SERVICE INSTRUCTIONS

AUTOLOAD®
FILMOSOUND® 16mm PROJECTOR
(AUTOMATIC THREADING)

Models 1595, 2585, 2590, 2592

(FOR MODELS ABOVE SERIAL NO. 3135000)

BELL & HOWELL

GENERAL SERVICE DEPT.
2230 BRUMMEL PLACE
EVANSTON, IL 60202-3612

PART NO. 74432

PRINTED IN U.S.A.

FACTORY SERVICE RECEIVING ADDRESS

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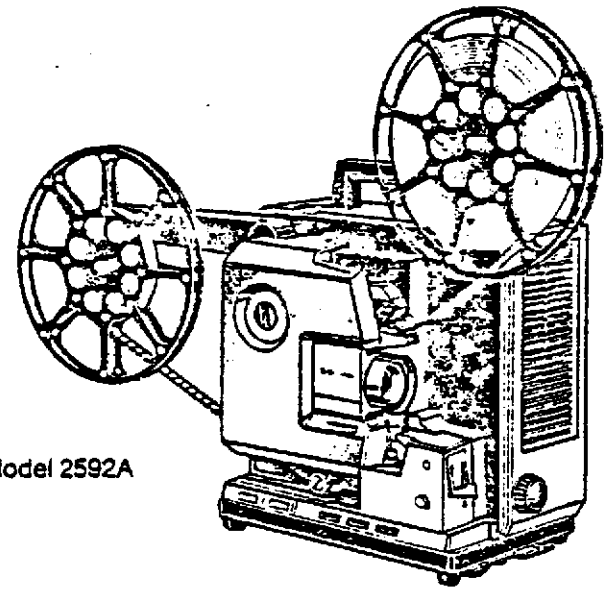
RECOMMENDED SPARE PARTS LIST
FOR REPAIR OF 50

MODEL 1595, 2585, 2590, AND 2592 AUTOMATIC THREADING
16MM SOUND PROJECTORS

REFERENCE: SERVICE MANUAL NO. 74432

PART NO.	DESCRIPTION	QTY
24047	Belt, Take-up	6
34884	Lamp, Exciter, Type BAK	6
44223	Lamp, Projector, Type BHB	2
709679	Belt, Drive	6
710662	Switch, Rotary	2
117172	Fuse, Slo-Blo, 4 amp	6
305792	Fuse, Slo-Blo, 2 amp	6
308638	Fuse, Slo-Blo, 3/4 amp	6
710396	Lamp, Projector, Type ELC	6
710660	Switch, Rotary	2
709107	Motor, Drive	1
015569	Photodiode Assembly	1
015921	Thermal Fuse and Sleeve Assembly	6
077195	PCB Amplifier Assembly	2
077632	Thermal Fuse and Sleeve Assembly	6
078561	Volume/Tone Controls Assembly	1
078577	PCB Amplifier Assembly	2

LIST OF ILLUSTRATIONS



Model 2592A

16mm Automatic Threading Projectors

FEATURE DESCRIPTION LIST

Color (all except 1595A) . . . . . Charcoal gray
Color (1595A only) . . . . . Black
Input Voltage —
2585A/AML 120VAC, 60Hz
2585AX/AXU 120/220/240V, 50/60Hz
2590A, 2592A 120VAC, 60Hz
2592AX/ASX 120/220/240V, 50/60Hz
1595A . . . . . 120 VAC, 60Hz
Film Threading . . . . . Fully automatic

Film Speeds —
Sound . . . . . 24fps in forward and reverse
Silent . . . . . 18fps in forward and reverse

Projector Controls —
1595, 2585, 2590 . . . . . Forward/Reverse
2592AX/ASX . Forward/Reverse/Still-Run
2592A . . . . . Forward/Reverse/Still-Run and Directamotion®

Projection Lamp —
2585, 2592 . . . Type ELC, 24V 250W/50 hr
1595, 2590 . . . . . Type BHB, 120V 250W 25 hr

Projection Lens —
All . . . . . 2 inches (51mm) f/1.2

Shutter —
2585A/AML,
2590A, 2592A . . . . . Rotating three blade
2585AX/AXU,
2592AX/ASX, 1595A . . . . . Rotating two blades

Exciter Lamp . . . Type BAK, 4V/0.75 Amp, 300 hr (approx.)

Amplifier Output . . . . . 20 Watts RMS

Built-In Speaker . . . . . 4" x 6" permanent magnet 16 ohm (overload protected)

Amplifier Controls —
2585, 2590, 1595 . . . . . Volume/Tone
2592 . . . . . Volume/Treble/Bass

Dimensions . . 14-1/4"w x 16"h x 10-1/4"d

Approximate Weight —
2585A/AML . . . . . 33 pounds (15Kg)
2585AX/AXU . . . . . 35.5 pounds (16Kg)
2590A, 1595A . . . . . 29 pounds (13.2 Kg)
2592A . . . . . 34 pounds (15.4Kg)
2592AX . . . . . 36.5 pounds (16.5Kg)
2592ASX . . . . . 39.5 pounds (17.9Kg)

INTRODUCTION

1. GENERAL.

This Service Manual provides the necessary information for the repair and adjustment of the Bell & Howell Company 16mm Automatic Loading Sound Projectors, Models 1595, 2585, 2590 and 2592. Major design and operating characteristics are listed in the Feature Description List on the preceding page. An illustrated Parts Catalog is included at the rear of the manual to identify replacement parts and to assist in the disassembly and reassembly of these projectors.

2. DESCRIPTION OF MODELS.

As noted in the following chart, this manual covers several variations of the basic 2500-series automatic loading projectors. Each model is "letter-coded" in the Parts Catalog so that replacement parts which are not common to all projectors can be readily identified.

MODEL	CODE
2585B	A
2585AML	B
2585AX	C
2585AXU	D
2590A	E
2592A	F
2592AX	G
2592ASX	H
1595A	J

Except for differences in operating voltages (single-line or multi-line) and certain special features, all projector models covered in this service manual are basically identical. The single-line voltage units (suffix letter "A" or "B" in the model designator) operate on 120V AC, 60Hz and are equipped with a line cord that is wired into the projector. The multi-line voltage units (all "AX" models) are equipped with a voltage selector switch which provides a means for varying input voltages (120 - 240V, 50/60Hz) and to match input voltage with those available globally. A male plug is supplied to mate with a female receptacle located on the rear cover for accommodation of global requirements.

Model 2585 AML is a militarized version of the 2585B unit and is further identifiable by two 5 amp Slo-Blo fuses mounted on the top cover. The 2585 AXU and 2592 ASX models are the only projectors in this series that are equipped with a front cover containing speakers.

The sound system control knobs located on the operating side of the base are not the same for all models. The 1595/ 2585/2590 models are equipped with a volume control and a single tone control. All 2592 models are equipped with a volume control and two tone controls; one for treble and one for bass.

All of the 2592 models are designed for "still" projection, however, only the 2592A model is equipped with the Directamotion® (animation) feature. To activate the animation feature place the main switch in the "forward project" or "reverse project" position. Then, with the projector running, place the run/still lever in the "still" position. To advance film frame-by-frame, press and release the animation lever located at the top left corner of the projector mechanism housing. To advance several frames of film (or a length of film at regular projection speed) press and hold the animation lever down. Release the lever to stop film motion. To resume normal film projection return the run/still lever to the "run" position.

3. AUTOMATIC LOADING OPERATION.

The automatic loading system consists of a series of film guides, loopformers and rollers designed to advance and guide the film smoothly and precisely through the film path to the take-up reel. This is accomplished when the system is in the "load" (closed) position. When the system is in the "open" (run) position, all guides are clear of the film path. All projectors are

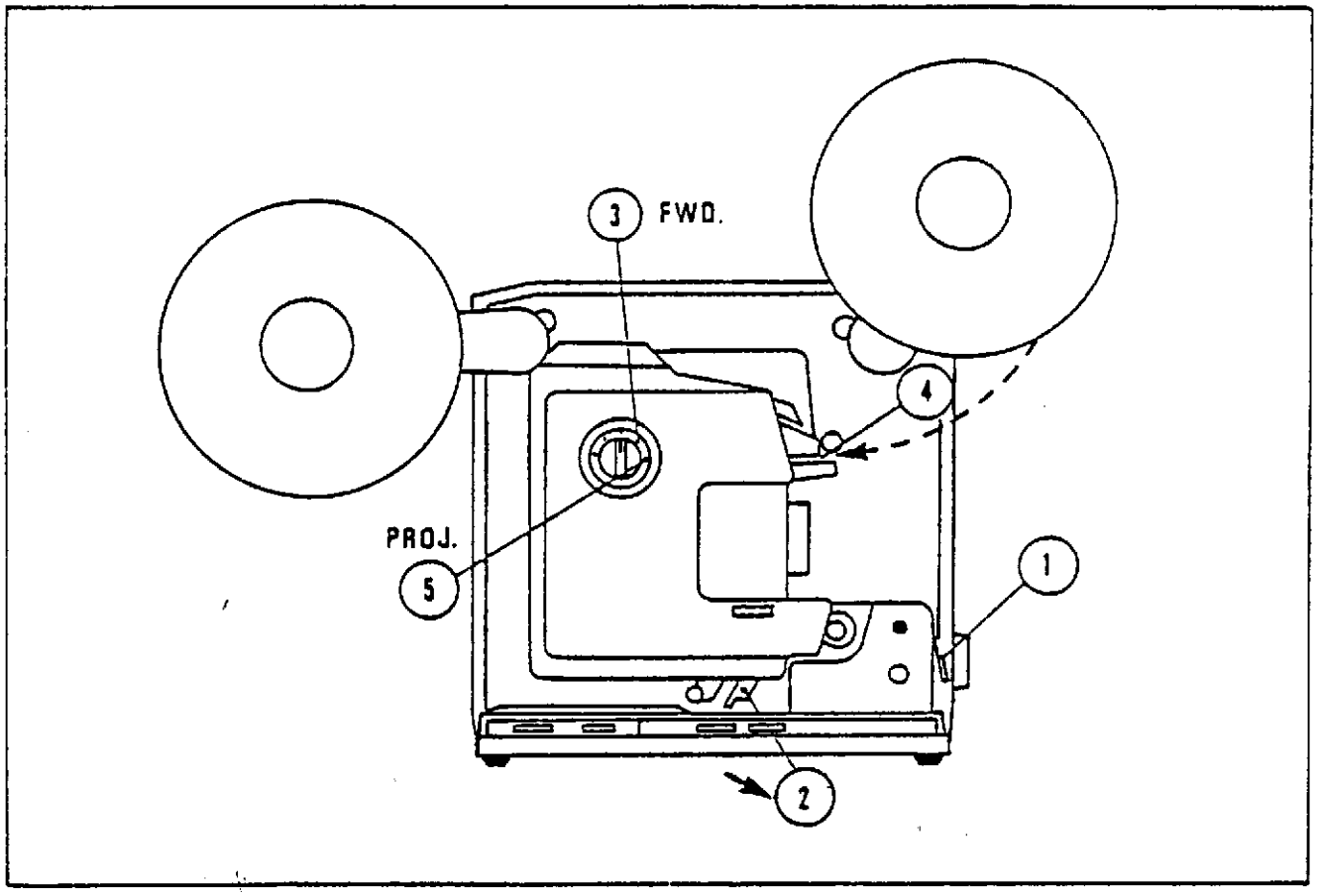


Figure A. Automatic Loading Operation

completely gear-driven, with shifting from forward to reverse accomplished by means of a rocker plate/idler gear arrangement.

The upper and lower guides are connected by a mechanical linkage with a locking lever at the lower end to actuate (close) the system. A film escape mechanism is included at the upper end of the linkage to prevent damage to the film due to jamming. When a film jam occurs, the film will fold and flow out through the kickplate of the escape mechanism until the operator has had an opportunity to stop the projector.

To thread film using the automatic loading system, refer to Figure A and proceed as follows:

Step 1: Check the leader (first three feet of film) for defects. If the film end is damaged or torn, insert it into the film trimmer (1) and trim the end.

Step 2: Push the auto-load lever (2) forward until it locks. (Note: If the projector being threaded is equipped with the still feature, place the run-still lever in the "run" position.)

Step 3: Turn the main switch to the "forward project" position (3).

Step 4: Insert the leader into the film channel under roller (4). Push the leader in until it engages the sprocket and the automatic loading system begins to thread the film. After two feet of leader has passed through the projector, pull lightly on the leader end until a "click" is heard signaling the release of the threading mechanism.

Step 5: Turn the main switch "off." Attach the leader end to the take-up reel and rotate the reel in a clockwise direction to take up film slack.

4. SPECIAL MAINTENANCE PRECAUTIONS.

Before beginning repairs, check specific customer complaints against the trouble shooting charts in this service manual for the most probable causes and suggested remedies. When repairs have been made, be sure to clean and lubricate the projector before it is returned to the customer.

The removal and installation of most projector components can be accomplished with tools normally found in an audio-visual equipment repair shop. Although most wiring connections are made by quick disconnects, a soldering gun should be available for some repairs. Special tools and gages necessary for projector alignments and adjustments are illustrated and listed in Figure B and its accompanying chart. The setscrew wrenches and test films are listed in separate charts and are not shown in Figure B.

