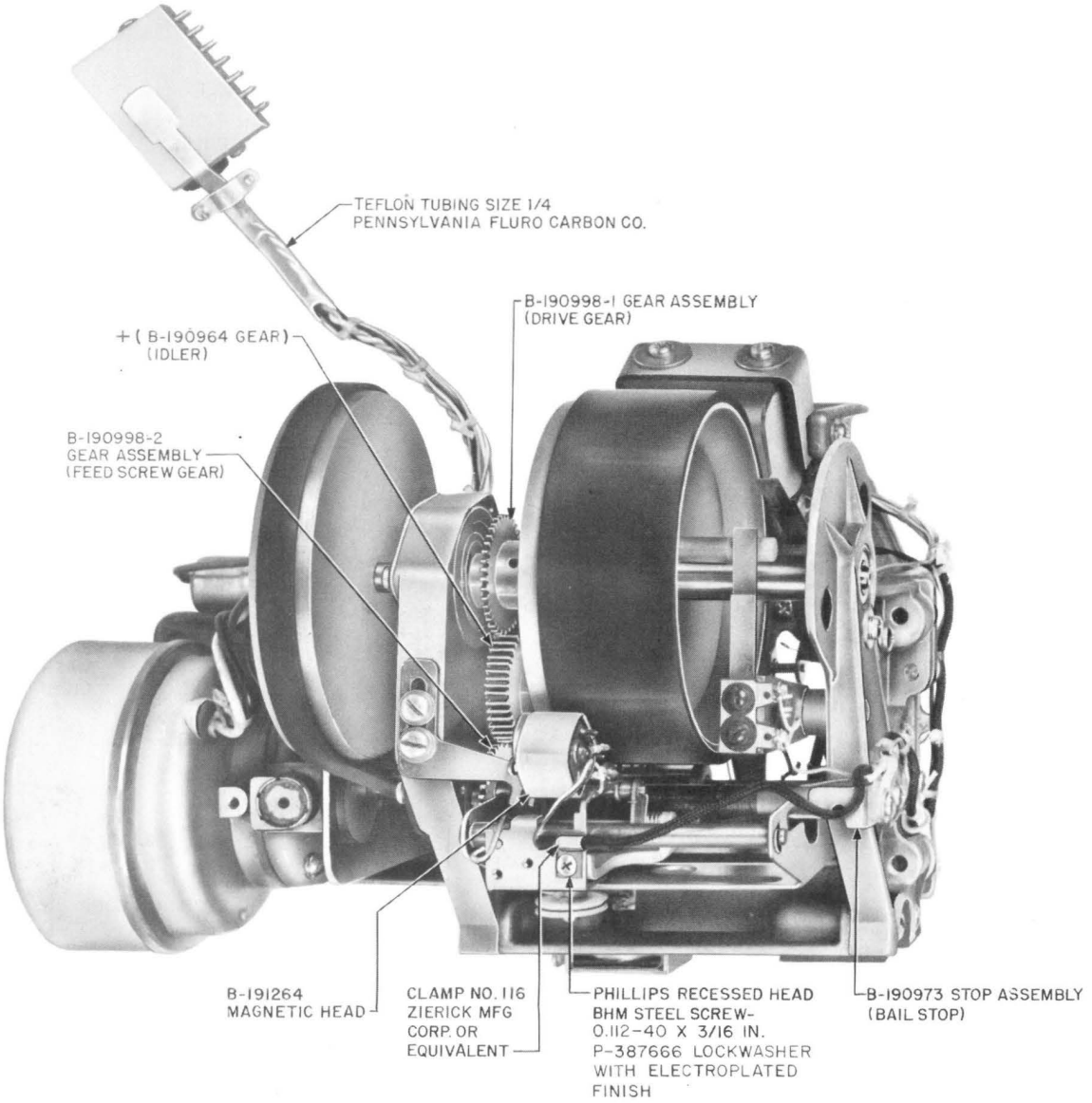
(7) Remount the announcement set in the equipment frame by reversing the procedure.

If information regarding terminal board connections is required, refer to SD-95283-01.

3.05 *Removal and Remounting KS-16765 L3 Recorder in Announcement Set*

(1) Using the 3-inch C screwdriver, loosen the four captive screws, two on each side of the front cover.

(2) Pull the cover off by placing one hand on the top and the other hand on the bottom and sliding the cover forward.



+ THE B-190964 GEAR IS MOUNTED ON THE B-190965 SPINDLE AND SECURED BETWEEN TWO B-191320 WASHERS BY TWO WALDES KOHINOOR, INC. NO. 5100-34 ZD OR ZF RETAINING RINGS.

Fig. 7—KS-16765 L3 Recorder Equipped With KS-15914 L2 Motor—Top View

Caution: The magnetic head and the recording band must be kept free of dirt, foreign matter, and contaminating materials. When possible, keep these parts covered with a clean KS-2423 cloth while work is being done on the recorder.

(3) Tilt the set back on the rear long edge, and using the 3-inch C screwdriver, remove the three mounting screws from the bottom of the set.

(4) Disconnect the recorder plug from the associated jack.

(5) Remove the recorder from the set by sliding it forward at a slight angle, with the left end of the recorder foremost, lifting it by its base, and placing it on a clean work surface.

