SERVICE INSTRUCTIONS

FILMOSOUND® PROJECTOR

(AUTOMATIC THREADING)

DESIGN 567

BELL & HOWELL

GENERAL SERVICE DEPT.
7100 McCORMICK ROAD
CHICAGO, ILLINOIS 60645

PART NO. 72798 PRINTED IN U.S.A. REVISED JULY 1974

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FACTORY SERVICE ADDRESSES

PRODUCT ONLY

CHICAGO

General Service Department
2200 Brummel Place
Evanston, Illinois 60202
Area Code: 312-673-3300

NEW YORK

General Service Department
200 Smith Street
E. Farmingdale, L.I., New York 11735
Area Code: 516-293-8910

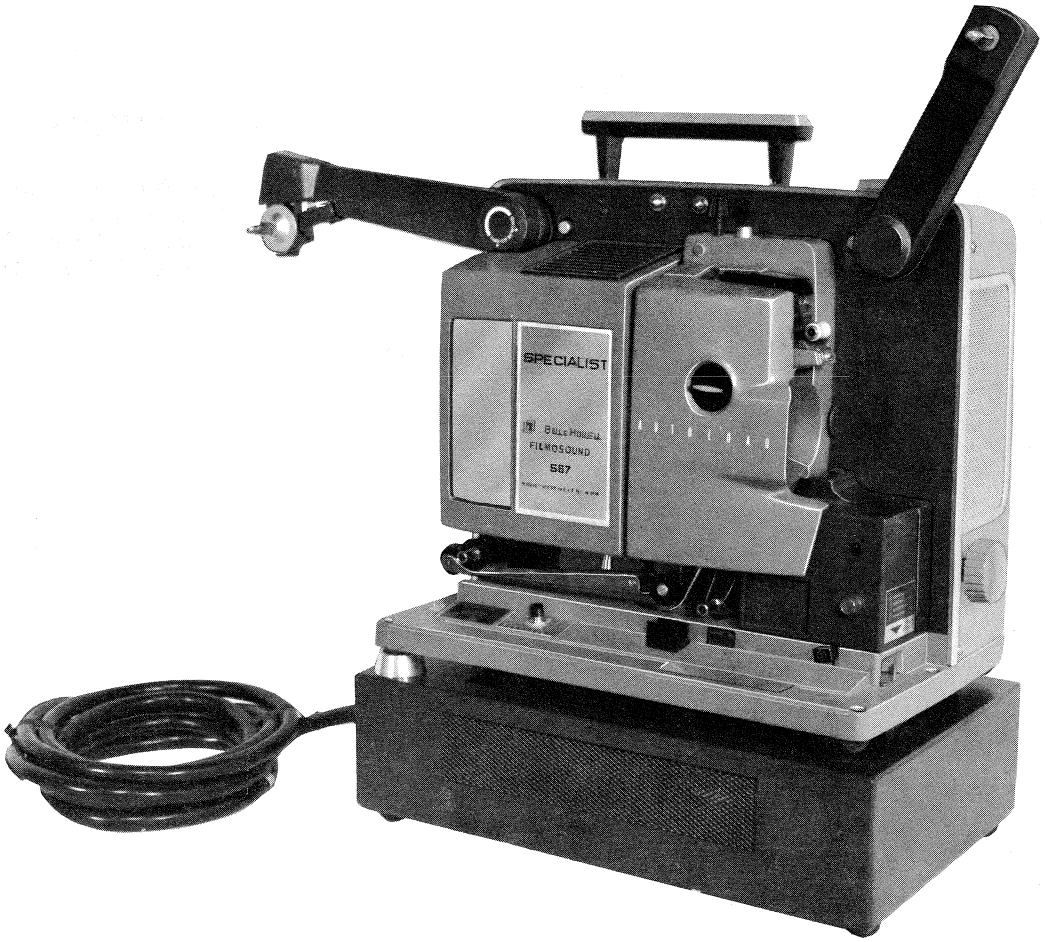
GLENDALE

General Service Department
623 Rodier Drive
Glendale, California 91201
Area Code: 213-245-6631

PARTS ORDERS AND SERVICE INFORMATION

General Service Department
7100 McCormick Road
Chicago, Illinois 60645
Area Code: 312-673-3300

Table of Contents



Design 567 Automatic Threading High-Intensity Arc Filmosound Projector

FEATURE DESCRIPTION LIST

General Description	Self-threading sound motion picture projector with switch-actuated changeover system for interconnecting two projectors; uses high intensity arc projection lamp requiring separate lamp supply unit.
Power Requirement	105 to 129 volts AC, 60 cycle
Projection Lamp	G.E. Marc 350/16T enclosed arc lamp
Exciter Lamp	Type BAK, 4 volt
Projection Control	Forward/Reverse/Thread/Project
Lamp Control	Off/Lamp/Fan
Amplifier Controls	Off/Volume/Tone
Lamp Supply Unit	Separately contained auxiliary unit (refer to Service Manual P/N 72798A)

Introduction

GENERAL.

This service manual has been prepared to aid in the repair and adjustment of the Bell & Howell Design 567 Automatic Threading High Intensity Arc Filmosound Projector. Special features of this projector are noted 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 aid the serviceman during projector repairs. All parts in the Parts Catalog illustrations are indexed in a suggested order of disassembly, with attaching parts immediately preceding those parts which they attach. Mechanical differences between early and current projector models are clearly noted in the "Description" column of the parts lists. The projector wiring diagrams (Parts Catalog Figures 16 and 17) illustrate the current (fused) projector models. This twin-fusing is the only major electrical difference between early and current projectors.

DESCRIPTION.

The Design 567 Filmosound projector is a 16-mm automatic threading unit equipped with a 10-watt integrated circuit amplifier and a high-intensity arc lamp. A separate 60 Hz lamp supply unit (B&H Part No. 014640) is required for projector operation and is covered in a separate service manual Part No. 72798A. Unlike most previous 500 series projectors, projector and amplifier controls for the Design 567 are mounted at the back end of the rear cover rather than behind the hinged lamphouse assembly.

The lamp supply unit is specifically designed for use with MARC-350 lamps and draws approximately 400 watts from the supply line. Although this is considerably less than the 1000 to 1200 watts often used in 16-mm projection, the MARC-350 lamp produces a screen brightness as much as four times greater than ordinary projection lamps.

Since the arc tube is made of quartz, it should never be touched with the bare hands. The normal secretions in the skin will leave a residue on the clear outer quartz surface. This residue, when heated, can cause a cloudy, light-obscuring phenomenon that will reduce light intensity and shorten lamp life. Always use clean tissue paper when handling the lamp.

Unlike the normal projection lamp, the arc lamp requires a short warm-up period to obtain peak light output. Approximately 45 seconds after the lamp is switched on, the light output will reach the brilliant white color suitable for viewing. If line current is interrupted during a film showing, the lamp will go out and the projector will stop running. After restoration of normal power, a delay of approximately 30 seconds is required before the unit will restart. Following is a list of special precautions regarding the arc lamp.

(1) The high intensity arc lamp can be used only in equipment which incorporates a special lamp supply unit and will not operate from ordinary 120-volt outlets.

(2) Be sure all power is disconnected before attempting to replace the lamp. Insert the lamp plug gently but fully into the receptacle.

(3) Always use tissue paper or a clean cloth when handling the lamp. Fingerprints or other similar contamination may upset the normal lamp operating cycle, thereby shortening lamp life or causing a premature reduction in light output.

(4) Do not operate the lamp for periods of less than three minutes. Short duration operating cycles can reduce lamp life.

GENERAL MAINTENANCE PRECAUTIONS.

Before proceeding with the repairs, refer to the Trouble Shooting guide for possible causes and proposed remedies for specific customer complaints.

The removal and installation of projector parts is comparatively simple and, for the most part, requires only those tools normally available in audio-visual repair shops. Special tools and gages required for adjustment and alignment procedures are illustrated in Figure A.

CLEANING PROCEDURES.

All film path components (film sprockets, sprocket shoes, film guides, aperture and pressure plates) must be thoroughly cleaned with Toluol to remove dirt and film emulsion. If necessary, use an orange stick or toothpick to loosen hardened emulsion. Do not use a knife blade or other metal tool to scrape away hardened emulsion as this can leave scratches which could damage the film.

Remove dirt and old lubricant from all other metal parts (except electrical components) with dry cleaning solvent and dry them with a lint-free cloth or low pressure jet of compressed air. Do not use trichloroethylene solvents to clean plastic parts. For such parts, a naphtha base cleaning fluid is recommended.

Whenever repair procedures require that the rear cover be removed, brush or blow out all loose particles of dirt from the exposed mechanism and projector base.

Clean all optical parts with a good commercial lens cleaning fluid and lens tissue. When such parts are removed as a part of the repair procedure, wrap them in tissue paper and put them aside to prevent accidental damage.

LUBRICATION.

Unless otherwise specified, apply one or two drops of oil (B&H Spec. 1705) to all shafts, sleeve bearings and sliding parts during reassembly. To lubricate felt pads and wicks, place them in a shallow container of the specified lubricant until saturated; then allow the excess to drain away before installation. Refer to the following list for lubrication of specific parts and recommended lubricant.

LUBRICATION CHART

PARTS TO BE LUBRICATED	LUBE CODE
Bearing surfaces of reel arm shafts	A
Clutch ball retainers	A
Sprocket shafts	A
Framer shaft	B
Bearing face of worm gear	B
Pin of rewind sprocket	B
Slots in bearing assembly	C

LUBRICATION CHART
(Continued)

PARTS TO BE LUBRICATED	LUBE CODE
Non-bearing machined surfaces of all castings	D
All shafts, sleeve bearings and sliding parts (unless otherwise specified)	E
Oil storage pads (in cams)	E
Tilt rack and pinions	F
Meshing gears in reel arms	F
Reel arm release mechanisms	F
Friction surface of lamp release ring	F
In-out cam and cam follower	F
Shuttle link bearings	F
All nylon gears	F
Cam wiper and wick	F
Pivot posts for all film guides	F
Upper and lower sprocket bearings	F
Shuttle guide and guide bearings	F
Loop restorer and self-centering assembly	F
Pin of take-up drive sprocket assembly	F
Threads of frame shaft	F
All diameters of camshaft bearing holes in mechanism	F
Sleeve of condenser holder	F

A - Oil, B&H Spec. 341 (part no. 08963)
B - Oil, B&H Spec. 1543 (part no. 04978)
C - Grease, B&H Spec. 1553 (part no. 070031)
D - Oil, B&H Spec. 1918 (part no. 070033)
E - Oil, B&H Spec. 1705 (part no. 070032)
F - Grease, B&H Spec. 1956 (part no. 070034)

TEST EQUIPMENT REQUIRED FOR SERVICE

EQUIPMENT	APPLICATION
Strobotac or Equivalent 105 - 129 VAC Voltage Source Variac with Meter AC Ammeter 0 - 20 Ampere 400 Feet of Film	To check speed over allowable voltage range
External Speaker Oscilloscope Test Film	To check amplifier operation

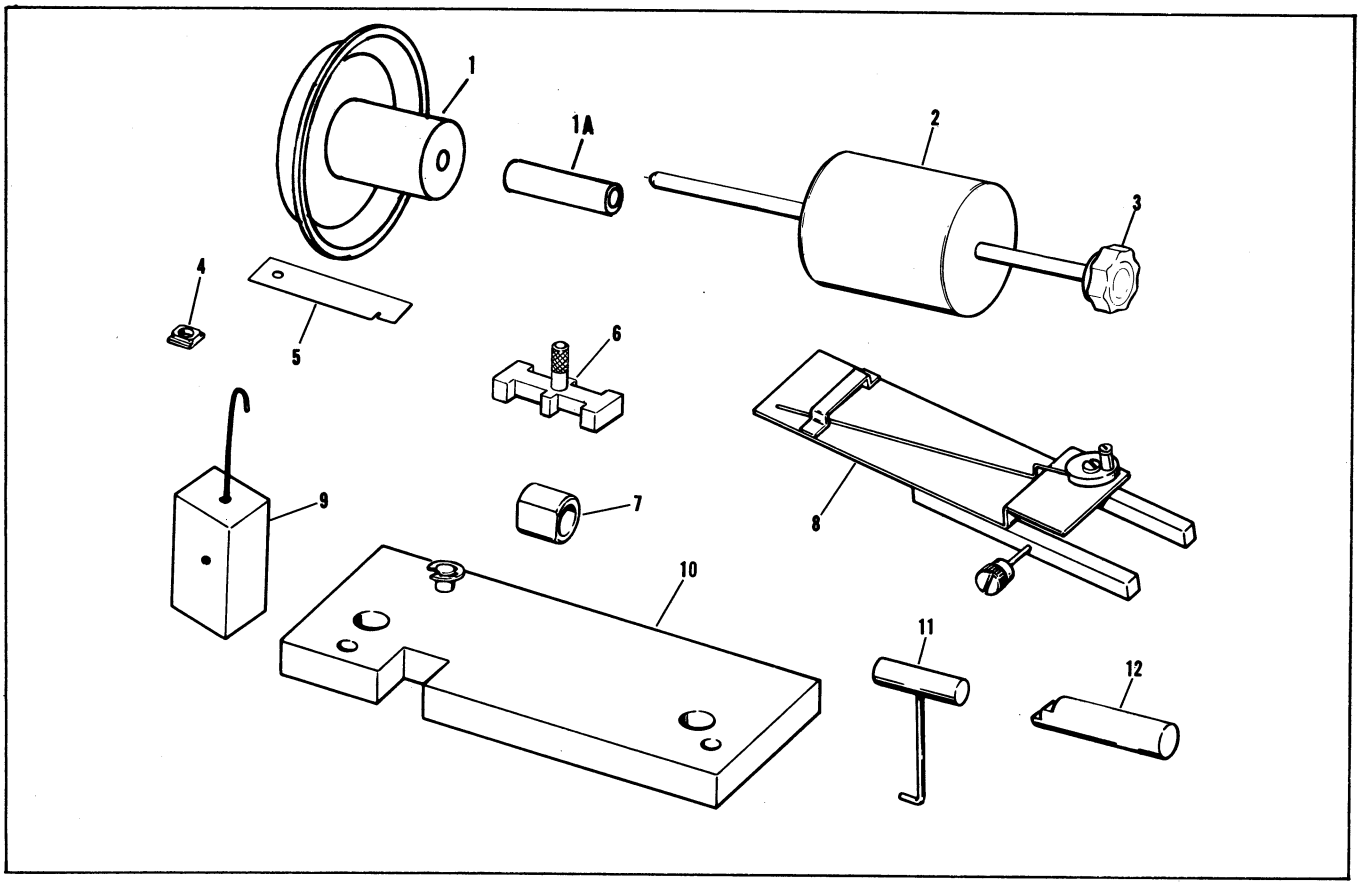


Figure A. Special Service Tools

INDEX NO.	TOOL NO.	NOMENCLATURE	TOOL APPLICATION
1	SD-567-1F1	Lamp Bracket Setting Plug	Alignment of optical system and lamp bracket (see Figure J)
1A	SD-567-1F2	Setting Plug Spacer	
2	SER-550-2-N1	Lens Plug	
3	SER-550-2-N2	Alignment Rod	
4	SER-550-2-N3	Aperture Plug	
5	SER-550-5-N2	Stroke Gage	Measure shuttle stroke
6	S-09701-35-N2	Shuttle Height Gage	Check shuttle protrusion
7	SER-552-2-N1	Restorer Positioning Tool	Adjusting the loop restorer
8	SER-552-4-N1	Shuttle Tension Gage	Shuttle tension (see Figure M)
9	SER-552-4-N2	Weight for Shuttle Tension Gage	Shuttle tension (see Figure M)
10	SER-552-1-N1	Timing and Alignment Plate	Timing the sprockets
11	SER-552-5-N1	Soundhead Locating Gage	Positioning the soundhead
12	SER-550-8-N1	Alignment Tool	Sound drum and photocell alignment (see Figure Q)
	SER-550-5-N1	Shuttle Stroke Target	Measurement of shuttle stroke (see Figure N)

Disassembly Procedure

1. GENERAL PRECAUTIONS.

a. It is advisable to remove "breakage" items such as lamps and optical parts before proceeding with projector repairs. Wrap such items in tissue paper and set them aside.

b. Be sure to use the proper size tools for disassembly and reassembly procedures. After removing attaching parts (screws, nuts, etc.), loosely reinstall these parts to the removed part or tapped holes to prevent loss.

c. Cemented or adhesive backed parts are so noted in the parts lists and can be removed by prying up one edge with a knife blade. Be careful not to scratch surrounding areas, and remove traces of old adhesive with solvent.

d. When unsoldering is required to remove electrical parts, it is advisable to tag leadwires or make a rough sketch of leadwire connections to facilitate installation of the parts. Unsolder leads with a pencil type soldering gun, using a heat sink if available, or gripping the lead with a pliers to provide additional heat dissipation.

e. When removing riveted parts for replacement, the old rivet must be drilled out with a drill equal to, or slightly smaller than, the diameter of the rivet to be installed. Refer to the parts lists for the rivet diameter.

2. REMOVING PROJECTOR COVERS AND HANDLE (Figure 1). Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Inspect the front cover assembly (1) for cracks or other signs of physical damage. Check for presence of the foam rubber cushion (1F) and the condition of the four cover feet (1E). Replace damaged parts.

b. Inspect the rear cover assembly (4) for cracks or other signs of physical damage. Remove the seven screws (2) at the ends and base of the projector and the two screws (3) at the top, on either side of the carrying handle, and withdraw the rear cover from the projector.

c. The carrying handle cap (6), body (7) and rubber grip (8) can be replaced by removing the two screws (5). If the strap (10) is to be replaced, note the presence of a spacer (11) located beneath the front end of the strap.

d. The spring (12) can be removed without disassembling the release lever (15) from the projector. To replace the release lever, remove the two retaining rings (13) and cover latch studs (14).

3. REMOVING THE REEL ARMS (Figure 1). Remove parts in their indexed order of disassembly, noting the following special precautions.

a. Loosen the two screws in the idler roller assembly located next to the rewind sprocket (21) to remove the tension from the rewind timing belt.

b. Loosen two setscrews (19) and disassemble the locking collar (20), rewind sprocket (21), two nylon washers (22), take-up sprocket (23) and two brass washers (24) from the reel arm shaft. As the rewind sprocket (21) is withdrawn, slip the rewind timing belt from the sprocket. As the take-up sprocket (23) is withdrawn, slip the long timing belt (40) from the sprocket. Loosen two setscrews (25) and disassemble the retaining collar (26), locking disc (27) and front reel arm assembly (28) from the projector main plate. Remove the bronze washer (29) from the reel arm shaft. Refer to paragraph 8 for front reel arm disassembly instructions.

c. Disengage the timing belt (40) from the sprocket (33). Remove the retaining ring (30) and disassemble the brass washer (31), nylon washers (32) and sprocket assembly (33) from the rear reel arm shaft. Loosen two setscrews (34) and disassemble the retaining collar (35), locking disc (36) and rear reel arm assembly (37) from the projector main plate. Remove the bronze washer (38) from the reel arm shaft. Refer to paragraph 9 for rear reel arm disassembly instructions.

d. The timing belt (40) can be replaced without further disassembly by temporarily disconnecting the push-on terminal lugs from the starting capacitor and motor relay located at the rear upper corner of the projector main plate.

NOTE: A protective switch cover (44) is attached to the rear grille on current models and can, if desired, be added to early models (see inset below parts list).

4. REMOVING FIGURE 2 COMPONENTS. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. The base shield (3) must be removed to permit replacement of items discussed in steps b and c, following. Tip the projector carefully on its back (control panel) end and unscrew the four rubber feet (1). Remove the single screw (2) located in the

approximate center of the base shield (3), and lift the shield from the base.

b. Remove film cutter parts (5 through 9) as follows: Unhook and remove the tension spring (5). Remove the two screws (6) and disassemble the film cutter (7), cutter arm spring (8) and cutter arm (9) from the base.

c. If the power cord (16) is to be replaced, refer to the pictorial wiring diagram, Figure 16, and disconnect or unsolder all power cord leads from their respective terminals. Leadwire clamp (11) and cable retaining clamp (15) must be removed before the power cord can be withdrawn from the base. To replace the pushbutton change over switch (17), unsolder the four leadwires from the switch terminals and remove the switch hex locking nut which secures the switch to the base.

d. Lamphouse components (22A through 22G) can be replaced without disassembling the lamphouse from the projector. If the complete lamphouse assembly (22) is to be replaced, remove the three screws (21) which secure the lamphouse to the hinge of the support bracket assembly (37).

CAUTION: Be sure the projector lamp (25) is off and cool enough to handle safely before attempting to remove the lamp from its socket. Always handle the lamp with tissue paper to avoid leaving fingerprints on the quartz tube. The lamp is removed by disconnecting the cord plug of the lamp (25) from the lamp plug connector (29) located just below the lamp socket. Pull the two lamp retainer clips (23) and (24) toward you just far enough to release the lamp, and lift the lamp from its socket. The lamp clips can be completely withdraw from the lamp bracket (31) by pulling them outward more forecefully, but should not be removed unless in need of replacement.

e. The control panel assembly (42) is secured to the projector main plate with two screws (40) and (41). Note that screw (41) also attaches the lower end of the rear motor bracket to the main plate.

NOTE: Current projectors are equipped with twin fuses mounted on a block at the rear of the projector (items 59 through 63) and wired into the circuitry as shown in Figure 16.

5. REMOVING FIGURE 3 COMPONENTS. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Support the speaker assembly (4) while removing the two screws (1) at the front edge of the main plate and the single screw (3) which attaches the speaker brace to the main plate. Disconnect the push-on lugs from the two terminals at the top of the speaker.

b. To remove the amplifier assembly (6), remove the three screws (5) at the rear edge of the base and the two screws (5A) and washers (5B) from the underside of the base. Refer to paragraph 17 for amplifier repairs.

c. To replace the motor relay (8), disconnect the push-on lugs from the relay terminals and remove the two screws (7) which secure the relay to the mounting bracket (15). The left-hand screw also attaches the terminal strip (9) to which the wire-wound resistor (10) is soldered.

d. To replace the starting capacitor (13), disconnect the push-on lugs from the capacitor terminals and loosen the screw (11) in the capacitor clamp (12) until the capacitor can be withdrawn from the clamp.

e. To remove the drive motor assembly (27), loosen the screws in the motor retaining straps (24) until both straps, with stability bracket (25) assembled, can be unhooked from the prongs of the motor mounting brackets (29). Disengage the drive belt (26) while lifting out the motor assembly. If the motor pulley must be replaced, be sure to install a pulley of the same color (red, gold, or blue) as indicated in the NOTE following the Figure 3 parts list.

6. REMOVING FIGURE 4 COMPONENTS. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Unhook and remove the extension spring (1) and clevis rod (2) from the solenoid bracket and the douser arm. Remove the two screws (3) that attach the switch and solenoid bracket assembly (4) to the projector and disassemble as necessary, to replace damaged parts.

b. The two solenoid bracket screws (3) also attach the rear end of the receptacle and relay assembly (14) to the main plate. Remove the remaining screw (13) and lift the assembly from the projector. Disassemble, as necessary, to replace damaged parts. Rivets (16A) must be drilled out and replaced.

c. Remove the two screws (21) and (22) and the blower support strap (23). Remove four screws (24) and lock washers (25) and lift out the blower and motor assembly (26), the air deflector (27) and the blower ducting (34). If the blower wheel (26E) must be replaced, loosen the setscrew which secures the wheel to the motor shaft. Remove the four studs (26A) and washers (26B), and disassemble the motor assembly (26C) from the blower housing, removing the blower wheel through the large blower housing opening.

d. Remove the screw (28) and washer (29) and disassemble the tilt bar (30) from the lower end of the tilt rack (33D). Remove two screws (32) and lift the tilt assembly (33) from the main plate. Disassemble, as necessary, to replace damaged parts.

7. REMOVING FIGURE 5 COMPONENTS. Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. To remove the mechanism cover assembly (1), swing open the cover. Then depress the spring located adjacent to the upper hinge finger and lift the cover straight up. Disassemble, as necessary, to replace damaged parts.

b. Insert a 1/16-inch diameter punch or steel rod through the hole in the sound drum shaft housing and into the hole in the shaft. Hold the shaft firmly while removing the flywheel nut (3). Withdraw the flywheel (4) from the flywheel shaft. Support the soundhead assembly (8) while removing the screws (6) and washers (7) at the rear of the projector main plate. When lifting the soundhead from the main plate, be careful not to damage the sound drum. Refer to paragraph 10 for exciter lamp cover and soundhead disassembly procedure.

c. Support the mechanism assembly (11) securely while removing the four screws (9) which secure this assembly to the projector main plate. Refer to paragraphs 11 through 14 for mechanism disassembly procedures. The shock mounts (10) are pressed into the main plate and must be driven out from the front side if in need of replacement.

d. Remove the stud (13) at the front end of the film guide (14), thus freeing the spacer (15) located between the film guide and the main plate. Remove the idler roller screw (12) and disassemble the film guide (14) and idler roller (16) from the end of the snubber mounting post (22). Remove the retaining ring (17) and disassemble the snubber roller assembly (18), snubber spring (19), spring retainer (20) and spring cover (21) from the mounting post (22). If in need of replacement, use a wrench to unscrew the post from the tapped hole in the main plate.

8. DISASSEMBLING THE FRONT REEL ARM (Figure 6). Remove front reel arm parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Remove the two cover screws (1) and lift off the reel arm cover (2). Be sure to note and save any shim washers (3) located between the cover and the reel arm bosses.

b. To remove the spindle parts (5 through 13), drive out the spring pin (4). This pin must be replaced with a new one at reassembly. Withdraw the spindle (12) and its washer (13) from the reel arms, catching the collar (5), torsion spring (7), gear assembly (8) and washers (9), (10) and (11) as the spindle is withdrawn.

c. Loosen the setscrews (14) and disassemble the upper gear assembly (15) and clutch spring (16) from the reel arm shaft (34). Remove the two retaining rings (17), clutch disc (18), brass washers (19) and spring tension washer (20).

d. Remove the retaining ring (21) and the two retaining clips (22) and disassemble the gears (23) and (24), the washer (25) and the drive shaft (26) from the reel arm. Inspect the nylon bearings (27) for damage and replace, if necessary.

e. Remove the two retaining rings (28) and disassemble the friction shoe (29), bracket assembly (31), disc assembly (32), bronze washer (33), reel arm shaft (34) and splined bearing (35) from the reel arm. Do not press out any of the needle bearings (35A), (38A) or (38B) unless obviously in need of replacement.

f. Remove the screw (36) and disassemble the brake spring (37) from the reel arm.

9. DISASSEMBLING THE REAR REEL ARM (Figure 7). Remove rear reel arm parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Disconnect and remove the take-up belt (1) and swivel the take-up arm (6), catching the spring (2) as it drops free. Do not disassemble the take-up arm from the rear reel arm (31).

b. Remove the two screws (7) and disassemble the reel arm cover (8) from the reel arm. Note and save any shim washers (9) located between the cover and the reel arm bosses.

c. Remove the retaining ring (10) and retaining clips (11) and disassemble the nylon gears (13) and (13) and washer (14) from the drive shaft. Remove the retaining ring (15) and withdraw the pulley and gear assembly (16) from the rewind drive shaft (23). Inspect the rubber sleeve (17) and nylon bearing (18) for wear or damage and replace, if necessary. Be careful not to lose the plunger (19) and spring (20). Loosen the setscrew (22) and lift the rewind drive shaft (23) from the reel arm. Remove the main drive shaft (24) and inspect the nylon bearings (25) for wear or damage. Replace bearings, if necessary.

d. Loosen the two setscrews (26) and disassemble the upper gear assembly (27) and washers (28) from the reel arm shaft (29). Disassemble the shaft (29) and splined bearing (30) from the reel arm. Do not press out the needle bearings (6A) or (30A) unless obviously in need of replacement.

10. DISASSEMBLING THE EXCITER LAMP COVER AND SOUNDHEAD ASSEMBLY (Figure 8). Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. To remove the exciter lamp (2), swing open the lamp release ring (11); then rotate the lamp counterclockwise and lift it from the locking pins (30A).

b. The optical slit assembly (5) can be removed by loosening the clamping screw (4) and withdrawing the assembly from its holder.

c. Remove the retaining ring (6) and unscrew the adjusting screw (7) from the shoundhead housing.

d. To remove the sound drum and shaft assembly (14), loosen the setscrew (12) and remove the two screws (13). Withdraw the sound drum assembly carefully, noting the manner in which the light pipe and cell assembly (16) and its retainer (15) are assembled into the slot in the sound drum shaft. Wrap the sound drum assembly and silicon cell assembly in tissue to protect them from damage.

e. The disassembly of remaining soundhead parts is a purely mechanical procedure. However, be sure to note the manner in which the springs (22) and (28) are assembled.

11. DISASSEMBLING THE MECHANISM (Figure 9). Remove mechanism parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Pry out the hinge pins (1) and (2) with a wire cutter or similar tool to free the lens carrier assembly (5). Note that the spring washer (3) is used with the upper pin and the flat washer (4) with the lower pin.

NOTE: All lens carrier parts, except the casting itself, can be replaced without disassembling the casting from the main plate. Refer to paragraph 15 for lens carrier disassembly procedure.

b. Remove one of the two retaining rings (12) from the end of the clutch lever shaft (13) and withdraw the shaft. Remove three screws (11) and disassemble the outboard bearing assembly (14) and rewind clutch lever (15) from the upper sprocket shaft. Lift the rewind button (16) and its spring (17) from the opening in the top of the casting.

c. Remove the rewind timing belt (18) and inspect it for unusual wear or physical damage. Remove the retaining rings (19) and disassemble the rewind drive sprocket (20), flat washer (21), spring (22) and spline driver (23) from the upper sprocket shaft. Loosen two setscrews (24) and remove the take-up drive sprocket (25).

d. The sprocket guard assembly (27) is secured with three screws (26) assembled from the rear of the casting. Disassemble, as necessary, to replace damaged parts. When removing the remaining sprocket guards (29) and (29A), note the manner in which the torsion springs (31) are assembled. Inspect all rollers (30) for nicks or scratches and replace if damaged.

e. Loosen two setscrews (32) in each sprocket gear (33) and (34), and disassemble the sprocket gears, tension washers (35), sprocket assemblies (36) and (37), the lower sprocket flange (38) and the thrust washers (39) from the mechanism casting.

12. DISASSEMBLING THE MECHANISM (Figure 10). Remove mechanism parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Remove the screws (1) and the three flanged guide rollers (2). Inspect the rollers for nicks and scratches and replace if damaged.

b. Remove the retaining ring (3) and disassemble the bracket and handle assembly (4) and the torsion spring (5) from the shaft of the lower guard mounting plate (25). Be sure to note the manner in which the torsion spring is installed.

c. Remove the screw (6) and film exit guide (7). Remove the screw (8) and locking lever pivot (9) and lift the locking lever (12) from the mechanism casting. Inspect the roller (11) for nicks or scratches and replace if damaged.

d. Note the manner in which the torsion spring (15) is installed. Remove the retaining ring (13) and disassemble the lower loopform (14) and torsion spring (15) from the lower stud of the connecting link assembly (39). Note the manner in which the legs of the release spring (18) are positioned before disassembling the screw (16), bushing (17) and spring (18) from the casting.

e. Remove the screw (19) and back-up bracket (20). Remove the retaining ring (21) and disassemble the lower film guide (23) and its flat washers (22) from the casting. Remove two screws (24) and the lower guard mounting plate (25). Remove the retaining ring (26) and disassemble the toggle lever (27) and upper film guide (28) from the mounting plate (25).

f. Remove two screws (29) and the leaf spring (30). Loosen the setscrew (31) and remove the threading lever (32) from the upper stud of the connecting link (39). Withdraw the connecting link from the casting and disassemble, as necessary, to replace any damaged parts (items 33 through 39). Remove two screws (40) and lift the upper guard mounting plate (41) from the casting.

13. DISASSEMBLING THE MECHANISM (Figure 11). Remove mechanism parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Remove the screw (1) and plain roller (2) from the end of the loop restorer stud. Inspect the roller for nicks and scratches and replace if damaged.

b. At the rear of the casting, unhook the extension spring (6) from between the lower end of the rewind adjustment stud and the upper loopformer shaft assembly (5). Loosen the two setscrews (4) and disassemble the shaft assembly (5) and complete upper loopformer assembly (items 8 through 14) from the casting. Be careful not to lose the washer (7). Before disassembling loopformer parts, note carefully the manner in which these parts are assembled.

c. Unhook the extension spring (18) from the end of the loop restorer shaft. The spring is secured to the casting with a screw (16) and flat washer (17). Remove screw (15) and washer (17) and disassemble the cam follower and support assembly (19) from the

casting. Disassemble, as necessary, to replace damaged parts.

d. Loosen the hex head screw (20) and disassemble the arm assembly (21), the flat washer (22) and the loop restorer lever and shaft assembly (23) from the casting. Remove two screws (24), lock washers (25), flat washers (26) and the self-centering assembly (27). Do not attempt to disassemble the self-centering assembly.

e. Remove two screws (28) and lift out the aperture plate assembly (29). Refer to paragraph 16 for aperture plate disassembly procedure.

f. When removing the lens carrier catch (31), be careful not to lose the washer (32) located between the catch and the casting. The hex head screw (33) is adjusted to align the lens carrier and should not be removed.

14. DISASSEMBLING THE MECHANISM (Figure 12). Remove mechanism parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Loosen the two setscrews (1) and withdraw the mechanism pulley (2) from the end of the camshaft. Remove screws (3) and (4) and lift off the heat baffle (5), the two spacers (6) and the bracket and douser assembly (7). Remove two screws (8) and the heat deflector (9).

b. Remove the shutter nut (10) and disassemble the counter balance weight (11), shutter (12) and fiber washer (13) from the camshaft.

c. Unless obviously in need of replacement, do not disassemble the stud and ball assemblies (15) or the shuttle link bearings (20A) from the shuttle arms (20). Inspect the pull-down cam followers (20B) for wear. The followers are staked in place in the recess of each shuttle arm and can be removed and reversed, or turned end-for-end, if badly worn. If the felt wiper (17) or felt wick are especially dirty or gummy, discard these items and replace with new ones. The shuttle arms can be removed, with wicks and springs and shuttle assembled, by loosening the hex nuts (14) on the stud assemblies (15).

d. Remove the pull-down cam (21) from the camshaft. Remove two screws (22) and lift the loosely assembled cam bracket (23) and in-out cam (24) from the mechanism casting and camshaft. Inspect the cam follower assembly (23A) and cam spring (23B) and replace if worn or damaged.

e. Remove two screws (25) and the shuttle arm plate assembly (26). Replace the bearing assembly (27) if the contact surface of the head is badly worn or marred.

f. Remove the large retaining ring (28) from the long cast arm of the mechanism casting. Remove two screws (29) and the bearing load spring (30). Loosen the setscrew (32) in the loop restorer cam (33) and press the camshaft (38) to the left until the bearing (31) is forced from its seat in the short cast arm of the mechanism casting. Remove the bearing.

g. Loosen the setscrews (34) in the worm gear (35) and remove the retaining ring (36) from the camshaft. Press the camshaft to the right until the large bearing (37) is forced from its seat in the long cast arm. Disassemble the loop restorer cam (33) and worm gear (35) from the camshaft as the camshaft is withdrawn.

h. Pull out the stop pin (42) and lift the framer knob assembly (43) from the mechanism casting. The rewind adjustment stud (45) is secured with setscrew (44) and should not be removed.

15. DISASSEMBLING THE LENS CARRIER (Figure 13). Except for the lens carrier casting (12), all lens carrier components can be replaced without disassembling the lens carrier from the projector main plate. No special instructions are necessary.

NOTE: Lens carrier assembly part no. 014149 has been superseded by carrier assembly no. 015287 and focus knob and lever assembly no. 015179. Replacement parts are available for the earlier lens carrier. However, if component wear or damage is extensive and requires complete lens carrier assembly replacement, the current lens carrier assembly and its companion focus lever assembly part no. 015179 must be installed.

16. DISASSEMBLING THE APERTURE PLATE (Figure 14). Remove parts, as necessary, in their indexed order of disassembly, noting the following special precautions.

a. Be very careful not to scratch or nick the aperture plate or rails when removing screws.

b. Note the manner in which the side tension spring (7) is assembled before removing the spring retaining cover (4).

17. REPAIRING THE AMPLIFIER ASSEMBLY (Figure 15). Amplifier repairs should be limited to the replacement of those components listed in the Figure 15 parts list. If a check of test voltages shown in the schematic diagram (Figure 17) indicates that either of the printed circuit boards is faulty, it is recommended that the complete circuit board be replaced. Do not attempt to replace circuit board components unless your service station is adequately equipped with audio testing and repair gear and your servicemen are thoroughly trained in such repairs.

Reassembly Procedure

18. GENERAL INSTRUCTIONS.

a. When the reassembly procedure includes the staking of rivets or similar parts, all staking and riveting operations should be performed during the early stages of reassembly to avoid damage to other parts. Be sure to support the major part solidly during staking operations.

b. Parts which require lubrication are listed in the Introduction section of this Service Manual, together with the specified lubricant. Lubricate sparingly and wipe away excess lubricant with a clean, lint-free cloth. During reassembly, apply a drop of oil to screw holes to facilitate screw installation.

c. Many of the nameplates and instructions plates have a protected adhesive backing. Remove the protective paper and brush the adhesive with a mixture of three parts Toluol to one part trichloroethylene. When adhesive is tacky, press the nameplate carefully but firmly in place. Wipe away excess adhesive with a cloth dampened in solvent.

d. When installing electrical components, refer to the pictorial wiring diagram, Figure 16, for proper point-to-point electrical connections. Specific instructions are not included for the repair and parts replacement of power supply and amplifier printed circuit board components (Figure 15).

19. REASSEMBLING THE APERTURE PLATE (Figure 15).

a. Assemble the film guide (9) to the aperture plate (10) with the screw (8). Hold the right edge of the film guide square with the edge of the aperture plate while tightening the screw.

b. Assemble the side tension spring (7) and film tension rail (6) to the aperture plate. The ends of the spring should engage the notches in the film tension rail and the center of the spring should bear against the staked pin in the aperture plate. Assemble the shoulder bushings (5) and spring retaining cover (4) to the aperture plate and install the two screws (3).

c. Attach the film guide rail (2) to the aperture plate with the two screws (1), tightening the screws securely. Refer to paragraph 22 for aperture plate installation instructions.

20. REASSEMBLING LENS CARRIER (Figure 13).

a. If the aperture plate (29, Figure 11) was removed or disturbed, do not install the pressure plate (6) until realignment has been accomplished (paragraph 34, step a). Early and current lens carrier components are assembled in much the same manner, with differences clearly noted in Figure 13. Be sure to install the pressure plate with the notched end up, and note that current models use a washer (8) but not the sleeve spacers (8A).

b. Lightly grease the bore of the lens carrier, the pinion like teeth of the focus knob assembly (3) and the focus shaft notches in the hold-down spring (2) and lens carrier casting. Engage the notches of the hold-down spring with the focus shaft and assemble these parts to the lens carrier. Install and tighten the two screws (1) and check to make certain that the focus knob rotates smoothly and without binding.

21. REASSEMBLING THE MECHANISM (Figure 12).

a. Lightly grease both bearing openings in the cast arms of the mechanism housing (46). Press the smaller ball bearing (31) into the short cast arm. Assemble the larger ball bearing (37) to the camshaft (38), seating it against the shoulder of the shaft. Install the retaining ring (36) to the camshaft just behind the bearing (37) with the bowed face of the ring 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. Assemble the loop restorer cam (33) to the camshaft with the hub of the cam towards the large bearing. Assemble the worm gear (35) to the camshaft with its hub facing away from the large bearing. Engage the end of the camshaft with the small bearing (31) and press the camshaft in place until the large bearing is fully seated in the bearing opening of the long cast arm. Secure the bearing loading spring (30) to the short cast arm with the two screws (29). Assemble the large retaining ring (28) into the ring groove within the bearing recess of the long cast arm.

c. Insert a 0.190-inch feeler gage between the hub of the loop restorer cam (33) and the long cast arm. Hold the cam firmly against the gage while tightening the cam setscrew (32) against the flat on the camshaft.

d. Screw the rewind adjustment stud (45) down into place until the top of the stud is approximately 1/16-inch below the top surface of the housing. Temporarily tighten the setscrew (44). Screw the framer knob and shaft assembly (43) down into the mechanism housing. Orient the stop pin (42) so that the flat side of the pin is facing the cut-out in the framer shaft and the flat is parallel with the shaft. Press the pin in place.

e. Assemble the in-out spring (40) to the shuttle retractor pin (41). Insert the rounded nose of the pin into the hole in the long cast arm, just to the right of the protruding camshaft and secure the loop end of the spring to the mechanism housing with the screw (39). Screw the support bearing (27) all the way up into the staked nut of the shuttle arm plate assembly (26). Engage the forked end of the shuttle arm plate framing arm with the cut-out at the lower end of the framer shaft and secure the plate to the cast arm of the mechanism housing with the two screws (25).

f. Loosely assemble the in-out cam (24) to the cam bracket assembly (23) so that the nylon face of the cam follower (23A) rides against the polished surface of the cam. Install this assembled group over the end of the camshaft and secure the cam bracket assembly to the mechanism housing with the two screws (22).

g. At this point, refer to Figure 11 and install the assembled aperture plate (29) with screws (28). Then return to Figure 12 and continue with reassembly as follows.

h. Make certain that the shuttle link bearings (20A) are firmly pressed into the notches at the front end of each shuttle arm (20) and that the cam followers (20B) are assembled into the center notched section of each arm (see Figure B). Insert the lubricated cam wiper wick (18) into the coils of the extension spring (16). Assemble the lubricated felt wiper (17) and the extension spring (16) to the shuttle arms as shown in Figure B. Assemble the ball and stud assemblies (15) to the ends of the arms with the hex nuts (14), tightening the nuts only fingertight. Carefully insert the front ends of the shuttle arms between the guides of the in-out bracket assembly (23). Assemble the shuttle (19) 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 (24) until the tongue protruding from the unpolished face of the cam rests down in the notch in the shoulder of the camshaft. Assemble the pull-down cam (21) 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 protrution on the face of the in-out cam. Back out the support bearing (27) until its socket-like nylon pad engages the ball of the upper stud assembly (15). The ball of the lower stud assembly should rest in the socket of the nylon pad mounted on the shuttle arm plate assembly (26). It may be necessary to loosen the hex nuts (14) and shift the ball and stud assemblies (15) until proper alignment is obtained.

i. Install the fiber washer (13) on the camshaft and up against the pull-down cam (21) so that the slot in the washer is aligned with the slot in the cam. Assemble the shutter (12) to the camshaft and install the counterbalance weight (11) so that its pin engages the slots in the shutter and pull-down cam. Install the shutter nut (10) with its shoulder in the center of the counterweight. Grip the flats at the end of the camshaft with an open-end wrench and tighten the nut (10) securely.