Keep your work bench clean and uncluttered. As parts are removed, group them together in an orderly fashion and reassemble attaching parts loosely to the parts they attach. Note or tag electrical wires or connectors so that they can be properly reconnected. If there is any doubt as to the connection of leadwires, refer to the proper wiring diagram at the rear of the Parts Catalog.

5. CLEANING INSTRUCTIONS.

Keep film path areas free of dirt and emulsion build-up; otherwise film jamming may occur during loading operations and projection. Use isopropyl alcohol and the special cleaning pad (P/N 48478) to remove hardened emulsion, and be careful not to scratch the surfaces that contact the film. Pay particular attention to the sound drum and the soundhead rollers.

Use isopropyl alcohol to clean plastic parts and be careful not to remove lubricants from critical areas, especially in the film threading linkage. These lubricants are applied during the assembly of the projector and, in many cases, it would be necessary to partially disassemble the projector to relubricate these parts. Blow away dust and film chips with a low-pressure jet of compressed air and wipe with a soft, lint-free cloth.

If the projector is especially dirty, the transport mechanism should be removed from the mainplate and thoroughly cleaned. Brush or blow out all accumulations of dirt and film chips. Wash "Oilite" bearings and cams with naphtha. If cleaning does not remove old lubricant from the felt wiper and wick, these items should be replaced. Clean all other moving parts with isopropyl alcohol and dry all parts with a low-pressure jet of compressed air. As soon as all parts have been cleaned and dried, apply a light film of the specified lubricants and reinstall the transport mechanism.

6. LUBRICATION INSTRUCTIONS.

The Lubrication Chart in this section indicates those parts and areas requiring lubrication. These are also pointed out in the Parts Catalog illustrations by means of ballooned letters "L" (for oil) and "G" (for grease). Specified lubricants are available from the Bell & Howell Company. Be sure that the part or area to be lubricated is clean before lubricant is applied, and be careful not to over-lubricate. A drop or two of oil or a very light film of grease will be adequate. Apply grease with a camel's hair brush and wipe away excess lubricant with a lint-free cloth.

Felt pads and wicks should be placed in a shallow pan containing the specified grease and allowed to stand until they are completely saturated. Wipe away excess grease before installing these felt parts.

7. GENERAL REPLACEMENT DATA.

These projectors are designed for easy accessibility, removal and replacement of most major components. Routine inspection, trouble shooting and lubrication generally can be accomplished by the removal of the front cover, the rear cover and the two covers located on the underside of the base. Most of the wiring connections

for the major electrical components are made by means of quick disconnect connectors or screw-on wire nuts, thus minimizing unsoldering operations. Wiring connections and leadwire colors are indicated in the wiring diagrams at the rear of the Parts Catalog.

The front cover is easily removed by unlatching the two top cover latches and lifting the cover from the projector. The rear cover is secured to the projector base with three screws and to the end caps with two screws each (see Figure C). When these seven screws have been removed, carefully work the cover free from the projector to the limit of the interconnecting leadwires. The covers on the underside of the base are secured by screws and can be removed to expose the amplifier and its controls.

8. FUSE REPLACEMENT.

a. Single-Line Voltage Models. The amplifier power input circuit and the audio system of these models is protected by a Slo-Blo fuse located adjacent to the rotary switch on the gear side of the mainplate. Remove the projector rear cover (paragraph 11) to gain access to this fuse. Additional protection is provided for the 2585AML units by two Slo-Blo fuses mounted on the top cover of the projector.

b. Multi-Line Voltage Models. The amplifier power input circuit of these models is protected by a Slo-Blo fuse located adjacent to the rotary switch on the gear side of the mainplate. The audio system of these models is protected by three Slo-Blo fuses that are mounted on a fuseboard/support assembly attached to the power transformer assembly. To gain access to all fuses, remove the rear cover as instructed in paragraph 11.

NOTE: Refer to the appropriate schematic wiring diagram in the Parts Catalog for correct values when replacing fuses.

c. All Models. The electrical system of all projectors is protected against accidental overheating by a special thermal fuse. This fuse is installed on the bracket located just above the drive motor. The projector rear cover must be removed (paragraph 11) and the wire nuts disconnected from the fuse leads for replacement.

9. LAMP REPLACEMENT.

a. Projection Lamp. With the line cord disconnected and the front cover removed, swing open the lamphouse cover and press in on the top of the lamp retainer spring to unlock the spring, then swing the spring down to release the tension on the projection lamp. Pull the lamp straight out from its socket (do not twist or wiggle the lamp during removal). Assemble the new lamp into the socket and swing the lamp retainer spring up into place. Close the lamphouse cover and replace the front cover.

b. Exciter Lamp. Disconnect the line cord. Loosen the thumbscrew on the exciter lamp cover and remove the cover. Rotate the lamp release ring until the exciter lamp can be turned and lifted from the lamp socket pins. Install the new lamp in the lamp socket. Then press down on the release ring and rotate to close the ring. Remove fingerprints from the lamp with lens tissue or a lint-free cloth and reinstall the covers.

LUBRICATION CHART

Parts To Be Lubricated	Lubricant	
Non-bearing machined surfaces of castings	Oil P/N 070033	(L1)
Upper sprocket shaft	Oil P/N 04978	(L2)
Framer shaft	Oil P/N 04978	(L3)
Bearing face of worm gear	Oil P/N 04978	(L3)
Lower sprocket shaft	Oil P/N 078215	(L4)
Felt pads	Oil P/N 070032	(L5)
Friction surfaces of all sliding parts (not otherwise specified)	Oil P/N 070032	(L5)
Worm gear and sprocket gear teeth	Grease P/N 070043	(G1)
All other gear and pinion teeth	Grease P/N 070034	(G2)
Reel arm lock buttons	Grease P/N 070034	(G2)
Shuttle link bearings	Grease P/N 070034	(G2)
In-out cam, cam follower and cam wicks	Grease P/N 070034	(G2)
All pivot posts and bearings (in the mechanism housing)	Grease P/N 070034	(G2)
Focus pinion teeth	Grease P/N 713278	(G3)
Lens Carrier bore	Grease P/N 713278	(G3)

MULTI-SPLINE SETSCREW TOOL CHART

TOOL NO.	DESCRIPTION	USED FOR
G1271-F1	Setscrew Wrench and Handle	4-40 multi-spline setscrews
G1271-X2	Setscrew Wrench	4-40 multi-spline setscrews
STK3852-B	Setscrew Wrench and Handle	6-32 multi-spline setscrews
STK3863-B	Setscrew Wrench	6-32 multi-spline setscrews
G165-F1	Setscrew Wrench and Handle	8-32 multi-spline setscrews
G165-X2	Setscrew Wrench	8-32 multi-spline setscrews
G165-F3	Special Setscrew Wrench	For setscrews in wrench handles

TEST FILM CHART

PART NO.	DESCRIPTION	USE
TFL-55 NX1	Test Film Loop	Adjust centering and framing
TFL-37 NX1	Test Film Loop	Check buzz track
TFL-26 NX3	Test Film Loop	Check 7KHz azimuth
TFL-23 NX1	Test Film Loop	Check 400Hz power output
TFL-D1580 NX2	Test Film Loop	Adjust centering and framing
TFR-D550 NX8	Test Film Roll	Final audio/centering/framing
TFS-D550 NX1	Test Film Strip (bad holes)	Check loop restorer function
TFS-D550 NX5	Test Film Strip (elongated holes)	Check loop restorer function

SERVICE TOOLS AND SUPPLIES CHART

Figure B Index No.	Tool No.	Tool Description	Tool Usage
1	S-078175-6 F1	Lamp Plug (ELC Lamp)	Optical system alignment (Fig. Q).
1A	S-1552-1 N1	Lamp Plug (BLB Lamp)	Optical system alignment (Fig. Q).
2	S-550-2 N1	Lens Plug	Optical system alignment (Fig. Q).
3	S-550-2 N2	Alignment Rod	Optical system alignment (Fig. Q).
4	S-550-2 N3	Aperture Plug	Optical system alignment (Fig. Q).
5	P/N 44507	Tension Spring	Optical system alignment (Fig. Q).
6	Make in Shop	Torque Wrench	Adjust rewind torque (para. 38).
7	P/N 710365	Rewind Torque Reel	Adjust rewind torque (para. 38).
	Purchase	Push-Pull Torque Scale (Chatillon #LP-72, Master Gage Co., Chicago, IL 60622)	Adjust rewind torque (para. 38).
8	S-09701-35 N2	Shuttle Height Gage	Check shuttle protrusion (Fig. T).
9	S-550-8 N1	Alignment Tool	Align sound drum (Fig. AC).
11	S-552-1 N1	Timing and Alignment Plate	Timing the sprockets (para. 37).
12	S-552-2 N1	Loop Restorer Roller Gage	Adjusting loop restorer (para. 36).
13	Make from 707588	Decal Removal Tool	Remove decals.
	P/N 70507	Adhesive (A1)	See parts catalog illustrations.
	P/N 70910	Heat Sync Compound (HS)	See paragraph 23.

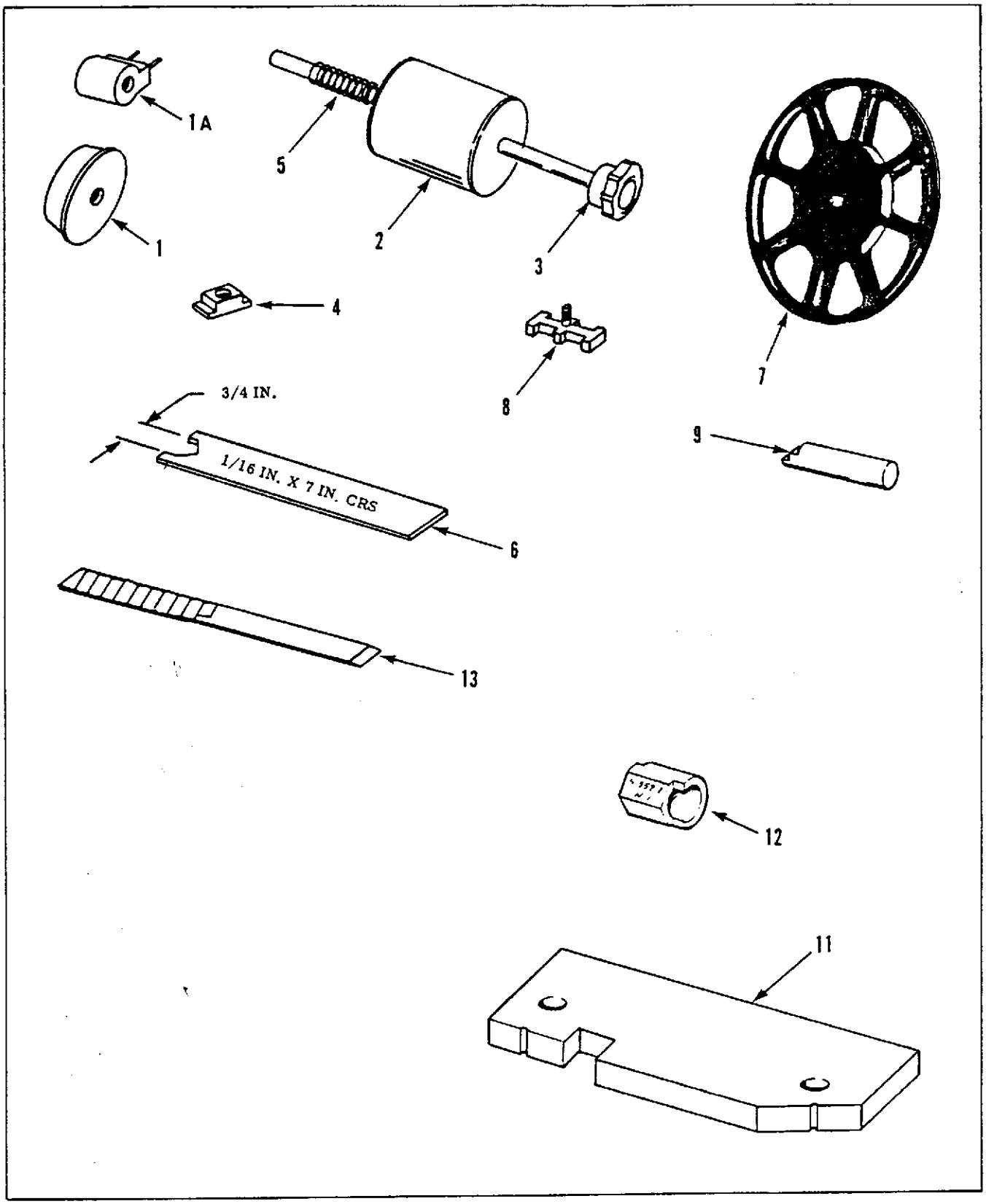


Figure B. Service Tools

DISASSEMBLY/REASSEMBLY PROCEDURES

10. GENERAL PRECAUTIONS.

a. Be sure to use the proper size tools for disassembly and reassembly procedures. After removing attaching parts (screws, nuts, etc.), loosely assemble these parts to the removed component or to the tapped holes in the major casting to prevent their loss.

b. Cemented or adhesive-backed parts are so noted in the parts lists and can be removed by carefully prying up one edge with a decal removal tool. Be careful not to scratch surrounding areas and remove traces of old adhesive with solvent before installing new labels or nameplates. If the new item is to be cemented in place, use Bell & Howell Company P/N 70507 cement. If the new item is adhesive-backed, peel off the protective tissue and smooth the item in place.

c. When disconnecting leadwires prior to the removal of electrical components, tag the leads or make a rough sketch of more complicated connections to assist in reinstallation. Where unsoldering is necessary, use a soldering gun and a heat sink to avoid the transfer of heat to adjacent parts. Leadwire colors and connections are shown in the wiring diagrams at the rear of the Parts Catalog section.

d. When removing riveted parts for replacement, drill out the old rivets with a drill equal in size or slightly smaller than the diameter of the rivets. Use screws and nuts of corresponding size to attach the replacement part, making sure that these parts do not interfere with the proper operation of the equipment.

e. The instructions contained in this section are limited to the replacement and/or repair and adjustment of major projector components. If further disassembly is required, refer to the Parts Catalog section for a more complete breakdown. All parts listings are arranged in a suggested order of disassembly to assist service personnel in the removal and replacement of worn or damaged parts.