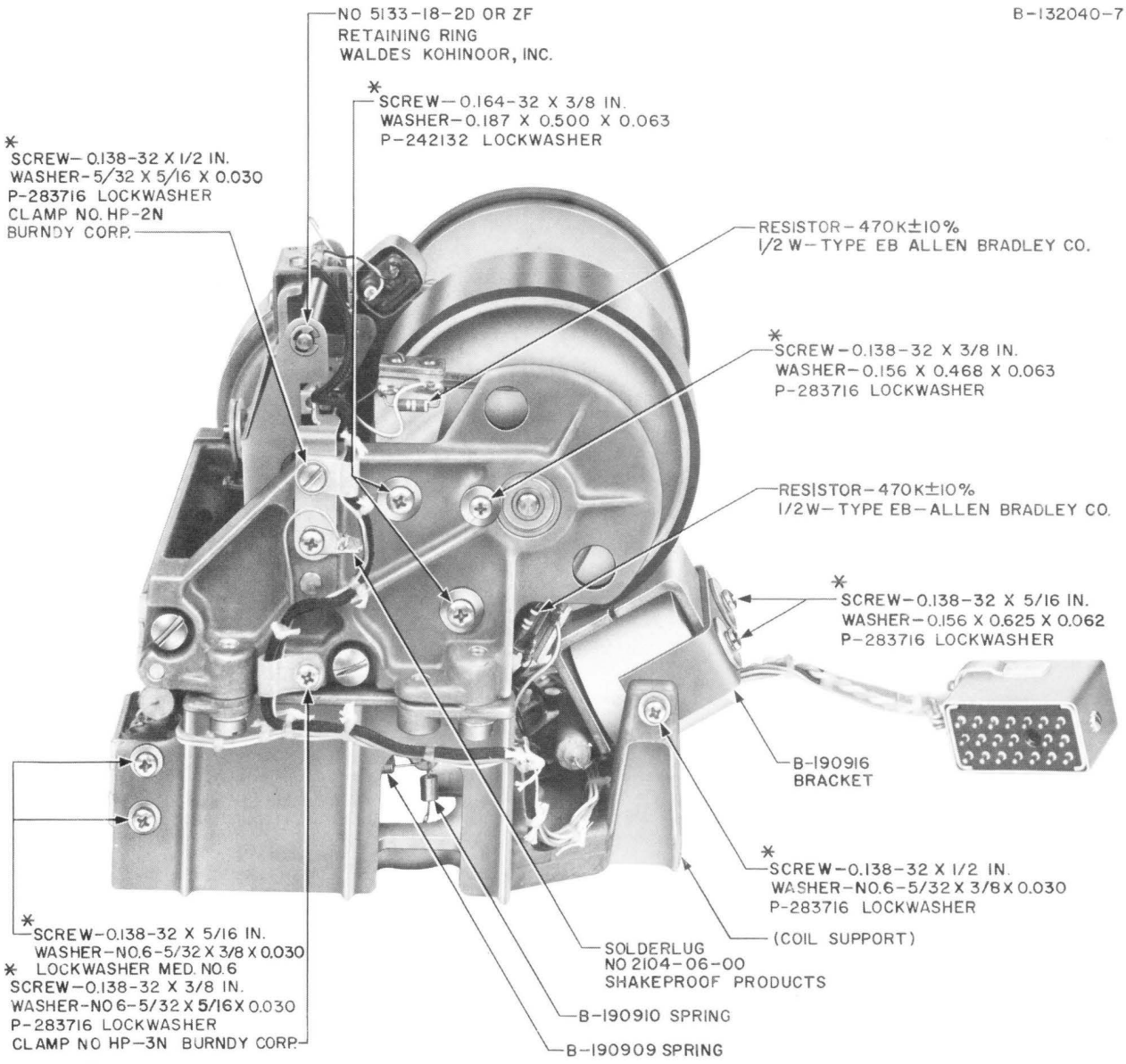


Fig. 8—KS-16765 L3 Recorder—Right Side View

(6) Remount the recorder by reversing the procedure.

(7) Remount the cover by sliding it back so that it engages the clips on the top and bottom of the cover with the top and bottom rear edges of the set chassis.

(8) Tighten the captive screws securely.

3.06 ***Removal and Replacement of Retaining Rings:*** The method used to remove and remount a retaining ring [the following (a), (b), (c), or (d)] is dependent upon the accessibility of the ring and type of ring.

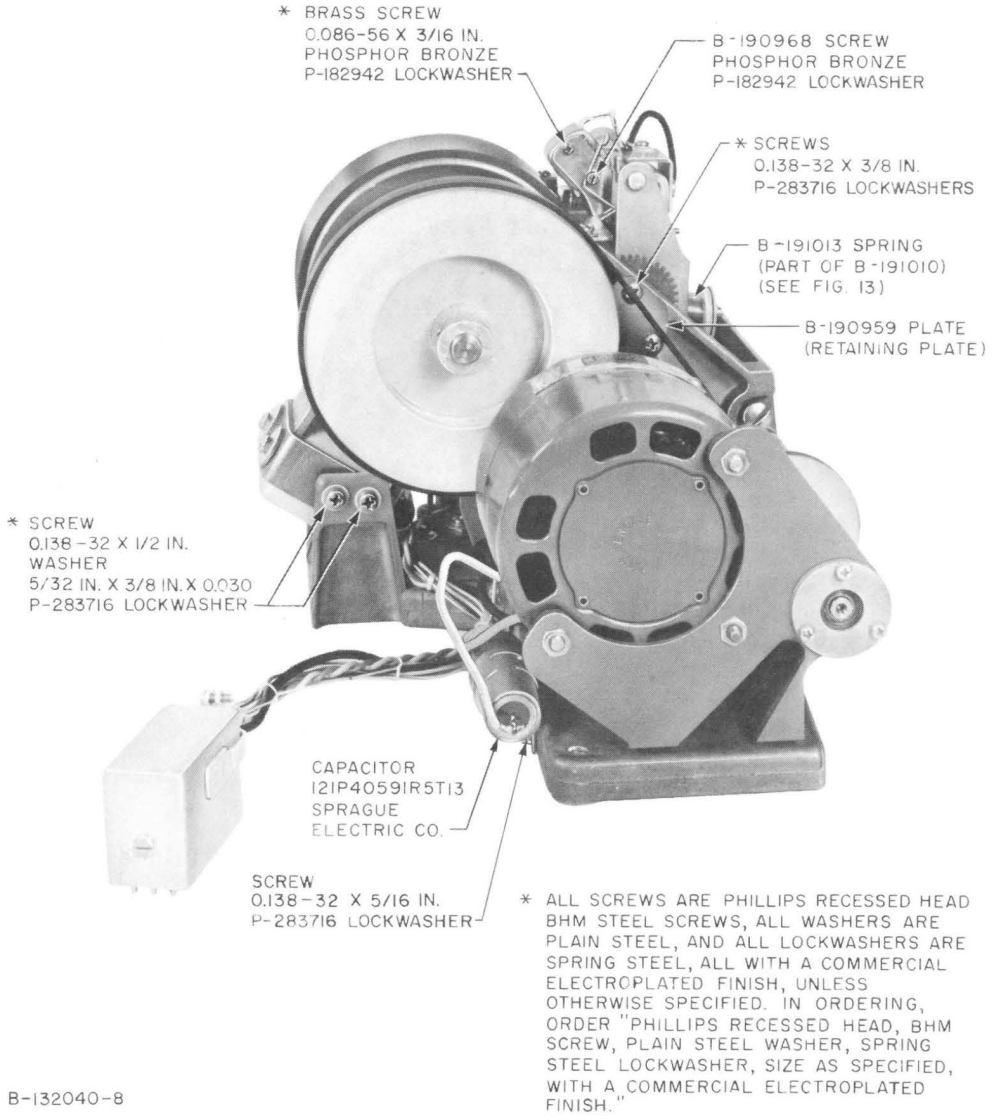


Fig. 9—KS-16765 L3 Recorder—Left Side View

(a) If the retaining ring is the E-type, small, and the associated stud is long enough, the ring may be removed as follows.

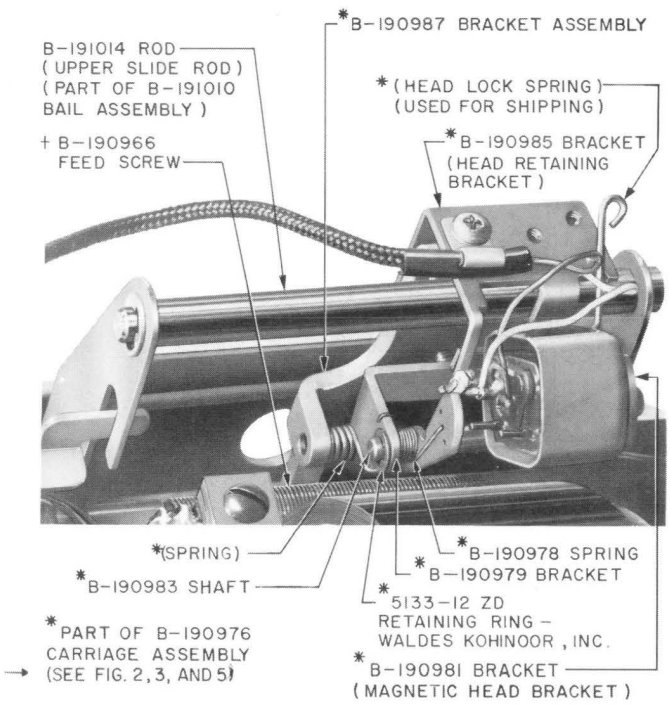
(1) Lay the wide face of a screwdriver on the stud beside the ring at a slight angle so that the corner of the blade is inserted into one of the openings between the ring and the stud.