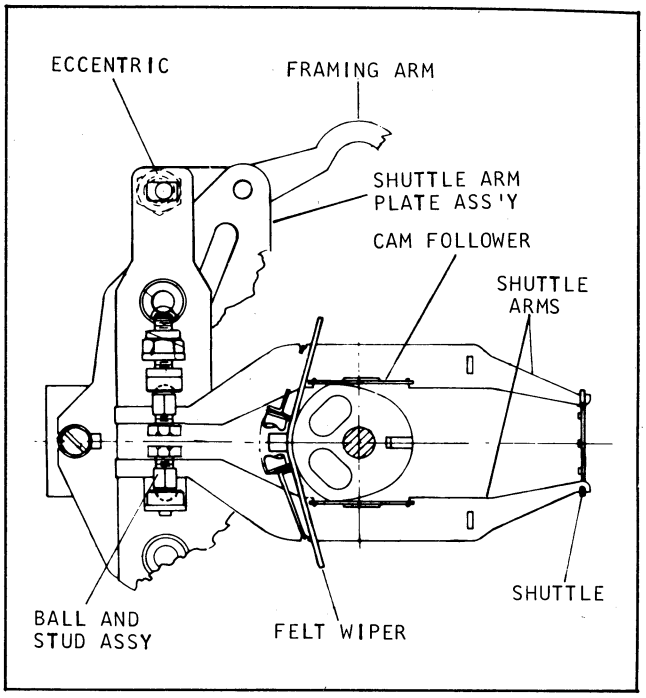


Figure B. Shuttle and Shuttle Arms Assembled

j. Assemble the pulley (2), hub facing in toward the shutter, to the end of the camshaft and temporarily tighten the two setscrews (1).

k. Slip the heat deflector (9) in position behind the shutter and secure the deflector to the mechanism housing with the two screws (8). Position the bracket and douser assembly (7) against the mechanism housing with upper and lower mounting holes aligned. Install the lower mounting screw (3) finger tight. Assemble the two screws (4) through the outer two holes of the heat baffle (5) and install a sleeve spacer (6) on each screw. Carefully lift the heat baffle up into position against the mechanism housing and drive the screws into the tapped holes. Before tightening screws (4), install the remaining screw (3) through the inner tab of the heat baffle (5) and the upper mounting hole of the douser bracket (7). Tighten all screws securely.

22. REASSEMBLING THE MECHANISM (Figure 11).

a. Turn the lens carrier stop screw (33) into the tapped hole in the mechanism housing until only one thread is visible. Secure the lens carrier catch (31) and spacing washer (32) to the mechanism housing with the screw (30). Refer to paragraph 36 for adjustment of the latch and stop screw after reassembly has been completed.

b. Attach the self centering assembly (27) to the mechanism housing with the two screws (24), lock washers (25) and flat washers (26). Insert the shaft of the loop restorer lever assembly (23) through the bearing hole in the mechanism housing. Loosely assemble the hex head screw (20) into the tapped hole in the arm assembly (21) and assemble the washer (22)

and arm assembly to the loop restorer lever shaft. The fork-like finger of the arm assembly (21) must engage the pin of the self centering assembly (27) between the two large diameter washers. Insert a 0.0015 inch feeler gage between the washer (22) and the machined boss of the mechanism housing. Grip the loop restorer lever (23) and arm assembly (21) to hold the gage in place while tightening the screw (20); then remove the feeler gage.

c. Assemble the cam follower parts (19A) through (19F) as shown in Figure 11. Attach this assembled group to the arm assembly (21) with the screw (15) and washer (17), tightening the screw just enough to hold. Hook one end of the spring (18) around the protruding end of the loop restorer lever shaft and secure the other end of the spring to the mechanism housing with the screw (16) and remaining washer (17). Secure the roller (2) to the loop restorer lever stud with the screw (1).

d. Assemble the "film escape" components (items 8 through 14) in the following manner. Assemble the hub assembly (13) to the locking pawl (12) with the screw (11). Insert the shaft (9) through one ear of the kickplate assembly (14), assemble the spring (10) and assembled hub and pawl on the shaft, and insert the end of the shaft through the second ear of the kickplate. Assemble one retaining ring (8) to the innermost end of the shaft and the second ring between the spring (10) and the hub assembly (13). Hook one end of the spring over the outer ear of the kickplate and the other end behind the upper finger of the hub assembly so that the hub and locking pawl tend to rotate clockwise around the shaft. Assemble the loopformer shaft assembly (5) to the mechanism housing and install the washer (7) and assembled "film escape" parts on the shaft. Hold these parts together while tightening the setscrews (4) in the hub of the kickplate assembly (14). Hook one end of the extension spring (6) into the small hole in the link of the shaft assembly (5) and the other end around the lower end of the rewind adjustment stud (item 45, Figure 12). Refer to paragraph 44, step d, for final adjustment of the "film escape" mechanism.

23. REASSEMBLING THE MECHANISM (Figure 10).

a. Secure the upper guard mounting plate (41) to the mechanism housing with the two screws (40), the left-hand screw being inserted through the half-moon slot in the kickplate assembly (item 14, Figure 11).

b. Assemble the shuttle retractor (38) to the connecting link (39) with the screw (35) and washer (36) and (37). Assemble the leaf spring (30) to the upper loopform assembly (34) with the two screws (29) and secure the loopform to the upper pin of the connecting link (39) with the retaining ring (33). Insert the shaft of the loopform (34) through the upper guard mounting plate (41) and the mechanism housing and install the threading lever (32) on the end of the shaft. Secure the threading lever by tightening the hex head setscrew (31).

c. Engage the small hole in the film guide (28) over the pin in the lower guard mounting plate (25) and hold the guide in place while inserting the shaft of the toggle lever assembly (27) through the mounting plate. Engage the fork-like ears of the toggle lever with the pin protruding from the mounting plate and install the toggle lever retaining ring (26).

d. Position the lower mounting plate (25) against the mechanism housing, raising the film guide (28) so that its large pivot hole slides onto the lower sprocket shaft bearing protruding from the housing. Engage the lower pin of the connecting link (39) with the remaining forked end of the toggle lever (27) and secure the mounting plate to the housing with the two screws (24).

e. Assemble a washer (22) and the film guide (23) over the lower sprocket shaft bearing, inserting the lower pin of the connecting link (39) through the hole in the film guide arm. Install the second washer (22) and secure all parts to the sprocket bearing with the retaining ring (21). Assemble the back-up bracket (20) to the upper right post of the lower mounting plate (25) and secure the bracket to the plate with the screw (19).

f. Assemble the loopform (14) and its torsion spring (15) to the lower pin of the connecting link (39) and install the retaining ring (13). The legs of the spring must be positioned so that they tend to force the loopform in a clockwise direction around the connecting link pin.

g. Assemble the pivot (9) and screw (8) to the locking lever (12). Rotate and hold the loopform (14) counterclockwise while assembling the locking lever to the mechanism housing and tighten the screw (8) securely. Again rotate the loopform (14) in a counterclockwise direction while assembling the film exit guide (7) to the lower mounting plate with screw (6). When released, the curved lip of upper loopform (14) must just touch the formed curve of the exit guide (7).

h. Assemble the bushing (17) into the release spring (18) and secure these parts to the mechanism housing with the screw (16). The long leg of the spring must hook behind the rear edge of the locking lever (12) and the short leg must bear against the rear rim of the housing. The resultant tension should tend to rotate the locking lever in a counterclockwise direction around the pivot (9). Assemble the roller (11) to the locking lever roller stud with screw (10).

i. Assemble the bracket and handle assembly (4) and its torsion spring (5) to the lower right stud of the mounting plate (25) and install retaining ring (3). Hook the bent end of the torsion spring behind the small finger at the front end of the locking lever with the straight end pressing against the flat surface of the bracket (4). The resultant tension should tend to pivot bracket (4) in a clockwise direction. The three flanged guide rollers (2) are to be installed on the upper right and lower left posts of the lower mounting plate (41). Lightly oil these parts and assemble rollers to the posts with screws (1). The counterbored end of the rollers must be at the tapped end of the posts.

24. REASSEMBLING THE MECHANISM (Figure 9).

a. Assemble the three torsion springs (31) to the three remaining roller studs of the upper and lower guard mounting plates. The short leg of the spring must be in toward the mechanism housing. Assemble the sprocket guards (29) and (29A) with their rollers (30) to the roller studs. The tapered end of the rollers must face in toward the mechanism housing. Hook the long bent end of the springs (31) over the top inner edge of the sprocket guards. Secure all sprocket guards with the screws (28), and rotate the guide rollers to check freedom of rotation. If rollers do not spin freely, or if "squeaking" is noted during rotation, add shim washers (28A) beneath the screw head until the problem is eliminated. Rotate the short (inner) end of each torsion spring (31) in a clockwise direction around the roller post until the bent end can be engaged in the small hole adjacent to the roller post.

b. Assemble two setscrews (32) to each of the sprocket gears (33) and (34), and press all sprocket guards to the "open" position. Assemble the flange (38) to the shaft if the lower sprocket (37) with the smallest diameter of the flange toward the sprocket. Assemble a thrust washer (39) to the sprocket shaft and lightly oil the end of the shaft. Insert the shaft through the lower sprocket bearing and assemble a spring tension washer (35) and the lower sprocket gear (33), hub facing out, to the end of the sprocket shaft. Shift the camshaft worm gear, as necessary, until the sprocket gear teeth engage the worm gear teeth at the approximate center of the worm gear. Then tighten the two worm gear setscrews securely. Insert a 0.005 inch feeler gage between the lower sprocket gear and its tension washer (35) and, while holding all parts together to eliminate end play (but without flattening the tension washer), tighten the sprocket gear setscrews (32) securely.

c. Assemble a thrust washer (39) to the shaft of the upper sprocket assembly (36) and lightly oil the end of the shaft. Insert the sprocket shaft through the upper sprocket bearing until the end of the shaft protrudes slightly at the rear of the mechanism housing. Assemble a tension washer (35) to the shaft; then hold the upper sprocket gear (34) in place, hub facing out and gear teeth meshing with the worm gear, and press the sprocket shaft all the way in place. Insert a 0.005 inch feeler gage between the sprocket gear and its tension washer and, while holding all parts in place to eliminate end play (but without flattening the tension washer), tighten the two setscrews (32) securely. "Close" all sprocket guards.

d. Assemble the sprocket guard assembly (27) to the housing beneath the upper sprocket with the three screws (26) inserted from the rear of the housing. Assemble the threading bar assembly (7) to the shaft protruding from the mechanism housing above the upper sprocket guard and install the retaining ring (6). Secure the hood (9) to the mechanism housing with two screws (8).

e. Assemble the drive sprocket assembly (25), hub facing in, to the upper sprocket shaft with its hub bearing lightly against the hub of the upper sprocket gear. Tighten the two setscrews (24) securely. Install the spring (17) and rewind button (16) into the opening in the top of the mechanism housing. Depress and hold the button while assembling the rewind clutch lever (15) to the mechanism, engaging the small fork-like end of the lever with the groove at the lower end of the rewind button shaft. Assemble the spline driver (23) to the upper sprocket shaft with the splines inserted through the legs at the lower end of the clutch lever and meshing with the splines of the drive sprocket (25). Assemble the spring (22) and washer (21) to the sprocket shaft and install a retaining ring (19) to retain these parts. Assemble the drive sprocket assembly (20), hub facing out, to the sprocket shaft and install the second retaining ring (19). Loop the timing belt (18) around the drive sprocket. Assemble the outboard bearing assembly (14) to the sprocket shaft with the ears for the clutch lever shaft (13) within and aligned with the ears of the clutch lever (15). Install a retaining ring (12) in the ring groove at one end of the shaft and insert the shaft through the clutch lever and outboard bearing ears; then install the second retaining ring (12). Secure the outboard bearing to the mechanism housing with the three screws (11). The parts discussed in this paragraph are shown assembled in Figure C.

f. Loosen the locking setscrew (Figure C) and turn the rewind adjusting stud in or out to obtain 0.010 inch clearance between the inner face of the spline driver (23) and the heads of the contact buttons on the lower legs of the rewind clutch lever (15). Then tighten the setscrew securely against the adjusting stud.

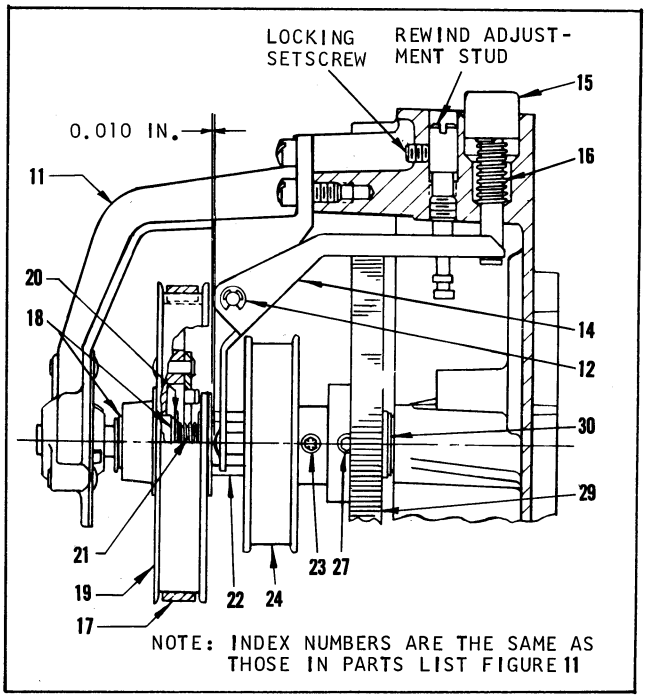


Figure C. Upper Sprocket Gear and Clutch Parts Assembled

g. Hold the lens carrier assembly (5) in position between the hinge bosses of the mechanism housing and carefully insert the washers (3) and (4) between the hinge bosses and carrier hinge ears. Press the hinge pins (1) and (2) fully into place. Refer to paragraph 36 for lens carrier adjustments.

25. REASSEMBLING THE SOUNDHEAD AND THE EXCITER LAMP COVER (Figure 8).

a. Assemble the springs (30C) and bushings (30B) into the openings in the soundhead casting. Then install the exciter lamp locking pins (30A), forcing the ends through the tops of the bushings as shown in the inset of Figure 8. Loosely assemble the edge guide screw (17), the optical slit clamping screw (4) and the setscrew (12) to their respective holes in the soundhead housing (30). Leave approximately three threads of the guide screw exposed.

b. Apply adhesive to approximately four center threads of the roller adjusting screw (7) and assemble the screw to the housing, leaving about two threads exposed. Secure the terminal lug (24) to the housing with the screw (23), with the free (upper) end of the lug positioned between twelve and one o'clock.

c. Lightly oil the roller studs of the stabilizer arms (27) and (29). Assemble the flanged roller (20) with its washer (19) to the roller stud of the upper arm (29) and the plain roller (21) with its washer (19) to the roller stud of the lower arm (27) and secure the rollers with the screws (18). The rollers should spin freely and without binding.

d. Assemble the lower stabilizer arm (27) to the shaft of the upper stabilizer arm (29). Assemble the torsion spring (28), long leg first, over the hub of the lower stabilizer arm. Assemble stabilizer arm (26) to the upper stabilizer arm (29) with the two screws (25) and tighten these screws securely. Hook the bent outer end of the torsion spring (28) into the small hole near the lower end of stabilizer arm (26). Wind the inner end of the spring one full turn clockwise and assemble the spring loop over the small pin protruding from the lower arm (27).

e. Insert the long shaft end of the upper stabilizer arm through the soundhead housing and the roller adjusting screw (7) and assemble the retaining ring (6) to the end of the shaft. Assemble the extension spring (22) between the terminal lug (24) and the notched end of the lower stabilizer arm (27). Figure D illustrates the proper assembly of the stabilizer arms and spring.

f. Carefully insert the shaft of the sound drum (14) through its opening in the soundhead housing until the inner face of the sound drum has not quite reached the centerline of the opening for the optical slit assembly (5). Install screws (13) and tighten just enough to hold. Insert the silicon cell assembly (16) from the mounting surface side of the housing, pushing it in carefully until the step at the front of the assembly is even with the front surface of the casting.

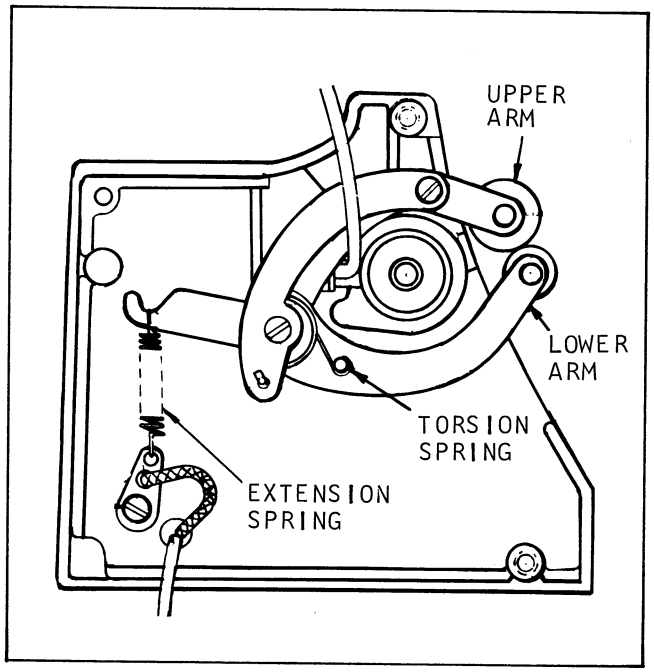


Figure D. Stabilizer Arms and Spring Assembled

Insert the retainer (15) from the front side of the housing with the rounded portion toward the cell assembly. The retainer must be positioned between the cell and the end of the setscrew (12). Tighten the setscrew securely and rotate the sound drum to make certain that the retainer is not binding against the sound drum shaft.

g. Lightly grease both surfaces of the lamp release ring (11) and assemble the ring and the exciter lamp contact assembly (9) to the housing ith the two screws (8). Check the action of the release ring.

h. Insert the optical slit assembly (5) into its holder in the soundhead housing and tighten the clamping screw (4) just enough to hold the slit in place. The exciter lamp (2) need not be installed until after all soundhead adjustments have been made (paragraph 40).

i. Secure the film guide (1E) to the exciter lamp cover (1H) with the two screws (1D). If the indicating ruby (1C) was replaced, cement the new relay into the exciter lamp cover. Assemble the screw (1B) to the cover and install the retaining ring (1A).

26. REASSEMBLING THE REAR REEL ARM (Figure 7).

a. Assemble the needle bearings (6A) and (30A) into the take-up arm assembly (6) and splined bearing assembly (30) respectively. Assemble nylon bearings (18) into the lower pulley and gear assembly (16) and nylon bearings (25) into the drive shaft support arms of the rear arm (31). Place one drop of oil in each nylon bearing and two drops of oil in each needle bearing. Assemble splined bearing (30) into reel arm.

b. Assemble the rubber sleeve (17) to the hub of the lower gear assembly (16). Assemble the retaining ring (21) and lower gear to the rewind drive shaft (23) and install the second retaining ring (15). Install the spring (20) and plunger (19) and hold in place while inserting the shaft (23) into the reel arm. Secure with the setscrew (22).

c. Assemble the lower spur gear (12) to the end of the drive shaft (24) which has one retaining ring slot, and install the retaining clip (11). Insert the opposite end of the drive shaft through both bearings (25) and install the washer (14), retaining clip (11), upper spur gear (13) and retaining ring (10). The lower nylon gear (12) must mesh with the crown gear teeth of the lower gear assembly (16) with a minimum of backlash. Loosen the setscrew (22) and shift the gear shaft (23) in or out as necessary; then retighten the setscrew securely.

d. Hold the upper gear assembly (27) in place, its teeth engaging those of the upper nylon gear (13) while inserting the rear reel arm shaft (29). Note the use of brass shims (28) located beneath the gear assembly (27). Use shims, as necessary, to reduce gear backlash to a minimum. When proper shimming has been determined, secure the gear assembly (27) with two setscrews (26).

e. Assemble the take-up spindle and pulley assembly (4) to the take-up arm (6) with the socket head screw (3). Hold the take-up arm in place with the belt (1) looped around the pulley assembly and the hub of the lower gear (16). Spring (2) must be inserted into the drilled hole in the take-up arm and the free end of the spring will bear against the reel arm as shown in Figure E. Install the pin (32) to secure the take-up arm to the reel arm.

f. Refer to paragraph 39, step b, for final backlash adjustments and lightly lubricate all gear teeth. Check smoothness of gear train action by rotating the shaft (29). Assemble the reel arm cover (8) to the reel arm with the screws (7), using shims (9), as necessary, between the reel arm bosses and cover bosses to eliminate dimpling of the cover as the screws are tightened. Refer to paragraph 32, step a, for rear reel arm installation instructions.

27. REASSEMBLING THE FRONT REEL ARM (Figure 6).

a. Assemble the needle bearings (35A), (38A) and (38B) into the splined bearing (35) and front reel arm (38) respectively, and place two drops of oil in each bearing. Assemble the nylon bearings (27) into the drive shaft support arms of the reel arm and lubricate each with one drop of oil.

b. Assemble the splined bearing (35) into the bearing opening of the front reel arm and install the bronze washer (33) and disc assembly (32) over the protruding end of the bearing. The pin of the disc assembly must be inserted through the hole in the front reel arm.

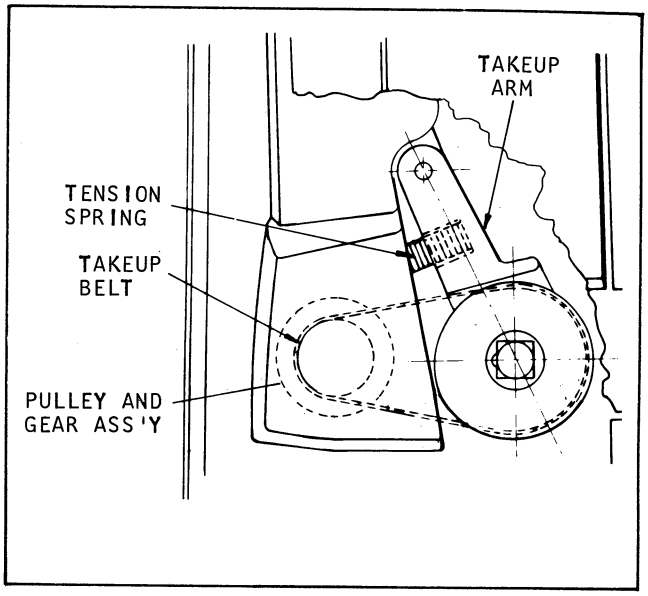


Figure E. Installing Take-Up Arm, Belt and Spring

c. Assemble the friction shoe (29) to the bracket assembly (31) with the retaining ring (28). Assemble the bracket assembly (31) onto the protruding pin of the disc assembly (32) and install the second retaining ring. Secure the brake spring (37) to the tapped boss of the front reel arm with the screw (36), flexing the spring so that the free end bears on the top edge of the bracket assembly (31).

d. Assemble the lower spur gear (23) and its retaining clip (22) to the end of the drive shaft (26) which has only one ring groove. Lightly oil the opposite end of the shaft and insert the shaft up through both nylon bearings (27). Assemble the washer (25), retaining clip (22) and upper spur gear (24) to the end of the shaft and secure all parts with the retaining ring (21). Rotate the gears to make sure that they turn smoothly and without binding.

e. Assemble the washer (13) to the spindle assembly (12) and insert the spindle shaft into and through needle bearing (38A). While continuing to press the shaft through this bearing, assemble the washers (11), (10) and (9), lower gear (8), spring (7) and spindle collar (5), with pin (6) assembled, to the spindle shaft. Hook the bent end of the spring (7) into a small hole in the inner face of the gear (8); then wind the spring one full turn and hook the straight leg of the spring beneath the pin (6). Align the hole in the collar with the hole in the spindle shaft and install a new spring pin (4). Lightly grease the teeth of the lower gear (8). Hold the lower nylon gear (23) stationary while turning the spindle. The spindle must rotate freely in the clockwise direction, but must not rotate when turned counterclockwise. Check the backlash between the lower gear (8) and the lower nylon gear (23). Backlash over an entire 360-degree rotation of gear (8) should be 0.005 inch minimum to 0.018 inch maximum and can be adjusted by altering the combination of

shim washers (9) and (10) on the spindle shaft. After adjustment has been made, drive the spring pin (4) fully into place.

f. Assemble a retaining ring (17) to the innermost ring groove in the reel arm shaft (34). Assemble the clutch disc (18) to the shaft, pin facing out, and install the second retaining ring (17). Assemble the clutch spring (16), loop end in toward the clutch, to the reel arm shaft. Engage the outer bent end of the spring in the small hole in the shaft; then wind the spring one full turn clockwise and hook the spring loop over the pin in the clutch disc. Assemble the upper gear assembly (15) to the end of the shaft, gear hub facing the clutch disc, and temporarily tighten the two setscrews (14). Install a brass washer (19), the spring tension washer (20) and a second brass washer (19) onto the reel arm shaft and up against the clutch disc. Lightly oil the end of the shaft and apply grease to the teeth of the upper gear (15). Insert the shaft through the spline bearing, positioning the friction shoe (29) so that its curved surface bears against the outer diameter of the clutch disc (18), and meshing the upper gear assembly (15) with the upper nylon gear (24).

g. Do not install the reel arm cover (2) until the reel arm is installed on the projector mainframe. Refer to paragraph 32, step b, for reel arm installation instructions.

28. REASSEMBLING THE PROJECTOR MAIN PLATE (Figure 5).

a. Assemble the snubber mounting post (22) into the tapped hole near the lower rear corner of the main plate. Insert the spring retainer (20) between the first and second coils of the spring (19) at the end opposite the hooked end of the spring. The largest diameter of the retainer must be positioned behind the formed end of the spring and the smaller diameter of the retainer within the inner diameter of the spring. Insert the assembled spring and retainer into the spring cover (21) so that the formed leg of the spring protrudes through the slot in the back wall of the spring cover. Assemble the snubber arm assembly (18) into the spring and engage the hook of the spring over the arm. Assemble this group of parts over the snubber mounting post (22), inserting the protruding inner end of the spring into the hole in the main plate below and to the rear of the mounting post. Install the retaining ring (17) to secure all parts. Assemble the roller (18D), washer (18B) and snubber handle (18A) to the roller post of the arm assembly (18). Hold the idler roller (16) between the arm of the film guide (14) and assemble these parts to the end of the snubber post. Install and tighten the roller screw (12). Lift the free end of the film guide (14) up in line with the mounting hole in the main plate. Insert the mounting stud (13) through the film guide and the spacer (15) and screw the stud tightly into place.

b. Press the four shock mounts (10) into the recesses in the main plate with the open end of the mounts facing out. Be sure the mounts are fully seated. Lift the assembled mechanism (11) carefully up into position against the main plate and install the four screws (9) through the mounts and into the tapped bosses in the mechanism housing.

c. Thread the soundhead wire leads through the opening in the main plate while lifting the soundhead (8) up into position. Secure the soundhead to the main plate with the screws (6) and washers (7). A washer is not used with the bottom screw. Do not install the exciter lamp cover (2) until soundhead adjustments have been made (paragraph 40).

d. Assemble the washer (5) and flywheel (4) to the sound drum shaft. Insert a 1/16-inch diameter steel pin or rod through the hole in the non-rotative shaft of the sound drum and into a corresponding hole in the rotating shaft. Hold the shaft stationary while tightening the flywheel nut to approximately 24 inch-ounces breakaway torque of the flywheel.

e. Reassemble the mechanism cover parts (items 1A through 1H) and set the cover assembly (1) to one side until all adjustments have been made.

29. REASSEMBLING THE PROJECTOR MAIN PLATE (Figure 4).

a. Lightly grease the teeth of the worm gear (33K) and assembly the washer (33L) to the worm gear shaft. Lightly oil the shaft and insert it through the bearing hole in the tilt housing (33M). Assemble the spring tension washer (33J) on the shaft with the bowed face toward the housing; then install the flat washer (33H) and retaining ring (33G). Lightly grease the teeth of the tilt rack (33D) and insert the rack down into the housing. Lightly grease the teeth of the tilt pinion (33F) and assemble the pinion into the tilt housing with the spring pin (33E), meshing the pinion teeth with those of the worm gear and tilt rack. Assemble the tilt knob (33B) to the end of the shaft with two setscrews (33A).

b. Fasten the tilt rack assembly (33) to the projector main plate with the two screws (32). Assemble the rubber feet (31) to the tilt bar (30) and secure the tilt bar to the tapped end of the tilt rack with the screw (28) and lock washer (29). Rotate the tilt knob to retract the tilt rack up into the housing.

c. Assemble the grommets (26D) into the bracket of the motor (26C). Hold the blower wheel (26E) within the blower wheel housing (26F), with the hub of the wheel toward the side where the motor assembly will be installed. Guide the shaft of the motor through the housing wall and the blower wheel hub. Assemble the large washers (26B) to the motor support studs (26A) and secure the motor assembly (26C) to the housing with the four studs, tightening the studs securely. Visually center the blower wheel within the walls of the housing and tighten its setscrews securely.

d. Assemble the blower ducting (34), the air deflector (27) and the assembled blower and motor (26) to the projector main plate with the four screws (24) and the lock washers (25). Secure the upper end of

the support strap (23) to the blower housing with the screw (21). Secure the lower end of the strap to the base with screw (22).

e. If either receptacle (17) or (18) was replaced, assemble the new receptacle to the mounting bracket (15) with the rivets (16) and washers (16A). Secure the enclosed relay (20) to the top of the mounting bracket with the screw (19). Lift the bracket up into position against the main plate and secure the left (front) end of the bracket with the screw (13) finger-tight. Assemble the douser solenoid (11) to bracket assembly (12) with the two screws (10) and washers (10A). Sandwich one insulator (9) between the two switches (8) and secure these parts and a second insulator (9) to the bracket assembly (3) with the two screws (5), lockwashers (7) and hex nuts (6). Hook the long end of the extension spring (1) around the pin in the solenoid clevis and remaining end through the hole at the top of the bracket (12). Hook the double-bent end of the clevis rod (2) into the hole in the bracket (12) and lift the bracket up into position against the main plate, engaging the free end of the rod (2) through the hole in the douser arm of the mechanism assembly. Insert the two screws (3) through the mounting holes in the bracket (12) and the receptacle bracket (14) and turn the screws securely into the tapped holes in the main plate. Tighten screw (13) securely.

30. REASSEMBLING THE PROJECTOR MAIN PLATE (Figure 3).

a. Secure the electrical shield (31) to the projector base just to the rear of the blower assembly with the screw (30). Attach the motor mounting brackets (29) to the main plate with the three screws (28). The screw which attaches the lower end of the rear bracket should not be installed until the control switch bracket is assembled to the projector.

b. If the motor pulley (27B) was replaced, be sure that the color of the replacement pulley is the same as the pulley which was replaced (see NOTE at end of Figure 3 parts list). Lift the assembled motor (27) up into position, looping the drive belt (26) around the mechanism pulley and motor pulley before seating the motor in the cradle-like arms of the mounting brackets (29). Install the assembled retaining straps (24) and stability bracket (25), engaging the loops of the straps with the ears of the mounting brackets (29). Tighten the strap screws until the straps are firmly locked around the mounting flanges of the motor.

NOTE: Do not install the reel arm locking parts (20) through (23) until the reel arms have been assembled to the projector (paragraph 32).

c. Lightly oil the roller studs of the idler assemblies (17) and (19). Assemble the rollers (17B) and (19B) to their respective studs and secure them with the retaining rings (17A) and (19A). Fasten the idler assemblies (17) and (19) loosely to the main plate with the screws (16) and (18). The idler assemblies will be adjusted in final assembly to provide proper belt tension (paragraph 41).

d. Fasten the relay mounting bracket (15) to the tapped bosses of the main plate with the two screws (14). Assemble the capacitor (13) into the clamp (12). Capacitor terminals must face toward the front of the projector when the clamp is installed. Secure the clamp to the mounting bracket (15) with the screw (11). Hold the relay (8) in position against the mounting bracket and install the screws (7). The front screw also attaches the terminal strip (9).

e. Lift the speaker (4) up into position against the main plate and secure the free end of the speaker support bar to the main plate with the single screw (3), tightening the screw fingertight. Install the remaining two screws (1) through the front edge of the main plate and into the speed nuts (2) pressed onto the inner edge of the speaker housing. Tighten all screws securely.

f. Position the assembled amplifier (6) on the projector base. The L-shaped grounding spring which is fastened to the amplifier must bear against the end of the sound drum shaft. Install the three screws (5) finger-tight; then carefully tip the projector up onto its rear end to expose the underside of the base and install the remaining two screws (5A) and washers (5B). Tighten all mounting screws securely.

31. REASSEMBLING THE PROJECTOR MAIN PLATE (Figure 2).

a. Only current projector models are fused (items 59 through 63), with wiring connections made as illustrated in Figure 16. After reassembling control panel components (items 43 through 56), secure the upper ear of the bracket (55) with screw (41), inserting the screw through the lower end of the motor mounting bracket also. Secure the lower ear of the bracket (55) with screw (40). Tighten both screws and install the pilot lamp (39).

b. Assemble the heat deflector (38) and support bracket assembly (37) to the main plate with the two screws (36). Secure the pulley shield (35) to the main plate with two screws (34). Secure the lamp shield (33) to the main plate with two screws (32). Fasten the lamp bracket assembly (31) to the main plate with two screws (30). Gently pull the lamp retainer clips (23) and (24) outward to their stops. The lamp (25) should not be installed until optical alignment has been accomplished (paragraph 34).

c. Assemble the lamphouse components (items 22A through 22H). Secure the lamphouse assembly (22) to the hinge of the support bracket assembly (37) with the three screws (21). If the power cord (16) was replaced, be sure to secure the cord and leads to the underside of the base with the lead clamps (11) and (15).

d. Secure the film cutter assembly (7) to the underside of the base with the two screws (6), with the front screw also securing the loop end of the cutter arm spring (8). Insert the tail of the film cutter arm assembly (9) into the rectangular slot at the rear of the film cutter (7) and engage the hook

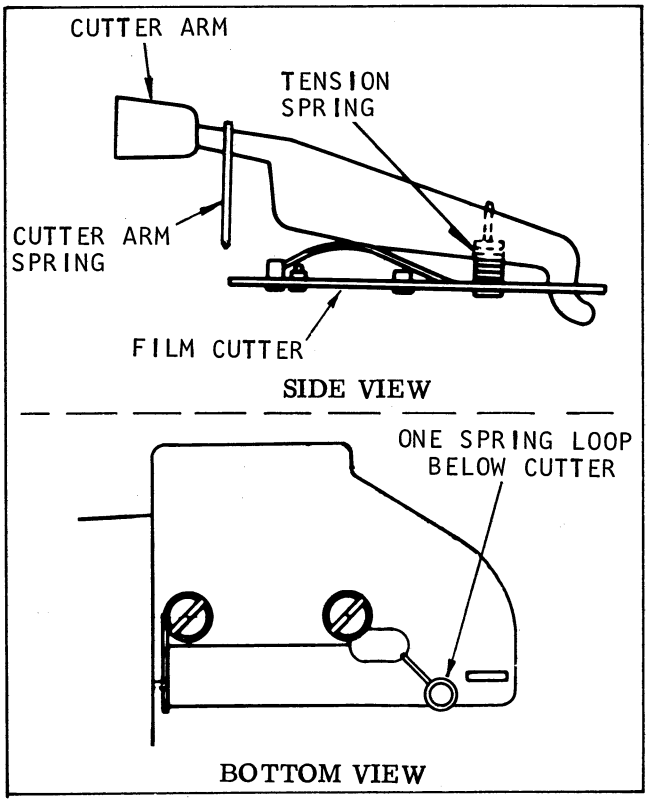


Figure F. Installing Film Cutter Parts

end of the spring (8) over the arm as shown in Figure F. Insert the bent loop end of the tension spring (5) through the elongaged hole in the film cutter (7) with one full coil of the spring on the underside of the cutter (Figure F). Hook the free (upper) end of the spring over the cutter arm.

e. Tilt the projector carefully back on its rear end and check to make certain that power cord leads are properly dressed and secured with leadwire clamps. Make certain that the tapped post (4) is tightened securely to the base. Position the base shield (3) on the base and install the screw (2) through the shield and into the tapped post (4). Install the four rubber feet (1).

32. REASSEMBLING THE PROJECTOR MAIN PLATE (Figure 1).

a. Assemble the large bronze washer (38) over the splined bearing of the rear reel arm assembly (37). Insert the reel arm shaft through the opening in the main plate and assemble the nickel-plated locking disc (36) over the splined bearing with the notch in the disc positioned approximately as shown in Figure G. Assemble the retaining collar (35) up against the locking disc and tighten the collar setscrews (34) securely. Now refer to Figure 3 and install reel arm lock plunger parts (20) through (23). When securing these parts to the main plate, note that the ear of the lock plunger bar engages the notch in the disc as shown in Figure G. Refer to Figure 1 and assemble two brass washers (31) and then the nylon washer

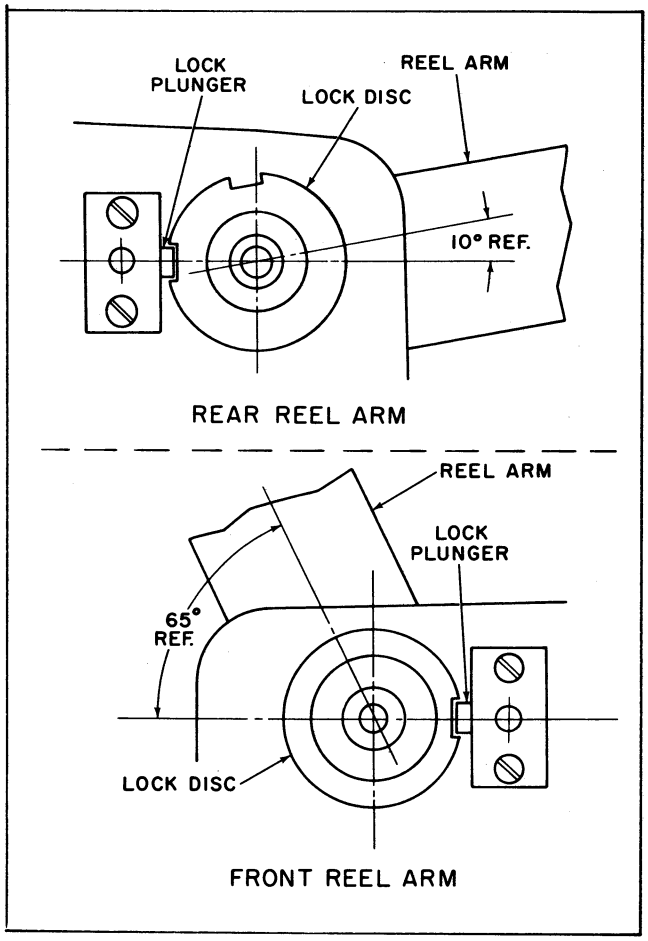


Figure G. Installing Reel Arm Lock Discs and Plungers

(32) to the rear reel arm shaft. Loop the timing belt (40) around the sprocket assembly (33) and assemble the sprocket assembly, the nylon washer (32) and remaining brass washer (31) on the shaft. Secure all parts with the retaining ring (30).