11. PROJECTOR REAR COVER REMOVAL (Figure C).

The lower end of the rear cover is secured to the base of the projector with three screws and to each end cap with two screws. When these seven screws have been removed, the rear cover can be carefully pulled away from the projector base and end caps to the limit of the interconnecting leadwires. Normally, this will be enough to expose all projector mainplate and base-mounted components for inspection, cleaning, lubrication and parts replacement. If it is necessary for the rear cover to be completely removed, all leadwires to the rear cover components must be disconnected. When reinstalling the rear cover, be sure that no leadwires have become caught and that the cover is fully seated before installing the mounting screws.

12. DRIVE BELT REPLACEMENT.

a. Remove the projector rear cover (paragraph 11), top cover (paragraph 13) and rear end cap (paragraph 15, step b).

b. If the drive belt is badly worn and in need of replacement, cut the old belt and remove it from the projector. Unplug the motor lead connector. Loosen the screw at the upper end of each motor bracket strap and disengage the straps from the motor mounting bracket. Remove the four screws that secure the motor brackets to the projector base and raise the motor just enough to permit the new belt to be passed around the motor toward the blower. Be careful not to lift the motor so high as to damage the blower fan. Clean both belt pulleys with isopropyl alcohol and loop the belt around the pulleys with as little stretching as possible. Reassemble the bracket straps to the

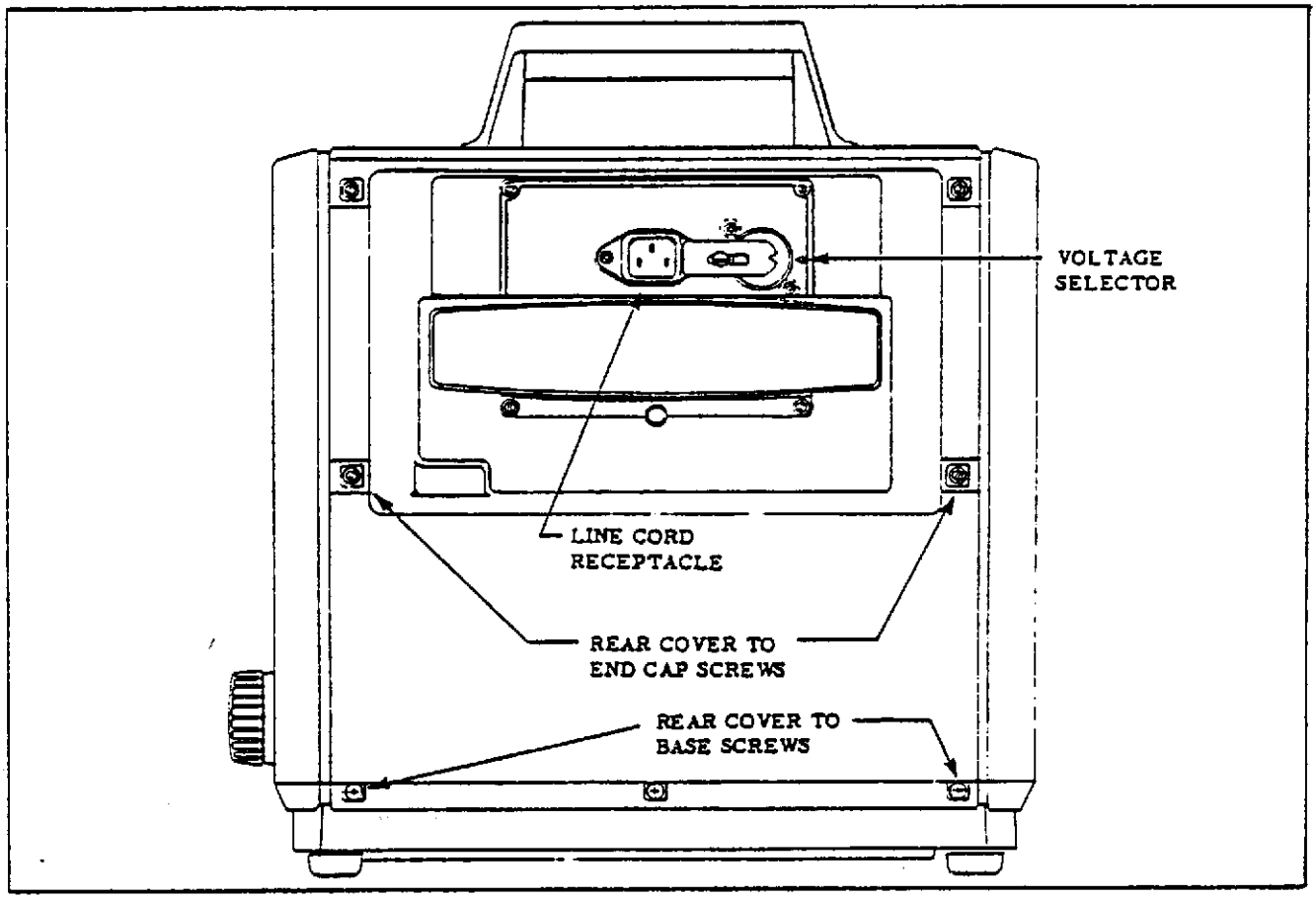


Figure C. Projector Rear Cover (Multi-Line Voltage Models Shown)

motor brackets and tighten the screws securely. Secure the motor mounting brackets to the projector base with the four screws and reconnect the motor lead connector. Reinstall the rear end cap and projector covers.

13. PROJECTOR TOP COVER AND HANDLE REMOVAL (Figure D).

Remove the rear cover (paragraph 11). The top cover is secured by two screws which are inserted through the upper sides of the mainplate and threaded into tapped mounting brackets on the underside of the top cover (see Figure D). Remove these two screws and lift the top cover from the projector. To replace the carrying handle, the two handle screws and cover mounting brackets must be disassembled from the top cover.

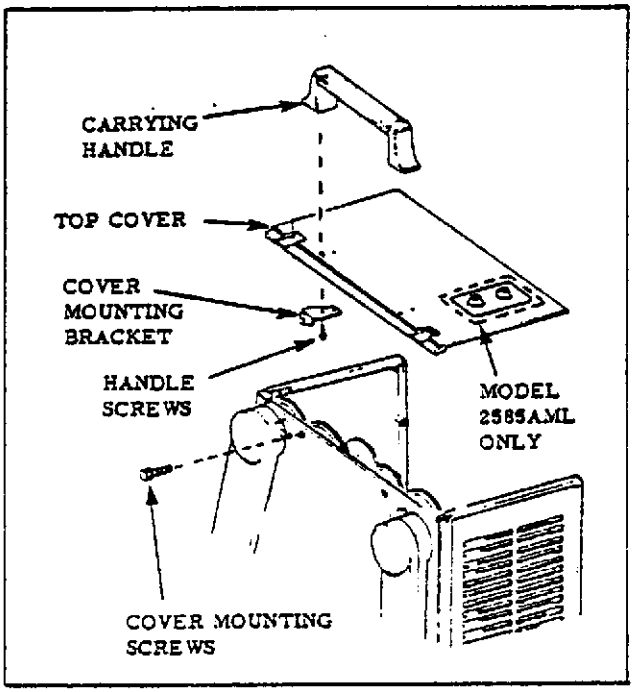


Figure D. Removing Top Cover and Handle

14. INTERNAL SPEAKER REPLACEMENT (Figure E).

The internal speaker is mounted to the front end cap and can be removed without disassembling the front end cap from the projector. Remove the rear cover (paragraph 11) to expose the speaker, and disconnect the two leads from the speaker terminals. Remove the four speed nuts from the mounting studs in the end cap and lift the speaker out from the projector. Reinstall the speaker in reverse fashion, pressing the leadwire lug connectors firmly in place on the speaker terminals. Redress any leadwires which may have been disturbed during speaker removal.

15. END CAP REMOVAL (Figure E).

If it should become necessary to remove the front or rear end caps from the projector, either for replacement or to gain access to other components, proceed in the following manner.

a. Front End Cap. Remove the rear cover (paragraph 11) and top cover (paragraph 13) from the projector. Disconnect the leadwires from the internal speaker terminals and tip the projector so that the underside of the base is exposed. Rotate the tilt knob until its setscrew is visible through the cutout in the collar surrounding the tilt knob. Loosen this setscrew and withdraw the tilt knob. Disassemble the screw and washer from the tilt bar assembly and from the projector rubber foot and remove these parts from the base. Remove the two screws that are inserted through the base and threaded into the lower Tinnerman nuts assembled to the underside of the end cap. Remove the two screws that are inserted through the mainplate and threaded into the Tinnerman nuts assembled to the front edge of the end cap. Reinstall the end cap in reverse fashion and reconnect the speaker leads to the speaker terminals. Reassemble the top and rear covers to the projector.

b. Rear End Cap. Remove the rear cover (paragraph 11) and top cover (paragraph 13) from the projector. Tip the projector so that the underside of the base is exposed and remove the two screws that are inserted through the base and threaded into the lower Tinnerman nuts assembled to the underside of the end cap. Remove the two screws that are inserted through the mainplate and threaded into the Tinnerman nuts assembled to the front edge of the end cap. If the rear end cap is to be replaced, move the end cap far enough away from the projector so that the leadwires to the end cap receptacles can be disconnected. Reinstall the end cap in reverse fashion, making certain that all leadwires are properly connected.

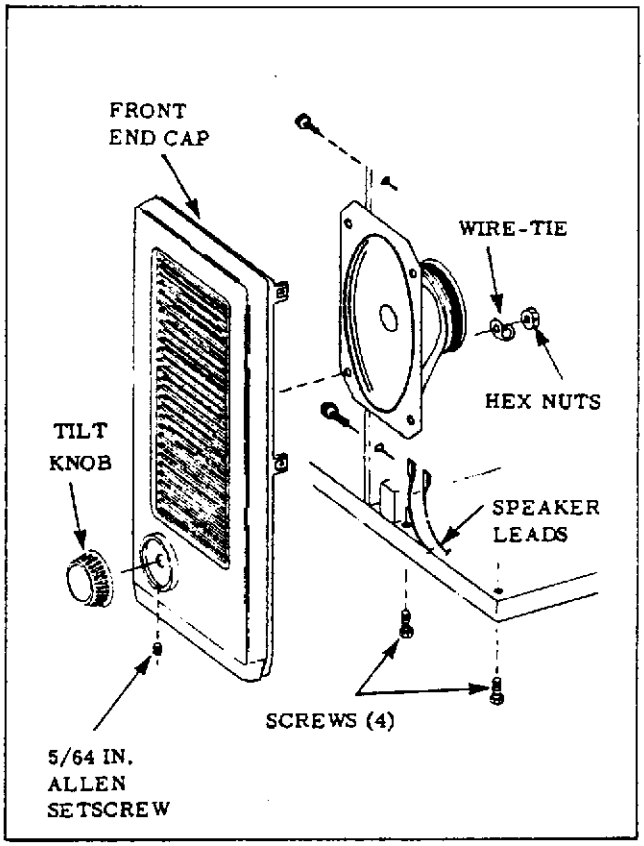


Figure E. Front End Cap and Speaker Removal

16. BLOWER REPAIRS (Figure F).

a. Remove the rear cover (paragraph 11), top cover (paragraph 13) and the rear end cap (paragraph 15, step b) from the projector. Move the covers far enough away from the projector to clear the blower housing without placing strain on the interconnecting leadwires.