(2) Keeping the corner of the screwdriver in this opening, twist the screwdriver and spring the ring away from the stud; take care to prevent the ring from flying or being lost.

(b) If the length of the associated stud is too short or the accessibility limited, proceed as follows.

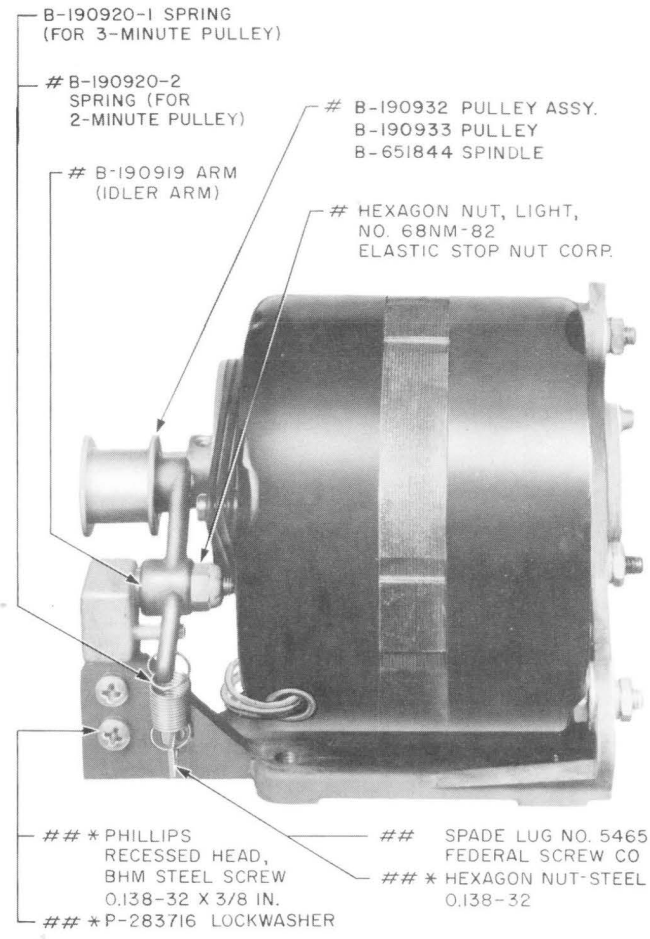
(1) Lay the screwdriver blade flat beside the ring so that its edge is against one or both points of the ring.

(2) Press the screwdriver toward the ring, causing the ring to spring off the stud; take care to prevent the screwdriver from slipping over the ring and damaging adjacent parts.



+ 0.1875 DIA. CORROSION RESISTANT STEEL BALL AT EACH END OF FEED SCREW.

Fig. 10—Details of Carriage Assembly



PART OF B-650683 IDLER ASSEMBLY (SEE FIG. 4) ORDER INDIVIDUAL PART AS REQUIRED

PART OF B-650412 DRIVE ASSEMBLY (SEE FIG. 2 AND 3) ORDER INDIVIDUAL PART AS REQUIRED

* WITH ELECTROPLATED FINISH.

Fig. 11—Details of B-650683 Idler Assembly

(3) 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. To prevent the stud from rotating, grasp the opposite end with the 485A pliers or KS-8511 tweezers as required.

(c) If remounting the E-type retaining springs using the proper Truarc applicator, proceed as follows.

(1) Insert the E-type ring in the recess of the applicator with the points outward.

(2) Mount the ring in the grooved portion of the stud by pushing it in place with the applicator.

(d) If removing and remounting the C-type rings, use the R-2975 adjustable pliers.

3.07 ***Removal and Replacement of Roll Pins:*** The drum, drive gear, feed screw gear, and pulley are pinned to their respective shafts with zinc-plated, carbon-steel roll pins. These pins may be removed and reused as follows.

(1) Determine, if possible, the direction the pin was inserted. This may generally be determined by deformation of the end of the pin caused by impact when it was inserted.

(2) Rotate the part being removed so that the end of the pin opposite the one with deformation is up.

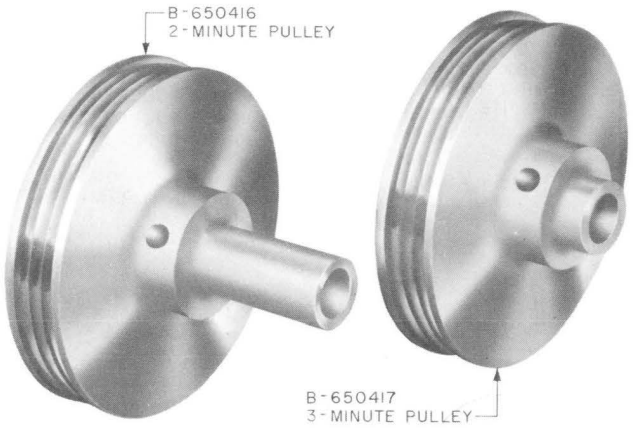


Fig. 12—Drive Pulleys

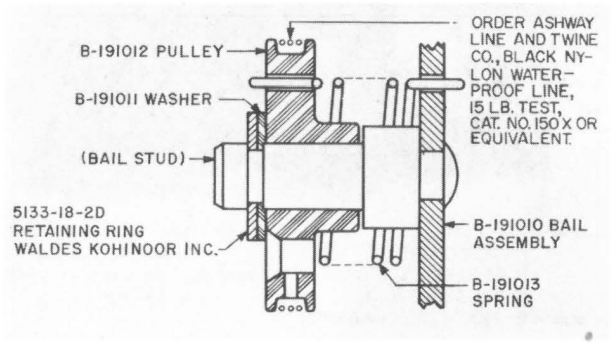


Fig. 13—Pulley and Associated Parts

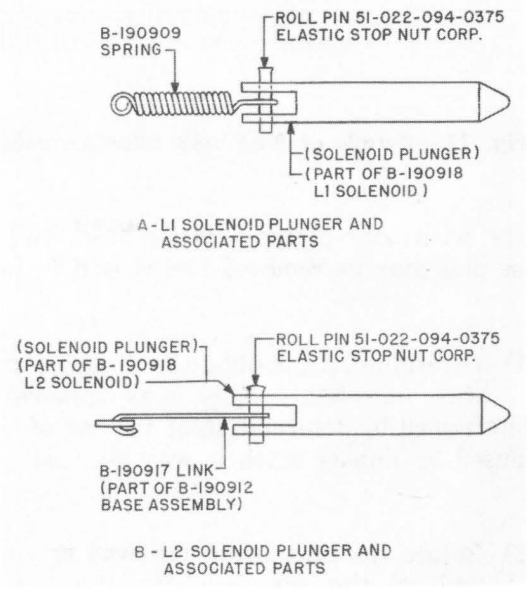


Fig. 14—Solenoid Plungers and Associated Parts

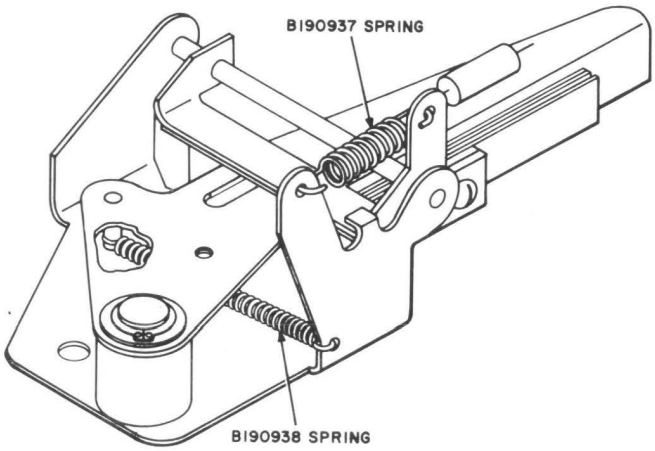


Fig. 15—Details of B-190934 Limit Switch (S1) Assembly

(3) Using the 4-ounce riveting hammer and the proper pin punch (3/32-inch punch for the 0.094-inch diameter roll pin and 1/8-inch punch for the 0.125-inch diameter roll pin), tap the roll pin lightly and drive it out. To avoid damaging parts, support the area under the pin with back-up material.