NOTE: If the timing belt was removed completely from the main plate, it will be necessary to disconnect the push-on leadwire lugs from the motor relay and starting capacitor so that the belt can be slipped behind these two items. The timing belt is shown installed in Figure R.

b. Assemble the large bronze washer (29) over the splined bearing of the front reel arm assembly (28). Insert the reel arm shaft through the opening in the main plate and assemble the black locking disc (27) over the splined bearing with the notch in in the disc positioned approximately as shown in Figure G. Assemble the retaining collar (26) up against the locking disc and tighten the collar setscrews. Rotate the large crown gear at the inner end of the front reel arm shaft through a full 360-degree rotation, checking the mesh of the crown gear teeth with the small nylon gear at the end of the reel arm drive shaft. Adjust the retaining collar (26), as necessary, to obtain 0.005 to 0.018 inch backlash and

retighten the collar setscrews. At this point, refer to Figure 3 and install the reel arm lock plunger parts (20) through (23). When securing these parts to the main plate, be sure to engage the ear of the lock plunger bar with the notch in the locking disc as shown in Figure G. Refer to Figure 1 and assemble two brass washers (24) and a nylon washer (22). Loop the face end of the long timing belt (40) around the take-up sprocket assembly (23) and assemble the sprocket and a second nylon washer (22) to the reel arm shaft. Refer to Figure R for complete timing belt engagement. The short rewind timing belt is looped loosely around the large rewind drive sprocket of the mechanism assembly. Loop this belt around the rewind sprocket assembly (21) and assemble this sprocket, slotted hub facing out, to the reel arm shaft. Install the locking collar (21), engaging its tongue with the slot in the sprocket (21). Insert a 0.002 inch feeler gage between the two brass washers (24) and press all parts together while tightening the collar setscrews (19). Refer to paragraph 41 for belt tension adjustment.

NOTE: At this time, refer to Figure 6 and install the front reel arm cover with the cover screws.

c. Carrying handle parts (5) through (15) are shown assembled and installed in Figure H. Assemble the latch studs (14) to the main plate and hold studs in place while installing the cover release lever (15). Secure the lever with the two retaining rings (13). Assemble the spring (12) to the tongue at the rear end of the lever and seat the free end of the spring in the recess of the main plate. Assemble a spacer (11) into each of the two slots of release lever so that they rest in the counterbore of the main plate. Secure the carrying strap (10) with the two screws (9) installed in the holes closest to the 90-degree upright bends of the strap. Assemble the rubber grip (8), handle body (7) and cap (6) to the strap with the two screws (5).

NOTE: Projector covers (1) and (4) should not be installed untill all projector adjustments have been

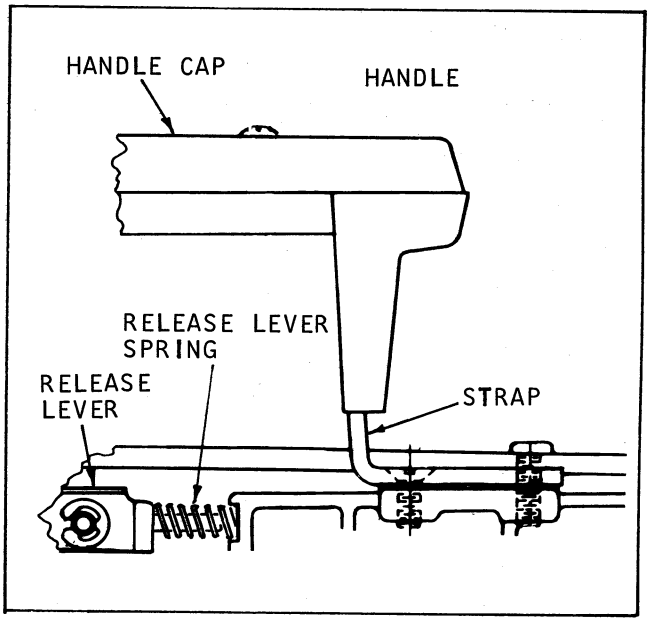


Figure H. Installing the Carrying Handle

made as outlined in the following section. Note that current projectors are equipped with a protective switch cover (44) secured to the rear grille. At customer request, this cover can be installed on earlier models (illustrated below Figure 1 parts list). After all adjustments and test have been made, install the rear cover as follows.

d. Assemble the moulding (16) to the main plate with the "U" shaped edge toward the rear (motor side) of the plate. Tap the moulding lightly with a rubber mallet to seat it against the main plate. Assemble the rear cover (4) to the base and main plate, adjusting the rear cover and moulding for fit and alignment. Secure the rear cover to the top of the main plate with two screws (3) inserted through the cover and the outer holes in the carrying handle strap. Install and tighten the remaining seven screws (2).

Adjustments

33. GENERAL INSTRUCTIONS.

The alignment and adjustments covered in this section are necessary to the proper operation of the projector. Even though the projector may not have undergone complete overhaul and repair, it is recommended that all adjustments be checked as a routine measure. Routine adjustments such as those applicable to sliding fits, clearances and end play have been covered in the reassembly procedures and are not repeated here except where they directly affect other adjustments or alignments.

All special tools and fixtures required to perform the adjustment procedures are illustrated in Figure A. In addition, special test films and electronic test equipment (vacuum tube voltmeter, volt-ohmmeter, oscillator and tachometer or Strobotac) are needed to check and adjust the sound system.

WARNING

Many of the procedures listed in this section require operation with the rear cover removed and the protective interlock switch defeated. To avoid shock hazards, disconnect the power and discharge the motor starting capacitor when not required. The use of an isolation transformer is recommended.

34. OPTICAL ALIGNMENT.

NOTE: Be sure to perform the alignments in the following listed sequence. Alignment tools required are shown installed in Figure J and are illustrated and listed in Figure A, Special Service Tools. Before proceeding with alignments, disconnect the power cord and remove the projection lamp and lens.

a. Aligning the Aperture Plate. Swing open the lens carrier and disassemble the pressure plate assembly from the lens carrier. Loosen the two aperture plate mounting screws just enough to permit free movement of the aperture plate and tip the projector carefully onto its back end so that the lens opening faces straight up. Insert the aperture plug (SER-550-2-N3) into the aperture opening of the aperture plate and close the lens carrier. Insert the lens plug (SER-550-2-N1) into the lens bore of the carrier. Insert the alignment rod (SER-550-2-N2) part way into the lens plug; then lower the rod slowly, shifting the aperture plate as necessary until the rod enters the hole in the aperture plug. With the rod in place, tighten the aperture plate mounting screws securely. Tip the projector back on its base, leaving the tools in place and the alignment rod extending approximately one inch beyond the aperture plate.

b. Aligning the Lamp Bracket. Loosen the lamp bracket mounting screws just enough to permit free movement of the bracket. Slide both lamp bracket clips outward to their stops and assemble the lamp bracket setting plug (SD-567-1F1) into position in the bracket as shown in Figure J. Hold the spacer (SD-567-1F2) in place while inserting the alignment rod through the spacer and the plug. Then slide the lamp bracket clips back into place to retain the plug. Shift the lamp bracket until the inner end of the adjustment spacer is lightly in contact with the aperture plate. Check to make certain that the alignment rod slides freely in all plugs. Tighten each bracket screw a little at a time, checking frequently for alignment rod freedom (minimum screw torque, 14 in-lb.).

c. Final Alignment Check. Slide the alignment rod back and forth in the plugs and gage. The rod is a lapped fit in the holes and a slight resistance, or "drag," should be felt. However, if the rod should bind, determine the point of binding (aperture plate or lamp bracket) and reposition the misaligned part. Remove the setting gage, alignment rod and plugs, and reassemble the pressure plate to the rear of the lens carrier (paragraph 20). Visually center the aperture opening of the pressure plate with that of the aperture plate before tightening the retaining screws.

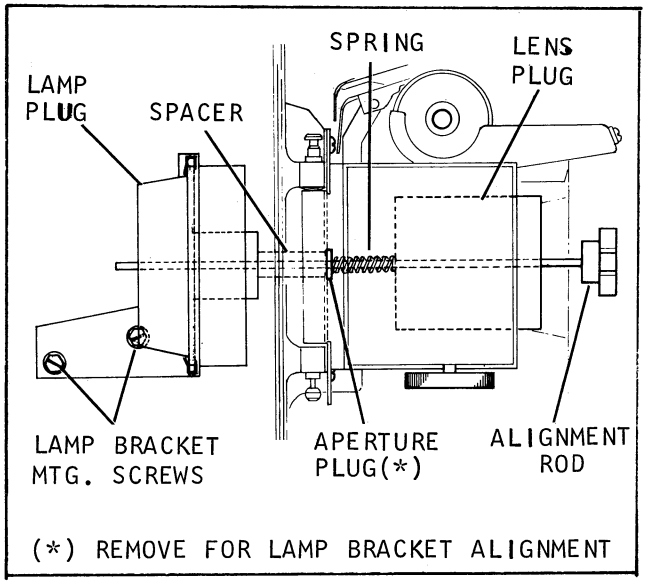


Figure J. Optical Alignment Tools Installed

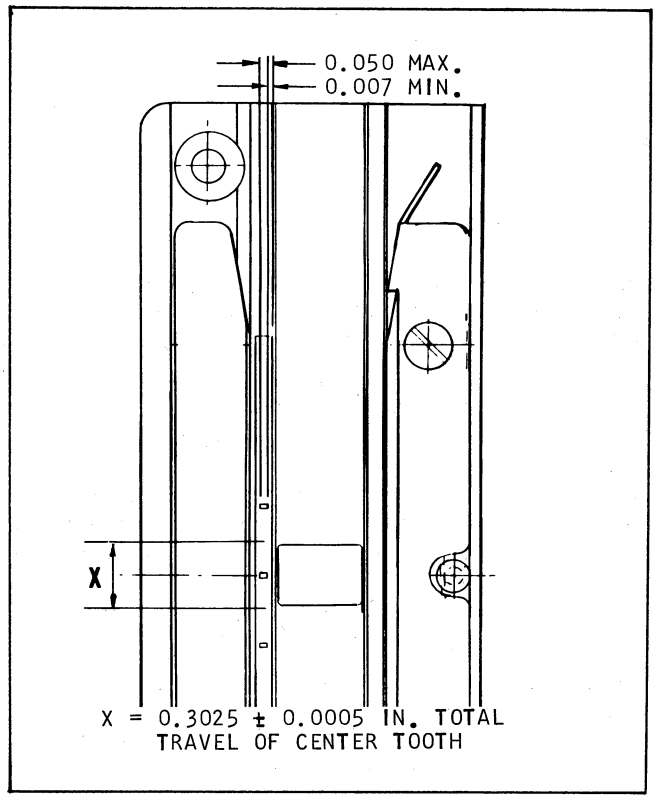


Figure K. Aperture Plate and Shuttle Tooth Clearance

35. ADJUSTING THE INTERMITTENT MECHANISM.

a. Checking Shuttle Tooth Side Clearance. Advance the mechanism manually until the shuttle is at the center of its stroke as shown in Figure K. The clearance from the edge of the shuttle slot to the inner end of the shuttle tooth (nearest the aperture opening) should be a 0.007-inch minimum. From the edge of the shuttle slot to the outer end of the shuttle tooth, the distance should be 0.050-inch maximum. Check these clearances at both the upper tooth and lower tooth. If the clearances vary at the upper and lower teeth and inner clearance is less than 0.007-inch at either end, the following possible causes should be checked and corrected.

(1) Aperture plate out of alignment. See paragraph 34, step a, Aligning the Aperture Plate.

(2) Shuttle stroke incorrect. See paragraph 35, step d, Shuttle Stroke Adjustment.

(3) Link bearing missing from end of shuttle arm. Partial disassembly, required to remove shuttle arm and replace link bearing (refer to paragraph 14 and Figure B).

(4) Ball and stud assembly loose on shuttle arm. Reposition ball and stud assembly (Figure B) and tighten stud nut securely.

b. Checking Shuttle Tooth Height. Swing open the lens carrier and advance the mechanism manually until the shuttle is at the center of its stroke as shown in Figure K. Hold the shuttle tooth height gage (item 7, Figure A) by its knurled handle and place it against the aperture plate between the rails. The center ears, on either side of the gage handle, are the height gages. Slowly slide the gage downward. The "Go" ear should pass over the shuttle tooth without catching. Rotate the gage so that the "No-Go" ear is over the shuttle slot and once more slide the gage downward. The "No-Go" ear must not pass over the shuttle teeth. If the shuttle teeth are too high or too low, adjust height as follows.

NOTE: If the mechanism assembly is installed on the mainframe, it will be necessary to open the lamphouse and remove the projection lamp (25, Figure 2), the lampholder (31) and the pulley shield (35) before proceeding.

(1) Turn the mechanism drive sprocket by hand until the access holes in the shutter and the heat baffle are aligned as shown in Figure L.

(2) Insert a No. 4 Bristol Wrench through these access openings and engage it in the socket of the in-out cam follower screw.

(3) If the shuttle teeth were too low (No-Go ear passes over shuttle teeth), turn the cam follower screw counterclockwise to increase shuttle tooth height. If the shuttle teeth were too high (Go ear catches against shuttle teeth), turn the cam follower screw clockwise. It may be necessary to re-check shuttle tooth height with the gage several times before the proper height has been obtained.

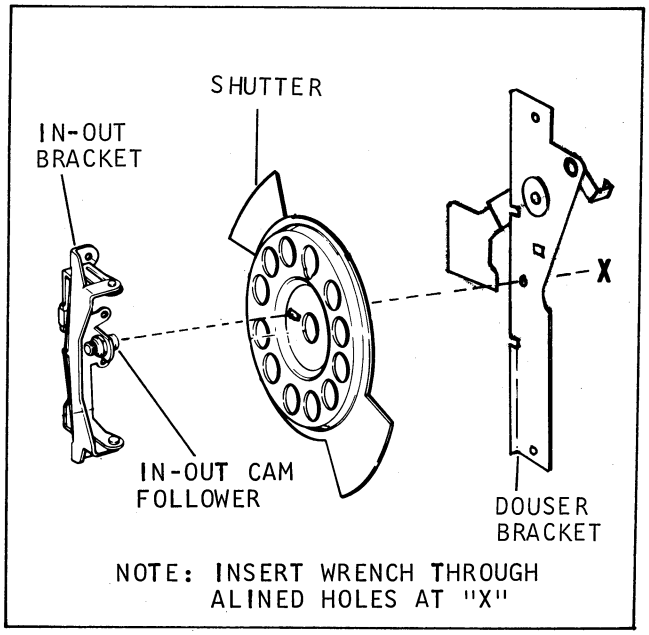


Figure L. Adjusting Shuttle Tooth Height

(4) If one of the teeth cannot be brought into tolerance by the above method, it may be necessary to loosen the screws which attach the in-out bracket (Figure L) and shift the bracket slightly. Tighten the mounting screws securely and check and adjust shuttle tooth height as outlined above.

c. Checking Fit of Shuttle Arms to Pull-Down Cam. (See Figure M.) Remove rear cover, projection lamp and blower belt.

NOTE: If projector has just been lubricated, run for two or three minutes before proceeding with this adjustment.

(1) Open film gate and turn projector mechanism by hand until shuttle teeth are retracted and have moved downward to approximately the center of the stroke (center tooth approximately on horizontal center line of aperture). Slip guide bars of tool SER-552-4-N1 over casting to which shuttle mounting plate is attached (Figure M). When tool (A) is positioned so that stud (B) can bear on shuttle arm (C), tighten thumbscrew (D) just enough to hold tool in position. Engage hook of tool SER-552-4-N2 in slot of stud (B) as shown, and allow weight (E) to swing downward. Tilt projector, if required, so that the weight does not rub on any stationary parts.

(2) Loosen upper bearing support assembly (F) approximately one turn. Rotate projector framer knob so that pointer (G) moves above witness mark (H). Then turn framer knob in the opposite direction until pointer (G) moves back down in line with mark (H).

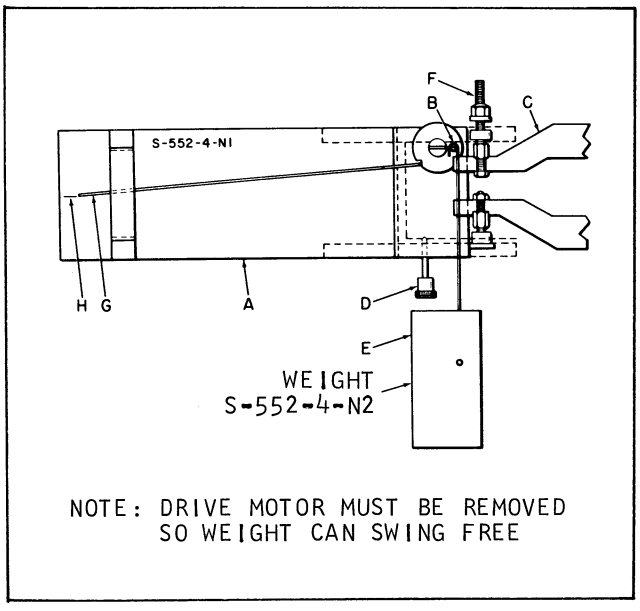


Figure M. Adjusting Fit of Shuttle Arms to Pull-Down Cam

NOTE: If adjustment of framer knob does not permit movement of pointer (G) as specified, it may be necessary to rotate the camshaft slightly to bring cam into proper position.

(3) Carefully tighten upper bearing support assembly (F) while observing alignment of pointer (G) with witness mark (H). The instant that pointer (G) starts to move upward stop turning support assembly (F). This is the proper adjustment.

CAUTION: Do not tighten shuttle arms more than is specified in an attempt to remove cam noise. Excessive tightening of shuttle arms for the purpose of reducing other noises will reduce life of cam and cam shoes.

d. Checking Shuttle Stroke. Normal shuttle stroke (vertical travel of shuttle teeth) is 0.3025 inches (Figure K). The most convenient means of measuring the stroke is to use the projector as an optical comparitor. The step on the stroke gage (item 6, Figure A) is the length of the nominal stroke. When it is inserted in the aperture and projected, it provides a reference dimension with which the actual stroke can be compared. Figure N shows a sketch of a target. The A to B section is a 100 to 1 enlargement of the gage. The C and D lines represent 100 to 1 enlargements of the limits of tolerance.

(1) Procedure for Measuring Shuttle Stroke. (See Figure N.)

(a) Remove pressure plate assembly (paragraph 15) and the condensing lens assembly.

(b) Re-engage blower belt and set framer at the mid-point of its over-all travel.

(c) Suspend target approximately 18 feet from the projector with center of target on same horizontal line as optical axis of projector. If room arrangement necessitates tilting projector, target must also be tilted so that angle between target and optical axis is 90 degrees. If this is not done, "Keystone" error will be produced.

(d) Turn the projector mechanism by hand until shuttle is at bottom of stroke and shutter just clears aperture.

(e) Insert stroke gage (SER-550-5-N2) in the aperture plate and lightly press it down against the top tooth of the claw. Close the film gate.

(f) Turn on the projector lamp and focus shuttle slot on the target. Move projector toward or away from the target until a sharply focused image of the step at end of stroke gage just reaches from line A to line B (Figure N).

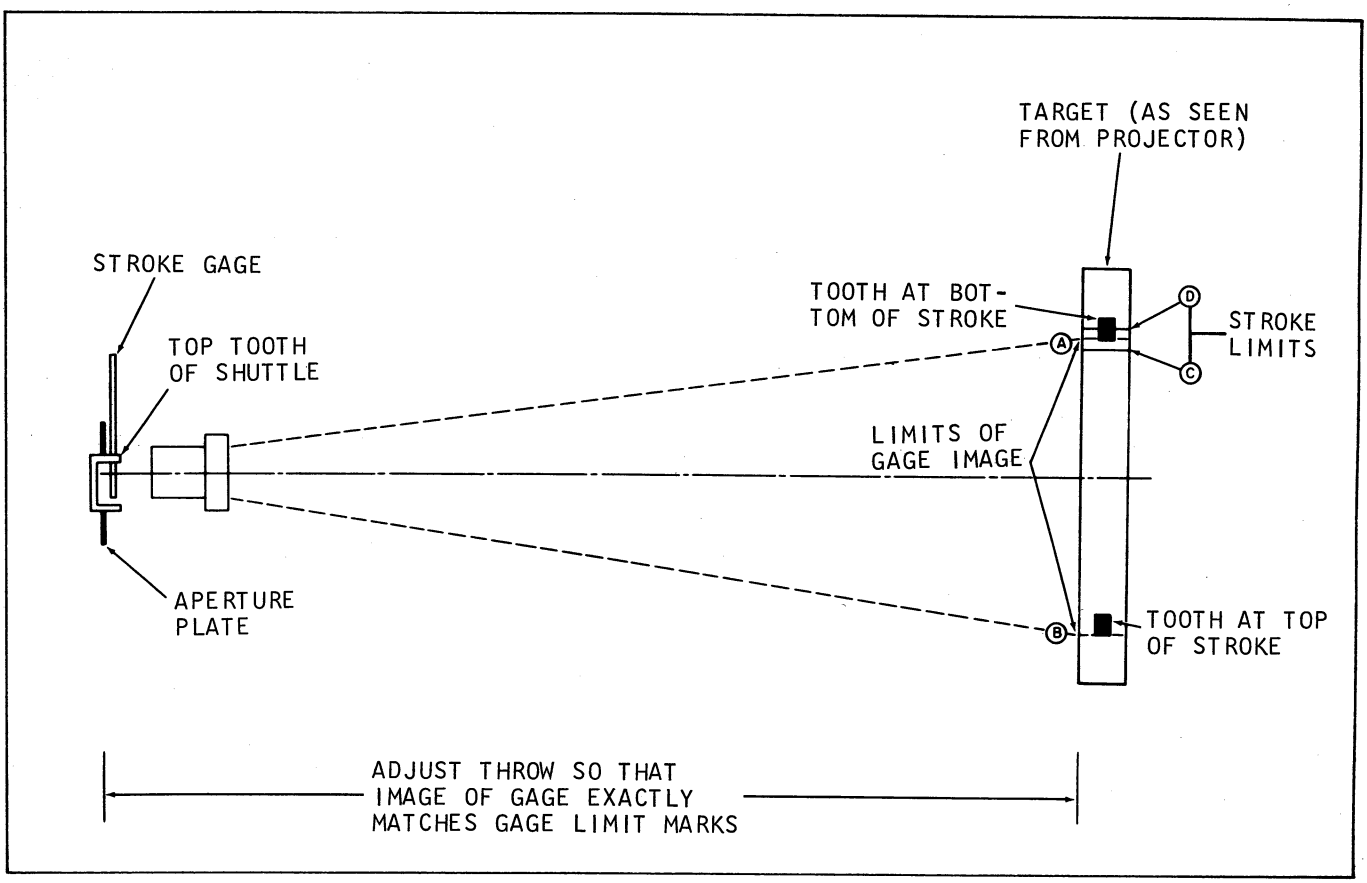


Figure N. Checking and Adjusting Shuttle Stroke with Target

(g) Slide the stroke gage up out of field-of-view and turn mechanism sprocket until center tooth of shuttle is at top of stroke indicated by image of tooth near line A. Adjust framer, if required, until projected image of edge of tooth just touches line A.

(h) Turn mechanism pulley until center tooth of shuttle reappears at top of target. Rock mechanism sprocket to find top of shuttle stroke. Edge of tooth used as reference in step (g) must fall between lines (C) and (D) (Figure N). If image falls between (C) and (A), stroke is too short. If image falls beyond (D), stroke is too long.

(2) Procedure for Adjusting Shuttle Stroke. Loosen the two shuttle plate mounting screws just enough to permit movement of the shuttle arm plate.

(a) To lengthen the stroke, shift the shuttle arm plate toward the pull-down cam.

(b) To shorten the stroke, shift the shuttle arm plate assembly away from the pull-down cam.

(c) After adjusting stroke, recheck shuttle tooth side clearance as instructed in paragraph 35, step a, and readjust if necessary.

CAUTION: Do not attempt to eliminate film slap by setting stroke outside established tolerance. This will produce double image and/or jump with films having different shrink or stretch.

e. Framing Adjustment. Thread the projector with film having proper frame line position. Project film and turn framing knob from one limit to the other. If at one limit a frame line is not visible, loosen nut on the framing eccentric located at top of shuttle arm plate assembly (Figure B) and turn eccentric until the frame line appears. Hold eccentric while tightening nut. Check adjustment by again turning framing knob from limit to limit while observing picture. When the eccentric is properly adjusted, either frame line can be projected and movement of film should be approximately equal at top and bottom of framer travel.

36. LENS CARRIER ADJUSTMENT. Angular relationship between the lens carrier and the aperture plate is controlled by lens mount stop screw (item 33, Figure 11). Thread projector with roll title or target film having sharp images in corners and project a picture approximately 30 inches high onto a matte surface. Projector must be square with the screen.

a. Tip the projector carefully on its back end and remove the projection lens. Look down through the lens barrel and visually check to make certain that the rectangular opening in the pressure plate is aligned with that of the aperture plate. If necessary, loosen the two screws which attach the half-moon adjustment plate to the lens barrel and shift the adjustment plate until the aperture openings are aligned. Hold the adjustment plate firmly while tightening the retaining screws. Tip the projector back on its base and reinstall the lens.

b. Focus the picture and compare resolution of the two sides of the image when viewed from a distance of approximately twice the width of the picture. If one side appears to be soft, refocus to sharpen that edge of the picture and note whether the lens is moved toward or away from the aperture. For example, if image at right-hand edge of screen is soft until lens is moved toward aperture, then lens stop screw is set too far forward and should be turned further into the casting (clockwise).

CAUTION: This adjustment is critical. Lens stop screw should be turned only a few degrees between tests for sharpness.

37. ADJUSTING DOUSER SOLENOID.

a. Watch the douser arm while momentarily energizing and de-energizing the douser solenoid. The douser arm must pivot each time the solenoid plunger is activated.

b. If douser arm is not positively activated by the solenoid, disconnect the power cord, loosen the two solenoid mounting screws, and carefully reposition the solenoid. Repeat the adjustment until proper response is obtained; then tighten the solenoid mounting screws securely.

38. ADJUSTING MICROSWITCHES (Figure P).

CAUTION: Be sure to unplug the power cord and switch off the projector before making this adjustment.

a. Connect a voltohmmeter (Simpson No. 260 or equal) between terminals A and NO of the latching switch. Manually depress the douser solenoid and check for continuity on the meter.

b. Connect the voltohmmeter between terminals A and NC of the sound changeover switch. Manually depress the douser solenoid and check for open circuit on the meter.

c. If the above results are not obtained, loosen the switch mounting screws and reposition the switches until proper operation occurs.

39. ADJUSTING REEL ARMS AND REWIND CLUTCH.

a. Front Reel Arm Adjustment. (See Figure 6.) Adjust end play of drive shaft (26) to 0.008 inch ± 0.003 inch by positioning retaining ring (21) against an 0.008 inch shim. The backlash on the lower gear assembly (8) should be between 0.005 inch minimum and 0.018 inch maximum. Adjust by assembling, as required, a combination of 0.010 inch washers (9) and 0.005 inch washers (10) on feed spindle assembly (12). Greater thickness in washer combinations reduces backlash.

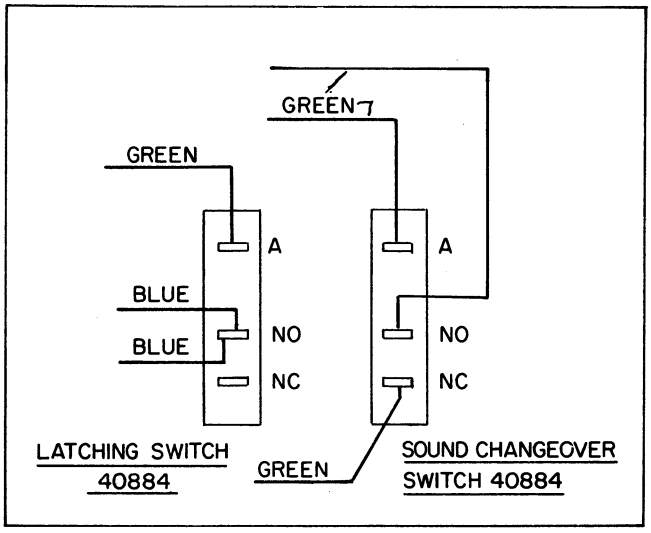


Figure P. Adjusting the Microswitches

b. Rear Reel Arm Adjustment. (See Figure 7.) Adjust end play of drive shaft (24) to 0.008 inch ± 0.003 inch by positioning retaining ring (9) against an 0.008 inch shim. The backlash on the upper gear assembly (27) should be 0.015 inch ± 0.003 inch. Adjust by increasing or decreasing a build-up of 0.005 inch and 0.0025 inch washers (28), as required, beneath the upper gear assembly (27). Greater thickness in washer combinations reduces backlash.

c. Rewind Clutch Adjustment. The rewind clutch system must be adjusted to produce a supply spindle torque of 5-1/2 to 6 inch-ounces when the rewind button is pressed during operation. Install an empty reel on the supply spindle and wrap several turns of a ten-inch film strip around the reel hub. Hook a spring scale to the free end of the film strip. Turn on the projector and press the rewind button. The spring scale must measure between 5-1/2 and 6 inch-ounces of torque. The clutch is adjusted by tightening (to increase torque) or loosening (to decrease torque) the hex adjusting nut on the outer end of the rewind sprocket (item 21, Figure 1). Hold the sprocket firmly and adjust the nut with an open-end wrench.

40. ADJUSTING THE SOUNDHEAD.

a. Removal. Due to the ease with which the soundhead can be removed and the greater accessibility thereby obtained, time will be saved by removing the soundhead if major work is required. Remove the soundhead as follows.

(1) Remove the projection lens from the projector and wrap lens in tissue paper. Remove the rear cover (paragraph 2).

(2) Remove the complete amplifier assembly from the base (paragraph 5), but leave leadwires attached except those from the soundhead cable and exciter lamp.

(3) Remove the exciter lamp cover and, with a sharp pencil draw a line on the main plate where the front edge of the soundhead meets the plate. This will provide a reference mark when reassembling.

(4) Insert the end of an Allen wrench or short steel pin in hole in sound drum bearing housing directly behind the flywheel until wrench or pin drops into the hole in sound drum shaft. Hold the pin firmly and remove flywheel retaining nut, flywheel and washer.

(5) Remove the three screws (6, Figure 5) and two washers (7), which secure the soundhead from rear of main plate, and carefully withdraw the soundhead.

b. Photocell Alignment. The light pipe of the silicon cell assembly must be precisely positioned under the edge of the sound drum so that the full length of the light beam falls on the silicon cell. Proceed as follows.

(1) Refer to Figure 8 and remove the exciter lamp (2) from its socket. Loosen the two sound drum locking screws (13), the light pipe retainer setscrew (12) and the optical slit clamping screw (4). Withdraw the optical slit assembly (5) from the soundhead.

(2) Insert the alignment tool (item 13, Figure A) into the optical slit mounting hole as shown in Figure Q, View A. Press the sound drum in until the inner face of the drum just contacts the first step of the alignment tool and tighten the sound drum screws (13) securely.

(3) Withdraw the alignment tool and while looking into the optical slit mounting hole, shift the photocell assembly until its forward tip is flush with inner face of the sound drum as shown in Figure Q, View B. Tighten setscrew (12) securely. Reinstall the optical slit and exciter lamp.

c. Roller Arm Tension Adjustment. (See Figure 8). The arms upon which rollers (20 and 23) are mounted are linked by torsion spring (31). Therefore, the roller arms move as a pair. Counterbalance spring (25) offsets the weight of the rollers and arms. Place the soundhead on a level surface and move the roller arms (as a set) to various positions. If spring tension is incorrect, roller arms will not remain in the position in which placed. If the roller arms swing downward, loosen retaining screw (26) and move spring terminal downward (clockwise) until weight of arms is counterbalanced. If roller arms move upward, move terminal upward to reduce counterbalancing force. Then tighten screw (26) securely.

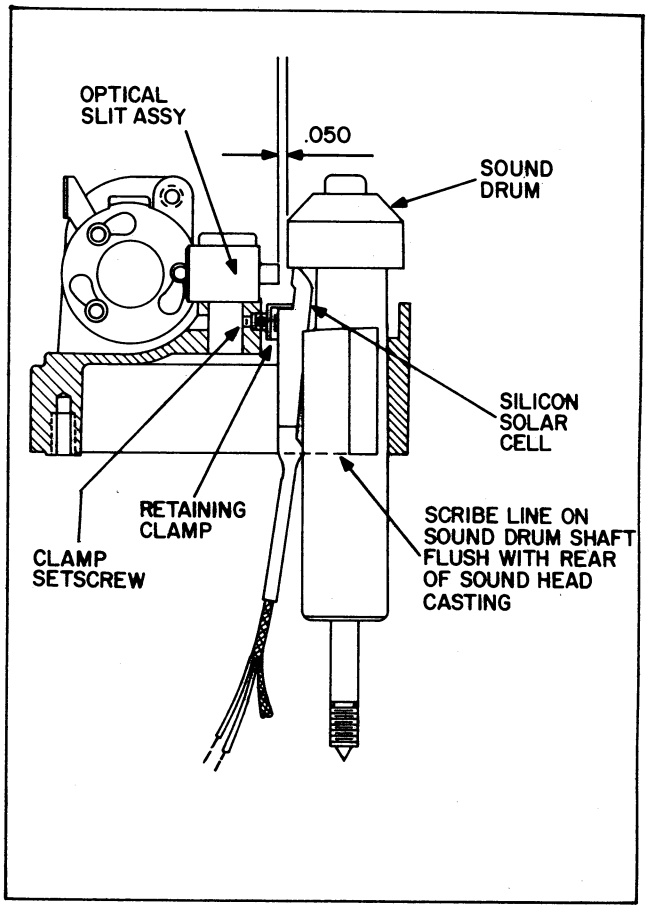


Figure Q. Positioning the Sound Drum and Photocell

d. Installing the Soundhead (Figure 5). Lift the soundhead assembly up into place against the main plate, making certain that the cables are threaded through the hole and behind the plate. Loosely install the soundhead mounting screws (6) and washers (7). Align the front edge of the soundhead casting with the pencil mark drawn on the main plate prior to removal and tighten the mounting screws securely. Assemble the flat washer (5) and flywheel (4) on the sound drum shaft and install the flywheel nut (3) fingertight. Insert a small diameter pin through the hole in the sound drum housing and rotate the drum until the pin drops into a similar hole in the shaft. Hold the pin securely and tighten the flywheel nut with an open-end wrench. Resolder the exciter lamp cable and its shield to the edge connector terminals as shown in Figure 16. Reassemble the printed circuit board to the edge connector, pressing down squarely and firmly until the board is fully seated; then secure the upper end of the board to its support bracket with the screw and hex nut.

e. Optical Slit Adjustment. (See Figure 8.)

(1) Loosen the clamping screw (4). If the optical slit does not slide freely in its holder,

insert the bit of a small screwdriver in the clamp slot and carefully wedge clamp open to free optical slit assembly. Thread projector with 7000 CPS optical setting film and connect a 16-ohm, 10-watt load resistor and output meter to the audio output connector in the rear cover. Connect an extermal speaker to the output connector.

NOTE: A pair of hairpin tongs approximately 6 inches long and formed with the ends turned inward and tapered to engage holes in end of slit barrel are very useful in adjusting the optical slit. They can be made from 20 to 26 gage music wire or 1/16 inch diameter drill rod.

(2) Set the speaker volume control at approximately mid-position and start projector. Move slit toward or away from film, as required, to obtain an output reading. Rotate the slit to obtain peak reading and simultaneously move in or out until maximum output is obtained. If film was threaded with emulsion toward the optical slit, move slit toward film until output drops 1-1/2 to 2 DB. If emulsion is toward sound drum, move slit away from film to obtain 1-1/2 to 2 DB drop in output. Tighten slit clamping screw (4) securely to lock the adjustment.

f. Buzz Track Adjustment. The lateral position of the film in the soundhead is controlled by the flanged roller (20) and edge guide screw (17). Unless the adjustment has been disturbed, it is not probable that the edge guide screw will require resetting. Thread the projector with buzz track film and adjust volume control to a suitable listening level. Turn adjusting screw (7) to move flanged roller laterally.

NOTE: There are two types of buzz track in use. On one, the track spacing exceeds the length of the scanning beam. This track can be positioned so that little or no signal is reproduced. On the other type of track, spacing is less than the length of the beam. This track should be positioned so that both tones are reproduced at approximately the same volume level. If, after adjustment of guide roller position, signal levels cannot be balanced (or eliminated on wide track), or level of tones fluctuates, adjust edge guide screw (17) to clear up the condition. If the edge guide screw is far out of adjustment, turn it clockwise until it clears the edge of film, adjust rollers and then set guide screw to stop weave of film.

41. ADJUSTING TIMING BELT TENSION. Both timing belts are adjusted by means of the idler assemblies shown in Figure R. Although belt tension is not critical, excessive tension will reduce belt life. Loosen the rewind idler bracket screws (Figure R) and position the rewind belt idler until the rewind timing belt can be depressed at mid-point approximately 1/8-inch with light thumb pressure. Tighten the idler bracket screws securely. Loosen the take-up idler bracket screws and position the take-up belt idler until the belt can just touch the motor relay mounting bracket when light thumb pressure is applied to the belt. Tighten idler bracket screws securely.

42. PROJECTOR SPEED CHECKS. Speed of the projector is not adjustable. Therefore, speed checks are primarily for the purpose of determining that the equipment is operating properly and as a means of detecting excessive mechanism loads, damaged drive belt or similar conditions.

a. Methods of Measurement. Various devices and procedures can be used to check projector speed. The most common ones are as follows:

(1) Photocell and Frequency Meter. Used to measure the number of pulsations of the projection beam per second. Pulsations per second is then converted to projector speed. This method is quite practical in large volume shops.

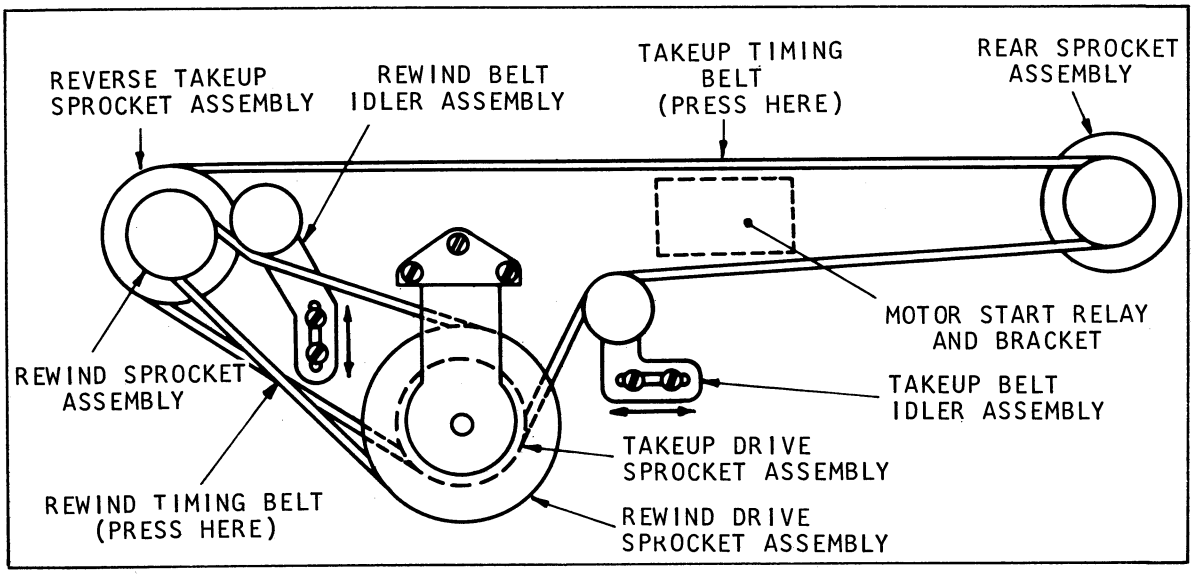


Figure R. Adjusting Timing Belt Tension

(2) Strobatac or Similar Strobe Light. Usually synchronized with interrupter shutter of shuttle. Shutter makes one revolution per frame. Shuttle makes one stroke per frame.

(3) Tachometer (Preferably Having a Speed Range with a Maximum Speed of 150-200 RPM). Used to measure RPM of the sprocket.

(4) Strobe Disc. Attached to sprocket by means of suction cup or rubber foot. For viewing with light from 60 CPS source, disc should have 70 dots for sound speed, 93 dots for silent speed. Count number of apparent revolutions of pattern for one minute. If pattern drifts in direction of rotation, add to design speed to obtain true speed. If pattern drifts against rotation, subtract from design speed to obtain true speed.

(5) Timed Loop. Make loop of exactly 120 frames. At sound speed splice will pass aperture 12 times per minute plus or minus the permissible variation in speed and the timing error.

b. Speeds at 120 Volts, 60 CPS AC.