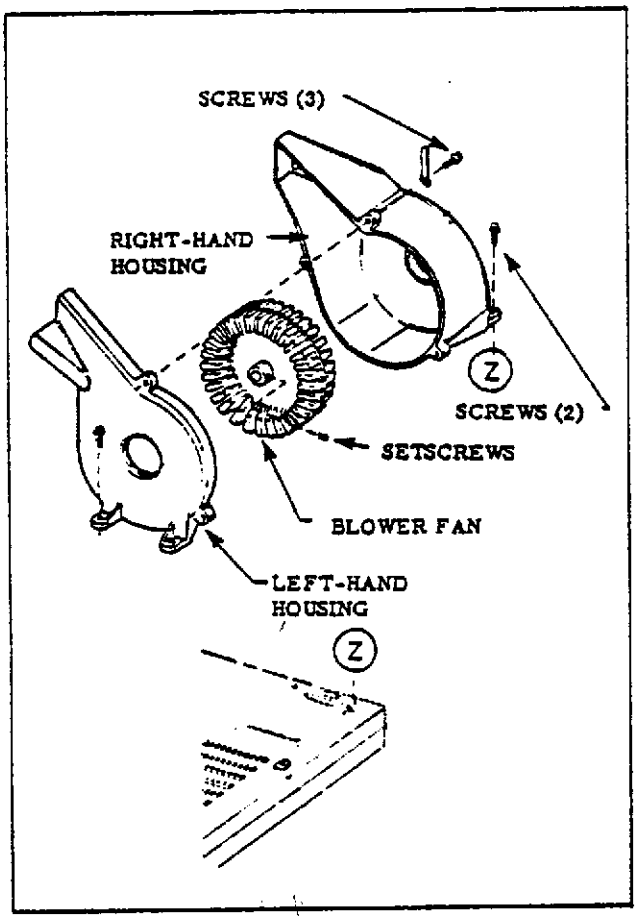


Figure F. Blower Repairs

b. The right-hand blower housing is attached to the left-hand housing with three screws and to the projector base with two screws. Remove these five screws and separate the two housings to expose the blower fan. If the blower fan is to be replaced, loosen the two setscrews and disassemble the blower fan from the motor shaft.

c. When reassembling the blower assembly, it is important that the fan be positioned so as not to strike against the two housings. Assemble the new fan to the motor shaft. Press the motor shaft to the left (to remove end play) and tighten the setscrews just enough to hold. Assemble the right-hand housing and hold in mounted position (screw holes aligned) while spinning the fan. Reposition the fan as necessary until there is clearance between the fan and both housings; then tigthen both setscrews securely.

d. Install the five housing mounting screws and check to make certain that all leadwires are properly dressed. Reassemble the rear end cap and projector top and rear covers.

17. MAIN SWITCH REPLACEMENT (Figure G).

Remove the rear cover (paragraph 11) from the projector to expose the switch. Swing open the lamphouse and remove the switch knob and grip ring from the front end of the switch shaft. Unscrew the lock nut that secures the switch to the mounting bracket. Withdraw the switch from the bracket, catching the lock nut and lockwasher as they become free.

NOTE: Model 2585 AML has capacitors wired across the switch terminals (see inset, Figure G) which must be disconnected from the old switch and reconnected to the replacement switch. Be sure to include the insulating sleeving on the capacitor lead to the fuseholder above the switch.

Insert the shaft of the new switch through the hole in the bracket and assemble the lockwasher and lock nut to the shaft before inserting it through the mainplate. Slide the lockwasher up against the switch boss and tighten the lock nut securely. Assemble the grip ring and switch knob to the end of the switch shaft and close the lamphouse. Reinstall the projector rear cover.

18. DRIVE MOTOR REPLACEMENT (Figure H).

Remove the projector rear cover (paragraph 11), top cover (paragraph 13) and rear end cap (paragraph 15, step b) and disconnect the motor leads. Remove the blower right-hand housing and blower fan (paragraph 16). Loosen the screw in the upper ears of each motor bracket strap and disengage the straps from the tongues of the mounting brackets. Remove the two screws from the left-hand mounting bracket only and slide the motor and bracket forward and out of the projector, while disengaging the drive belt from the motor

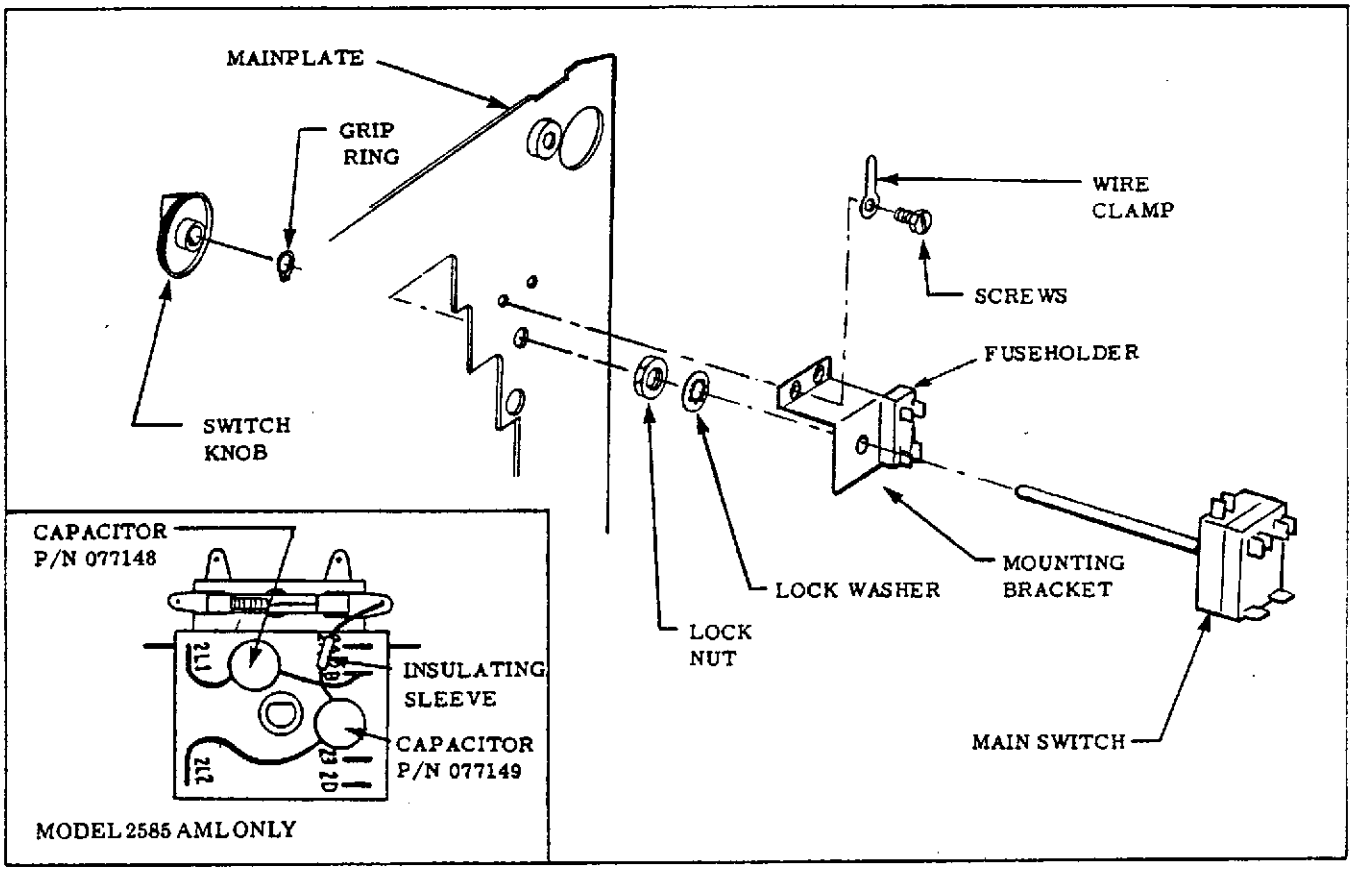


Figure G. Replacing the Main Switch

pulley. If the motor is to be replaced, remove the pulley from the motor shaft. Assemble the new motor and left-hand bracket to the projector base, with the pulley loosely installed on the motor shaft, and the drive belt looped around the pulley. Rest the motor end bell in the cradle of the right-hand mounting bracket and position the left-hand bracket so that the mounting screws can be installed. Assemble the motor bracket straps to the end bells and mounting bracket ears and tighten the strap screws. Insure that the thermal fuse and sleeve assembly is properly positioned and retained against the motor. Reassemble the right-hand blower housing and blower fan to the motor shaft (paragraph 16). Position the drive pulley so that the drive belt is perpendicuar between drive pulley and mechanism pulley. Then tighten the two pulley setscrews securely and reconnect the motor leads. Replace the rear end cap and projector top and rear covers.

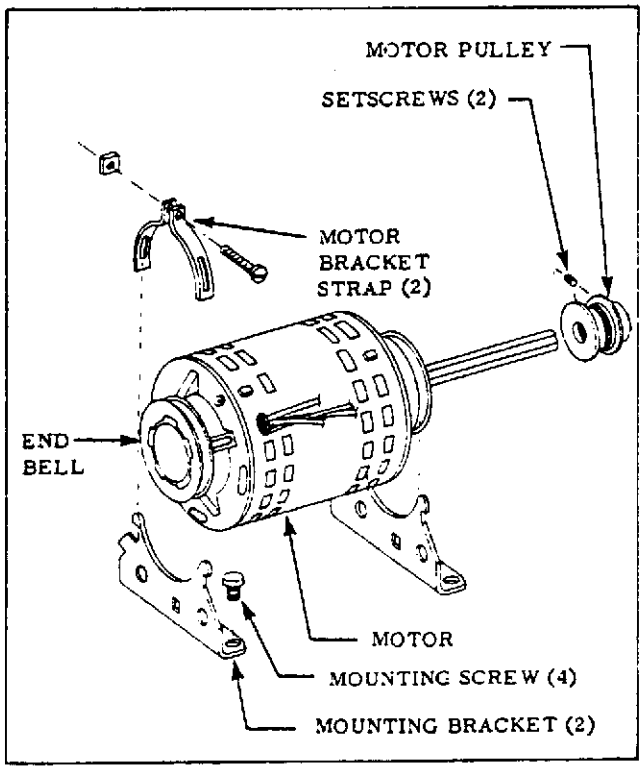


Figure H. Replacing the Drive Motor

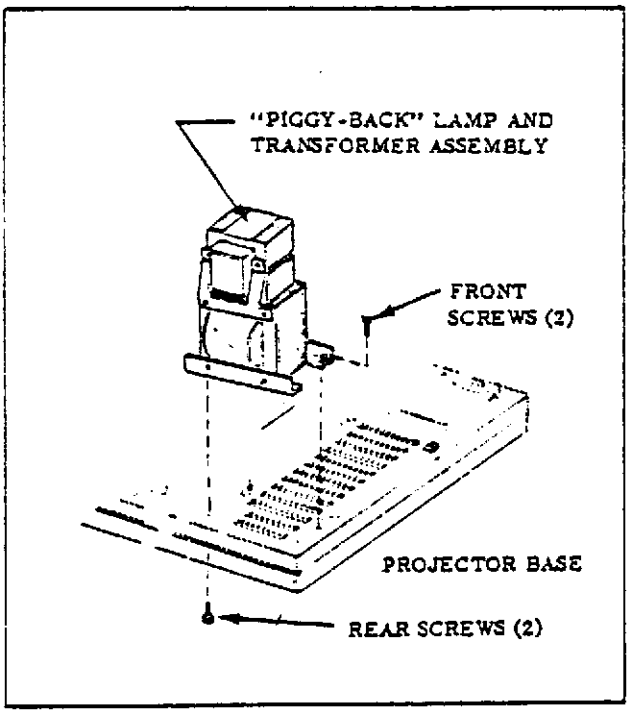


Figure J. Replacing the Transformer (Single-Line Voltage Models Shown)

19. TRANSFORMER REPLACEMENT (Figure J).

a. Single-Line Voltage Models. Although the 2585/2592 units are equipped with a "piggy-back" power and lamp transformer and the 1595/2590 units are equipped with a power transformer only; transformer replacement procedure for all single-line voltage units is the same. To gain access to the transformer, remove the rear cover (paragraph 11), top cover (paragraph 13) and rear end cap (paragraph 15, step b). To replace the transformer, first remove the two screws closest to the mainplate installed from the underside of the projector base. Then remove the two remaining screws installed from the top of and down into the left-hand and right-hand transformer brackets into the projector base. See Parts Catalog Figures 9A and 9B if further breakdown of the transformer is required. Reinstall the transformer by reversing the removal procedure. Refer to the appropriate wiring diagram in the Parts Catalog for proper wiring connections. Replace the rear end cap and projector covers.

b. Multi-Line Voltage Models. These models are equipped with a power transformer only. To replace the power transformer remove the rear cover (paragraph 11), top cover (paragraph 13) and rear end cap (paragraph 15, step b). Next remove the four screws that are installed from the top of the transformer mounting bracket and down into the projector base. Remove the two hex nuts to disassemble the fuseboard support from the transformer. Reverse the removal procedure to reinstall the transformer. Refer to the appropriate wiring diagram in the Parts Catalog for proper wiring connections. Replace the rear end cap and projector covers.

20. REAR REEL ARM REPLACEMENT (Figure K).

a. Remove the projector rear cover (paragraph 11) and top cover (paragraph 13) and disassemble the retaining rings, gear and washer from the rear reel arm shaft. Note the manner in which the reel arm disc is oriented in regard to the mainplate. Remove the three screws and disassemble the disc and reel arm from the mainplate. The lock button and its spring will "pop" from position when the reel arm is removed. Be careful not to lose these parts. The lock button cup may be removed by applying finger pressure to the cup from the gear side of the mainplate.