(4) Replace a roll pin by lining up the hole in the shaft with the hole in the part to be installed.

(5) Insert the end of the roll pin showing the least deformation into the part. Support the area under the pin with the back-up material, and tap the pin lightly using the proper punch and the 4-ounce riveting hammer until fully inserted.

KS-15914 L1 OR L2 MOTOR AND ASSOCIATED PARTS

3.08 *Motor*

(1) Remove the flat drive belt (Fig. 5).

(2) Tag the terminals on the capacitor (Fig. 4) and unsolder the leads.

(3) Unsolder the black ground lead from the motor.

(4) Using the 6-inch B screwdriver, remove the four mounting screws which fasten the motor to the base.

Note: If the replacement part is the B-650412 drive assembly, proceed to 3.10(10) through (13).

(5) Substitute the new motor being sure that the motor is mounted on the isolation grommets of the motor mounting.

(6) Remount the four mounting screws and tighten securely.

(7) Resolder the leads to their respective terminals.

(8) Remount the flat drive belt.

3.09 *Idler Arm and Idler Pulley*

(1) Unhook the idler spring (Fig. 6) from the idler arm.

(2) Using the 474A wrench, remove the hexagon nut (Fig. 11) securing the idler arm on the shaft and remove the arm and pulley assembly.

(3) Using the 3-inch C screwdriver, remove the idler pulley from the idler arm by turning the spindle of the idler pulley counterclockwise.

(4) Replace either the idler arm or idler pulley as required, being sure the lockwasher is between the boss on the idler arm and the spindle of the idler pulley.

(5) Reassemble the idler arm and idler pulley on the shaft; do not tighten the hexagon nut excessively.

(6) Rehook the tension spring to the idler arm, and check the requirements of the flat drive belt (Section 034-354-701).

B-650418 MOTOR AND ASSOCIATED PARTS

3.10 *Motor*

(1) Tag the terminals on the capacitor (Fig. 4) and unsolder the leads.

(2) Unsolder the black ground lead from the motor.

(3) Remove the flat drive belt (Fig. 4).

(4) Using the 6-inch B screwdriver, remove the four screws and lockwashers which fasten the drive assembly (Fig. 3) to the recorder base.

(5) Remove the drive assembly.

(6) Remove the three round drive belts (Fig. 3).

(7) Using the 4-inch B screwdriver, remove the two screws (Fig. 11) which fasten the idler assembly to the motor support and remove the idler assembly.

(8) Using the proper Allen wrench, loosen the setscrew in the collar of the drive pulley and remove the pulley.

(9) Using the 418A wrench, remove the three nuts and lockwashers (Fig. 3) which fasten the motor to the motor support.

(10) Substitute the new motor.

Note: The B-650418 motor has been rated M.D. Use L-517092. (See Caution in 3.14)

(11) Reassemble parts in reverse order of removal [3.10(9) through (1)] being sure to align the grooves in the drive pulley (Fig. 12) with the grooves in the motor shaft and that the round drive belts are parallel with each other.

(12) Solder all the leads to the associated terminals.

(13) Shift the idler assembly as necessary to meet the requirements for the flat drive belt (Section 034-354-701).

3.11 *Idler Arm and Idler Pulley*

(1) Remove the flat drive belt (Fig. 3).

(2) Using the 6-inch B screwdriver, remove the four screws and lockwashers which fasten the drive assembly to the base of the recorder and remove the drive assembly.

(3) Unhook the idler spring from the idler arm.

(4) Using the 4-inch B screwdriver, remove the two screws (Fig. 11) which fasten the idler

assembly to the motor support and remove the idler assembly.

(5) Using the 3-inch C screwdriver, remove the idler pulley from the idler arm by turning the spindle of the idler pulley counterclockwise.

(6) If the idler arm is to be replaced, using the 474A wrench, remove the hexagon nut securing the idler arm on the shaft and substitute the new idler arm.

(7) If the idler pulley is to be replaced, substitute the new pulley being sure the lockwasher is between the boss on the idler arm and the spindle of the idler arm.

(8) Reassemble the parts by reversing the procedures. Shift the idler assembly as necessary to meet the requirements for the flat drive belt (Section 034-354-701).

3.12 *2- or 3-Minute Drive Pulley*

(1) Remove the flat drive belt (Fig. 3).

(2) Using the 6-inch B screwdriver, remove the four screws and lockwashers which fasten the motor drive assembly to the base of the recorder and remove the drive assembly.

(3) Remove the three round drive belts (Fig. 3).

(4) Using the proper size Allen wrench, remove the setscrew from the collar of the drive pulley and remove the pulley.

(5) Transfer the setscrew to the new drive pulley.

(6) Mount the drive pulley and align the grooves in the drive pulley with the grooves in the motor drive shaft.

(7) Reassemble the parts by reversing procedure (1) through (3) being sure that the round drive belts are parallel with each other.

3.13 *Capacitor*

(1) Tag the leads and unsolder the leads from the capacitor terminals.

(2) Using the 4-inch B screwdriver, remove the screw securing the capacitor clamp and remove the clamp and capacitor (Fig. 4).

(3) Mount the new capacitor and solder the leads to the respective terminals.

(4) Check that the motor starts and drum speed requirements are met (Section 034-354-701).

▶L-517092 MOTOR AND ASSOCIATED PARTS

3.14 *Motor*

(1) Tag the terminals on the capacitor (Fig. 4) and unsolder the leads.

(2) Unsolder the black ground lead from the standoff mounted on the casting.

(3) Remove the flat drive belt (Fig. 4).

(4) Using the 6-inch B screwdriver, remove the four screws and lockwashers which fasten the drive assembly (Fig. 2) to the recorder base.

(5) Remove the drive assembly.

(6) Remove the three round drive belts (Fig. 2).

(7) Using the 4-inch B screwdriver, remove the two screws (Fig. 11) which fasten the idler assembly to the motor support and remove the idler assembly.

(8) Using the proper Allen wrench, loosen the setscrew in the collar of the drive pulley and remove the pulley.

(9) Using the 418A wrench, remove the three nuts and lockwashers (Fig. 2) which fasten the motor to the motor support.

(10) Substitute the new motor.

Caution: When the L-517092 motor, which is a 30-volt motor, is used with the B-191263 transformer (located on the announcement set), which is 48-volt transformer, an L-5170921 voltage control module must be used. (Refer to 3.15). The B-191263 48-volt transformer was used on L1 announcement sets up to and including

S/N 39104, and on L2 sets up to and including S/N 34889. Subsequent sets use a 30-volt transformer and are marked with a letter "T" on the nameplate side of the announcement set. A voltage control module is not required with the 30-volt transformer.

(11) Reassemble the parts in reverse order of removal 3.14(9) through (1), being sure to align the grooves in the drive pulley with the grooves in the motor shaft and that the round drive belts are parallel with each other.