(1) Sound Speed (24 FPS ± 2%).
Shutter - 1440 RPM ± 2%
Sprocket - 102.86 RPM ± 2%

(2) Silent Speed (18 FPS ± 4%).
Shutter - 1080 RPM ± 4%
Sprocket - 77.1 RPM ± 4%

43. AUTOLOAD SYSTEM ADJUSTMENT PROCEDURE — GENERAL.

a. The autoload system consists of a series of guides and rollers which, when the system is in the load position, are so located as to guide the film through the threading path. When the system is in the open position, the guides and rollers clear the film path.

b. When the system is in the open position, the location of the guiding parts is not critical. Therefore, adjustments to assure proper location of the guiding parts are made with the system in the load position.

c. The guides are connected by mechanical linkage. The system is actuated by a cocking lever at the lower end of the linkage and the movement is stopped at the top end of the linkage. The specified clearances must be checked with the system in the load position. If the need for adjustments is detected, it is important that the repairman proceeds in the sequence listed in this section. The sprocket timing and the locating of the soundhead may be done without disturbing the guide adjustments.

44. CHECKING AND ADJUSTING LOADING GUIDES.

a. Open the film gate and the upper take-up sprocket shoe (1, Figure S) and remove retaining screw (2).

b. Place timing plate (SER-552-1-N1) over the sprocket hubs (3) and (4). The timing plate locating pin should enter the counterbore from which screw (2) was removed. If the locating pin does not enter counterbore, loosen three sprocket guard plate attaching screws (1, Figure T) and rotate the lower guard plate (2) until pin enters hole. Then tighten the three screws securely.

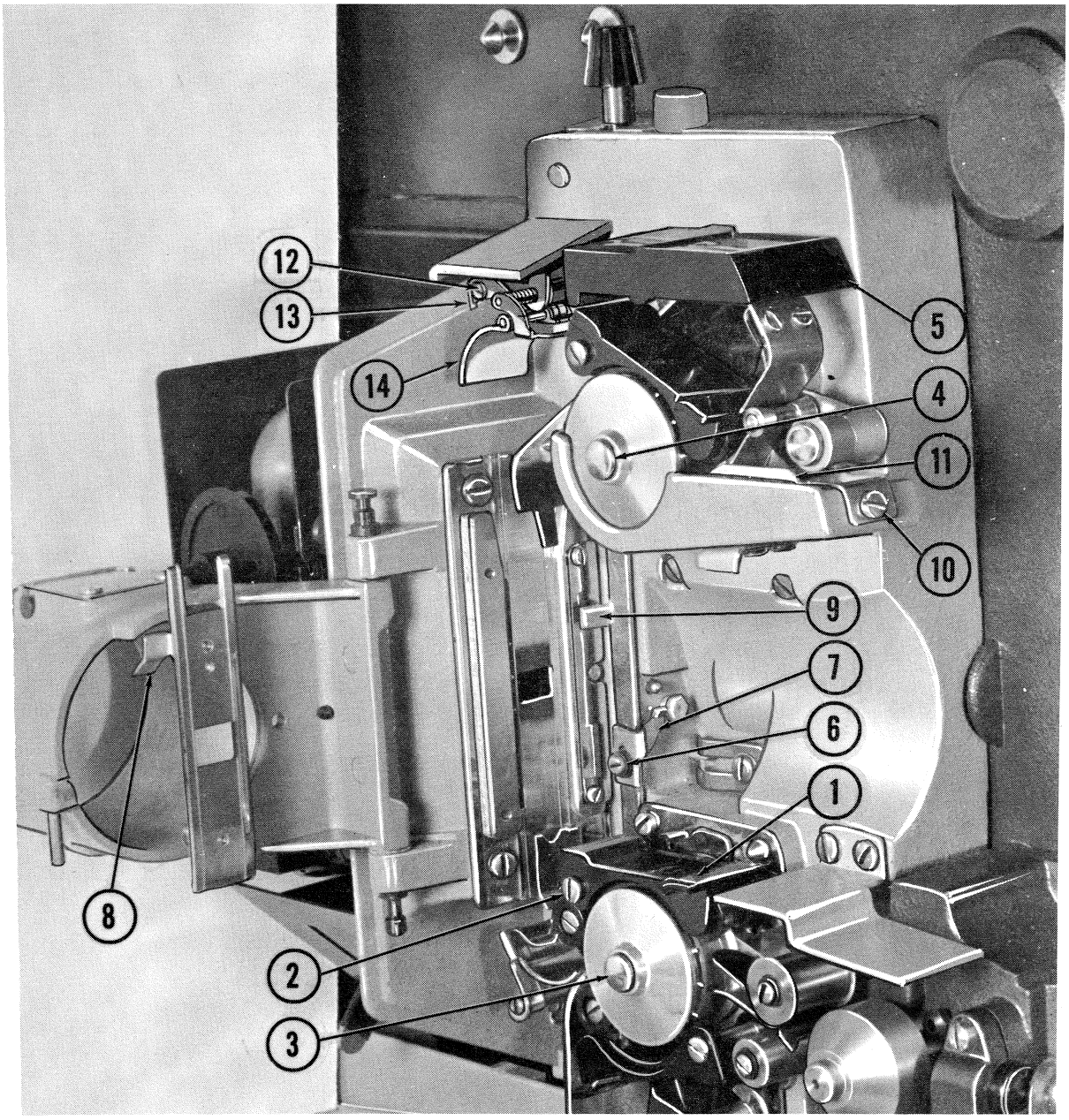
c. Remove retaining ring that secures the actuating assembly (5, Figure S) and lock the autoload system. Place a 0.015-inch feeler gage between the film support rails of the aperture plate and the rear surface of the lower loopform assembly (4, Figure T). This surface should touch the feeler gage just as the heel of the loopform (5, Figure T) strikes the shoulder on the mounting stud for the entrace guide roller (6, Figure T). To adjust, loosen two screws (7, Figure T) which attach the upper sprocket guard plate. Press downward on front end of loopform assembly and rotate upper sprocket guard plate until heel of loopform strikes shoulder of stud and rear surface clears aperature rails by 0.015-inch. Then tighten screws (7, Figure T) securely.

d. Check operation of the film escape mechanism by leaving the auto-thread system open. Manually advance the film and jam it in the upper channel. The film should fold and flow out through the kickplate in the loopformer (14, Figure S). If the kickplate does not release, the arm of the hub assembly (13, Figure S) is not striking the hood (9, Figure T) properly. The hood can be moved slightly and the hub assembly should be adjusted accordingly.

e. When the auto-system is activated and the kickplate does not lock in position, loosen the screw (12, Figure S) holding the hub assembly to the locking pawl and adjust the hub assembly until the tip of the bracket touches the upper curved surface of the loop former. This will lock kickplate in position.

f. Again depress the loopform assembly and check to make certain that there is 0.012 to 0.015 inch clearance between the top surface of the loower loopform (4, Figure T) and the bottom surface of the upper loopform (8). If adjustment is required, remove the two screws which attach the hood (9). Loosen two setscrews (10) and rotate upper loopform (8) to obtain desired clearance. Tighten setscrews and reinstall hood. Before tightening hood retaining screws, press hood toward rear of projector.

g. With the autoload system locked and film gate open, check to make certain that the shuttle teeth do not protrude through the slot in the aperture plate. If shuttle teeth protrude, loosen screw (6, Figure S) and carefully raise the shuttle retractor (7) until teeth are retracted, then tighten screw (6) securely.



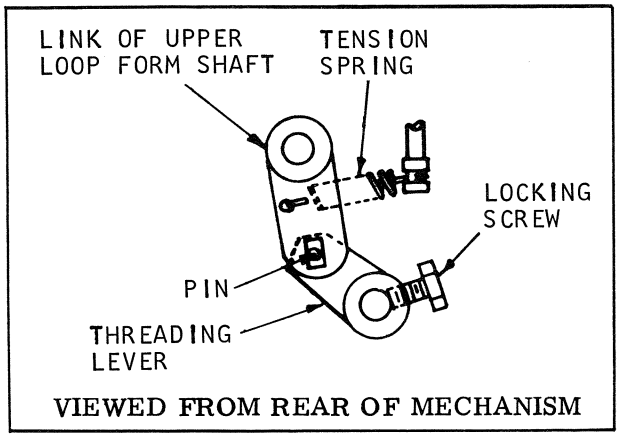


Figure S. Autoload System Adjustments — View I

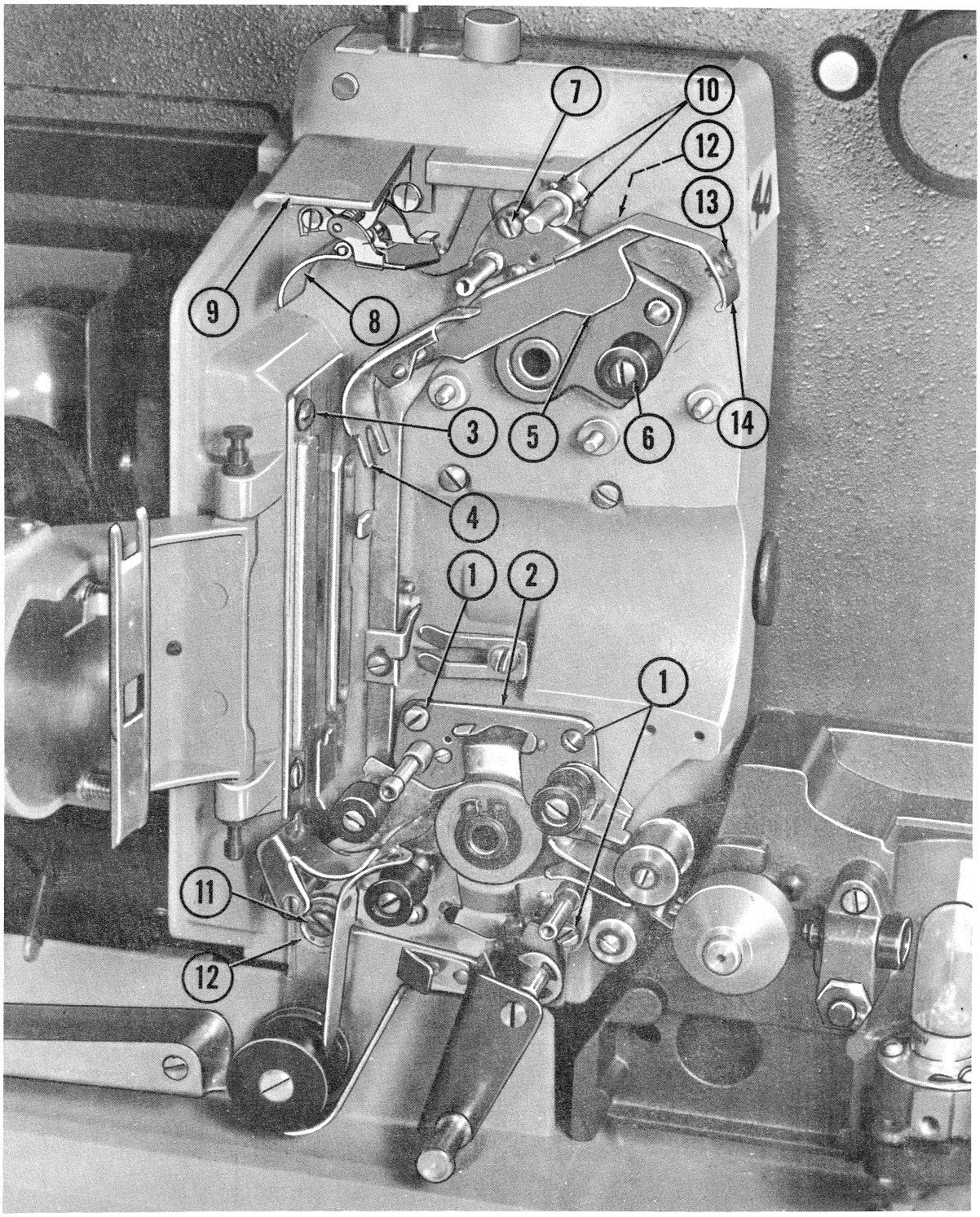
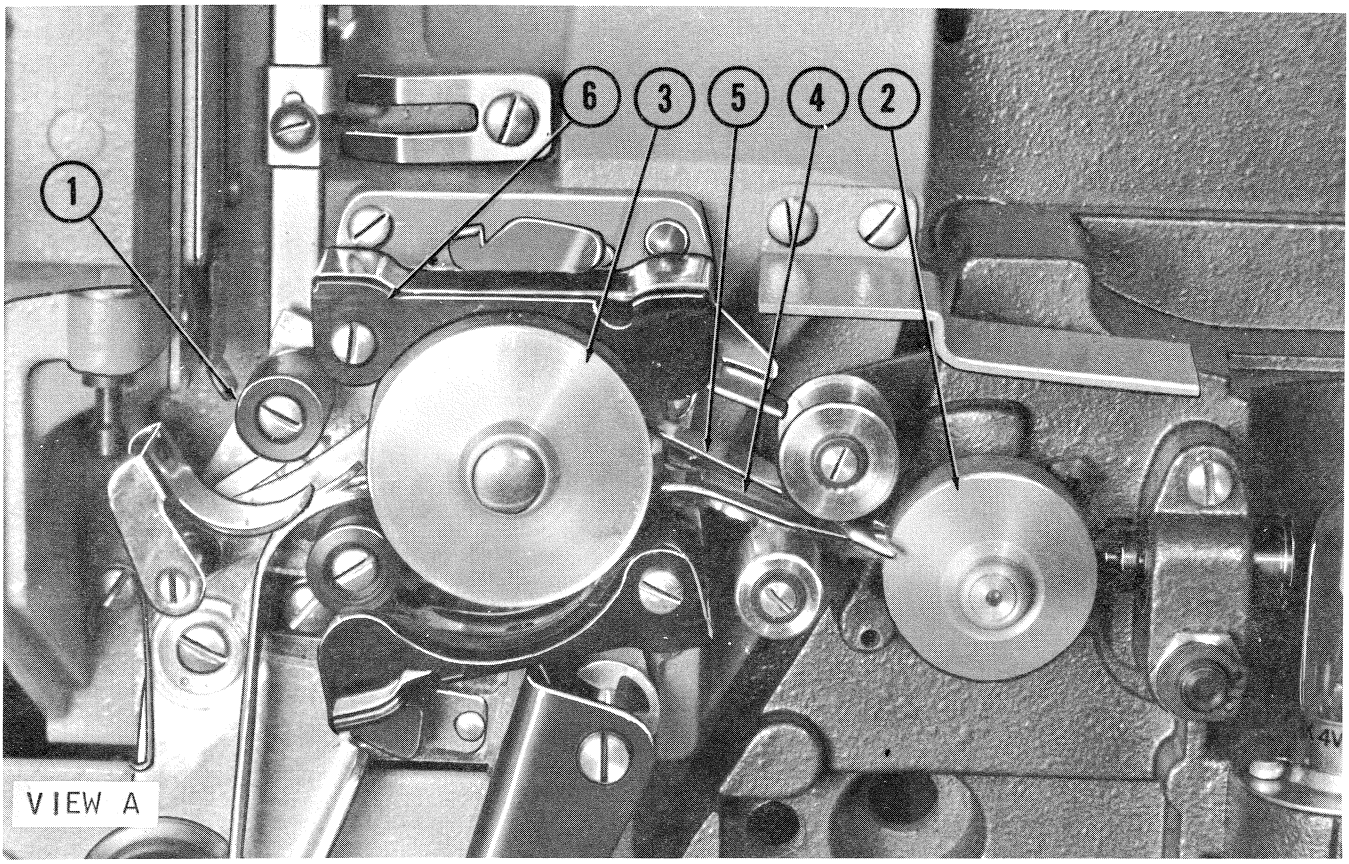


Figure T. Autoload System Adjustments — View II



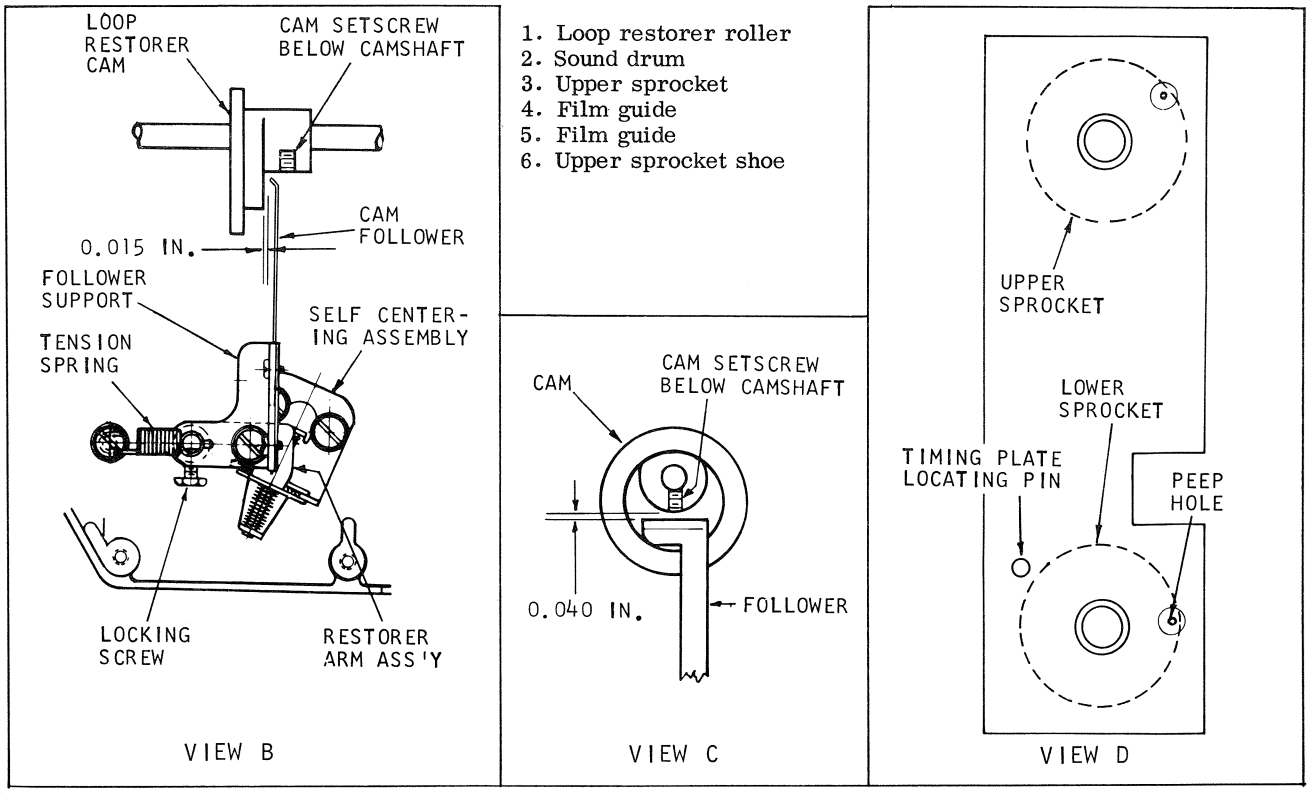


Figure U. Autoload System Adjustments — View III

CAUTION: The top end of the shuttle retractor must not strike the casting.

h. Close the film gate while observing to see that the film pressure plate does not contact the aperture plate. If the pressure plate remains in contact with the aperture plate, either the pressure plate lift-off ear (8, Figure S) or the ear (9) on the threading guide linkage is bent. Reform ear, or ears, as necessary.

i. Loosen screw (10, Figure S) and align the film guide (11) so that film will feed squarely to the sprocket; then retighten screw (10).

j. Loosen screw (11, Figure T), lock the system, and check to make certain that loopform heel (5) is bearing on shoulder of roller stud (6). If necessary, rotate the eccentric pivot (12) with a wire pick or pin punch until heel bears against stud shoulder. When loopform is pressed downward, there must be no clearance between heel and stud shoulder. Recheck clearance between rear of loopform and aperture rails. Also, make certain that end of upper loopform (8) is tangent to or slightly ahead of the plane of the aperture plate film support rails. If readjustment is necessary, refer to steps c through e, preceding. Install actuating assembly (5, Figure S).

k. Lock the system and try inserting film into the feed sprocket. If film slips in too freely, loosen the two screws (13, Figure T) and move leaf spring (14) downward to increase pressure on the film. If the film buckles as it is inserted, move the leaf spring upward to reduce the pressure; then tighten screw (13).

45. CHECKING AND ADJUSTING LOOP RESTORER. Check the operation of the loop restorer by threading the projector with a loop of test film in which two or three successive perforations have been purposely enlarged at points approximately one foot apart. The first set of damaged holes should be located about two feet from the aperture. Run the projector in "forward" and observe the action of the loop restorer as the enlarged perforations run through the film gate. The lower loop should be automatically restored within five or six frames. To adjust the loop restorer, refer to Figure U and proceed as follows:

a. Slip the loop restorer position tool (item 7, Figure A) over the loop restorer roller (1, Figure U) with the flat on the tool facing the guide roller at the rear end of the upper sprocket shoe (6, Figure U). The flat of the tool should just touch the guide roller lightly. To adjust spacing between loop restorer roller and guide roller, loosen the mounting screws in the self-centering assembly (inset A, Figure U) and raise or lower that assembly until the proper spacing is obtained. Then tighten the mounting screws securely. Be sure that the ear of the loop restorer arm is positioned between the two spring-loaded keeper plates of the self-centering assembly.

b. Rotate the mechanism pulley until the setscrew in the loop restorer cam is at the bottom, directly below the camshaft (see inset A, Figure U). The clearance between the upper tip of the cam follower blade and the face of the cam should be 0.015 inch. To adjust this clearance, loosen the cam follower support mounting screw (inset A) and rotate the support accordingly; then retighten the screw securely. Now check the clearance between the upper end of the cam follower and the small diameter of the loop restorer cam (inset B). This clearance should be 0.040-inch (±0.005 inch). Be sure that the cam setscrew is still positioned at the bottom of the cam, below the camshaft. To adjust this clearance, loosen the two follower screws (inset A) and raise or lower the cam follower blade as necessary; then, retighten the two screws securely.

c. Recheck the clearance between the loop restorer roller and upper sprocket shoe guide roller as outlined in step a, above. Remove the restorer positioning tool and once more check loop restorer operation with the loop of test film.

46. TIMING THE SPROCKETS.

a. Open the film gate and turn down the framer shaft as far as it will go. Then turn the mechanism manually until the shuttle is at the bottom of the stroke (teeth protruding) and the edge of the shutter blade bisects the aperture opening.

b. Timing of the sprockets requires the use of the timing and alignment plate SER-552-1-N1 and the soundhead locating gage SER-552-5-N1, both of which are illustrated in Figure A.

c. Open the film sprocket shoes and place the timing plate (item 10, Figure A) over the sprocket hubs (see inset C, Figure U). Dip the end of a straightened paper clip in red lacquer and insert it down through the peep holes to mark the face of each sprocket. Remove timing plate and place a light pencil mark on the face of each sprocket in line with the teeth nearest the red dot. If this pencil mark does not align with the red dot, the sprockets are out-of-time. Note the direction in which each sprocket must be rotated to bring teeth back in line with peep holes; then proceed as follows:

d. To retime the feed (upper) sprocket, hold the large sprocket gear at the rear of the upper sprocket shaft stationary while loosening its setscrews; then carefully rotate the upper sprocket until the pencil mark appears in the center of the upper peep hole. Tighten the sprocket gear setscrews securely. To retime the take-up (lower) sprocket, hold the lower sprocket gear stationary and loosen its setscrews; then rotate the lower sprocket until its pencil mark appears in the center of the lower peep hole and tighten the sprocket gear setscrews securely.

47. POSITION THE SOUNDHEAD.

a. Lock the system in the "thread" position and loosen the three screws (6, Figure 5) which attach the soundhead to the main frame casting.

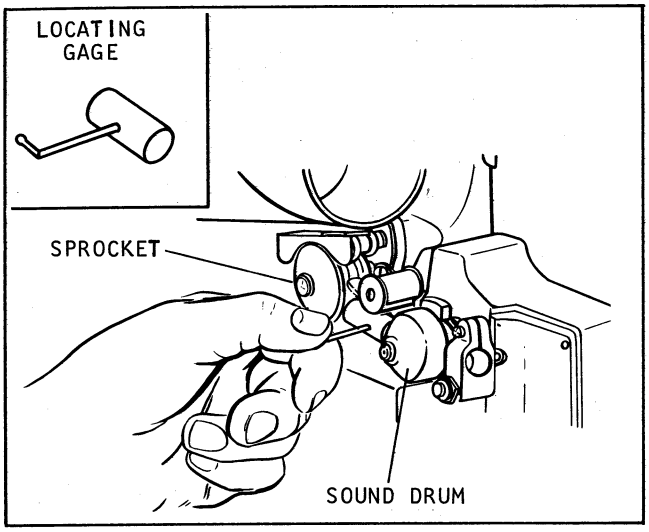


Figure V. Positioning the Soundhead

b. Hold the soundhead locating gage (item 12, Figure A) by its handle and insert the gage carefully between the sound drum and take-up sprocket as shown in Figure V. The gage must be between the sound drum threading guides. Position the gage so that one end bears against the supporting ribs for the sound track edge of the film and with the round body of the gage in contact with the rear sprocket glange, as shown.

c. Tilt the gage so that it lies on a centerline between the take-up sprocket and sound drum. Shift the soundhead toward the take-up sprocket until the sound drum bears lightly against the end of the gage, and tighten the soundhead attaching screws securely.

48. CHECKING THE EXCITER LAMP COVER CLEARANCE. Since the film must pass between the sound drum and exciter lamp cover, the clearance between these two items should be checked. Insert a #77 drill or a straight piece of #25 wire into the channel between the drum and cover. Gage should enter channel with slight friction but without forcing. If clearance is inadequate, straighten the exciter cover locating pins to obtain proper clearance.

49. CHECKING OPERATING VOLTAGE, FILM SPEED AND MAXIMUM CURRENT.

a. Allow the projector to attain sound speed (minimum of ten feet run through the projector).

b. Vary voltage from 105 to 129 volts. Speed of the projector must be within limits specified.

c. Observe Strobotac for proper speed.

d. With 400 feet of film on front reel arm at 105-129 volts AC, 60 cycle, the film shall travel forward at the standard sound speed of 24 frames per second ±2%. This is equivalent to a camshaft speed of 1440 RPM ± 28.8 RPM.

e. Maximum current shall not exceed 12 amp at 120 volts, 60 cycles.

50. CHECKING FILM BURN AND DOUSER CONTROL OPERATION.

a. Operate projector without film and with the projector lamp on. Operate in "Forward Project" and "Reverse Project" position 25 times.

b. With film in gate, stop film by turning center switch to "OFF" position.

c. Turn amplifier on and check operation of the ventilation fan.

d. Douser shall fully open when operated in both "Forward Project" and "Reverse Project" positions.

e. With the lamp on and with the center control switch in "Thread Forward," "Off" and "Reverse" positions, the douser shall cover the aperture promptly and completely, allowing no blistering or burning of the film.

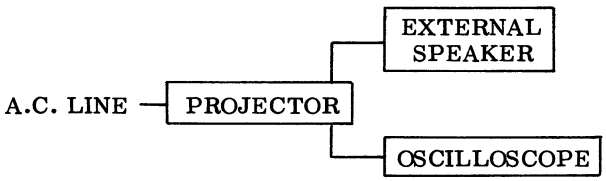
f. Solenoid hum is acceptable, but solenoid clatter is unacceptable during douser actuation.

g. Ventilation fan must run when:

(1) The fan switch is in the "Fan" or "Lamp" position.

(2) With the fan switch "Off" and the amplifier turned "On."

51. CHECK SOUND REPRODUCTION CHARACTERISTICS OF THE AMPLIFIER AND THE SPEAKER.



a. Microphonics.

(1) Turn amplifier "On."

(2) Use external speaker.

(3) Volume control full CW.

(4) Tone control normal.

(5) Projector "On."

(6) Tap projector case with palm of hand near amplifier and on exciter lamp cover.

b. Parasitics and Noise.

(1) Turn amplifier "On."

(2) Use external speaker.

(3) Projector "On."

(4) Tone control position 1) normal; 2) hi; 3) lo.

(5) Vary volume control slowly from full CCW to CW in each tone position in (4).

c. Acoustical Feed Back.

(1) Turn amplifier "On."

(2) Use internal speaker.

(3) Volume control at 2 o'clock position.

(4) Tone normal.

(5) Projector "On."

(6) Switch to tone hi and low positions.

d. Speaker Power Handling Ability.

(1) Thread projector with sound test film.

(2) Amplifier "On."

(3) Tone normal.

(4) Projector "On."

(5) Advance volume control to full CW for short duration.

(6) Switch between internal and external speakers.

(7) Adjust the volume control for 10 watt level. (Peaks of program material to align with calibrated lines on scope - peak of 8.5 VRMS at external speaker jack).

(8) Repeat step (6).

(9) Adjust volume control to 2-watt level. (Peaks of program material to align with calibrated lines on scope-peak of 4.0 VRMS at external speaker jack).

(10) Use internal speaker.

(11) Rotate tone control to hi and lo positions.

52. AMPLIFIER OPERATIONAL TEST.

a. No prolonged, damped or sustained oscillations should be heard.

b. No objectionable audible parasitic oscillations or volume control noise shall exist.

c. No objectionable audible acoustical feedback shall exist.

d. Volume full CW: No objectionable speaker bottoming or break-up shall exist.

Volume at 10 watt level (8.5 VRMS): No objectionable speaker rattle shall exist.

Volume at 2 watt level (4 VRMS): All tone positions shall produce clear, clean, quality sound reproductions.

Trouble Shooting

TROUBLE	PROBABLE CAUSE	REMEDY
	MISCELLANEOUS TROUBLES AND REMEDIES	
Nothing runs NOTE: Current projector models are fused. Remove rear cover and check condition of 0.5 amp fuses.	1. Damaged power cable from line to lamp power supply.	1. Repair or replace cable.
	2. Loose connections.	2. Repair.
	3. Damaged power cable from lamp power supply to projector.	3. Repair or replace cable.
	4. Power supply fuse blown.	4. Replace fuse.
	5. Changeover and latching interlock switches out-of-adjustment.	5. Readjust switches, see paragraph 38.
Motor hums but does not run	1. Starting circuit open or shorted.	1. Repair loose or transposed connections.
	2. Faulty starting capacitor or starting relay.	2. Replace starting capacitor or starting relay.
Motor runs but mechanism does not run	1. Drive belt off of pulley.	1. Reinstall drive belt.
	2. Motor or driven pulley loose on shaft.	2. Position pulley and tighten setscrews.
	3. Damaged belt.	3. Replace belt.
Rewind does not operate	1. Rewind clutch not engaging.	1. Adjust (paragraph 39).
	2. Rewind clutch slipping.	2. Adjust (paragraph 39).
Feed spindle does not revolve in reverse	1. Dirt in feed spindle clutch.	1. Clean.
Gate will not lock	1. Latch spring set too close to lens mount stop.	1. Adjust latch spring.
	2. Pressure plate out of line.	2. Realign pressure plate.
Take-up does not operate	1. Belt (1, Figure 7) slipping or badly worn.	1. Clean pulley (4) and sleeve (17), Figure 7, replace belt.
	2. Teeth on sprocket (21, Figure 1) worn so that clutch slips.	2. Replace sprocket.
	3. Gears in reel arm not aligned.	3. Adjust per paragraph 39.

TROUBLE	PROBABLE CAUSE	REMEDY
Projector lamp does not light but projector runs	1. Recycle attempted too soon.	1. Wait one full minute before attempting restart.
	2. Suspected lamp failure.	2. Observe the following procedure: a. Try a second lamp to isolate trouble to lamp or power supply. b. If second lamp does not light, remove wall outlet power cord and check power supply fuses. c. Any lamp supply unit fuse failure which cannot be obviously accounted for should put the lamp supply unit in question. Refer to power supply Service Manual No. 72798A.
Speed is slow	1. Binding in mechanism.	1. Free binding condition.
	2. Slipping belt.	2. Clean or replace belt.
	3. Pulleys out of line.	3. Realign pulleys.
System locks when actuator is depressed	1. Linkage screws at rear of mechanism loose.	1. Reset linkage and tighten screws.
	2. Eccentric pivot (9, Figure 10) improperly aligned.	2. Readjust pivot (paragraph 44).
	3. Wear between locking lever (12) and film guide (23, Figure 10).	3. Replace worn parts.
Changeover does not operate	1. Changeover cable not connected.	1. Connect cable plugs.
	2. Broken cable leads.	2. Repair leads or replace cable.
	3. Loose plugs.	3. Tighten plugs.
	PICTURE TROUBLES AND REMEDIES	
Film jump	1. Damaged film.	1. Replace or repair.
	2. Loose shuttle.	2. Adjust and tighten (paragraph 35, step c).
	3. Dirty film gate.	3. Clean film gate.
	4. Damaged or lost pressure plate spring.	4. Replace spring (paragraph 15).
	5. Pressure plate misaligned.	5. Realign pressure plate with aperture plate.
	6. Incorrect shuttle stroke.	6. Adjust (paragraph 35, step d).
Double image	1. Incorrect shuttle stroke.	1. Adjust (paragraph 35, step d).
	2. Excessive shuttle protrusion.	2. Adjust (paragraph 35, step b).

TROUBLE	PROBABLE CAUSE	REMEDY
Frame line creeps	1. Framer eccentric loose.	1. Align and tighten (paragraph 35, step e).
Insufficient framing	1. Framer eccentric out of adjustment.	1. Adjust (paragraph 35, step e).
Trailer ghost	1. Shutter out of time.	1. Reassemble properly (paragraph 21).

FILM TRANSPORT TROUBLES AND REMEDIES

Loss of loops	1. Damaged film.	1. Repair or replace.
	2. Inadequate shuttle protrusion.	2. Adjust (paragraph 35, step b).
	3. Inadequate or excessive shuttle stroke.	3. Adjust (paragraph 35, step d).
	4. Pressure plate spring lost.	4. Replace spring (paragraph 15).
	5. Pressure plate mounting plate screws loose.	5. Align pressure plate and tighten screws.
	6. Sprocket shoe locks not closing.	6. Clean or adjust.
	7. Sprocket drive gear loose on shaft.	7. Retime (paragraph 46) and tighten.
	8. In-out bracket spring broken.	8. Replace spring.
Lower loop not restored	1. Loop restorer stroke too short.	1. Adjust (paragraph 45).
	2. Loop restorer does not engage restorer cam.	2. Adjust (paragraph 45).
Film rubs on loop restorer roller	1. Restorer arm out of position.	1. Reposition (paragraph 45).
Excessive film slap	1. Damaged film.	1. Recondition or replace.
	2. Green film.	2. Age or buff.
	3. Dirty film gate.	3. Clean gate.
	4. Pressure plate rubbing on edge guides.	4. Realign.
	5. Incorrect shuttle stroke.	5. Adjust (paragraph 35, step d).
Splices jam in sprocket shoes	1. Bad splices.	1. Replace.
	2. Emulsion build-up.	2. Clean (see Introduction section).

TROUBLE	PROBABLE CAUSE	REMEDY
	SOUND SYSTEM TROUBLES AND REMEDIES	
Projector runs, but no voltage at amplifier P.C. board	1. Loose connection.	1. Repair connection.
	2. Amplifier switch damaged.	2. Replace switch.
Projector runs, voltage at P.C. board, but exciter lamp does not light	1. Exciter lamp cable disconnected.	1. Connect cable.
	2. Wrong exciter lamp used.	2. Replace with correct lamp.
	3. Projector switch open or leads disconnected.	3. Replace switch or connect leads.
Voltage at P.C. board and exciter lamp lights, but no sound	1. Speaker jack disconnected.	1. Connect leads.
	2. Speaker jack switch open.	2. Repair or replace jack.
	3. Photocell cable disconnected or leads reversed.	3. Connect cable properly.
	4. Photocell out-of-line.	4. Realign (paragraph 40, step b).
	5. Dirt on photocell or optical slit.	5. Clean photocell and optical slit.
	6. Wrong exciter lamp used.	6. Replace with correct lamp.
Low volume	1. Faulty P.C. board.	1. Replace P.C. board.
	2. Wrong exciter lamp used.	2. Replace with correct lamp.
	3. Photocell out-of-line.	3. Realign (paragraph 40, step b).
	4. Dirt on photocell or optical slit.	4. Clean photocell and optical slit.
	5. Optical slit misaligned.	5. Realign slit (paragraph 40, step d).
	6. Buzz track misaligned.	6. Realign buzz track (paragraph 40, step f).
Distortion at all volume levels	1. Wrong exciter lamp used.	1. Replace with correct lamp.
	2. Faulty P.C. board.	2. Replace P.C. board.
Crackling noises	1. Broken ground lead to main plate.	1. Repair lead.
	2. Grounding spring loose, bent or lost. (not contacting end of sound drum shaft).	2. Repair or replace spring.
	3. Broken power cord shield.	3. Repair or replace power cord.
	4. Buzz track out-of-line.	4. Realign buzz track (paragraph 40, step f).

TROUBLE	PROBABLE CASUE	REMEDY
Wow or flutter	1. Soundhead stabilizer guide roller sticking.	1. Clean roller and roller shaft.
	2. Stabilizer guide roller spring broken, unhooked or lost.	2. Repair or replace spring.
	3. Soundhead film edge guide out-of-line.	3. Realign edge guide (paragraph 40, step e).
	4. Loose flywheel.	4. Tighten flywheel.
	5. Damaged sound drum bearing.	5. Replace bearing.
	6. Dirt causing guide roller arm pivot bearing to bind.	6. Clean and polish.
	7. Photocell or exciter cable rubbing against flywheel.	7. Reposition cables.
	8. Chips or dirt in take-up sprocket gear teeth.	8. Clean sprocket gear.
	9. Loop restorer stroke is too short or restorer set too low.	9. Adjust (paragraph 45).
Clicking noise	1. Dirt on sound drum.	1. Clean sound drum.
	2. Broken ground lead to main plate.	2. Repair lead.
	3. Sound drum grounding spring loose, bent or lost.	3. Repair or replace spring (located on amplifier P.C. board).
High frequencies fade (jumps focus)	1. Warped film.	1. Recondition or replace.
	2. Soundhead film edge guide out-of-line.	2. Realign edge guide (paragraph 40, step e).
	3. Dirt on sound drum.	3. Clean sound drum.
Hum	1. Grounded wiring.	1. Correct grounded condition.
	2. Faulty amplifier P.C. board.	2. Replace P.C. board.

TROUBLE SHOOTING THE AUTOLOAD SYSTEM

a. General. Any obstruction in the film path, such as caked emulsion, film chips or splicing tape, can be expected to interfere with proper threading. Time will be saved by cleaning the threading path and, at the same time, making a visual inspection of all shoes and guides before attempting to localize the trouble. Do not use metal tools to remove material adhering to the guides or rollers. Use an orange stick, plastic rod or toothpick whenever scraping is necessary. Pipe cleaners dampened with Tuoluol, naphtha or iso-propyl-alcohol are very convenient for cleaning in restricted areas. Do not use trichloroethylene or carbon tetrachloride as cleaning solvents as they might damage or stain plastic parts. Do not use excessive amounts of solvents, or lubricants will be removed from linkage pivots, slides, etc., and will have to be replenished.

b. Test Film. The autoload system has been designed to function properly with all film which can be described as being in projectable condition (see Operators Instructions for limits of shrinkage, curl, etc.). Generally, any film which functions properly in other Bell & Howell projectors (such as Designs 399, 540 and 542) can be used for testing the autoload system. Any film which does not thread properly should be inspected. The end of the leader must be properly trimmed and free from sharp bends. All sprocket holes in the first 18-inches of leader must be in good condition. Splines must be properly registered and in good condition. Sprocket holes restricted by cement or splicing tape must be cleared or the splice remade. The repairman is cautioned that it would be a waste of time to adjust or attempt to adjust the autoload system to auto-thread a film which is in such poor condition as to be incapable of being the source of an uninterrupted film presentation of acceptable quality.

c. Autoload Trouble Shooting Chart.