NOTE: If further reel arm repair is required, refer to Parts Catalog Figure 12 for a complete breakdown of reel arm parts. When reassembling the reel arm, be sure to maintain a backlash of 0.005 to 0.018 inch (0.127mm to 0.460mm) between the upper face gear and its mating spur gear.

b. Apply a light film of grease (B&H P/N 070034) to the mounting flange of the reel arm and around the reel arm hole in the mainplate. Assemble the tension spring to the shaft of the lock button and insert the button shaft into the small hole adjacent to the reel arm hole. Depress the button while assembling the reel arm to the mainplate. With the reel arm in the "down" position, release the button and assemble the reel arm disc to the reel arm shaft. Install the three disc mounting screws and tighten to 14 inch-pounds. Manually depress the

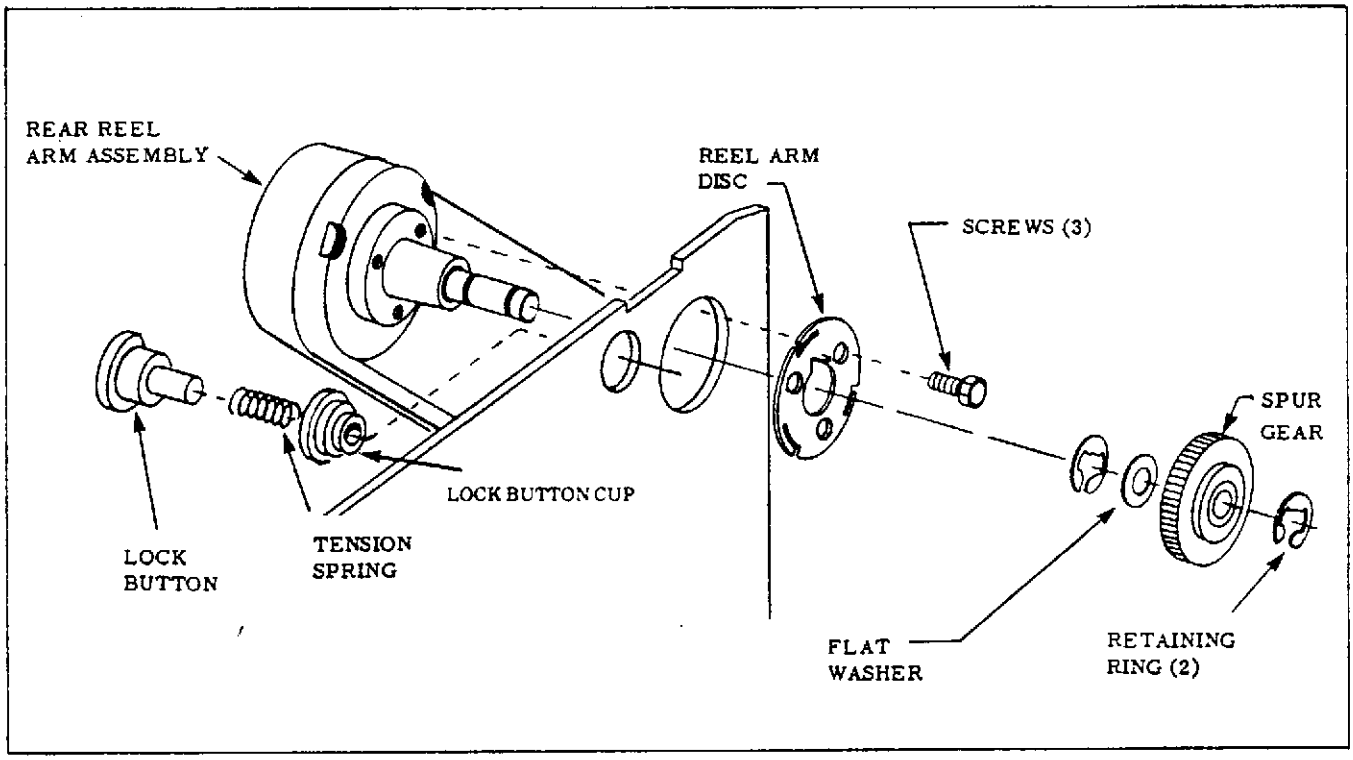


Figure K. Replacing the Rear Reel Arm

lock button and raise and lower the reel arm to check for freedom of movement. Assemble a retaining ring, flat washer and spur gear to the reel arm shaft and secure these parts with the second retaining ring. Lightly brush the gear teeth with grease and manually rotate the spur gear to check engagement with the mating idler gear. There should be a barely perceptible amount of backlash between gears.

21. FRONT REEL ARM REPLACEMENT (Figure L).

a. Remove the projector rear cover (paragraph 11). Note the manner in which the clutch gearing is assembled to the reel arm shaft. Remove the retaining ring and disassemble the gearing from the reel arm shaft. Note the manner in which the reel arm disc is oriented in regard to the mainplate. Remove the three disc screws and disassemble the disc and reel arm from the mainplate. Be careful not to lose the lock button and spring when they "pop" from place. The lock button cup may be removed by applying finger pressure to the cup from the gear side of the mainplate.

NOTE: If further reel arm repair is required, refer to Parts Catalog Figure 11 for a complete breakdown of reel arm parts. When reassembling the reel arm be sure to maintain a backlash of 0.005 to 0.018 inch (0.127mm to 0.460mm) between the upper face gear and its mating spur gear.

b. Apply a light film of grease (B&H P/N 070034) to the mounting flange of the reel arm and around the reel arm hole in the mainplate. Assemble the tension spring to the shaft of the lock button and insert the button shaft into the small hole adjacent to the reel arm hole. Hold the lock button in while assembling the reel arm (in "down" position) to the mainplate; then release the button. Assemble the reel arm disc to the reel arm shaft. Install the three disc mounting screws and tighten to 14 inch-pounds. Assemble the rewind gear to the shaft with the square hole in the gear hub engaging the square retaining clip. Assemble the clutch gear and the bearing assembly to the reel arm shaft, turning the spring leg of the bearing assembly and engaging it between the pins of the

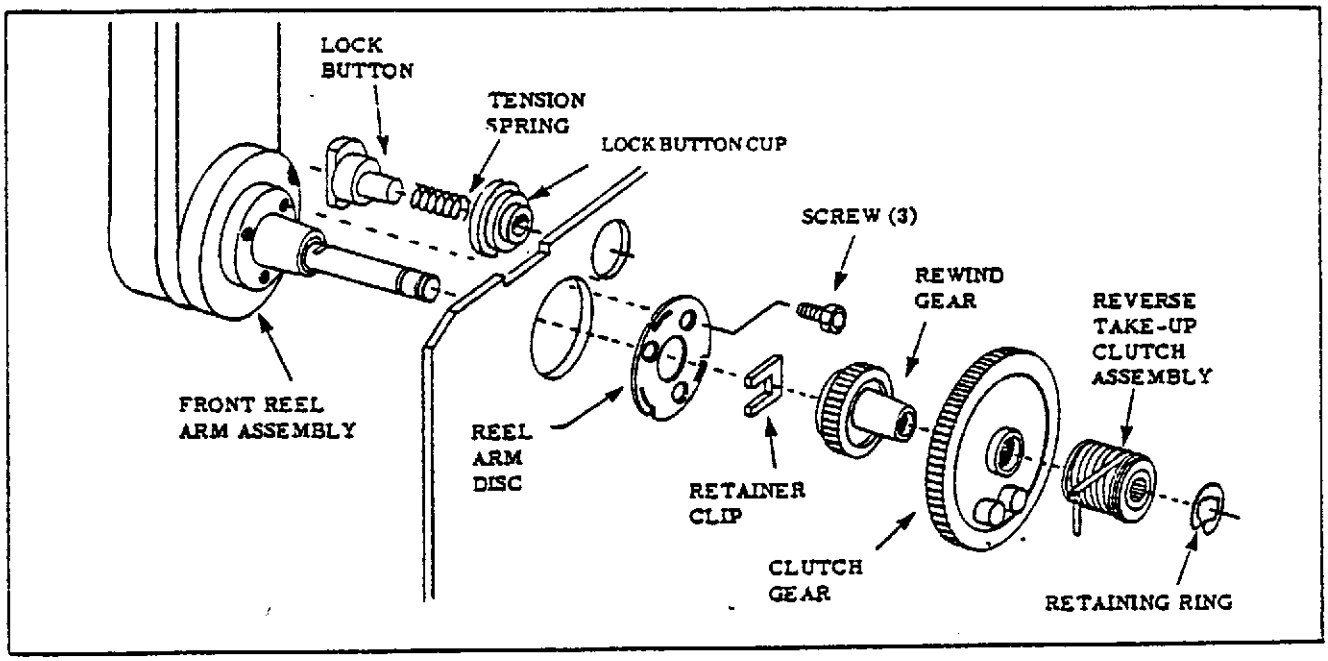


Figure L. Replacing the Front Reel Arm

clutch gear. Secure all parts with the retaining ring. Manually depress the lock button and raise and lower the reel arm to check for freedom of movement. Lightly brush all gear teeth with grease and manually rotate the gears to check the engagement of mating gear teeth. There should be a barely perceptible amount of backlash between mating gears.

22. STILL-RUN/ANIMATION CLUTCH AND HEAT SHUTTER LINKAGE REPAIR (2592 MODELS ONLY).

a. The still-run and animation clutch linkages are shown assembled in Figure W. Except for possible breakage and/or weaking of the compression springs, it is doubtful that any parts replacement will be needed. It may be necessary, however, to adjust these linkages. These adjustment procedures are covered in paragraph 34.

b. The heat shutter linkage is shown in Figure 6 of the Parts Catalog. If the heat shutter compression spring must be replaced, make sure that the beveled face of the collar is toward the spring when replacing the spring and collar on the lower end of the heat shutter rod. If noise is heard during operation after the spring has been replaced, the collar is set to loose. Loosen the collar setscrew and raise the collar, as necessary, to eliminate noise.

23. AMPLIFIER AND CONTROLS REPAIR (Figure M).

NOTE: Amplifier circuit board repairs are not recommended except as an emergency measure and then only if qualified electronics personnel and test equipment are available. Using standard electronic shop test equipment and techniques, check the amplifier assembly and its components for continuity and for shorts and open circuits. Refer to the appropriate wiring diagram for voltages and ratings of components and for test points. If a faulty condition is tracked to the amplifier, replace the complete assembly. See Parts Catalog Figure 7 for NEW and rebuilt amplifier policy.

a. Tip the projector to expose the underside of the projector base. The amplifier cover and volume/tone controls cover are each secured to the base with hex washer

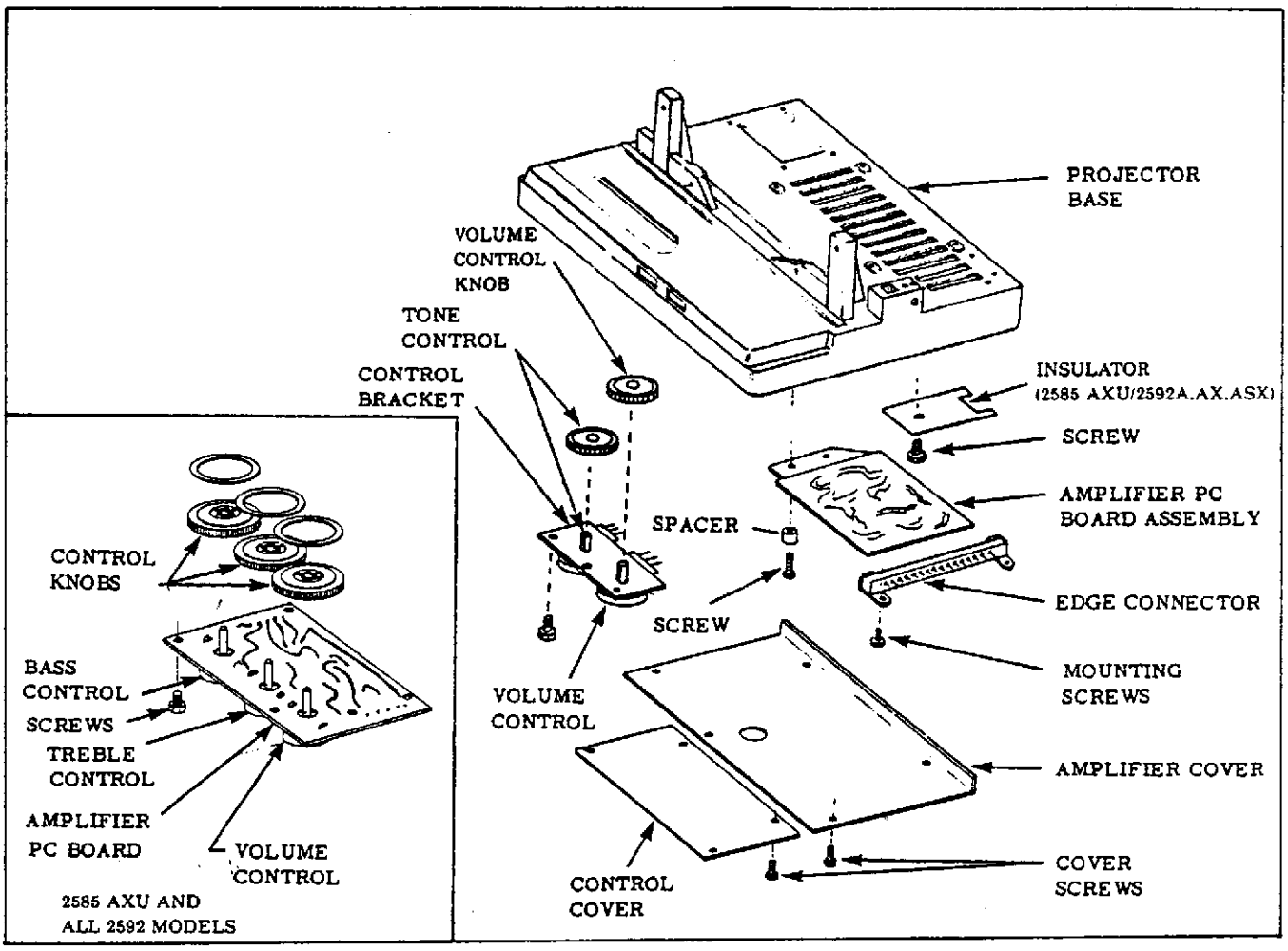


Figure M. Amplifier and Controls Repair

head screws. Remove both covers to expose the amplifier and controls for inspection and repairs.

b. If the amplifier must be replaced, remove the two screws which attach the amplifier edge connector to the base and the three screws and spacers which attach the amplifier assembly to the base. Lift the amplifier from the base and disconnect the amplifier board from the edge connector. Reassemble the new amplifier to the edge connector and apply a fresh coating of heat sink compound and assemble these items back into the base with the screws and spacers. Be sure to redress all leadwires.

c. To replace the volume and/or tone control, remove the screws that attach the controls bracket to the base. Pull the knobs from the control shafts. Remove the hex nut from the faulty control and disconnect the leadwires. Install the new control, reassemble leads and reinstall the controls assembly.