(12) Solder all leads to the associated terminals. If an L-5170921 voltage control module is to be installed, refer to 3.15.

(13) Shift the idler assembly as necessary to meet the requirements for the flat drive belt (Section 034-354-701).

3.15 ***Voltage Control Module***

(1) Unsolder the black motor lead from the terminal on the voltage control module.

(2) Unsolder the yellow voltage control module lead from the standoff mounted on the casting.

(3) Using the 418A wrench, remove the nut and two lockwashers holding the voltage control module to the motor support (Fig. 2).

(4) Substitute the new voltage control module.

(5) Reassemble the parts in reverse order of removal [(3) through (1)].

3.16 ***Idler Arm and Idler Pulley*** (Same as 3.11)

3.17 ***2- or 3-Minute Drive Pulley*** (Same as 3.12)

3.18 ***Capacitor*** (Same as 3.13)◀

DRIVE ASSEMBLY AND ASSOCIATED PARTS

3.19 ***Pulley***

(1) Remove the flat drive belt (Fig. 4).

(2) Remove the roll pin from the pulley (3.07).

(3) Substitute the new pulley on the shaft by lining up the hole in the shaft with the hole in the hub of the pulley.

(4) Replace the roll pin (3.07).

(5) Replace the flat drive belt.

3.20 ***Drive Gear, Drum Assembly, Shaft, and Recording Band***

(1) Remove the pulley (3.19).

(2) Remove the roll pins (Fig. 4 and 5) from the drive gear and drum (3.07).

(3) Using the 4-inch B screwdriver, remove the retaining plate from the pulley end of the recorder frame.

(4) Remove the shaft and bearing by pulling the shaft at the pulley end. The shaft is a loose fit in the bearing at the drum end and a press fit in the bearing at the pulley end. The shaft and bearing slides out from the frame.

Note: If the shaft is replaced, the pressed bearing at the pulley end of the shaft must also be replaced.

(5) Substitute a new drive gear, drum assembly, recording band, or shaft as required and reassemble by reversing the procedure.

Note 1: Coat metal drum with KS-21154 L2 flurocarbon polymer solution prior to installation.

Caution: Do not get flurocarbon polymer solution on rubber surface of drum.

Note 2: Coat the surface of the recording band with a thin film of G. E. Silicone SF1147, 200CS.

(6) Before engaging the drive gear and idler gear, align the carriage assembly (Fig. 2, 3, or 5) as follows or refer to (7) for an alternate method for alignment of the carriage assembly.

(a) Remove the drive belt from the drum shaft pulley; disengage the idler gear from both mating gears; and connect a 81A test set or other suitable signaling device across terminals of the S3 switch.

(b) Move the carriage assembly approximately 1/16 inch away from its zero position, and fully engage the half nut and feed screw by pushing the carriage assembly.

(c) Hold these parts engaged; apply central office battery to the L1 solenoid; and check that these parts are now engaged without endplay.

(d) Place the tip of the dial indicator against the right side of the carriage assembly and move the dial indicator until it indicates approximately 0.100 inch.

(e) Slowly turn the feed screw clockwise as viewed from the motor side. Stop turning the instant the indicator needle stops. Note the needle indication. Turn the feed screw counterclockwise approximately one-half a revolution.

(f) Again slowly turn the feed screw clockwise until the indicator needle stops and note the needle indication. If the two needle indications coincide, the carriage assembly is at its zero position and the adjustment can be continued. If indications do not coincide, de-energize L1 solenoid and repeat (b), (c), (d), (e), and (f) until two consecutive identical indications have been attained.

Note 1: The indicator tip must remain in contact with the carriage assembly throughout the procedure in (e) and (f). This can be ensured by making the indicator movement in (d) greater than the carriage assembly movement in (b).

Note 2: The feed screw must be stopped the instant the indicator needle stops. Continued rotation of the feed screw results in an incorrect adjustment.

(g) De-energize L1 solenoid and turn the feed screw approximately 45 degrees clockwise, as viewed from the motor side.

(h) Holding the feed screw in this position, turn the drum counterclockwise, as viewed from the motor side, until the S3 switch is just operated as indicated by the test set.

(i) Holding both the feed screw and drum to prevent turning, reengage the idler gear. To reengage the idler gear with both mating gears, first mesh the idler gear with either the drum gear or feed screw gear. Then rotate the unmeshed gear a maximum of one tooth, as required to mesh with the idler gear.

(j) Check the adjustment by turning drum counterclockwise, as viewed from the motor side, until the test set across S3 switch just operates.

(k) Apply battery to L1 solenoid.

(l) Slowly rotate the drum counterclockwise. The drum should rotate approximately 45 degrees before the carriage assembly moves, as shown by the dial indicator.

(7)→Alternate method for carriage alignment:

(a) Mesh the idler gear with the drive gear and the feed screw gear without locking the spindle tight.

(b) Attach the No. 645 deviation indicator and the RS-18258 holding fixture (Fig. 17) to the L3 casting in a position which allows the indicator plunger to rest against the bail assembly.

(c) Preload the deviation indicator until it reads approximately 0.100 inch.

(d) Start the motor to engage the bail. Once the bail is engaged on the feed screw, there should be a 0.0005 inch or less excursion in the deviation indicator reading. If the excursion is 0.0005 inch or less, proceed to (e) If the excursion is greater than 0.0005 inch, perform the following:

(1) Stop the motor

(2) Loosen the idler gear spindle retaining screw until the gear is free from the main drive gear and the feed screw gear.

Note: Do not disturb the position of the main drive gear.

(3) Turn the feedscrew gear counterclockwise 5 teeth when viewed from the motor side. Then mesh the idler gear with the drive and feedscrew gears without locking the spindle tight

(4) Start the motor to engage the bail and observe the deviation indicator. If an excursion greater than 0.0005 inch still appears, repeat (1) through (3), advancing the feedscrew gear an additional 5 teeth each time until the requirement is met

(e) When the excursion on the deviation indicator is 0.0005 or less, tighten the spindle locking screw and remove the holding fixture and deviation meter.←

3.21 *Idler Gear Assembly*

(1) Using the 541A wrench, remove the hexagon cap screw securing the spindle to the recorder frame.

(2) Remove the gear assembly (Fig. 7).

(3) Replace the gear or spindle as required.

(4) Replace the repaired gear assembly into recorder frame, taking care to mesh the gears and align the carriage assembly [3.20(6)] or [3.20(7)].

(5) Apply a thin film of KS-19139 L4 grease to the gear teeth.

(6) Using the 541A wrench, tighten the hexagon cap screw.

ERASE COIL AND ASSOCIATED PARTS

3.22 *Erase Coil and Bracket*

(1) Using the 4-inch B screwdriver, remove the two screws and washers securing the erase coil to the bracket (Fig. 4).

(2) Using the 4-inch B screwdriver, remove the three screws and washers securing the bracket to the recorder frame and remove the bracket.

(3) If the erase coil is to be replaced, unsolder the leads from the old erase coil and solder them to the respective terminals of the new erase coil.

(4) Remount the erase coil in the bracket, and remount the bracket on the recorder frame.

(5) Adjust to meet requirements (Section 034-354-701).

3.23 *Switches (S2 and S3)*

(1) Tag and unsolder the leads from the switch (Fig. 4 and 6).

(2) Using the 4-inch B screwdriver, remove the screws securing the switch assembly to the recorder.

(3) If S2 switch is replaced, mount so that springs are horizontal.