TROUBLE	PROBABLE CAUSE	REMEDY
Film cannot be inserted into feed sprocket	1. Obstruction in film channel of sprocket guard.	1. Remove obstruction.
	2. Guide finger on channel (27D, Figure 9) bent or binding.	2. Straighten or replace channel.
	3. Excessive pressure on leaf spring (30, Figure 10).	3. Adjust leaf spring (paragraph 44).
Film will not pull between feed sprocket and sprocket shoe	1. Entrance guide (11, Figure S) misaligned.	1. Realign per paragraph 44.
	2. Feed sprocket shoe sticking.	2. Clean sprocket shoe pivot.
	3. Feed sprocket shoe spring (31, Figure 9) broken.	3. Replace spring.
	4. Caked emulsion or burr on sprocket shoe film rails.	4. Clean; remove burr with crocus cloth.
Film comes out the side of top sprocket	1. Obstruction in sprocket shoe.	1. Remove obstruction.
	2. Damaged sprocket shoe.	2. Replace sprocket shoe.
	3. Sprocket shoe and sprocket misaligned laterally.	3. Realign.
Film strikes top of aperture plate and begins to pile up	1. Upper loopformer (8, Figure T) bent or out-of-adjustment.	1. Straighten or replace if bent; or readjust per paragraph 44.
	2. Lower loopformer (4, Figure T) set too close to aperture plate.	2. Readjust per paragraph 44.
Film butts into or goes under top end of aperture plate side tension rail or strikes fixed rail	1. Upper loopformer (8, Figure T) bent, causing sidewise deflection of film.	1. Straighten or replace.
	2. Lower loopformer (4, Figure T) bent or out-of-adjustment.	2. Straighten or replace if bent, or readjust per paragraph 44.
Film butts into top of film pressure plate (7, Figure 15) or passes over outside of pressure plate.	1. Lower loopformer (4, Figure T) out-of-adjustment.	1. Readjust per paragraph 44.
	2. Pressure plate not lifting off of aperture plate when film gate is closed.	2. Bent parts need straightening (paragraph 44) or replacing.
Film ejects between bottom of gate and top of take-up sprocket, or piles up in this area	1. Lower loopform (14, Figure 10) bent or sticking.	1. Straighten, remove bind, or replace as necessary.
	2. Lower loopform spring (15, Figure 10) broken.	2. Replace spring.
	3. Loop restorer out-of-adjustment or restorer roller stud bent.	3. Readjust loop restorer (paragraph 45) replaced damaged parts.
	4. Obstruction or burr in take-up sprocket upper shoe.	4. Clean; remove burr with crocus cloth.
	5. Sprockets out of time.	5. Time sprockets per paragraph 46.

TROUBLE	PROBABLE CAUSE	REMEDY
Film not threading over take-up sprocket	1. Sprocket guard mounting plate (25, Figure 10) out of position.	1. Reposition per paragraph 44.
	2. Obstruction in upper sprocket shoe.	2. Remove obstruction.
	3. Sprocket shoe spring (31, Figure 9) broken.	3. Replace spring.
	4. Take-up sprocket shaft loose in gear (33, Figure 9).	4. Retime sprockets (paragraph 46) and tighten setscrews (32, Figure 10).
Film piles up ahead of sound drum	1. Insufficient clearance between soundhead threading guides (4 and 5, Figure U).	1. Readjust all guides per paragraph 44.
	2. Backup bracket (20, Figure 10) bent downward.	2. Straighten bracket.
	3. Exciter lamp cover loose.	3. Tighten cover retaining screw.
	4. Obstruction in gap between sound drum and exciter lamp cover.	4. Remove obstruction.
	5. Not enough clearance between sound drum and cover.	5. Check clearance per paragraph 48.
	6. Edge guide adjusting screw (19, Figure 8) out too far.	6. Adjust per paragraph 40, step f.
Film ejects ahead of lower take-up sprocket shoe or piles up in this area	1. Insufficient clearance between soundhead threading guides (4 and 5, Figure U).	1. Readjust all guides per paragraph 44.
	2. Soundhead loose or improperly positioned.	2. Reposition per paragraph 47.
	3. Obstruction or burr in lower take-up sprocket shoe.	3. Remove obstruction; remove burr with crocus cloth.
	4. Film guide (1E, Figure 8) improperly positioned.	4. Reposition guide.
Film sticks in or is ejected from lower take-up sprocket shoe	1. Obstruction or burr in lower take-up sprocket shoe.	1. Remove obstruction; remove burr with crocus cloth.
	2. Sprocket shoe sticking.	2. Clean sprocket shoe pivot.
	3. Broken sprocket shoe spring (31, Figure 9).	3. Replace spring.
	4. Sprocket shoe and sprocket misaligned laterally.	4. Realign.
	5. Film exit guide (7, Figure 10) bent or improperly positioned.	5. Reposition or straighten guide.
Film piles up ahead of idler roller (11, Figure 10) or is ejected from this area	1. Film exit guide (7, Figure 10) bent or improperly positioned.	1. Reposition or straighten guide.
	2. Idler roller sticking or roller stud loose or bent.	2. Remedy sticking condition; replace locking lever (12, Figure 10).
System will not lock	1. Locking lever (12, Figure 10) binding.	1. Repair or replace lever.
	2. Release spring (18, Figure 10) disengaged or broken.	2. Engage spring with locking lever, or replace spring.

TROUBLE	PROBABLE CAUSE	REMEDY
System will not lock (Cont'd)	3. Eccentric pivot (9, Figure 10) improperly adjusted.	3. Readjust pivot per paragraph 44.
Loop restorer cycles continuously	1. Restorer out-of-adjustment.	1. Adjustment per paragraph 45.
	2. Shuttle retractor pin (41, Figure 12) sticking.	2. Clean and lubricate pin.
	3. Pressure plate (5, Figure 13) binding on aperture plate edge guide.	3. Realign pressure plate.
Slack film in soundhead area	1. Sprocket shoes sticking.	1. Clean sprocket shoe pivots.
	2. Take-up jerking.	2. Check take-up torque and check for binding in take-up reel arm (paragraph 39).
	3. Soundhead film rollers sticking.	3. Clean and lubricate rollers and shafts.
	4. Soundhead improperly positioned.	4. Reposition per paragraph 47.
	5. Dirt or obstruction between sound drum and exciter lamp cover.	5. Remove obstruction.
Film scratches	1. Caked emulsion on film path parts.	1. Clean film path.
	2. Film chips in sprocket shoes.	2. Remove film chips.
	3. Scratches or burrs on film guides, shoes, aperture or pressure plate.	3. Polish with crocus cloth or replace.
	4. Soundhead film roller sticking.	4. Clean and lubricate rollers and shafts.
Perforations checked	1. Shuttle not retracting.	1. Adjust per paragraph 44.
	2. Pressure plate not lifting from aperture plate.	2. Adjust per paragraph 44.
	3. Excessive feed or take-up tension.	3. Adjust tension (paragraph 39).
Film dimpled between perforations	1. Sprocket shoes sticking.	1. Clean sprocket shoe pivots.
	2. Shuttle not retracting.	2. Adjust per paragraph 44.
	3. Sprockets out of time.	3. Retime sprockets per paragraph 46.
	4. Inadequate pressure on leaf spring (30, Figure 10).	4. Adjust per paragraph 44.
	5. End of film leader not cut clean and square.	5. Check film cutter; replace if dull or broken.
Film escape mechanism does not open to permit exit of film	1. Film exit latching is out-of-adjustment.	1. Readjust per paragraph 44.
Film escape locking pawl does not seat properly; film exists constantly	1. Torsion spring (10, Figure 11) disconnected.	1. Connect torsion spring.
	2. Locking pawl (12, Figure 11) out-of-adjustment.	2. Readjust locking pawl per paragraph 44.

PARTS CATALOG

FILMOSOUND® PROJECTOR

(AUTOMATIC THREADING)

DESIGN 567

BELL & HOWELL

GENERAL SERVICE DEPT.
7100 McCORMICK ROAD
CHICAGO, ILLINOIS 60645

PART NO. 72798-1 PRINTED IN U.S.A. REVISED JULY 1974

Replacement Parts

The following pages illustrate and list, by part number and description, all replacement parts for Bell & Howell Design 567 Autothread Filmosound Projectors. Mechanical differences between the early and current production models are clearly noted in the "Description" column of the parts lists. Be sure to note these differences when ordering replacement parts.

The wiring diagrams at the end of the Parts Catalog section illustrate the wiring circuitry for the current (fused) production models. The two fuses constitute the only major electrical difference between early and current models.

The following accessory items are not illustrated but are available for the Design 567 projector. Parts for the Lamp Supply Unit used with this projector are covered in a separate service manual, part no. 72798A.

ACCESSORY ITEMS

Power Supply Unit . . . . . part no. 014640

Projection Lens . . . . . part no. 020311

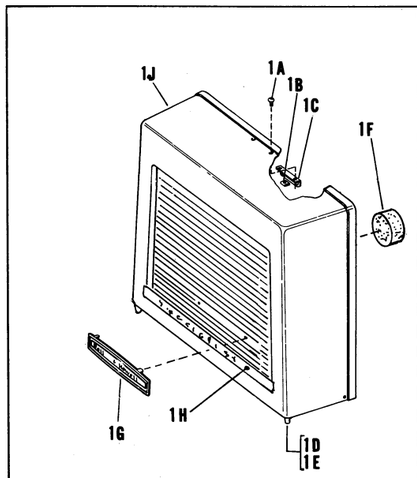
Film Reel (400 feet) . . . . . part no. 010572

Adapter, 3-wire . . . . . part no. 334382

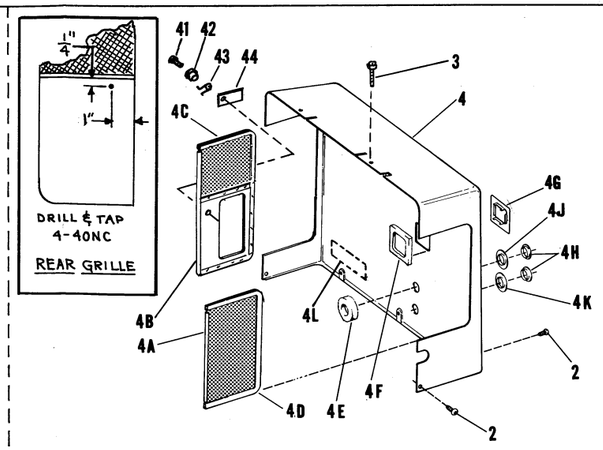
Line Cord . . . . . part no. 40827

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		COVERS, HANDLE AND REEL ARMS		
1-1	014798	COVER ASSEMBLY, Front, complete	1	
-1A	19535	. SCREW, Phillips round head, 6-32 by 3/8 inch	2	
-1B	43290	. SPEED NUT, 6-32	2	
-1C	33383	. LATCH PLATE, Front cover	1	
-1D	33373	. SCREW, Phillips truss head tapping, 6-20 by 5/16 inch . .	4	
-1E	33372	. FOOT, Front cover	4	
-1F	34798	. CUSHION, Foam rubber (cement in place)	1	
-1G	46440	. NAMEPLATE, "Bell & Howell 567" (adhesive backed) . . .	1	
-1H	41344	. NAMEPLATE, "Specialist" (adhesive backed)	1	
-1J	No Number	. COVER AND MOULDING ASSEMBLY (Order complete front cover assembly) . .	NP	
-2	36051	SCREW, Phillips truss head, 6-32 by 3/8 inch	7	
-3	36052	SCREW, Phillips truss head, 6-32 by 5/8 inch	2	
-4	014786	COVER ASSEMBLY, Rear, complete	1	
-4A	33494	. GUARD, Grille edge, front	1	
-4B	46348	. GUARD, Grille edge, rear	1	
-4C	014785	. GRILLE ASSEMBLY, Ventilation, rear	1	
-4D	011175	. GRILLE ASSEMBLY, Ventilation, front	1	
-4E	40851	. GASKET, Round	2	
-4F	40850	. GASKET, Square	1	
-4G	40848	. NAMEPLATE, "Changeover Receptacle" (adhesive backed)	1	
-4H	39578	. BEZEL	2	
-4J	40849	. NAMEPLATE, "Circuit Breaker" (adhesive backed)	1	
-4K	39579	. NAMEPLATE, "External Speaker" (adhesive backed) . . .	1	
-4L	87129	. LABEL, Warning (adhesive backed)	1	
-4M	No Number	. COVER, Rear (order complete rear cover assembly) . . .	NP	

FIG. & INDEX NO.	PART NO.	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		COVERS, HANDLE AND REEL ARMS (CONT'D)		
1-5	33391	SCREW, Phillips oval head, 6-32 by 3/8 inch	2	
-6	43360	CAP, Carrying handle	1	
-7	33368	BODY, Carrying handle	1	
-8	33370	RUBBER GRIP, Handle	1	
-9	30857	SCREW, Posidriv flat head swage type, 8-32 by 7/16 inch	2	
-10	36060	STRAP, Carrying handle	1	
-11	33300	SPACER, Handle strap	2	
-12	33302	SPRING, Release lever	1	
-13	33299	RING, Retaining, external, 0.156 inch ID	2	
-14	33301	STUD, Cover latch	2	
-15	09910	LEVER ASSEMBLY, Cover release	1	
-16	400476	MOULDING, Projector main frame	1	
-17	46349	NAMEPLATE, Serial Number (adhesive backed)	1	
-18	35886	PLATE, Snubber roller threading (adhesive backed)	1	
-19	36769	SETSCREW, Fluted socket, 8-32 by 1/4 inch	2	
-20	36532	COLLAR, Locking	1	
-21	012661	SPROCKET ASSEMBLY, Rewind	1	
-22	31237	WASHER, Nylon	2	
-23	012662	SPROCKET ASSEMBLY, Take-up	1	
-24	31372	WASHER, Brass	2	
-25	36769	SETSCREW, Fluted socket, 8-32 by 1/4 inch	2	
-26	35811	COLLAR, Retaining	1	
-27	31358	DISC, Locking, front arm	1	
-28	09849	REEL ARM ASSEMBLY, Front (see Figure 6 for component parts)	1	
-29	31370	WASHER, Bronze	1	
-30	21736	RING, Retaining, 0.209 inch ID	1	
-31	31372	WASHER, Brass	3	
-32	31237	WASHER, Nylon	2	
-33	012654	SPROCKET ASSEMBLY	1	
-34	36769	SETSCREW, Fluted socket, 8-32 by 1/4 inch	2	
-35	35811	COLLAR, Retaining	1	
-36	34765	DISC, Locking, rear arm	1	
-37	03980	REEL ARM ASSEMBLY, Rear (see Figure 7 for component parts)	1	
-38	31370	WASHER, Bronze	1	
-39	34760	DECAL, "Take-Up-Rewind" (adhesive backed)	1	
-40	31342	BELT, Timing	1	
-41	36837	SCREW, Pan head, 4-40 by 1/4 inch (current models)	1	
-42	47861	BUSHING, Switch cover (current models)	1	
-43	47862	SPRING, Torsion (current models)	1	
-44	47860	COVER, Switch (current models)	1	



FRONT COVER PARTS



REAR COVER PARTS

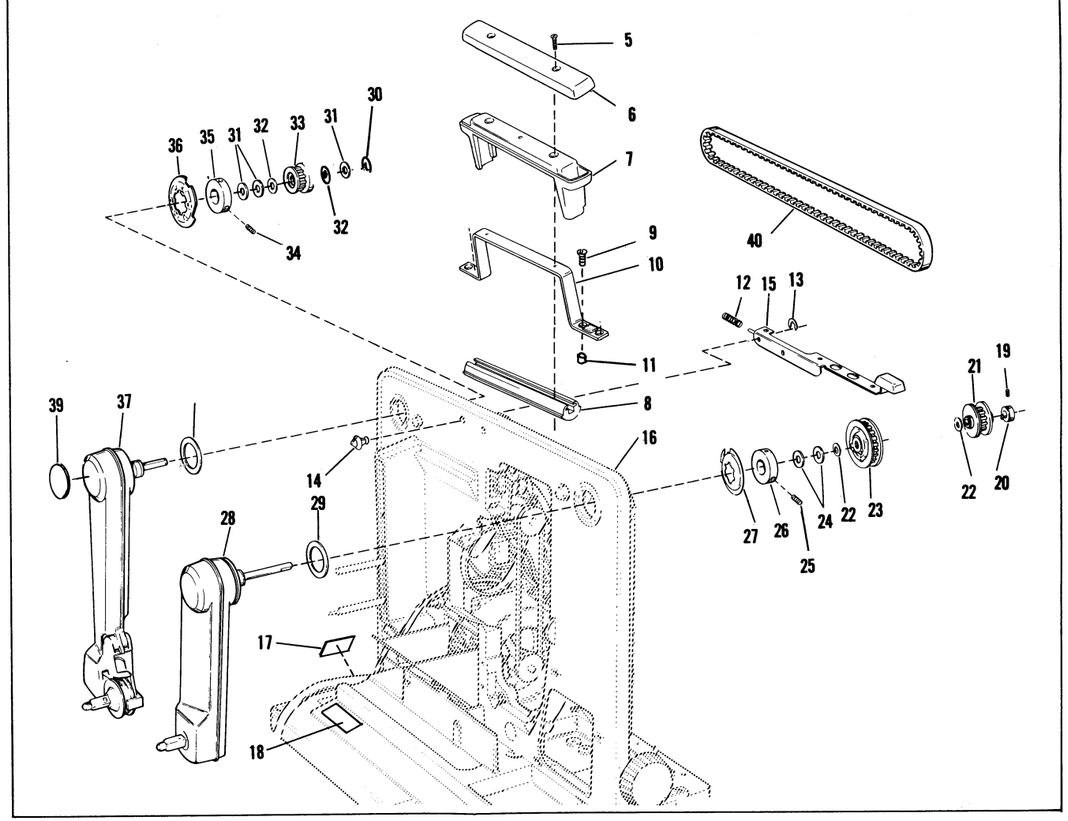


Figure 1. Covers, Handle and Reel Arms

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		PROJECTOR MAIN PLATE COMPONENTS		
2-1	18086 or 41381	FOOT, Rubber	4	
-2	707026	SCREW, Slotted pan head, 8-32 by 1/4 inch	1	
-3	015575	SHIELD ASSEMBLY, Base	1	
-4	43268	POST, Tapped	1	
-5	33491	SPRING, Tension	1	
-6	30808	SCREW, Hex head swage type, 6-32 by 5/16 inch	2	
-7	09808	CUTTER ASSEMBLY, Film	1	
-8	36059	SPRING, Cutter arm	1	
-9	09804	ARM ASSEMBLY, Film cutter	1	
-10	30816	SCREW, Hex head swage type, 8-32 by 5/8 inch	1	
-11	39352	CLAMP, Leadwire	1	
-12	707026	SCREW, Slotted pan head, 8-32 by 1/4 inch	1	
-13	15563	WASHER, Lock	1	
-14	302097	WASHER, Flat	1	
-15	40892	CLAMP, Cable retaining	1	
-16	43265	CORD, Power	1	
-17	48198	SWITCH, Changeover (includes mounting nut)	1	
-18	40862	NAMEPLATE, "Changeover" (adhesive backed)	1	
-19	36841	SCREW, Pan head, 6-32 by 1/4 inch	1	
-20	40950	CLIP, Power cord retaining	1	
-21	30804	SCREW, Hex head swage type, 4-40 by 1/4 inch	3	
-22	014788	LAMPHOUSE ASSEMBLY, Complete	1	
-22A	47102	. LABEL, Lamp designation (adhesive backed)	1	
-22B	367175	. NAMEPLATE, Lamphouse (cement in place)	1	
-22C	36094	. BAFFLE, Heat (cement in place)	1	
-22D	36026	. HANDLE, Lamphouse	1	
-22E	09806	. LATCH ASSEMBLY, Lamphouse	1	
-22F	30804	. SCREW, Hex head swage type, 4-40 by 1/4 inch	2	
-22G	40867	. REFLECTOR, Heat	1	
-22H	No Number	. LAMPHOUSE AND GRILLE ASSEMBLY (Order lamphouse assembly, complete)	NP	
-23	40942	CLIP, Lamp retainer, upper	1	
-24	40802	CLIP, Lamp retainer, lower	1	
-25	484290	LAMP, Projector, enclosed arc, Marc 350/16T	1	
-26	31943	SCREW, Slotted binding head, 6-32 by 0.187 inch	2	
-27	40873	BRACKET, Lamp connector mounting	1	
-28	40957	RETAINER, Lamp connector	2	
-29	40844	CONNECTOR, Lamp plug	1	
-30	30815	SCREW, Hex washer head swage type, 8-32 by 3/8 inch	2	
-31	014789	BRACKET AND TUBE ASSEMBLY, Lamp	1	
-31A	37343	. SCREW, Slotted fillister head, 4-40 by 1/4 inch	4	
-31B	367142	. TUBE, Lamp	1	
-31C	48178	. BRACKET, Lamp	1	
-32	36841	SCREW, Slotted pan head, 6-32 by 1/4 inch	2	
-33	47127	SHIELD, Lamp	1	
-34	30804	SCREW, Hex head swage type, 4-40 by 1/4 inch	2	
-35	40871	SHIELD, Pulley	1	
-36	30816	SCREW, Hex washer head swage type, 8-32 by 5/8 inch	2	
-37	014787	BRACKET ASSEMBLY, Support	1	
-38	46346	DEFLECTOR, Heat	1	
-39	41142	LAMP, Pilot	1	
-40	30817	SCREW, Hex washer head swage type, 8-32 by 1/2 inch	1	
-40A	33300	WASHER, Spacer	1	
-41	30822	SCREW, Hex washer head swage type, 10-32 by 7/16 inch	1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		PROJECTOR MAIN PLATE COMPONENTS (CONT'D)		
2-42	No Number	CONTROL PANEL ASSEMBLY	NP	
-43	09896	. KNOB, Volume control (not part of item -42)	1	
-44	09887	. KNOB, Tone control (not part of item -42)	1	
-45	367135	. CONTROL, Tone and volume (not part of item -42)	1	
-45A	47217	. SHIELD, Volume control	1	
-47	36763	. SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	2	
-48	014782	. KNOB, "Fan-Lamp"	1	
-49	011946	. KNOB, Projector control	1	
-50	013020	. INSULATOR, Switch	1	
-51	40868	. SWITCH, "Fan-Lamp"	1	
-52	367149	. SWITCH, Projector control	1	
-53	700167	. SCREW, Slotted fillister head, 6-32 by 1/4 inch	2	
-54	367157	. BEZEL	1	
-55	014793	. BRACKET ASSEMBLY, Switch mounting	1	
-56	014781	. NAMEPLATE ASSEMBLY, Control switch	1	
-57	46592	PLATE, Power clip cord	1	
-58	46524	LABEL, U.L. (adhesive backed)	1	
	NOTE:	Items -59 through -65 were not provided on early models.		
-59	36052	SCREW, Phillips truss head, 6-32 by 5/8 inch	2	
-60	014916	BLOCK ASSEMBLY, Fuse	1	
-61	900530	SPACER, Sleeve	2	
-62	302153	FUSE, Slo-Blo, 0.5 amp, 125 volt	2	
-63	48193	LABEL, Fuse rating (adhesive backed)	1	
-64	48194	LABEL, Caution (adhesive backed)	1	
-65	48192	INSULATOR, Fish paper (adhesive backed)	1	

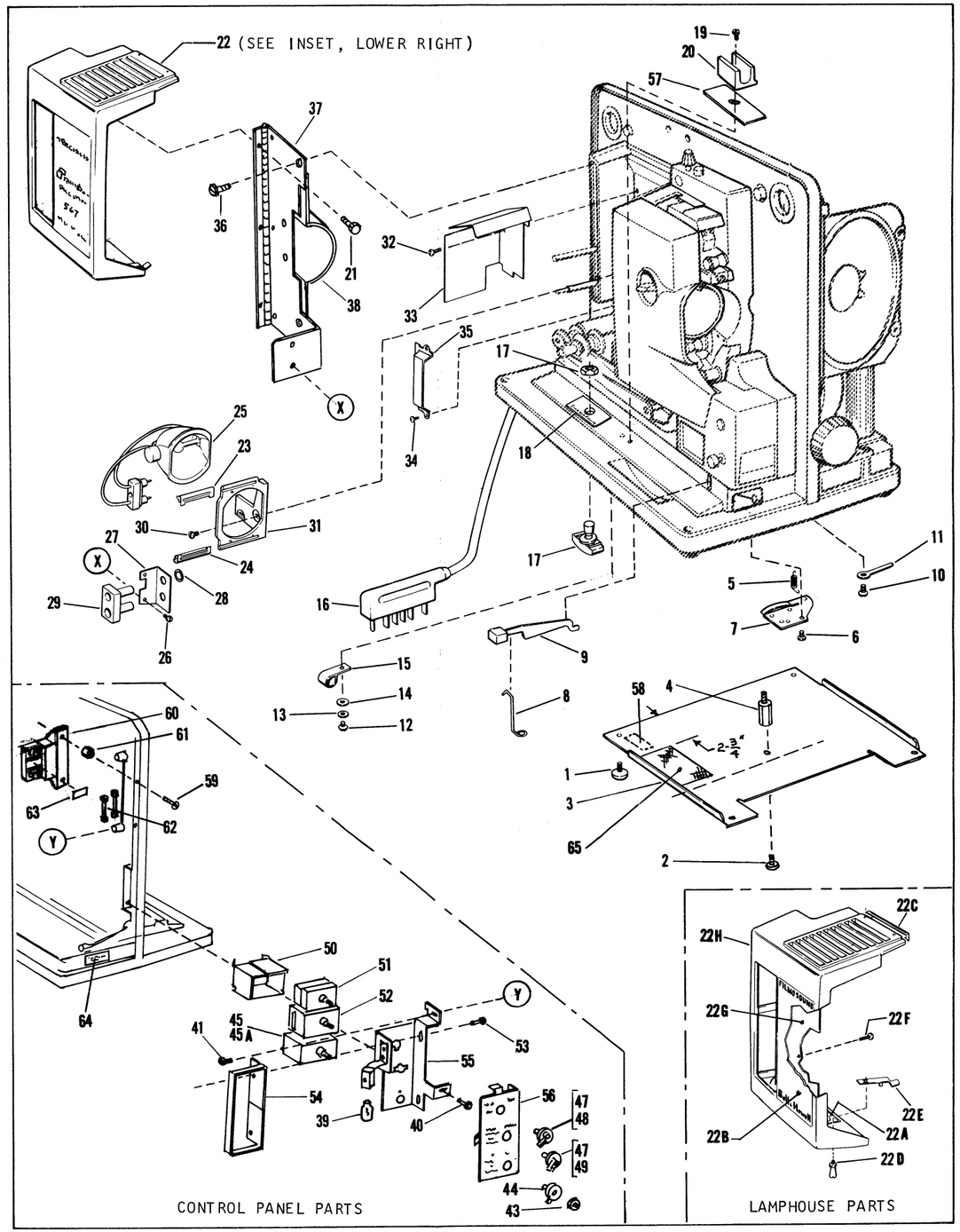


Figure 2. Projector Main Plate Components

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		PROJECTOR MAIN PLATE COMPONENTS (CONT'D)		
3-1	706193	SCREW, Phillips pan head tapping, 6-20 by 1/2 inch	2	
-2	43290	NUT, Speed, Type U	2	
-3	30815	SCREW, Hex washer head swage type, 8-32 by 3/8 inch	1	
-4	09810	SPEAKER ASSEMBLY	1	
-5	700136	SCREW, Slotted binding head, 8-32 by 3/8 inch	3	
-5A	31491	SCREW, Slotted binding head, 8-32 by 1/2 inch (from beneath the base)	2	
-5B	15563	WASHER, Flat	2	
-6	014791	AMPLIFIER ASSEMBLY (See Figure 15 for component parts)	1	
-7	43474	SCREW, Phillips pan head tapping, 6-32 by 7/16 inch	2	
-8	33427 or 36520	RELAY, Motor (see inset, Figure 3)	1	
-9	27834	TERMINAL STRIP	1	
-10	37322	RESISTOR, Wirewound, 10 ohm, 5 watt	1	
-11	30816	SCREW, Hex washer head swage type, 8-32 by 5/8 inch	1	
-12	31503	CLAMP, Starting capacitor	1	
-13	31266	CAPACITOR, Starting	1	
-14	30808	SCREW, Hex head swage type, 8-32 by 5/16 inch	2	
-15	41378	BRACKET, Capacitor-relay mounting	1	
-16	30809	SCREW, Hex washer head swage type, 6-32 by 3/8 inch	2	
-17	09768	IDLER ASSEMBLY, Rewind belt	1	
-17A	36083	. RING, Retaining, external, 0.250 inch ID	1	
-17B	611107	. ROLLER, Idler	1	
-18	30809	SCREW, Hex washer head swage type, 6-32 by 3/8 inch	2	
-19	09769	IDLER ASSEMBLY, Main timing belt	1	
-19A	36083	. RING, Retaining, external, 0.250 inch ID	1	
-19B	611107	. ROLLER, Idler	1	
-20	30857	SCREW, Phillips flat head swage type, 8-32 by 7/16 inch	4	
-21	38207	BRACKET, Reel arm lock	2	
-22	31231	SPRING, Reel arm lock	2	
-23	43251	LOCK, Reel arm	2	
-24	41323	STRAP, Motor retaining	2	
-25	41125	BRACKET, Stability	1	
-26	40948	BELT, Drive	1	
-27	011893	MOTOR ASSEMBLY, Drive (includes items -27C to -27F)	1	
-27A	36763	. SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	2	
-27B	Note A	. PULLEY, Motor	1	
-27C	70345	. CUSHION, Motor support	2	
-27D	28820	. TERMINAL, Straight push-on	2	
-27E	32093	. TERMINAL, Flag push-on	2	
-27F	36068	. MOTOR, Drive, 50/60Hz	1	
-28	30822	SCREW, Hex washer head swage type, 10-32 by 7/16 inch	3	
-29	31263	BRACKET, Motor mounting	2	
-30	30815	SCREW, Hex washer head swage type, 8-32 by 3/8 inch	1	
-31	367160	SHIELD, Electrical	1	

NOTE A: When replacing the motor pulley (item -27B), replace with one of like color: Blue, P/N 40877; Gold, P/N 40947; Red, P/N 40951.

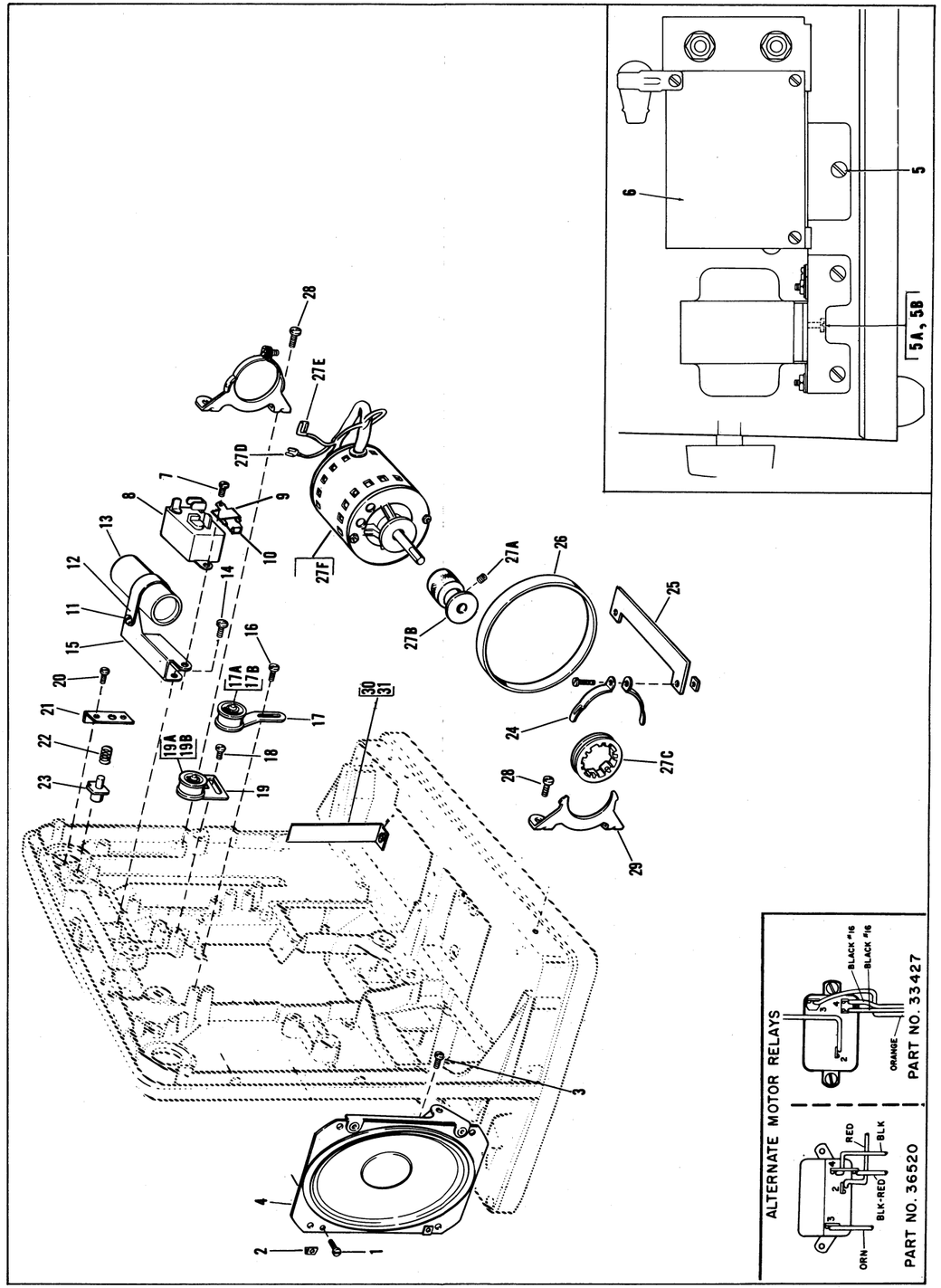


Figure 3. Projector Main Plate Components

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		PROJECTOR MAIN PLATE COMPONENTS (CONT'D)		
4-1	40880	SPRING, Extension	1	
-2	40879	ROD, Clevis	1	
-3	36802	SCREW, Slotted pan head Sems, 6-32 by 5/16 inch	2	
-4	015130	SWITCH, SOLENOID AND BRACKET ASSEMBLY.	1	
-5	33785	. SCREW, Slotted round head, 2-56 by 3/4 inch	2	
-6	32048	. NUT, Plain hex	2	
-7	32943	. WASHER, Lock	2	
-8	40884	. SWITCH, Subminiature, SPDT leaf-actuated	2	
-9	40878	. INSULATOR, Switch	2	
-10	706964	. SCREW, Slotted pan head, 6-32 by 3/16 inch	2	
-10A	14175	. WASHER, Lock	2	
-11	013896	. SOLENOID ASSEMBLY	1	
-12	013021	. BRACKET ASSEMBLY, Solenoid	1	
-13	36801	SCREW, Slotted pan head Sems, 6-32 by 1/4 inch	1	
-14	015129	RELAY AND RECEPTACLE ASSEMBLY	1	
-15	40890	. BRACKET, Receptacle mounting	1	
-16	36909	. RIVET, Semi-tubular, 0.123 inch diameter	4	
-16A	31456	. WASHER, Flat	4	
-17	40887	. RECEPTACLE, Female, 3-pin	1	
-18	40886	. RECEPTACLE, Male, polarized, 3-pin	1	
-19	36841	. SCREW, Slotted pan head, 6-32 by 1/4 inch	1	
-20	40885	. RELAY, Enclosed	1	
-21	36801	SCREW, Slotted pan head Sems, 6-32 by 1/4 inch	1	
-22	30815	SCREW, Hex washer head swage type, 8-32 by 3/8 inch	1	
-23	41110	STRAP, Blower support	1	
-24	31499	SCREW, Slotted binding head, 6-32 by 3/8 inch	4	
-25	14175	WASHER, Lock	4	
-26	014783	BLOWER AND MOTOR ASSEMBLY	1	
-26A	40824	. STUD, Motor support	4	
-26B	28718	. WASHER, Flat	4	
-26C	013374	. MOTOR AND BRACKET ASSEMBLY	1	
-26D	39177	. GROMMET, Rubber	4	
-26E	43276	. WHEEL, Blower (includes setscrew)	1	
-26F	013906	. HOUSING ASSEMBLY, Blower wheel	1	
-27	014784	DEFLECTOR ASSEMBLY, Air	1	
-28	34889	SCREW, Slotted binding head, 1/4-28 by 3/8 inch	1	
-29	8179	WASHER, Lock	1	
-30	34766	BAR, Tilt	1	
-31	31561	FOOT, Rubber	2	
-32	30857	SCREW, Flat head swage type, 8-32 by 7/16 inch	2	
-33	013915	TILT ASSEMBLY, Complete	1	
-33A	36769	. SETSCREW, Fluted socket cup pt, 8-32 by 1/4 inch	1	
-33B	09902	. KNOB ASSEMBLY, Tilt	1	
-33C	31567	. PIN, Spring	2	
-33D	41379	. RACK, Tilt	1	
-33E	31568	. PIN, Spring	1	
-33F	31565	. PINION, Tilt	1	
-33G	21736	. RING, Retaining, 0.207 inch ID	1	
-33H	31039	. WASHER, Flat	1	
-33J	34822	. WASHER, Spring tension	1	
-33K	31564	. GEAR, Worm	1	
-33L	31039	. WASHER, Flat	1	
-33M	31563	. HOUSING, Tilt mechanism	1	

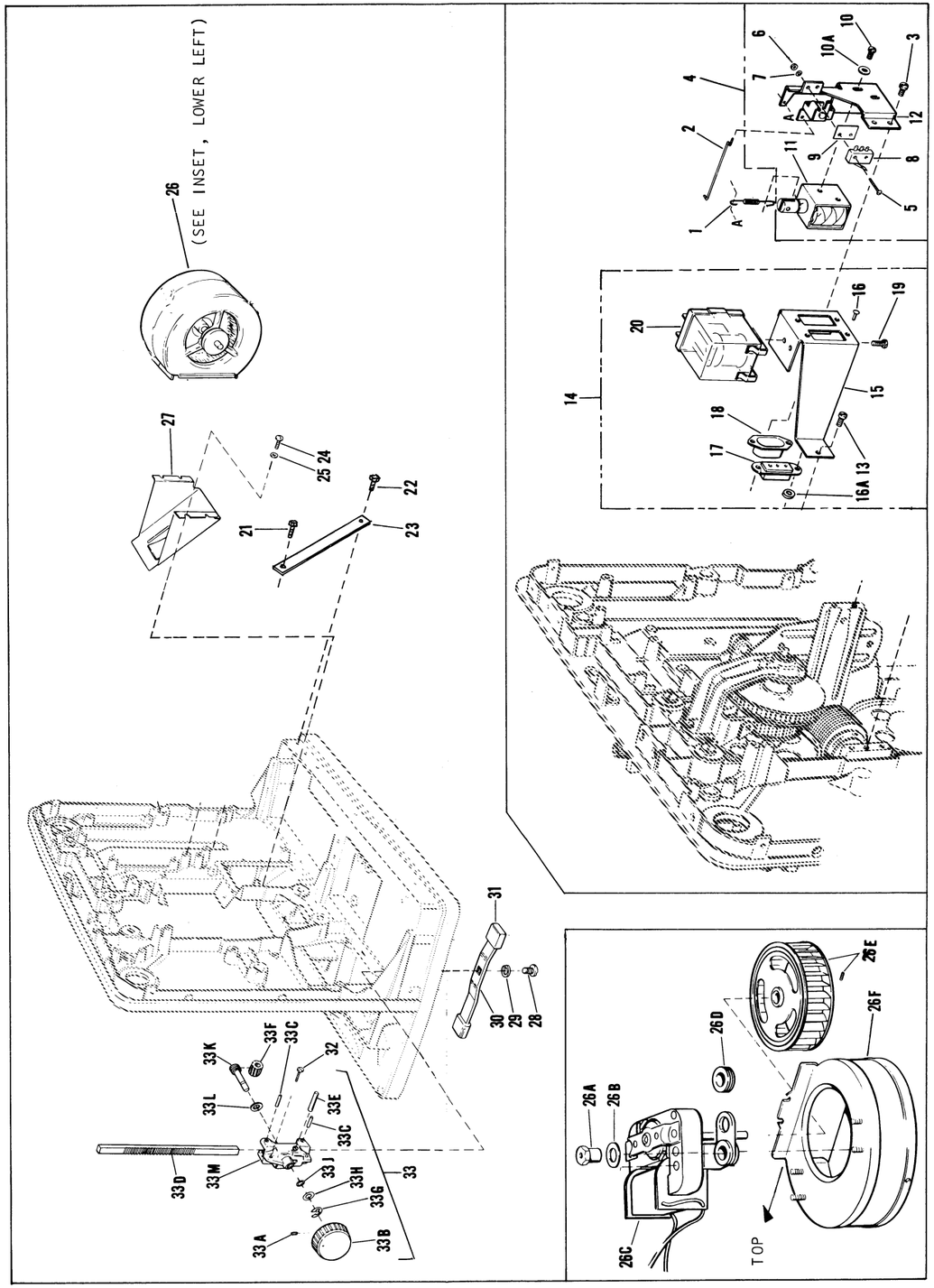


Figure 4. Projector Main Plate Components

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		PROJECTOR MAIN PLATE COMPONENTS (CONT'D)		
5-1	013326	COVER ASSEMBLY, Mechanism	1	
-1A	30808	. SCREW, Hex washer head swage type, 6-32 by 5/16 inch	1	
-1B	31609	. SPRING, Latch	1	
-1C	30808	. SCREW, Hex washer head swage type, 6-32 by 5/16 inch	2	
-1D	31610	. BRACKET, Hinge	1	
-1E	34878	. WASHER, Spacer	AR	
-1F	36069	. SPRING, Cover retaining	1	
-1G	36070	. LABEL, Instruction (adhesive backed)	1	
-1H	42211	. COVER	1	
-2	013333	COVER ASSEMBLY, Exciter lamp (see Figure 8 for component parts)	1	
-3	31476	NUT, Flywheel	1	
-4	40883	FLYWHEEL	1	
-5	31017	WASHER, Flat	1	
-6	31491	SCREW, Slotted binding head, 8-32 by 1/2 inch	3	
-7	31243	WASHER, Flat	2	
-8	013484	SOUNDHEAD ASSEMBLY (See Figure 8 for component parts)	1	
-9	30824	SCREW, Hex washer head swage type, 10-32 by 1 inch	4	
-10	31219	SHOCK MOUNT, Mechanism	4	
-11	014778	MECHANISM ASSEMBLY, Complete (see Figure 9 through 12 for component parts)	1	
-12	30164	SCREW, Slotted binding head, 4-40 by 3/16 inch	1	
-13	35861	STUD, Film guide mounting	1	
-14	35852	GUIDE, Film	1	
-15	35862	SPACER, Film guide	1	
-16	41330	ROLLER, Idler	1	
-17	97509	RING, Retaining, external, 0.250 inch ID	1	
-18	013913	ROLLER ASSEMBLY, Snubber, complete	1	
-18A	36065	. HANDLE, Snubber	1	
-18B	41334	. WASHER, Flat	1	
-18C	36033	. INSERT, Number "5" (adhesive backed)	1	
-18D	41330	. ROLLER, Idler	1	
-18E	No Number	. ARM AND STUD ASSEMBLY (Order complete snubber roller assembly -18)	NP	
-19	35859	SPRING, Snubber	1	
-20	35858	RETAINER, Snubber spring	1	
-21	35856	COVER, Snubber spring	1	
-22	35860	POST, Snubber mounting	1	
-23	36030	LABEL, "Autoload Position" (adhesive backed)	1	
-24	30816	SCREW, Hex washer head swage type, 8-32 by 5/8 inch	3	
-25	30820	SCREW, Hex washer head swage type, 8-32 by 1-3/8 inch	2	
-26	46347	PLATE, Main	1	
-27	43375	BASE, Projector	1	
-28	40893	BUSHING, Snap	2	