NOTE: Model 2585 AXU and all 2592 models are equipped with three amplifier controls (treble, bass and volume) located on the front of the projector base. All other models are equipped with two controls (tone and volume only).

24. SOUNDHEAD REPLACEMENT (Figure N).

a. Removing the Soundhead Assembly. Remove the rear cover (paragraph 11), top cover (paragraph 13) and the rear end cap

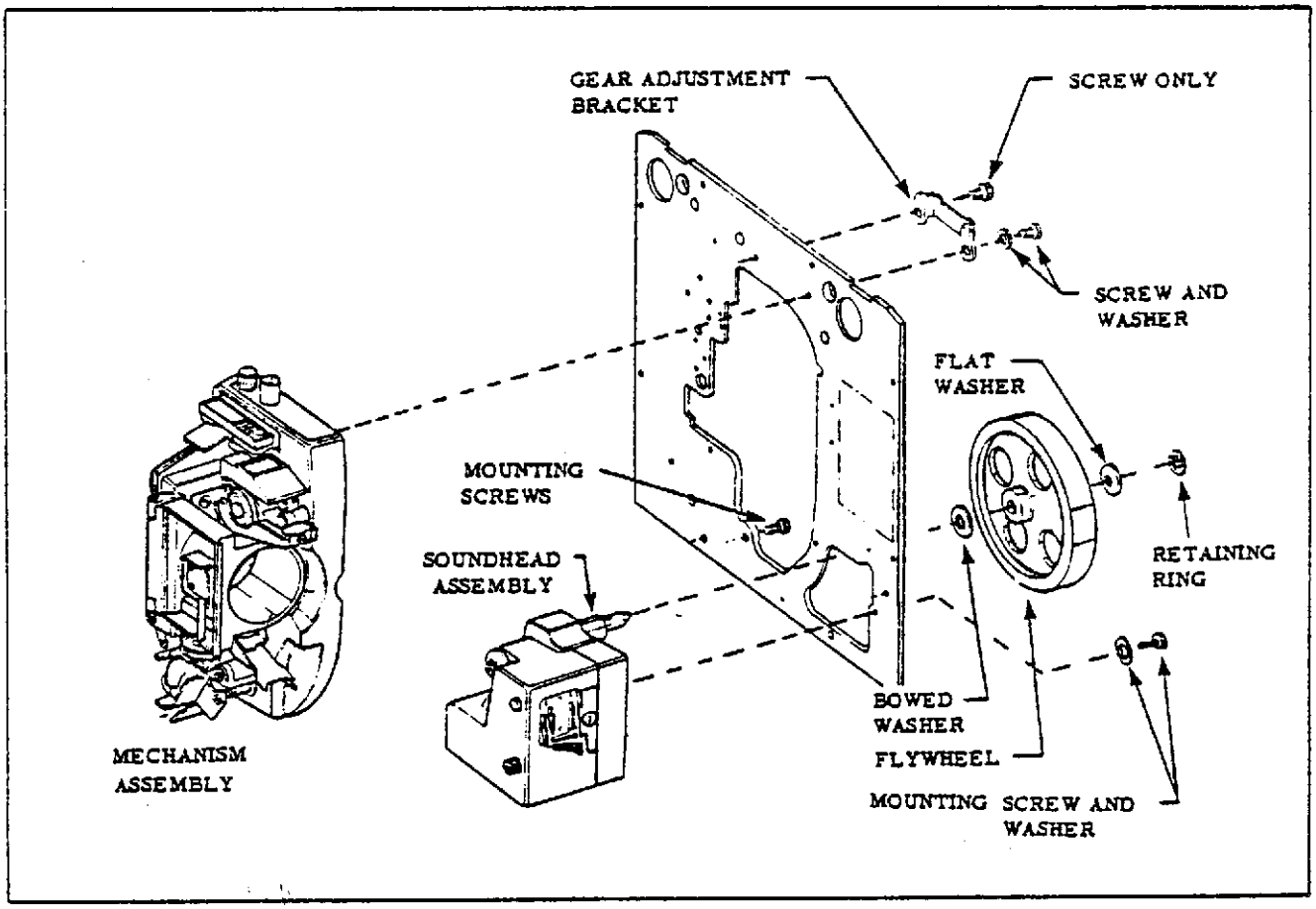


Figure N. Replacing the Soundhead and Mechanism Assemblies

(paragraph 15, step b). Then remove the transformer assembly (paragraph 19) to expose the flywheel. Remove the retaining ring, flat washer, flywheel and bowed washer from the sound drum shaft. Before removing the soundhead assembly from the mainplate, lightly scribe a pencil line on the mainplate along the top and right side of the soundhead housing. This will provide a reference mark for proper positioning of the soundhead assembly after reinstallation. Disconnect the photocell and exciter lamp leadwires. Hold the soundhead firmly and remove the three soundhead mounting screws and washers from the rear of the mainplate. Then withdraw the sound drum shaft through the cut-out in the mainplate. If further disassembly of the soundhead is required, refer to Parts Catalog Figure 13 and to the soundhead adjustments covered in paragraph 39.

NOTE: Be very careful not to strike the sound drum shaft against the cut-out in the mainplate when removing and replace the soundhead assembly.

b. Installing the Soundhead Assembly. Carefully reinsert the sound drum shaft through the cut-out in the mainplate. Hold the soundhead firmly and replace the three soundhead assembly mounting washers and screws. Tighten the screws just enough to hold the soundhead in place (note that the soundhead must be positioned before the mounting screws are tightened, see paragraph 25). Refer to the appropriate wiring diagram in the parts catalog manual and reconnect the photocell and exciter lamp leadwires. Reassemble the bowed washer (bowed face out), the flywheel, the flat washer and the retaining ring to the sound drum shaft.

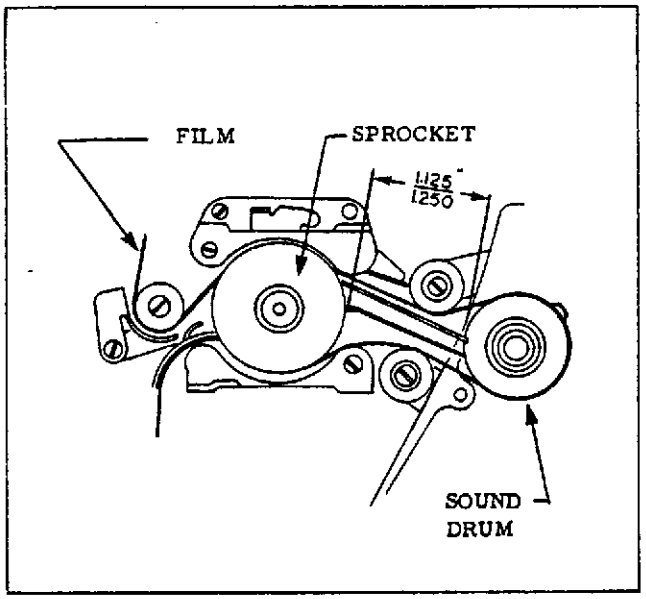


Figure P. Positioning the Soundhead

25. SOUNDHEAD POSITIONING (Figure P). Before the soundhead mounting screws are tightened securely, the soundhead housing must be positioned using one of the following methods.

a. If scribe lines were marked on the mainplate prior to removal of the soundhead housing; align the soundhead housing with the scribe marks on the mainplate and hold in this position while tightening the three mounting screws.

b. If the soundhead housing cannot be positioned by aligning scribe lines; positioning can be obtained without any special tooling using a piece of film, ruler, scale or dial caliper and proceeding as follows. Lock the automatic loading system in the "load" position. Insert a piece of film as shown in Figure P and check that the upper and lower stabilizer arms have "bounce" when touched. Measure for a distance of approximately 1.125 to 1.250 inches from the edge of the lower sprocket to the edge of the sound drum (see Figure P). Then tighten the three mounting screws.

c. After the soundhead housing has been properly positioned, replace the transformer assembly, rear end cap and projector rear and top covers.

26. MECHANISM ASSEMBLY REPLACEMENT (Figure N).

Remove the projection lamp (paragraph 9), rear cover (paragraph 11), top cover (paragraph 13) and rear end cap (paragraph 15, step b). Disengage the drive belt from the mechanism pulley and remove the drive motor (paragraph 18). Remove the rewind clutch and idler gear assemblies from the upper sprocket shaft. From the top rear portion of the mainplate disassemble the two screws and washer from the idler gear adjustment bracket. While supporting the mechanism assembly remove the two screws at the bottom of the mechanism casting. Then carefully lift the complete mechanism assembly from the mainplate. Reverse the removal procedure to reinstall the mechanism assembly.

NOTE: The following paragraphs outline the procedures for complete disassembly and reassembly of mechanism components for replacement.

27. DISASSEMBLY OF MECHANISM COMPONENTS.

Refer to the Parts Catalog manual parts lists and exploded views (Figures 14 - 17) and remove parts in indexed order, noting any special service instructions.

REMOVAL OF FIGURE 14 — MECHANISM COMPONENTS

a. To remove the lens carrier assembly (5), pry out the hinge pins (1) and (2) with a wire cutter or similar tool and lift the lens carrier from the mechanism. Note that the spring washer (3) is used with the upper pin and the flat washer (4) with the lower pin. No special instructions are required for the removal of lens carrier parts (5A through 5N). The adjustment plate (5H) need not be removed unless it has been badly nicked or scratched.

b. Remove the retaining ring (6) and withdraw the actuating lever (7). Remove the two screws (9) and the hood (10).

c. Loosen two setscrews (11) in each sprocket gear (12) and (13) and remove the gears, tension washers (14) and flat washers (14A) from the sprocket shafts. Withdraw the upper sprocket assembly (17) from the mechanism housing and disassemble the thrust washer (18) and flange (17A) from the upper sprocket. Remove the lower sprocket assembly (19) from the mechanism housing and disassemble the thrust washer (21) and flange (20) from the lower sprocket.

d. Remove the retaining ring (22) from the lower end of the rewind button shaft, and lift the rewind button (23) and its spring (24) from the top of the mechanism housing.

e. When removing sprocket guards (27) and (28), note the manner in which the torsion springs (30) are assembled so that they may be properly reinstalled.

f. Model 2592A Only. Loosen the setscrews (34) and disassemble the animation switch lever (35), grip ring (36) and switch lever crank (37) from the mechanism housing. Note that the crank opening is sealed with a disc (38) on all other units covered in these service instructions.

REMOVAL OF FIGURE 15A — MECHANISM COMPONENTS

a. Remove the three screws (1) and the flanged rollers (2). Remove the retaining ring (3) and withdraw the threading arm (4) from the mounting posts of the guard mounting plate (21).

b. Remove the retaining rings (6) and (11A) and the flat washer (11B). Remove the film guide (7) and flanged roller (11C). Disconnect the hook of extension spring (10) from the shaft extension. Remove the film guide stud (8), eccentric (9) and the autoload latch assembly (11D).

c. Note the manner in which the legs of the torsion spring (14) are engaged. Remove the retaining ring (12) and lift off the lower loopformer (13) and the torsion spring (14).

d. Remove the screw (15) and back-up bracket (16). Remove the large retaining ring (17) and lift off the lower film guide (19) and two washers (18). Remove two screws (20) and the lower guard mounting plate (21). Remove the retaining ring (22) and disassemble the toggle lever and pivot assembly (23) and lower film guide (24) from the mounting plate (21). Remove the extension spring (10) from the cast boss.

e. Loosen the locking screw (27) and disassemble the threading lever assembly (28) from the rear shaft end of the upper loopformer (29). Remove the retaining ring (30) and withdraw the upper loopformer assembly (31). Remove the connecting link and stud assembly (36).

f. The hex head screw (37) is used to adjust the lens carrier and should not be disturbed. Do not remove the lens carrier catch (38) unless it is to be replaced.

g. Remove the two screws (39) and the upper guard mounting plate assembly (40). Note the manner in which the legs of the torsion spring (47) are engaged. Loosen two setscrews (44) and disassemble the shaft assembly (45), torsion spring (47) and flat washer (46).