(4) If S3 switch is replaced, mount so that springs are at an approximate angle of 30 degrees to the vertical.

(5) Resolder the leads to the respective terminals.

SOLENOIDS AND ASSOCIATED PLUNGERS

3.24 *L1 and L2 Solenoids*

(1) Tag and unsolder the connecting leads.

(2) Using the 4-inch B screwdriver, remove the solenoid mounting screws (Fig. 8).

Note: Since the plungers are part of the solenoids, the plungers should be replaced when the solenoids are replaced.

(3) Remount the new solenoid and resolder the connecting leads to the respective terminals.

(4) Position the solenoid to meet the requirements for magnetic head position (Section 034-354-701).

3.25 *L1 Plunger Spring*

(1) Using the 4-inch B screwdriver, remove the L1 solenoid mounting screws (Fig. 8).

(2) Using the 485A pliers, open the loop of the spring connected to the bail assembly and remove the spring and plunger.

(3) Remove the roll pin (Fig. 14A) from the plunger and substitute the new spring.

(4) Replace the roll pin and connect the free end of the spring to the bail assembly (Fig. 8).

(5) Remount the L1 solenoid and check requirements for magnetic head position (Section 034-354-701).

3.26 *L2 Plunger Connecting Link*

(1) Using the 4-inch B screwdriver, remove the L2 solenoid mounting screws (Fig. 8).

(2) Using the 485A pliers, open the hook at the end of the connecting link (Fig. 14B) and disconnect the connecting link from the tab provided on the clamp of the S1 switch assembly.

(3) Remove the plunger and connecting link.

(4) Remove the roll pin (3.07) from the plunger and substitute the new connecting link.

(5) Replace the roll pin and connect the free end of the connecting link to the tab on the clamp of the S1 switch assembly and bend hook closed.

(6) Remount the L2 solenoid and check requirements for the magnetic head position (Section 034-354-701).

CARRIAGE RETURN PULLEY AND ASSOCIATED PARTS

3.27 *Retaining Ring, Washer, Pulley, and Spring (Fig. 13)*

(1) Remove the retaining ring (3.06) and remove the washer.

(2) Remove the tension on the spring by unwrapping the nylon line from the pulley.

(3) Remove the pulley and spring from the bail stud.

(4) Using the KS-8511 tweezers, draw the knotted end of the line out of the face of the pulley.

(5) If knots are not cemented, untie the knots and remove the nylon line from the pulley.

(6) If knots are cemented, replace the nylon line (3.28).

(7) Replace worn or damaged parts as required.

(8) Replace the spring and pulley on the bail stud by inserting the pulley hub into the spring coils.

(9) Insert one end of the spring in the hole in the bail assembly and the other end in the small hole in the pulley.

(10) Replace the washer and replace the retaining ring (3.06).

(11) If there is any excess spring protruding from the pulley face, bend it over against the pulley face.

(12) Assemble the line to the pulley and apply tension (3.28).

3.28 *Nylon Line*

(1) Using the B scissors and the KS-8511 tweezers, remove the old nylon line (Fig. 5).

(2) Tie several knots in one end of the new nylon line to form a large knot.

(3) Insert the other end of the new nylon line into the hole in the pulley face, and draw it through the hole in the groove so that the knot seats in the place provided.

(4) Apply a drop of EC-847 adhesive to the knot and allow to dry.

(5) Rotate the pulley 2-1/4 turns counterclockwise (looking at pulley in the direction of the bail assembly) and, holding this position, wrap the nylon line one turn counterclockwise in the groove of the pulley.

(6) With the carriage assembly in the extreme right position, pass the end of the nylon line through the eyelet in the tab of the carriage assembly twice and pull the line tight without moving the carriage assembly or the pulley.

(7) Tie the nylon line securely at the tab and coat with EC-847 adhesive.

(8) Check that the pulley operates properly by moving the carriage assembly to several positions, one of which is close to zero position, and observe that it moves smoothly and rapidly to the left.

(9) Check that the carriage assembly meets the requirements (Section 034-354-701).

BAIL AND CARRIAGE ASSEMBLY PARTS

3.29 *Magnetic Head and Shield Assembly*

(1) Cover the recording band with a clean KS-2423 cloth for protection from hot solder.

(2) Using the soldering copper, unsolder and unwrap the connections to the magnetic head (Fig. 7).

(3) Note placement of special design screw (Fig. 9). Using the KS-6854 screwdriver, remove the two screws securing the magnetic head and shield assembly to the magnetic head bracket (Fig. 10).

Note: Coat magnetic head with KS-21154 L2 fluorcarbon polymer solution prior to installation.

Caution: Do not get fluorcarbon polymer solution on rubber surface of drum.

(4) Substitute the new part as required.

(5) Position the magnetic head so that the part number is up; remount the magnetic head and shield to the magnetic head bracket; and be sure to place the special design screw as noted in (3).

(6) Take care to keep the heat applied to the terminals to a minimum while soldering; using the soldering copper, resolder the leads to their respective terminals; and wrap one turn of wire around each terminal after soldering.

(7) Adjust the position of the magnetic head (3.30).

3.30 *Positioning Magnetic Head*

(1) With the magnetic head securely mounted, operate the L1 solenoid to place the magnetic head pole pieces in contact with the recording band.

(2) Using the 541A wrench, loosen the locknut (Fig. 2, 3, and 5) securing the magnetic head adjustment screw.

(3) Using the proper size Allen wrench, adjust the position of the magnetic head so that the gap between the pole pieces rests directly on the recording band (Fig. 16A).

(4) Tighten the locknut and release the L1 solenoid.

(5) With the limit switch stop set at the 2- or 3-minute maximum setting as applicable, adjust the magnetic head pole pieces for tangency with the surface of the recording band for the full length of its travel.

Note: The initial adjustment for tangency may be made by visual inspection in order to facilitate final setting for maximum output. Under no conditions shall a visual adjustment alone be considered satisfactory.

(6) Connect the output of the audio oscillator to terminals 9 and 42 on TB1.

(7) Connect the electronic-type voltmeter to J3 and J4 jacks.

(8) Mount the recorder in the announcement set (3.05).

(9) Connect the ac power (115 ±1 volts, 60 Hz) to the announcement set; apply ac power to the announcement set; and allow the set to warm up for approximately 1 minute.

(10) Operate and hold the S4 key (located on the announcement set) to DICTATE through a 2- or 3-minute cycle as applicable. The DICTATE lamp lights at the end of the cycle.

(11) Adjust the output frequency of the oscillator to 3000 Hz and output level to 0.08 V RMS; record this 3000-Hz tone for the full 2- or 3-minute cycle as applicable, or until the S1 limit switch operates.

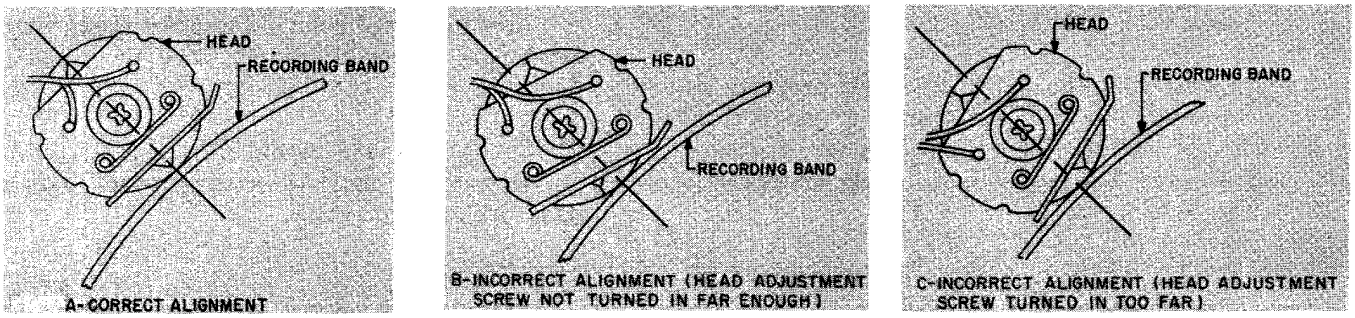


Fig. 16—Position of Magnetic Gap of Recording Head on Recording Band

(12) Turn the oscillator off and operate the S4 key to CHECK.