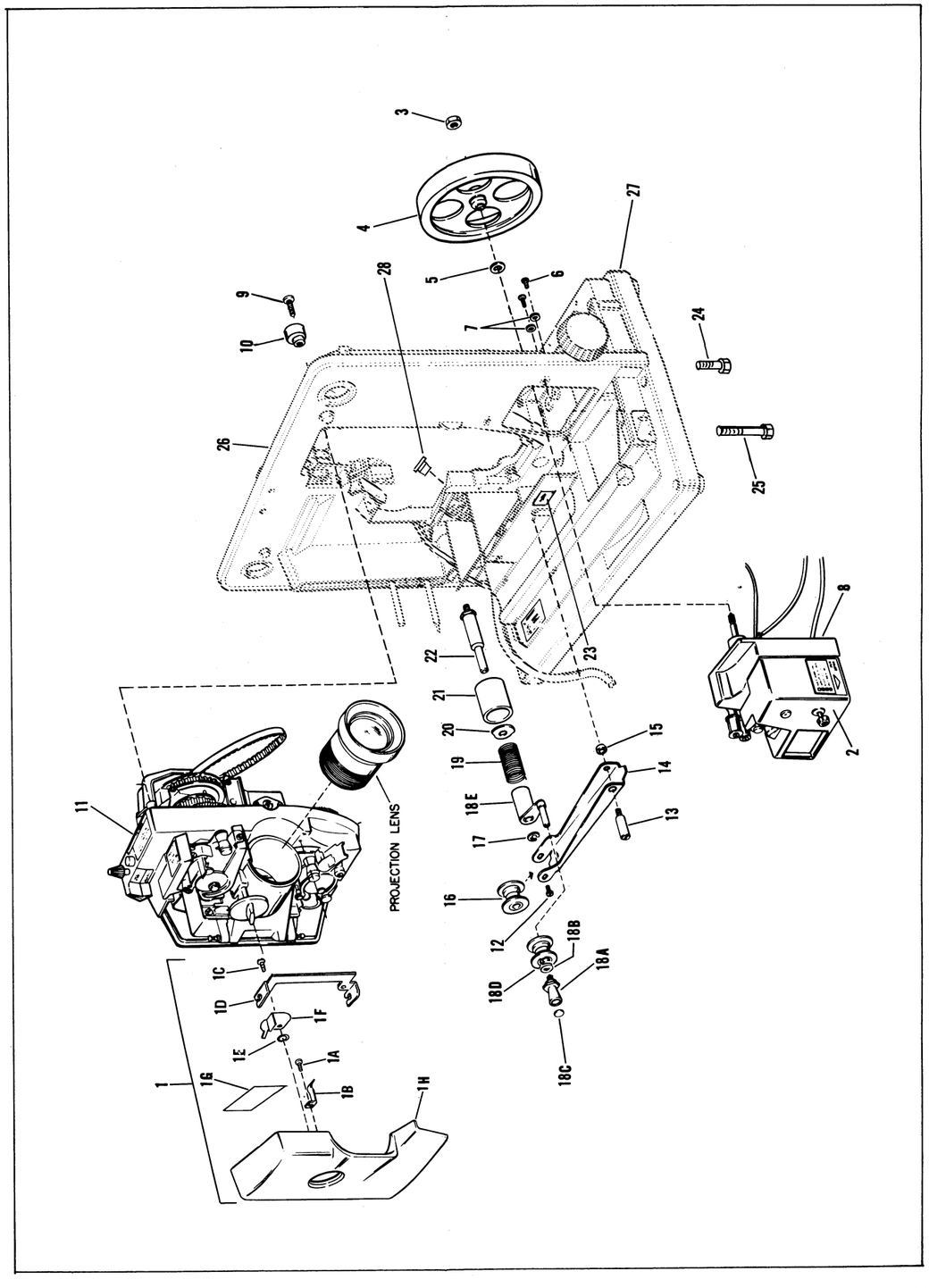


Figure 5. Projector Main Plate Components

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		FRONT REEL ARM ASSEMBLY		
6-	09849	REEL ARM ASSEMBLY, Front	REF	
-1	30882	. SCREW, Swage type, special	2	
-2	42217	. COVER, Reel arm	1	
-3	34874	. WASHER, Shim, steel	AR	
-4	31366	. PIN, Spring	1	
-5	31363	. COLLAR, Feed spindle	1	
-6	31365	. PIN, Straight	1	
-7	31364	. SPRING, Torsion	1	
-8	09776	. GEAR ASSEMBLY, Lower	1	
-9	31371	. WASHER, Brass	1	
-10	36084	. WASHER, Shim	AR	
-11	34860	. WASHER, Thrust, special	1	
-12	09774	. SPINDLE ASSEMBLY, Feed	1	
-13	31359	. WASHER, Flat	1	
-14	36769	. SETSCREW, Fluted socket cup pt, 8-32 by 1/4 inch	2	
-15	011948	. GEAR ASSEMBLY, Upper	1	
-16	31369	. SPRING, Clutch	1	
-17	24903	. RING, Retaining, external crescent, 0.250 inch ID	2	
-18	36080	. DISC, Clutch	1	
-19	31372	. WASHER, Brass	2	
-20	34861	. WASHER, Spring tension	1	
-21	31245	. RING, Retaining, external, 0.187 inch ID	1	
-22	31241	. CLIP, Gear retaining	2	
-23	31239	. GEAR, Spur, lower	1	
-24	33385	. GEAR, Spur, upper	1	
-25	31243	. WASHER, Steel	1	
-26	31360	. SHAFT, Drive	1	
-27	31236	. BEARING, Nylon	2	
-28	17639	. RING, Retaining, external, 0.125 inch ID	2	
-29	31367	. SHOE, Friction	1	
-31	09778	. BRACKET ASSEMBLY, Friction shoe	1	
-32	014905	. DISC ASSEMBLY, Spline bearing	1	
-33	31370	. WASHER, Bronze	1	
-34	31356	. SHAFT, Front reel arm	1	
-35	09752	. BEARING ASSEMBLY, Splined	1	
-35A	31911	. . BEARING, Needle	2	
-36	30813	. SCREW, Hex head swage type, 4-40 by 3/8 inch	1	
-37	43282	. SPRING, Brake	1	
-38	014903	. ARM AND BEARING ASSEMBLY, Front	1	
-38A	43373	. . BEARING, Needle	1	
-38B	31375	. . BEARING, Needle (closed end)	1	

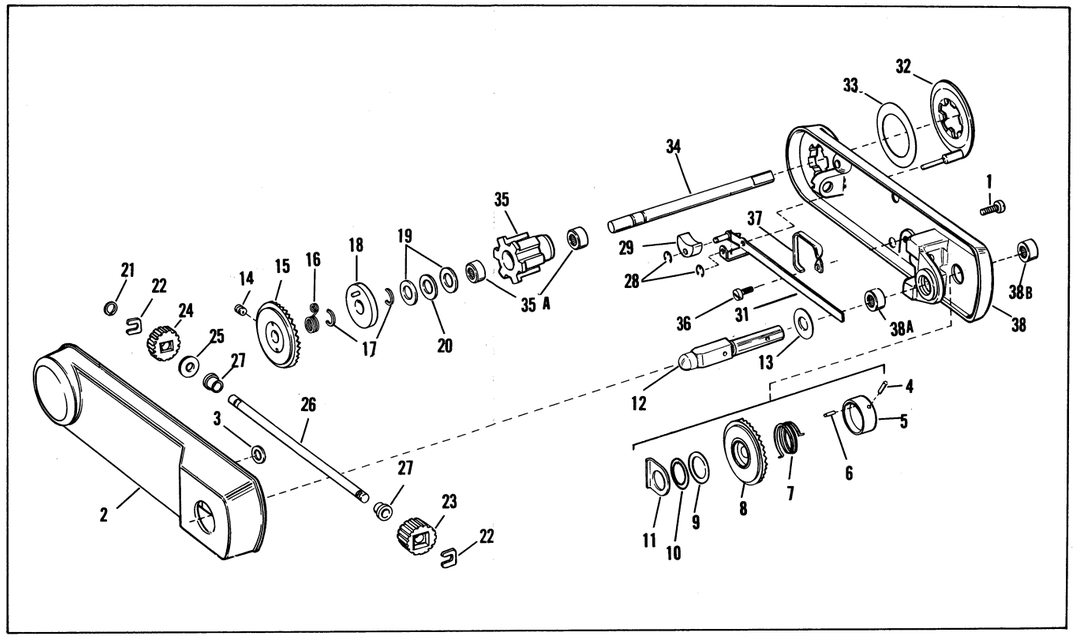


Figure 6. Front Reel Arm Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		REAR REEL ARM ASSEMBLY		
7-	03980	REEL ARM ASSEMBLY, Rear	REF	
-1	24047	. BELT, Take-up	1	
-2	36038	. SPRING, Tension	1	
-3	31247	. SCREW, Phillips button head, 10-32 by 1/4 inch	1	
-4	09753	. SPINDLE AND PULLEY ASSEMBLY, Take-up	1	
-5	700672	. WASHER, Shim	1	
-6	09755	. ARM ASSEMBLY, Take-up	1	
-6A	43373	. . BEARING, Needle	2	
-7	30882	. SCREW, Swage type, special	2	
-8	42218	. COVER, Rear reel arm	1	
-9	34874	. WASHER, Shim, steel	AR	
-10	31245	. RING, Retaining, external, 0.187 inch ID	1	
-11	31241	. CLIP, Gear retaining	2	
-12	31239	. GEAR, Spur, lower	1	
-13	31239	. GEAR, Spur, upper	1	
-14	31243	. WASHER, Steel	1	
-15	36083	. RING, Retaining, external, 0.250 inch ID	1	
-16	011889	. PULLEY AND GEAR ASSEMBLY	1	
-17	~~36057~~ 45684	. . SLEEVE, Rubber	1	
-18	31235	. BEARING, Nylon	2	
-19	31242	. PLUNGER, Spring	1	
-20	31246	. SPRING, Compression	1	
-21	33966	. RING, Retaining, external, 0.219 inch ID	1	
-22	36763	. SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	1	
-23	31234	. SHAFT, Rewind drive	1	
-24	31238	. SHAFT, Main drive	1	
-25	31236	. BRARING, Nylon	2	
-26	36769	. SETSCREW, Fluted socket cup pt, 8-32 by 1/4 inch	2	
-27	011948	. GEAR ASSEMBLY, Upper	1	
-28	36085	. WASHER, Brass, 0.0025 inch thick	AR	
-28	36086	. WASHER, Brass, 0.005 inch thick	AR	
-29	40295	. SHAFT, Rear reel arm	1	
-30	09752	. BEARING ASSEMBLY, Splined	1	
-30A	24042	. . BEARING, Needle	2	
-31	013339	. ARM ASSEMBLY, Rear reel	1	
-32	41331	. PIN, Take-up arm	1	

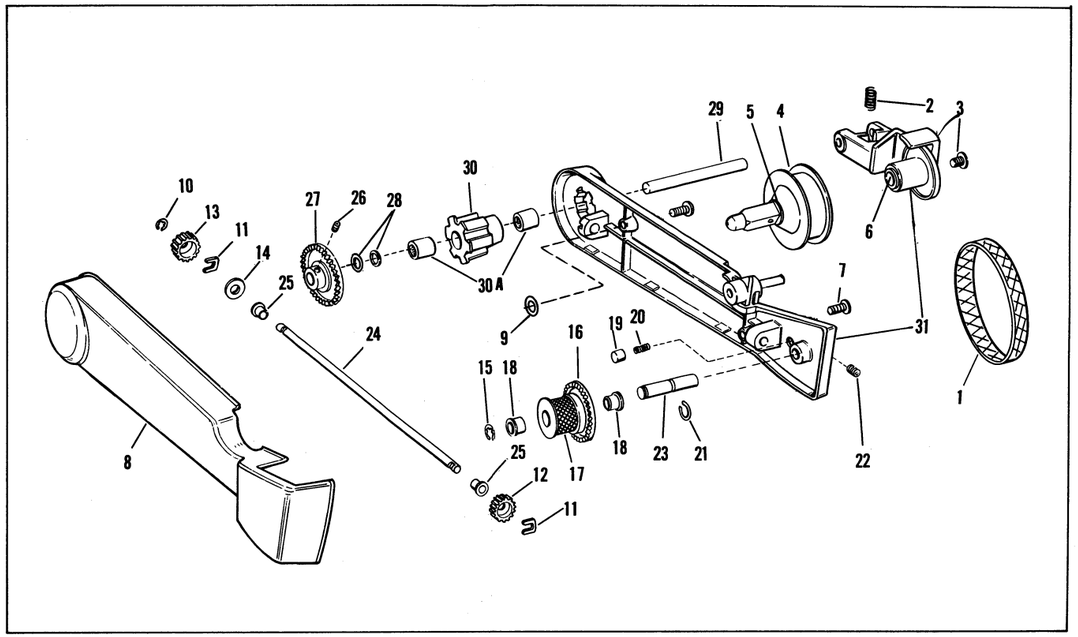


Figure 7. Rear Reel Arm Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		EXCITER LAMP COVER AND SOUNDHEAD		
8-1	013333	COVER ASSEMBLY, Exciter lamp	REF	
-1A	20808	. RING, Retaining, external, 0.145 inch ID	1	
-1B	43288	. SCREW, Cover retaining	1	
-1C	34787	. RUBY, Indicating (cement in place)	1	
-1D	30163	. SCREW, Slotted binding head, 5-40 by 3/8 inch	2	
-1E	35823	. GUIDE, Film	1	
-1F	31643	. LABEL, Instruction, film cutter (adhesive backed)	1	
-1G	36094	. BAFFLE, Light (cement in place)	1	
-1H	013334	. COVER, Exciter lamp	1	
8-	013484	SOUNDHEAD ASSEMBLY, Complete	1	
-2	34884	. LAMP, Exciter, Type BAK	1	
-3	34892	. DECAL, Lamp designation (adhesive backed)	1	
-4	30810	. SCREW, Hex head swage type, 6-32 by 1/2 inch	1	
-5	020240	. SLIT ASSEMBLY, Optical	1	
-6	31671	. RING, Retaining, external, 0.250 inch ID	1	
-7	31630	. SCREW, Roller adjusting	1	
-8	31638	. SCREW, Fillister head, 6-32 by 0.438 inch	2	
-9	09828	. CONTACT ASSEMBLY, Exciter lamp	1	
-10	09840	. LEADWIRE ASSEMBLY, Lamp contact	1	
-11	31636	. RING, Lamp release	1	
-12	36765	. SETSCREW, Fluted socket cup pt, 6-32 by 1/4 inch	1	
-13	36668	. SCREW, Pan head Sems, 6-32 by 5/16 inch	2	
-14	013398	. SOUND DRUM AND SHAFT ASSEMBLY	1	
-15	31669	. RETAINER, Light pipe	1	
-16	013486	. LIGHT PIPE AND SILICON CELL ASSEMBLY	1	
-17	09826	. SCREW ASSEMBLY, Edge guide	1	
-18	30163	. SCREW, Slotted binding head, 5-40 by 3/8 inch	2	
-19	31674	. WASHER, Flat	2	
-20	09834	. ROLLER ASSEMBLY, Flanged, upper	1	
-21	09835	. ROLLER ASSEMBLY, Plain, lower	1	
-22	31673	. SPRING, Extension	1	
-23	30804	. SCREW, Hex head swage type, 4-40 by 1/4 inch	1	
-24	31675	. TERMINAL LUG	1	
-25	30804	. SCREW, Hex head swage type, 4-40 by 1/4 inch	2	
-26	31659	. ARM, Stabilizer	1	
-27	09832	. ARM ASSEMBLY, Stabilizer, lower	1	
-28	39789	. SPRING, Stabilizer arm	1	
-29	09838	. ARM ASSEMBLY, Stabilizer, upper	1	
-30	013331	. HOUSING ASSEMBLY, Soundhead	1	
-30A	41321	. . PIN, Locking	3	
-30B	41320	. . BUSHING, Locking pin	3	
-30C	602339	. . SPRING, Compression	3	
-30D	No Number	. . HOUSING, Soundhead (order housing assembly item -30)	NP	

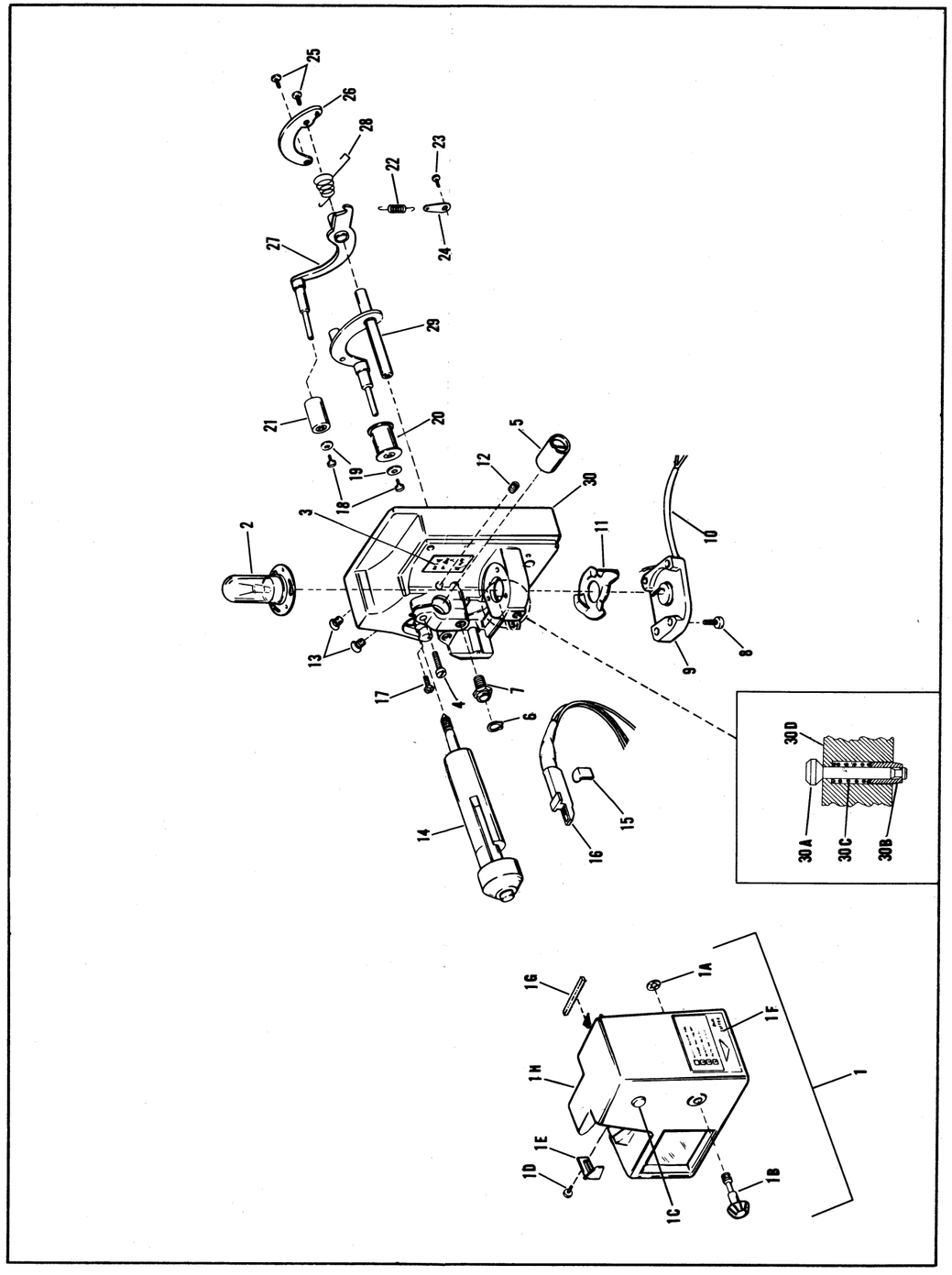


Figure 8. Exciter Lamp Cover and Soundhead

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MECHANISM ASSEMBLY COMPONENTS		
9-	014778	MECHANISM ASSEMBLY, Complete	REF	
-1	31958	. PIN, Hinge, lens carrier (upper)	1	
-2	31957	. PIN, Hinge, lens carrier (lower)	1	
-3	31019	. WASHER, Spring tension	1	
-4	31020	. WASHER, Flat	1	
-5	014149	. LENS CARRIER ASSY (Early models) (see Fig. 13 for parts)	1	
-5	015287	. LENS CARRIER ASSY (Current models) (see Fig. 13 for parts)	1	
-6	20808	. RING, Retaining, external, 0.145 inch ID	1	
-7	012135	. THREADING BAR ASSEMBLY	1	
-7A	36062	. . NAMEPLATE, System restorer	1	
-8	30807	. SCREW, Hex washer head, swage type, 6-32 by 1/4 inch	2	
-9	42232	. HOOD	1	
-10	31536	. PLUG, Hole	1	
-11	30879	. SCREW, Pan head, swage type, 6-32 by 3/8 inch	3	
-12	17639	. RING, Retaining, external, 0.125 inch ID	2	
-13	31045	. SHAFT, Clutch lever	1	
-14	09721	. BEARING ASSEMBLY, Outboard (includes following parts)	1	
	31906	. . RIVET, Tubular	3	
	31121	. . RETAINER, Bearing	1	
	7994	. . BEARING	1	
	31120	. . RING, Felt	1	
-15	31041	. LEVER, Rewind clutch	1	
-16	31044	. BUTTON, Rewind	1	
-17	31042	. SPRING, Rewind button	1	
-18	31023	. BELT, Rewind timing	1	
-19	36083	. RING, Retaining, external, 0.250 inch ID	2	
-20	09724	. SPROCKET ASSEMBLY, Rewind drive	1	
-21	31039	. WASHER, Flat	1	
-22	31040	. SPRING, Compression	1	
-23	09730	. DRIVER ASSEMBLY, Spline	1	
-24	706811	. SETSCREW, Fluted socket cup pt, 8-32 by 3/16 inch	2	
-25	013949	. SPROCKET ASSEMBLY, Take-up drive	1	
-26	31928	. SCREW, Pan head, 6-32 by 1/2 inch	3	
-27	013358	. GUARD, Sprocket	1	
-27A	36032	. . INSERT, Number "4" (adhesive backed)	1	
-27B	31551	. . SCREW, Slotted pan head, 5-40 by 1/4 inch	1	
-27C	700639	. . WASHER, Flat	1	
-27D	012332	. . CHANNEL AND POST ASSEMBLY	1	
-27E	30164	. . SCREW, Slotted binding head, 4-40 by 3/16 inch	1	
-27F	37000	. . STRIKE, Cover	1	
-27G	42230	. . GUARD, Sprocket	1	
-28	30164	. SCREW, Binding head, 4-40 by 3/16 inch	3	
-28A	34878	. WASHER, Shim	AR	
-28A	34879	. WASHER, Shim	AR	
-29	35814	. GUARD, Sprocket	2	
-29A	36999	. GUARD, Sprocket, upper (for lower sprocket only)	1	
-30	36081	. ROLLER, Film guide	3	
-31	35830	. SPRING, Torsion	3	
-32	36771	. SETSCREW, Fluted socket cup pt, 8-32 by 3/8 inch	4	
-33	012126	. GEAR ASSEMBLY, Sprocket, lower	1	
-34	013948	. GEAR ASSEMBLY, Sprocket, upper	1	
-35	31015	. WASHER, Spring tension	2	
-36	012327	. SPROCKET ASSEMBLY, Upper	1	
-37	013946	. SPROCKET ASSEMBLY, Lower	1	
-38	35910	. FLANGE, Lower sprocket	1	
-39	31017	. WASHER, Thrust	2	

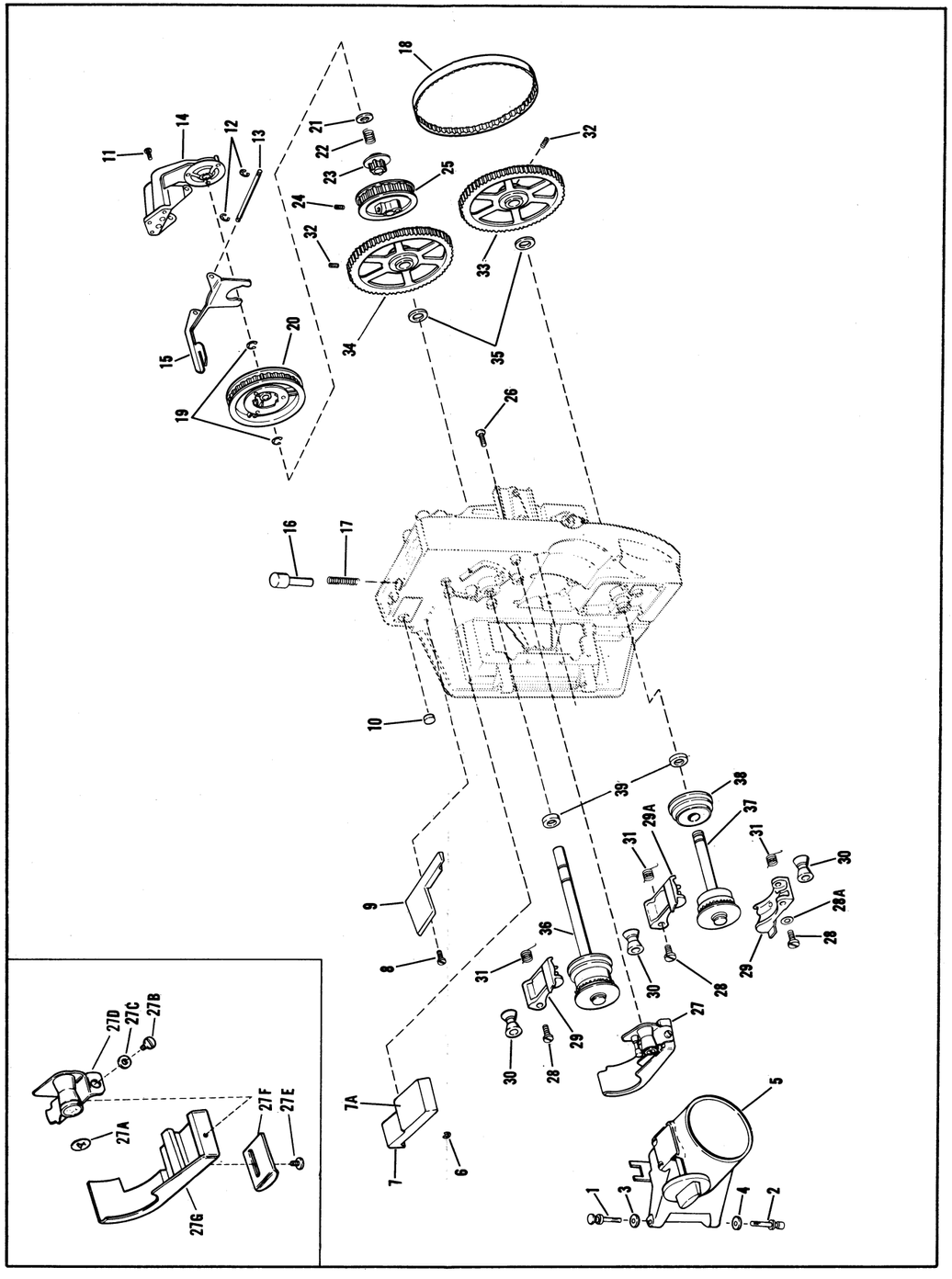


Figure 9. Mechanism Assembly Components

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MECHANISM ASSEMBLY COMPONENTS (CONT'D)		
10-1	30164	. SCREW, Slotted binding head, 4-40 by 3/16 inch	3	
-2	36082	. ROLLER, Guide, flanged	3	
-3	97509	. RING, Retaining, 0.250 inch ID	1	
-4	011245	. BRACKET AND HANDLE ASSEMBLY	1	
-4A	36031	. INSERT, Number "3" (adhesive backed)	1	
-5	36023	. SPRING, Torsion	1	
-6	31049	. SCREW, Slotted binding head, 6-32 by 1/4 inch	1	
-7	35849	. GUIDE, Film exit	1	
-8	31049	. SCREW, Slotted binding head, 6-32 by 1/4 inch	1	
-9	35863	. PIVOT, Locking lever	1	
10-	013923	. LEVER ASSEMBLY, Locking	1	
-10	36061	. . SCREW, Truss head, 5-40 by 0.123 inch	1	
-11	41330	. . ROLLER, Idler	1	
-12	011220	. . LEVER, Locking	1	
-13	17676	. RING, Retaining, external, 0.156 inch ID	1	
-14	35874	. LOOPFORM, Lower	1	
-15	35838	. SPRING, Torsion	1	
-16	30805	. SCREW, Hex washer head swage type, 4-40 by 3/8 inch	1	
-17	35867	. BUSHING, Release spring	1	
-18	35866	. SPRING, Release	1	
-19	31551	. SCREW, Slotted pan head, 5-40 by 1/4 inch	1	
-20	35822	. BRACKET, Back-up	1	
-21	31413	. RING, Retaining, external, 0.416 inch ID	1	
-22	35834	. WASHER, Flat	2	
-23	35850	. GUIDE, Film, lower	1	
-24	31551	. SCREW, Slotted pan head, 5-40 by 1/4 inch	2	
-25	013921	. PLATE ASSEMBLY, Guard mounting, lower	1	
-26	17639	. RING, Retaining, external, 0.125 inch ID	1	
-27	011221	. LEVER ASSEMBLY, Toggle	1	
-28	35846	. GUIDE, Film, upper	1	
-29	303541	. SCREW, Slotted binding head, 3-56 by 1/8 inch	2	
-30	36018	. SPRING, Leaf	1	
-31	33347	. SETSCREW, Hex head, special	1	
-32	09789	. LEVER ASSEMBLY, Threading	1	
10-	013922	. LINK AND LOOPFORM ASSEMBLY, Connecting	1	
-33	17639	. . RING, Retaining, external, 0.125 inch ID	1	
-34	011233	. . LOOPFORM ASSEMBLY, Upper	1	
-35	31555	. . SCREW, Slotted pan head, 3-56 by 3/16 inch	1	
-36	83663	. . WASHER, Lock	1	
-37	31451	. . WASHER, Flat	1	
-38	35820	. . RETRACTOR, Shuttle	1	
-39	011218	. . LINK ASSEMBLY, Connecting	1	
-40	31551	. SCREW, Slotted pan head, 5-40 by 1/4 inch	2	
-41	011212	. PLATE ASSEMBLY, Guard mounting, upper	1	

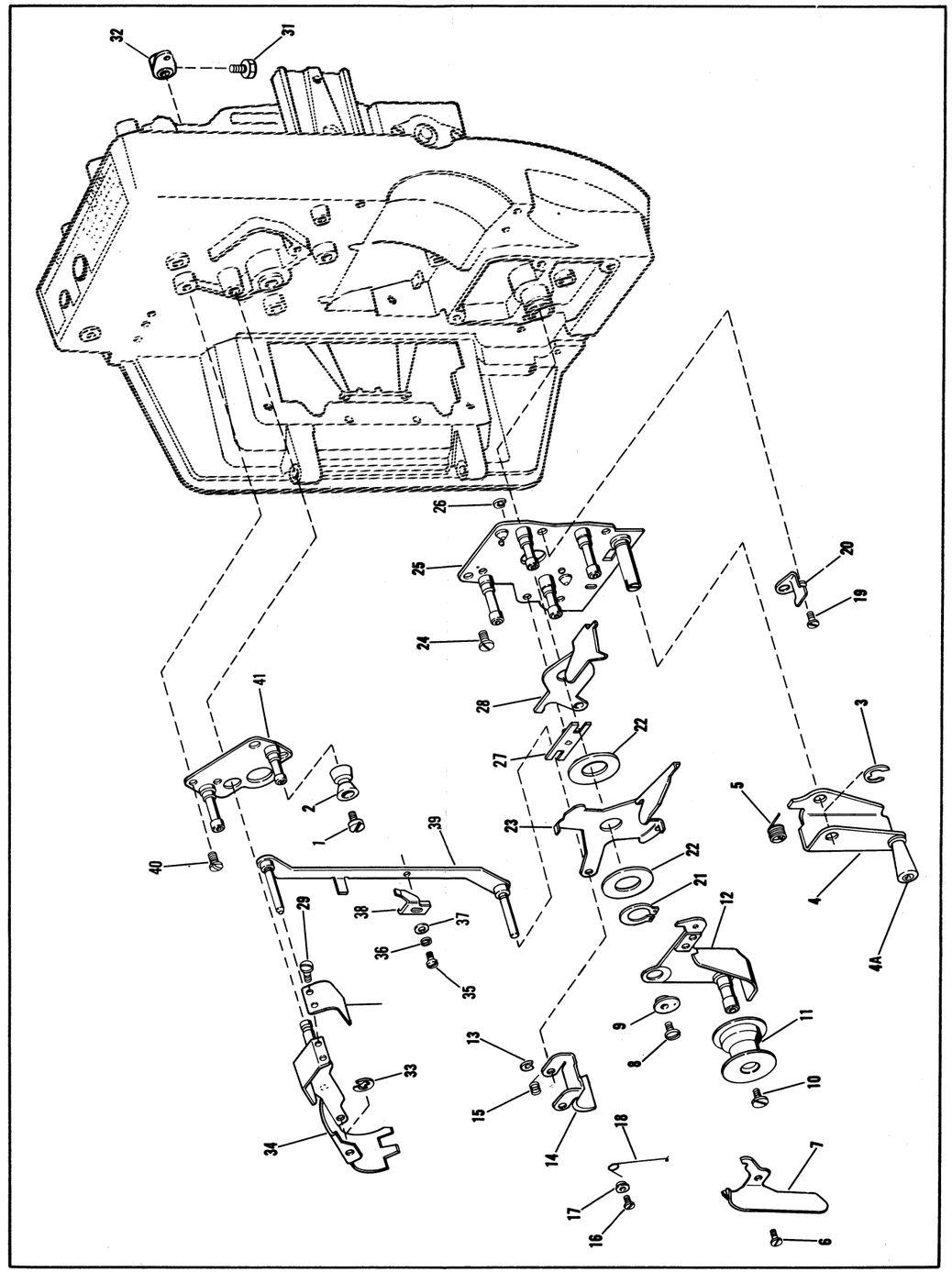


Figure 10. Mechanism Assembly Components

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		MECHANISM ASSEMBLY COMPONENTS (CONT'D)		
11-1	30164	. SCREW, Slotted binding head, 4-40 by 3/16 inch	1	
-2	35840	. ROLLER, Plain	1	
-3	20808	. RING, Retaining, external, 0.145 inch ID	1	
-4	36763	. SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	2	
-5	011214	. SHAFT ASSEMBLY, Upper loopformer	1	
-6	35869	. SPRING, Extension	1	
-7	34878	. WASHER, Flat	1	
11-	013962	. LOOPFORMER AND PAWL ASSEMBLY, Upper	1	
-8	99828	. . RING, Retaining, external, 0.062 inch ID	2	
-9	37303	. . SHAFT, Locking pawl	1	
-10	37304	. . SPRING, Torsion	1	
-11	30164	. . SCREW, Slotted binding head, 4-40 by 3/16 inch	1	
-12	37302	. . PAWL, Locking	1	
-13	012134	. . HUB ASSEMBLY, Pawl	1	
-14	012133	. . KICKPLATE ASSEMBLY	1	
-15	36801	. SCREW, Pan head Sems, 6-32 by 1/4 inch	1	
-16	30808	. SCREW, Hex washer head swage type, 6-32 by 5/16 inch	1	
-17	21238	. WASHER, Flat	2	
-18	36044	. SPRING, Extension	1	
-19	011249	. FOLLOWER AND SUPPORT ASSEMBLY, Cam	1	
-19A	31555	. . SCREW, Slotted pan head, 3-56 by 3/16 inch	2	
-19B	31474	. . BRACKET, Alignment	1	
-19C	36027	. . SPRING, Cam follower	2	
-19D	36099	. . DAMPER, Spring	1	
-19E	36047	. . FOLLOWER, Cam	1	
-19F	36028	. . SUPPORT, Cam follower	1	
-20	33347	. SETSCREW, Hex head cup pt, 6-32 by 1/4 inch	1	
-21	011250	. ARM ASSEMBLY, Loop restorer	1	
-22	34878	. WASHER, Flat	1	
-23	011219	. LEVER AND SHAFT ASSEMBLY, Loop restorer	1	
-24	31551	. SCREW, Slotted pan head, 5-40 by 1/4 inch	2	
-25	31977	. WASHER, Lock	2	
-26	31020	. WASHER, Flat	2	
-27	011248	. SELF-CENTERING ASSEMBLY	1	
-28	31049	. SCREW, Slotted binding head, 6-32 by 1/4 inch	2	
-29	014974	. APERTURE PLATE ASSEMBLY (See Figure 14 for component parts)	1	
-30	30807	. SCREW, Hex washer head swage type, 6-32 by 1/4 inch	1	
-31	34885	. CATCH, Lens carrier	1	
-32	13918	. WASHER, Flat	1	
-33	41342	. SCREW, Hex head swage type, 10-32 by 1/4 inch	1	
-34	31954	. PLATE, Rewind instructions (adhesive backed)	1	