REMOVAL OF FIGURE 15B — MECHANISM COMPONENTS

a. Remove the loopformer and lock pawl assembly (1) from the mechanism housing. Do not disassemble the parts from the loopformer and lock pawl assembly unless visual inspection indicates a need for parts replacement.

b. Remove parts (2) through (6) and lift the cam follower and support assembly (7) from the mechanism housing. Then remove parts (8,9 and 10) to remove the shaft and lever assembly (22) from the mechanism housing.

c. Remove two screws (11), lock washers (12) and flat washer (13) and disassemble the self-centering assembly (14). Do not attempt to disassemble this assembly.

d. Remove screws (15) to free the aperture plate assembly (16). Refer to Figure 18 for aperture plate parts replacement.

REMOVAL OF FIGURE 16 — MECHANISM COMPONENTS

a. Loosen the two setscrews (1) and withdraw the mechanism pulley (2) from the end of the camshaft (item 28C, Figure 17).

b. 1595/2585/2590 Models Only. Remove four screws (3) and lift the heat shutter assembly (4) from the mechanism housing. Check the condition of the lampholder spring (4E) in model 2585.

c. 2592 Models Only. Remove four screws (3) and lift the heat shutter assembly (4) from the mechanism housing. Check for the presence and condition of the tension spring (4A) and lampholder spring (4E).

d. Remove the two screws (5) and the heat baffle (6). Unscrew the shutter nut (7) and remove the counterbalance weight (8), shutter (9) and fiber washer (10).

e. Unless obviously in need of replacement, do not disassemble the ball and stud assemblies (12) or the shuttle link bearing (17A) from the shuttle arms (17). Inspect the pull-down cam follower (17B) for wear. Badly worn shuttle arms should be replaced. Unhook the extension spring (13) from the end of each shuttle arm and remove the shuttle arms and the felt wiper (14). The felt wick (15) is inserted within the coils of the spring (13). If either of these felts seem unusually dirty, they should be replaced. New felts should be lubricated as instructed in paragraph 6.

f. Withdraw the pull-down cam (18) from the camshaft. Remove the two screws (19) and lift the in-out cam (20) and cam bracket assembly (21) from the mechanism. Inspect the cam follower (21A) and tension spring (21B) and replace if damaged. Remove the two screws (22) and the shuttle arm plate assembly (23). Inspect the bearing support assembly (24) and replace if damaged or worn.

g. With a sharp-nose pliers, pull out the framer shaft stop pin (25). Unscrew the framer shaft (26) from the mechanism housing. Remove the screw (27), the pin return spring (28) and the shuttle retractor pin (29).

h. 2592 Models Only. To remove the still-run rod and the animation solenoid rod from the stop pawl refer to Figure W in the Adjustments section. Note that the solenoid rod is found only on the 2592A units. Loosen the setscrews in the lower collars (underneath the stop pawl) and remove the collars from the ends of the rods catching the compression spring as it falls from the still-run rod. Disassemble the rods from the stop pawl (32). Remove the two retaining rings (30) and disassemble the stop pawl shaft (31) and stop pawl (32). Remove the screws (33) and (35) and disassemble the bearing bracket (34), stop bracket (34A) and stop pawl shaft bracket (36) from the mechanism housing. Inspect the grommets (36A) and, if damaged, press them from the bracket (36B).

REMOVAL OF FIGURE 17 — MECHANISM COMPONENTS

a. 2592 Models Only. Remove the round nut (1) and washer (2) and disassemble the shuttle adjustment bracket (3) from the animated clutch bracket assembly (7). Remove the screws (4) and (5) and lock washer (6) and lift the animated clutch bracket assembly (7) from the mechanism housing. Do not disassemble the animated clutch bracket assembly unless parts are damaged and in need of replacement.

b. 2592 Models Only. Remove the large retaining ring (8), the two screws (9) and the bearing loading spring (10). Loosen the setscrew (11) in the loop restorer cam (27) and press the camshaft (28C) to the left until the

ball bearing (12) is forced from the mechanism housing. Pull the bearing from the camshaft. Remove retaining rings (16) from the camshaft and press the camshaft to the right to force the large ball bearing (28B) from its seat. Remove the clutch. gear and cam parts (13) through (27) as the camshaft is withdrawn. Make a note of the manner in which the torsion spring (14) is assembled.

c. 1595, 2585 and 2590 Models Only. Remove the retaining ring (8), the two screws (9) and the bearing loading spring (10). Loosen the setscrews (11) and (24A) in the loop restorer cam (27) and worm gear (24) and press the camshaft (28C) to the left until the ball bearing (12) is forced from its seat in the mechanism housing. Then press the camshaft to the right to force the large ball bearing (28B) from its seat. Remove the worm gear and loop restorer cam as the camshaft is withdrawn from the mechanism housing.

28. GENERAL MECHANISM COMPONENTS REASSEMBLY PRECAUTIONS.

a. Before reassembling mechanism parts, be sure to clean them thoroughly. Metal parts can be immersed in a pan of nonflammable solvent or wiped with a cloth dampened with solvent; then blown dry with a low pressure jet of compressed air or dried with a lint-free cloth. Do not clean plastic or electrical components with solvent. Simply wipe plastic and electrical components with a clean, dry cloth. Clean optical parts with a good quality lens cleaner and lens tissue or a lint-free cloth.

b. When reassembly procedures include staking or riveting operations, it is wise to perform these operations before assembling other parts. Be sure to support the major casting or plate solidly during staking operations to avoid distorting the casting or plate.

NOTE: In many instances, you will find that you can install previously riveted items with screws and nuts. These are mentioned in the reassembly instructions.

c. When installing electrical components, refer to the wiring diagrams at the rear of the Parts Catalog for the proper connection of leadwires. Refer to paragraph 45 for special instructions regarding testing and replacement of the amplifier circuit board.

d. Most of the nameplates and the instruction plates are provided with an adhesive backing. Make certain that the area to which such parts are to be secured is thoroughly clean by wiping with a cloth dampened with solvent. Remove the protective paper backing and brush the adhesive with a mixture of three parts Toluol to one part of trichloroethylene. When the adhesive is tacky, press the nameplate carefully but firmly in place. Wipe away any excess adhesive with a cloth dampened with solvent.

e. Lubrication instructions are provided in the Introduction section of this service manual. Do not over-lubricate. Apply grease and oil sparingly as indicated, and wipe away any excess lubricant with a lint-free cloth. Gears should be lubricated by specking the gear teeth and then running the projector for a few moments to distribute the grease. Where oil is indicated, a drop or two will usually suffice.

29. REASSEMBLY OF MECHANISM COMPONENTS.

To reassemble the mechanism components, refer to parts lists and exploded views (Figures 14 - 17) in the Parts Catalog manual and reassemble the components as outlined in the following paragraphs. Routine adjustments for sliding fits, clearances and end play are included in the reassembly instructions.

INSTALLING FIGURE 17 — MECHANISM COMPONENTS

NOTE: Steps a through i of the following reassembly procedures for Figure 17 apply to the 1595/2585/2590 model projectors. Reassembly procedures for the 2592 models will start with step d and conclude with step j.

a. Lightly grease both bearing openings in the cast arms of the mechanism housing. Press the ball bearing (12) into its bearing opening until fully seated. Assemble the large ball bearing (28B) to the camshaft (28C) until the bearing is seated against the shoulder of the shaft. Install the retaining ring (28A) to the camshaft with the bowed surface of the ring facing away from the bearing.

b. Insert the long end of the camshaft through the bearing hole in the long cast arm of the mechanism housing. As the shaft end protrudes through the cast arm, assemble the loop restorer cam (27), and worm gear (24) to the shaft. Continue sliding the shaft to the left, inserting the end of the shaft into the left-hand ball bearing (12) while seating the large ball bearing (28B) in the bearing opening of the right-hand cast arm. Make certain that both ball bearings are fully seated; then install the bearing loading spring (10) to the left-hand cast arm with the two screws (9). Assemble the large retaining ring (8) into the inner ring groove in the right-hand ball bearing opening. The bowed surface of the ring must face the large ball bearing (28B).

c. Insert a 0.190 inch feeler gage between the loop restorer cam and the cast arm of the mechanism housing. Tighten the cam setscrew (11) firmly against the flat of the camshaft. Remove the feeler gage. Tighten the worm gear setscrew (24A) enough to hold until final adjustments are made.

d. Lightly grease both bearing openings in the cast arms of the mechanism housing. Press the ball bearing (12) into its bearing opening until fully seated. Assemble the large ball bearing (28B) to the camshaft (28C) until the bearing is seated against the shoulder of the shaft. Install retaining ring (28A) to the camshaft with the bowed surface of the ring facing away from the ball bearing.

e. Assemble the three rubber bushings (25) into the corresponding openings in the face of the worm gear assembly (24). Assemble the bearing assembly (23) to the worm gear so that the formed ears of the bearing are aligned with the corresponding notches in the worm gear. Insert the bent ears of the clutch yoke (21) through the slots in the bearing assembly, while assembling the spring (22) over the protruding finger of the clutch yoke and into the hole in the bearing assembly. Hold these parts together while assembling the two shoulder pins (20) to the bearing assembly, pressing them in until they engage the bent ears of the clutch yoke. Assemble the trigger (19) to the sleeve bearing (18) and press the bearing through the bearing assembly (23) and into the worm gear (24).

f. Insert the end of the camshaft (28C), with ball bearing (28B) assembled, through the bearing hole in the right-hand cast arm of the mechanism housing. To the shaft, assemble the loop restorer cam (27), shim washer (26) and the assembled worm gear group. Assemble the torsion spring (14) over the hub of the driven clutch (15), spreading the legs of the spring so that they straddle the bent ear at the top of the clutch. Insert the hub of the driver clutch (13) through the hub of the driven clutch, spreading the legs of the torsion spring still further until one of the lugs of the driver clutch is also straddled by the spring legs. Install the washer (17) and the assembled clutches on the camshaft. When installed, the bent ear of the driven clutch (15) must be parallel with the camshaft flat for the loop restorer cam (27).

g. Slide the camshaft all the way in place, inserting the end of the camshaft into the ball bearing (12) while seating the large ball bearing (28B) in the bearing hole of the cast arm. Assemble the two retaining rings (16) to the camshaft, one between washer (26) and loop restorer cam (27); the other between washer (17) and clutch (15). The clutch and loop restorer will require adjustment after reassembly has been completed.

h. Fasten the bearing loading spring (10) to the cast arm of the mechanism housing with two screws (9). Assemble the large retaining ring (8) into the ring groove of the housing arm, with the bowed face of the ring against the ball bearing (28B).

i. Insert a 0.190-inch feeler gage between the loop restorer cam and the cast arm of the mechanism housing. Hold the cam firmly against the feeler gage while tightening the setscrew (11) against the flat of the camshaft. Remove the feeler gage.

j. 2592 Models Only. Assemble the strike (7J) to the clutch slide bar assembly (7G) with the screw (7H). Insert the shaft (7C) part way through the right-hand arm of the mounting bracket assembly (7K) and install the bumper (7D) on the end of the shaft. Hold the slide bar assembly (7G) in position between the arms of the bracket assembly and continue to insert the shaft, assembling the flat washer (7E) and the spring (7F) on the shaft before it is inserted through the left-hand arms. Install the three retaining rings (7B), with the center ring to the right of the spring and washer. The setscrew (7A) must be adjusted at final assembly to limit slide bar travel. Assemble the complete animated clutch bracket assembly (7) to the mechanism housing with the two screws (4) and (5) and lock washer (6), and press down firmly on the bracket while tightening the screws. Assemble the shuttle adjustment bracket (3) to the end of the longer screw (5) and install the washer (2) and the round nut (1), tightening the nut finger tight.

INSTALLING FIGURE 16 — MECHANISM COMPONENTS

NOTE: Figure 16 reassembly procedures for units equipped with the still-run feature begin with step a, continue through step h and conclude with step j. All other units begin with procedure step d and conclude with step i.

a. Assemble the rubber grommet (36A) into the stop pawl bracket (36B). Assemble one retaining ring (30) into the first groove (the groove nearest to the end) of the stop pawl shaft (31). Then insert the opposite end of the stop pawl shaft through the shaft hole in the molded tab of the bearing bracket (34) and through both ears of the stop pawl (32). Install the stop bracket (34A) onto the bearing bracket with a hex head screw (33).

NOTE: At this point the solenoid rod on the 2592A units should be assembled to the stop pawl. Slide the stop pawl (32) up over the end of the solenoid rod. Assemble a setscrew to a collar and slide the lower solenoid collar (small diameter down) up against the underside of the stop pawl tightening the collar setscrew just enough to hold the collar on the rod.

b. Loosely attach the stop and bearing brackets to the cast arm of the mechanism housing with the two hex head screws (33). Assemble the stop pawl shaft bracket (36) to the free end of the shaft (31) and fasten the shaft bracket to the mechanism housing with the two shoulder screws (35). Tighten all the bracket mounting screws (33) and (35) securely. Assemble the second retaining ring (30) into the groove of the stop pawl shaft so that the right-hand ear of the stop pawl is held against the bearing bracket (34).

c. Refer to Figure 6 in the parts catalog and assemble a collar (2), small diameter up, to the still-run rod and insert the straight end of the rod up through the stop pawl. If the bent end of the still-run rod is free, rehook the bent end through the hole in the long arm of the pivoting link assembly (16). Assemble the compression spring (3) and the second collar (2) small diameter down, to the upper end of the still-run rod. Slide the lower collar (2) up against the underside of the stop pawl and compress the spring (3) slightly with the upper collar (2). Tighten all collar setscrews (1).