(13) Using the 541A wrench, loosen the locknut securing the magnetic head adjustment screw.

(14) Reproduce the 3000-Hz tone and, observing the voltmeter indication, turn the magnetic head adjustment screw to produce the maximum indication. The maximum indication may extend over a wide range of adjustment.

(15) Adjust the magnetic head adjustment screw to midposition of the range.

(16) After the proper setting has been obtained, tighten the locknut being sure that the adjustment screw does not turn.

(17) If the output level exceeds 3-dB fluctuation, erase 3000-Hz tone and repeat (10) through (16).

(18) Disconnect the voltmeter and oscillator.

Note: A 3000-Hz signal, if available, is preferable to a 1000-Hz signal because the maximum indication is obtained as a sharp peak. The 1000-Hz signal may be used when making this adjustment if the quality of reproduction is satisfactory.

3.31 ***Magnetic Head Bracket and Associated Parts:*** To replace the magnetic head bracket, head pressure spring, or shaft (Fig. 10), disassemble the parts as follows until the part to be replaced is reached and then substitute the new part and reassemble.

(1) Without unsoldering the leads, remove the magnetic head and shield (3.29).

(2) Remove the retaining ring (on left as shown in Fig. 10) (3.06).

(3) Using the KS-8511 tweezers, unhook the head pressure spring.

(4) Remove the shaft removing parts as encountered.

(5) Remove remaining retaining ring from shaft.

(6) Using the 12E Truarc applicator, mount one of the retaining rings in either groove of the shaft.

(7) Holding the magnetic head bracket in position, insert the end of the shaft through the head retaining bracket from the right side.

(8) Place the head pressure spring on the shaft, and place the shaft through the left side of the head retaining bracket.

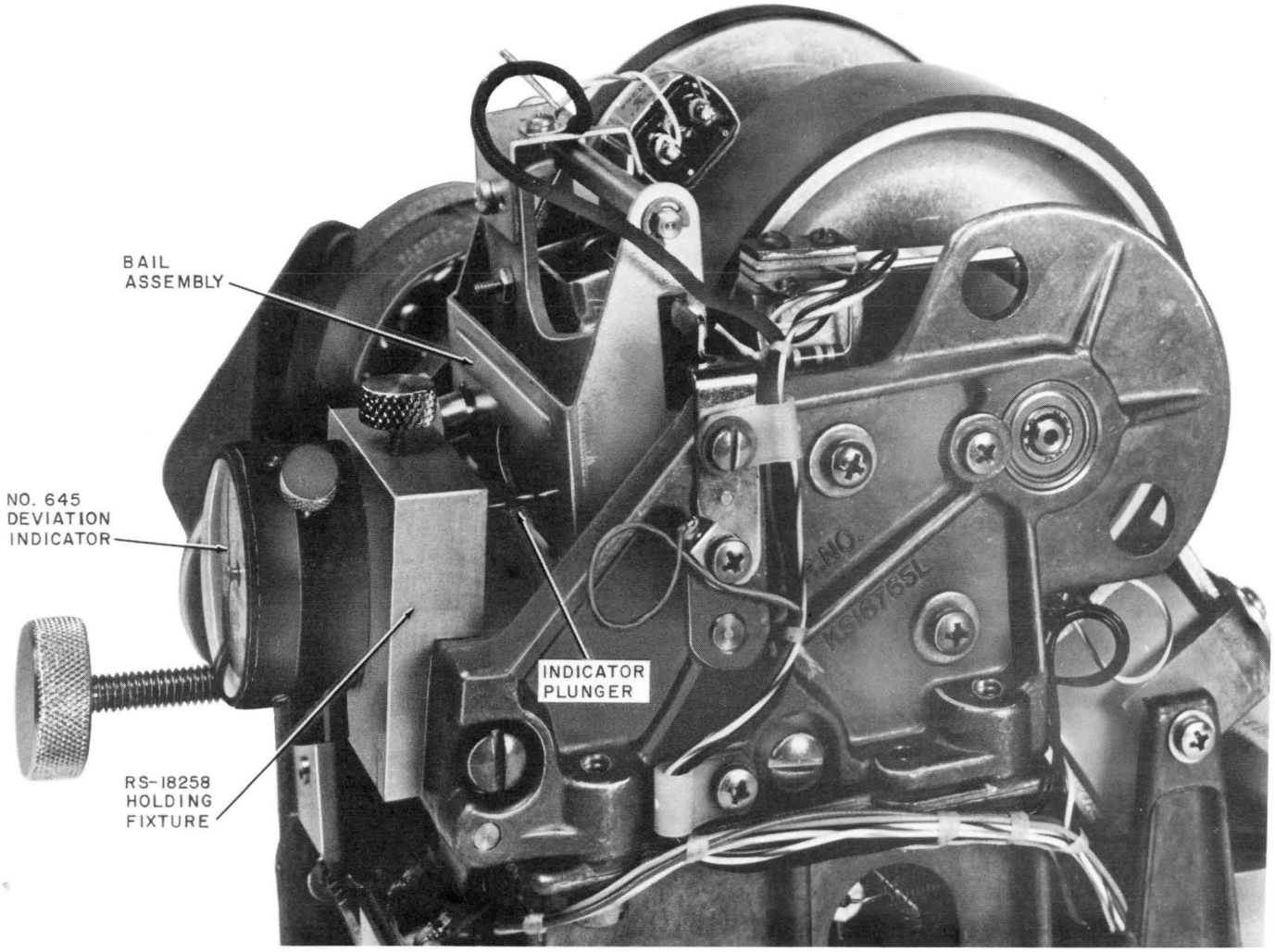


Fig. 17—KS-16765 L3 Recorder—Carriage Alignment Set-up

(9) Using the 12E Truarc applicator, mount the retaining ring in the shaft.

(10) Using the KS-8511 tweezers, hook the head pressure spring in appropriate holes.

(11) Remount magnetic head and shield (3.29).

(12) Check that magnetic head pressure meets requirement (Section 034-354-701).

(13) Adjust the head position (3.30).

3.32 *Magnetic Head Adjustment Screw*

(1) Note the position of the adjustment screw and, using the 541A wrench, remove the locknut (Fig. 2, 3, and 5).

(2) Using the proper size Allen wrench, remove the adjustment screw.

(3) Insert the replacement screw and turn in to the approximate position held by the old screw.

(4) Replace locknut and adjust the position of the magnetic head (3.30).

FEED SCREW, SLIDE RODS, AND ASSOCIATED PARTS

3.33 *Feed Screw Retaining Plates*

(a) Replace the feed screw retaining plate (Fig. 9) as follows.

(1) Remove the drive pulley (3.19).

(2) Using the 4-inch B screwdriver, carefully remove the mounting screws from the plate ensuring not to lose the ball which acts as end bearings.