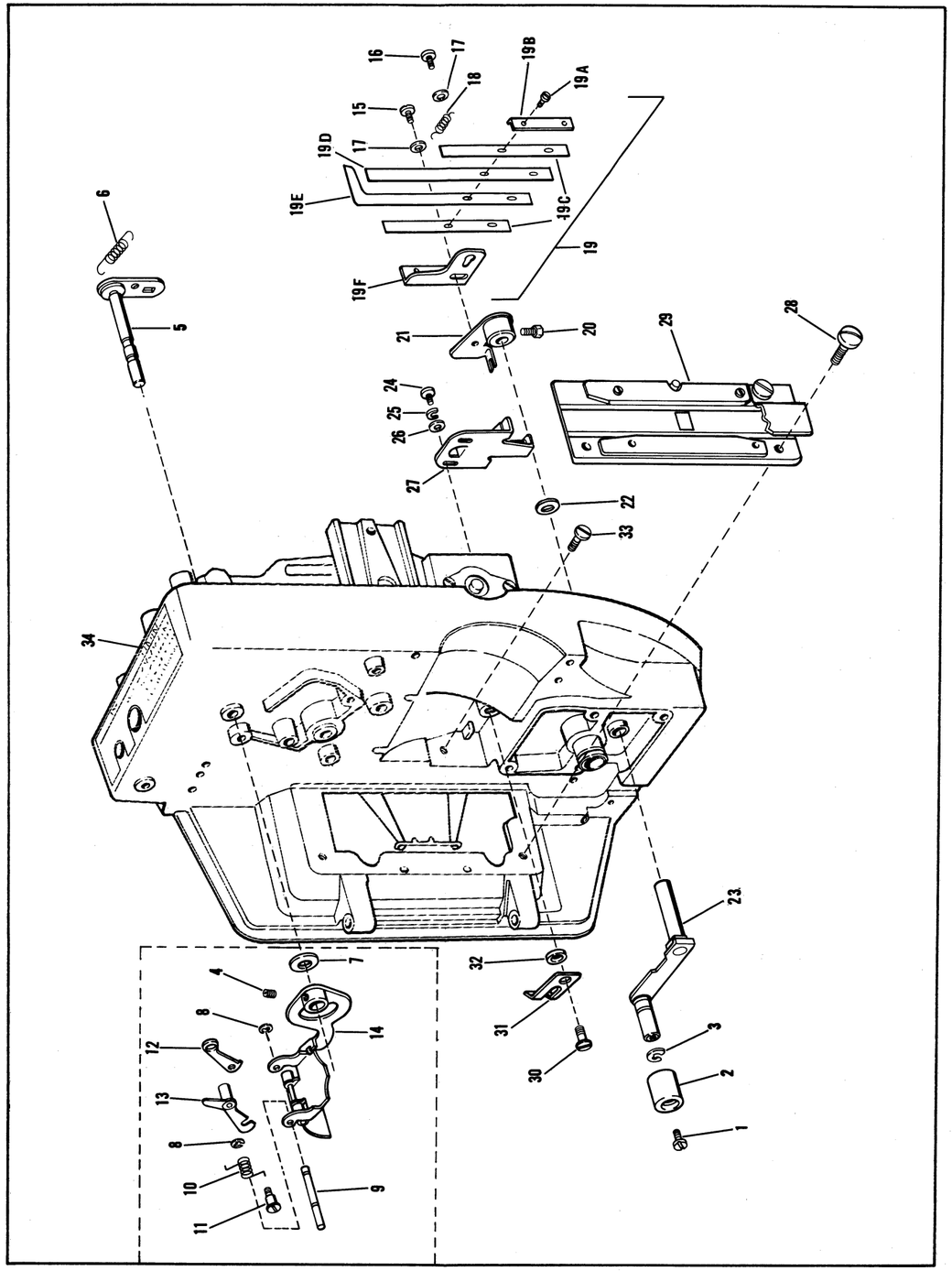


Figure 11. Mechanism Assembly Components

FIG. & INDEX NO.	PART NO.	1 2 3 4 5 6 7 DESCRIPTION	UNITS PER ASSY	USABLE ON CODE
		MECHANISM ASSEMBLY COMPONENTS (CONT'D)		
12-1	36770	. SETSCREW, Fluted socket cup pt, 8-32 by 1/4 inch	2	
-2	40835	. PULLEY, Mechanism	1	
-3	30808	. SCREW, Hex washer head swage type, 6-32 by 5/16 inch .	2	
-4	30881	. SCREW, Phillips pan head swage type, 6-32 by 9.16 inch .	2	
-5	367147	. BAFFLE, Heat	1	
-6	40834	. SPACER, Sleeve	2	
-7	013010	. BRACKET AND DOUSER ASSEMBLY	1	
-8	30879	. SCREW, Phillips pan head swage type, 6-32 by 3/8 inch .	2	
-9	014973	. BAFFLE ASSEMBLY, Heat	1	
-10	31005	. NUT, Shutter	1	
-11	31037	. WEIGHT, Counterbalance	1	
-12	41309	. SHUTTER, Two-blade	1	
-13	34797	. WASHER, Fiber	1	
-14	12087	. NUT, Hex, 10-32	2	
-15	011886	. BALL AND STUD ASSEMBLY	2	
-16	36015	. SPRING, Extension	1	
-17	36013	. WIPER, Felt	1	
-18	30614	. WICK, Felt	1	
-19	31557	. SHUTTLE	1	
-20	011235	. ARM AND BEARING ASSEMBLY, Shuttle	2	
-20A	31011	. . BEARING, Shuttle link	1	
-20B	31003	. . FOLLOWER, Pull-down cam	1	
-21	41307	. CAM, Pull-down	1	
-22	36668	. SCREW, Pan head Sems, 6-32 by 5/16 inch	2	
-23	011236	. BRACKET ASSEMBLY, In-out cam	1	
-23A	09702	. . FOLLOW ASSEMBLY, In-out cam	1	
-23B	~~31100~~ 76724	. . SPRING, In-out cam	1	
-24	31001	. CAM, In-out	1	
-25	30817	. SCREW, Hex washer head swage type, 8-32 by 1/2 inch . .	2	
-26	013917	. PLATE ASSEMBLY, Shuttle arm	1	
-27	09712	. . BEARING ASSEMBLY, Support	1	
-28	31009	. RING, Retaining, external bowed, 0.866 inch ID	1	
-29	30804	. SCREW, Hex head swage type, 4-40 by 1/4 inch	2	
-30	42244	. SPRING, Bearing load	1	
-31	31007	. BEARING, Ball	1	
-32	36763	. SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	1	
-33	36042	. CAM, Loop restorer	1	
-34	36769	. SETSCREW, Fluted socket cup pt, 8-32 by 1/4 inch	2	
-35	012666	. WORM GEAR ASSEMBLY	1	
-36	31078	. RING, Retaining	1	
-37	31006	. BEARING, Ball	1	
-38	36065	. CAMSHAFT	1	
-39	30801	. SCREW, Hex washer head swage type, 2-56 by 3/16 inch .	1	
-40	35837	. SPRING, In-out	1	
-41	36667	. PIN, Shuttle retractor	1	
-42	36048	. PIN, Stop	1	
-43	09732	. KNOB ASSEMBLY, Framer	1	
-44	36763	. SETSCREW, Fluted socket cup pt, 6-32 by 1/8 inch	1	
-45	35875	. STUD, Rewind adjustment	1	
-46	013348	. HOUSING AND BEARING ASSEMBLY, Mechanism	1	

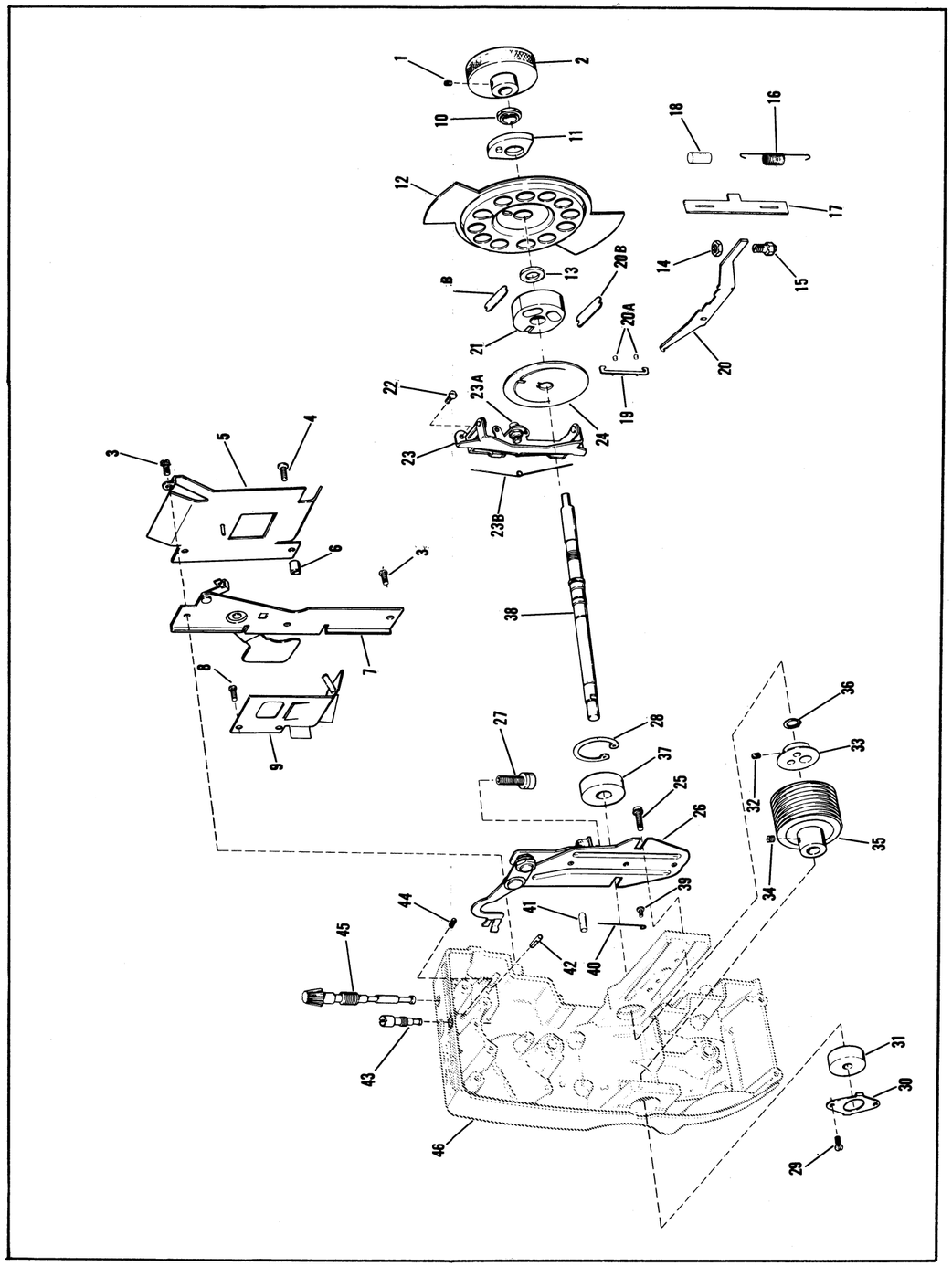
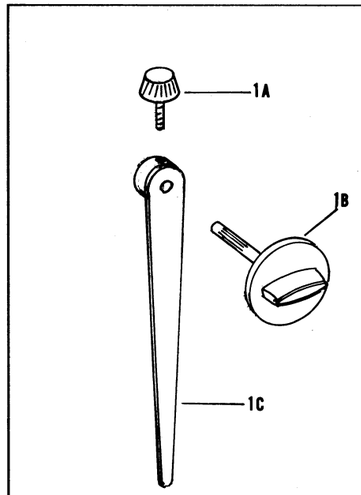


Figure 12. Mechanism Assembly Components

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		LENS CARRIER ASSEMBLY		
13-1	015179	KNOB AND LEVER ASSEMBLY, Focus (current models — NOTE A)	1	
-1A	012980	. KNOB ASSEMBLY, Lock	1	
-1B	09847	. KNOB ASSEMBLY, Focus	1	
-1C	015178	. LEVER ASSEMBLY, Focus	1	
13-	014149	CARRIER ASSEMBLY, Lens (early models — NOTE A)	REF	
13-	015287	CARRIER ASSEMBLY, Lens (current models — NOTE A)	REF	
-2	30804	. SCREW, Hex head swage type, 4-40 by 1/4 inch	2	
-3	31093	. SPRING, Hold-down (early models)	1	
-3	47617	. SPRING, Hold-down (current models)	1	
-4	09847	. KNOB ASSEMBLY (early models)	1	
-5	35880	. SCREW, Pressure plate (early models)	2	
-5	45688	. SCREW, Pressure plate (current models)	2	
-6	34888	. PLATE, Pressure (early models)	1	
-6	31092	. PLATE, Pressure (current models)	1	
-7	34897	. SPRING, Compression	2	
-8	45687	. WASHER, Spacer (current models)	1	
-8A	31097	. SPACER, Sleeve (early models)	2	
-9	35819	. LEVER, Pressure plate	1	
-10	30804	. SCREW, Hex head swage type, 4-40 by 1/4 inch	2	
-11	31095	. PLATE, Adjustment	1	
-12	013355	. CARRIER, Lens	1	

NOTE A: Lens Carrier Assembly P/N 014149 has been superseded by current carrier assembly P/N 015287. Piece parts for the earlier design are available; however, if the complete carrier is to be replaced, install the current assembly plus the Focus Lever and Knob Assembly P/N 015179.

		APERTURE PLATE ASSEMBLY	
14-	014974	APERTURE PLATE ASSEMBLY	REF
-1	31978	. SCREW, Slotted pan head, 3-56 by 1/8 inch	2
-2	36064	. RAIL, Film guide	1
-3	37296	. SCREW, Slotted pan head, 3-56 by 1/4 inch	2
-4	36078	. COVER, Spring retaining	1
-5	37295	. BUSHING, Spacer	2
-6	37293	. RAIL, Side tension	1
-7	31135	. SPRING, Side tension	1
-8	31978	. SCREW, Slotted pan head, 3-56 by 1/8 inch	1
-9	36075	. GUIDE, Film	1
-10	~~012132~~ 015516	. PLATE, Aperture	1



FOCUS KNOB AND LEVER ASSEMBLY
(CURRENT MODEL PROJECTORS)

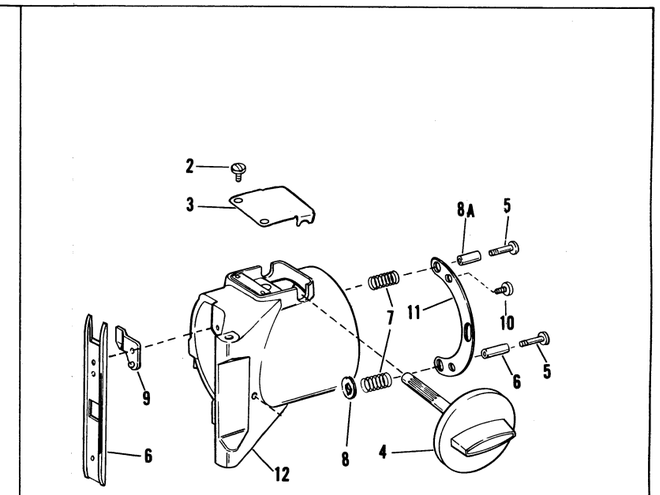


Figure 13. Lens Carrier Assembly

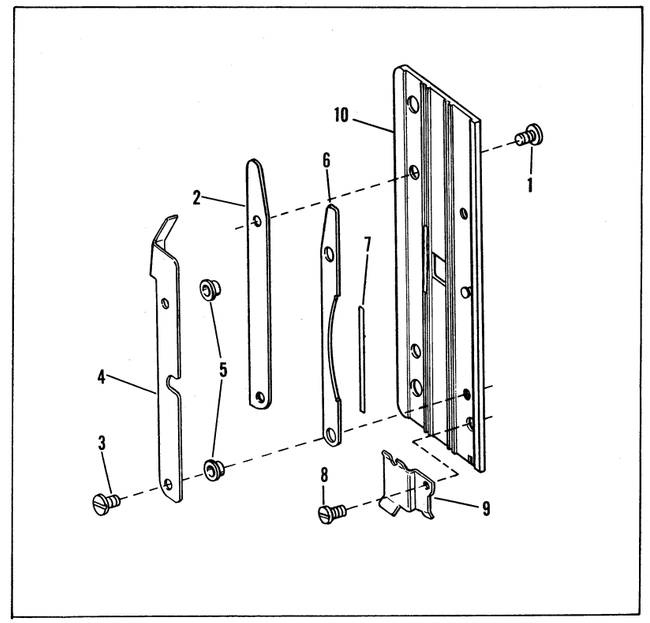


Figure 14. Aperture Plate Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		AMPLIFIER ASSEMBLY, COMPLETE		
15-	014791	AMPLIFIER ASSEMBLY, 10-watt	REF	
-1	7856	. SCREW, Slotted round head, 6-32 by 3/16 inch	1	
-2	600735	. WASHER, Lock	1	
-3	40814	. SPRING, Sound drum shaft grounding	1	
-4	36848	. SCREW, Slotted pan head, 8-32 by 3/8 inch	4	
-5	35164	. NUT, Hex Sems, 8-32	4	
-6	43204	. TRANSFORMER, Power	1	
-7	36848	. SCREW, Slotted pan head, 8-32 by 3/8 inch	1	
-8	014021	. BARRETTER AND BRACKET ASSEMBLY	1	
-9	19233	. NUT, Plain hex, 3/8-32	1	
-10	19154	. WASHER, Lock	1	
-11	43209	. CIRCUIT BREAKER	1	
-12	621132	. SCREW, Slotted pan head, 4-40 by 0.313 inch	3	
-13	34784	. WASHER, Flat	3	
-14	36848	. SCREW, Slotted pan head, 8-32 by 3/8 inch	3	
-15	013852	. PRINTED CIRCUIT BOARD, Amplifier (see list of electrical components below)	1	
-16	013853	. PRINTED CIRCUIT BOARD, Power supply (see list of electrical components below)	1	
-17	31685	. JACK, Auxiliary speaker	1	
-18	41130	. PLATE, Mounting	1	

AMPLIFIER CIRCUIT BOARD COMPONENTS (013852)

REFERENCE DESIGNATION	PART NO.	DESCRIPTION
C1	41398	CAPACITOR
C2, C3	88654	CAPACITOR
C5	41172	CAPACITOR
C6	41171	CAPACITOR
C7	41394	CAPACITOR
C8	29630	CAPACITOR
C9	41392	CAPACITOR
C10, C11	41393	CAPACITOR
C12	31733	CAPACITOR
D1, D2	43210	DIODE
D3 to D6	41173	DIODE
IC-1	41180	INTEGRATED CIRCUIT
Q1	41175	TRANSISTOR
Q2	41176	TRANSISTOR
Q3	41177	TRANSISTOR

REFERENCE DESIGNATION	PART NO.	DESCRIPTION
R1	41192	RESISTOR
R2	41191	RESISTOR
R3	41190	RESISTOR
R4	41189	RESISTOR
R5	31743	RESISTOR
R8	38187	RESISTOR
R9	41188	RESISTOR
R10	41186	RESISTOR
R11	31732	RESISTOR
R12	38182	RESISTOR
R13	41193	RESISTOR
R14, R15	36074	RESISTOR
R16, R17	765286	RESISTOR
R18, R19	36311	RESISTOR
R20, R21	43202	RESISTOR
R22	41194	RESISTOR
Q4	013950	TRANSISTOR ASSY
Q5	013955	TRANSISTOR ASSY

POWER SUPPLY CIRCUIT BOARD COMPONENTS (013853)

C13, C14	41396	CAPACITOR
C15	41397	CAPACITOR
C16	41395	CAPACITOR
C17	41393	CAPACITOR
D7 to D14	41174	DIODE
Q6	41177	TRANSISTOR
R23, R25	31743	RESISTOR
R24	41185	RESISTOR
Q7	013950	TRANSISTOR ASSY

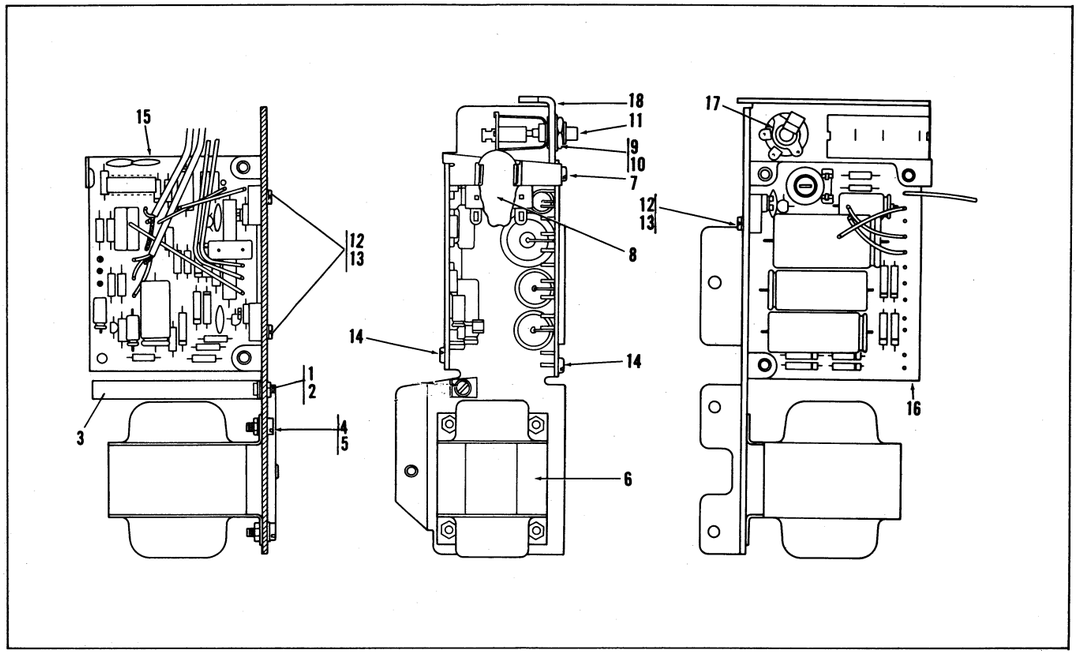


Figure 15. Amplifier Assembly, Complete

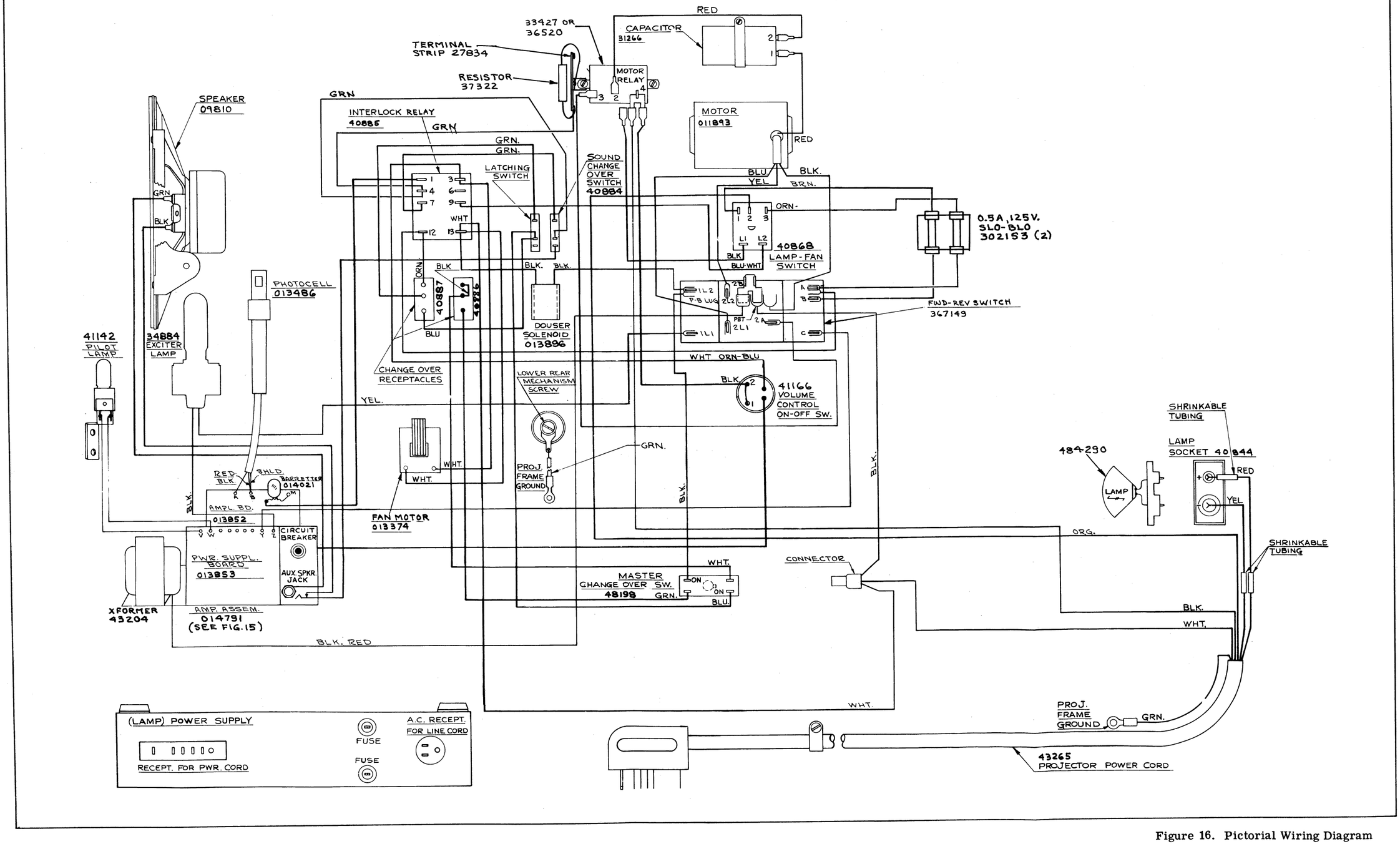


Figure 16. Pictorial Wiring Diagram
Design 567 Projector

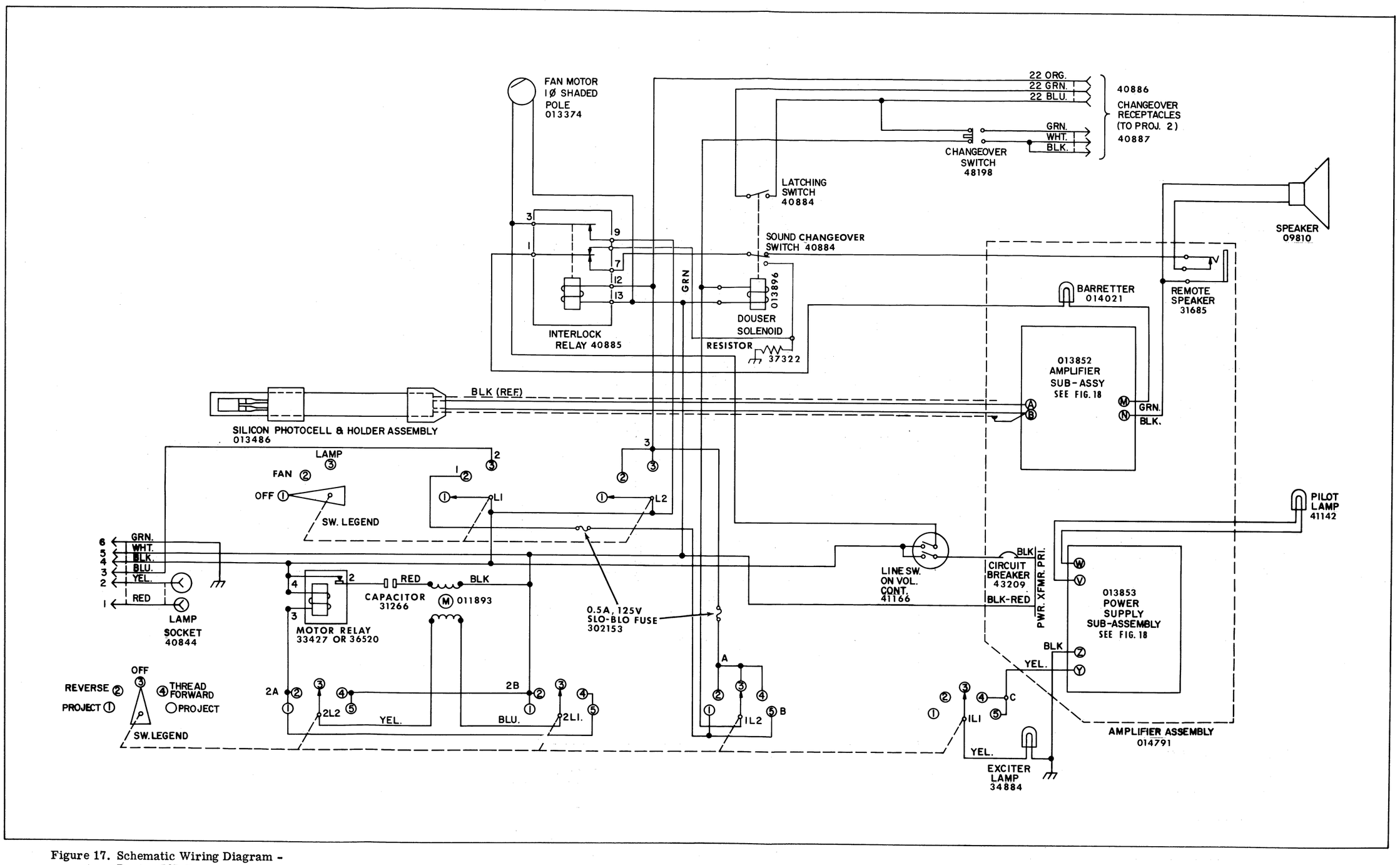
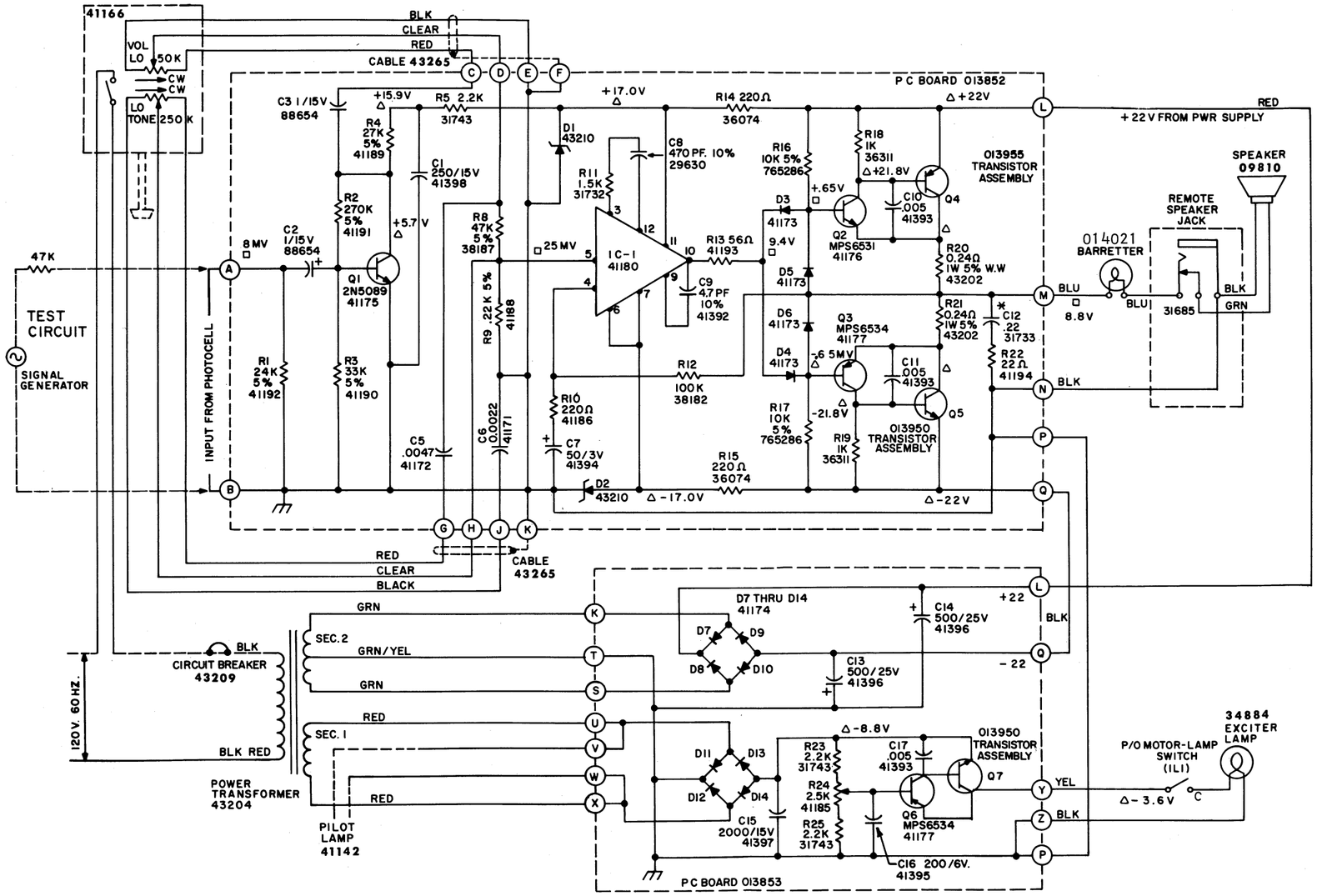
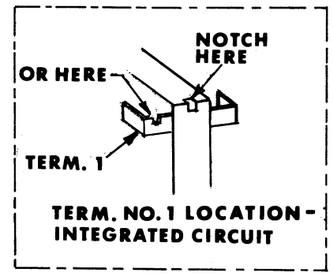


Figure 17. Schematic Wiring Diagram - Design 567 Projector





NOTES: ALL MEASUREMENTS MADE WITH 120V 60HZ LINE

△ = DC VOLTAGES MEASURED TO GROUND USING ELECTRONIC VOLTMETER WITHOUT SIGNAL, ±10%.

□ = SIGNAL VOLTAGES MEASURED TO GROUND, USING ELECTRONIC VOLTMETER; VOLUME CONTROL MAX. CW, 8 WATTS OUTPUT (8 VOLTS) INTO 8 OHM RESISTIVE LOAD AT 1000 HZ ± 10%.

EXCITER LAMP PART OF SOUNDHEAD ASSEMBLY.

Figure 18. Amplifier Schematic Diagram - Design 567 Projector

PART NO.	FIG. & INDEX NO.
03980	1-37, 7-
09702	12-23A
09712	12-27
09721	9-14
09724	9-20
09730	9-23
09732	12-43
09752	6-35, 7-30
09753	7-4
09755	7-6
09768	3-17
09769	3-19
09774	6-12
09776	6-8
09778	6-31
09789	10-32
09804	2-9
09806	2-22E
09808	2-7
09810	3-4
09826	8-17
09828	8-9
09832	8-27
09834	8-20
09835	8-21
09838	8-29
09840	8-10
09847	13-1B, 13-4
09849	1-28, 6-
09887	2-44
09896	2-43
09902	4-33B
09910	1-15
010572	Page 2
011175	1-41D
011212	10-41
011214	11-5
011218	10-39
011219	11-23
011220	10-12
011221	10-27
011233	10-34
011235	12-20
011236	12-23
011245	10-4
011249	11-19
011250	11-21
011886	12-15
011889	7-16
011893	3-27
011946	2-49
011948	6-15, 7-27, 11-27
012126	9-33
012132	14-10
012133	11-14
012134	11-13
012135	9-7
012327	9-36
012332	9-27D
012654	1-33
012661	1-21
012662	1-23
012666	12-35
012980	13-1A
013010	12-7
013020	2-50
013021	4-12
013326	5-1
013331	8-30
013333	5-2, 8-1
013334	8-1H
013339	7-31
013348	12-46
013355	13-12
013358	9-27
013374	4-26C
013398	8-14
013484	5-8, 8-
013486	8-16
013852	15-15
013853	15-16
013896	4-11
013906	4-26F
013913	5-18
013915	4-33
013917	12-26
013921	10-25
013922	10-
013923	10-
013946	9-37
013948	9-34
013949	9-25
013950	15-Q4, 15-Q7
013955	15-Q5
013962	11-
014021	15-8
014149	9-5, 13-
014640	Page 2
014778	5-11, 9-
014781	2-56
014782	2-48
014783	4-26
014784	4-27
014785	1-4C
014786	1-4
014787	2-37
014788	2-22
014789	2-31
014791	3-6, 15-
014793	2-55
014798	1-1
014903	6-38
014905	6-32
014916	2-60
014973	12-9
014974	11-29
015129	4-14
015130	4-4
015178	13-1C
015179	13-1
015287	9-5, 13-
015575	2-3
020240	8-5
020311	Page 2
7856	15-1
7994	9-
8179	4-29
12087	12-14
13918	11-32
14175	4-10A, 4-25
15563	2-13, 3-5B
17639	6-28, 9-12, 10-26, 10-33
17676	10-13
18086	2-1
19154	15-10
19233	15-9
19535	1-1A
20808	8-1A, 9-6, 11-3
21238	11-17
21736	1-30, 4-33G
24042	7-30A
24047	7-1
24903	6-17
27834	3-9
28718	4-26B
28820	3-27D
29630	15-C8
30163	8-1D, 8-18
30164	5-12, 9-27E, 9-28, 10-1, 11-1, 11-11
30614	12-18
30801	12-39
30804	2-21, 2-22F, 2-34, 8-23, 8-25, 12-29, 13-2, 13-10
30805	10-16
30807	9-8, 11-30
30808	2-6, 3-14, 5-1A, 5-1C, 11-16, 12-3
30809	3-16, 3-18
30810	8-4
30813	6-36
30815	2-30, 3-3, 3-30, 4-22
30816	2-10, 2-36, 3-11, 5-24
30817	2-40, 12-25
30820	5-25
30822	2-41, 3-28
30824	5-9
30857	1-9, 3-20, 4-32
30879	9-11, 12-8
30881	12-4
30882	6-1, 7-7
31001	12-24
31003	12-20B
31005	12-10
31006	12-37
31007	12-31
31009	12-28
31011	12-20A
31015	9-35
31017	5-5, 9-39
31019	9-3
31020	9-4, 11-26
31023	9-18
31037	12-11
31039	4-33H, 4-33L, 9-21
31040	9-22
31041	9-15
31042	9-17
31044	9-16
31045	9-13
31049	10-6, 10-8, 11-28
31078	12-36
31092	13-6
31093	13-3
31095	13-11
31097	13-8A
31100	12-23B
31120	9-
31121	9-
31135	14-7
31219	5-10
31231	3-22
31234	7-23
31235	7-18
31236	6-27, 7-25
31237	1-22, 1-32
31238	7-24
31239	6-23, 7-12, 7-13
31241	6-22, 7-11
31242	7-19
31243	5-7, 6-25, 7-14
31245	6-21, 7-10
31246	7-20
31247	7-3
31263	3-29
31266	3-13
31342	1-40
31356	6-34
31358	1-27
31359	6-13
31360	6-26
31363	6-5
31364	6-7
31365	6-6
31366	6-4
31367	6-29
31369	6-16
31370	1-29, 1-38, 6-33
31371	6-9
31372	1-24, 1-31, 6-19
31375	6-38B
31413	10-21
31451	10-37
31456	4-16A
31474	11-19B
31476	5-3
31491	3-5A, 5-6
31499	4-24
31503	3-12
31536	9-10
31551	9-27B, 10-19, 10-24, 10-40, 11-24
31555	10-35, 11-19A
31557	12-19
31561	4-31
31563	4-33M
31564	4-33K
31565	4-33F
31567	4-33C
31568	4-33E
31609	5-1B
31610	5-1D
31630	8-7
31636	8-11
31638	8-8
31643	8-1F
31659	8-26
31669	8-15
31671	8-6
31673	8-22
31674	8-19
31675	8-24
31685	15-17
31732	15-R11
31733	15-C12
31743	15-R5, 15-R23, 15-R25
31906	9-
31911	6-35A
31928	9-26
31943	2-26
31954	11-34
31957	9-2
31958	9-1
31977	11-25
31978	14-1, 14-8
32048	4-6
32093	3-27E
32943	4-7
33299	1-13
33300	1-11, 2-40A
33301	1-14
33302	1-12
33347	10-31, 11-20
33368	1-7
33370	1-8
33372	1-1E
33373	1-1D
33383	1-1C
33385	6-24
33391	1-5
33427	3-8
33491	2-5
33494	1-4A
33785	4-5
33966	7-21
34760	1-39
34765	1-36
34766	4-30
34784	15-13
34787	8-1C
34797	12-13
34798	1-1F
34822	4-33J
34860	6-11
34861	6-20
34874	6-3, 7-9
34878	5-1E, 9-28A, 11-7, 11-22
34879	9-28A
34884	8-2
34885	11-31
34888	13-6
34889	4-28
34892	8-3
34897	13-7
35164	15-5
35811	1-26, 1-35
35814	9-29
35819	13-9
35820	10-38
35822	10-20
35823	8-1E
35830	9-31
35834	10-22
35837	12-40
35838	10-15
35840	11-2
35846	10-28
35849	10-7
35850	10-23
35852	5-14
35856	5-21
35858	5-20
35859	5-19
35860	5-22
35861	5-13
35862	5-15
35863	10-9
35866	10-18
35867	10-17
35869	11-6
35874	10-14
35875	12-45
35880	13-5
35886	1-18
35910	9-38
36013	12-17
36015	12-16
36018	10-30
36023	10-5
36026	2-22D
36027	11-19C
36028	11-19F
36030	5-23
36031	10-4A
36032	9-27A
36033	5-18C
36038	7-2
36042	12-3
36044	11-18
36047	11-19E
36048	12-42
36051	1-2
36052	1-3, 2-59
36057	7-17
36059	2-8
36060	1-10
36061	10-10
36062	9-7A
36064	14-2
36065	5-18A, 12-38
36068	3-27F
36069	5-1F
36070	5-1G
36074	15-R14, 15-R15
36075	14-9
36078	14-4
36080	6-18
36081	9-30
36082	10-2
36083	3-17A, 3-19A, 7-15, 9-19
36084	6-10
36085	7-28
36086	7-28
36094	2-22C, 8-1G
36099	11-19D
36311	15-R18, 15-R19
36520	3-8
36532	1-20
36667	12-41
36668	8-13, 12-22
36763	2-47, 3-27A, 7-22, 11-4, 12-32, 12-44
36765	8-12
36769	1-19, 1-25, 1-34, 4-33A, 6-14, 7-26, 12-34
36770	12-1
36771	9-32
36801	4-13, 4-21, 11-15
36802	4-3
36837	1-41
36841	2-19, 2-32, 4-19
36848	15-4, 15-7, 15-14
36909	4-16
36999	9-29A
37000	9-27F
37246	14-3
37293	14-6
37295	14-5
37302	11-12
37303	11-9
37304	11-10
37322	3-10
37343	2-31A
38182	15-R12
38187	15-R8
38207	3-21
39177	4-26D
39352	2-11
39578	1-4H
39579	1-4K
39789	8-28
40295	7-29
40802	2-24
40814	15-3
40824	4-26A
40827	Page 2
40834	12-6