NOTE: After complete reassembly of the mechanism, all linkages must be adjusted as described in the Adjustments section, paragraph 34, step d.

d. Refer to Figure 16 and assemble the shuttle retractor pin (29) and pin return spring (28) and insert the rounded end of the pin into the hole in the long cast arm, just to the right of the camshaft. Secure the loop end of the spring to the casting with the screw (27).

e. Screw the framer knob and shaft (26) down into the mechanism housing. Press the stop pin (25) in place. Screw the bearing support (24) all the way up into the staked nut (24A) of the shuttle arm plate assembly (23). Engage the fork-like end of the shuttle arm plate framing arm with the cut-out at the lower end of the framer shaft, and fasten the plate to the cast arm of the mechanism housing with the two screws (22).

f. Loosely assemble the in-out cam (20) to the cam bracket assembly (21) so that the nylon face of the cam follower (21A) rides against the polished surface of the cam (indicated by the dashed arrow in Figure 16). Install the in-out cam tension spring (21B) to the cam bracket and then install this assembled group over the end of the camshaft securing the cam bracket assembly to the cast arm of the mechanism housing with the two screws (19).

NOTE: At this point, refer to Figure 15B and install the assembled aperture plate (16) with screws (15). Then return to Figure 16 and continue with reassembly as follows.

g. Make certain that the shuttle link bearings (17A) are firmly pressed into the notches at the front end of each shuttle arm (17) and that the cam followers (17B) are assembled into the center notched section of each arm (see Figure S). Insert the lubricated cam wiper wick (15) into the coils of the extension spring (13). Assemble the lubricated felt wiper (14) and the extension spring (13) to the shuttle arms as shown in Figure S. Assemble the ball and stud assemblies (12) to the ends of the arms with the hex nuts (11), tightening the nuts only fingertight. Carefully insert the front ends of the shuttle arms between the guides of the in-out bracket assembly (21). Assemble the shuttle (16) to the front ends of the shuttle arm so that the shuttle teeth extend through the shuttle slot in the aperture plate and face in toward the mechanism housing. Rotate the in-out cam (20) until the tongue protruding from the unpolished surface of the cam rests down in the notch in the shoulder of the camshaft. Assemble the pull-down cam (18) to the camshaft, spreading the shuttle arms lightly until the cam is fully in place. The notch in the inner face of the pull-down cam must engage a mating protrusion on the face of the in-out cam. Back out the bearing support (24) until its socket-like nylon pad engages the ball of the upper stud assembly (12). The ball of the lower stud assembly should rest in the socket of the nylon pad mounted on the shuttle arm plate assembly (23). It may be necessary to loosen the hex nuts (11) and shift the ball and stud assemblies (12) until proper alignment is obtained.

h. Install the fiber washer (10) on the camshaft and up against the pull-down cam (18) so that the slot in the washers is aligned with the slot in the cam. Assemble the shutter (9) to the camshaft and install the counterbalance weight (8) so that its pin engages the slots in the shutter and the pull-down cam. Install the shutter nut (7) with its shoulder in the center hole of the counterweight. Grip the flats at the end of the camshaft with an open-end wrench and tighten the nut (7) securely.

i. Assemble the heat baffle (6) to the mechanism housing beneath the shutter with the two screws (5). Attach the heat shutter (4) and lamp holder spring (4E) to the mechanism housing with four screws (3). Assemble the pulley (2) to the end of the camshaft and tighten the setscrews (1) down on the shaft.

j. Assemble the heat baffle (6) to the mechanism housing beneath the shutter with the two screws (5). Insert the long straight end of the heat shutter rod (item 8, Figure 6) down behind the pivoting link assembly (item 16, Figure 6) and through the hole in the bent ear of the link. Slide the compression spring (item 7, Figure 6) and collar (6), beveled face of collar toward the spring, onto the lower end of the heat shutter rod and tighten the collar setscrew (5) just enough to hold the rod in place. Engage the upper (bent) end of the rod with the hole in the heat shutter filter arm and then tighten the collar setscrew (5). Return to Figure 16 and assemble the pulley (2) to the end of the camshaft and tighten the setscrews (1) down on the shaft.

NOTE: When the still-run lever is placed in the "still" position, the heat shutter should be centered over the aperture opening. In the "run" position, the heat shutter should swing completely away from the aperture opening and the heat shutter collar should be lightly compressing the spring. If noise is heard during projector operation, the heat shutter collar is set too loose.

INSTALLING FIGURE 15B — MECHANISM COMPONENTS

a. Attach the self-centering assembly (14) to the mechanism housing with two screws (11), lock washers (12) and flat washers (13). Assemble the lever and shaft assembly (22) to the mechanism housing and install the washer (10) and arm assembly (9) on the end of the shaft. The fork-like finger of the arm assembly must engage the pin of the self-centering assembly between the two large washers. Insert a 0.0015-inch feeler gage between the washer (10) and the machined boss of the housing. Grip the shaft (22) and arm (10) to hold the feeler gage while tightening the hex head screw (8); then remove the feeler gage. Assemble the retaining ring (21) to the shaft assembly (22).

NOTE: The shaft assembly (22), when installed, must be positioned approximately as shown in Figure 15B, with the notched area in its upper edge positioned beneath the lower sprocket shaft bearing of the mechanism housing.

b. Assemble the cam follower parts (7A) through (7F) as shown in Figure 15B. Attach this assembled group to the arm assembly (9) with the screw (5) and washer (6). Tighten the screw just enough to hold the follower group. Hook one end of the spring (4) around the end of the lever shaft (22) and secure the other end to the mechanism housing with the screw (2) and washer (3).

c. Assemble the film escape mechanism components (1A) through (1G) in the following manner. Assemble the hub assembly (1F) to the locking pawl (1E) with the screw (1D). Insert the shaft (1B) through one ear of the upper loopformer assembly (1G) and install the spring (1C) and the assembled hub and pawl on the shaft. Then engage the end of the shaft with the second ear of the loopformer. Assemble the retaining rings (1A) to the shaft, with the center ring between the spring (1C) and hub assembly (1F). Hook one end of the spring over the outer ear of the loopformer and hook the other end behind the upper finger of the hub assembly (1F). The spring should tend to rotate the hub and locking pawl in a clockwise direction.

INSTALLING FIGURE 15A — MECHANISM COMPONENTS

a. Install the torsion spring (47), short leg first, on the shaft of the shaft and link assembly (45) and insert the shaft through the bearing in the mechanism housing. Hook the long leg of the spring beneath the tapped mounting boss in the upper left-hand corner of the mechanism housing. Hook the short, bent end of the spring behind the left edge of the link. Assemble the washer (46) and assembled items 1A through 1G, Figure 15B (film escape mechanism parts) to the protruding end of the shaft (45) and temporarily tighten the setscrews (44).

b. Attach the upper sprocket guard mounting plate (40) to the mechanism housing with two screws (39).

c. Attach the lens carrier catch (38) to the mechanism housing with the screw (37). Turn the hex head lens stop screw (18, Figure 15B) into the tapped hole in the housing until only one thread is visible. It may be necessary to adjust the catch and stop screw at final assembly to insure proper operation of the lens carrier.

d. Assemble the shuttle retractor (35) to the connecting link assembly (36) with the screw (32) lock washer (33) and flat washer (34). Assemble the upper loopformer assembly (31) to the upper end of the connecting link (36) and install the retaining ring (30). Slip the pin end of the threading lever (28) up behind the link (45) engaging the pin with the rectangular slot in the link. Insert the shaft of the loopformer assembly through the mechanism housing, and into the hub of the threading lever (28). Tighten the hex

head locking screw (27) securely. Attach the leaf spring (26) to the upper loopformer with two screws (25).

e. Assemble the round loop of the spring (10) to the cast boss of the mechansim housing. Assemble the small hole in the film guide (24) over the pin in the lower sprocket guard mounting plate (21) and hold the film guide in place while inserting the shaft of the toggle lever assembly (23) through the guard plate. The forked end of the toggle lever must straddle the film guide mounting pin. Secure the toggle lever to the mounting plate with the retaining ring (22). Engage the remaining forked end of the toggle lever with the pin at the lower end of the connecting link (36) and secure the lower mounting plate (21) to the mechansim housing with the two screws (20). The film guide (24) must be lifted slightly during this operation so that its large pivot hole slides over the sprocket shaft bearing in the housing.

f. Assemble one large washer (18) and the lower film guide (19) over the lower sprocket bearing, at the same time inserting the pin at the lower end of the connecting link (36) through the hole in the arm of the film guide (19). Install the second large washer (18) and secure these parts with the retaining ring (17).

g. Fasten the back-up bracket (16) to the mounting plate (21) with the screw (15). Assemble the loopformer (13) and the torsion spring (14) onto the lower pin of the connecting link (36) and install the retaining ring (12). The legs of the spring must bear against the underside of the loopformer in such a manner that they will force the loopformer to pivot clockwise around the connecting link pin.

h. Assemble the Autoload latch assembly (11-D) and eccentric (9) to the mounting plate (21) with the film guide stud (8). Attach the hook of the spring (10) to the end of shaft on the back side of the Autoload latch assembly (11D).

i. Assemble the flanged roller (11C) to the shaft of the Autoload latch assembly (11D) and the film guide (7) to the film guide stud (8). Engage the tab of the film guide in the slot of the latch. Secure the film guide with retaining ring (6). Secure the flanged roller with one flat washer (11B) and one retaining ring (11A).

j. Assemble the threading arm (4) to the stud in the lower right-hand corner of the mounting plate (21). Check for the presence of the plastic tip (48) on the threading arm. Install the retaining ring (3) to secure the arm to the stud.

k. Install the three rollers (2) on their respective studs and secure them with the screws (1).

INSTALLING FIGURE 14 — MECHANISM COMPONENTS

a. Models 2592A Only. Engage the free end of the animation switch lever crank (37) into the hole at the top of the mechanism housing. Replace the switch lever (35) and tighten the setscrew (34). Insert a 0.010-inch feeler gage between the animation switch lever (35) and the mechanism housing and hold the lever against a shim while pressing the crank grip ring (36) in against the mechanism housing. Remove the shim.

b. Rotate and hold the lower loopformer (13, Figure 15A) fully counterclockwise and assemble the film exit guide (32, Figure 14) to the mechanism housing with screw (31).

c. Assemble the sprocket guards (27) and (28), rollers (29) and torsion springs (30) to the tapped mounting posts of the guard mounting plates. The rollers must be assembled as shown in the inset of Figure 14. The inner bent end of each spring is inserted into small spring holes in the mounting plates adjacent to the tapped posts. The outer bent ear of each spring hooks over the outer edge of each sprocket guard (27) and (28). The springs should tend to rotate the free (unmounted) end of the sprocket guard toward the sprocket bearings in the

mechanism housing. Secure the sprocket guards to their mounting post with the screws (25) and the shim washers (26).

d. Assemble spring (24) to the shaft of the rewind button (23) and insert the shaft down into the opening in the top of the mechanism housing. Depress the button and assemble the retaining ring (22) into the groove at the lower end of the shaft.

e. Assemble the lower sprocket flange (20) and thrust washer (21) onto the shaft of the lower sprocket assembly (19). Spread the two lower sprocket guards and insert the sprocket shaft through the lower bearings in the mechanism housing until the sprocket is fully seated. Release the sprocket guards. Assemble a flat washer (14A), a spring tension washer (14) and the lower sprocket gear (13) to the sprocket shaft, meshing the sprocket gear teeth with the worm gear. Align either setscrew (11) with the groove on the sprocket shaft and tighten both setscrews securely. The sprocket and gear must turn freely but with only a minimum of end play.

f. Assemble the upper sprocket flange (17A) and thrust washer (18) to the shaft of the upper sprocket assembly (17). Lift the free end of the upper sprocket guard (27) and insert the sprocket shaft through the upper bearings in the mechanism housing until the sprocket is fully seated. Release the sprocket guard.

g. Assemble a flat washer (14A), tension washer (14) and the upper sprocket gear (12) to the sprocket shaft. Align either setscrew (11) with the groove on the sprocket shaft and carefully mesh the sprocket gear with the worm gear. Tighten both setscrews(11) securely. The sprocket and gear must turn freely, but with a minimum of end play.

h. Fasten the hood (10) to the mechanism housing with the two screws (9). Press down and hold the upper loopformer (31, Figure 15A) while assembling the threading lever (7, Figure 14) to the lever shaft. Install the retaining ring (6).

i. Hold the assembled lens carrier (5) between the hinge bosses of the mechanism housing. Insert the flat washer (4) on top of the lower hinge boss and the spring tension washer (3) beneath the upper hinge boss. Press the hinge pins (1) and (2) into place to hold the lens carrier. Adjust the lens carrier catch (38, Figure 15A) so that it holds the lens carrier firmly against the stop screw (18, Figure 15B) in the closed position; yet permits the carrier to be opened easily.

j. Insert the assembled mechanism through the cut-out in the mainplate and install the two screws at the bottom of the mechanism casting. At the top rear portion of the mainplate reinstall the idler gear adjustment bracket securing it to the mainplate with two washers and screws. Replace the rewind clutch and idler gear assemblies on the upper sprocket shaft as shown in Parts Catalog Figure 5. Reassemble the drive belt to the mechanism pulley and replace the drive motor (paragraph 18) and the projection lamp (paragraph 9).

NOTE: At this point, and before reinstalling the end cap and projector covers; all of the final adjustments outlined in the Adjustments section should be made.