(3) If necessary, clean the ball with a KS-2423 cloth moistened with KS-7860 petroleum spirits.

(4) Apply a thin film of KS-16326 L1 oil to the ball.

(5) Install the ball and replacement plate; do not tighten mounting screws excessively.

(6) Check that the feed screw rotates freely.

(7) Remount the drive pulley (3.19).

(b) Replace the bail stop (Fig. 7), which also serves as retaining plate for the feed screw as follows.

(1) Using the 4-inch B screwdriver, remove the two mounting screws along with the clamp and soldering lug.

(2) Remove the bail stop, ball, and pressure spring.

(3) If necessary, clean the ball and spring as in (a) and apply a thin film of KS-16326 L1 oil.

(4) Using a KS-2423 cloth moistened with KS-7860 petroleum spirits and a KS-6320 orange stick, clean the recess in the shaft.

(5) Install ball, spring, and replacement part being sure to replace clamp and soldering lug in proper position. Do not tighten the screws excessively.

(6) Check that feed screw rotates freely.

3.34 *Feed Screw, Feed Screw Gear, and Steel Balls*

(1) Check that the bail assembly is in the unoperated position.

(2) Remove the roll pin from the feed screw gear (3.07).

(3) Remove the bail stop and feed screw retaining plate (3.33).

(4) Slide the feed screw (Fig. 10) out of the bearings and remove the feed screw gear.

(5) Substitute replacement parts as required.

(6) Apply a thin film of oil to the feed screw and steel balls and slide it into one of the bearings being sure that the end with the spring is fartherest from drive pulley.

(7) Place the feed screw gear on the feed screw with the hub turned away from the drive pulley.

(8) Place the other end of the feed screw in the bearing and install feed screw plates (3.33).

(9) Replace the roll pin in the feed screw gear (3.07).

(10) Align carriage assembly [3.20(5)].

3.35 *Lower Slide Rod*

(1) Remove the retaining ring (3.06) from the lower slide rod (Fig. 2, 3, and 5).

(2) Using the proper size Allen wrench, loosen the setscrew in the boss of the recorder frame at the left end.

(3) Taking care not to damage the bearings which are pressed in the legs of the carriage bracket, remove the lower slide rod out the drum side of the frame by pushing the opposite end of the rod with the KS-6320 orange stick.

(4) With the grooved end entering last, start the lower slide rod in from the drum end; insert it through the bail assembly, the carriage bearings, and into the boss.

(5) Replace the retaining ring (3.06).

(6) Adjust the lower slide rod to meet requirements for carriage assembly (Section 034-354-701) and tighten the setscrew.

3.36 *Upper Slide Rod*

(1) Remove the retaining ring (3.06) from either end of the upper slide rod (Fig. 8).

(2) Remove the upper slide rod by pulling it out.

(3) Substitute the replacement rod and replace the retaining rings using the 18E Truarc applicator.

BAIL AND CARRIAGE ASSEMBLIES

3.37 *Bail Assembly*

(1) Remove the upper slide rod (3.36).

(2) Untie or cut the nylon line (Fig. 5) on the carriage return tab.

(3) Unhook the bail retractile spring from the bail assembly (Fig. 2 and 3).

(4) Remove the lower slide rod (3.35).

(5) Disengage the bail assembly from the carriage assembly by lifting straight up ensuring not to damage head or wiring.

(6) Remove the upper slide rod from the replacement bail assembly and lower it into place.

(7) Remount the lower slide rod (3.35).

(8) Assemble the upper slide rod (3.36) being careful not to bend or distort the head lifting tab on the carriage.

(9) Rehook the bail retractile spring to the bail assembly.

(10) Connect a new nylon line to the pulley and return tab (3.28).

(11) Check that the recorder meets the requirements (Section 034-354-701).

3.38 *Carriage Assembly*

(1) Without unsoldering the leads, remove the magnetic head assembly (3.29).

(2) Using the 4-inch B screwdriver, remove the clamp holding the magnetic head leads.

(3) Remove the bail assembly (3.37).

(4) Lift the carriage assembly from the recorder being careful not to damage the feed screw threads.

(5) Mount and align the replacement carriage assembly on the feed screw [3.20(5)].

(6) Assemble the bail assembly on the lower slide rod (3.37).

(7) Insert the upper slide rod (3.36).

(8) Remount the magnetic head and the clamp which holds the wires.

(9) Adjust the magnetic head position (3.30).

(10) Check that the carriage and bail assemblies meet requirements (Section 034-354-701).

LIMIT SWITCH AND ASSOCIATED PARTS

3.39 *Limit Switch Assembly*

(1) Without unsoldering the leads, remove the erase coil (3.22).

(2) Using the 4-inch B screwdriver, remove the two limit switch mounting screws.

(3) Remove the limit switch assembly (Fig. 2, 3, and 5), being careful not to damage the plunger or the wiring.

(4) Using the 485A pliers, unhook the connecting link from the switch assembly.

(5) Tag and unsolder the leads on the switch terminals. Retain the resistor.

(6) Using the 485A pliers as required, transfer the plunger and link to the replacement switch assembly.

(7) Transfer and solder the leads and resistor to the proper terminals of the replacement switch assembly.

(8) Remount the switch assembly by inserting the plunger into the solenoid when moving the switch assembly into position.

(9) Using the 4-inch B screwdriver, insert and tighten the limit switch mounting screws.

(10) Remount the erase coil (3.22).

(11) Check that the erase coil, plunger, and limit switch meet requirements (Section 034-354-701).

3.40 *Limit Switch Retractile Spring*

(1) Reduce the tension on the retractile spring (Fig. 15) by operating the L2 solenoid to permit the limit switch to return to its zero position.

(2) Using the KS-8511 tweezers, unhook the stationary end of the spring. The other end of the spring may then be freed from the stud.

(3) Substitute the replacement spring hooking on to the stud first, and hook the other end of the spring into the hole in the bracket.

3.41 *Clamp Retractile Spring*

(1) Using the 485A pliers, remove the end of the clamp retractile spring (Fig. 15) farthest from the solenoid plunger.

(2) Unhook other end of clamp retractile spring from limit switch clamp and remove spring.

(3) Substitute the replacement spring; hook one end into the hole in the limit switch clamp; and insert the other end in the hole on the fixed portion of the bracket.

3.42 *Limit Switch Stop, Tube and Associated Parts*

(1) With the carriage assembly in the extreme left position, manually operate the limit switch clamp to permit the S1 limit switch lever to stop against the zero stop.

(2) Using the proper size Allen wrench, remove the screw holding the calibrated stop (Fig. 2, 3, and 5).

(3) Using the proper size Allen wrench, loosen the setscrew securing the tube.

(4) Slide the parts to the left, removing the tube first and the calibrated stop last.

(5) Substitute the replacement parts.

(6) Insert the short end of the calibrated stop through the hole in the support.

(7) Place the tube on the long end of the calibrated stop and slide it into place.

(8) Secure the calibrated stop in the tube so that the right-hand mark on the calibrated stop is flush with the left face of the tube.

(9) Position the tube so that the calibrated stop just touches the right side of the vertical flange of the limit switch lever.

(10) Do not close the contacts of the limit switch.

(11) Secure the tube in the support.

(12) Loosen the calibrated stop in the tube, and locate the stop so that the extreme left mark is flush with the left face of the tube.

(13) Secure the calibrated stop in this position which is the 2- or 3-minute maximum as applicable.

(14) If required, set stop in accordance with local instructions.