PART NO.	FIG. & INDEX NO.
40835	12-2
40844	2-29
40848	1-4G
40849	1-4J
40850	1-4F
40851	1-4E
40862	2-18
40867	2-22G
40868	2-51
40871	2-35
40873	2-27
40878	4-9
40879	4-2
40880	4-1
40883	5-4
40884	4-8
40885	4-20
40886	4-18
40887	4-17
40890	4-15
40892	2-15
40893	5-28
40942	2-23
40948	3-26
40950	2-20
40957	2-28
41110	4-23
41125	3-25
41130	15-18
41142	2-39
41171	15-C6
41172	15-C5
41173	15-D3, 15-D4, 15-D5, 15-D6
41174	15-D7, 15-D8, 15-D9, 15-D10, 15-D11, 15-D12, 15-D13, 15-D14
41175	15-Q1
41176	15-Q2
41177	15-Q3, 15-Q6
41180	15-IC-1
41185	15-R24
41186	15-R10
41188	15-R9
41189	15-R4
41190	15-R3
41191	15-R2
41192	15-R1
41193	15-R13
41194	15-R22
41307	12-21
41309	12-12
41320	8-30B
41321	8-30A
41323	3-24
41330	5-16, 5-18D, 10-11
41331	7-32
41334	5-18B
41342	11-33
41344	1-1H
41378	3-15
41379	4-33D
41381	2-1
41392	15-C9
41393	15-C10, 15-C11, 15-C17
41394	15-C7
41395	15-C16
41396	15-C13, 15-C14
41397	15-C15
41398	15-C1
42211	5-1H
42217	6-2
42218	7-8
42230	9-27G
42232	9-9
42244	12-30
43202	15-R20, 15-R21
43204	15-6
43209	15-11
43210	15-D1, 15-D2
43251	3-23
43265	2-16
43268	2-4
43276	4-26E
43282	6-37
43288	8-1B
43290	1-1B, 3-2
43360	1-6
43373	6-38A, 7-6A
43375	5-27
43474	3-7
45687	13-8
45688	13-5
46346	2-38
46347	5-26
46348	1-4B
46349	1-17
46419	6-30
46440	1-1G
46592	2-57
47102	2-22A
47127	2-33
47167	13-3
47217	2-45A
47860	1-44
47861	1-42
47862	1-43
48178	2-31C
48192	2-65
48193	2-63
48194	2-64
48198	2-17
70345	3-27C
83663	10-36
86524	2-58
87129	1-4L
88654	15-C2, 15-C3
97509	5-17, 10-3
99828	11-8
302097	2-14
302153	2-62
303541	10-29
334382	Page 2
367135	2-45
367142	2-31B
367147	12-5
367149	2-52
367157	2-54
367160	3-31
367175	2-22B
400476	1-16
484290	2-25
600735	15-2
602339	8-30C
611107	3-17B, 3-19B
621132	15-12
700136	3-5
700167	2-53
700639	9-27C
700672	7-5
706193	3-1
706811	9-24
706964	4-10
707026	2-2, 2-12
765286	15-R16, 15-R17
900530	2-61

SERVICE INSTRUCTIONS

LAMP SUPPLY UNIT

PART NO. 014640

BELL & HOWELL

GENERAL SERVICE DEPT.
7100 McCORMICK ROAD
CHICAGO, ILLINOIS 60645

PART NO. 72798A PRINTED IN U.S.A. DECEMBER 1972

FACTORY SERVICE ADDRESSES

PRODUCT ONLY

CHICAGO

General Service Department
2200 Brummel Place
Evanston, Illinois 60202
Area Code: 312-673-3300

NEW YORK

General Service Department
200 Smith Street
E. Farmingdale, L.I., New York 11735
Area Code: 516-293-8910

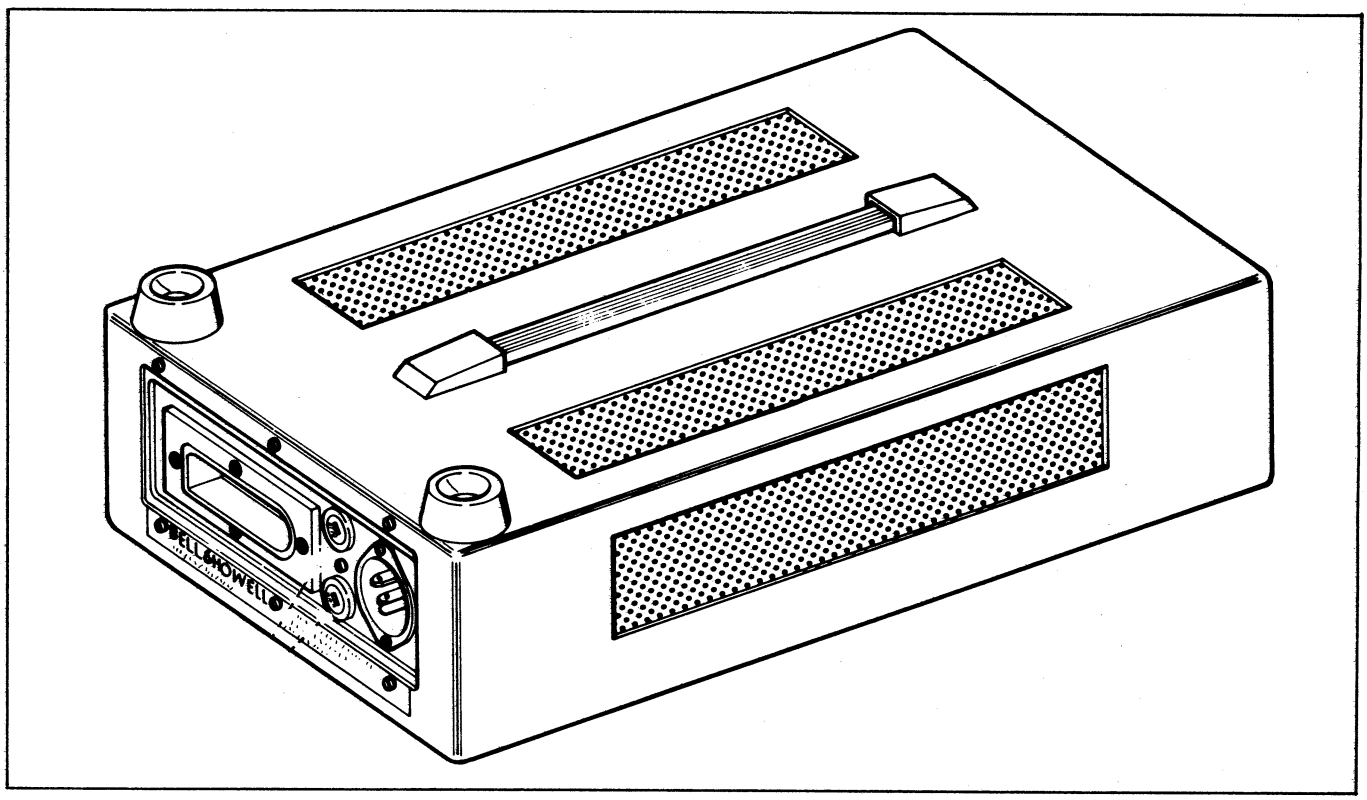
GLENDALE

General Service Department
623 Rodier Drive
Glendale, California 91201
Area Code: 213-245-6631

PARTS ORDERS AND SERVICE INFORMATION

General Service Department
7100 McCormick Road
Chicago, Illinois 60645
Area Code: 312-673-3300

Table of Contents



60Hz Lamp Supply Unit for Marc-300 Projection Lamp

FEATURE DESCRIPTION LIST

Bell & Howell Part No. 014640

Overall Dimensions . . . . . 5-3/16"h by 10-1/8"w x 16-3/8"l

Input Voltage . . . . . 105 to 120VAC, 60Hz

Electrical Specifications During Start:

- Open Circuit . . . . . 400V minimum (105VAC input) to 490V maximum (120VAC input)
- Pulse Voltage . . . . . 6600V minimum (105VAC input) to 12000V maximum (120VAC input)
- Pulses in 30 Seconds . . . . . 10 minimum to 40 maximum
- Load Inrush Current . . . . 11.5A minimum to 16.5A maximum with 120VAC input

Electrical Specifications, Running:

- Output Current at 120VAC . . . . . 7.4ADC to 7.9ADC
- Ripple Voltage at 120VAC . . . . . 10.0V P-P maximum
- Input Current at 120VAC . . . . . 9A maximum

SERVICE INSTRUCTIONS

1. GENERAL DESCRIPTION.

These service instructions are provided to assist in the testing and repair of the Bell & Howell 60Hz Lamp Supply Unit, Part No. 014640. This power supply is designed to operate one Marc-350/16T projector lamp such as is used in the Design 566A and 567A Motion Picture Projectors.

Total system power for the projector and the lamp is fed through the lamp supply unit and then to the projection equipment. A power switch on the projector controls the application of power to the lamp supply unit. The electrical circuitry of this unit is shown in the schematic wiring diagram, Figure A.

The pulse transformer (T2) provides the ionizing voltage for starting the lamp. This starting voltage is increased by the boost transformer (T1). After the lamp arc is established, the starting circuit automatically becomes inoperative. The operating power is limited to the rated value by the AC indicator (L1). The bridge rectifier (D2) provides DC power which is filtered by two capacitors (C1 and C2) and two filter inductors (L2 and L3).

WARNING

During the lamp starting cycle, potentially dangerous high voltages are normally present in the pulse transformer and the lamp circuitry. In addition, lower voltages with high current capability exist within the lamp supply unit. Only trained and qualified service personnel should be permitted to operate or troubleshoot the lamp supply unit with the enclosing cover removed. DO NOT ATTEMPT TO CHANGE THE LAMP WITH THE POWER ON.

2. GENERAL MAINTENANCE PROCEDURES.

a. As noted in the preceding "WARNING," only qualified service personnel should attempt to troubleshoot and repair the lamp supply unit. Be sure to take the necessary precautions to protect against electrical shocks.

b. Use standard circuit tracing techniques to isolate faulty components. Refer to paragraph 4, following, for component testing procedures.

c. Make a general visual inspection of the unit to check for mechanical defects or damage.

d. Before replacing the enclosing cover, blow all loose dirt and dust from the chassis with a low-pressure jet of compressed air. Wipe the inside and outside of the cover with a cloth dampened with cleaning solvent.

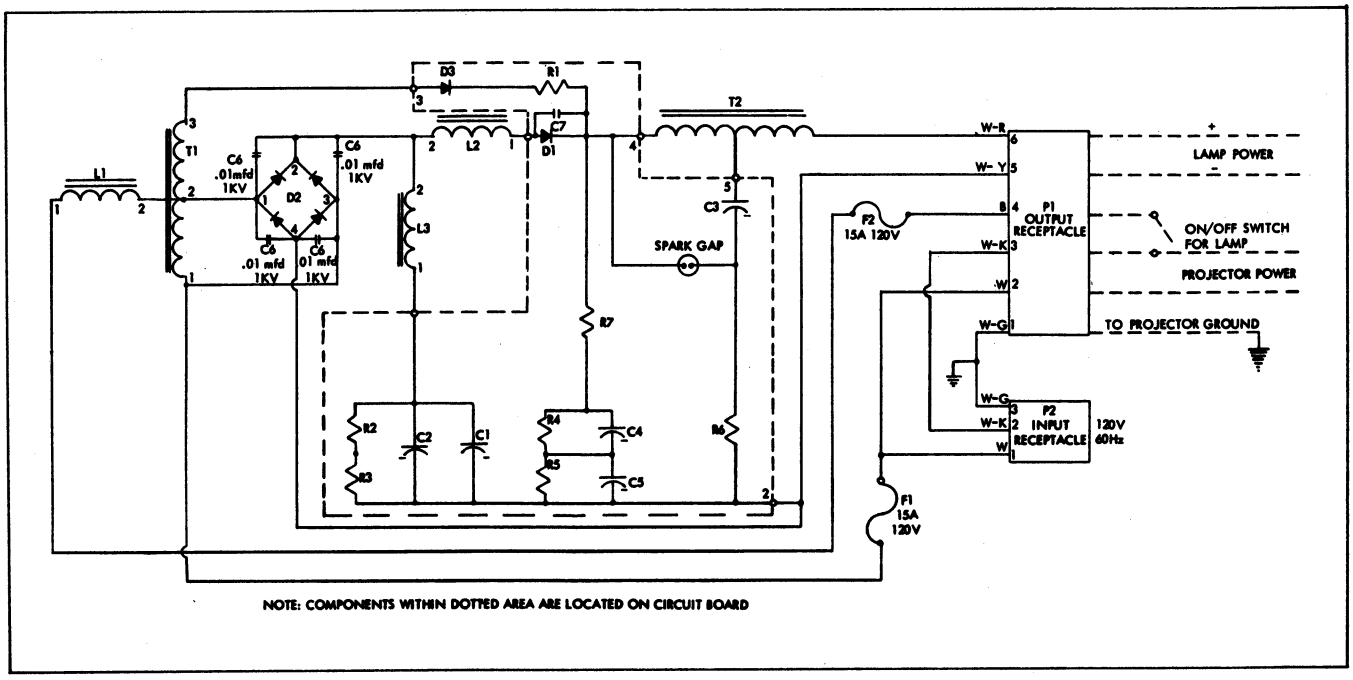


Figure A. Lamp Supply Unit Schematic Wiring Diagram

3. REMOVING THE COVER.

WARNING

DO NOT REMOVE THE COVER WITHOUT FIRST DISCONNECTING THE LAMP SUPPLY UNIT FROM THE POWER SOURCE.

a. Turn the unit over on its top side and unscrew and remove the four rubber feet and the six hex washer head screws from around the outside edge of the bottom plate.

b. Hold the cover and bottom plate securely while turning the unit right-side up, and remove the six slotted pan head screws which hold the front receptacle panel to the cover. Lift off the cover.

TABLE I. COMMERCIAL TEST EQUIPMENT REQUIRED

Test Equipment	Recommended Model
AC Ammeter (0-10A)	
AC Voltmeter	
DC Ammeter (0-15A)	Weston Model 430 or equal
DC Voltmeter (0-500V)	Simpson Model 1327 or equal
Hi-Pot Tester	Associated Research Model 411 or equal
Hi-Voltage Probe	Tektronix Model T6013A or equal
Oscilloscope	Tektronix Model 543A or equal
Variac (Monitored)	General Radio Type W20M73A or equal
Voltohmmeter	Any good quality unit

4. TESTING ELECTRICAL COMPONENTS.

CAPACITORS: Check with capacitor bridge.

DIODES: Check continuity with voltohmmeter.

FUSES: Check for continuity with voltohmmeter.

INDUCTOR L1: Apply 100VAC across terminals 1 and 2; must read 8.5 amps ±5 percent.

INDUCTOR L2: Apply 20VAC across terminals 1 and 2; must read 11.0 amps ±5%.

INDUCTOR L3: Apply 10VAC across terminals 1 and 2; must read 6.0 amps ±10 percent.

RECEPTACLE (OUTPUT): Check for continuity with voltohmmeter.

RESISTORS: Make conventional measurements with voltohmmeter.

TRANSFORMER T1 (BOOST): Apply 120VAC across terminals 1 and 2; must read 380 volts between terminals 1 and 3. Check for shorts between core and winding with voltohmmeter.

TRANSFORMER T2 (PULSE): Determine if faulty by substituting a known good pulse transformer.

NOTE: Spark gap can be measured by checking components of the circuit board for continuity with voltohmmeter (should measure "open").

5. HI-POTENTIAL TEST.

The lamp supply unit must withstand 900 volts AC for one (1) minute or 1080 volts AC for one (1) second when this potential is applied (from zero) between all current carrying parts of the lamp supply unit and dead metal parts.

NOTE: If the results obtained during the following tests (paragraphs 6 through 10) are not as specified, refer to the Troubleshooting chart for corrective action.

6. OPEN CIRCUIT VOLTAGE TEST.

a. With the test hook-up as shown in Figure B (Test Hook-Up No. 1), connect the six-prong plug of the power cable to the lamp supply unit. The switch across the AC ammeter should be closed except when taking the current readings.

b. Switch on the variac and adjust for 105 volts on the AC voltmeter. The DC output voltage on the DC voltmeter should read greater than 400 volts.

c. Adjust the variac for 120 volts on the AC voltmeter. The DC output voltage on the DC voltmeter should read less than 490 volts.

7. PULSE VOLTAGE AND TIME CYCLE TESTS.

a. With the test hook-up as shown in Figure C (Test Hook-Up No. 2), connect the six-prong plug of the power cable to the lamp supply unit. The switch across the AC ammeter should be closed except when taking current readings.

b. Set the VOLTS/CM control at the 2.0 volts/CM position and the TIME/CM control at the 5 microsecond/CM position. Set the "Trigger Mode" control at AC (LF REJECT) and the "Trigger Slope" control at "+" INT.

c. Switch on the variac and adjust the "Stability" and "Triggering Level" controls (per manufacturers instructions) to obtain a single pulse.

d. Adjust the variac for 120 volts AC on the AC voltmeter and measure the peak amplitude of the starting pulse. The pulse should not be greater

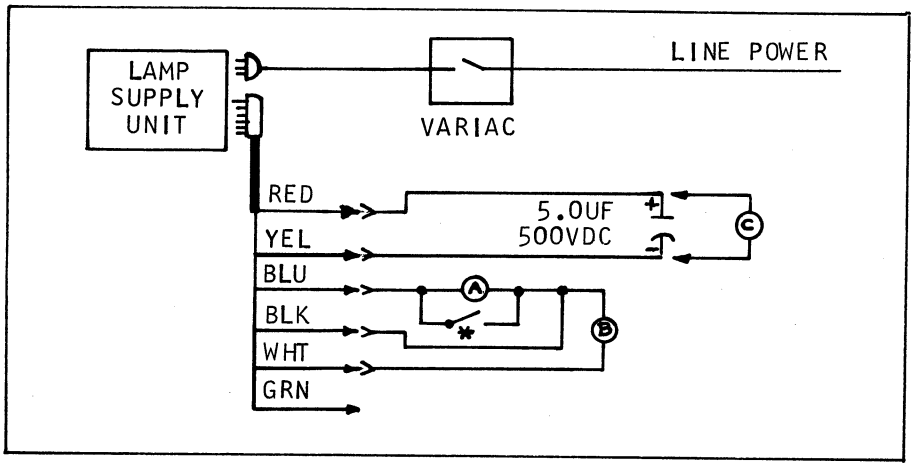


Figure B. Test Hook-Up No. 1

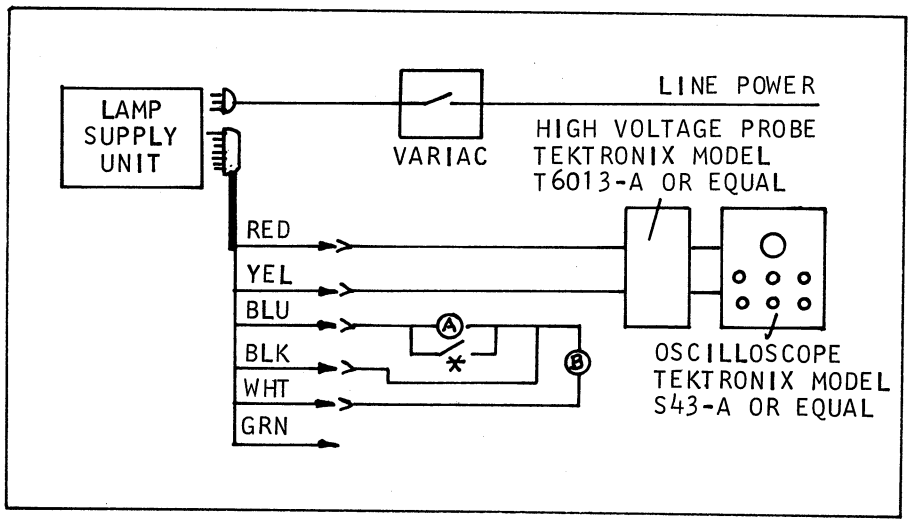


Figure C. Test Hook-Up No. 2

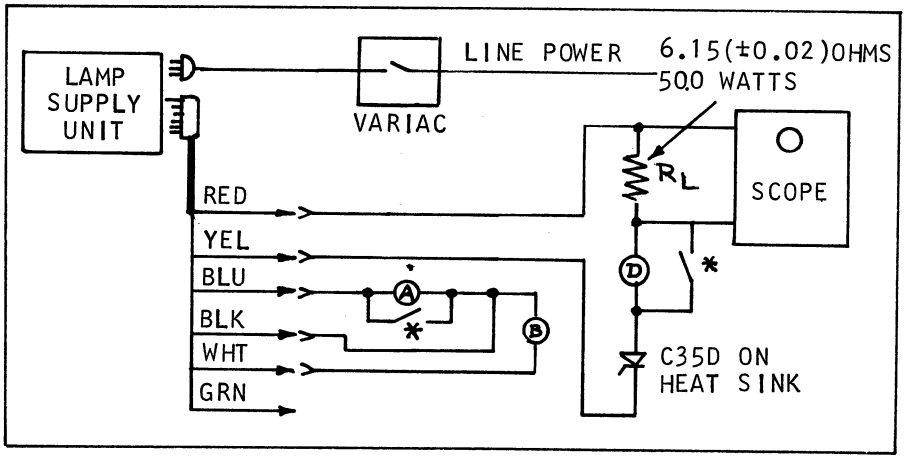


Figure D. Test Hook-Up No. 3

KEY TO TEST EQUIPMENT (ALL DIAGRAMS)

A - AC Ammeter, 0-10A

B - AC Voltmeter

C - DC Voltmeter, 0-500V

D - DC Ammeter (Weston Model 430 or Equal)

* - Switch closed except when taking current readings.

than 12,000 volts (12 volts on scope with 1000X multiplier probe).

e. Using the sweep-second hand of an accurate watch or clock, count the number of pulses in a 30-second period. The pulse count should be between 10 and 40.

f. Adjust the variac for 105 volts on the AC voltmeter and measure the peak amplitude of the starting pulse. The pulse should not be less than 6,600 volts (6.6 volts on scope with 1000X multiplier probe).

8. LOAD INRUSH CURRENT TEST.

a. With the test hook-up as shown in Figure D (Test Hook-Up No. 3), connect the six-prong plug of the power cables to the lamp supply unit. The switches across the ammeters should be closed except when taking current readings.

b. With the oscilloscope in the AC position, set the VOLTS/CM control at the 5 volts/CM position, the TIME/CM control at the 200 millisecond/CM position, the "Multiplier" control at NORMAL, the "Trigger Mode" control at AC (LF REJECT) and the "Trigger Slope" control at "+" INT position.

c. Switch on the variac and adjust for 120 volts on the AC voltmeter.

d. Measure the pulse on the oscilloscope by clicking the ON-OFF switch on the variac. Peak voltage, as measured across the 6.0 ohm load resistor, should be 70 volts minimum to 100 volts maximum (7.0 volts minimum to 10.0 volts maximum on scope with 10X multiplier probe).

9. RIPPLE CURRENT TEST.

a. With the test hook-up as shown in Figure D (Test Hook-Up No. 3), connect the six-prong plug of the power cable to the lamp supply unit. The switches across the ammeters should be closed except when taking current readings.

b. Set the VOLTS/CM control at 0.2 volts/CM position, the TIME/CM control at 5 milliseconds/CM position, and the "Trigger Mode" control at AUTO.

c. Switch on the variac and adjust for 120 volts on the AC voltmeter.

d. Measure the ripple voltage on the scope (across the 6.15 ohm load resistor). Ripple voltage should not exceed 10.0 volts P-P maximum (1.0 volts P-P maximum on scope with 10X multiplier probe).

10. DC OUTPUT AND AC INPUT CURRENT TESTS.

a. With the test hook-up as shown in Figure D (Test Hook-Up No. 3), connect the six-prong plug of the power cable to the lamp supply unit. The switches across the ammeters should be closed except when taking current readings.

b. Switch on the variac and adjust for 120 volts on the AC voltmeter.

c. Close the switch across the DC ammeter, and check the output current reading. Output current should read between 7.4 and 7.9 amps DC. Open the switch.

d. Close the switch across the AC ammeter, and check the input current reading. Input current should not exceed 9.0 amp. Open the switch.

11. TROUBLESHOOTING PROCEDURES.

The following troubleshooting procedures are separated into two groups: those which deal with faulty lamp operation (lamp supply unit connected to the projector), and those which are designed to remedy faulty results obtained during the testing of the lamp supply unit itself (paragraphs 6 through 10). Verification of component failure can be made by performing standard continuity checks or by substituting a new part for the suspected component. Refer to the schematic diagram (Figure A) for component location and identification.

Trouble Shooting

TROUBLE	PROBABLE CAUSE	REMEDY
	FAULTY LAMP OPERATION	
Lamp will not start, but arcs internally	1. Defective lamp.	1. Replace with known good lamp.
	2. Open diode D1.	2. Replace diode.
	3. Open rectifier bridge D2.	3. Replace rectifier bridge.
Lamp will not start, no internal arcing evident	1. Defective lamp.	1. Replace with known good lamp.
	2. Blown fuse (F1, F2).	2. Replace blown fuse.
	3. Defective projector switch or disconnected switch leadwire.	3. Replace switch; reconnect leadwire.
	4. Defective output receptacle or disconnected receptacle leadwire.	4. Replace receptacle; reconnect leadwire.
	5. Defective pulse transformer T2.	5. Test transformer (paragraph 4); replace if defective.
	6. Defective boost transformer T1.	6. Test transformer (paragraph 4); replace if defective.
	7. Defective spark gap (check for continuity: C3, C4, C5, C7, D1, D3, R1, R4, R5, R7. All should measure "open").	7. Replace complete circuit board assembly.
Lamp light output low	1. Defective lamp.	1. Replace with known good lamp.
	2. Excessively low line voltage.	2. Increase line voltage (should be 105 to 120 volts AC, 60Hz).
	3. Defective AC inductor L1.	3. Test inductor (paragraph 4); replace if defective.
Visible "flicker" on screen	1. Defective filter components (C1, C2, L2, L3).	1. Test filter components (paragraph 4); replace defective component.
	2. Defective rectifier bridge D2.	2. Replace rectifier bridge.
Fuse blows repeatedly	1. Grounded AC inductor L1.	1. Replace inductor.
	2. Shorted rectifier bridge D2.	2. Replace rectifier bridge.
Major audible noise	1. Defective AC inductor L1.	1. Test inductor (paragraph 4); replace if defective.

TROUBLE	PROBABLE CAUSE	REMEDY
	IMPROPER SUPPLY UNIT TEST RESULTS (See paragraphs 6 through 10)	
No open circuit voltage (paragraph 6)	1. Blown fuse F1.	1. Replace fuse.
	2. Open connection in circuit.	2. Check circuit and correct "open" condition.
	3. Shorted boost transformer T1.	3. Test transformer (paragraph 4); replace if defective.
	4. Shorted rectifier bridge D2.	4. Replace rectifier bridge.
Open circuit voltage too low (paragraph 6)	1. Open connection in circuit.	1. Check circuit and correct "open" condition.
	2. Open rectifier bridge D2.	2. Replace rectifier bridge.
	3. Defective boost transformer T1.	3. Test transformer (paragraph 4); replace if defective.
	4. Leaky filter capacitor, C1 or C2.	4. Replace defective capacitor.
	5. Defective filter inductor, L2 or L3.	5. Test inductors (paragraph 4); replace if defective.
No pulse voltage (paragraph 7)	1. Open connection or short circuit.	1. Check circuit and correct faulty condition.
	2. Defective pulse transformer T2.	2. Test transformer (paragraph 4); replace if defective.
	3. Open or shorted filter component (C1, C2, L2, L3).	3. Test filter components (paragraph 4); replace defective component.

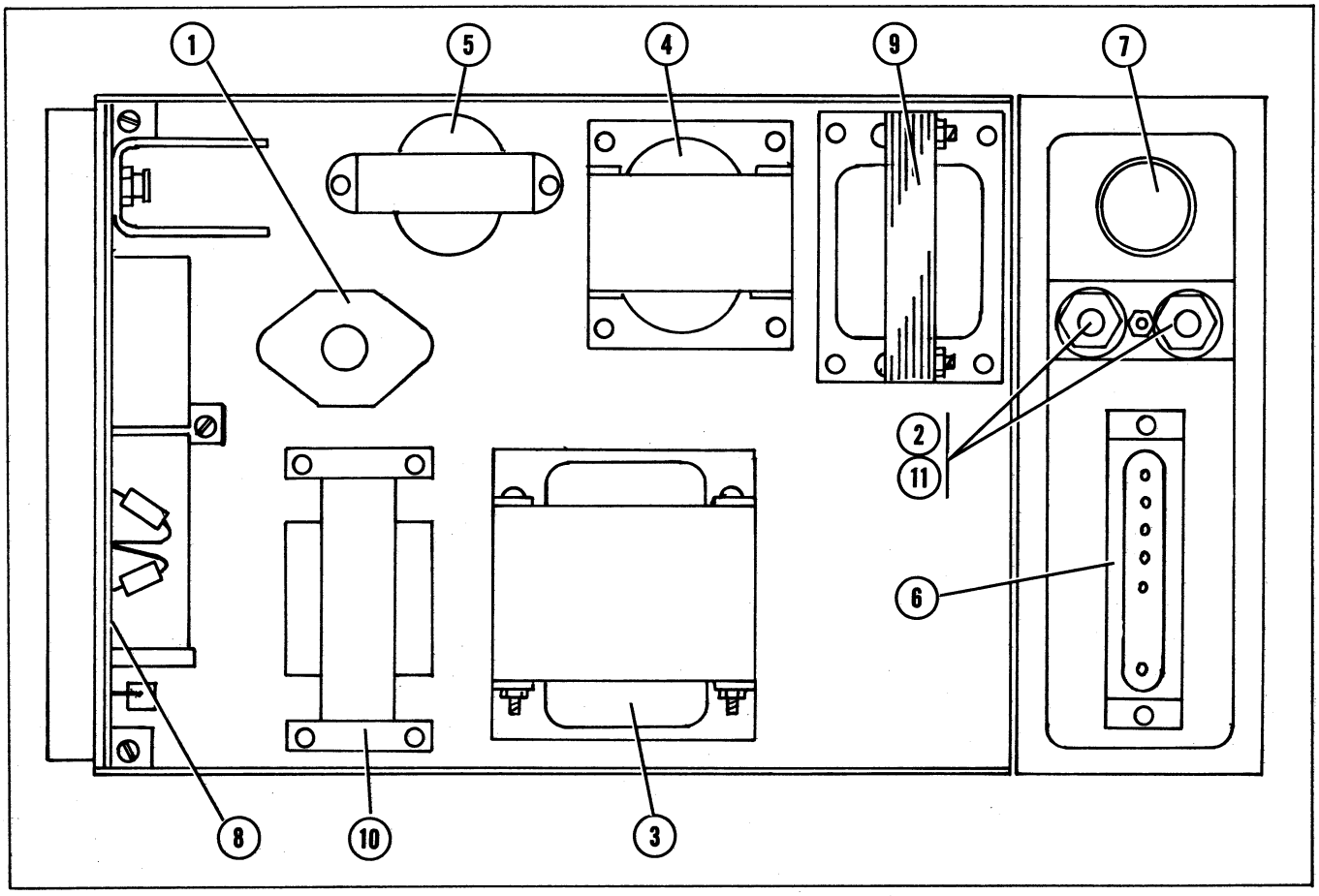


Figure 1. Replacement Parts for Lamp Supply Unit, Part No. 014640

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
		LAMP SUPPLY UNIT		
1-	014640	LAMP SUPPLY UNIT, 60Hz, complete	1	
-1	73175	. BRIDGE RECTIFIER (D2)	1	
-2	73128	. FUSEHOLDER (FH1, FH2)	2	
-3	73171	. INDUCTOR, AC (L1)	1	
-4	73172	. INDUCTOR, Filter (L2)	1	
-5	73173	. INDUCTOR, Filter (L3)	1	
-6	73176	. RECEPTACLE, Output (P1)	1	
-7	73177	. RECEPTACLE, Input (P2)	1	
-8	73174	. PRINTED CIRCUIT BOARD (PCB)	1	
-9	73169	. TRANSFORMER, Boost (T1)	1	
-10	73170	. TRANSFORMER, Pulse (T2)	1	
-11	611895	. FUSE (F1, F2)	2	
		HARDWARE AND MISCELLANEOUS		
	36607	. NUT, Base plate to chassis	8	
	36849	. SCREW, Base plate to chassis	8	
	36882	. SCREW, Slotted hex washer head tapping	12	
	45582	. NAMEPLATE, Bell & Howell (adhesive backed)	1	
	87462	. LABEL, UL (adhesive backed)	1	

SERVICE INSTRUCTIONS

LAMP SUPPLY UNIT

PART NO.077259

This manual is used in conjunction with 16mm Projector Service Manuals P/N 70472, dated December 1969 (Model 566) and P/N 72798, Revised July 1974 (Model 567).

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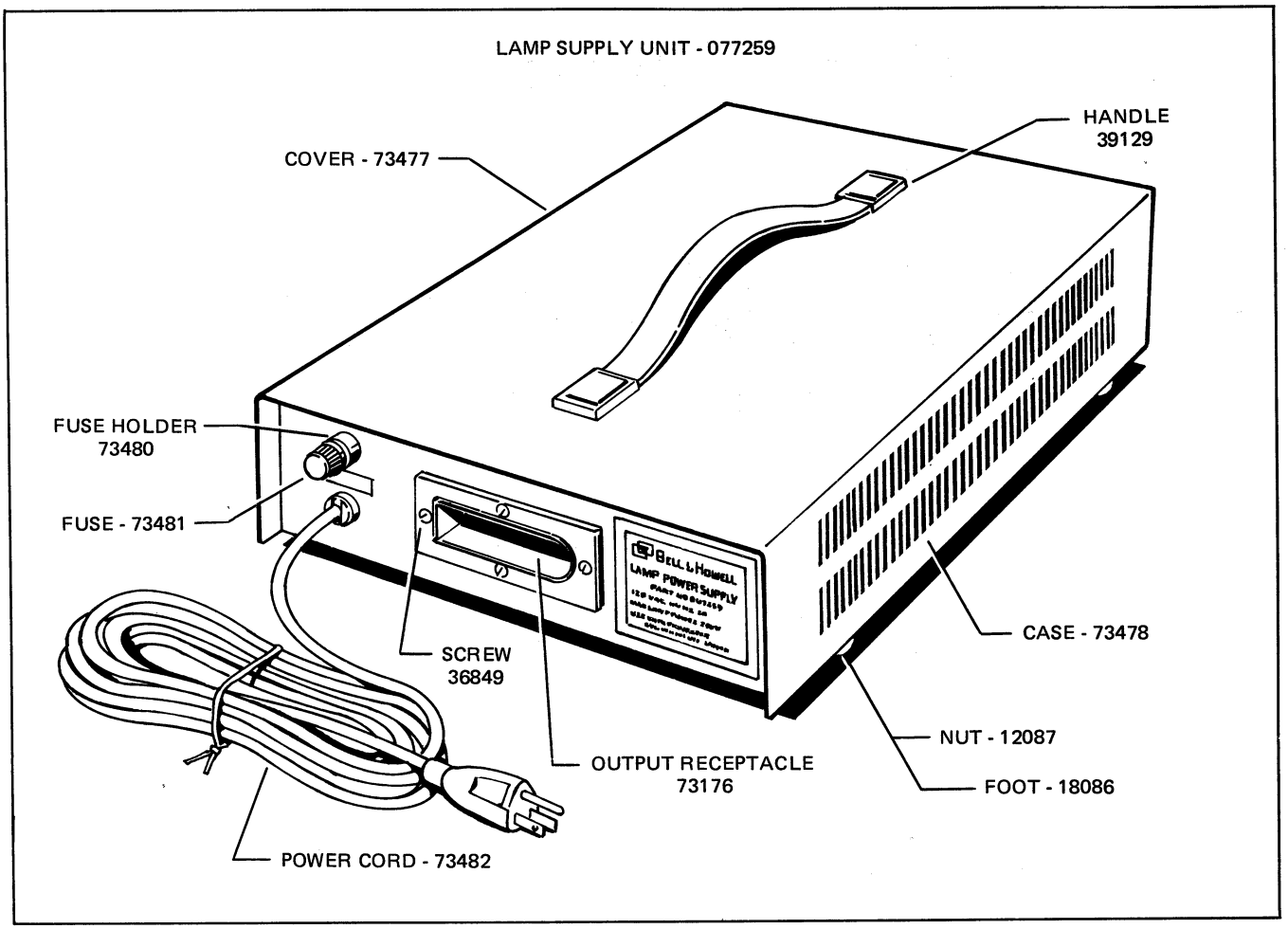
BELL & HOWELL

GENERAL SERVICE DEPT.
7100 McCORMICK ROAD
CHICAGO, ILLINOIS 60645

PART NO. 74418 PRINTED IN U.S.A. OCTOBER 1979



Lamp Supply Unit for Marc[T.M.]-300 or 350 Projection Lamps

FEATURE DESCRIPTION LIST

Bell & Howell Part No. 077259

Overall Dimensions . . . . . 4-3/8"h x 11-11/16"w x 16-1/4"l

Input Voltage . . . . . 105 to 130VAC, 50, 60 or 400Hz

Electrical Specifications, Running:

Output Current at 120VAC . . . . . 7.4ADC ±5%

Input Current at 120VAC . . . . . 7 Amp Maximum

FOR PARTS, ORDERS AND SERVICE INFORMATION
Bell & Howell Company
General Service Dept.
7100 McCormick Road
Chicago, IL 60645
(312) 273-5820

FACTORY SERVICE RECEIVING ADDRESS
Bell & Howell Company
General Service Department
2200 Brummel Place
Evanston, Illinois 60202
(312) 273-5820

1. General Description.

These instructions are provided to assist in the repair/replacement procedures of the Bell & Howell Company 60Hz Lamp Supply Unit, Part No. 077259. This power supply is designed to operate one Marc$^{T.M.}$-350/16T projector lamp such as is used in the Model 566A and 567A motion picture projector.

There will not be any repair/adjusting information available for this power supply. Since the adjustments are extremely critical in allowable tolerances, Bell & Howell Company recommends that electronic repair/adjustments of this power supply not be attempted (see NOTE).

SPECIAL MAINTENANCE PRECAUTIONS.

This service manual is intended for use by professional service personnel with appropriate expertise and tools; it is supplemental information to qualified training and is not to be used by untrained personnel.

All safety precautions included in this service manual (as well as those for any electrical mechanical device) should be followed.

NOTE: If service troubles are traced to the lamp supply unit, the lamp supply unit must be returned to Bell & Howell Company for exchange/replacement. The lamp supply unit should be shipped in its original packaging to prevent possible damage in shipment.

WARNING

Hazardous high voltage and energy (12.5KV starting pulse and 170V at 7.7ADC) are present at the output and in the internal circuitry of this equipment. Service should only be attempted by a qualified serviceman. LAMPS SHOULD NEVER BE CHANGED WITH POWER APPLIED. Unit should only be operated with output connector properly engaged.

2. Principles of Operation.

The power supply described is a new off-line operated high frequency switching type. This supply can operate either the Marc$^{T.M.}$-300 or 350 arc discharge lamp equally well. This supply is rated for operation on ordinary 120VAC circuits at 50, 60 or even 400Hz. A special HV connector is used to connect the power supply to the lamp and to the projector, or optical instrument, associated with the system. Total system power is fed through the power supply to the projector, or optical equipment, by means of the special output connector. ON-OFF operation is achieved by a power switch within the equipment to which the output connector is attached.

A normal-blo 10 amp, 3AG fuse is rated to operate reliably when the projector, or optical equipment, system load does not exceed 2 amps.

A pulse transformer provides the high voltage pulse for initiating pulse breakdown of the lamp gas discharge and starting of the lamp.

Circuitry within the power supply automatically provides a starting pulse to the lamp when power is initially applied. The pulse circuit is disabled once starting is accomplished. Once the arc discharge is established, feedback circuitry within the power supply acts to maintain a constant highly regulated current in the lamp.

An auxiliary transformer provides the isolated voltages needed for operating the regulating circuitry and the starting circuit. This supply is rated for intermittent and continuous duty operation in ambient temperatures between +40 and +104°F. An EMI filter is provided within the supply.

3. Trouble Shooting.

Connect projector to the power supply. Connect the power supply cord to any 120VAC 60Hz outlet. Turn the projector function knob to the project lamp position.

If the lamp does not operate, disconnect line cord and check the fuses, continuity of line cord and continuity of projector cord.

Check the projection lamp.

After evaluating above items and finding them to be okay, the power supply unit should be returned to the General Service Department in the original packaging for replacement (see NOTE).